REPORT

of a

DIAMOND DRILL PROGRAM

on the

LAC DES ILES PROPERTY

of

LAC DES ILES MINES LIMITED

Michael J. Michaud

October 28, 1992

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Report of a Diamond Drill Program on the Lac des Iles Property

Introduction

A diamond drill program was recently completed on the Lac des Iles Property of Lac des Iles Mines Ltd. The Lac des Iles Property, approximately 50 miles north of Thunder Bay, Ontario, is located in the Thunder Bay Mining Division in Northwestern Ontario.

Twenty-two diamond drill holes, totalling 3,862 feet, were drilled on the Lac des Iles Property between March 1 and March 18, 1992. The drilling, which was concentrated in three different areas of the property, was completed to outline any potential mineralization in the proposed waste rock dump area and the proposed tailings pond area which will be required in the event of a future mining and/or milling operation on the Lac des Iles Property. Additional drilling was completed in the east-central portion of the Roby Zone to better delineate and define the eastern contact of the Platinum and Palladium mineralization.

Location and Access

The Lac des Iles Property, which is located in the Lac des Iles Area of the Thunder Bay Mining Division, Ontario, is approximately 50 air miles north of the City of Thunder Bay, Ontario (Figure 1). The property is centered upon Latitude 49 10'N and Longitude 89 37'W, National Topographic Series map area 52 H/4 NE.

The property is easily accessible from the City of Thunder Bay by travelling 60 miles north along Provincial Highway 527 and proceeding 10 miles west along a gravel roadway.

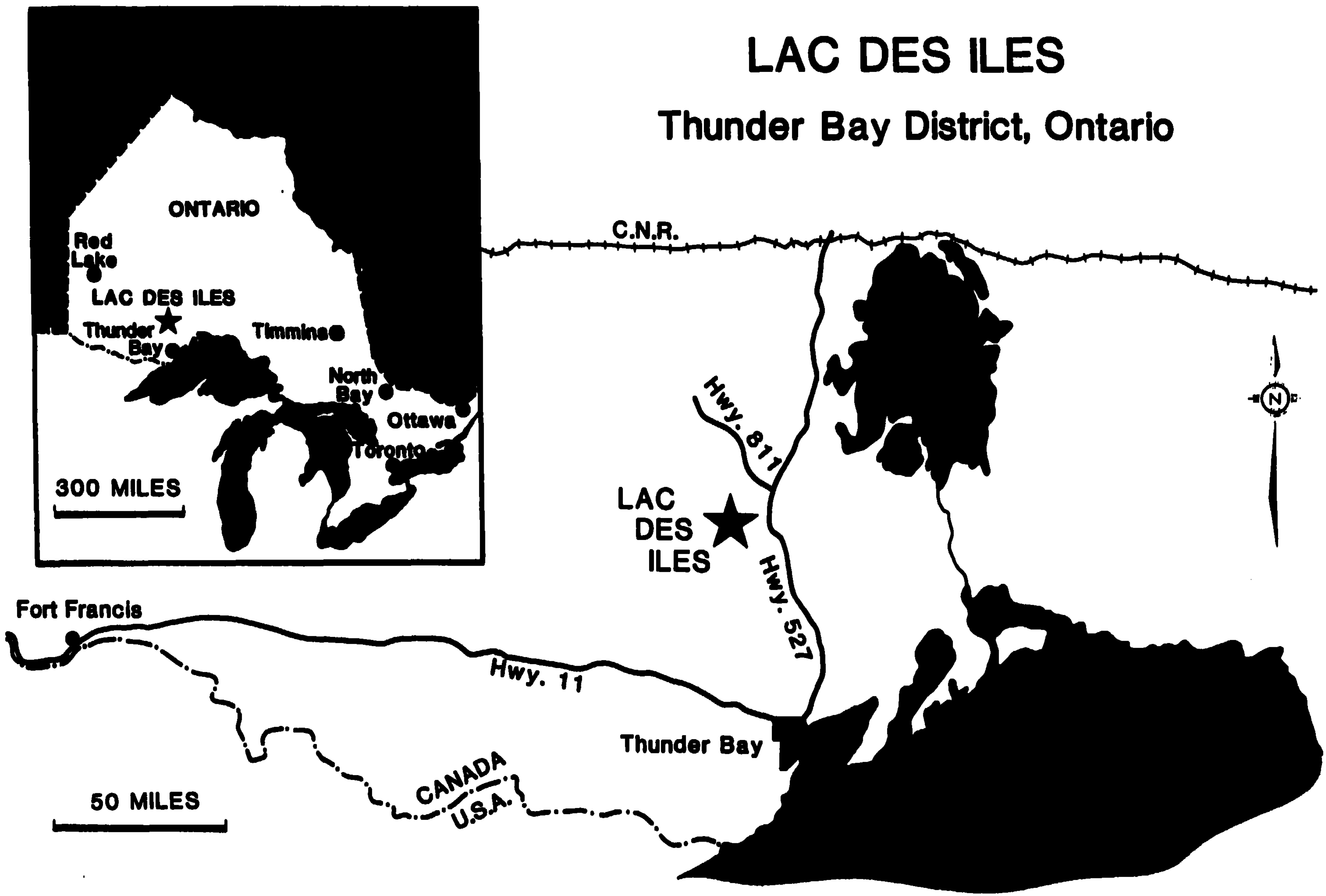

Figure 1: Location Map

Property Claim Group

The Lac des Iles Property, located in the Lac des Iles Area of the Thunder Bay Mining Division, consists of a contiguous claim block comprised of 85 patented and 26 unpatented mining claims (Figure 2). The patented and unpatented mining claims cover a total area of approximately 7,600 acres (Appendix E: Property Claims Listing).

Previous Work

Exploration interest in the area began in the late 1950s, following airborne geophysical surveys which indicated magnetic anomalies associated with the Lac des Iles Comlex. Widespread copper-nickel mineralization was discovered south of Lac des Iles by prospectors W. Baker and G. Moore in 1963. These claims were acquired by Gunnex Limited and subsequently optioned by Anaconda American Brass Ltd. Work by these companies, between 1963 and 1966, resulted in the delineation and examination of eight mineralized zones with significant PGE concentrations. The claims were allowed to laspe and were staked by K. Kuhner in 1973. The claims were acquired by Boston Bay Mines Ltd. in 1974. Texasgulf Canada Ltd. optioned the property in 1975 and with Boston Bay Mines Ltd. carried out an extensive exploration program in 1975 and 1976. This work included geological mapping, surface stripping and trenching and diamond drilling of 117 holes totalling 65,356 feet. The exploration effort resulted in the delineation of a zone of palladium and platinum mineralization named the Roby Zone. Texasgulf Canada Ltd. dropped the property in 1976.

In 1986, Madeleine Mines Ltd. acquired the claims from the Platinum Group Ltd., a private, federally chartered company which was 90 percent owned by Boston Bay Mines Ltd. Madeleine Mines Ltd completed linecutting, clearing of timber and surface stripping of overburden in the area of the Roby Zone. Madeleine Mines Ltd. completed 34 diamond drill holes totalling 36,777 feet in 1986 and 16 drill holes totalling 11,319 feet in 1987.

The property is presently controlled by Lac des Iles Mines Limited.

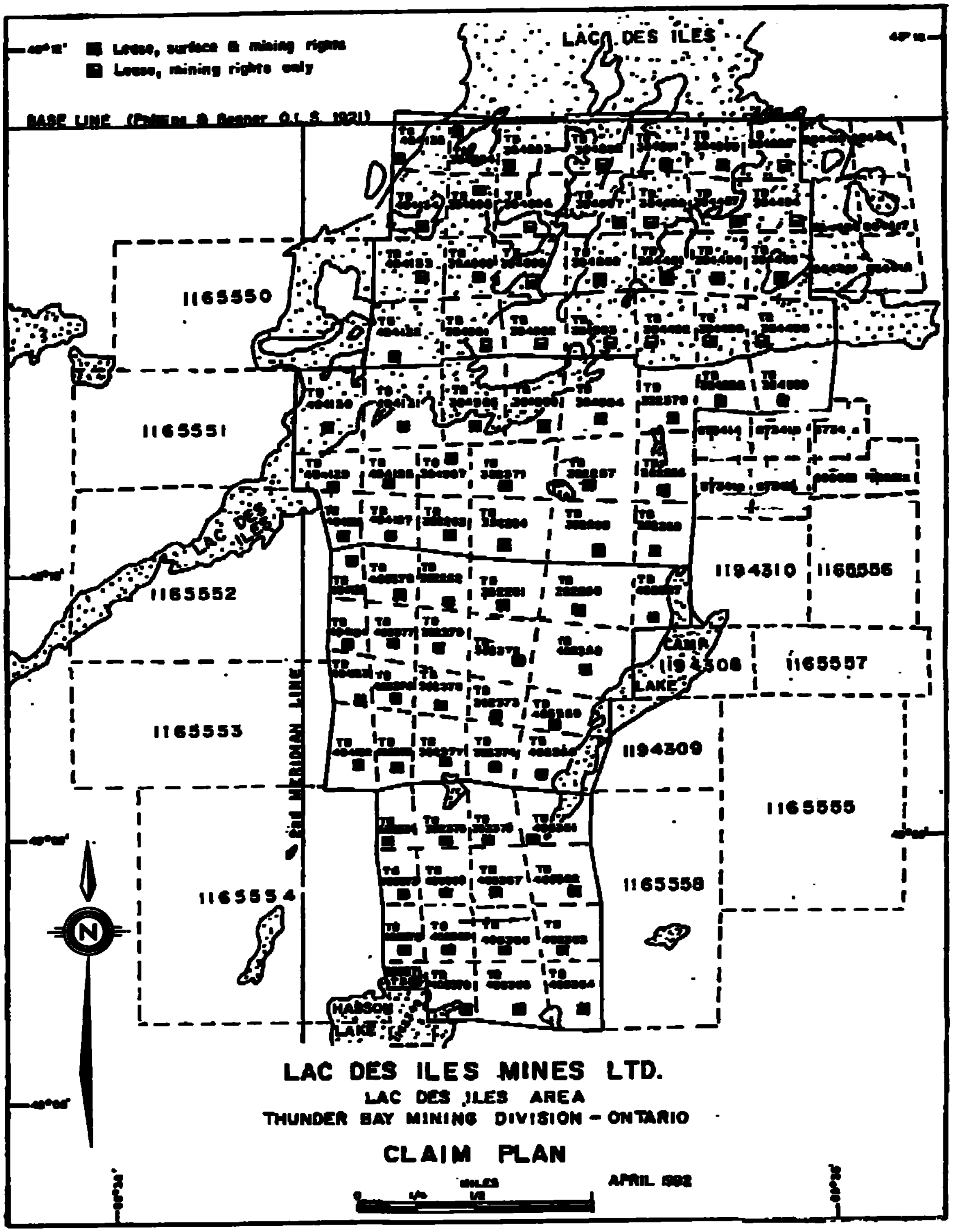

Figure 2: Property Claim Package

Regional Geology

The Archean Lac des Iles (LDI) mafic-ultramafic Complex, which lies within granite-granite gneiss terrain of the Wabigoon Subprovince, forms part of the east-northeast trending linear zone of mafic plutons extending from Atikokan to Lake Nipigon. This zone parallels the boundary between the Wabigoon and Quetico Subprovinces.

The mafic intrusions in the Lac des Iles Area, of which the LDI Complex is the largest, form a circular structure approximately 18 miles in diameter (Figure 3). The mafic and ultramafic rocks of the complex intrude and are intruded by a suite of tonalite plutons, which implies coeval felsic and mafic magmatism. To the east of the LDI Complex a volcanic-sedimentary greenstone belt of the Southern Wabigoon Subprovince is sub-parallel to the boundary with the Quetico Subprovince to the South. The locally intense deformation in the volcanic and sedimentary rocks does not occur within the LDI intrusion. In addition, the volcanic and sedimentary rocks have been metamorphosed to amphibolite grade, whereas in contrast, the LDI intrusive rocks are unmetamorphosed. All the Archean rocks have been intruded by Proterozoic diabase dykes and sills.

Local Geology

The northern ultramafic centre of the LDI Complex has been further subdivided into several intrusive phases, which consist mainly of pyroxenite and peridotite (Figure 4). The gabbroic centre to the south consists of norite, gabbronorite and gabbro, which are intruded by several mafic to ultramafic dykes and sills. The gabbroic rocks, which are host to the PGE mineralization of the Roby Zone, commonly contain an igneous lamination, which dips steeply inwards and generally parallel to the margin of the intrusion.

Modal layering is rare, but dips steeply sub-parallel to this lamination. Both the igneous lamination and the modal layering within the gabbroic rocks define an elongate, funnel shape. The gabbroic rocks have undergone significant alteration, ascribed to deuteric processes, resulting in partial to total saussurization of feldspar and uralitization of clinopyroxene.

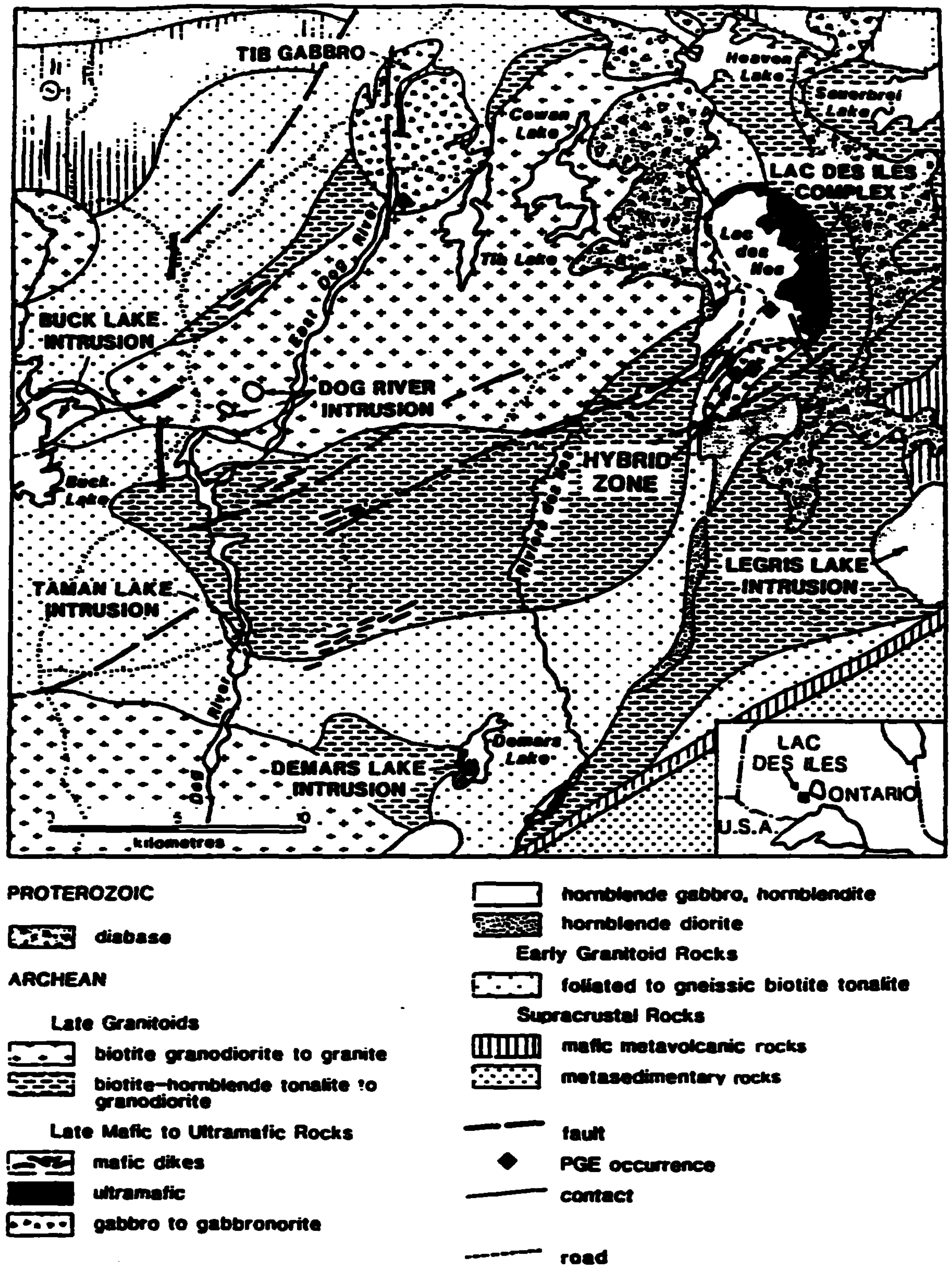

Figure 3: Regional Geology

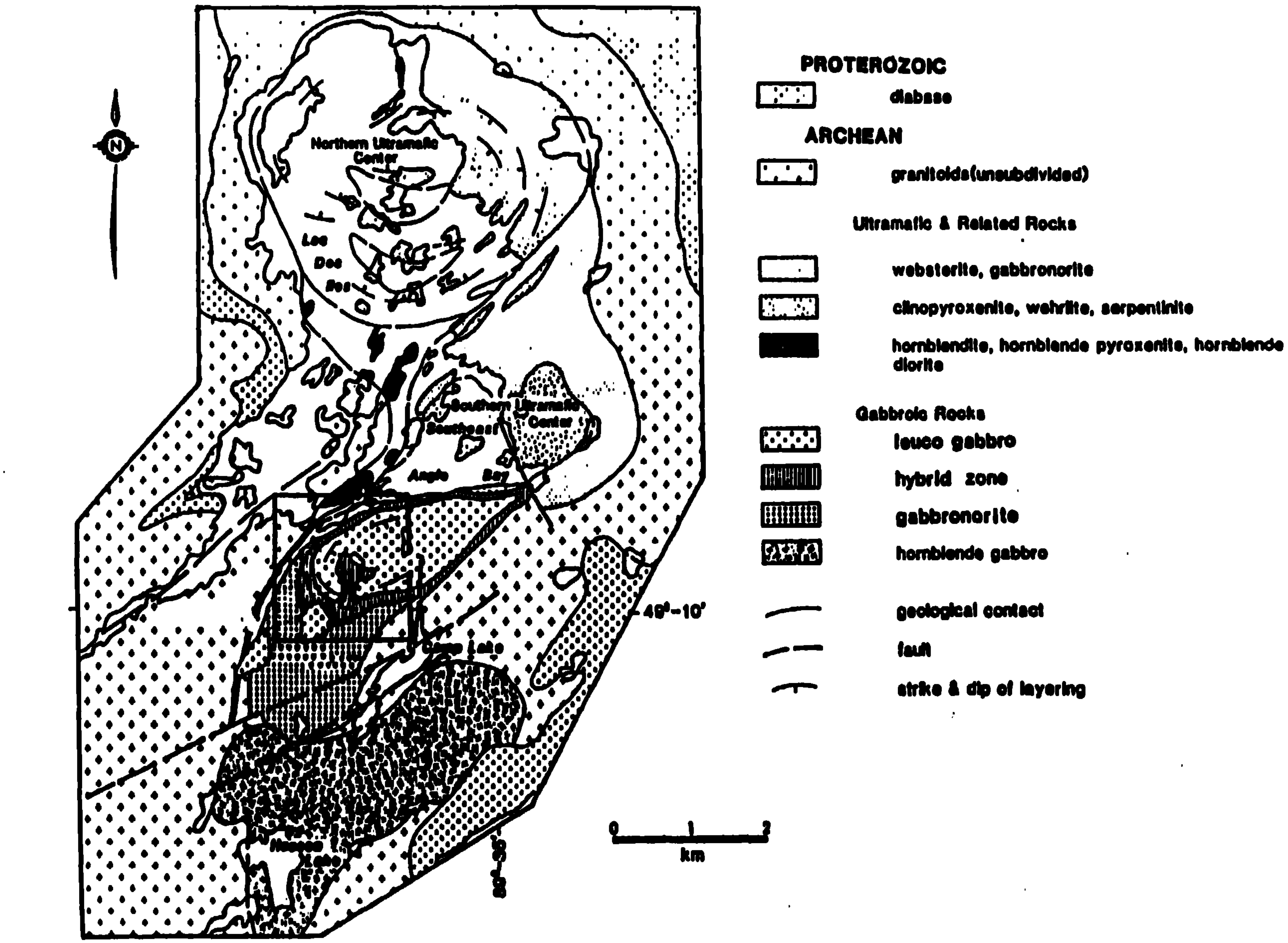

Figure 4: Local Geology

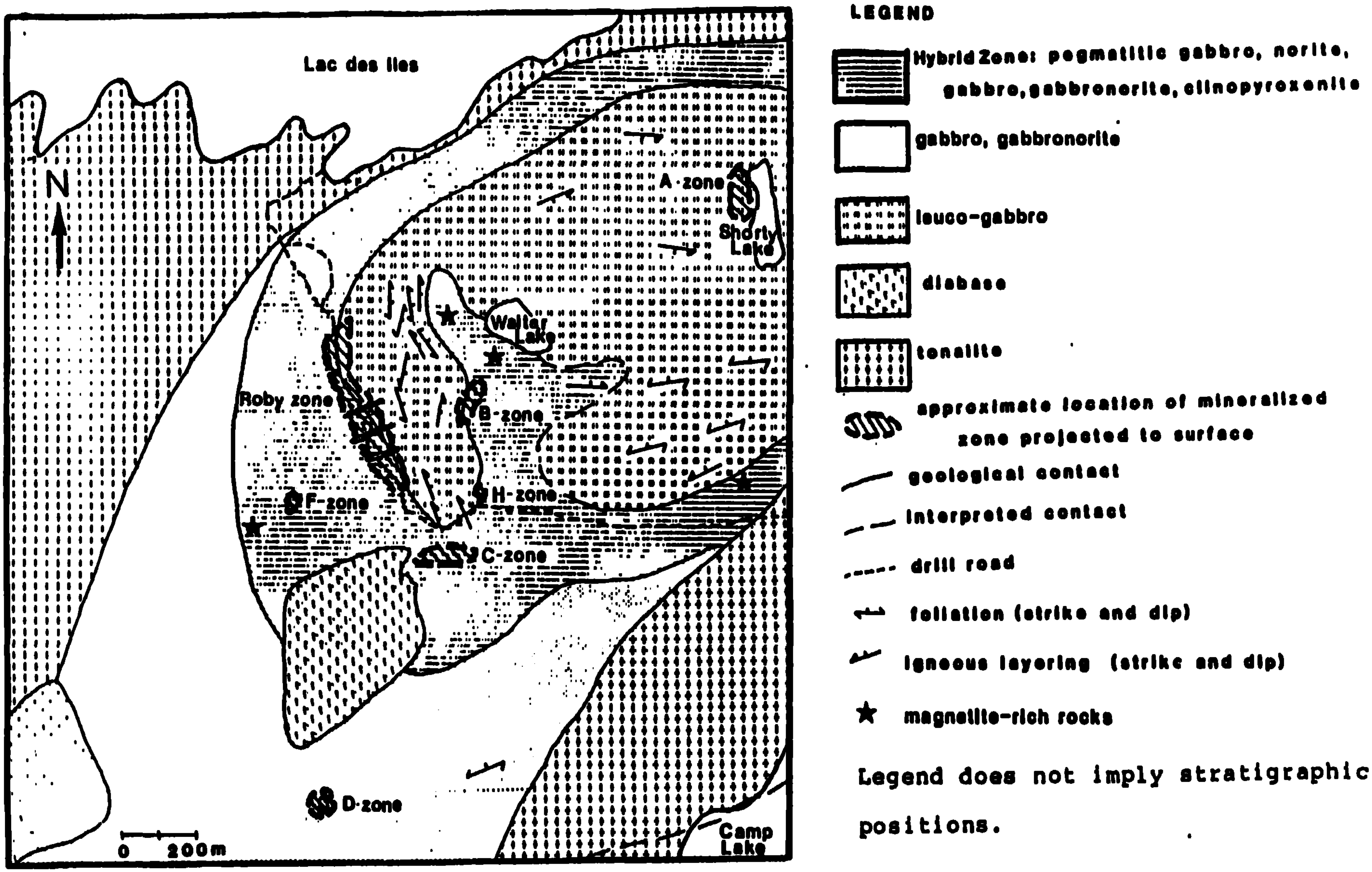

Figure 5: Property Geology

The PGE Mineralized Roby Zone, extending for a strike length of 2000 feet and a width up to 400 feet, occurs in a very compositionally and texturally complex zone of the gabbroic portion of the LDI Complex (Figure 5). This unit, termed "Varitextured Gabbro", hosts a very high degree of variability, where rock compositions range from pyroxenite to norite, gabbronorite, gabbro and anorthosite, and grain size ranges from fine grained to sizes up to 4 inches in length. The varitextured gabbro is intruded by a number of late-stage pyroxenite dykes and coarse grained gabbro-norite dykes. The pyroxenite units are locally sheared with abundant amphibole and talc alteration. Mineralization of the gabbroic and pyroxenitic portions of the Roby Zone consists of generally less than 3-5% disseminated and irregular blebs of pyrite, pyrrhotite and chalcopyrite. The varitextured gabbro and the associated PGE mineralization is interpreted to be a result of a complex interaction between felsic, ultramafic and highly fractionated, volatile-bearing gabbroic magmas.

Results of Diamond Drilling

Recently, a diamond drill program was completed on the Lac des Iles Property of Lac des Iles Mines Ltd. The drilling was performed by Norex Drilling Ltd. between March 1 and March 18, 1992. A total of 22 holes were drilled (Numbered 92-1 to 92-22) for 3,862 feet of drill core. Of this total, 3022 feet of drill core is BQ size and the remaining 840 feet is NQ size. The NQ sized core was drilled in the PGE mineralized Roby Zone to obtain a larger, more representative sample and to provide a sufficient sample for possible future metallurgical analysis. The drill core was logged and sampled over 10 foot sections of core, except across geological contacts (Appendices B and C). The samples were assayed for Platinum and Palladium by Barringer Laboratories using a 2 assay-ton sample for Fire Assay with an AA Finish (Appendix D). The drill core is presently being stored in the mill complex located on the Lac des Iles Property.

The drilling was completed in three different areas of the property; the proposed tailings pond area, the proposed waste rock dump area and the east-central portion of the PGE mineralized Roby Zone (Appendix A). Drilling in the areas of the proposed tailings pond and the proposed waste rock dump was completed to outline any potential mineralization that may exist. Drilling of the Roby Zone was completed to better delineate and define the distinct, eastern mineralized contact of the zone near surface, and to, secondly, provide a sufficient sample of the mineralized Pyroxenite unit, adjacent to the east contact, for future metallurgical analysis.

The five drill holes, numbered 92-1 to 92-5, drilled in the vicinity of the proposed tailings pond area intersected a relatively uniform package of medium grained, leucogabbro to gabbro with a limited amount of local compositional variation to melagabbro. The gabbroic rocks have undergone only minor amphibole alteration of the pyroxenes. Mineralization includes only trace amounts of fine grained, disseminated pyrite and pyrrhotite. All assays returned less than 100 ppb PGE (Platinum plus Palladium).

Three drill holes, 92-6, 92-21 and 92-22, were drilled in the area of the proposed waste rock dump, which is located approximately 1400 feet west of the Roby Zone. The drill holes intersected a package of anorthosite, leucogabbro, gabbro and varitextured gabbro. These lithologies, which are correlatible between drill holes, are steeply dipping to the east. The varitextured unit was moderately amphibole altered with up to 2% disseminated and irregular blebs of pyrite, pyrrhotite and chalcopyrite. Drill holes 92-6 and 92-22 intersected this varitextured gabbro unit and returned .003 opt Pt and .026 opt Pd over 87.25 feet and .004 opt Pt and .027 opt Pd over 60 feet, respectively. Drill hole 92-21 returned several anomalous values up to .002 opt Pt and .018 opt Pd over 10 feet from moderately amphibilotized gabbro with a minor amount of textural and compositional variability.

A total of 11 diamond drill holes were drilled along the eastern contact of the mineralized Roby Zone. The holes intersected varitextured gabbro to the west, a uniform leucogabbro package to the east, and an, up to 50 foot wide, pyroxenite horizon at or near the contact of the gabbroic units.

The varitextured gabbro is very compositionally, from anorthositic to pyroxenitic, and texturally, from fine grained to up to 4 inches in size, complex. The varitextured gabbro is locally, intensely sheared and amphibole and talc altered, with moderate amounts of chlorite and epidote alteration. Mineralization consists of up to 5% disseminated and irregular shaped and sized blebs of pyrite and pyrrhotite with chalcopyrite rims. The pyroxenite horizon, located at or near the east, mineralized, varitextured gabbro contact, is up to 50 feet wide and dips to the east at approximately 80 degrees. The pyroxenite unit, often termed amphibolite in the drill logs, is highly sheared, amphibilotized and talc altered. Mineralization includes 2-3% disseminated pyrite and pyrrhotite, with a lesser amount of chalcopyrite. A uniform package of medium grained, locally layered, leucogabbro occurs east of and adjacent to the east contact of the PGE mineralization. The PGE mineralization in the Roby Zone appears to be associated with the varitextured gabbro and the pyroxenite horizon. The assay results are summarized in Table 1 below.

Drill Hole Number	Weighted Average (opt Pt, opt Pd/Footage)
92-7	.006, .071 / 59.15
92-8	.006, .084 / 66.0
92-9	.008, .137 / 105.0
92-10	.010, .072 / 8.0
92-11	.013, .149 / 77.0
92-12	.003, .051 / 72.0
92-13	.025, .350 / 63.5
92-14	.005, .063 / 29.0
92-15	.001, .021 / 43.0
92-16	.006, .058 / 55.0
92-17	.005, .054 / 45.0
92-18	.007, .065 / 34.0
92-19	.011, .132 / 276.0
92-20	.007, .116 / 190.0 from 140.0 to 330.0 feet

Table 1 : Results of 1992 Roby Zone Drilling

Conclusions and Recommendations

Twenty-two diamond drill holes , totalling 3862 feet, were recently completed in three different areas of the Lac des Iles Property; the proposed tailings pond area, the proposed waste rock dump area, and the east-central portion of the PGE mineralized Roby Zone.

Five drill holes were completed in the proposed tailings pond area and returned no significant assays. The relatively uniform package of gabbroic rocks in the area, combined with the results of the recent diamond drilling, suggests that this area has a low potential for PGE mineralization.

Three diamond drill holes completed in the proposed waste rock dump area intersected significant, low grade PGE mineralization. The anomalous assays are associated with a locally amphibolitized, varitextured gabbro similar to that of the Roby Zone. It is recommended that surface mapping and surface stripping or trenching be completed to obtain a better understanding and delineation of the PGE mineralization. Additional drilling of this area should be pending the results of the surface exploration.

Drilling of the east-central portion of the Roby Zone intersected the PGE mineralized, varitextured gabbro to the west, a non-mineralized, uniform package of leucogabbro to the east, and a mineralized, up to 50 foot wide, pyroxenite horizon near or at the contact of the gabbroic units. It is recommended that additional drilling should be completed along the strike of the distinctive, mineralized, near surface, contact of the Roby Zone. This will provide invaluable information for future ore reserve calculations and mining designs.

Respectfully Submitted

Michael J. Michaud

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Edgar, A.D. and Sweeny, J.M. 1991. The Geochemistry, Origin and Economic Potential of the Platinum Group Element Bearing Rocks of the Lac des Iles Complex, Northwestern Ontario, Ontario Geoscience Research Grant Program, Grant No. 286; Ontario Geological Survey, Open File Report 5746, 87p.

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Pye, E.G. 1968. Geology of the Lac des ILes Area, District of Thunder Bay. Ontario Department of Mines, Geological Report 64, 47 p.

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Certificate of Qualifications

I, Michael J. Michaud, hereby certify that:

1. I reside at 104 Newberry Crescent in Thunder Bay, Ontario.

2. I am a graduate of the University of Waterloo's Honours Earth Science Program as of April, 1987.

3. I have been actively engaged in mineral exploration and mining since 1985.

4. I am a member of the Geological Association of Canada and the Prospectors and Developers Association.

5. I hold no, nor do I expect to hold any, direct or indirect interest in the Lac des Iles Property.

Michael Michaud

October 28, 1992

APPENDIX A

APPENDIX B

APPENDIX C

Geological Legend for the Lac Des Iles Property

An	Anorthosite
lGab	Leucogabbro
Gab	Gabbro
mGab	Melagabbro
Am	Amphibolite *
Pxn	Pyroxenite
G	Undifferentiated Granites
Db	Diabase
qv	Quartz Vein

Note: The above order does not represent age relationship

cpn	clinopyroxene	f	fine grained
opn	orthopyroxene	m	medium grained
pn	pyroxene *	c	coarse grained
h	horneblende *	v	very coarse grained
ov	olivine *	uni	uniform textured
bz	bronzite	var	variable textured
sup	serpentine *	gntx	gneissic textured
aug	augite *	layc	compositionally layered
bi	biotite *	layt	texturally layered
ch	chlorite *	fol	foliated
ep	epidote *	sh	sheared
tk	talc *	fr	fractured
mag	magnetite *	min	minor
hem	hematite *	mod	moderate
ur	uralite	abn	abundant
Pt	platinum	alts	serpentinized
Pd	palladium	altc	chloritized
Au	gold	alte	epidotized
py	pyrite *	altt	talc altered
cpy	chalcopyrite	altu	uralitized
po	pyrrhotite *	alta	amphibilotized
pent	pentlandite		
mo	molybdenite *		
fel	feldspar *		

* Denotes the abbreviations taken from:

Geological Survey of Canada, 1975, "Guide to Authors- A Guide for the Preparation of Geological Maps and Reports", Miscellaneous Report 16, p. 17.

DIAMOND DRILL RECORD

NAME OF PROPERTY: LAC DES ILES MINE
HOLE NO.: 92-1
LENGTH: ~~300'~~ 302.25
LOCATION: D ZONE LOCATION 'D' Tailings Area
LATITUDE: 101,823 N
DEPARTURE: 104,802 (Not Surveyed)
ELEVATION: 9950.0
AZIMUTH: S 30° W
DIP: -45°
STARTED: 1 MAR '92
FINISHED: 2 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-1 SHEET NO. 1 OF 6
REMARKS: CASING TO 10'
CORE BQ
Drill cont. Norex
LOGGED BY: S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0	8'	OVERBURDEN - GLACIAL TILL, POORLY SORTED, FRAGMENTS OF COBBLES & PEBBLES RECOVERED RANGING FROM GRANITE TO PYROXENITE TO DIABASE.
8'	16.5'	GABBRO - MEDIUM GRAINED, 65% DARK GREEN/BROWN PYROXENES, 35% FELDSPARS WITH A PALE MAUVE HUE, MINOR BIOTITE SCATTERED THROUGHOUT. NO SULFIDES NOTED.
16.5'	65.5'	GABBRO - MEDIUM GRAINED, 50% MEDIUM GREEN PYROXENES, 50% MILKY COLOURED FELDSPARS. BANDS OF ANORTHOSITE SPECKLED MODERATELY TO HEAVILY WITH BIOTITE OCCUR THROUGHOUT THIS UNIT AS ITEMIZED BELOW. 16.95 - 17.00 ANORTHOSITE VEIN AT 30° - STAINED WITH MEDIUM-GRAINED PYROXENES. 19.70 - 20.70 ANORTHOSITE SPECKLED WITH 2-3% BIOTITE 22.15 - 22.30 ANORTHOSITE, 5% BIOTITE 22.50 - 23.85 ANORTHOSITE 10-15% BIOTITE, ¼" MASSIVE BIOTITE ALONG A 50° FRACTURE AT 22.75. MINOR MARGIN OF PYROXENES BELOW FRACTURE. 24.70 - 25.00 ANORTHOSITE 5-10% BIOTITE 25.50 - 25.70 ANORTHOSITE, SPECKS & CLUSTERS OF BIOTITE 27.00 - 27.15 ANORTHOSITE 15% BIOTITE 28.70 - 30.85 ANORTHOSITE FIRST 4" >50% BIOTITE, REMAINDER 25% BIOTITE. PYRITE NOTED

m	RQD
0-1	—
2	—
3	57
4	58
5	74
6	23
7	74
8	42
9	72
10	67
11	75
12	45
13	78
14	73
15	49
16	75
17	61
18	68
19	80
20	95
21	97
22	94
23	100
24	96
25	94

SAMPLE NO.	% SULPH-IDES	FOOTAGE FROM	FOOTAGE TO	TOTAL	ASSAYS %	%	Pt oz/ton	Pd oz/ton
501		7.85	10	2.15				
502		10	20	10			<.001	<.001
503		20	30	10				
504		30	40	10			<.001	<.001
505		40	50	10				
506		50	60	10			<.001	<.001
507		60	70	10				
~~508~~								
~~509~~								
~~510~~								
~~511~~								

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-1 LENGTH 203'
LOCATION D ZONE LOCATION 'D'
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH S 30° W DIP -45°
STARTED 1 MAR '92 FINISHED 3 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-1 SHEET NO. 2 of 6
REMARKS ______
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
		31.70-31.80 ANORTHOSITE VEIN AT 15° - ZONED FROM FINE GRAINED AT CENTER TO MEDIUM GRAINED CONTACTS.
		32.50-32.85 ANORTHOSITE, 20% BIOTITE
		37.00 SILICIFIED FRACTURE AT 60° WITH GOLDEN BROWN LEACH STAINING.
		37.70 SILICIFIED FRACTURE AT 90°
		38.30 SILICIFIED FRACTURE AT 50°
		40.30-40.50 ANORTHOSITE / QUARTZ VEIN AT 40°
		41.30 SILICIFIED FRACTURE AT 40°
		46.00-47.00 GABBRO SLIGHTLY REMOBILIZED + SMALL DIABASE VEIN ASSOCIATED WITH ALTERATION FROM 46.00-46.10
		53.90-56.50 ANORTHOSITE VEIN AT 40° SLIGHTLY REMOBILIZED WITH LINEATION PARALLEL TO CONTACTS.
		62.10-62.25 ANORTHOSITE VEIN 3% BIOTITE.
65.5'	89.15'	FELDSPATHIC PYROXENITE - MEDIUM GRAINED 75% MEDIUM GREEN TO BRONZE COLOURED PYROXENES 25% MILKY WHITE FELDSPARS NO SULFIDES NOTED.
89.15'	97.75'	GABBRO MEDIUM GRAINED, 40% MEDIUM GREEN PYROXENES, 60% MILKY WHITE TO BROWNISH WHITE FELDSPARS WHICH ARE SLIGHTLY COARSER GRAINED THAN THE PYROXENES.
		88.00-88.05 SLIGHTLY SERPENTINIZED FRACTURE AT 40°

m	RQD
25-26	90
27	50
28	98
29	98
30	95
31	97
32	100
33	83
34	89
35	96
36	79
37	99
38	98
39	88
40	89
41	71
42	69
43	96
44	98
45	97
46	97
47	88
48	63
49	93
50	66

SAMPLE NO.	% SULPH IDES	FOOTAGE FROM	FOOTAGE TO	FOOTAGE TOTAL	ASSAYS %	%	Pt. OZ/TON	Pd. OZ/TON
508		70	80	10			<.001	<.001
509		80	90	10				
510		90	100	10			<.001	<.001

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-1 LENGTH 303'
LOCATION D ZONE LOCATION 'D'
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH S 30° W DIP -45°
STARTED 1 MAR '92 FINISHED 2 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-1 SHEET NO. 3 of 6
REMARKS ____
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	m	RQD	SAMPLE NO.	%	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
97.75'	154.00'	GABBRO - MEDIUM-GRAINED, 60% MEDIUM TO DARK GREEN PYROXENES, 40% MILKY WHITE FELDSPARS. NO SULFIDES NOTED	50-51	86	511		100	110	10				
			52	91									
			53	94	512		110	120	10			<.001	<.001
			54	91									
		125.75 CHLORITIZED FRACTURE AT 65°	55	95	513		120	130	10				
		126.25 CHLORITIZED FRACTURE AT 65°	56	88									
		128.70 CHLORITIZED FRACTURE AT 65°	57	100	514		130	140	10			<.001	<.001
		129.10 CHLORITIZED FRACTURE AT 65° 130.30 CHLORITIZED FRACTURE AT 65°	58	100	515		140	150	10				
		134.30 CHLORITIZED FRACTURE AT 55°	59	100									
154.00'	156.60	GABBRO - COARSE GRAINED, 50% DARK GREEN PYROXENES, 50% MILKY WHITE FELDSPARS WITH A MAUVE HUE.	60	92	516		150	160	10			<.001	<.001
			61	60									
			62	77	517		160	170	10				
			63	97									
		155.15 MYLONITE FRACTURE AT 65°	64	100	518		170	180	10			<.001	<.001
156.60	161.75	GABBRO - MEDIUM GRAINED, 60% MEDIUM TO DARK GREEN PYROXENES, 40% MILKY WHITE FELDSPARS.	65	98									
			66	89									
161.75	163.05	GABBRO - COARSE GRAINED, 50% DARK GREEN PYROXENES, 50% MILKY WHITE FELDSPARS WITH A MAUVE HUE.	67	92									
			68	97									
163.05	180.05	GABBRO - MEDIUM GRAINED, 60% MEDIUM TO DARK GREEN PYROXENES, 40% MILKY WHITE FELDSPARS.	69	87									
			70	95									
			71	93									
		164.90-165.05 DIABASE ~~[illegible]~~ SEGMENT AT 50°	72	83									
			73	96									
			74	81									
			75	68									

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-1 LENGTH [illegible]
LOCATION D ZONE LOCATION 'D'
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH S 30° W DIP -45°
STARTED 1 MAR '92 FINISHED 3 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-1 SHEET NO. 4 of 6
REMARKS ____
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
180.05	187.00	GABBRO. COARSE TO MEDIUM GRAINED IN A FINING UPWARD CYCLE. 50% MEDIUM GREEN PYROXENES, 50% GREYISH TO MILKY WHITE FELDSPARS. >1% SULFIDES NOTED IN COARSE SEGMENTS. 180.85-181.50 MEDIUM GRAINED 180.85-180.95 FINE GRAINED DIABASE SEGMENT AT 40° 181.50-187.00 COARSE GRAINED 182.20-182.50 ANORTHOSITE SEGMENT WITH INTERSTITIAL QUARTZ. 40° 184.30-186.00 SLIGHTLY REMOBILIZED AND CROSSCUT WITH MINOR ANORTHOSITE VEINS AND MYLONITIC PORTIONS.	519		180	187	7				
187.00	199.00	GABBRO - COARSE TO MEDIUM GRAINED IN A FINING UPWARD CYCLE. 50% MEDIUM GREEN PYROXENES, 50% GREYISH TO MILKY WHITE FELDSPARS. <1% SULFIDES NOTED. 187.00-199.50 MEDIUM GRAINED 199.50-199.00 COARSE GRAINED 197.25 ANORTHOSITE 1/4" AT 40°	520		187	199	12			<.001	<.001
199.00	203.85	GABBRO - MEDIUM GRAINED, SLIGHTLY COARSER WITH BOTTOM FOOT. 60% MEDIUM GREEN PYROXENES, 40% FELDSPARS WITH A MAUVE HUE.	521		199	204	5				

m	RQD
75-76	91
77	90
78	80
79	96
80	100
81	96
82	80
83	100
84	87
85	85
86	100
87	93
88	94
89	100
90	87
91	100
92.13	82

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE

HOLE NO. 92-1 LENGTH ~~303'~~

LOCATION D ZONE LOCATION 'D'

LATITUDE ______ DEPARTURE ______

ELEVATION ______ AZIMUTH S 30° W DIP -45°

STARTED 1 MAR '92 FINISHED 2 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-1 SHEET NO. 5 of 6

REMARKS ______

LOGGED BY S. FRANKU

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPH	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	OZ/TON	OZ/TON
203.85	230.00	GABBRO - MEDIUM TO COARSE GRAINED IN A FINING UPWARD CYCLE. 60% MEDIUM GREEN PYROXENES, 40% FELDSPARS WITH A MAUVE HUE. >1% SULFIDES NOTED	522		204	214	10			<.001	<.001
		203.85-209.30 ANORTHOSITE WITH MINOR EPIDOTE + BIOTITE	523		214	224	10				
		209.80-229.50 MEDIUM GRAINED	524		224	230	6			<.001	<.001
		224.50-230.00 COARSE GRAINED	525		230	243	13				
		226.20 MYLONITE SHEAR AT 50°	526		243	250	7			<.001	<.001
		229.05 ANORTHOSITE ~1" AT 40°									
230.00	243.25	GABBRO - MEDIUM GRAINED, SLIGHTLY COARSER TOWARDS BASE. 60% MEDIUM TO DARK GREEN POIKILITIC PYROXENES, 40% FELDSPARS WITH A MAUVE HUE. ≤1% SULFIDES NOTED.									
		240.05 ¼" ANORTHOSITE AT 35°									
		241.70 ANORTHOSITE 1" AT 40° SPLIT BY ½" FINE GRAINED DYKELET.									
243.25	250.25	GABBRO - FINE TO MEDIUM TO COARSE GRAINED IN A FINING UPWARDS CYCLE. 50% MEDIUM TO DARK GREEN PYROXENE, 50% FELDSPARS WITH A MAUVE HUE >1% SULFIDES NOTED									
		243.25-243.50 FINE GRAINED									
		243.50-244.85 MEDIUM GRAINED									
		243.15 ANORTHOSITE ¼" AT 25°									
		244.85-250.25 COARSE GRAINED									
		249.85-250.15 MYLONITIC ~~[illegible]~~ FRACTURE AT 40°									

DIAMOND DRILL RECORD

NAME OF PROPERTY: LAC DES ILES MINE
HOLE NO.: 92-1 LENGTH: 302
LOCATION: D ZONE LOCATION 'D'
LATITUDE: DEPARTURE:
ELEVATION: AZIMUTH: S 30° W DIP: -45°
STARTED: 1 MAR '92 FINISHED: 2 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-1 SHEET NO. 6 OF 6
REMARKS:
LOGGED BY: S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
250.25	259.30	GABBRO - FINE TO MEDIUM GRAINED IN A FINING UPWARD CYCLE. 50% MEDIUM TO DARK GREEN PYROXENES, 50% MILKY WHITE TO GREY FELDSPARS. <1% SULFIDES 250.25-250.75 FINE GRAINED - SCATTERED SULFIDES 250.75-259.30 MEDIUM GRAINED 254.75 - 3mm CLUSTER OF PYRITE (LARGEST GRAIN OF SULFIDE NOTED IN HOLE)
259.30	278.50	GABBRO - MEDIUM TO COARSE GRAINED IN A FINING UPWARD CYCLE. 60% MEDIUM TO DARK GREEN PYROXENES, 40% MILKY WHITE TO MAUVE FELDSPARS. <1% SULFIDES 259.30-277.75 MEDIUM GRAINED 277.75-278.50 COARSE GRAINED 269.85 - 2.0cm ANORTHOSITE VEIN AT 40° WITH INCLUSIONS OF REMOBILIZED PYROXENES.
278.50	278.70	ANORTHOSITE VEIN 30° WITH DISSEMINATED BIOTITE.
278.70	299.85	GABBRO - MEDIUM TO COARSE GRAINED IN A FINING UPWARDS CYCLE. 50% MEDIUM TO DARK GREEN PYROXENES, 50% MILKY WHITE TO MAUVE FELDSPARS. 278.70-298.75 MEDIUM GRAINED 298.75-299.85 COARSE GRAINED
299.85	302.25	GABBRO - MEDIUM GRAINED, 60% MEDIUM DARK GREEN PYROXENES, 40% GREYISH FELDSPARS. MINOR BIOTITE NOTED.

E.O.H. 302.25'

SAMPLE NO.	% CORE REC.	FOOTAGE FROM	FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON
527		250	259	9				
528		259	269	10			<.001	<.001
529		269	279	10				
530		279	290	11			<.001	<.001
531		290	300	10				
532		300	302	2			<.001	<.001

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-2 LENGTH 301'
LOCATION LOCATION 'A' Tailings Area
LATITUDE 100,401 N DEPARTURE 105,745 (Not Surveyed)
ELEVATION 9940.0 AZIMUTH N 45° W DIP -60°
STARTED 2 MAR '92 FINISHED 3 MAR. 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
301	-56°	NA			

HOLE NO. 92-2 SHEET NO. 1 of 4
REMARKS CASING TO 17'
RQD - COUNTING NATURAL FRACTURES ONLY.
Drilled by: Noren, BQ Core
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	m	RQD	SAMPLE NO.	% SULPH-IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	Pt oz/ton	Pd oz/ton	ASSAYS Pt oz/ton	ASSAYS Pd oz/ton	
												PPb	PPb	
0	17.75	OVERBURDEN - GLACIAL TILL. FIRST 6"	0-5.18	—										
		OF CORE RECOVERED IS A COBBLE	6	34										
		OF GRANODIORITE FOLLOWED BY	7	64	534		50	60	10	<.001	<.001	<15	11	
		A 4" FRAGMENT OF PYROXENITE	8	86										
		OF SEEMINGLY LOCAL ORIGIN.	9	54										
			10	56										
			11	70										
			12	96										
17.75	57.85	FELDSPATHIC PYROXENITE - GREYISH BROWN	13	80	535		100	110	10	<.001	<.001	<15	9	
		TO BLUISH GREEN, MEDIUM GRAINED	14	70										
		WITH GENERALLY 80% PYROXENES	15	87										
		AND 20% FELDSPARS WITH INTERMITTANT	16	93										
		SEGMENTS MORE GABBROIC WITH UP TO	17	94										
		40% FELDSPARS. NUMEROUS	18	87										
		SERPENTINIZED FRACTURES THROUGHOUT.	19	91										
			20	91										
			21	98										
57.85	106.25	PYROXENITE - GREYISH BROWN, MEDIUM GRAINED	22	83										
		WITH <10% FELDSPARS, >90%	23	100								345 PPb =		.01 g
		PYROXENES. SLIGHTLY MORE	24	100										
		FELDSPATHIC OVER LOWER 10'	25	100										
		81'-83' SLIGHTLY SERPENTINIZED												
		82.5' 1/2" ANORTHOSITE VEIN AT 60°												

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-2 LENGTH 301'
LOCATION LOCATION 'A'
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH N 45° W DIP -60°
STARTED 2 MAR '92 FINISHED 3 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-2 SHEET NO. 2 of 9
REMARKS ______
LOGGED BY S. FRANILO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	R.	RQD	SAMPLE NO.	% SULPH-IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS Pt oz/ton	ASSAYS Pd oz/ton	ASSAYS oz/ton	ASSAYS oz/ton
~~[illegible]~~			25-26	97								ppb	ppb
106.35	107.75	FRACTURE ZONE AT 50° - MODERATELY	27	100									
		SERPENTINIZED.	28	96									
			29	100									
107.75	136.15	NORITE - BROWN & WHITE, MEDIUM GRAINED	30	94									
		50% PYROXENES (PROBABLY BRONZITE)	31	90									
		50% FELDSPARS.	32	43									
		115.5-116.75 HIGHLY FRACTURED	33	98	536		150	160	10	<.001	<.001	<15	9
			34	58									
136.15	150.65	GABBRO - BROWN TO BLUISH GREEN, MEDIUM	35	64									
		GRAINED, 60% PYROXENES (AUGITE &	36	93									
		BRONZITE OR HYPERSTHENE)	37	100									
		40% FELDSPARS.	38	76									
			39	77									
150.65	170.10	PYROXENITE - GREYISH BROWN, MEDIUM GRAINED	40	100									
		<10% FELDSPARS, >90%	41	94									
		PYROXENES. <1% SULFIDES NOTED.	42	61									
			43	100									
			44	100									
			45	100									
			46	72									
170.10	185.35	NORITE - BROWN & WHITE, MEDIUM GRAINED,	47	100									
		50% PYROXENES (PROBABLY BRONZITE)	48	98									
		50% FELDSPARS.	49	77									
		178.5-179.0 SLIGHTLY SERPENTINIZED.	50	85									

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-2 LENGTH 301'
LOCATION LOCATION 'A'
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH N 45° W DIP -60°
STARTED 2 MAR '92 FINISHED 3 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-2 SHEET NO. 3 of 4
REMARKS ____
LOGGED BY S. FRAMO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
185.35	191.65	PYROXENITE - BLUISH GREEN, MEDIUM GRAINED, 95% PYROXENES (PROBABLY AUGITE & HYPERSTHENE), 5% FELDSPARS. 189.25-190.0 SERPENTINIZED SHEAR ZONE AT 50°
191.65	201.90	NORITE - BROWN & WHITE, MEDIUM GRAINED 50% PYROXENES (PROBABLY BRONZITE) 50% FELDSPARS.
201.90	235.75	FELDSPATHIC PYROXENITE → GABBRO BLUISH GREEN, MEDIUM GRAINED, FELDSPATHIC PYROXENITE (75% PYROXENES, 25% FELDSPARS) GRADES INTO A GABBRO OF SIMILAR COMPOSITION WITH A 50/50 SPLIT OF PYROXENES TO FELDSPARS. 212.25-213.0 ½" VEIN OF BLACK SPARKLY, FINELY DISSEMINATED, METALLIC, NON MAGNETIC MINERAL WHICH COULD BE CHROMITE. (SAMPLED FOR PGM) 80° TO CORE.
235.75	236.15	SERPENTINIZED SHEAR AT 60°

m	RQD
50.9	43
52	96
53	100
54	100
55	91
56	94
57	100
58	0
59	92
60	100
61	100
62	89
63	29
64	100
65	67
66	100
67	81
68	58
69	72
70	86
71	78
72	18
73	85
74	96
75	91

SAMPLE NO.	% SULPHIDES	FOOTAGE FROM	FOOTAGE TO	TOTAL	Pt oz/ton %	Pd oz/ton %	Pt oz/ton	Pd oz/ton	
537		200	210	10	<.001	<.001	<15	14	
53533		212	213	1	<.001	<.001	<15	11	ppb

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE

HOLE NO. 92-2 LENGTH 301'

LOCATION LOCATION "A"

LATITUDE ______ DEPARTURE ______

ELEVATION ______ AZIMUTH N 45° W DIP -60°

STARTED 2 MAR 92 FINISHED 3 MAR 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-2 SHEET NO. 4 OF 4

REMARKS ______

LOGGED BY S. FRANKLU

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	m	RQD	SAMPLE NO.	% SULPH IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS Pt oz/ton	ASSAYS Pd oz/ton	Pt OZ/TON ppb	Pd OZ/TON ppb	
236.15	248.50	PYROXENITE - BLUISH GREEN, MEDIUM GRAINED,	75-76	88										
		SLIGHTLY FELDSPATHIC. 95%	77	97										
		PYROXENES (POSSIBLY AUGITE &	78	100										
		HYPERSTHENE) 5% FELDSPARS.	79	96	538		250	260	10	<.001	<.001	<15	17	(.0005 ?)
			80	100										
			81	97										
248.50	291.75	PYROXENITE - GREYISH BROWN, MEDIUM GRAINED	82	100										
		PYROXENES (HYPERSTHENE OR BRONZITE)	83	100										
			84	100										
			85	100										
291.75	301.00	PYROXENITE - DARK GREEN, MEDIUM GRAINED.	86	82										
	EOH	PYROXENES MAINLY AUGITE WITH	87	91										
		HYPERSTHENE OR BRONZITE.	88	71										
			89	85										
		E.O.H.	90	17										
			91	75	539		290	300	10	<.001	<.001	<15	13	
			91.50 EOH	86										

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-3 LENGTH 300'
LOCATION POSITION 'C' Tailings Area
LATITUDE 100,320 N DEPARTURE 104,829 (Not Surveyed)
ELEVATION 9990.0 AZIMUTH N 45° E DIP -60°
STARTED 3 MAR '92 FINISHED 4 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
300	-56°	NA			

HOLE NO. 92-3 SHEET NO. 1 of 5
REMARKS CASING TO 13'
BQ Core
Drilled by: Noren
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	% SULPH-IDES	FOOTAGE FROM	FOOTAGE TO	TOTAL	ASSAYS Pt oz/ton	Pd oz/ton	Pt ppb	Pd ppb
0	13	OVERBURDEN - GLACIAL TILL											
13	42.15	GABBRO - GREEN & WHITE TO BLUISH GREEN WITH MAUVE FELDSPARS, MEDIUM GRAINED, 50% PYROXENE, 50% FELDSPAR. 15.50 - 15.75 ANORTHOSITE VEIN WITH 5% BIOTITE. AT 60°			56		50	60		<.001	<.001	<15	8
42.15	59.65	GABBRO - GREYISH BROWN, MEDIUM GRAINED, 60% PYROXENE, 40% FELDSPAR.											
59.65	80.25	GABBRO - BLUISH GREEN TO GREEN & WHITE, MEDIUM GRAINED, 50% PYROXENE, 50% FELDSPAR, BECOMING COARSER GRAINED AND MORE FELDSPATHIC DOWNWARDS TO 60% FELDSPAR, 40% PYROXENE. 65.05 - 65.15 ANORTHOSITE VEIN AT 40°											
80.25	94.75	GABBRO - BLUISH GREEN, MEDIUM GRAINED 50% PYROXENE, 50% FELDSPAR. ~~[illegible]~~ 93.70 ¼" ANORTHOSITE VEIN AT 40°											

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE

HOLE NO. 92-3 LENGTH 300'

LOCATION POSITION 'C'

LATITUDE ______ DEPARTURE ______

ELEVATION ______ AZIMUTH N45°E DIP -60°

STARTED 3 MAR '92 FINISHED 4 MAR 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-3 SHEET NO. 2 of 3

REMARKS ______

LOGGED BY 3. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	% SULPH. IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS Pt oz/ton	Pd oz/ton	Pt oz/ton ppb	Pd oz/ton ppb
94.75	124.30	GABBRO - GREYISH BROWN, MEDIUM GRAINED 60% PYROXENE, 40% FELDSPAR, BECOMING COARSER AND PYROXENITIC OVER LOWER 2'			541		100	110	10	<.001	<.001	<15	6
124.30	125.20	DIABASE DYKE AT 45° TOP CONTACT, 53° BOTTOM CONTACT.											
125.20	132.50	GABBRO - GREEN & WHITE, COARSE GRAINED, 50% PYROXENE, 50% FELDSPAR.											
132.50	155.50	FELDSPATHIC PYROXENITE - GREYISH BROWN, MEDIUM GRAINED, 70% PYROXENE, 30% FELDSPAR. BECOMING COARSER AND MORE FELDSPATHIC OVER LOWER 5' <1% SULFIDES NOTED.			542		150	160	10	<.001	<.001	<15	7
155.50	157.75	DIABASE - FINE GRAINED, GRADES INTO LOWER GABBRO ~~UNIT~~ UNIT. 155.35 - 156.15 PEGMATOIDAL GABBRO SEGMENT.											

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-3 LENGTH 300'
LOCATION POSITION "C"
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH N 45° E DIP -60°
STARTED 3 MAR '92 FINISHED 4 MAR 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-3 SHEET NO. 3 of 5
REMARKS ______
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SLUDGE	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS Pt oz/ton %	Pd oz/ton %	Pt oz/ton ppb	Au oz/ton ppb
157.75	166.65	GABBRO - BLUISH GREEN, MEDIUM TO COARSE GRAINED, 60% PYROXENE, 40% FELDSPAR BECOMING COARSER AND MORE FELDSPATHIC OVER LOWER 3'									
166.65	167.20	PYROXENITE - BLUISH GREEN, MEDIUM GRAINED.									
167.20	186.15	GABBRO - GREYISH GREEN, MEDIUM GRAINED TO COARSE GRAINED. 50% PYROXENE, 50% FELDSPAR BECOMING MORE PYROXENITIC OVER LOWER 2.8 170.25 - 170.50 FINE GRAINED SEGMENT 171.20 - 171.60 FINE GRAINED SEGMENT									
186.15	191.75	PYROXENITE - ~~GREENISH GREY~~ GREYISH BROWN, MEDIUM GRAINED >90% PYROXENE, <10% FELDSPAR.									
191.75	206.60	GABBRO - GREEN + WHITE, MEDIUM TO COARSE GRAINED, 50% PYROXENE, 50% FELDSPAR.	543		200	210	10	<.001	<.001	<15	6

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE

HOLE NO. 92-3 LENGTH 300'

LOCATION POSITION 'C'

LATITUDE ______ DEPARTURE ______

ELEVATION ______ AZIMUTH N 45° E DIP -60°

STARTED 3 MAR '92 FINISHED 4 MAR 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-3 SHEET NO. 4 of 5

REMARKS ______

LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO. 25	% SULPH. IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS Pt oz/ton	Pd oz/ton	Au PPb	Rh PPb
206.60	209.50	PYROXENITE - GREYISH BROWN, MEDIUM GRAINED 90% PYROXENE, 10% FELDSPAR.									
209.50	236.30	FELDSPATHIC PYROXENITE ~~GABBRO~~ - BLUISH GREEN, MEDIUM GRAINED FELDSPATHIC PYROXENITE, 80% PYROXENE, 20% FELDSPAR GRADING INTO A COARSE GRAINED GREEN & WHITE GABBRO 50% PYROXENE, 50% FELDSPAR. 228.20 - 228.45 QUARTZ VEIN AT 40°									
236.30	255.15	GABBRO - GREEN & WHITE, MEDIUM GRAINED 60% PYROXENE 40% FELDSPAR. < 1% SULFIDES NOTED 244.15 - 244.35 ANORTHOSITE VEIN AT 50° 248.50 - 250.00 DIABASE VEIN AT 70°	544		250	260	10	<.001	<.001	<15	<5
255.15	271.50	GABBRO - BROWNISH GREEN, MEDIUM GRAINED, 60% PYROXENE, 40% FELDSPAR.									
271.50	280.25	GABBRO - GREEN & WHITE, MEDIUM TO COARSE GRAINED, 50% PYROXENE, 50% FELDSPAR.									

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-3 LENGTH 300'
LOCATION LOCATION 'C'
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH N 45° E DIP -60°
STARTED 3 MAR 92 FINISHED 4 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-3 SHEET NO. 5 OF 5
REMARKS ____
LOGGED BY S FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPH-IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS Pt oz/ton %	Pd oz/ton %	Pt oz/ton ppb	Pd oz/ton ppb
280.25	283.75	PYROXENITE - BROWN, MEDIUM GRAINED, >90% PYROXENE, <10% FELDSPAR.	545		290	300	10	<.001	<.001	<15	5
283.75	300.00	GABBRO - BLUISH GREEN, MEDIUM GRAINED, 60% PYROXENE, 40% FELDSPAR 285.75 - 286.65 DIABASE VEIN AT 45°. EOH.									

DIAMOND DRILL RECORD

NAME OF PROPERTY: LAC DES ILES MINE
HOLE NO.: 92-4 LENGTH: 300'
LOCATION: LOCATION 'B' Tailings Area
LATITUDE: 100,618 N DEPARTURE: 104,615 (Not Surveyed)
ELEVATION: 9940.0 AZIMUTH: S 45° E DIP: -60°
STARTED: 4 MAR '92 FINISHED: 5 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
300	-56°	NA			

HOLE NO.: 92-4 SHEET NO.: 1 of 2
REMARKS: CASING TO 28'
Drilled by: Norex
BQ Core
LOGGED BY: S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0	27.50	OVERBURDEN - GLACIAL TILL
27.50	300.00	GABBRO - BLUISH GREEN, MEDIUM GRAINED, 55% PYROXENE, 45% FELDSPAR, NO SULFIDES NOTED. THIS GABBRO IS INTRUDED BY NUMEROUS TONALITE DYKES AS INDICATED, CAUSING LOCALIZED COARSE GRAINED TEXTURE TO THE SURROUNDING GABBRO.
		28.25 - 32.30 TONALITE DYKE - FINE GRAINED, KHAKI COLOUR, 50% FELDSPARS, 30% HORNBLENDE, 20% QUARTZ AND SULFIDES SCATTERED THROUGHOUT.
		32.80 - 33.80 TONALITE
		34.80 - 37.00 TONALITE
		40.25 - 43.50 TONALITE
		47.50 - 52.25 TONALITE
		66.05 - 67.25 TONALITE
		86.50 - 88.05 TONALITE
		93.00 - 93.75 TONALITE
		102.50 - 105.25 TONALITE.

SAMPLE NO.	% SULPHIDES	FOOTAGE FROM	FOOTAGE TO	TOTAL	Pt oz/ton	Pd oz/ton	ASSAYS Pt ppb	ASSAYS Pd ppb
546		50	60	10	<.001	<.001	<15	<5
547		100	110	10	<.001	<.001	<15	7
548		150	160	10	<.001	<.001	<15	9
549		200	210	10	<.001	<.001	<15	9
550		250	260	10	<.001	<.001	<15	6
551		290	300	10	<.001	<.001	<15	8

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE

HOLE NO. 92-4 LENGTH 300'

LOCATION LOCATION 'B'

LATITUDE ____ DEPARTURE ____

ELEVATION ____ AZIMUTH S 45° E DIP -60°

STARTED 4 MAR 92 FINISHED 5 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-4 SHEET NO. 2 of 2

REMARKS ____

LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS OZ/TON	ASSAYS OZ/TON	
		GABBRO												
		124.00-124.10 ANORTHOSITE VEIN												
		124.75-124.85 ALKALI VEIN												
		148.50-149.65 DIABASE DYKE												
		149.65-152.00 TONALITE												
		178.50-179.30 ANORTHOSITE VEIN WITH BIOTITE												
		193.30-193.50 ANORTHOSITE VEIN WITH BIOTITE												
		193.85-194.00 ANORTHOSITE VEIN WITH BIOTITE.												
		201.45-201.65 DIABASE VEIN												
		205.05-205.25 ANORTHOSITE VEIN												
		206.15-206.25 ANORTHOSITE VEIN												
		207.50 ½" ANORTHOSITE VEIN												
		221.00-222.75 QUARTZ VEIN WITH EPIDOTE, PINK FELDSPAR AND SULFIDES.												
		243.50-246 DIABASE DYKE												
		272.50-276.00 DIABASE DYKE.												
		280.35-280.75 ANORTHOSITE VEIN WITH BIOTITE & ½" QUARTZ VEIN THROUGH CENTER.												
		292.15-293.65 DIABASE DYKE - GABBRO AT CONTACTS IS PEGMATOIDAL												
		300' EOH.												

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-5 LENGTH 300'
LOCATION Location 'F' Tailings Area
LATITUDE 100,421 DEPARTURE 104,328 (Not Surveyed)
ELEVATION 9940.0 AZIMUTH S 45° E DIP -60°
STARTED 5 MAR '92 FINISHED 7 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
300	-59°	NA			

HOLE NO. 92-5 SHEET NO. 1 of 2
REMARKS CASING TO 40'
Drilled by: Norex Drilling Ltd.
· BQ Core
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	Pt oz/ton	Pd oz/ton	Pt OZ/TON ppb	Pd OZ/TON ppb
0	37.50	OVERBURDEN											
37.50	300.00	GABBRO - BLUISH GREEN, MEDIUM GRAINED, 50% PYROXENE,			552		50	60	10	<.001	<.001	<15	5
		50% FELDSPAR. COARSE GRAINED SEGMENTS SURROUNDING			553		100	110	10	<.001	<.001	<15	6
		INTRUSIONS ARE DARK GREEN AND WHITE IN COLOUR.			554		150	160	10	<.001	<.001	<15	<5
		37.75 - 38.00 TONALITE - FINE GRAINED, KHAKI COLOUR, 50% FELDSPAR, 35% HORNBLENDE, 15% QUARTZ.			555		200	210	10	<.001	<.001	<15	6
		59.75 - 63.30 QUARTZ/FELDSPAR VEIN REPLACED BY TONALITE.			556		250	260	10	<.001	<.001	<15	<5
		59.75 - 59.85 FELDSPAR 59.85 - 60.95 QUARTZ - CROSSCUT BY TONALITE 60.95 - 63.25 TONALITE 63.25 - 63.95 FELDSPAR.			557		290	300	10	<.001	<.001	<15	6
		96.75 - 96.85 QUARTZ VEIN.											
		107.00 FRACTURE AT 60° INFILLED BY QUARTZ.											
		118.75 - 120.65 DIABASE DYKE - FINE GRAINED.											
		167.25 SERPENTINIZED FRACTURE AT 65°											

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY: LAC DES ILES MINE
HOLE NO.: 92-5 LENGTH: 300'
LOCATION: LOCATION 'F'
LATITUDE: DEPARTURE:
ELEVATION: AZIMUTH: S45°E DIP: -60°
STARTED: 5 MAR '92 FINISHED: 7 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO.: 92-5 SHEET NO.: 2 OF 2
REMARKS:
LOGGED BY: S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	SULPHIDES %	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS OZ/TON	ASSAYS OZ/TON	
		GABBRO												
		221.30-222.75 DIABASE DYKE - FINE GRAINED.												
		242.85-243.75 DIABASE DYKE - FINE GRAINED												
		246.75-247.45 DIABASE DYKE - MINOR PYRITE NOTED.												
		290.65-291.00 DIABASE DYKE - FINE GRAINED.												
		300.00 EOH.												

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY: LAC DES ILES MINE
HOLE NO.: 92-6, LENGTH: 300'
LOCATION: Location 'E' West of Roby Zone
LATITUDE: 104,045 N DEPARTURE: 104,420 E (Not Surveyed)
ELEVATION: 9990.0 AZIMUTH: S 71° W DIP: -45°
STARTED: 8 MAR 92 FINISHED: 9 MAR 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
300	-47°	NA			

HOLE NO. 92-6 SHEET NO. 1 of 3
REMARKS: CASING TO 28'

LOGGED BY: S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
0	28.00	GLACIAL TILL												
28.00	116.85	GABBRO - LIGHT BLUISH GREEN FINE TO MEDIUM GRAINED, 50% PYROXENE, 50% FELDSPAR, GRADING INTO LOWER ANORTHOSITE UNIT.			558		50	60	10			<.001	.004	
		53.15 - 53.35 QUARTZ VEIN												
		53.35 - 54.00 TONALITE - PINKISH BROWN, FINE GRAINED 50% FELDSPAR, 30% HORNBLENDE, 20% QUARTZ.			559		100	110	10			<.001	.009	
		57.75 - 59.25 TONALITE - AS ABOVE.												
116.85	138.00	ANORTHOSITE - WHITE & GREY, MEDIUM GRAINED, 65% FELDSPAR, 35% PYROXENE.												
		122.05 - 122.50 MYLONITIZED ANORTHOSITE SHEARED AT 60°												
138.00	140.75	ANORTHOSITE - GREY, FINE GRAINED, 65% FELDSPAR, 35% PYROXENE.												

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-6 LENGTH 300'
LOCATION LOCATION 'E'
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH S 71° W DIP -45
STARTED 8 MAR '92 FINISHED 9 MAR '92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-6 SHEET NO. 2 OF 3
REMARKS ______
LOGGED BY S. FRANCO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
140.75	166.50	ANORTHOSITE - WHITE & GREY, MEDIUM TO COARSE GRAINED, 80% FELDSPAR, 20% PYROXENE, SECONDARY PYRITE AND EPIDOTE NOTED ALONG SMALL FRACTURES. A CONVOLUTED IGNEOUS CONTACT BETWEEN THE ANORTHOSITE AND GABBRO GIVES NO INDICATION OF ORDER OF EMPLACEMENT.	560		150	160	10			<.001	<.001
			561		160	166.5	6.5			<.001	<.001
166.50	267.25	VARITEXTURED GABBRO - BLUISH GREEN, VARYING BETWEEN FINE AND MEDIUM GRAINED, 60% PYROXENE, 40% FELDSPAR. WELL MINERALIZED THROUGHOUT WITH PYRRHOTITE AND PYRITE. OVERALL CONCENTRATION OF SULFIDES 1-2% BUT OCCURING IN CLUSTERS GIVING HIGHER LOCALIZED % SULFIDES. STRATIFICATION IN THE CORE WHERE NOTED IS APPROXIMATELY 45° INDICATING A NEAR VERTICAL LAYERING. OCCASIONAL FRACTURES ARE FILLED WITH REMOBILIZED FELDSPAR OR QUARTZ.	562		166.5	170	3.5			<.001	.001
			563		170	180	10			<.001	.009
			564		180	190	10			.002	.028
			565		190	200	10			.001	.021
			566		200	210	10			.004	.053
			567		210	220	10			.002	.019
			568		220	230	10			.003	.027
			569		230	240	10			.002	.009
			570		240	250	10			.010	.032
			571		250	260	10			.001	.016
			572		260	267.25	7.25			.002	.029
		265.50 ¼" QUARTZ VEIN.								.003	.026
										87.25'	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-6 LENGTH 300'
LOCATION LOCATION 'E'
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH S71°W DIP -45°
STARTED 8 MAR 92 FINISHED 9 MAR 92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-6 SHEET NO. 3 of 3
REMARKS ______
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION			SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
267.25	285.50	FELDSPATHIC PYROXENITE - FINE GRAINED, GREEN, 80% PYROXENE, 20% FELDSPAR <1% SULFIDES NOTED.			573		267.25	275	7.75			<.001	.014	
		273.75 ¼" QUARTZ/FELDSPAR VEIN			574		275	285.5	10.5			<.001	.008	
285.50	289.75	GABBRO - BLUISH GREEN, MEDIUM GRAINED 60% PYROXENE, 40% FELDSPAR <1% SULFIDES NOTED.			575		285.5	289.75	4.25			<.001	.003	
		286.50 ½" QUARTZ/FELDSPAR VEIN												
289.75	297.30	FELDSPATHIC PYROXENITE - GREEN, FINE GRAINED, 75% PYROXENE, 25% FELDSPAR <1% SULFIDES NOTED.			576		289.75	297.3	7.55			<.001	<.001	
297.30	300.00	VARITEXTURED GABBRO - BLUISH GREEN, MEDIUM TO FINE GRAINED, 60% PYROXENE, 40% FELDSPAR <1% SULFIDES NOTED.			577		297.3	300	2.7			<.001	.007	
		EOH.												

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-7 LENGTH 70'
LOCATION RORY ZONE
LATITUDE 105,143.968 DEPARTURE 105,241.016
ELEVATION 10,011.171 AZIMUTH 071° DIP -45°
STARTED March 8/92 FINISHED March 9/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-7 SHEET NO. 1 of 1
REMARKS NQ Core
Drilled by Norex Drilling Ltd.
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
0	6	CASING										
6	65.15	CLINOPYROXENITE - LIGHT GREYISH GREEN, FINE GRAINED TO DARK BLUISH GREEN, MEDIUM GRAINED, MODERATELY SERPENTINIZED DIOPSIDIC AUGITE. WELL MINERALIZED WITH UP TO 3% SULFIDES, NOTABLY PYRITE & PYRRHOTITE.	578		6	10	4			.010	.095	
			579		10	20	10			.012	.127	
			580		20	30	10			.007	.089	
			581		30	40	10			.006	.098	
		21.50 - 21.75 BRECCIATED ANORTHOSITE	582		40	50	10			.004	.055	
		60.75 - 61.25 ANORTHOSITIC SEGMENT - 60% FELDSPAR 40% PYROXENE	583		50	60	10			.002	.011	
		62.50 - 63.00 ANORTHOSITE - WHITE & MAUVE FELDSPAR.	584		60	65.15	5.15			.002	.068	
65.15	70	ANORTHOSITIC GABBRO - EASTERN GABBRO - MEDIUM GRAINED, 60% GREYISH WHITE FELDSPAR, 40% BLACK PYROXENE. OCCASIONAL PYRITE NOTED, <1%.	585		65.15	70	4.85			<.001	.006	
										From:	6.0' -	65.15'
										.006	.071	
										59.	15'	
		EOH.										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-8 LENGTH 70'
LOCATION Roby Zone
LATITUDE 105,188.351 DEPARTURE 105,185.194
ELEVATION 10,005.458 AZIMUTH 071° DIP -45°
STARTED March 9/92 FINISHED March 9/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-8 SHEET NO. 1 of 1
REMARKS NQ Core
Drilled by Norex Drilling Ltd.
LOGGED BY S. FRANKO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPH-IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	%	%	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
0	4	CASING									
			586		4	10	6			.005	.065
4	70	CLINOPYROXENITE - GREYISH GREEN, FINE GRAINED	587		10	20	10			.009	.137
		MODERATELY SERPENTINIZED. SLIGHTLY ANORTHOSITIC IN SEGMENTS	588		20	30	10			.009	.105
		AS INDICATED. UP TO 1% SULFIDES NOTED.	589		30	40	10			.004	.055
		5.75 - 8.25 FELDSPATHIC CLINOPYROXENITE - 30% FELDSPAR. MEDIUM GRAINED	590		40	50	10			.007	.106
		19.50 - 20.25 FELDSPATHIC CLINOPYROXENITE - 40% FELDSPAR MEDIUM GRAINED.	591		50	60	10			.007	.089
		27.50 QUARTZ VEIN 4" AT 40°									
		29.00 - 29.30 ANORTHOSITE - WITH UP TO 25% PYROXENE INCLUSIONS.	592		60	70	10			.003	.024
		59.25 - 60.15 ANORTHOSITE - WITH UP TO 35% PYROXENE INCLUSIONS.								.006	.084
										66.	0'
		61.50 - 70.00 FELDSPATHIC CLINOPYROXENITE - UP TO 40% FELDSPAR.									
		EOH.									

DIAMOND DRILL RECORD

NAME OF PROPERTY LAC DES ILES MINE
HOLE NO. 92-9 LENGTH 125'
LOCATION ROBY ZONE
LATITUDE 105,224.467 DEPARTURE 105,161.471
ELEVATION 10,003.282 AZIMUTH 071° DIP -45°
STARTED March 9/92 FINISHED March 9/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-9 SHEET NO. 1 of 1
REMARKS NQ Core, Drilled by Norex Drilling Ltd.
LOGGED BY S. FRANCO

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0	7	CASING
7	18.15	LEUCOGABBRO - WHITE & GREEN, COARSE GRAINED, 65% FELDSPAR, 35% PYROXENE. UP TO 1% SULFIDES NOTABLY PYRITE & PYRRHOTITE.
18.15	28.00	GABBRO - WHITE & GREEN, MEDIUM GRAINED, 50% FELDSPAR, 50% PYROXENE, ≤ 1% SULFIDES NOTED.
28.00	115.85	CLINOPYROXENITE - DARK GREYISH GREEN, FINE GRAINED, SLIGHTLY SERPENTINIZED. FELDSPATHIC SEGMENTS AS NOTED. < 1% SULFIDES THROUGHOUT.
		37.50 - 38.30 FELDSPATHIC CLINOPYROXENITE - 25% FELDSPAR
		52.15 - 56.00 CORE LOSS - PROBABLY A HIGHLY SERPENTINIZED SHEAR ZONE.
		58.30 - 66.50 FELDSPATHIC CLINOPYROXENITE - SLIGHTLY REMOBILIZED, 40% FELDSPAR.
		72.75 - 74.75 FELDSPATHIC CLINOPYROXENITE - 30% FELDSPAR.
		105.00 - 115.85 FELDSPATHIC CLINOPYROXENITE - 25% FELDSPAR.
115.85	125.00	ANORTHOSITIC GABBRO - EASTERN GABBRO - GREEN & WHITE, MEDIUM GRAINED, 60% FELDSPAR 40% PYROXENE.
		END.

SAMPLE NO.		FOOTAGE FROM	FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON
2559	3	5.0	10.0	5.0			.012	.125
2559	4	10.0	20.0	10.0			.011	.158
2559	5	20.0	30.0	10.0			.009	.184
2559	6	30.0	40.0	10.0			.012	.266
2559	7	40.0	50.0	10.0			.009	.179
2559	8	50.0	60.0	10.0			.005	.098
2559	9	60.0	70.0	10.0			.009	.160
2560	0	70.0	80.0	10.0			.007	.119
2560	1	80.0	90.0	10.0			.006	.116
2560	2	90.0	100.0	10.0			.006	.074
2560	3	100.0	110.0	10.0			.004	.026
2560	4	110.0	120.0	10.0			<.001	.004
2560	5	120.0	125.0	5.0			<.001	<.001
							From: 5.0'- 110.0' .008	.137
							105.0'	

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-10 LENGTH 14 feet
LOCATION Roby Zone
LATITUDE 105,271.439 DEPARTURE 105,140.336
ELEVATION 10,005.324 AZIMUTH 071° DIP -45°
STARTED March 10/92 FINISHED March 10/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-10 SHEET NO. 1 of 1
REMARKS NQ Core
Drilled by Noren Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON	
0.0	6.0	Overburden										
6.0	14.0	Gabbro - medium to coarse grained, greenish gray unit with 55% pyroxenes and 45% feldspars - feldspar crystals locally up to 1cm in size and are well formed - fracture at 8.4' is at 13° tca and is 1cm wide filled with feldspathic, white material - fracture at 12.3' is 2mm wide at 11° tca with minor talc alteration - overall weak to moderate amount of pyroxene alteration to light green, soft, fibrous amphibole (uralite) - 1-2% fine to medium grained, disseminated po, py and pentlandite Core Loss: several sections of broken, rubbly core - 6.0' to 14.0' - only 6.2' of core	25694		6.0	14.0	8.0			.010	.072	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-11 LENGTH 86.0 feet
LOCATION Roby Zone
LATITUDE 105,277.691 DEPARTURE 105,158.764
ELEVATION 10,006.046 AZIMUTH 071° DIP -45°
STARTED March 10/92 FINISHED March 10/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-11 SHEET NO. 1 of 5
REMARKS NQ Core
Drilled by Norex Drilling

LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
0.0	5.0	Overburden									
5.0	11.0	Anorthositic Gabbro - coarse grained to pegmatic, light greenish gray unit with 75% feldspar and 25% pyroxene - pegmatic section from 5.3' to 11.0' with broken core at contacts contains feldspars and pyroxenes up to 1.5cm in size - feldspars are light yellowish green coloured representing epidote (saussiritization) - pyroxenes are locally and weakly altered to light green amphiboles (uralite) often associated with crosscutting fractures - several fractures, up to 2-3mm wide with chlorite and amphiboles associated are orientated in two prominent directions i) subparallel to CA at <10° tca and ii) 45-50° tca and anastamosing - trace to 1% fine to medium grained, disseminated po > cpy and as <.5cm sized, irregular shaped blebs of po core and cpy rims - lower contact sharp but irregular	25695		5.0	11.0	6.0			.008	.080

DIAMOND DRILL RECORD

NAME OF PROPERTY ____________________
HOLE NO. 92-11 LENGTH ____________________
LOCATION ____________________
LATITUDE ____________ DEPARTURE ____________
ELEVATION ____________ AZIMUTH ____________ DIP ____________
STARTED ____________ FINISHED ____________

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-11 SHEET NO. 2 of 5
REMARKS ____________________
LOGGED BY ____________________

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
11.0	33.8	Feldspathic Pyroxenite - fine to medium grained, dark greenish gray with 85-90% pyroxenes and 10-15% feldspars - several feldspathic sections (up to 30% feldspars) with gradational contacts at 12.5'-13.5', 17.2' to 18.1' and 31.2'-32.0' - feldspars are locally altered to a pale yellowish green (epidote - overall weak to moderate alteration of pyroxenes to light green amphibole (uralite) and dark green-black amphibole (hornblende) - local sections of strong amphibole, weak talc alteration with a moderate developed foliation at 34° tca occurring at 19.9'-21.0' and 24.3'-25.3' - several, anastamosing and linear, < 1cm wide, chlorite-amphibole filled fractures orientated between 21°-40° tca - 1-2% fine to medium, disseminated po and trace cpy and pentlandite - po also occurs as stringers along fractures and as <.5cm sized irregular shaped blobs with po core and cpy rims - gradational lower contact	25696		11.0	17.0	6.0			.021	.227	
			25697		17.0	27.0	10.0			.022	.266	
			25698		27.0	37.0	10.0			.017	.213	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-11 LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-11 SHEET NO. 3 of 5
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
33.8	63.6	Pyroxenite - fine to medium, with local sections of pyroxenes up to 1cm in size, dark green to black unit with 95% pyroxenes and <5% feldspars									
		- weak to moderate foliation developed locally and composed of amphibole altered sections	25699		37.0	47.0	10.0			.013	.209
		- foliation at 42°-51° tca, locally anastamosing	25700		47.0	57.0	10.0			.008	.091
		- overall moderate to strong amphibole (uralite) alteration of pyroxenes to lighter green	25701		57.0	67.0	10.0			.012	.102
		- strong amphibole alteration with minor talc at 38.4'-39.3'									
		- 1-2% fine to medium, grained po, trace cpy and pentlandite - sulphides also occur as 1mm wide by 1cm long wisps parallelling foliation and as <.5cm sized, irregular shaped blebs									
		- gradational lower contact									
63.6	75.5	Gabbro - medium to coarse grained, light to dark greenish gray unit with gradual compositional changes of 40-60% pyroxene and 40-60% feldspars	25702		67.0	75.0	8.0			.002	.010
		- top of unit (63.6'-67.0') hosts several, white quartz - feldspar, veins up to 15cm wide with sharp irregular and linear contacts at 25°-35° tca									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-11 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-11 SHEET NO. 4 of 5
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		- gradual transition into medium grained, uniform pyroxenite unit at 69.3'-71.3' - minor epidote alteration (saussiritization) of feldspars locally - associated with fractures - several, chloritic fractures, < 3mm wide orientated at 34° tca - overall weak to moderate, and local alteration of pyroxenes to lighter green coloured amphibole - 1-2% fine to medium grained po with trace cpy, py and pentlandite - sulphides also occur as irregular shaped, <.5cm sized, blebs of po core with cpy rims - sharp lower contact at 53° tca										
75.5	81.9	<u>Pyroxenite</u> - fine to medium grained, dark green unit with > 95% pyroxenes - non-foliated, non-fractured, relatively uniform unit - weak, pervasive, light green amphibole (uralite) alteration of pyroxenes - 2-3%, medium grained, disseminated po with trace amounts of cpy - several, <.5cm sized, irregular shaped blebs of po with local cpy rims - sharp lower contact at 27° tca	25703	3	75.0	82.0	7.0			.009	.105	
										From:	5.0'-	82.0'
										.013	.149	
										77	0'	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-11 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

REMARKS

LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		- fining of pyroxene crystals adjacent to sharp, upper and lower contact may represent a chilled margin - pyroxenite unit has intruded adjacent gabbroic units									
81.9	86.0	<u>Anorthositic Gabbro</u> - medium to coarse grained, light green-gray, mottled textured unit with 65% feldspar and 35% pyroxene - local and weak alteration of pyroxenes to amphibole - several, <3 mm wide, chloritic fractures orientated in two prominent directions i) <10° tca and ii) 45°-50° tca - minor amount of epidote alteration of feldspars (saussuritization) - trace amount of fine grained po and py	25704		82.0	86.0	4.0			<.001	.003
		E.O.H.									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-12 LENGTH 86.0 feet
LOCATION Roby Zone
LATITUDE 105,322.013 DEPARTURE 105,135.905
ELEVATION 10,066.149 AZIMUTH 071° DIP -45°
STARTED March 10/92 FINISHED March 11/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-12 SHEET NO. 1 of 4
REMARKS NQ Core
, Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON
0.0	4.0	Overburden									
4.0	24.0	Varitextured Gabbro - very, non-uniform unit with gradual transition to and from, fine to coarse grained sections, light to dark green sections and compositional changes from 60% pyroxene and 40% feldspar to more pyroxenitic sections of 90% pyroxene and 10% feldspar	25705		4.0	16.0	12.0			.010	.181
		-fine to coarse grained, dark green pyroxenite sections, with gradational contacts occur at 7.8'-9.5' and 10.5'-13.4'	25706		16.0	26.0	10.0			.003	.060
		-6.4' to 6.6' - highly amphibolitized section with a strong, anastamosing foliation at 50°-55° tca									
		-15.3' to 16.0' - creamy white coloured, fine to medium grained anorthositic vein with strong foliation of chlorite wisps orientated parallel to the sharp vein contacts at 28° tca									
		-overall moderate to strong light green amphibole (uralite) alteration of pyroxenes and very weak and local, yellowish green epidote alteration (saussuritization) of the feldspars									
		-minor fracturing consists of up to .5cm wide chlorite & amphibole filled fractures orientated at 35°-40° tca and another fracture set at 15° tca									
		-overall 1-2% fine to medium grained, disseminated py and po									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-12 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-12 SHEET NO. 2 of 4
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	%	%	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		- 4to5% medium grained py and po at 7.8' - 9.5'; this pyroxenite unit appears to be a dyke into the gabbroic host - lower gradational contact									
24.0	43.6	Anorthositic Gabbro - medium to coarse grained, mottled dark green - white unit with 70-75% feldspar and 25-30% pyroxene - grayish white, fine to medium grained, anorthosite vein at 36.8' - 39.2' with numerous, <2mm wide chlorite filled fractures that are randomly orientated - local yellowish green epidote (saussuritization) alteration of feldspars	25707		26.0	36.0	10.0			<.001	.010
		- 32.5 to 34.3' - pyroxenite dyke with sharp but anastamosing, irregular contact at 0-12° tca	25708		36.0	46.0	10.0			<.001	.006
		- pyroxenite dyke hosts 4-5% py and po - overall weak amphibole alteration of pyroxene - fractures are randomly orientated and <3mm wide with chlorite ± amphibole infilling - trace amounts of fine grained, disseminated py - 42.2' to 43.6' - anorthositic gabbro grades into gabbro - sharp, anastamosing, lower contact at 12-15° tca									
43.6	76.0	Alternating Gabbro - Pyroxenite - alternating, varying widths of sections of medium to coarse grained, dark green pyroxenite with >90% pyroxene and <5% feldspar and medium to coarse grained, greenish gray gabbroic sections with 60% pyroxene and 40% feldspar									

FORM I

DIAMOND DRILL RECORD

NAME OF PROPERTY

HOLE NO. 92-12 LENGTH

LOCATION

LATITUDE DEPARTURE

ELEVATION AZIMUTH DIP

STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-12 SHEET NO. 3 of 4

REMARKS

LOGGED BY

FOOTAGE — FROM: | TO:

DESCRIPTION

- pyroxenite sections occur at 43.6'-47.5', 51.9-54.9', 58.0-58.2', 60.9-61.6, 62.6-63.2, 64.0-64.3', 67.7-74.7' and 75.4'-76.0'
- contacts of pyroxenite sections with gabbro are gradational, irregular and linear at 50-55° tca,
- contact zone shows no chilled margin therefore pyroxenite sections due to differentiation as opposed to dyking
- 45.5' to 47.1' - fine, grained, massive, weakly magnetic diabase dike with sharp upper contact at 25° tca and sharp lower contact at 79° tca
- 69.4' to 70.2' - diabase dike with anastomosing contacts at 10-20° tca
- several whitish gray, fine to medium grained, anorthositic veins occur at 45.4'-45.5', 73.0'-73.1' and 73.9'-74.1', local alteration of feldspars (saussuritization) to 1cm long, tabular shaped, light yellowish green epidote
- trace py associated with anorthosite veins
- local and weak foliation developed in pyroxenite sections, anastomosing at 40°-45° tca
- minor fracturing consists of <.5cm wide chlorite ± quartz ± amphibole filling and orientated at 40-50° tca and subparallel (<10°) tca
- overall weak to moderate light green (uralite) alteration of pyroxenes to amphibole
- pyroxenite sections host 2-3%, fine to medium grained, disseminated py, po and trace cpy

SAMPLE NO.	% SULPHIDES	FOOTAGE FROM	FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON
25709		46.0	56.0	10.0			.001	.014
25710		56.0	66.0	10.0			.002	.015
25711		66.0	76.0	10.0			.003	.044
							From:	4.0'- 76.0'
							.003	.051
							72.0'	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-12 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-12 SHEET NO. 4 of 4
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	Pt OZ/TON	Pd OZ/TON	
		- gabbro sections host trace to 1% locally, fine grained po and py - sharp lower contact at 42° tca										
76.0	86.0	Anorthositic Gabbro - medium to coarse grained, mottled gray-green, uniform unit with 65% feldspar and 35% pyroxene - moderate amount of, up to 1cm wide, chlorite & amphibole filled, fractures, somewhat anastamosing at 25-30° tca - 78.9' - 2cm wide, white quartz vein with chloritic contacts at 29° tca - minor amount of chlorite and amphibole alteration of pyroxenes and epidote alteration of feldspars associated with fractures - trace amounts of fine grained py E.O.H.	2571	2	76.0	86.0	10.0			<.001	.001	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-13 LENGTH 76.0 feet
LOCATION Roby Zone
LATITUDE 105,367.304 DEPARTURE 105,104.538
ELEVATION 10,004.783 AZIMUTH 071° DIP -45°
STARTED March 11/92 FINISHED March 11/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-13 SHEET NO. 1 of 2
REMARKS NQ Core
'Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0.0	4.0	Overburden
4.0	67.5	Pyroxenite - medium to coarse grained, dark green relatively uniform unit with >90% pyroxene and <5% feldspars - lighter green sections due to increased amphibole alteration of pyroxenes -54.9' to 60.5' - medium grained gabbro section with gradational contacts and 70% pyroxene and 30% feldspar - overall moderate alteration of pyroxenes to lighter green coloured, fibrous, amphibole (uralite) - intense amphibole alteration with minor talc alteration in well foliated pyroxenite sections at 4.0'-17.2', 30.7-32.8' and 41.8'-45.7' - foliation is anastamosing at 35°-45° tca - 21.0' to 21.9' - fine to medium grained, pinkish alkali feldspar dike with several, crosscutting, randomly orientated, white-gray, <1cm wide qtz veins - feldspar dyke occurs at 16° tca - 44' to 45.0' - white and pinkish, <2cm wide qtz-feldspar veins, boudinaged and anastamosing subparallel tca - minor fracturing up to .5cm wide, orientated predominately at 40°-50° tca and chlorite ± amphibole filled, locally quartz, feldspar and epidote - trace to 1%, locally, fine to medium grained disseminated po and py

SAMPLE NO.	% SULPHIDES	FROM	TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON	
25713		4.0	10.0	6.0			.036	.766	
25714		10.0	17.0	7.0			.038	.714	
25715		17.0	27.0	10.0			.044	.620	
25716		27.0	37.0	10.0			.038	.376	
25717		37.0	47.0	10.0			.016	.162	
25718		47.0	57.5	10.5			.009	.074	
25719		57.5	67.5	10.0			.006	.010	
							From:	4.0' -	67.5'
							.025	.350	
							63.	5'	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-13 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-13 SHEET NO. 2 of 2
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON	
		- several, up to 5mm sized, irregular shaped blebs of po core and cpy rims - sharp lower contact at 21° tca										
67.5	76.0	<u>Anorthosite to Anorthositic Gabbro</u> - medium to coarse grained unit, mottled texture, compositional and gradual change from anorthosite (>90% feldspar) from 67.5'-70.2' to anorthositic gabbro (70% feldspar) from 70.2'-72.3' to gabbro (50% feldspar, 50% pyroxene) from 72.3'-76.0' - minor fracturing consists of ≤3mm wide chlorite ± amphibole filled fractures orientated 32°-40° tca - local epidote alteration (saussiritization) of feldspars associated with fracturing - overall trace amounts of fine grained py E.O.H.	25720		67.5	76.0	8.5			.001	.003	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-14 LENGTH 96.0 feet
LOCATION Roby Zone
LATITUDE 105,357.675 DEPARTURE 105,160.800
ELEVATION 10,003.607 AZIMUTH 251° DIP -45°
STARTED March 11/92 FINISHED March 12/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-14 SHEET NO. 1 of 4
REMARKS NQ Core
Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
0.0	4.0	Overburden									
4.0	17.9	Igneo-Fragmental Breccia Dyke - Zone of numerous clasts, up to 15cm in size, with irregular and often angular shapes hosted in dark green to black, locally magnetic gabbroic matrix									
		-clasts consist of orangish-pink coloured hornblende-tonalite clasts, gabbroic clasts and pyroxenite clasts	25721		4.0	8.0	4.0			.002	.007
			25722		8.0	17.0	9.0			<.001	.005
		-local, strong foliation, very anastamosing around clasts producing augen structure									
		-tonalite clasts are non-foliated and several are gneissic in texture									
		-fine to medium grained, pale orangish gray tonalite veins occur at 18.6'-19.8' and 20.5'-23.7' and 15.6'-17.9'									
		-tonalite veins consist of 80% feldspar, 5-10% quartz and 10-15% hornblende, trace fine grained py									
		-tonalite veins have sharp contacts (often irregular) at 50-55° tca which parallels the foliation locally developed in the vein									
		-gabbro matrix contains trace to 1% fine grained py/po									
		-irregular, sharp lower contact									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-14 LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-14 SHEET NO. 2 of 4
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
17.9	23.7	Pyroxenite - medium grained, uniform, dark green unit with > 95% euhedral pyroxenes - top 20cm and lower 20cm of unit are highly magnetic caused by < 2mm sized, disseminated magnetite - no fining of pyroxene crystal size towards contact - cannot determine if pyroxenite a dyke - overall weak, light green amphibole (uralite) alteration of pyroxenes - trace to 1% fine grained, disseminated py/po - sharp lower contact at 62° tca									
23.7	49.8	Anorthositic Gabbro - medium to coarse grained, mottled textured, green-gray unit with 65-70% feldspar and 30-35% pyroxene - medium grained, greenish gray gabbroic section	25723		17.0	27.0	10.0			.001	.011
		at 30.0'-32.9' - sharp lower contact at 55° tca and sharp upper contact epidote rich zone,	25724		27.0	37.0	10.0			<.001	.003
		at 61° tca	25725		37.0	47.0	10.0			<.001	.001
		- pegmatitic gabbro section with feldspar and pyroxene crystals up to 1.5cm in size occurs at 23.7'-30.0' - fining of crystal size towards upper contact (Possible chilled zone of late-stage pegmatite dike) - several fractures orientated at 32-38° tca are chlorite filled with epidote contacts - locally the fractures are white quartz filled such as at 36.4'-36.6' and 42.5'-43.1									

FORM I

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-14 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-14 SHEET NO. 3 of 4
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
		-local, weak, yellowish green epidote alteration (saussuritization) of feldspar -overall trace amounts of fine grained py/po -sharp lower contact at 18° tca									
49.8	66.9	<u>Pegmatitic Gabbro</u> - coarse grained, white feldspars (50-60%) and green-black, euhedral pyroxenes (40-50%) up to 2cm in size along long axis of crystal -definite decrease in crystal size towards upper and lower contact (may represent chilled margin of pegmatite dyke)	25726		47.0	57.0	10.0			<.001	.003
		-white quartz veins occur at 53.7'-54.4' and 59.6'-59.9' with sharp irregular contacts and contacts at 23° tca	25727		57.0	67.0	10.0			<.001	.005
		-overall weak and local, light green amphibole alteration of pyroxenes and epidote alteration of feldspars -minor fracturing consists of < 3mm wide chlorite ± amphibole ± epidote filling orientated at 20°-30° tca -trace amounts of fine grained py often associated with chloritic ± quartz filled fractures -sharp lower contact at 39° tca									
66.9	79.1	<u>Pyroxenite</u> - medium grained, dark green-black unit with >90% pyroxenes -coarse grained pegmatitic gabbro dike(?) at 68.2'-69.8' - sharp but irregular contacts to pyroxenite unit									

FORM I

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-14 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-14 SHEET NO. 4 of 4
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		- gabbro section at 70.8'-74.1' - pyroxenite contacts show a chilled margin therefore pyroxenite dyke intruded gabbro unit - sharp contacts at 33° tca (lower) and 44° tca (upper)										
		- pyroxenite unit is highly magnetic with fine grained disseminated magnetite grains up to 2% of rock	2572	8	67.0	77.0	10.0			.003	.045	
		- overall weak, light green, amphibole (uralite) alteration of pyroxenes										
		- 3-4% fine to medium grained, disseminated py > po and as 1cm sized, irregular shaped blebs and < 3mm wide stringers parallel to fracturing at 52° tca										
		- sharp lower contact at 56° tca										
79.1	96.0	Pegmatitic Gabbro - medium to coarse grained (up to 3cm in size) green-whitish gray unit with 50% anhedral to euhedral white-gray feldspars and 50% green pyroxenes	2572	9	77.0	87.0	10.0			.007	.075	
		- overall weak to moderate, light green amphibole (uralite) alteration of pyroxenes	2573	0	87.0	96.0	9.0			.006	.071	
		- several fractures, orientated at 20°-35° tca, are chlorite ± grayish white quartz core filling								From:	67.0'-	96.0
		- 2-5%, locally, of fine to medium grained, disseminated po > py with trace cpy and as .5cm sized, irregular shaped blebs with po core and cpy rims								.005	.063	
										29.	0'	
	E.O.H.	Core Loss: 86.0'-96.0' - only 8.9' of core										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-15 LENGTH 50.0 feet
LOCATION Roby Zone
LATITUDE 105,361.414 DEPARTURE 105,137.609
ELEVATION 10,008.619 AZIMUTH 071° DIP -45°
STARTED March 12/92 FINISHED March 12/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-15 SHEET NO. 1 of 4
REMARKS NQ Core
Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
0.0	1.0	Overburden									
1.0	5.5	Pegmatitic Gabbro - Coarse grained, anhedral to euhedral, white-cloudy gray feldspar (60%) and green pyroxene (40%) crystals up to 2cm in size -minor amount of black coloured, up to 3mm sized biotite crystals at 4.5'-4.8' -minor amphibole and chlorite alteration of pyroxenes which increases towards lower contact -chlorite ± amphibole alteration associated with several, < 3mm wide, fractures orientated at 21°-36° tca -3 to 4% fine to medium grained, disseminated py and po with trace amounts of cpy and pentlandite -sulphides also occur as, < .5cm sized, irregular shaped blebs and are associated with pyroxene ± amphibole crystals, not the feldspars -sharp, irregular and broken lower contact	2573	1	1.0	6.0	5.0			.002	.015
5.5	25.2	Feldspathic Pyroxenite - fine to medium grained, light green (amphibolitized sections) to dark greenish gray unit with 80% pyroxenes and 20% white-gray, fractured, feldspars locally up to 2 cm in size -minor amount of yellowish green, epidote alteration (saussiritization) of feldspar crystals									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-15 LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-15 SHEET NO. 2 of 4
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS OZ/TON Pt	ASSAYS OZ/TON Pd
		-5.5'-7.3' - magnetite rich zone with 4-5%, fine to medium grained, disseminated, black magnetite crystals up to 2 mm in size -moderate, pervasive, light green amphibole (uralite) alteration with sections of strong amphibole and minor talc alteration and a well developed foliation at 7.3'-9.9', 11.1'-13.7' and 16.0'-16.9'	25732		6.0	16.0	10.0			<.001	.019
		-foliation at 37° tca	25733		16.0	26.0	10.0			.002	.035
		-13.1' to 13.7' - several, up to 2cm wide, milky white quartz veins - anastamosing with sharp irregular contacts with an overall orientation at 39° tca -trace fine grained pyrite in quartz veins -2 to 3% fine to medium grained, disseminated po > py with trace cpy -sulphides also occur as <.5cm sized, irregular shaped blebs of po core and cpy rims -distinctive lower contact at 41° tca Core Loss: Rubbly, broken core at 16.4' -16.0' to 26.0' - only 8.8' of core									
25.2	43.8	Pyroxenite - fine to medium grained, light green (amphibolitized sections) to dark greenish gray unit with > 95% pyroxenes and < 5% feldspars -overall weak pervasive light green amphibole alteration of pyroxenes with local sections									

FORM I

DIAMOND DRILL RECORD

NAME OF PROPERTY ____
HOLE NO. 92-15 LENGTH ____
LOCATION ____
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH ____ DIP ____
STARTED ____ FINISHED ____

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-15 SHEET NO. 3 of 4
REMARKS ____
LOGGED BY ____

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON
		of strong to intense amphibole (uralite) alteration at 25.2'-27.2', 35.4'-35.9' and 42.7'-43.8' - strong amphibole altered sections have gradational contacts and a local, weak developed foliation at 45°-53° tca									
		- several different orientations of fractures include i) <3mm wide, chlorite ± py stringers, anastamosing at 26°-40° tca and ii) subparallel tca (ie <10°) and iii) <3mm wide, quartz-feldspar, whitish filled fractures at 70°-75° tca	2573	4	26.0	36.0	10.0			.001	.021
			2573	5	36.0	44.0	8.0			.001	.009
										From:	1.0' - 44.0'
										.001	.021
		- overall 1-2% fine to medium grained, disseminated po > py with trace cpy - several, <3mm wide semi-massive, anastamosing py stringers along fractures - fine grained pyroxenes at lower contact (may represent chilled margin - ie pyroxenite dike) - sharp lower contact at 42° tca Core Loss: Ground core at 35.4' - 26.0' to 36.0' - only 9.6' of core								43.0'	
43.8	50.0	<u>Gabbro</u> - medium grained, uniform, green and white, mottled texture unit with 55% feldspar and 45% pyroxenes	2573	6	44.0	50.0	6.0			<.001	.001
		- feldspars are locally a cloudy purplish gray colour - minor amount of light green amphibole alteration of pyroxenes									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY 92-15
HOLE NO. 92-15 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-15 SHEET NO. 4 of 4
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		-unit is moderately fractured and consists of up to 1cm wide chlorite ± amphibole filled fractures orientated at 35°-40° tca with a lesser amount anastamosing subparallel tca (0-10° tca) -minor amount of yellowish green, epidote alteration of feldspars concentrated at contacts of fractures -2cm wide, milky white quartz vein, with sharp and irregular, chloritic contacts, at 48.9' -trace amounts of fine grained py and po E.O.H.										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-16 LENGTH 68.5 feet
LOCATION Roby Zone
LATITUDE 115,254.590 DEPARTURE 105,171,376
ELEVATION 10,005.099 AZIMUTH 071° DIP -45°
STARTED March 12/92 FINISHED March 12/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-16 SHEET NO. 1 of 3
REMARKS NQ Core
Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
0.0	5.0	Overburden									
5.0	49.1	Amphibolitized Pyroxenite - Fine to medium grained, light green to dark greenish gray unit with > 90% pyroxene and <10% cloudy, grayish white disseminated feldspars									
		- overall moderate to strong, light green, fibrous	25737		5.0	10.0	5.0			.003	.048
		amphibole (uralite) alteration of pyroxenes - gradational	25738		10.0	20.0	10.0			.006	.095
		transition between varying intensities of alteration	25739		20.0	30.0	10.0			.010	.044
		- locally, a weak, anastamosing foliation is	25740		30.0	40.0	10.0			.003	.048
		developed at 38°-52° tca	25741		40.0	50.0	10.0			.008	.077
		- several milky white and cloudy grayish white quartz ± feldspar veins crosscut this unit - the veins have irregular, anastamosing, chloritic contacts and are up to 2cm wide occuring at 10.2'-10.6', 21.3'-22.8', 27.4'-27.5' and 45.6'-46.4'									
		- the quartz veins, often with a pinkish orange tinge are boudinaged and orientated 43°-52° tca									
		- tourmaline occurs in the core of the vein at 45.6'									
		- 46.7' to 47.9' - 2cm long, dark green-black fibrous actinolite crystals parallel to foliation at 29° tca									
		- 43.4' to 43.5' - fine grained, massive diabase dyke orientated at 43° tca									
		- 1% fine to medium grained, disseminated py and po with trace amounts of cpy									
		- distinctive lower contact at 28° tca									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-16 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-16 SHEET NO. 2 of 3
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		Core Loss: 5.0'-16.0' - only 9.6' of core : 36.0'-46.0' - only 9.2' of core										
49.1	60.0	<u>Pyroxenite</u> - fine to medium grained, dark greenish gray unit with >90% pyroxenes and <10% disseminated cloudy, grayish white feldspars - several sections of up to 20% feldspar with gradational contacts at 52.3'-54.5' and 57.4'-60.0' - weak and local, light green amphibole alteration of pyroxenes - local, weakly developed foliation at 40°-45° tca - several fractures, up to 1cm wide, with chlorite & whitish gray quartz core at 45° tca - 55.7' to 56.1' - fine to medium grained, grayish biege quartz-feldspar dike with a sharp upper contact at 38° tca and an irregular lower contact - 1% fine to medium grained, disseminated py and po with trace amounts of cpy - sharp, irregular lower contact Core Length: 46.0'-56.0', 12.5' of core, therefore remaining down hole footage tags moved uphole 2.5 feet	2574	2	50.0	60.0	10.0			.005	.029	
										From:	5.0'-	60.0'
										.006	.058	
										55.	0'	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-16 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-16 SHEET NO. 3 of 3
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
60.0	68.5	Anorthositic Gabbro - medium grained, uniform, mottled unit with 65-70% white feldspars and 30-35% dark green pyroxenes - local, yellowish green patches of epidote alteration (saussiritization) of feldspars most often concentrated along fractures - several fractures, up to 1cm wide, are chlorite ± quartz ± epidote filled and orientated at 35-40° tca or subparallel tca (<10°) - trace amounts of fine grained py and po E.O.H.	2574	3	60.0	68.5	8.5			<.001	.001	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-17 LENGTH 54.0 feet
LOCATION Roby Zone
LATITUDE 105,210.071 DEPARTURE 105,191.226
ELEVATION 10,005.54 AZIMUTH 071° DIP -45°
STARTED March 13/92 FINISHED March 13/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-17 SHEET NO. 1 of 2
REMARKS NQ Core
'Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
0.0	4.0	Overburden										
4.0	33.2	Amphibolitized Pyroxenite - fine to medium grained, light green to dark greenish gray, locally magnetic unit with > 90% pyroxenes and < 10% disseminated cloudy, grayish white feldspar crystals up to 1cm in size										
		-overall moderate to strong, light green fibrous amphibole (uralite) alteration of pyroxenes	2574	4	4.0	16.0	12.0			.006	.085	
		-local foliated, intensely amphibolitized zones with gradational contacts at 18.0'-19.8', 27.1'-27.3' and 31.5'-33.2'	2574	5	16.0	26.0	10.0			.006	.074	
			2574	6	26.0	36.0	10.0			.004	.098	
		-local foliation at 41°-51° tca										
		-18.5' to 19.8' - several, fine to medium grained, cloudy grayish white, locally orange tinge, quartz-feldspar dyke sharp upper contact at 45° tca and sharp irregular lower contacts										
		-several, randomly orientated, up to 3mm wide, chloritic fractures										
		-locally 2% fine to medium grained disseminated po and py with trace amounts of cpy, often associated with rims of po grains										
		-subtle lower contact at 22° tca										
		Core Loss: 4.0'-6.0' only 0.5' of core										
33.2	48.8	Feldspathic Pyroxenite - Pyroxenite - fine to medium grained, light greenish gray sections with 20-25% feldspars and 75-80% pyroxenes and dark green sections with > 90% pyroxenes and < 10% feldspars										

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-17 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-17 SHEET NO. 2 of 2
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON	
		- more feldspathic sections (20-25 feldspars) have gradational and distinctive, but irregular contacts, and occur at 36.6'-37.1', 37.5'-39.9' and 46.0'-48.8'	25747		36.0	46.0	10.0			.004	.015	
			25748		46.0	49.0	3.0			.002	.007	
		- overall, only weak and local, light green, amphibole alteration of pyroxenes								From:	4?.0' -	49.0'
		- minor amount of local, yellowish green epidote alteration of feldspars								.005	.054	
										45.0'		
		- minor amount of < 3mm wide chlorite ± amphibole filled fractures orientated at 35°-40° tca										
		- 1% fine to medium grained, disseminated py and po with trace cpy										
		- sharp lower contact at 47° tca										
48.8	54.0	Gabbro - medium grained, uniform, mottled unit with 60-65% white, often grayish purple tinge, feldspars and 35-40% dark green pyroxenes										
		- several, < 3mm wide, chlorite ± epidote filled, anastamosing fractures orientated at 35°-45° tca and subparallel tca (<10°)	25749		49.0	54.0	5.0			<.001	<.001	
		- local epidote alteration of feldspars										
		- trace amounts of fine grained py										
		E.O.H.										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-18 LENGTH 46.0 feet
LOCATION Roby Zone
LATITUDE 105,123.828 DEPARTURE 105,261.956
ELEVATION 10,613.235 AZIMUTH 071° DIP -45°
STARTED March 13/92 FINISHED March 13/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
NA					

HOLE NO. 92-18 SHEET NO. 1 of 3
REMARKS NQ Core
'Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
0.0	8.0	Overburden										
8.0	11.9	Pegmatite Dyke - very coarse grained, euhedral, up to 7cm sized, white with local purplish gray tinge feldspars (50%) and dark green to black, locally light green pyroxenes (50%) -feldspar grains are highly fractured with <2mm wide fractures filled with chlorite ± py ± po ± epidote - local and weak to moderate light green amphibole alteration of pyroxenes - 2 to 3% fine to medium grained, disseminated py and po with trace amounts of cpy and pentlandite - py and po also occur as semi-massive, up to 1cm sized, irregular shaped blebs associated with chloritic filled fractures in feldspar grains - broken, irregular lower contact	2575	0	8.0	12.0	4.0			.027	.345	
11.9	41.8	Amphibolitized Pyroxenite - fine to coarse grained, light green to dark greenish gray, locally foliated, locally magnetic unit with >90% pyroxenes and <5% feldspars - gradational transition between fine to coarse grained sections, magnetic sections (with 2-5% fine to medium grained, black magnetite grains) and more amphibolitized sections - overall moderate to strong, light green fibrous										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-18 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-18 SHEET NO. 2 of 3
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SAMPLE % SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		amphibole (uralite) alteration of pyroxenes										
		-local, weakly developed foliation at 35°-45° tca										
		-minor amount of <3mm wide, chlorite ± amphibole ± white quartz core, filled fractures, orientated at 35°-50° tca										
		-31.1' to 32.6' - more feldspathic section, with up to 20% feldspar, and gradational contacts with	25751		12.0	22.0	10.0			.005	.005	
		adjacent pyroxenite sections	25752		22.0	32.0	10.0			.007	.068	
		-minor epidote alteration of feldspars										
		-37.3' to 38.0' - several, up to 5cm wide, milky white,	25753		32.0	42.0	10.0			.002	.009	
		fine to medium grained, quartz - feldspar (anorthosite)								From:	8.0' -	42.0'
		vein with chloritic and brown hornblende at								.007	.065	
		contacts - contacts are sharp and at irregular orientations								34.	0'	
		-39.5' to 40.3' - several, up to 1cm wide, anastamosing epidote-pyrite rich (with trace cpy) veins orientated at 31°-35° tca										
		-Anorthositic gabbro, irregular shaped clast from adjacent lower unit suggesting pyroxenite unit is a dyke										
		-overall 1-2% fine to medium grained, disseminated py and po with trace amounts of cpy										
		-sulphides also occur as, up to 1cm wide, irregular shaped blebs with po rims and cpy rims often associated with coarser grained sections of pyroxenite unit										
		-sharp lower contact at 24° tca										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-18 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-18 SHEET NO. 3 of 3
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
41.8	46.0	Anorthositic Gabbro - medium grained, uniform, mottled white, locally gray feldspars (65%) and dark green pyroxenes (35%) -minor amount of <2mm wide chlorite ± epidote filled fractures that are randomly orientated -rare specks of fine grained py	2575	4	42.0	46.0	4.0			<.001	.001
		E.O.H.									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-19(R) LENGTH 316 feet
LOCATION Roby Zone
LATITUDE 105,263.623 DEPARTURE 104,975.578
ELEVATION 10,000.963 AZIMUTH 071° DIP -45°
STARTED March 16/92 FINISHED March 17/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
316	-42°	NA			

HOLE NO. 92-19(R) SHEET NO. 1 of 8
REMARKS BQ Core
'Drilled by Norex Drilling Ltd.
LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	%	%	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
0.0	4.0	Overburden									
4.0	29.1	Varitextured Gabbro - medium to coarse grained, irregularly, compositionally banded, greenish gray unit									
		-local pale purple colour from 5.6' to 15.1' due to alteration of feldspars	25617		4.0	10.0	6.0			.021	.369
		-banding consists of darker green sections with up to 60% pyroxene and 40% feldspar while lighter greenish gray sections contain 50-60% feldspar	25618		10.0	20.0	10.0			.018	.230
			25619		20.0	30.0	10.0			.012	.153
		-banding contacts are gradational and orientated at 45° to 65° tca								From: 4.0'-40.0'	
										.015	.208
										36.0'	
		-minor amount of, < 3mm wide, chlorite filled fractures orientated 35-45° tca									
		-overall weak chlorite alteration and saussiritization of feldspars into epidote									
		-alteration concentrated around fractures									
		-Mineralization includes sulphide concentrations of 2% of rock where po > cpy > py > pentlandite(?)									
		-sulphides occur as fine grain disseminates and as irregular blebs up to 1.5cm in size - blebs have a po core with cpy rims									
		-gradational lower contact									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-19(R) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 2 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPH. %	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
29.1	36.1	Feldspathic Pyroxenite - fine to medium grained, dark greenish gray, massive, uniform unit with up to 75% pyroxenes and 25% feldspars	25620		30.0	40.0	10.0			.012	.147
		- minor amount of < 3mm wide fractures orientated 30-40° tca									
		- minor amount of chlorite alteration - concentrated along fractures									
		- mineralization includes 1-2% fine grained disseminated po and cpy with several, up to .5cm sized irregular blebs									
		- gradational, irregular lower contact									
36.1	79.3	Gabbro - medium to coarse grained, greenish grays massive, uniform unit with 55% feldspar and 45% pyroxenes	25621		40.0	50.0	10.0			.009	.102
		- minor amount of fractures, which are < 3mm wide and orientated in two principle directions - 45° and 85° tca	25622		50.0	60.0	10.0			.010	.111
			25623		60.0	70.0	10.0			.008	.105
		- overall weak to moderate alteration of pyroxenes producing mostly chlorite and minor amphibolite	25624		70.0	80.0	10.0			.014	.147
		- alteration of feldspars appears as 1-2mm sized, irregular pathes of buff coloured material									
		- alteration is concentrated along fractures such as chlorite and epidote which is a product of saussirization									

FORM I

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-19 (R) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 3 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		- mineralization includes 1-2% f.g.r. disseminated po and cpy and also as irregular, <.6cm sized irregular blebs										
		- irregular lower contact										
79.8	101.1	Pegmatitic Gabbro - very coarse grained unit with up to 3 cm sized, euhedral pyroxene and feldspar crystals										
		- feldspars are milky white from top of unit to 85.2' at which point they gradually become more whitish gray	25625		80.0	90.0	10.0			.008	.089	
			25626		90.0	100.0	10.0			.017	.180	
		- feldspars are fractured and locally epidote alteration (saussirization) is present								From	90.0' -	120.0'
										.014	.206	
										30.	0'	
		- the pyroxenes are have been partially or completed altered to amphiboles (fibrous-uralite)										
		- chlorite alteration is present throughout but mostly associated with several, minute randomly orientated fractures										
		- two, 1.5cm wide, quartz and epidote veins occur at 86.4' and 96.3' at 40° tca										
		- mineralization consists of 2% po and cpy and occur predominately as po core-cpy rimmed, irregular shaped blebs up to 2 cm in size										
		- gradational lower contact										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-19 (R) LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 4 of 8
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
101.1	141.4	Gabbro - fine to medium grained, greenish gray unit with 50-60% pyroxenes and 40-50% feldspars - gabbro grades into two pegmatitic gabbroic sections at 120.4 - 123.2' and 139.9 - 141.4 where feldspar crystals (gray in colour) are up to 2.5 cm in size and euhedral - pyroxenes are locally altered to light brown/green amphiboles (uralite) - 123.7 to 124.4 → fine grained, dark green/gray pyroxenite unit with sharp upper and lower contact - upper contact - 75° tca - lower contact - 45° tca - overall 1-2% fine grained disseminated po, cpy and py and also as 1cm sized irregular blebs of po core and cpy rims - only trace amounts of po and cpy occur in the pegmatitic sections - gradational lower contact Lost Core: 106' to 116' - only 9.6 feet	25627 25628 25629 25630		100.0 110.0 120.0 130.0	110.0 120.0 130.0 140.0	10.0 10.0 10.0 10.0			.012 .013 .007 .013	.222 .215 .096 .177	
141.4	175.6	Anorthositic Gabbro - Gabbro - medium to coarse grained, massive, relatively uniform, light greenish gray unit with 60-65% feldspar and 35-40% pyroxenes										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-19 (R) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 5 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		- minor amount of, up to 1cm wide, chlorite-quartz filled fractures at 40-55° tca	25631		140.0	150.0	10.0			.013	.134
		- moderate alteration of pyroxenes to light green/brown amphiboles (uralite)	25632		150.0	160.0	10.0			.008	.105
		- overall weak chlorite alteration, concentrated along fractures	25633		160.0	170.0	10.0			.010	.111
			25634		170.0	180.0	10.0			.010	.079
		- 2% fine to medium grained po and cpy as disseminated grains and as irregular shaped blebs up to 1cm in size									
		- gradational lower contact									
175.6	234.1	Varitextured Gabbro - fine to coarse grained, non-uniform unit with 60% pyroxenes and 40% feldspar									
		- randomly occurring and varying width of light and darker green/gray bands due to increase	25635		180.0	190.0	10.0			.014	.101
		of feldspars and amphibole alteration (uralite)	25636		190.0	200.0	10.0			.008	.077
		in the lighter sections and increase percentage of pyroxenes in the darker sections	25637		200.0	210.0	10.0			.006	.028
		- gradational contacts between sections	25638		210.0	220.0	10.0			.008	.082
		- overall moderate pyroxene alteration to amphiboles and local alteration of feldspars	25639		220.0	230.0	10.0			.009	.064
		to epidote (saussiritization)	25640		230.0	240.0	10.0			.009	.118
		- fracturing consists of, up to 1cm wide, quartz-chlorite ± epidote filled fractures orientated 37-45° tca									
		- 202.4' to 206.0 → fine grained, dark green pyroxenite with minor amphibole alteration									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ____
HOLE NO. 92-19(R) LENGTH ____
LOCATION ____
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH ____ DIP ____
STARTED ____ FINISHED ____

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 6 of 8
REMARKS ____
LOGGED BY ____

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		- sharp upper (25° tca) and lower (47° tca) contact (diabase?)										
		- overall 1-2% fine to medium grained disseminated po and cpy and also as .5cm sized irregular blebs										
		- sharp lower contact at 50° tca										
234.1	302.6	Pyroxenite - medium to coarse grained, dark green/gray unit with 85-90% pyroxenes and 10-15% feldspar	25641		240.0	250.0	10.0			.010	.129	
		- pyroxenite grades into several gabbroic sections with up to 25-30% feldspars (254'-256')	25642		250.0	260.0	10.0			.006	.058	
		- the feldspars are locally altered to a	25643		260.0	270.0	10.0			.015	.202	.014 opt Pt
		light yellowish green colour - epidote	25644		270.0	280.0	10.0			.012	.172	.187 opt Pd / 20.0'
		- overall the pyroxenes are moderately to strongly altered to amphibole (uralite?)	25645		280.0	290.0	10.0			.006	.056	
		- intense amphibole alteration locally and grades into moderately altered sections	25646		290.0	300.0	10.0			.002	.017	
		- sections of moderate to weak foliation at 30° tca								From: 4.0' — .011	.132 / 276.0'	280.0'
		- 302.3' to 302.5' - intense talc alteration adjacent to lower anorthosite unit										
		- unit crosscut by several, up to 5cm wide, white quartzo-feldspathic veins that are randomly orientated and at 45°-50° tca (243.0', 243.6', 248.1', 252.2', 268.8' and 277.3')										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-19 (R) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 7 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
		- 285.9' to 288.6' - section of randomly orientated, white-pink, quartz-feldspar veining with irregular contacts, also contains minor chlorite and epidote - 1-2% fine to medium grained, anhedral, disseminated po and py with only trace grains of cpy - sulphides also occur as irregular shaped blebs up to 1cm in size - sharp lower contact at 53° tca Lost Core: 296'-306' only 7.1' (rubbly, broken core at 296.7')									
302.5	311.5	<u>Anorthosite</u> - medium to coarse grained, massive, uniform, light gray unit with a purplish tinge - 80 to 90% feldspar with 10-20% pyroxenes - minor amounts of epidote and chlorite alteration which is concentrate in areas adjacent to < 3mm wide fractures orientated at 45° tca - trace amounts of fine grained disseminated po and py - sharp lower contact at 53° tca	25647		300.0	310.0	10.0			.002	.005

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-19(R) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-19(R) SHEET NO. 8 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
311.5	316.0	Pyroxenite - medium to coarse grained, dark green-gray unit with >90% , euhedral pyroxenes and 10% feldspars - weak alteration of pyroxenes to amphiboles - minor chlorite and epidote alteration is associated with several, up to .5cm wide, fractures orientated 40° to 65° tca - 1-2% fine to medium grained, disseminated py and po with only trace amounts of cpy E.O.H.	2564	8	310.0	316.0	6.0			.001	.008

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-20(S) LENGTH 338 feet
LOCATION Roby Zone
LATITUDE 105,464.454 DEPARTURE 104,820.104
ELEVATION 9993.467 AZIMUTH 071° DIP −45°
STARTED March 13/92 FINISHED March 16/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
338	-45°	NA			

HOLE NO. 92-20(S) SHEET NO. 1 of 8
REMARKS BQ Core

LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPH-IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
0.0	1.5	Overburden									
1.5	17.9	Gabbro - medium to coarse grained, massive, light greenish gray, uniform unit with 50% pyroxenes and 50% feldspars	25649		1.5	10.0	8.5			.002	.008
		- minor amount of < 3mm. wide chloritic fractures orientated at 40° tca	25650		10.0	20.0	10.0			.003	.016
		- minor amphibolite alteration of pyroxenes									
		- trace amounts of fine grained, disseminated py and po									
		- 11.1' to 11.6' - coarse grained, pegmatitic section with irregular and gradational contacts									
		- gradational lower contact									
		Core Loss: 16.0' to 26.0' only 8.4' of core									
17.9	54.4	Varitextured Gabbro - fine to coarse grained, light to dark, greenish gray unit with gradually altering sections of 60% feldspar and 40%	25651		20.0	30.0	10.0			.006	.029
		pyroxenes to 40% feldspar and 60% pyroxenes	25652		30.0	40.0	10.0			.004	.022
		- very non-uniform unit									
		- several pegmatitic sections at 29.5'-34.1' and 38.5'-45.3' which contain, up to 2cm sized,	25653		40.0	50.0	10.0			.008	.038
		euhedral pyroxenes and feldspars	25654		50.0	60.0	10.0			.004	.023
		- 35.7' to 38.5' - fine to medium grained, massive uniform pyroxenite with a sharp irregular upper contact and a sharp lower contact at 50° tca									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-20 (5) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(5) SHEET NO. 2 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		- minor alteration of pyroxenes to amphibole (ie uralite) - feldspars in the pegmatitic sections have been altered to a light yellowish green epidote - 1-2 % fine to medium grained, disseminated po and cpy, as well several, up to .5cm wide irregular shaped blebs with po cores and cpy rims - gradational lower contact									
54.4	68.9	Feldspathic Pyroxenite - fine to medium grained, green-gray, massive, uniform unit with 75% pyroxenes and 25% feldspars - minor chlorite alteration along, < 2mm wide fractures orientated 40°-50° tca - local and weak amphibole alteration - overall trace to 1% fine grained disseminated po and py - gradational lower contact Core Loss: 66.0'-76.0' only 9.8' of core	25655		60.0	70.0	10.0			.002	.005
68.9	102.2	Varitextured Gabbro - fine to coarse grained, green-gray, non-uniform unit with 50-65% pyroxenes and 35-50% feldspars - gradual change between more pyroxene rich sections and coarse grained sections									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ____
HOLE NO. 92-20(S) LENGTH ____
LOCATION ____
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH ____ DIP ____
STARTED ____ FINISHED ____

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(S) SHEET NO. 3 of 8
REMARKS ____
LOGGED BY ____

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
		- local amphibolite alteration and chlorite alteration of pyroxenes and epidote alteration of feldspars									
		- chlorite alteration associated with < 3 mm wide fractures orientated 40°-50° tca	25656		70.0	80.0	10.0			.003	.019
		- 83.4' to 85.3' - pegmatitic gabbro section with up to 3 cm sized, euhedral feldspar and pyroxene crystals	25657		80.0	90.0	10.0			.002	.014
		- fine to medium grained, dark green pyroxenite sections with gradational contacts at 94.9'-96.8' and 101.7'-102.2'	25658		90.0	100.0	10.0			.002	.010
		- 1-2% fine to medium grained, disseminated po and cpy and py - also as irregular shaped blebs up to 1cm in size with po cores and cpy rims									
		- sharp lower contact at 41° tca									
102.2	138.2	<u>Anorthositic Gabbro</u> - medium to coarse grained, light greenish gray unit with 60-70% feldspars and 30-40% pyroxenes	25659		100.0	110.0	10.0			.003	.023
		- weak to moderate amphibole alteration of the pyroxenes (uralite)	25660		110.0	120.0	10.0			.004	.019
		- several pegmatitic zones with gradational contacts occur at 116.3'-118.0' and 135.9-138.2' - up to 2cm sized, euhedral feldspar and pyroxene crystals	25661		120.0	130.0	10.0			.003	.032
			25662		130.0	140.0	10.0			.002	.010

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-20(5) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(S) SHEET NO. 4 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPH-IDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		- minor epidote and chlorite associated with <.5cm wide fractures orientated 35°-45° tca									
		- 121.8' to 122.4' - white, crystaline quartz-feldspar vein with sharp, chloritic, epoditic contacts, upper contact is irregular, lower contact is at 29° tca									
		- trace amounts fine grained, disseminated py/po									
		- Sharp lower contact at 43° tca									
138.2	202.6	Gabbro - medium to coarse grained, greenish gray unit with 50% feldspars and 50% pyroxenes									
		- overall weak to moderate alteration of pyroxenes producing amphibole (uralite)	2566	3	140.0	150.0	10.0			.011	.087
		- local feldspar alteration of yellowish green epidote (saussirization)	2566	4	150.0	160.0	10.0			.006	.029
			2566	5	160.0	170.0	10.0			.008	.044
		- chlorite and epidote concentrated in up to 1cm wide fractures orientated 30°-45° tca	2566	6	170.0	180.0	10.0			.005	.055
			2566	7	180.0	190.0	10.0			.007	.088
		- several, anorthositic, light purplish gray sections with gradational contacts occur at 163.5'-166.8', 179.0'-191.6' and 191.8'-195.5'	2566	8	190.0	200.0	10.0			.009	.143
		- 2% fine to medium grained, disseminated po and cpy and trace py, and also as .5cm sized irregular blebs of po core and cpy rims									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-20(S) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(S) SHEET NO. 5 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON	
		-gradational lower contact										
202.6	236.6	Anorthositic Gabbro - Coarse grained, light greenish gray unit with 65-75% feldspar and 25-35% pyroxenes crystals up to 1.cm in size	25669		200.0	210.0	10.0			.009	.172	
		-relatively uniform unit	25670		210.0	220.0	10.0			.004	.033	
		-overall weak to moderate alteration of pyroxenes to a pale green coloured amphibole (uralite) -	25671		220.0	230.0	10.0			.003	.023	
		strong alteration at 207.4' to 208.0'	25672		230.0	236.0	6.0			.005	.079	
		- minor alteration of feldspars to a light yellowish green - epidote								From: 140.0' -	236.0'	
										.007	.075	
										96.0'		
		- several, <3mm wide, chlorite filled fractures that are randomly orientated and at 25°-40° tca										
		- 1-2% fine to medium grained, disseminated po, py and cpy, trace pentlandite (?)										
		- sharp lower contact at 48° tca										
236.6	246.9	Pyroxenite - fine to medium grained, light green, uniform, non-foliated unit with > 90% amphibolitized pyroxenes	25673		236.0	246.0	10.0			.011	.198	
		- pervasive, moderate to strong light green amphibole (uralite) alteration with minor talc alteration										
		- several, <2mm wide quartz-chlorite filled fractures orientated at 35-40° tca										
		- fibrous amphiboles give a "dogshair" appearance										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-20(S) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(S) SHEET NO. 6 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
		-overall trace amounts of fine grained, disseminated po and py increasing up to 2% of rock in lower 25cm of section - gradational lower contact
246.9	302.5	Varitextured Gabbro - fine to coarse grained, light to dark greenish gray, very non-uniform unit with gradational, compositional changes with 40-60% feldspars and 40-60% pyroxenes - several, anorthositic, coarse grained to pegmatitic sections at 247.9'-249.7', 263.4'-269.5' and 284.6'-289.0' - all sections have gradational contacts - pervasive, weak to moderate, light green amphibole alteration - local and weak epidote alteration of feldspars - 274.6' to 275.3' - moderate, light green coloured talc alteration zone - gradational contact - trace to 1%, fine grained, disseminated po, py and cpy with several, irregular shaped blebs up to .5cm in size - well defined lower contact at 51° tca

SAMPLE NO.	% SULPHIDES	FOOTAGE FROM	FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON
25674		246.0	250.0	4.0			.007	.079
25675		250.0	260.0	10.0			.007	.078
25676		260.0	270.0	10.0			.005	.046
25677		270.0	280.0	10.0			.003	.033
25678		280.0	290.0	10.0			.003	.020
25679		290.0	300.0	10.0			.004	.056

FORM I

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-20 (S) LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(S) SHEET NO. 7 of 8
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	%	%	Pt OZ/TON	Pd OZ/TON	
302.5	320.1	Pyroxenite - Fine to medium grained light greenish gray to dark green unit with >90% pyroxenes and <10% feldspars										
		- moderate to strong alteration of pyroxene to light green coloured amphiboles (uralite) often giving the appearance of "dogs hair"	25680		300.0	310.0	10.0			.017	.307	
			25681		310.0	320.0	10.0			.020	.616	
		- minor amount and local saussuritization of feldspars to yellowish green epidote								.019	.461	
										20.0'		
		- moderate talc alteration at 304.5'-304.9' and 308.2'-308.8' with gradational contacts								From:	236.0'-	330.0'
										.008	.158	
		- weak, anastamosing foliation developed in talc alteration zones between 35°-45° tca								94.0'		
		- trace to 1% fine grained disseminated po and py and as irregular shaped blebs up to .5cm in size										
		- sharp but irregular lower contact										
		Core Loss: 306.0' to 316.0' - only 8.3' of core										
320.1	338.0	Gabbro - medium grained, greenish gray, uniform unit with 70% pyroxenes and 30% feldspars	25682		320.0	330.0	10.0			.004	.103	
		- mottled texture with minor amphibolite alteration of pyroxenes and void of any significant feldspar alteration	25683		330.0	338.0	8.0			.002	.025	
		- minor amount of less than .5cm wide										

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-20(5) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-20(5) SHEET NO. 8 of 8
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS OZ/TON	ASSAYS OZ/TON
		chloritic fractures orientated at 40°-45° tca -2cm wide quartz-feldspar vein at 234.9', orientated 37° tca -trace amounts of fine grained, dissseminated po and py E.O.H.									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-21 (T) LENGTH 300 feet
LOCATION West of Roby Zone
LATITUDE 103,930 N DEPARTURE 104,030 (Not surveyed)
ELEVATION 9990.0 AZIMUTH 251° DIP -45°
STARTED March 17/92 FINISHED March 18/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
300'	-44°	NA			

HOLE NO. 92-21(T) SHEET NO. 1 of 5
REMARKS BQ Core

LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
0.0	10.0	Overburden										
10.0	18.5	Anorthositic Gabbro - medium grained, light gray, uniform unit with 70-75% feldspar and 25-30%. pyroxenes -several feldspars have a purplish tinge but otherwise are unaltered -minor chlorite alteration of pyroxenes but concentrated along, up to .5cm wide fractures orientated 35°-45° tca -trace amounts of fine grained, disseminated po and py -sharp and irregular lower contact										
18.5	61.0	Gabbro - medium grained, greenish gray with local sections of purple tinge unit with 50% feldspars and 50% pyroxenes -purple tinge section, 37.0' to 46.0', with gradational contacts produced by purplish feldspars -minor chlorite and amphibole alteration of pyroxenes, concentrated along <.5cm wide fractures orientated at 35-40° tca -weak foliation developed at 50.0' at 32° tca -trace amounts of fine grained disseminated po, py and cpy with several, irregular	2568	4	50.0	60.0	10.0			<.001	.003	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-21 (T) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-21(T) SHEET NO. 2 of 5
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		shaped, up to .5cm sized blebs of po core and cpy rims - gradational lower contact									
61.0	103.4	Varitextured Gabbro - medium to coarse grained, light to dark greenish gray, gradational alternating sections of 40-60% feldspar and 40-60% pyroxenes									
		- local, purple tinge colouration at 96.0'-99.0'	25685		60.0	70.0	10.0			.001	.011
		- several, pegmatitic sections with gradational contacts occur at 61.5'-63.0' and 63.6'-64.8' with pyroxene and feldspar crystals well formed up to 2 cm. in size - very fine grained, massive, dark gray diabase dikes with sharp contacts at 45°-50° tca occur at 73.5'-74.1' and 74.8'-75.2' - weak foliation developed at 65.1'-65.9' at 51° tca - overall, minor and local amphibole (uralite) alteration of pyroxenes - minor fracturing at 40°-45° tca are up to .5cm wide and are chlorite and amphibole or feldspathic material filled fractures - overall trace amounts of fine to medium grained, disseminated po and py with up to 1-2% po and py and trace cpy in top ten feet of unit - irregular lower contact									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-21(T) LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-21(T) SHEET NO. 3 of 5
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
103.4	135.8	Diabase Dike Swarm - fine grained, dark gray, massive uniform, weakly magnetic dikes with sharp contacts - the diabase dikes, with often, chilled margins and sharp contacts at 50° to 55° tca intrude light gray, medium grained, uniform gabbro unit - dikes occur at 103.4'-108.2', 119.9'-125.5' and 126.7'-133.9' - local chlorite alteration of gabbro at contact to diabase - trace, very fine grained py in diabase and trace to 1%, fine to medium grained py and po in gabbro, with several, a few sized, irregular shaped blebs - irregular lower contact	25686		110.0	120.0	10.0			<.001	.016
135.8	185.4	Anorthositic Gabbro to Gabbro - gradual transition between alternating sections of random widths of fine to medium grained, greenish gray gabbro with 60% pyroxene and 40% feldspar with medium to coarse grained, light greenish gray anorthositic gabbro with 60-70% feldspar and 30-40% pyroxene - several quartz-feldspar, white veins with sharp contacts occur at 162.7'-162.9', 164.7'-168.1 and 169.8'-170.0'	25687		160.0	170.0	10.0			<.001	.005

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-21(T) LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		-veins contain anastamosing, chloritic wisps and irregular blebs with 1-2% fine grained disseminated pyrite and as stringers associated with chloritic wisps									
		-146.6' to 147.3' - foliated, chloritic section at 52° tca									
		-several, < 1cm wide chlorite-filled fractures orientated at 35°-40° tca									
		- overall, weak chlorite and/or light green amphibole (uralite) alteration of pyroxenes									
		- trace to 1% fine to medium grained, disseminated py, po and cpy and as < .5cm sized, irregular shaped blebs of py and po									
		- gradational lower contact									
135.4	271.6	Gabbro - fine to medium grained, greenish gray unit with 55-65% pyroxenes and 35-45% feldspars									
		-local purplish tinge colour of the feldspars	25688		190.0	200.0	10.0			.002	.018
		- several pegmatitic gabbro sections with gradational contacts and pyroxenes and feldspars crystals	25689		230.0	240.0	10.0			<.001	.002
		up to 1.5cm in size occur at 196.3'-197.8', 187.6'-189.4' and 266.0'-267.0', 226.6'-230.5'	25690		240.0	250.0	10.0			.002	.011
		-228.8' to 229.5' and 230.2' to 230.5' - light grayish white, fine to medium grained feldspathic	25691		250.0	260.0	10.0			.001	.006
		(anorthositic) veins with sharp contacts at 45°-55° tca	25692		260.0	270.0	10.0			.001	.008
		- veins host 10-15% chlorite wisps representing a moderately developed foliation at 54° tca									
		-195.6' to 196.0' - chloritic zone with 4-5% medium grained py and po as stringers									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ____
HOLE NO. 92-21 (T) LENGTH ____
LOCATION ____
LATITUDE ____ DEPARTURE ____
ELEVATION ____ AZIMUTH ____ DIP ____
STARTED ____ FINISHED ____

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-21(T) SHEET NO. 5 of 5
REMARKS ____
LOGGED BY ____

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		parallel to foliation at 48° tca - minor Ca carbonate associated with this chloritic zone - several fractures occur at 35°-45° tca and are up to 1 cm. wide with quartz-calcite-chlorite and epidote-chlorite filled - moderate light green amphibole (uralite) alteration of pyroxenes with minor chlorite alteration at 236.5'-237.3', 253.9'-255.4' and 260.1-260.5' - 1% fine grained, disseminated py and po with trace amounts of cpy in anorthositic veins - sulphides also occur as <.5cm sized, irregular shaped blebs of py and po - gradational lower contact									
271.6	300.0	Anorthositic Gabbro - medium to coarse grained, greenish gray, uniform unit with euhedral pyroxenes (40%) and feldspars (60%) up to 1cm in size - medium grained, more pyroxene rich (50-55%) gabbroic section with irregular contacts at 282.4'-289.8' - several fractures, up to 1cm wide and orientated at 45-50° tca are chlorite ± calcite ± feldspar filled - local and weak amphibole alteration of pyroxenes - trace to 1%, fine grained po, py and cpy. locally, with several <.5cm sized, irregular shaped blebs of po core and cpy rims E.O.H.	A569	3	290.0	300.0	10.0			.001	.006

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY Lac Des Iles Property
HOLE NO. 92-22 LENGTH 264 feet
LOCATION West of Roby Zone
LATITUDE 104,032 N DEPARTURE 104,365 (Not surveyed)
ELEVATION 9990 AZIMUTH 251° DIP -45°
STARTED March 18/92 FINISHED March 18/92

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH
264	-44°	NA			

HOLE NO. 92-22 SHEET NO. 1 of 5
REMARKS BQ Core

LOGGED BY M. Michaud

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS OZ/TON Pt	ASSAYS OZ/TON Pd
0.0	32.0	Overburden									
32.0	43.1	Gabbro - fine to medium grained, greenish gray; massive, uniform unit with approximately 60-65% feldspar and 35-40% pyroxenes - unit transected by several, dark green, chloritic filled fractures up to .5cm wide - rare specks of pyrite and pyrrhotite associated with chloritic fractures - fractures are randomly orientated between 30°-55° tca. - very minor amount of light green, patchy alteration of feldspars (saussurization) - feldspar alteration is more developed at fracture contacts - overall only rare specks of py/po - gradational lower contact									
43.1	63.6	Anorthositic Gabbro - fine to medium grained, light greenish gray with gradual transition to and from darker greenish gray sections - 65% to 75% feldspar, 25-35% pyroxene - several fractures are orientated predominately in two directions, 40° and 85° tca, respectively - 40° tca fracture - up to 1cm wide with quartz and chlorite rims									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-22 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-22 SHEET NO. 2 of 5
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
		- 85° tca fracture consists of chlorite and up to widths of .5 cm - very minor amount of light green, patchy feldspar alteration - overall only rare specks of f.gr. py and po and is usually concentrated along fractures, as is the feldspar alteration - 1 cm. quartz vein at 57.1' - irregular and gradational lower contact	25606		60.0	60.0	10.0			.001	.011
63.6	102.3	Anorthosite - fine to medium grained, gray to greenish gray in sections of increased pyroxenes - approximately 80-90% feldspar and 10-20% pyrox - gradational increase in decrease of pyroxene percentages throughout unit - several sections, ranging in width from 1 cm to 20 cm, consist of fine grained, green gabbroic zones with sharp contacts at predominately 45-50° tca (see 67.0-67.8') - several, less than .5 cm wide, chlorite filled fractures occur at random orientations - only a rare amount of sulphide specks - py, po occurs along fractures as does very minor feldspar alteration (sericite)									

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-22 LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-22 SHEET NO. 3 of 5
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	TOTAL	ASSAYS %	%	Pt OZ/TON	Pd OZ/TON
		- sharp lower contact at 40° tca									
102.3	115.7	Feldspathic Pyroxenite - fine to medium grained,	25607		102.3	110.0	7.7			<.001	.001
		green, massive unit with 80% pyroxenes	25608		110.0	120.0	10.0			<.001	.006
		and 20% feldspars									
		- weak chlorite alteration of pyroxene and feldspar alteration (saussuritization)									
		- fine grained anorthosite vein with irregular contacts at 105.1 - 106.0'									
		- minor amount of chlorite and sericite fractures up to .5cm wide orientated 40°-65° tca									
		- mineralization includes 1% po, cpy and py as fine grained disseminations and as irregular shaped blebs up to 1cm in size									
		- gradational lower contact									
115.7	172.6	Vacitextured Gabbro - fine grained, lighter green	25609		120.0	130.0	10.0			.002	.019
		pyroxene rich bands alternating with coarse	25610		130.0	140.0	10.0			.004	.036
		grained dark green pyroxenes (up to 60%)	25611		140.0	150.0	10.0			.002	.028
		and coarse grained whitish feldspars	25612		150.0	160.0	10.0			.004	.027
		- bands commonly 5-10 cm wide and are	25613		160.0	170.0	10.0			.005	.027
		orientated 50° tca	25614		170.0	180.0	10.0			.006	.025
		- overall weak to moderate chlorite alteration and weak feldspar alteration								.004	.027
										60.0'	

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY
HOLE NO. 92-22 LENGTH
LOCATION
LATITUDE DEPARTURE
ELEVATION AZIMUTH DIP
STARTED FINISHED

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-22 SHEET NO. 4 of 5
REMARKS
LOGGED BY

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE FOOTAGE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON
		- 136.5' to 136.9' - highly foliated, chlorite zone with quartz and 1cm sized blebs of po/cpy - orientated 40° tca - very minor amount of chloritic microfractures at 40°-50° tca - overall 1-2% sulphides - po > cpy > py as disseminated grains and as up to 1cm sized irregular shaped blebs - gradational lower contact - Core Loss - 136' to 146' is only 9.5'									
172.6	191.5	Varitextured Gabbro - similar to above unit with only weak chlorite alteration and feldspar alteration · only trace amounts of fine grained disseminated po and cpy - gradational lower contact	25755		180.0	190.0	10.0			<.001	.006
191.5	201.6	Feldspathic Pyroxenite - fine to medium grained green unit, weak banding in unit of darker green sections of increased pyroxene content - 80% pyroxenes and 20% feldspars - minor fracturing at 40°-45° tca of up to 3mm wide chlorite and quartz filled	25756		190.0	200.0	10.0			.001	.013

FORM 1

DIAMOND DRILL RECORD

NAME OF PROPERTY ______
HOLE NO. 92-22 LENGTH ______
LOCATION ______
LATITUDE ______ DEPARTURE ______
ELEVATION ______ AZIMUTH ______ DIP ______
STARTED ______ FINISHED ______

FOOTAGE	DIP	AZIMUTH	FOOTAGE	DIP	AZIMUTH

HOLE NO. 92-22 SHEET NO. 5 of 5
REMARKS ______
LOGGED BY ______

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	SAMPLE NO.	% SULPHIDES	SAMPLE FOOTAGE FROM	SAMPLE FOOTAGE TO	SAMPLE TOTAL	ASSAYS %	ASSAYS %	ASSAYS Pt OZ/TON	ASSAYS Pd OZ/TON	
		- trace to locally 1% fine grained disseminated po and cpy										
		- gradational lower contact	25757		200.0	210.0	10.0			<.001	.010	
201.6	264.0	Varitextured Gabbro - fine grained, lighter green	25758		210.0	220.0	10.0			<.001	.005	
		pyroxene rich (75%) bands alternating with	25759		220.0	230.0	10.0			<.001	.008	
		coarse grained pyroxene (60%) and feldspars (40%)	26615		230.0	240.0	10.0			.006	.017	
		- similar to unit intersected above (115.7'-172.6')	25616		240.0	250.0	10.0			.002	.014	
		- compositional bands, up to 5-10 cm wide, are orientated 40° tca	25760		250.0	260.0	10.0			<.001	.005	
		- weak chlorite alteration and minor feldspar alteration concentrated along microfractures which occur at 45° tca	25761		260.0	264.0	4.0			<.001	.002	
		- trace amounts of fine grained disseminated po and cpy throughout - except for section 237' to 249' where sulphides are 1-2% of rock								From:	230.0'	250.0'
		- Core Loss - 246.0' to 256.0' is only 9.6'								.004	.015	
		- 256.0' to 264.0' is only 7.3'								20.0'		
		E.O.H.										

FORM 1

APPENDIX D

BARRINGER LABORATORIES

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
PHONE: (416) 890-8586
FAX: (416) 890-8575

BARRINGER / ACCURASSAY LABORATORIES
THUNDER BAY DIVISION

7-Apr-92

LAC DES ILES MINES LTD.
Suite 1814, 150 York Street
Toronto, ON
M5H 3S5

Page: 1
Copy: 1 of 2
Set : 1

Attn: Mr. Glen Clark
Project:

Received: 30-Mar-92 15:51

PO #:

Job: 924068T

Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25534	<15	11
25535	<15	9
25536	<15	7
25537	<15	14
25538	<15	17
25539	<15	13
25540	<15	8
25541	<15	6
25542	<15	7
25543	<15	6
25544	<15	<5
25545	<15	5
25546	<15	<5
25547	<15	7
25548	<15	9
25549	<15	9
25550	<15	6
25551	<15	8
25552	<15	5
25553	<15	6
25554	<15	<5
25555	<15	6
25556	<15	<5
25557	<15	6
25558	<15	119
25559	17	304
5560	<15	<5
:5561	<15	19

BARRINGER LABORATORIES

BARRINGER / ACCURASSAY LABORATORIES
THUNDER BAY DIVISION

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
PHONE: (416) 890-8566
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LAC DES ILES MINES LTD.
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Toronto, ON
M5H 3S5

7-Apr-92

Page: 2
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Attn: Mr. Glen Clark
Project:

PO #:

Received: 30-Mar-92 15:51

Job: 924068T

Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25562	<15	39
25563	32	294
25564	56	967
25565	44	703
25566	120	1814
25567	71	653
25568	96	932
25569	64	314
25570	339	1096
25571	43	553
25572	62	997
25573	46	473
25574	26	269
25575	32	111
25576	<15	5
25577	16	226
25578	349	3269
25579	394	4365
25580	222	3060
25581	211	3369
25582	144	1894
25583	59	364
25584	55	284
25585	27	188
25586	156	2223
25587	314	4684
5588	324	3608
5589	147	1884

BARRINGER LABORATORIES

BARRINGER / ACCURASSAY LABORATORIES
THUNDER BAY DIVISION

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
PHONE: (416) 890-8566
FAX: (416) 890-8575

7-Apr-92

LAC DES ILES MINES LTD.
Suite 1814, 150 York Street
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Page: 3
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Attn: Mr. Glen Clark
Project:

PO #:

Received: 30-Mar-92 15:51

Job: 924068T

Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25590	234	3618
25591	226	3040
25592	118	832

BARRINGER LABORATORIES

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7-Apr-92

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Attn: Mr. Glen Clark
Project:

Received: 30-Mar-92 15:51
PO #:

Job: 924068T Status: Final

Abbreviations:

Parameters:

Pt : Platinum
Pd : Palladium

Methods:

FA/AA1.3 : Fire Assay/Atomic Absorption (1.3 assay ton)

Units:

ppb : parts per billion

Quality control:

< : Less than quoted detection limit

Signed:
....
Jeffrey Davis, B.Sc.,C.Chem.
Manager, Thunder Bay Division

17-Mar-92

LAC DES ILES MINES LTD.
Suite 1814, 150 York Street
Toronto, ON
M5H 3S5

Page: 2
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Attn: Mr. Glen Clark
Project:

PO #:

Received: 6-Mar-92 09:04

Job: 9240481

Status: Preliminary

Core Samples

Sample	Pt FA/AA1.3 oz/T	Pd FA/AA1.3 oz/T	Pt FA/AA1.3 g/tonne	Pd FA/AA1.3 g/tonne
25502	<0.001	<0.001	<0.02	<0.005
25504	<0.001	<0.001	<0.02	<0.005
25506	<0.001	<0.001	<0.02	<0.005
25508	<0.001	<0.001	<0.02	<0.005
25510	<0.001	<0.001	<0.02	<0.005
25512	<0.001	<0.001	<0.02	<0.005
25514	<0.001	<0.001	<0.02	<0.005
25516	<0.001	<0.001	<0.02	<0.005
25518	<0.001	<0.001	<0.02	<0.005
25520	<0.001	<0.001	<0.02	<0.005
25522	<0.001	<0.001	<0.02	<0.005
25524	<0.001	<0.001	<0.02	<0.005
25526	<0.001	<0.001	<0.02	<0.005

17-Mar-92

LAC DES ILES MINES LTD.
Suite 1814, 150 York Street
Toronto, ON
M5H 3S5

Page: 1
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Attn: Mr. Glen Clark
Project:

PO #:

Received: 6-Mar-92 09:04

Job: 924048T

Status: Preliminary

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25533	<15	11

BARRINGER LABORATORIES

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
PHONE: (416) 890-8566
FAX: (416) 890-8575

BARRINGER / ACCURASSAY LABORATORIES
THUNDER BAY DIVISION

10-Apr-92

LAC DES ILES MINES LTD.
111 Richmond Street West, Suite 916
Toronto, ON
M5H 2G4

Page: 1
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Attn: Mr. Glen Clark
Project:

PO #:

Received: 6-Apr-92 10:19

Job: 924070T

Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25593	404	4286
25594	359	5422
25595	309	6319
25596	409	9110
25597	289	6140
25598	173	3349
25599	294	5482
25600	239	4066
25601	202	3967
25602	205	2551
25603	136	892
25604	22	138
25605	<15	26

BARRINGER LABORATORIES
BARRINGER / ACCURASSAY LABORATORIES
THUNDER BAY DIVISION

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
PHONE: (416) 890-8566
FAX: (416) 890-8575

10-Apr-92

LAC DES ILES MINES LTD.
111 Richmond Street West, Suite 916
Toronto, ON
M5H 2G4

Page: 2
Copy: 1 of 1
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Attn: Mr. Glen Clark
Received: 6-Apr-92 10:19
Project:
PO #:

Job: 924070T
Status: Final

Signed:
....
Jeffrey Davis, B.Sc.,C.Chem.
Manager, Thunder Bay Division

BARRINGER LABORATORIES

BARRINGER / ACCURASSAY LABORATORIES
THUNDER BAY DIVISION

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
PHONE: (416) 890-8566
FAX: (416) 890-8575

LAC DES ILES MINES LTD.
111 Richmond Street West, Suite 916
Toronto, ON
M5H 2G4

28-Apr-92

Page: 1
Copy: 1 of 1
Set : 1

Attn: Mr. Glen Clark
Project:

PO #:

Received: 20-Apr-92 07:09

Job: 924092T

Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25617	713	12650
25618	603	7874
25619	419	5233
25620	419	5033
25621	299	3488
25622	354	3787
25623	274	3588
25624	478	5033
25625	264	3050
25626	573	6179
25627	414	7625
25628	429	7375
25629	229	3289
25630	434	6080
25631	453	4585
25632	289	3608
25633	344	3807
25634	344	2711
25635	468	3448
25636	269	2651
25637	209	942
25638	284	2811
25639	294	2178
25640	304	4027
25641	329	4425
25642	189	1973
25643	508	6927
5644	419	5880

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28-Apr-92

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Toronto, ON
M5H 2G4

Attn: Mr. Glen Clark
Project:

Received: 20-Apr-92 07:09

PO #:

Job: 924092T

Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25645	204	1909
25646	79	588
25647	56	186
25648	48	259
25672	160	2691
25673	369	6777
25674	240	2691
25675	239	2671
25676	177	1575
25677	112	1146
25678	101	693
25679	130	1934
25680	588	10510
25681	698	21130
25682	151	3528
25683	75	867

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28-Apr-92

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Toronto, ON
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Page: 3
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Attn: Mr. Glen Clark
Project:

Received: 20-Apr-92 07:09

PO #:

Job: 924092T

Status: Final

Signed:

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Jeffrey Davis, B.Sc., C.Chem.
Manager, Thunder Bay Division

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5-May-92

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Attn: Mr. Glen Clark
Project:
PO #:
Received: 24-Apr-92 07:49

Job: 924097T
Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25606	37	361
25607	20	42
25608	19	216
25609	69	633
25610	133	1239
25611	68	955
25612	132	940
25613	178	910
25614	193	858
25615	188	575
25616	78	469
25649	74	268
25650	118	546
25651	210	1000
25652	135	758
25653	279	1299
25654	150	779
25655	62	161
25656	90	633
25657	65	478
25658	50	340
25659	113	776
25660	151	663
25661	105	1090
25662	60	348
25663	361	2970
25664	188	985
25665	263	1493

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Received: 24-Apr-92 07:49

Job: 924097T
Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25666	179	1896
25667	244	3030
25668	296	4910
25669	299	5896
25670	144	1127
25671	109	791
25684	31	101
25685	39	364
25686	<15	552
25687	<15	156
25688	51	618
25689	19	80
25690	63	371
25691	44	207
25692	44	285
25693	39	204

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Attn: Mr. Glen Clark
Project:

Received: 24-Apr-92 07:49

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8-May-92

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Page: 1
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Attn: Mr. Glen Clark
Project:
PO #:
Received: 1-May-92 16:13

Job: 924104T
Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25694	343	2463
25695	269	2731
25696	731	7791
25697	746	9134
25698	575	7313
25699	472	7164
25700	260	3134
25701	412	3507
25702	59	336
25703	308	3582
25704	<15	93
25705	346	6209
25706	113	2067
25707	31	349
25708	32	213
25709	44	463
25710	51	500
25711	107	1493
25712	<15	37
25713	1239	26269
25714	1299	24478
25715	1522	21254
25716	1306	12896
25717	549	5567
25718	307	2522
25719	219	1022
25720	38	105
25721	51	237

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Attn: Mr. Glen Clark
Project:
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Received: 1-May-92 16:13

Job: 924104T
Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25722	<15	157
25723	36	367
25724	<15	96
25725	<15	46
25726	<15	102
25727	<15	184

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Attn: Mr. Glen Clark
Project:
PO #:
Received: 6-May-92 11:39

Job: 924110T
Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25728	116	1537
25729	240	2567
25730	199	2448
25731	52	507
25732	20	634
25733	58	1187
25734	41	709
25735	46	291
25736	16	37
25737	109	1657
25738	188	3246
25739	347	1515
25740	116	1657
25741	260	2627
25742	167	985
25743	16	42
25744	212	2910
25745	204	2552
25746	119	1642
25747	122	522
25748	66	245
25749	<15	28
25750	919	11821
25751	178	2097
25752	232	2313
25753	50	313
5754	18	44

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PO #:

Job: 924110T
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Manager, Thunder Bay Division

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Attn: Mr. Glen Clark
Project:
PO #:
Received: 11-May-92 09:15

Job: 924118T Status: Final

Core Samples

Sample	Pt FA/AA1.3 ppb	Pd FA/AA1.3 ppb
25755	<15	209
25756	37	460
25757	22	356
25758	19	162
25759	<15	261
25760	<15	165
25761	<15	64

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Project:

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PO #:

Job: 924118T   Status: Final

Signed:
....
Jeffrey Davis, B.Sc.,C.Chem.
Manager, Thunder Bay Division

APPENDIX E

Lac des Iles Mines Ltd.

Claims Listing

Lac des Iles Area

Thunder Bay Mining Division

Patented Claims:

TB 352256
TB 352257
TB 352258
TB 352259
TB 352260
TB 352261
TB 352262
TB 352263
TB 352370
TB 352371
TB 352372
TB 352373
TB 352374
TB 352375
TB 352376
TB 352377
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TB 384484
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TB 384889
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TB 384902
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TB 352264
TB 384904
TB 384905
TB 384906
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TB 384908
TB 384909
TB 404122
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TB 405371
TB 405372
TB 405373
TB 405374
TB 405375
TB 405376
TB 405377
TB 405378

Unpatented Claims:

TB 864416	TB 1165549
TB 864417	TB 1165550
TB 864418	TB 1165551
TB 864419	TB 1165552
TB 864420	TB 1165553
TB 864421	TB 1165554
TB 873412	TB 1165555
TB 873413	TB 1165556
TB 873414	TB 1165557
TB 873415	TB 1165558
TB 873416	TB 1194308
TB 909812	TB 1194309
TB 909813	TB 1194310

LAC DES ILES PROJECT

1992 FACTUAL SOILS REPORT

Prepared For

Lac des Iles Mines Ltd.

Suite 916

111 Richmond St. W.

Toronto, Ontario

M5H 2G4

Distribution List

Lac des Iles - 6

DNE - 1

File number: 0786007

October 9, 1992

DNE

TABLE OF CONTENTS

1.0 INTRODUCTION

This report details the findings of a field investigation program conducted by Dennis Netherton Engineering (DNE) personnel from May 14, 1992 to May 25, 1992 at the Lac des Iles mine site. The purposes of the investigation were to determine the subsurface conditions along the alignments of the proposed Phase 1 Tailings Management Facility (TMF) Retention Structures and to locate a source of fill material for the construction of the proposed Tailings and Water Retention Structures.

The subsurface investigation along the alignments consisted of test pitting of the overburden with a Cat 235 excavator, provided by Lac des Iles Mines Ltd., as well as conducting a number of pump-in bedrock permeability tests in bedrock along the north, west and east parts of the proposed alignments. A total of 22 test pits were excavated and five boreholes were drilled for permeability testing.

The test pits were logged by DNE's field staff as they were excavated and representative soil samples were collected from each test pit for later testing. The information logged consisted of a field identification of the soil type, depth to bedrock as well as depth to the water table (if encountered). The soil samples were returned to our laboratory in North Bay and tested to assist in soil classification and to determine their engineering properties.

The pump-in permeability tests in bedrock were performed in the same manner as those conducted along the south end of the existing tailings area in March, 1992 (see DNE's Report on Bedrock Permeability Testing at South End of Existing Tailings Area, Lac des Iles, Ontario). The testing was conducted along the west, north and east ends of the proposed Stage 1 tailings alignments, at locations where the head of water within the proposed tailings impoundments was anticipated to be the maximum. The tests were conducted in 15 metre deep, 75mm (3 inches) diameter, vertical boreholes drilled by Lac des Iles Mines Ltd. at locations selected by DNE's field project leader.

The procedure used for the permeability testing consisted of isolating a section of the diamond drill hole with a double pneumatic packer system. Water was then pumped down rods connected to the packer system and injected into the isolated section of drill hole. The water pressure for each test was set at a predetermined value and the flow of water into the rockmass was measured. A pressure gauge connected to the system behind the flow meter was used to monitor the water pressure. The water take was measured using a flow meter (able to measure flows in the range of 0.4 to 20 gal/min) or by measuring the drop in the water level in the water reserve tank and calculating the volume of water used during the test when the flow was below 0.4 gal/min.

The water takes for the test sections of all drill holes were generally less than what could be accurately recorded by the flow meter, (less than .4 gal/min) and thus the method of measuring the water reserve level was used.

The relationship between water pressure, water take and permeability is as follows:

- $K=(1.6E\text{-}6 \times Cp \times Q)/H$

where K is the permeability in cm/s, Cp is a constant related to the borehole diameter and the test interval length, Q is the water flow, and H is determined from the following relationship:

- $H=H_1+H_2+(Pg \times 2.308 \text{ ft/psi})-H_L$

where H_1 is the vertical depth to the midpoint of the test interval less natural water level above the test interval, H_2 is the vertical height of the pressure gauge from the drill hole collar, Pg is the pressure gauge reading and H_L is the predetermined head loss of the system for the average flow range of the test and the particular rod string employed. For flows less than 1 l/s H_L can be neglected as laminar flow occurs within the test string.

Upon completion of the permeability testing, piezometers were installed in the boreholes to permit later monitoring of the ground water levels and quality. The piezometers consisted of a 1.5 metre length of 50mm inside diameter pvc well pipe screen with 10 micron slots, connected to 1.5 metre lengths of 50mm inside diameter pvc well pipe riser with the screen installed at the bottom of the borehole. A 600 mm thick cement seal was installed at the collar of the bore hole to prevent surface runoff from contaminating the subsurface water. Appendix V, Tables 1 to 5 contain the installation logs for each piezometer installation.

Concurrent to the permeability testing, test pitting of possible borrow sites were conducted in order to assess the suitability of the sites as a source of fill for the construction of the Retention structures. The borrow sites selected and examined were all located within 1.6 km of the Tailings Management Facility (see DWG 0786-301). DNE's soil technician logged and sampled each of the test pits following the same criteria used for the Tailings Management Facility alignment.

The sites that were examined lie either south of the proposed tailings facility or to the north east. To the west there was very little visual evidence of any significant volume of fill material. All the access roads in the area had been built by scratching for fill or by using the open pit strippings.

A total of four areas were examined to the south of the proposed tailings facility, the Southwest site, the West Camp lake site, the Southeast site, and the South Camp Lake site (see DWG 0786-301). The Southwest site consists of a 600 metre long ridge that runs southwest from the bottom of Camp Lake towards Hasson Lake. The West Camp Lake site occupies a cut over area south of the proposed tailings facility and immediately west of the south end of Camp Lake. This area has been called the "G" zone by Lac des Iles Mines Ltd. The Southeast Camp Lake site was located along a 400 metre long ridge located immediately to the east of the south end of the Camp Lake. The mid-southern end of the ridge had previously been used for borrow during the construction of a road across the outlet of Camp Lake in order to construct an explosives storage area. The South Camp Lake site extends to the northeast of the explosive storage area for a distance of 550 metres.

Two areas were examined to the northeast of the proposed tailings area, the North Camp Lake site and the Main Gate site. The North Camp Lake site consists of 500 metre long ridge located along the northeast side of Camp Lake and south of the mine access road. The Main Gate site occurs along the west side of a bedrock ridge located north of the North Camp Lake site and the north side of the mine access road and approximately 300 metres east of the main gate entrance to the mine site.

The topography and test pit locations along the south end of the existing tailings area, the locations of the test pits at the Explosives Storage clearing, the "G" zone and to the northeast of the main gate were surveyed in using a Wild RDS. The RDS is an instrument capable of measuring distances and orientations so that it was possible to use the survey information to generate topographic contours and location plans of the test pits. A compass and hip chain were used to locate the test pits within forested areas where the RDS would have been slow and inefficient. All the test pit locations as surveyed were checked against the aerial photographs and topographic mapping that were available after the field investigation was completed. This information was used to calculate preliminary volume estimates.

2.0 SITE AND GEOLOGY

2.1 Site Description

The Lac des Iles Mine site is located approximately 70 km due north of Thunder Bay, Ontario. The site is accessed by a 25 km gravel road leading off the west side of the Armstrong Highway (Highway 527).

The terrain is of moderate relief (ridged) with a ground moraine lying as a shallow veneer over bedrock (OGS Northern Ontario Engineering Geology Terrain Study 41, Heaven Lake Area, NTS 52H/SW, 1981). A low relief peat organic terrain exists as a subordinate landform in low lying areas. Drainage conditions for the ground moraine are indicated as dry while for the peat terrain, wet. On-site observations agree with the OGS terrain study. Bedrock was noted to outcrop frequently, especially along sides of the ridges. Observations made during test pitting and inspection of exposures, indicated the bedrock to be very irregular in relief.

The mine site occupies the height of land between the water bodies Lac des Iles and Hassen Lake (see DWG 0786-001). Camp Lake lies to the immediate east side of the mine-site and drains southward into Hasson Lake via a small stream. Surface drainage consists of several small streams. Ponding of water on surface was common throughout the area of the mine-site. Test pitting revealed that these areas are underlain by silt and clay.

2.2 Geology

Surficial (Pleistocene) deposits are comprised of glacial ground moraine deposits that have been locally modified by glacio-fluvial action. Recent deposits consisted of organic material or muskeg which has accumulated in swamps or low lying areas.

Archean bedrock underlies the Pleistocene deposits with numerous outcrops throughout the area. The bedrock consisted of a gabbro complex intruded into a gneissic to foliated tonalite suite (MNDM Map 2542). Examination of the gabbro complex indicates that it is competent with only minor faulting and shearing evident.

3.0 SUBSURFACE CONDITIONS

Subsurface conditions were determined for both the Proposed Stage One Tailings Management Facility Retention Structure Alignments and for possible fill borrow sites (see DWG 0786-301). The test pits were located, logged and sampled by DNE's field staff. Bedrock conditions in the north half of the Tailings Dam Alignments were evaluated with five bore holes that were drilled using an air track percussion drill supplied by Lac des Iles Mines Ltd. DNE's previous experience testing of air track boreholes has determined that the hydrogeological results from such boreholes compare favorably with holes drilled by a rotary diamond drill bit. DNE's field staff conducted pump-in permeability tests in the boreholes and installed piezometers in the bore holes upon completion of the tests.

3.1 Proposed Phase One TMF Retention Structure Alignments

The subsurface conditions along the Proposed Phase One TMF Tailings alignments was investigated by a total of 22 test pits and 5 bedrock boreholes during the May, 1992, investigation. Prior to this testing, DNE carried out bedrock permeability testing in 4 exploration diamond drill holes located in the southern part of the proposed Phase One TMF alignments. Locations of the test pits and boreholes are indicated on DWG-0786-301 at the back of this report. The results of the Laboratory testing is presented in Appendix II, along with the test pit logs.

It should be noted that soils and bedrock investigations use point sources of stratigraphic information and that "methods of grouping" are used to delineate the various strata. Variations in strength, colour or consistency may occur within a specific stratum. It is recommended that site specific information be obtained from the description and pertinent in situ and lab testing of the nearest investigation points. Laboratory testing samples were collected usually from the minus 50mm size fraction of the material and the fraction of the material that was greater was estimated in the field.

SOILS

<u>Topsoil/organics (Pt)</u>

A surficial deposit of topsoil and/or organics was found throughout the vicinity of the proposed tailings area. The deposit was generally thin, less than 0.3 metres with the exception of the valley immediately downstream of the existing secondary water pond Test Pit No. 24, encountered muskeg was excavated to a depth of 3.0 metres. The center of the valley was not excavated as it was not possible to cross the intervening muskeg and creek with the Cat 235. It is suspected that muskeg depths on the order of 5 metres may be present based upon the diamond drilling conducted in March 1992 (DD-92-05). Boulders in this area ranged from 0.15 to 1.2 metres and locally comprised up to 60 percent of the deposit.

Silt Till

A cobble silt till deposit, which ranged from silty sand, with some gravel, to silt and sand, with trace gravel, overlay the bedrock along the proposed Phase One TMF alignments. Test Pit No. 19 was the exception to the above range and contained coarser material that classified as sand and gravel with some silt. Boulders ranged from 0.15 to 1.2 metres in size and comprised up to 35 percent of the deposit. The depth of the deposit varied greatly, ranging from 0.3 to 3.0 metres. The range in thickness was due in part to the uneven nature of the bedrock and to the lodgment of till against the glaciated sides of bedrock faces (Test Pit No.1 and No. 20). Test pitting revealed that wet, boggy areas are underlain by a silt layer that was localized in extent and becomes silty sand with depth. The deposit was identified as ground moraine with some silt deposited locally on top, probably a result of ponding of melt waters against the retreating Pleistocene ice mass.

A total of 22 sieves and 6 hydrometers were performed on samples collected from the stratum in order to determine the grain size distribution (Figures 1 to 6, Appendix II). The grain size distributions indicated that the deposit was relatively consistent throughout the proposed Phase One TMF tailings area and was predominately a silty sand with some gravel to a silt and sand with some gravel. The deposit contained approximately 20 to 35 percent cobbles and boulders. The material from test pit No. 16 was more sandy and was classified as a sand with some gravel and trace silt.

Water contents for the samples collected ranged from 6.6 to 15.5 percent for those collected above the water table and from 8.6 to 16.1 for those collected below the water table. Samples collected from test pits No. 2 and No. 3 were collected from below a perched water table and had water contents of 8.4 and 9.6 percent, respectively. Test pit No. 14 also encountered a perched water table with a water content of 20.7 percent for a sample collected within the perched water table and a value of 6.8 for a sample collected below. Including the values from the perched samples the average natural moisture content of the samples collected above the water table was 9.8 percent and for those collected below it was 13.7 percent.

The till deposit was considered to be "compact" as it was dug with some difficulty with a hand shovel and the side slopes commonly stood to 3m or more during backhoe excavation. DNE conducted one standard proctor density test on the material from test pit No. 4 and obtained a maximum dry density of 2130 $kg.m^{-3}$ at an optimum water content of 7.3 percent, which is quite typical of silt till deposits.

The permeability of the deposit was quite variable. Observations made in the field indicate that ground water flow was through discrete high permeability zones of sand and gravel. Perched water tables were observed to occur when ever silt rich horizons overlay the silty sand to sand and silt strata. The siltier zones of higher silt content were not laterally extensive and seemed to be restricted to topographic lows. The coefficient of permeability was determined for the samples collected from test pits No. 4 and No. 16 by using a constant head permeameter test at DNE's Laboratory. The value obtained from test pit No. 4 was 1.26 E-05 cm/s and from test pit No.16 was 5.7 E-06 cm/s (average was 8.5 E-06 cm/s). The coefficient of permeability was also estimated for all the samples by using Hazens empirical relationship:

- $k = 10^{-2} D_{10}^{2}$ (m/s)

where D_{10} is the effective grain size in mm obtained from the grain size distribution curve. They ranged from 7.9 E-03 to 1.7 E-04 cm/s with a log-normal average of 7.3 E-04 cm/s.

Bedrock

The bedrock underlying the proposed Phase One TMF alignment consists of massive to foliated gabbroic intrusive complex. An overall RQD of 80+ was determined from the diamond drill core during the March, 1992, site visit for the upper 24 metres of the rockmass along the southern edge of the proposed Phase One South Tailings Dam. Examination of the bedrock exposures throughout the TMF area indicated that there were no apparent significant differences in the type and extent of the discontinuities and thus the entire area was assumed to have an RQD similar to that determined for the diamond drill core.

Bedrock permeability testing along the perimeter of the proposed tailings retention area has been conducted on two separate occasions. In March, 1992, four exploratory BQ diamond drill holes were tested to provide preliminary hydrogeological data for the proposed Phase One TMF, South Tailings Dam. During the May, 1992, field investigation program, 5 additional NX air track boreholes were drilled specifically for the hydrogeological testing of the northern part of the proposed tailings area in order to provide information for the TMF structures. These boreholes were located at points where the maximum head of water would exist for the proposed Phase Two retention structures.

Tables 1 to 9, Appendix IV, list the test interval, test data and the associated permeability value determined by the above relationship for each location as determined in the March and May, 1992, tests. Tables 10 and 11, Appendix IV, contain the summaries and statistics of the tests with Table 10 containing the permeabilities determined by the above relationship without any correction applied for the limitations of the equipment and Table 11 containing the permeabilities obtained after a correction factor was applied to reflect the limitations of the equipment. Permeability values below 1E-06 cm/s as calculated by the above relationship were corrected to equal 1E-06 cm/s as this value represents the lower most limit of the test equipment.

The values obtained for the Proposed Tailings Management Facility ranged from an overall high of 2.7E-03 cm/s (DD-92-05) to a low of 1E-06 cm/s (calculated for test intervals in all holes except DD-92-05) for all tests completed. An average permeability of all the tests as determined by a log-normal statistical analysis was 1.8E-06 cm/s for the corrected values.

In the report issued in April, 1992, DNE reported that a reasonable value for the rockmass coefficient of permeability would be in the range of 2 to 5 E-5 cm/s for those tests for which it was possible to measure water flow. If the tests which were corrected are excluded from the log-normal statistics, a value of 1.6 E-5 cm/s was obtained. The rockmass along the proposed tailings facility was therefore characterized by a coefficient of permeability of 2 E-06 to 2 E-05 cm/s. Grouting of the bedrock is therefore not warranted.

Water Conditions

Water levels were observed and recorded for all test pits and bore holes along the proposed Phase One TMF alignments. The water levels are indicated on the logs for the test pits (Tables 1 to 8, Appendix II) and on the piezometer installation logs (Figures 1 to 5, Appendix V).

In general, the water table was close to or at the surface. This was due in part to the recent spring thaw and in part to the heavy rain encountered during the field investigation. The water table was found to be at or just above the bedrock in test pits that were dug away from surface drainage paths. Perched water tables were encountered throughout the proposed tailings facility area as a result of silty horizons overlying the till. Preferential ground water flow was found to occur along discrete zones of sands and gravels having a low silt content. These zones were found to occur at random throughout the proposed Tailings Management Facility area.

3.2 Borrow Investigations

Borrow searches were carried out at the south and north ends of Camp Lake as these areas were considered to have the best potential for supplying the fill material required for the proposed Phase One Tailings Management Facility Retention Structures (see Drawing 0786-301). The area immediately west of the Mill and the open pit were discounted due to the amount of bedrock exposed and the obvious difficult search for material used in construction of the existing roads. Further west, access was prevented by a locked gate and this area was reported by Lac des Iles Mines Ltd. personnel to have little material. With the exception of an existing borrow site, 8 km from the main camp gate and which has a 800 metre long road exposure, there was little indication of a possible borrow site east of the fuelling station located immediately outside the mine site gate. Bedrock exposures were common along the road and it appears the sourcing of material for the road was quite difficult as well.

3.2.1 Southwest Camp Lake Site

A rounded ridge located to the south west of Camp Lake was examined by 11 test pits to determine its potential as a source of borrow material (see Drawing 0786-301). It was hoped that till had lodged against the side of the ridge as it had else where (borrow pit outside of main gate). With the exception of a small pocket of till occupying a bedrock depression, the till was only 0.3 to 1.5 metres thick. The pocket contains approximately 7 000 cubic metres of till with an average depth of 4 metres.

SOILS

Topsoil/Organics (Pt)

A surficial deposit of topsoil and/or organics was found along the ridge. The deposit was generally thin, less than 0.3 metres and consisted of oxidized sandy loam. Boulders ranged from 0.15 to 1.2 metres in size and locally comprised up to 30 percent of the deposit.

Silt Till

A cobble silt till deposit ranging from silty sand, with some gravel, to sand and gravel, with some silt, overlies bedrock in the Southwest Camp Lake site. The grain size envelope derived from the 50 mm minus fraction collected in the field was found to have has a maximum of 26% gravel, 57% sand, I7% silt and 0% clay, and a minimum of 3% gravel, 58% sand, 38% silt and 1% clay. Following the convention of describing tills on the basis of the binder material or matrix, the deposit is described as a silt till. Boulders ranging from 0.15 to 1.20 metres were common and comprised up to 35 percent of the deposit. The depth of the deposit varied widely, ranging from 0.3 to 6 metres. The range in thickness was due in part to the uneven nature of the bedrock and to the lodgment of till in a bedrock hollow between the two high points of the ridge (Test Pit No. 3, 4, 6 and 8).

A total of 6 sieves and 1 hydrometer were performed on samples collected from the stratum in order to determine the grain size distribution (Figures 1 and 2, Appendix III). The grain size distributions indicated that the deposit was consistent within the area and was predominately a silty sand with some gravel. The deposit contained approximately 20 to 35 percent cobbles and boulders. The material from test pit No. 6 was slightly less silty and was classified as a sand with some silt and gravel.

Water contents for the samples collected ranged from 7.4 to 7.8 percent for those collected from above the water table and from 9.3 to 12.0 for those collected below the water table. The average for all samples was 8.5 percent.

The till deposit was considered to be "compact" as it was dug with some difficulty with a hand shovel, and the banks stood vertically to heights of 2 to 4 m. The Cat 235 did not have any problems while digging in the till. DNE conducted one standard proctor density test on the material from test pit No. 4 and obtained a maximum dry density of 2162 kg/m^3 at an optimum water content of 7.4 percent (Figure 3, Appendix III), which is quite typical for a predominantly silt till.

The permeability of the deposit was found to be quite variable. Observations made in the field indicate that ground water flow occurred through discrete high permeability zones of sand and gravel. The coefficient of permeability was determined for the samples collected from test pits No. 4 by using a constant head permeameter test at DNE's Laboratory. The value obtained from test pit No. 4 was 2.04 E-05 cm/s. The coefficient of permeability was also determined for all the samples by using Hazens empirical relationship. They ranged from 1.02E-03 to 3.2 E-04 cm/s with a log-normal average of 7.5 E-04 cm/s.

Bedrock

The bedrock underlying the Southwest Camp Lake site consisted of the gabbroic complex found in the tailing retention area. It had a rough relief and rose rapidly towards the crest of the ridge. A bedrock notch occurred between the two high points of the ridge.

Water Conditions

Water levels were observed and recorded for Test Pits No. 4, 5, 6 and 8 and are indicated on the test pit logs (Tables 1 to 4, Appendix III). Perched water tables were observed to occur whenever sand and gravel rich horizons occurred in the silty sand till.

3.2.2 West Camp Lake Site

The area to the west of Camp Lake and south of the proposed Phase One Tailings Management Facility area (also known as the "G" zone) was test pitted at the suggestion of Lac des Iles Mines Ltd. A total of 15 test pits were dug using the Cat 235 excavator. The northwest corner of the area contained an old borrow pit that was used for the construction of the logging access road that runs along the north side of the site. The area was quite wet as it lies only one meter higher, than the water level in Camp Lake. Overburden in the area was also quite shallow, ranging from 0.3 to 1.8 metres depth, with an average 0.82 metres. There was no significant volume of borrow material in the area.

3.2.3 Southeast Camp Lake Site

This site consists of a ridge that runs north-south along the edge of Camp Lake (see DWG 0786-301). An existing borrow site was present at the southwest end of the ridge and was used for the construction of the access road to the explosives storage clearing. A total of fifteen test pits were excavated with the Cat 235 in order to determine the extent of the existing burrow site. Access to the test pit locations required cutting a trail through a mature poplar forest for Test Pits No. 6 to 12 including B and C.

A 3.7 metre high face of granular till was exposed at the existing borrow site. Bedrock forms the floor of the excavation and rose rapidly toward the crest of the ridge where test pit No. 5 determined the depth of till to be 0.76 metres. The test pitting determined that a narrow wedge of till occurs along the west central part of the ridge. It was found to contain approximately 19 000 m^3 of till. Elsewhere the till was only 0.9 to 1.8 metres in thickness and is not judged a viable source of fill material.

SOILS

Topsoil/Organics (Pt)

A surficial deposit of topsoil and/or organics was present throughout the site. The deposit was generally thin, 0.3 to 0.6 metres in depth. Boulders ranged from a size of 0.15 to 1.2 metres and comprised up to 40 percent of the deposit.

Silt Till

A granular till deposit underlies the topsoil/organic stratum and was found to overlie bedrock at all of the test pit locations. The till was predominately a silty sand with some gravel. Local variations were present with the sampled material being either coarser or finer (i.e. more gravelly or silty). The grain size envelope derived from the 50 mm minus fraction has a maximum gradation of 45% gravel, 48% sand, 7% silt and 0% clay, and a minimum of 0% gravel, 47% sand, 51% silt and 2% clay. Following the convention of describing tills on the basis of the binder material, the deposit is a silt till. Boulders ranging from 0.15 to 1.2 metres were common and comprised up to 35 percent of the deposit. The depth of the deposit ranged from 0.46 to 6.1 metres. The greatest depths occurred in a band along the west central side of the ridge (see DWG 0786-301).

A total of 11 sieves and 3 hydrometer tests were performed on samples collected from the stratum in order to determine the grain size distribution (Figures 4 to 6, Appendix III). The grain size distributions indicated that the deposit was fairly consistent throughout and was predominately a silty sand with some gravel. Variation in the till was evident as samples collected from three test pits classified either slightly coarser or finer. Coarser till was sampled at Test Pits No. B, sand and gravel with some silt, and Test Pit No. 5, gravelly sand with some silt. Test Pit No. 2 contained finer material which classified as a silt and sand, with trace gravel.

Water contents for the samples collected ranged from 6.5 to 12.6 percent for those collected above the water table. Two samples were collected from below and at the water table (Test Pit No. 2) and had values of 12.6 and 14.8 percent respectively. The average for all samples was 10.4 percent.

The till deposit was considered to be "compact" as it was dug with some difficulty with a hand shovel, and test pit walls of 4 m were maintained in a near vertical configuration. A Proctor Density test on the material from Test Pit No. 1 and obtained a maximum dry density of 2169 kg/m³ at an optimum water content of 7.4 percent (Figure 7, Appendix III).

A constant head coefficient of permeability test determined to a value of 4.22 E-6 cm/s for a sample collected from Test Pit No. A. The coefficient of permeability was also determined for all the samples by using Hazens empirical relationship. They range from 6.25 E-03 to 2.0 E-04 cm/s with a log-normal average of 8.3 E-04 cm/s, however, Hazen's test is more applicable to clear well rounded sand sizes.

Bedrock

The bedrock underlying the Southeast Camp Lake site consists of the gabbroic complex found in the proposed tailings facility area. It has a moderate to high relief and rose approximately 16.8 metres between Test Pits No. 1 and No. 5 (146 metres apart). Vertical bedrock outcrops were found to occur along the west edge of the ridge. The exposed vertical faces were up to 2 metres in height.

Water Conditions

Water levels were observed and recorded in 3 of the Test Pits (No. A, 2 and 8). The water levels are indicated on the logs for the test pits (Tables 15 to 18, Appendix III). Test Pits No. A and 1 were located adjacent to the stream flowing out of Camp Lake and had water levels at 4.57 and 3.05 metres below ground surface respectively. This translated into an elevation difference of less than 1 metre between the stream surface and the ground water levels. Test Pit No. 6 had a water level that was 0.91 metres below the ground surface.

3.2.4 South Camp Lake Site

The area investigated is located to the east of the Southeast Camp Lake site. It consists of a low relief terrain that was void of any bedrock outcrops. Surface water was absent and it seemed to be well drained. The area was forested by mature popular trees and this in combination with the low relief and the absence of any bedrock outcrops, indicated the possibility of sufficient overburden depth for a borrow site. A total of twelve test pits were excavated with the Cat 235 in order to determine the nature of the overburden (see DWG 0786-301). With the exception of three test pits, No. 6, 8 and 10, the overburden averaged only 0.88 metres. Test Pits No. 6 and 8 had 2 metres of overburden while Test Pit No. 10 had 3 metres of overburden.

SOILS

Topsoil/Organics (Pt)

A surficial deposit of topsoil and/or organics was present throughout the site. The deposit was generally thin, 0.3 to 0.6 metres in depth. It consisted of an oxidized sandy loam with boulders ranging from 0.15 to 1.2 metres that comprised up to 35 percent of the deposit.

Silt Till

A granular till deposit underlies the topsoil/organic strata and overlies the bedrock at all the test pits. The till was a gravelly sand with some silt to a silty sand with some gravel. Local variations were present within the sampled material, coarser or finer (i.e. more gravelly or silty). The grain size envelope derived from the 25 mm minus fraction collected has a maximum of 30% gravel, 60% sand, 10% silt and 0% clay, and a minimum of 0% gravel, 35% sand, 64% silt and 1% clay. Following the convention of describing tills on the basis of the binder material, the deposit is a silt till. Boulders ranging from 0.15 to 1.2 metres comprised up to 35 percent of the deposit. The depth of the deposit ranged from 0.5 to 1.8 metres. Test Pits No. 6, 8 and 10 had the thickest depths, 1.4, 1.4 and 1.8 metres respectively. Elsewhere the deposit was quite thin, 0.15 to 0.5 metres in depth.

A total of 1 hydrometer and 3 sieves were performed on samples collected from Test Pits No. 6, 8 and 10 in order to determine the grain size distributions (Figure 8, Appendix III). The grain size distributions indicated that the deposit was relatively consistent and ranged from a gravelly sand with silt to a silty sand with gravel.

Water contents for the samples collected ranged from 7.5 to 13.4 percent, with all samples collected from above the water table. The average of the samples was 10.7 percent.

The till deposit was considered to be "compact" as it was dug with some difficulty with a hand shovel, and test pit walls of 3 metres were maintained in a near vertical configuration.

The coefficient of permeability was determined for the samples collected from Test Pits No. 6, 8 and 10 by using Hazens empirical relationship. Values of 9.0 E-04, 3.6 E-04 and 2.6 E-03 cm/s were determined for test pits No. 6, 8 and 10 respectively. The log-normal average of the coefficient of permeability was 9.5 E-04 cm/s.

Bedrock

The bedrock underlying the South Camp Lake site consists of the Archean foliated tonalite suite. It was assumed to have a low to moderate relief based upon the information from the test pitting and the absence of bedrock ridges.

Water Conditions

Water levels occurring within the overburden stratum were observed and recorded in 1 of the test pits (No. 8). This test pit was located in a topographic low that acts as a local drainage zone. Water levels in the other test pits occurred at the bedrock surface.

3.2.5 North Camp Lake Site

This area lies to the south of the Lac des Iles Mines Ltd. access road along the northeast side of Camp Lake (see DWG 0786-301). It consists of a north-south oriented ridge that rises 20 metres above Camp Lake. The ridge is smoothly rounded and has a mature growth of popular and birch trees. The rational for examining the ridge was the presence of the borrow site approximately 91 metres north of the beginning of the ridge as well as the smoothly rounded nature of the ridge and the mature growth of popular.

A total of eight test pits were excavated with the Cat 235 in order to determine the nature and depth of the overburden. With the exception of test pit No. 7, the overburden averaged only 0.9 metres in depth (see Tables 19 to 21, Appendix III). Test pit No. 7 was located in an eroded east-west fault zone that had 4.3 metres of overburden.

SOILS

Topsoil/Organics (Pt)

A surficial deposit of topsoil and/or organics was present throughout the site. The deposit was generally thin, 0.3 to 0.6 metres in depth and consisted of oxidized sandy loam. The exception was Test Pit No. 1 which had 1.22 metres of muskeg and boulders overlying the bedrock at the north base of the ridge. Boulders ranged from 0.15 to 1.2 metres and comprised up to 35 percent of the deposit.

Silt Till

A cobble silt till deposit underlies the topsoil/organic strata and overlies the bedrock at Test Pits No. 2, 3, 4 and 7. The till ranged from a gravelly sand with some silt to a silty sand with some gravel. Boulders ranged from 0.15 to 1.2 metres and comprised up to 35 percent of the deposit. Test Pits No. 3 and 7 had the thickest depths, 1.5 and 3.7 metres respectively. Elsewhere the deposit was quite thin, 0.15 to 0.5 metres thick.

One sieve size analysis was performed on the sample collected from Test Pit No. 7 in order to compare the grain size distribution with those obtained from the other sites (Figure 9, Appendix III). The grain size distribution indicated that the deposit was relatively similar with the till examined at the other borrow site locations and that the material was a sand with some gravel and trace silt.

The water content for the sample collected was found to be 10.8 percent which was similar to other locations.

The till deposit was considered to be "compact" as it was dug with some difficulty with a hand shovel, with near vertical walls to depths of 4.2 m.

The coefficient of permeability as determined by Hazens empirical relationship was 6.4 E-02 cm/s which was significantly higher than previous values but was reasonable based on the observations of discrete zones of high permeability in other test pits.

Bedrock

The bedrock underlying the North Camp Lake site consisted of an Archean foliated tonalite suite (MNDM Map 2542, Bedrock Geology of Ontario, west-central sheet). It was assumed to have a low to moderate relief based upon the information from the test pitting.

Water Conditions

Water levels were observed and recorded for test pits No. 1 and 7 at depths of 10.3 m and 2.4 m respectively. Both test pits were located in topographic lows that are part of the local drainage.

3.2.6 Main Gate Site

The Main Gate site was located on the north side of the mine access road and approximately 335 metres east of the Lac des Iles mine site gate (see DWG 0786-301). The site has been clear cut in the past and now had a regrowth of 1.5 to 3.0 metre birch and popular saplings. It consisted of a wedge of granular till that lay against the west side of a north-south trending bedrock ridge. Preliminary evaluation of the site indicated that the till extended north of an existing borrow site. It is bounded to the west by a muskeg deposit and to the east by bedrock outcrops that occurred along the ridge crest. The top of the muskeg deposit is approximately 4.4 metres below the top of the till wedge and has a stream, flowing south in to Camp Lake, located in the center.

The existing borrow has a 4.6 metre high face exposed (see Photograph No. 17, Appendix I). Test pitting by Lac des Iles personnel on the mid-west side of the borrow determined that approximately 3 metres of till underlay the existing bench.

A total of nineteen test pits were excavated with the Cat 235 in order to determine how far along the ridge the till ledge extended along with the subsurface conditions (see DWG 0786-301). The test pitting indicated that there was approximately 60 000 m^3 of granular till present in the wedge lying against the ridge that extended approximately 380 metres north with an average depth of 3.5 metres.

SOILS

Topsoil/Organics (Pt)

A surficial deposit of topsoil and/or organics was present through out the site. The deposit was generally thin, 0.3 - 0.6 metres in depth. Boulders ranged from 0.15 to 1.2 metres and comprised up to 35 percent of the deposit.

Muskeg to depths of 3.1 metres was found to occur along the western side of the till deposit. It was not possible to dig Test Pits No. 3 and 4 as the muskeg did not support the weight of the Cat 235 excavator when it tried to reach the planned test pit locations in the bottom of the valley.

Silt Till

A granular deposit underlies the topsoil/organic strata and overlays the bedrock at all of the test pits. It was predominately a silty sand to sand and silt, but ranged from a gravelly sand, with trace silt to a sandy silt, with trace gravel. The grain size envelope derived from the 50 mm minus fraction has a maximum gradation of 30% gravel, 60% sand, 10% silt and 0% clay, and a minimum of 0% gravel, 33% sand, 66% silt and <1% clay. Following the convention of describing tills on the basis of the binder material, the deposit is a silt till. Boulders ranged from 0.15 to 1.2 metres and comprised up to 35 percent of the deposit. The depth of the deposit ranged from 0.6 to 9.5 metres, the thickest depths occurred in a band along the west central side of the ridge.

A total of 15 sieves and 4 hydrometers were performed on samples collected from the stratum in order to determine the grain size distributions (Figures 10 to 13, Appendix III). The grain size distributions indicated that the deposit was fairly consistent throughout and was predominately a silty sand with some gravel to a sand and silt with some gravel. Some variation in the till stratum was observed, and samples collected from the test pits range from gravelly sand with some silt (Test Pit No. 12) to sandy silt with trace gravel (Test Pit No. 1). There was no discernable pattern in the variation of the grain size distribution and as in Photograph No. 17, Appendix I, the transition between grain size distributions is abrupt. The envelope of the grain size distributions for the Main Gate site corresponded to those from other areas at the Lac des Iles mine site.

Water contents for the samples collected ranged from 7.4 to 18.3 percent for those from above the water table and from 6.8 to 19.8 for samples from below the water table. The average for all samples was 10.5 percent.

The till deposit was considered to be "compact" as it was dug with some difficulty with a hand shovel, and test pits stood with near vertical walls to heights of 10 m. The Cat 235 did not have any problems with digging in the till. DNE conducted standard proctor density tests on the material collected from Test Pits No. 2, 10, and 15 with results of 2103 $kg.m^{-3}$ at 9.4% water, 2150 $kg.m^{-3}$ at 8.9% water, and 2100 $kg.m^{-3}$ at 9.5% water respectively (Figures 14 to 16, Appendix III). The average of the tests was 2118 $kg.m^{-3}$ at an optimum water content 9.3%.

The coefficient of permeability as determined by a constant head permeability test was found to be 4.38 E-5 cm/s for a sample collected from Test Pit No. 1. The coefficient of permeability was also determined for all the samples by Hazens empirical relationship. They ranged from 6.4 E-03 to 6.7 E-05 cm/s with a log-normal average of 1.0 E-03 cm/s.

Bedrock

The bedrock that underlies the Main Gate site consists of an Archean foliated tonalite suite. The bedrock rises eastward from a depth of 9.5 metres at Test Pit No. 10 to a depth of 0.15 metres at Test Pit No. 15, over a distance of 82 metres. The bedrock has a low relief along the western side of the borrow area but changes to a moderate to high relief on the east side of the burrow area. Test Pit No. 15 on the east side had a sloping bedrock surface that rose from 0.15 to 1.8 metres depth towards the ridge crest. The east side of the ridge as well as the ridge bounding the west side of the muskeg deposit has vertical rock faces in excess of 20 metres.

Water Conditions

Water levels were observed and recorded in 10 of the Test Pits (No. 2, 5, 6, 7, 8, 10, 12, 13, 15 and 16). The water levels are indicated on the logs for the test pits (Tables 22 to 27, Appendix III). The water tables that observed in Test Pits No. 2, 5, 6, 7, 8, and 16 were perched and restricted to localized zones of coarser, sand and gravel located within the till. These zones were commonly less than 0.3 metres in thickness. Test Pits No. 5 and 6 had a second perched water table that was approximately 0.3 metres below the ground surface and was considered to be connected to surface water. This occurred within the upper part of the muskeg deposit which was vegetated by loose grass and moss vegetation.

APPENDIX I

PHOTOGRAPHIC SUMMARY

Photographs 1 to 17

Dn

Photo 1. View looking south of Test Pit No. 2. Bedrock was a smooth hump with the high point located at the edge of the ponded water. The ponded water originated in the upper 0.30 m of the strata in the south end of the pit where it was perched above a silty horizon. (May 15, 1992)

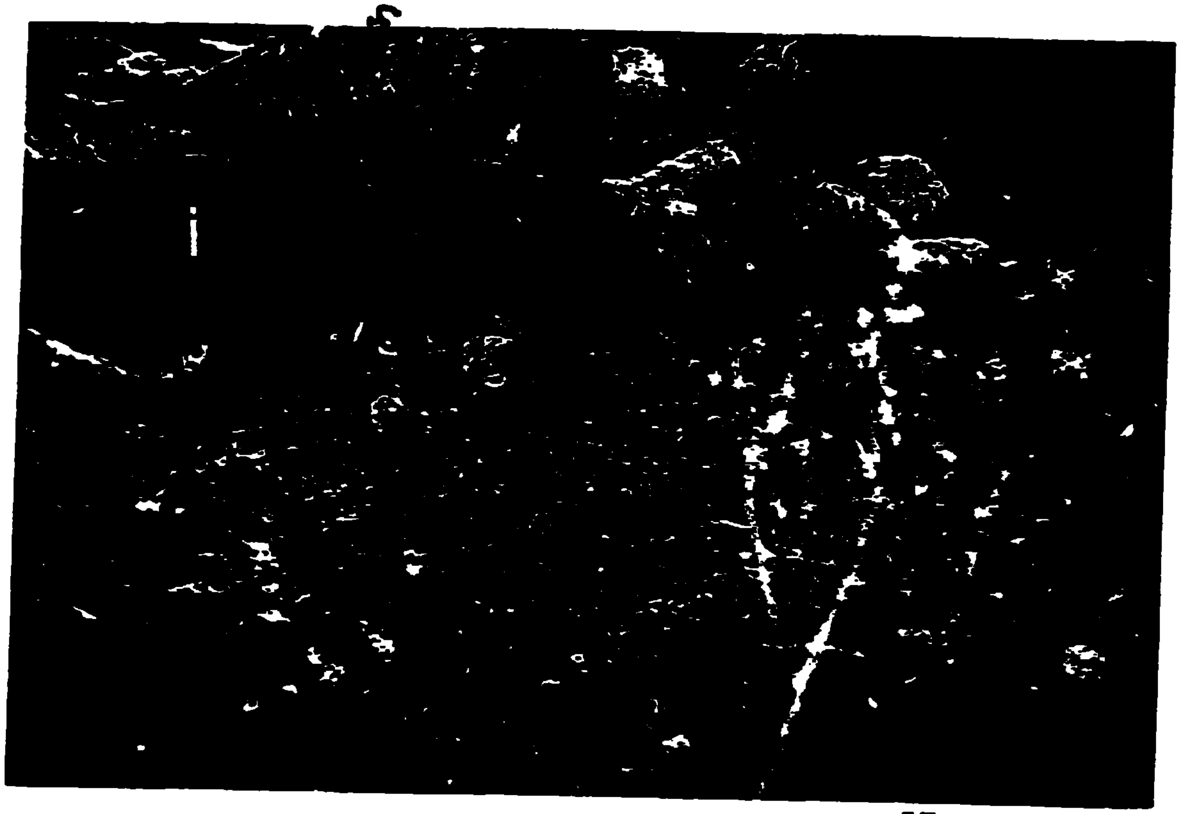


Photo 2. View of Test Pit No. 5, Proposed Phase 1 tailings alignment. Note the boulders and oxided layer overlying the grey silt till. Bedrock was uneven and sloped from a depth of 0.8 m to a depth of 1.2 m. (May 15, 1992)

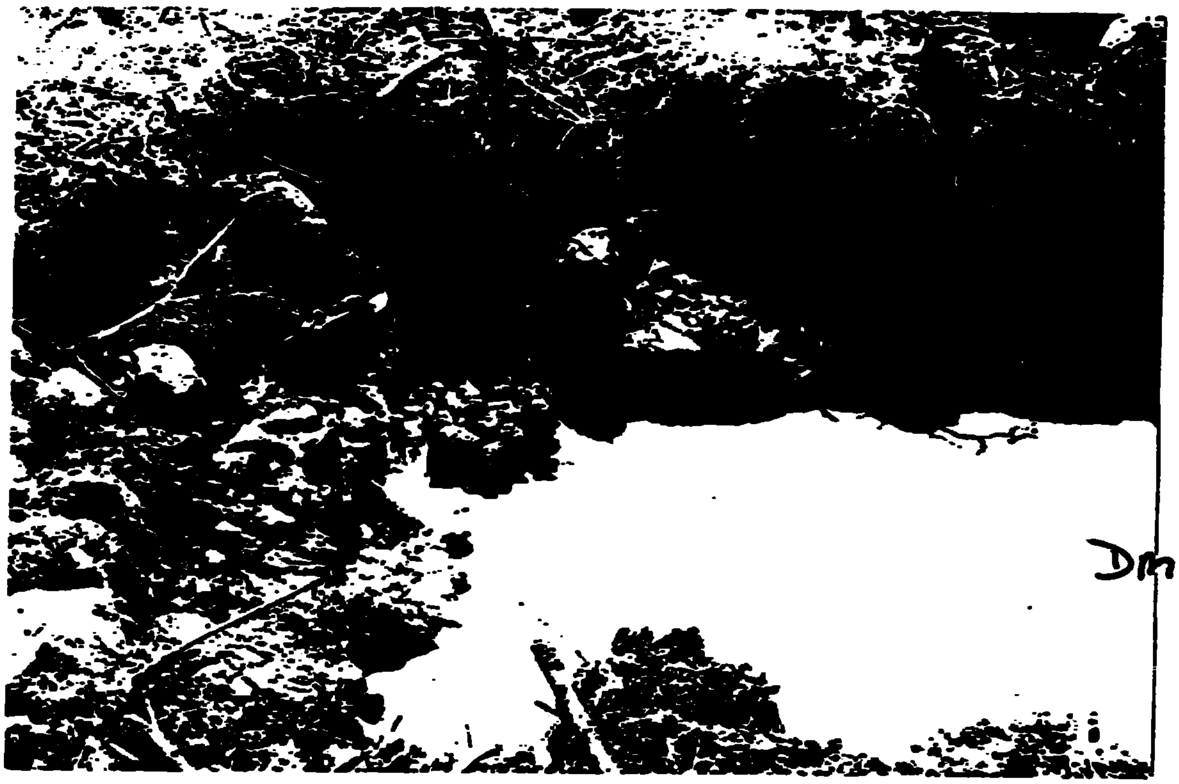


Photo 3. View of Test Pit No. 6, Proposed Phase 1 TMF alignment. Test pit was dug in the bottom of a seasonal drainage course. The upper 0.3 m of the strata contained organics and boulders from which the fines had been washed out from. Water table was close to the surface and was a result of the recent spring thaw. (May 15, 1992)

Photo 4. View of Test Pit No. 10, Proposed Phase 1 TMF alignment, showing irregular nature of bedrock, which ranged from 0.15 to 2.29m depth. (May 15, 1992)

Photo 5. View of Test Pit No. 17, Proposed Phase 1 TMF alignment. Note oxidized layer of till overlying the grey till. The till is competent as is evident by the stable test pit wall and the imprints of the backhoe bucket teeth. (May 15, 1992)

Photo 6. View of Test Pit No. 19, Proposed Phase 1 TMF alignment. Note the wet conditions present. The disturbed material flowed readily, while the test pit walls were relatively stable. (May 23, 1992)

Photo 7. View, looking south, of Test Pit No. 4, South West Camp Lake borrow investigation site, showing the compact nature of the till. Note the oxidized till in the upper 0.20 m of the test pit as well as the localized inflow of water at the mid left point of the far test pit wall. (May 16, 1992)

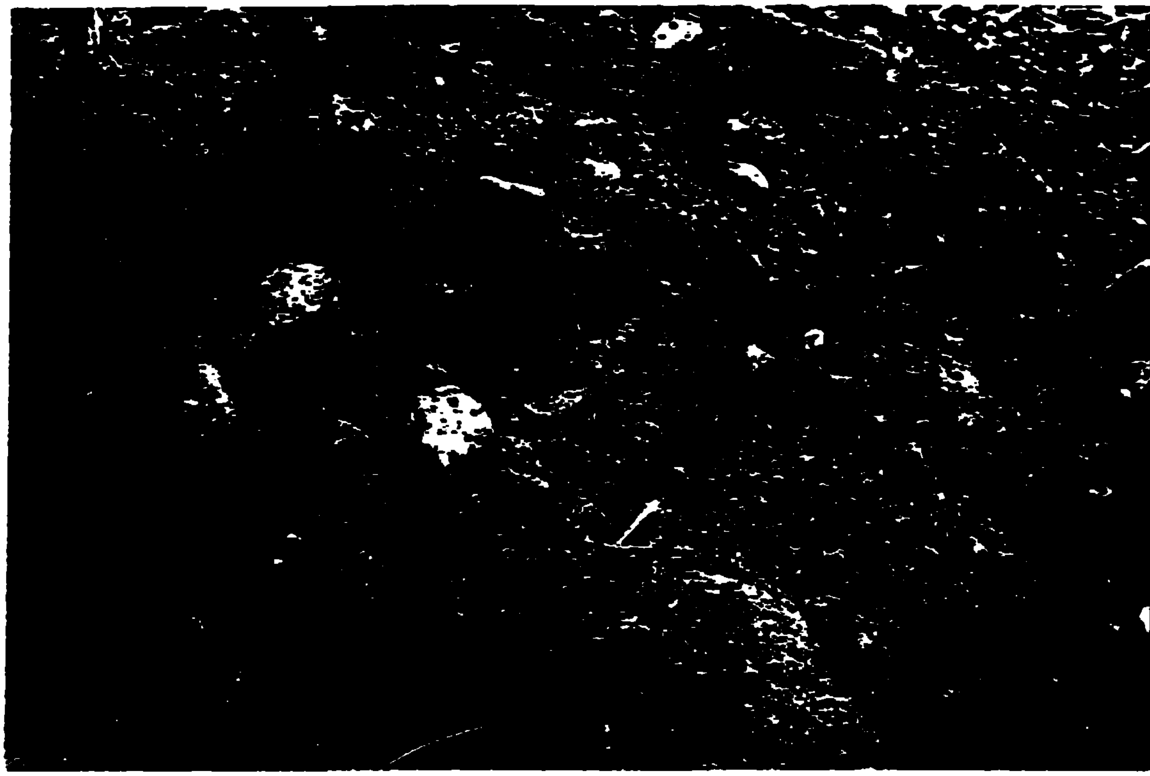


Photo 8. View showing close-up of grey silty sand with some gravel excavated from Test Pit No. 4, Southwest Camp Lake borrow investigation site. Cobbles and boulders account for approximately 25+ % of material. (May 16, 1992)

Photo 9. View of Test Pit No. 12, West Camp Lake borrow investigation site, showing the wet conditions encountered there. (May 22, 1992)

Photo 10. View of Test Pit No. 14, West Camp Lake borrow investigation site. Water table was located at 0.30m and was concentrated in the cobble and boulders visible in the left side of the photography. (May 22, 1992)

Photo 11. View of Test Pit No. 5, Southeast Camp Lake borrow investigation site, showing the shallow nature of the till on the ridge top. (May 17, 1992)

Photo 12. View showing terrain and forest cover at the Southeast Camp Lake borrow investigation site. The two people are standing on a trail cleared through the forest to permit access by the backhoe which is visible behind the trees just left of center. This type of terrain and cover was also typical of the South Camp Lake borrow investigation site. (May 18, 1992)

Dm

Photo 13. View of Test Pit No. 4, South Camp Lake borrow investigation site. Shallow depth was typical of the South Camp Lake site. (May 21, 1992)

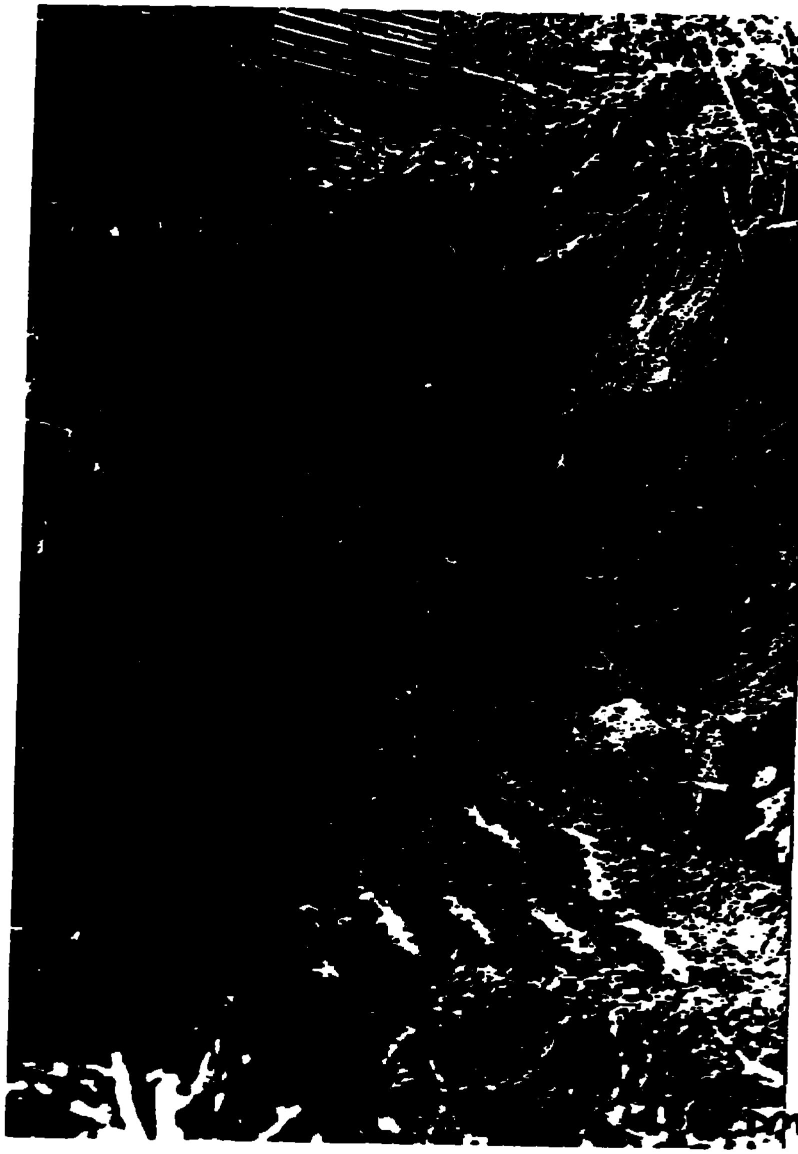


Photo 14. View of Test Pit No. 3, North Camp Lake borrow investigation site. Stratigraphy and depth was typical of the North Camp Lake borrow search site. (May 25, 1992)

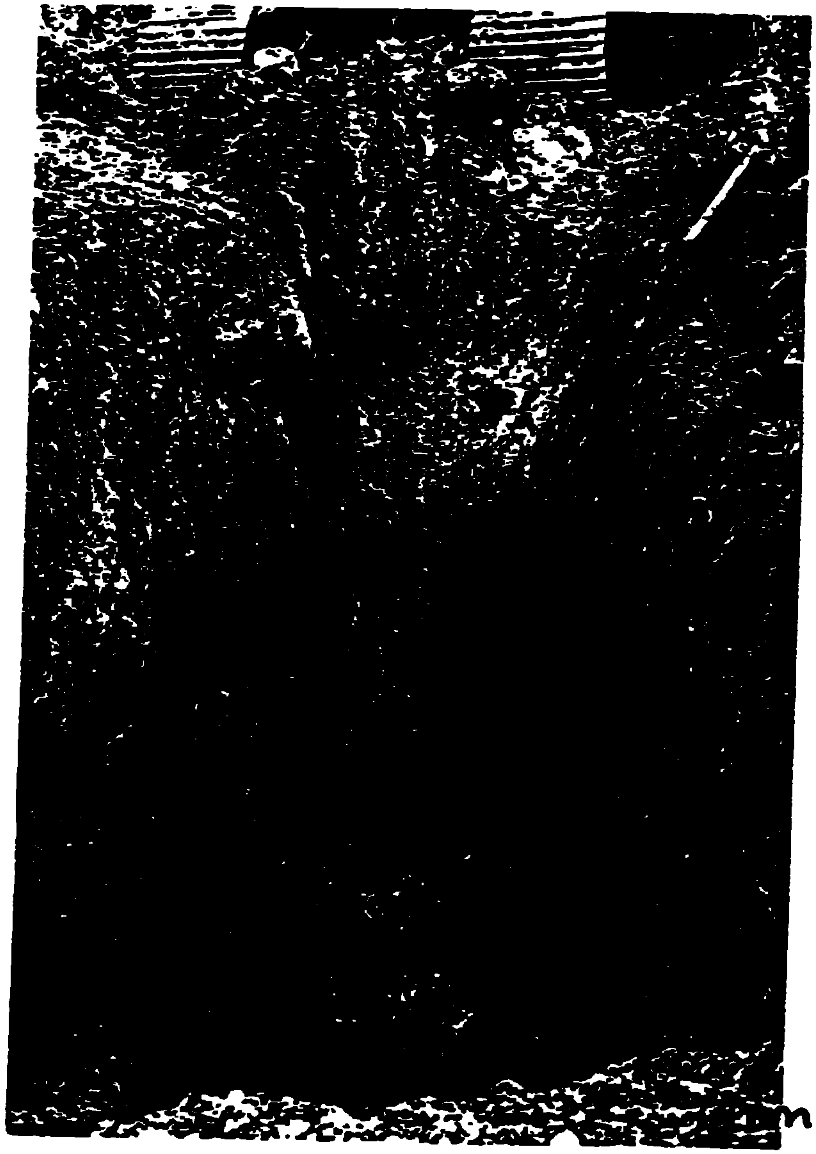


Photo 15. View of Test Pit No. 8, Main Gate borrow investigation site, showing 4.5 m near vertical test pit walls indicating competent till. (May 23, 1992)

Photo 16. View of Test Pit No. 16, Main Gate borrow investigation site. Water table was encountered at 3.66m and as can be seen in the above photography, significant flow occurred through a coarse (gravel-boulder) zone. Such zones were encountered throughout the Lac des Iles investigation area. (May 23, 1992)

Photo 17. View of working face in existing borrow located at the south end of the Main Gate borrow investigation site. Notice the juxtaposition of strata with differing grain size distributions. This lack of homogeneity was common throughout the Lac des Iles investigation area. (October 17, 1992)

APPENDIX II

PROPOSED PHASE ONE TMF, RETENTION STRUCTURE ALIGNMENTS
TEST PIT LOGS AND SOIL TESTING RESULTS
(Tables 1 through 8)
(Lab Test figures 1 through 7)

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 1

TEST PIT NO. 1

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.15	ORGANICS	
.15-.76	BROWN, SILTY SAND WITH 10% BOULDERS	BROWN COLOUR MAY BE RESULT OF OXIDIZATION
.76-1.52	GREY, SILTY SAND WITH SOME GRAVEL, 15 % COBBLES. LARGE BOULDERS PRESENT	
	W.C.=8.5%, HAZEN k=5.5E-4 cm/s (SAMPLE No.1)	
1.52-3.05	GREY SILTY SAND, FEW BOULDERS, COBBLES COMMON	WATER TABLE @ BEDROCK SURFACE
	W.C.=7.2%, HAZEN k=1.5E-3 cm/s (SAMPLE No.2)	
3.05	BEDROCK, GABBROIC COMPLEX, UNDULATORY SURFACE	
	END OF TEST PIT	

TEST PIT NO. 2

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.15	ORGANICS	
.15-.46	YELLOW SILTY SAND, PEPPLES ARE COMMON	PERCHED W.L. AT .15M OVERLIES SILT
.46-1.22	GREY SILTY SAND WITH SOME GRAVEL.	SILT AND SAND HORIZEN PINCH OUT SOUTHWARD
	W.C.=8.4%, HAZEN k=5.5E-4 cm/s (SAMPLE No.1)	AND IS REPLACED BY THE SILTY SAND
.92-1.22	BEDROCK, GABBROIC COMPLEX, UNDULATORY SURFACE	
	END OF TEST PIT	

TEST PIT NO. 3

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	ORGANICS AND BOULDERS (25%)	
.30-1.22	YELLOW SILTY SAND, PEBBLES COMMON	
	W.C.=9.5%, HAZEN k=3.4E-4 cm/s (SAMPLE No.1)	
1.22-1.52	GREY SILTY SAND, PEBBLES COMMON	COMPACTED AS BREAKING IN TO LUMPS
1.52-1.83	BROWN SILTY SAND, CONTAINS SOME SILT SEAMS	WATER SEEPING THROUGH
1.83	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 2

TEST PIT NO. 4

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.15	ORGANICS	
.15-.61	RED BROWN SANDY LOAM WITH .61-1.22M BOULDERS	RED BROWN COLOUR MAY BE RESULT OF OXIDIZATION
.61-1.22	GREY, SILTY SAND WITH SOME GRAVEL, 10 % COBBLES. LARGE BOULDERS PRESENT W.C.=12.2%, HAZEN k=4.8E-4 cm/s, PERMEAMETER k=1.28E-5 cm/s (SAMPLE No.1) PROCTOR MAX DENSITY = 2195 kg/m^3 @7.2% w.c.	
.61-1.22	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE END OF TEST PIT	

TEST PIT NO. 5

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.15	ORGANICS	
.15-.30	TOPSOIL AND 20% BOULDERS UPTO .92M IN SIZE	
.30-1.22	GREY SILT AND SAND WITH TRACE GRAVEL. W.C.=10.0%, HAZEN k=3.0E-4 cm/s (sample nO.1)	
.76-1.07	BEDROCK, GABBROIC COMPLEX, UNDULATORY SURFACE END OF TEST PIT	

TEST PIT NO. 6

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	ORGANICS	A ZONE FROM .30-1.22M DEPTH CONTAINED NOTHING BUT SHATTERED ROCK, POSSIBLY AN OLD DRAINAGE COURSE THAT WASHED OUT THE FINES. WATER WAS FLOWING THROUGH THE BOULDERS.
.30-1.22	SILTY SAND WITH TRACE GRAVEL. W.C.=12.6%, HAZEN k=6.2E-4 cm/s (sample nO.1)	
1.22	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 3

TEST PIT NO. 7

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	ORGANICS	
.30-.76	BROWN SILTY SAND TILL WITH .30-.92M BOULDERS	BROWN COLOUR MAY BE RESULT OF OXIDIZATION
.76-1.83	GREY, SILTY SAND WITH SOME GRAVEL, 20 % COBBLES. LARGE BOULDERS PRESENT W.C.=6.6%, HAZEN k=1.5E-3 cm/s (SAMPLE No.1)	
.61-1.83	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE	
	END OF TEST PIT	

TEST PIT NO. 8

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.06	ORGANICS	
.06-.23	RED GRAVELLY SILTY SAND, 5% BOULDERS	RED COLOUR DUE TO OXIDIZATION
.23-.61	RED TO GREY GRAVELLY SILTY SAND WITH 5% BOULDERS W.C.=15.5%, HAZEN k=3.0E-4 cm/s (SAMPLE No.1)	
.61	BEDROCK, GABBROIC COMPLEX, SMOOTH SURFACE	
	END OF TEST PIT	

TEST PIT NO. 10

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.06	ORGANICS	
.06-.61	BROWN SILTY SAND WITH SOME GRAVEL, 8% COBBLES AND BOULDERS	
.61-2.29	GREY SILTY SAND WITH SOME GRAVEL, 8% COBBLES AND BOULDERS W.C.=10.7%, HAZEN k=1.65E-3 cm/s (SAMPLE No.1)	
.15-2.29	BEDROCK, GABBROIC COMPLEX, IRREGULAR SURFACE	WATER FLOWING ALONG BEDROCK / TILL CONTACT
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 4

TEST PIT NO. 11

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	BROWN SILTY GRAVELLY SAND, 15% BOULDERS	BROWN COLOUR MAY BE RESULT OF OXIDIZATION
.61-1.83	GREY SILTY GRAVELLY SAND, 15% BOULDERS W.C.=13.6%, HAZEN k=6.2E-4 cm/s (SAMPLE No.1)	
.61-1.83	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE END OF TEST PIT	

TEST PIT NO. 12

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.76	BROWN SILTY SAND WITH SOME GRAVEL, 20% COBBLES AND BOULDERS	BROWN COLOUR MAY BE RESULT OF OXIDIZATION
.76-1.68	GREY SILTY SAND WITH SOME GRAVEL, 20% COBBLES AND BOULDERS W.C.=10.5%, HAZEN k=1.0E-3 cm/s (SAMPLE No.1)	
1.68	BEDROCK, GABBROIC COMPLEX END OF TEST PIT	

TEST PIT NO. 13

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.46	BROWN SILTY SAND TRACE GRAVEL, BOULDERY	
.46-2.74	GREY SILTY SAND TRACE GRAVEL, BOULDERY W.C.=6.6%, HAZEN k=1.6E-3 cm/s (SAMPLE No.1)	TILL IS MOIST AND SIDES OF EXCAVATION CAVED EASILY
.46-2.74	BEDROCK, GABBROIC COMPLEX, IRREGULAR SURFACE END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 5

TEST PIT NO. 14

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.92	75% 0.2-0.5m BOULDERS WITH AN ORGANIC MATRIX, 5% OF BOULDERS WERE 0.5-1.5m IN SIZE.	W.T. @ .15M
.92-1.68	BLACK SAND AND SILT, SOME GRAVEL. W.C.=20.7%, HAZEN k=2.1E-4 cm/s (SAMPLE No.1)	BLACK COLOUR MAY BE RESULT OF ORGANICS, ROTTEN VEGETATION SMELL
1.68-2.74	SILTY SAND WITH TRACE GRAVEL, COBBLES AND BOULDERS PRESENT W.C.=6.8%, HAZEN k=1.8E-3 cm/s (SAMPLE No.2)	
2.74	BEDROCK END OF TEST PIT	UNABLE TO SEE BEDROCK DUE TO WATER IN EXCAVATION

TEST PIT NO. 15

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.23	ORGANICS WITH 80% BOULDERS	BOULDERS LARGE, 1.5M AVERAGE SIZE
.23-.53	BROWN SILT AND SAND WITH TRACE GRAVEL, 20% COBBLES AND BOULDERS	BROWN COLOUR RESULT OF OXIDIZATION
.53-1.52	GREY SILT AND SAND WITH TRACE GRAVEL, 20% COBBLES AND BOULDERS W.C.=11.2%, HAZEN k=2.1E-4 cm/s (SAMPLE No.1)	WATER FLOWING IN SIDE, ABOVE BEDROCK / TILL CONTACT
1.37-1.52	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE END OF TEST PIT	

TEST PIT NO. 16

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.08	ORGANICS WITH 8% BOULDERS UP TO 1.5M IN SIZE	
.08-.61	BROWN SAND WITH SOME GRAVEL AND TRACE SILT, 10% COBBLES AND BOULDERS	W.T. @ .46M, LOCALLIZED ZONE
.61-3.05	GREY SAND WITH SOME GRAVEL AND TRACE SILT, 10% COBBLES AND BOULDERS W.C.=9.1%, HAZEN k=7.9E-3 cm/s (SAMPLE No.1)	CAUSED CAVING OF EXCAVATION SIDE
1.83-3.05	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 6

TEST PIT NO. 17

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.09	ORGANICS	
.09-.46	BROWN SILTY SAND WITH SOME GRAVEL. COBBLES AND BOULDERS UPTO 0.4M.	
.46-2.44	GREY SILTY SAND WITH SOME GRAVEL. COBBLES AND BOULDERS PRESENT.	
	W.C.=6.6%, HAZEN k=9.0E-4 cm/s (SAMPLE No.1)	
1.98-2.44	BEDROCK, GABBROIC COMPLEX, ROUNDED SURFACE	
	END OF TEST PIT	

TEST PIT NO. 18

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND MUSKEG WITH BOULDERS	W.T. @ .30M
.30-.92	BROWN SILT AND SAND WITH SOME GRAVEL, COBBLES AND BOULDERS PRESENT.	BROWN COLOUR MAY BE RESULT
.92-1.98	BROWN TO GREY SILT AND SAND WITH SOME GRAVEL, COBBLES AND BOULDERS PRESENT.	OF OXIDIZATION
	W.C.=14.8%, HAZEN k=1.7E-4 cm/s (SAMPLE No.1)	
1.83-1.98	BEDROCK, GABBROIC COMPLEX	
	END OF TEST PIT	

TEST PIT NO. 19

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ .76M
.30-.61	BROWN SAND AND GRAVEL WITH SOME SILT.	BROWN COLOUR MAY BE RESULT
.61-1.22	FIRM BROWN TO GREY SAND AND GRAVEL WITH SOME SILT.	OF OXIDIZATION
	W.C.=16.1%, HAZEN k=7.3E-4 cm/s (SAMPLE No.1)	
1.07-1.22	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 7

TEST PIT NO. 20

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.92	BROWN SILTY SAND WITH SOME GRAVEL.	W.T. @ 1.52M
.92-3.35	GREY SILTY SAND WITH SOME GRAVEL. W.C.=16.0%, HAZEN k=1.7E-4 cm/s (SAMPLE No.1)	
3.35	BEDROCK, GABBROIC COMPLEX	
	END OF TEST PIT	

TEST PIT NO. 23

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	BROWN SILT AND SAND WITH TRACE GRAVEL, COBBLES AND BOULDERS PRESENT. W.C.=19.2%, HAZEN k=1.7E-4 cm/s (SAMPLE No.1)	BROWN COLOUR MAY BE RESULT OF OXIDIZATION
.61	BEDROCK, GABBROIC COMPLEX	
	END OF TEST PIT	

TEST PIT NO. 24

DEPTH (METRES)	DESCRIPTION	REMARKS
0-3.05	MUSKEG	W.T. @ .30M NOT SAMPLED
3.05	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
PROPOSED PHASE ONE TMF AREA

APPENDIX II

TABLE 8

TEST PIT NO. 25

DEPTH (METRES)	DESCRIPTION	REMARKS
0-?	MUSKEG	W.T. @ SURFACE NOT DUG DUE TO ACESS PROBLEMS

TEST PIT NO. 26

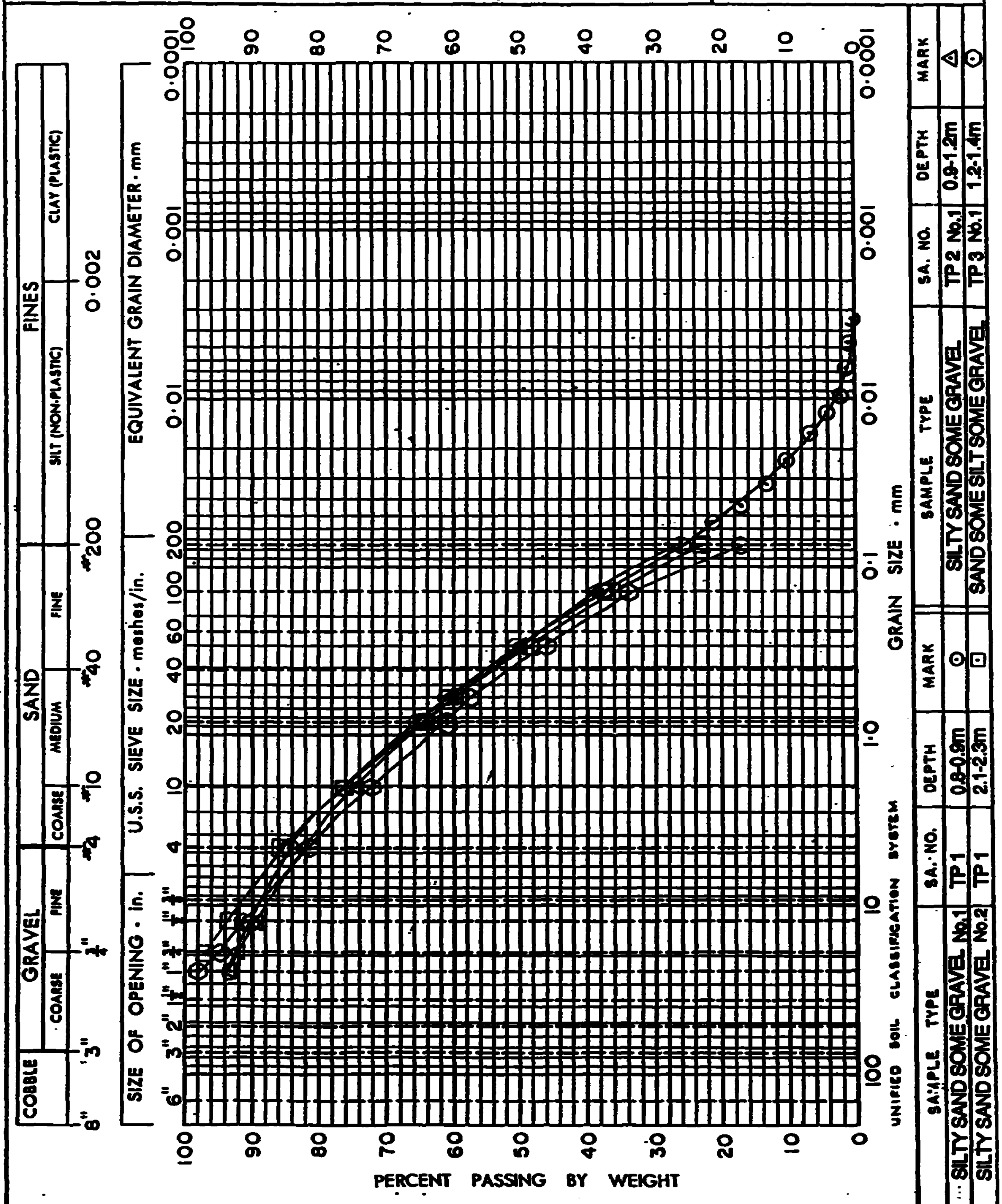
DEPTH (METRES)	DESCRIPTION	REMARKS
0-1.83 1.83	MUSKEG AND BOULDERS BEDROCK END OF TEST PIT	W.T. @ .15M NOT SAMPLED

TEST PIT NO.

DEPTH (METRES)	DESCRIPTION	REMARKS

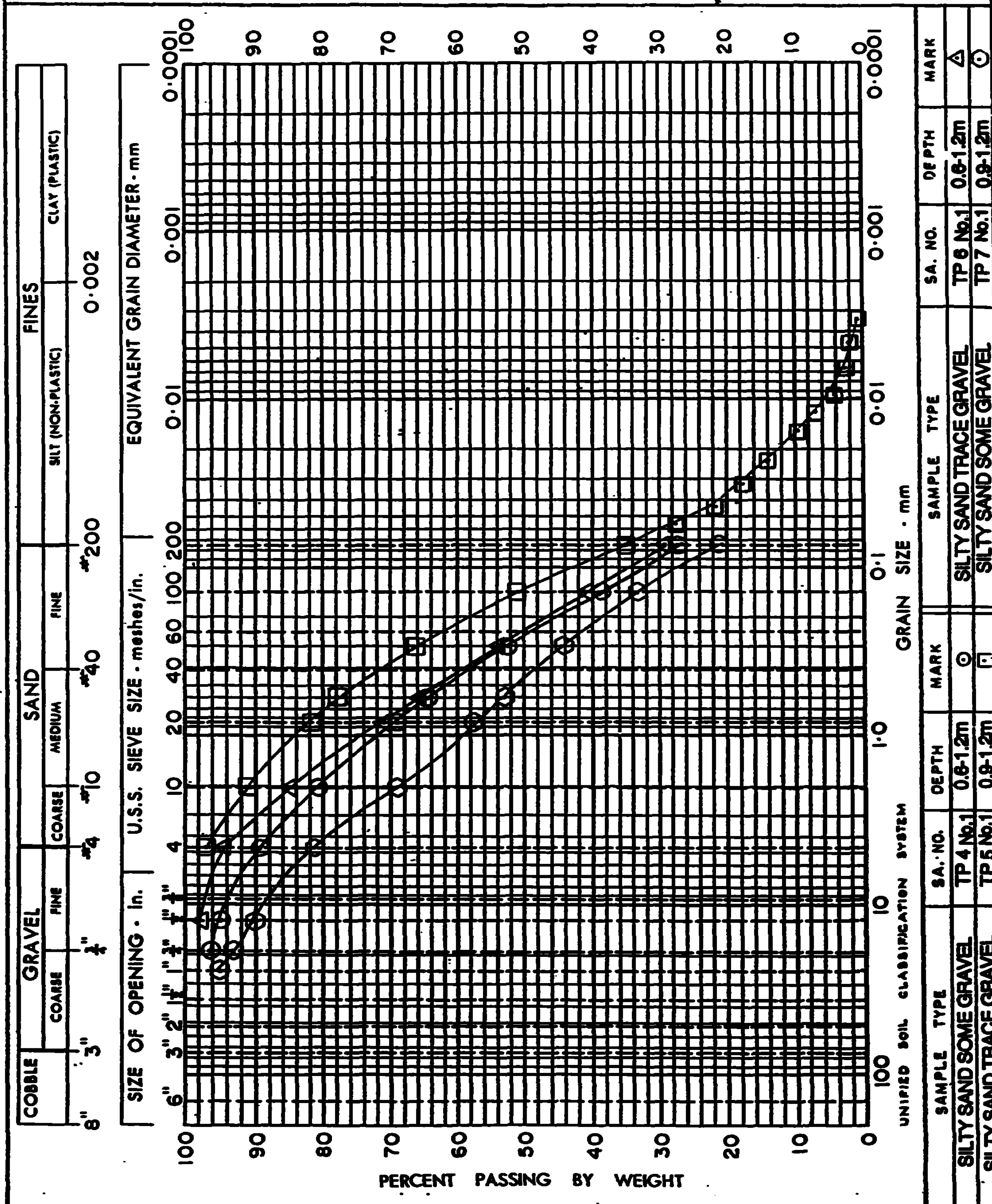
LAC DES ILES FOUNDATION SOILS

GRAIN SIZE DISTRIBUTION	APPENDIX II
PROPOSED PHASE 1 TMF RETENTION STRUCTURES	FIG. NO. 1



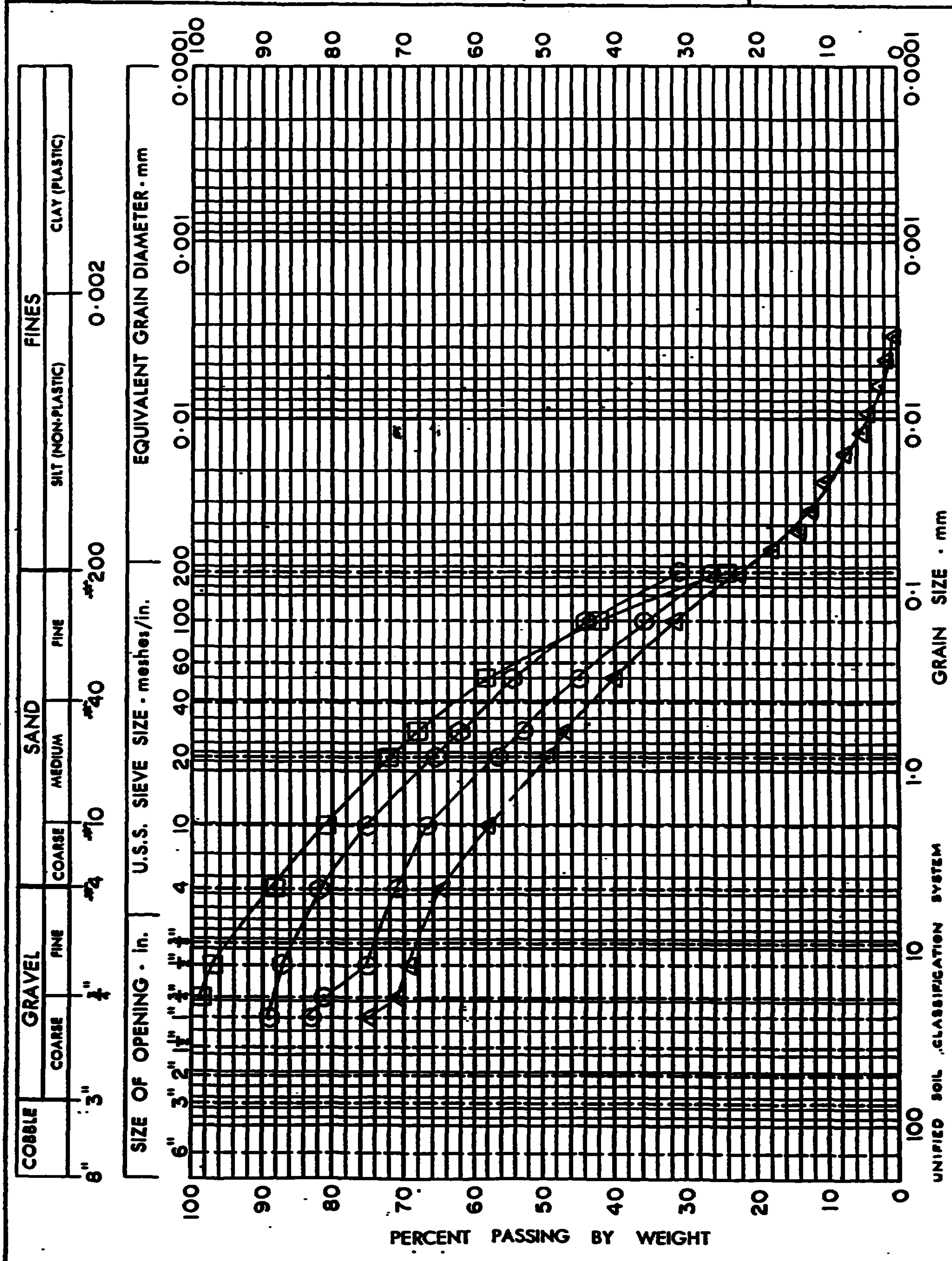
LAC DES ILES FOUNDATION SOILS

GRAIN SIZE DISTRIBUTION	APPENDIX II
PROPOSED PHASE 1 TMF RETENTION STRUCTURES	FIG. NO. 2



LAC DES ILES FOUNDATION SOILS

GRAIN SIZE DISTRIBUTION	APPENDIX II
PROPOSED PHASE 1 TMF RETENTION STRUCTURES	FIG. NO. 3



SAMPLE TYPE	SA. NO.	DEPTH	MARK
GRAVELLY SILTY SAND	TP 8 No.1	0.3-0.6m	⊙
SILTY SAND SOME GRAVEL	TP 10 No.1	1.7-2.1m	⊡
SILTY GRAVELLY SAND	TP 11 No.1	1.2-1.5m	△
SILTY SAND SOME GRAVEL	TP 12 No.1	1.2-1.5m	⊙

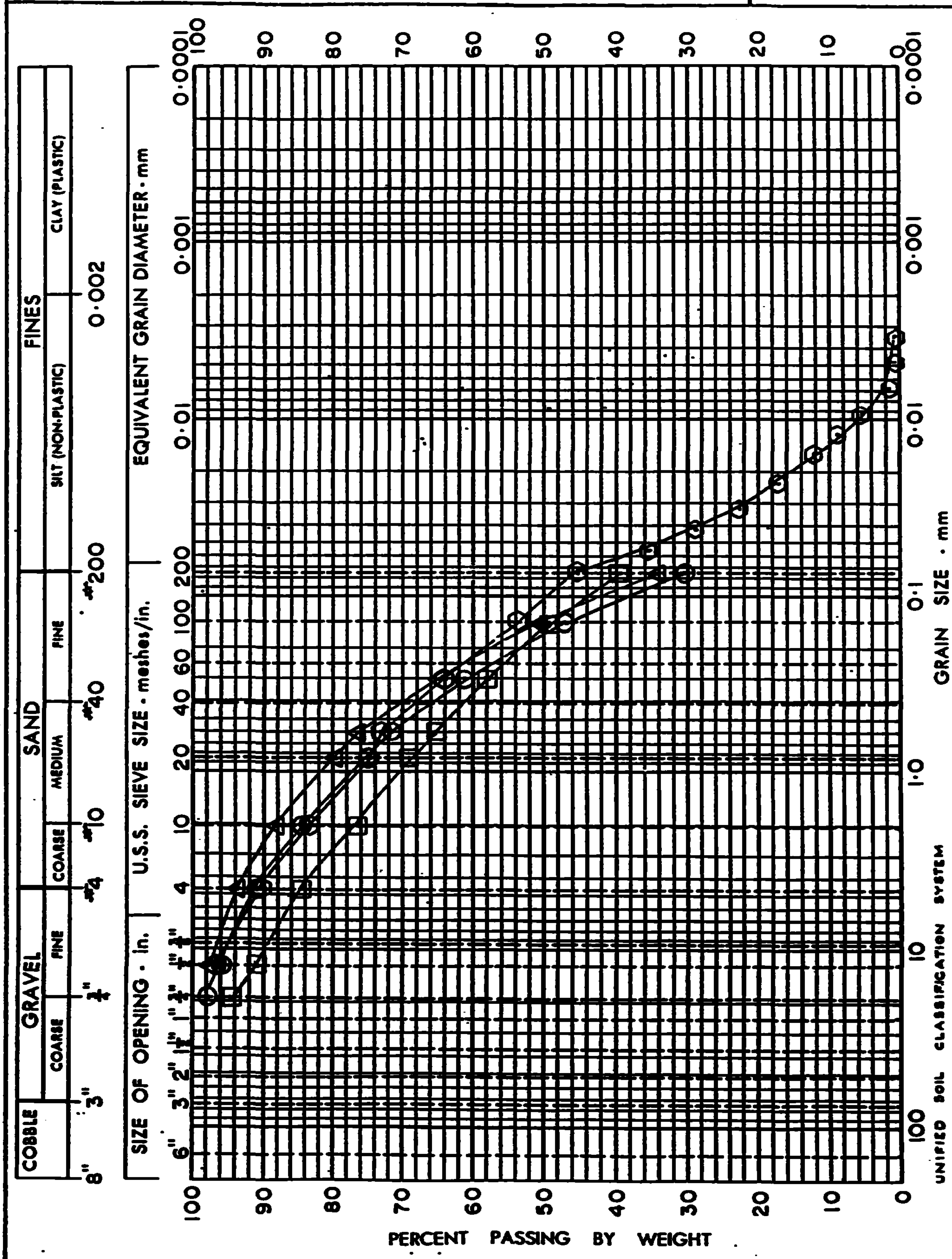
LAC DES ILES FOUNDATION SOILS

GRAIN SIZE DISTRIBUTION

PROPOSED PHASE 1 TMF RETENTION STRUCTURES

APPENDIX II

FIG. NO. 4



SAMPLE TYPE	SA. NO.	DEPTH	MARK
SILTY SAND TRACE GRAVEL	TP 13 No.1	1.5-1.8m	⊙
SAND AND SILT SOME GRAVEL	TP 14 No.1	1.1-1.4m	□
SILTY SAND TRACE GRAVEL	TP 14 No.2	2.1-2.4m	△
SILT AND SAND TRACE GRAVEL	TP 15 No.1	1.2-1.5m	⬡

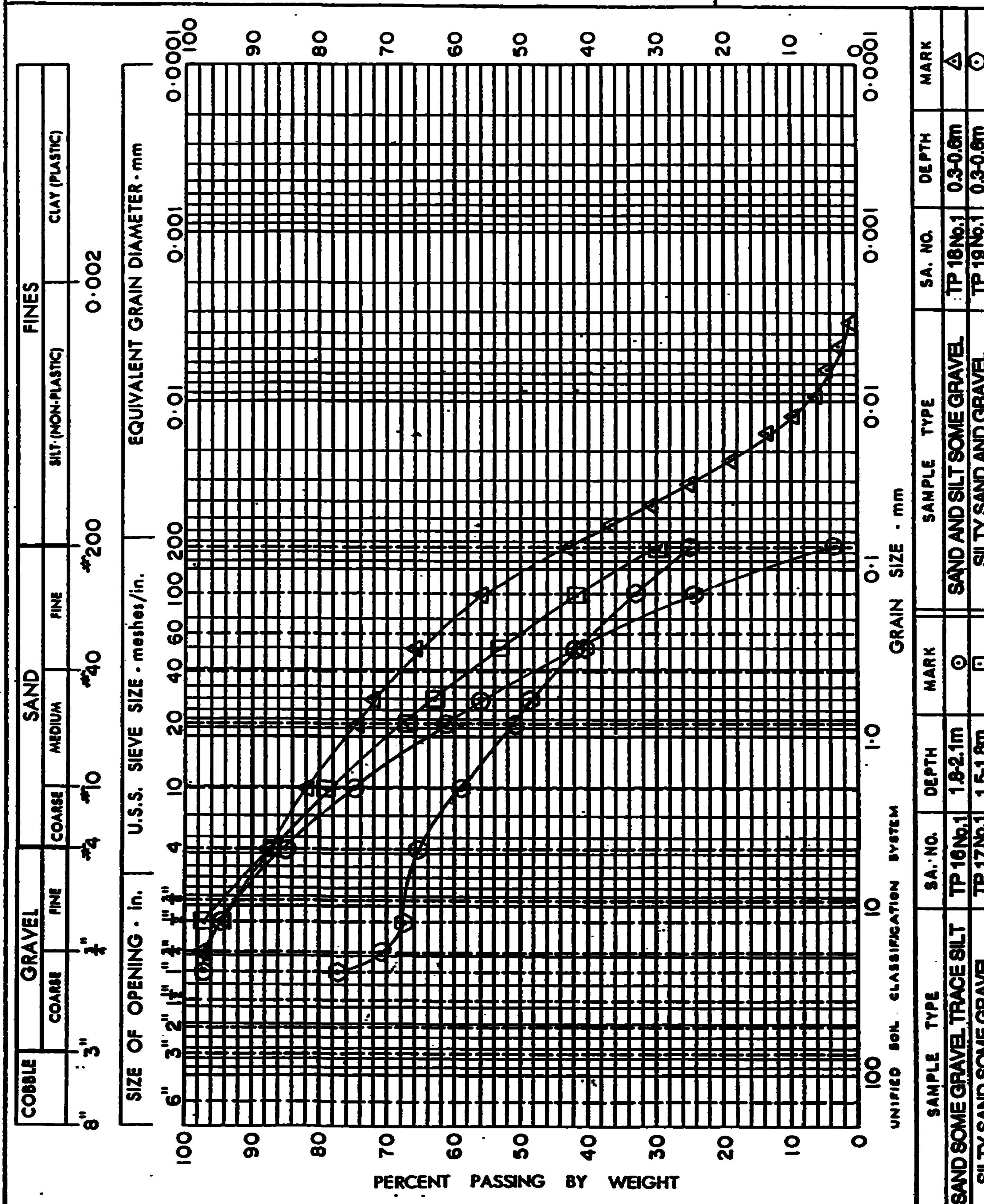
LAC DES ILES FOUNDATION SOILS

GRAIN SIZE DISTRIBUTION

PROPOSED PHASE 1 TMF RETENTION STRUCTURES

APPENDIX II

FIG. NO. 5



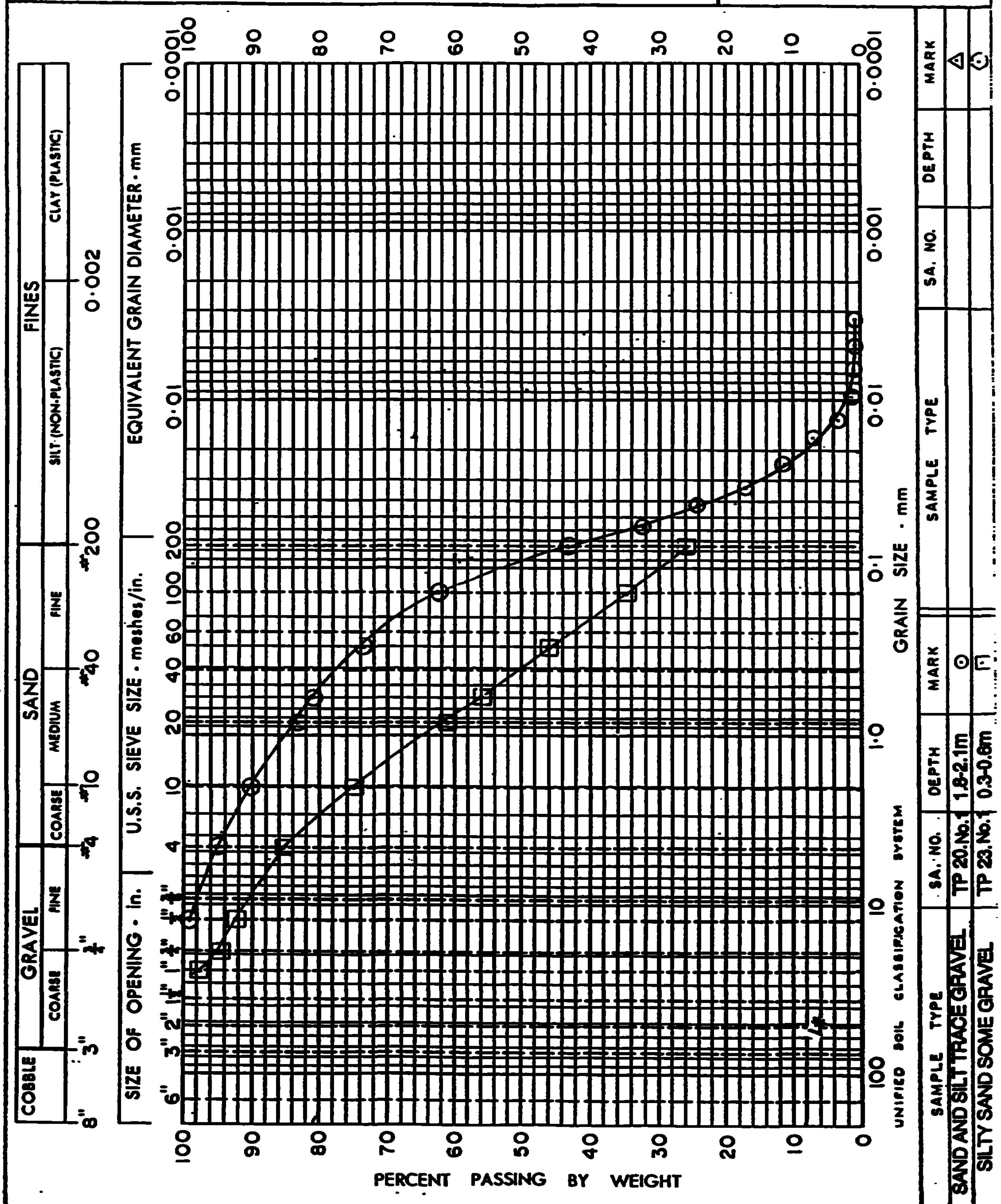
LAC DES ILES FOUNDATION SOILS

GRAIN SIZE DISTRIBUTION

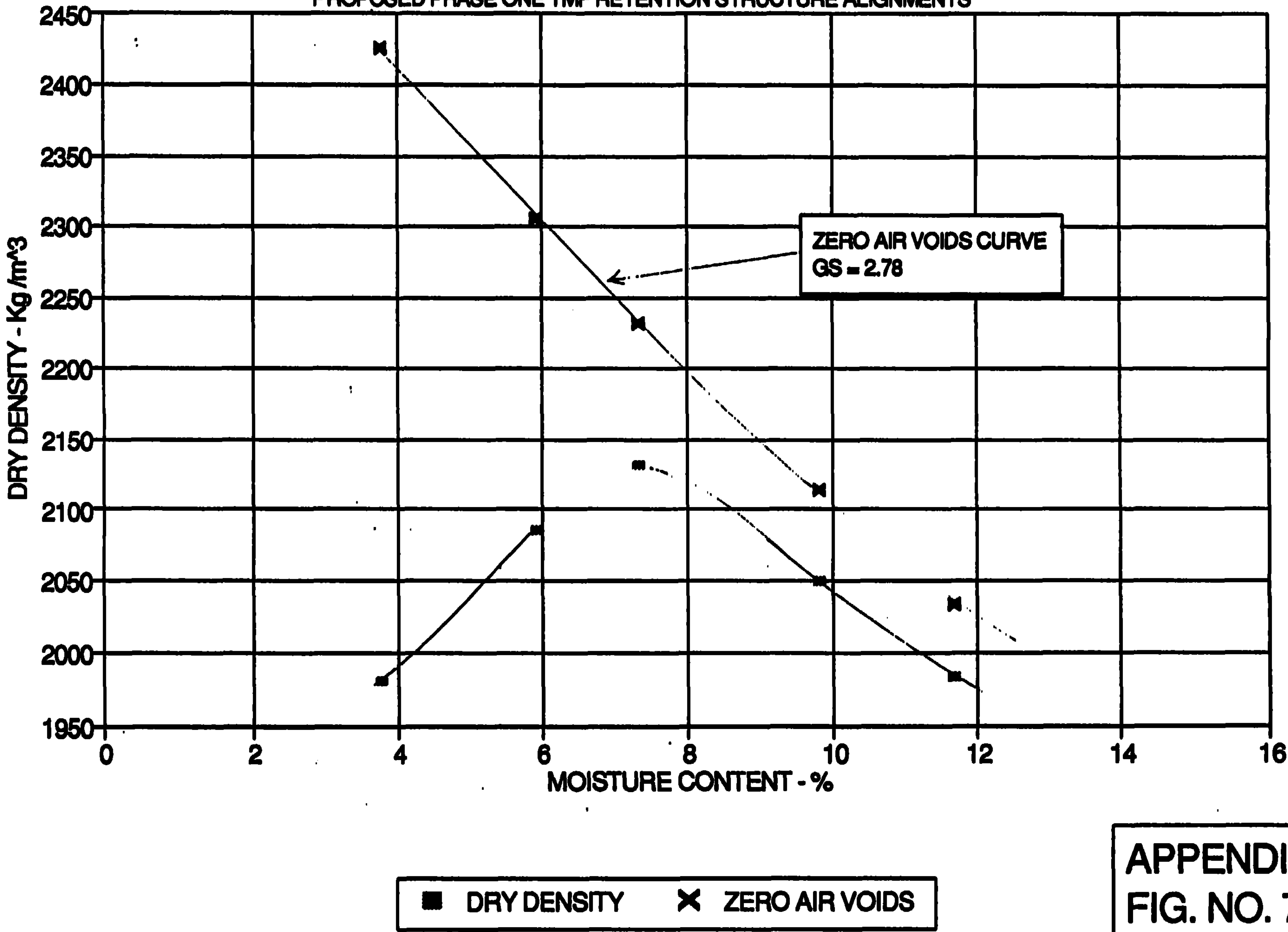
PROPOSED PHASE 1 TMF RETENTION STRUCTURES

APPENDIX II

FIG. NO. 6



STANDARD PROCTOR COMPACTION CURVE
SILTY SAND TRACE GRAVEL TP4 #1
PROPOSED PHASE ONE TMF RETENTION STRUCTURE ALIGNMENTS



APPENDIX II
FIG. NO. 7

APPENDIX III

BORROW INVESTIGATIONS
TEST PIT LOGS AND SOIL TESTING RESULTS
(Tables 1 through 28)
(Figures 1 through 16)

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH WEST CAMP LAKE SITE

APPENDIX III

TABLE 1

TEST PIT NO. 1		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.09	ORGANICS	
.09-.46	RED BROWN SILTY SAND, SOME GRAVEL. 25% COBBLES AND BOULDERS	RED BROWN COLOUR DUE TO OXIDIZATION
.46-.76	GREY SILTY SAND, SOME GRAVEL. 25% COBBLES AND BOULDERS	
.76	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE	
	END OF TEST PIT	

TEST PIT NO. 2		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.09	ORGANICS	W.T. @ .15M
.09-.46	RED BROWN SILTY SAND, SOME GRAVEL. 25% COBBLES AND BOULDERS	RED BROWN COLOUR DUE TO OXIDIZATION
.46-.81	GREY SILTY SAND, SOME GRAVEL. 25% COBBLES AND BOULDERS	
.81	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE	
	END OF TEST PIT	

TEST PIT NO. 3		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.09	ORGANICS	
.09-.52	RED BROWN SILTY SAND WITH SOME GRAVEL. 40% COBBLES AND BOULDERS	RED BROWN COLOUR DUE TO OXIDIZATION
.52-2.18	GREY SILTY SAND WITH SOME GRAVEL. 40% COBBLES AND BOULDERS	
	W.C.=7.8%, HAZEN k=9.0E-4 cm/s (SAMPLE No.1)	
1.87-2.18	BEDROCK, GABBROIC COMPLEX, SMOOTH SLOPING SURFACE	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH WEST CAMP LAKE SITE

APPENDIX III

TABLE 2

TEST PIT NO. 4		
DEPTH (METRES)	**DESCRIPTION**	**REMARKS**
0-.09	ORGANICS	
.09-.46	RED BROWN SILTY SAND, SOME GRAVEL. 25% COBBLES AND BOULDERS	RED BROWN COLOUR DUE TO OXIDIZATION
.46-6.10	GREY SILTY SAND, SOME GRAVEL. 25% COBBLES AND BOULDERS W.C.=7.8% &8.5%,HAZEN k=9.0E-4cm/s.PERMEABILITY k=2.0E-5cm/s (SAMPLES No.1 and No.2) PROCTOR MAX DENSITY = 2160 kg/m^3 @ 7% w.c. (SAMPLE No.1)	LOCALIZED PERCHED W.T.s @4.42 & 5.49 M SAMPLE No.1: 2.4-3.0M DEPTH SAMPLE No.2: 4.5-4.9M DEPTH
6.10	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE END OF TEST PIT	

TEST PIT NO. 5		
DEPTH (METRES)	**DESCRIPTION**	**REMARKS**
0-.09	ORGANICS	W.T. @ .76M
.09-.61	RED BROWN GRAVELLY SILTY SAND. 25% COBBLES AND BOULDERS	RED BROWN COLOUR DUE TO OXIDIZATION
.61-1.68	GREY GRAVELLY SILTY SAND. 25% COBBLES AND BOULDERS W.C.=12.0%,HAZENk=1.0-5cm/s (SAMPLE No.1)	
1.68	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE END OF TEST PIT	

TEST PIT NO. 6		
DEPTH (METRES)	**DESCRIPTION**	**REMARKS**
0-.3	TOPSOIL AND BOULDERS	
.3-5.49	GREY SAND WITH SOME GRAVEL AND SILT. BOULDERS PRESENT W.C.=7.4%, HAZEN k=1.0E-3 cm/s (SAMPLE No.1)	W.T.@1.52M
5.49	BEDROCK END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH WEST CAMP LAKE SITE

APPENDIX III

TABLE 3

TEST PIT NO. 7

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.46	RED BROWN GRAVELLY SILTY SAND.	
.46-.61	GREY GRAVELLY SILTY SAND.	
.61	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 8

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 5.79M
.30-6.10	GREY SILTY SAND WITH TRACE GRAVEL 25% BOULDERS	
	W.C.=7.4%, HAZEN k=8.2E-4 cm/s (SAMPLE No.1)	
6.10	BEDROCK, GABBROIC COMPLEX, UNEVEN SURFACE	
	END OF TEST PIT	

TEST PIT NO. 9

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH TRACE GRAVEL 25% BOULDERS	
.61-1.22	GREY MOIST SILTY SAND WITH TRACE GRAVEL 25% BOULDERS	
1.22	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH WEST CAMP LAKE SITE

APPENDIX III

TABLE 4

TEST PIT NO. 10

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.76	RED BROWN TO GREY MOIST SILTY SAND WITH TRACE GRAVEL.	
.76	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 11

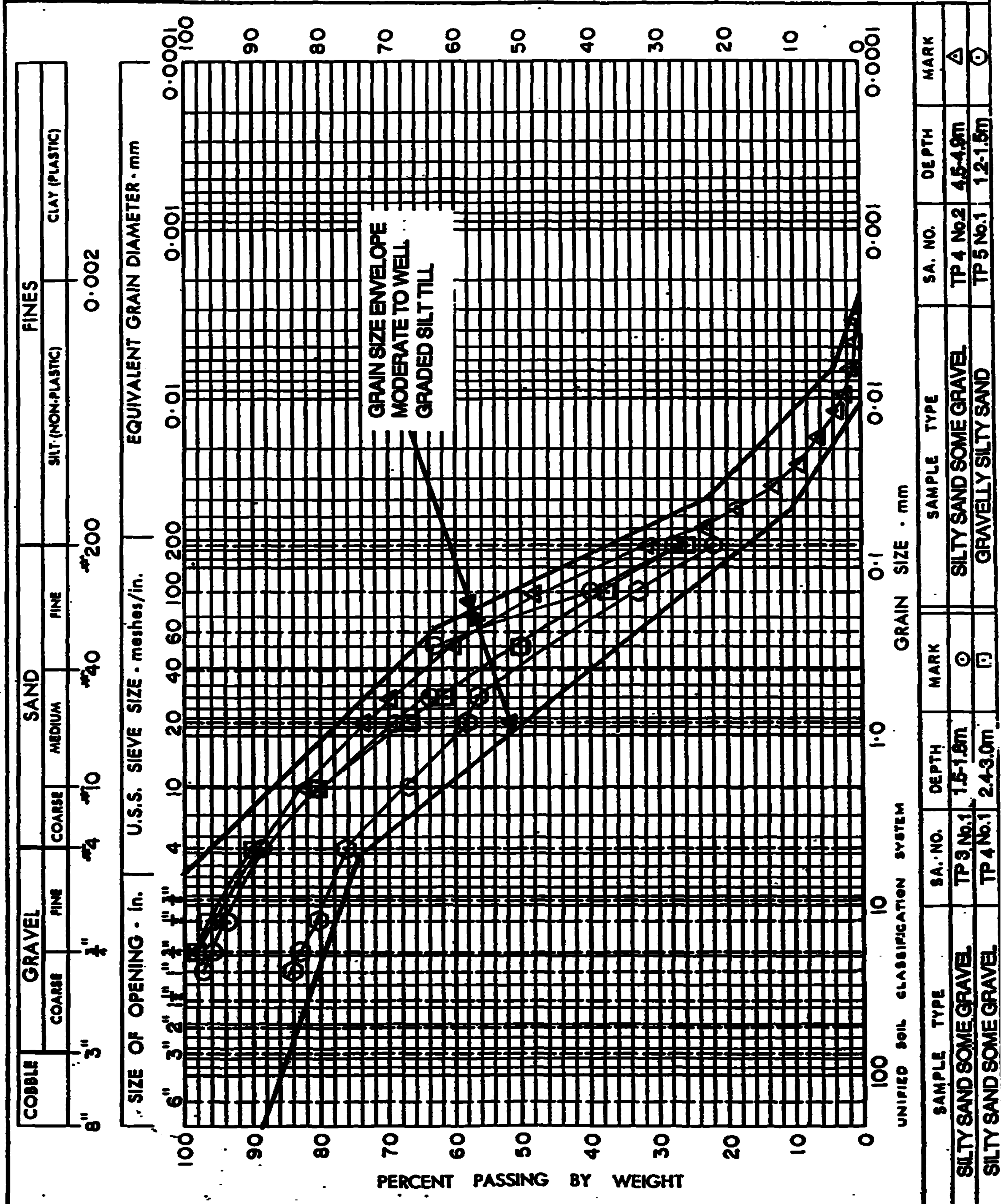
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL, SOME BOULDERS	
.30-.76	RED BROWN TO GREY SILTY SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
.76	BEDROCK	
	END OF TEST PIT	

TEST PIT NO.

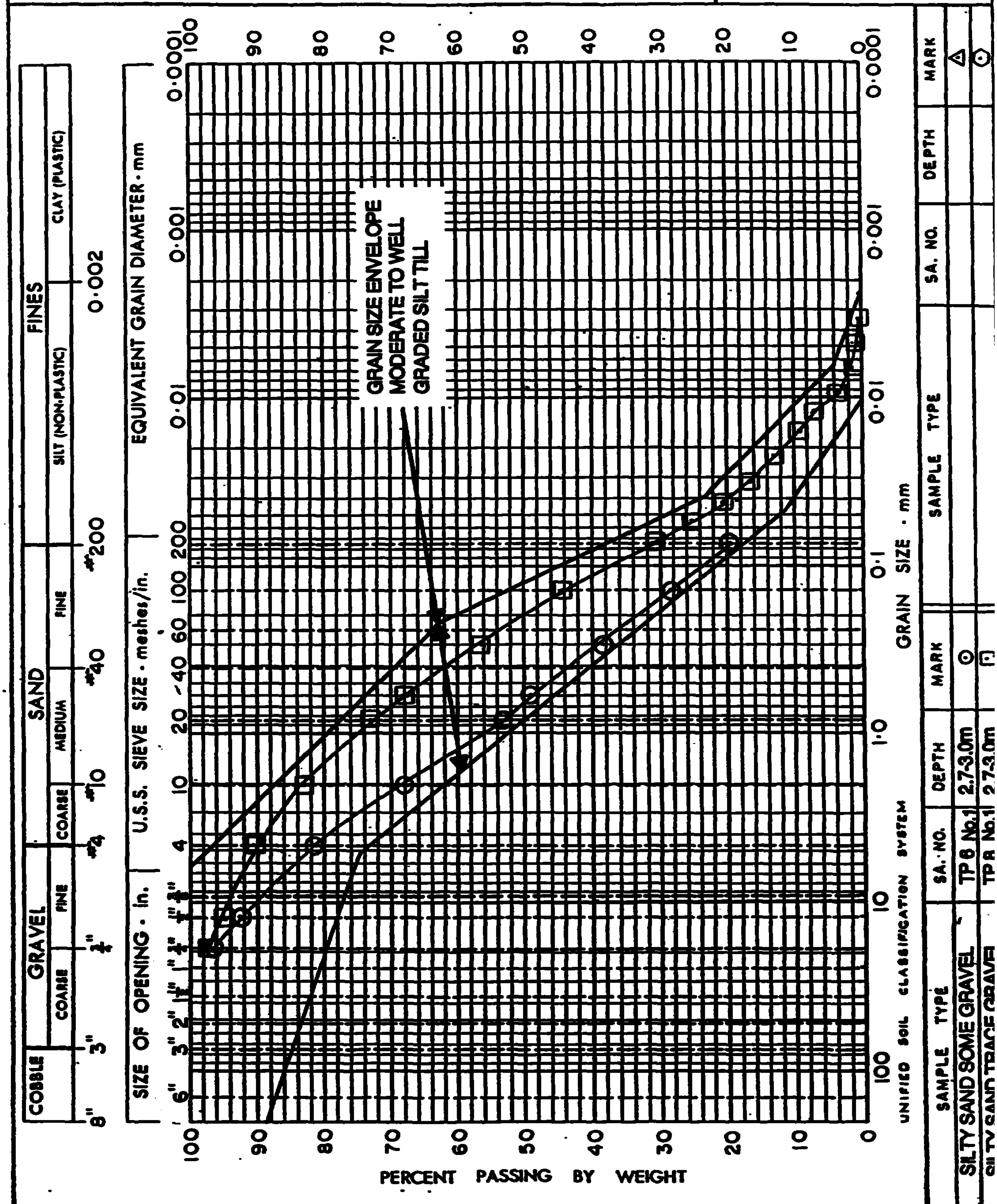
DEPTH (FEET)	DESCRIPTION	REMARKS

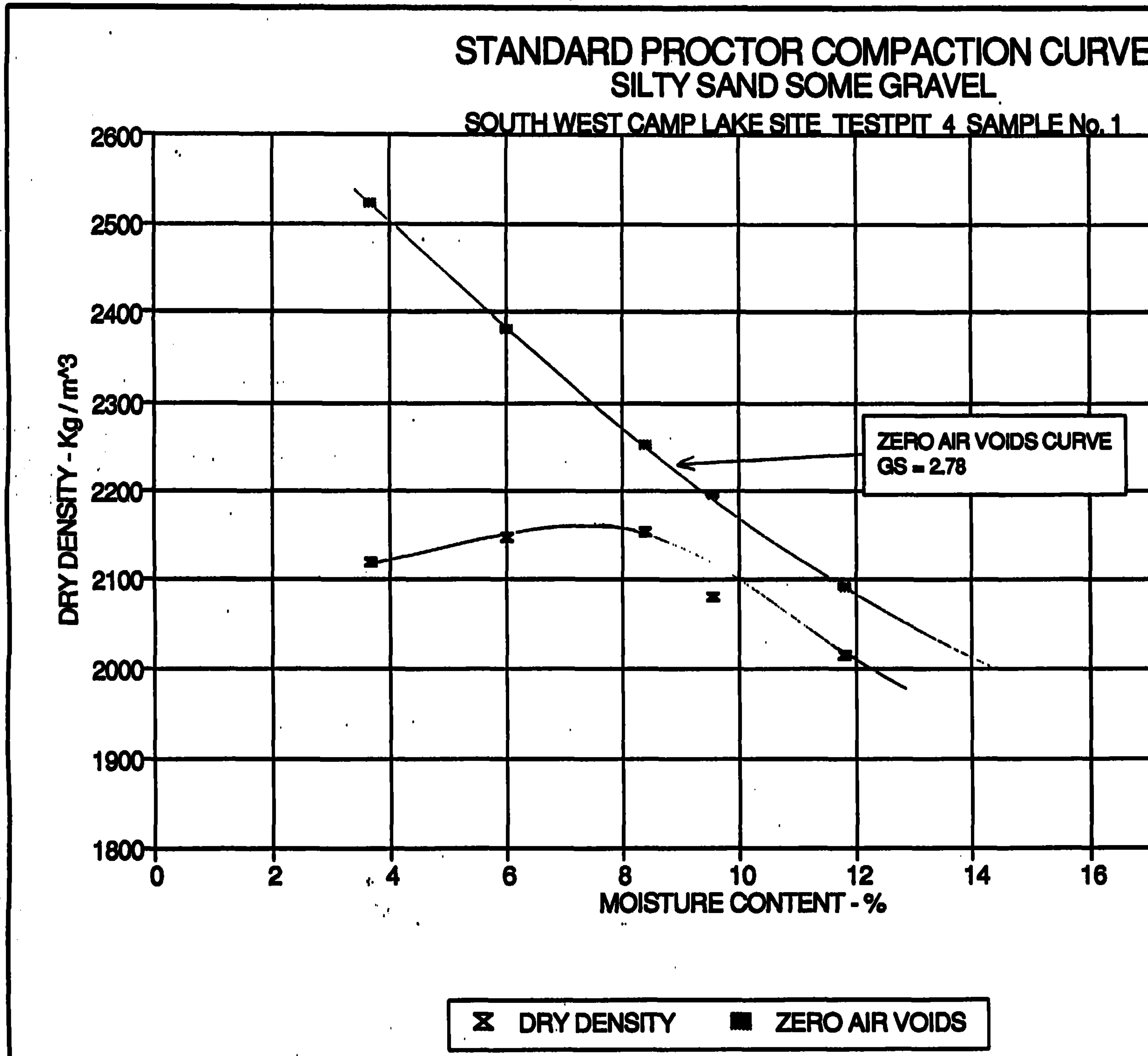
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION SOUTH WEST CAMP LAKE SITE	APPENDIX III FIG. NO. 1



GRAIN SIZE DISTRIBUTION	APPENDIX III
SOUTH WEST CAMP LAKE SITE	FIG. NO. 2





APPENDIX III
FIG. NO. 3

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
WEST CAMP LAKE SITE

APPENDIX III

TABLE 5

TEST PIT NO. 1		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.76 .76	TOPSOIL RED BROWN SILTY SAND WITH SOME GRAVEL. BEDROCK END OF TEST PIT	

TEST PIT NO. 2		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.61 .61-.92 .92-1.83 1.83-1.92	TOPSOIL AND BOULDERS RED BROWN SILTY GRAVELLY SAND. BOULDERS PRESENT WET DENSE GREY SILTY SAND WITH SOME GRAVEL. BEDROCK END OF TEST PIT	W.T. @ .76M

TEST PIT NO. 3		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.92 .92-1.22 1.22	TOPSOIL AND MUSKEG MOIST DENSE GREY SILTY SAND WITH TRACE GRAVEL. BEDROCK END OF TEST PIT	W.T. @ .76M

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
WEST CAMP LAKE SITE

APPENDIX III

TABLE 6

TEST PIT NO. 4

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND MUSKEG	W.T. @ .61M
.30-1.07	MOIST GREY SILTY SAND AND TRACE GRAVEL.	
.92-1.07	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 5

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ .76M
.30-.61	RED BROWN SILTY GRAVELLY SAND. BOULDERS PRESENT	
.61-1.22	FIRM GREY SILTY SAND WITH SOME GRAVEL.	
.76-1.22	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 6

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ .61M
.30-.61	BOULDERS	
.61	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
WEST CAMP LAKE SITE

APPENDIX III

TABLE 7

TEST PIT NO. 7

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ .61M
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.52	MOIST GREY SILTY SAND WITH SOME GRAVEL.	
1.52	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 8

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.15	TOPSOIL	
.15	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 9

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.46	TOPSOIL AND BOULDERS	
.46	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
WEST CAMP LAKE SITE

APPENDIX III

TABLE 8

TEST PIT NO. 10		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30	TOPSOIL BEDROCK END OF TEST PIT	

TEST PIT NO. 11		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30	TOPSOIL BEDROCK END OF TEST PIT	

TEST PIT NO. 12		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.76 .76	TOPSOIL AND BOULDERS RED BROWN SILTY SAND WITH TRACE GRAVEL. BEDROCK END OF TEST PIT	W.T. @ .46M

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
WEST CAMP LAKE SITE

APPENDIX III

TABLE 9

TEST PIT NO. 13

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND MUSKEG	W.T. @ .46M
.30-.92	BOULDERS AND WET BLACK MUSKEG	
.92	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 14

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ .30M
.30-.61	RED BROWN SILTY SAND WITH TRACE GRAVEL	
.61	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 15

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ .30M
.30-.46	RED BROWN SILTY SAND WITH TRACE GRAVEL	
.46	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH EAST CAMP LAKE SITE

APPENDIX III

TABLE 10

TEST PIT NO. 1

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL	
.61-4.57	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=8.5% & 12.6, HAZEN k=7.8E-4 & 6.3E-4 cm/s (SAMPLES No.1 and No.2)	SAMPLE No.1: 2.4 - 3.0M DEPTH SAMPLE No.2: 3.4 - 3.7M DEPTH
4.57	BEDROCK	
	END OFTEST PIT	

TEST PIT NO. 2

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 3.05M
.30-.92	RED BROWN SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
.92-6.40	MOIST GREY SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT W.C.=14.8% & 12.6%, HAZEN k=2.0E-4 &7.8E-4 cm/s (SAMPLES No.1 AND No.2)	SAMPLE No.1: 2.7 - 3.0M DEPTH SAMPLE No.2: 6.1 - 6.4M DEPTH
6.40	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 3

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND AND GRAVEL. BOULDERS PRESENT	
.61-1.83	GREY SILTY SAND AND GRAVEL. BOULDERS PRESENT W.C.=9.0%, HAZEN k=6.2E-3 cm/s (SAMPLE No.1)	
1.83	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH EAST CAMP LAKE SITE

APPENDIX III

TABLE 11

TEST PIT NO. 4		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.61 .61-2.13 2.13	TOPSOIL AND BOULDERS RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=9.2%, HAZEN k=5.8E-4 cm/s (SAMPLE No.1) BEDROCK END OFTEST PIT	

TEST PIT NO. 5		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.61 .61-1.07 .92-1.07	TOPSOIL RED BROWN GRAVELLY SAND WITH SOME SILT. BOULDERS PRESENT BROWN TO GREY GRAVELLY SAND WITH SOME SILT. BOULDERS PRESENT W.C.=11.0%, HAZEN k=2.8E-4 cm/s (SAMPLE No.1) BEDROCK END OF TEST PIT	

TEST PIT NO. 6		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.61 .61-1.83 1.83	TOPSOIL AND BOULDERS RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=9.0%, HAZEN k=4.0E-4 cm/s (SAMPLE No.1) BEDROCK END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION **APPENDIX III**
LAC DES ILES MINES LTD.
SOUTH EAST CAMP LAKE SITE **TABLE 12**

TEST PIT NO. 7		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.52	GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=9.8%, HAZEN k=5.8E-4cm/s (SAMPLE No.1)	
1.22-1.52	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 8		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ .92M
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.22	GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.92-1.22	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 9		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.22	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
1.22	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH EAST CAMP LAKE SITE

APPENDIX III

TABLE 13

TEST PIT NO. 10

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.22	GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
1.22	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 11

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
61-1.22	GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.92-1.22	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 12

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.22	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
1.22	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH EAST CAMP LAKE SITE

APPENDIX III

TABLE 14

TEST PIT NO. A

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 4.57M
.30-.92	RED BROWN SILTY SAND WITH SOME GRAVEL.	
.92-6.71	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=8.9%, HAZEN k=9.0E-4 cm/s (SAMPLE No.1)	
6.71	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. B

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.92	RED BROWN SAND AND GRAVEL WITH SOME SILT. BOULDERS PRESENT	
.92-2.13	BROWN TO GREY SAND AND GRAVEL WITH SOME SILT. BOULDERS PRESENT W.C.=11.2%, HAZEN k=9.0E-4 cm/s (SAMPLE No.1)	
1.98-2.13	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. C

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.31	TOPSOIL AND BOULDERS	
.31-1.37	RED BROWN TO GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.31-1.37	BEDROCK	
	END OF TEST PIT	

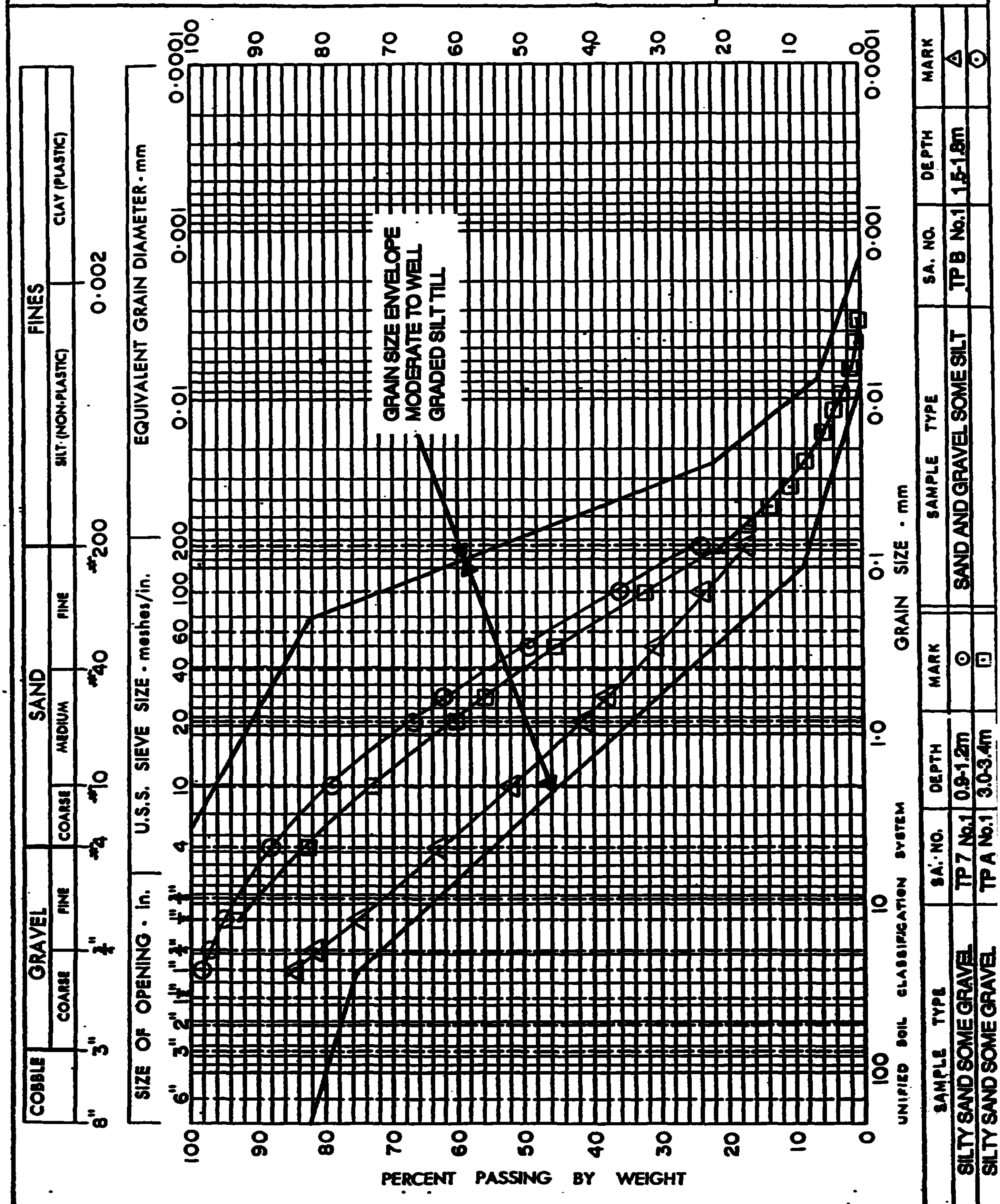
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

SOUTH EAST CAMP LAKE SITE

APPENDIX III

FIG. NO. 4



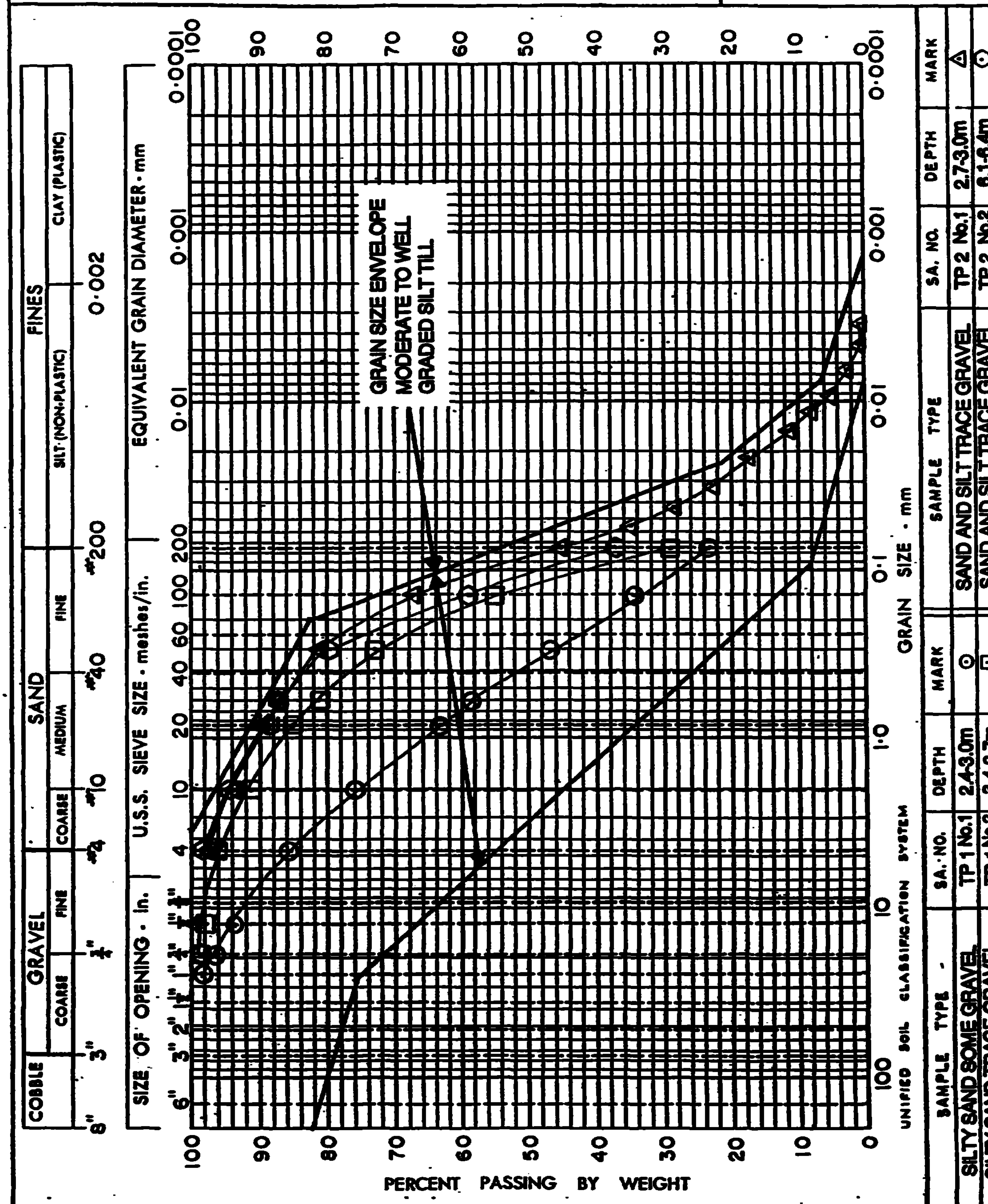
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

SOUTH EAST CAMP LAKE SITE

APPENDIX III

FIG. NO. 5



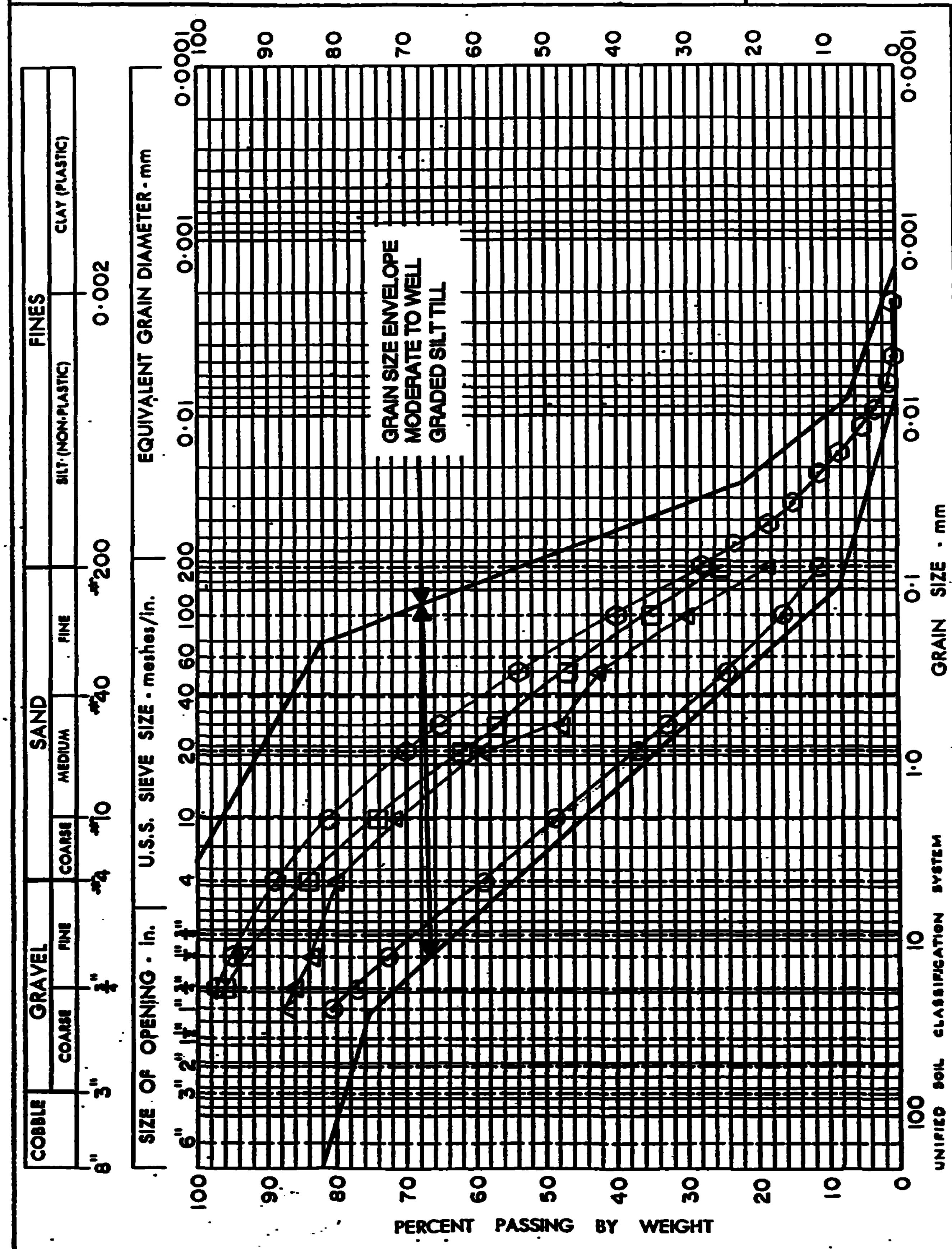
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

SOUTH EAST CAMP LAKE SITE

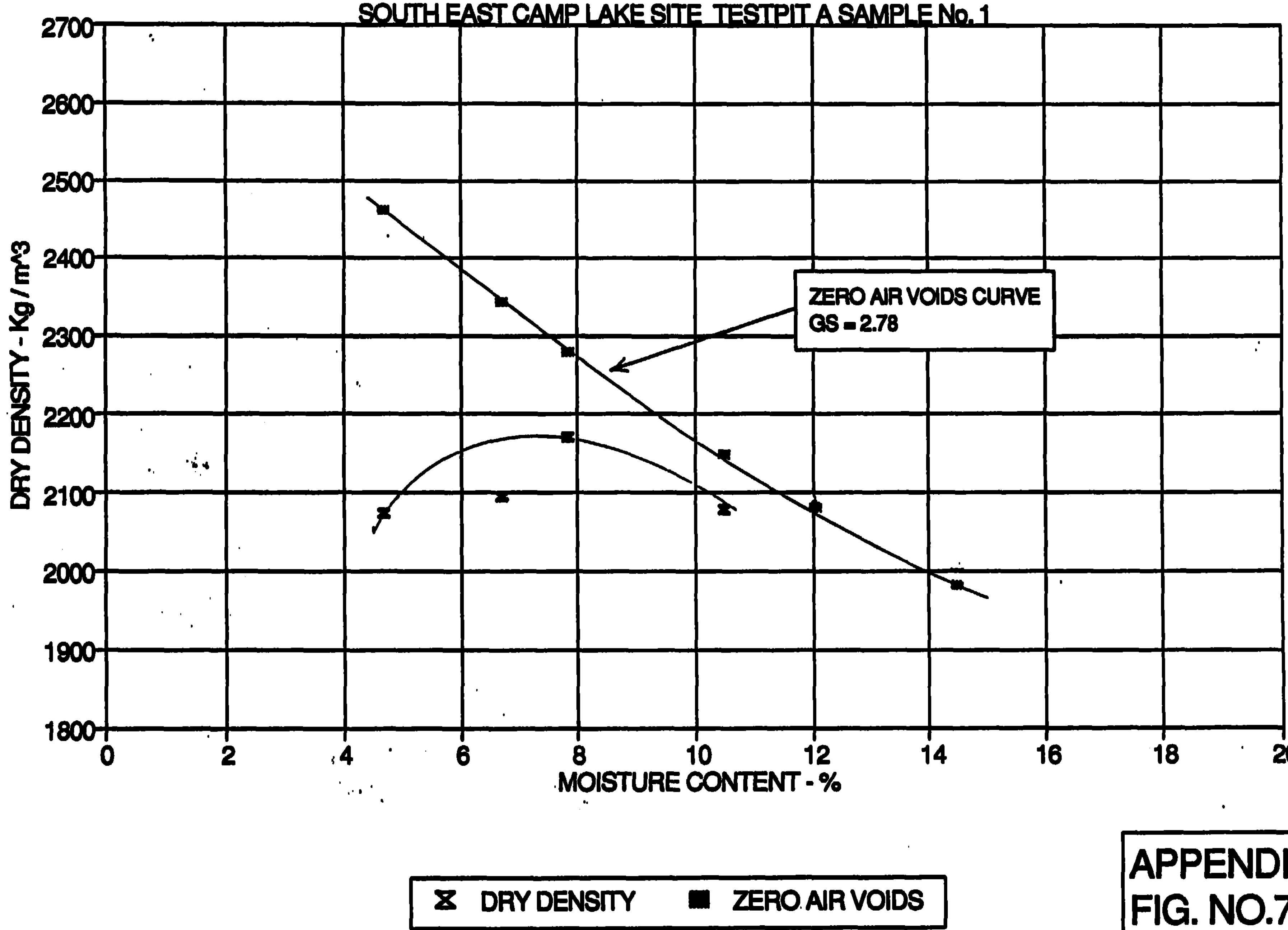
APPENDIX III

FIG. NO. 6



SAMPLE TYPE	SA. NO.	DEPTH	MARK
SILTY SAND AND GRAVEL	TP 3 No.1	1.5-1.8m	⊙
SILTY SAND SOME GRAVEL	TP 4 No.1	1.8-2.1m	⊡
GRAVELLY SAND SOME SILT	TP 5 No.1	0.6-0.9m	△
SILTY SAND SOME GRAVEL	TP 6 No.1	1.2-1.5m	⊙

STANDARD PROCTOR COMPACTION CURVE
SILTY SAND SOME GRAVEL
SOUTH EAST CAMP LAKE SITE TESTPIT A SAMPLE No. 1



APPENDIX III
FIG. NO.7

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH CAMP LAKE SITE

APPENDIX III

TABLE 15

TEST PIT NO. 1

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL.	SURFACE OXIDIZATION ABOVE WATER TABLE
.61-1.07	MOIST GREY SILTY SAND WITH SOME GRAVEL.	
1.07	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 2

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL.	SURFACE OXIDIZATION ABOVE WATER TABLE
.61-1.07	MOIST GREY SILTY SAND WITH SOME GRAVEL.	
1.07	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 3

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.08	TOPSOIL	
.08	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH CAMP LAKE SITE

APPENDIX III

TABLE 16

TEST PIT NO. 4		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.92 .92	TOPSOIL RED BROWN TO GREY SILTY SAND WITH SOME GRAVEL. BEDROCK END OF TEST PIT	

TEST PIT NO. 5		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.76 .76	TOPSOIL AND BOULDERS RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT BEDROCK END OF TEST PIT	

TEST PIT NO. 6		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30 .30-.92 .92-1.98 1.88-1.98	TOPSOIL AND BOULDERS RED BROWN GRAVELLY SAND WITH SOME SILT. BOULDERS PRESENT MOIST GREY GRAVELLY SAND WITH SOME SILT. BOULDERS PRESENT W.C.=7.5%, HAZEN k=9.0E-4 cm/s (SAMPLE No.1) BEDROCK END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH CAMP LAKE SITE

APPENDIX III

TABLE 17

TEST PIT NO. 7

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.76	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.76-1.07	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.92-1.07	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 8

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ 1.98M
.30-.81	RED BROWN SILTY SAND WITH SOME GRAVEL.	
.81-1.98	MOIST GREY SILTY SAND WITH SOME GRAVEL. W.C.=18.4%, HAZEN k=8.6E-4 cm/s (SAMPLE No.1)	
.76-1.98	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 9

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.92	RED BROWN SILTY SAND WITH SOME GRAVEL.	
.92	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
SOUTH CAMP LAKE SITE

APPENDIX III

TABLE 18

TEST PIT NO. 10

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.76	RED BROWN GRAVELLY SAND WITH SOME SILT. BOULDERS PRESENT	
.76-3.05	MOIST GREY GRAVELLY SAND WITH SOME SILT. BOULDERS PRESENT	
	W.C.=11.2%, HAZEN k=2.6E-3 cm/s (SAMPLE No.1)	
3.05	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 11

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.76	RED BROWN SILTY SAND WITH SOME GRAVEL.	
.76	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 12

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.76	RED BROWN TO GREY SILTY SAND WITH SOME GRAVEL.	
.76	BEDROCK	
	END OF TEST PIT	

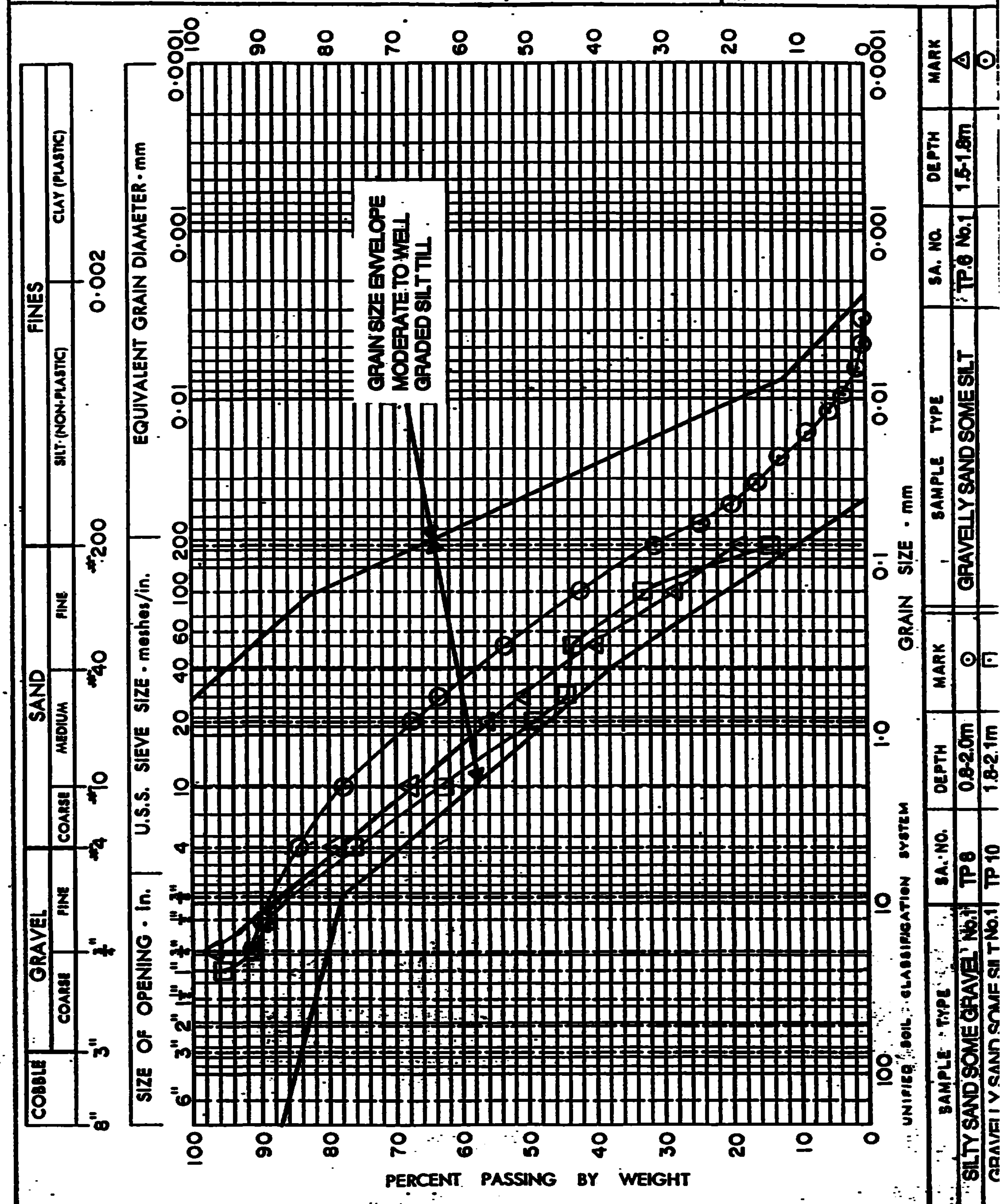
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

SOUTH CAMP LAKE SITE

APPENDIX III

FIG. NO. 8



SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
NORTH CAMP LAKE SITE

APPENDIX III

TABLE 19

TEST PIT NO. 1

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ .31M
.30-1.22	MUSKEG AND BOULDERS	
1.22	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 2

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.92	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.92-1.22	GREY GRAVELLY SAND WITH SOME SILT.	
1.22	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 3

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.83	GREY GRAVELLY SAND WITH SOME SILT.	
1.83	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
NORTH CAMP LAKE SITE

APPENDIX III

TABLE 20

TEST PIT NO. 4

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-1.52	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
1.22-1.52	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 5

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 6

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
NORTH CAMP LAKE SITE

APPENDIX III

TABLE 21

TEST PIT NO. 7		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 2.44M
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-4.27	MOIST GREY SAND WITH SOME GRAVEL AND TRACE SILT. BOULDERS PRESENT W.C.=10.8%, HAZEN k=6.4E-2 cm/s (SAMPLE No.1)	
3.96-4.27	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 8		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.15	TOPSOIL	
.15	BEDROCK	
	END OF TEST PIT	

TEST PIT NO.		
DEPTH (METRES)	DESCRIPTION	REMARKS

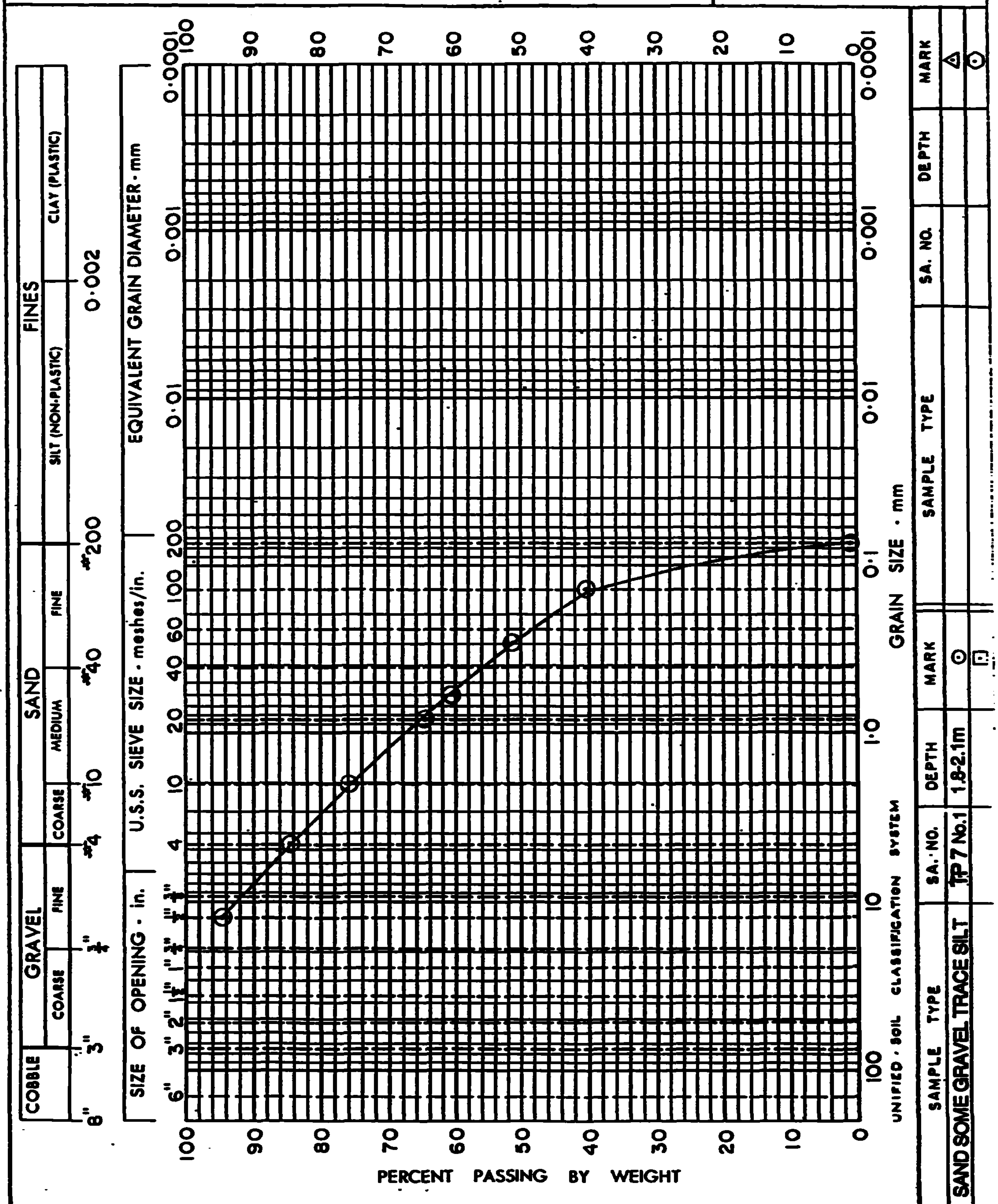
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

NORTH CAMP LAKE SITE

APPENDIX III

FIG. NO. 9



SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
MAIN GATE SITE

APPENDIX III

TABLE 22

TEST PIT NO. 1		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-1.98	GREY SANDY SILT WITH TRACE GRAVEL. SOME BOULDERS PRESENT W.C.=13.8, HAZEN k=6.7E-5 cm/s, PERMEAMETER k=4.36E-5 cm/s (SAMPLE No. 1)	
1.98	BEDROCK END OF TEST PIT	

TEST PIT NO. 2		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-1.52	FIBROUS MUSKEG	W.T. @ 1.37M
1.52-3.05	WET GREY SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT W.C.=13.6%, HAZEN k=6.4E-3 cm/s (SAMPLE No. 1)	WATER FLOWED IN STRONGLY AT BOULDER LAYER
3.05	BOULDERS END OF TEST PIT	

TEST PIT NO. 3		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-?	MUSKEG	NOT DUG DUE TO ACCESS PROBLEMS

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
MAIN GATE SITE

APPENDIX III

TABLE 23

TEST PIT NO. 4		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-?	MUSKEG	NOT DUG DUE TO ACESS PROBLEMS

TEST PIT NO. 5		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-0.3	TOPSOIL AND MUSKEG	PERCHED W.T. @ .30 & 1.52M
0.3-0.76	RED BROWN GRAVELLY SAND WITH SOME SILT	SIDES OF EXCAVATION UNSTABLE AND
.76-3.81	MOIST GREY GRAVELLY SAND WITH SOME SILT W.C.=6.8%, HAZEN k=2.2E-3 cm/s (SAMPLE No. 1)	COLLAPSED WHILE OPEN
3.81	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 6		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-3.05	MUSKEG	PERCHED W.T. @ .30 & 1.68M
3.05-3.66	BOULDERS	SIDES OF EXCAVATION UNSTABLE AND
3.66-4.12	WET GREY SAND	DIGGING HAD TO BE HALTED
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD
MAIN GATE SITE

APPENDIX III
TABLE 24

TEST PIT NO. 7

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ 1.83M
.30-.61	RED BROWN SAND WITH SOME SILT AND SOME GRAVEL. BOULDERS PRESENT	
.61-3.05	MOIST GREY SAND WITH SOME SILT AND SOME GRAVEL. BOULDERS PRESENT W.C.=7.0%, HAZEN k=2.3E-4 cm/s (SAMPLE No.1)	
3.05	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 8

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 2.13M
.30-.61	RED BROWN SILT AND SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-4.57	MOIST GREY SILT AND SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=11.4%, HAZEN k=1.7E-4 cm/s (SAMPLE No.1)	
4.57	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 9

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-4.73	MOIST GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT. W.C.=10.2%, HAZEN k=1.1E-3 cm/s (SAMPLE No.1)	
4.42-4.73	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
MAIN GATE SITE

APPENDIX III

TABLE 25

TEST PIT NO. 10

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ 8.08M
0.3-0.61	RED BROWN SILTY SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
0.61-9.45	GREY SILTY SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
	W.C.=7.4%, HAZEN k=2.5E-3 cm/s (SAMPLE No.1)	
9.15-9.45	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 11

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-.61	RED BROWN SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
.61-1.98	MOIST GREY SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
	W.C.=18.3%, HAZEN k=4.4E-4 cm/s (SAMPLE No.1)	
1.83-1.98	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 12

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 3.81M
.30-.76	RED BROWN GRAVELLY SILTY SAND. BOULDERS PRESENT	BEDROCK SLOPING DOWNHILL
.76-4.57	MOIST GREY GRAVELLY SILTY SAND. BOULDERS PRESENT.	
	W.C.=7.8%, HAZEN k=1.3E-3 cm/s (SAMPLE No.1)	
4.12-4.57	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
MAIN GATE SITE

APPENDIX III

TABLE 26

TEST PIT NO. 13

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 1.98M
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	
.61-3.81	GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT W.C.=12.0%, HAZEN k=1.7E-3 cm/s (SAMPLE No.1)	
3.66-3.81	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 14

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	
.30-1.37	RED BROWN TO GREY SAND WITH SOME SILT AND SOME GRAVEL. BOULDERS PRESENT W.C.=15.2%, HAZEN k=4.9E-3 cm/s (SAMPLE No.1)	
1.22-1.37	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 15

DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 1.68M
.30-.61	RED BROWN SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
.61-1.83	MOIST GREY SILT AND SAND WITH TRACE GRAVEL. BOULDERS PRESENT. W.C.=19.8%, HAZEN k=7.8E-4 cm/s (SAMPLE No.1)	
.15-1.83	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
MAIN GATE SITE

APPENDIX III

TABLE 27

TEST PIT NO. 16		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	W.T. @ 3.66M
.30-.61	RED BROWN SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	W.T. ASSUMED TO BE HIGHER AS WATER
.61-4.88	GREY SILTY SAND WITH SOME GRAVEL. BOULDERS PRESENT	GUSHED IN" TO EXCAVATION AT
	W.C.=9.6%, HAZEN k=9.0E-4 cm/s (SAMPLE No.1)	THIS ELEVATION.
4.57-4.88	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 17		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL	
.30-.61	RED BROWN SILTY SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
.61-2.59	GREY SILTY SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
	W.C.=9.2%, HAZEN k=3.8E-4 cm/s (SAMPLE No.1)	
2.44-2.59	BEDROCK	
	END OF TEST PIT	

TEST PIT NO. 18		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-3.96	GREY SILTY SAND WITH TRACE GRAVEL. BOULDERS PRESENT	
3.66-3.96	BEDROCK	
	END OF TEST PIT	

SUMMARY OF TEST PITTING AND SAMPLE INFORMATION
LAC DES ILES MINES LTD.
MAIN GATE SITE

APPENDIX III

TABLE 28

TEST PIT NO. A		
DEPTH (METRES)	DESCRIPTION	REMARKS
0-.30	TOPSOIL AND BOULDERS	W.T. @ 1.83M
.30-.76	RED BROWN SILTY GRAVELLY SAND. BOULDERS PRESENT	BEDROCK SLOPING DOWNHILL
.81-2.74	MOIST GREY SILTY GRAVELLY SAND. BOULDERS PRESENT	
	W.C.=9.5%, HAZEN k=1.6E-4 cm/s (SAMPLE No.1)	
2.44-2.74	BEDROCK	
	END OF TEST PIT	

TEST PIT NO.		
DEPTH (METRES)	DESCRIPTION	REMARKS

TEST PIT NO.		
DEPTH (METRES)	DESCRIPTION	REMARKS

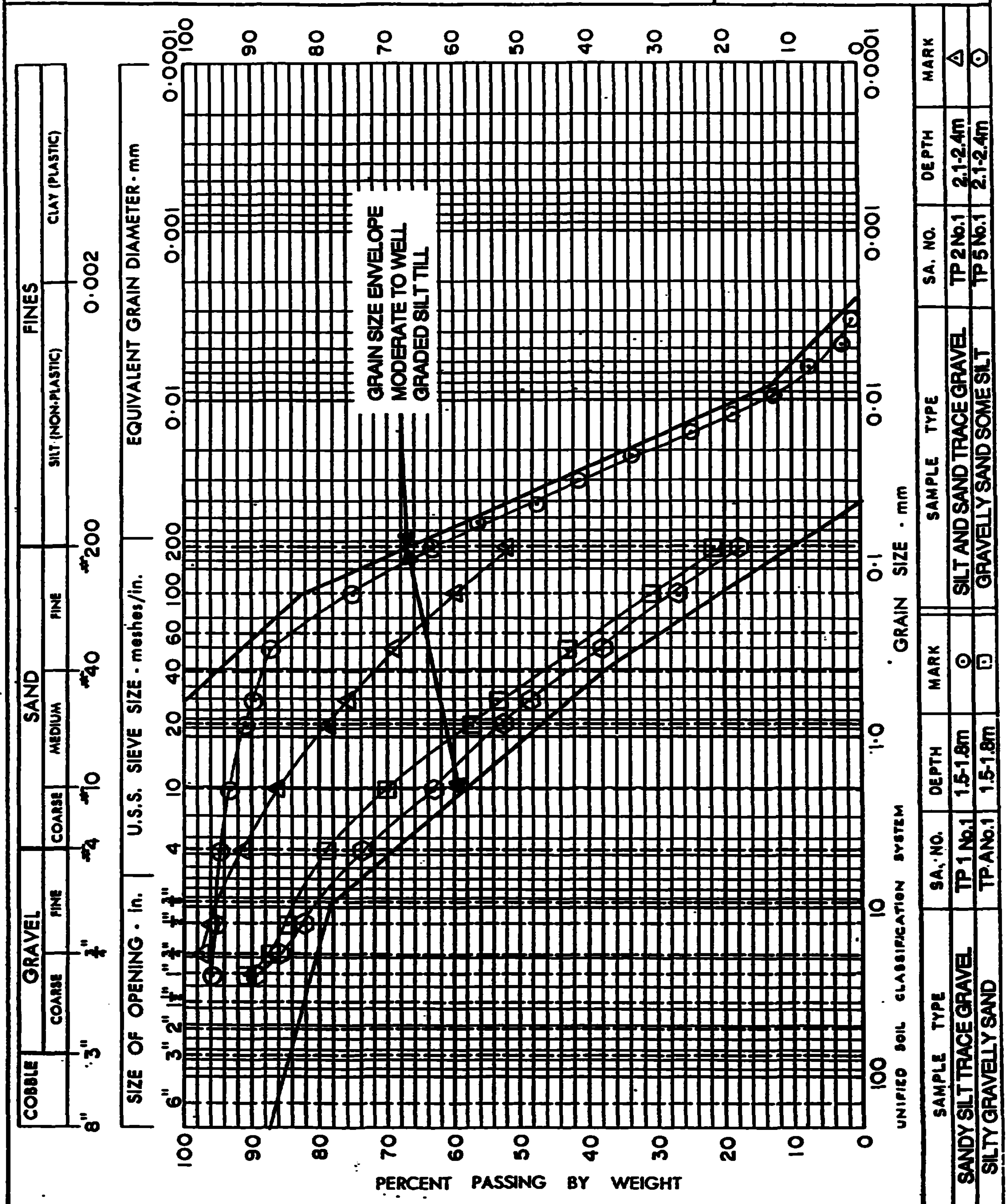
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

MAIN GATE SITE

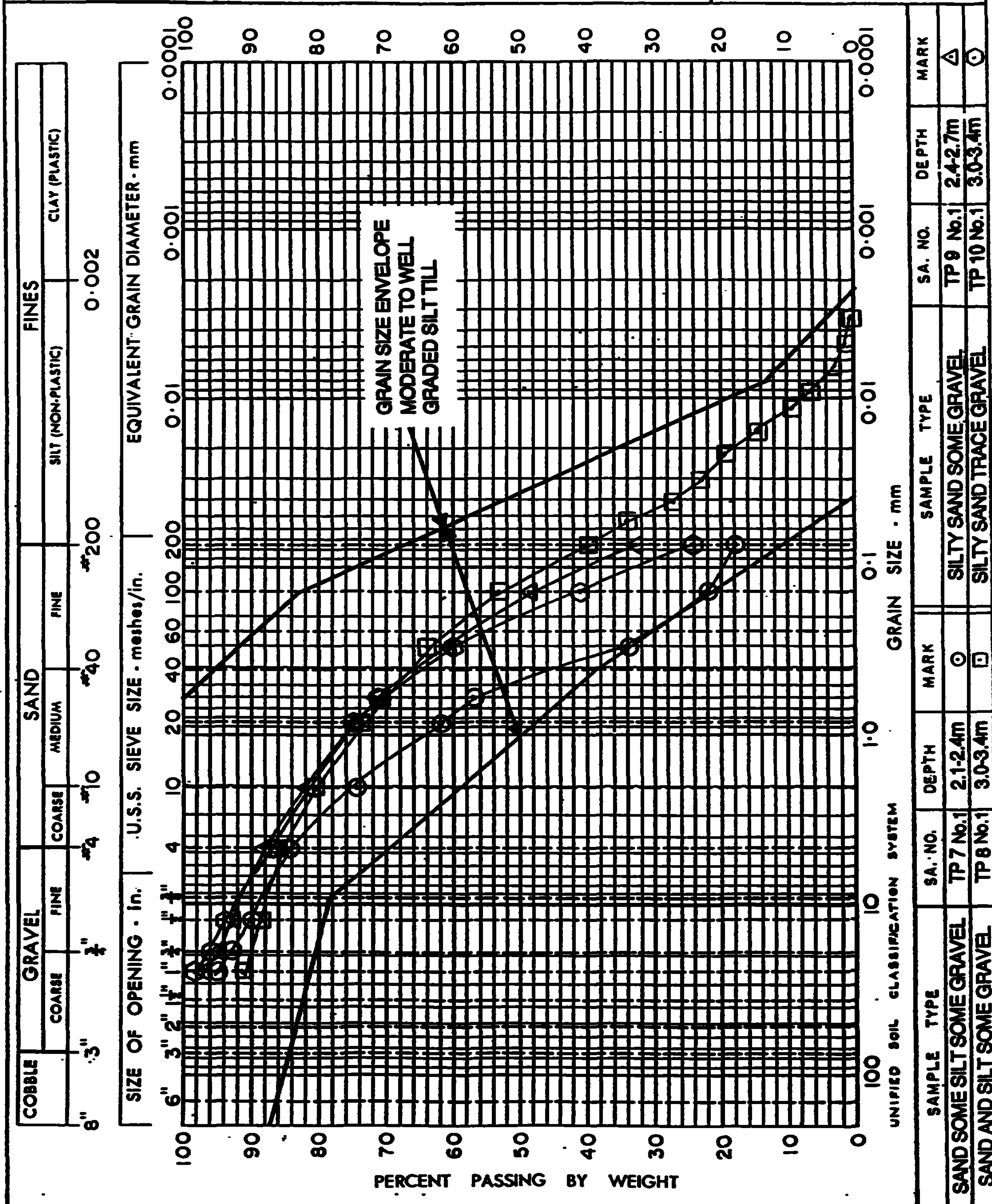
APPENDIX III

FIG. NO. 10



LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION	APPENDIX III
MAIN GATE SITE	FIG. NO. 11



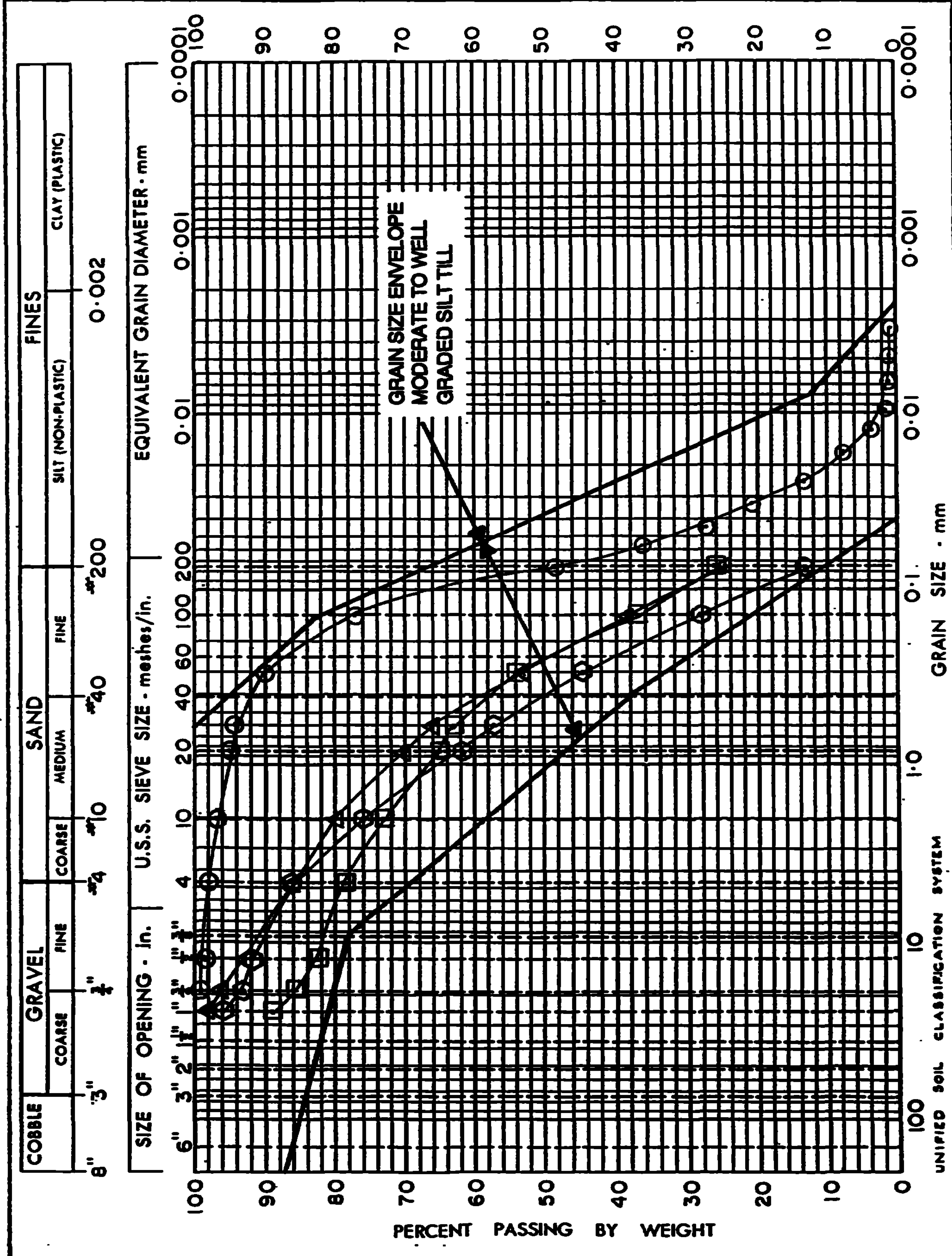
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

MAIN GATE SITE

APPENDIX III

FIG. NO. 12



SAMPLE TYPE	SA. NO.	DEPTH	MARK
SILT AND SAND TRACE GRAVEL	TP 11 No.1	1.2-1.5m	⊙
GRAVELLY SILTY SAND	TP 12 No.1	3.4-3.7m	⊡
SILTY SAND SOME GRAVEL	TP 13 No.1	2.1-2.4m	△
SAND SOME SILT SOME GRAVEL	TP 14 No.1	0.9-1.2m	⊙

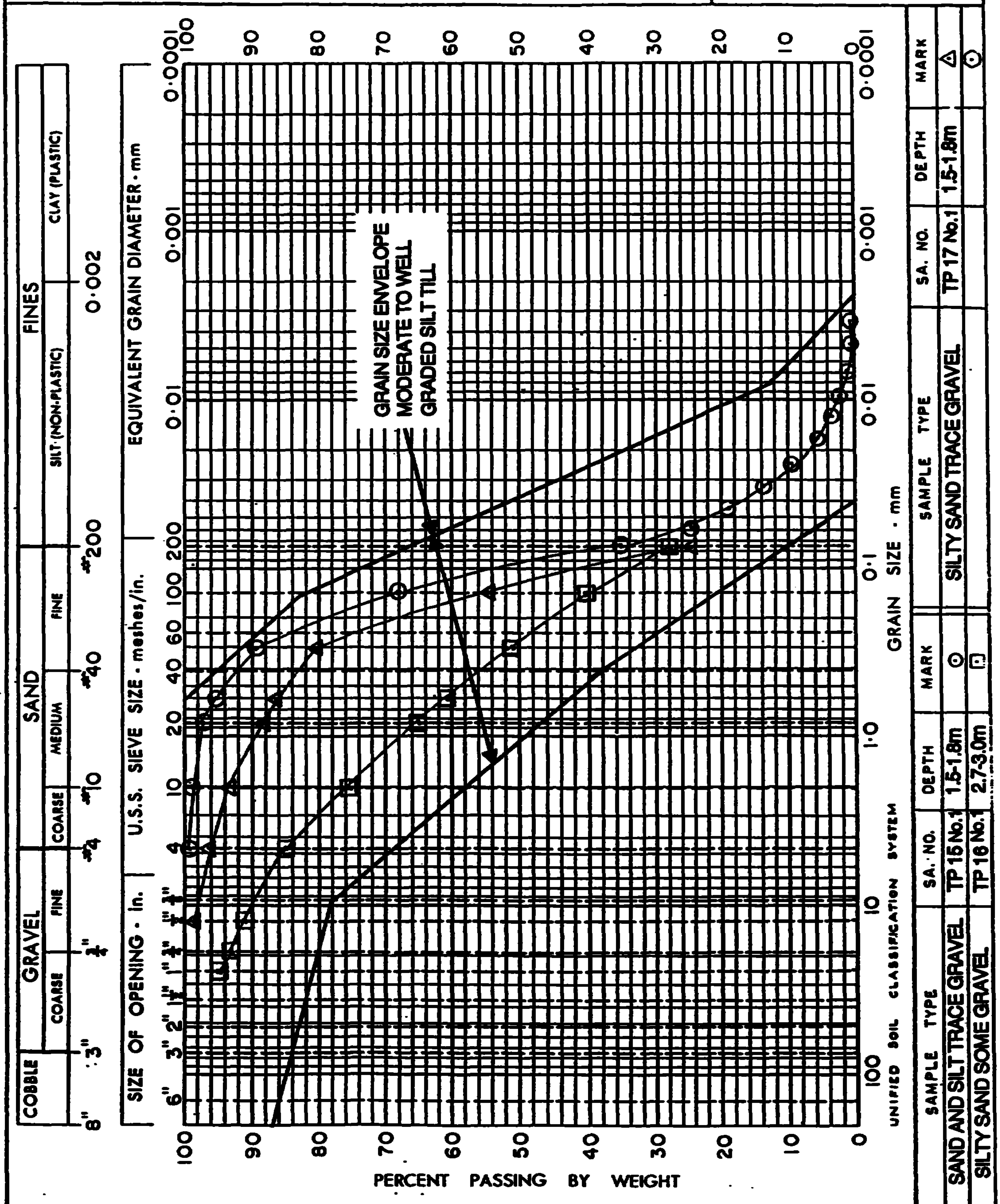
LAC DES ILES BORROW SEARCH INVESTIGATION

GRAIN SIZE DISTRIBUTION

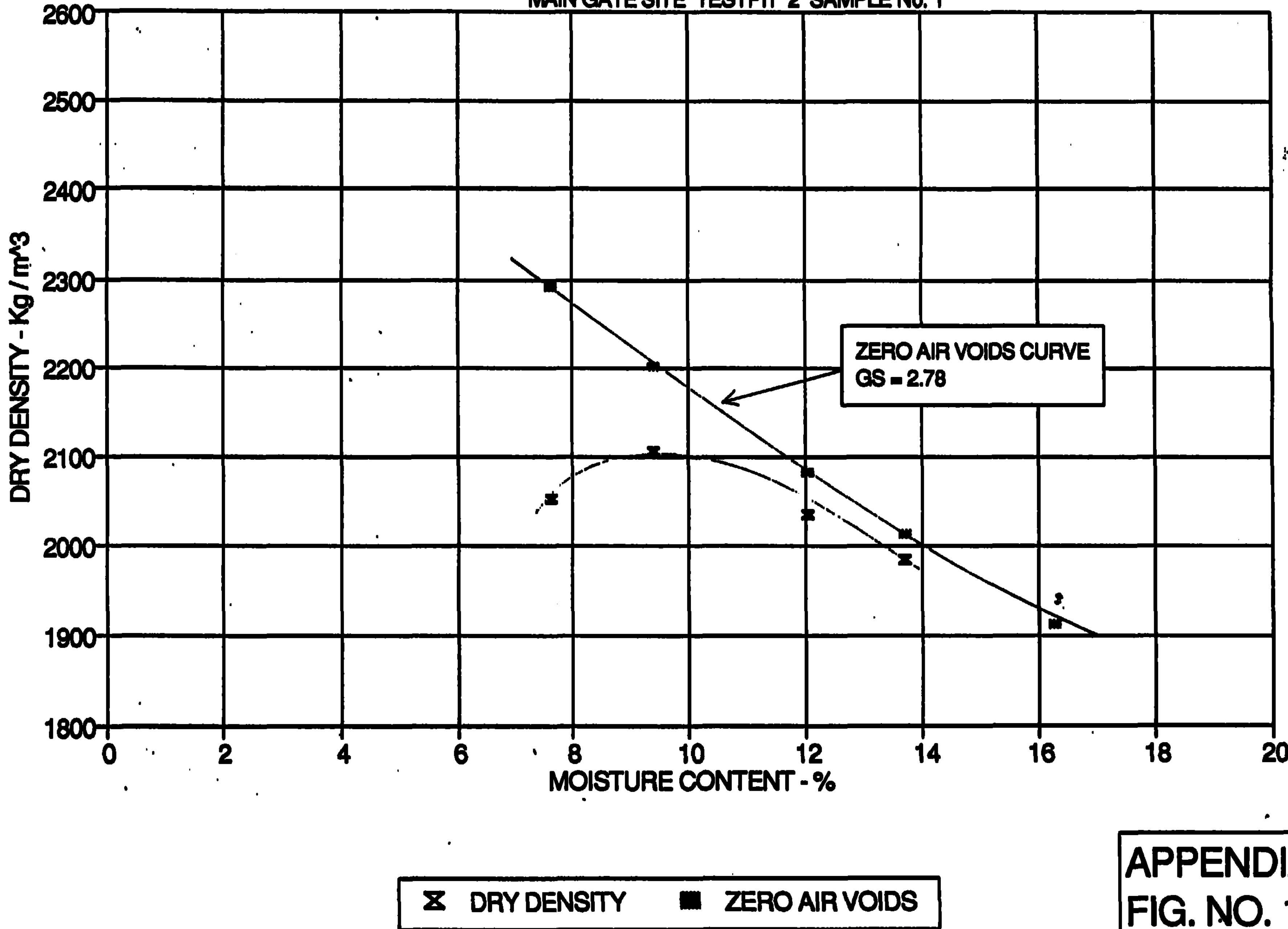
MAIN GATE SITE

APPENDIX III

FIG. NO. 13



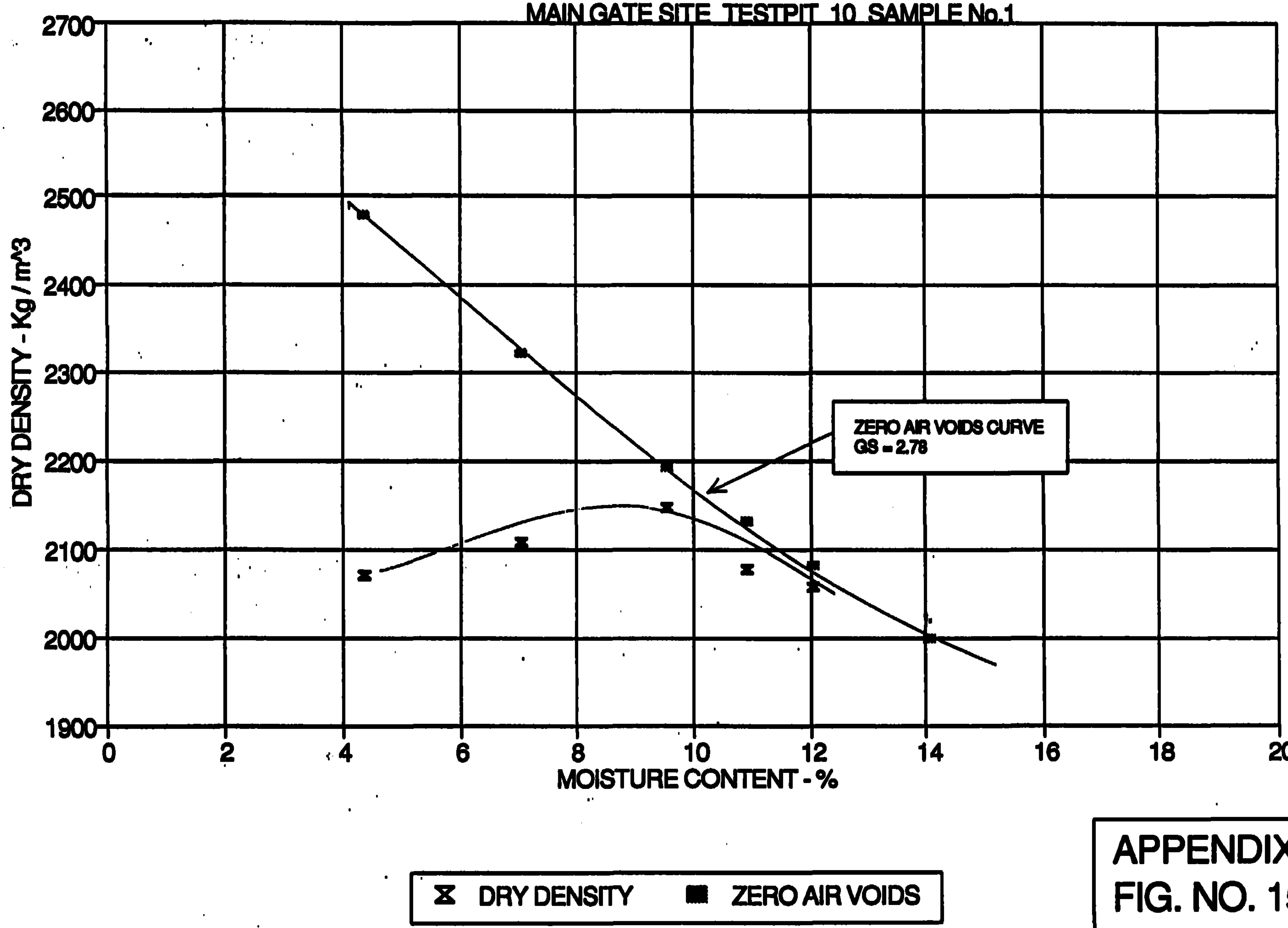
STANDARD PROCTOR COMPACTION CURVE
SILT AND SAND WITH TRACE GRAVEL
MAIN GATE SITE TESTPIT 2 SAMPLE No. 1



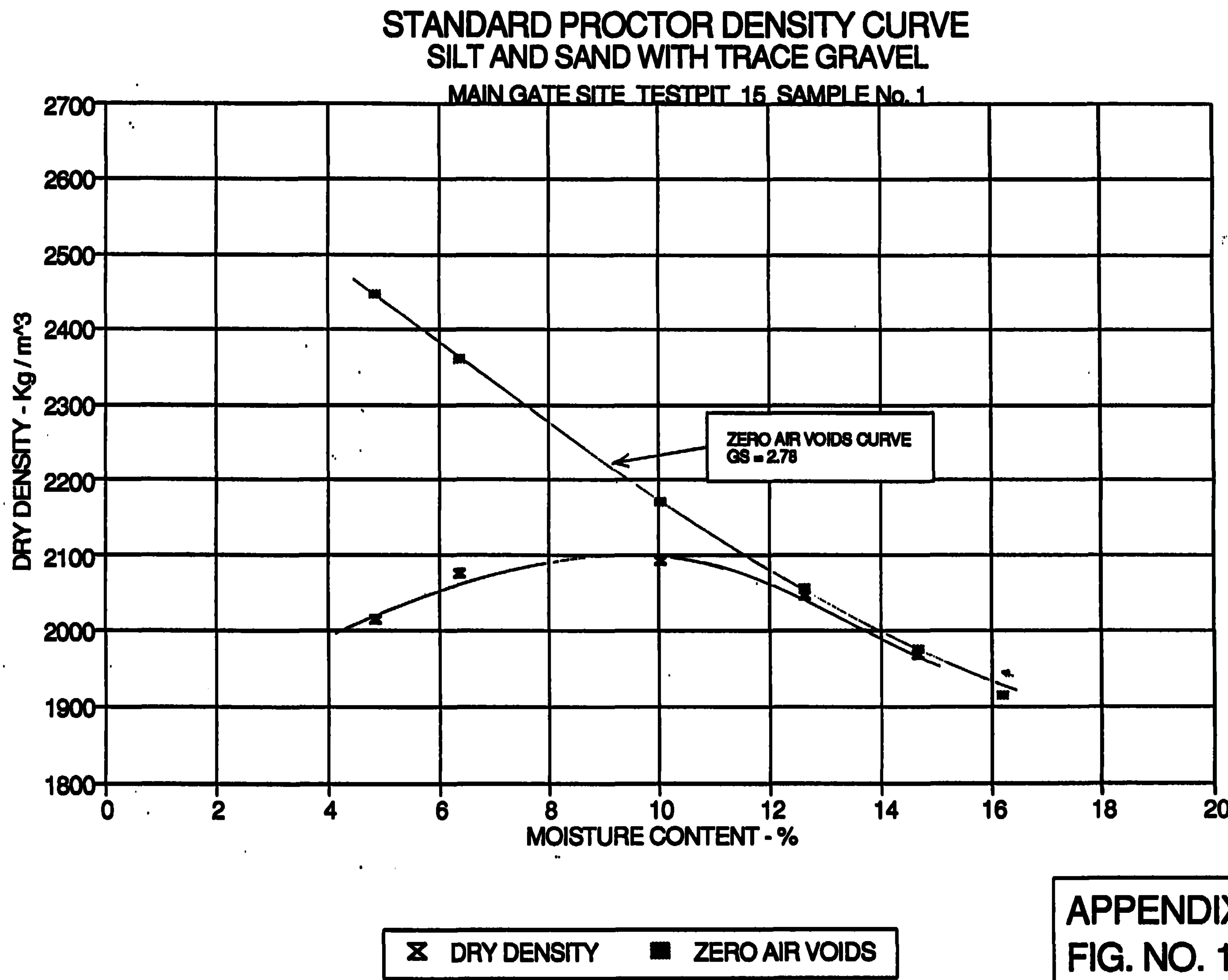
APPENDIX III
FIG. NO. 14

STANDARD PROCTOR COMPACTION CURVE
SILTY SAND TRACE GRAVEL

MAIN GATE SITE TESTPIT 10 SAMPLE No.1



APPENDIX III
FIG. NO. 15



APPENDIX III
FIG. NO. 16

APPENDIX IV

BEDROCK PERMEABILITY RESULTS
(Tables 1 through 11)

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 1

DATE: MAY, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0788-002

AIRTRACK DRILLHOLE #	TEST INTERVAL (ft)	TEST DEPTH MIDPOINT (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	DROP W. L. (mm/min)	FLOW Q (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
MW-92-01	2 - 8.5	5.30	6.5	1.93	5	0.2	0.0002	6800	8.01E-08	
MW-92-01	2 - 8.5	5.30	6.5	0.83	10	0.25	0.0002	6800	6.43E-08	
MW-92-01	7 - 13.5	10.30	6.5	0.83	8	1	0.0010	6800	2.54E-07	
MW-92-01	7 - 13.5	10.30	6.5	0.83	13	1.2	0.0011	6800	2.19E-07	
MW-92-01	7 - 13.5	10.30	6.5	0.83	18	1.8	0.0017	6800	2.57E-07	
MW-92-01	12 - 18.5	15.30	6.5	0.83	10	0.2	0.0002	6800	3.83E-08	
MW-92-01	12 - 18.5	15.30	6.5	0.83	15	0.35	0.0003	6800	5.18E-08	
MW-92-01	12 - 18.5	15.30	6.5	0.83	20	0.4	0.0004	6800	4.82E-08	
MW-92-01	17 - 23.5	20.30	6.5	0.83	10	0.2	0.0002	6800	3.40E-08	
MW-92-01	17 - 23.5	20.30	6.5	0.83	18	0.3	0.0003	6800	3.60E-08	
MW-92-01	17 - 23.5	20.30	6.5	0.83	25	0.4	0.0004	6800	3.81E-08	
MW-92-01	22 - 28.5	25.30	6.5	0.83	13	4.4	0.0042	6800	5.89E-07	
MW-92-01	22 - 28.5	25.30	6.5	0.83	23	5.6	0.0053	6800	5.31E-07	
MW-92-01	22 - 28.5	25.30	6.5	0.83	30	2.4	0.0023	6800	1.89E-07	
MW-92-01	27 - 33.5	30.30	6.5	0.83	13	3.4	0.0032	6800	4.18E-07	
MW-92-01	27 - 33.5	30.30	6.5	0.83	23	4.8	0.0046	6800	4.28E-07	
MW-92-01	27 - 33.5	30.30	6.5	0.83	30	5.3	0.0050	6800	3.97E-07	
MW-92-01	32 - 38.5	35.30	6.5	0.83	13	0.7	0.0007	6800	7.95E-08	
MW-92-01	32 - 38.5	35.30	6.5	0.83	23	0.8	0.0008	6800	6.74E-08	
MW-92-01	32 - 38.5	35.30	6.5	0.83	30	1.1	0.0010	6800	7.84E-08	
MW-92-01	37 - 43.5	40.30	6.5	0.83	15	0.2	0.0002	6800	1.98E-08	
MW-92-01	37 - 43.5	40.30	6.5	0.83	25	0.25	0.0002	6800	1.90E-08	
MW-92-01	37 - 43.5	40.30	6.5	0.83	33	0.2	0.0002	6800	1.28E-08	
MW-92-01	42 - 48.5	45.30	6.5	0.83	15	0.5	0.0005	6800	4.65E-08	
MW-92-01	42 - 48.5	45.30	6.5	0.83	25	0.3	0.0003	6800	2.17E-08	
MW-92-01	42 - 48.6	45.30	6.5	0.83	33	0.9	0.0009	6800	5.53E-08	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 2

DATE: MAY, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0788-002

AIRTRACK DRILLHOLE #	TEST INTERVAL (ft)	TEST DEPTH MIDPOINT (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	DROP W.L. (mm/min)	FLOW Q (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
MW-92-02	2 - 8.5	5.30	6.5	1.83	8	0.35	0.0003	6800	1.03E-07	
MW-92-02	2 - 8.5	5.30	6.5	1.83	13	0.35	0.0003	6800	7.08E-08	
MW-92-02	7 - 13.5	10.30	6.5	1.83	8	0.1	0.0001	6800	2.46E-08	
MW-92-02	7 - 13.5	10.30	6.5	1.83	15	0.3	0.0003	6800	4.82E-08	
MW-92-02	12 - 18.5	15.30	6.5	1.83	10	1	0.0010	6800	1.87E-07	
MW-92-02	12 - 18.5	15.30	6.5	1.83	20	7	0.0067	6800	8.31E-07	
MW-92-02	17 - 23.5	20.30	6.5	1.83	10	0.1	0.0001	6800	1.66E-08	
MW-92-02	17 - 23.5	20.30	6.5	1.83	23	0.3	0.0003	6800	3.00E-08	
MW-92-02	22 - 28.5	25.30	6.5	1.83	10	0.15	0.0001	6800	2.24E-08	
MW-92-02	22 - 28.5	25.30	6.5	1.83	20	0.1	0.0001	6800	1.03E-08	
MW-92-02	22 - 28.5	25.30	6.5	1.83	30	0.1	0.0001	6800	7.80E-09	
MW-92-02	27 - 33.5	30.30	6.5	1.83	10	0.15	0.0001	6800	2.04E-08	
MW-92-02	27 - 33.5	30.30	6.5	1.83	20	0.2	0.0002	6800	1.92E-08	
MW-92-02	27 - 33.5	30.30	6.5	1.83	32	0.35	0.0003	6800	2.48E-08	
MW-92-02	32 - 38.5	35.30	6.5	1.83	10	0.1	0.0001	6800	1.25E-08	
MW-92-02	32 - 38.5	35.30	6.5	1.83	20	0.1	0.0001	6800	9.02E-09	
MW-92-02	32 - 38.5	35.30	6.5	1.83	32	0.35	0.0003	6800	2.37E-08	
MW-92-02	37 - 43.5	40.30	6.5	1.83	10	0.3	0.0003	6800	3.46E-08	
MW-92-02	37 - 43.5	40.30	6.5	1.83	20	0.5	0.0005	6800	4.25E-08	
MW-92-02	37 - 43.5	40.30	6.5	1.83	32	0.5	0.0005	6800	3.24E-08	
MW-92-02	42 - 48.5	45.30	6.5	1.83	10	0.05	0.0000	6800	5.35E-09	
MW-92-02	42 - 48.5	45.30	6.5	1.83	20	0.3	0.0003	6800	2.42E-08	
MW-92-02	42 - 48.6	45.30	6.5	1.83	32	0.3	0.0003	6800	1.86E-08	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 3

DATE: MAY, 1992 MADE BY: D. MACHIN PROJECT NO.: 0786-002

AIRTRACK DRILLHOLE #	TEST INTERVAL (ft)	TEST DEPTH MIDPOINT (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	DROP W.L. (mm/min)	FLOW Q (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
MW-92-03	2 - 8.5	5.30	6.5	3.41	5		0.0000	6800	0.00E+00	
MW-92-03	2 - 8.5	5.30	6.5	3.41	10	12.7	0.0121	6800	3.00E-08	
MW-92-03	7 - 13.5	10.30	6.5	3.41	8		2.9000	6800	7.11E-04	
MW-92-03	7 - 13.5	10.30	6.5	3.41	15		9.6300	6800	1.57E-03	
MW-92-03	12 - 18.5	15.30	6.5				0.0000	6800	0.00E+00	NOT TESTED AS
MW-92-03	12 - 18.5	15.30	6.5				0.0000	6800	0.00E+00	PACKER STUCK
MW-92-03	17 - 23.5	20.30	6.5	0.91	10	0.1	0.0001	6800	1.70E-08	
MW-92-03	17 - 23.5	20.30	6.5	0.91	18	0.2	0.0002	6800	2.39E-08	
MW-92-03	17 - 23.5	20.30	6.5	0.91	25	0.3	0.0003	6800	2.86E-08	
MW-92-03	22 - 28.5	25.30	6.5	0.91	10	0.2	0.0002	6800	3.05E-08	
MW-92-03	22 - 28.5	25.30	6.5	0.91	20	0.7	0.0007	6800	7.27E-08	
MW-92-03	22 - 28.5	25.30	6.5	0.91	30	0.9	0.0009	6800	7.08E-08	
MW-92-03	27 - 33.5	30.30	6.5	0.91	10	0.1	0.0001	6800	1.38E-08	
MW-92-03	27 - 33.5	30.30	6.5	0.91	20	0.2	0.0002	6800	1.94E-08	
MW-92-03	27 - 33.5	30.30	6.5	0.91	30	0.2	0.0002	6800	1.50E-08	
MW-92-03	32 - 38.5	35.30	6.5	0.91	10	0.2	0.0002	6800	2.53E-08	
MW-92-03	32 - 38.5	35.30	6.5	0.91	20	0.2	0.0002	6800	1.82E-08	
MW-92-03	32 - 38.5	35.30	6.5	0.91	33	0.3	0.0003	6800	2.01E-08	
MW-92-03	37 - 43.5	40.30	6.5	0.91	10	0.15	0.0001	6800	1.75E-08	
MW-92-03	37 - 43.5	40.30	6.5	0.91	20	0.15	0.0001	6800	1.29E-08	
MW-92-03	37 - 43.5	40.30	6.5	0.91	33	0.1	0.0001	6800	6.40E-09	
MW-92-03	42 - 48.5	45.30	6.5	0.91	10	0.1	0.0001	6800	1.08E-08	
MW-92-03	42 - 48.5	45.30	6.5	0.91	20	0.2	0.0002	6800	1.63E-08	
MW-92-03	42 - 48.6	45.30	6.5	0.91	33	0.6	0.0006	6800	3.68E-08	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 4

DATE: MAY, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0786-002

AIRTRACK DRILLHOLE #	TEST INTERVAL (ft)	TEST DEPTH MIDPOINT (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	DROP W.L. (mm/min)	FLOW Q (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
MW-92-04	2 - 8.5	5.30	6.5	0.5	8	27	0.0257	6800	8.36E-06	
MW-92-04	2 - 8.5	5.30	6.5	0.5	13		4.4333	6800	9.77E-04	
MW-92-04	7 - 13.5	10.30	6.5	0.5	8	0.2	0.0002	6800	5.13E-08	
MW-92-04	7 - 13.5	10.30	6.5	0.5	15	0.1	0.0001	6800	1.65E-08	
MW-92-04	12 - 18.5	15.30	6.5	0.5	10	0.1	0.0001	6800	1.93E-08	
MW-92-04	12 - 18.5	15.30	6.5	0.5	20	0.1	0.0001	6800	1.21E-08	
MW-92-04	17 - 23.5	20.30	6.5	0.5	10	0.1	0.0001	6800	1.71E-08	
MW-92-04	17 - 23.5	20.30	6.5	0.5	20	0.15	0.0001	6800	1.68E-08	
MW-92-04	22 - 28.5	25.30	6.5	0.5	10	0.1	0.0001	6800	1.54E-08	
MW-92-04	22 - 28.5	25.30	6.5	0.5	20	0.1	0.0001	6800	1.04E-08	
MW-92-04	22 - 28.5	25.30	6.5	0.5	29	0.1	0.0001	6800	8.10E-09	
MW-92-04	27 - 33.5	30.30	6.5	0.5	10	0.1	0.0001	6800	1.39E-08	
MW-92-04	27 - 33.5	30.30	6.5	0.5	20	0.1	0.0001	6800	9.76E-09	
MW-92-04	27 - 33.5	30.30	6.5	0.5	29	0.1	0.0001	6800	7.69E-09	
MW-92-04	32 - 38.5	35.30	6.5	0.5	10	0.1	0.0001	6800	1.28E-08	
MW-92-04	32 - 38.5	35.30	6.5	0.5	20	0.1	0.0001	6800	9.17E-09	
MW-92-04	32 - 38.5	35.30	6.5	0.5	29	0.1	0.0001	6800	7.31E-09	
MW-92-04	37 - 43.5	40.30	6.5	0.5	10	0.1	0.0001	6800	1.18E-08	
MW-92-04	37 - 43.5	40.30	6.5	0.5	20	0.1	0.0001	6800	8.64E-09	
MW-92-04	37 - 43.5	40.30	6.5	0.5	29	0.1	0.0001	6800	6.97E-09	
MW-92-04	42 - 48.5	45.30	6.5	0.5	10	0.1	0.0001	6800	1.09E-08	
MW-92-04	42 - 48.5	45.30	6.5	0.5	20	0.1	0.0001	6800	8.17E-09	
MW-92-04	42 - 48.6	45.30	6.5	0.5	29	0.1	0.0001	6800	6.66E-09	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 5

DATE: MAY, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0788-002

AIRTRACK DRILLHOLE #	TEST INTERVAL (ft)	TEST DEPTH MIDPOINT (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	DROP W.L. (mm/min)	FLOW Q (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
MW-92-05	2 - 8.5	5.30	6.5	2.5	10	0.6	0.0006	6800	1.46E-07	
MW-92-05	2 - 8.5	5.30	6.5	2.5	15	0.6	0.0006	6800	1.42E-07	
MW-92-05	7 - 13.5	10.30	6.5	1.5	13	0.5	0.0005	6800	8.99E-08	
MW-92-05	7 - 13.5	10.30	6.5	1.5	27	0.1	0.0001	6800	1.01E-08	
MW-92-05	12 - 18.5	15.30	6.5	1.5	8	0.2	0.0002	6800	4.26E-08	
MW-92-05	12 - 18.5	15.30	6.5	1.5	15	0.3	0.0003	6800	4.38E-08	
MW-92-05	17 - 23.5	20.30	6.5	1.5	14	0.2	0.0002	6800	2.78E-08	
MW-92-05	17 - 23.5	20.30	6.5	1.5	20	0.1	0.0001	6800	1.11E-08	
MW-92-05	22 - 28.5	25.30	6.5	1.5	10	0.3	0.0003	6800	4.52E-08	
MW-92-05	22 - 28.5	25.30	6.5	1.5	20	0.4	0.0004	6800	4.12E-08	
MW-92-05	22 - 28.5	25.30	6.5	1.5	25	0.3	0.0003	6800	2.67E-08	
MW-92-05	27 - 33.5	30.30	6.5	1.5	10	0.1	0.0001	6800	1.37E-08	
MW-92-05	27 - 33.5	30.30	6.5	1.5	20	0.1	0.0001	6800	9.64E-09	
MW-92-05	27 - 33.5	30.30	6.5	1.5	30	0.15	0.0001	6800	1.12E-08	
MW-92-05	32 - 38.5	35.30	6.5	1.5	10	0.1	0.0001	6800	1.25E-08	
MW-92-05	32 - 38.5	35.30	6.5	1.5	20	0.1	0.0001	6800	9.06E-09	
MW-92-05	32 - 38.5	35.30	6.5	1.5	30	0.1	0.0001	6800	7.06E-09	
MW-92-05	37 - 43.5	40.30	6.5	1.5	10	0.2	0.0002	6800	2.32E-08	
MW-92-05	37 - 43.5	40.30	6.5	1.5	20	0.2	0.0002	6800	1.71E-08	
MW-92-05	37 - 43.5	40.30	6.5	1.5	30	0.3	0.0003	6800	2.03E-08	
MW-92-05	42 - 48.5	45.30	6.5	1.5	10	0.1	0.0001	6800	1.08E-08	
MW-92-05	42 - 48.5	45.30	6.5	1.5	20	0.1	0.0001	6800	8.08E-09	
MW-92-05	42 - 48.6	45.30	6.5	1.5	30	0.1	0.0001	6800	6.47E-09	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 6

DATE: APRIL, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0789-001

DIAMOND DRILLHOLE #	TEST DEPTH (INCLINED) (ft)	TEST DEPTH (VERTICAL) (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	FLOW Q (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
92-02	24	20.78	4	5	10	7.9	10300	1.93E-03	WATER BY PASS
92-02	29	25.11	4	5	15	0	10300	0.00E+00	
92-02	29	25.11	4	5	20	0	10300	0.00E+00	
92-02	29	25.11	4	5	28	0	10300	0.00E+00	
92-02	34	29.44	4	5	15	0	10300	0.00E+00	
92-02	34	29.44	4	5	25	0	10300	0.00E+00	
92-02	34	29.44	4	5	30	0	10300	0.00E+00	
92-02	39	33.77	4	5	15	0	10300	0.00E+00	
92-02	39	33.77	4	5	25	0	10300	0.00E+00	
92-02	39	33.77	4	5	30	0	10300	0.00E+00	
92-02	42	36.37	4	5	16	0	10300	0.00E+00	
92-02	42	36.37	4	5	25	0	10300	0.00E+00	
92-02	42	36.37	4	5	30	0	10300	0.00E+00	
92-02	46	39.84	4	5	15	0	10300	0.00E+00	
92-02	46	39.84	4	5	25	0	10300	0.00E+00	
92-02	46	39.84	4	5	30	0	10300	0.00E+00	
92-02	54	46.77	4	5	16	0	10300	0.00E+00	
92-02	54	46.77	4	5	20	0	10300	0.00E+00	
92-02	54	46.77	4	5	30	0	10300	0.00E+00	
92-02	59	51.10	4	5	25	0	10300	0.00E+00	
92-02	59	51.10	4	5	35	1.5	10300	1.31E-04	
92-02	64	55.43	4	5	25	0	10300	0.00E+00	
92-02	64	55.43	4	5	35	0.07	10300	5.92E-06	
92-02	69	59.76	4	5	25	0.24	10300	2.34E-05	
92-02	69	59.76	4	5	35	0.36	10300	3.12E-05	
92-02	74	64.09	4	5	25	0	10300	0.00E+00	
92-02	74	64.09	4	5	35	0	10300	0.00E+00	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 7

DATE: APRIL, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0788-001

DIAMOND DRILLHOLE #	TEST DEPTH (INCLINED) (ft)	TEST DEPTH (VERTICAL) (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	FLOW (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
92-03	24	20.78	4	5	8	0	10300	0.00E+00	
92-03	24	20.78	4	5	15.5	0	10300	0.00E+00	
92-03	29	25.11	4	5	10	0	10300	0.00E+00	
92-03	29	25.11	4	5	15	0	10300	0.00E+00	
92-03	29	25.11	4	5	20	0.05	10300	7.83E-06	
92-03	34	29.44	4	5	10	0	10300	0.00E+00	
92-03	34	29.44	4	5	18	0	10300	0.00E+00	
92-03	34	29.44	4	5	25	0	10300	0.00E+00	
92-03	39	33.77	4	5	15	0	10300	0.00E+00	
92-03	39	33.77	4	5	23	0	10300	0.00E+00	
92-03	39	33.77	4	5	30	0	10300	0.00E+00	
92-03	44	38.11	4	5	16	0	10300	0.00E+00	
92-03	44	38.11	4	5	25	0	10300	0.00E+00	
92-03	44	38.11	4	5	30	0.03	10300	3.19E-06	
92-03	49	42.44	4	5	15	0	10300	0.00E+00	
92-03	49	42.44	4	5	25	0	10300	0.00E+00	
92-03	49	42.44	4	5	30	0	10300	0.00E+00	
92-03	54	46.77	4	7	15	0	10300	0.00E+00	
92-03	54	46.77	4	7	25	0	10300	0.00E+00	
92-03	54	46.77	4	7	35	0	10300	0.00E+00	
92-03	59	51.10	4	7	18	0.19	10300	2.28E-05	
92-03	59	51.10	4	7	28	0.32	10300	3.24E-05	
92-03	59	51.10	4	7	35	0.42	10300	3.61E-05	
92-03	64	55.43	4	7	15	0	10300	0.00E+00	
92-03	64	55.43	4	7	25	0	10300	0.00E+00	
92-03	64	55.43	4	7	35	0	10300	0.00E+00	
92-03	69	59.76	4	7	15	0	10300	0.00E+00	
92-03	69	59.76	4	7	25	0	10300	0.00E+00	
92-03	69	59.76	4	7	35	0	10300	0.00E+00	
92-03	74	64.09	4	7	15	0	10300	0.00E+00	
92-03	74	64.09	4	7	25	0	10300	0.00E+00	
92-03	74	64.09	4	7	35	0	10300	0.00E+00	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 8

DATE: APRIL, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0788-001

DIAMOND DRILLHOLE #	TEST DEPTH (INCLINED) (ft)	TEST DEPTH (VERTICAL) (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	FLOW (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
92-04	34	29.44	4	5	10	0.18	10300	3.74E-05	
92-04	34	29.44	4	5	15	0.09	10300	1.56E-05	
92-04	34	29.44	4	5	25	0.27	10300	3.50E-05	
92-04	39	33.77	4	5	10	0	10300	0.00E+00	
92-04	39	33.77	4	5	15	0	10300	0.00E+00	
92-04	39	33.77	4	5	25	0	10300	0.00E+00	
92-04	44	38.11	4	5	15	0.015	10300	2.31E-06	
92-04	44	38.11	4	5	25	0.07	10300	8.30E-06	
92-04	44	38.11	4	5	30	0.03	10300	3.19E-06	
92-04	49	42.44	4	5	15	0	10300	0.00E+00	
92-04	49	42.44	4	5	25	0.012	10300	1.36E-06	
92-04	49	42.44	4	5	36	0.017	10300	1.56E-06	
92-04	54	46.77	4	5	15	0.05	10300	6.92E-06	
92-04	54	46.77	4	5	25	0.54	10300	5.89E-05	
92-04	54	46.77	4	5	35	0.38	10300	3.43E-05	
92-04	59	51.10	4	5	18	0	10300	0.00E+00	
92-04	59	51.10	4	5	28	0.04	10300	4.12E-06	
92-04	59	51.10	4	5	38	0.05	10300	4.29E-06	
92-04	64	55.43	4	5	15	0	10300	0.00E+00	
92-04	64	55.43	4	5	25	0	10300	0.00E+00	
92-04	64	55.43	4	5	35	0.2	10300	1.69E-05	
92-04	69	59.76	4	5	15	0	10300	0.00E+00	
92-04	69	59.76	4	5	25	0	10300	0.00E+00	
92-04	69	59.76	4	5	35	0	10300	0.00E+00	
92-04	74	64.09	4	5	15	0.04	10300	4.61E-06	
92-04	74	64.09	4	5	25	0	10300	0.00E+00	
92-04	74	64.09	4	5	35	0.08	10300	6.36E-06	

BEDROCK PERMEABILITY VALUES DETERMINED BY PACKER TESTING.

APPENDIX IV

TABLE 9

DATE: APRIL, 1992 MADE BY: D. MACHIN PROJECT NO.: 0786-001

DIAMOND DRILLHOLE #	TEST DEPTH (INCLINED) (ft)	TEST DEPTH (VERTICAL) (ft)	TEST INTERVAL (ft)	HEIGHT GAUGE (ft)	GAUGE PRESSURE (psi)	FLOW (gal/min)	Cp CONSTANT	PERMEABILITY (cm/sec)	COMMENTS
92-05	44	38.11	4	5	0.5	10	10300	2.70E-03	LEAK, LOST ALL WATER
92-05	49	42.44	4	5	25	0.11	10300	1.25E-05	
92-05	49	42.44	4	5	36	0.21	10300	1.92E-05	
92-05	54	46.77	4	5	25	0.15	10300	1.64E-05	
92-05	54	46.77	4	5	35	0.18	10300	1.62E-05	
92-05	59	51.10	4	5	25	0.05	10300	5.25E-06	
92-05	59	51.10	4	5	35	0.08	10300	6.98E-06	
92-05	64	55.43	4	5	25	0.18	10300	1.82E-05	
92-05	64	55.43	4	5	35	0.22	10300	1.86E-05	
92-05	69	59.76	4	5	15	0.06	10300	7.21E-06	
92-05	69	59.76	4	5	25	0.07	10300	6.83E-06	
92-05	69	59.76	4	5	35	0.08	10300	6.57E-06	
92-05	74	64.09	4	5	15	0.07	10300	8.06E-06	
92-05	74	64.09	4	5	25	0.13	10300	1.23E-05	
92-05	74	64.09	4	5	35	0.16	10300	1.28E-05	

BEDROCK PERMEABILTIY STATISTICS
(BEFORE CORRECTION FOR EQUIPMENT LIMITATIONS)

APPENDIX IV
TABLE 10

DATE: JUNE, 1992 | MADE BY: D. MACHIN | PROJECT NO.: 0786

BOREHOLE NO.	DRILL RIG TYPE	PERMEABILITY (cm/s)				
		MEAN	SDEV	VAR	MAX	MIN
MW-92-01	AIRTRACK	1.6E-07	1.7E-07	3.0E-14	5.9E-07	1.3E-08
MW-92-02	AIRTRACK	7.0E-08	1.7E-07	2.9E-14	8.3E-07	5.4E-09
MW-92-03	AIRTRACK	1.8E-07	6.8E-07	4.7E-13	3.0E-06	6.4E-09
MW-92-04	AIRTRACK	4.3E-05	2.0E-04	4.1E-08	9.8E-04	6.7E-09
MW-92-05	AIRTRACK	3.4E-08	4.0E-08	1.6E-15	1.5E-07	6.5E-09
92-02	DIAMOND	4.8E-05	5.6E-05	3.2E-09	1.3E-04	5.9E-06
92-03	DIAMOND	2.1E-05	1.5E-05	2.1E-10	3.6E-05	3.2E-06
92-04	DIAMOND	1.5E-05	1.7E-05	2.9E-10	5.9E-04	1.4E-06
92-05	DIAMOND	1.2E-05	5.1E-06	2.6E-11	1.9E-05	5.3E-06

BEDROCK PERMEABILTIY STATISTICS
(AFTER CORRECTION FOR EQUIPMENT LIMITATIONS)

APPENDIX IV
TABLE 11

DATE:	JUNE, 1992	MADE BY:	D. MACHIN	PROJECT NO.: 0786		
BOREHOLE NO.	DRILL RIG TYPE	PERMEABILITY (cm/s)				
		MEAN	SDEV	VAR	MAX	MIN
MW-92-01	AIRTRACK	1.0E-06	0.0E+00	0.0E+00	1.0E-06	1.0E-06
MW-92-02	AIRTRACK	1.0E-06	0.0E+00	0.0E+00	1.0E-06	1.0E-06
MW-92-03	AIRTRACK	1.1E-06	4.6E-07	2.1E-13	3.0E-06	1.0E-06
MW-92-04	AIRTRACK	4.4E-05	2.0E-04	4.1E-08	9.8E-04	1.0E-06
MW-92-05	AIRTRACK	1.0E-06	0.0E+00	0.0E+00	1.0E-06	1.0E-06
92-02	DIAMOND	8.2E-06	2.6E-05	6.8E-10	1.3E-04	1.0E-06
92-03	DIAMOND	4.0E-06	8.9E-05	7.9E-11	3.6E-05	1.0E-06
92-04	DIAMOND	1.0E-05	1.5E-05	2.3E-10	5.9E-05	1.0E-06
92-05	DIAMOND	1.2E-05	5.1E-06	2.6E-11	1.9E-05	5.3E-06

NOTE: SEE SECTION 1.0 OF FACTUAL SOILS REPORT FOR DISCUSSION ON EQUIPMENT LIMITATIONS.

APPENDIX V

MONITORING WELL INSTALLATIONS
(MW92-01 through MW92-05)

PIEZOMETER NUMBER

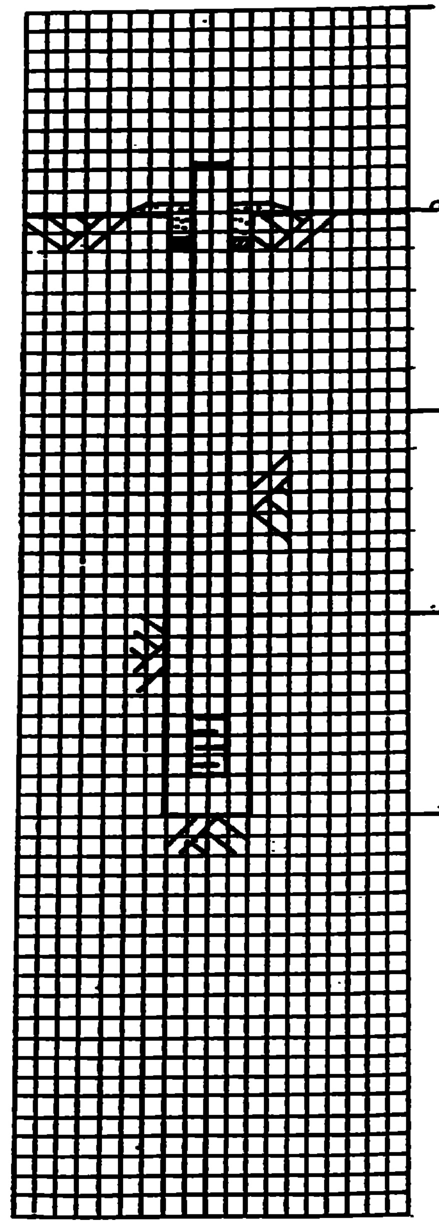
APPENDIX V
MW-92-01

LOCATION: LAC DES ILES MINES, NORTHWEST SIDE OF PROPOSED PHASE 1 TMF AREA.

DESCRIPTION: 3cm STANDPIPE WITH 1.5M, 10 MICRON SLOTTED SCREEN INSTALLED IN A 7.5cm AIRTRACK DRILLED VERTICAL BOREHOLE. A 0.6M CEMENT CAP OVERLIES A PLASTIC SEAL. 1.2M STICK-UP. ONE 1.25cm STEEL ROD, 1.5M LONG, LOST AT BOTTOM OF HOLE.

DATE D/M/YR.	WATER LEVEL —	DATE D/M/YR.	WATER LEVEL —

INSTALLATION SKETCH



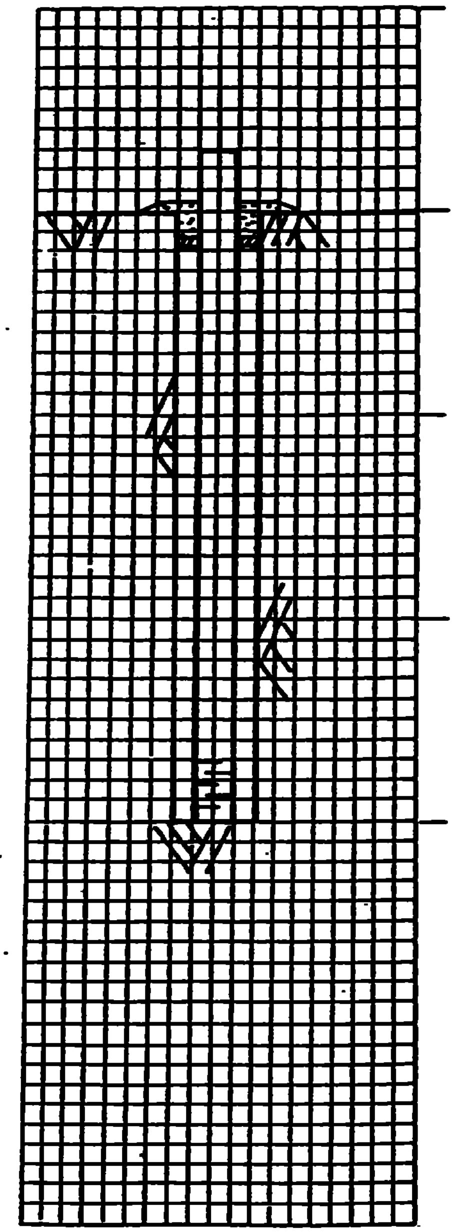
FOR PETUR PIEZOMETER

PIEZOMETRIC HEAD = TIP ELEVATION IN FT. + (GAUGE READING IN PSI) x 2.31

PIEZOMETER NUMBER

APPENDIX V
MW-92-02

INSTALLATION SKETCH



LOCATION: LAC DES ILES MINES, NORTHEAST SIDE OF PROPOSED PHASE 1 TMF AREA.

DESCRIPTION: 3cm STANDPIPE WITH 1.5M, 10 MICRON SLOTTED SCREEN INSTALLED IN A 7.5cm AIRTRACK DRILLED VERTICAL BOREHOLE. A 0.6M CEMENT CAP OVERLIES A PLASTIC SEAL. 1.5M STICK-UP.

DATE D/M/YR.	WATER LEVEL —	DATE D/M/YR.	WATER LEVEL —

FOR PETUR PIEZOMETER

PIEZOMETRIC HEAD = TIP ELEVATION IN FT. + (GAUGE READING IN PSI) x 2.31

PIEZOMETER NUMBER

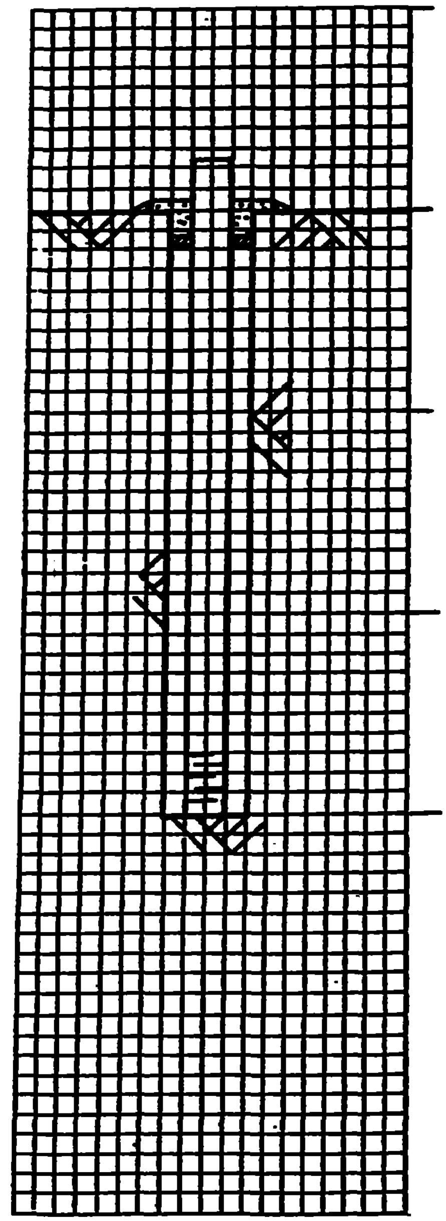
APPENDIX V
MW-92-03

LOCATION: LAC DES ILES MINES, NORTHEAST SIDE OF PROPOSED PHASE 1 TMF AREA.

DESCRIPTION: 3cm STANDPIPE WITH 1.5M, 10 MICRON SLOTTED SCREEN INSTALLED IN A 7.5cm AIRTRACK DRILLED VERTICAL BOREHOLE. A 0.6M CEMENT CAP OVERLIES A PLASTIC SEAL. 1.2M STICK-UP.

DATE	WATER LEVEL	DATE	WATER LEVEL
D/M/YR.	—	D/M/YR.	—

INSTALLATION SKETCH



FOR PETUR PIEZOMETER

PIEZOMETRIC HEAD = TIP ELEVATION IN FT. + (GAUGE READING IN PSI) x 2.31

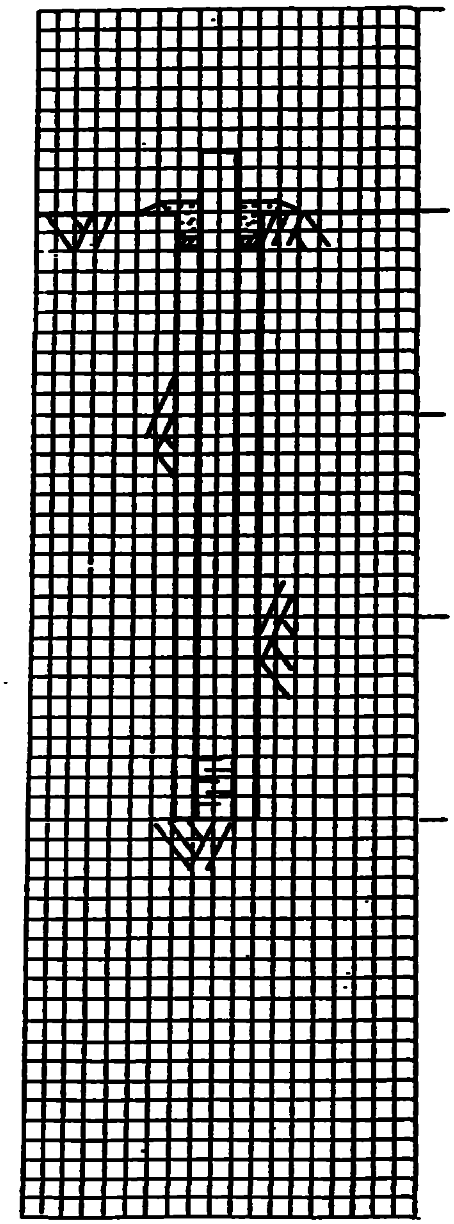
PIEZOMETER NUMBER	APPENDIX V MW-92-04

LOCATION: LAC DES ILES MINES, NORTHWEST SIDE OF PROPOSED PHASE 1 TMF AREA.

DESCRIPTION: 3cm STANDPIPE WITH 1.5M, 10 MICRON SLOTTED SCREEN INSTALLED IN A 7.5cm AIRTRACK DRILLED VERTICAL BOREHOLE. A 0.6M CEMENT CAP OVERLIES A PLASTIC SEAL. 1.5M STICK-UP.

DATE D/M/YR.	WATER LEVEL —	DATE D/M/YR.	WATER LEVEL —

INSTALLATION SKETCH



FOR PETUR PIEZOMETER

PIEZOMETRIC HEAD = TIP ELEVATION IN FT. + (GAUGE READING IN PSI) x 2.31

PIEZOMETER NUMBER

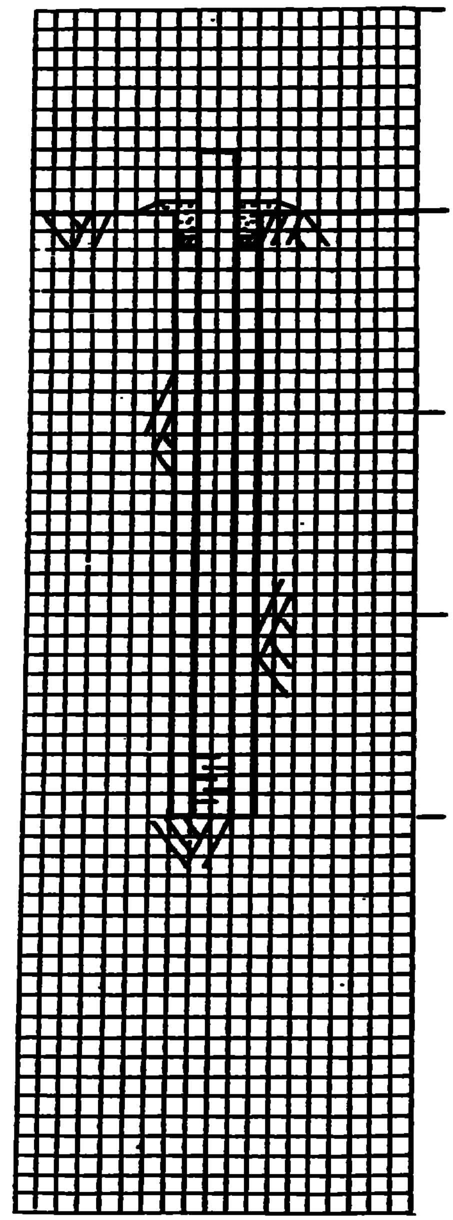
APPENDIX V
MW-92-05

LOCATION: LAC DES ILES MINES, NORTHEAST SIDE
OF PROPOSED PHASE 1 TMF AREA.

DESCRIPTION: 3cm STANDPIPE WITH 1.5M, 10 MICRON
SLOTTED SCREEN INSTALLED IN A 7.5cm AIRTRACK
DRILLED VERTICAL BOREHOLE. A 0.6M CEMENT CAP
OVERLIES A PLASTIC SEAL. 1.5M STICK-UP.

DATE D/M/YR.	WATER LEVEL —	DATE D/M/YR.	WATER LEVEL —

INSTALLATION SKETCH



FOR PETUR PIEZOMETER

PIEZOMETRIC HEAD = TIP ELEVATION IN FT. + (GAUGE READING IN PSI) x 2.31

APPENDIX VI

DRAWINGS

0786-099

0786-301

An Investigation of
THE RECOVERY OF COPPER, NICKEL and PG METALS
from ROBY ZONE project samples
submitted by
LAC des ILES MINES LTD.

Progress Report No. 1

Project No. L.R. 4255

NOTE:

This report refers to the samples as received.

The practice of this Company in issuing reports of this nature is to require the recipient not to publish the report or any part thereof without the written consent of Lakefield Research.

LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
June 17th, 1992

TABLE OF

INTRODUCTION

This report presents testwork conducted from February to June, 1992, on Composite M92 and a Roby Zone composite prepared from drill chips submitted by Lac des Iles Mines Ltd. This testwork investigated recovery of platinum group metals in copper - nickel flotation concentrates.

The test program was discussed regularly with Mr. R.F. Down, consultant and Mr. G.R. Clark, Lac des Iles Mines.

LAKEFIELD RESEARCH

S.J. Parker
Project Manager

K.W. Sarbutt
Manager - Mineral Processing

Steve R. Williams
Senior Project Manager

Investigation by: B. Wakeford

SUMMARY

1.0 Description of Samples

Approximately 200 kilograms of Roby Zone sample were blended and crushed to nominal minus 10 mesh. A head sample was removed, 80 kilograms was riffled into 2 kilogram charges for testwork and the remainder was stored. All samples were stored at minus 5° C. The assay heads, presented in Table 1, were lower grade than desired for the test program. The sample was reserved for possible Bond Grindability testwork. Sixteen additional samples were received, individually crushed and sampled for analysis. The individual assays are presented in the Sample Preparation section. Twelve of the sixteen bags, as indicated in the Sample Preparation, were blended as Composite M92 for testwork.

Table 1: Head Analyses

Sample	Assays, %, g/t									
	Cu	Ni	Au	Pt	Pd	As	S	Fe t	Fe py	Fe po
Roby	0.16	0.16	0.30	0.29	2.40	<0.001	0.59	4.61	0.58	0.73
M92	0.18	0.24	0.42	0.59	9.87	<0.001	1.03	7.91	1.18	1.04

Standard Bond Ball Mill Grindability tests are summarized in Table 2.

Table 2: Bond Grindability Tests

Sample	Mesh of Grind	Feed k80, microns	Product k80, microns	Bond Work Index, metric
Roby	150	1328	78	18.6
M92	150	1053	75	15.3

2. Rougher Flotation Circuit

The effect of primary grind fineness, circuit pH, collector and frother selection, sodium sulphide addition level and reagent addition point were investigated in rougher flotation tests. Flash flotation was simulated in two tests.

2.1 Primary Grind

Flotation response was compared for mill discharge ranging from 40% passing 200 mesh to 97% minus 200 mesh. The results are presented in Table 3.

Table 3: Primary Grind

Test % Pass 200 mesh	Product	Wt %	Assays, %, g/t						% Distribution					
			Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
2 47	Ro Conc 1	4.4	5.60	6.12	131	2.10	2.32	12.3	44.9	46.5	55.5	41.7	54.4	60
	Ro Conc 1+2	11.0	2.78	3.12	65.0	1.11	1.11	6.67	55.2	58.9	68.1	55.0	64.5	82
	Scav Conc 1	3.6	0.84	1.17	18.8	0.34	0.24	1.47	5.4	7.2	6.4	5.4	4.5	6
	Sc Conc 1+2	6.5	0.65	0.90	14.2	0.28	0.20	1.01	7.6	10.0	8.8	8.2	6.9	7
	Comb Conc	17.6	1.98	2.30	46.1	0.80	0.77	4.57	62.8	69.0	76.9	63.2	71.3	89
	Scav Tail	82.4	0.25	0.22	2.95	0.10	0.066	0.12	37.2	31.0	23.1	36.8	28.7	11
	Head(calc)	-	0.55	0.58	10.5	0.22	0.19	0.90	-	-	-	-	-	-
1 61	Ro Conc 1	4.1	7.18	6.45	137	2.95	3.40	13.5	47.7	47.6	55.3	48.0	68.4	62
	Ro Conc 1+2	7.8	4.83	4.21	87.2	1.88	1.99	9.44	61.4	59.5	67.4	58.6	76.5	83
	Scav Conc 1	2.7	2.14	1.60	22.1	0.41	0.42	2.70	9.5	7.9	6.0	4.5	5.7	8
	Sc Conc 1+2	4.9	1.46	1.19	16.6	0.34	0.31	1.79	11.8	10.7	8.2	6.7	7.6	10
	Comb Conc	12.8	3.52	3.03	59.8	1.28	1.33	6.46	73.1	70.1	75.6	65.3	84.1	93
	Scav Tail	87.2	0.19	0.19	2.84	0.10	0.037	0.07	26.9	29.9	24.4	34.7	15.9	7
	Head(calc)	-	0.62	0.55	10.1	0.25	0.20	0.89	-	-	-	-	-	-
3 90	Ro Conc 1	6.5	6.03	5.44	114	1.86	2.18	11.2	67.2	64.9	73.4	52.8	78.6	78
	Ro Conc 1+2	11.9	3.60	3.35	68.5	1.16	1.28	7.26	73.5	73.3	81.0	60.3	84.9	92
	Scav Conc 1	3.7	0.40	0.55	8.93	0.21	0.11	0.61	2.5	3.7	3.2	3.3	2.2	2
	Sc Conc 1+2	7.2	0.36	0.45	7.15	0.19	0.097	0.43	4.4	6.0	5.1	5.8	3.9	3
	Comb Conc	19.2	2.37	2.25	45.3	0.79	0.84	4.68	77.9	79.3	86.1	66.2	88.8	96
	Scav Tail	80.8	0.16	0.14	1.74	0.096	0.025	0.05	22.1	20.7	13.9	33.8	11.2	4
	Head(calc)	-	0.58	0.55	10.1	0.23	0.18	0.94	-	-	-	-	-	-

Increasing the primary grind from 47 to 61% minus 200 mesh, improved the gold, platinum and palladium rougher grade - recovery relationship. Grinding to 90% minus 200 mesh improved recoveries as compared to recoveries from the 61% passing feed size.

Later in the test program, following definition of reagent requirements, the primary grind was examined again. The results are compared in Table 4.

Table 4: Different Primary Grinds with Cleaner Stages.

Test % Pass 200M	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	%Distribution Au	Pt	Pd	Ni	Cu
26 59	5th Cl Conc	3.5	10.2	9.26	181	2.62	3.27	57.7	54.5	60.7	42.1	66.8
	4th Cl Conc	6.0	6.45	6.05	115	1.66	2.05	63.6	59.0	64.3	46.3	72.9
	3rd Cl Conc	7.7	5.29	5.08	94.8	1.38	1.67	66.6	62.6	67.8	49.3	76.0
	2nd Cl Conc	9.9	4.23	4.13	76.8	1.14	1.34	68.9	66.8	72.1	52.7	78.6
	1st Cl Conc	14.2	3.11	3.07	57.0	0.88	0.97	72.2	71.3	76.6	57.8	81.6
	Scav Conc	22.3	2.07	2.07	38.3	0.63	0.65	75.8	75.9	81.1	65.0	85.7
	Scav Tail	77.7	0.19	0.16	2.26	0.097	0.031	24.2	21.2	17.1	35.0	14.3
	Head(calc)	-	0.61	0.59	10.3	0.22	0.17	-	-	-	-	-
24 68	4th Cl Conc	9.0	4.28	4.71	91.0	1.27	1.55	71.5	74.0	76.5	53.7	80.1
	3rd Cl Conc	10.6	3.78	4.12	79.4	1.12	1.34	74.3	76.0	78.6	55.8	81.6
	2nd Cl Conc	12.4	3.31	3.61	69.6	1.00	1.17	75.9	77.7	80.3	57.8	83.0
	1st Cl Conc	16.2	2.61	2.86	55.2	0.81	0.92	78.0	80.3	83.0	61.5	85.0
	Scav Conc	22.5	1.92	2.11	40.7	0.63	0.68	79.9	82.5	85.2	66.2	87.1
	Scav Tail	77.5	0.14	0.13	2.05	0.093	0.029	20.1	17.5	14.8	33.8	12.9
	Head(calc)	-	0.54	0.58	10.7	0.21	0.17	-	-	-	-	-
25 86	4th Cl Conc	5.8	7.13	7.61	136	1.94	2.37	70.5	70.1	74.1	50.4	79.4
	3rd Cl Conc	7.2	5.89	6.35	113	1.63	1.96	72.6	72.9	76.9	52.7	81.8
	2nd Cl Conc	9.2	4.76	5.17	92.0	1.34	1.58	74.2	75.1	79.2	55.1	83.5
	1st Cl Conc	12.8	3.48	3.80	67.7	1.02	1.15	75.9	77.1	81.5	58.3	85.2
	Scav Conc	22.6	2.05	2.24	40.0	0.65	0.68	78.9	80.4	85.1	65.4	88.4
	Scav Tail	77.4	0.16	0.16	2.05	0.100	0.026	21.1	19.6	14.9	34.6	11.6
	Head(calc)	-	0.59	0.63	10.6	0.22	0.17	-	-	-	-	-

Comparison of the rougher concentrate recoveries for all six tests, in Figure 1, indicates a slight improvement in copper and palladium recoveries with primary grinds finer than 68% minus 200 mesh. A decrease in gold and platinum recoveries is noted.

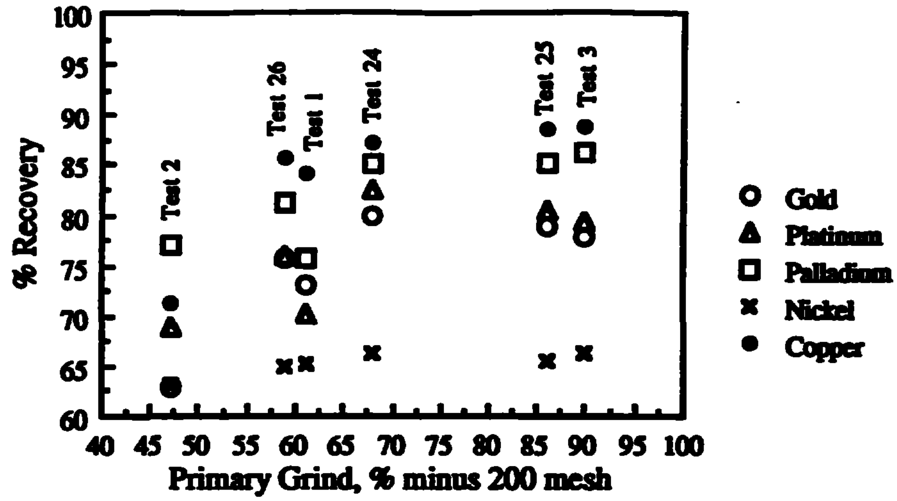


Figure 1: Rougher Recovery vs Flotation Feed Size

2.2 Rougher pH

Using Test 3, at pH 10 with Na_2CO_3 as a baseline, flotation was conducted at natural pH and at pH 6.5 with SO_2. Figures 2 and 3 illustrate the combined Cu+Ni and Platinum Group metal grade - recovery curves. The results are contained in Table 5.

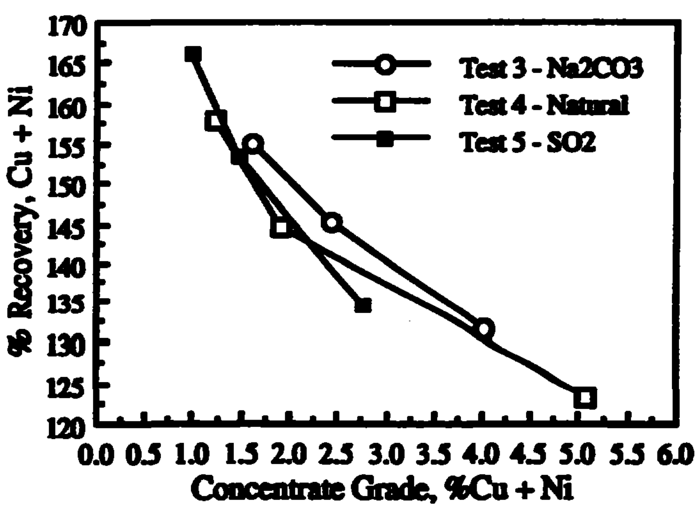


Figure 2: Effect of pH on Base Metal Flotation

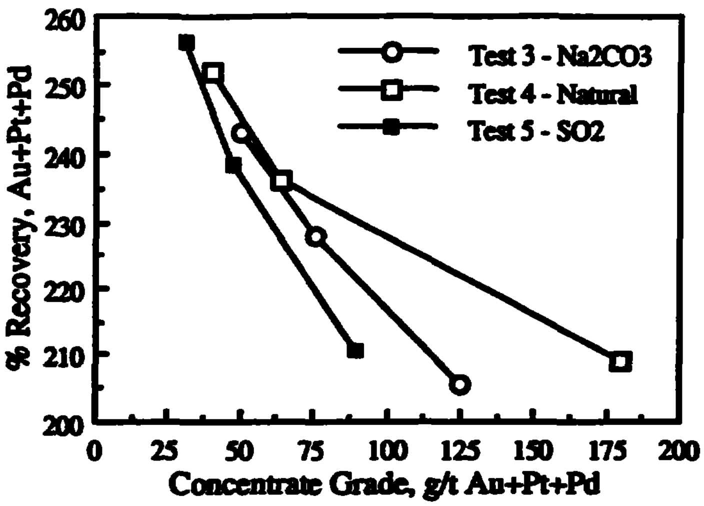


Figure 3: Effect of pH on Platinum Group Metals Flotation

Table 5: Rougher Scavenger pH

Test pH	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	%Distribution Au	Pt	Pd	Ni	Cu	S
3 10 with Na_2CO_3	Ro Conc 1	6.5	6.03	5.44	114	1.86	2.18	11.2	67.2	64.9	73.4	52.8	78.6	78
	Ro Conc 1+2	11.9	3.60	3.35	68.5	1.16	1.28	7.26	73.5	73.3	81.0	60.3	84.9	92
	Scav Conc 1	3.7	0.40	0.55	8.93	0.21	0.11	0.61	2.5	3.7	3.2	3.3	2.2	2
	Sc Conc 1+2	7.2	0.36	0.45	7.15	0.19	0.097	0.43	4.4	6.0	5.1	5.8	3.9	3
	Comb Conc	19.2	2.37	2.25	45.3	0.79	0.84	4.68	77.9	79.3	86.1	66.2	88.8	96
	Scav Tail	80.8	0.16	0.14	1.74	0.096	0.025	0.05	22.1	20.7	13.9	33.8	11.2	4
	Head(calc)	-	0.58	0.55	10.1	0.23	0.18	0.94	-	-	-	-	-	-
4 8.5 without soda ash	Ro Conc 1	5.0	7.27	7.54	165	2.35	2.73	12.8	67.4	66.9	74.7	49.5	73.9	69
	Ro Conc 1+2	15.6	2.60	2.76	58.7	0.92	0.99	5.32	75.8	76.9	83.5	60.7	83.7	90
	Scav Conc 1	5.4	0.29	0.37	6.42	0.20	0.11	0.69	2.9	3.6	3.2	4.6	3.3	4
	Sc Conc 1+2	10.7	0.25	0.31	5.29	0.18	0.092	0.48	4.9	5.9	5.2	8.0	5.4	6
	Comb Conc	26.2	1.64	1.76	37.0	0.62	0.62	3.35	80.7	82.8	88.6	68.7	89.1	96
	Scav Tail	73.8	0.14	0.13	1.69	0.100	0.027	0.05	19.3	17.2	11.4	31.3	10.9	4
	Head(calc)	-	0.53	0.56	10.9	0.24	0.18	0.92	-	-	-	-	-	-
5 6.5 with SO_2	Ro Conc 1	9.4	3.78	4.07	82.1	1.25	1.52	8.06	68.1	68.9	73.5	52.8	81.7	86
	Ro Conc 1+2	20.0	1.99	2.18	43.7	0.71	0.78	4.17	76.5	78.7	83.2	64.2	89.0	94
	Scav Conc 1	7.9	0.24	0.33	5.48	0.16	0.058	0.30	3.6	4.7	4.1	5.7	2.6	3
	Sc Conc 1+2	13.1	0.22	0.29	4.65	0.15	0.055	0.24	5.5	6.9	5.8	8.7	4.1	4
	Comb Conc	33.1	1.29	1.43	28.2	0.49	0.49	2.61	82.0	85.5	89.0	72.9	93.1	98
	Scav Tail	66.9	0.14	0.12	1.72	0.090	0.018	0.03	18.0	14.5	11.0	27.1	6.9	2
	Head(calc)	-	0.52	0.55	10.5	0.22	0.17	0.88	-	-	-	-	-	-

Soda ash seems to be of little benefit and SO_2 to pH 6.5 increased recoveries at the expense of concentrate grade. Weight recovery increased to 33%.

2.3 Collectors

Maintaining Test 3 as a baseline, collectors Aero 404 and Aero 3501 were substituted for Aerofloat 208. Potassium amyl xanthate was used as the primary collector in these tests. In Test 8, Aero 3501 was used as the auxiliary collector and sodium isopropyl xanthate replaced the potassium amyl xanthate. These results are summarized in Table 5A.

Table 5A: Auxiliary Collectors

Test	Product	Wt	Assays, %, g/t						%Distribution					
Cltr. Chng.		%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
3	Ro Conc 1	6.5	6.03	5.44	114	1.86	2.18	11.2	67.2	64.9	73.4	52.8	78.6	78
10	Ro Conc 1+2	11.9	3.60	3.35	68.5	1.16	1.28	7.26	73.5	73.3	81.0	60.3	84.9	92
with	Scav Conc 1	3.7	0.40	0.55	8.93	0.21	0.11	0.61	2.5	3.7	3.2	3.3	2.2	2
10g/t	Sc Conc 1+2	7.2	0.36	0.45	7.15	0.19	0.097	0.43	4.4	6.0	5.1	5.8	3.9	3
R208	Comb Conc	19.2	2.37	2.25	45.3	0.79	0.84	4.68	77.9	79.3	86.1	66.2	88.8	96
	Scav Tail	80.8	0.16	0.14	1.74	0.096	0.025	0.05	22.1	20.7	13.9	33.8	11.2	4
	Head(calc)	-	0.58	0.55	10.1	0.23	0.18	0.94	-	-	-	-	-	-
6	Ro Conc 1	6.7	5.73	5.64	119	1.74	2.10	9.89	70.8	68.2	74.6	48.2	76.0	73
with	Ro Conc 1+2	14.5	2.92	2.96	61.1	0.97	1.06	5.75	78.5	77.9	83.3	58.3	83.3	92
10	Scav Conc 1	4.5	0.28	0.40	6.78	0.20	0.085	0.46	2.3	3.2	2.9	3.7	2.1	2
g/t	Sc Conc 1+2	8.6	0.28	0.34	5.63	0.18	0.080	0.34	4.4	5.3	4.6	6.5	3.7	3
404	Comb Conc	23.1	1.93	1.98	40.4	0.67	0.69	3.73	82.9	83.2	87.9	64.8	87.0	96
	Scav Tail	76.9	0.12	0.12	1.67	0.11	0.031	0.05	17.1	16.8	12.1	35.2	13.0	4
	Head(calc)	-	0.54	0.55	10.6	0.24	0.18	0.90	-	-	-	-	-	-
7	Ro Conc 1	6.5	6.15	5.86	120	1.82	2.18	10.0	72.4	68.0	74.3	49.0	78.9	75
with	Ro Conc 1+2	16.3	2.73	2.69	54.1	0.93	0.96	4.99	80.8	78.5	84.3	62.9	87.2	94
10	Scav Conc 1	5.3	0.27	0.37	5.89	0.17	0.088	0.33	2.6	3.5	3.0	3.8	2.6	2
g/t	Sc Conc 1+2	9.3	0.25	0.33	5.12	0.17	0.078	0.28	4.3	5.5	4.6	6.4	4.1	3
3501	Comb Conc	25.6	1.83	1.83	36.2	0.65	0.64	3.28	85.1	84.0	88.8	69.3	91.3	97
	Scav Tail	74.4	0.11	0.12	1.57	0.099	0.021	0.04	14.9	16.0	11.2	30.7	8.7	3
	Head(calc)	-	0.55	0.56	10.4	0.24	0.18	0.87	-	-	-	-	-	-
8	Ro Conc 1	9.2	4.39	4.60	91.2	1.33	1.55	7.96	72.0	74.6	77.4	53.3	80.2	82
with	Ro Conc 1+2	19.1	2.36	2.45	48.1	0.75	0.80	4.40	80.7	82.8	85.1	62.8	86.4	94
250	Scav Conc 1	6.5	0.25	0.30	5.03	0.16	0.075	0.28	2.9	3.5	3.0	4.6	2.8	2
g/t	Sc Conc 1+2	10.3	0.22	0.26	4.37	0.15	0.069	0.23	4.1	4.7	4.2	6.9	4.1	3
SIPX	Comb Conc	29.4	1.61	1.68	32.8	0.54	0.54	2.94	84.8	87.5	89.3	69.7	90.4	97
	Scav Tail	70.6	0.12	0.10	1.63	0.098	0.024	0.04	15.2	12.5	10.7	30.3	9.6	3
	Head(calc)	-	0.56	0.56	10.8	0.23	0.18	0.89	-	-	-	-	-	-

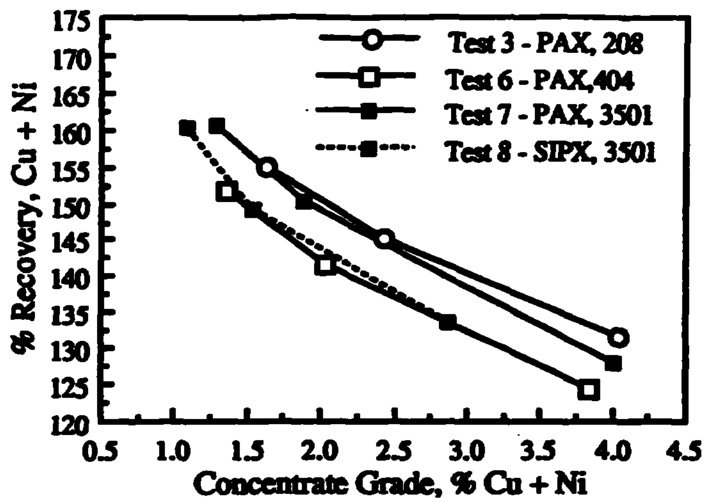


Figure 4: Effect of Collector Type on Base Metal Flotation

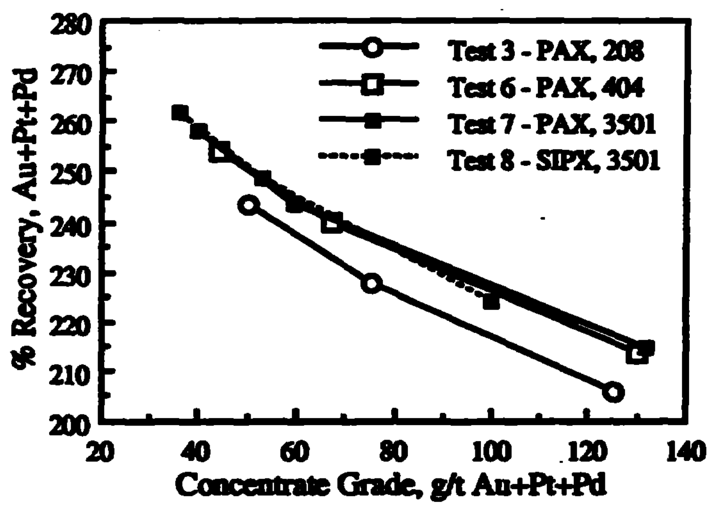


Figure 5: Effect of Collector on Platinum Group Metals Flotation

Figures 4 and 5 show potassium amyl xanthate with 3501 or 208 gave similar copper plus nickel grades and recoveries but the 3501 improved combined platinum group metal recovery.

In another collector series, the Na_2S was reduced from 375 g/t to 175 g/t, potassium amyl xanthate was used as the primary collector with auxiliary collectors Aerofloat 208, Aero 3501 and Aero 3477. The results are presented in Table 5B and Figures 6 and 7.

Table 5B: Collectors at 175 g/t Na_2S

Test Coll	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	%Distribution Au	Pt	Pd	Ni	Cu	S
12 PAX, 208	Ro Conc 1	7.0	6.19	5.30	111	1.68	1.99	9.88	75.2	67.9	73.9	50.2	78.6	78
	Ro Conc 1+2	15.6	3.02	2.71	55.8	0.91	0.97	5.33	82.1	77.7	83.2	60.6	85.9	94
	Scav Conc 1	5.3	0.24	0.40	7.02	0.20	0.084	0.47	2.2	3.9	3.5	4.5	2.5	3
	Sc Conc 1+2	9.4	0.21	0.33	5.64	0.18	0.073	0.34	3.5	5.7	5.1	7.2	3.9	4
	Comb Conc	25.0	1.96	1.82	36.9	0.63	0.63	3.45	85.6	83.4	88.2	67.8	89.8	98
	Scav Tail	75.0	0.11	0.12	1.64	0.10	0.024	0.03	14.4	16.6	11.8	32.2	10.2	3
	Head(calc)	-	0.57	0.54	10.5	0.23	0.18	0.88	-	-	-	-	-	-
15 PAX, 3501	Ro Conc 1	9.6	4.72	4.90	88.3	1.32	1.58	-	72.5	74.2	76.9	55.2	81.4	-
	Ro Conc 1+2	19.5	2.52	2.68	47.9	0.76	0.84	-	79.1	82.8	85.1	64.8	87.8	-
	Scav Conc 1	8.0	0.25	0.32	5.09	0.16	0.075	-	3.2	4.1	3.7	5.6	3.2	-
	Sc Conc 1+2	12.6	0.39	0.27	4.35	0.15	0.067	-	7.8	5.4	5.0	8.2	4.5	-
	Comb Conc	32.1	1.69	1.74	30.8	0.52	0.53	-	86.9	88.2	90.1	73.0	92.3	-
	Scav Tail	67.9	0.12	0.11	1.61	0.091	0.021	-	13.1	11.8	9.9	27.0	7.7	-
	Head(calc)	-	0.62	0.63	11.0	0.23	0.19	-	-	-	-	-	-	-
16 PAX, 3477	Ro Conc 1	9.5	5.47	4.86	86.0	1.30	1.54	-	75.8	73.0	76.2	54.6	81.6	-
	Ro Conc 1+2	19.5	2.86	2.62	46.0	0.74	0.80	-	81.5	80.9	83.9	63.9	87.2	-
	Scav Conc 1	6.7	0.23	0.32	5.32	0.16	0.068	-	2.2	3.4	3.3	4.7	2.5	-
	Sc Conc 1+2	10.9	0.21	0.28	4.63	0.16	0.063	-	3.3	4.8	4.7	7.5	3.8	-
	Comb Conc	30.5	1.91	1.78	31.2	0.53	0.54	-	84.8	85.7	88.6	71.4	91.1	-
	Scav Tail	69.5	0.15	0.13	1.75	0.093	0.023	-	15.2	14.3	11.4	28.6	8.9	-
	Head(calc)	-	0.69	0.63	10.7	0.23	0.18	-	-	-	-	-	-	-

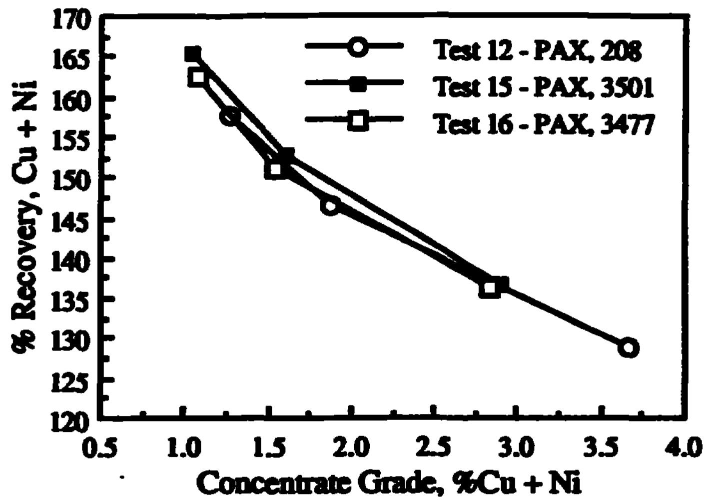


Figure 6: Effect of Collector at Reduced Na_2S Levels on Base Metal Flotation

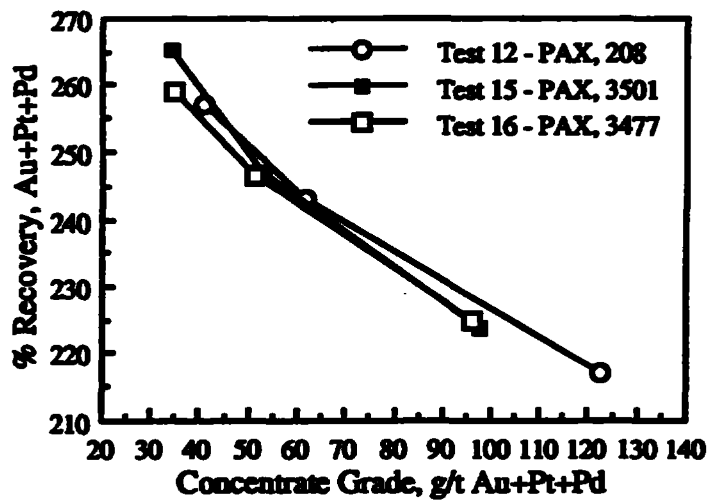


Figure 7: Effect of Collector at Reduced Na_2S Levels on Platinum Group Metals Flotation

The auxiliary collectors tested had little affect at the reduced Na_2S level.

2.4 Na_2S Addition

The level of Na_2S added to the primary grind was varied from 0 to 375 g/t. Figures 8 and 9 illustrate the combined grades and recoveries outlined in Table 7.

Table 7: Na_2S Addition

Test Na_2S	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	%Distribution Au	Pt	Pd	Ni	Cu	S
3	Ro Conc 1	6.5	6.03	5.44	114	1.86	2.18	11.2	67.2	64.9	73.4	52.8	78.6	78
10	Ro Conc 1+2	11.9	3.60	3.35	68.5	1.16	1.28	7.26	73.5	73.3	81.0	60.3	84.9	92
with	Scav Conc 1	3.7	0.40	0.55	8.93	0.21	0.11	0.61	2.5	3.7	3.2	3.3	2.2	2
375g/t	Sc Conc 1+2	7.2	0.36	0.45	7.15	0.19	0.097	0.43	4.4	6.0	5.1	5.8	3.9	3
Na_2S	Comb Conc	19.2	2.37	2.25	45.3	0.79	0.84	4.68	77.9	79.3	86.1	66.2	88.8	96
	Scav Tail	80.8	0.16	0.14	1.74	0.096	0.025	0.05	22.1	20.7	13.9	33.8	11.2	4
	Head(calc)	-	0.58	0.55	10.1	0.23	0.18	0.94	-	-	-	-	-	-
12	Ro Conc 1	7.0	6.19	5.30	111	1.68	1.99	9.88	75.2	67.9	73.9	50.2	78.6	78
with	Ro Conc 1+2	15.6	3.02	2.71	55.8	0.91	0.97	5.33	82.1	77.7	83.2	60.6	85.9	94
175g/t	Scav Conc 1	5.3	0.24	0.40	7.02	0.20	0.084	0.47	2.2	3.9	3.5	4.5	2.5	3
Na_2S	Sc Conc 1+2	9.4	0.21	0.33	5.64	0.18	0.073	0.34	3.5	5.7	5.1	7.2	3.9	4
	Comb Conc	25.0	1.96	1.82	36.9	0.63	0.63	3.45	85.6	83.4	88.2	67.8	89.8	98
	Scav Tail	75.0	0.11	0.12	1.64	0.10	0.024	0.03	14.4	16.6	11.8	32.2	10.2	3
	Head(calc)	-	0.57	0.54	10.5	0.23	0.18	0.88	-	-	-	-	-	-
11	Ro Conc 1	6.0	6.51	6.08	123	1.81	2.28	10.7	69.9	64.4	70.2	47.2	78.6	73
with-	Ro Conc 1+2	13.9	3.13	3.06	61.5	0.97	1.08	5.84	78.0	75.0	81.3	58.9	85.8	93
out	Scav Conc 1	4.9	0.27	0.43	7.64	0.21	0.087	0.49	2.4	3.7	3.6	4.5	2.5	3
Na_2S	Sc Conc 1+2	8.8	0.26	0.38	6.45	0.20	0.079	0.38	4.0	5.9	5.4	7.5	4.0	4
	Comb Conc	22.7	2.02	2.02	40.1	0.67	0.69	3.73	82.0	80.9	86.7	66.4	89.8	97
	Scav Tail	77.3	0.13	0.14	1.81	0.10	0.023	0.04	18.0	19.1	13.3	33.6	10.2	3
	Head(calc)	-	0.56	0.57	10.5	0.23	0.17	0.88	-	-	-	-	-	-

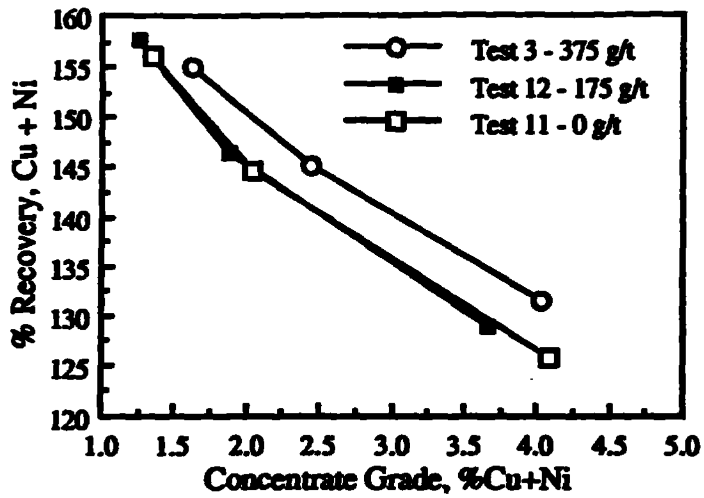


Figure 8: Effect of Na2S on Base Metal Flotation

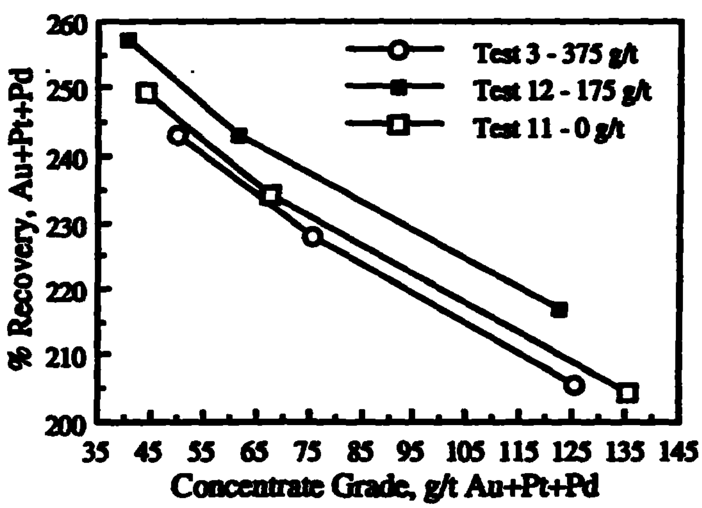


Figure 9: Effect of Na2S on Platinum Group Metals Flotation

Additions of Na_2S may be beneficial to metal recoveries. More testwork would be required to determine the optimum amount.

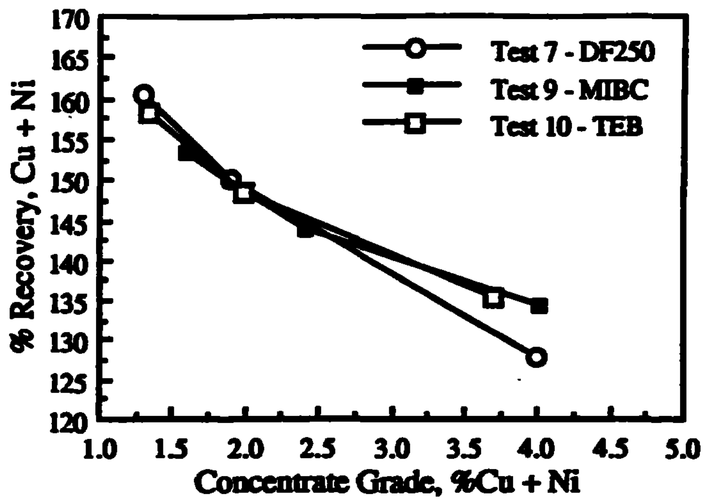


Figure 10: Effect of Frother on Base Metal Flotation

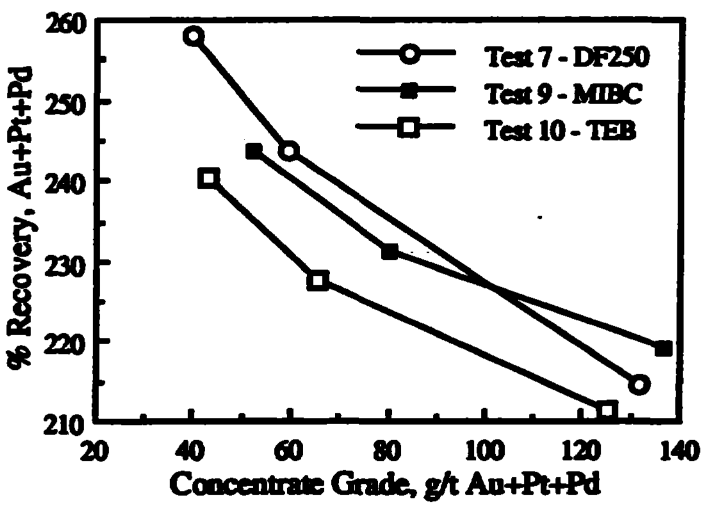


Figure 11: Effect of Frother on Platinum Group Metals Flotation

Frother selection did not affect base metal flotation. Both MIBC and DF250 improved PGM recoveries.

2.6 Gravity - Flotation

In Test 13 Composite M92 was ground and passed across the 1/8 size Wilfley Table. The table concentrate was upgraded on a Mozley Mineral Separator. Using the reagent balance derived from the testwork to date, a flotation test was conducted on fresh mill discharge (Test 14) and on the gravity tail. The results are contained in Table 9.

Table 9: Gravity Flotation

Test	Product	Wt %	Assays, %, g/t						%Distribution					
			Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
14	Ro Conc 1	12.6	3.79	3.13	64.6	1.01	1.11	6.08	76.2	71.7	76.4	55.5	78.3	87
	Ro Conc 1+2	21.1	2.42	2.09	42.0	0.69	0.72	3.95	81.4	80.1	83.3	63.7	85.0	94
	Scav Conc 1	7.7	0.26	0.32	5.65	0.17	0.081	0.37	3.2	4.5	4.1	5.7	3.5	3
	Sc Conc 1+2	11.8	0.25	0.30	5.28	0.17	0.079	0.31	4.7	6.5	5.8	8.6	5.2	4
	Comb Conc	32.9	1.64	1.45	28.9	0.50	0.49	2.64	86.1	86.6	89.1	72.2	90.2	99
	Scav Tail	67.1	0.13	0.11	1.73	0.095	0.026	0.02	13.9	13.4	10.9	27.8	9.8	2
	Head(calc)	-	0.63	0.55	10.7	0.23	0.18	0.88	-	-	-	-	-	-
13 Grav/ Flot.	Mozley Conc	0.2	74.1	20.5	402	-	-	-	27.2	8.7	9.0	-	-	-
	Ro Conc 1+2	24.0	1.54	1.72	34.3	0.58	0.63	-	55.9	71.9	75.6	64.7	86.2	-
	Sc Conc 1+2	13.8	0.23	0.27	4.52	0.15	0.072	-	4.8	6.5	5.7	9.3	5.7	-
	Comb Ro/Sc	37.8	1.06	1.19	23.4	0.42	0.43	-	60.7	78.4	81.4	74.1	91.9	-
	Comb Conc	38.0	1.53	1.31	25.8	-	-	-	87.8	87.0	90.3	-	-	-
	Scav Tail	62.0	0.13	0.12	1.70	0.090	0.023	-	12.2	13.0	9.7	25.9	8.1	-
	Head(calc)	-	0.66	0.57	10.9	0.21	0.18	-	-	-	-	-	-	

The overall results were similar. A Mozley concentrate was produced which assayed 74 g/t Au, 20 g/t Pt and 402 g/t Pd. Recoveries to this concentrate were 27%, 8.7% and 9%, respectively.

2.7 Point of Reagent Addition

When the CMC is added to the rougher conditioner the pulp is very viscous and poorly dispersed. Excessive amounts of liberated gangue are entrained in the froth. Adding the CMC to the last 5 minutes of the primary grind improved the pulp dispersion. The PAX dosage was reduced by 100 g/t and the flotation time extended to recover a cleaner rougher concentrate but recoveries were much lower. Adding the CMC to the grind, but omitting the Na_2CO_3 from the circuit, improved recoveries but they remain lower than Test 24 where CMC is added to the conditioner. The results are condensed in Table 10.

Table 10: Point of Reagent Addition

Test Add	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	%Distribution Au	Pt	Pd	Ni	Cu
24 Ro Cond	Scav Conc	22.5	1.92	2.11	40.7	0.63	0.68	79.9	82.5	85.2	66.2	87.1
	Scav Tail	77.5	0.14	0.13	2.05	0.093	0.029	20.1	17.5	14.8	33.8	12.9
	Head(calc)	-	0.54	0.58	10.7	0.21	0.17	-	-	-	-	-
28 PG	Scav Conc	9.6	4.00	3.89	74.4	1.20	1.30	64.0	69.8	74.5	53.7	78.6
	Scav Tail	90.4	0.24	0.18	2.72	0.11	0.038	36.0	30.2	25.5	46.3	21.4
	Head(calc)	-	0.60	0.54	9.63	0.21	0.16	-	-	-	-	-
29 PG No Na_2CO_3	Scav Conc	16.2	2.42	2.60	52.8	0.85	0.88	74.0	75.2	82.3	59.9	85.5
	Scav Tail	83.8	0.17	0.17	2.20	0.11	0.029	26.0	24.8	17.7	40.1	14.5
	Head(calc)	-	0.53	0.56	10.4	0.23	0.17	-	-	-	-	-

A polished thin section was prepared from Test 28 scavenger tailing to determine the nature of the nickel minerals remaining. All non - opaque minerals present were as inclusions in silicate particles ranging in size from 15 micrometres to less than 4 micrometres. At least 50% of the nickel is likely to be present in a silicate mineral - either serpentine or chlorite. Chlorite is present in the tailing; electron probe analysis would be required to prove the presence of nickel in chlorite. The complete report is contained in Appendix 2.

2.8 Flash Flotation

Two tests were performed to simulate flash flotation. The minus 10 mesh feed was ground for 5 minutes in Test 34 and 2 minutes in Test 35, Flash Conc 1 was floated with 50 g/t PAX and 25 g/t Aero 3501. The tailings were ground for 10 and 5 minutes respectively, and a second flotation stage performed with 100 g/t PAX and 50 g/t Aero 3501. This tailing was ground for 10 and 5 minutes respectively and floated for 30 minutes with staged collector additions. CMC was added to all grinds in Test 35. The results are summarized in Table 11.

Table 11: Flash Flotation

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	%Distribution Au	Pt	Pd	Ni	Cu
34 M92	Flash 1	2.4	9.24	7.17	169	1.93	3.00	35.0	26.8	35.5	19.9	42.7
	Flash 1+2	9.1	4.50	4.13	86.5	1.24	1.35	65.1	59.0	69.5	49.0	73.6
	Scav Conc	20.0	2.56	2.56	49.5	0.76	0.76	81.0	79.9	86.9	65.5	90.5
	Scav Tail	80.0	0.15	0.16	1.86	0.10	0.020	19.0	20.1	13.1	34.5	9.5
	Head(calc)	-	0.63	0.64	11.4	0.23	0.17	-	-	-	-	-
35 M92	Flash 1	2.9	6.45	5.98	141	1.87	2.53	28.1	28.3	36.6	23.9	43.3
	Flash 1+2	4.8	6.98	5.49	122	1.69	2.08	51.6	44.0	53.9	36.7	60.4
	Scav Conc	20.1	2.46	2.28	45.1	0.71	0.72	75.6	76.2	82.7	64.1	87.0
	Scav Tail	79.9	0.20	0.18	2.38	0.10	0.027	24.4	23.8	17.3	35.9	13.0
	Head(calc)	-	0.65	0.60	11.0	0.22	0.17	-	-	-	-	-

Overall grades and recoveries are similar to previous tests. Earlier staged rougher floats indicated 70 to 80% of the PGM minerals, 50% of the nickel and 80 to 85% of the copper are recovered in the first 3 to 5 minutes flotation. It would be difficult to determine, on a laboratory scale if flash flotation would be beneficial and if a final grade concentrate could be produced.

3.0 Cleaner Flotation Circuit

The rougher conditions were held constant while the effect of regrind fineness and depressant selection were investigated.

3.1 Regrind

The effect of fineness of cleaner circuit feed size is compared in Table 12 and Figures 12 and 13.

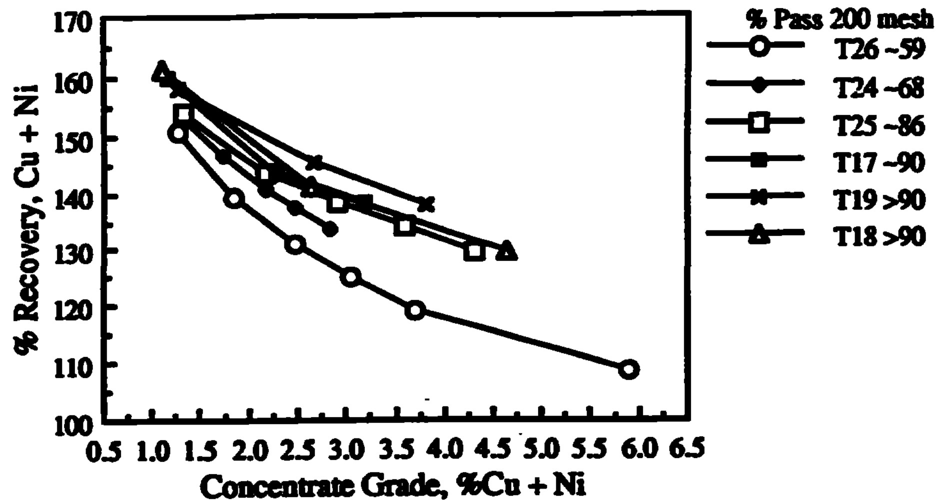


Figure 12: Effect of Regrind Fineness on Base Metal Flotation

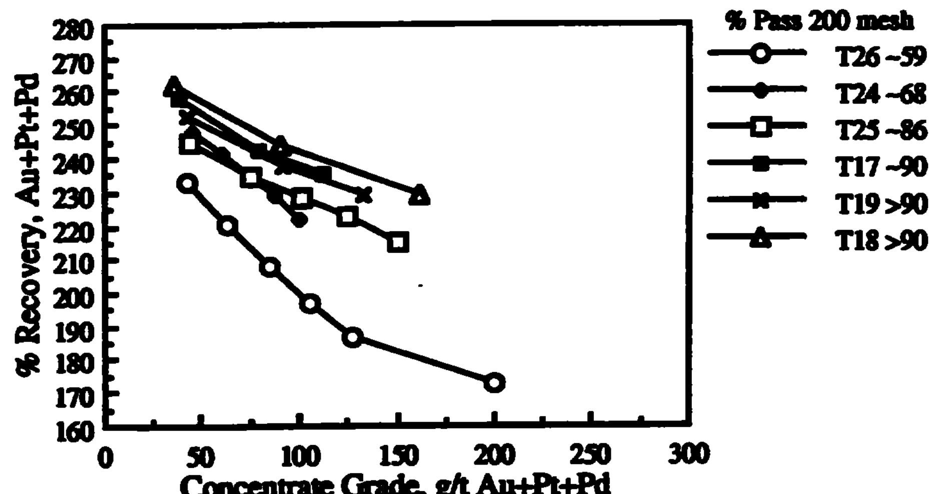


Figure 13: Effect of Regrind Fineness on Platinum Group Metals Flotation

Table 12: Regrind Times

Test Reg	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	%Distribution Au	Pt	Pd	Ni	Cu
26	5th Cl Conc	3.5	10.2	9.26	181	2.62	3.27	57.7	54.5	60.7	42.1	66.8
59PG	4th Cl Conc	6.0	6.45	6.05	115	1.66	2.05	63.6	59.0	64.3	46.3	72.9
No	3rd Cl Conc	7.7	5.29	5.08	94.8	1.38	1.67	66.6	62.6	67.8	49.3	76.0
Reg	2nd Cl Conc	9.9	4.23	4.13	76.8	1.14	1.34	68.9	66.8	72.1	52.7	78.6
	1st Cl Conc	14.2	3.11	3.07	57.0	0.88	0.97	72.2	71.3	76.6	57.8	81.6
	Scav Conc	22.3	2.07	2.07	38.3	0.63	0.65	75.8	75.9	81.1	65.0	85.7
	Scav Tail	77.7	0.19	0.16	2.26	0.097	0.031	24.2	21.2	17.1	35.0	14.3
	Head(calc)	-	0.61	0.59	10.3	0.22	0.17	-	-	-	-	-
24	4th Cl Conc	9.0	4.28	4.71	91.0	1.27	1.55	71.5	74.0	76.5	53.7	80.1
68PG	3rd Cl Conc	10.6	3.78	4.12	79.4	1.12	1.34	74.3	76.0	78.6	55.8	81.6
No	2nd Cl Conc	12.4	3.31	3.61	69.6	1.00	1.17	75.9	77.7	80.3	57.8	83.0
Reg	1st Cl Conc	16.2	2.61	2.86	55.2	0.81	0.92	78.0	80.3	83.0	61.5	85.0
	Scav Conc	22.5	1.92	2.11	40.7	0.63	0.68	79.9	82.5	85.2	66.2	87.1
	Scav Tail	77.5	0.14	0.13	2.05	0.093	0.029	20.1	17.5	14.8	33.8	12.9
	Head(calc)	-	0.54	0.58	10.7	0.21	0.17	-	-	-	-	-
25	4th Cl Conc	5.8	7.13	7.61	136	1.94	2.37	70.5	70.1	74.1	50.4	79.4
86	3rd Cl Conc	7.2	5.89	6.35	113	1.63	1.96	72.6	72.9	76.9	52.7	81.8
No	2nd Cl Conc	9.2	4.76	5.17	92.0	1.34	1.58	74.2	75.1	79.2	55.1	83.5
Reg	1st Cl Conc	12.8	3.48	3.80	67.7	1.02	1.15	75.9	77.1	81.5	58.3	85.2
	Scav Conc	22.6	2.05	2.24	40.0	0.65	0.68	78.9	80.4	85.1	65.4	88.4
	Scav Tail	77.4	0.16	0.16	2.05	0.10	0.026	21.1	19.6	14.9	34.6	11.6
	Head(calc)	-	0.59	0.63	10.6	0.22	0.17	-	-	-	-	-
17	2nd Cl Conc	8.6	4.71	5.31	102	1.43	1.76	77.8	76.9	80.7	54.0	84.5
90PG	1st Cl Conc	12.5	3.35	3.78	72.5	1.05	1.24	79.8	79.1	83.1	57.4	86.2
No	Scav Conc	27.8	1.60	1.81	34.7	0.57	0.59	84.8	84.3	88.7	68.8	91.2
Reg	Scav Tail	72.2	0.11	0.13	1.70	0.099	0.022	15.2	15.7	11.3	31.2	8.8
	Head(calc)	-	0.52	0.60	10.9	0.23	0.18	-	-	-	-	-
19	2nd Cl Conc	7.1	6.91	6.35	120	1.70	2.11	76.2	75.2	77.7	53.4	84.7
90PG	1st Cl Conc	10.8	4.66	4.36	83.2	1.23	1.43	77.9	78.3	81.7	58.4	87.0
	Scav Conc	24.7	2.15	2.03	38.5	0.61	0.65	82.5	83.7	86.7	67.0	91.1
20	Scav Tail	75.3	0.15	0.13	1.93	0.099	0.021	17.5	16.3	13.3	33.0	8.9
Min.												
Reg	Head(calc)	-	0.64	0.60	11.0	0.23	0.18	-	-	-	-	-
18	2nd Cl Conc	5.4	8.89	8.12	145	2.03	2.62	77.3	75.6	76.0	48.3	81.5
90PG	1st Cl Conc	10.3	4.81	4.51	81.1	1.21	1.43	80.8	81.2	82.1	55.6	85.8
40	Scav Conc	28.8	1.81	1.75	31.6	0.54	0.55	85.0	87.6	89.1	69.6	91.7
Min.	Scav Tail	71.2	0.13	0.10	1.56	0.096	0.020	15.0	12.4	10.9	30.4	8.3
Reg	Head(calc)	-	0.62	0.57	10.2	0.22	0.17	-	-	-	-	-

Although there are differences in the primary grind fineness in this series of tests, the results indicate that the metals recovery increases with finer cleaner circuit feed size up to approximately 85% minus 200 mesh.

3.2 Depressants

To determine the effect of various depressants, the roughers were floated without depressant, followed by cleaning using Aqualon's CMC-T, Ogilive's WC9524, Aqualon's PA MED or a SO_2/Jaguar MDD depressant system. Table 13 presents the results.

Table 13: Depressants in Cleaner Stages Only

Test Dep	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	%Distribution Au	Pt	Pd	Ni	Cu
20 CMC (in Cl'ng only)	2nd Cl Conc	10.6	4.13	4.19	78.0	1.18	1.37	78.2	78.7	80.9	55.6	84.3
	1st Cl Conc	16.1	2.80	2.88	53.7	0.85	0.93	80.7	82.2	84.8	61.0	87.2
	Scav Conc	27.4	1.72	1.76	32.8	0.56	0.57	84.4	85.8	88.3	68.6	90.3
	Scav Tail	72.6	0.12	0.11	1.64	0.097	0.023	15.6	14.2	11.7	31.4	9.7
	Head(calc)	-	0.56	0.56	10.2	0.22	0.17	-	-	-	-	-
21 WC 9524	4th Cl Conc	5.2	9.30	8.00	150	2.18	2.74	74.1	68.0	73.8	50.5	77.1
	3rd Cl Conc	7.1	7.07	6.21	116	1.70	2.10	76.8	71.9	77.5	53.7	80.6
	2nd Cl Conc	10.8	4.86	4.34	80.8	1.22	1.46	79.7	76.0	81.8	58.4	84.5
	1st Cl Conc	16.4	3.29	2.97	55.1	0.87	0.99	82.0	78.8	84.8	62.8	86.9
	Scav Conc	29.4	1.90	1.73	32.1	0.54	0.57	84.9	82.8	88.6	70.9	90.5
	Scav Tail	70.6	0.14	0.15	1.71	0.093	0.025	15.1	17.2	11.4	29.1	9.5
	Head(calc)	-	0.66	0.62	10.6	0.23	0.19	-	-	-	-	-
22 PA MED	4th Cl Conc	4.3	9.24	9.32	171	2.56	3.12	69.7	69.8	71.3	48.0	77.0
	3rd Cl Conc	5.7	7.23	7.31	134	2.01	2.42	72.6	72.8	74.2	50.1	79.5
	2nd Cl Conc	8.1	5.26	5.36	98.4	1.50	1.76	74.8	75.7	77.3	53.1	81.8
	1st Cl Conc	14.0	3.21	3.29	61.0	0.97	1.07	78.9	80.1	82.7	59.2	85.9
	Scav Conc	27.0	1.76	1.81	33.6	0.58	0.58	83.4	84.8	87.6	68.3	90.4
	Scav Tail	73.0	0.13	0.12	1.76	0.10	0.023	16.6	15.2	12.4	31.7	9.6
	Head(calc)	-	0.57	0.58	10.4	0.23	0.17	-	-	-	-	-
23 Jaguar MDD with SO_2	4th Cl Conc	1.9	14.5	13.4	257	3.55	4.26	44.9	43.5	45.7	29.7	47.2
	3rd Cl Conc	2.5	12.3	12.1	227	3.16	3.83	50.9	52.7	54.1	35.4	56.9
	2nd Cl Conc	3.7	9.29	9.45	176	2.47	2.98	56.4	60.2	61.3	40.6	64.8
	1st Cl Conc	7.5	5.23	5.43	101	1.48	1.72	64.6	70.2	71.9	49.4	75.8
	Scav Conc	26.8	1.70	1.84	34.5	0.57	0.57	74.7	84.9	87.3	67.4	90.5
	Scav Tail	73.2	0.21	0.12	1.84	0.10	0.022	25.3	15.1	12.7	32.6	9.5
	Head(calc)	-	0.61	0.58	10.6	0.22	0.17	-	-	-	-	-

There was very little difference between the two Aqualon carboxymethyl cellulose products and the wheat dextrin WC9524. The SO_2/guar system was not as effective.

The 4th cleaner concentrate from Test 23 was submitted for a NaOH fusion to isolate palladium for examination. Prior to fusion, vysotskite (Pd, Pt, Ni, S), kotulskite (Pd, Pt, Te, Bi) and braggite (Pd, Pt, Ni)S were identified in the concentrate. Unfortunately the fusion was not successful in isolating the PGE minerals. The full report is contained in Appendix 1.

3.3 Reverse Flotation

The rougher concentrate was reground and conditioned with 1625 g Na_2S /t of feed to depress the sulphides. The froth product was conditioned with another 813 g Na_2S/t of feed and recleaned. Complete depression of the sulphides was not achieved.

Table 14: Reverse Flotation

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	%Distribution Au	Pt	Pd	Ni	Cu
31	2nd Cl Froth	1.7	10.7	10.0	229	2.80	2.72	35.6	30.1	37.9	21.3	27.3
	2nd Cl Cell	4.8	1.94	2.76	55.2	0.95	0.99	18.1	23.3	25.5	20.3	27.8
	1st Cl Froth	6.6	4.25	4.65	101	1.44	1.45	53.7	53.4	63.4	41.6	55.2
	1st Cl Cell	11.7	0.94	1.09	17.6	0.44	0.45	21.1	22.2	19.7	22.6	30.5
	Scav Froth	18.2	2.13	2.37	47.6	0.80	0.81	74.8	75.7	83.1	64.2	85.7
	Scav Cell	81.8	0.16	0.17	2.16	0.099	0.030	25.2	24.3	16.9	35.8	14.3
	Head(calc)	-	0.52	0.57	10.4	0.23	0.17	-	-	-	-	-

3.4 NaCl in Grind

Some Australian Cu Ni deposits have shown improved flotation response when floated in a brackish solution (site water) or in sodium chloride solution. In Test 26 the final cleaner was performed in a 10% NaCl solution. The froth appearance improved. A full test was conducted on each ore type where the primary grind was performed in a NaCl solution. The CMC and Na_2CO_3 were both omitted from the reagent balances. The results are compared with tests using CMC in the primary grind. The results are presented in Table 15.

Table 15: Effect of NaCl

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	%Distribution Au	Pt	Pd	Ni	Cu	S
30	4th Cl Conc	0.8	20.3	18.7	163	7.27	11.0	-	52.9	51.3	58.5	44.3	67.6	-
	3rd Cl Conc	0.9	19.1	17.7	154	6.91	10.3	-	53.8	52.6	59.7	45.6	68.3	-
	2nd Cl Conc	1.0	16.6	15.5	135	6.12	8.91	-	54.4	53.7	60.9	46.9	68.9	-
	1st Cl Conc	2.3	7.60	7.19	62.1	2.90	3.99	-	56.6	56.5	63.7	50.5	70.3	-
Roby	Scav Conc	7.8	2.56	2.47	21.0	1.03	1.26	-	64.5	65.7	72.7	60.5	74.9	-
Zone	Scav Tail	92.2	0.12	0.11	0.67	0.057	0.036	-	35.5	34.3	27.3	39.5	25.1	-
	Head(calc)	-	0.31	0.30	2.26	0.13	0.13	-	-	-	-	-	-	-
32	3rd Cl Conc	1.1	22.9	15.8	132	5.20	9.53	21.0	61.7	53.3	57.3	38.3	70.0	57.8
Roby	2nd Cl Conc	1.4	18.0	12.6	105	4.31	7.46	17.0	62.9	55.3	59.6	41.4	71.2	60.7
Zone	1st Cl Conc	3.7	7.52	5.69	48.3	2.25	3.10	7.63	68.1	64.6	70.7	55.8	76.7	70.7
	Scav Conc	9.2	3.20	2.51	21.0	1.02	1.28	3.80	73.1	71.9	77.5	63.7	79.8	88.5
5%	Scav Tail	90.8	0.12	0.10	0.62	0.059	0.033	0.05	26.9	28.1	22.5	36.3	20.2	11.5
NaCl	Head(calc)	-	0.40	0.32	2.50	0.15	0.15	0.40	-	-	-	-	-	
29	4th Cl Conc	1.8	17.1	14.9	332	4.50	6.12	-	58.1	47.9	57.6	35.3	65.9	-
	3rd Cl Conc	2.0	15.4	13.7	303	4.12	5.57	-	59.3	50.1	59.6	36.7	68.0	-
M92	2nd Cl Conc	2.6	12.5	11.5	250	3.42	4.56	-	61.1	53.7	62.6	38.8	71.0	-
	1st Cl Conc	6.0	5.95	6.08	127	1.86	2.20	-	67.6	65.6	73.8	48.9	79.6	-
	Scav Conc	16.2	2.43	2.60	52.8	0.85	0.88	-	74.0	75.2	82.3	59.9	85.5	-
	Scav Tail	83.8	0.17	0.17	2.20	0.11	0.029	-	26.0	24.8	17.7	40.1	14.5	-
	Head(calc)	-	0.53	0.56	10.4	0.23	0.17	-	-	-	-	-	-	-
33	3rd Cl Conc	5.2	7.07	7.71	156	2.16	2.64	15.2	68.5	68.9	75.3	50.2	83.1	84.0
M92	2nd Cl Conc	7.0	5.37	5.97	120	1.72	2.00	11.8	70.7	72.5	78.8	54.2	85.7	88.4
	1st Cl Conc	9.5	4.11	4.54	91.5	1.35	1.50	8.96	73.4	74.7	81.2	57.5	87.1	91.2
2.5%	Scav Conc	18.4	2.23	2.52	50.0	0.79	0.81	4.91	77.0	80.2	85.8	65.1	90.5	96.5
NaCl	Scav Tail	81.6	0.15	0.14	1.87	0.095	0.019	0.04	23.0	19.8	14.2	34.9	9.5	3.5
	Head(calc)	-	0.53	0.58	10.7	0.22	0.16	-	-	-	-	-	-	-

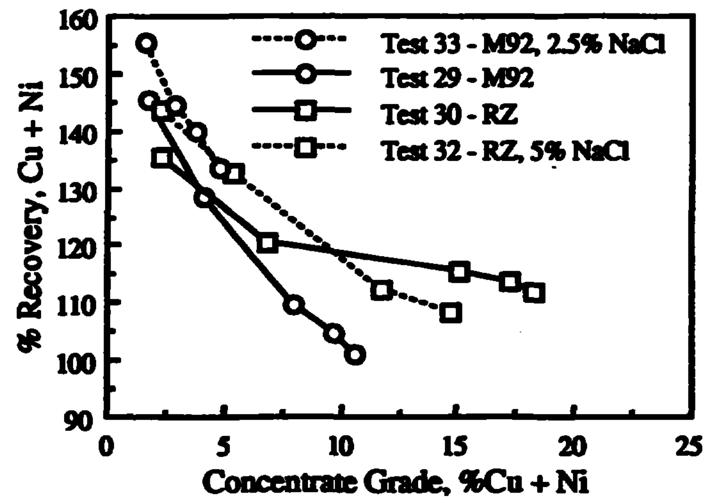


Figure 14: Effect of NaCl on Base Metals Flotation

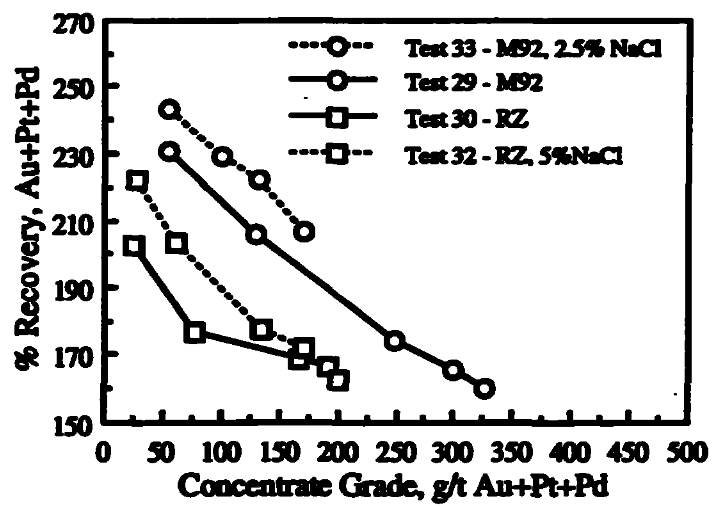


Figure 15: Effect of NaCl on Platinum Group Metals Flotation

The metallurgical response of the two composites is similar. All metal recoveries improved when grinding was performed in NaCl solutions.

The settling characteristics improved when the primary grind was performed in sodium chloride solution.

4.0 Testwork on Tailing

4.1 Settling Tests

The settling characteristics of flotation rougher tailings from Test 31 were investigated. Small pulp samples were used to scope flocculants and the best flocculant tested at various lime - pH levels. The results are presented in Table 16.

Table 16: Settling Rates and Thickener Areas

Test	Percol 156 g/t	pH	% Solids		Feed Conc. Zone		Compression Zone	
			Initial	Final	Rate*	Area**	Rate*	Area**
S1	0	8.2	23.4	66.1	0.33	0.35	0.10	0.50
S2	0	10.4	23.4	65.4	0.33	0.35	0.09	0.50
S7	0	12.0	23.4	68.0	0.53	0.22	0.10	0.37
S3	5	8.2	27.4	65.3	0.38	0.24	0.10	0.39
S4	5	10.0	28.4	64.8	0.42	0.20	0.10	0.37
S5	10	8.2	27.4	65.6	0.54	0.17	0.11	0.34
S6	10	10.0	28.4	64.5	0.63	0.13	0.10	0.30
S8	15	8.2	27.4	65.0	0.87	0.10	0.11	0.25
S9	15	10.0	28.4	64.2	0.93	0.10	0.09	0.23
S10	15	11.7	28.4	63.7	0.62	0.13	0.10	0.28

* meters per hour
** square meter per tonne of dry solids per 24 hours (no safety factor applied)

At natural pH, with <10 g Percol 156/t the supernatant remained cloudy after 24 hours. The supernatant clarity improves at pH ≥10 with or without flocculant. At pH 11.7 with 15 g Percol 156/t the solution cleared rapidly.

4.2 Tailing Decant Analysis

The supernatant from Test S10 was decanted and submitted for analysis. The results are presented in Table 17.

Table 17: 24 Element Semi-Quantitative ICP Scan: Drinking Water Quality

Sample Description		Concentration *
Reporting Limit, mg/L	Element	Tailing Decant Test S10
0.2	Al	1.0
0.1	As	<0.1
0.05	Ba	<0.05
0.01	Be	<0.01
0.2	Ca	120
0.05	Cd	<0.05
0.05	Co	<0.05
0.05	Cr[f]	<0.05
0.05	Cu	<0.05
0.05	Fe	<0.05
0.10	Mg	0.10
0.05	Mn	<0.05
0.1	Mo	<0.1
0.10	Na	37
0.05	Ni	<0.05
0.2	P	<0.2
0.1	Pb	<0.1
2	S	67
0.1	Sb	<0.1
0.5	Se	<0.5
0.1	Si	12
0.2	Sn	<0.2
0.1	Te	<0.1
0.05	Zn	<0.05
1.0	Hardness	300

* All results are reported in mg/L. Some detection limits may be elevated due to interference

CONCLUSIONS

The lower grade Roby Zone sample has a Bond Work Index of 18.6, Composite M92 would grind slightly finer with identical power input with a Bond Work Index of 15.3.

The optimum primary grind for Composite M92, based on this investigation, is ≥ 68% minus 200 mesh. A rougher concentrate regrind of ≥ 85% minus 200 mesh is recommended prior to cleaning.

In one test a gravity concentrate was recovered by tabling prior to flotation. This concentrate was upgraded on the Mozley separator to 74 g/t Au, 20.5 g/t Pt and 402 g/t Pd. Gold recovery was 27%, Pt and Pd recoveries were <10%.

Flash flotation may be applicable. This is difficult to simulate on a laboratory scale. Results obtained were similar to batch staged rougher flotation. A unit recovery cell could be included in a pilot scale investigation.

Frother performance is also difficult to evaluate in batch laboratory tests. Our tests indicate MIBC and DF250C performed better than TEB. Pilot scale testing would be required for confirmation.

Using Na_2S as an activator was beneficial to recoveries. Further testwork would be required to optimize the addition rate. Test results indicate 175 g/t is preferable to 375 g/t.

Grinding in a NaCl solution improved results, increasing recoveries of all metals. The pulp thickening characteristics were also improved. However, a NaCl solution would be corrosive to equipment. Further testwork would be required to determine the lower limit of NaCl which would improve the metallurgical response or if an alternate less corrosive chemical can be substituted for NaCl .

The addition point for CMC seems to be critical for adequate dispersion or talc depression. The CMC was much more effective when added to the final 5 minutes of the grind than when added to the rougher conditioner.

Na_2CO_3 was of little benefit as a pulp dispersant and flotation at natural pH appears to be preferable.

Several collectors were tested. Potassium amyl xanthate with a dithiophosphate as a secondary collector performed the best. The dodecyl mercaptan, P3, was only tested in the NaCl circuit and should be evaluated in the standard circuit.

Further batch testwork should emphasize improving the cleaner circuit performance to improve final concentrate grade while maintaining or improving final recovery. Cycle tests should be performed to determine the disposition of the metals in the cleaner tailings.

SAMPLE PREPARATION

On January 20, 1992 10 bags containing approximately 200 kilograms of Roby Zone ore were received under our reference number LR9238328. The sample was air dryed, blended and crushed to nominal 10 mesh. Head samples were removed for analysis, mineralogy and size analysis. Forty 2 kilogram charges and three 40 kilogram charges were stored in 2 boxes and 1 barrel at minus 5° C. This composite was rejected for flotation testwork because of low PGM content (0.3 g/t Au, 0.29 g/t Pt, 2.4 g/t Pt).

Screen Analysis Roby Zone

Mesh Size (Tyler)	Micron Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 10	1,651	4.2	4.2	95.8
14	1,168	22.8	27.0	73.0
20	833	16.4	43.4	56.6
28	589	12.8	56.1	43.9
35	417	8.2	64.4	35.6
48	295	6.7	71.1	28.9
65	208	4.9	76.1	23.9
100	147	4.3	80.4	19.6
150	104	3.3	83.7	16.3
200	74	2.7	86.4	13.6
270	53	2.1	88.5	11.5
400	38	2.4	90.9	9.1
- 400	- 38	9.1	-	-
	Total	100.0	-	-

On February 5, 1992 16 bags containing approximately 2400 kilograms of drill chips were received under our reference number LR9238472. The samples were individually crushed to nominal 1/4 inch. Head samples were removed from each bag for analysis.

Sample Number	Assays, %, g/t				
	Cu	Ni	Au	Pt	Pd
92 M1 28841 A	0.058	0.10	0.67	1.03	20.4
92 M1 28841 B	0.058	0.10	0.40	1.00	20.8
92 M1 28842	0.040	0.096	0.36	0.76	16.5
92 M1 28843	0.025	0.096	0.25	0.93	22.2
92 M2 28845 A	0.14	0.18	0.30	0.35	5.28
92 M2 28845 B	0.18	0.24	0.96	0.44	6.01
92 M2 28846 A	0.34	0.48	0.75	0.64	11.9
92 M2 28846 B	0.30	0.42	0.73	0.62	12.0
92 M2 28847 A	0.17	0.20	0.51	0.33	4.35
92 M2 28847 B	0.23	0.35	0.53	0.55	8.03
92 M3 38849 A	0.16	0.19	0.55	0.41	7.08
92 M3 38849 B	0.15	0.18	0.50	0.49	8.70
92 M3 38850 A	0.092	0.12	0.23	0.44	8.45
92 M3 38850 B	0.10	0.13	0.33	0.43	8.31
92 M3 38851 A	0.081	0.13	0.32	0.76	16.6
92 M3 38851 B	0.10	0.14	0.37	0.65	14.3

All 92 M1 samples were excluded from Composite M92, they remain at minus 1/4 inch in cold storage. The remaining bags were combined and crushed to nominal minus 10 mesh. A head sample was removed for analysis and size analysis. Twenty 2 kilogram charges and eight 40 kilogram charges were stored in 2 barrels at minus 5° C. This composite was used for flotation testwork.

Screen Analysis Composite M92

Mesh Size (Tyler)	Micron Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 10	1,651	3.2	3.2	96.8
14	1,168	13.2	16.4	83.6
20	833	10.5	26.9	73.1
28	589	9.2	36.2	63.8
35	417	7.2	43.3	56.7
48	295	7.1	50.4	49.6
65	208	6.2	56.6	43.4
100	147	5.8	62.4	37.6
150	104	4.9	67.3	32.7
200	74	4.3	71.6	28.4
270	53	4.0	75.7	24.3
400	38	4.1	79.8	20.2
- 400	- 38	20.2	100.0	-
	Total	100.0	-	-

REAGENTS

$Ca(OH)_2$	Calcium Hydroxide	Nymoc Chemicals
Na_2CO_3	Sodium Carbonate	Fisher Scientific
SO_2	Sulphur Dioxide H_2SO_3	Fisher Scientific
Na_2S	Sodium Sulphide	Nymoc Chemicals
$CuSO_4 \cdot 5H_2O$	Copper Sulphate	Nymoc Chemicals
NaCl	Sodium Chloride	Nymoc Chemicals
Aerofloat 208 promoter	Dithiophosphate collector	Cyanamid
Aero 3477 promoter	Dithiophosphate collector	Cyanamid
Aero 404 promoter	Mercaptobenzothizole collector	Cyanamid
Aero 3501 promoter	Dithiophosphate collector	Cyanamid
Pennfloat 3	Dodecyl Mercaptan collector	Pennwalt
SIPX	Sodium IsoPropyl Xanthate	Hoechst
PAX	Potassium Amyl Xanthate	Hoechst
MIBC	Me:hyl IsoButyl Carbinol	CIL Chemicals
DF250C	polyglycol frother	Dow
TEB	Triethoxy butane frother	Stanfroth
WC 9524	Wheat Dextrine	Ogilive
PA MED	Carboxyl Methyl Cellulose	Aqualon
CMC 7LT	Carboxyl Methyl Cellulose medium viscosity	Aqualon
Jaguar MDD	Guar depressant	Hi Tek
Percol 156	Anionic polyacrylamide flocculant	Allied Colloids

Percol 611	Anionic polyacrylamide flocculant, very high molecular wt	Allied Colloids
Percol 351	Non ionic polyacrylamide flocculant	Allied Colloids
Percol 352	Cationic polyacrylamide flocculant, low molecular wt	Allied Colloids
Percol 368	Cationic polyacrylamide flocculant, high molecular wt	Allied Colloids

DETAILS OF TESTWORK

Comp M92 - Calculated Heads from Testwork

Au	Pt	Pd	Ni	Cu	S
0.65	0.60	11.0	0.22	0.17	
0.63	0.64	11.4	0.23	0.17	
0.53	0.58	10.7	0.22	0.16	0.93
0.52	0.57	10.4	0.23	0.17	
0.53	0.56	10.4	0.23	0.17	
0.60	0.54	9.63	0.21	0.16	
0.61	0.59	10.3	0.22	0.17	
0.59	0.63	10.6	0.22	0.17	
0.54	0.58	10.7	0.21	0.17	
0.61	0.58	10.6	0.22	0.17	
0.57	0.58	10.4	0.23	0.17	
0.66	0.62	10.6	0.23	0.19	
0.56	0.56	10.2	0.22	0.17	
0.64	0.60	11.0	0.23	0.18	
0.62	0.57	10.2	0.22	0.17	
0.52	0.60	10.9	0.23	0.18	
0.69	0.63	10.7	0.23	0.18	
0.62	0.63	11.0	0.23	0.19	
0.63	0.55	10.7	0.23	0.18	
0.66	0.57	10.9	0.21	0.18	
0.57	0.54	10.5	0.23	0.18	
0.56	0.57	10.5	0.23	0.17	0.88
0.53	0.58	11.0	0.23	0.18	0.88
0.52	0.59	10.8	0.23	0.18	0.87
0.56	0.56	10.8	0.23	0.18	0.89
0.55	0.56	10.4	0.24	0.18	0.87
0.54	0.55	10.6	0.24	0.18	0.90
0.52	0.55	10.5	0.22	0.17	0.88
0.53	0.56	10.9	0.24	0.18	0.92
0.58	0.55	10.1	0.23	0.18	0.94
0.55	0.58	10.5	0.22	0.19	0.90
0.62	0.55	10.1	0.25	0.20	0.89
0.58	0.58	10.6	0.23	0.18	0.90 Average
0.69	0.64	11.4	0.25	0.20	0.94 High
0.52	0.54	9.63	0.21	0.16	0.87 Low
0.050	0.028	0.346	0.009	0.009	0.023 Std Dev

LAKEFIELD RESEARCH

Standard Bond Ball Mill Grindability Test

Project No. 4255 | **Product: Minus 10 Mesh** | **Date: 22-May-92**

Sample: Roby Zone

Purpose: To determine the ball mill grindability of the sample in terms of a Bond work index number.

Procedure: The equipment and procedure duplicate the Bond method for determining ball mill work indices.

Test Conditions:

Mesh of grind:		150 mesh
Test feed weight (700 mL):		1256 grams
Equivalent to :	1794 kg/m^3 at Minus 6 mesh	
Weight % of the undersize material in the ball mill feed		16.3 %
Weight of undersize product for 100% circulating load:		359 grams

Results: Average for last three stages = 360 g : 249 % circulation load

CALCULATION OF A BOND WORK INDEX

$$\boxed{BWI = \frac{44.5}{P1^{0.23} \times Grp^{0.82} \times \left\{\frac{10}{\sqrt{P}} - \frac{10}{\sqrt{F}}\right\}}}$$

P1 = 100% passing size of the product	104 microns
Grp = Grams per revolution	1.06 grams
P80 = 80% passing size of product	78 microns
F80 = 80% passing size of the feed	1328 microns

BWI = 16.9 (imperial)

BWI = 18.6 (metric)

Stage No.	Revs	New Feed (grams)	Undersize In Feed (grams)	Undersize To Be Ground (grams)	U'Size In Product (grams)	Undersize Product Total (grams)	Undersize Product Per Mill Rev (grams)
1	150	1,256	205	154	398	193	1.29
2	228	398	65	294	311	246	1.08
3	286	311	51	308	347	296	1.04
4	291	347	57	302	368	311	1.07
5	280	368	60	299	364	304	1.09

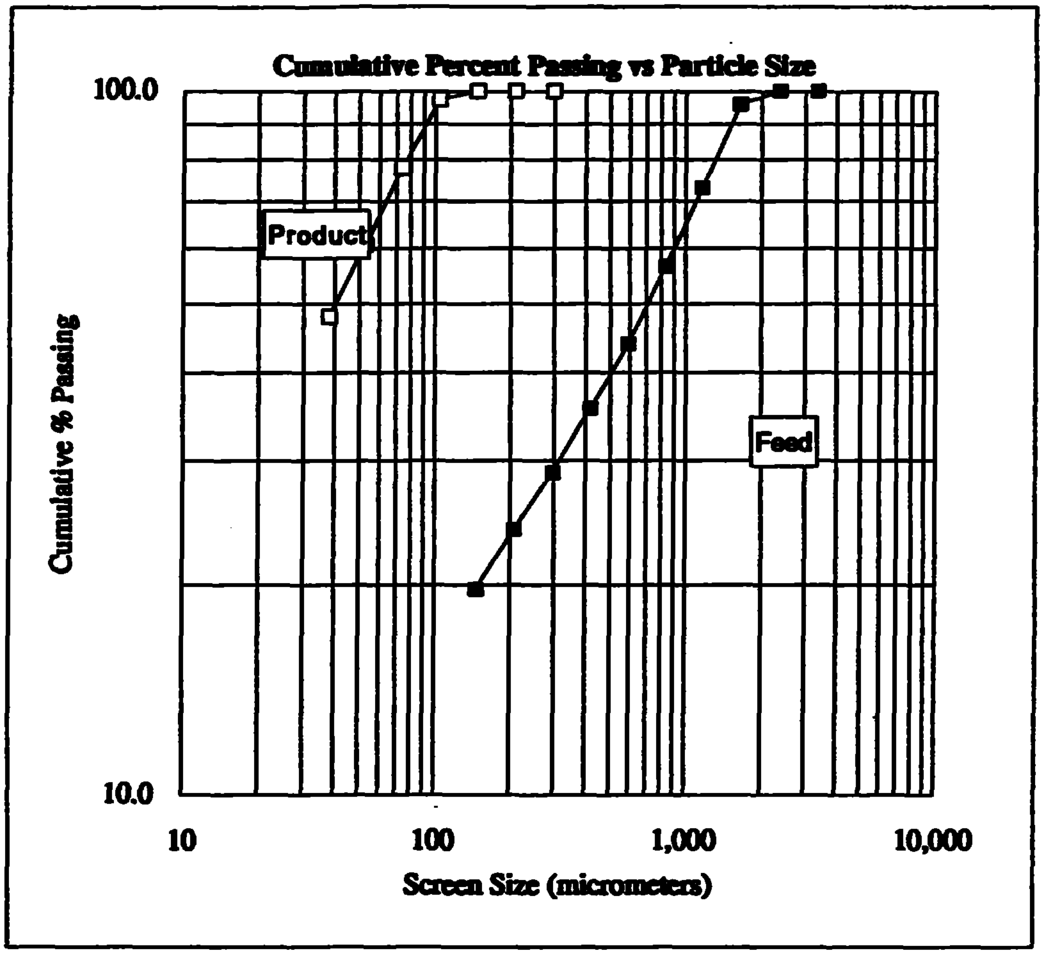
Average for Last Three Stages = 1.06

Feed K80

Size Mesh	Size µm	Weight grams	% Retained Individual	% Retained Cumulative	% Passing Cumulative
6	3,327	0.0	0.0	0.0	100.0
8	2,362	0.0	0.0	0.0	100.0
10	1,651	4.2	4.2	4.2	95.8
14	1,168	22.8	22.8	27.0	73.0
20	833	16.4	16.4	43.4	56.6
28	589	12.8	12.8	56.2	43.8
35	417	8.2	8.2	64.4	35.6
48	295	6.7	6.7	71.1	28.9
65	208	4.9	4.9	76.0	24.0
100	147	4.3	4.3	80.3	19.7
150	104	3.3	3.3	83.6	16.4
200	74	2.7	2.7	86.3	13.7
270	53	2.1	2.1	88.4	11.6
400	38	2.4	2.4	90.8	9.2
Pan	-38	9.2	9.2	100.0	0.0
Total	-	100.0	100.0	-	-
K80	1,328				

Product K80

Size Mesh	Size µm	Weight grams	% Retained Individual	% Retained Cumulative	% Passing Cumulative
48	295	0.0	0.0	0.0	100.0
65	208	0.0	0.0	0.0	100.0
100	147	0.0	0.0	0.0	100.0
150	104	3.7	2.6	2.6	97.4
200	74	27.8	19.5	22.1	77.9
270	53	24.4	17.1	39.2	60.8
400	38	18.3	12.8	52.0	48.0
Pan	-38	68.4	48.0	100.0	0.0
Total	-	142.6	100.0	-	-
K80	78				


Cumulative Percent Passing vs Particle Size
100.0
10.0
10
100
1,000
10,000
Cumulative % Passing
Screen Size (micrometers)
Product
Feed

LAKEFIELD RESEARCH

Standard Bond Ball Mill Grindability Test

Project No. 4255 | Product: Minus 10 Mesh | Date: May 22,1992

Sample: Comp. M92

Purpose: To determine the ball mill grindability of the sample in terms of a Bond work index number.

Procedure: The equipment and procedure duplicate the Bond method for determining ball mill work indices.

Test Conditions:

Mesh of grind:		150 mesh
Test feed weight (700 mL):		1397 grams
Equivalent to :	1996 kg/m^3 at Minus 6 mesh	
Weight % of the undersize material in the ball mill feed		32.7 %
Weight of undersize product for 100% circulating load:		399 grams

Results: Average for last two stages = 396 g : 253 % circulation load

CALCULATION OF A BOND WORK INDEX

$$BWI = \frac{44.5}{P1^{0.23} \times Grp^{0.82} \times \left\{ \frac{10}{\sqrt{P}} - \frac{10}{\sqrt{F}} \right\}}$$

P1 = 100% passing size of the product	104 microns
Grp = Grams per revolution	1.38 grams
P80 = 80% passing size of product	75 microns
F80 = 80% passing size of the feed	1053 microns

BWI = 13.9 (imperial)

BWI = 15.3 (metric)

Grindability Test Data | Project No. 4255 | Sample: Comp. M92

Stage No.	Revs	New Feed (grams)	Undersize In Feed (grams)	Undersize To Be Ground (grams)	U'Size In Product (grams)	Undersize Product Total (grams)	Undersize Product Per Mill Rev (grams)
1	150	1,397	457	-58	628	171	1.14
2	170	628	205	194	455	250	1.47
3	170	455	149	250	394	245	1.44
4	188	394	129	270	405	276	1.47
5	164	405	132	267	365	233	1.42
6	197	365	119	280	393	274	1.39
7	195	393	129	271	398	269	1.38

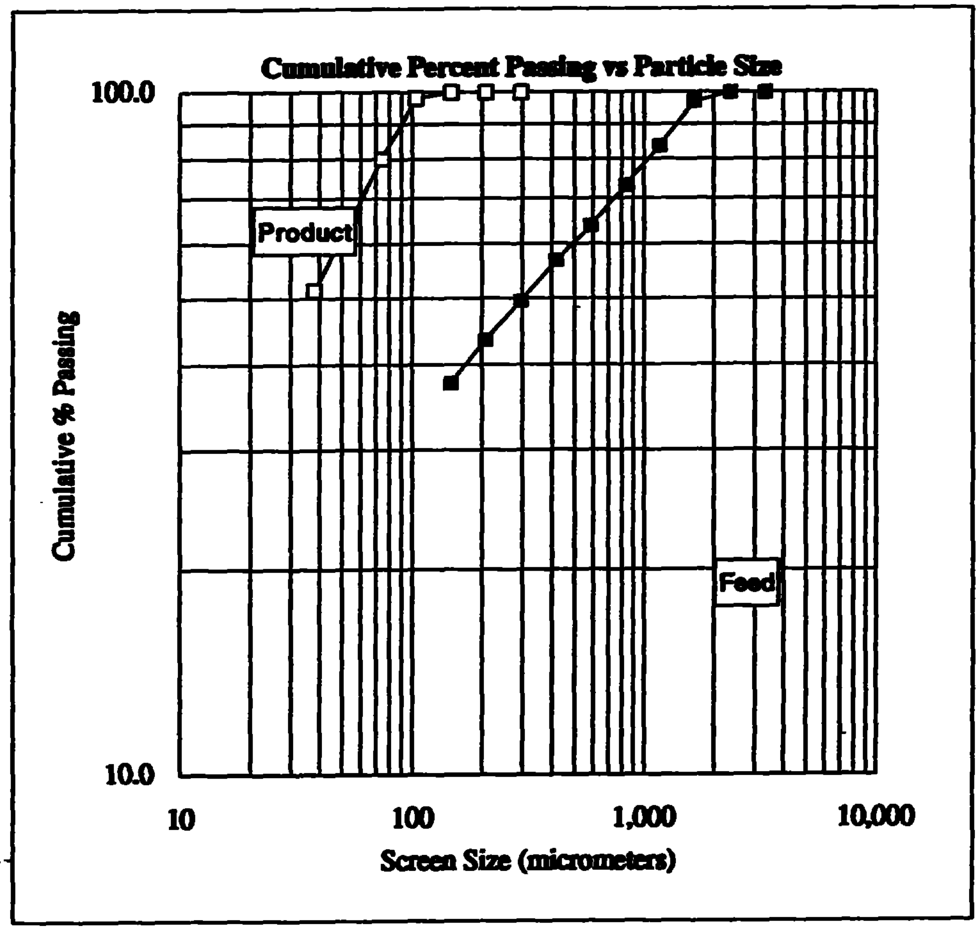
Average for Last Two Stages = 1.38

Feed K80

Size Mesh	Size µm	Weight grams	% Retained Individual	% Retained Cumulative	% Passing Cumulative
6	3,327	0.0	0.0	0.0	100.0
8	2,362	0.0	0.0	0.0	100.0
10	1,651	19.7	3.2	3.2	96.8
14	1,168	81.0	13.2	16.4	83.6
20	833	64.2	10.5	26.9	73.1
28	589	56.6	9.2	36.2	63.8
35	417	43.8	7.2	43.3	56.7
48	295	43.6	7.1	50.4	49.6
65	208	37.9	6.2	56.6	43.4
100	147	35.7	5.8	62.4	37.6
150	104	29.9	4.9	67.3	32.7
200	74	26.4	4.3	71.6	28.4
270	53	24.7	4.0	75.7	24.3
400	38	25.4	4.1	79.8	20.2
Pan	-38	123.6	20.2	100.0	0.0
Total	-	612.5	100.0	-	-
K80	1,053				

Product K80

Size Mesh	Size µm	Weight grams	% Retained Individual	% Retained Cumulative	% Passing Cumulative
48	295	0.0	0.0	0.0	100.0
65	208	0.0	0.0	0.0	100.0
100	147	0.0	0.0	0.0	100.0
150	104	2.8	2.1	2.1	97.9
200	74	24.3	17.9	19.9	80.1
270	53	22.1	16.3	36.2	63.8
400	38	17.0	12.5	48.7	51.3
Pan	-38	69.8	51.3	100.0	0.0
Total	-	136.0	100.0	-	-
K80	75				


Cumulative Percent Passing vs Particle Size
100.0
10.0
Cumulative % Passing
Product
Feed
10
100
1,000
10,000
Screen Size (micrometers)

Test: 1 Project: 4255 Date: Feb 19/92 Operator: BW

Purpose: To repeat conditions of testwork provided by Lac des Iles.

Procedure: Targeted flotation feed size 38.7% minus 200 mesh, assuming a Wi of 16
Actual flotation feed size 60.8% minus 200 mesh

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 15 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	R208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							15			8.8
Condition 1		2000							2		10.5
2				250					5		10.2
3			400		10	100			3		10.2
Rougher 1							25		1	3	
2							12.5		1	5	
Scavenger 1	100					100	12.5		2	5	10.0
2	25					50	12.5		2	5	-

Microns	Mesh	Weight Grams	% Weight		
			Ind.	Cum.	Passing
295	48	3.5	3.5	3.5	96.5
208	65	5.9	5.9	9.4	90.6
147	100	9.9	9.9	19.3	80.7
104	150	10.6	10.6	29.9	70.1
74	200	9.3	9.3	39.2	60.8
53	270	8.0	8.0	47.2	52.8
38	400	8.8	8.8	56.0	44.0
-38	-400	44.0	44.0	100.0	-
	Total	100.0	100.0	-	-

Test: 1

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	80.2	4.1	7.18	6.45	137	2.95	3.40	13.5	47.7	47.6	55.3	48.0	68.4	62.1
2 CuNi Ro Conc 2	73.4	3.7	2.26	1.76	32.8	0.71	0.44	5.00	13.7	11.9	12.1	10.6	8.1	21.0
3 CuNi Sc Conc 1	53.7	2.7	2.14	1.60	22.1	0.41	0.42	2.70	9.5	7.9	6.0	4.5	5.7	8.3
4 CuNi Sc Conc 2	44.0	2.2	0.62	0.68	9.90	0.25	0.18	0.68	2.3	2.8	2.2	2.2	2.0	1.7
5 Cu Ni Scav Tail	1708.0	87.2	0.19	0.19	2.84	0.100	0.037	0.070	26.9	29.9	24.4	34.7	15.9	6.9
Head (calc)	1959.3	100.0	0.62	0.55	10.1	0.25	0.20	0.89	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		7.8	4.83	4.21	87.2	1.88	1.99	9.44	61.4	59.5	67.4	58.6	76.5	83.1
CuNi Sc Conc (3 + 4)		5.0	1.46	1.19	16.6	0.34	0.31	1.79	11.8	10.7	8.2	6.7	7.6	10.0
Ro + Sc Conc (1 to 4)		12.8	3.52	3.03	59.8	1.28	1.33	6.46	73.1	70.1	75.6	65.3	84.1	93.1

Test: 2 Project: 4255 Date: Feb 21/92 Operator: BW

Purpose: To repeat conditions of Test 1 and target a primary grind size of 38.7% minus 200 mesh.

Procedure: Targeted flotation feed size 38.7% minus 200 mesh, assuming a Wi of 16
Actual flotation feed size 47% minus 200 mesh

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 7.5 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	R208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							7.5			8.8
Condition 1		2000							2		10.2
2				250					5		10.2
3			400		10	100			3		10.2
Rougher 1							37.5		1	3	
2							25		1	5	
Scavenger 1	100					100	-		2	5	10.1
2	25					50	12.5		2	5	10.0

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Passing
1,651	10	0.6	0.2	0.2	99.8
1,168	14	6.1	1.8	2.0	98.0
833	20	8.9	2.6	4.6	95.4
589	28	14.0	4.1	8.7	91.3
417	35	18.3	5.4	14.0	86.0
295	48	28.1	8.2	22.2	77.8
208	65	29.5	8.6	30.9	69.1
147	100	29.2	8.5	39.4	60.6
104	150	25.7	7.5	46.9	53.1
74	200	22.1	6.5	53.4	46.6
53	270	21.0	6.1	59.5	40.5
38	400	24.5	7.2	66.7	33.3
-38	-400	113.8	33.3	100.0	-
	Total	341.8	100.0	-	-

Test: 2

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	88.3	4.4	5.60	6.12	131	2.10	2.32	12.3	44.9	46.5	55.5	41.7	54.4	60.7
2 CuNi Ro Conc 2	130.9	6.6	0.87	1.10	20.2	0.45	0.29	2.88	10.3	12.4	12.6	13.3	10.1	21.1
3 CuNi Sc Conc 1	71.1	3.6	0.84	1.17	18.8	0.34	0.24	1.47	5.4	7.2	6.4	5.4	4.5	5.8
4 CuNi Sc Conc 2	58.6	3.0	0.41	0.57	8.55	0.21	0.15	0.45	2.2	2.9	2.4	2.8	2.3	1.5
5 Cu Ni Scav Tail	1637.3	82.4	0.25	0.22	2.95	0.100	0.066	0.12	37.2	31.0	23.1	36.8	28.7	11.0
Head (calc)	1986.2	100.0	0.55	0.58	10.5	0.22	0.19	0.90	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		11.0	2.78	3.12	65.0	1.11	1.11	6.67	55.2	58.9	68.1	55.0	64.5	81.7
CuNi Sc Conc (3 + 4)		6.5	0.65	0.90	14.2	0.28	0.20	1.01	7.6	10.0	8.8	8.2	6.9	7.3
Ro + Sc Conc (1 to 4)		17.6	1.98	2.30	46.1	0.80	0.77	4.57	62.8	69.0	76.9	63.2	71.3	89.0

Test: 3 Project: 4255 Date: Feb 19/92 Operator: BW

Purpose: To repeat conditions of Test 1 but target a primary grind size of 80% minus 200 mesh.

Procedure: Targeted flotation feed size 80% minus 200 mesh
Actual flotation feed size 90% minus 200 mesh

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	A208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							45			8.8
Condition 1		2000							2		10.5
2				250					5		10.1
3			400		10	100			3		10.1
Rougher 1							25		1	3	
2							12.5		1	5	
Scavenger 1	100					100	12.5		2	5	10.0
2	25					50	12.5		2	5	10.0

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Passing
208	65	0.1	0.1	0.1	99.9
147	100	0.4	0.4	0.5	99.5
104	150	2.6	2.6	3.1	96.9
74	200	6.9	6.9	10.0	90.0
53	270	11.8	11.8	21.8	78.2
38	400	14.6	14.6	36.4	63.6
-38	-400	63.6	63.6	100.0	-
	Total	100.0	100.0	-	-

Test: 3

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	128.3	6.5	6.03	5.44	114	1.86	2.18	11.2	67.2	64.9	73.4	52.8	78.6	77.7
2 CuNi Ro Conc 2	107.0	5.4	0.68	0.84	14.0	0.32	0.21	2.53	6.3	8.4	7.5	7.6	6.3	14.6
3 CuNi Sc Conc 1	72.0	3.7	0.40	0.55	8.93	0.21	0.11	0.61	2.5	3.7	3.2	3.3	2.2	2.4
4 CuNi Sc Conc 2	70.8	3.6	0.31	0.35	5.33	0.16	0.084	0.25	1.9	2.3	1.9	2.5	1.7	1.0
5 Cu Ni Scav Tail	1592.4	80.8	0.16	0.14	1.74	0.096	0.025	0.050	22.1	20.7	13.9	33.8	11.2	4.3
Head (calc)	1970.5	100.0	0.58	0.55	10.1	0.23	0.18	0.94	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		11.9	3.60	3.35	68.5	1.16	1.28	7.26	73.5	73.3	81.0	60.3	84.9	92.4
CuNi Sc Conc (3 + 4)		7.2	0.36	0.45	7.15	0.19	0.097	0.43	4.4	6.0	5.1	5.8	3.9	3.3
Ro + Sc Conc (1 to 4)		19.2	2.37	2.25	45.3	0.79	0.84	4.68	77.9	79.3	86.1	66.2	88.8	95.7

Test: 4 Project: 4255 Date: Feb 26/92 Operator: BW

Purpose: To repeat conditions of Test 3 without Na2CO3.

Procedure: As shown Below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	CMC 7LT	CuSO4	R208	PAX	DF 250C		Grind	Cond.	Froth	
Primary Grind	250							45			8.5
Condition 1			250						5		8.2
2		400		10	100				3		8.2
Rougher 1						37.5			1	3	
2						25			1	5	
Scavenger 1	100				100	-			2	5	8.7
2	25				50	12.5			2	5	8.7

Test: 4

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	98.5	5.0	7.27	7.54	165	2.35	2.73	12.8	67.4	66.9	74.7	49.5	73.9	69.3
2 CuNi Ro Conc 2	210.8	10.6	0.42	0.53	9.00	0.25	0.17	1.82	8.3	10.1	8.7	11.3	9.8	21.1
3 CuNi Sc Conc 1	107.6	5.4	0.29	0.37	6.42	0.20	0.11	0.69	2.9	3.6	3.2	4.6	3.3	4.1
4 CuNi Sc Conc 2	104.6	5.3	0.20	0.25	4.12	0.15	0.074	0.27	2.0	2.4	2.0	3.4	2.1	1.6
5 Cu Ni Scav Tail	1466.0	73.8	0.14	0.13	1.69	0.100	0.027	0.050	19.3	17.2	11.4	31.3	10.9	4.0
Head (calc)	1987.5	100.0	0.53	0.56	10.9	0.24	0.18	0.92	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		15.6	2.60	2.76	58.7	0.92	0.99	5.32	75.8	76.9	83.5	60.7	83.7	90.3
CuNi Sc Conc (3 + 4)		10.7	0.25	0.31	5.29	0.18	0.092	0.48	4.9	5.9	5.2	8.0	5.4	5.6
Ro + Sc Conc (1 to 4)		26.2	1.64	1.76	37.0	0.62	0.62	3.35	80.7	82.8	88.6	68.7	89.1	96.0

Test: 5 **Project:** 4255 **Date:** Feb 26/92 **Operator:** BW

Purpose: To repeat conditions of Test 3 at pH 6.5 with SO2.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	SO2	CMC 7LT	CuSO4	R208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							45			8.6
Condition 1		600							2		6.5
2				250					5		6.5
3			400		10	100			3		6.5
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	100	150				100	12.5		2	5	6.5
2	25	75				50	12.5		2	5	6.5

Test: 5

Metallurgical Balance

Product	Weight g	Weight %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	% Distribution Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	186.6	9.4	3.78	4.07	82.1	1.25	1.52	8.06	68.1	68.9	73.5	52.8	81.7	85.6
2 CuNi Ro Conc 2	210.2	10.6	0.41	0.51	9.67	0.24	0.12	0.71	8.3	9.7	9.7	11.4	7.3	8.5
3 CuNi Sc Conc 1	156.1	7.9	0.24	0.33	5.48	0.16	0.058	0.30	3.6	4.7	4.1	5.7	2.6	2.7
4 CuNi Sc Conc 2	104.7	5.3	0.19	0.23	3.42	0.13	0.050	0.16	1.9	2.2	1.7	3.1	1.5	1.0
5 Cu Ni Scav Tail	1330.4	66.9	0.14	0.12	1.72	0.090	0.018	0.030	18.0	14.5	11.0	27.1	6.9	2.3
Head (calc)	1988.0	100.0	0.52	0.55	10.5	0.22	0.17	0.88	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		20.0	1.99	2.18	43.7	0.71	0.78	4.17	76.5	78.7	83.2	64.2	89.0	94.1
CuNi Sc Conc (3 + 4)		13.1	0.22	0.29	4.65	0.15	0.055	0.24	5.5	6.9	5.8	8.7	4.1	3.6
Ro + Sc Conc (1 to 4)		33.1	1.29	1.43	28.2	0.49	0.49	2.61	82.0	85.5	89.0	72.9	93.1	97.7

Test: 6 Project: 4255 Date: Feb 27/92 Operator: BW

Purpose: To repeat conditions of Test 3 with 404 in place of A208.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	404	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							45			8.6
Condition 1		2000							2		10.3
2				250					5		10.0
3			400		10	100			3		10.0
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	100					100	12.5		2	5	10.0
2	25					50	12.5		2	5	9.9

Test: 6

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	132.0	6.7	5.73	5.64	119	1.74	2.10	9.89	70.8	68.2	74.6	48.2	76.0	73.0
2 CuNi Ro Conc 2	155.6	7.8	0.53	0.68	11.9	0.31	0.17	2.23	7.7	9.7	8.8	10.1	7.3	19.4
3 CuNi Sc Conc 1	88.6	4.5	0.28	0.40	6.78	0.20	0.085	0.46	2.3	3.2	2.9	3.7	2.1	2.3
4 CuNi Sc Conc 2	82.1	4.1	0.27	0.27	4.39	0.16	0.074	0.22	2.1	2.0	1.7	2.8	1.7	1.0
5 Cu Ni Scav Tail	1526.5	76.9	0.12	0.12	1.67	0.11	0.031	0.050	17.1	16.8	12.1	35.2	13.0	4.3
Head (calc)	1984.8	100.0	0.54	0.55	10.6	0.24	0.18	0.90	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		14.5	2.92	2.96	61.1	0.97	1.06	5.75	78.5	77.9	83.3	58.3	83.3	92.4
CuNi Sc Conc (3 + 4)		8.6	0.28	0.34	5.63	0.18	0.080	0.34	4.4	5.3	4.6	6.5	3.7	3.3
Ro + Sc Conc (1 to 4)		23.1	1.93	1.98	40.4	0.67	0.69	3.73	82.9	83.2	87.9	64.8	87.0	95.7

Test: 7 Project: 4255 Date: Feb 27/92 Operator: BW

Purpose: To repeat conditions of Test 3 with 3501 in place of A208.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							45			8.7
Condition 1		2000							2		10.3
2				250					5		10.0
3			400		10	100			3		10.0
Rougher 1							50		1	3	
2							25		1	5	
Scavenger 1	100					100	12.5		2	5	10.0
2	25					50	12.5		2	5	9.9

Test: 7

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	128.2	6.5	6.15	5.86	120	1.82	2.18	10.0	72.4	68.0	74.3	49.0	78.9	74.5
2 CuNi Ro Conc 2	194.5	9.8	0.47	0.60	10.6	0.34	0.15	1.69	8.4	10.6	10.0	13.9	8.2	19.1
3 CuNi Sc Conc 1	105.2	5.3	0.27	0.37	5.89	0.17	0.088	0.33	2.6	3.5	3.0	3.8	2.6	2.0
4 CuNi Sc Conc 2	79.6	4.0	0.23	0.27	4.10	0.16	0.065	0.21	1.7	1.9	1.6	2.7	1.5	1.0
5 Cu Ni Scav Tail	1474.0	74.4	0.11	0.12	1.57	0.099	0.021	0.040	14.9	16.0	11.2	30.7	8.7	3.4
Head (calc)	1981.5	100.0	0.55	0.56	10.4	0.24	0.18	0.87	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		16.3	2.73	2.69	54.1	0.93	0.96	4.99	80.8	78.5	84.3	62.9	87.2	93.6
CuNi Sc Conc (3 + 4)		9.3	0.25	0.33	5.12	0.17	0.078	0.28	4.3	5.5	4.6	6.4	4.1	3.0
Ro + Sc Conc (1 to 4)		25.6	1.83	1.83	36.2	0.65	0.64	3.28	85.1	84.0	88.8	69.3	91.3	96.6

Test: 8 Project: 4255 Date: March 4/92 Operator: BW

Purpose: To repeat conditions of Test 7 with SIPX in place of PAX.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	SIPX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250							45			8.5
Condition 1		2000							2		10.3
2				250					5		10.0
3			400		10	100			3		9.9
Rougher 1							50		1	3	
2							25		1	5	
Scavenger 1	100					100	12.5		2	5	9.9
2	25					50	12.5		2	5	9.8

Test: 8

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	181.2	9.2	4.39	4.60	91.2	1.33	1.55	7.96	72.0	74.6	77.4	53.3	80.2	81.7
2 CuNi Ro Conc 2	196.6	9.9	0.49	0.47	8.39	0.22	0.11	1.12	8.7	8.3	7.7	9.6	6.2	12.5
3 CuNi Sc Conc 1	129.1	6.5	0.25	0.30	5.03	0.16	0.075	0.28	2.9	3.5	3.0	4.6	2.8	2.0
4 CuNi Sc Conc 2	75.3	3.8	0.17	0.18	3.23	0.14	0.060	0.15	1.2	1.2	1.1	2.3	1.3	0.6
5 Cu Ni Scav Tail	1397.5	70.6	0.12	0.10	1.63	0.098	0.024	0.040	15.2	12.5	10.7	30.3	9.6	3.2
Head (calc)	1979.7	100.0	0.56	0.56	10.8	0.23	0.18	0.89	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						

Combined Products

CuNi Ro Conc (1 + 2)		19.1	2.36	2.45	48.1	0.75	0.80	4.40	80.7	82.8	85.1	62.8	86.4	94.1
CuNi Sc Conc (3 + 4)		10.3	0.22	0.26	4.37	0.15	0.069	0.23	4.1	4.7	4.2	6.9	4.1	2.7
Ro + Sc Conc (1 to 4)		29.4	1.61	1.68	32.8	0.54	0.54	2.94	84.8	87.5	89.3	69.7	90.4	96.8

Test: 9 Project: 4255 Date: March 4/92 Operator: BW

Purpose: To repeat conditions of Test 7 with MIBC in place of DF250C.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	250							45			8.6
Condition 1		2000							2		10.2
2				250					5		10.0
3			400		10	100			3		10.0
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	100					100	12.5		2	5	10.0
2	25					50	12.5		2	5	10.0

Test: 9

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	132.1	6.7	5.50	6.19	125	1.86	2.16	11.0	71.0	70.6	77.7	53.8	80.7	84.5
2 CuNi Ro Conc 2	104.2	5.3	0.35	0.48	8.52	0.25	0.12	1.32	3.6	4.3	4.2	5.7	3.5	8.0
3 CuNi Sc Conc 1	89.1	4.5	0.29	0.43	7.04	0.19	0.099	0.41	2.5	3.3	3.0	3.7	2.5	2.1
4 CuNi Sc Conc 2	58.7	3.0	0.22	0.23	4.16	0.16	0.070	0.21	1.3	1.2	1.1	2.1	1.2	0.7
5 Cu Ni Scav Tail	1586.4	80.5	0.14	0.15	1.87	0.100	0.027	0.050	21.7	20.6	14.0	34.7	12.1	4.6
Head (calc)	1970.5	100.0	0.52	0.59	10.8	0.23	0.18	0.87	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		12.0	3.23	3.67	73.6	1.15	1.26	6.73	74.5	75.0	81.9	59.5	84.2	92.5
CuNi Sc Conc (3 + 4)		7.5	0.26	0.35	5.90	0.18	0.087	0.33	3.8	4.5	4.1	5.8	3.7	2.8
Ro + Sc Conc (1 to 4)		19.5	2.09	2.39	47.6	0.78	0.81	4.27	78.3	79.4	86.0	65.3	87.9	95.4

Test: 10 Project: 4255 Date: March 4/92 Operator: BW

Purpose: To repeat conditions of Test 7 with TEB in place of DF250C.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	TEB	Grind	Cond.	Froth	
Primary Grind	250							45			8.5
Condition 1		2000							2		10.2
2				250					5		10.0
3			400		10	100			3		9.9
Rougher 1							37.5		1	3	
2							25		1	5	
Scavenger 1	100					100	12.5		2	5	9.9
2	25					50	12.5		2	5	9.9

Test: 10

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	142.8	7.2	4.95	5.44	115	1.71	2.00	10.3	67.8	68.3	75.2	54.8	80.6	84.8
2 CuNi Ro Conc 2	150.9	7.6	0.35	0.44	7.65	0.23	0.12	1.05	5.1	5.8	5.3	7.8	5.1	9.1
3 CuNi Sc Conc 1	129.4	6.5	0.28	0.34	5.57	0.16	0.079	0.29	3.5	3.9	3.3	4.6	2.9	2.2
4 CuNi Sc Conc 2	48.4	2.4	0.13	0.19	3.40	0.16	0.059	0.17	0.6	0.8	0.8	1.7	0.8	0.5
5 Cu Ni Scav Tail	1504.7	76.1	0.16	0.16	2.24	0.092	0.025	0.040	23.1	21.2	15.4	31.1	10.6	3.5
Head (calc)	1976.2	100.0	0.53	0.58	11.0	0.23	0.18	0.88	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		14.9	2.59	2.87	59.8	0.95	1.03	5.55	72.8	74.2	80.5	62.6	85.7	93.9
CuNi Sc Conc (3 + 4)		9.0	0.24	0.30	4.98	0.16	0.074	0.26	4.1	4.7	4.1	6.4	3.7	2.6
Ro + Sc Conc (1 to 4)		23.9	1.70	1.90	39.2	0.65	0.67	3.55	76.9	78.8	84.6	68.9	89.4	96.5

Test: 11 Project: 4255 Date: Feb 27/92 Operator: BW

Purpose: To repeat conditions of Test 3 without Na2S.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2CO3	CMC 7LT	CuSO4	A208	PAX	DF 250C		Grind	Cond.	Froth	
Primary Grind								45			8.5
Condition 1	2000								2		10.2
2			250						5		9.9
3		400		10	100				3		9.8
Rougher 1						50			1	3	
2						25			1	5	
Scavenger 1					100	12.5			2	5	9.7
2					50	12.5			2	5	9.6

Test: 11

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	118.9	6.0	6.51	6.08	123	1.81	2.28	10.7	69.9	64.4	70.2	47.2	78.6	73.3
2 CuNi Ro Conc 2	156.5	7.9	0.57	0.76	14.7	0.34	0.16	2.15	8.1	10.6	11.0	11.7	7.3	19.4
3 CuNi Sc Conc 1	97.3	4.9	0.27	0.43	7.64	0.21	0.087	0.49	2.4	3.7	3.6	4.5	2.5	2.7
4 CuNi Sc Conc 2	76.9	3.9	0.24	0.31	4.94	0.18	0.069	0.24	1.7	2.1	1.8	3.0	1.5	1.1
5 Cu Ni Scav Tail	1531.0	77.3	0.13	0.14	1.81	0.100	0.023	0.040	18.0	19.1	13.3	33.6	10.2	3.5
Head (calc)	1980.6	100.0	0.56	0.57	10.5	0.23	0.17	0.88	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		13.9	3.13	3.06	61.5	0.97	1.08	5.84	78.0	75.0	81.3	58.9	85.8	92.7
CuNi Sc Conc (3 + 4)		8.8	0.26	0.38	6.45	0.20	0.079	0.38	4.0	5.9	5.4	7.5	4.0	3.8
Ro + Sc Conc (1 to 4)		22.7	2.02	2.02	40.1	0.67	0.69	3.73	82.0	80.9	86.7	66.4	89.8	96.5

Test: 12 Project: 4255 Date: Mar. 3/92 Operator: BW

Purpose: To repeat conditions of Test 11 with 125 g/t Na_2S to the primary grind and 50 g/t Na_2S to the 1st scavenger.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	A208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.4
Condition 1		2000							2		10.1
2				250					5		10.0
3			400		10	100			3		10.0
Rougher 1							50		1	3	
2							25		1	5	
Scavenger 1	50					100	12.5		2	5	9.9
2						50	12.5		2	5	9.8

Test: 12

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	138.1	7.0	6.19	5.30	111	1.68	1.99	9.88	75.2	67.9	73.9	50.2	78.6	77.8
2 CuNi Ro Conc 2	170.6	8.6	0.46	0.62	11.2	0.28	0.15	1.65	6.9	9.8	9.2	10.3	7.3	16.0
3 CuNi Sc Conc 1	104.6	5.3	0.24	0.40	7.02	0.20	0.084	0.47	2.2	3.9	3.5	4.5	2.5	2.8
4 CuNi Sc Conc 2	82.0	4.1	0.18	0.24	3.87	0.15	0.060	0.18	1.3	1.8	1.5	2.7	1.4	0.8
5 Cu Ni Scav Tail	1488.2	75.0	0.11	0.12	1.64	0.100	0.024	0.030	14.4	16.6	11.8	32.2	10.2	2.5
Head (calc)	1983.5	100.0	0.57	0.54	10.5	0.23	0.18	0.88	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		15.6	3.02	2.71	55.8	0.91	0.97	5.33	82.1	77.7	83.2	60.6	85.9	93.8
CuNi Sc Conc (3 + 4)		9.4	0.21	0.33	5.64	0.18	0.073	0.34	3.5	5.7	5.1	7.2	3.9	3.6
Ro + Sc Conc (1 to 4)		25.0	1.96	1.82	36.9	0.63	0.63	3.45	85.6	83.4	88.2	67.8	89.8	97.5

Test: 13 Project: 4255 Date: March 13/92 Operator: BW

Purpose: To conduct a gravity test followed by a flotation test on the gravity tails using the conditions of Test 14.

Procedure: The sample was ground and tabled on a Wilfley table. The Wilfley table concentrate was upgraded on a Mozley table and this table concentrate was submitted for assays.(Au,Pt,Pd). The table tails were combined, thickened and became the flotation feed.

Feed: Approx. 2000g of gravity tails.

Grind: 2 kg of minus 10 mesh (Comp M92) ground for 45 minutes at 65 % solids in a laboratory ball mill

Conditions:

Stage	Reagents, g/t						Time, minutes			pH
	Na2S	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
										7.9
Condition 1	125							2		8.6
Condition 2			250					5		7.7
Condition 3		400		10	100			3		7.0
Rougher 1						50		1	3	
2						25		1	5	
Scavenger 1					100	12.5		2	5	7.9
2					50	12.5		2	5	7.9

NOTE : Rougher concentrates 1 and 2 in this test were combined as well as Scavenger concentrates 1 and 2.

Test: 13

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Mozley Conc.	4.7	0.2	74.1	20.5	402	-	-	27.2	8.7	9.0	-	-
2 CuNi Ro Conc	467.2	24.0	1.54	1.72	34.3	0.58	0.63	55.9	71.9	75.6	64.7	86.2
3 CuNi Sc Conc	269.0	13.8	0.23	0.27	4.52	0.15	0.072	4.8	6.5	5.7	9.3	5.7
4 Cu Ni Scav Tail	1206.4	62.0	0.13	0.12	1.70	0.090	0.023	12.2	13.0	9.7	25.9	8.1
Head (calc)	1947.3	100.0	0.66	0.57	10.9	0.21	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					
Combined Products												
Ro + Sc Conc (2 & 3)		37.8	1.06	1.19	23.4	0.42	0.43	60.7	78.4	81.4	74.1	91.9
Mozley + Ro Conc(1+2)		24.2	2.27	1.91	38.0	-	-	83.0	80.6	84.6	-	-
Comb Conc(1 to 3)		38.0	1.53	1.31	25.8	-	-	87.8	87.0	90.3	-	-

Test: 14 Project: 4255 Date: March 10/92 Operator: BW

Purpose: To conduct a flotation test with a reagent scheme derived from the best conditions from all of the reagent scoping test.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t						Time, minutes			pH
	Na2S	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125						45			8.7
Condition 1			250					5		8.2
Condition 2		400		10	100			3		8.1
Rougher 1						50		1	3	
2						25		1	5	
Scavenger 1					100	12.5		2	5	8.6
2					50	12.5		2	5	8.4

Test: 14

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	250.1	12.6	3.79	3.13	64.6	1.01	1.11	6.08	76.2	71.7	76.4	55.5	78.3	86.7
2 CuNi Ro Conc 2	168.8	8.5	0.38	0.54	8.62	0.22	0.14	0.79	5.2	8.4	6.9	8.2	6.7	7.6
3 CuNi Sc Conc 1	152.8	7.7	0.26	0.32	5.65	0.17	0.081	0.37	3.2	4.5	4.1	5.7	3.5	3.2
4 CuNi Sc Conc 2	81.5	4.1	0.23	0.27	4.58	0.16	0.076	0.21	1.5	2.0	1.8	2.9	1.7	1.0
5 Cu Ni Scav Tail	1330.1	67.1	0.13	0.11	1.73	0.095	0.026	0.020	13.9	13.4	10.9	27.8	9.8	1.5
Head (calc)	1983.3	100.0	0.63	0.55	10.7	0.23	0.18	0.88	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	1.03						
Combined Products														
CuNi Ro Conc (1 + 2)		21.1	2.42	2.09	42.0	0.69	0.72	3.95	81.4	80.1	83.3	63.7	85.0	94.3
CuNi Sc Conc (3 + 4)		11.8	0.25	0.30	5.28	0.17	0.079	0.31	4.7	6.5	5.8	8.6	5.2	4.2
Ro + Sc Conc (1 to 4)		32.9	1.64	1.45	28.9	0.50	0.49	2.64	86.1	86.6	89.1	72.2	90.2	98.5

Test: 15 Project: 4255 Date: Mar. 17/92 Operator: BW

Purpose: To repeat conditions of Test 12 with 3501 replacing A208.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.5
Condition 1		2000							2		10.1
2				250					5		9.8
3			400		10	100			3		9.7
Rougher 1							50		1	3	
2							25		1	5	
Scavenger 1	50					100	12.5		2	5	9.6
2						50	12.5		2	5	9.4

Test: 15

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 CuNi Ro Conc 1	184.5	9.6	4.72	4.90	88.3	1.32	1.58	72.5	74.2	76.9	55.2	81.4
2 CuNi Ro Conc 2	192.1	10.0	0.41	0.55	9.03	0.22	0.12	6.6	8.7	8.2	9.6	6.4
3 CuNi Sc Conc 1	154.5	8.0	0.25	0.32	5.09	0.16	0.075	3.2	4.1	3.7	5.6	3.2
4 CuNi Sc Conc 2	88.2	4.6	0.63	0.18	3.06	0.13	0.052	4.6	1.3	1.3	2.6	1.3
5 Cu Ni Scav Tail	1307.6	67.9	0.12	0.11	1.61	0.091	0.021	13.1	11.8	9.9	27.0	7.7
Head (calc)	1926.9	100.0	0.62	0.63	11.0	0.23	0.19	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					
Combined Products												
CuNi Ro Conc (1 + 2)		19.5	2.52	2.68	47.9	0.76	0.84	79.1	82.8	85.1	64.8	87.8
CuNi Sc Conc (3 + 4)		12.6	0.39	0.27	4.35	0.15	0.067	7.8	5.4	5.0	8.2	4.5
Ro + Sc Conc (1 to 4)		32.1	1.69	1.74	30.8	0.52	0.53	86.9	88.2	90.1	73.0	92.3

Test: 16 Project: 4255 Date: Mar. 17/92 Operator: BW

Purpose: To repeat conditions of Test 12 with 3477 replacing A208.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3477	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.5
Condition 1		2000							2		10.0
2				250					5		9.8
3			400		10	100			3		9.6
Rougher 1							50		1	3	
2							25		1	5	
Scavenger 1	50					100	12.5		2	5	9.5
2						50	12.5		2	5	9.4

Test: 16

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 CuNi Ro Conc 1	188.6	9.5	5.47	4.86	86.0	1.30	1.54	75.8	73.0	76.2	54.6	81.6
2 CuNi Ro Conc 2	199.3	10.0	0.39	0.50	8.20	0.21	0.100	5.7	7.9	7.7	9.3	5.6
3 CuNi Sc Conc 1	132.4	6.7	0.23	0.32	5.32	0.16	0.068	2.2	3.4	3.3	4.7	2.5
4 CuNi Sc Conc 2	84.5	4.3	0.17	0.21	3.55	0.15	0.055	1.1	1.4	1.4	2.8	1.3
5 Cu Ni Scav Tail	1380.6	69.5	0.15	0.13	1.75	0.093	0.023	15.2	14.3	11.4	28.6	8.9
Head (calc)	1985.4	100.0	0.69	0.63	10.7	0.23	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					
Combined Products												
CuNi Ro Conc (1 + 2)		19.5	2.86	2.62	46.0	0.74	0.80	81.5	80.9	83.9	63.9	87.2
CuNi Sc Conc (3 + 4)		10.9	0.21	0.28	4.63	0.16	0.063	3.3	4.8	4.7	7.5	3.8
Ro + Sc Conc (1 to 4)		30.5	1.91	1.78	31.2	0.53	0.54	84.8	85.7	88.6	71.4	91.1

Test: 17 Project: 4255 Date: Mar. 23/92 Operator: BW

Purpose: To repeat conditions of Test 15 with cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.2
Condition 1		2000							2		10.0
2				250					5		9.8
3			400		25	100			3		9.5
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	12.5		2	5	9.7
2						50	12.5		2	5	9.9
1st Cleaner			100						1	5	9.8
					5	20			1	5	
2nd Cleaner			50						1	6	9.3

Test: 17

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	170.8	8.6	4.71	5.31	102	1.43	1.76	77.8	76.9	80.7	54.0	84.5
2 2nd Cleaner Tail	75.8	3.8	0.28	0.34	6.94	0.20	0.080	2.1	2.2	2.4	3.4	1.7
3 1st Cleaner Tail	303.2	15.3	0.17	0.20	3.96	0.17	0.059	5.0	5.1	5.6	11.4	5.0
4 Scavenger Tail	1426.3	72.2	0.11	0.13	1.70	0.099	0.022	15.2	15.7	11.3	31.2	8.8
Head (calc)	1976.1	100.0	0.52	0.60	10.9	0.23	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

1st Cleaner Conc (1 + 2)		12.5	3.35	3.78	72.5	1.05	1.24	79.8	79.1	83.1	57.4	86.2
Scavenger Conc (1 to 3)		27.8	1.60	1.81	34.7	0.57	0.59	84.8	84.3	88.7	68.8	91.2

Test: 18 Project: 4255 Date: Mar. 24/92 Operator: BW

Purpose: To repeat conditions of Test 17 with a 40 minute pebble mill regrind before the cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.5
Condition 1		2000							2		10.2
2				250					5		9.8
3			400		25	100			3		9.6
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	12.5		2	5	9.9
2						50	12.5		2	5	9.8
P.M. Regrind								40			
1st Cleaner			100						1	5	9.4
					5	20			1	5	
2nd Cleaner			50						1	6	8.9

Product: Combined Cleaner Product Test No: 18 S.G.- 3.03

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
41.4μ	0.16	0.3	0.3	99.7
32.1	0.48	1.0	1.3	98.7
22.4	2.76	5.5	6.8	93.2
15.4	5.50	11.0	17.8	82.2
11.9	3.23	6.5	24.3	75.7
-11.9	37.87	75.7	100.0	-
Total	50.00	100.0	-	-

Test: 18

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	106.2	5.4	8.89	8.12	145	2.03	2.62	77.3	75.6	76.0	48.3	81.5
2 2nd Cleaner Tail	99.0	5.0	0.43	0.64	12.5	0.33	0.15	3.5	5.6	6.1	7.3	4.3
3 1st Cleaner Tail	366.8	18.5	0.14	0.20	3.86	0.17	0.055	4.2	6.4	7.0	14.0	5.9
4 Scavenger Tail	1412.0	71.2	0.13	0.100	1.56	0.096	0.020	15.0	12.4	10.9	30.4	8.3
Head (calc)	1984.0	100.0	0.62	0.57	10.2	0.22	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

1st Cleaner Conc (1 + 2)	10.3	4.81	4.51	81.1	1.21	1.43	80.8	81.2	82.1	55.6	85.8
Scavenger Conc (1 to 3)	28.8	1.81	1.75	31.6	0.54	0.55	85.0	87.6	89.1	69.6	91.7

Test: 19 Project: 4255 Date: Mar. 24/92 Operator: BW

Purpose: To repeat conditions of Test 17 with a 20 minute pebble mill regrind before the cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.6
Condition 1		2000							2		10.3
2				250					5		10.1
3			400		25	100			3		10.0
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	12.5		2	5	9.6
2						50			2	5	9.9
P.M. Regrind								20			
1st Cleaner			100						1	5	9.6
					5	20			1	5	
2nd Cleaner			50						1	6	9.6

Product: Combined Cleaner Product Test No: 19 S.G.- 3.05

Mesh	Weight Grams	% Weight Ind.	Cum.	Passing
41.4μ	0.51	1.0	1.0	99.0
32.1	1.36	2.7	3.7	96.3
22.4	4.25	8.5	12.2	87.8
15.4	6.10	12.2	24.4	75.6
11.9	3.20	6.4	30.8	69.2
-11.9	34.58	69.2	100.0	-
Total	50.00	100.0	-	-

Test: 19

Metallurgical Balance

Product	Weight g	Weight %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	% Distribution Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	141.2	7.1	6.91	6.35	120	1.70	2.11	76.2	75.2	77.7	53.4	84.7
2 2nd Cleaner Tail	73.0	3.7	0.30	0.51	11.9	0.31	0.11	1.7	3.1	4.0	5.0	2.3
3 1st Cleaner Tail	276.8	13.9	0.21	0.23	3.95	0.14	0.052	4.5	5.3	5.0	8.6	4.1
4 Scavenger Tail	1496.5	75.3	0.15	0.13	1.93	0.099	0.021	17.5	16.3	13.3	33.0	8.9
Head (calc)	1987.5	100.0	0.64	0.60	11.0	0.23	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					
Combined Products												
1st Cleaner Conc (1 + 2)		10.8	4.66	4.36	83.2	1.23	1.43	77.9	78.3	81.7	58.4	87.0
Scavenger Conc (1 to 3)		24.7	2.15	2.03	38.5	0.61	0.65	82.5	83.7	86.7	67.0	91.1

Test: 20 Project: 4255 Date: Mar. 25/92 Operator: BW

Purpose: To repeat conditions of Test 17 without CMC in the rougher but with CMC added to the cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	CMC 7LT	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.4
Condition 1		2000							2		10.2
2				250					5		9.8
3					25	100			3		9.8
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	12.5		2	5	9.7
2						50	12.5		2	5	9.7
1st Cleaner			300						1	5	9.6
					5	20			1	5	
2nd Cleaner			100						1	6	9.5

Test: 20

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	208.8	10.6	4.13	4.19	78.0	1.18	1.37	78.2	78.7	80.9	55.6	84.3
2 2nd Cleaner Tail	108.8	5.5	0.25	0.36	7.12	0.22	0.091	2.5	3.5	3.8	5.4	2.9
3 1st Cleaner Tail	224.2	11.3	0.18	0.18	3.18	0.15	0.047	3.7	3.6	3.5	7.6	3.1
4 Scavenger Tail	1435.6	72.6	0.12	0.11	1.64	0.097	0.023	15.6	14.2	11.7	31.4	9.7
Head (calc)	1977.4	100.0	0.56	0.56	10.2	0.22	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

1st Cleaner Conc (1 + 2)	16.1	2.80	2.88	53.7	0.85	0.93	80.7	82.2	84.8	61.0	87.2
Scavenger Conc (1 to 3)	27.4	1.72	1.76	32.8	0.56	0.57	84.4	85.8	88.3	68.6	90.3

Test: 21 **Project:** 4255 **Date:** Mar. 27/92 **Operator:** BW

Purpose: To repeat conditions of Test 20 replacing CMC with WC 9524 and completing 4 cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	WC 9524	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.4
Condition 1		2000							2		10.1
2				250					5		9.7
3					25	100			3		9.7
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	12.5		2	5	9.6
2						50	12.5		2	5	9.5
1st Cleaner			300						1	5	9.5
					5	20			1	5	
2nd Cleaner			100						1	6	9.3
3rd Cleaner			50						1	5	9.0
4th Cleaner			25						1	5	8.1

Test: 21

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	104.0	5.2	9.30	8.00	150	2.18	2.74	74.1	68.0	73.8	50.5	77.1
2 4th Cleaner Tail	37.8	1.9	0.92	1.27	20.7	0.38	0.34	2.7	3.9	3.7	3.2	3.5
3 3rd Cleaner Tail	72.2	3.6	0.53	0.69	12.7	0.29	0.20	2.9	4.1	4.3	4.7	3.9
4 2nd Cleaner Tail	111.2	5.6	0.26	0.31	5.62	0.18	0.080	2.2	2.8	3.0	4.5	2.4
5 1st Cleaner Tail	259.1	13.0	0.15	0.19	3.13	0.14	0.051	3.0	4.0	3.8	8.1	3.6
6 Scavenger Tail	1404.2	70.6	0.14	0.15	1.71	0.093	0.025	15.1	17.2	11.4	29.1	9.5
Head (calc)	1988.5	100.0	0.66	0.62	10.6	0.23	0.19	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

3rd Cleaner Conc (1 + 2)	7.1	7.07	6.21	116	1.70	2.10	76.8	71.9	77.5	53.7	80.6
2nd Cleaner Conc (1 to 3)	10.8	4.86	4.34	80.8	1.22	1.46	79.7	76.0	81.8	58.4	84.5
1st Cleaner Conc (1 to 4)	16.4	3.29	2.97	55.1	0.87	0.99	82.0	78.8	84.8	62.8	86.9
Scavenger Conc (1 to 5)	29.4	1.90	1.73	32.1	0.54	0.57	84.9	82.8	88.6	70.9	90.5

Test: 22 **Project:** 4255 **Date:** Mar. 28/92 **Operator:** BW

Purpose: To repeat conditions of Test 20 replacing CMC with PA MED and completing 4 cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	PA MED	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							45			8.4
Condition 1		2000							2		10.1
2				250					5		9.2
3					25	100			3		
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	6		2	5	9.5
2						50	12.5		2	5	9.5
1st Cleaner			300						1	5	9.4
					5	20			1	5	
2nd Cleaner			100						1	6	9.4
3rd Cleaner			50						1	5	8.7
4th Cleaner			25						1	5	7.8

Test: 22

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	85.3	4.3	9.24	9.32	171	2.56	3.12	69.7	69.8	71.3	48.0	77.0
2 4th Cleaner Tail	28.2	1.4	1.14	1.24	21.0	0.34	0.30	2.8	3.1	2.9	2.1	2.4
3 3rd Cleaner Tail	47.3	2.4	0.54	0.68	13.2	0.28	0.17	2.3	2.8	3.0	2.9	2.3
4 2nd Cleaner Tail	116.8	5.9	0.39	0.43	9.51	0.24	0.12	4.0	4.4	5.4	6.2	4.1
5 1st Cleaner Tail	256.8	13.0	0.20	0.21	3.90	0.16	0.061	4.5	4.7	4.9	9.0	4.5
6 Scavenger Tail	1443.0	73.0	0.13	0.12	1.76	0.100	0.023	16.6	15.2	12.4	31.7	9.6
Head (calc)	1977.4	100.0	0.57	0.58	10.4	0.23	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

3rd Cleaner Conc (1 + 2)		5.7	7.23	7.31	134	2.01	2.42	72.6	72.8	74.2	50.1	79.5
2nd Cleaner Conc (1 to 3)		8.1	5.26	5.36	98.4	1.50	1.76	74.8	75.7	77.3	53.1	81.8
1st Cleaner Conc (1 to 4)		14.0	3.21	3.29	61.0	0.97	1.07	78.9	80.1	82.7	59.2	85.9
Scavenger Conc (1 to 5)		27.0	1.76	1.81	33.6	0.58	0.58	83.4	84.8	87.6	68.3	90.4

Test: 23 Project: 4255 Date: Mar. 28/92 Operator: BW

Purpose: To repeat conditions of Test 20 with 4 cleaning stages, replacing CMC with Jaguar MDD and using SO2 to modify the pH.(7.0 in the first cleaner, 6.5 in the second, 5.5 in the third and 4.5 in the fourth cleaning stage.)

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 45 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na2S	SO2	Na2CO3	Jaguar MDD	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125								45			8.3
Condition 1			2000							2		10.1
2					250					5		9.2
3						25	100			3		
Rougher 1								50		1	3	
2								12.5		1	5	
Scavenger 1	50						100	6		2	5	9.5
2							50	12.5		2	5	9.5
1st Cleaner		300		400						1	5	6.8
						5	20			1	5	
2nd Cleaner		180		100						1	6	6.5
3rd Cleaner		120		50						1	5	5.5
4th Cleaner		90		25						1	5	3.6

Test: 23

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	37.3	1.9	14.5	13.4	257	3.55	4.26	44.9	43.5	45.7	29.7	47.2
2 4th Cleaner Tail	12.7	0.6	5.68	8.36	140	2.00	2.56	6.0	9.2	8.4	5.7	9.7
3 3rd Cleaner Tail	23.2	1.2	2.89	3.71	64.7	0.99	1.15	5.6	7.5	7.1	5.2	7.9
4 2nd Cleaner Tail	75.5	3.8	1.30	1.53	29.5	0.52	0.49	8.1	10.0	10.6	8.8	11.0
5 1st Cleaner Tail	382.1	19.3	0.32	0.44	8.48	0.21	0.13	10.1	14.6	15.4	18.0	14.8
6 Scavenger Tail	1450.9	73.2	0.21	0.12	1.84	0.100	0.022	25.3	15.1	12.7	32.6	9.5
Head (calc)	1981.7	100.0	0.61	0.58	10.6	0.22	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

3rd Cleaner Conc (1 + 2)		2.5	12.3	12.1	227	3.16	3.83	50.9	52.7	54.1	35.4	56.9
2nd Cleaner Conc (1 to 3)		3.7	9.29	9.45	176	2.47	2.98	56.4	60.2	61.3	40.6	64.8
1st Cleaner Conc (1 to 4)		7.5	5.23	5.43	101	1.48	1.72	64.6	70.2	71.9	49.4	75.8
Scavenger Conc (1 to 5)		26.8	1.70	1.84	34.5	0.57	0.57	74.7	84.9	87.3	67.4	90.5

Test: 24 Project: 4255 Date: April 3rd/92 Operator: BW

Purpose: To repeat conditions of Test 17 at 68% minus 200 mesh, with PA MED replacing CMC and with 4 cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	PA MED	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							22			8.2
Condition 1		2000							2		10.1
2				250					5		9.6
3			400		25	100			3		9.5
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100	12.5		2	5	9.7
2						50	12.5		2	5	9.6
1st Cleaner			100						1	5	9.5
					5	20			1	5	
2nd Cleaner			50						1	6	9.3
3rd Cleaner			25						1	4	9.1
4th Cleaner			10						1	3	8.7

Size Analysis:

Microns	Mesh	Weight Grams	% Weight Ind.	Cum.	Pass.
208	65	3.6	2.8	2.8	97.2
147	100	8.0	6.2	9.0	91.0
104	150	14.9	11.6	20.6	79.4
74	200	14.8	11.5	32.1	67.9
53	270	14.9	11.6	43.7	56.3
38	400	12.7	9.9	53.6	46.4
-38	-400	59.7	46.4	100.0	-
	Total	128.6	100.0	-	-

Test: 24

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	166.4	9.0	4.28	4.71	91.0	1.27	1.55	71.5	74.0	76.5	53.7	80.1
2 4th Cleaner Tail	29.3	1.6	0.96	0.75	13.8	0.28	0.17	2.8	2.1	2.0	2.1	1.5
3 3rd Cleaner Tail	32.6	1.8	0.48	0.55	10.2	0.24	0.14	1.6	1.7	1.7	2.0	1.4
4 2nd Cleaner Tail	69.5	3.8	0.31	0.39	7.92	0.21	0.089	2.2	2.6	2.8	3.7	1.9
5 1st Cleaner Tail	116.4	6.3	0.16	0.20	3.67	0.16	0.060	1.9	2.2	2.2	4.7	2.2
6 Scavenger Tail	1428.9	77.5	0.14	0.13	2.05	0.093	0.029	20.1	17.5	14.8	33.8	12.9
Head (calc)	1843.1	100.0	0.54	0.58	10.7	0.21	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

Product	Weight %	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
3rd Cleaner Conc (1 + 2)	10.6	3.78	4.12	79.4	1.12	1.34	74.3	76.0	78.6	55.8	81.6
2nd Cleaner Conc (1 to 3)	12.4	3.31	3.61	69.6	1.00	1.17	75.9	77.7	80.3	57.8	83.0
1st Cleaner Conc (1 to 4)	16.2	2.61	2.86	55.2	0.81	0.92	78.0	80.3	83.0	61.5	85.0
Scavenger Conc (1 to 5)	22.5	1.92	2.11	40.7	0.63	0.68	79.9	82.5	85.2	66.2	87.1

Test: 25 Project: 4255 Date: April 6th/92 Operator: BW

Purpose: To repeat conditions of Test 24 at 86% minus 200 mesh.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 35 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	PA MED	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							35			8.3
Condition 1		2000							2		10.1
2				250					5		9.6
3			400		25	100			3		
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100			2	5	
2						50	12.5		2	5	9.5
1st Cleaner			100						1	5	9.5
					5	20			1	5	
2nd Cleaner			50						1	6	9.3
3rd Cleaner			25						1	4	8.7
4th Cleaner			10						1	3	7.9

Size Analysis:

Microns	Mesh	Weight Grams	% Weight		
			Ind.	Cum.	Pass.
208	65	0.1	0.1	0.1	99.9
147	100	0.9	0.7	0.8	99.2
104	150	4.9	3.8	4.6	95.4
74	200	11.9	9.2	13.8	86.2
53	270	16.1	12.5	26.3	73.7
38	400	19.0	14.7	41.0	59.0
-38	-400	76.0	59.0	100.0	-
	Total	128.9	100.0	-	-

Test: 25

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	107.2	5.8	7.13	7.61	136	1.94	2.37	70.5	70.1	74.1	50.4	79.4
2 4th Cleaner Tail	26.4	1.4	0.87	1.24	20.6	0.35	0.29	2.1	2.8	2.8	2.2	2.4
3 3rd Cleaner Tail	35.5	1.9	0.51	0.71	12.6	0.28	0.15	1.7	2.2	2.3	2.4	1.7
4 2nd Cleaner Tail	67.3	3.6	0.27	0.35	6.85	0.20	0.080	1.7	2.0	2.3	3.3	1.7
5 1st Cleaner Tail	181.7	9.8	0.18	0.21	3.84	0.16	0.057	3.0	3.3	3.6	7.0	3.2
6 Scavenger Tail	1428.0	77.4	0.16	0.16	2.05	0.100	0.026	21.1	19.6	14.9	34.6	11.6
Head (calc)	1846.1	100.0	0.59	0.63	10.6	0.22	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

3rd Cleaner Conc (1 + 2)		7.2	5.89	6.35	113	1.63	1.96	72.6	72.9	76.9	52.7	81.8
2nd Cleaner Conc (1 to 3)		9.2	4.76	5.17	92.0	1.34	1.58	74.2	75.1	79.2	55.1	83.5
1st Cleaner Conc (1 to 4)		12.8	3.48	3.80	67.7	1.02	1.15	75.9	77.1	81.5	58.3	85.2
Scavenger Conc (1 to 5)		22.6	2.05	2.24	40.0	0.65	0.68	78.9	80.4	85.1	65.4	88.4

Test: 26 Project: 4255 Date: April 8th/92 Operator: BW

Purpose: To repeat conditions of Test 17 at 59% minus 200 mesh, PA MED replacing CMC and with 4 cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 16 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	PA MED	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							16			8.2
Condition 1		2000							2		10.2
2				250					5		
3			400		25	100			3		9.8
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100			2	5	9.8
2						50	12.5		2	5	
1st Cleaner			100						1	5	9.7
					5	20			1	5	
2nd Cleaner			50						1	6	9.3
3rd Cleaner			25						1	4	8.9
4th Cleaner			10						1	3	8.3
5th Cleaner	Flotation was performed in a 10 % NaCl solution.								1	2	

Size Analysis:

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Pass.
589	28	0.0	0.0	0.0	100.0
417	35	1.4	1.3	1.3	98.7
295	48	2.1	2.0	3.3	96.7
208	65	5.9	5.6	8.9	91.1
147	100	9.7	9.2	18.2	81.8
104	150	12.8	12.2	30.3	69.7
74	200	10.9	10.4	40.7	59.3
53	270	10.3	9.8	50.5	49.5
38	400	9.8	9.3	59.8	40.2
-38	-400	42.3	40.2	100.0	-
	Total	105.2	100.0	-	-

Test: 26

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	64.1	3.5	10.2	9.26	181	2.62	3.27	57.7	54.5	60.7	42.1	66.8
2 5th Cleaner Tail	47.4	2.6	1.39	1.71	25.6	0.36	0.40	5.8	7.4	6.3	4.3	6.0
3 4th Cleaner Tail	31.0	1.7	1.11	1.58	22.5	0.38	0.32	3.0	4.5	3.6	2.9	3.2
4 3rd Cleaner Tail	42.1	2.3	0.63	0.91	15.7	0.32	0.19	2.3	3.5	3.5	3.4	2.6
5 2nd Cleaner Tail	78.6	4.2	0.47	0.58	10.5	0.26	0.12	3.3	4.2	4.3	5.1	3.0
6 1st Cleaner Tail	151.0	8.1	0.27	0.33	5.66	0.19	0.086	3.6	4.6	4.5	7.2	4.1
7 Scavenger Tail	1442.8	77.7	0.19	0.16	2.26	0.097	0.031	24.2	21.2	17.1	35.0	14.3
Head (calc)	1857.0	100.0	0.61	0.59	10.3	0.22	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

4th Cleaner Conc (1 + 2)	6.0	6.45	6.05	115	1.66	2.05	63.6	59.0	64.3	46.3	72.9
3rd Cleaner Conc (1 to 3)	7.7	5.29	5.08	94.8	1.38	1.67	66.6	62.6	67.8	49.3	76.0
2nd Cleaner Conc (1 to 4)	9.9	4.23	4.13	76.8	1.14	1.34	68.9	66.8	72.1	52.7	78.6
1st Cleaner Conc (1 to 5)	14.2	3.11	3.07	57.0	0.88	0.97	72.2	71.3	76.6	57.8	81.6
Scavenger Conc (1 to 6)	22.3	2.07	2.07	38.3	0.63	0.65	75.8	75.9	81.1	65.0	85.7

Test: 27 **Project:** 4255 **Date:** April 8th/92 **Operator:** BW

Purpose: To repeat conditions of Test 17 at 76.5% minus 200 mesh, PA MED replacing CMC and with 4 cleaning stages.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 27 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	PA MED	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125							27			8.1
Condition 1		2000							2		10.1
2				250					5		
3			400		25	100			3		9.6
Rougher 1							50		1	3	
2							12.5		1	5	
Scavenger 1	50					100			2	5	9.5
2						50	12.5		2	5	
1st Cleaner			100						1	5	9.5
					5	20			1	5	
2nd Cleaner			50						1	6	9.4
3rd Cleaner			25						1	4	9.0
4th Cleaner			10						1	3	8.4

Size Analysis:

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Pass.
208	65	1.0	0.8	0.8	99.2
147	100	4.1	3.2	4.0	96.0
104	150	10.8	8.4	12.3	87.7
74	200	14.4	11.2	23.5	76.5
53	270	15.1	11.7	35.2	64.8
38	400	16.4	12.7	47.9	52.1
-38	-400	67.2	52.1	100.0	-
	Total	129.0	100.0	-	-

Test: 28 Project: 4255 Date: April 9th/92 Operator: BW

Purpose: To conduct a flotation test on Comp. M92 at 68% minus 200 mesh with the following procedure.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	Na2CO3	PA MED	CuSO4	3501	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	125	*2000	*400		*25	*50		22			9.8
Rougher 1							25		1	3	
							MIBC				
2							5		1	5	
Scavenger 1	50			50		25	10		1	7	9.8
2						25			1	5	
						25			1	5	
						25			1	5	
PM Regrind			*100		*5	*20		15			
1st Cleaner									1	7	9.2
						10			1	5	
						5			1	3	
2nd Cleaner			50						1	3.5	8.0
						5			1	2	
						5	2.5		1	3	
3rd Cleaner			10						1	3	7.7
						5			1	2	
4th Cleaner									1	3	
						5			1	2	8.0

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage.

Circuit	Cell	RPM
Ro/Scav	D-1, 1000g	1750
1st & 2nd Cl's	D-1, 500g	1300
3rd &4th Cl's	D-1, 250g	1100

Test: 28

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	27.1	1.4	23.6	20.1	372	4.64	7.76	53.6	51.2	52.9	29.6	66.4
2 4th Cleaner Tail	2.8	0.1	3.95	5.80	141	2.93	1.32	0.9	1.5	2.1	1.9	1.2
3 3rd Cleaner Tail	7.0	0.4	2.72	4.46	101	2.03	1.00	1.6	2.9	3.7	3.3	2.2
4 2nd Cleaner Tail	26.1	1.3	1.35	2.21	46.3	1.00	0.48	3.0	5.4	6.3	6.1	4.0
5 1st Cleaner Tail	127.7	6.5	0.46	0.72	14.0	0.42	0.12	4.9	8.6	9.4	12.6	4.8
6 Scavenger Tail	1787.2	90.4	0.24	0.18	2.72	0.11	0.038	36.0	30.2	25.5	46.3	21.4
Head (calc)	1977.9	100.0	0.60	0.54	9.63	0.21	0.16	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

3rd Cleaner Conc (1 + 2)		1.5	21.8	18.8	350	4.48	7.16	54.6	52.7	55.0	31.6	67.6
2nd Cleaner Conc (1 to 3)		1.9	18.1	16.0	303	4.02	5.99	56.2	55.7	58.7	34.9	69.8
1st Cleaner Conc (1 to 4)		3.2	11.2	10.3	197	2.77	3.71	59.1	61.1	65.1	41.1	73.7
Scavenger Conc (1 to 5)		9.6	4.00	3.89	74.4	1.20	1.30	64.0	69.8	74.5	53.7	78.6

Test: 29 Project: 4255 Date: April 20th/9 Operator: BW

Purpose: To repeat test 28 without Na2CO3, with Na2S added to the last 5 minutes of the primary grind and with MIBC only for frother.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		22			8.5
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	8.5
2						25			1	5	
						25			1	5	
						25			1	5	
PM Regrind			*100		*5	*20		15			
1st Cleaner									1	7	8.3
						10			1	5	
						5			1	3	
2nd Cleaner			50						1	3.5	8.2
						5	2.5		1	2	
						5			1	3	
3rd Cleaner			10						1	3	8.0
						5	2.5		1	2	
						5			1	3	
4th Cleaner							2.5		1	3	
						5			1	2	8.0

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1, 1000g	1750
1st & 2nd Cl's	D-1, 500g	1300
3rd &4th Cl's	D-1, 250g	1100

Test: 29

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t						% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Rh	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	35.9	1.8	17.1	14.9	332	4.50	6.12	0.08	58.1	48.0	57.6	35.3	65.9
2 4th Cleaner Tail	4.8	0.2	2.67	5.06	85.4	1.26	1.45	-	1.2	2.2	2.0	1.3	2.1
3 3rd Cleaner Tail	11.2	0.6	1.74	3.55	56.6	0.89	0.88	-	1.8	3.6	3.1	2.2	3.0
4 2nd Cleaner Tail	68.4	3.4	1.01	1.94	33.8	0.67	0.42	-	6.5	11.9	11.2	10.0	8.6
5 1st Cleaner Tail	202.3	10.2	0.33	0.53	8.68	0.25	0.097	-	6.3	9.6	8.5	11.1	5.9
6 Scavenger Tail	1666.1	83.8	0.17	0.17	2.20	0.11	0.029	-	26.0	24.8	17.7	40.1	14.5
Head (calc)	1988.7	100.0	0.53	0.56	10.4	0.23	0.17	-	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18	-					
Combined Products													
3rd Cleaner Conc (1 + 2)		2.0	15.4	13.7	303	4.12	5.57	-	59.3	50.1	59.6	36.7	68.0
2nd Cleaner Conc (1 to 3)		2.6	12.5	11.5	250	3.42	4.56	-	61.1	53.7	62.6	38.8	71.0
1st Cleaner Conc (1 to 4)		6.0	5.95	6.08	127	1.86	2.20	-	67.7	65.6	73.8	48.9	79.6
Scavenger Conc (1 to 5)		16.2	2.42	2.60	52.8	0.85	0.88	-	74.0	75.2	82.3	59.9	85.5

Test: 30 Project: 4255 Date: April 23th/92 Operator: BW

Purpose: To repeat test 29 on the Roby Zone composite.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Roby Zone composite.

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		22			9.7
Rougher 1							25		1	3	
2							10		1	5	
Scavenger 1	50			50		25	5		1	5	9.5
2						25			1	5	
						25	5		1	5	
						25			1	5	
PM Regrind			*100		*5	*20		15			
1st Cleaner							2.5		1	7	9.0
						10	2.5		1	5	
						5	2.5		1	3	
2nd Cleaner			50				5		1	3.5	8.9
						5	2.5		1	2	
						5			1	3	
3rd Cleaner			10						1	3	8.5
						5	2.5		1	2	
4th Cleaner									1	2.5	
						5	2.5		1	1	8.0

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage.

Circuit	Cell	RPM
Ro/Scav	D-1, 1000g	1750
1st & 2nd Cl's	D-1, 500g	1300
3rd & 4th Cl's	D-1, 250g	1100

NOTE: The products from this test with Roby Zone as feed had a settling rate much poorer than Test 29 which used Comp. M92 for feed.

Test: 30

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Cleaner Conc.	15.9	0.8	20.3	18.7	163	7.27	11.0	52.9	51.3	58.5	44.3	67.6
2 4th Cleaner Tail	1.3	0.1	4.12	5.71	43.3	2.54	1.40	0.9	1.3	1.3	1.3	0.7
3 3rd Cleaner Tail	2.8	0.1	1.32	2.13	17.8	1.22	0.52	0.6	1.0	1.1	1.3	0.6
4 2nd Cleaner Tail	25.5	1.3	0.54	0.65	5.00	0.37	0.14	2.3	2.9	2.9	3.6	1.4
5 1st Cleaner Tail	108.2	5.5	0.44	0.49	3.67	0.24	0.11	7.8	9.2	9.0	10.0	4.6
6 Scavenger Tail	1807.3	92.2	0.12	0.11	0.67	0.057	0.036	35.5	34.3	27.3	39.5	25.1
Head (calc)	1961.0	100.0	0.31	0.30	2.26	0.13	0.13	100.0	100.0	100.0	100.0	100.0
(direct)			0.30	0.29	2.40	0.16	0.16					

Combined Products

3rd Cleaner Conc (1 + 2)		0.9	19.1	17.7	154	6.91	10.3	53.8	52.6	59.7	45.6	68.3
2nd Cleaner Conc (1 to 3)		1.0	16.6	15.5	135	6.12	8.91	54.4	53.7	60.9	46.9	68.9
1st Cleaner Conc (1 to 4)		2.3	7.60	7.19	62.1	2.90	3.99	56.6	56.5	63.7	50.5	70.3
Scavenger Conc (1 to 5)		7.8	2.56	2.47	21.0	1.03	1.26	64.5	65.7	72.7	60.5	74.9

Test: 31 Project: 4255 Date: April 20th/9 Operator: BW

Purpose: To repeat test 29 without reagents in the regrind and with the changes shown in the cleaning stages

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		22			8.5
Scavenger 1	50			50		25	7.5		1	7	8.4
2						25			1	5	
						25	2.5		1	5	
						25			1	5	
PM Regrind								15			8.4
1st Cleaner	1625									5	11.8
2nd Cleaner	813									2	12.0

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750
1st & 2nd Cl's	D-1 , 500g	1300

Test: 31

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 2nd Cl. Froth	34.3	1.7	10.7	10.0	229	2.80	2.72	35.6	30.1	37.9	21.3	27.3
2 2nd Cl. Cell Prod.	95.9	4.8	1.94	2.76	55.2	0.95	0.99	18.1	23.3	25.5	20.3	27.8
3 1st Cl. Cell Prod.	231.5	11.7	0.94	1.09	17.6	0.44	0.45	21.1	22.2	19.7	22.6	30.5
4 Scav. Cell Prod.	1625.0	81.8	0.16	0.17	2.16	0.099	0.030	25.2	24.3	16.9	35.8	14.3
Head (calc)	1986.7	100.0	0.52	0.57	10.4	0.23	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					
Combined Products												
1st Cl. Froth (1 & 2)		6.6	4.25	4.65	101	1.44	1.45	53.7	53.4	63.4	41.6	55.2
Scavenger Froth (1 to 3)		18.2	2.13	2.37	47.6	0.80	0.81	74.8	75.7	83.1	64.2	85.7

Test: 32 Project: 4255 Date: May 5th/92 Operator: SP

Purpose: To conduct a flotation test on Roby Zone at 68% minus 200 mesh ground in a 5% NaCl solution, using collector P3.

Procedure: As shown below. Settling and filtration were good throughout test.

Feed: 2000 grams minus 10 mesh Roby Zone Comp

Grind: 25 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	NaCl			Na2S	A350	P3	MIBC	Grind	Cond.	Froth	
Primary Grind	25000				50	25		25			
Rougher							5		1	3	
					25	10	15		1	3	8.7
					25	10	5		2	3	
					10	5			1	3	
				125	25	10	5		2	3	9.2
				125	25	10	10		2	3	
					25	10	10		1	3	
				125	25	10	10		2	3	
					25	10	10		2	3	
					25	10	10		1	3	
PM Regrind						10		30			
1st Cleaner										5	
					10	5			1	5	
					10	5			1	5	
2nd Cleaner									1	5	
3rd Cleaner									1	5	

Circuit	Cell	RPM
Ro/Scav	D-1, 1000g	2100
1st Cl	D-1, 500g	1600
2nd & 3rd Cl's	D-1, 250g	1100

Test: 32

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Cleaner Conc.	21.7	1.1	22.9	15.8	132	5.20	9.53	21.0	61.7	53.3	57.3	38.3	70.0	57.8
2 3rd Cleaner Tail	6.5	0.3	1.55	1.97	17.6	1.36	0.55	3.45	1.3	2.0	2.3	3.0	1.2	2.8
3 2nd Cleaner Tail	44.8	2.2	0.93	1.33	12.3	0.95	0.36	1.76	5.2	9.3	11.0	14.5	5.5	10.0
4 1st Cleaner Tail	110.8	5.6	0.36	0.42	3.09	0.21	0.082	1.27	5.0	7.2	6.9	7.9	3.1	17.9
5 Rougher Tail	1809.1	90.8	0.12	0.100	0.62	0.059	0.033	0.050	26.9	28.1	22.5	36.3	20.2	11.5
Head (calc)	1992.9	100.0	0.40	0.32	2.50	0.15	0.15	0.40	100.0	100.0	100.0	100.0	100.0	100.0

Combined Products

2nd Cleaner Conc (1 + 2)	1.4	18.0	12.6	105	4.31	7.46	17.0	62.9	55.3	59.6	41.4	71.2	60.7
1st Cleaner Conc (1 to 3)	3.7	7.52	5.69	48.3	2.25	3.10	7.63	68.1	64.6	70.7	55.8	76.7	70.7
Rougher Conc (1 to 4)	9.2	3.20	2.51	21.0	1.02	1.28	3.80	73.1	71.9	77.5	63.7	79.8	88.5

Test: 33 Project: 4255 Date: May 11th/92 Operator: BW

Purpose: To conduct a flotation test on Comp M92 at 68% minus 200 mesh ground in a 2.5% NaCl solution, using collector P3.

Procedure: As shown below. Settling and filtration were good throughout test.

Feed: 2000 grams minus 10 mesh Comp. M92.

Grind: 25 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	NaCl			Na2S	A350	P3	MIBC	Grind	Cond.	Froth	
Primary Grind	25000			125	50	25		25			8.2
Rougher							5		1	3	
					50	20	15		2	6	
					50	20	15		2	6	
					50	20	10		2	6	
					50	20			2	6	
					50	20			2	6	
PM Regrind				50		10		30			
1st Cleaner										5	
					10	5			2	5	
					10	5			2	5	
2nd Cleaner										5	
					10	5			2	5	
3rd Cleaner										5	

Circuit	Cell	RPM
Ro/Scav	D-1, 1000g	2100
1st Cl	D-1, 500g	1600
2nd & 3rd Cl's	D-1, 250g	1100

Test: 33

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Cleaner Conc.	102.3	5.2	7.07	7.71	156	2.16	2.64	15.2	68.5	68.9	75.3	50.2	83.1	84.0
2 3rd Cleaner Tail	36.7	1.9	0.64	1.12	20.3	0.48	0.23	2.22	2.2	3.6	3.5	4.0	2.6	4.4
3 2nd Cleaner Tail	49.3	2.5	0.57	0.52	10.1	0.30	0.088	1.03	2.7	2.2	2.3	3.4	1.3	2.7
4 1st Cleaner Tail	175.7	8.9	0.22	0.36	5.55	0.19	0.064	0.56	3.7	5.5	4.6	7.6	3.5	5.3
5 Rougher Tail	1617.1	81.6	0.15	0.14	1.87	0.095	0.019	0.040	23.0	19.8	14.2	34.9	9.5	3.5
Head (calc)	1981.1	100.0	0.53	0.58	10.72	0.22	0.16	0.93	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							

Combined Products

2nd Cleaner Conc (1 + 2)		7.0	5.37	5.97	120	1.72	2.00	11.8	70.7	72.5	78.8	54.2	85.7	88.4
1st Cleaner Conc (1 to 3)		9.5	4.11	4.54	91.5	1.35	1.50	8.96	73.4	74.7	81.2	57.5	87.1	91.2
Rougher Conc (1 to 4)		18.4	2.23	2.52	50.0	0.79	0.81	4.91	77.0	80.2	85.8	65.1	90.5	96.5

Test: 34 Project: 4255 Date: May 15th/92 Operator: BW

Purpose: To conduct a flash flotation test on Comp M92.

Procedure: The sample was ground for 5 minutes in a laboratory ball mill and flash floated with 50 g/t of PAX and 25g/t of 3501. The tailings were screened at 48 mesh and the screen oversize was ground for 10 minutes in a ball mill. The ground product was recombined with the screen undersize and flash floated with 50 g/t of PAX and 25 g/t 3501. The tailings were screened at 100 mesh and the screen oversize was ground for 10 minutes with 125 g/t of Na_2S, 200 g/t of CMC (PA Med.) and 25 g/t 3501. The ground product was recombined with the screen undersize and floated in several stages, with additions of PAX and 3501, for a total of 30 minutes. A small representative sample of about 100 mls of the final tailings was upgraded on a Mozley table.

All the products were filtered and submitted for weights and analyses. Details of the flotation procedures are shown below.

Feed: 2000 grams minus 10 mesh Comp. M92.

Grind: 5 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t						Time, minutes			pH
	A350 (PAX)	3501	Na2S	CMC (PA Med)	DF250		Grind	Cond.	Froth	
Primary Grind							5			
Flash Float 1	50	25			10			1	1	8.2
Screen (48 mesh)										
Grind Screen O/S							10			
Flash Float 2	50	25						1	1	8
	50	25						1	2	
Screen (100 mesh)										
Grind Screen O/S		25	125	200			10			
Rougher Float 1					5			1	5	8.2
2	25	10			5			1	5	
3	25	10						1	5	
4	25	10						1	5	
5	25	10						1	5	
6	25	10						1	5	

Test: 34

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Flash 1 Conc.	46.7	2.4	9.24	7.17	169	1.93	3.00	10.5	35.0	26.8	35.5	19.9	42.7	27.1
2 Flash 2 Conc.	131.7	6.7	2.82	3.05	57.2	1.00	0.77	6.67	30.1	32.2	33.9	29.1	30.9	48.5
3 Ro Float Conc.	197.4	10.1	0.95	1.27	19.0	0.36	0.27	1.74	15.2	20.1	16.9	15.7	16.2	19.0
4 Ro Scav. Conc.	14.2	0.7	0.54	0.70	8.57	0.24	0.14	0.61	0.6	0.8	0.5	0.8	0.6	0.5
5 Ro Scav. Tail	1563.9	80.0	0.15	0.16	1.86	0.100	0.020	0.058	19.0	20.1	13.1	34.5	9.5	5.0
Head (calc)	1953.9	100.0	0.63	0.64	11.4	0.23	0.17	0.93	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							
Combined Products														
Flash 1&2 Conc. (1&2)		9.1	4.50	4.13	86.5	1.24	1.35	7.67	65.1	59.0	69.5	49.0	73.6	75.6
Flash+Ro Conc. (1 to 3)		19.2	2.64	2.63	51.0	0.78	0.78	4.56	80.3	79.1	86.4	64.7	89.9	94.5
Comb. Conc's. (1 to 4)		20.0	2.56	2.56	49.5	0.76	0.76	4.41	81.0	79.9	86.9	65.5	90.5	95.0
Mozley Sep'n of Scav Tailing														
Mozley Conc	0.48	0.6	0.15	1.53	7.34	1.33	0.16	5.26	0.1	1.4	0.4	3.3	0.5	3.3
Mozley Tailing	65.7	79.5	0.15	0.15	1.82	0.091	0.019	0.020	18.9	18.7	12.7	31.2	9.0	1.7
Scav Tailing	66.18	80.0	0.15	0.16	1.86	0.100	0.020	0.058	19.0	20.1	13.1	34.5	9.5	5.0

Test: 35 Project: 4255 Date: May 27th/92 Operator: BW

Purpose: To conduct a flash flotation test on Comp M92.

Procedure: The sample was ground for 2 minutes in a laboratory ball mill with 25 g/t of 3501 and 100g/t of CMC (PA Med). The ground product was floated for 1 minute with 50g/t of PAX and 10 g/t of DF 250. The tailings were decanted and the decant product was saved. The remaining tails were ground for 5 minutes in a ball mill with 25 g/t 3501 and 200 g/t of CMC (PA Med). The ground product was floated for 3 minutes with 100 g/t of PAX and 25 g/t 3501. The tailings were decanted and the decant product was saved. The remaining tails were ground for 5 minutes with 25 g/t of 3501, 125 g/t of Na_2S and 200 g/t of CMC (PA Med). The ground product was recombined with the decant products and floated in several stages, with additions of PAX and 3501 for a total of 30 minutes.

All the products were filtered and submitted for weights and analyses. Details of the flotation procedures are shown below.

Feed: 2000 grams minus 10 mesh Comp. M92.

Grind: 2 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t						Time, minutes			pH
	A350 (PAX)	3501	Na2S	CMC (PA Med)	DF250		Grind	Cond.	Froth	
Primary Grind		25		100			2			
Flash Float 1	50				10			1	1	8.1
Grind Decant U/S		25		200			5			
Rougher Float	100	25						1	3	8.1
Tailings Decanted										
Grind Decant U/S		25	125	200			5			
Scavenger Float 1					10			1	5	8.2
2	25	10			10			1	5	
3	25	10						1	5	
4	25	10						1	5	
5	25	10						1	5	
6	25	10						1	5	

Test: 35

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Flash Conc.	55.8	2.9	6.45	5.98	141	1.87	2.53	11.2	28.1	28.3	36.6	23.9	43.3	38.1
2 Rougher Conc.	38.9	2.0	7.73	4.78	95.3	1.43	1.43	10.8	23.5	15.7	17.3	12.8	17.1	25.6
3 Scav. Conc.	299.0	15.3	1.03	1.27	20.7	0.40	0.29	1.88	24.0	32.2	28.8	27.4	26.6	34.3
4 Scav. Tail	1562.6	79.9	0.20	0.18	2.38	0.100	0.027	0.020	24.4	23.8	17.3	35.9	13.0	1.9
Head (calc)	1956.3	100.0	0.65	0.60	11.0	0.22	0.17	0.84	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							
Combined Products														
Products 1 & 2		4.8	6.98	5.49	122	1.69	2.08	11.0	51.6	44.0	53.9	36.7	60.4	63.8
Products 1 to 3		20.1	2.46	2.28	45.1	0.71	0.72	4.08	75.6	76.2	82.7	64.1	87.0	98.1

Flocculant Scoping Tests **Project: 4255** **Date: April 29th/92** **Operator: BW**

Purpose: To scope potential flocculants to determine which would produce acceptable settling qualities in order to do a series of settling tests.

Procedure: A small amount of representative pulp was placed in a small beaker (50ml). The selected flocculant was added as a 0.10% solution in increments of 2 to 5 drops. The pulp was gently agitated (after each addition of flocculant) and then allowed to settle. The pulp was observed and any observations were recorded.

Feed: Test 31 Scavenger Tails (Comp M92)

Data:

Flocculant	Number of Drops	Observations
-	-	On its own the pulp is a pale green/grey colour. The pulp contained sands which settled out quickly leaving a grey pulp above with a mudline of its own. The solution above the mudline was cloudy and the pulp settled slowly. After sitting for a short time the sands and any settled pulp form a packed bed.
155 (Medium Anionic)	5	Small flocs were noticed and the settling rate was improved slightly. The solution remains cloudy.
	8	Quite noticeable flocs were present and the settling rate was favourable however the solution showed no signs of improvement.
	10	Not much change. Solution clarity is beginning to improve.
	14	Solution showing more signs of improvement but not clear.
	16	Solution is clear. Settling and flocculation is favourable as well.

4255 **Flocculant Scoping Tests Continued**

Data:

Flocculant	Number of Drops	Observations
156 (High Anionic)	5	Some small flocculated particles forming. Settling rate is fair but the solution is cloudy.
	8	Noticeable flocculation and quicker settling. Solution is still cloudy
	10	Settling and flocculation is good now and although the solution is not clear it is showing signs of improvement.
	12	Not much change but solution is only slightly hazy.
	14	Settling very well and the solution is clearing nicely.
	16	Solution is clear and settling and flocculation is good.
611 (Very High Anionic)	8	Some noticeable flocculation and not bad settling but the solution is cloudy.
	10	Very little change observed.
	13	Better settling and flocculation but no change in solution clarity.
	16	Very little change occurred.
	> 16	Very little change occurred except a very small change in solution clarity.

4255 **Flocculant Scoping Tests Continued**

Data:

Flocculant	Number of Drops	Observations
351 (Non-Ionic)	5	Very small flocculated particles and slow settling pulp. Solution clarity was poor.
	10	Flocculation and settling were good but clarity was still poor.
	15	Very little change observed.
	20	Large flocculated particles, good settling and good solution clarity.
352 (Low Cationic)	5	Very cloudy solution, slow settling rate and small flocculated particle size.
	8	Increased flocculated particle size and an increase in in the settling rate but the solution remains cloudy.
	11	Good settling and flocculation but the solution is still hazy.
	14	No change other than the solution cleared slightly.
	16	Solution was clear, settling and flocculation were good.

4255 Flocculant Scoping Tests Continued

Data:

Flocculant	Number of Drops	Observations
368 (High Cationic)	5	Very small flocculated particles, slow settling and cloudy solution.
	8	No apparent change.
	10	Slightly more flocculation. The solution is only hazy but the settling rate is slow.
	12	Excellent solution clarity but poor flocculation and settling rate.
	14	Not much change occurred other than the solution was very clear.

4255 Flocculant Scoping Tests Continued

Conclusions : From the data listed above, it was concluded that the feed responded the best to Percol 156. Also, it was found during the lab flotation tests, that increasing the pH of the pulp with lime greatly increased the effect of the flocculant.

NOTE :

Scoping tests were performed with mixed flocculants (example: 156/368 , 1:1) to investigate the possibility of combining their desired qualities. The results showed no improvements.

Settling Test Report

Test No. S-1 Project No. 4255 Date: April 29/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails without a pH modifier or flocculant.

Feed: Test 31 Ro Tails

Lime: 0 g/t pH: 8.2 Flocculant: none

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
1:12 PM	0	1890		79	620
	5	1770		87	600
	10	1621		95	598
	14	1520		145	550
	18	1420		211	520
	27	1170	Final	1080	505
	35	990			
	43	870			
	52	790			
	57	740			
	61	700			
	70	640			
	73	630			

Observations: The mudline was visible but not clearly defined. The solution was very cloudy and was still hazy after 18 hours.

Initial Pulp Weight	2.2316 kg
Initial Pulp Volume	1.890 L
Initial Pulp Height	38.7 cm
Weight of Dry Solids	0.589 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.505 L
Tangent Intersect Y (vol.)	1.182 L
Corresponding X value (Time)	26.2 min
Slope of Tangent Y (mudline)	0.471 L
Slope of Tangent X (time)	90 min

Test No. S-1

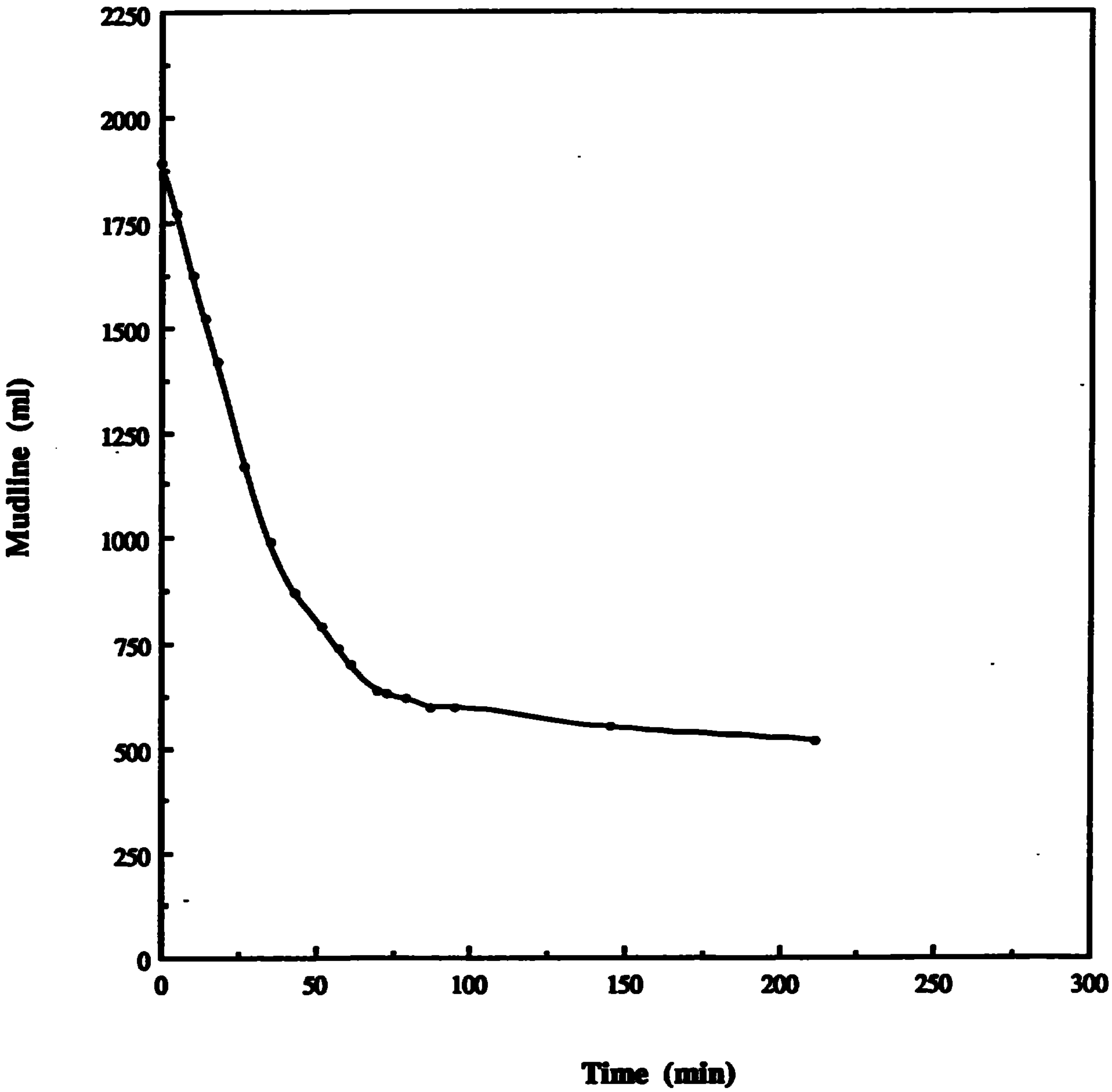
FEED CONCENTRATION ZONE

Initial Pulp Density:	1181 g/L
Initial Percent Solids:	23.4 %
Rate:	0.332 m/h
Thickener Area Required:	0.350 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1326 g/L
Initial Percent Solids:	37.6 %
Final Pulp Density:	1764 g/L
Final Percent Solids:	66.1 %
Rate:	0.097 m/h
Thickener Area Required:	0.498 sq. meters/tonne/day (no safety factor applied)

Graph of Test 1 Mudline
vs
Time



Settling Test Report

Test No. S-2 Project No. 4255 Date: April 30/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 340 g/t CaOH2.

Feed: Test 31 Ro Tails

Lime: 340 g/t pH: 10.4 Flocculant: none

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
9:00 AM	0	1890		90	600
	4	1770		107	595
	6	1700		125	575
	8	1655		143	560
	12	1540		153	550
	23	1258		176	530
	28	1130	Final	1440	515
	39	915			
	47	820			
	53	760			
	56	740			
	58	720			
	60	700			

Observations: The solution was cloudy throughout the test but clearing very gradually. It was clear 24 hours.

Initial Pulp Weight	2.2316 kg
Initial Pulp Volume	1.890 L
Initial Pulp Height	38.7 cm
Weight of Dry Solids	0.589 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.515 L
Tangent Intersect Y (vol.)	1.136 L
Corresponding X value (Time)	28 min
Slope of Tangent Y (mudline)	0.36 L
Slope of Tangent X (time)	107 min

Test No. S-2

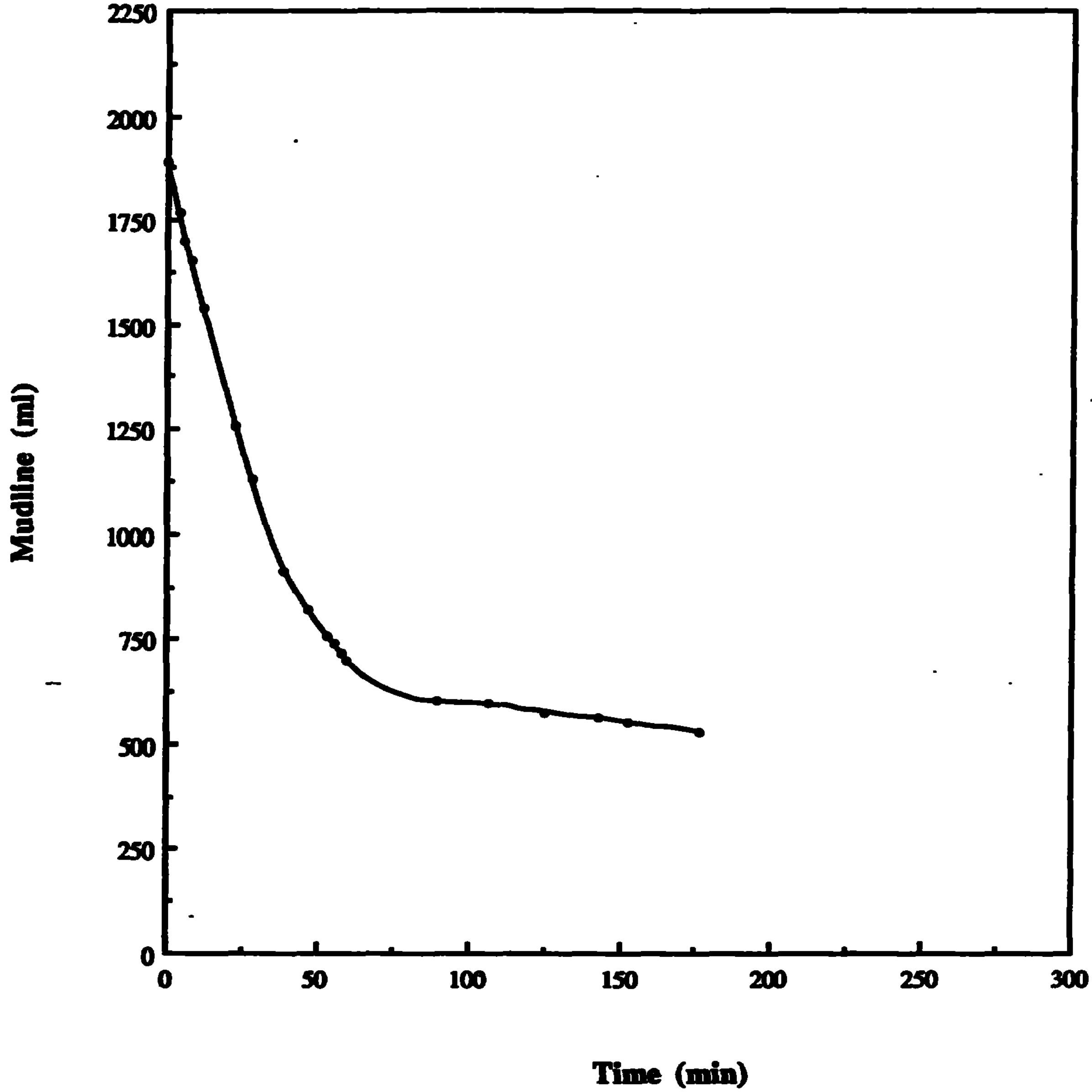
FEED CONCENTRATION ZONE

Initial Pulp Density:	1181 g/L
Initial Percent Solids:	23.4 %
Rate:	0.331 m/h
Thickener Area Required:	0.349 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1340 g/L
Initial Percent Solids:	38.7 %
Final Pulp Density:	1749 g/L
Final Percent Solids:	65.4 %
Rate:	0.089 m/h
Thickener Area Required:	0.497 sq. meters/tonne/day (no safety factor applied)

Graph of Test 2 Mudline
vs
Time



Settling Test Report

Test No. S-3 Project No. 4255 Date: April29/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 5 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 0 g/t pH: 8.2 Flocculant: 5 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
1:14 PM	0	1890		59	845
	3	1930		68	820
	8	1738		71	810
	12	1580		77	800
	16	1480		85	780
	25	1280		93	770
	33	1135		153	700
	41	1000		219	660
	50	900	Final	1080	645
	55	860			

Observations: Small flocculated particles were present and the mudline was obvious. The solution was cloudy but had cleared to a slight haze after 18 hours.

Initial Pulp Weight	2.4873 kg
Initial Pulp Volume	2.040 L
Initial Pulp Height	41.6 cm
Weight of Dry Solids	0.736 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.645 L
Tangent Intersect Y (vol.)	1.302 L
Corresponding X value (Time)	24 min
Slope of Tangent Y (mudline)	0.61 L
Slope of Tangent X (time)	87 min

Test No. S-3

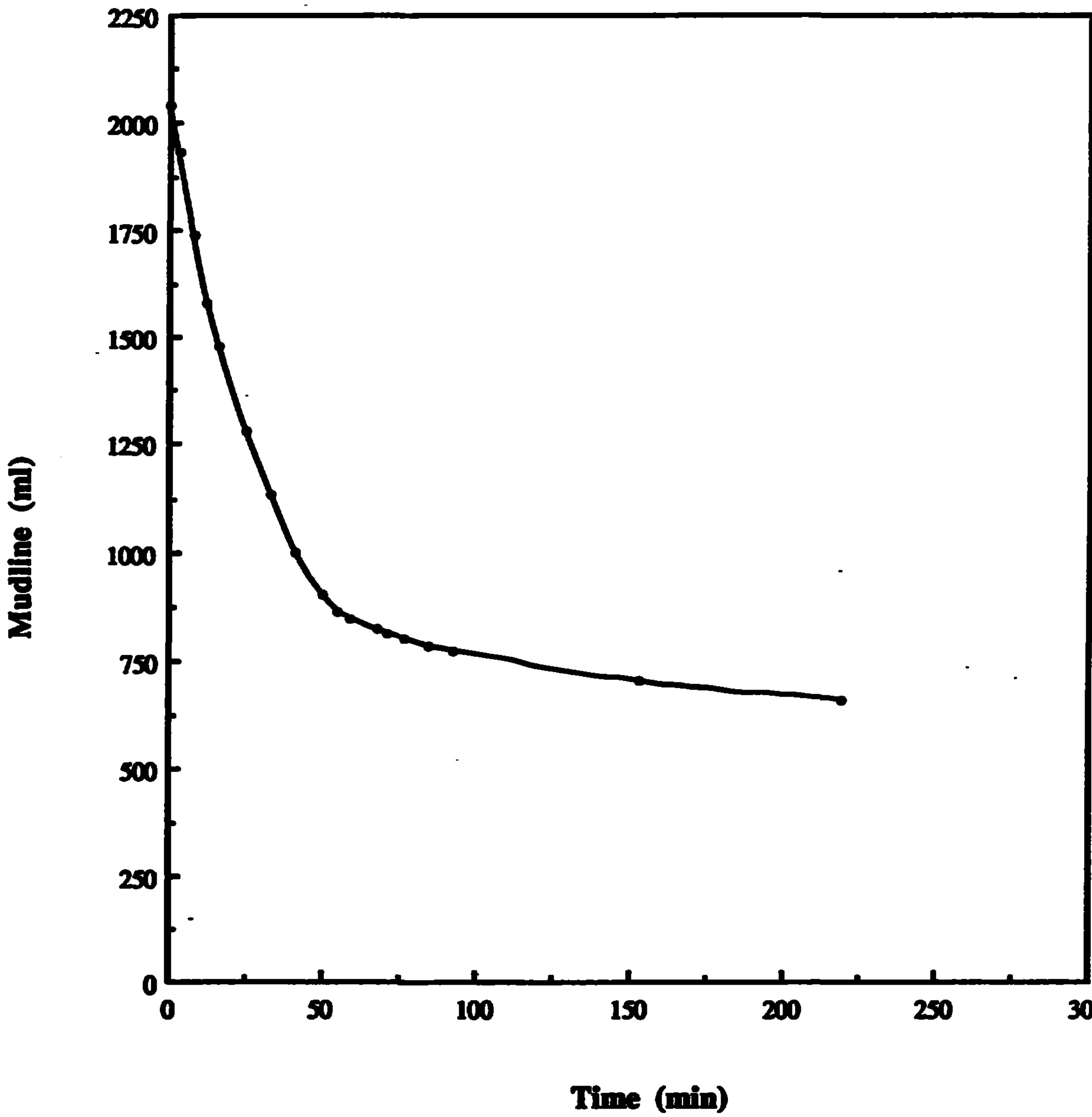
FEED CONCENTRATION ZONE

Initial Pulp Density:	1219 g/L
Initial Percent Solids:	27.4 %
Rate:	0.376 m/h
Thickener Area Required:	0.236 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1370 g/L
Initial Percent Solids:	41.2 %
Final Pulp Density:	1747 g/L
Final Percent Solids:	65.3 %
Rate:	0.097 m/h
Thickener Area Required:	0.385 sq. meters/tonne/day (no safety factor applied)

Graph of Test 3 Mudline
vs
Time



Settling Test Report

Test No. S-4 Project No. 4255 Date: April29/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 267 g/t CaOH2 and 5 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 267.0 g/t pH: 10.0 Flocculant: 5 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
1:15 PM	0	2030		67	800
	2	1960		76	780
	7	1738		84	760
	11	1560		92	748
	15	1460		142	682
	24	1240		208	660
	32	1070	Final	1080	660
	40	950			
	49	878			
	54	840			
	58	830			

Observations: Small flocculated particles were present and the mudline was obvious. The solution was cloudy but better than in test 3. A slight haze remained at 18 hours.

Initial Pulp Weight	2.4944 kg
Initial Pulp Volume	2.030 L
Initial Pulp Height	39.7 cm
Weight of Dry Solids	0.743 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.660 L
Tangent Intersect Y (vol.)	1.28 L
Corresponding X value (Time)	21 min
Slope of Tangent Y (mudline)	0.47 L
Slope of Tangent X (time)	100 min

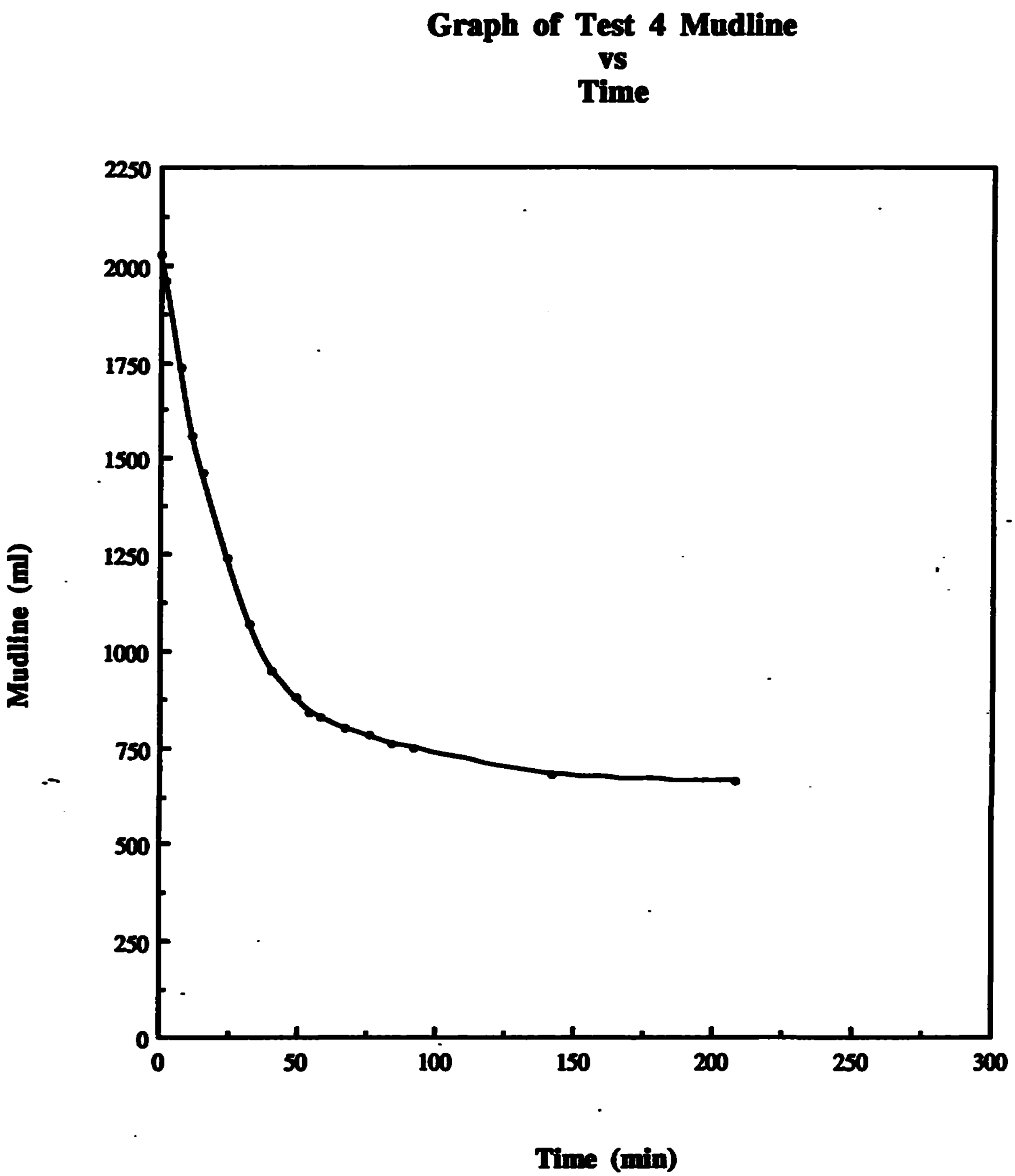
Test No. S-4

FEED CONCENTRATION ZONE

Initial Pulp Density:	1229 g/L
Initial Percent Solids:	28.4 %
Rate:	0.419 m/h
Thickener Area Required:	0.198 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1380 g/L
Initial Percent Solids:	42.0 %
Final Pulp Density:	1737 g/L
Final Percent Solids:	64.8 %
Rate:	0.095 m/h
Thickener Area Required:	0.369 sq. meters/tonne/day (no safety factor applied)



Graph of Test 4 Mudline
vs
Time
Mudline (ml)
2250
2000
1750
1500
1250
1000
750
500
250
0
0
50
100
150
200
250
300
Time (min)

Settling Test Report

Test No. S-5 Project No. 4255 Date: April30/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 10 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 0 g/t pH: 8.2 Flocculant: 10 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
9:01 AM	0	2040		59	800
	3	1860		89	740
	5	1720		106	715
	7	1620		124	700
	11	1470		142	685
	22	1160		152	680
	27	1050		175	670
	38	900	Final	1440	640
	46	860			
	52	835			
	55	820			
	57	805			

Observations: Larger flocculated particles were present and the the solution was cloudy. The solution was clearing as the test continued and was clear after 24 hours.

Initial Pulp Weight	2.4873 kg
Initial Pulp Volume	2.040 L
Initial Pulp Height	41.6 cm
Weight of Dry Solids	0.736 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.640 L
Tangent Intersect Y (vol.)	1.27 L
Corresponding X value (Time)	17.5 min
Slope of Tangent Y (mudline)	0.27 L
Slope of Tangent X (time)	115 min

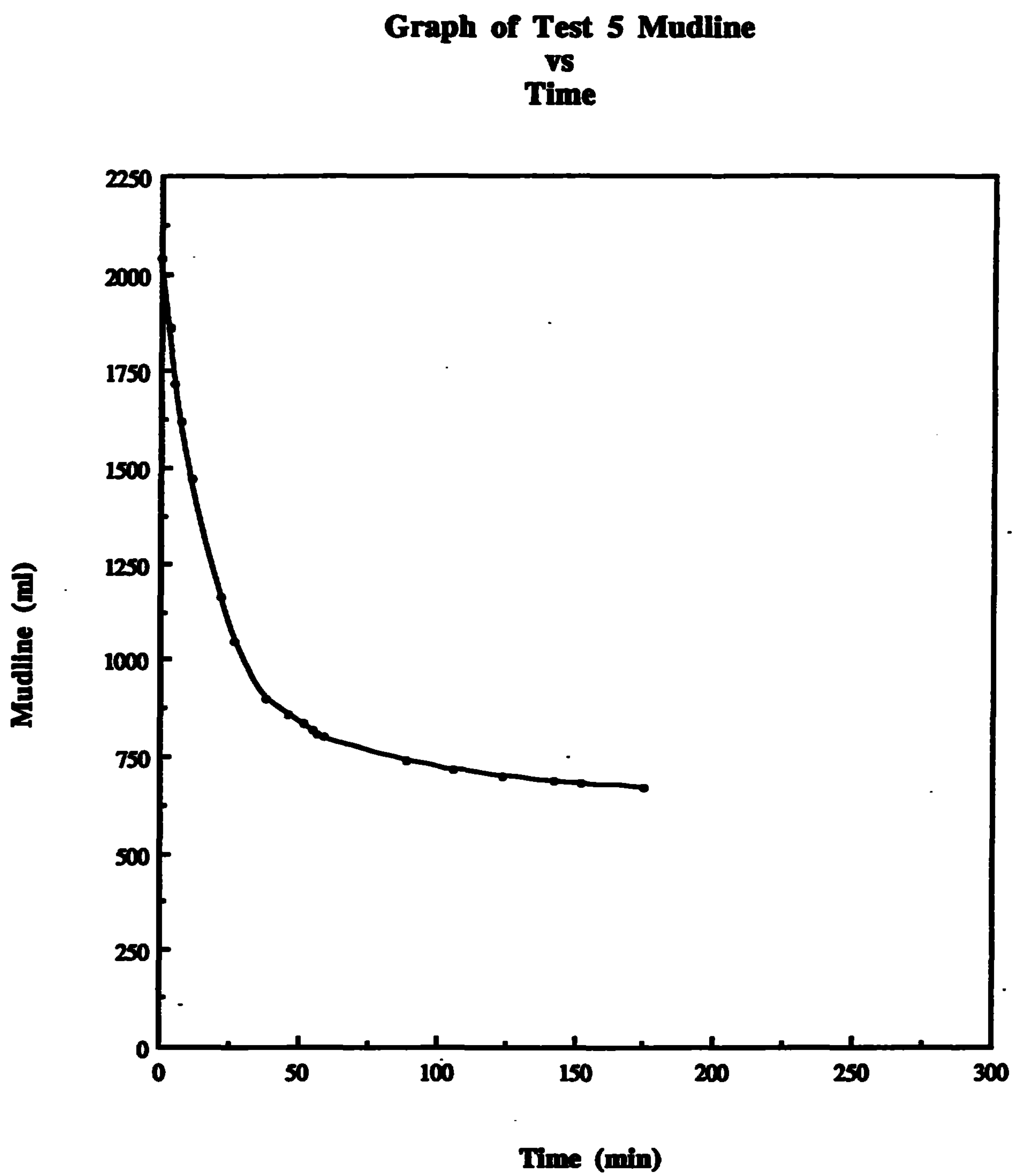
Test No. S-5

FEED CONCENTRATION ZONE

Initial Pulp Density:	1219 g/L
Initial Percent Solids:	27.4 %
Rate:	0.538 m/h
Thickener Area Required:	0.165 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1380 g/L
Initial Percent Solids:	42.0 %
Final Pulp Density:	1753 g/L
Final Percent Solids:	65.6 %
Rate:	0.106 m/h
Thickener Area Required:	0.338 sq. meters/tonne/day (no safety factor applied)


Graph of Test 5 Mudline
vs
Time
Mudline (ml)
2250
2000
1750
1500
1250
1000
750
500
250
0
0
50
100
150
200
250
300
Time (min)

Settling Test Report

Test No. S-6 Project No. 4255 Date: April30/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 267 g/t CaOH2 and 10 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 267 g/t pH: 10.0 Flocculant: 10 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
9:02 AM	0	2030		56	775
	2	1860		58	765
	4	1680		88	700
	6	1560		105	690
	10	1400		123	670
	21	1060		141	665
	26	970		151	665
	37	860		174	665
	45	820	Final	1440	665
	51	800			
	54	780			

Observations: Larger flocculated particles were present.
The solution clarity was not as good as test 5.
After 24 hours, however, the solution was clear.

Initial Pulp Weight	2.4944 kg
Initial Pulp Volume	2.030 L
Initial Pulp Height	39.7 cm
Weight of Dry Solids	0.743 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.665 L
Tangent Intersect Y (vol.)	1.17 L
Corresponding X value (Time)	16 min
Slope of Tangent Y (mudline)	0.51 L
Slope of Tangent X (time)	80 min

Test No. S-6

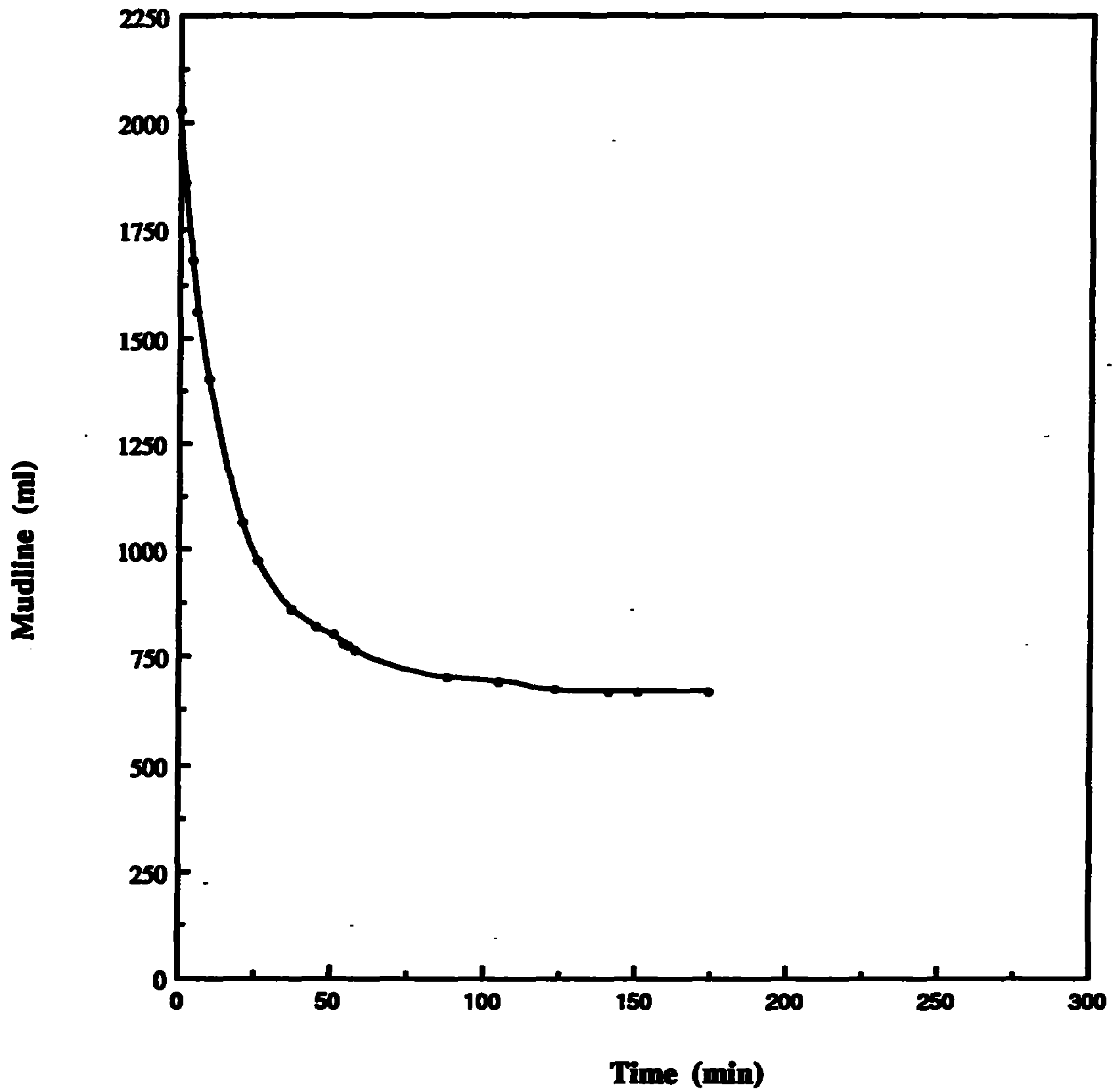
FEED CONCENTRATION ZONE

Initial Pulp Density:	1229 g/L
Initial Percent Solids:	28.4 %
Rate:	0.631 m/h
Thickener Area Required:	0.131 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1416 g/L
Initial Percent Solids:	44.8 %
Final Pulp Density:	1732 g/L
Final Percent Solids:	64.5 %
Rate:	0.097 m/h
Thickener Area Required:	0.295 sq. meters/tonne/day (no safety factor applied)

Graph of Test 6 Mudline
vs
Time



Settling Test Report

Test No. S-7 Project No. 4255 Date: April 30/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 1698 g/t CaOH2.

Feed: Test 31 Ro Tails

Lime: 1698 g/t pH: 12.0 Flocculant: none

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
9:09 AM	0	1890		44	640
	4	1650		77	580
	8	1450		95	560
	15	1240		165	555
	21	960	Final	1440	480
	30	800			
	32	765			
	35	720			
	38	690			
	41	660			

Observations: The solution clarity was good throughout the test. (Solution was totaly clear at 20 minutes.)

Initial Pulp Weight	2.2316 kg
Initial Pulp Volume	1.890 L
Initial Pulp Height	38.7 cm
Weight of Dry Solids	0.589 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.480 L
Tangent Intersect Y (vol.)	0.982 L
Corresponding X value (Time)	21 min
Slope of Tangent Y (mudline)	0.43 L
Slope of Tangent X (time)	70 min

Test No. S-7

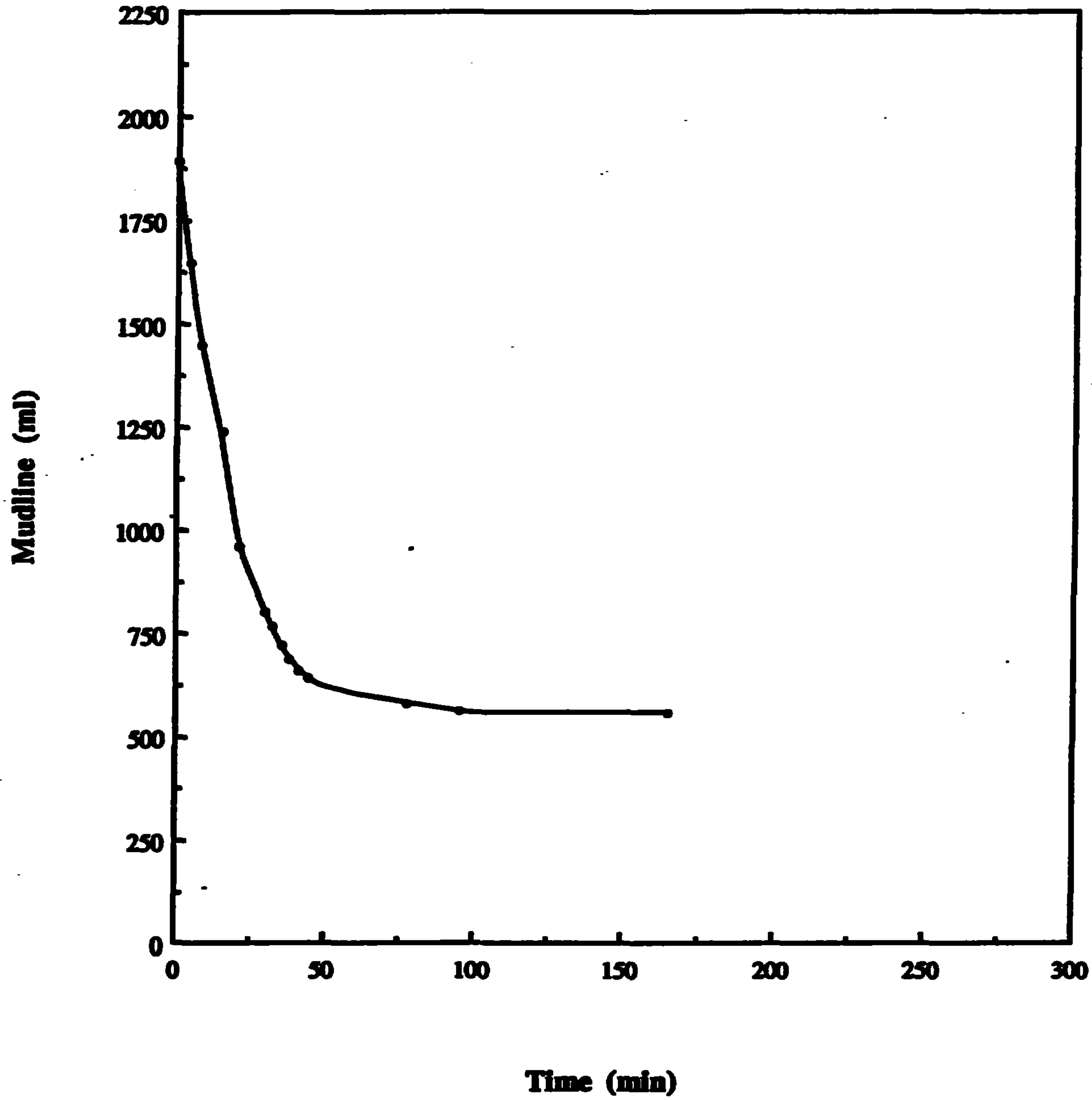
FEED CONCENTRATION ZONE

Initial Pulp Density:	1181 g/L
Initial Percent Solids:	23.4 %
Rate:	0.531 m/h
Thickener Area Required:	0.222 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1393 g/L
Initial Percent Solids:	43.0 %
Final Pulp Density:	1804 g/L
Final Percent Solids:	68.0 %
Rate:	0.097 m/h
Thickener Area Required:	0.370 sq. meters/tonne/day (no safety factor applied)

Graph of Test 7 Mudline
vs
Time



Settling Test Report

Test No. S-8 Project No. 4255 Date: May 1/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 15 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 0 g/t pH: 8.2 Flocculant: 15 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
9:10 AM	0	2040		37	810
	3	1705		40	795
	7	1450		43	785
	14	1115		76	725
	20	960		94	705
	29	860		164	670
	31	840	Final	1440	650
	34	820			

Observations: Large flocculated particles were present and the solution was slightly cloudy. The solution was clear after 24 hours.

Initial Pulp Weight	2.4873 kg
Initial Pulp Volume	2.040 L
Initial Pulp Height	41.6 cm
Weight of Dry Solids	0.736 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.650 L
Tangent Intersect Y (vol.)	1.115 L
Corresponding X value (Time)	13 min
Slope of Tangent Y (mudline)	0.23 L
Slope of Tangent X (time)	100 min

Test No. S-8

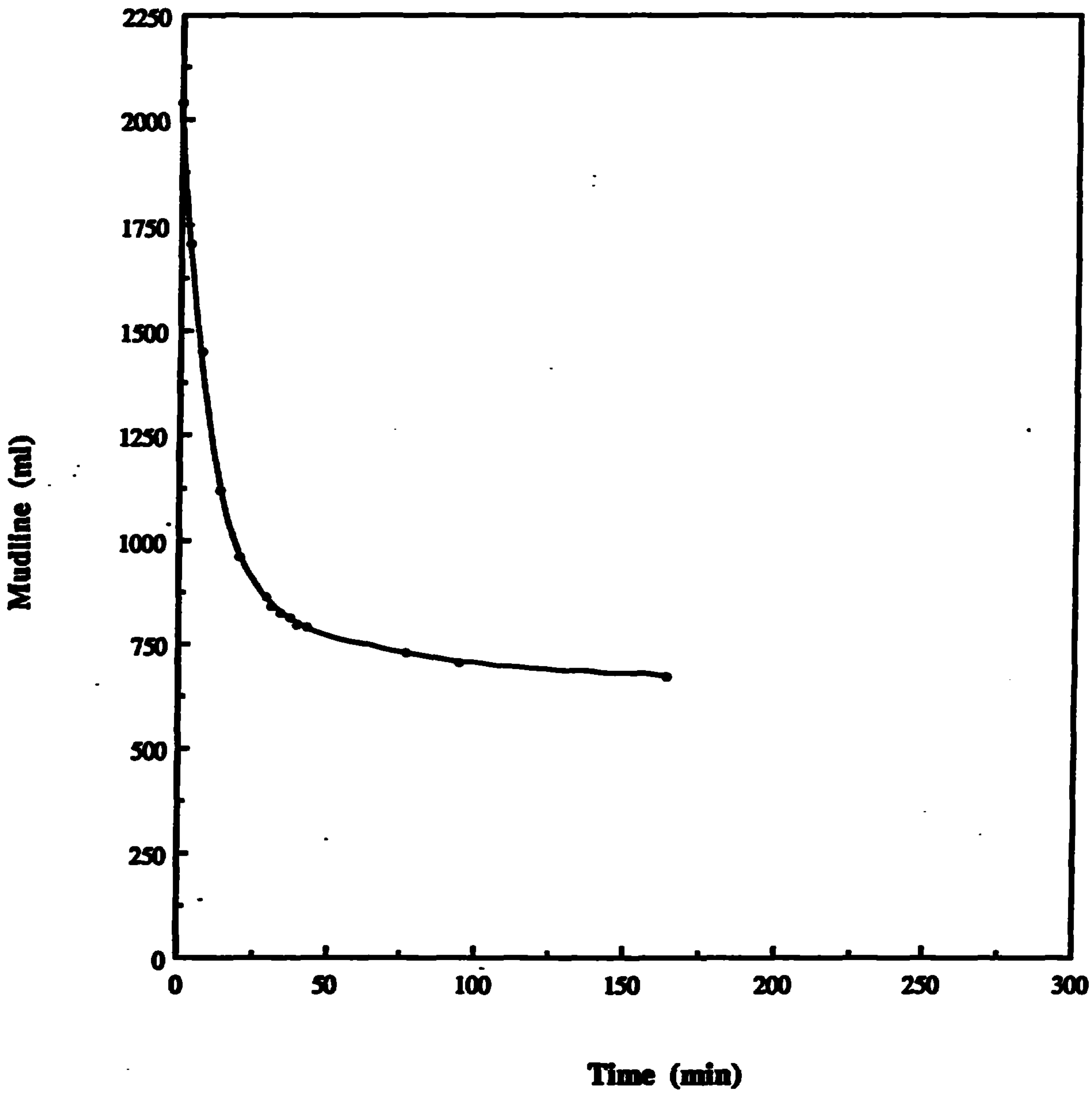
FEED CONCENTRATION ZONE

Initial Pulp Density:	1219 g/L
Initial Percent Solids:	27.4 %
Rate:	0.871 m/h
Thickener Area Required:	0.102 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1432 g/L
Initial Percent Solids:	46.1 %
Final Pulp Density:	1742 g/L
Final Percent Solids:	65.0 %
Rate:	0.108 m/h
Thickener Area Required:	0.245 sq. meters/tonne/day (no safety factor applied)

Graph of Test 8 Mudline vs Time



Settling Test Report

Test No. S-9 **Project No.** 4255 **Date:** May 1/92 **Operator** B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 267 g/t $CaOH2$ and 15 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 267 g/t **pH:** 10.0 **Flocculant:** 15 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
9:11 AM	0	2030		39	760
	2	1700		42	755
	6	1390		75	705
	13	1040		93	700
	19	910		163	690
	28	820	Final	1440	670
	30	810			
	33	790			
	36	770			

Observations: Large flocculated particles were present. The solution clarity was not as good as test 8. After 24 hours, however, the solution was clear.

Initial Pulp Weight	2.4944 kg
Initial Pulp Volume	2.030 L
Initial Pulp Height	39.7 cm
Weight of Dry Solids	0.743 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.670 L
Tangent Intersect Y (vol.)	1.075 L
Corresponding X value (Time)	12 min
Slope of Tangent Y (mudline)	0.15 L
Slope of Tangent X (time)	110 min

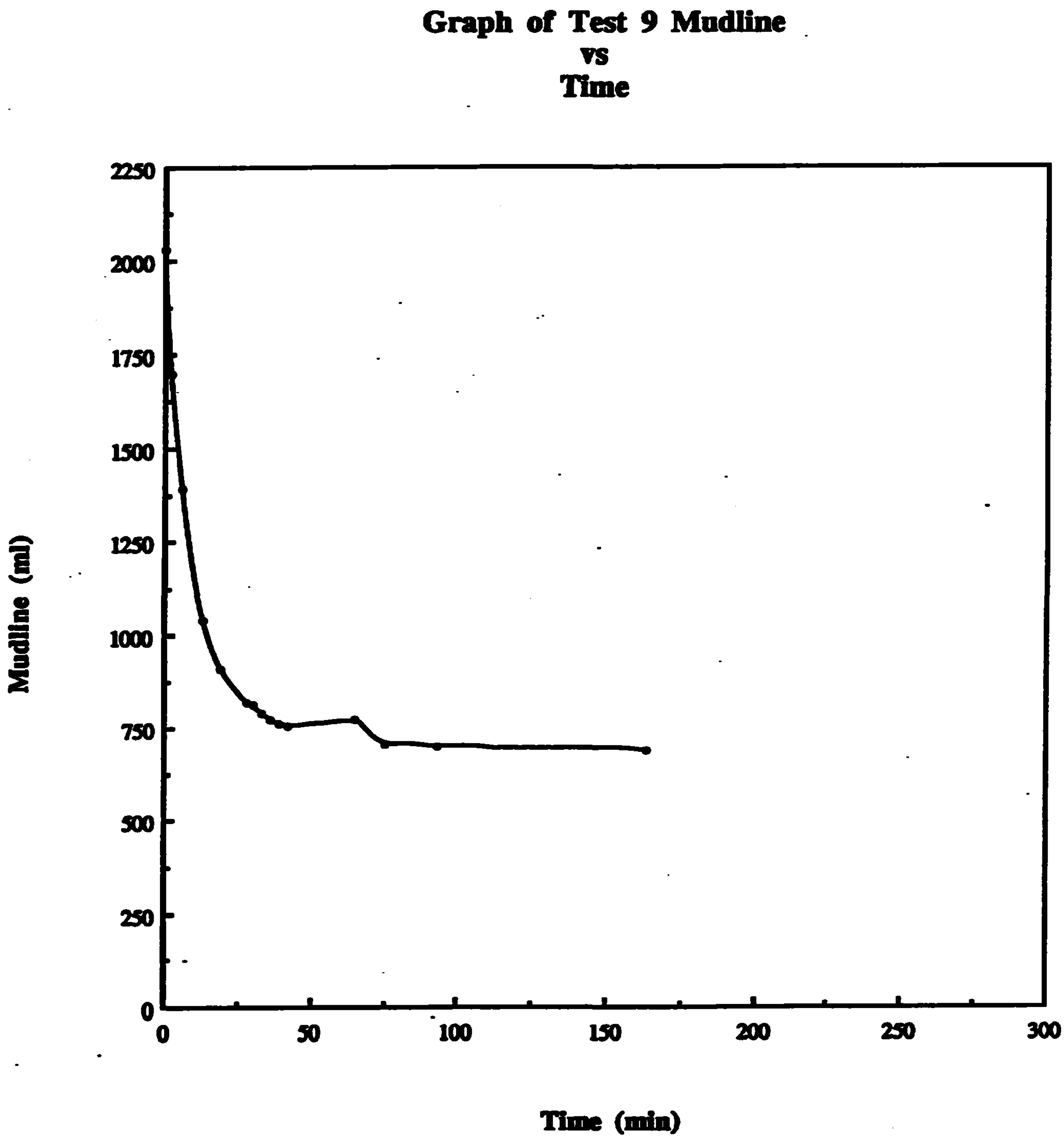
Test No. S-9

FEED CONCENTRATION ZONE

Initial Pulp Density:	1229 g/L
Initial Percent Solids:	28.4 %
Rate:	0.934 m/h
Thickener Area Required:	0.088 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1453 g/L
Initial Percent Solids:	47.6 %
Final Pulp Density:	1726 g/L
Final Percent Solids:	64.2 %
Rate:	0.099 m/h
Thickener Area Required:	0.232 sq. meters/tonne/day (no safety factor applied)



Graph of Test 9 Mudline
vs
Time
2250
2000
1750
1500
1250
1000
750
500
250
0
Mudline (ml)
0
50
100
150
200
250
300
Time (min)

Settling Test Report

Test No. S-10 Project No. 4255 Date: May 5/92 Operator B.W.

Purpose: To investigate the settling characteristics of 4255 Test 31 Rougher Tails with 1403 g/t CaOH2 and 15 g/t P - 156.

Feed: Test 31 Ro Tails

Lime: 1403 g/t pH: 11.7 Flocculant: 15 g/t P-156

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
8:47 AM	0	2030		51	820
	3	1850		53	810
	8	1560		61	780
	18	1120		65	770
	21	1040		67	765
	28	940		110	710
	33	900	Final	1440	680
	39	870			
	43	850			

Observations: Large flocculated particles were present.
The solution clarity was excellent.
The solution cleared as the pulp settled.

Initial Pulp Weight	2.4944 kg
Initial Pulp Volume	2.030 L
Initial Pulp Height	39.7 cm
Weight of Dry Solids	0.743 kg
Dry Solids S.G.	2.9 g/cc or kg/L
Liquid S.G.	1.0 g/cc or kg/L
Final Mudline	0.680 L
Tangent Intersect Y (vol.)	1.19 L
Corresponding X value (Time)	16 min
Slope of Tangent Y (mudline)	0.49 L
Slope of Tangent X (time)	80 min

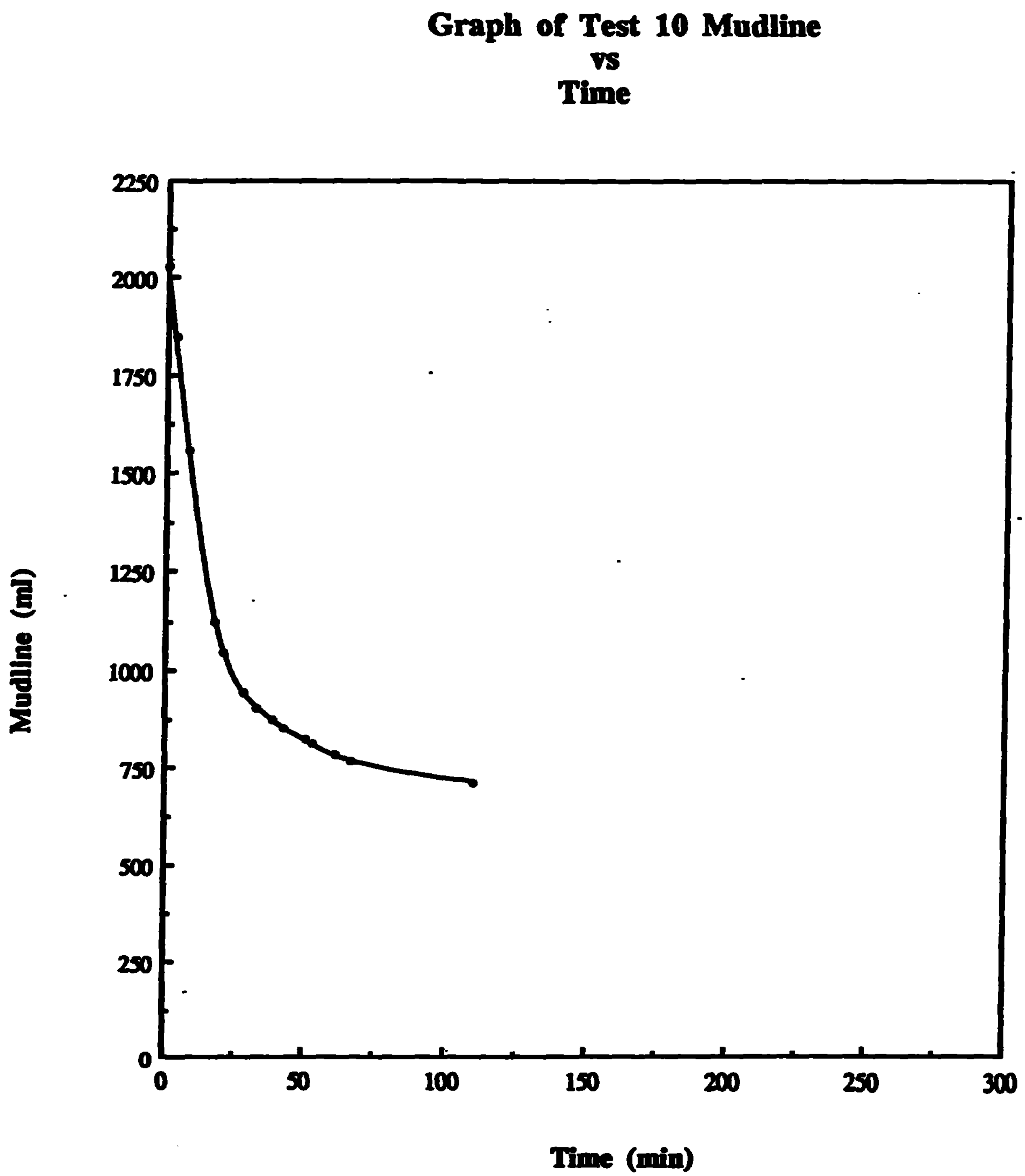
Test No. S-10

FEED CONCENTRATION ZONE

Initial Pulp Density:	1229 g/L
Initial Percent Solids:	28.4 %
Rate:	0.616 m/h
Thickener Area Required:	0.133 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1409 g/L
Initial Percent Solids:	44.3 %
Final Pulp Density:	1716 g/L
Final Percent Solids:	63.7 %
Rate:	0.103 m/h
Thickener Area Required:	0.281 sq. meters/tonne/day (no safety factor applied)


Graph of Test 10 Mudline
vs
Time
2250
2000
1750
1500
1250
1000
750
500
250
0
Mudline (ml)
0
50
100
150
200
250
300
Time (min)

Appendix 1

Mineralogical Examination
of a sample of cleaner concentrate
submitted on behalf of
Richard Down, Ph.D.

SUMMARY

The platinum group minerals identified in the sample were vysotskite (Pd, Pt, Ni, S), kotulskite (Pd, Pt, Te, Bi) and braggite (Pd, Pt, Ni) S. These minerals were associated with pyrrhotite, chalcopyrite, pyrite and millerite as inclusions; interstitially between grains and as attached particles (vysotskite). Other minerals present in the sample were: marcasite, chalocite, covellite, sphalerite, galena, magnetite and violarite.

No free/liberated P G E mineral was identified but undoubtedly were present. Particle sizes ranged from 10 micrometers to smaller than 3 micrometers.

The fusion test was not successful in fielding material for examination for palladium.

INTRODUCTION

A sample identified as LR4255 - Test 23 - Cu Ni 4th cleaner concentrate was received in the Mineralogy laboratory for examination. The sample was derived from testwork done on composite Sample M92 of Project No. LR 4255.

On instructions from Mr. Richard Down, P.Eng., the sample was submitted for mineralogical examination with special attention paid to identification of any Platinum Group Element minerals present. In addition, a portion of the sample was to be submitted for a fusion test employing sodium hydroxide to dissolve the silicate minerals present. The residue would be submitted for determination of the character, association and mode of occurrence of the Platinum Group metals present in the residue.

R.W. Deane
Mineralogist

PREPARATION AND PROCEDURE

A portion of the sample was split into four similar fractions and each fraction was then briquetted and polished for incident light microscopic examination. A further portion of the sample was submitted for the sodium hydroxide fusion test. This latter portion first was roasted in air at a temperature between 500°C and 600°C before being fused in the muffle furnace. The residue obtained was examined.

A further small sample was submitted for semi-quantitative spectrometry in an attempt to identify trace elements useful for the identification of the PGE minerals.

RESULTS

Microscopic

The following three Platinum Group Metal Minerals were identified and are listed in decreasing order of abundance:

Vysotskite	(Pd, Ni, Pt)S
Kotulskite	$Pd(Te, Bi)_{1-2}$
Braggite	(Pt, Pd, Ni)S

Other PGE minerals identified in earlier investigations on this occurrence were not identified but may well have been present. The minerals identified were present as particles measuring 10 micrometers and smaller and, were associated with pyrrhotite, chalcopyrite, pyrite plus millerite as inclusions, an attached particle (vysotskite) and interstitially between grains. The combined total of PGE minerals seen accounted for an estimated 40 percent of the palladium and platinum known present, i.e., 257 g/t and 13.4 g/t respectively. Rapid identification of free grains of these PGE minerals in a host of equally free and fine grained chalcopyrite, pyrite, millerite, pentlandite and pyrrhotite is almost impossible, particularly when the sample examined is sulphide concentrate, and the minerals measure 5 or less micrometers in section.

Minerals other than PGE minerals present in the sample were:

Pyrite	FeS_2
Pyrrhotite	Fe
Chalcopyrite	$CuFeS_2$
Pentlandite	$(Fe, Ni)_9S_8$
Violarite	$(Ni,Fe)_3S_4$
Millerite	NiS
Marcasite	FeS_2
Sphalerite	ZnS
Covellite	CuS
Chalcocite	Cu_2S
Galena	PbS
Molybdenite	MoS_2
Magnetite	Fe_3O_4
Quartz	SiO_2

The grain sizes ranged from 60 to smaller than 3 micrometers.

Roasting and Fusion

The reject left from preparation of the polished sections was roasted in air in a muffle furnace for one hour a 700°C. The calcine obtained was fused using NaOH (sodium hydroxide). Fusion was carried out using a sample to NaOH ratio of about 1:10 with the fusion taking place in a 300 mL Ni crucible placed in a muffle furnace for one hour at 500°C. The resulting product was leached in boiling water. A portion of the residue obtained was used in the preparation of two polished sections for incident light microscopic examination and the remaining reject was set aside for possible analytical determinations.

Weight loss of sample after roasting was 30.5 percent, and further 1.2 percent was lost in leaching after fusion.

Examination of the briquetted leach residue showed that less than 0.5% sulphide (pyrite) remained unoxidized. In addition, there was present in each briquette one grain of what may have been an alloy of gold/electrum and other metal. The remainder of the grains in the briquettes were Fe-OOH. An electron micro probe analysis would be necessary for the identification of any other oxides (eg. Ni, Cu or Pd).

The weight loss resulting after roasting was due to oxidation of the sulphide minerals - loss of sulphur to the atmosphere. The loss resulting from leaching following fusion primarily was due to removal of sodium silicate and of any oxide soluble in the caustic leach.

We do not consider the fusion treatment to have been successful. The preliminary roasting stage was necessary for the break down of the sulphide particle and removal of the sulphur for the fusion process to have a chance of success. Furthermore, roasting probably would oxidize any PGE sulphides present, i.e. vysotskite, kotulskite, etc. and the Rabber Manufacturers Handbook of Chemistry indicates that such oxides are soluble in a caustic solution. Some of the oxidized palladium may have been dissolved in the hot NaOH melt.

Conventional treatment of flotation concentrates containing PGE minerals is made on concentrates containing 100 g/t or more Pt. Treatment is by leaching using aqua-regia or a combination of hydrochloric acid and chlorine which takes the PGE metals into solution from which these elements are recovered.

Appendix 2

Mineralogical Examination
of a Scavenger Tailing Sample
submitted on behalf of
Richard Down, P. Eng.

Project No. L.R. 4255

NOTE:

This report refers to the samples as received.

The practice of this Company in issuing reports of this nature is to require the recipient not to publish the report or any part thereof without the written consent of Lakefield Research.

LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
June 24th,1992

SUMMARY

The non-opaque minerals identified were:

pyrite
chalcopyrite
pyrrhotite
millerite (?)
pentlandite (?)
magnetite
ilmenite

All of these minerals were present as inclusions in silicate minerals as particles which ranged in size from about 12-15 micrometres to smaller than 4 micrometres in section. No nickel mineral larger than 5 by 5 micrometres was identified with certainty.

Analyses performed on the sample yielded the following results

0.24 g/t Au
0.18 g/t Pt
2.72 g/t Pd
0.04 % Cu
0.11% Ni
0.09% S

from which it will be plain that not all of the nickel present was so as sulfide. We concluded that as much as 50 percent of the nickel present was so in a silicate - in a serpentine or chlorite group mineral.

INTRODUCTION

A sample identified as 4255-28 Scavenger Tails was received in the Mineralogy laboratory for examination. The purpose of the examination was to identify the nickel minerals present and determine the cause for their remaining in the flotation tailings.

LAKEFIELD RESEARCH

R.W. Deane
Consultant

PREPARATION AND PROCEDURE

A portion of the sample was used to prepare two polished, briquetted grain mounts and for analyses for Au, Pt, Pd, Cu, Ni and S.

RESULTS

The results of the analytical procedure were as follows:

0.24 g/t Au
0.18 g/t Pt
2.72 g/t Pd
0.04 % Cu
0.11 % Ni
0.09% S

The opaque minerals identified with certainty were:

pyrite
marcasite
chalcopyrite
pyrrhotite
magnetite
ilmenite

Tentatively identified were:

pentlandite
millerite

The particle size of the sulfide minerals ranged from a maximum of 12 to 15 micrometres to smaller than 4 by 4 micrometres in section.

Pyrite and chalcopyrite were present in the coarser range and the remaining sulfide minerals were smaller than 10 micrometres in section. One grain of pentlandite measuring 6 by 8 micrometres was identified. All other identification of nickel minerals were tentative because of the small grain size.

Not all of the nickel was present as sulfide nickel. Reference to the tabulation of analytical results confirms this. Allowing 0.04 percent sulfur for chalcopyrite and 0.02 percent sulfur for pyrite plus pyrrhotite plus marcasite leaves 0.03 percent sulfur for 0.11 percent nickel. Were all of the nickel present as millerite at least 0.06 percent sulfur would be necessary for stochiometry. Therefore 50 percent or more of the nickel must be present in a silicate mineral - either serpentine or chlorite.

Examination of grains mounted in refractive index oils proved the presence of a sheet structure mineral such as chlorite but electron probe analysis is required to prove the presence of nickel in this silicate.

An Investigation of

THE RECOVERY OF COPPER, NICKEL and PG METALS

from ROBY ZONE project samples
submitted by

LAC des ILES MINES LTD.

Progress Report No. 2

Project No. L.R. 4255

NOTE:

This report refers to the samples as received.

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LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
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52H04NE0015 OM92-113 LAC DES ILES

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INTRODUCTION

This report presents testwork conducted from June to September, 1992, on Composite M92 prepared from drill chips submitted by Lac des Iles Mines Ltd., and on five variability composites. This testwork investigated recovery of platinum group metals in copper-nickel flotation concentrates.

The test program was discussed regularly with Mr. G. Reschke and Mr. G.R. Clark, Lac des Iles Mines.

LAKEFIELD RESEARCH

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SUMMARY

1. Description of Samples

Composite M92 and the Roby Zone sample, as described in LR 4255, Progress Report 1 were used for the flotation program. The variability samples, designated as Groups 1 to 5, were prepared by blending equal weights of sub-samples:

Group	Sub-samples
1	25643 and 25644
2	25635 to 25640
3	25631 to 25630
4	25627 to 25630
5	25680 to 25681

The head analyses are presented in Table 1.

Table 1: Head Analyses

Sample	Assays, %, g/t									
	Cu	Ni	Au	Pt	Pd	As	S	Fe t	Fe py	Fe po
M92	0.18	0.24	0.42	0.59	9.87	<0.001	1.03	7.91	1.18	1.04
Roby	0.16	0.16	0.30	0.29	2.40	<0.001	0.59	4.61	0.58	0.73
92M1										
28843	0.025	0.096	0.25	0.93	22.2	-	-	-	-	-
G1	0.045	0.091	0.23	0.49	6.47	-	0.15	-	-	-
G2	0.11	0.15	0.27	0.30	2.90	-	0.24	-	-	-
G3	0.16	0.20	0.68	0.35	4.35	-	0.43	-	-	-
G4	0.17	0.28	0.94	0.40	7.54	-	0.51	-	-	-
G5	0.039	0.11	0.23	0.67	17.2	-	0.14	-	-	-
Roby	0.16	0.16	0.30	0.29	2.40	<0.001	0.59	4.61	0.58	0.73

A sub-sample of Composite M92 weighing 25 kg was prepared for Mr. G. Clark in September assaying:

%Cu	%Ni	g/t Au	g/t Pt	g/t Pd
0.17	0.24	0.60	0.66	10.7

2. Flotation Testwork

This phase of the testwork investigated the effect of the water source, rougher flotation density, magnetic separation and the reagent balance on the flotation response. Much of the testwork was performed with the assistance of Mr. G. Reschke, Lac des Iles Mines.

2.1 Site Water

Flotation tests were conducted on Composite M92 using Camp Lake (CL), Lac des Iles (LdI) and Lakefield (Lkfd) water. The primary grind was 70% minus 200 mesh in Test 36 but adjusted to 78% minus 200 mesh for subsequent tests. Some adjustments were made to the reagent balance and the flotation density. The results are compared with earlier testwork in Table 2.

Table 2: Water Source

Test % Pass 200 mesh	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	% Distribution Au	Pt	Pd	Ni	Cu	S
1	Ro Conc 1	4.1	7.18	6.45	137	2.95	3.40	13.5	47.7	47.6	55.3	48.0	68.4	62
61	Ro Conc 1+2	7.8	4.83	4.21	87.2	1.88	1.99	9.44	61.4	59.5	67.4	58.6	76.5	83
	Scav Conc 1	2.7	2.14	1.60	22.1	0.41	0.42	2.70	9.5	7.9	6.0	4.5	5.7	8
Lkfd	Sc Conc 1+2	4.9	1.46	1.19	16.6	0.34	0.31	1.79	11.8	10.7	8.2	6.7	7.6	10
water	Comb Conc	12.8	3.52	3.03	59.8	1.28	1.33	6.46	73.1	70.1	75.6	65.3	84.1	93
33%	Scav Tail	87.2	0.19	0.19	2.84	0.10	0.037	0.07	26.9	29.9	24.4	34.7	15.9	7
solids	Head(calc)	-	0.62	0.55	10.1	0.25	0.20	0.89	-	-	-	-	-	-
36	Ro Conc 1	3.4	8.82	8.36	170	2.09	3.21	12.6	47.1	47.8	53.8	32.1	63.0	52
70	Ro Conc 1+2	6.9	5.19	5.20	108	1.48	1.84	8.51	57.0	61.1	70.3	46.9	74.1	72
	Scav Conc	4.0	0.96	1.46	22.1	0.45	0.28	3.99	6.2	10.0	8.4	8.3	6.6	20
CL	Comb Conc	10.9	3.63	3.82	76.5	1.10	1.26	6.84	63.2	71.2	78.7	55.2	80.7	92
water	Scav Tail	89.1	0.25	0.19	2.55	0.11	0.037	0.07	36.8	28.8	21.3	44.8	19.3	8
20% solids	Head(calc)	-	0.63	0.59	10.6	0.22	0.17	0.81	-	-	-	-	-	-
40	Ro Conc 1	2.8	12.9	9.82	192	2.26	3.84	-	60.5	49.3	52.7	27.8	59.8	-
78	Ro Conc 1+2	5.7	7.12	5.92	122	1.72	2.22	-	68.1	60.7	68.5	43.1	70.3	-
	Scav Conc 1	4.4	0.65	1.10	19.8	0.50	0.27	-	4.7	8.6	8.5	9.6	6.5	-
LdI	Comb Conc	10.1	4.32	3.84	78.0	1.19	1.38	-	72.9	69.3	77.0	52.6	77.0	-
water	Scav Tail	89.9	0.18	0.19	2.61	0.12	0.046	-	27.1	30.7	23.0	47.4	23.0	-
20% solids	Head(calc)	-	0.60	0.56	10.2	0.23	0.18	-	-	-	-	-	-	-

No differences in flotation response were noticed when the water source was varied.

2.2 Sodium Silicate

Metso granular sodium silicate, Na_2SiO_3, was tested as an auxiliary dispersant and as the sole dispersant. Camp Lake water was used in these tests. The test results are condensed in Table 3.

Table 3: Effect of Na_2SiO_3

Test g/t Na_2SiO_3	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	% Distribution Au	Pt	Pd	Ni	Cu	S
36	Ro Conc 1	3.4	8.82	8.36	170	2.09	3.21	12.6	47.1	47.8	53.6	32.1	63.0	52
0	Ro Conc 1+2	6.9	5.19	5.20	108	1.48	1.84	8.51	57.0	61.1	70.3	46.9	74.1	72
2000g/t	Scav Conc 1	4.0	0.96	1.46	22.1	0.45	0.28	3.99	6.2	10.0	8.4	8.3	6.6	20
Na_2CO_3	Comb Conc	10.9	3.63	3.82	76.5	1.10	1.26	6.84	63.2	71.2	78.7	55.2	80.7	92
250 g/t	Scav Tail	89.1	0.26	0.19	2.55	0.11	0.037	0.07	36.8	28.8	21.3	44.8	19.3	8
Na_2S														
	Head(calc)	-	0.63	0.59	10.6	0.22	0.17	0.81	-	-	-	-	-	-
37	Ro Conc 1	1.9	15.3	12.7	225	2.06	5.10	16.4	47.5	40.9	40.4	18.1	57.3	35
2000	Ro Conc 1+2	3.5	9.86	9.03	170	1.97	3.29	12.6	56.9	54.0	56.8	32.2	68.7	51
1000g/t	Scav Conc 1	5.1	1.52	1.85	39.2	0.87	0.40	4.68	12.7	16.1	19.0	20.6	12.1	27
Na_2CO_3	Comb Conc	8.5	4.92	4.78	92.5	1.32	1.58	7.91	69.7	70.1	75.8	52.8	80.8	78
250 g/t	Scav Tail	91.5	0.20	0.19	2.76	0.11	0.035	0.21	30.3	29.9	24.2	47.2	19.2	22
Na_2S														
	Head(calc)	-	0.60	0.58	10.4	0.21	0.17	0.87	-	-	-	-	-	-
38	Ro Conc 1	2.9	11.7	9.66	198	2.22	3.80	14.7	54.2	47.6	52.9	29.4	65.1	49
1000	Ro Conc 1+2	4.9	7.69	7.00	145	1.84	2.54	10.7	60.8	58.9	66.2	41.7	74.1	60
1000g/t	Scav Conc 1	5.0	1.07	1.36	24.6	0.54	0.29	3.44	8.6	11.7	11.4	12.5	8.7	20
Na_2CO_3	Comb Conc	9.9	4.35	4.15	84.2	1.18	1.40	7.02	69.4	70.6	77.6	54.2	82.8	80
250 g/t	Scav Tail	90.1	0.21	0.19	2.67	0.11	0.032	0.19	30.6	29.4	22.4	45.8	17.2	20
Na_2S														
	Head(calc)	-	0.62	0.58	10.7	0.22	0.17	0.87	-	-	-	-	-	-
39	Ro Conc 1	8.7	4.08	4.01	87.5	1.16	1.44	6.29	65.0	62.4	70.0	44.9	75.1	63
2000	Ro Conc 1+2	12.5	3.02	3.07	66.0	0.92	1.07	5.03	69.3	68.7	75.9	51.3	80.4	73
	Scav Conc 1	4.5	0.51	0.78	13.3	0.34	0.17	2.23	4.2	6.3	5.5	6.8	4.6	12
no	Comb Conc	18.7	2.18	2.30	48.2	0.73	0.77	4.15	74.7	76.8	82.9	60.3	86.4	90
Na_2CO_3	Scav Tail	81.3	0.17	0.16	2.29	0.11	0.028	0.11	25.3	23.2	17.1	39.7	13.6	10
250 g/t														
Na_2S	Head(calc)	-	0.55	0.56	10.9	0.23	0.17	0.87	-	-	-	-	-	-

Sodium silicate was less effective as a dispersant than Na_2CO_3, recoveries increased but concentrate grades were much lower. Used with Na_2CO_3, grades and recoveries were similar to those achieved with 400 g/t CMC.

2.3 Sodium Sulphide and CMC Levels

These tests used Lac des Iles water and 1000 g/t Na_2CO_3. The primary grind was 78% minus 200 mesh. The results of testwork with and without Na_2S and CMC additions are presented in Table 4.

Table 4: Effect of Na_2S and CMC

Test	Product	Wt	Assays, %, g/t					% Distribution				
		%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
40	Ro Conc 1	2.8	12.9	9.82	192	2.26	3.84	60.5	49.3	52.7	27.8	59.8
	Ro Conc 1+2	5.7	7.12	5.92	122	1.72	2.22	68.1	60.7	68.5	43.1	70.3
125g/t	Scav Conc 1	4.4	0.65	1.10	19.8	0.50	0.27	4.7	8.6	8.5	9.6	6.5
Na_2S	Comb Conc	10.1	4.32	3.84	78.0	1.19	1.38	72.9	69.3	77.0	52.6	77.0
	Scav Tail	89.9	0.18	0.19	2.61	0.12	0.046	27.1	30.7	23.0	47.4	23.0
400g/t CMC	Head(calc)	-	0.60	0.56	10.2	0.23	0.18	-	-	-	-	-
41	Ro Conc 1	5.0	7.26	6.77	137	1.79	2.45	64.5	60.0	64.6	42.0	66.5
	Ro Conc 1+2	7.6	5.19	5.08	103	1.43	1.79	69.5	67.8	73.0	50.4	73.1
0g/t	Scav Conc 1	3.9	0.59	1.07	18.7	0.47	0.26	4.0	7.3	6.8	8.5	5.4
Na_2S	Comb Conc	11.5	3.63	3.72	74.3	1.10	1.27	73.5	75.1	79.8	58.9	78.6
	Scav Tail	88.5	0.17	0.16	2.44	0.10	0.045	26.5	24.9	20.2	41.1	21.4
400g/t CMC	Head(calc)	-	0.57	0.57	10.7	0.22	0.19	-	-	-	-	-
42	Ro Conc 1	6.3	5.83	5.36	113	1.46	1.92	63.1	57.4	65.6	40.7	66.4
	Ro Conc 1+2	9.6	4.17	4.03	84.1	1.16	1.40	69.3	66.3	74.8	49.5	74.1
0g/t	Scav Conc 1	5.1	0.49	0.87	14.8	0.39	0.22	4.3	7.6	7.0	8.9	6.2
Na_2S	Comb Conc	14.8	2.89	2.94	60.0	0.89	0.99	73.6	73.9	81.8	58.4	80.3
	Scav Tail	85.2	0.18	0.18	2.31	0.11	0.042	26.4	26.1	18.2	41.6	19.7
200g/t CMC	Head(calc)	-	0.58	0.59	10.8	0.23	0.18	-	-	-	-	-
43	Ro Conc 1	7.7	5.71	4.65	96.7	1.26	1.65	69.4	60.5	67.3	41.9	67.9
	Ro Conc 1+2	11.9	3.98	3.45	71.2	1.01	1.18	74.7	69.3	76.5	51.7	75.3
0g/t	Scav Conc 1	6.1	0.47	0.69	11.4	0.35	0.19	4.5	7.1	6.3	9.2	6.2
Na_2S	Comb Conc	17.9	2.79	2.51	50.9	0.78	0.85	79.2	76.4	82.8	60.9	81.5
	Scav Tail	82.1	0.16	0.17	2.31	0.11	0.042	20.8	23.6	17.2	39.1	18.5
0g/t CMC	Head(calc)	-	0.63	0.59	11.0	0.23	0.19	-	-	-	-	-

Omitting the sodium sulphide addition increased metal recoveries, especially platinum and nickel. Concentrate grades were somewhat lower. Reducing the CMC to 200 g/t allowed more gangue to float reducing concentrate grade without increasing metal recoveries, the the exception of palladium. Omitting the CMC further increased the concentrate weight recovery, increasing metal recoveries at lower grades.

2.4 Ammonium Sulphate Addition

Table 5 compares results of tests with Na_2S and $(NH_4)_2SO_4$.

Table 5: $(NH_4)_2SO_4$ Addition

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	% Distribution Au	Pt	Pd	Ni	Cu	S
37	Ro Conc 1	1.9	15.3	12.7	225	2.06	5.10	16.4	47.5	40.9	40.4	18.1	57.3	35
	Ro Conc 1+2	3.5	9.86	9.03	170	1.97	3.29	12.6	56.9	54.0	56.8	32.2	68.7	51
250g/t	Scav Conc 1	5.1	1.52	1.85	39.2	0.87	0.40	4.68	12.7	16.1	19.0	20.6	12.1	27
Na_2S	Comb Conc	8.5	4.92	4.78	92.5	1.32	1.58	7.91	69.7	70.1	75.8	52.8	80.8	78
	Scav Tail	91.5	0.20	0.19	2.76	0.11	0.035	0.21	30.3	29.9	24.2	47.2	19.2	22
	Head(calc)	-	0.60	0.58	10.4	0.21	0.17	0.87	-	-	-	-	-	-
50	Ro Conc 1	4.1	9.48	8.60	162	2.08	3.02	12.6	63.7	55.5	60.1	38.0	68.9	54
	Ro Conc 1+2	6.6	6.39	6.15	118	1.64	2.06	9.63	69.4	64.1	70.8	48.5	76.0	66
250g/t	Scav Conc 1	4.1	0.62	0.97	17.6	0.41	0.22	3.52	4.2	6.3	6.5	7.5	5.0	15
$(NH_4)_2$	Comb Conc	10.7	4.18	4.17	79.6	1.17	1.36	7.29	73.5	70.4	77.3	56.0	81.0	81
SO_4	Scav Tail	89.3	0.18	0.21	2.79	0.11	0.038	0.20	26.5	29.6	22.7	44.0	19.0	19
	Head(calc)	-	0.61	0.63	11.0	0.22	0.18	0.96	-	-	-	-	-	-

At addition rates of 250 g/t ammonium sulphate and sodium sulphide, the test with ammonium sulphate was less selective.

2.5 Flotation Density

Flotation was conducted at approximately 33 and 20% solids. The pulp viscosity was reduced and froth appearance and concentrate grades, especially the platinum group metals, improved at the lower density. The results are compared in Table 6.

Table 6: Effect of Flotation Density

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	% Distribution Au	Pt	Pd	Ni	Cu	S
29	4th Cl Conc	1.8	17.1	14.9	295	4.50	6.12	-	58.1	47.9	54.2	35.3	65.9	-
	3rd Cl Conc	2.0	15.4	13.7	270	4.12	5.57	-	59.3	50.1	56.3	36.7	68.0	-
33%	2nd Cl Conc	2.6	12.5	11.5	225	3.42	4.56	-	61.1	53.7	59.7	38.8	71.0	-
solids	1st Cl Conc	6.0	5.95	6.08	117	1.86	2.20	-	67.6	65.6	72.2	48.9	79.6	-
	Scav Conc	16.2	2.43	2.60	49.2	0.85	0.88	-	74.0	75.2	81.2	59.9	85.5	-
	Scav Tail	83.8	0.17	0.17	2.20	0.11	0.029	-	26.0	24.8	18.8	40.1	14.5	-
	Head(calc)	-	0.53	0.56	10.4	0.23	0.17	-	-	-	-	-	-	-
51	4th Cl Conc	1.7	25.8	20.2	356	4.88	6.63	31.0	58.2	52.6	55.6	36.4	68.5	60
	3rd Cl Conc	1.9	23.4	18.6	329	4.53	6.03	28.5	59.4	54.3	57.7	38.1	70.1	62
20%	2nd Cl Conc	2.2	20.7	16.4	291	4.03	5.30	25.2	60.6	55.6	59.0	39.1	71.1	63
solids	1st Cl Conc	4.2	11.5	9.75	174	2.46	3.01	15.2	64.6	63.1	67.5	45.7	77.4	73
	Ro Conc	13.5	4.42	3.48	62.5	0.98	1.02	6.01	79.2	72.0	77.7	58.0	84.1	92
	Ro Tail	86.5	0.18	0.21	2.79	0.11	0.03	0.08	20.8	28.0	22.3	42.0	15.9	8
	Head(calc)	-	0.75	0.65	10.8	0.23	0.16	0.88	-	-	-	-	-	-

2.6 Magnetic Separation

A Jeffrey magnetic separation was conducted on the mill discharge prior to conditioning for flotation. Very little magnetic material was recovered. Table 7 contains the results.

Table 7: Magnetic Separation

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	% Distribution Au	Pt	Pd	Ni	Cu
44	Jeff Mags	1.0	3.72	1.27	20.2	0.48	0.50	6.9	2.1	1.9	2.1	2.8
	Ro Conc 1	4.4	6.29	7.07	129	1.89	2.60	51.7	51.0	55.4	37.0	64.0
	Ro Conc 1+2	6.8	4.50	5.28	97.0	1.46	1.85	57.1	58.7	64.2	44.1	70.2
	Scav Conc 1	4.8	0.58	1.00	17.4	0.34	0.21	5.2	7.8	8.1	7.2	5.6
	Comb Conc	12.6	2.95	3.33	60.7	0.96	1.12	69.1	68.6	74.3	53.5	78.5
	Scav Tail	87.4	0.19	0.22	3.03	0.12	0.044	30.9	31.4	25.7	46.5	21.5
	Head(calc)	-	0.54	0.61	10.3	0.23	0.18	-	-	-	-	-
38	Ro Conc 1	2.9	11.7	9.66	198	2.22	3.80	54.2	47.6	52.9	29.4	65.1
	Ro Conc 1+2	4.9	7.69	7.00	145	1.84	2.54	60.8	58.9	66.2	41.7	74.1
	Scav Conc 1	5.0	1.07	1.36	24.6	0.54	0.29	8.6	11.7	11.4	12.5	8.7
	Comb Conc	9.9	4.35	4.15	84.2	1.18	1.40	69.4	70.6	77.6	54.2	82.8
	Scav Tail	90.1	0.21	0.19	2.67	0.11	0.032	30.6	29.4	22.4	45.8	17.2
	Head(calc)	-	0.62	0.58	10.7	0.22	0.17	-	-	-	-	-

2.7 Variability

The variability of the flotation response was scoped in a series of three rougher tests and six rougher - cleaner tests. Eight different samples, with various base metal and PGM contents and ratios, were tested.

2.7.1 Series A - Rougher Circuit

The variability of rougher flotation response was compared for Composite M92, Roby Zone Composite and sub-sample 92 M1 28843. The results are compared in Table 8 and Figures 1 and 2.

Table 8: Variability - Rougher Circuit

Test	Product	Wt	Assays, %, g/t						% Distribution					
		%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
45/46	Ro Conc 1	1.7	19.1	13.1	216	2.06	4.93	16.8	50.8	38.3	37.2	16.0	48.9	33
M92	Comb Conc	4.0	10.6	8.69	159	2.22	2.87	12.5	65.6	59.0	64.0	40.0	66.4	57
	Ro + Sc Conc	8.2	5.54	4.84	88.9	1.44	1.60	7.31	69.6	66.7	72.4	52.7	74.9	67
	Scav Tail	91.8	0.22	0.21	3.02	0.11	0.05	0.31	30.4	33.3	27.6	47.3	25.1	33
	Head(calc)	-	0.65	0.59	10.0	0.22	0.17	0.89	-	-	-	-	-	-
47/48	Ro Conc 1	1.1	11.1	10.0	82.5	3.81	5.69	16.8	35.4	34.7	38.7	34.7	44.6	42
Roby	Comb Conc	2.5	6.73	6.24	52.4	2.46	3.28	11.1	39.5	50.9	57.7	52.5	60.2	65
Zone	Ro + Sc Conc	6.4	3.13	3.04	25.1	1.17	1.54	5.33	63.7	62.3	69.7	63.2	71.1	78
	Scav Tail	93.6	0.11	0.12	0.75	0.047	0.043	0.10	34.1	37.7	30.3	36.8	28.9	22
	Head(calc)	-	0.30	0.31	2.30	0.12	0.14	0.43	-	-	-	-	-	-
49	Ro Conc 1	4.1	3.26	13.1	295	0.24	0.44	1.63	51.2	54.2	54.2	10.4	55.3	44
92-M1	Ro Conc 1+2	11.5	1.45	6.22	139	0.18	0.19	0.86	63.2	71.5	71.0	22.0	68.0	63
28843	Scav Conc 1	14.0	0.16	0.55	12.6	0.10	0.022	0.14	8.5	7.7	7.8	14.6	9.3	13
	Comb Conc	25.5	0.74	3.11	69.7	0.14	0.10	0.46	71.7	79.1	78.8	36.7	77.4	76
	Scav Tail	74.5	0.10	0.28	6.42	0.081	0.010	0.05	28.3	20.9	21.2	63.3	22.6	24
	Head(calc)	-	0.26	1.00	22.5	0.095	0.033	0.16	-	-	-	-	-	-

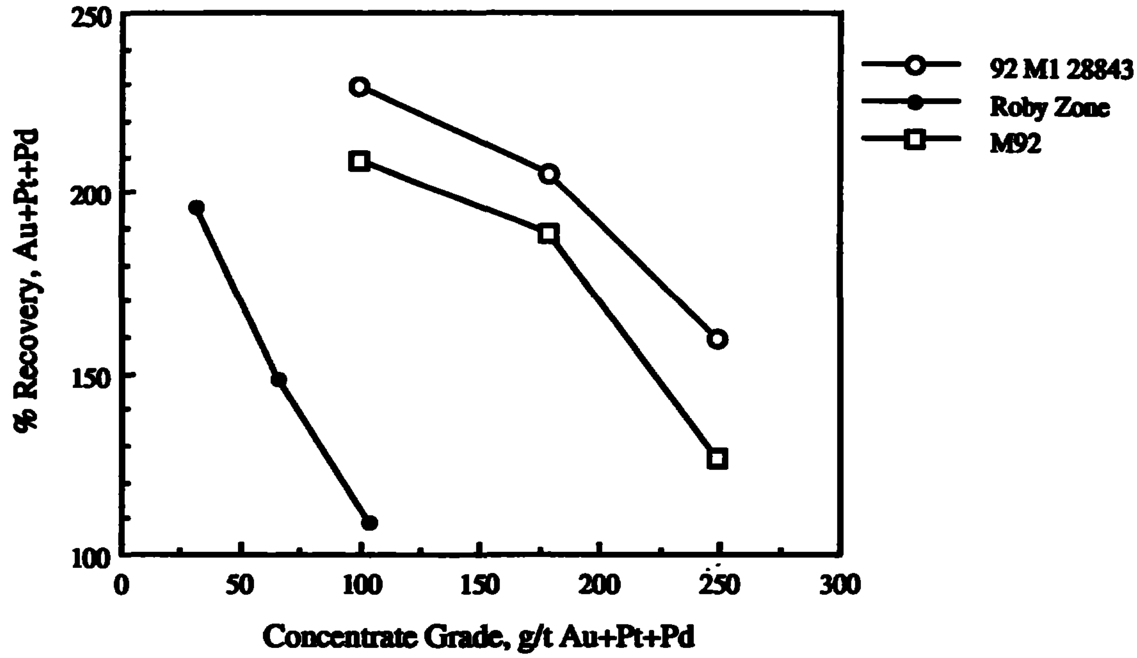


Figure 1: Variability - PGM Rougher Flotation

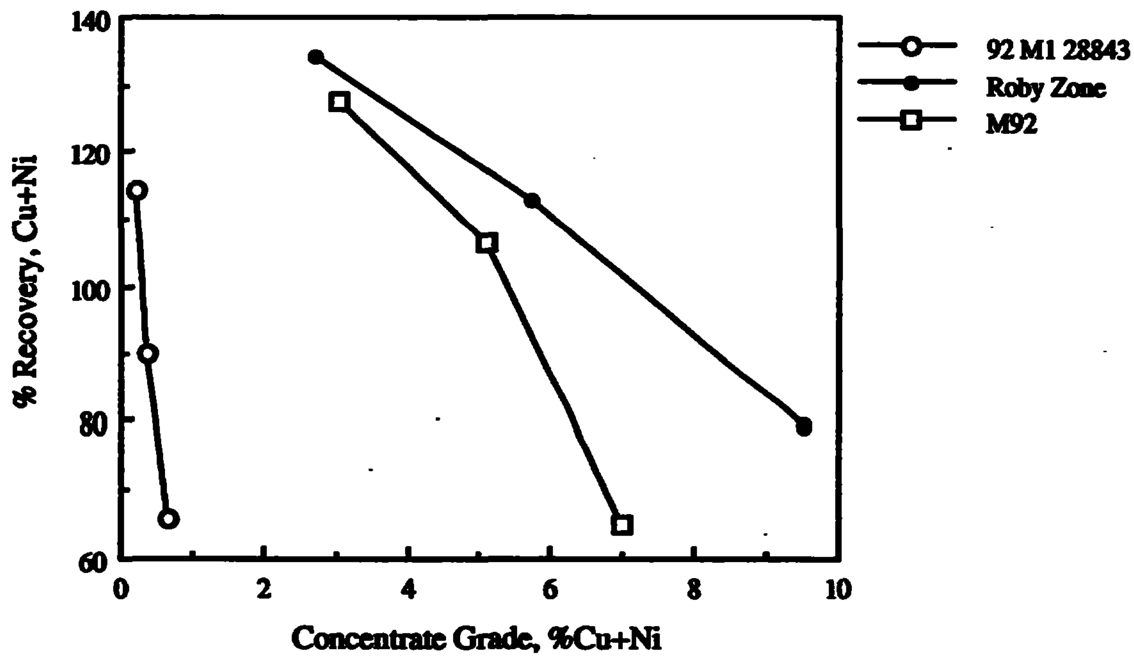


Figure 2: Variability - Rougher Base Metal Flotation

2.7.2 Series B - Cleaner Circuit

The rougher - cleaner circuit response was scoped for Composite M92 and Group 1 to 5 Composites. The results are presented in Table 9 and Figures 3 and 4.

Table 9: Variability - Cleaner Circuit

		Wt	Assays, %, g/t						% Distribution					
Test	Product	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
53A	3rd Cl Conc	2.0	16.1	15.5	336	4.05	6.00	27.0	60.8	55.8	63.1	36.7	72.7	32
M92	2nd Cl Conc	2.3	13.9	13.6	293	3.59	5.19	23.8	61.8	57.4	64.8	38.2	73.9	33
	1st Cl Conc	3.9	8.67	8.89	190	2.47	3.25	16.0	65.3	63.8	71.3	44.5	78.4	38
	Ro Conc	10.3	3.56	3.81	80.1	1.14	1.31	7.15	70.5	71.9	78.9	54.3	83.3	45
	Ro Tail	89.8	0.17	0.17	2.45	0.11	0.030	1.01	29.5	28.1	21.1	45.7	16.7	55
	Head(calc)	-	0.52	0.54	10.4	0.22	0.16	1.64	-	-	-	-	-	-
55	2nd Cl Conc	0.9	12.9	19.1	373	1.27	3.78	-	46.2	38.4	54.6	11.8	82.6	-
G1	1st Cl Conc	1.9	6.30	10.2	186	0.69	1.83	-	50.7	46.1	61.1	14.4	89.9	-
	Ro Conc	5.1	2.64	4.63	78.2	0.34	0.75	-	56.4	55.5	68.2	18.7	97.6	-
	Ro Tail	94.9	0.11	0.20	1.96	0.079	0.001	-	43.6	44.5	31.8	81.3	2.4	-
	Head(calc)	-	0.24	0.49	6.47	0.091	0.045	-	-	-	-	-	-	-
56	2nd Cl Conc	0.5	30.3	21.3	261	5.94	10.9	-	37.7	37.8	49.4	21.9	57.2	-
G2	1st Cl Conc	1.2	12.4	8.77	108	3.24	4.66	-	38.7	39.1	51.1	30.0	61.5	-
	Ro Conc	4.2	4.12	3.21	38.1	1.14	1.41	-	44.9	50.0	63.4	36.9	65.1	-
	Ro Tail	95.8	0.22	0.14	0.96	0.085	0.033	-	55.1	50.0	36.6	63.1	34.9	-
	Head(calc)	-	0.38	0.27	2.51	0.13	0.091	-	-	-	-	-	-	-
57	2nd Cl Conc	0.8	45.7	23.0	305	6.37	10.7	-	63.2	57.3	60.8	30.5	64.4	-
G3	1st Cl Conc	1.6	24.5	13.0	187	4.72	5.81	-	65.6	62.6	72.2	43.8	67.8	-
	Ro Conc	3.9	10.3	5.62	82.8	2.29	2.44	-	68.9	67.6	79.7	52.9	70.8	-
	Ro Tail	96.1	0.19	0.11	0.86	0.083	0.041	-	31.1	32.4	20.3	47.1	29.2	-
	Head(calc)	-	0.59	0.33	4.07	0.17	0.13	-	-	-	-	-	-	-
58	2nd Cl Conc	1.0	41.9	26.6	401	7.22	10.6	-	59.0	65.3	61.0	39.9	71.0	-
G4	1st Cl Conc	1.9	23.8	15.3	253	4.92	6.03	-	61.7	69.1	70.7	50.0	74.5	-
	Ro Conc	4.7	10.2	6.52	119	2.51	2.53	-	66.9	74.6	84.7	64.7	79.2	-
	Ro Tail	95.3	0.25	0.11	1.07	0.068	0.033	-	33.1	25.4	15.3	35.3	20.8	-
	Head(calc)	-	0.72	0.41	6.67	0.18	0.15	-	-	-	-	-	-	-
59	1st Cl Conc	0.7	24.9	44.6	1023	2.72	3.63	-	50.7	60.6	61.5	6.6	69.6	-
G5	Ro Conc	3.6	5.31	9.69	228	0.84	0.77	-	57.1	69.5	72.3	10.9	78.5	-
	Ro Tail	96.4	0.15	0.16	3.29	0.26	0.008	-	42.9	30.5	27.7	89.1	21.5	-
	Head(calc)	-	0.34	0.51	11.4	0.28	0.039	-	-	-	-	-	-	-

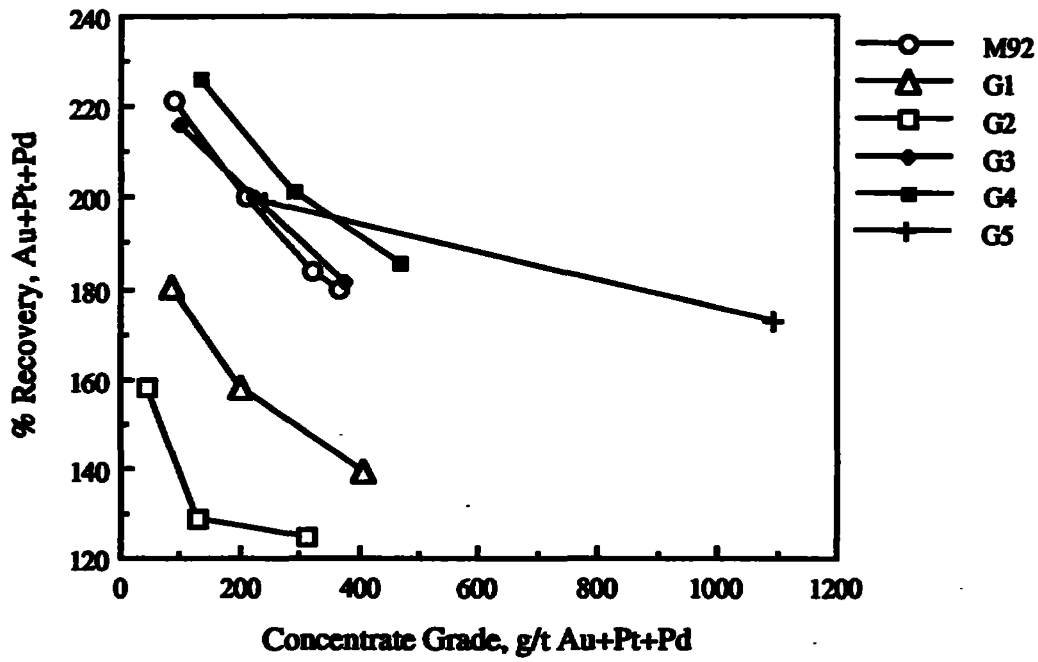


Figure 3: Variability - Cleaner Circuit PGM

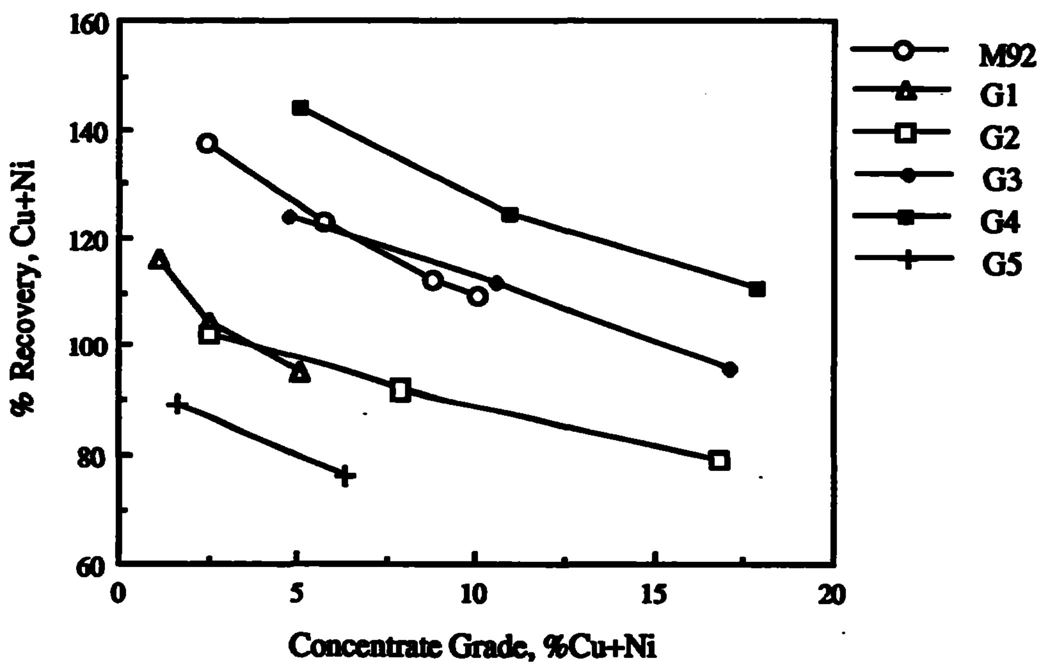


Figure 4: Variability - Cleaner Circuit Base Metals

The concentrate grades and recoveries of the samples varied considerably. No correlation has been noted between feed grades or the Ni:Cu ratio and the metallurgical response. Table 10 summarizes the feed grades, rougher recoveries and Ni:Cu ratio of the samples used in the variability study.

Table 10: Variability Feed Samples

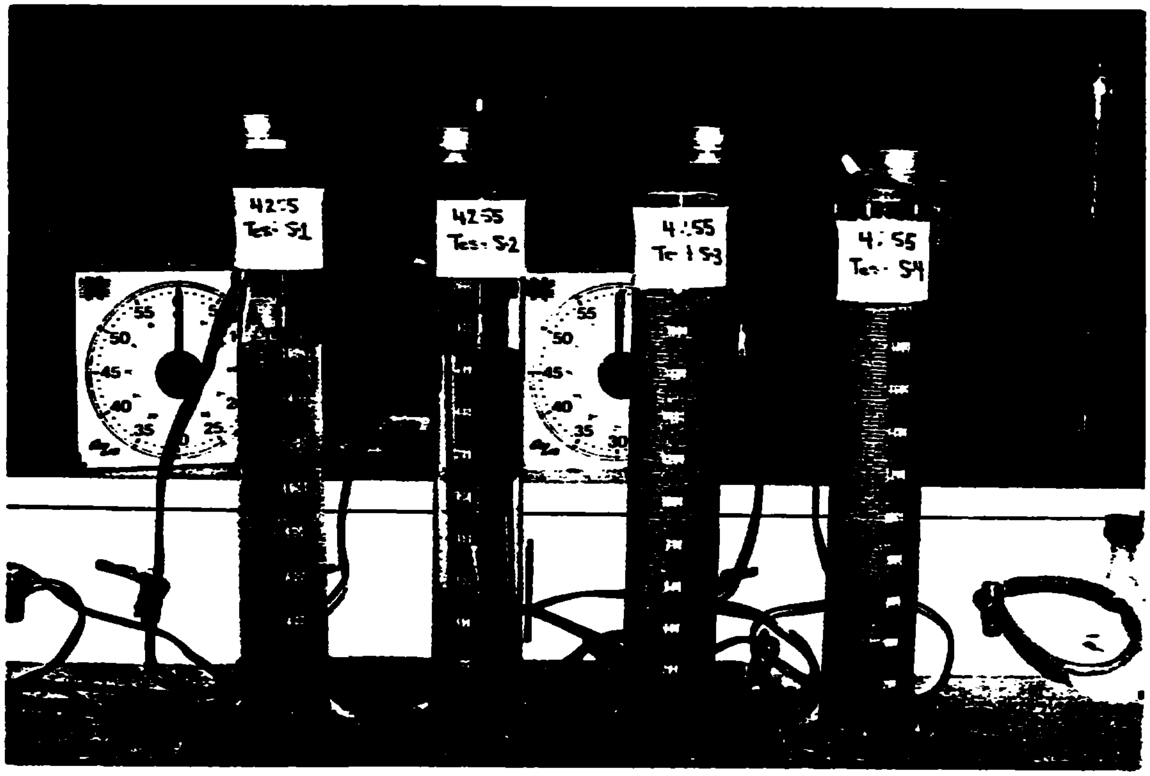
Comp	Head Assays, g/t Au	Pt	Pd	Total PGM	Ro Rec'y PGM	Head, % Ni	Cu	Total BM	Ratio Ni:Cu	Ro Rec'y BM
92M1	0.26	1.00	22.5	23.8	230	0.095	0.033	0.13	2.88	114
G4	0.72	0.41	6.67	7.80	226	0.18	0.15	0.33	1.20	144
M92	0.65	0.59	10.0	11.2	221	0.22	0.17	0.39	1.29	138
G3	0.59	0.33	4.07	4.99	216	0.17	0.13	0.30	1.31	124
G5	0.34	0.51	11.4	12.3	199	0.28	0.39	0.32	7.18	89
Roby	0.30	0.31	2.30	2.91	196	0.12	0.14	0.26	0.86	134
G1	0.24	0.49	6.47	7.20	180	0.091	0.045	0.14	2.02	116
G2	0.38	0.27	2.51	3.16	158	0.13	0.091	0.22	1.43	102

3. Settling Testwork

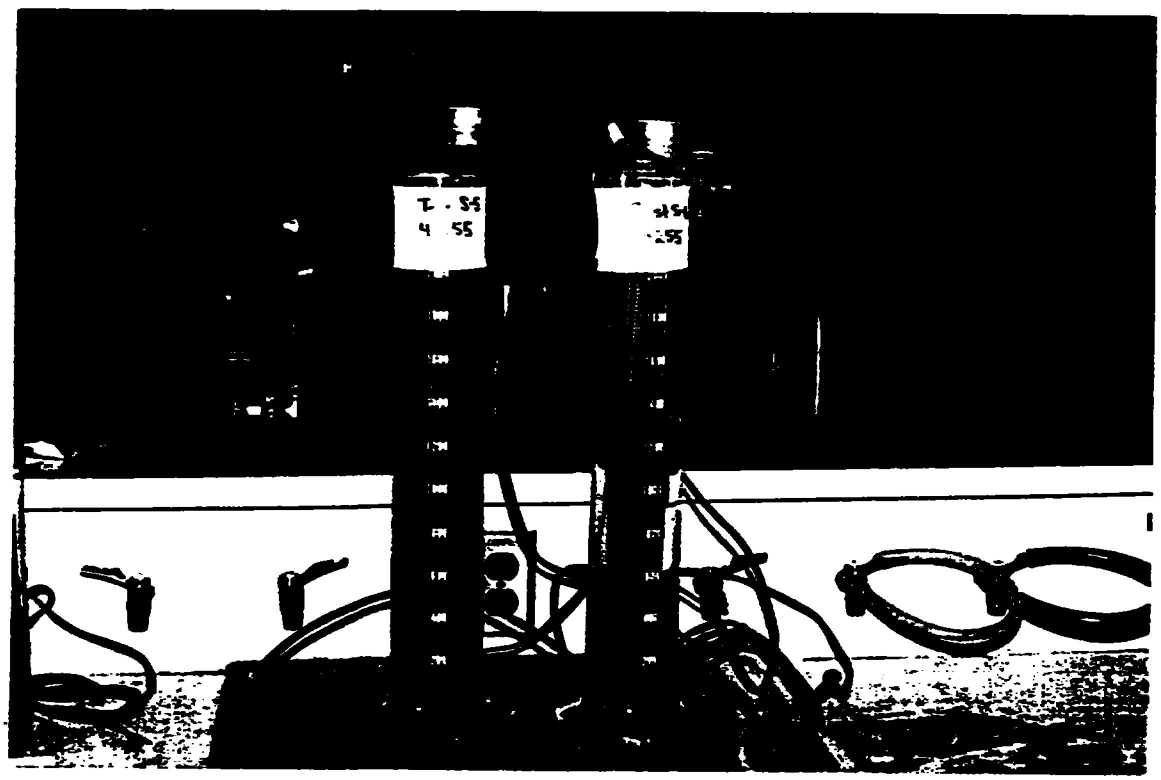
Settling tests were conducted on flotation tailing from Test 52 with CMC PA MED, no Na_2CO_3, no Na_2SiO_3 and from Test 53 with CMC 7MF, Na_2CO_3 and Na_2SiO_3. Supernatant from Test 52, with and without flocculant was submitted for water quality analysis.

3.1 Thickening Tests

The tailing from Test 53 (Tests S3 and S4) was so well dispersed that no visible settling occurred prior to the addition of 1950 g/t $CuSO_4$. Photograph 1 shows the supernatant clarity after 24 hours of settling tests on the two different tailings with and without flocculant. Photograph 2 shows the effect of the $CuSO_4$ addition on Tests S3 and S4. The thickening test results are summarized in Table 11.



Photograph 1



Photograph 2

Table 11: Thickening Test Results

Test No.	Product	Percol 156 g/t	CuSO4 g/t	Pulp Density % Solids		Settling Rate (m/h)		Thickener Area Requirement (m2/t/day)*	
				Initial	Final	Feed Conc Zone	Compression Zone	Feed Conc Zone	Compression Zone
S-1	Test 52 Tailing	-	-	21.0	63.2	0.207	0.030	0.646	1.257
S-2	Test 52 Tailing	15	-	23.5	63.4	0.916	0.049	0.122	0.397
S-3	Test 53 Tailing	-	-	-	-	-	-	-	-
S-4	Test 53 Tailing	15	-	-	-	-	-	-	-
S-5	Test 53 Tailing	-	1950	19.2	61.0	0.841	0.157	0.179	0.307
S-6	Test 53 Tailing	15	1950	19.5	59.2	1.123	0.174	0.128	0.238

* no safety factor applied

3.2 Water Quality

Supernatant from thickening tests S1 and S2 was removed and submitted for drinking water quality 24 element quantitative ICP analysis. Dissolved and total metals concentrations are reported in Table 12. Quantitative analysis of Cu, Se, Pb, Cd, total suspended solids and total dissolved solids are reported in Table 13.

Table 12: Semi-Quantitative Water Analysis

Element	Detection Limit,mg/L	Concentration, mg/L						
		Dissolved				Total		
		Blank	S1-24 h	S2-24 h	S1-72 h	S1-24 h	S2-24 h	S1-72 h
Al	0.1	<0.1	<0.1	<0.1	<0.1	1.61	1344	0.30
As	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ba	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Be	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ca	0.1	<0.1	37.2	37.2	38.4	37.2	37.2	38.4
Cd	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Co	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cr	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cu	0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.02	<0.02
Fe	0.02	<0.02	<0.02	<0.02	<0.02	1.74	1.29	0.39
Mg	0.05	<0.05	17	17	17.3	17.0	17.0	17.3
Mn	0.01	<0.01	0.02	0.01	0.02	0.04	0.03	0.02
Mo	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Na	0.05	<0.05	29	30	29.3	29.0	29.0	29.3
Ni	0.02	<0.02	0.02	0.02	0.02	0.08	0.07	0.03
P	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pb	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
S	1.0	<1.0	58	56	50.7	69.2	68.2	50.7
Sb	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Se	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Si	0.05	0.05	3.4	3.3	3.60	3.95	3.61	3.60
Sn	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Te	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zn	0.01	<0.01	<0.01	<0.01	0.02	0.14	0.05	0.24
Hardness			163	163				

Table 13: Quantitative Water Analysis

Sample	Concentration, mg/L					
	Cu	Se	Pb	Cd	TSS	TDS
S1, 24 h TM	0.021	<0.10	0.017	0.0003	39	-
S1, 24 h DM	0.007	<0.10	0.006	0.0002	-	346
S1, 72 h TM	0.010	<0.10	0.010	<0.0002	-	-
S1, 72 h DM	<0.003	<0.10	<0.005	<0.0002	-	-
S2, 24 h TM	0.022	<0.10	0.008	<0.0002	20	-
S2, 24 h DM	0.004	<0.10	<0.005	<0.0002	-	340
Blank DM	<0.003	<0.10	-	-	-	-

TM = total metal
DM = dissolved metal

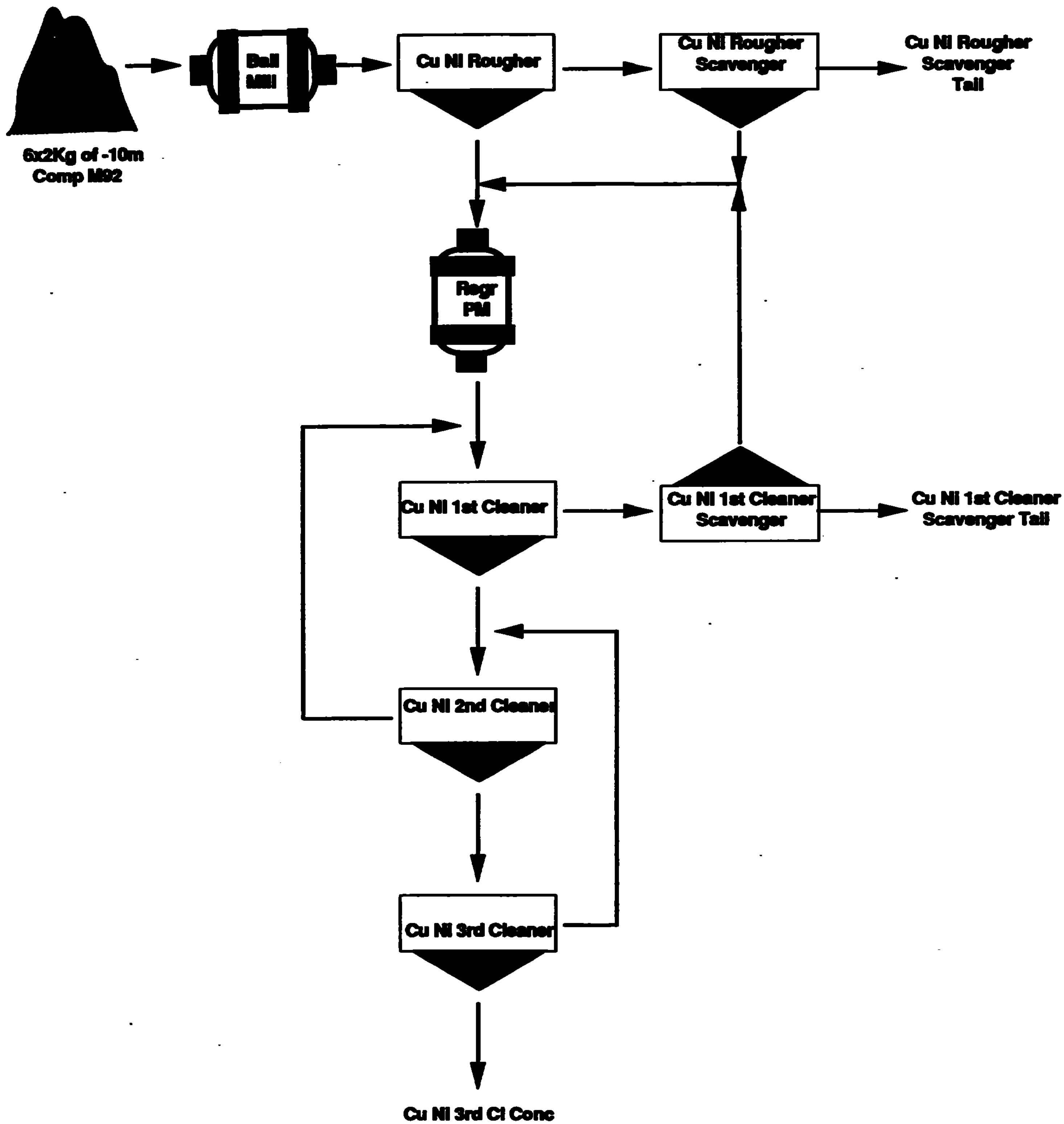
4. Cycle Test

A six stage cycle test was conducted using these conditions:

Primary Grind:	65% minus 200 mesh with reagents added to last 5 minutes of grind
	125 g/t Na_2S
	400 g/t PA MED
	25 g/t 3501
	50 g/t PAX
Rougher:	25 g/t MIBC
	8 minutes flotation
Scavenger:	50 g/t Na_2S
	50 g/t $CuSO_4$
	4 x 5 g/t stages PAX
	MIBC as required
	7+5+5+5 minutes flotation stages
Regrind:	90% minus 400 mesh with reagents added to last 5 minutes of grind
	100 g/t PA MED
	5 g/t 3501
	20 g/t PAX
1st Cleaner:	15 g/t PAX
	15 minutes flotation
1st Cleaner Scav:	50 g/t Na_2S
	20 g/t PAX
	10 minutes flotation
2nd Cleaner:	50 g/t PA MED
	5 g/t 3501
	15 g/t PAX
	8.5 minutes flotation
3rd Cleaner:	10 g/t PA MED
	2.5 g/t 3501
	10 g/t PAX
	8 minutes flotation

The flowsheet is shown in Figure 5.

Figure 5: Cycle Test Flowsheet



4.1 Metallurgical Results

The results of a batch test under similar conditions are compared with the cycle test in Table 14.

Table 14: Test Results

Test	Product	Wt %	Assays, %, g/t Au	Pt	Pd	Ni	Cu	S	% Distribution Au	Pt	Pd	Ni	Cu	S
53A	3rd Cl Conc	2.0	16.1	15.5	336	4.05	6.00	27.0	60.8	55.8	63.1	36.7	72.7	32
	2nd Cl Conc	2.3	13.9	13.6	293	3.59	5.19	23.8	61.8	57.4	64.8	38.2	73.9	33
	1st Cl Conc	3.9	8.67	8.89	190	2.47	3.25	16.0	65.3	63.8	71.3	44.5	78.4	38
	Ro Conc	10.3	3.56	3.81	80.1	1.14	1.31	7.15	70.5	71.9	78.9	54.3	83.3	45
	Ro Tail	89.8	0.17	0.17	2.45	0.11	0.030	1.01	29.5	28.1	21.1	45.7	16.7	55
	Head(calc)	-	0.52	0.54	10.4	0.22	0.16	1.64	-	-	-	-	-	-
54	CuNi Conc	3.3	12.1	11.6	229	3.04	3.88	-	69.5	67.3	73.0	47.1	78.0	-
	Comb Tail	96.7	0.18	0.19	2.91	0.12	0.038	-	30.5	32.7	27.0	52.9	22.0	-
	Head(calc)	-	0.58	0.57	10.4	0.21	0.17	-	-	-	-	-	-	-

Recoveries above the batch test 1st cleaner concentrate level were achieved with recirculation of the 2nd and 3rd cleaner tailings and 1st cleaner scavenger concentrate, however the final concentrate grade was lower.

4.2 Concentrate Quality

Table 15 and Figure 6 illustrate the effect of weight recovery and concentrate grade (concentrates from Composite M92) on MgO content.

Table 15: MgO Content of Concentrates

Test	Product	Wt %	Assays, g/t, % Au	Pt	Pd	Ni	Cu	MgO
51	4th Cl Conc	1.7	25.8	20.2	356	4.88	6.63	3.79
51	2nd Cl Conc	2.2	20.7	16.4	291	4.03	5.30	6.58
54	3rd Cl Conc	3.3	12.1	11.6	229	3.04	3.88	9.12

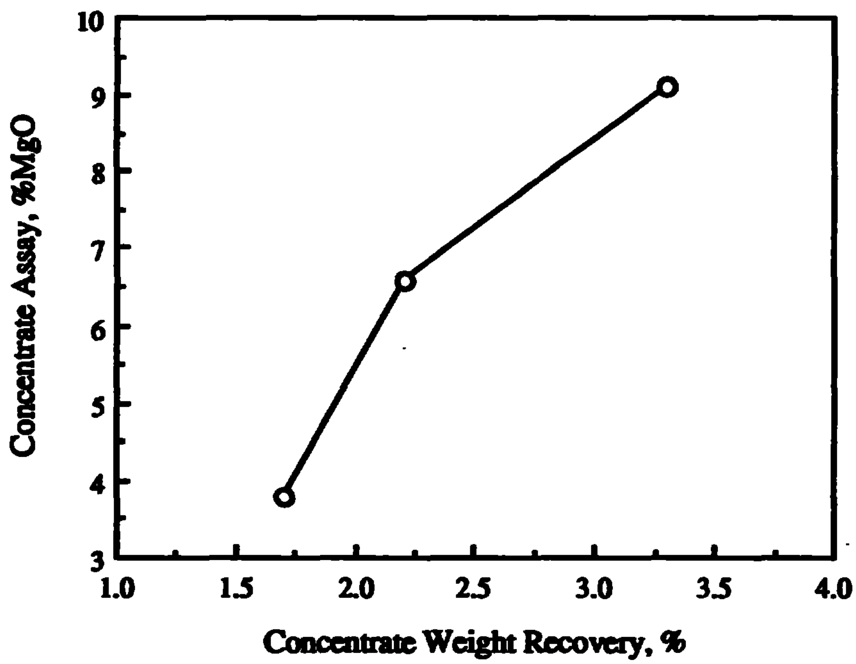


Figure 6: Weight Recovery vs MgO Assay

A 24 element semi quantitative scan of the final concentrate from the cycle test is reported in Table 16.

Table 16: Concentrate Scan

Element	Detection Limit %	Concentration, % 3rd Cl Conc D-F Test 54
Ba	0.0005	0.002
Be	0.0001	<0.0001
Ca	0.02	1.31
Cd	0.0005	0.001
Co	0.0005	0.13
Cr	0.0005	0.020
Cu	0.0005	3.72
Fe	0.0005	26.0
La	0.001	<0.001
Mg	0.0005	5.50
Mn	0.005	0.044
Mo	0.001	<0.01
Na	0.0005	0.20
Nd	0.005	<0.005
Ni	0.0005	2.66
P	0.002	<0.002
Pb	0.001	0.083
S	0.02	14.1
Sb	0.001	<0.001
Se	0.005	0.008
Sn	0.002	<0.002
Te	0.01	<0.003
Y	0.001	<0.001
Zn	0.0005	0.26

4.3 Cyanidation of 1st Cleaner Scavenger Tailing

The 1st cleaner scavenger tailings, cycles A to F were combined, and split into three charges for bottle roll leaching. The preliminary test was a single stage 48 hour cyanide leach. Two additional tests were conducted to confirm results, investigate the effect of a finer leach feed size, and investigate the effect of retention time. The results are presented in Table 17.

Table 17: Cyanide Leach Results

Test	Regrind	Reag Cons kg/t		% Extraction									Head, Au g/t Calc		
				48 hour			72 hour			96 hour					
		NaCN	CaO	Au	Pt	Pd	Au	Pt	Pd	Au	Pt	Pd	Au	Pt	Pd
54C	no	5.16	0.97	88.6	13.2	65.3	-	-	-	-	-	-	0.52	0.59	10.0
1C	no	5.91	1.78	-	-	-	51.1	6.1	51.2	83.3	21.6	61.2	0.54	0.67	9.54
2C	yes	7.96	1.25	59.3	6.3	60.2	60.6	6.9	65.3	77.4	21.3	65.5	0.62	0.65	9.03

Residue assays(g/t) were:

Test	Au	Pt	Pd
54C	0.05, 0.07	0.46, 0.52	3.63, 3.46
1C	0.11, 0.07	0.52, 0.53	3.75, 3.65
2C	0.21, 0.07	0.50, 0.52	3.15, 3.08

Extended leach time and fine grinding did not improve extractions.

CONCLUSIONS

The use of waters obtained from the Lac des Iles Mine site throughout batch laboratory tests did not effect results. A lower flotation density of 18-20% solids improved the grade-recovery relationship slightly. A soda-ash, sodium silicate circuit gave similar metallurgical results as the CMC circuit. However, the settling characteristics of the tailings was adversely affected.

The predicted results from composite M92, based on a six stage locked cycle test, Test 54, are:

Product	Weight	Assays, %, g/t					% Distribution				
	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
3rd Cl Conc	3.32	12.1	11.6	229	3.04	3.88	69.5	67.3	73.0	47.1	78.0
1st Cl Sc Tail	8.27	0.42	0.56	9.91	0.27	0.10	6.0	8.0	7.9	10.3	5.0
Ro Tail	88.41	0.16	0.16	2.26	0.10	0.032	24.5	24.7	19.1	42.6	16.9
Head(calc)	100.00	0.58	0.57	10.4	0.21	0.17	100.0	100.0	100.0	100.0	100.0
Comb Tail	96.68	0.18	0.19	2.91	0.12	0.038	30.5	32.7	27.0	52.9	22.0

Final concentrate weight recovery below 2% would be required to obtain MgO levels below 5%. The above concentrate assays 9.12% MgO.

Of the PGM's contained in the 1st cleaner scavenger tailing, approximately 80% of the gold and 65% of the Pd could be extracted by direct cyanidation of this tailing. This would represent an additional overall extraction of approximately 5% each of Au and Pd.

The samples submitted for variability testwork were quite different in feed grades and metallurgical response.

SAMPLE PREPARATION

Preparation of Composite M92 is detailed in LR4255, Progress Report 1.

Ten kilograms of Sample 92M1 28843, which was excluded from Composite M92 because of the low Cu Ni content and high Pd, was crushed to minus 10 mesh and ten 1 kilogram charges prepared.

The variability samples were received under our reference numbers LR9239846 and LR9239887. Eight 1 kilogram charges of Group 1 were blended using equal weights of samples 25643 and 25644. Twenty-five 1 kilogram charges of Group 2 were blended using equal weights of samples 25635 to 25640. Sixteen 1 kilogram charges of Group 3 were blended using equal weights of samples 25631 to 25634. Sixteen 1 kilogram charges of Group 4 were blended using equal weights of samples 25627 to 25630. Six 1 kilogram charges of Group 5 were blended using equal weights of samples 25680 and 25681.

REAGENTS

$Ca(OH)_2$	Calcium Hydroxide	Nymoc Chemicals
Na_2CO_3	Sodium Carbonate	Fisher Scientific
Na_2S	Sodium Sulphide	Nymoc Chemicals
$CuSO_4 \cdot 5H_2O$	Copper Sulphate	Nymoc Chemicals
NaCN	Sodium Cyanide	Nymoc Chemicals
$(NH_4)_2SO_4$	Ammonium Sulphate	Fisher Scientific
Aerofloat 208 promoter	Dithiophosphate collector	Cyanamid
Aero 3501 promoter	Dithiophosphate collector	Cyanamid
PAX	Potassium Amyl Xanthate	Hoechst
MIBC	Methyl IsoButyl Carbinol	CIL Chemicals
DF250C	polyglycol frother	Dow
DF250	polyglycol frother	Dow
PA MED	Carboxyl Methyl Cellulose	Aqualon
CMC 7LT	Carboxyl Methyl Cellulose medium viscosity	Aqualon
CMC 7MF	Carboxyl Methyl Cellulose	Aqualon
Na_2SiO_3	Sodium silicate	National Silicate
Percol 156	Anionic polyacrylamide flocculant, high molecular wt	Allied Colloids

DETAILS OF TESTWORK

Test	Composite	Conditions
36	M92	70% minus 200 mesh, 20% solids, Camp Lake water
37	M92	78% minus 200 mesh, 20% solids, Na2SIO3, Camp Lake water
38	M92	Repeat 37, reduce Na2SiO3
39	M92	Repeat 37 without Na2CO3
40	M92	Reduced Na2S, Na2CO3, Lac des Iles water
41	M92	Repeat 40 without Na2S
42	M92	Repeat 41 with reduced CMC
43	M92	Repeat 42 without CMC
44	M92	Repeat 38 no Na2SiO3, Jeffery sep'n flot feed, Lakefield water
45,46	M92	Repeat 37, GR operator
47,48	Roby Zone	Repeat 45,46, GR operator
49	92M1 28843	Repeat 37, LP operator
50	M92	Repeat 37, with (NH4)2SO4, LP operator
51	M92	Repeat 29 at low density
52	M92	Repeat 31 to produce tailing for settling tests
53	M92	Repeat 37 to produce tailing for settling tests
S1 to 6	Tailings	Settling tests
53A	M92	Precycle test, GC operator
54	M92	Cycle Test, GC operator
54C	M92	48h CN Leach 1st Cl Tailing
1C	M92	96h CN Leach 1st Cl Tailing
2C	M92	96h CN Leach reground1st Cl Tailing
55	G1	Variability test, GC operator
56	G2	Variability test
57	G3	Variability test
58	G4	Variability test
59	G4	Variability test

Test: 36 Project: 4255 Date: May 27th/92 Operator: BW

Purpose: To conduct a flotation test on 1000 g of Comp M92 at 70% minus 200 mesh using Camp Lake water throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 12 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2CO3	Na2S	CMC 7LT	CuSO4	A350	R-208	DF-250	Grind	Cond.	Froth	
Primary Grind	2000	250						12			9.8
Rougher Cond. 1			400						3		
Rougher Cond. 2				250					5		
Rougher Cond. 3					100	40			3		
Rougher 1							5		1	2	
Rougher 2					50	20	10		1	2	9.6
Scavenger Cond.		100							2		9.7
										5	
Scavenger					100	20			2	6	9.6

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Size Analysis of Combined Products:

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Pass.
208	65	4.2	4.2	4.2	95.8
147	100	5.0	5.0	9.2	90.8
104	150	10.3	10.3	19.5	80.5
74	200	10.2	10.2	29.7	70.3
45	325	16.7	16.7	46.4	53.6
-45	-325	53.6	53.6	100.0	-
	Total	100.0	100.0	-	-

Test: 36

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Rougher Conc. 1	32.9	3.4	8.82	8.36	170	2.09	3.21	12.6	47.1	47.8	53.6	32.1	63.0	52.2
2 Rougher Conc. 2	34.7	3.5	1.75	2.21	50.0	0.91	0.54	4.64	9.9	13.3	16.6	14.7	11.2	20.3
3 Scav. Conc.	39.6	4.0	0.96	1.46	22.1	0.45	0.28	3.99	6.2	10.0	8.4	8.3	6.6	19.9
4 Scav. Tail	872.8	89.1	0.26	0.19	2.55	0.11	0.037	0.070	36.8	28.8	21.3	44.8	19.3	7.7
Head (calc)	980.0	100.0	0.63	0.59	10.6	0.22	0.17	0.81	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							

Combined Products

Products 1 & 2		6.9	5.19	5.20	108	1.48	1.84	8.51	57.0	61.1	70.3	46.9	74.1	72.4
Products 1 to 3		10.9	3.63	3.82	76.5	1.10	1.26	6.84	63.2	71.2	78.7	55.2	80.7	92.3

Test: 37 Project: 4255 Date: May 28th/92 Operator: BW

Purpose: To repeat Test 36 with the CMC 7MF replacing CMC 7LT, and with the addition of Sodium Silicate type "O" (Na_2SiO_3). Other changes are shown below.
Camp Lake water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na_2CO_3	Na_2S	CMC 7MF	Na_2SiO_3	$CuSO_4$	A350	R 208	DF-250	Grind	Cond.	Froth	
Primary Grind	1000	250		2000					15			9.6
Rougher Cond. 1			400							3		
Rougher Cond. 2					250					5		
Rougher Cond. 3						100	40			3		
Rougher 1								20		1	2	9.3
Rougher 2						100	20			2	2	9.3
Scavenger Cond.		100								2		
Scavenger						100	20			2	6	9.3

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Size Analysis of Combined Products:

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Pass.
208	65	1.2	1.2	1.2	98.8
147	100	3.4	3.4	4.6	95.4
104	150	7.5	7.5	12.1	87.9
74	200	9.9	9.9	22.0	78.0
53	270	11.1	11.1	33.1	66.9
38	400	12.4	12.4	45.5	54.5
-38	-400	54.5	54.5	100.0	-
	Total	100.0	100.0	-	-

Test: 37

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Rougher Conc. 1	18.4	1.9	15.3	12.7	225	2.06	5.10	16.4	47.5	40.9	40.4	18.1	57.3	35.4
2 Rougher Conc. 2	15.8	1.6	3.53	4.75	106	1.87	1.18	8.16	9.4	13.1	16.3	14.1	11.4	15.1
3 Scav. Conc.	49.7	5.1	1.52	1.85	39.2	0.87	0.40	4.68	12.7	16.1	19.0	20.6	12.1	27.3
4 Scav. Tail	899.4	91.5	0.20	0.19	2.76	0.11	0.035	0.21	30.3	29.9	24.2	47.2	19.2	22.2
Head (calc)	983.3	100.0	0.60	0.58	10.4	0.21	0.17	0.87	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							

Combined Products

Products 1 & 2		3.5	9.86	9.03	170	1.97	3.29	12.6	56.9	54.0	56.8	32.2	68.7	50.5
Products 1 to 3		8.5	4.92	4.78	92.5	1.32	1.58	7.91	69.7	70.1	75.8	52.8	80.8	77.8

Test: 38 Project: 4255 Date: May 28th/92 Operator: BW

Purpose: To repeat Test 37 with 1000 g/t of Na2SiO3.
Camp Lake water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na2CO3	Na2S	CMC 7MF	Na2SiO3	CuSO4	A350	R 208	DF-250	Grind	Cond.	Froth	
Primary Grind	1000	250		1000					15			9.5
Rougher Cond. 1			400							3		
Rougher Cond. 2					250					5		9.1
Rougher Cond. 3						100	40			3		
Rougher 1								40		1	2	9.0
Rougher 2						100	20			2	2	9.0
Scavenger Cond.		100								3		9.1
Scavenger						100	20			2	6	9.1

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Size Analysis of Combined Products:

Microns	Mesh	Weight	% Weight		
		Grams	Ind.	Cum.	Pass.
208	65	1.3	1.3	1.3	98.7
147	100	3.0	3.0	4.3	95.7
104	150	7.1	7.1	11.4	88.6
74	200	10.1	10.1	21.5	78.5
53	270	12.0	12.0	33.5	66.5
38	400	13.0	13.0	46.5	53.5
-38	-400	53.5	53.5	100.0	-
	Total	100.0	100.0	-	-

Test: 38

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Rougher Conc. 1	27.9	2.9	11.7	9.66	198	2.22	3.80	14.7	54.2	47.6	52.9	29.4	65.1	48.7
2 Rougher Conc. 2	19.7	2.0	2.02	3.23	70.3	1.31	0.75	4.97	6.6	11.2	13.3	12.3	9.1	11.6
3 Scav. Conc.	48.6	5.0	1.07	1.36	24.6	0.54	0.29	3.44	8.6	11.7	11.4	12.5	8.7	19.9
4 Scav. Tail	876.3	90.1	0.21	0.19	2.67	0.11	0.032	0.19	30.6	29.4	22.4	45.8	17.2	19.8
Head (calc)	972.5	100.0	0.62	0.58	10.7	0.22	0.17	0.87	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							

Combined Products

Products 1 & 2		4.9	7.69	7.00	145	1.84	2.54	10.7	60.8	58.9	66.2	41.7	74.1	60.4
Products 1 to 3		9.9	4.35	4.15	84.2	1.18	1.40	7.02	69.4	70.6	77.6	54.2	82.8	80.2

Test: 39 Project: 4255 Date: May 28th/92 Operator: BW

Purpose: To repeat Test 38 with 2000 g/t of Na_2SiO_3 and without Na_2CO_3. Camp Lake water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S	CMC 7MF	Na2SiO3	CuSO4	A350	R-208	DF-250	Grind	Cond.	Froth	
Primary Grind	250		2000					15			8.9
Rougher Cond. 1		400							3		
Rougher Cond. 2				250					5		8.5
Rougher Cond. 3					100	40			3		
Rougher 1							40		1	2	8.5
Rougher 2					100	20			2	2	8.5
Scavenger 1 Cond.	100								3		8.9
Scavenger 1					100	20			2	6	8.5
Scavenger 2 Cond.	100								2		8.9
Scavenger 2					50	20			2	5	8.6

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Size Analysis of Combined Products:

Microns	Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Pass.
208	65	1.4	1.4	1.4	98.6
147	100	4.5	4.5	5.9	94.1
104	150	8.5	8.5	14.4	85.6
74	200	10.6	10.6	25.0	75.0
53	270	11.9	11.9	36.9	63.1
38	400	13.3	13.3	50.2	49.8
-38	-400	49.8	49.8	100.0	-
	Total	100.0	100.0		-

Test: 39

Metallurgical Balance

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 Rougher Conc. 1	84.6	8.7	4.08	4.01	87.5	1.16	1.44	6.29	65.0	62.4	70.0	44.9	75.1	63.2
2 Rougher Conc. 2	37.0	3.8	0.61	0.93	16.9	0.38	0.23	2.16	4.3	6.3	5.9	6.4	5.2	9.5
3 Scav. 1 Conc.	43.7	4.5	0.51	0.78	13.3	0.34	0.17	2.23	4.2	6.3	5.5	6.8	4.6	11.6
4 Scav. 2 Conc.	16.5	1.7	0.41	0.60	9.82	0.30	0.14	2.76	1.3	1.8	1.5	2.3	1.4	5.4
5 Scav. Tail	789.1	81.3	0.17	0.16	2.29	0.11	0.028	0.11	25.3	23.2	17.1	39.7	13.6	10.3
Head (calc)	970.9	100.0	0.55	0.56	10.9	0.23	0.17	0.87	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							

Combined Products

Products 1 & 2		12.5	3.02	3.07	66.0	0.92	1.07	5.03	69.3	68.7	75.9	51.3	80.4	72.7
Products 1 to 3		17.0	2.36	2.47	52.1	0.77	0.83	4.29	73.5	75.0	81.4	58.1	85.0	84.3
Products 1 to 4		18.7	2.18	2.30	48.2	0.73	0.77	4.15	74.7	76.8	82.9	60.3	86.4	89.7

Test: 40 Project: 4255 Date: June 4th/92 Operator: BW

Purpose: To repeat Test 39 without Na2SiO3 and with 1 g/t Na2CO3.
Lac des Iles water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Na2S	CMC 7MF	Na2CO3	CuSO4	A350	R-208	DF-250	Time, minutes Grind	Cond.	Froth	pH
Primary Grind	125		1000					15			9.5
Rougher Cond. 1		400							3		
Rougher Cond. 2				250					5		9.2
Rougher Cond. 3					100	40			3		
Rougher 1							40		1	2	9.0
Rougher 2					100	20			2	2	8.8
Scavenger Cond.	125								2		9.1
Scavenger Cond.				250					5		8.8
Scavenger					100	40			3	6	8.5

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Test: 40

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Rougher Conc. 1	27.2	2.8	12.9	9.82	192	2.26	3.84	60.5	49.3	52.7	27.8	59.8
2 Rougher Conc. 2	28.3	2.9	1.56	2.18	55.4	1.20	0.66	7.6	11.4	15.8	15.3	10.7
3 Scav. 1 Conc.	42.3	4.4	0.65	1.10	19.8	0.50	0.27	4.7	8.6	8.5	9.6	6.5
4 Scav. Tail	874	89.9	0.18	0.19	2.61	0.12	0.046	27.1	30.7	23.0	47.4	23.0
Head (calc)	971.8	100.0	0.60	0.56	10.2	0.23	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

Products 1 & 2		5.7	7.12	5.92	122	1.72	2.22	68.1	60.7	68.5	43.1	70.5
Products 1 to 3		10.1	4.32	3.84	78.0	1.19	1.38	72.9	69.3	77.0	52.6	77.0

Test: 41 Project: 4255 Date: June 4th/92 Operator: BW

Purpose: To repeat Test 40 without Na2S in the primary grind
Lac des Iles water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Na2S	CMC 7MF	Na2CO3	CuSO4	A350	R-208	DF-250	Time, minutes Grind	Cond.	Froth	pH
Primary Grind			1000					15			9.0
Rougher Cond. 1		400							3		
Rougher Cond. 2				250					5		8.5
Rougher Cond. 3					100	40			3		
Rougher 1							40		1	2	8.6
Rougher 2					100	20			2	2	8.5
Scavenger Cond.	250								2		9.1
Scavenger Cond.				250					5		8.9
Scavenger					100	40			3	6	8.6

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Test: 41

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Rougher Conc. 1	50.2	5.0	7.26	6.77	137	1.79	2.45	64.5	60.0	64.6	42.0	66.5
2 Rougher Conc. 2	25.4	2.6	1.10	1.75	35.0	0.71	0.48	4.9	7.8	8.4	8.4	6.6
3 Scav. 1 Conc.	38.7	3.9	0.59	1.07	18.7	0.47	0.26	4.0	7.3	6.8	8.5	5.4
4 Scav. Tail	880.9	88.5	0.17	0.16	2.44	0.100	0.045	26.5	24.9	20.2	41.1	21.4
Head (calc)	995.2	100.0	0.57	0.57	10.7	0.22	0.19	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

Products 1 & 2		7.6	5.19	5.08	103	1.43	1.79	69.5	67.8	73.0	50.4	73.1
Products 1 to 3		11.5	3.63	3.72	74.3	1.10	1.27	73.5	75.1	79.8	58.9	78.6

Test: 42 Project: 4255 Date: June 4th/92 Operator: BW

Purpose: To repeat Test 41 with half of the CMC 7MF.
Lac des Iles water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage								Time, minutes			
	Na2S	CMC 7MF	Na2CO3	CuSO4	A350	R-208	DF-250	Grind	Cond.	Froth	pH
Primary Grind			1000					15			9.0
Rougher Cond. 1		200							3		
Rougher Cond. 2				250					5		8.6
Rougher Cond. 3					100	40			3		
Rougher 1							40		1	2	8.6
Rougher 2					100	20			2	2	8.5
Scavenger Cond.	250								2		9.1
Scavenger Cond.				250					5		9.0
Scavenger					100	40			3	6	8.6

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Test: 42

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Rougher Conc. 1	62.4	6.3	5.83	5.36	113	1.46	1.92	63.1	57.4	65.6	40.7	66.4
2 Rougher Conc. 2	33.3	3.4	1.07	1.55	29.9	0.59	0.42	6.2	8.9	9.3	8.8	7.7
3 Scav. 1 Conc.	50.9	5.1	0.49	0.87	14.8	0.39	0.22	4.3	7.6	7.0	8.9	6.2
4 Scav. Tail	845.8	85.2	0.18	0.18	2.31	0.11	0.042	26.4	26.1	18.2	41.6	19.7
Head (calc)	992.4	100.0	0.58	0.59	10.8	0.23	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

Products 1 & 2		9.6	4.17	4.03	84.1	1.16	1.40	69.3	66.3	74.8	49.5	74.1
Products 1 to 3		14.8	2.89	2.94	60.0	0.89	0.99	73.6	73.9	81.8	58.4	80.3

Test: 43 Project: 4255 Date: June 4th/92 Operator: BW

Purpose: To repeat Test 42 without CMC 7MF.
Lac des Iles water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage								Time, minutes			pH
	Na2S	CMC 7MF	Na2CO3	CuSO4	A350	R-208	DF-250	Grind	Cond.	Froth	
Primary Grind			1000					15			9.0
Rougher Cond. 1				250					5		8.5
Rougher Cond. 2					100	40			3		
Rougher 1							40		1	2	8.5
Rougher 2					100	20			2	2	8.5
Scavenger Cond.	250								2		9.1
Scavenger Cond.				250					5		9.0
Scavenger					100	40			3	6	8.6

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Test: 43

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Rougher Conc. 1	76.2	7.7	5.71	4.65	96.7	1.26	1.65	69.4	60.5	67.3	41.9	67.9
2 Rougher Conc. 2	41.5	4.2	0.79	1.24	24.5	0.54	0.33	5.2	8.8	9.3	9.8	7.4
3 Scav. 1 Conc.	60.4	6.1	0.47	0.69	11.4	0.35	0.19	4.5	7.1	6.3	9.2	6.2
4 Scav. Tail	814.4	82.1	0.16	0.17	2.31	0.11	0.042	20.8	23.6	17.2	39.1	18.5
Head (calc)	992.5	100.0	0.63	0.59	11.0	0.23	0.19	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

Products 1 & 2	11.9	3.98	3.45	71.2	1.01	1.18	74.7	69.3	76.5	51.7	75.3
Products 1 to 3	17.9	2.79	2.51	50.9	0.78	0.85	79.2	76.4	82.8	60.9	81.5

Test: 44 Project: 4255 Date: June 8th/92 Operator: BW

Purpose: To repeat Test 38 without 1000 g/t of Na_2SiO_3 and with a Jeffery Magnetic separation done on the feed before the flotation stages.
Lakefield Research water was used throughout the test.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na_2CO_3	Na_2S	CMC 7MF		$CuSO_4$	A350	R 208	DF-250	Grind	Cond.	Froth	
Primary Grind									15			
Magnetic Separation	(Jeffery Magnetic separation at 2.0 amps.)											
Rougher Cond. 1	1000	250								3		9.9
Rougher Cond. 2			400							3		
Rougher Cond. 3					250					5		9.8
Rougher Cond. 4						100	40			3		
Rougher 1								20		1	2	
Rougher 2						100	20			2	2	9.5
Scavenger Cond.		100								3		
Scavenger						100	20	10		2	6	9.4

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Test: 44

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 Jeffery Magnetics	9.5	1.0	3.72	1.27	20.2	0.48	0.50	6.9	2.1	1.9	2.1	2.8
2 Rougher Conc. 1	42.4	4.4	6.29	7.07	129	1.89	2.60	51.7	51.0	55.4	37.0	64.0
3 Rougher Conc. 2	23.0	2.4	1.20	1.97	38.0	0.67	0.46	5.4	7.7	8.8	7.1	6.1
4 Scav. Conc.	46.0	4.8	0.58	1.00	17.4	0.34	0.21	5.2	7.8	8.1	7.2	5.6
5 Scav. Tail	839.4	87.4	0.19	0.22	3.03	0.12	0.044	30.9	31.4	25.7	46.5	21.5
Head (calc)	960.3	100.0	0.54	0.61	10.3	0.23	0.18	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					

Combined Products

Products 2 & 3		6.8	4.50	5.28	97.0	1.46	1.85	57.1	58.7	64.2	44.1	70.2
Products 2 to 4		11.6	2.88	3.51	64.1	1.00	1.17	62.2	66.5	72.3	51.4	75.8
Products 1 to 4		12.6	2.95	3.33	60.7	0.96	1.12	69.1	68.6	74.3	53.5	78.5

Test: 45,46 Project: 4255 Date: June 18/92 Operator: George Reschke

Purpose: To repeat test 37 with two cleaning stages.

Procedure: The rougher and scavenger stages were conducted on tests 45 and 46. The rougher and scavenger concentrates from tests 45 and 46 were combined for cleaning.

Feed: 2 X 1000 grams minus 10 mesh Comp M92

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH 45/46
	Na_2S	Na_2CO_3	Na_2SiO_3	CMC 7MF	$CuSO_4$	R208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250	1000	2000	-	-	-	-	-	15			
Ro Condition 1	-	-	-	400	-	-	-	-		3		9.9/9.9
2	-	-	-	-	250	-	-	-		5		9.69/9.76
3	-	-	-	-	-	* 40	100	-		3		
Rougher 1	-	-	-	-	-	-	-	40		1	2	
2	-	-	-	-	-	20	100	-		2	2	9.60/9.73
Scav Cond 1	100	-	-	-	-	-	-	-		2		9.76/9.80
2	-	-	-	-	250	-	-	-		5		9.63/9.67
3	-	-	-	-	-	40	100	-		3		
Scavenger 1	-	-	-	-	-	-	-	-			6	
	Combine rougher concentrates and scavenger concentrates from tests 45 and 46.											
Cleaner 1	-	-	-	-	-	10	25	-		2	5	9.18
Cleaner 2	-	250	-	50	-	-	-	-		2		
	-	-	-	-	-	10	-	12.5		2	3	10.38
	-	-	-	50	-	-	-	-		2	3	

Stage	Cond.	Ro 1	Ro 2	Scav.	Cl 1	Cl 2
Flotation Cell		D-1000			D-1000	
Speed R.P.M.	1500	2100	2100	2100	2100	2100
Pulp Density	Approx. 20 % soilids					

* Reagent addition unknown in test 45. > 40 g/t added.

** All reagents in the rougher and scavenger stages are calculated in g/t based on 1000 grams of feed. All reagents in the two cleaning stages are calculated in g/t based on 2000 grams of feed.

Test: 45,46
M92

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1A	19.7	1.0	15.0	11.9	206	2.11	4.56	16.1	22.9	19.9	20.4	9.4	26.0	18.0
2 CuNi Ro Conc 1B	14.6	0.7	24.6	14.8	229	2.00	5.42	17.7	27.9	18.4	16.8	6.6	22.9	14.7
3 CuNi 2nd Cl Conc	45.6	2.3	4.19	5.35	117	2.33	1.32	9.27	14.8	20.7	26.8	24.0	17.4	24.1
4 CuNi 2nd Cl Tail	18.7	0.9	1.05	2.11	41.2	0.35	0.19	3.96	1.5	3.4	3.9	1.5	1.0	4.2
5 CuNi 1st Cl Tail	63.4	3.2	0.50	0.80	14.0	0.79	0.41	1.76	2.5	4.3	4.5	11.3	7.5	6.3
6 CuNi Scav Tail A	904.8	45.6	0.21	0.22	3.00	0.12	0.047	0.35	14.7	16.9	13.6	24.5	12.3	18.0
7 Cu Ni Scav Tail B	916.5	46.2	0.22	0.21	3.04	0.11	0.048	0.28	15.6	16.4	14.0	22.8	12.7	14.6
Head (calc)	1983.3	100.0	0.65	0.59	10.0	0.22	0.17	0.89	100.0	100.0	100.0	100.0	100.0	100.0

Combined Products

CuNi Ro Conc (1 + 2)		1.7	19.1	13.1	216	2.06	4.93	16.8	50.8	38.3	37.2	16.0	48.9	32.8
CuNi Comb Conc (1 to 3)		4.0	10.6	8.69	159	2.22	2.87	12.5	65.6	59.0	64.0	40.0	66.4	56.8
CuNi Comb Conc (1 to 4)		5.0	8.78	7.44	137	1.86	2.36	10.9	67.1	62.4	67.9	41.4	67.4	61.0
CuNi Comb Conc (1 to 5)		8.2	5.54	4.84	88.9	1.44	1.60	7.31	69.6	66.7	72.4	52.7	74.9	67.4
Scav Tail A+B (6+7)		91.8	0.22	0.21	3.02	0.11	0.05	0.31	30.4	33.3	27.6	47.3	25.1	32.6

Test: 47,48 Project: 4255 Date: June 19/92 Operator: George Reschke

Purpose: To repeat test 45,46 on the Roby Zone Composite.

Procedure: The rougher and scavenger stages were conducted on tests 47 and 48. The rougher and scavenger concentrates from tests 47 and 48 were combined for cleaning.

Feed: 2 X 1000 grams minus 10 mesh Comp M92

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH 47/48
	Na2S	Na2CO3	Na2SiO3	CMC 7MF	CuSO4	R208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250	1000	2000	-	-	-	-	-	15			
Ro Condition 1	-	-	-	400	-	-	-	-		3		10.1/10.13
2	-	-	-	-	250	-	-	-		5		9.69/9.76
3	-	-	-	-	-	40	100	-		3		
Rougher 1	-	-	-	-	-	-	-	40		1	2	
2	-	-	-	-	-	20	100	-		2	2	
Scav Cond 1	100	-	-	-	-	-	-	-		2		9.90/9.97
2	-	-	-	-	250	-	-	-		5		
3	-	-	-	-	-	40	100	-		3		
Scavenger 1	-	-	-	-	-	-	-	-			6	
	Combine rougher concentrates and scavenger concentrates from tests 45 and 46.											
Cleaner 1	-	-	-	100	-	-	-	-		2	4	8.40
Cleaner 2	-	125	-	100	-	-	-	-		2	3	9.65
Cleaner 3	-	125	-	-	-	-	-	-		2	3	9.67

Stage	Cond.	Ro 1	Ro 2	Scav.	Cl 1	Cl 2
Flotation Cell		D-1000			D-1000	
Speed R.P.M.	1500	2100	2100	2100	2100	2100
Pulp Density	Approx. 20 % soilids					

** All reagents in the rougher and scavenger stages are calculated in g/t based on 1000 grams of feed.
All reagents in the two cleaning stages are calculated in g/t based on 2000 granis of feed.

Test: 47,48
Roby Zone

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1A	9.9	0.5	11.4	10.3	89.0	4.04	6.04	18.1	18.8	16.6	19.3	17.0	21.9	20.8
2 CuNi Ro Conc 1B	11.5	0.6	10.9	9.70	76.9	3.61	5.39	15.7	20.9	18.1	19.4	17.7	22.7	21.0
3 CuNi 3rd Cl Conc	28.8	1.5	3.46	3.47	30.1	1.45	1.48	6.81	16.6	16.2	19.0	17.8	15.6	22.8
4 CuNi 3rd Cl Tail	15.2	0.8	1.61	2.01	14.4	0.58	0.81	2.80	4.1	5.0	4.8	3.8	4.5	4.9
5 CuNi 2nd Cl Tail	16.2	0.8	1.03	1.33	10.5	0.50	0.53	2.36	2.8	3.5	3.7	3.5	3.1	4.4
6 CuNi 1st Cl Tail	44.8	2.3	0.37	0.41	3.49	0.18	0.20	0.84	2.8	3.0	3.4	3.4	3.3	4.4
7 CuNi Scav Tail A	933.3	47.0	0.12	0.11	0.80	0.048	0.045	0.08	18.7	16.7	16.4	19.1	15.4	8.7
8 Cu Ni Scav Tail B	924.2	46.6	0.10	0.14	0.69	0.045	0.040	0.12	15.4	21.0	14.0	17.7	13.5	12.9
Head (calc)	1983.9	100.0	0.30	0.31	2.30	0.12	0.14	0.43	100.0	100.0	100.0	100.0	100.0	100.0

Combined Products

CuNi Ro Conc (1 + 2)	1.1	11.1	10.0	82.5	3.81	5.69	16.8	35.4	34.7	38.7	34.7	44.6	41.8
CuNi Comb Conc (1 to 3)	2.5	6.73	6.24	52.4	2.46	3.28	11.1	39.5	50.9	57.7	52.5	60.2	64.6
CuNi Comb Conc (1 to 4)	3.3	5.54	5.26	43.6	2.02	2.70	9.15	42.3	55.8	62.5	56.3	64.7	69.6
CuNi Comb Conc (1 to 5)	4.1	4.64	4.48	37.0	1.72	2.27	7.80	45.0	59.3	66.2	59.7	67.8	74.0
CuNi Comb Conc (1 to 6)	6.4	3.13	3.04	25.1	1.17	1.54	5.33	63.7	62.3	69.7	63.2	71.1	78.4
Scav Tail A+B (7+8)	93.6	0.11	0.12	0.75	0.047	0.043	0.10	34.1	37.7	30.3	36.8	28.9	21.6

Test: 49 Project: 4255 Date: June 19/92 Operator: LP

Purpose: To repeat test 37 on 92 M1 28843 Composite.

Procedure: As outlined below.

Feed: 1000 grams minus 10 mesh Comp 92 M1 28843

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na2S	Na2CO3	Na2SiO3	CMC 7MF	CuSO4	R208	PAX	DF 250C	Grind	Cond.	Froth	
Primary Grind	250	1000	2000	-	-	-	-	-	15			
Ro Condition 1	-	-	-	400	-	-	-	-		3		9.96
2	-	-	-	-	250	-	-	-		5		9.78
3	-	-	-	-	-	40	100	-		3		
Rougher 1	-	-	-	-	-	-	-	40		1	2	
2	-	-	-	400	-	40	100	-		2	2	
Scav Cond 1	100	-	-	400	-	-	-	-		2		
2	-	-	-	-	-	40	100	-		2	6	

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell		D-1000		
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Observations: Extremely talcy.

Product: Combined Product Test No: 49

Microns	Mesh	Weight Grams	% Weight		
			Ind.	Cum.	Passing
208	65	0.3	0.3	0.3	99.7
147	100	1.9	1.9	2.2	97.8
104	150	5.3	5.3	7.5	92.5
74	200	8.7	8.7	16.2	83.8
53	270	11.6	11.6	27.8	72.2
38	400	13.4	13.4	41.2	58.8
-38	-400	58.8	58.8	100.0	-
	Total	100.0	100.0	-	-

Test: 49

Sample 92M128843 ground to 84% minus 200 mesh

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi Ro Conc 1	40.7	4.1	3.26	13.1	295	0.24	0.44	1.63	51.2	54.2	54.2	10.4	55.3	43.5
2 CuNi Ro Conc 2	72.3	7.4	0.43	2.34	51.2	0.15	0.057	0.42	12.0	17.2	16.7	11.6	12.7	19.9
3 CuNi Sc Conc	137.2	14.0	0.16	0.55	12.6	0.10	0.022	0.14	8.5	7.7	7.8	14.6	9.3	12.6
4 Cu Ni Scav Tail	732.5	74.5	0.10	0.28	6.42	0.081	0.010	0.050	28.3	20.9	21.2	63.3	22.6	24.0
Head (calc)	982.7	100.0	0.26	1.00	22.5	0.095	0.033	0.16	100.0	100.0	100.0	100.0	100.0	100.0
Combined Products														
CuNi Ro Conc (1 + 2)		11.5	1.45	6.22	139	0.18	0.19	0.86	63.2	71.5	71.0	22.0	68.0	63.4
Ro + Sc Conc (1 to 3)		25.5	0.74	3.11	69.7	0.14	0.100	0.46	71.7	79.1	78.8	36.7	77.4	76.0

Test: 50 Project: 4255 Date: June 19/92 Operator: LP

Purpose: To repeat test 37 with $(NH_4)_2SO_4$ instead of Na_2S.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na2CO3	(NH4)2SO4	CMC 7MF	Na2SiO3	CuSO4	A350	R 208	DF-250	Grind	Cond.	Froth	
Primary Grind	1000	250	400	2000	-	-	-		15			9.2
							-					
Rougher Cond. 1	-	-	-	-	250	-	40			5		9.0
Rougher Cond. 2	-	-	-	-	-	100	-			3		
Rougher 1	-	-	-	-	-	-	-	20		1	2	9.0
Rougher 2	-	-	-	-	-	100	20			2	2	8.9
Scavenger Cond.	-	100	-	-	-	-	-			2		
			-	-	-	-	-					
Scavenger	-	-	-	-	-	100	20			2	6	8.8

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Test: 50
Sample M92

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
CuNi Ro Conc 1	40.5	4.1	9.48	8.60	162	2.08	3.02	12.6	63.7	55.5	60.1	38.0	68.9	53.7
CuNi Ro Conc 2	25.0	2.5	1.38	2.17	46.6	0.93	0.50	4.81	5.7	8.6	10.7	10.5	7.0	12.7
CuNi Sc Conc	40.5	4.1	0.62	0.97	17.6	0.41	0.22	3.52	4.2	6.3	6.5	7.5	5.0	15.0
Cu Ni Scav Tail	886.2	89.3	0.18	0.21	2.79	0.11	0.038	0.20	26.5	29.6	22.7	44.0	19.0	18.6
Head (calc)	992.2	100.0	0.61	0.63	11.0	0.22	0.18	0.96	100.0	100.0	100.0	100.0	100.0	100.0
Combined Products														
CuNi Ro Conc (1 + 2)		6.6	6.39	6.15	118	1.64	2.06	9.63	69.4	64.1	70.8	48.5	76.0	66.3
Ro + Sc Conc (1 to 3)		10.7	4.18	4.17	79.6	1.17	1.36	7.29	73.5	70.4	77.3	56.0	81.0	81.4

Test: 51

Sample M92 Repeat Test 29 with lower Ro Density

<u>Metallurgical Balance</u>

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 CuNi 4th Cl Conc	33.5	1.7	25.8	20.2	356	4.88	6.63	31.0	58.2	52.6	55.6	36.4	68.5	59.7
2 CuNi 4th Cl Tail	4.2	0.2	4.25	5.43	110	1.74	1.24	8.90	1.2	1.8	2.2	1.6	1.6	2.1
3 CuNi 3rd Cl Tail	5.8	0.3	3.11	2.71	49.0	0.76	0.56	3.53	1.2	1.2	1.3	1.0	1.0	1.2
4 CuNi 2nd Cl Tail	39.8	2.0	1.49	2.43	45.4	0.75	0.51	4.24	4.0	7.5	8.4	6.7	6.3	9.7
5 CuNi 1st Cl Tail	183.4	9.3	1.19	0.63	12.0	0.30	0.12	1.84	14.7	9.0	10.3	12.3	6.8	19.4
6 Cu Ni Scav Tail	1714.2	86.5	0.18	0.21	2.79	0.11	0.03	0.08	20.8	28.0	22.3	42.0	15.9	7.9
Head (calc)	1980.9	100.0	0.75	0.65	10.8	0.23	0.16	0.88	100.0	100.0	100.0	100.0	100.0	100.0

Combined Products

CuNi 3rd Cl Conc (1 + 2)		1.9	23.4	18.6	329	4.53	6.03	28.5	59.4	54.3	57.7	38.1	70.1	61.8
CuNi 2nd Cl Conc (1 to 3)		2.2	20.7	16.4	291	4.03	5.30	25.2	60.6	55.6	59.0	39.1	71.1	63.0
CuNi 1st Cl Conc (1 to 4)		4.2	11.5	9.75	174	2.46	3.01	15.2	64.6	63.1	67.5	45.7	77.4	72.7
Ro Conc (1 to 5)		13.5	4.42	3.48	62.5	0.98	1.02	6.01	79.2	72.0	77.7	58.0	84.1	92.1

	%MgO
CuNi 4th Cl Conc:	3.76
CuNi 2nd Cl Conc:	6.58

Test: 52 Project: 4255 . Date: July 6/92 Operator: LP

Purpose: Repeat test 31 to produce tailings for settling tests.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		22			8.2
Scavenger 1	50			50		25	7.5		1	7	8.3
2						25			1	5	
						25	2.5		1	5	
						25			1	5	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750

Test: 53 Project: 4255 Date: July 6/92 Operator: LP

Purpose: Repeat test 37 to produce tailing for settling tests.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh Comp. M92.

Grind: 15 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t								Time, minutes			pH
	Na2CO3	Na2S	CMC 7MF	Na2SiO3	CuSO4	A350	R 208	DF-250	Grind	Cond.	Froth	
Primary Grind	1000	250		2000					15			9.3
Rougher Cond. 1			400							3		9.2
Rougher Cond. 2					250					5		
Rougher Cond. 3						100	40			3		
Rougher 1								20		1	2	9.0
Rougher 2						100	20			2	2	9.0
Scavenger Cond.		100								2		
Scavenger						100	20			2	6	9.0

Stage	Cond.	Ro 1	Ro 2	Scav.
Flotation Cell	D-1000			
Speed R.P.M.	1500	2100	2100	2100
Pulp Density	Approx. 20 % soilids			

Settling Test Report

Test No. S-1 **Project No.: 4255** **Date: July 7/92/92** **Operator: LP**

Purpose: To investigate the settling characteristics of test 52 tailing.

Feed: Test 52 tailing

Flocculant: - **pH: 8.0**

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
	0	2000		280	530
	2	1950		350	510
	5	1895		410	490
	10	1770		Final	480
	15	1680			
	20	1580			
	25	1490			
	30	1390			
	35	1300			
	40	1230			
	45	-			
	50	1080			
	55	1020			
	60	970			
	80	840			
	95	730			
	120	620			
	180	565			

Observations: After 2 minutes, sands had settled to 250 mL.
The supernatant was very cloudy until 970 mL.

Initial Pulp Weight	2.3216 kg
Initial Pulp Volume	2.000 L
Initial Pulp Height	42.0 cm
Weight of Dry Solids	0.5207 kg
Dry Solids S.G.	2.94 g/cc or kg/L
Liquid S.G.	1.00 g/cc or kg/L
Final Mudline	0.480 L
Tangent Intersect Y (vol.)	0.95 L
Corresponding X value (Time)	64 min
Slope of Tangent Y (mudline)	0.280 L
Slope of Tangent X (time)	280 min

Test No. S-1 Project No.: 4255 Date: July 7/92/92 Operator: LP

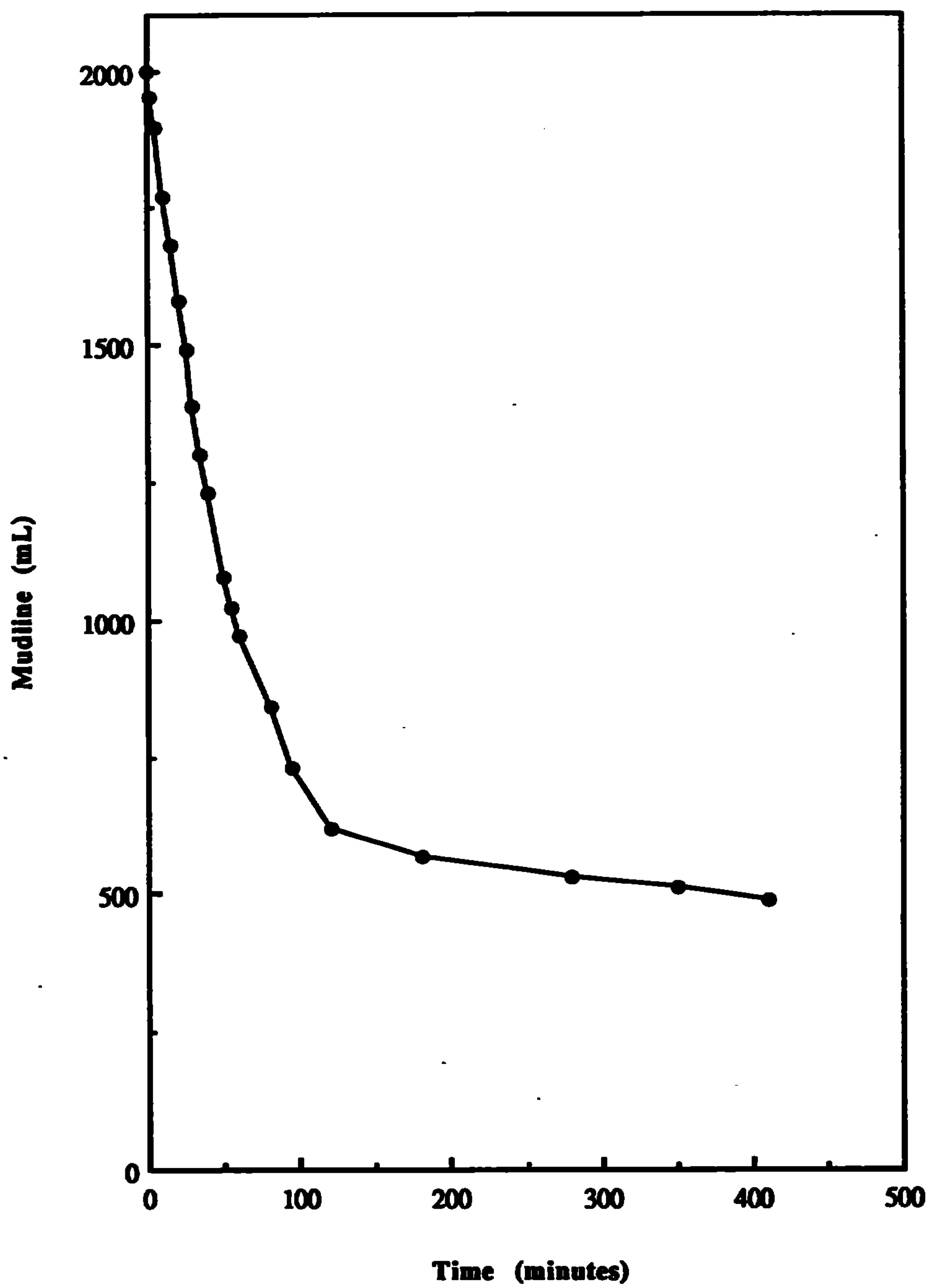
FEED CONCENTRATION ZONE

Initial Pulp Density:	1161 g/L
Initial Percent Solids:	21.0 %
Rate:	0.207 m/h
Thickener Area Required:	0.646 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1362 g/L
Initial Percent Solids:	40.3 %
Final Pulp Density:	1716 g/L
Final Percent Solids:	63.2 %
Rate:	0.030 m/h
Thickener Area Required:	1.257 sq. meters/tonne/day (no safety factor applied)

S-1



2000
1500
1000
500
0
Mudline (mL)
0
100
200
300
400
500
Time (minutes)

Settling Test Report

Test No. S-2 Project No.: 4255 Date: July 7/92/92 Operator: LP

Purpose: To investigate the effect of 15 g/t Percol 156 on the settling characteristics of test 52 tailing.

Feed: Test 52 tailing

Flocculant: 15 g/t Percol 156 pH: 8.0

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
	0	2040		18	820
	1	1880		20	790
	1.5	1800		25	740
	2	1710		30	700
	2.5	1610		35	-
	3	1540		40	650
	3.5	1480		45	630
	4	1430		50	620
	4.5	1390		70	600
	5	1350		85	580
	6	1290		110	575
	7	1210		170	565
	8	1160		270	560
	9	1100		340	560
	10	1050		400	560
	12	-		Final	550
	14	900			
	16	850			

Observations: The supernatant was cloudy throughout the test.

Initial Pulp Weight	2.4152 kg
Initial Pulp Volume	2.040 L
Initial Pulp Height	41.0 cm
Weight of Dry Solids	0.5992 kg
Dry Solids S.G.	2.94 g/cc or kg/L
Liquid S.G.	1.00 g/cc or kg/L
Final Mudline	0.550 L
Tangent Intersect Y (vol.)	0.825 L
Corresponding X value (Time)	16 min
Slope of Tangent Y (mudline)	0.180 L
Slope of Tangent X (time)	160 min

Test No. S-2	Project No.: 4255	Date: July 7/92/92	Operator: LP

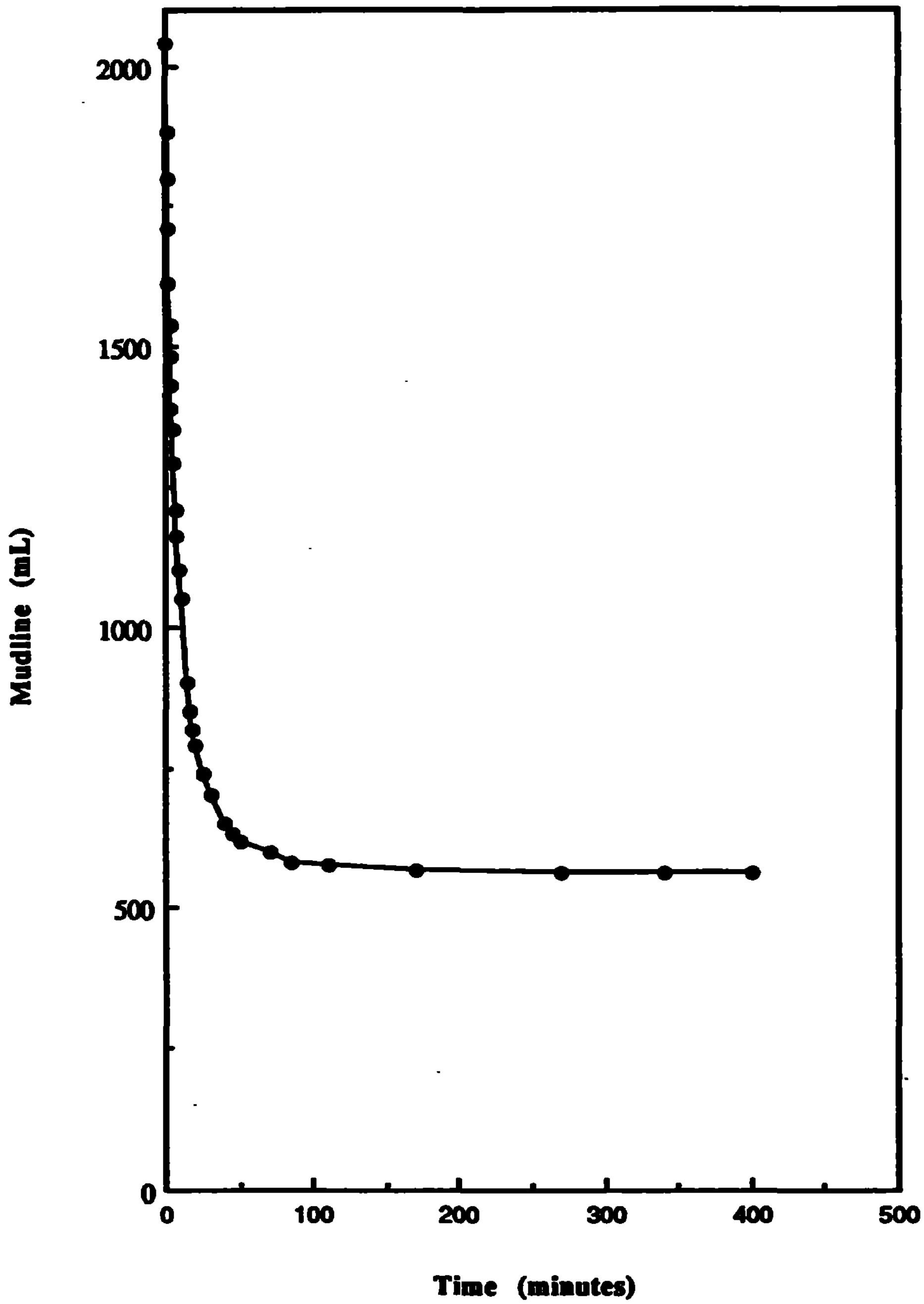
FEED CONCENTRATION ZONE

Initial Pulp Density:	1184 g/L
Initial Percent Solids:	23.5 %
Rate:	0.916 m/h
Thickener Area Required:	0.122 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1479 g/L
Initial Percent Solids:	49.1 %
Final Pulp Density:	1719 g/L
Final Percent Solids:	63.4 %
Rate:	0.049 m/h
Thickener Area Required:	0.397 sq. meters/tonne/day (no safety factor applied)

Test S-2



Mudline (mL)
2000
1500
1000
500
0
0
100
200
300
400
500
Time (minutes)

Settling Test Report

Test No. S-3 Project No.: 4255 Date: July 7/92/92 Operator: LP

Purpose: To investigate the settling characteristics of test 53 tailing.

Feed: Test 53 tailing

Flocculant: - pH: 8.8

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
	0	2000 (initial mudline)		30	* 380
	1	* 170		60	* 390
	1.5	* 190		120	* 405
	2	* 210		220	* 405
	2.5	* 230		290	* 415
	3	* 250		350	* 415
	3.5	* 260		Final	* 425
	4	* 275			
	4.5	* 280			
	5	* 290			
	7	* 310			
	8.5	* 320			
	10	* 330			
	12	* 340			
	14	* 345			
	16	* 350			
	18	* 360			
	20	* 360			

Observations: There was no visible mudline.
* The mudlines recorded are the volume of the sands which have settled at the bottom of the cylinder. This made graphing of the results impossible.

Initial Pulp Weight	2.3063 kg
Initial Pulp Volume	2.000 L
Initial Pulp Height	39.5 cm
Weight of Dry Solids	0.5143 kg
Dry Solids S.G.	2.84 g/cc or kg/L
Liquid S.G.	1.00 g/cc or kg/L
Final Mudline	0.425 L
Tangent Intersect Y (vol.)	- L
Corresponding X value (Time)	- min
Slope of Tangent Y (mudline)	- L
Slope of Tangent X (time)	- min

Settling Test Report

Test No. S-4 Project No.: 4255 Date: July 7/92/92 Operator: LP

Purpose: To investigate the effect of 15 g/t Percol 156 on the settling characteristics of the test 53 tailing.

Feed: Test 53 tailing

Flocculant: 15 g/t Percol 156 pH: 8.8 $CuSO_4$: -

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
	0	2030 (initial mudline)		110	*445
	0.5	*100		210	*450
	1	*150		280	*460
	1.5	*190		340	*460
	2	*220		Final	*465
	2.5	*240			
	3	*260			
	3.5	*280			
	4	*300			
	4.5	*320			
	5	*330			
	6	*340			
	7	*360			
	8	*370			
	9	*380			
	10	*390			
	20	*420			
	50	*440			

Observations: There was no apparent mudline. *The mudlines recorded are the volume of the sands which have settled at the bottom of the cylinder. This made graphing of the results impossible.

Initial Pulp Weight	2.3355 kg
Initial Pulp Volume	2.030 L
Initial Pulp Height	40.5 cm
Weight of Dry Solids	0.5184 kg
Dry Solids S.G.	2.84 g/cc or kg/L
Liquid S.G.	1.00 g/cc or kg/L
Final Mudline	0.465 L
Tangent Intersect Y (vol.)	- L
Corresponding X value (Time)	- min
Slope of Tangent Y (mudline)	- L
Slope of Tangent X (time)	- min

Settling Test Report

Test No. S-5 Project No.: 4255 Date: July 8/92 Operator: LP

Purpose: To investigate the effect of 1950 g/t $CuSO_4$ on the settling characteristics of the test 53 tailing.

Feed: Test 53 tailing

Flocculant: - pH: 7.3 $CuSO_4$: 1950 g/t

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
	0	2020		24	790
	0.5	1960		26	750
	1	1900		28	720
	2	1790		30	710
	3	1700		35	675
	4	1600		40	650
	5	1520		45	630
	6	1450		60	575
	7	1400		85	540
	8	1340		Final	510
	9	1290			
	10	1240			
	12	-			
	14	1080			
	16	1005			
	18	940			
	20	880			
	22	830			

Observations: The supernatant was very cloudy throughout the test.

Initial Pulp Weight	2.3063 kg
Initial Pulp Volume	2.020 L
Initial Pulp Height	40.0 cm
Weight of Dry Solids	0.5143 kg
Dry Solids S.G.	2.84 g/cc or kg/L
Liquid S.G.	1.00 g/cc or kg/L
Final Mudline	0.510 L
Tangent Intersect Y (vol.)	1.1 L
Corresponding X value (Time)	13 min
Slope of Tangent Y (mudline)	0.440 L
Slope of Tangent X (time)	50 min

Test No. S-5	Project No.: 4255	Date: July 8/92	Operator: LP

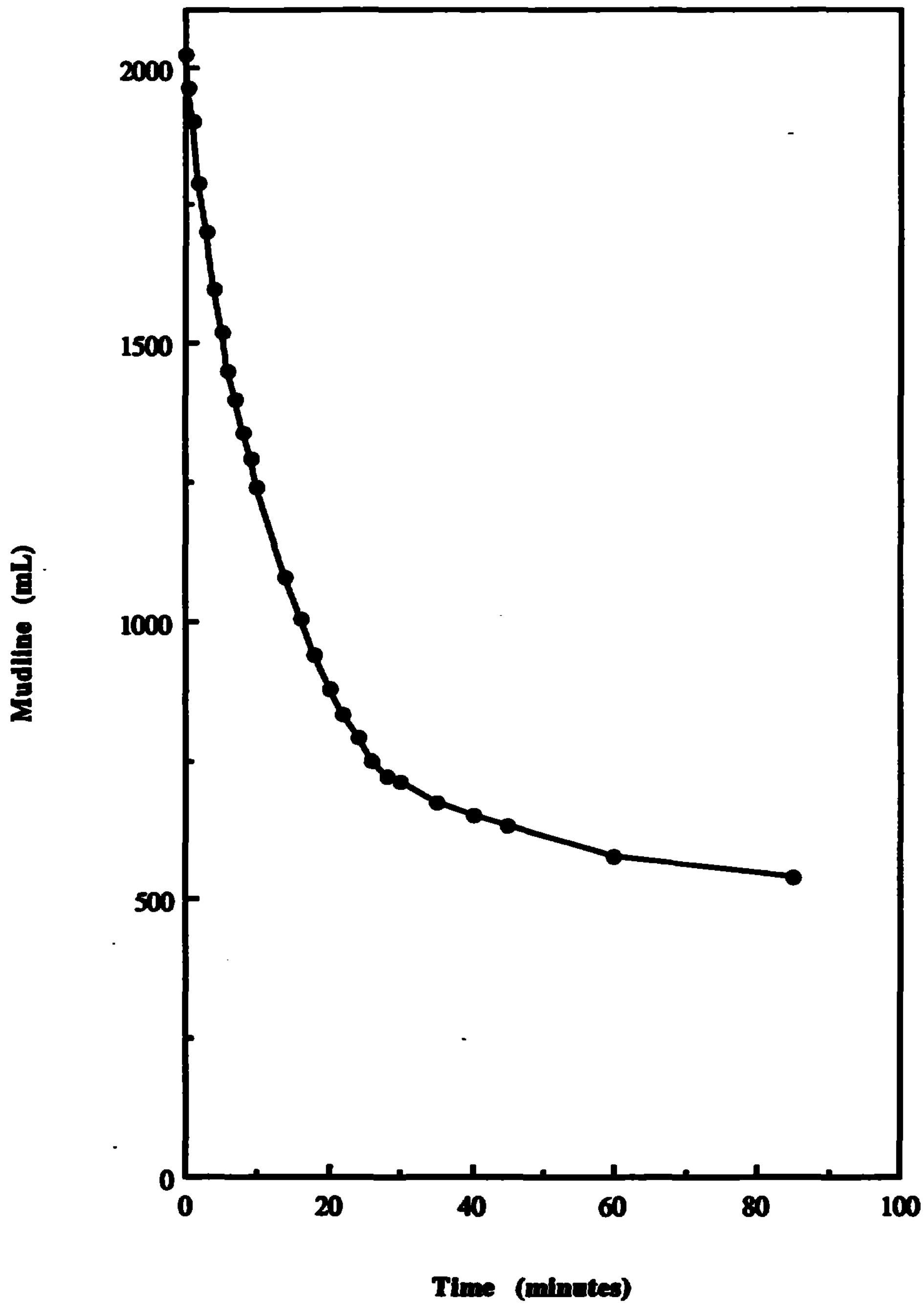
FEED CONCENTRATION ZONE

Initial Pulp Density:	1142 g/L
Initial Percent Solids:	19.2 %
Rate:	0.841 m/h
Thickener Area Required:	0.179 sq. meters/tonne/day
	(no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1303 g/L
Initial Percent Solids:	35.9 %
Final Pulp Density:	1653 g/L
Final Percent Solids:	61.0 %
Rate:	0.157 m/h
Thickener Area Required:	0.307 sq. meters/tonne/day
	(no safety factor applied)

Test S-5



Settling Test Report

Test No. S-6 **Project No.: 4255** **Date: July 8/92** **Operator: LP**

Purpose: To investigate the effect of 1950 g/t $CuSO_4$ and 15 g/t Percol 156 on the settling characteristics of the test 53 tailing.

Feed: Test 53 tailing

Flocculant: 15 g/t Percol 156 **pH:** 7.3 **$CuSO_4$:** 1950 g/t

Time		Mudline	Time		Mudline
a.m./p.m.	elapsed,min.	mL	a.m./p.m.	elapsed,min.	mL
	0	2040		35	625
	1	1910		50	590
	2	1780		75	550
	3	1680		Final	540
	4	1580			
	5	1480			
	6	1390			
	7	1290			
	8	1220			
	9	1140			
	10	1080			
	12	960			
	14	880			
	16	820			
	18	780			
	20	750			
	25	685			
	30	640			

Observations: The supernatant was somewhat cloudy throughout the test.

Initial Pulp Weight	2.3355 kg
Initial Pulp Volume	2.040 L
Initial Pulp Height	40.5 cm
Weight of Dry Solids	0.5184 kg
Dry Solids S.G.	2.84 g/cc or kg/L
Liquid S.G.	1.00 g/cc or kg/L
Final Mudline	0.540 L
Tangent Intersect Y (vol.)	1.05 L
Corresponding X value (Time)	10.5 min
Slope of Tangent Y (mudline)	0.320 L
Slope of Tangent X (time)	50 min

Test No. S-6	Project No.: 4255	Date: July 8/92	Operator: LP

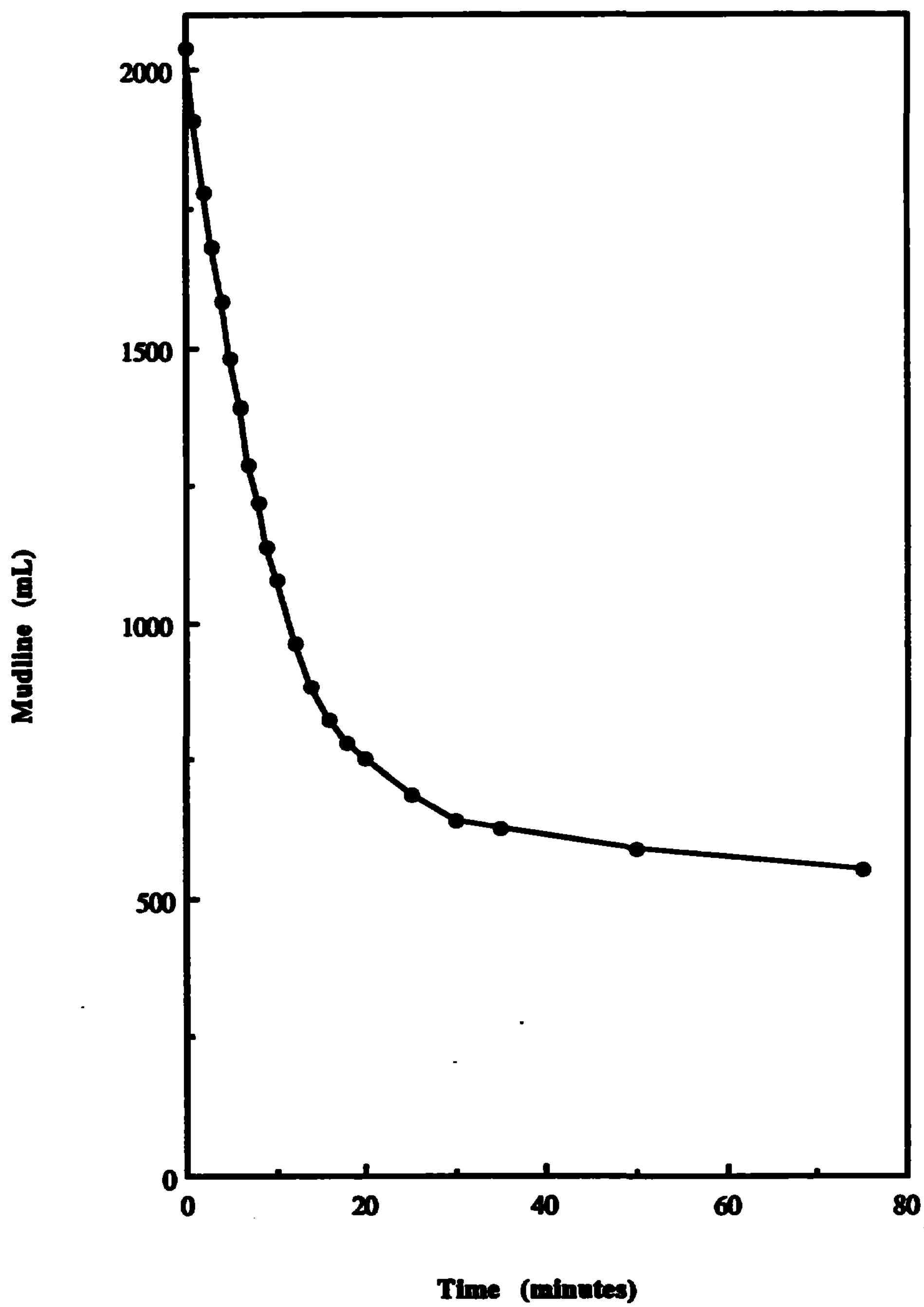
FEED CONCENTRATION ZONE

Initial Pulp Density:	1145 g/L
Initial Percent Solids:	19.5 %
Rate:	1.123 m/h
Thickener Area Required:	0.128 sq. meters/tonne/day (no safety factor applied)

ENTRANCE TO COMPRESSION ZONE

Initial Entr Zone Pulp Density:	1320 g/L
Initial Percent Solids:	37.4 %
Final Pulp Density:	1622 g/L
Final Percent Solids:	59.2 %
Rate:	0.174 m/h
Thickener Area Required:	0.238 sq. meters/tonne/day (no safety factor applied)

Test S-6



Test: 53a Project: 4255 Date: July 28/92 Operator: GC

Purpose: Conduct a batch test using cycle test conditions.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		22			7.9
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	8.3
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	8.1
PM Regrind			*100		*5	*20		15			
1st Cleaner							5		1	7	8.2
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	10	8.8
2nd Cleaner			50						1	3.5	8.5
					5	10	7.5		1	2	
						5			1	3	
3rd Cleaner			10				5		1	3	8.6
					2.5	5	2.5		1	2	
						5			1	3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750

Test: 53a

__Metallurgical Balance__

Product	Weight		Assays, %, g/t						% Distribution					
	g	%	Au	Pt	Pd	Ni	Cu	S	Au	Pt	Pd	Ni	Cu	S
1 3rd Cl Conc	38.6	2.0	16.1	15.5	336	4.05	6.00	27.0	60.8	55.8	63.1	36.7	72.7	32.2
2 3rd Cl Tail	5.2	0.3	2.00	3.31	66.3	1.28	0.74	7.33	1.0	1.6	1.7	1.6	1.2	1.2
3 2nd Cl Tail	31.6	1.6	1.12	2.17	42.0	0.85	0.46	4.77	3.5	6.4	6.5	6.3	4.6	4.7
4 1st Cl Sc Conc	10.8	0.5	1.02	2.48	50.0	1.10	0.38	8.93	1.1	2.5	2.6	2.8	1.3	3.0
5 1st Cl Sc Tail	114.5	5.8	0.37	0.53	8.94	0.26	0.10	1.04	4.1	5.7	5.0	7.0	3.6	3.7
6 Scav Tail	1772.3	89.8	0.17	0.17	2.45	0.11	0.030	1.01	29.5	28.1	21.1	45.7	16.7	55.3
Head (calc)	1973.0	100.0	0.52	0.54	10.4	0.22	0.16	1.64	100.0	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18							

Combined Products

2nd Cl Conc (1 & 2)		2.3	13.9	13.6	293	3.59	5.19	23.8	61.8	57.4	64.8	38.2	73.9	33.4
1st Cl Conc (1 to 3)		3.9	8.67	8.89	190	2.47	3.25	16.0	65.3	63.8	71.3	44.5	78.4	38.0
Ro Conc (1 to 5)		10.3	3.56	3.81	80.1	1.14	1.31	7.15	70.5	71.9	78.9	54.3	83.3	44.7

Test: 54 Project: 4255 Date: July 28/92 Operator: GC

Purpose: To conduct a 6 cycle locked test.

Procedure: As shown below using a 2000 g D-1 cell instead of a 1000 g D-1 cell.

Feed: 6 x 2000 grams minus 10 mesh Comp M92

Grind: 22 minutes per 2000 g charge at 65% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		22			8.5
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	8.4
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	8.1
PM Regrind			*100		*5	*20		15			
1st Cleaner							5		1	7	8.2
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	10	
2nd Cleaner			50						1	3.5	7.4
					5	10	7.5		1	2	
						5			1	3	
3rd Cleaner			10				5		1	3	7.2
					2.5	5	2.5		1	2	
						5			1	3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1, 2000g	1750
1st & 2nd Cl	D-1, 500g	1300
3rd & 4th Cl	D-1, 250g	1100

Test: 54

Metallurgical Balance

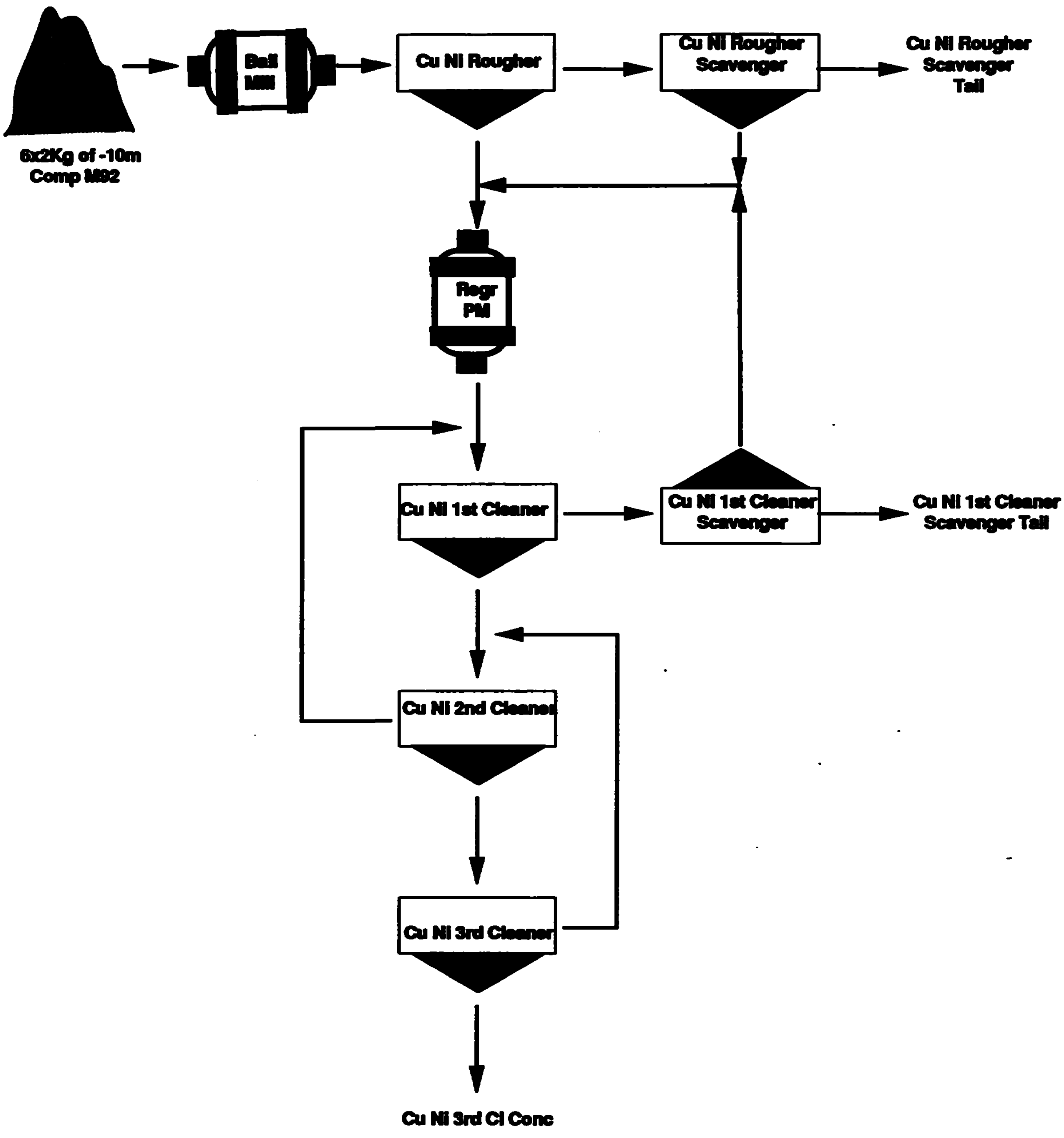
Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 3rd Cl Conc A	54.2	0.45	12.8	12.5	250	3.27	4.52	10.0	9.9	11.0	6.9	12.3
2 3rd Cl Conc B	51.2	0.43	13.1	12.8	257	3.25	4.57	9.6	9.6	10.6	6.5	11.8
3 3rd Cl Conc C	54.1	0.45	15.5	13.1	254	3.25	4.67	12.0	10.4	11.1	6.8	12.7
4 3rd Cl Conc D	60.4	0.50	13.4	12.4	244	3.14	4.26	11.6	11.0	11.9	7.4	12.9
5 3rd Cl Conc E	69.2	0.58	12.5	11.8	234	3.19	3.90	12.4	12.0	13.1	8.6	13.6
6 3rd Cl Conc F	71.6	0.60	10.6	10.8	211	2.81	3.54	10.9	11.3	12.2	7.8	12.7
7 3rd Cl Tail F	15.2	0.13	1.48	2.24	42.1	0.78	0.43	0.3	0.5	0.5	0.5	0.3
8 2nd Cl Tail F	73.9	0.61	0.92	1.59	31.7	0.64	0.30	1.0	1.7	1.9	1.8	1.1
9 1st Cl Sc Conc F	28.6	0.24	1.11	1.55	32.9	0.75	0.32	0.5	0.6	0.8	0.8	0.5
10 1st Cl Sc Tail A	139.4	1.16	0.35	0.48	8.10	0.23	0.099	0.7	1.0	0.9	1.2	0.7
11 1st Cl Sc Tail B	126.3	1.05	0.37	0.55	10.7	0.31	0.11	0.7	1.0	1.1	1.5	0.7
12 1st Cl Sc Tail C	165.9	1.38	0.35	0.50	9.64	0.26	0.10	0.8	1.2	1.3	1.7	0.8
13 1st Cl Sc Tail D	175.9	1.46	0.47	0.61	11.1	0.30	0.11	1.2	1.6	1.6	2.0	1.0
14 1st Cl Sc Tail E	175.8	1.46	0.38	0.51	9.27	0.26	0.094	1.0	1.3	1.3	1.8	0.8
15 1st Cl Sc Tail F	145.7	1.21	0.41	0.55	9.25	0.24	0.097	0.9	1.2	1.1	1.4	0.7
16 Ro Tail A	1752.6	14.57	0.20	0.17	2.25	0.11	0.032	5.0	4.4	3.2	7.5	2.8
17 Ro Tail B	1794.9	14.92	0.19	0.18	2.42	0.11	0.035	4.9	4.7	3.5	7.7	3.2
18 Ro Tail C	1755.8	14.60	0.17	0.16	2.23	0.10	0.032	4.3	4.1	3.2	6.8	2.8
19 Ro Tail D	1765.8	14.68	0.15	0.16	2.35	0.10	0.033	3.8	4.1	3.4	6.9	2.9
20 Ro Tail E	1794.9	14.92	0.17	0.17	2.24	0.11	0.032	4.4	4.5	3.3	7.7	2.9
21 Ro Tail F	1758.1	14.61	0.16	0.15	2.18	0.10	0.030	4.0	3.9	3.1	6.8	2.7
Head (calc)	12029.5	100.00	0.58	0.57	10.3	0.21	0.17	100.0	100.0	100.0	100.0	100.0
(direct)			0.42	0.59	9.87	0.24	0.18					
Combined Products												
3rd Cl Conc A-F		3.00	12.9	12.1	240	3.14	4.19	66.6	64.2	70.0	43.9	76.1
1st Cl Sc Tail A-F		7.72	0.39	0.53	9.70	0.27	0.10	5.2	7.3	7.3	9.6	4.7
Ro Tail A-F		88.30	0.17	0.17	2.28	0.11	0.032	26.4	25.7	19.6	43.3	17.3

Projected Results Cycles D, E and F (Based on 2 product formula and Cu assays)

Test: 54

Product	Weight	Assays, %, g/t					% Distribution				
	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
3rd Cl Conc	3.32	12.1	11.6	229	3.04	3.88	69.5	67.3	73.0	47.1	78.0
1st Cl Sc Tail	8.27	0.42	0.56	9.91	0.27	0.10	6.0	8.0	7.9	10.3	5.0
Ro Tail	88.41	0.16	0.16	2.26	0.10	0.032	24.5	24.7	19.1	42.6	16.9
Head(calc)	100.00	0.58	0.57	10.4	0.21	0.17	100.0	100.0	100.0	100.0	100.0
Comb Tail	96.68	0.18	0.19	2.91	0.12	0.038	30.5	32.7	27.0	52.9	22.0

4255-54



4255-54 Cycle Test Flowsheet

Project No: 4255 MB

Product: Cu Ni 1st Cl. Sc. Tail D-F Test No: 54 S.G.- 3.00

Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Passing
200	1.33	1.8	1.8	98.2
34.4µ	6.95	9.3	11.0	89.0
26.6	6.54	8.7	19.8	80.2
18.6	10.46	13.9	33.7	66.3
12.8	10.26	13.7	47.4	52.6
9.9	3.71	4.9	52.3	47.7
-9.9	35.75	47.7	100.0	-
Total	75.00	100.0	-	-

Product: Cu Ni 3rd Cl Conc. D-F Test No: 54 S.G.- 3.47

Mesh	Weight Grams	% Weight Ind.	% Weight Cum.	% Weight Passing
270	3.02	4.0	4.0	96.0
30.8µ	6.96	9.3	13.3	86.7
23.9	6.15	8.2	21.5	78.5
16.6	10.23	13.6	35.1	64.9
11.4	10.15	13.5	48.7	51.3
8.8	4.15	5.5	54.2	45.8
-8.8	34.34	45.8	100.0	-
Total	75.00	100.0	-	-

Project No: 4255 MB

Product: Cu Ni Ro Tail D-F Test No: 54

Microns	Mesh	Weight Grams	% Weight		
			Ind.	Cum.	Passing
208	65	3.6	3.6	3.6	96.4
147	100	6.2	6.2	9.8	90.2
104	150	12.5	12.5	22.3	77.7
74	200	11.7	11.7	34.0	66.0
53	270	11.7	11.7	45.7	54.3
38	400	9.8	9.8	55.5	44.5
-38	-400	44.5	44.5	100.0	-
	Total	100.0	100.0	-	-

Project No. 4255 Cyanidation Test Report Date: Aug 31,'92
Test No. 54C Operator: BW

Purpose: To conduct a 48 hour cyanidation test on combined cl scav tailing from Test 54.

Procedure : The sample was pulped with water in a 2.5 liter bottle. NaCN and lime were added and the cyanidation was carried out on the rolls in 1 x 48 hour stage.
The residue was washed three times with water.

Feed: 250 g of combined 1st cl scav tailings.

Solution Volume: 500 mL Pulp Density: 33 % Solids

Sol'n Composition: 2.0 g/L NaCN

pH Range: 10.5 with Ca(OH)2

Reagent Consumption (kg/t of cyanide feed) NaCN: 5.16 CaO: 0.97

Time	Added, Grams				Residual		Consumed		
	Actual		Equivalent		Grams		Grams		pH
Hours	NaCN	Ca(OH)2	NaCN	CaO	NaCN	CaO	NaCN	CaO	4.4
0 - 18	1.05	0.30	1.00	0.23	0.35	-	0.65	-	7.0 - 10.6
18 - 42	0.68	0.05	0.65	0.04	0.53	-	0.47	-	10.3 - 10.6
42 - 48	0.49	0	0.47	0	0.84	0.03	0.16	0.24	10.6 - 10.6
Total	2.22	0.35	2.12	0.27	0.84	0.03	1.28	0.24	

Results

Product	Amount (g, mL)	Assays, mg/L, g/t Au	Pt	Pd	% Distribution Au	Pt	Pd
1. 48 Hr P&W	960	0.12	0.02	1.68	88.6	13.2	65.3
2. 48 Hr cyn Residue	248.2	0.06	0.51	3.46	11.4	86.8	34.7
Head (calc.)	248.2	0.52	0.59	10.0	100.0	100.0	100.0
direct		0.42	0.56	9.91			

Test No. 1C Project No. 4255 Operator: B.W. Date: Oct. 5th/92

Purpose: To conduct a cyanidation test on Test 54 combined 1st Cl Scav. Tails A - F.

Procedure : The sample was pulped with water in a 1L bottle and agitated on mechanical rolls. Lime, NaCN were added and maintained as per conditions described below, for a 96h retention time. A solution sample was taken at 72 hours. The pulp was filtered and washed, with all products being submitted for analysis.

Feed: 125g of Test 54 Combined 1st Cl Scav. Tails A to F

Solution Volume: 250 mL Pulp Density: 33 % Solids

Solution Composition: 2.0g/L

pH Range: 10.5 with $Ca(OH)_2$

Grind: No Grind

Reagent Consumption (kg/t of cyanide feed) NaCN: 5.91
$Ca(OH)_2$ 1.78

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
Hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0 - 2	0.53	0.17	0.50	0.13	0.33	-	0.18	-	10.7- 10.0
2-24	0.19	0.09	0.18	0.07	0.30	-	0.20	-	10.6-10.2
24-48	0.21	0.04	0.20	0.03	0.36	-	0.14	-	10.5-10.5
48-72	0.15	0	0.14	0	0.36	-	0.14	-	10.5-10.5
72-96	0.15	0	0.14	0	0.43	0.01	0.07	0.22	10.5-10.5
Total	1.22	0.30	1.16	0.22	0.43	0.01	0.73	0.218	

Metallurgical Balance

Product	Amount	Assays %,g/t,mg/L			% Distribution		
	g,ml	Au	Pt	Pd	Au	Pt	Pd
1 72 hr. Preg sol'n	25.0	0.135	0.02	2.40	51.1	6.1	51.2
2 96 hr. Preg &Wash sol'n	860.0	0.060	0.020	0.764	83.3	21.6	61.2
3 96 hr. Residue	122.7	0.09	0.53	3.7	16.7	78.4	38.8
Head (calc.)	122.7	0.54	0.67	9.54	100.0	100.0	100.0

Test No. 2C Project No. 4255 Operator: B.W. Date: Oct. 5th/92

Purpose: To conduct a cyanidation test on the reground combined 1st Cl Scav. Tails A from Test 54

Procedure : The sample was pulped with water in a 1L bottle and agitated on mechanical rolls. Lime, NaCN were added and maintained as per conditions described below, for a 96h retention time. Solution samples were taken at 48 and 72 hours and submitted for analysis. The pulp was filtered and washed with all products being submitted for analysis.

Feed: 125g of Test 54 Combined 1st Cl Scav. Tails A to F

Solution Volume: 250 mL Pulp Density: 33 % Solids

Solution Composition: 2.0g/L

pH Range: 10.5 with $Ca(OH)_2$

Grind: The sample was ground at 50 % solids, for 10 minutes, in a laboratory pebble mill.

Reagent Consumption (kg/t of cyanide feed) NaCN: 7.96
$Ca(OH)_2$ 1.25

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
Hours	NaCN	Ca(OH)2	NaCN	CaO	NaCN	CaO	NaCN	CaO	
0 - 2	0.53	0.20	0.50	0.15	0.29	-	0.21	-	10.9-10.4
2-24	0.22	0.05	0.21	0.04	0.23	-	0.27	-	10.6-10.5
24-48	0.28	0	0.27	0	0.33	-	0.17	-	10.5-10.5
48-72	0.18	0	0.17	0	0.33	-	0.17	-	10.5-10.5
72-96	0.18	0	0.17	0	0.35	0.03	0.15	-	10.5-10.5
Total	1.39	0.25	1.32	0.19	0.35	0.03	0.97	0.153	

Metallurgical Balance

Product	Amount g,ml	Assays %,g/t,mg/L Au	Pt	Pd	% Distribution Au	Pt	Pd
1 48 hr. Preg sol'n	25.0	0.180	0.02	2.66	59.3	6.3	60.2
2 72 hr. Preg sol'n	25.0	0.166	0.02	2.62	60.6	6.9	65.3
3 96 hr. Preg &Wash sol'n	795.0	0.063	0.02	0.744	77.4	21.3	65.5
4 96 hr. Residue	122.4	0.14	0.51	3.12	22.6	78.7	34.5
Head (calc.)	122.4	0.62	0.65	9.03	100.0	100.0	100.0

Test: 55 **Project:** 4255 **Date:** July 28/92 **Operator:** GC

Purpose: Conduct a batch test using low density conditions on group 1 ore.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh group 1 ore.

Grind: 11 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		11			8.7
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	
PM Regrind			*100		*5	*20		7.5			
1st Cleaner							5		1	7	
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	3	8.8
2nd Cleaner			50						1	3.5	8.5
						10	5	7.5	1	2	
									1	3	
3rd Cleaner			10					5	1	3	
						5	2.5			2	
						5				3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750

Test: 55

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 2nd Cl Conc	8.5	0.9	12.9	19.1	373	1.27	3.78	46.2	38.4	54.6	11.8	82.6
2 2nd Cl Tail	10.6	1.1	1.01	3.07	35.8	0.22	0.27	4.5	7.7	6.5	2.5	7.4
3 1st Cl Sc Conc	3.3	0.3	0.95	1.61	16.5	0.18	0.13	1.3	1.3	0.9	0.6	1.1
4 1st Cl Sc Tail	28.3	2.9	0.36	1.22	12.7	0.12	0.090	4.3	8.2	6.2	3.7	6.5
5 Scav Tail	941.2	94.9	0.11	0.20	1.96	0.079	0.001	43.6	44.5	31.8	81.3	2.4
Head (calc)	991.9	100.0	0.24	0.43	5.86	0.092	0.039	100.0	100.0	100.0	100.0	100.0
Head (direct)			0.23	0.49	6.47	0.091	0.045					

Combined Products

1st Cl Conc (1 & 2)		1.9	6.30	10.2	186	0.69	1.83	50.7	46.1	61.1	14.4	89.9
Ro Conc (1 to 4)		5.1	2.64	4.63	78.2	0.34	0.75	56.4	55.5	68.2	18.7	97.6

Test: 56 Project: 4255 Date: July 28/92 Operator: GC

Purpose: As per Test 55, but on group 2 ore.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh group 2 ore.

Grind: 11 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		11			8.7
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	8.8
PM Regrind			*100		*5	*20		7.5			
1st Cleaner							5		1	7	8.3
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	10	
2nd Cleaner			50						1	3.5	
					5	10	7.5		1	2	
									1	3	
3rd Cleaner			10						1	3	
					2.5	5	5		1	2	
						5			1	3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750

Test: 56

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 2nd Cl Conc	4.7	0.5	30.3	21.3	261	5.94	10.9	37.7	37.8	49.4	21.9	57.2
2 2nd Cl Tail	7.1	0.7	0.55	0.48	5.98	1.45	0.53	1.0	1.3	1.7	8.1	4.2
3 1st Cl Sc Conc	3.1	0.3	4.06	5.78	66.2	0.87	0.27	3.3	6.8	8.3	2.1	0.9
4 1st Cl Sc Tail	26.4	2.7	0.42	0.42	3.79	0.23	0.092	2.9	4.2	4.0	4.8	2.7
5 Scav Tail	946.4	95.8	0.22	0.14	0.96	0.085	0.033	55.1	50.0	36.6	63.1	34.9
Head (calc)	987.7	100.0	0.38	0.27	2.51	0.13	0.091	100.0	100.0	100.0	100.0	100.0
Head (direct)			0.27	0.30	2.90	0.15	0.11					

Combined Products

1st Cl Conc (1 & 2)		1.2	12.4	8.77	108	3.24	4.66	38.7	39.1	51.1	30.0	61.5
Ro Conc (1 to 5)		4.2	4.12	3.21	38.1	1.14	1.41	44.9	50.0	63.4	36.9	65.1

Test: 57 Project: 4255 Date: July 28/92 Operator: GC

Purpose: As per Test 55, but on group 3 ore.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh group 3 ore.

Grind: 11 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		11			
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	
PM Regrind			*100		*5	*20		7.5			
1st Cleaner							5		1	7	
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	10	
2nd Cleaner			50						1	3.5	
					5	10	7.5		1	2	
						5			1	3	
3rd Cleaner			10						1	3	
					2.5	5	5		1	2	
						5			1	3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1, 1000g	1750

Test: 57

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 2nd Cl Conc	8.0	0.8	45.7	23.0	305	6.37	10.7	63.2	57.3	60.8	30.5	64.4
2 2nd Cl Tail	7.5	0.8	1.81	2.28	60.6	2.96	0.59	2.3	5.3	11.3	13.3	3.3
3 1st Cl Sc Conc	1.7	0.2	2.06	1.47	35.1	1.60	0.34	0.6	0.8	1.5	1.6	0.4
4 1st Cl Sc Tail	21.4	2.2	0.73	0.62	11.3	0.58	0.16	2.7	4.1	6.0	7.4	2.6
5 Scav Tail	946.8	96.1	0.19	0.11	0.86	0.083	0.041	31.1	32.4	20.3	47.1	29.2
Head (calc)	985.4	100.0	0.59	0.33	4.07	0.17	0.13	100.0	100.0	100.0	100.0	100.0
Head (direct)			0.68	0.35	4.35	0.20	0.16					
Combined Products												
1st Cl Conc (1 & 2)		1.6	24.5	13.0	187	4.72	5.81	65.6	62.6	72.2	43.8	67.8
Ro Conc (1 to 5)		3.9	10.3	5.62	82.8	2.29	2.44	68.9	67.6	79.7	52.9	70.8

Test: 58 Project: 4255 Date: July 28/92 Operator: GC

Purpose: As per Test 55, but on group 4 ore.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh group 4 ore.

Grind: 11 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		11			
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	
PM Regrind			*100		*5	*20		7.5			
1st Cleaner							5		1	7	
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	10	
2nd Cleaner			50						1	3.5	
					5	10	7.5		1	2	
						5			1	3	
3rd Cleaner									1	3	
					2.5	5	5		1	2	
						5			1	3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750

Test: 58

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 2nd Cl Conc	10.1	1.0	41.9	26.6	401	7.22	10.6	59.0	65.3	61.0	39.9	71.0
2 2nd Cl Tail	8.5	0.9	2.25	1.84	76.1	2.19	0.61	2.7	3.8	9.7	10.2	3.4
3 1st Cl Sc Conc	2.8	0.3	2.10	1.19	88.7	2.72	0.35	0.8	0.8	3.7	4.2	0.7
4 1st Cl Sc Tail	25.7	2.6	1.24	0.75	26.5	0.75	0.24	4.4	4.7	10.3	10.5	4.1
5 Scav Tail	948.2	95.3	0.25	0.11	1.07	0.068	0.033	33.1	25.4	15.3	35.3	20.8
Head (calc)	995.3	100.0	0.72	0.41	6.67	0.18	0.15	100.0	100.0	100.0	100.0	100.0
(direct)			0.94	0.40	7.54	0.28	0.17					
Combined Products												
1st Cl Conc (1 & 2)		1.9	23.8	15.3	253	4.92	6.03	61.7	69.1	70.7	50.0	74.5
Ro Conc (1 to 5)		4.7	10.2	6.52	119	2.51	2.53	66.9	74.6	84.7	64.7	79.2

Test: 59 Project: 4255 Date: July 28/92 Operator: GC

Purpose: As per Test 55, but on group 5 ore.

Procedure: As shown below.

Feed: 1000 grams minus 10 mesh group 5 ore.

Grind: 11 minutes at 50% solids in the yellow ball mill.

Conditions:

Stage	Reagents, g/t							Time, minutes			pH
	Na2S		PA MED	CuSO4	3501	PAX	MIBC	Grind	Cond.	Froth	
Primary Grind	*125		*400		*25	*50		11			
Rougher 1							25		1	3	
2									1	5	
Scavenger 1	50			50		25			1	7	
2						25			1	5	
						25	7.5		1	5	
						25	7.5		1	5	
PM Regrind			*100		*5	*20		7.5			
1st Cleaner							5		1	7	
						10			1	5	
						5			1	3	
1st Cl Scav	50					20			2	10	
2nd Cleaner			50						1	3.5	
					5	10	7.5		1	2	
						5			1	3	
3rd Cleaner			10						1	3	
					2.5	5	5		1	2	
						5			1	3	

* Indicates that the reagent was added for the last 5 minutes of the corresponding grinding stage

Circuit	Cell	RPM
Ro/Scav	D-1 , 1000g	1750

Test: 59

Metallurgical Balance

Product	Weight		Assays, %, g/t					% Distribution				
	g	%	Au	Pt	Pd	Ni	Cu	Au	Pt	Pd	Ni	Cu
1 1st Cl Conc	6.8	0.7	24.9	44.6	1023	2.72	3.63	50.7	60.6	61.5	6.6	69.6
2 1st Cl Sc Conc	1.5	0.2	2.57	5.91	176	1.26	0.28	1.2	1.8	2.3	0.7	1.2
3 1st Cl Sc Tail	27.6	2.8	0.63	1.29	34.7	0.36	0.098	5.2	7.1	8.5	3.6	7.6
4 Scav Tail	954.7	96.4	0.15	0.16	3.29	0.26	0.008	42.9	30.5	27.7	89.1	21.5
Head (calc)	990.6	100.0	0.34	0.51	11.4	0.28	0.036	100.0	100.0	100.0	100.0	100.0
(direct)			0.23	0.67	17.2	0.11	0.039					

Combined Products

1st Cl+Cl Sc Conc (1 & 2)	0.8	20.9	37.6	870	2.46	3.02	51.9	62.4	63.8	7.3	70.8
Ro Conc (1 to 3)	3.6	5.31	9.69	228	0.84	0.77	57.1	69.5	72.3	10.9	78.5

APPENDIX 1

Mineralogical Examination of a PGM Leach Residue

submitted by

George W. Reschke

(Lac des Iles)

Project LR4255

SUMMARY

The samples appeared to have been solids held in suspension which, given enough time, have settled and formed a residue.

It appeared to consist of silicates and sulphides, mostly chalcopyrite and pyrite.

INTRODUCTION

A sample identified as "LAN #7, Sept. 7th, 80% salt 20% PGM + Au: Sample H" was received in the Mineralogy laboratory for examination. The purpose of the examination was to confirm the composition as salts plus PGM plus Au.

pr. Greg Davison
R.W. Deane
Mineralogist

PREPARATION AND PROCEDURE

A portion of the sample was briquetted and polished for incident light microscopy. The reject was submitted for powder x-ray diffractometry.

RESULTS

The sample consisted of rock-forming silicates plus fine-grained sulphides, notably chalcopyrite and pyrite. From the history of the sample, as supplied by Mr. Reschke, we have deduced the following:

- A concentrate containing Platinum Group Metals was leached with hydrochloric acid and a little nitric acid under 100 psi oxygen pressure. Following the leaching period, the liquor was separated from the residue and set aside. A day following the leaching, the liquor was observed to have a sediment. The liquor plus sediment were filtered and the filter paper plus sediment were submitted to Lakefield Research as the sample identified above.

- We concluded that the sample consists of fine-grained particles held in suspension at the time of the original separation of liquor and residue; particles which, given time to do so, settled out to form more residue.

REPORT ON

BASELINE SURFACE WATER AND SEDIMENT QUALITY MONITORING PROGRAM AT THE LAC DES ILES MINE SITE

Prepared for:

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November 1992

52H04NE0015 OM91-024 LAC DES ILES

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1.0 INTRODUCTION

In March 1992, SENES Consultants Limited (SENES) was contracted by Lac des Iles Mines Ltd. to initiate baseline aquatic environment studies at the Lac des Iles mine site some 90 km north of Thunder Bay, Ontario (see Figure 1.1). The first of three surveys in the planned program was conducted in March 1992. Both surface water and bottom sediment samples were collected in this survey. In late May 1992, a second sampling program was carried out by Niblett Environmental Associates Inc. (NEA), subconsultants retained to perform biological studies. In addition to collection of water samples, the May program included benthic sampling, fish netting and habitat investigations. To augment the database on local surface water quality, a third water quality survey was undertaken in August 1992.

The program was designed to collect data on those surface water bodies which are most likely to be impacted by the development and operation of a proposed palladium/platinum/gold/copper/nickel mine and mill complex.

Existing facilities on the Lac des Iles mine site from past exploration and mining activities, and proposed future development is contained primarily within the Hasson Lake watershed which flows southward into the Dog River. The water bodies identified for inclusion in the sampling program are located in the immediate vicinity of the mine site (see Figure 1.2):

- Camp Lake - located to the east and south of the surface facilities which may be used as a source of fresh water for the mill;
- Hasson Lake - located to the south of the surface facilities. It receives runoff from a small volume of tailings deposited in a low-lying area in the lake watershed; and
- two ponds (First Pond and Second Pond) - located on the drainage course between the tailings area and Hasson Lake.

The details of the sampling program and results of the field and laboratory measurements are discussed in the following sections. Copies of the field reports and laboratory analyses are provided in the appendices.

FIGURE 1.1

Study Site Location for Lac des Iles Mine

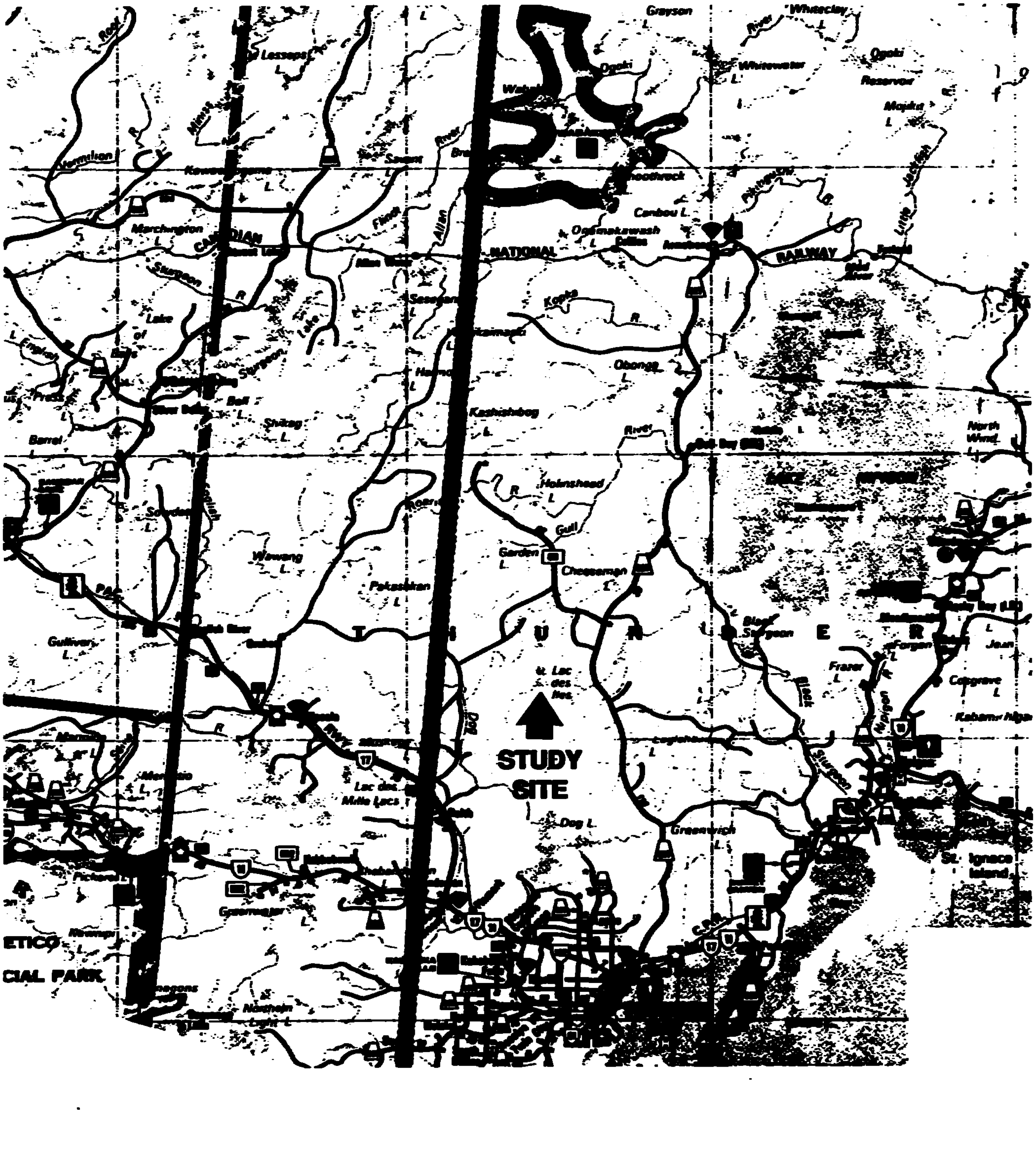
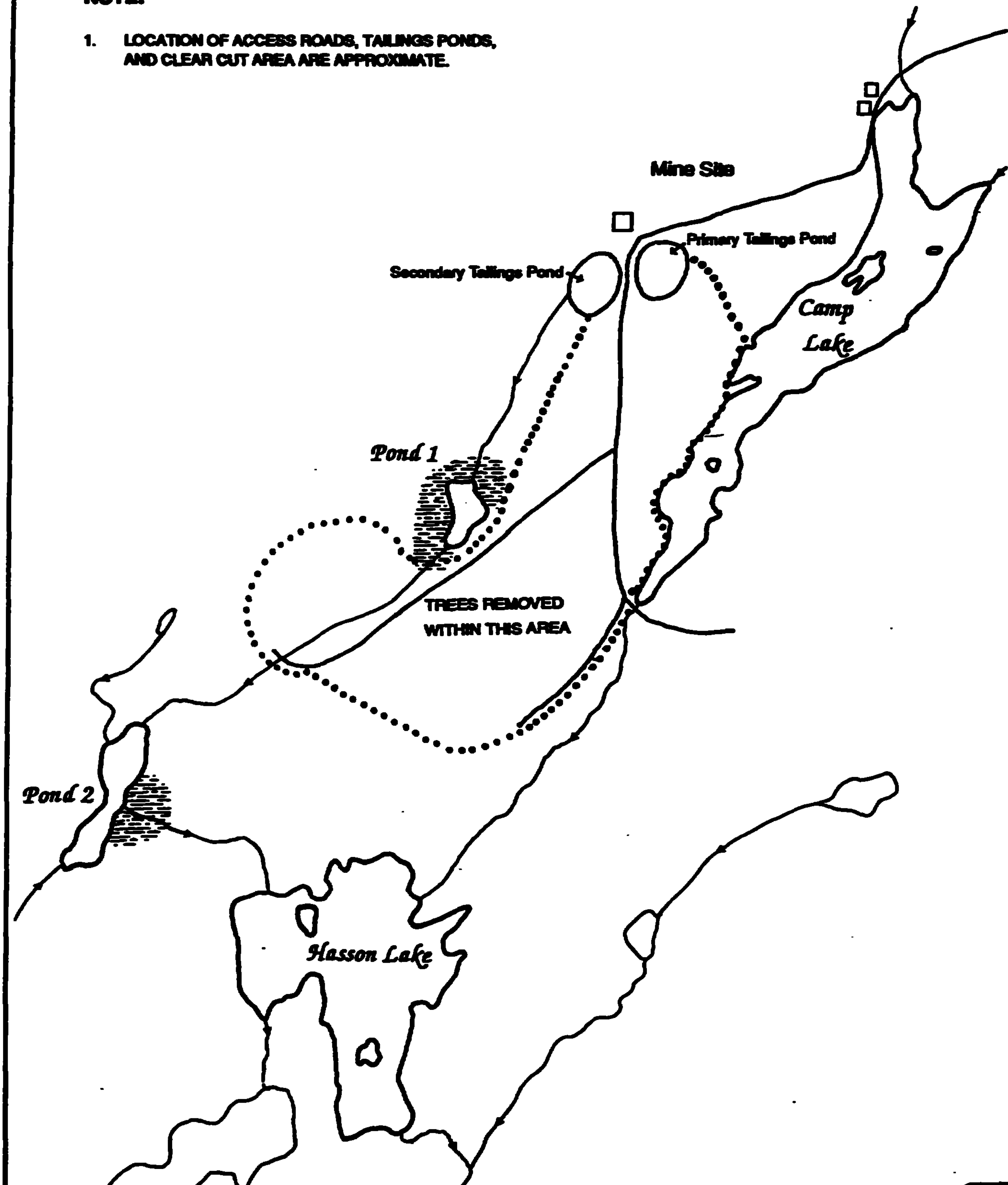


FIGURE 1.2

Study Area at Lac des Iles Mine

NOTE:

1. LOCATION OF ACCESS ROADS, TAILINGS PONDS, AND CLEAR CUT AREA ARE APPROXIMATE.



SOURCE: NIBLETT ENVIRONMENTAL ASSOCIATES INC., 1992

2.0 MONITORING PROGRAM

The baseline monitoring program included measurements of field pH, temperature and dissolved oxygen for each of the water bodies. Lake water samples were collected for chemical analyses during all surveys. Bottom sediment samples were only collected during the March survey. In addition, water samples were obtained from the existing tailings management facility (TMF) for chemical analyses. In each survey, a total of nine (9) surface water samples were collected: two (2) from Camp Lake, three (3) from Hasson Lake, one (1) from each of the two ponds, one (1) from the tailings secondary sedimentation pond and one (1) from the tailings decant pond. Seven (7) sediment samples were collected during the March survey: two (2) from Camp Lake, three (3) from Hasson Lake and one (1) from each of the two ponds. In addition to the above, a water sample was collected from Lac des Iles during the August survey for comparison purposes.

A summary of the program sampling frequencies and locations is provided on Table 2.1. Field dissolved oxygen and temperature measurements were taken over the depth of the water columns at a minimum of two stations on each pond and lake during the March and August surveys and at a single location during the May survey. The locations of the monitoring stations are shown on Figures 2.1 to 2.5.

Bathymetry mapping on Camp Lake indicates that the lake is deepest in the north and mid-lake basins and is quite shallow in the south arm. The sampling stations on Camp Lake were chosen to allow for sampling in the vicinity of the deepest points. Field pH, dissolved oxygen and temperature measurements were also taken at a station in the south basin during the August survey.

No bathymetry mapping was available on Hasson Lake or the two ponds downstream of the TMF at the time of the March 1992 survey. Consequently, Hasson Lake was sampled at three locations to obtain an appreciation of the characteristics of this water body. Only one (1) water sample was taken from each of the ponds for chemical analyses; however, field dissolved oxygen and temperature measurements were performed at two locations as shown on Figure 2.3. Subsequently, during the May field survey, the bathymetry of Hasson Lake and the two ponds

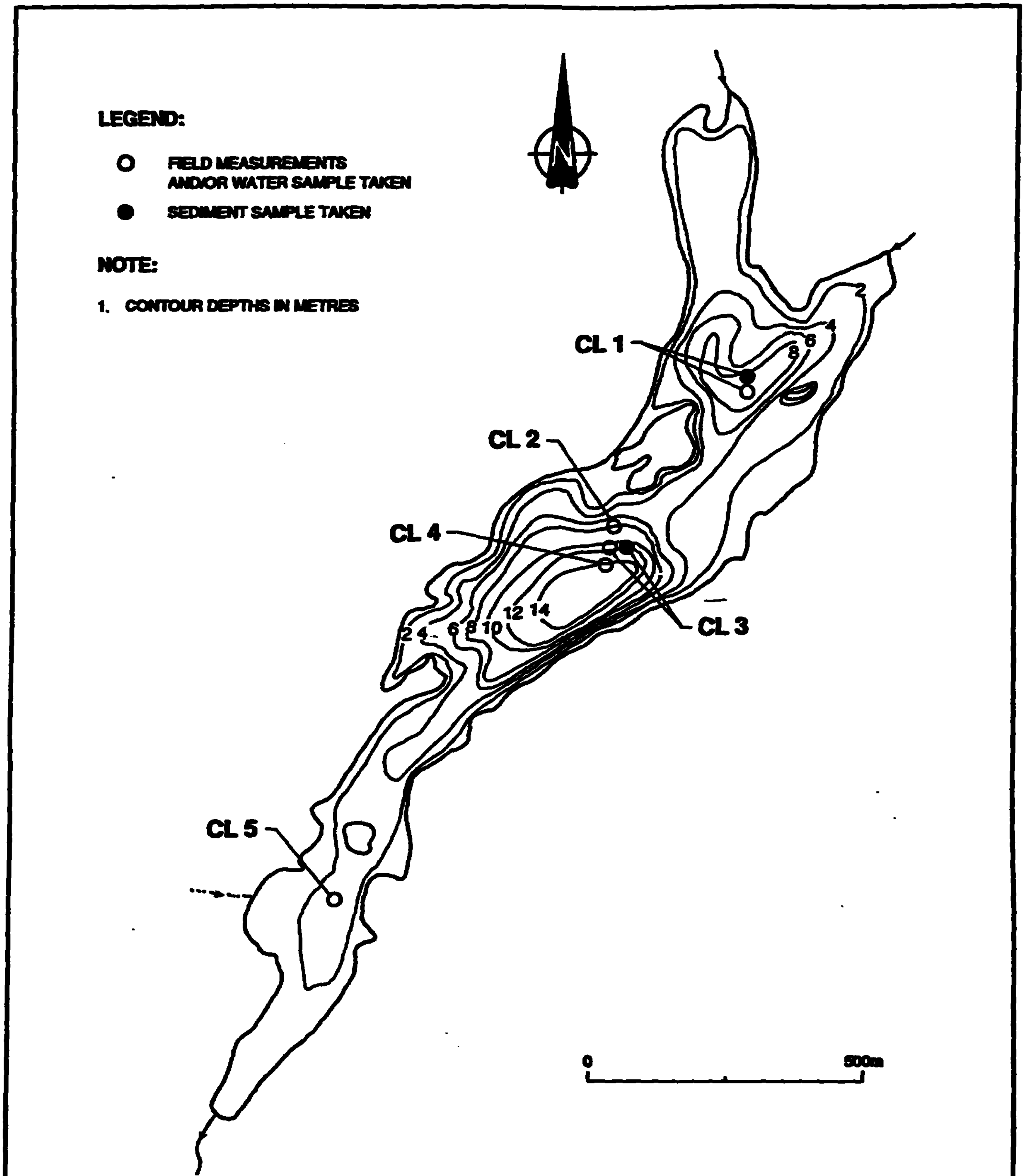


FIGURE 2.1

Camp Lake
Sampling Station Locations

SOURCE: ADAPTED FROM NIBLETT ASSOCIATES INC., 1992

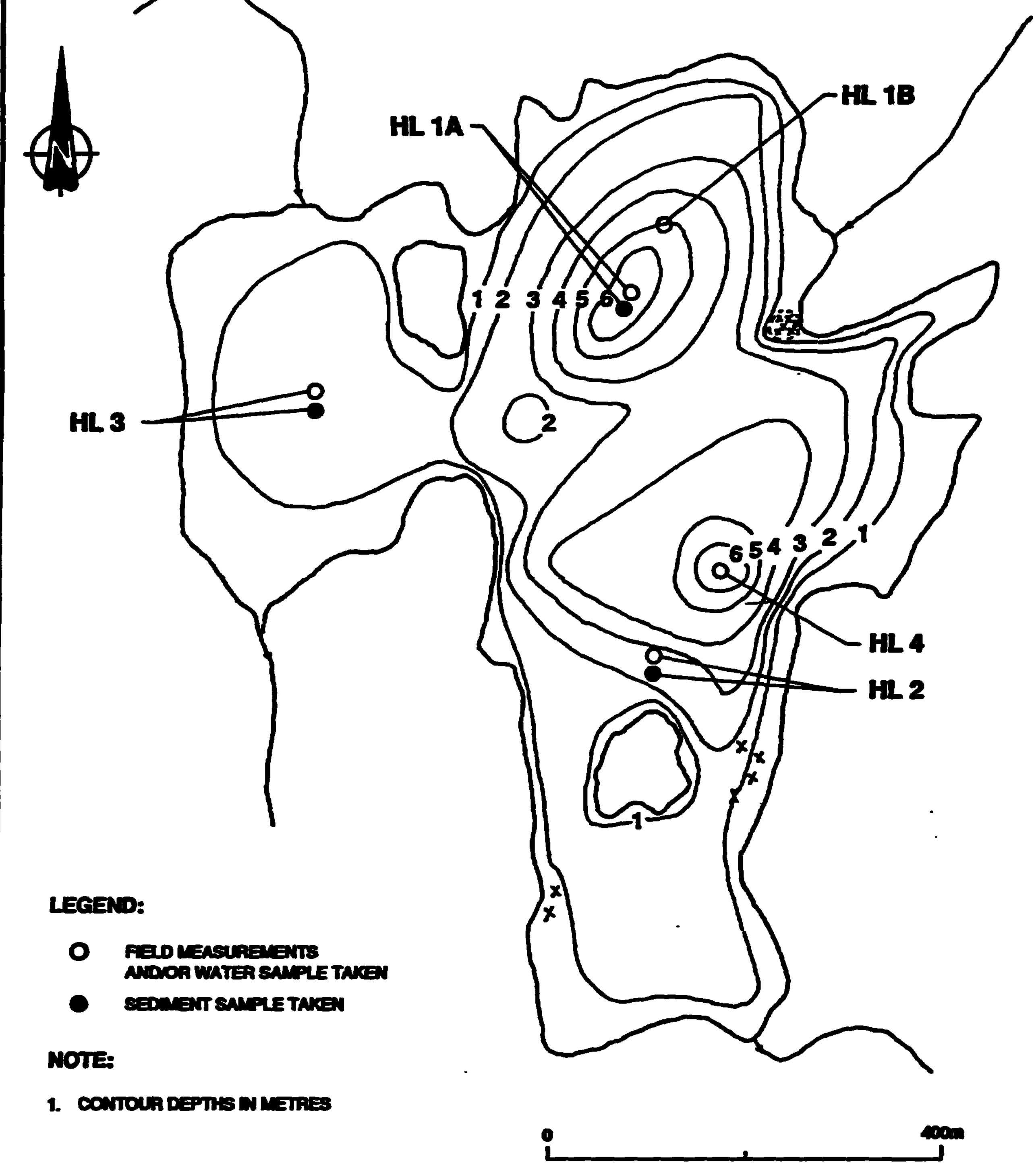


FIGURE 2.2

Hasson Lake
Sampling Station Locations

SOURCE: ADAPTED FROM NIBLETT ASSOCIATES INC., 1992

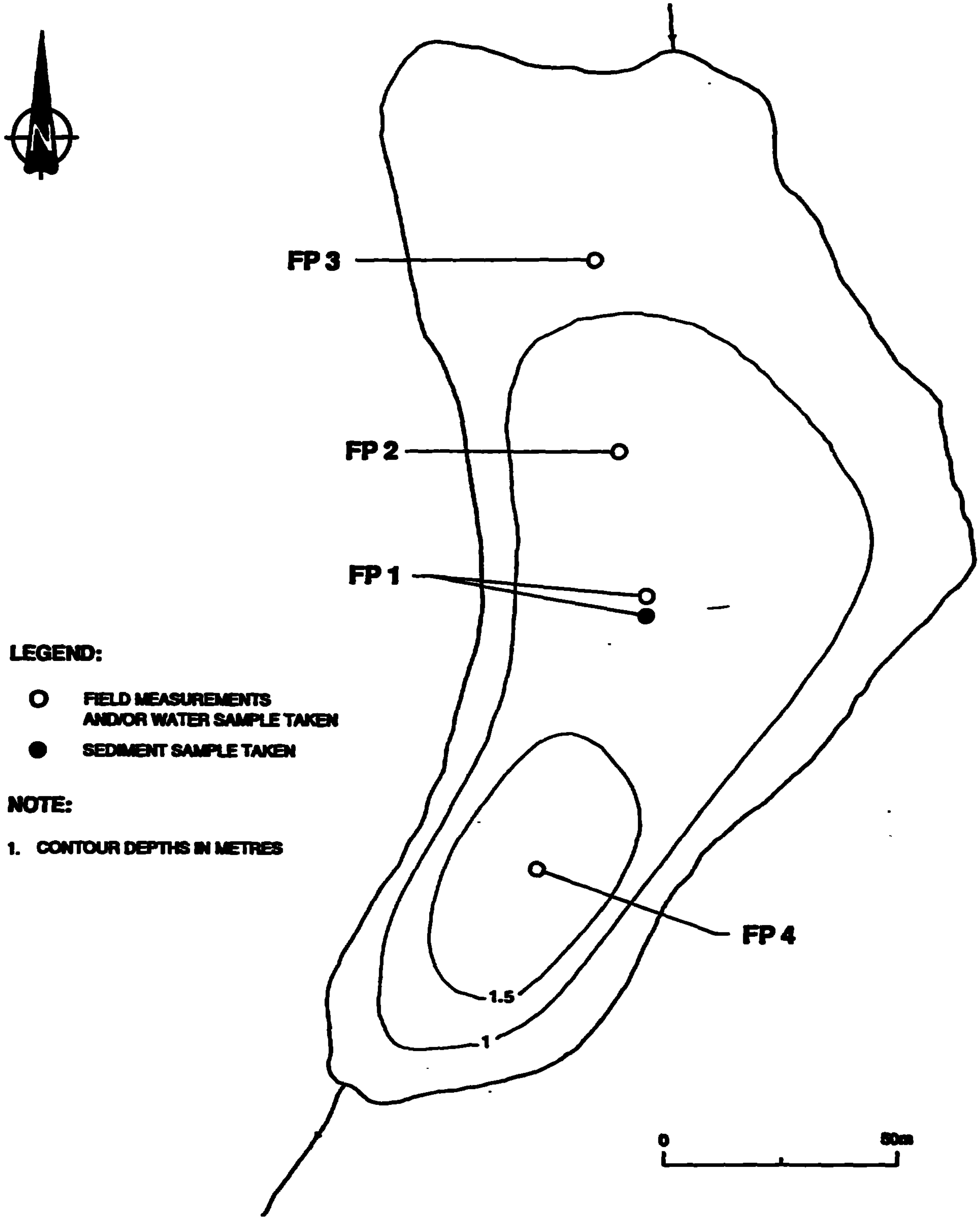
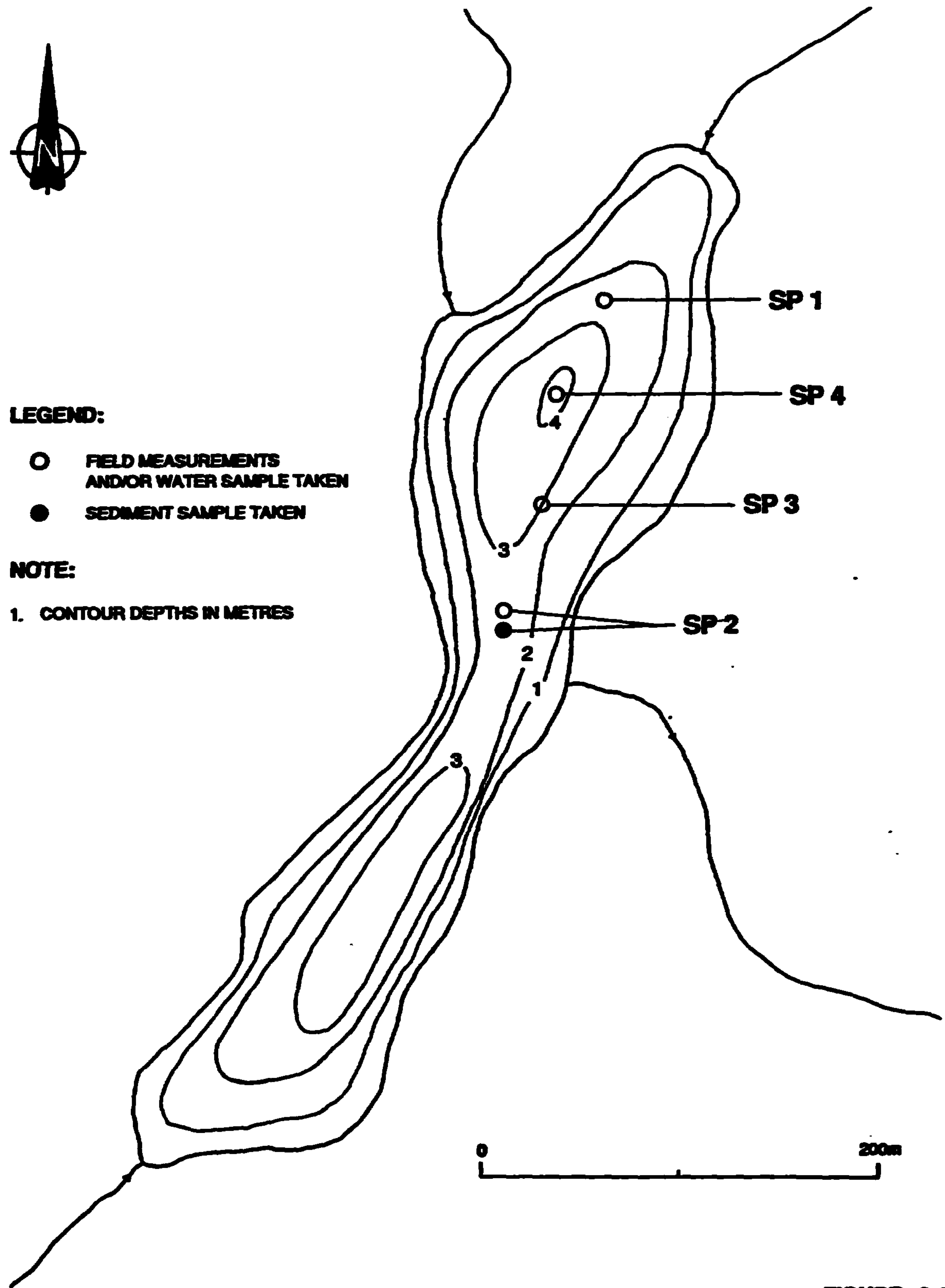


FIGURE 2.3

First Pond Sampling Station Locations

SOURCE: ADAPTED FROM NIBLETT ASSOCIATES INC., 1992



LEGEND:

○ FIELD MEASUREMENTS AND/OR WATER SAMPLE TAKEN

● SEDIMENT SAMPLE TAKEN

NOTE:

1. CONTOUR DEPTHS IN METRES

FIGURE 2.4

Second Pond Sampling Station Locations

SOURCE: ADAPTED FROM NIBLETT ASSOCIATES INC., 1992

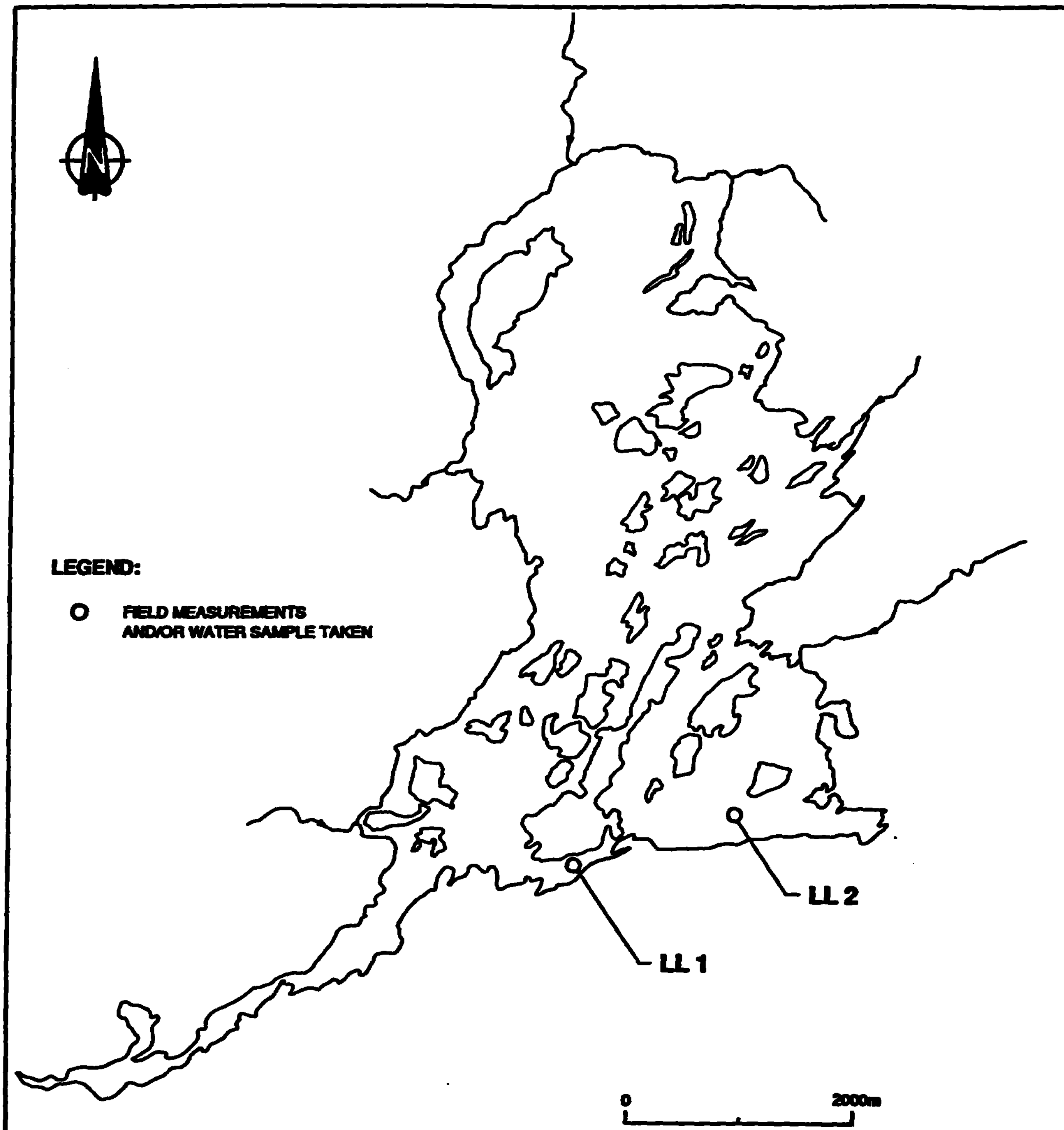


FIGURE 2.5

Lac des Iles
Sampling Station Locations

SOURCE: ADAPTED FROM NIBLETT ASSOCIATES INC., 1992

was determined by Niblett Environmental Associates Inc., (NEA, 1992). The locations of the monitoring stations were adjusted, where appropriate, to include the deepest points in the water bodies.

The water and sediment samples were stored in coolers with ice packs and shipped, via air, to Barringer Laboratories in Mississauga, Ontario, for chemical analyses. The water samples were analyzed for trace metals, major anions and cations and nutrients, as well as for ammonia, total and ortho-phosphorus, dissolved organic carbon (DOC) and colour. The sediment samples were analyzed for metals and loss on ignition (LOI).

The first sampling program was carried out on 4-5 March, 1992 under ideal weather conditions. Access to the water bodies was difficult; however, as the lakes were covered with up to 30 cm of snow and slush. To obtain the water and sediment samples it was necessary to auger through more than a half metre of ice. The second and third programs took place under ideal weather conditions on 29-31 May 1992, and 12-13 August 1992, respectively. The details of the March and August field programs are recorded in Appendices A and B, respectively. The May survey was carried out as part of the biological survey and is documented in the report by NEA (1992).

Table 2.1

WATER AND SEDIMENT SURVEY LOCATIONS AND FREQUENCY

Lake Name	Reference Figure #	Station Number	Period Sampled or Measurements Taken		
			Field Measurements	Water Sample Collected	Sediment Sample Collected
Camp Lake	2.1	CL1	March, August	March, May, August	March
		CL2	March	-	-
		CL3	March	March	March
		CL4	May, August	May, August	-
		CL5	August	-	-
Hasson Lake	2.2	HL1A	March, August	March, May, August	March
		HL1B	March, August	-	-
		HL2	March	March	March
		HL3	March, August	March, May, August	March
		HL4	May, August	May, August	-
First Pond	2.3	FP1	March, August	-	March
		FP2	March	March	-
		FP3	May	May	-
		FP4	August	August	-
Second Pond	2.4	SP1	March	March	-
		SP2	March	-	March
		SP3	May	May	-
		SP4	August	August	-
Lac des Iles	2.5	LL1	August	August	-
		LL2	August	-	-
TMF Decant Pond	-	TMF1	-	March, May, August	-
TMF Secondary Pond	-	TMF2	-	March, May, August	-

3.0 MONITORING RESULTS

3.1 FIELD MEASUREMENTS

3.1.1 March Survey

For the March survey, the water temperature was observed to vary from a low of 0.2°C just below the ice surface to a high of 4.1°C near the bottom of the water column. Temperature profiles were measured generally at 1 m intervals and are recorded on the field note reports included in Appendix A and on Table 3.1.

The dissolved oxygen measurements are summarized on Table 3.1 for each of the water bodies surveyed. For comparison, the solubility of oxygen in water, with a chloride content near zero and a temperature of between 0 to 4°C, ranges from 13.1 mg/L (at 4°C) to 14.6 mg/L (at 0°C). As seen from Table 3.1, the measured dissolved oxygen levels were all less than the solubility limits. This observation is not surprising; however, as the water bodies had been under ice cover for several months at the time of the survey.

At most of the monitoring stations the dissolved oxygen profile showed decreasing concentrations from top to bottom. This is a common observation and reflects the effect of the oxygen demand exerted by bottom sediments which undergo degradation, albeit slowly, even in the winter months.

In Camp Lake, the oxygen concentrations were found to drop below 5 mg/L only in the bottom 2 to 3 m of the water column. The dissolved oxygen level in Camp Lake is considered to be good, considering the survey was carried out late in the winter season, and is acceptable for sustaining aquatic life.

In contrast, the dissolved oxygen level in Hasson Lake was greater than 5 mg/L only in the upper 1 m of the water column. This observation is attributed to the shallowness of the lake at the survey locations. The significance of lake depth is that the shallower the lake, the smaller the volume of water contained in the lake, and hence, the smaller the oxygen source available to satisfy the oxygen demand exerted by the bottom sediments.

The observation made above for Hasson Lake was also very evident in the dissolved oxygen profiles measured on the two ponds south of the existing tailings area. These ponds are very shallow (measured depths of <1.5 m in the first pond and <2.5 m in the second pond) and the dissolved oxygen levels in the water column were found to be quite low. As noted in a subsequent section, the organic content of the sediments in these ponds is high which may explain why the dissolved oxygen levels in the ponds are so low.

The pH values recorded in the field ranged from 6.7 to 7.4 during all surveys and are typical of values usually reported for precambrian shield waters. Camp Lake, First Pond and Second Pond were all found to be very slightly acidic while Hasson Lake was very slightly alkaline.

3.1.2 May Survey

At the time of the lake surveys on 29-31 May 1992, the water temperature in the surface layer on Camp Lake ranged from 14.2 to 14.3 °C whereas the surface temperature in Hasson Lake varied between 16.2 °C and 16.3 °C (see Table 3.2). The difference in the surface water temperatures in these lakes may be attributed to the fact that Camp Lake has a greater volume (1.79×10^6 m^3 in Camp Lake versus 0.86×10^6 m^3 in Hasson Lake) and greater depth (mean depth of 3.9 m in Camp Lake versus 2.1 m in Hasson Lake). As a consequence of these factors, the water temperature in Camp Lake will take longer to react to the sun's energy than Hasson Lake. For the converse reason the water temperatures in First Pond and Second Pond were higher (>18 °C in First Pond and >17.5 °C in Second Pond). The water volume in these ponds have been estimated to be an order of magnitude or more smaller than Hasson Lake and Camp Lake (i.e. volume of First Pond and Second Pond equals 1.6×10^4 m^3 and 9.4×10^4 m^3, respectively).

The temperature data on Table 3.2 for Camp Lake indicate that the water column was thermally stratified at the time of the survey with the thermocline extending from about 3 m to 7 m below

Table 3.1

DISSOLVED OXYGEN AND TEMPERATURE LEVELS OBSERVED DURING MARCH 1992 SURVEY

Depth from Surface (m)	Camp Lake						First Pond South of TMF				Second Pond South of TMF				Hasson Lake					
	North Basin Station CL1		Mid Lake Station CL2		Mid Lake Station CL3		Station FP1		Station FP2		Station SP1		Station SP2		North Basin Station HL1		Mid Lake Station HL2		West Basin Station HL3	
	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)
0.3	-	-	-	-	-	-	1.4	0.2	2.5	0.4	2.2	0.3	1.3	0.2	-	-	9.0	0.2	3.0	0.2
1.0	10.7	0.6	9.5	0.7	10.0	0.7	0.3	1.8	0.4	1.4	4.5	0.8	4.2	1.0	8.9	1.1	7.4	1.3	3.4	0.7
1.5	-	-	-	-	-	-	0.17[a]	2.4	-	-	-	-	-	-	-	-	-	-	2.4	1.1
2.0	9.0	2.1	8.4	2.1	8.4	2.1	-	-	-	-	4.8	2.6	0.2[a]	2.5	5.3	3.3	4.7	3.0	-	-
2.5	-	-	-	-	-	-	-	-	-	-	0.2[a]	2.9	-	-	-	-	3.5	3.6	-	-
3.0	7.5	2.6	7.1	2.6	7.1	2.6	-	-	-	-	-	-	-	-	3.1	3.7	-	-	-	
3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.0	6.7	2.8	6.4	2.8	6.1	2.8	-	-	-	-	-	-	-	-	2.8	3.9	-	-	-	
4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5.0	6.2	2.9	6.3	2.9	6.0	2.8	-	-	-	-	-	-	-	-	3.0	3.8	-	-	-	
5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.0	3.4	2.9	0.4[a]	2.9	5.8	2.9	-	-	-	-	-	-	-	-	0.4	4.1	-	-	-	
6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.0	2.1	3.0	-	-	5.5	2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	
7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.0	0.5	3.3	-	-	5.2	2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	
8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.0	0.2[a]	3.6	-	-	4.6	2.9	-	-	-	-	-	-	-	-	-	-	-	-	-	
9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.0	-	-	-	-	4.4	3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	
10.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11.0	-	-	-	-	0.2[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTE:
a) Dissolved oxygen measured in bottom sediment.

Table 3.2
DISSOLVED OXYGEN AND TEMPERATURE LEVELS OBSERVED DURING MAY 1992 SURVEY

Depth from Surface (m)	Camp Lake Mid Lake Station CL4		First Pond South of TMF Station FP3		Second Pond South of TMF Station SP3		Hasson Lake Mid Lake Station HL4	
	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)
Surface	8.56	14.3	9.50	18.4	9.85	17.7	8.45	16.3
0.5	-	-	9.42	18.2	9.60	17.6	-	-
1.0	8.40	14.2	7.00	16.4	9.83	16.4	8.48	16.2
1.5	-	-	2.85	14.4	8.95	13.1	-	-
2.0	8.45	14.2	-	-	8.11	10.9	8.01	13.2
2.5	-	-	-	-	7.65	10.4	-	-
3.0	8.45	13.8	-	-	4.80	8.3	7.53	12.1
3.5	-	-	-	-	1.50	7.7	-	-
4.0	8.05	12.4	-	-	-	-	6.75	10.9
4.5	-	-	-	-	-	-	-	-
5.0	7.56	10.7	-	-	-	-	5.97	10.0
5.5	-	-	-	-	-	-	-	-
6.0	6.75	8.3	-	-	-	-	3.94	8.7
6.5	-	-	-	-	-	-	-	-
7.0	6.48	6.6	-	-	-	-	-	-
7.5	-	-	-	-	-	-	-	-
8.0	6.11	6.1	-	-	-	-	-	-
8.5	-	-	-	-	-	-	-	-
9.0	5.90	5.8	-	-	-	-	-	-
9.5	-	-	-	-	-	-	-	-
10.0	5.27	5.5	-	-	-	-	-	-
10.5	-	-	-	-	-	-	-	-
11.0	4.40	5.2	-	-	-	-	-	-
11.5	-	-	-	-	-	-	-	-
12.0	3.53	5.0	-	-	-	-	-	-
12.5	-	-	-	-	-	-	-	-
13.0	1.30	4.9	-	-	-	-	-	-

the lake surface. The bottom water temperature ranged between 4.9 and 6.6 °C. By contrast, because First Pond, Second Pond and Hasson Lake are all quite shallow, the water temperature was typically higher near the bottom of these water bodies. This observation was even more evident during the August survey discussed below (see Table 3.3).

The dissolved oxygen levels in Camp Lake were found to be more uniform over the column depth in the May survey than during the March survey. This observation suggests that the lake water had turned over during the spring snow melt introducing oxygenated water to the lake bottom. However, the dissolved oxygen level was observed to decrease sharply near the bottom indicating that the bottom sediments were exerting an oxygen demand on the water column.

Dissolved oxygen levels throughout the Camp Lake water column were below saturation levels which are estimated to range between 12.8 mg/L at 5 °C to 10.3 mg/L at 14 °C. A similar observation can be made about the dissolved oxygen levels in Hasson Lake. In the First and Second Ponds; however, the measured surface water dissolved oxygen levels were near saturation (i.e. the solubility of oxygen in water at 18.4 °C equals 9.39 mg/L and at 17.6 °C equals 9.55 mg/L). In all four water bodies, the dissolved oxygen levels were generally satisfactory for the protection of aquatic life. The provincial surface water quality objectives for dissolved oxygen, at a temperature of 15 °C, are >6 mg/L for cold water biota and >5 mg/L for warm water biota. These objectives were met except in the very deepest waters.

The pH values measured in the field during the survey varied between 6.8 and 7.4. The pH range was very close to that observed in March.

3.1.3 August Survey

The results of field measurements of dissolved oxygen and temperature made during the survey on 12-13 August 1992 are summarized on Table 3.3. The field notes from the survey are included as Appendix B.

Surface water temperatures were slightly higher in Camp Lake and Hasson Lake than observed

Table 3.3

DISSOLVED OXYGEN AND TEMPERATURE LEVELS OBSERVED DURING AUGUST 1992 SURVEY

Depth from Surface (m)	Camp Lake						First Pond South of TMF				Second Pond South of TMF	
	North Basin Station CL1		Mid Lake Basin Station CL4		South Basin Station CL5		Station FP1		Station FP4		Station SP4	
	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O (mg/L)	Temp (°C)
Surface	7.80	18.1	7.95	18.3	8.80	18.5	6.47	17.9	6.50	18.2	6.69	16.9
0.5	7.80	17.9	7.98	18.4	8.72	18.5	-	-	-	-	6.65	16.5
1.0	7.80	17.5	8.03	18.2	8.60	18.5	5.61	16.1	4.63	15.4	6.05	16.3
1.5	-	-	-	-	5.10	17.8	4.22	15.7	-	-	-	-
2.0	7.52	17.2	7.85	17.4	-	-	-	-	3.40	15.4	5.60	14.5
2.5	-	-	-	-	-	-	-	-	-	-	-	-
3.0	7.15	16.9	7.70	17.2	-	-	-	-	-	-	0.22	11.8
3.5	-	-	-	-	-	-	-	-	-	-	-	-
4.0	6.40	16.4	3.95	14.9	-	-	-	-	-	-	0.12	10.0
4.5	-	-	-	-	-	-	-	-	-	-	-	-
5.0	3.10	14.7	2.32	12.8	-	-	-	-	-	-	-	-
5.5	-	-	-	-	-	-	-	-	-	-	-	-
6.0	1.79	12.2	1.38	10.7	-	-	-	-	-	-	-	-
6.5	-	-	-	-	-	-	-	-	-	-	-	-
7.0	1.00	10.6	1.76	8.5	-	-	-	-	-	-	-	-
7.5	-	-	-	-	-	-	-	-	-	-	-	-
8.0	0.07	9.6	1.60	7.0	-	-	-	-	-	-	-	-
8.5	-	-	-	-	-	-	-	-	-	-	-	-
9.0	8.5	-	0.70	6.1	-	-	-	-	-	-	-	-
9.5	-	-	-	-	-	-	-	-	-	-	-	-
10.0	-	-	0.06	5.7	-	-	-	-	-		-	-
10.5	-	-	-	-	-	-	-	-	-	-	-	-
11.0	-	-	0.02	5.4	-	-	-	-	-	-	-	-
11.5	-	-	-	-	-	-	-	-	-	-	-	-
12.0	-	-	0.02	5.3	-	-	-	-	-	-	-	-
12.5	-	–	–	–	–	–	–	–	–	–	–	–
13.0	-	-	0.02	5.2	-	-	-	-	-	-	-	-

Table 3.3, Cont'd

Depth from Surface (m)	Hasson Lake								Lac des Iles			
	North Basin Station HL1A		North Basin Station HL1B		Mid Lake Basin Station HL4		West Basin Station HL3		Bay Near Lodge Station LL1		Angle Bay Station LL2	
	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)	D.O. (mg/L)	Temp (°C)
Surface	7.68	16.8	7.58	16.9	7.66	17.0	7.81	17.1	8.38	18.9	8.43	18.5
0.5	7.68	16.8	7.58	16.9	7.66	17.0	7.83	16.9	-	-	-	-
1.0	7.70	16.8	7.62	16.9	7.66	17.0	7.66	16.7	8.52	18.0	8.47	18.4
1.5	-	-	-	-	-	-	7.10	16.1	-	-	-	-
2.0	7.70	16.8	7.62	16.9	7.32	16.9	-	-	8.50	17.6	8.47	18.1
2.5	-	-	-	-	-	-	-	-	-	-	-	-
3.0	7.26	16.5	7.16	16.5	7.27	16.8	-	-	8.08	15.5	8.37	17.3
3.5	5.87	15.7	5.82	15.7	7.16	-	-	-	-	-	-	-
4.0	0.55	13.7	0.62	13.6	5.64	16.7	-	-	5.00	11.2	8.00	17.2
4.5	0.09	12.2	0.13	11.9	0.82	-	-	-	-	-	-	-
5.0	-	-	0.09	11.0	0.10	15.8	-	-	0.24	9.0	7.75	17.0
5.5	-	-	-	-	0.07	-	-	-	-	-	-	-
6.0	-	-	-	-	0.05	14.1	-	-	0.13	8.7	7.75	16.7
6.5	-	-	-	-	-	-	-	-	-	-	-	-
7.0	-	-	-	-	-	12.8	-	-	-	-	5.56	14.1
7.5	-	-	-	-	-	-	-	-	-	-	-	-
8.0	-	-	-	-	-	12.0	-	-	-	-	2.40	11.0
8.5	-	-	-	-	-	-	-	-	-	-	-	-
9.0	-	-	-	-	-	11.9	-	-	-	-	-	-
9.5	-	-	-	-	-	-	-	-	-	-	-	-
10.0	-	-	-	-	-	-	-	-	-	-	-	-
10.5	-	-	-	-	-	-	-	-	-	-	-	-
11.0	-	-	-	-	-	-	-	-	-	-	-	-
11.5	-	-	-	-	-	-	-	-	-	-	-	-
12.0	-	-	-	-	-	-	-	-	-	-	-	-
12.5	-	-	-	-	-	-	-	-	-	-	-	-
13.0	-	-	-	-	-	-	-	-	-	-	-	-

in late May. The temperature in the top 1 m of the water columns ranged from 17.5 to 18.5 °C in Camp Lake (surveyed in the late afternoon) to 16.7 to 17.1 °C in Hasson Lake (surveyed in the early morning). The water temperature in First and Second Ponds fell within the range of values recorded in Camp Lake and Hasson Lake.

The bottom waters of Camp Lake, below about 5 m, were found to be essentially devoid of oxygen. This finding is similar to that noted in March and unquestionably reflects the oxygen demand of the naturally high organic sediments found in all water bodies (discussed further in Section 3.3). The dissolved oxygen level is the water columns of Hasson Lake and the two ponds were found to drop below 5 mg/L only in the immediate vicinity of the bottom sediments as none of these water bodies stratify due to these shallow depths.

For comparison purposes, dissolved oxygen and temperature measurements were performed at two locations in Lac des Iles which is a huge water body compared to those discussed above. Interestingly, the depth of Lac des Iles at the two monitoring stations was less than the deepest parts of Camp Lake. The water temperature and dissolved oxygen profiles in Lac des Iles were found to be very similar to those observed in Camp Lake. Lac des Iles generally had a slightly higher dissolved oxygen level than found in Camp Lake. As observed in Camp Lake, the dissolved oxygen level dropped below 5 mg/L in the bottom water.

The measured dissolved oxygen levels in all water bodies were below saturation levels, which for temperatures of 18 to 19 °C, varies between 9.28 and 9.47 mg/L. This observation suggests that none of the water bodies are highly productive (i.e. phytoplankton levels are presumably fairly low).

The pH values measured in the field were generally found to be marginally lower than observed in the earlier surveys and varied from 6.22 on Camp Lake to 6.64 on Hasson Lake. The pH level measured on Lac des Iles was somewhat higher at 7.35. This observation is not surprising as the waters of Camp Lake, Hasson Lake and the two ponds had a much browner colour and, by inference, a higher organic acid content than Lac des Iles.

3.2 SURFACE WATER CHEMICAL QUALITY

The analytical results for key constituents in the surface water and tailings water samples are summarized in Tables 3.4 and 3.5, respectively. The complete data sets are presented in Appendix C. In general, the data for Camp Lake, Hasson Lake and the two ponds downstream of the existing tailings basin indicate that the concentrations of many of the trace metals (not shown) were quite low and generally less than the detection limits of the analytical techniques (i.e. silver, boron, barium, beryllium, cobalt, chromium, molybdenum, nickel, lead, strontium, titanium, vanadium and zinc). The concentrations (not shown) of the major cations (i.e. calcium, potassium, magnesium, sodium and silica) and anions (i.e. chloride, carbonate, bicarbonate and sulphate) were also low.

The theoretical total dissolved solids level in the surface water samples were calculated to vary between 25 and 41 mg/L, with the exception of the first pond values (96 mg/L in March, 53 mg/L in May and 58 mg/L in August), which apparently reflect the influence of the discharge from the existing tailings basin. The generally low concentrations of the major and trace elements is typical of many precambrian shield waters.

The alkalinity of Camp Lake and Hasson Lake waters varied between 14.9 and 21.2 mg/L $CaCO_3$ and between 14.1 to 26.6 mg/L $CaCO_3$, respectively, over the three surveys. The alkalinity of the Lac des Iles sample taken in August measured 22.6 mg/L $CaCO_3$. The limited buffering capacity of these waters is typical of surface runoff on much of the precambrian shield. The average alkalinity of the water samples taken from the first pond below the TMF (i.e. between 34.6 and 64.9 mg/L $CaCO_3$) is higher than observed in the other water bodies and apparently reflects the influence of the tailings discharge water which had an alkalinity of between 89 mg/L $CaCO_3$ and 250 mg/L $CaCO_3$ during the survey period (see Table 3.5). The alkalinity of the Second Pond was similar to that observed in Camp Lake and Hasson Lake, and apparently, was not measurably affected by the outflow from the First Pond.

The lake and pond water samples had a distinctive dark brown colour typical of waters affected by the by-products of organic matter decay. These waters have various descriptors: "swamp water", "humus water" or "coloured water". The observed range of the colour readings, between 108 TCU on Hasson Lake North Basin during the August survey and 379 TCU on First Pond during the March survey, are characteristic of waters with a high organic acid content. The sample taken during August from Lac des Iles had a colour of 49 TCU which concurs with the visual observation that the sample had a light yellowish appearance compared to the other samples which had a light to dark yellowish brown appearance. Because Lac des Iles is vastly larger than the other water bodies, this finding was expected.

The presence of organic matter in the Lac Des Iles area waters is also confirmed by the dissolved organic carbon (DOC) measurements. The measured levels generally range from 14.3 mg/L to 29.0 mg/L, with the exception of an unusually low value of 4.9 mg/L measured in March for the First Pond. Typical concentrations of organic carbon in surface waters are reported by the Canadian Council of Ministers of the Environment (CCME, 1987) to range from 1 to 3 mg/L in pristine streams, 2 to 10 mg/L in rivers and lakes, and 10 to 60 mg/L in swamps, marshes and bogs. Comparing the measured levels to the classification range quoted above, the water quality in Camp Lake, Hasson Lake, Lac des Iles and the two ponds would fall into the latter group.

The presence of organic acids can dramatically increase the solubility of metals as most metals form complexes with humic substances in water (CCME, 1987). At low pH, those metals which complex with fulvic acid, in order of decreasing stability, are reported to be: iron (III); aluminum (III); copper (II); nickel (II); cobalt (II); lead (II); calcium (II); zinc (II); cadmium (II); iron (II); manganese (II); and magnesium (II).

This factor would explain the elevated iron levels reported in Table 3.4 which varied from a low of 0.29 mg/L to a high of 1.46 mg/L in Hasson Lake and from a low of 0.31 mg/L to a high of 0.52 mg/L in Camp Lake. The unusually high levels of iron recorded in the two ponds and in the west bay of Hasson Lake during the March survey were not repeated in the May or August surveys. However, the measured iron levels consistently exceed the provincial surface water quality objective of 0.30 mg/L for protection of aquatic life (MOE, 1984).

The presence of organic acids may have also influenced the observed levels of aluminum which were generally marginally greater than the provincial objective for total aluminum of 0.075 mg/L for protection of aquatic life in fresh waters with pH $\geq$ 6.5 and $\leq$ 9.0. The only sample with an aluminum level below the guideline was taken from Lac des Iles.

The copper levels measured on samples taken during the March survey from Camp Lake and First Pond were found to be slightly above the provincial objective of 0.005 mg/L for protection of aquatic life (MOE, 1984). However, the copper levels measured on all samples collected during the May and August surveys were found to be consistently below the objective.

The measured concentrations of the nutrients (i.e. nitrogen and phosphorus compounds) were generally found to be present in fairly low concentrations. The total phosphorus levels measured in Camp Lake and Hasson Lake were generally less than the guideline of 0.020 mg/L to protect against nuisance aquatic plant growth in lake systems. The total phosphorus levels measured in the First Pond (0.080, 0.033 and 0.027 mg/L in March, May and August, respectively) were higher than the guideline, but were still considerably lower than the levels reported on Table 3.5 for the tailings pond water during each survey. The ammonia-nitrogen concentrations were found to be elevated for most samples during the March survey, but were still well below the surface water quality objective. In contrast to the March survey, the May tailings pond water samples did not contain elevated ammonia-nitrogen levels, although it was elevated in the tailings secondary pond at the time of the August survey. None of the measured ammonia and nitrogen levels posed an environmental concern.

In summary, the waters of Camp Lake, Hasson Lake and the ponds downstream of the TMF are typically characterized by strong, dark brown colour indicative of the presence of humic acids. As a consequence, the waters also contain elevated levels of aluminum, copper and iron, as these metals tend to most readily form organic metal complexes. The waters have a neutral pH and modest buffering capacity against pH change.

3.3 Sediment Chemical Quality

The sediment samples were analyzed for 24 metals and percent loss on ignition (LOI). The

Table 3.4

CHEMICAL QUALITY OF SURFACE WATER SAMPLES

	Aluminum (Al) (mg/L)	Copper (Cu) (mg/L)	Iron (Fe) (mg/L)	Nitrite (NO_2-N) (mg/L)	Nitrate (NO_3-N) (mg/L)	Alkalinity 4.2 (mg $CaCO_3$/L)	Ammonia Nitrogen (NH_3-N) (mg/L)	Ortho-Phosphorus (mg/L)	Total Phosphorus (mg/L)	Dissolved Organic Carbon (mg/L)	Theoretical Tot. Diss. Solids (mg/L)	Colour (TCU)
Provincial Water Quality Objective or Guideline[a]	0.075	0.005	0.30				1.67[b]		0.020			
Camp Lake North Basin												
• March 1992	0.08	0.009	0.47	<0.02	0.15	21.2	0.02	<0.01	0.011	18.9	33	130.
• May 1992	0.09	<0.002	0.31	<0.02	0.16	14.9	0.05	<0.02	0.011	15.5	29	124
• August 1992	0.10	0.003	0.35	<0.020	0.05	16.6	<0.02	0.004	0.019	15.3	28	139
Camp Lake Mid Lake												
• March 1992	0.10	0.006	0.52	<0.02	0.16	21.3	<0.02	<0.01	0.011	15.6	34	130.
• May 1992	0.10	<0.002	0.36	<0.02	0.18	15.4	<0.02	<0.02	0.016	14.3	28	130
• August 1992	0.11	0.003	0.43	<0.020	0.07	16.4	<0.02	0.004	0.016	15.3	28	131
First Pond South of TMF												
• March 1992	0.32	0.007	1.27	<0.02	0.06	64.9	0.18	<0.01	0.080	4.9	96	379.
• May 1992	0.11	0.003	0.22	<0.02	<0.02	34.6	<0.02	<0.02	0.033	22.0	53	216
• August 1992	0.15	0.002	0.68	<0.020	0.03	40.6	0.04	0.008	0.027	29.0	58	275
Second Pond South of TMF												
• March 1992	0.24	0.004	6.51	<0.02	0.07	22.9	0.18	<0.01	0.060	17.2	33	210.
• May 1992	0.15	<0.002	0.25	<0.02	0.05	14.3	<0.02	<0.02	0.016	17.8	25	128
• August 1992	0.15	0.002	0.55	<0.020	<0.02	20.2	0.05	0.016	0.022	23.0	31	230
Hasson Lake North Basin												
• March 1992	0.12	0.003	0.56	<0.02	0.20	20.3	0.02	<0.01	0.012	18.8	33	135.
• May 1992	0.10	<0.002	0.30	<0.02	0.15	14.8	<0.02	<0.02	0.008	14.1	27	128
• August 1992	0.10	0.003	0.38	<0.020	<0.02	16.2	<0.02	0.004	0.014	15.1	26	108
Hasson Lake West Bay												
• March 1992	0.20	0.002	1.46	<0.02	0.10	26.6	0.11	<0.01	0.022	15.5	41	227.
• May 1992	0.10	<0.002	0.29	<0.02	0.12	14.5	<0.02	<0.02	0.013	14.4	26	136
• August 1992	0.11	0.002	0.40	<0.020	<0.02	16.4	<0.02	0.004	0.014	16.5	27	140
Hasson Lake Mid Lake												
• March 1992	0.11	0.003	0.51	<0.02	0.19	20.3	<0.02	<0.01	0.012	18.7	32	139.
• May 1992	0.11	<0.002	0.34	<0.02	0.16	14.1	<0.02	<0.02	0.011	14.4	26	138
• August 1992	0.10	0.002	0.39	<0.020	<0.02	15.8	<0.02	0.008	0.015	15.1	26	125
Lac des Iles Bay near Lodge												
• August 1992	<0.05	0.002	0.10	<0.020	<0.02	22.6	<0.02	<0.002	0.017	15.3	33	49

Notes: a) Provincial Water Quality Objectives for Protection of Aquatic Life and Recreation (MOE, 1984 and 1991).
b) Ammonia nitrogen objective given applies at a pH of 7.5 and temperature of 20°C and is based on an un-ionized ammonia objective of 0.02 mg/L.

Table 3.5

CHEMICAL QUALITY OF TMF WATER SAMPLES

	Aluminum (Al) (mg/L)	Copper (Cu) (mg/L)	Iron (Fe) (mg/L)	Nitrite (NO_2-N) (mg/L)	Nitrate (NO_3-N) (mg/L)	Alkalinity 4.2 (mg $CaCO_3$/L)	Ammonia Nitrogen (NH_3-N) (mg/L)	Ortho-Phosphorus (mg/L)	Total Phosphorus (mg/L)	Dissolved Organic Carbon (mg/L)	Theoretical Tot. Diss. Solids (mg/L)	Colour (TCU)
Provincial Water Quality Objective or Guideline[a]	0.075	0.005	0.30	-	-	-	1.67[b]	-	0.020	-	-	-
Tailings Decant Water												
• March 1992	0.57	0.015	4.75	<0.02	<0.02	309.	2.60	0.05	0.240	28.0	401	285
• May 1992	0.73	0.037	0.93	<0.02	<0.02	83.8	<0.02	<0.02	0.059	15.8	124	120
• August 1992	0.67	0.025	1.34	<0.020	<0.02	135.	<0.02	0.006	0.044	21.4	181	132
Tailings Secondary Pond												
• March 1992	0.47	0.014	6.57	<0.02	<0.02	250.	1.91	0.06	0.290	16.3	335	352
• May 1992	0.10	0.013	1.00	<0.02	<0.02	88.8	<0.02	<0.02	0.088	18.2	127	126
• August 1992	0.13	0.006	4.03	<0.020	<0.02	125.	0.80	0.036	0.124	57.0	167	270

<u>Notes:</u> a) Provincial Water Quality Objectives for Protection of Aquatic Life and Recreation (MOE, 1984 and 1991).

b) Ammonia nitrogen objective given applies at a pH of 7.5 and temperature of 20°C and is based on an un-ionized ammonia objective of 0.02 mg/L.

results of the analyses for key constituents are summarized in Table 3.6. Full analytical results are given in Appendix C. In addition, typical background levels of several of the metals in sediments from the Great Lakes are included in the table for comparison purposes.

The three sediment samples collected from Camp Lake are seen to have a very consistent quality. The duplicate samples taken from the north basin of Camp Lake (denoted North Basin #1 and North Basin #2) showed essentially no difference in most of the parameters measured (i.e. the levels fall within the expected range of natural variability). The measured levels of several of the metals (i.e. cadmium, chromium, manganese, nickel, lead and zinc) are characteristic of the reported typical background levels. The measured iron levels were approximately one-half the typical value reported on Great Lakes sediment. In contrast, the copper levels were more than twice the background values. This observation is not surprising as Camp Lake is located in an area of mineralization. The organic content of the sediments in Camp Lake is high. This is reflected by the loss on ignition measurements which ranged from 29.1% to 35.8%. This finding is consistent with expectations based on visual observations (see Field Notes in Appendix A).

The sediment sample taken from the north basin of Hasson Lake is seen to have very similar characteristics to the sediment in Camp Lake. However, the sediment samples from the west basin and mid lake basin station on Hasson Lake had quite different chemical characteristics. These sediment samples were found to have a much higher silt content and corresponding lower organic content (i.e. low LOI values). Accordingly, the metals content of these samples differed from the north basin sample and the Camp Lake samples.

The sediments in the two ponds downstream of the TMF are seen from Table 3.6 to have a high organic content (i.e. high LOI), similar to that measured on the sediments from Camp Lake. The metals content of the sediment from the Second Pond is also comparable to the metal levels found in Camp Lake. Interestingly, the metal levels measured in the sediment sample from the First Pond are generally lower than the levels found in the sediments from the Second Pond, the north basin of Hasson Lake and Camp Lake. It is possible that the sediment quality has been altered by tailings deposition in the watershed, although this is strictly speculation.

Table 3.6

CHEMICAL QUALITY OF SEDIMENTS SAMPLED DURING MARCH 1992 SURVEY
(units are in µg/g dry weight except for LOI in percent)

Analyte	Typical Background Levels[a]	Camp Lake North Basin #1	Camp Lake North Basin #2	Camp Lake Mid Lake	First Pond South of TMF	Second Pond South of TMF	Hasson Lake North Basin	Hasson Lake Mid Lake	Hasson Lake West Basin
Aluminum (Al)	-	15700	16700	17100	5400	14300	13400	10200	6920
Cadmium (Cd)	1.1	0.9	0.7	0.8	1.3	0.7	0.8	<0.3	<0.3
Chromium (Cr)	31	23.2	26.1	24.5	13.8	22.6	22.8	13.9	11.5
Copper (Cu)	25	63.6	67.4	61.5	36.0	50.9	56.9	11.2	10.9
Iron (Fe)	31200.	12600.	12300.	19700.	4150.	21100.	13400.	17600.	9380.
Manganese (Mn)	400.	233.	240.	410.	102.	146.	179.	226.	112.
Nickel (Ni)	31	23	24	30	23	31	22	17	15
Phosphorus (P)	-	1230	1320	1360	510	700	950	440	320
Lead (Pb)	23	21	16	20	7	9	32	3	6
Zinc (Zn)	65	64.7	53.2	86.3	29.0	87.4	74.7	57.6	53.4
LOI	-	34.8	35.8	29.1	34.5	36.7	35.8	4.30	7.17

Note:

a) Typical background levels for metals are based on analyses of Great Lakes pre-colonial sediment horizon (MOE, 1991a).

In summary, the sediments from the lakes and ponds sampled in this initial survey were found to have typical sediment quality characteristics, in most respects. Several of the sediment samples had a high organic carbon content and an elevated copper level. These attributes are indicative of the effects of local forestation and mineralization.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The results of three surveys of surface water and sediment quality in the vicinity of the Lac des Iles mine site are presented in this report. The water bodies sampled included Camp Lake, Hasson Lake and two ponds downstream of the existing TMFs; those which are most apt to be impacted by the mining activities and the proposed tailings management facility. In addition, benthic sampling, fish netting and habitat investigations were carried out on these water bodies. The results of these investigations are discussed in a separate report (NEA, 1992).

The results of the surface water monitoring program indicate that the waters of Camp Lake, Hasson Lake and the two ponds are characterized by strong, dark brown colour indicative of the presence of humic acids. As a consequence, the waters also contain elevated levels of aluminum and iron, as these metals tend to most readily form organic complexes. The surface waters have a neutral pH and modest buffering capacity against pH change. The dissolved oxygen level in the lakes and ponds showed evidence of stress due to the oxygen demand exerted by the sediments. All four water bodies had naturally low dissolved oxygen levels throughout the depth of the water columns after several months of ice cover. Also, the bottom waters of Camp Lake, which stratifies during the summer months, were found to contain low dissolved oxygen levels. The dissolved oxygen levels in the upper portion of all the water bodies surveyed were found to be acceptable to sustain aquatic life.

The sediments from the lakes and ponds sampled in the March survey were found to have typical sediment quality characteristics in most respects. Several of the sediment samples had a high organic carbon content and an elevated copper level. These attributes are indicative of the effects of local forestation and mineralization.

In conclusion, the data presented in this report and the biological survey report prepared by NEA (1992), provide a baseline against which the potential impact of the proposed mining operation at the Lac des Iles site can be assessed and future change can be measured. If it is intended to proceed with the project, then it is recommended that each of the water bodies be monitored quarterly to augment the existing database. The monitoring program should include measurements of field pH, dissolved oxygen and temperature and the collection of water samples for analyses of those parameters included in the program discussed in this report. An additional set of sediment samples should be collected for measurements and organic carbon analyses. These recommendations do not consider the requirements for effluent monitoring, nor for additional sampling which may be required downstream of the point of effluent discharge.

5.0 REFERENCES

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APPENDIX A

FIELD NOTES - 4-5 MARCH 1992

APPENDIX A: FIELD NOTES: LAC DES ILES MINE SITE BASELINE MONITORING SURVEY 4 AND 5 MARCH 1992

Program Scope

Mr. Bruce E. Halbert of SENES Consultants Limited travelled to the Lac Des Iles Mine Site approximately 90 km north of Thunder Bay to collect water and sediment samples from ponds and lakes in the vicinity of the existing mine facilities. The purpose of the program was to establish baseline conditions under winter conditions. The program included the collection of water and sediment samples for chemical analyses and measurement of field pH, temperature and dissolved oxygen. The program was carried out on 4 and 5 March 1992 and included sampling of:

- Camp Lake to the south east of the mine camp facilities as this lake may be used as a source of process water;
- Hasson Lake to the south of the mine site as this lake may receive the effluent from the proposed tailings management facility (TMF);
- two ponds downstream of the proposed TMF; and,
- pond water in the area which currently contains tailings from past operations.

Field Conditions

Weather conditions at the time of sample collection were excellent with the temperature ranging from about -5°C to +5°C.

Working conditions on the lakes were difficult as they were covered with approximately 15 cm of snow, underlain with several centimetres of slush and 60 cm or more of solid ice. The conditions were unsuitable for use of a snowmobile thus all equipment had to be back-packed out to the sampling station locations. The General Manager for the mine, Mr. Glen Clark, kindly assisted with the field program and provided the services of mine workers to haul the field equipment onto and off of the lakes and to cut the access holes through the ice.

Field Measurements

In situ measurements of water temperature and dissolved oxygen were made using a YSI Model 58 dissolved oxygen meter equipped with a 50 m probe extension. Measurements were made generally at 1 m intervals over the depth of the water column by lowering the probe progressively downward from the top to the bottom. The meter was calibrated at each station location using a sample of lake water by partially filling a sample bottle and shaking the bottle for several minutes to saturate the water with dissolved oxygen.

Field pH measurements were made using a Solinat pen pH meter. The pH of the surface water was recorded at each site.

The results of the field program are recorded on the "Lake Survey Field Notes" forms attached to this report.

Sample Collection

Water samples were collected from the pond and lake monitoring stations using a Kemmerer acrylic water sampler. At the shallow monitoring stations (generally < 3 m deep) the water samples were taken approximately 1 m below the surface. At the deep monitoring stations (generally > 6 m), water samples were taken from the top meter, mid-depth and bottom meter and composited to obtain one sample for chemical analyses. At the intermediate depth stations (generally between 2 and 6 m deep), a composite water sample was obtained for submission to the laboratory by compositing samples taken from the top and bottom waters.

One litre samples were taken from each station and stored in a cooler with ice packs to keep the samples cold. The samples were not filtered in the field and no preservatives were added. The samples were shipped by air to Barringer Laboratories in Mississauga for chemical analyses.

Sediment samples were taken with a Wildco Instrument 6 inch scoop (dredge) sampler. In general, the top 5 cm of the bottom sediments were removed and placed in glass jars for shipment to the laboratory for chemical analyses. These samples were also packed in the cooler to keep them cold and shipped overnight by air to the laboratory.

Observations made in the field about the characteristics of the sediments are summarized on the "Lake Survey Field Notes" forms attached hereto. In general, the sediment samples were found to have a high consistency, a dark brown, mucky appearance and a uniform texture. Most of the samples appeared to have a high organic content and were generally odorous.

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac Des Iles Mine Site

Watershed Name: Dog River Sub-watershed

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 4 March 92 **Survey Time:** 10^{30} AM

Survey Team: B E. Halbert **and** Two Mine Staff.

Air Temperature: 3°c **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100 %

Waterbody Surveyed: Camp Lake

Location Sampled: North Basin - Station CL1

Water Sample(s) Taken: ✓ YES ___ NO

Water Sample Type: ___ Top Metre ___ Mid Depth ___ Bottom Metre
✓ Composite (top, mid depth, bottom)
___ Other (specify) ___

Water Colour: ___ Clear ___ Turbid ___ Blue/Green
✓ Brown ___ Other (Specify)

Lake Survey Field Notes, cont'd.

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
1	0.6	10.7	7.3	–
2	2.1	9.0	–	–
3	2.6	7.5	–	–
4	2.8	6.7	–	–
5	2.9	6.2	–	–
6	2.9	3.4	–	–
7	3.0	2.1	–	–
8	3.3	0.5	–	–
9 *	3.6	0.2	–	–

* D.O. probe was into sediment at 9 m depth.

Sediment Sample Taken: ✓ YES ____ NO

Sediment Sample Characteristics: ____ Clay ____ Gravel ✓ Muck ____ Sand ____ Silt ____ Other (specify)

Sediment Sample Colour: ____ Black ✓ Brown ____ Grey ____ Other (specify)

Sediment Sample Odour: ____ Not odourous Slightly Odourous

Vegetation: ____ Emergent ____ Floating ____ Submergent None Other

Other Observations: Sediment sample had a dark brown colour and a very consistent texture. Sediment appeared to have a high organic content and was quite thick.

Surveyors Signature: [signature]

31132 - March 1992

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 – Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring – Lac Des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 4 March 92 **Survey Time:** 11:00 AM

Survey Team: B.E. Holbert **and** Two Mine Staff

Air Temperature: 3°C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100 %

Waterbody Surveyed: Camp Lake

Location Sampled: Mid Lake – Station CL2

Water Sample(s) Taken: ______ YES ✓ NO

Water Sample Type: ______ Top Metre ______ Mid Depth ______ Bottom Metre

______ Composite (top, mid depth, bottom)

______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green

✓ Brown ______ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
1	0.7	9.5	7.3	–
2	2.1	8.4	–	–
3	2.6	7.1	–	–
4	2.8	6.4	–	–
5	2.9	6.3	–	–
6*	2.9	0.4	–	–

* D.O. probe was into sediment at 6 m depth.

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck ______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent Algae Other

Other Observations: Temperature and dissolved oxygen only were measured at this station. Another attempt was made to find a deeper station to sample in the mid lake basin.

Surveyors Signature [signature]

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 – Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring – Lac Des Iles Mine Site

Watershed Name: Dog River Subwatershed.

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 4 March 92 **Survey Time:** 12^{20} PM.

Survey Team: B. Halbert **and** The Mine Staff

Air Temperature: 4°C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100 %

Waterbody Surveyed: Camp Lake

Location Sampled: Mid Lake – Station CL3

Water Sample(s) Taken: ✓ YES ______ NO

Water Sample Type: ______ Top Metre ______ Mid Depth ______ Bottom Metre

✓ Composite (top, mid depth, bottom)

______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green

✓ Brown ______ Other (Specify)

Lake Survey Field Notes, cont'd.

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
1	0.7	10.0	7.2	–
2	2.1	8.4	–	–
3	2.6	7.1	–	–
4	2.8	6.1	–	–
5	2.8	6.0	–	–
6	2.9	5.8	–	–
7	2.9	5.5	–	–
8	2.9	5.2	–	–
9	2.9	4.6	–	–
10	3.0	4.4	–	–
11*	–	0.2	–	–

* D.O. probe was into sediment at 11m depth.

Sediment Sample Taken: ✓ YES ____ NO

Sediment Sample Characteristics: ____ Clay ____ Gravel ✓ Muck ____ Sand ____ Silt ____ Other (specify)

Sediment Sample Colour: ____ Black ✓ Brown ____ Grey ____ Other (specify)

Sediment Sample Odour: ____ Not odourous Slightly Odourous

Vegetation: ____ Emergent ____ Floating ____ Submergent None Other

Other Observations: Sediment was thick, had a dark brown appearance and uniform consistency.

Surveyors Signature Bruce E Holt[illegible]

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 – Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring – Lac Des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 4 March 92 **Survey Time:** 2^{45} P.M.

Survey Team: B.E. Halbert **and** Four Mine Staff

Air Temperature: 4°C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100%

Waterbody Surveyed: First Pond Southwest of Tailings Management Area.

Location Sampled: Two Mid Pond Stations – FP1 at Narrows
– FP2 North of Narrows.

Water Sample(s) Taken: ✓ YES ___ NO

Water Sample Type: ✓ Top Metre ___ Mid Depth ___ Bottom Metre
___ Composite (top, mid depth, bottom)
___ Other (specify) ___

Water Colour: ___ Clear ___ Turbid ___ Blue/Green
Dark Brown & Turbid Other (Specify)

Lake Survey Field Notes, cont'd.

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
Station FP1				
0.3	0.2	1.4	6.8	—
1.0	1.8	0.3	—	—
1.5*	2.4	0.17	—	—
* D.O. probe was into sediment at 1.5 m depth				
Station FP2				
0.3	0.4	2.5	—	—
1.0	1.4	0.4	—	—

Sediment Sample Taken: ✓ YES ______ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel Organic Muck ______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black Dark Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous Very Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent NONE Other

Other Observations: Sediment Sample was taken at Station FP1 and had a strong anaerobic odour. Water sample was taken at Station FP2, had a deep brown colour and contained a noticeable level of suspended solids.

Surveyors Signature [signature]

31132 - March 1992

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

5 of 8

Project Number: 31121 - Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac Des Iles Mine Site.

Watershed Name: Dog River Subwatershed.

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 4 March 92 **Survey Time:** 4^{30} p.m.

Survey Team: R.E. Hallett and Four Mine Staff

Air Temperature: 4 °C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100 %

Waterbody Surveyed: Second Pond Southwest of Tailings Mgt. Area

Location Sampled: Two stations; SP1 - North End of North Basin
SP2 - South End of North Basin

Water Sample(s) Taken: ✓ YES ___ NO

Water Sample Type: ✓(SP1) Top Metre ___ Mid Depth ___ Bottom Metre
___ Composite (top, mid depth, bottom)
___ Other (specify) ___

Water Colour: ___ Clear ___ Turbid ___ Blue/Green
Dark Brown ___ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
STATION SP1				
0.3	0.3	2.1/2.3 (confirmed)	6.7	—
1.0	0.8	4.5	—	—
2.0	2.6	4.8	—	—
2.5 *	2.9	0.2	—	—
* D.O. probe was into sediment at 2.5 m depth!				
STATION SP2				
0.3	0.2	1.3 (confirmed)	—	—
1.0	1.0	4.2	—	—
2.0*	2.5	0.2	—	—

Sediment Sample Taken: ✓ (SP2) YES ______ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel Organic Muck
______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous Strong Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent None Other

Other Observations: Sediment Sample, taken from Station SP2, had a deep dark brown colour, was odourous and had a uniform texture and consistency.

Surveyors Signature Bruce E. [signature]

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 – Lac Des Iles Mine Ltd.

Project Name: Baseline Monitoring – Lac Des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 5 March 92 **Survey Time:** 9 00 AM.

Survey Team: B.E. Halbert **and** Three Mine Staff

Air Temperature: <0°C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100 %

Waterbody Surveyed: Hassen Lake

Location Sampled: Entrance to North Basin – Station HL1

Water Sample(s) Taken: ✓ YES ________ NO

Water Sample Type: ________ Top Metre ________ Mid Depth ________ Bottom Metre

________ Composite (top, mid depth, bottom)

Composite Other (specify) Top & bottom waters.

Water Colour: ________ Clear ________ Turbid ________ Blue/Green

✓ Brown ________ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
1.0	1.1	8.9	6.9	–
2.0	3.3	5.3	–	–
3.0	3.7	3.1	–	–
4.0	3.9	3.8	–	–
5.0	3.8	3.0	–	–
6.0	4.1	0.4	–	–

Sediment Sample Taken: ✓ YES ______ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ✓ Muck ______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ✓ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous Slightly Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent None Other

Other Observations: Sediment had higher silt content than other lakes and ponds sampled during survey

Surveyors Signature Bruce E. Holt

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

7 of 8

Project Number: 31121 – Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring – Lac Des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 5 March 92 **Survey Time:** 9^{45} to 10^{45} AM

Survey Team: B. E. Halbert and Three Mine Staff

Air Temperature: <0°C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100%

Waterbody Surveyed: Hessen Lake

Location Sampled: Station HL2 – Mid Lake
HL3 – Centre of West Basin

Water Sample(s) Taken: ✓ YES ______ NO

Water Sample Type: ✓ HL3 Top Metre ✓ HL2 Mid Depth ______ Bottom Metre
______ Composite (top, mid depth, bottom)
______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green
✓ Brown ______ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
STATION HL2 – MID LAKE				
0.3	0.2	9.0	6.9	—
1.0	1.3	7.4	—	—
2.0	3.0	4.7	—	—
2.5	3.6	3.5	—	—
STATION HL3 – Centre of West Basin				
0.3	0.2	5.0	6.9	—
1.0	0.7	3.4	—	—
1.5	1.1	2.4	—	—

Sediment Sample Taken: ✓ HL2 & HL3 YES ________ NO

Sediment Sample Characteristics: ____ Clay ____ Gravel Silty Muck ✓ ____ Sand ____ Silt ____ Other (specify)

Sediment Sample Colour: ____ Black ✓ Brown ____ Grey ____ Other (specify)

Sediment Sample Odour: ____ Not odourous Slightly Odourous

Vegetation: ____ Emergent ____ Floating ____ Submergent NONE. Other

Other Observations: Sediment samples had higher silt content than other lakes and ponds sampled, particularly the sediment from the mid lake station. Very little sediment was obtained using the clam in each attempt.

Surveyors Signature Bruce E. Hilton

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

8 of 8

Project Number: 31121 – Lac Des Iles Mines Ltd.

Project Name: Baseline Monitoring – Lac Des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay

PART B: SURVEY INFORMATION

Survey Date: 5 March 92 **Survey Time:** 11 30 AM.

Survey Team: BE Hubbard **and** Three Mine Staff

Air Temperature: < 0 °C **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): 100 %

Waterbody Surveyed: Tailing Management Facility Ponds

Location Sampled: TMF1 – Tailings Pond Decant Water.
TMF2 – Tailings Secondary Sedimentation Pond

Water Sample(s) Taken: ✓ YES ___ NO

Water Sample Type: ✓ Top Metre ___ Mid Depth ___ Bottom Metre
___ Composite (top, mid depth, bottom)
___ Other (specify) ___

Water Colour: ___ Clear ✓ Turbid ___ Blue/Green
___ Brown ___ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck
______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent None Other

Other Observations: Both tailings water samples had a grey/green colour and were quite turbid and odourous. The auger holes through the ice only partially filled with water making it difficult to obtain ice free samples.

Surveyors Signature [illegible]

APPENDIX B

FIELD NOTES: LAC DES ILES MINE SITE
BASELINE MONITORING SURVEY 12-13 AUGUST 1992

APPENDIX B: FIELD NOTES: LAC DES ILES MINE SITE, BASELINE MONITORING SURVEY 12 AND 13 AUGUST 1992

Program Scope

Mr. Bruce E. Halbert of SENES Consultants Limited travelled to the Lac Des Iles Mine Site approximately 90 km north of Thunder Bay to collect water samples from ponds and lakes in the vicinity of the existing mine facilities on 12 and 13 August 1992. The purpose of the program was to establish baseline conditions during the period to complement data collected previously during the winter and spring periods. The program included the collection of water samples for chemical analyses and measurement of field pH, temperature and dissolved oxygen. Water samples were collected for chemical analyses from:

- Camp Lake to the south east of the mine camp facilities as this lake may be used as a source of process water;
- Hasson Lake to the south of the mine site as this lake may receive the effluent from the proposed tailings management facility (TMF);
- two ponds downstream of the proposed TMF (i.e. designated First Pond and Second Pond);
- pond water in the area which currently contains tailings from past operations; and
- Lac des Iles to the north of the mine facilities and which could potentially be used as a water supply source.

Field Conditions

Weather conditions at the time of sample collection were excellent. Mr. Mike Michaud, mine site geologist kindly assisted with the field program.

Field Measurements

In situ measurements of water temperature and dissolved oxygen were made using a YSI Model

58 dissolved oxygen meter equipped with a 15 m probe extension. Measurements were made generally at 1 m intervals over the depth of the water column by lowering the probe progressively downward from the top to the bottom. The meter was calibrated in the field using a sample of lake water by partially filling a sample bottle and shaking the bottle for several minutes to saturate the water with dissolved oxygen.

Field pH measurements were made using a Cole-Parme Model 05669-00 Digital Handheld pH meter. The pH of the surface water was recorded at each site.

The results of the field program are recorded on the "Lake Survey Field Notes" forms attached to this report.

Sample Collection

Water samples were collected from the pond and lake monitoring stations using a Kemmerer acrylic water sampler. At the shallow monitoring stations (generally < 3 m deep) the water samples were taken approximately 1 m below the surface. At the deep monitoring stations (generally > 6 m), water samples were taken from the top meter, mid-depth and bottom meter and composited to obtain one sample for chemical analyses. At the intermediate depth stations (generally between 2 and 6 m deep), a composite water sample was obtained for submission to the laboratory by compositing samples taken from the top and bottom waters.

One litre samples were taken from each station and stored in a cooler with ice packs to keep the samples cold. The samples were not filtered in the field and no preservatives were added. The samples were shipped by air to Barringer Laboratories in Mississauga for chemical analyses.

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 – Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring – Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT.

PART B: SURVEY INFORMATION

Survey Date: 12 Aug 92 **Survey Time:** 7:30 p.m.

Survey Team: B. E. Halbert and M. Michaud

Air Temperature: ______ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): ______

Waterbody Surveyed: Camp Lake.

Location Sampled: South Basin – Stn CLS

Water Sample(s) Taken: ___ YES ✓ NO

Water Sample Type: ___ Top Metre ___ Mid Depth ___ Bottom Metre
___ Composite (top, mid depth, bottom)
___ Other (specify) ______

Water Colour: ___ Clear ___ Turbid ___ Blue/Green
___ Brown Slightly yellow Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
Surface	18.5	8.80	6.60	
0.5	18.5	8.72		
1.0	18.5	8.60		
1.5	17.8	5.10		

Sediment Sample Taken: ________YES ____✓____NO

Sediment Sample Characteristics: ________Clay ________Gravel ________Muck
________Sand ________Silt ________Other (specify)

Sediment Sample Colour: ________Black ________Brown ________Grey ________Other (specify)

Sediment Sample Odour: ________Not odourous ________Odourous

Vegetation: ________Emergent ________Floating ________Submergent ________Other

Other Observations: ____

____

Surveyors Signature B. E. Holbert

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT.

PART B: SURVEY INFORMATION

Survey Date: 12 Aug 92 **Survey Time:** 8:00 pm.

Survey Team: B.E. Halbert **and** M. Michaud.

Air Temperature: ______ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): ______

Waterbody Surveyed: Camp Lake

Location Sampled: Mid Lake - Stn CL4

Water Sample(s) Taken: ✓ YES ______ NO

Water Sample Type: ______ Top Metre ______ Mid Depth ______ Bottom Metre

✓ Composite (top, mid depth, bottom)

______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green

______ Brown Slightly Yellow Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
Surface	18.3	7.95	6.22	
0.5	18.4	7.98		
1	18.2	8.03		
2	17.4	7.85		
3	17.2	7.70		
4	14.9	3.95		
5	12.8	2.32		
6	10.7	1.38		
7	8.5	1.76		
8	7.0	1.60		
9	6.1	0.70		
10	5.7	0.06		
11	5.4	0.02		
12	5.3	0.02		
13	5.2	0.02		

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck
______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent ______ Other

Other Observations: ______

Surveyors Signature B. E. Walkert

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT

PART B: SURVEY INFORMATION

Survey Date: 12 Aug 92 **Survey Time:** 8:30 p.m.

Survey Team: B.E. Hulbert and M. Michaud

Air Temperature: ________ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): ________

Waterbody Surveyed: Camp Lake

Location Sampled: North Basin - Stn CL1

Water Sample(s) Taken: ✓ YES ______ NO

Water Sample Type: ______ Top Metre ______ Mid Depth ______ Bottom Metre

✓ Composite (top, ~~mid-depth~~, bottom)

______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green

______ Brown Slightly Yellow Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
Surface	18.1	7.80	6.35	
0.5	17.9	7.80		
1	17.5	7.80		
2	17.2	7.52		
3	16.9	7.15		
4	16.4	6.40		
5	14.7	3.10		
6	12.2	1.79		
7	10.6	1.00		
8	9.6	0.07		
9 *	8.5	—		
* Bottom				

Sediment Sample Taken: ____ YES ✓ NO

Sediment Sample Characteristics: ____ Clay ____ Gravel ____ Muck ____ Sand ____ Silt ____ Other (specify)

Sediment Sample Colour: ____ Black ____ Brown ____ Grey ____ Other (specify)

Sediment Sample Odour: ____ Not odourous ____ Odourous

Vegetation: ____ Emergent ____ Floating ____ Submergent ____ Other

Other Observations: ____________________

Surveyors Signature B. S. [illegible]

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT

PART B: SURVEY INFORMATION

Survey Date: 12 Aug 92 **Survey Time:** 6:50 pm.

Survey Team: B.E. Walbert **and** M. Michaud

Air Temperature: ______ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): ______

Waterbody Surveyed: First Pond Southwest of Tailings Management Facility

Location Sampled: Stn FP4 - South Bay
Stn FP1 - Near Narrows

Water Sample(s) Taken: ✓ YES ______ NO
from FP4

Water Sample Type: ✓ Top Metre ______ Mid Depth ______ Bottom Metre
______ Composite (top, mid depth, bottom)
______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green
Yellowish Brown ______ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
Station RP1				
Surface	17.9	6.47	6.48	
1.0	16.1	5.61		
1.5	15.7	4.22		
Station RP4				
Surface	18.2	6.50	6.43	
1.0	15.4	4.63		
1.5	15.4	3.40		

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck ______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent ______ Other

Other Observations: ______

Surveyors Signature B. E. Holben

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT

PART B: SURVEY INFORMATION

Survey Date: 13 Aug 92 Survey Time: 9:00 A.M.

Survey Team: B.S. Halbert and M. Michaud

Air Temperature: ______ Precipitation: ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): clear, bright day with partial cloud cover.

Waterbody Surveyed: Hasson Lake

Location Sampled: North Basin - Stn HL1A & Stn HL1B

Water Sample(s) Taken: ✓ YES ______ NO
from Stn HL1B

Water Sample Type: ______ Top Metre ______ Mid Depth ______ Bottom Metre

✓ Composite (top, ~~mid-depth,~~ bottom)

______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green

______ Brown Yellowish Tint Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
Stn. HL1A				
Surface	16.8	7.68	—	
0.5	16.8	7.68		
1.0	16.8	7.70		
2.0	16.8	7.70		
3.0	16.5	7.26		
3.5	15.7	5.87		
4.0	13.7	0.65		
4.5	12.2	0.09		
Stn HL1B				
Surface	16.9	7.58	6.64	
0.5	16.9	7.58		
1.0	16.9	7.62		
2.0	16.9	7.62		
3.0	16.5	7.16		
3.5	15.7	5.82		
4.0	13.6	0.62		
4.5	11.9	0.13		
5.0	11.0	0.09		

Sediment Sample Taken: ________ YES ✓ NO

Sediment Sample Characteristics: ________ Clay ________ Gravel ________ Muck ________ Sand ________ Silt ________ Other (specify)

Sediment Sample Colour: ________ Black ________ Brown ________ Grey ________ Other (specify)

Sediment Sample Odour: ________ Not odourous ________ Odourous

Vegetation: ________ Emergent ________ Floating ________ Submergent ________ Other

Other Observations: ________________________________

Surveyors Signature B. S. Halbert

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT.

PART B: SURVEY INFORMATION

Survey Date: 13 Aug 92 **Survey Time:** 10:00 A.M.

Survey Team: B. E. Halbert and M. Michaud

Air Temperature: ______ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): bright, partial cover

Waterbody Surveyed: Hasson Lake

Location Sampled: Mid Lake Deep Basin - Stn HL4

Water Sample(s) Taken: ✓ YES ______ NO

Water Sample Type: ______ Top Metre ______ Mid Depth ______ Bottom Metre

✓ Composite (top, ~~mid-depth~~, bottom)

______ Other (specify) ______

Water Colour: ______ Clear ______ Turbid ______ Blue/Green

______ Brown Yellowish Tint Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
Surface	17.0	7.66	6.64	
0.5	17.0	7.66		
1.0	17.0	7.66		
2.0	16.9	7.32		
3.0	16.8	7.27		
3.5	16.7	7.16		
4.0	15.8	5.64		
4.5	14.1	3.82		
5.0	12.8	0.10		
5.5	12.0	0.07		
6.0 *	11.9	0.05		
* Bottom				

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck ______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent ______ Other

Other Observations: ____________________

Surveyors Signature B. S. Hallet.

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac des Iles Mines Site

Watershed Name: Dog River Subwatershed.

Municipality: Thunder Bay, ONT.

PART B: SURVEY INFORMATION

Survey Date: 13 Aug 92 **Survey Time:** 11:00 A.m.

Survey Team: B. C. Hallant **and** M. Marchand

Air Temperature: ______ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): bright, partial cover.

Waterbody Surveyed: Hasson Lake

Location Sampled: West Basin - Stn HL3; Inlet from Second Pond; outlet from West Basin

Water Sample(s) Taken: ✓ **YES** ______ **NO**

Stn HL3

Water Sample Type: ______ **Top Metre** ✓ **Mid Depth** ______ **Bottom Metre**

______ **Composite (top, mid depth, bottom)**

______ **Other (specify)** ______

Water Colour: ______ **Clear** ______ **Turbid** ______ **Blue/Green**

______ **Brown** Yellowish **Other (Specify)**

Tnt

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
Stn HL3				
Surface	17.1	7.81	6.64	
0.5	16.9	7.83		
1.0	16.7	7.66		
1.5	16.1	7.10		
Inflow from Second Ponds (Below Rapids near Second Pond Outlet).				
.	16.1	7.10	6.22	
Outflow from West Basin				
	16.9	7.84	6.59	

Sediment Sample Taken: ________YES ________NO

Sediment Sample Characteristics: ________Clay ________Gravel ________Muck
________Sand ________Silt ________Other (specify)

Sediment Sample Colour: ________Black ________Brown ________Grey ________Other (specify)

Sediment Sample Odour: ________Not odourous ________Odourous

Vegetation: ________Emergent ________Floating ________Submergent ________Other

Other Observations: Outlet from Kerr Lake in West Basin measured ~ 2 m wide x 0.2 m deep and was flowing rapidly.

Surveyors Signature B. S. Holbert.

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT.

PART B: SURVEY INFORMATION

Survey Date: 13 Aug 92 **Survey Time:** 1:45 p.m.

Survey Team: R.S Halbert **and** M. Michaud

Air Temperature: ____ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): ____

Waterbody Surveyed: Second Pond Southwest of Tailings Management Facility.

Location Sampled: Stn SP4 - North Basin

Water Sample(s) Taken: ✓ YES ____ NO

Water Sample Type: ____ Top Metre ✓ Mid Depth ____ Bottom Metre
____ Composite (top, mid depth, bottom)
____ Other (specify) ____

Water Colour: ____ Clear ____ Turbid ____ Blue/Green
Yellowish Brown ____ Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (µmhos/cm)
Surface	16.9	6.69	6.40	
0.5	16.5	6.65		
1.0	16.3	6.05		
2.0	14.5	5.60		
3.0	11.8	0.22		
4.0	10.0	0.12		

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck
______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent ______ Other

Other Observations: ______

Surveyors Signature B E Holb

LAKE SURVEY FIELD NOTES

PART A: GENERAL INFORMATION

Project Number: 31121 - Lac des Iles Mines Ltd.

Project Name: Baseline Monitoring - Lac des Iles Mine Site

Watershed Name: Dog River Subwatershed

Municipality: Thunder Bay, ONT.

PART B: SURVEY INFORMATION

Survey Date: 13 Aug 92 **Survey Time:** 3:30 p.m.

Survey Team: B. S. Holbert and M. Michaud

Air Temperature: ________ **Precipitation:** ✓ none ___ rain ___ snow

Overcast Conditions (percent cloud cover): ________

Waterbody Surveyed: Lac des Iles

Location Sampled: LL1 - Bay North of Mine Lodge
LL2 - Angle Bay

Water Sample(s) Taken: ✓ YES ________ NO
from LL1

Water Sample Type: ____ Top Metre ____ Mid Depth ____ Bottom Metre
✓ Composite (top, ~~mid-depth~~, bottom)
____ Other (specify) ________

Water Colour: ____ Clear ____ Turbid ____ Blue/Green
____ Brown Light Yellowish Tinge. Other (Specify)

PART C: FIELD OBSERVATIONS AND NOTES

Depth (m)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	Field pH	Conductivity (umhos/cm)
Station LL1 Surface	18.9	8.38	7.33	
1.0	18.0	8.52		
2.0	17.6	8.50		
3.0	17.2	8.08		
4.0	15.5	5.00		
5.0	11.2	0.24		
6.0	9.0	0.13		
Station LL2 Surface	18.5	8.43	7.35	
1.0	18.4	8.47		
2.0	18.1	8.47		
3.0	17.3	8.37		
4.0	17.2	8.00		
5.0	17.0	7.75		
6.0	16.7	7.75		
7.0	14.1	5.56		
8.0	11.0	2.40		

Sediment Sample Taken: ______ YES ✓ NO

Sediment Sample Characteristics: ______ Clay ______ Gravel ______ Muck ______ Sand ______ Silt ______ Other (specify)

Sediment Sample Colour: ______ Black ______ Brown ______ Grey ______ Other (specify)

Sediment Sample Odour: ______ Not odourous ______ Odourous

Vegetation: ______ Emergent ______ Floating ______ Submergent ______ Other

Other Observations: ______

Surveyors Signature B. E. Halbert

APPENDIX C

SURFACE WATER CHEMICAL QUALITY DATA SETS

BARRINGER LABORATORIES

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
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FAX: (416) 890-8575

25-Mar-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Page: 1
Copy: 1 of 1
Set : 1

Attn: Ms. Trudi Collins
Project:
PO #:
Received: 6-Mar-92 11:25

Job: 924617
Status: Final

Sediment Samples

Sample Id	Ag ICAP ppm	Al ICAP ppm	Ba ICAP ppm	Be ICAP ppm	Ca ICAP ppm	Cd ICAP ppm	Co ICAP ppm
FIRST POND SOUTH OF TMA SEDIMENT	<0.2	5400	32.5	0.13	5630	1.3	2
SECOND POND SOUTH OF TMA SEDIMENT	<0.2	14300	117.	0.61	11800	0.7	13
HASSON LAKE NORTH SEDIMENT	<0.2	13400	62.5	0.39	5310	0.8	6
HASSON MID LAKE SEDIMENT	<0.2	10200	24.4	0.37	5020	<0.3	8
HASSON LAKE WEST SEDIMENT	<0.2	6920	25.4	0.19	3810	<0.3	5
CAMP LAKE NORTH #1 SEDIMENT	<0.2	15700	72.6	0.39	6150	0.9	5
CAMP LAKE NORTH #2 SEDIMENT	<0.2	16700	75.1	0.40	6710	0.7	4
CAMP LAKE MID STATION SEDIMENT	<0.2	17100	71.1	0.48	5230	0.8	12
Blank	<0.2	<10	<0.3	<0.02	<20	<0.3	<2
QC Standard (actual)	1.1	17100	149.	0.68	5820	0.5	28
QC Standard (expected)	1.5	16500	149.	0.73	5920	0.5	26
Repeat FIRST POND	<0.2	5320	32.6	0.13	5460	2.4	2

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25-Mar-92

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Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
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PO #:
Received: 6-Mar-92 11:25

Job: 924617
Status: Final

Sediment Samples

Sample Id	Cr ICAP ppm	Cu ICAP ppm	Fe ICAP ppm	K ICAP ppm	Mg ICAP ppm	Mn ICAP ppm	Mo ICAP ppm
FIRST POND SOUTH OF TMA SEDIMENT	13.8	36.0	4150.	340	1720.	102.	<3
SECOND POND SOUTH OF TMA SEDIMENT	22.6	50.9	21100.	370	2890.	146.	<3
HASSON LAKE NORTH SEDIMENT	22.8	56.9	13400.	400	1920.	179.	<3
HASSON MID LAKE SEDIMENT	13.9	11.2	17600.	320	2290.	226.	<3
HASSON LAKE WEST SEDIMENT	11.5	10.9	9380.	290	2120.	112.	<3
CAMP LAKE NORTH #1 SEDIMENT	23.2	63.6	12600.	410	2590.	233.	<3
CAMP LAKE NORTH #2 SEDIMENT	26.1	67.4	12300.	410	2670.	240.	<3
CAMP LAKE MID STATION SEDIMENT	24.5	61.5	19700.	420	2380.	410.	<3
Blank	<0.3	<0.3	<10.0	<20	<0.3	<0.3	<3
QC Standard (actual)	39.4	33.9	32100.	2580	7880.	1170.	<3
QC Standard (expected)	39.5	29.9	29500.	2480	7600.	1040.	<3
Repeat FIRST POND	14.0	37.1	3770.	320	1720.	102.	<3

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Received: 6-Mar-92 11:25

Job: 924617 Status: Final

Sediment Samples

Sample Id	Na ICAP ppm	Ni ICAP ppm	P ICAP ppm	Pb ICAP ppm	Sr ICAP ppm	Th ICAP ppm	Ti ICAP ppm
FIRST POND SOUTH OF TMA SEDIMENT	570	23	510	7	12.7	<2	82.1
SECOND POND SOUTH OF TMA SEDIMENT	300	31	700	9	21.2	6	361.
HASSON LAKE NORTH SEDIMENT	110	22	950	32	14.1	3	139.
HASSON MID LAKE SEDIMENT	940	17	440	3	14.6	4	486.
HASSON LAKE WEST SEDIMENT	520	15	320	6	10.7	3	436.
CAMP LAKE NORTH #1 SEDIMENT	340	23	1230	21	16.9	4	169.
CAMP LAKE NORTH #2 SEDIMENT	300	24	1320	16	17.8	4	199.
CAMP LAKE MID STATION SEDIMENT	260	30	1360	20	14.7	4	216.
Blank	<20	<2	<20	<2	<0.3	<2	<0.3
QC Standard (actual)	360	41	810	22	28.7	10	727.
QC Standard (expected)	350	39	700	23	26.8	11	732.
Repeat FIRST POND	580	24	500	7	12.8	2	78.0

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Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
Project:
PO #:
Received: 6-Mar-92 11:25

Job: 924617 Status: Final

Sediment Samples

Sample Id	V ICAP ppm	Zn ICAP ppm	Zr ICAP ppm	LOI Grav. %
FIRST POND SOUTH OF TMA SEDIMENT	9.8	29.0	<2	34.5
SECOND POND SOUTH OF TMA SEDIMENT	105.	87.4	9	36.7
HASSON LAKE NORTH SEDIMENT	54.4	74.7	4	35.8
HASSON MID LAKE SEDIMENT	75.1	57.6	3	4.30
HASSON LAKE WEST SEDIMENT	38.4	53.4	2	7.17
CAMP LAKE NORTH #1 SEDIMENT	49.9	64.7	5	34.8
CAMP LAKE NORTH #2 SEDIMENT	51.7	53.2	5	35.8
CAMP LAKE MID STATION SEDIMENT	65.0	86.3	6	29.1
Blank	<0.3	<0.5	<2	<0.01
QC Standard (actual)	43.1	123.	11	8.92
QC Standard (expected)	43.8	112.	13	9.13
Repeat FIRST POND	9.8	29.2	<2	36.2

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L4B 1G5

Attn: Ms. Trudi Collins
Project: PO #:

Received: 6-Mar-92 11:25

Job: 924617 Status: Final

Water Samples

Sample Id	Ag ICAP mg/L	Al ICAP mg/L	B ICAP mg/L	Ba ICAP mg/L	Be ICAP mg/L	Ca ICAP mg/L	Cd ICAP mg/L
#1-CAMP LAKE NORTH BASIN	<0.005	0.08	<0.010	<0.005	<0.0005	5.27	<0.005
#2-CAMP LAKE MID LAKE COMPOSITE	<0.005	0.10	<0.010	<0.005	<0.0005	5.41	<0.005
#3-FIRST POND SOUTH OF TMA	<0.005	0.32	<0.010	0.007	<0.0005	5.96	<0.005
#4-SECOND POND SOUTH OF TMA	<0.005	0.24	<0.010	0.006	<0.0005	4.98	<0.005
#5-HASSON LAKE NORTH SAMPLE	<0.005	0.12	<0.010	0.005	<0.0005	5.31	<0.005
#6-HASSON LAKE WEST BAY SAMPLE	<0.005	0.20	<0.010	0.006	<0.0005	5.28	<0.005
#7-HASSON LAKE MID LAKE SAMPLE	<0.005	0.11	<0.010	0.005	<0.0005	5.11	<0.005
#8-TAILINGS SECONDARY POND	<0.005	0.47	0.012	0.021	<0.0005	21.9	<0.005
#9-TAILINGS DECANT WATER	<0.005	0.57	0.011	0.016	<0.0005	32.2	<0.005
Blank	<0.005	<0.05	<0.010	<0.005	<0.0005	<0.05	<0.005
QC Standard (actual)	<0.005	10.0	0.193	0.998	0.0187	50.0	0.191
QC Standard (expected)	<0.005	10.0	0.200	1.00	0.0200	50.0	0.200
Repeat #1-CAMP LAKE NORTH	<0.005	0.09	<0.010	<0.005	<0.0005	5.21	<0.005

BARRINGER LABORATORIES

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25-Mar-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
Project: PO #:   Received: 6-Mar-92 11:25

Job: 924617   Status: Final

Water Samples

Sample Id	Co ICAP mg/L	Cr ICAP mg/L	Cu ICAP mg/L	Fe ICAP mg/L	K ICAP mg/L	Mg ICAP mg/L	Mn ICAP mg/L
#1-CAMP LAKE NORTH BASIN	<0.05	<0.01	<0.01	0.47	<1.0	2.48	0.01
#2-CAMP LAKE MID LAKE COMPOSITE	<0.05	<0.01	<0.01	0.52	<1.0	2.56	0.01
#3-FIRST POND SOUTH OF TMA	<0.05	<0.01	<0.01	1.27	2.4	3.11	0.18
#4-SECOND POND SOUTH OF TMA	<0.05	0.01	<0.01	6.51	<1.0	2.23	0.15
#5-HASSON LAKE NORTH SAMPLE	<0.05	0.01	<0.01	0.56	<1.0	2.35	0.02
#6-HASSON LAKE WEST BAY SAMPLE	<0.05	<0.01	<0.01	1.46	<1.0	2.23	0.11
#7-HASSON LAKE MID LAKE SAMPLE	<0.05	0.01	<0.01	0.51	<1.0	2.19	0.02
#8-TAILINGS SECONDARY POND	<0.05	0.01	0.01	6.57	6.1	11.6	2.65
#9-TAILINGS DECANT WATER	<0.05	0.01	0.01	4.75	6.2	16.1	1.68
Blank	<0.05	<0.01	<0.01	<0.01	<1.0	<0.05	<0.01
QC Standard (actual)	0.19	0.20	0.20	9.71	50.5	9.93	0.19
QC Standard (expected)	0.20	0.20	0.20	10.0	50.0	10.0	0.20
Repeat #1-CAMP LAKE NORTH	<0.05	<0.01	<0.01	0.46	<1.0	2.46	0.01

BARRINGER LABORATORIES

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25-Mar-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
Project: PO #:

Received: 6-Mar-92 11:25

Job: 924617 Status: Final

Water Samples

Sample Id	Mo ICAP mg/L	Na ICAP mg/L	Ni ICAP mg/L	P ICAP mg/L	Pb ICAP mg/L	Si ICAP mg/L	Sr ICAP mg/L
#1-CAMP LAKE NORTH BASIN	<0.2	1.1	<0.05	<0.5	<0.05	3.04	0.011
#2-CAMP LAKE MID LAKE COMPOSITE	<0.2	1.1	<0.05	<0.5	<0.05	3.23	0.012
#3-FIRST POND SOUTH OF TMA	<0.2	23.2	<0.05	<0.5	<0.05	9.45	0.013
#4-SECOND POND SOUTH OF TMA	<0.2	1.9	<0.05	<0.5	<0.05	7.96	0.012
#5-HASSON LAKE NORTH SAMPLE	<0.2	1.3	<0.05	<0.5	<0.05	3.38	0.012
#6-HASSON LAKE WEST BAY SAMPLE	<0.2	4.6	<0.05	<0.5	<0.05	6.21	0.013
#7-HASSON LAKE MID LAKE SAMPLE	<0.2	1.4	<0.05	<0.5	<0.05	3.26	0.012
#8-TAILINGS SECONDARY POND	<0.2	72.1	<0.05	<0.5	<0.05	10.4	0.052
#9-TAILINGS DECANT WATER	<0.2	74.5	<0.05	<0.5	<0.05	14.5	0.072
Blank	<0.2	<0.5	<0.05	<0.5	<0.05	<0.05	<0.001
QC Standard (actual)	0.5	50.8	0.20	9.9	0.19	10.0	0.197
QC Standard (expected)	0.5	50.0	0.20	10.0	0.20	10.0	0.200
Repeat #1-CAMP LAKE NORTH	<0.2	1.1	<0.05	<0.5	<0.05	3.03	0.011

BARRINGER LABORATORIES

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25-Mar-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
Project:
PO #:
Received: 6-Mar-92 11:25

Job: 924617
Status: Final

Water Samples

Sample Id	Ti ICAP mg/L	V ICAP mg/L	Zn ICAP mg/L	F- IC mg/L	Cl- IC mg/L	NO2-N IC mg/L	PO4-3 IC mg/L
#1-CAMP LAKE NORTH BASIN	<0.005	<0.005	<0.01	<0.10	0.61	<0.02	<0.1
#2-CAMP LAKE MID LAKE COMPOSITE	<0.005	<0.005	<0.01	<0.10	0.54	<0.02	<0.1
#3-FIRST POND SOUTH OF TMA	0.005	<0.005	<0.01	<0.10	3.39	<0.02	<0.1
#4-SECOND POND SOUTH OF TMA	<0.005	<0.005	0.02	<0.10	0.35	<0.02	<0.1
#5-HASSON LAKE NORTH SAMPLE	<0.005	<0.005	<0.01	<0.10	0.51	<0.02	<0.1
#6-HASSON LAKE WEST BAY SAMPLE	<0.005	<0.005	<0.01	<0.10	0.96	<0.02	<0.1
#7-HASSON LAKE MID LAKE SAMPLE	<0.005	<0.005	<0.01	<0.10	0.52	<0.02	<0.1
#8-TAILINGS SECONDARY POND	0.011	0.008	<0.01	<0.10	11.2	<0.02	0.3
#9-TAILINGS DECANT WATER	0.011	<0.005	<0.01	<1.00	10.8	<0.02	0.2
Blank	<0.005	<0.005	<0.01	<0.10	<0.01	<0.02	<0.1
QC Standard (actual)	0.196	0.198	0.19	0.44	2.01	0.99	2.0
QC Standard (expected)	0.200	0.200	0.20	0.46	2.00	1.00	2.0
Repeat #1-CAMP LAKE NORTH	<0.005	<0.005	<0.01	<0.10	0.63	<0.02	<0.1

BARRINGER LABORATORIES

5735 McADAM ROAD
MISSISSAUGA, ONTARIO
CANADA L4Z 1N9
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25-Mar-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
Project:
PO #:
Received: 6-Mar-92 11:25

Job: 924617
Status: Final

Water Samples

Sample Id	Br- IC mg/L	NO3-N IC mg/L	SO4= IC mg/L	pH pH Elec. pH Units	Alk 8.3 Titr. 1 mg CaCO3/L	Alk 4.2 Titr. 1 mg CaCO3/L
#1-CAMP LAKE NORTH BASIN	<0.05	0.15	2.11	7.14	<0.1	21.2
#2-CAMP LAKE MID LAKE COMPOSITE	<0.05	0.16	2.03	7.00	<0.1	21.3
#3-FIRST POND SOUTH OF TMA	<0.05	0.06	1.46	7.18	<0.1	64.9
#4-SECOND POND SOUTH OF TMA	<0.05	0.07	1.27	6.93	<0.1	22.9
#5-HASSON LAKE NORTH SAMPLE	<0.05	0.20	2.12	6.94	<0.1	20.3
#6-HASSON LAKE WEST BAY SAMPLE	<0.05	0.10	1.68	6.91	<0.1	26.6
#7-HASSON LAKE MID LAKE SAMPLE	<0.05	0.19	2.06	6.91	<0.1	20.3
#8-TAILINGS SECONDARY POND	0.11	<0.02	1.44	7.34	<0.1	250.
#9-TAILINGS DECANT WATER	0.10	<0.02	1.24	7.36	<0.1	309.
Blank	<0.05	<0.02	<0.05	5.68	<0.1	<0.1
QC Standard (actual)	1.88	0.45	2.00	4.47	<0.1	244.
QC Standard (expected)	2.00	0.44	2.00	4.45	<0.1	250.
Repeat #1-CAMP LAKE NORTH	<0.05	0.16	2.04	7.11	<0.1	21.0

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Attn: Ms. Trudi Collins
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Received: 6-Mar-92 11:25

Job: 924617
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Water Samples

Sample Id	NH3-N A. Col. mg/L	Ortho P A. Col. mg/L	DOC A. Col. mg/L	Th. Cond. Calc. umhos/cm	Th. TDS Calc. mg/L	pHs Calc. pH Units	CAB Calc. %
#1-CAMP LAKE NORTH BASIN	0.02	<0.01	18.9	51.4	33	9.28	-4.02
#2-CAMP LAKE MID LAKE COMPOSITE	<0.02	<0.01	15.6	51.9	34	9.27	-5.28
#3-FIRST POND SOUTH OF TMA	0.18	<0.01	4.9	148.1	96	8.79	-6.64
#4-SECOND POND SOUTH OF TMA	0.18	<0.01	17.2	50.9	33	9.29	-4.48
#5-HASSON LAKE NORTH SAMPLE	0.02	<0.01	18.8	50.6	33	9.31	-5.68
#6-HASSON LAKE WEST BAY SAMPLE	0.11	<0.01	15.5	62.7	41	9.19	-5.89
#7-HASSON LAKE MID LAKE SAMPLE	<0.02	<0.01	18.7	49.6	32	9.32	-4.15
#8-TAILINGS SECONDARY POND	1.91	0.06	16.3	515.0	335	7.73	-1.17
#9-TAILINGS DECANT WATER	2.60	0.05	28.0	616.5	401	7.48	0.29
Blank	<0.02	<0.01	<0.2	3.8	2	13.64	-64.40
QC Standard (actual)	0.11	0.38	10.1	592.0	385	7.41	-15.09
QC Standard (expected)	0.10	0.40	10.0	594.6	386	7.37	-13.64
Repeat #1-CAMP LAKE NORTH	0.02	<0.01	18.2	50.8	33	9.28	-3.82

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25-Mar-92

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Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Trudi Collins
Project:

PO #:

Received: 6-Mar-92 11:25

Job: 924617

Status: Final

Water Samples

Sample Id	Hard(Calc) Calc. mg CaCO3/L	CO3= Calc. mg/L	HCO3- Calc. mg/L	L.I. Calc. None	A.I. Calc. None	R.S.I. Calc. None	Colour M. Col. TCU
#1-CAMP LAKE NORTH BASIN	23.4	0.1	25.6	-2.1	9.84	11.4	130.
#2-CAMP LAKE MID LAKE COMPOSITE	24.1	0.1	25.7	-2.3	9.71	11.5	130.
#3-FIRST POND SOUTH OF TMA	27.7	0.1	78.9	-1.6	10.43	10.4	379.
#4-SECOND POND SOUTH OF TMA	21.6	0.1	27.7	-2.4	9.62	11.6	210.
#5-HASSON LAKE NORTH SAMPLE	23.0	0.1	24.5	-2.4	9.61	11.7	135.
#6-HASSON LAKE WEST BAY SAMPLE	22.4	0.1	32.2	-2.3	9.68	11.5	227.
#7-HASSON LAKE MID LAKE SAMPLE	21.8	0.1	24.5	-2.4	9.56	11.7	139.
#8-TAILINGS SECONDARY POND	102.6	0.1	304.6	-0.4	11.75	8.1	352.
#9-TAILINGS DECANT WATER	147.1	0.1	376.5	-0.1	12.02	7.6	285.
Blank	0.3	0.1	0.0	-8.0	4.20	21.6	---
QC Standard (actual)	166.0	0.1	297.4	-2.9	9.08	10.3	50.0
QC Standard (expected)	166.0	0.1	304.6	-2.9	9.07	10.3	50.0
Repeat #1-CAMP LAKE NORTH	23.1	0.1	25.4	-2.2	9.80	11.5	130.

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Attn: Ms. Trudi Collins
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Received: 6-Mar-92 11:25

Job: 924617 Status: Final

Water Samples

Sample Id	Cd GFAAS mg/L	Cu ICAP mg/L	Ni ICAP mg/L	Pb ICAP mg/L	Total P A. Col. mg/L
#1-CAMP LAKE NORTH BASIN	0.0010	0.009	<0.01	<0.01	0.011
#2-CAMP LAKE MID LAKE COMPOSITE	0.0001	0.006	<0.01	<0.01	0.011
#3-FIRST POND SOUTH OF TMA	0.0001	0.007	0.01	<0.01	0.080
#4-SECOND POND SOUTH OF TMA	0.0001	0.004	<0.01	<0.01	0.060
#5-HASSON LAKE NORTH SAMPLE	<0.0001	0.003	<0.01	<0.01	0.012
#6-HASSON LAKE WEST BAY SAMPLE	<0.0001	0.002	<0.01	<0.01	0.022
#7-HASSON LAKE MID LAKE SAMPLE	<0.0001	0.003	<0.01	<0.01	0.012
#8-TAILINGS SECONDARY POND	0.0004	0.014	0.06	<0.01	0.290
#9-TAILINGS DECANT WATER	0.0002	0.015	0.04	<0.01	0.240
Blank	<0,0001	<0.002	<0.01	<0.01	<0.002
QC Standard (actual)	0.0024	0.197	0.20	0.20	0.081
QC Standard (expected)	0.0025	0.200	0.20	0.20	0.084
Repeat #1-CAMP LAKE NORTH	0.0010	---	---	---	0.011

Job approved by:

Signed: ....
Mike Muneswar
Senior Supervisor, Environmental Analytical Services

BARRINGER LABORATORIES

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26-Jun-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Mr. Prohibta Gupta
Project:
PO #:
Received: 4-Jun-92 13:36

Job: 925572 Status: Final

Water Samples

Sample Id	Ag ICAP mg/L	Al ICAP mg/L	B ICAP mg/L	Ba ICAP mg/L	Be ICAP mg/L	Ca ICAP mg/L	Cd ICAP mg/L
CAMP LAKE STA.1 MAY 29/92	<0.001	0.09	<0.01	<0.005	<0.0005	4.56	<0.005
CAMP LAKE STA.2 MAY 29/92	<0.001	0.10	<0.01	<0.005	<0.0005	4.55	<0.005
HASSON LAKE STA.1 MAY 29/92	<0.001	0.10	<0.01	<0.005	<0.0005	4.37	<0.005
HASSON LAKE STA.2 MAY 29/92	<0.001	0.11	<0.01	<0.005	<0.0005	4.18	<0.005
HASSON LAKE STA.3 MAY 29/92	<0.001	0.10	<0.01	<0.005	<0.0005	4.08	<0.005
FIRST POND-LAC DES ISLE MAY 31/92	<0.001	0.11	<0.01	<0.005	<0.0005	4.28	<0.005
SECOND POND MAY 30/92	<0.001	0.15	<0.01	<0.005	<0.0005	3.17	<0.005
TAILINGS DECANT WATER MAY 29/92	<0.001	0.73	<0.01	<0.005	<0.0005	12.8	<0.005
TAILINGS SECONDARY POND MAY 29/92	<0.001	0.10	<0.01	<0.005	<0.0005	10.7	<0.005
Blank	<0.001	<0.05	<0.01	<0.005	<0.0005	<0.05	<0.005
QC Standard (actual)	0.812	10.1	0.20	0.983	0.0183	50.4	0.212
QC Standard (expected)	1.00	10.0	0.20	1.00	0.0200	50.0	0.200
Repeat CAMP LAKE STA.1	<0.001	0.09	<0.01	<0.005	<0.0005	4.46	<0.005

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26-Jun-92

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52 West Beaver Creek
Unit #4
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L4B 1G5

Attn: Mr. Prohibta Gupta
Project: PO #:

Received: 4-Jun-92 13:36

Job: 925572 Status: Final

Water Samples

Sample Id	Co ICAP mg/L	Cr ICAP mg/L	Cu ICAP mg/L	Fe ICAP mg/L	K ICAP mg/L	Mg ICAP mg/L	Mn ICAP mg/L
CAMP LAKE STA.1 MAY 29/92	<0.01	<0.01	<0.002	0.31	<1.0	2.30	0.01
CAMP LAKE STA.2 MAY 29/92	<0.01	<0.01	<0.002	0.36	<1.0	2.30	0.02
HASSON LAKE STA.1 MAY 29/92	<0.01	<0.01	<0.002	0.30	<1.0	1.96	<0.01
HASSON LAKE STA.2 MAY 29/92	<0.01	<0.01	<0.002	0.34	<1.0	1.84	<0.01
HASSON LAKE STA.3 MAY 29/92	<0.01	<0.01	<0.002	0.29	<1.0	1.80	<0.01
FIRST POND-LAC DES ISLE MAY 31/92	<0.01	<0.01	0.003	0.22	1.8	2.37	<0.01
SECOND POND MAY 30/92	<0.01	<0.01	<0.002	0.25	<1.0	1.56	<0.01
TAILINGS DECANT WATER MAY 29/92	<0.01	<0.01	0.037	0.93	2.3	6.10	0.03
TAILINGS SECONDARY POND MAY 29/92	<0.01	<0.01	0.013	1.00	2.9	5.60	0.01
Blank	<0.01	<0.01	<0.002	<0.01	<1.0	<0.05	<0.01
QC Standard (actual)	0.20	0.20	0.201	9.53	9.7	8.02	0.20
QC Standard (expected)	0.20	0.20	0.200	10.0	10.0	8.00	0.20
Repeat CAMP LAKE STA.1	<0.01	<0.01	<0.002	0.30	<1.0	2.26	0.01

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26-Jun-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Mr. Prohibta Gupta
Project:

PO #:

Received: 4-Jun-92 13:36

Job: 925572

Status: Final

Water Samples

Sample Id	Mo ICAP mg/L	Na ICAP mg/L	Ni ICAP mg/L	P ICAP mg/L	Pb ICAP mg/L	Si ICAP mg/L	Sr ICAP mg/L
CAMP LAKE STA.1 MAY 29/92	<0.1	1.4	<0.01	<0.1	<0.01	3.76	0.008
CAMP LAKE STA.2 MAY 29/92	<0.1	1.0	<0.01	<0.1	<0.01	3.77	0.008
HASSON LAKE STA.1 MAY 29/92	<0.1	1.7	<0.01	<0.1	<0.01	3.37	0.008
HASSON LAKE STA.2 MAY 29/92	<0.1	1.5	<0.01	<0.1	<0.01	3.47	0.008
HASSON LAKE STA.3 MAY 29/92	<0.1	1.6	<0.01	<0.1	<0.01	3.20	0.007
FIRST POND-LAC DES ISLE MAY 31/92	<0.1	10.4	<0.01	<0.1	<0.01	2.22	0.008
SECOND POND MAY 30/92	<0.1	3.2	<0.01	<0.1	<0.01	2.33	0.006
TAILINGS DECANT WATER MAY 29/92	<0.1	20.1	0.04	<0.1	<0.01	3.85	0.025
TAILINGS SECONDARY POND MAY 29/92	<0.1	23.8	0.01	<0.1	0.01	4.25	0.022
Blank	<0.1	<0.1	<0.01	<0.1	<0.01	<0.05	<0.001
QC Standard (actual)	0.5	51.2	0.19	9.9	0.22	10.0	0.199
QC Standard (expected)	0.5	50.0	0.20	10.0	0.20	10.0	0.200
Repeat CAMP LAKE STA.1	<0.1	1.1	<0.01	<0.1	<0.01	3.64	0.008

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26-Jun-92

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Job: 925572 Status: Final

Water Samples

Sample Id	Ti ICAP mg/L	V ICAP mg/L	Zn ICAP mg/L	F- IC mg/L	Cl- IC mg/L	NO2-N IC mg/L	PO4-3 IC mg/L
CAMP LAKE STA.1 MAY 29/92	<0.005	<0.005	<0.01	<0.1	0.66	<0.02	<0.1
CAMP LAKE STA.2 MAY 29/92	<0.005	<0.005	<0.01	<0.1	0.64	<0.02	<0.1
HASSON LAKE STA.1 MAY 29/92	<0.005	<0.005	<0.01	<0.1	0.54	<0.02	<0.1
HASSON LAKE STA.2 MAY 29/92	<0.005	<0.005	<0.01	<0.1	0.51	<0.02	<0.1
HASSON LAKE STA.3 MAY 29/92	<0.005	<0.005	<0.01	<0.1	0.54	<0.02	<0.1
FIRST POND-LAC DES ISLE MAY 31/92	<0.005	<0.005	<0.01	<0.1	1.43	<0.02	<0.1
SECOND POND MAY 30/92	<0.005	<0.005	<0.01	<0.1	0.49	<0.02	<0.1
TAILINGS DECANT WATER MAY 29/92	0.005	<0.005	<0.01	<0.1	2.48	<0.02	<0.1
TAILINGS SECONDARY POND MAY 29/92	<0.005	<0.005	<0.01	<0.1	3.70	<0.02	<0.1
Blank	<0.005	<0.005	<0.01	<0.1	<0.01	<0.02	<0.1
QC Standard (actual)	0.200	0.201	0.21	0.6	2.11	1.07	2.0
QC Standard (expected)	0.200	0.200	0.20	0.6	2.00	1.00	2.0
Repeat CAMP LAKE STA.1	<0.005	<0.005	<0.01	<0.1	0.67	<0.02	<0.1

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26-Jun-92

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L4B 1G5

Attn: Mr. Prohibta Gupta
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Received: 4-Jun-92 13:36

Job: 925572
Status: Final

Water Samples

Sample Id	Br- IC mg/L	NO3-N IC mg/L	SO4= IC mg/L	pH pH Elec. pH Units	Alk 8.3 Titr. 1 mg CaCO3/L	Alk 4.2 Titr. 1 mg CaCO3/L
CAMP LAKE STA.1 MAY 29/92	<0.05	0.16	2.59	6.55	<0.1	14.9
CAMP LAKE STA.2 MAY 29/92	<0.05	0.18	2.03	6.68	<0.1	15.4
HASSON LAKE STA.1 MAY 29/92	<0.05	0.15	1.91	6.64	<0.1	14.8
HASSON LAKE STA.2 MAY 29/92	<0.05	0.16	1.80	6.51	<0.1	14.1
HASSON LAKE STA.3 MAY 29/92	<0.05	0.12	1.78	6.82	<0.1	14.5
FIRST POND-LAC DES ISLE MAY 31/92	<0.05	<0.02	1.33	6.94	<0.1	34.6
SECOND POND MAY 30/92	<0.05	0.05	1.32	6.68	<0.1	14.3
TAILINGS DECANT WATER MAY 29/92	<0.05	<0.02	5.82	7.74	<0.1	83.8
TAILINGS SECONDARY POND MAY 29/92	<0.05	<0.02	2.90	7.06	<0.1	88.8
Blank	<0.05	<0.02	<0.05	5.20	<0.1	1.0
QC Standard (actual)	2.00	0.44	2.05	4.45	<0.1	49.9
QC Standard (expected)	2.00	0.44	2.00	4.45	<0.1	50.0
Repeat CAMP LAKE STA.1	<0.05	0.17	2.50	6.63	<0.1	15.2

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26-Jun-92

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L4B 1G5

Attn: Mr. Prohibta Gupta
Project:
PO #:
Received: 4-Jun-92 13:36

Job: 925572
Status: Final

Water Samples

Sample Id	NH3-N A. Col. mg/L	Ortho P A. Col. mg/L	DOC A. Col. mg/L	Th. Cond. Calc. umhos/cm	Th. TDS Calc. mg/L	pHs Calc. pH Units	CAB Calc. %
CAMP LAKE STA.1 MAY 29/92	0.05	<0.02	15.5	44.8	29	9.50	-13.26
CAMP LAKE STA.2 MAY 29/92	<0.02	<0.02	14.3	43.5	28	9.48	-11.38
HASSON LAKE STA.1 MAY 29/92	<0.02	<0.02	14.1	42.2	27	9.52	-13.38
HASSON LAKE STA.2 MAY 29/92	<0.02	<0.02	14.4	40.2	26	9.56	-12.91
HASSON LAKE STA.3 MAY 29/92	<0.02	<0.02	14.4	40.2	26	9.56	-11.72
FIRST POND-LAC DES ISLE MAY 31/92	<0.02	<0.02	22.0	81.1	53	9.17	-8.38
SECOND POND MAY 30/92	<0.02	<0.02	17.8	38.8	25	9.67	-14.74
TAILINGS DECANT WATER MAY 29/92	<0.02	<0.02	15.8	191.1	124	8.36	-5.28
TAILINGS SECONDARY POND MAY 29/92	<0.02	<0.02	18.2	195.3	127	8.41	-3.90
Blank	<0.02	<0.02	<0.2	3.7	2	12.61	-15.14
QC Standard (actual)	0.09	0.12	9.7	342.5	223	8.05	-65.94
QC Standard (expected)	0.10	0.12	10.0	339.0	220	8.05	-65.62
Repeat CAMP LAKE STA.1	0.05	<0.02	15.2	44.1	29	9.50	-10.72

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26-Jun-92

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Richmond Hill, ON
L4B 1G5

Attn: Mr. Prohibta Gupta
Project:
PO #:
Received: 4-Jun-92 13:36

Job: 925572
Status: Final

Water Samples

Sample Id	Hard(Calc) Calc. mg CaCO3/L	CO3= Calc. mg/L	HCO3- Calc. mg/L	L.I. Calc. None	A.I. Calc. None	R.S.I. Calc. None
CAMP LAKE STA.1 MAY 29/92	20.8	0.1	17.9	-2.9	9.04	12.4
CAMP LAKE STA.2 MAY 29/92	20.8	0.1	18.5	-2.8	9.19	12.3
HASSON LAKE STA.1 MAY 29/92	19.0	0.1	17.8	-2.9	9.09	12.4
HASSON LAKE STA.2 MAY 29/92	18.0	0.1	16.9	-3.0	8.92	12.6
HASSON LAKE STA.3 MAY 29/92	17.6	0.1	17.4	-2.7	9.23	12.3
FIRST POND-LAC DES ISLE MAY 31/92	20.4	0.1	41.9	-2.2	9.79	11.4
SECOND POND MAY 30/92	14.3	0.1	17.2	-3.0	8.99	12.7
TAILINGS DECANT WATER MAY 29/92	57.2	0.0	102.0	-0.6	11.42	9.0
TAILINGS SECONDARY POND MAY 29/92	49.8	0.1	108.0	-1.4	10.71	9.8
Blank	0.3	0.1	1.0	-7.4	4.72	20.0
QC Standard (actual)	159.1	0.1	60.6	-3.6	8.35	11.6
QC Standard (expected)	157.8	0.1	60.7	-3.6	8.35	11.7
Repeat CAMP LAKE STA.1	20.5	0.1	18.3	-2.9	9.12	12.4

BARRINGER LABORATORIES

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26-Jun-92

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Richmond Hill, ON
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Attn: Mr. Prohibta Gupta
Project:
PO #:
Received: 4-Jun-92 13:36

Job: 925572
Status: Final

Water Samples

Sample Id	Cd-GFAAS GFAAS mg/L	Total P A. Col. mg/L	Colour M. Col. TCU
CAMP LAKE STA.1 MAY 29/92	0.0002	0.011	124
CAMP LAKE STA.2 MAY 29/92	0.0001	0.016	130
HASSON LAKE STA.1 MAY 29/92	0.0001	0.008	128
HASSON LAKE STA.2 MAY 29/92	0.0001	0.011	138
HASSON LAKE STA.3 MAY 29/92	0.0001	0.013	136
FIRST POND-LAC DES ISLE MAY 31/92	0.0001	0.033	216
SECOND POND MAY 30/92	0.0001	0.016	128
TAILINGS DECANT WATER MAY 29/92	0.0001	0.059	120
TAILINGS SECONDARY POND MAY 29/92	0.0002	0.088	126
Blank	<0.0001	<0.002	<1
QC Standard (actual)	0.0026	0.085	50
QC Standard (expected)	0.0025	0.084	50
Repeat CAMP LAKE STA.1	0.0001	0.012	124

Job approved by:

Signed: ....

Agnes Love, B.Sc.
Manager, Environmental Inorganic Services

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26-Jun-92

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Attn: Mr. Prohibta Gupta
Project:
PO #:
Received: 4-Jun-92 13:36

Job: 925572
Status: Final

fish

Sample Id	Hg CVAAS ppb
CAMP LAKE NP1	1610
CAMP LAKE NP2	1560
CAMP LAKE NP3	1230
CAMP LAKE NP4	1990
CAMP LAKE NP5	2040
CAMP LAKE NP6	1410
CAMP LAKE NP7	2030
CAMP LAKE NP8	1440
CAMP LAKE NP9	1740
CAMP LAKE NP10	1760
HASSON LAKE NP1	1390
HASSON LAKE NP2	1360
HASSON LAKE NP3	670
HASSON LAKE NP4	540
HASSON LAKE NP5	590
HASSON LAKE NP6	620
HASSON LAKE NP7	1270
HASSON LAKE NP8	1190
HASSON LAKE NP9	1110
HASSON LAKE NP10	750

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26-Jun-92

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Attn: Mr. Prohibta Gupta
Project:
PO #:
Received: 4-Jun-92 13:36

Job: 925572 Status: Final

fish

Sample Id	Hg CVAAS ppb
SECOND POND NP1	960
SECOND POND NP2	1170
SECOND POND NP3	750
SECOND POND NP4	610
SECOND POND NP5	220
SECOND POND NP6	230
SECOND POND NP7	260
SECOND POND NP8	700
SECOND POND NP9	730
SECOND POND NP10	390
Blank	<10
QC Standard (actual)	54
QC Standard (expected)	57
Repeat CAMP LAKE NP1	1580

Job approved by:

Signed: ....
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9-Nov-92

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L4B 1G5

Attn: Ms. Protibha Gupta
Project: 31121-0
PO #:
Received: 14-Aug-92 13:38

Job: 926442
Status: Final

Water Samples

Sample Id	Ag ICAP mg/L	Al ICAP mg/L	B ICAP mg/L	Ba ICAP mg/L	Be ICAP mg/L	Ca ICAP mg/L	Cd ICAP mg/L
STN# FP1	<0.005	0.15	<0.010	0.006	<0.0005	5.85	<0.005
STN# CL1	<0.005	0.10	<0.010	<0.005	<0.0005	4.38	<0.005
STN# CL2	<0.005	0.11	<0.010	<0.005	<0.0005	4.37	<0.005
STN# HL1	<0.005	0.10	0.017	<0.005	<0.0005	4.05	<0.005
STN# HL2	<0.005	0.10	<0.010	<0.005	<0.0005	4.00	<0.005
STN# HL3	<0.005	0.11	<0.010	<0.005	<0.0005	4.10	<0.005
TAILINGS DECANT POND	<0.005	0.67	0.021	0.007	<0.0005	18.5	<0.005
TAILINGS SEDIMENTATION POND	<0.005	0.13	0.020	0.014	<0.0005	14.4	<0.005
BY NEAR LODGE COMPOSITE	<0.005	<0.05	0.015	0.007	<0.0005	5.29	<0.005
STN# SP1	<0.005	0.15	<0.010	<0.005	<0.0005	4.02	<0.005
Blank	<0.005	<0.05	<0.010	<0.005	<0.0005	<0.05	<0.005
QC Standard (actual)	0.026	10.1	0.215	1.01	0.0184	50.6	0.196
QC Standard (expected)	0.020	10.0	0.200	1.00	0.0190	50.0	0.200
Repeat STN# FP1	<0.005	0.15	0.012	0.006	<0.0005	5.90	<0.005

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Attn: Ms. Protibha Gupta
Project: 31121-0
PO #:
Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	Co ICAP mg/L	Cr ICAP mg/L	Cu ICAP mg/L	Fe ICAP mg/L	K ICAP mg/L	Mg ICAP mg/L	Mn ICAP mg/L
STN# FP1	<0.01	<0.01	<0.01	0.68	1.4	3.28	0.13
STN# CL1	<0.01	<0.01	<0.01	0.35	<1.0	2.26	0.02
STN# CL2	<0.01	<0.01	<0.01	0.43	<1.0	2.24	0.04
STN# HL1	<0.01	<0.01	<0.01	0.38	<1.0	1.82	0.01
STN# HL2	<0.01	<0.01	<0.01	0.39	<1.0	1.81	0.01
STN# HL3	<0.01	<0.01	<0.01	0.40	<1.0	1.86	0.01
TAILINGS DECANT POND	<0.01	<0.01	0.02	1.34	3.7	9.17	0.05
TAILINGS SEDIMENTATION POND	<0.01	<0.01	<0.01	4.03	4.2	7.83	1.15
BY NEAR LODGE COMPOSITE	<0.01	<0.01	<0.01	0.10	<1.0	2.77	<0.01
STN# SP1	<0.01	<0.01	<0.01	0.55	<1.0	1.93	0.02
Blank	<0.01	<0.01	<0.01	<0.01	<1.0	<0.05	<0.01
QC Standard (actual)	0.20	0.20	0.20	9.95	10.1	8.03	0.20
QC Standard (expected)	0.20	0.20	0.20	10.0	10.0	8.00	0.20
Repeat STN# FP1	<0.01	<0.01	<0.01	0.67	1.4	3.26	0.13

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Attn: Ms. Protibha Gupta
Project: 31121-0
PO #:
Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	Mo ICAP mg/L	Na ICAP mg/L	Ni ICAP mg/L	P ICAP mg/L	Pb ICAP mg/L	Si ICAP mg/L	Sr ICAP mg/L
STN# FP1	<0.1	9.9	<0.05	<0.1	<0.05	2.60	0.012
STN# CL1	<0.1	1.0	<0.05	<0.1	<0.05	2.74	0.009
STN# CL2	<0.1	1.0	<0.05	<0.1	<0.05	2.86	0.009
STN# HL1	<0.1	1.6	<0.05	<0.1	<0.05	1.67	0.008
STN# HL2	<0.1	1.6	<0.05	<0.1	<0.05	1.62	0.008
STN# HL3	<0.1	1.8	<0.05	<0.1	<0.05	1.63	0.008
TAILINGS DECANT POND	<0.1	28.0	<0.05	<0.1	<0.05	2.93	0.042
TAILINGS SEDIMENTATION POND	<0.1	29.0	<0.05	0.1	<0.05	3.93	0.035
BY NEAR LODGE COMPOSITE	<0.1	0.7	<0.05	<0.1	<0.05	1.95	0.008
STN# SP1	<0.1	3.6	<0.05	<0.1	<0.05	2.23	0.009
Blank	<0.1	<0.1	<0.05	<0.1	<0.05	<0.05	<0.001
QC Standard (actual)	0.5	51.0	0.20	10.3	0.20	10.6	0.976
QC Standard (expected)	0.5	50.0	0.20	10.0	0.20	10.0	1.00
Repeat STN# FP1	<0.1	10.0	<0.05	<0.1	<0.05	2.64	0.012

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Attn: Ms. Protibha Gupta
Project: 31121-0
PO #:
Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	Ti ICAP mg/L	V ICAP mg/L	Zn ICAP mg/L	F- IC mg/L	Cl- IC mg/L	NO2-N A. Col. mg/L	PO4-3 IC mg/L
STN# FP1	<0.005	<0.005	<0.01	<0.10	0.77	<0.020	<0.1
STN# CL1	<0.005	<0.005	<0.01	<0.10	0.58	<0.020	<0.1
STN# CL2	<0.005	<0.005	<0.01	<0.10	0.58	<0.020	<0.1
STN# HL1	<0.005	<0.005	<0.01	<0.10	0.38	<0.020	<0.1
STN# HL2	<0.005	<0.005	<0.01	<0.10	0.41	<0.020	<0.1
STN# HL3	<0.005	<0.005	<0.01	<0.10	0.40	<0.020	<0.1
TAILINGS DECANT POND	0.006	<0.005	<0.01	<0.10	2.65	<0.020	<0.1
TAILINGS SEDIMENTATION POND	<0.005	<0.005	0.03	<0.10	3.24	<0.020	<0.1
BY NEAR LODGE COMPOSITE	<0.005	<0.005	0.02	<0.10	0.29	<0.020	<0.1
STN# SP1	<0.005	<0.005	<0.01	<0.10	0.40	<0.020	<0.1
Blank	<0.005	<0.005	<0.01	<0.10	<0.01	<0.020	<0.1
QC Standard (actual)	0.202	0.206	0.20	0.60	2.08	1.07	1.9
QC Standard (expected)	0.200	0.200	0.20	0.60	2.00	1.00	2.0
Repeat STN# FP1	<0.005	<0.005	<0.01	<0.10	0.76	<0.020	<0.1

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9-Nov-92

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Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Protibha Gupta
Project: 31121-0
PO #:
Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	Br- IC mg/L	NO3-N IC mg/L	SO4= IC mg/L	pH pH Elec. pH Units	Alk 8.3 Titr. 1 mg CaCO3/L	Alk 4.2 Titr. 1 mg CaCO3/L	NH3-N A. Col. mg/L
STN# FP1	<0.05	0.03	0.49	6.48	<0.1	40.6	0.04
STN# CL1	<0.05	0.05	1.97	6.41	<0.1	16.6	<0.02
STN# CL2	<0.05	0.07	1.95	6.22	<0.1	16.4	<0.02
STN# HL1	<0.05	<0.02	1.67	6.26	<0.1	16.2	<0.02
STN# HL2	<0.05	<0.02	1.72	6.24	<0.1	15.8	<0.02
STN# HL3	<0.05	<0.02	1.54	6.12	<0.1	16.4	<0.02
TAILINGS DECANT POND	<0.05	<0.02	2.82	7.29	<0.1	135.	<0.02
TAILINGS SEDIMENTATION POND	<0.05	<0.02	0.48	7.07	<0.1	125.	0.80
BY NEAR LODGE COMPOSITE	<0.05	<0.02	2.07	6.38	<0.1	22.6	<0.02
STN# SP1	<0.05	<0.02	0.74	6.35	<0.1	20.2	0.05
Blank	<0.05	<0.02	<0.05	4.97	<0.1	1.8	<0.02
QC Standard (actual)	1.96	0.44	2.06	4.46	<0.1	49.5	0.53
QC Standard (expected)	2.00	0.44	2.00	4.45	<0.1	50.0	0.50
Repeat STN# FP1	<0.05	0.03	0.42	6.52	<0.1	39.9	0.06

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Attn: Ms. Protibha Gupta
Project: 31121-0 PO #:
Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	Ortho P A. Col. mg/L	DOC A. Col. mg/L	Th. Cond. Calc. umhos/cm	Th. TDS Calc. mg/L	pHs Calc. pH Units	CAB Calc. %	Hard(Calc) Calc. mg CaCO3/L
STN# FP1	0.008	29.0	89.6	58	8.94	-9.58	28.1
STN# CL1	0.004	15.3	43.1	28	9.44	-8.64	20.2
STN# CL2	0.004	15.3	42.9	28	9.44	-8.76	20.1
STN# HL1	0.004	15.1	40.5	26	9.48	-8.78	17.6
STN# HL2	0.008	15.1	40.2	26	9.50	-9.19	17.5
STN# HL3	0.004	16.5	41.3	27	9.47	-10.28	17.9
TAILINGS DECANT POND	0.006	21.4	278.3	181	8.00	-2.53	84.2
TAILINGS SEDIMENTATION POND	0.036	57.0	256.2	167	8.13	-3.28	68.4
BY NEAR LODGE COMPOSITE	<0.002	15.3	51.5	33	9.23	-3.82	24.6
STN# SP1	0.016	23.0	47.4	31	9.39	-11.17	18.0
Blank	<0.002	<0.2	4.4	3	12.33	7.33	0.3
QC Standard (actual)	0.024	10.0	343.8	223	8.02	-66.33	159.5
QC Standard (expected)	0.024	10.0	339.9	221	8.02	-65.76	157.8
Repeat STN# FP1	0.008	28.0	89.3	58	8.95	-10.91	28.2

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9-Nov-92

SENES CONSULTANTS LIMITED
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Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Protibha Gupta
Project: 31121-0 PO #:
Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	CO3= Calc. mg/L	HCO3- Calc. mg/L	L.I. Calc. None	A.I. Calc. None	R.S.I. Calc. None	Total P A. Col. mg/L	Colour M. Col. TCU
STN# FP1	0.1	49.3	-2.5	9.54	11.4	0.027	275
STN# CL1	0.1	20.0	-3.0	8.94	12.5	0.019	139
STN# CL2	0.1	19.8	-3.2	8.74	12.7	0.016	131
STN# HL1	0.1	19.5	-3.2	8.72	12.7	0.014	108
STN# HL2	0.1	19.0	-3.3	8.68	12.8	0.015	125
STN# HL3	0.1	19.8	-3.4	8.59	12.8	0.014	140
TAILINGS DECANT POND	0.1	165.0	-0.7	11.35	8.7	0.044	132
TAILINGS SEDIMENTATION POND	0.1	152.7	-1.1	11.00	9.2	0.124	270
BY NEAR LODGE COMPOSITE	0.1	27.3	-2.8	9.13	12.1	0.017	49
STN# SP1	0.1	24.4	-3.0	8.91	12.4	0.022	230
Blank	0.1	2.0	-7.4	4.74	19.7	<0.002	<1
QC Standard (actual)	0.1	60.1	-3.6	8.36	11.6	0.140	50
QC Standard (expected)	0.1	60.7	-3.6	8.35	11.6	0.140	50
Repeat STN# FP1	0.1	48.4	-2.4	9.57	11.4	0.026	275

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9-Nov-92

SENES CONSULTANTS LIMITED
52 West Beaver Creek
Unit #4
Richmond Hill, ON
L4B 1G5

Attn: Ms. Protibha Gupta
Project: 31121-0 PO #:

Received: 14-Aug-92 13:38

Job: 926442 Status: Final

Water Samples

Sample Id	Cd-GFAAS GFAAS mg/L	Cu ICAP mg/L	Ni ICAP mg/L	Pb ICAP mg/L	Ag ICAP mg/L
STN# FP1	<0.0001	0.002	<0.01	<0.01	<0.001
STN# CL1	<0.0001	0.003	<0.01	<0.01	<0.001
STN# CL2	<0.0001	0.003	<0.01	<0.01	<0.001
STN# HL1	<0.0001	0.003	<0.01	<0.01	<0.001
STN# HL2	<0.0001	0.002	<0.01	<0.01	<0.001
STN# HL3	<0.0001	0.002	<0.01	<0.01	<0.001
TAILINGS DECANT POND	<0.0001	0.025	0.02	<0.01	<0.001
TAILINGS SEDIMENTATION POND	<0.0001	0.006	<0.01	<0.01	<0.001
BY NEAR LODGE COMPOSITE	<0.0001	0.002	<0.01	<0.01	<0.001
STN# SP1	<0.0001	0.002	<0.01	<0.01	<0.001
Blank	<0.0001	<0.002	<0.01	<0.01	<0.001
QC Standard (actual)	0.0023	0.198	0.20	0.21	<0.001
QC Standard (expected)	0.0025	0.200	0.20	0.20	<0.001
Repeat STN# FP1	<0.0001	---	---	---	---

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Attn: Ms. Protibha Gupta
Project: 31121-0 PO #: Received: 14-Aug-92 13:38

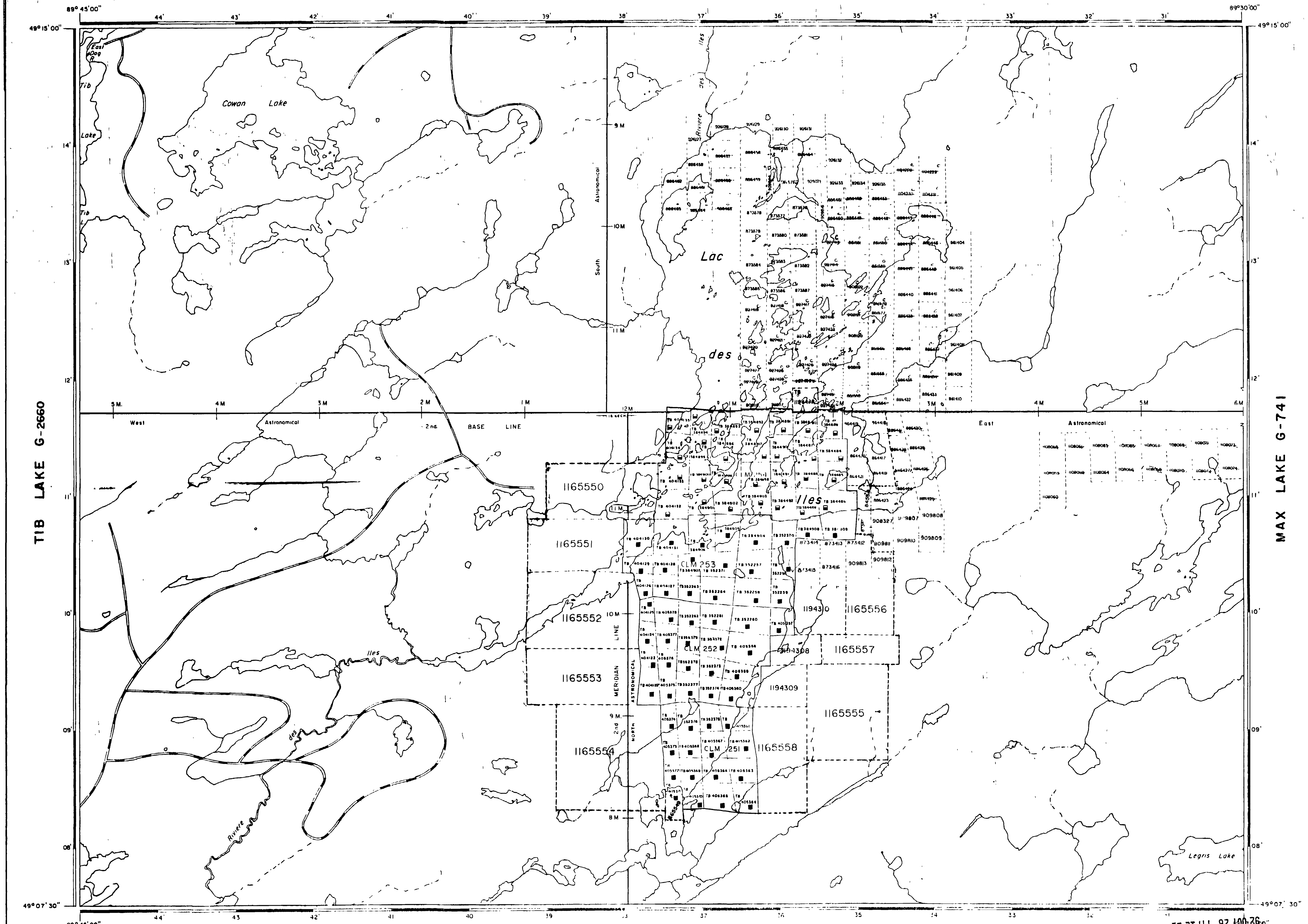
Job: 926442 Status: Final

Job approved by:

Signed:

....
Agnes Love, B.Sc.
Manager, Environmental Inorganic Services

HEAVEN LAKE G-729



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REFERENCES

TOPOGRAPHY

LAKES, RIVERS, ETC, FROM FOREST RESOURCES INVENTORY SHEET Nº 492 893

THE INFORMATION THAT APPEARS ON THIS MAP HAS BEEN COMPILED FROM VARIOUS SOURCES AND ACCURACY IS NOT GUARANTEED THOSE WISHING TO STAKE MINING CLAIMS SHOULD CONSULT WITH THE MINING RECORDER MINISTRY OF NORTHERN DEVELOPMENT AND MINES FOR ADDITIONAL INFORMATION ON THE STATUS OF THE LANDS SHOWN HEREON

LEGEND

HIGHWAY AND ROUTE No
OTHER ROADS
TRAILS
SURVEYED LINES
TOWNSHIPS BASE LINES ETC
LOTS, MINING CLAIMS PARCELS ETC
UNSURVEYED LINES
LOT LINES
PARCEL BOUNDARY
MINING CLAIMS ETC
RAILWAY AND RIGHT OF WAY
UTILITY LINES
NON PERENNIAL STREAM
FLOODING OR FLOODING RIGHTS
SUBDIVISION OR COMPOSITE PLAN
RESERVATIONS
ORIGINAL SHORELINE
MARSH OR MUSKEG
MINES
TRAVERSE MONUMENT

DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT	SYMBOL
PATENT, SURFACE & MINING RIGHTS	●
" , SURFACE RIGHTS ONLY	
" , MINING RIGHTS ONLY	
LEASE, SURFACE & MINING RIGHTS	■
" , SURFACE RIGHTS ONLY	
" , MINING RIGHTS ONLY	
LICENCE OF OCCUPATION	▼
ORDER-IN COUNCIL	OC
RESERVATION	
CANCELLED	
SAND & GRAVEL	

LAND USE PERMITS FOR COMMERCIAL TOURISM OUTPOST CAMPS

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 6 1913, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT R.S.O 1970 CHAP 380 SEC 63 SUBSEC 1

SCALE: 1 INCH = 40 CHAINS

FEET 0 1000 2000 4000 6000 8000
METRES 0 200 1000 (1 KM) 2000 (2 KM)

AREA

LAC DES ILES

M.N.R. ADMINISTRATIVE DISTRICT
THUNDER BAY

MINING DIVISION
THUNDER BAY

LAND TITLES / REGISTRY DIVISION
THUNDER BAY

Ministry of Natural Resources — Land Management Branch
Ontario

Date JANUARY, 1983

Number G-739

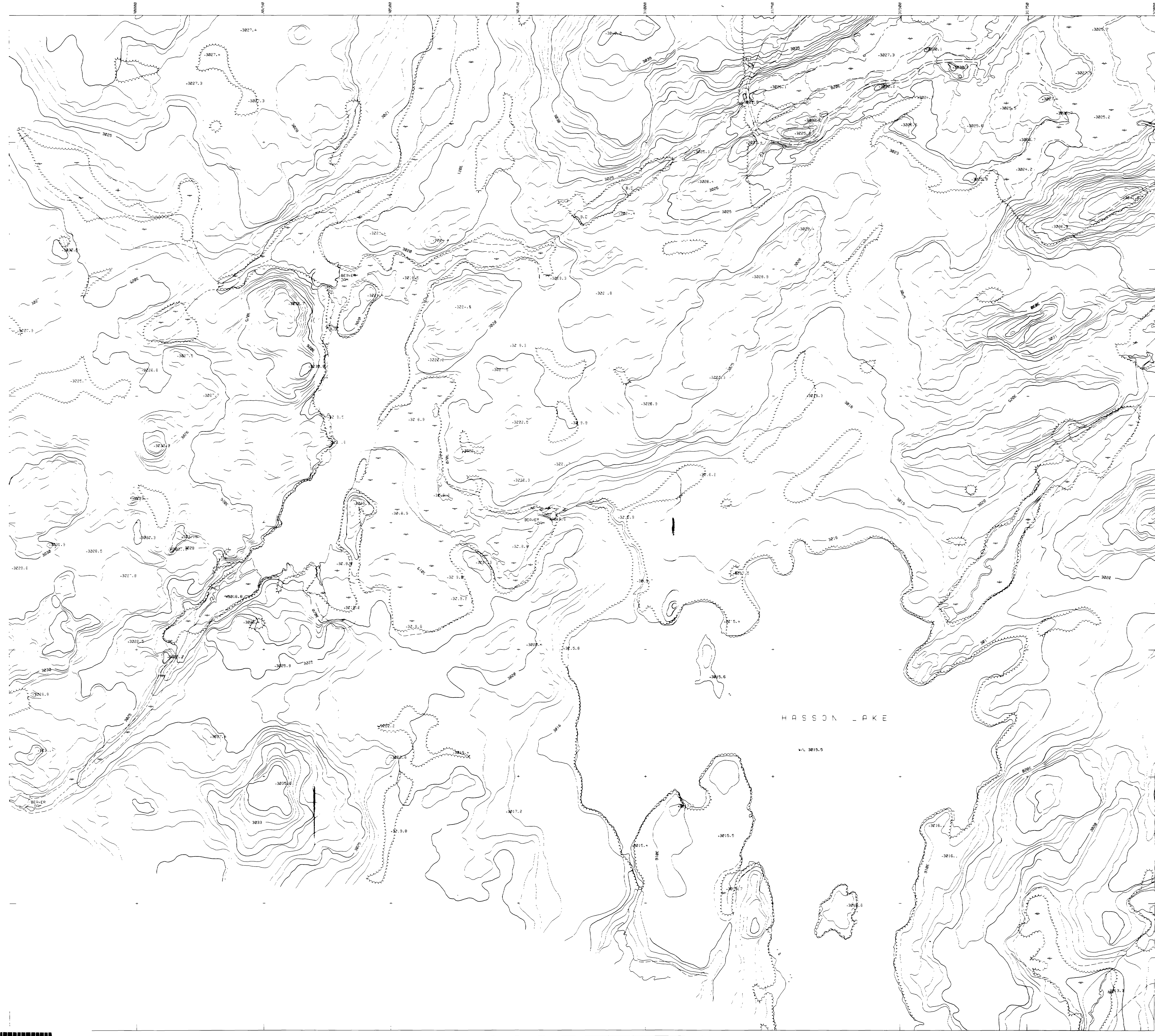
RECEIVED OCT 26 1983 PM 12 21 THUNDER BAY MINING DIVISION

52H04NE0015 OM92-113 LAC DES ILES

200

LAC DES ILES MINES LTD.

LAC DES ILES MINES



NOTES:

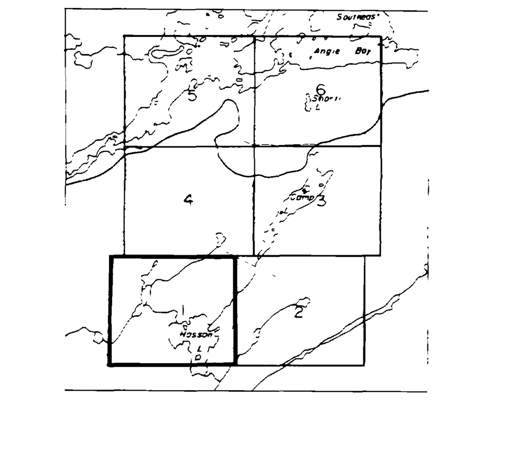
(1) ALL CO-ORDINATES, DISTANCES AND ELEVATIONS SHOWN ARE IN METRES
(2) ELEVATIONS ARE BASED ON MINE DATUM
(3) CO-ORDINATES SHOWN ARE BASED ON MINE DATUM
(4) CONTOUR INTERVAL - 1.0 METER
(5) THIS DRAWING WAS PRODUCED FROM 1:10000 AERIAL PHOTOGRAPHY UTILIZING PHOTOGRAMETRIC METHODS. PHOTOGRAPHY DATED JUNE 1992

1:2500

50 0 50 100 150 200 METRES

LEGEND

- DITCH
- GATE
- STREAM
- FENCE
- CUTLINE
- TRAIL
- SWAMP
- PIPE
- TREELINE
- TOWER
- BUILDING
- ROCK OUTCROP
- HYDRO POLE



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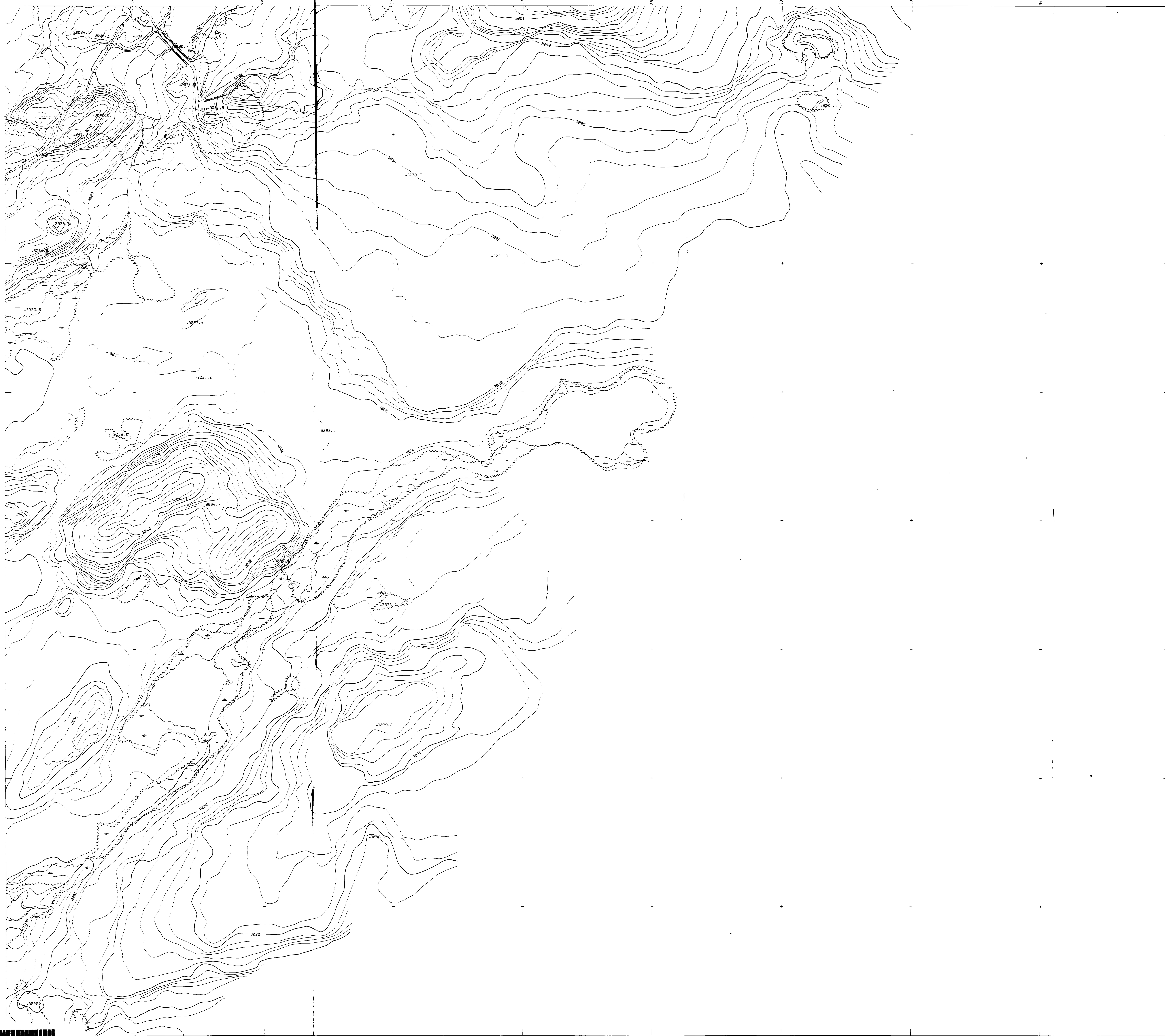

LAC DES ILES MINES LTD.

LAC DES ILES MINES

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(3) CO-ORDINATES SHOWN ARE BASED ON MINE DATUM
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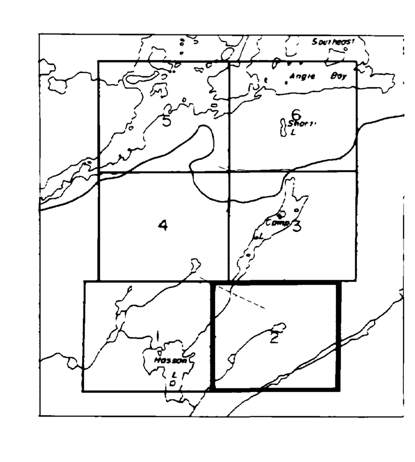
1:2500

50 0 50 100 150 200 METRES

LEGEND

DITCH
GATE
STREAM
FENCE
CUTLINE
TRAIL
SWAMP
PIPE
TREELINE
TOWER
BUILDING
ROCK OUTCROP
HYDRO POLE



AIRQUEST

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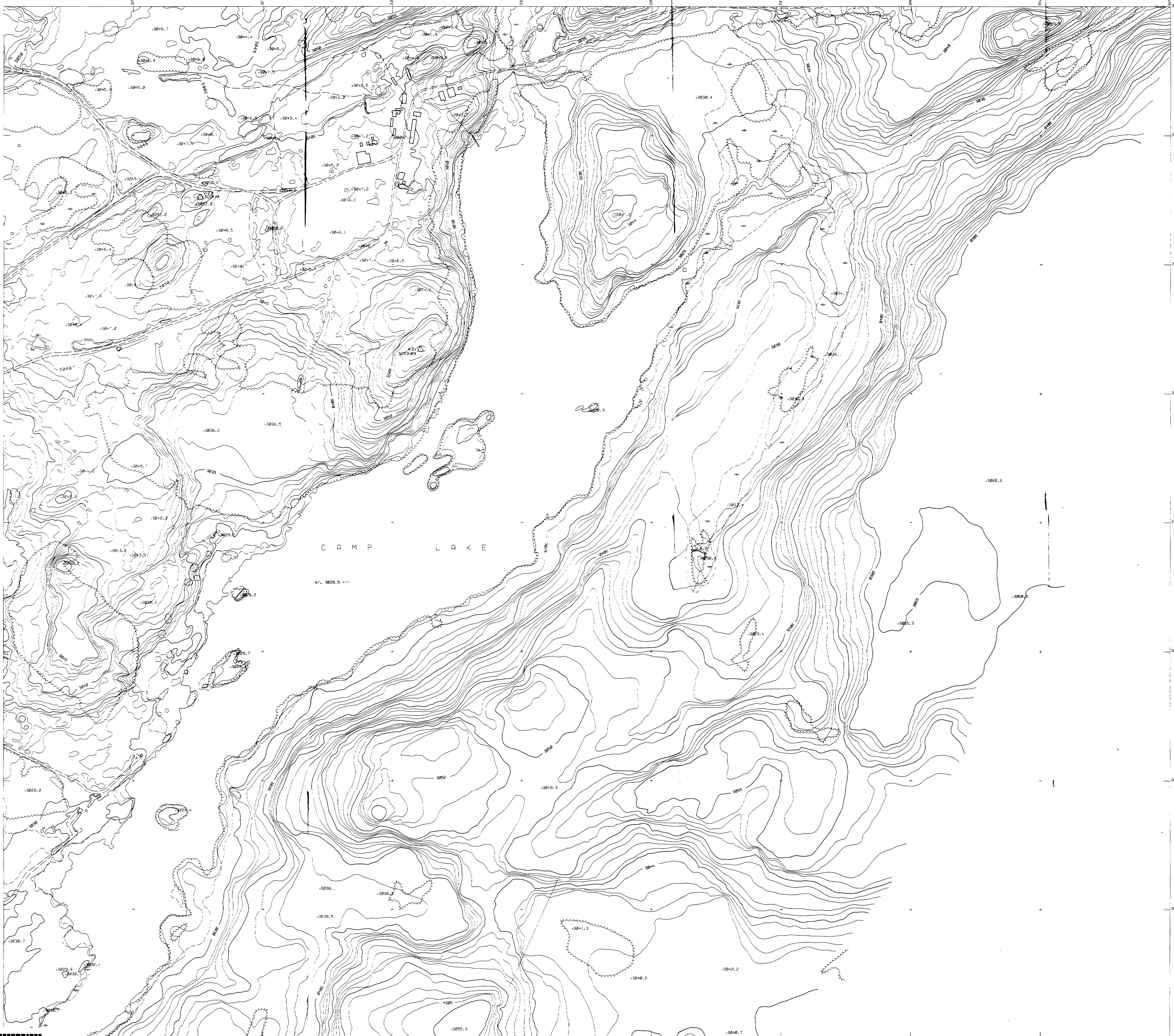

LAC DES ILES MINES LTD.

LAC DES ILES MINES

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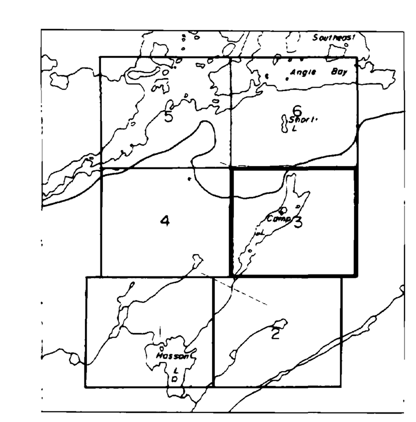
1:2500

50 0 50 100 150 200 METRES

LEGEND

DITCH
GATE
STREAM
FENCE
CUTLINE
TRAIL
SWAMP
PIPE
TREELINE
TOWER
BUILDING
ROCK OUTCROP
HYDRO POLE



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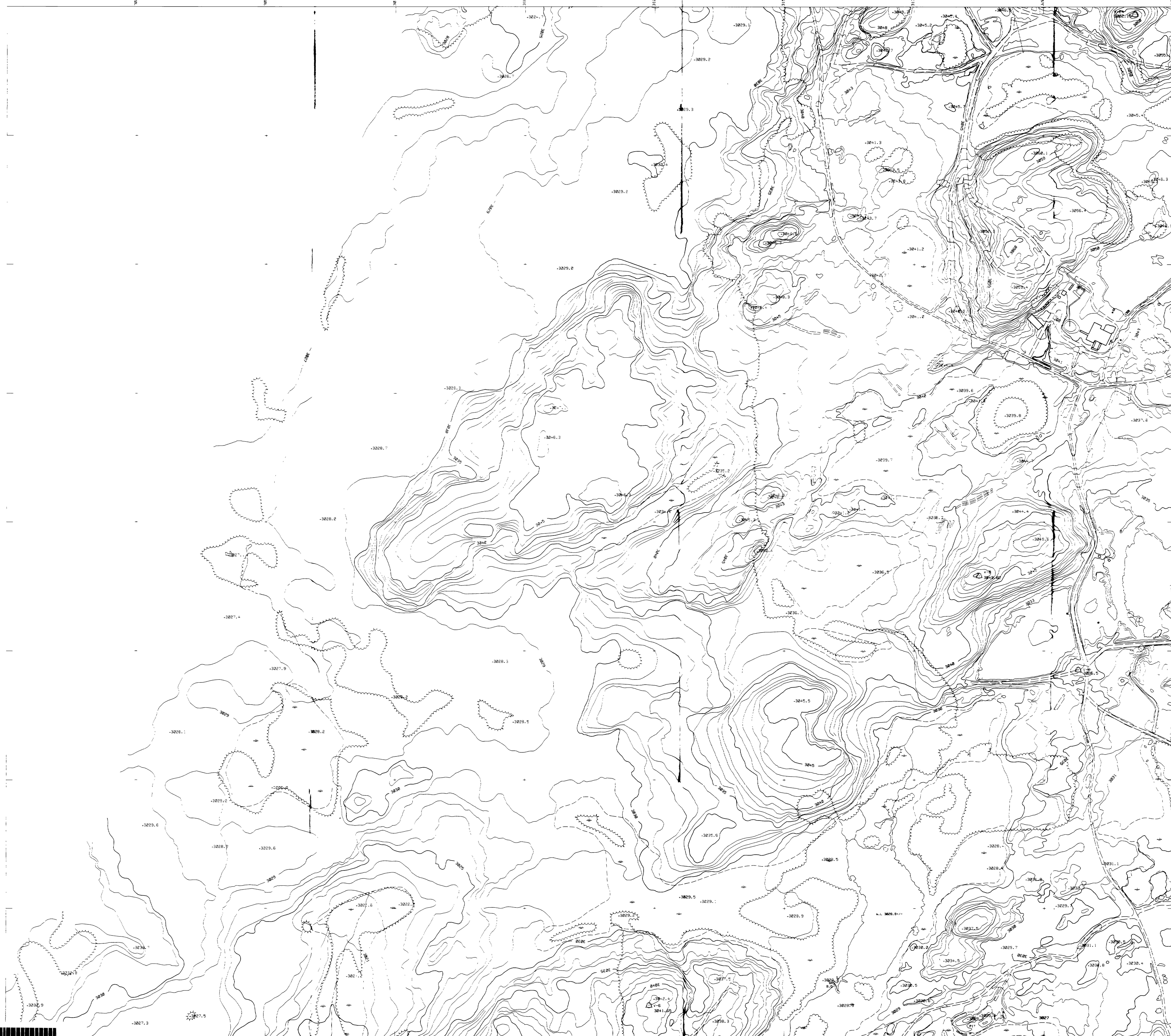

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LAC DES ILES MINES

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(1) ALL CO-ORDINATES, DISTANCES AND ELEVATIONS SHOWN ARE IN METRES
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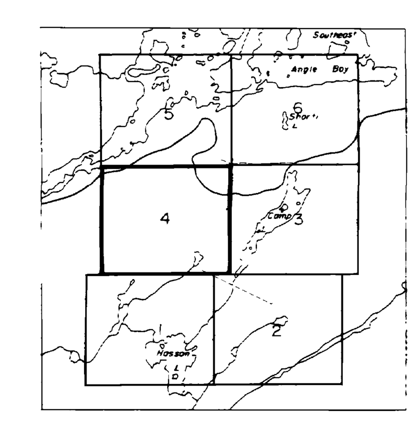
1:2500

50 0 50 100 150 200 METRES

LEGEND

DITCH
GATE
STREAM
FENCE
CUTLINE
TRAIL
SWAMP
PIPE
TREELINE
TOWER
BUILDING
ROCK OUTCROP
HYDRO POLE



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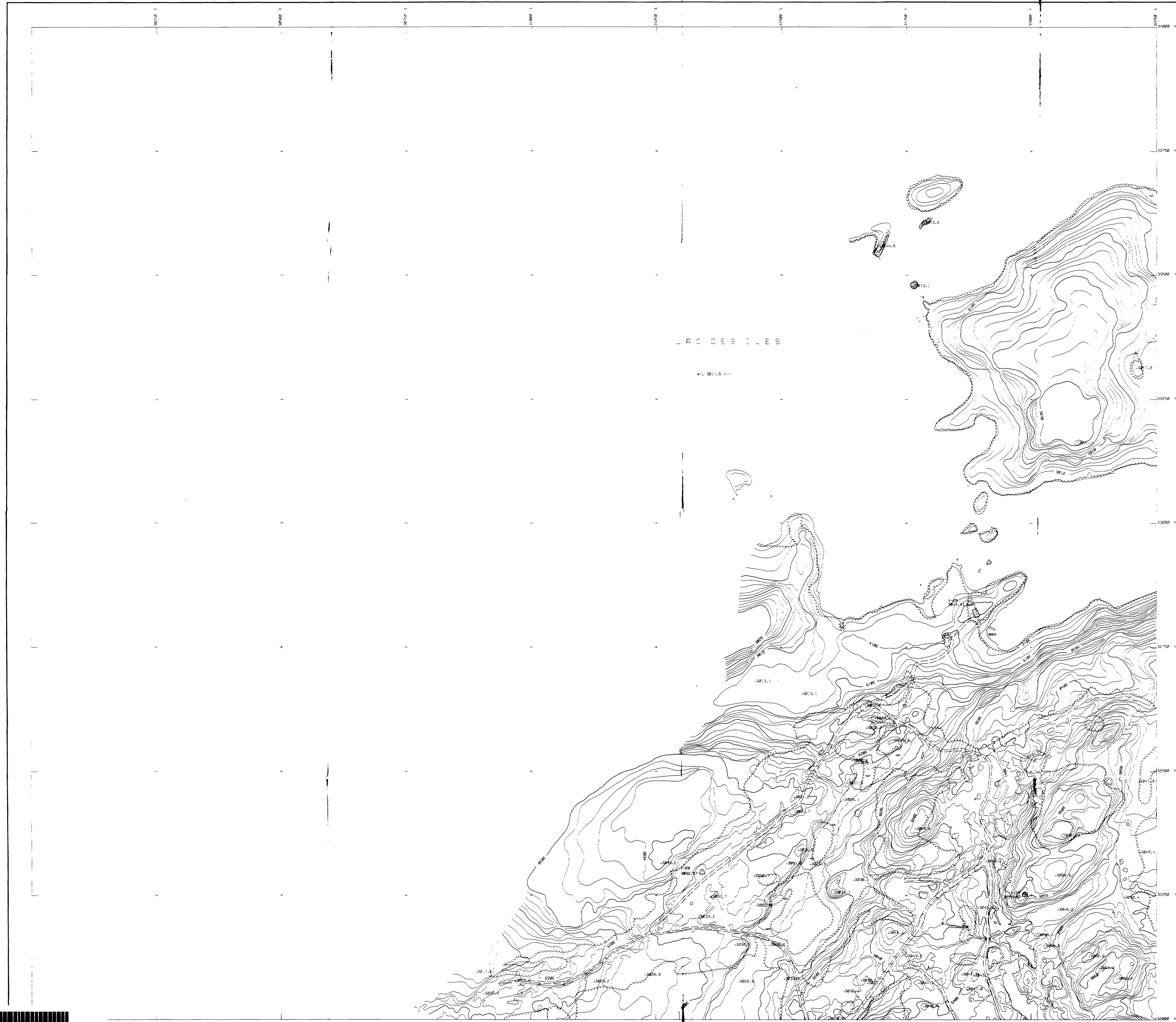

LAC DES ILES MINES LTD.

LAC DES ILES MINES

NOTES:

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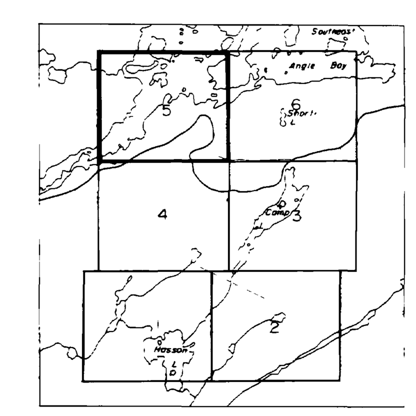
1:2500

50 0 50 100 150 200 METRES

LEGEND

- DITCH
- GATE
- STREAM
- FENCE
- CUTLINE
- TRAIL
- SWAMP
- PIPE
- TREELINE
- TOWER
- BUILDING
- ROCK OUTCROP
- HYDRO POLE



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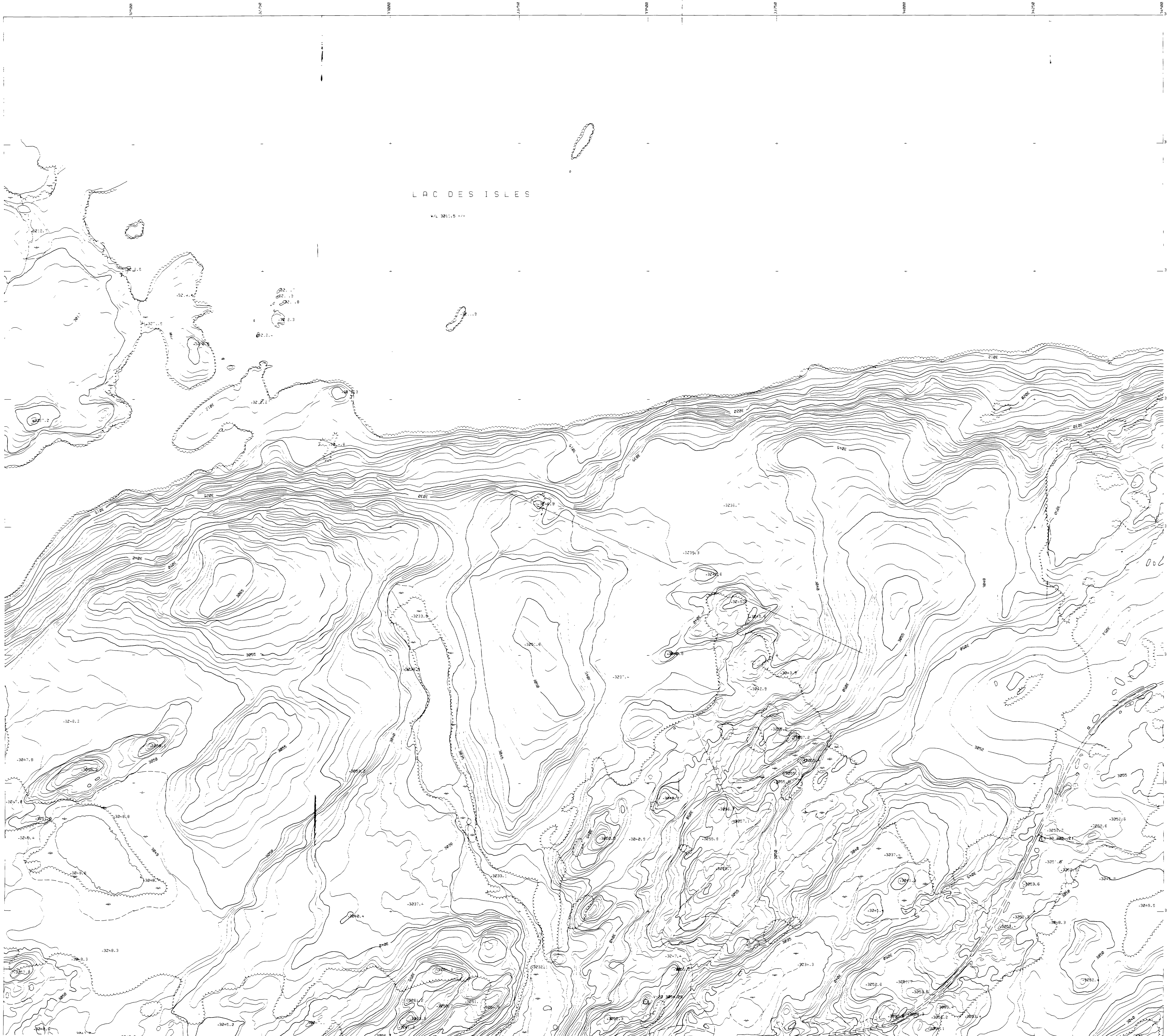

LAC DES ILES MINES LTD.

LAC DES ILES MINES

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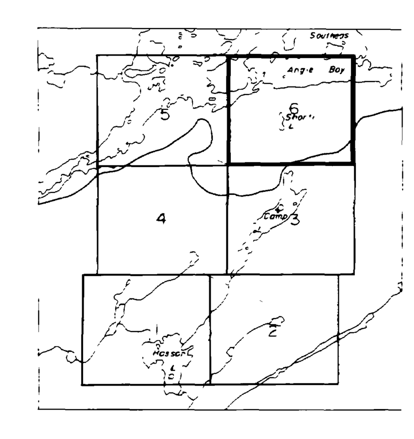
1:2500

50 0 50 100 150 200 METRES

LEGEND

DITCH	D
GATE	
STREAM	
FENCE	x
CUTLINE	
TRAIL	
SWAMP	
PIPE	
TREELINE	
TOWER	
BUILDING	
ROCK OUTCROP	
HYDRO POLE	



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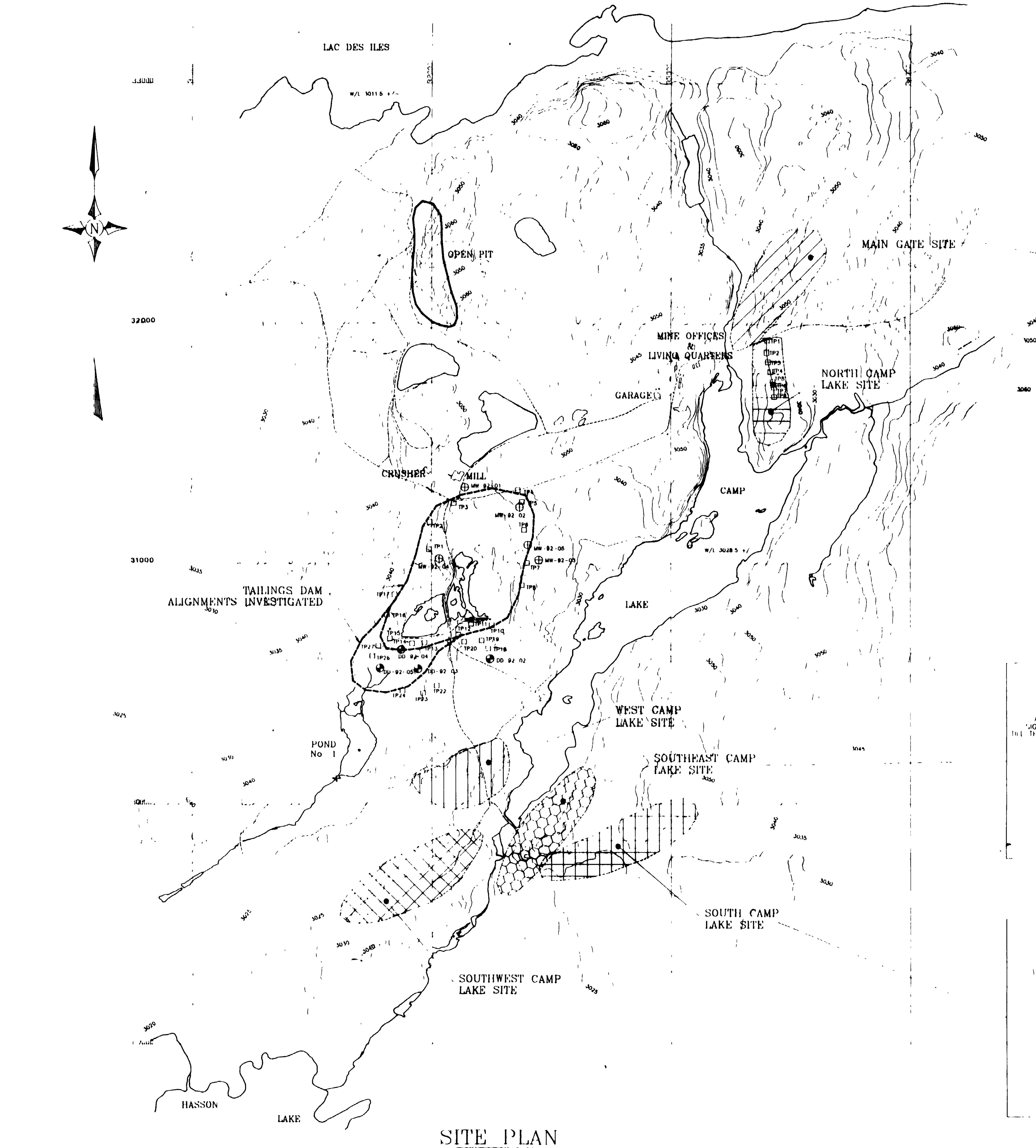
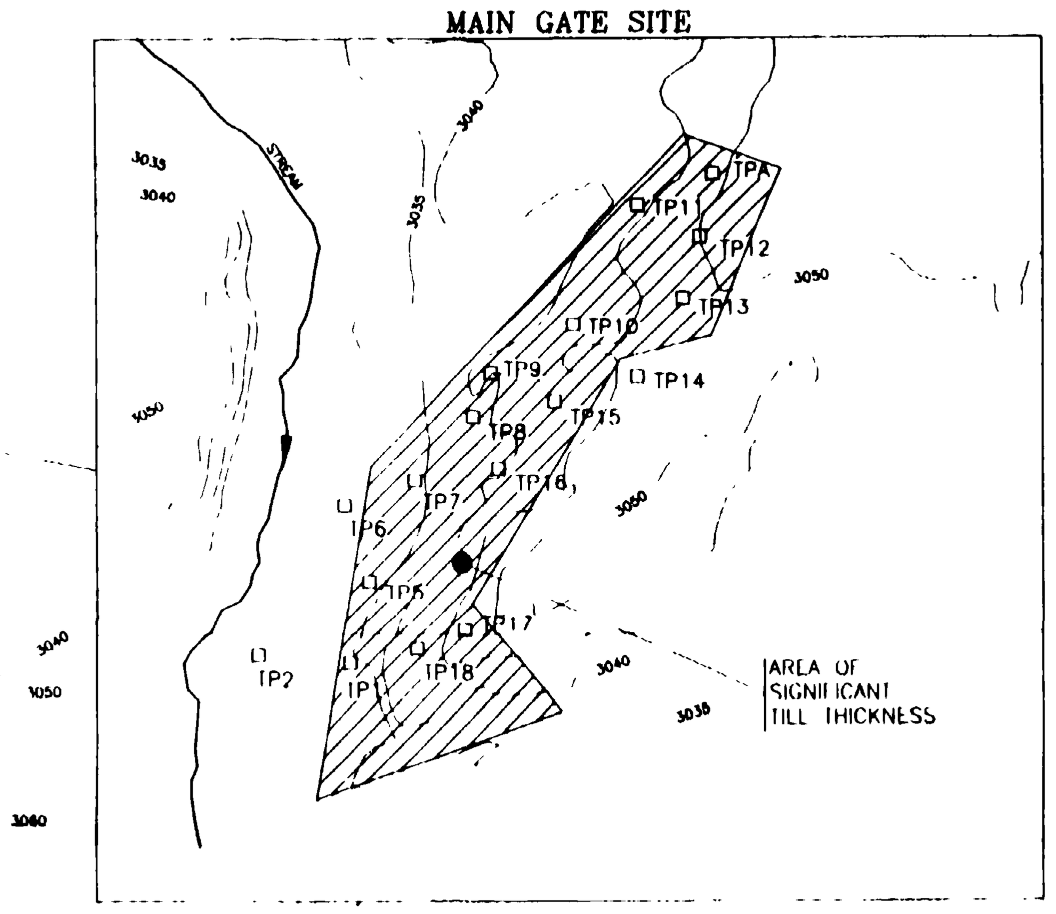
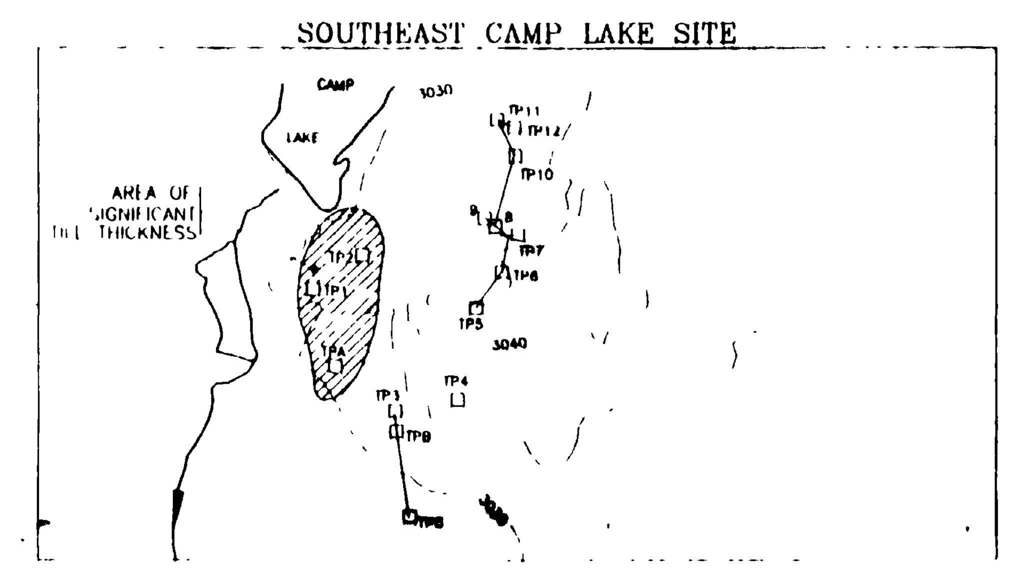
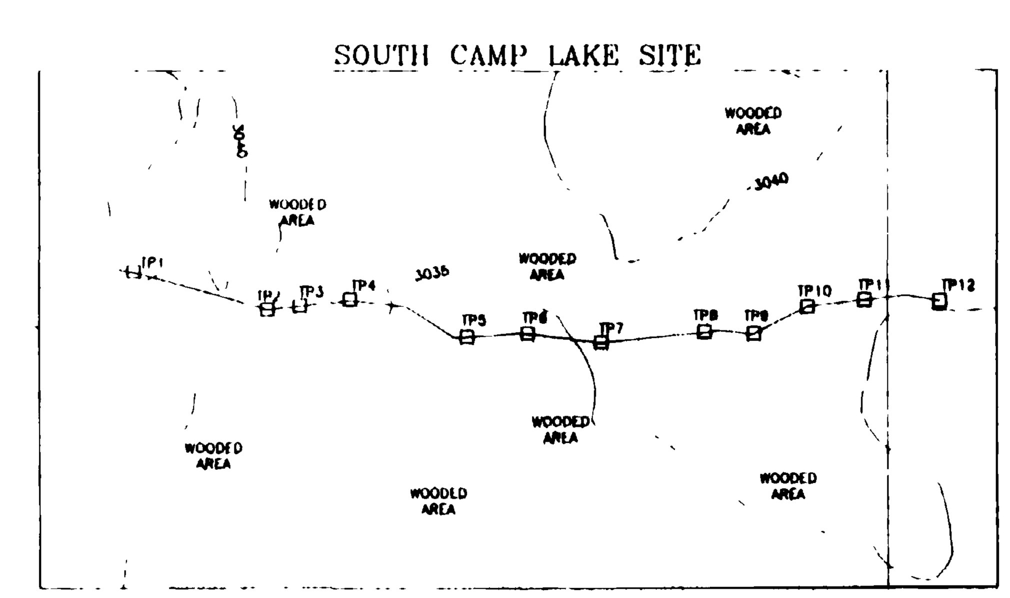


SITE PLAN







KEY

OPEN PIT

PHASE 1 TAILINGS MANAGEMENT FACILITY ALIGNMENT INVESTIGATED

BORROW INVESTIGATIONS

SOUTHWEST CAMP LAKE SITE (SWCL)

WEST CAMP LAKE SITE (WCL)

SOUTHEAST CAMP LAKE SITE (SECL)

SOUTH CAMP LAKE SITE (SCL)

NORTH CAMP LAKE SITE (NCL)

MAIN GATE SITE (MGS)

DD-92-xx DIAMOND DRILL HOLE

MW-92-xx MONITORING WELL INSTALLATION

TPx TEST PIT LOCATION

NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ACCOMPANYING DOCUMENT No. 0786-07.
2. CONTOUR INTERVAL IS 5 METRES.
3. ELEVATIONS ARE REFERENCED TO MINE DATUM.
4. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES.

REVISIONS		
MARK	DATE	DESCRIPTION

SECTION No — DWG No WHERE SECTION IS SHOWN BLANK IF SAME DRAWING

DETAIL No — DWG No WHERE DETAIL IS SHOWN BLANK IF SAME DRAWING

REFERENCE	
DWG. NO.	DESCRIPTION
0786-099	SITE LOCATION PLAN

REFERENCE	
DWG. NO.	DESCRIPTION

LAC DES ILES MINES LTD.

LAC DES ILES ONTARIO

LOCATION PLAN FOR SUBSURFACE TESTING-MAY 1992

DENNIS HETHERTON ENGINEERING — ENGINEERING FOR THE RESOURCE INDUSTRIES

DATE SEPT., 1992 SCALE : 1:10000

DWG NO. 0786-301

52H04NE0016 OM92-113 LAC DES ILES

270

MARK	DATE	REVISIONS DESCRIPTION

SECTION No.
DWG. No. WHERE SECTION IS SHOWN. BLANK IF SAME DRAWING.

DETAIL No.
DWG. No. WHERE DETAIL IS SHOWN. BLANK IF SAME DRAWING.

REFERENCE DWG. NO.	DESCRIPTION
20 16 3000 54400	ONTARIO BASE MAP
20 16 3100 54400	ONTARIO BASE MAP
20 16 3100 54500	ONTARIO BASE MAP
20 16 3000 54500	ONTARIO BASE MAP

REFERENCE DWG. NO.	DESCRIPTION
0786-301	LOCATION PLAN FOR SUBSURFACE TESTING - MAY 1992

LAC DES ILES MINES LTD
LAC DES ILES ONTARIO
SITE LOCATION PLAN

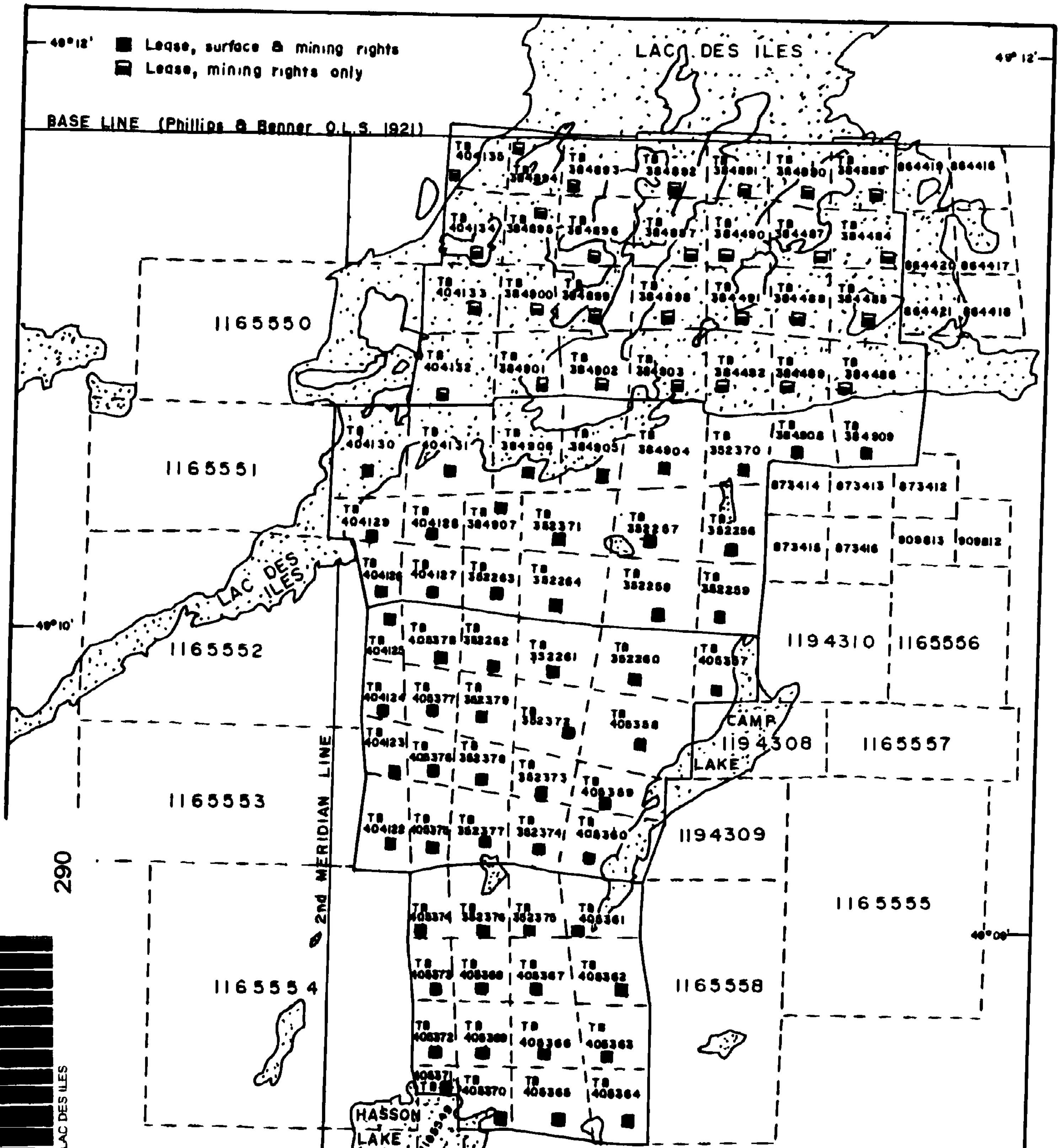
DENNIS NETHERTON ENGINEERING
ENGINEERING FOR THE RESOURCE INDUSTRIES

DATE AUG 1, 1992 SCALE : 1 : 20,000

MADE | CHKD. | APPD. | DWG. NO. 0786-099

52H04NE0015 OM92-113 LAC DES ILES

280



LAC DES ILES MINES LTD.

LAC DES ILES AREA

THUNDER BAY MINING DIVISION - ONTARIO

CLAIM PLAN

MILES 0 1/4 1/2

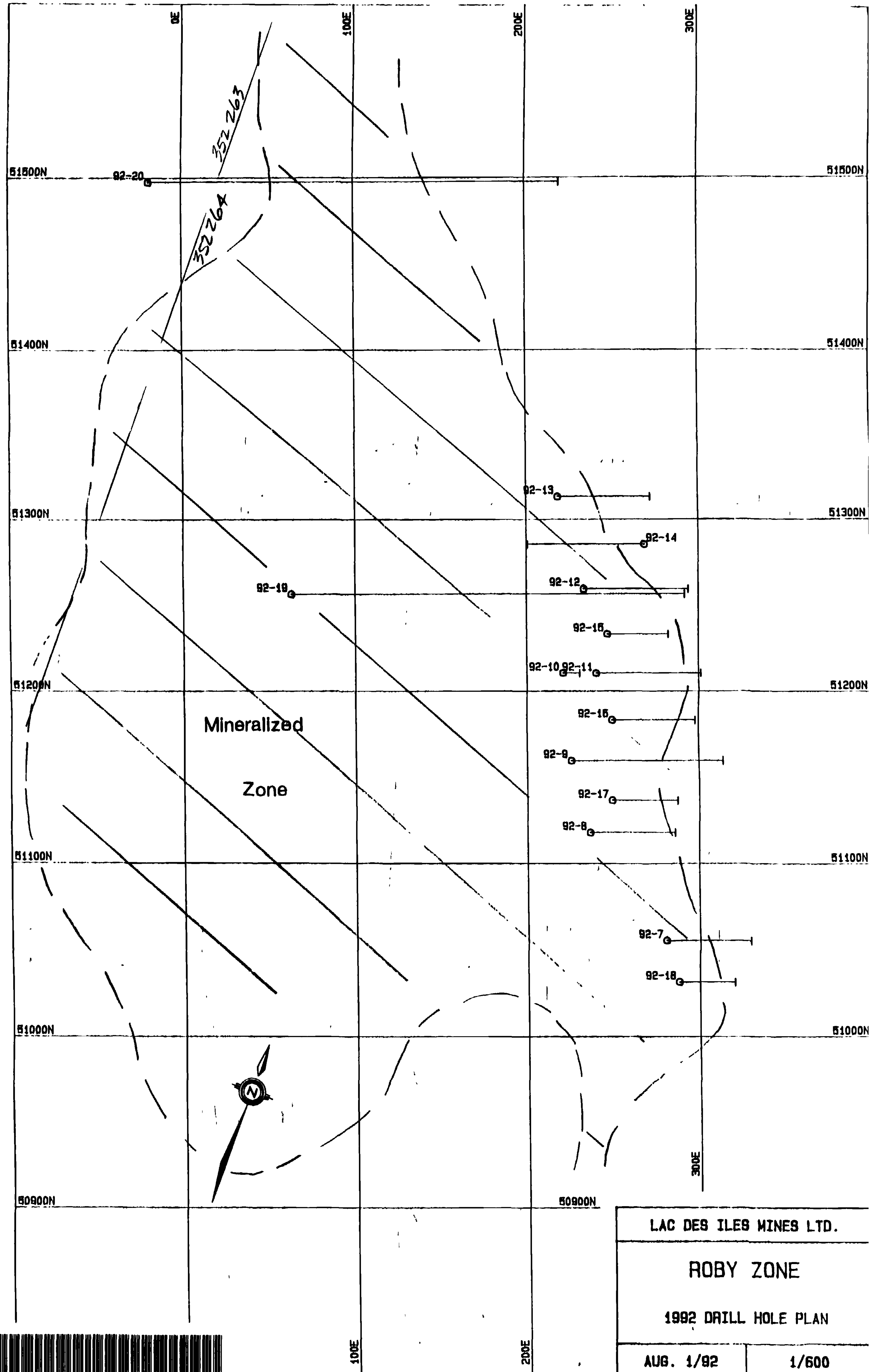
APRIL 1992

290

52H04NE0015 OM82-113 LAC DES ILES

52H04NE0016 OM92-113 LAC DES ILES

300

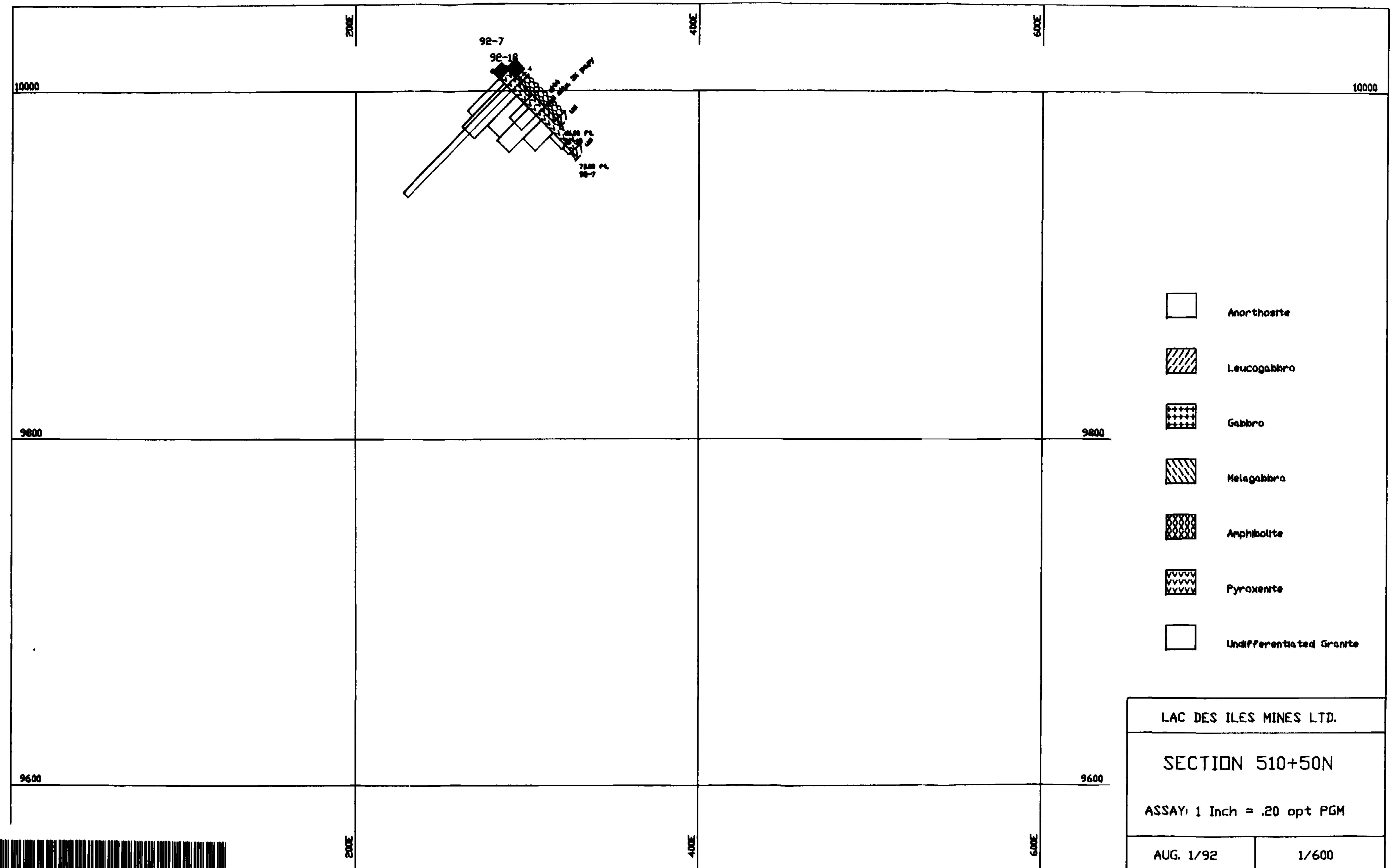


LAC DES ILES MINES LTD.

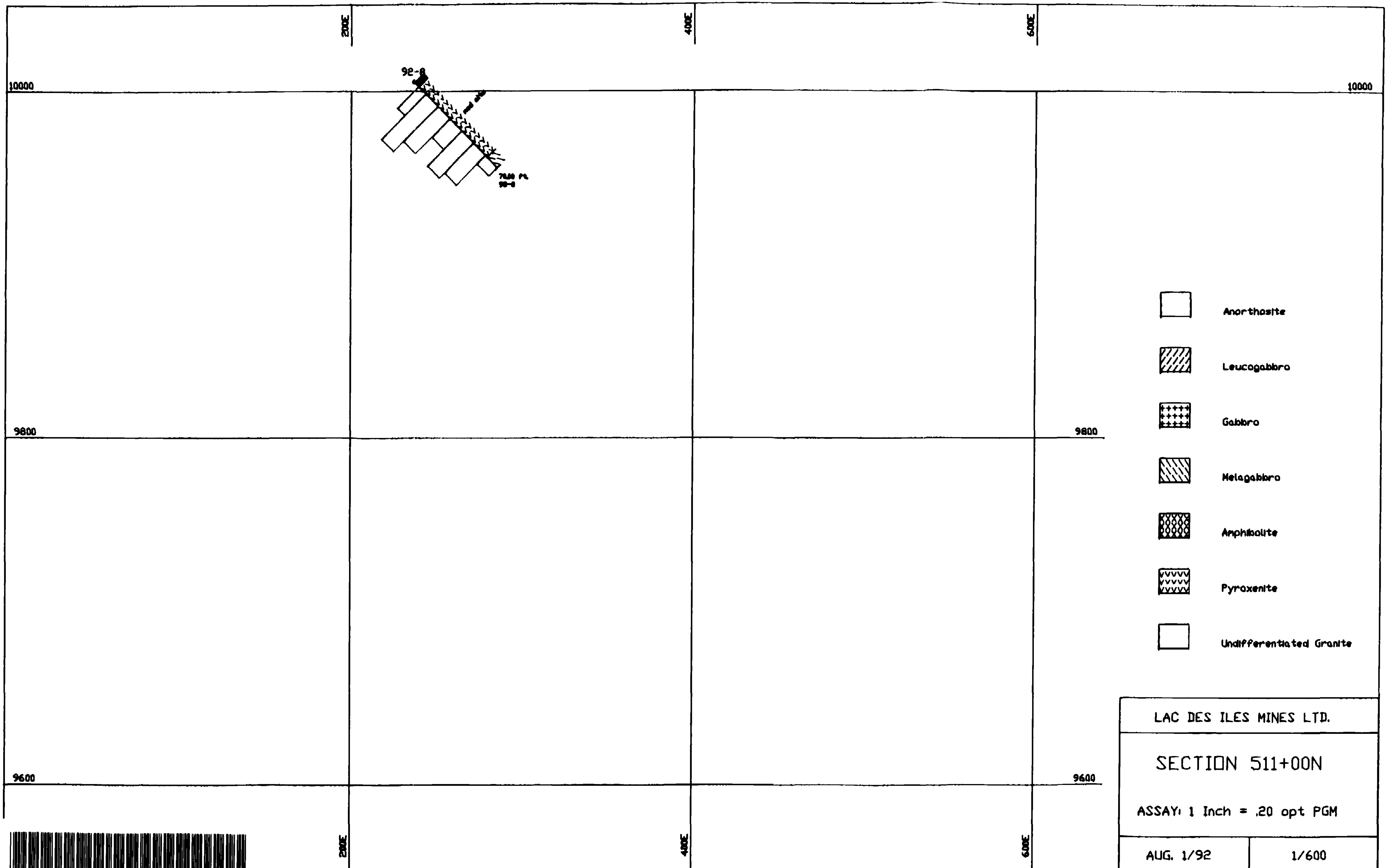
ROBY ZONE

1992 DRILL HOLE PLAN

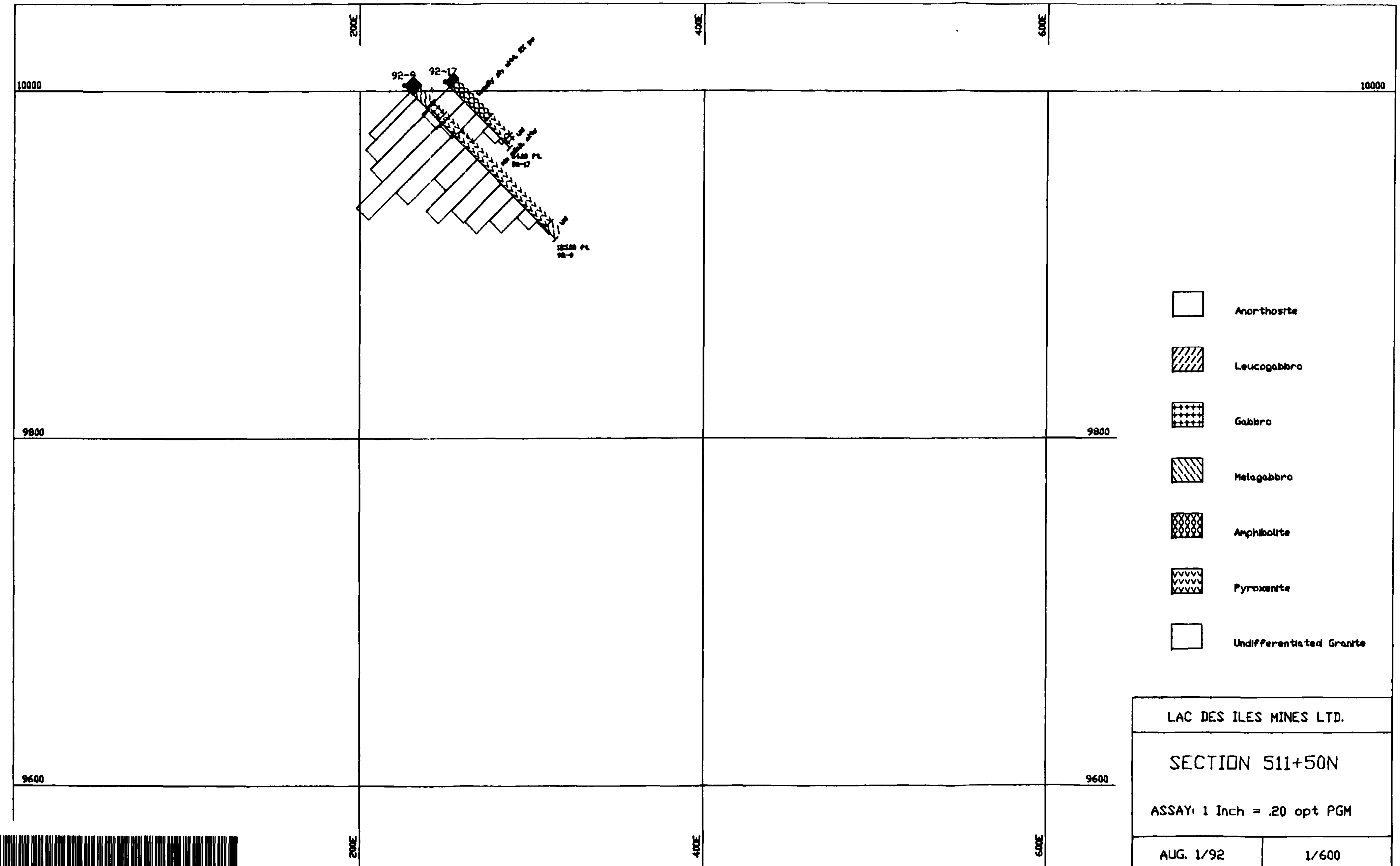
AUG. 1/92 | 1/600



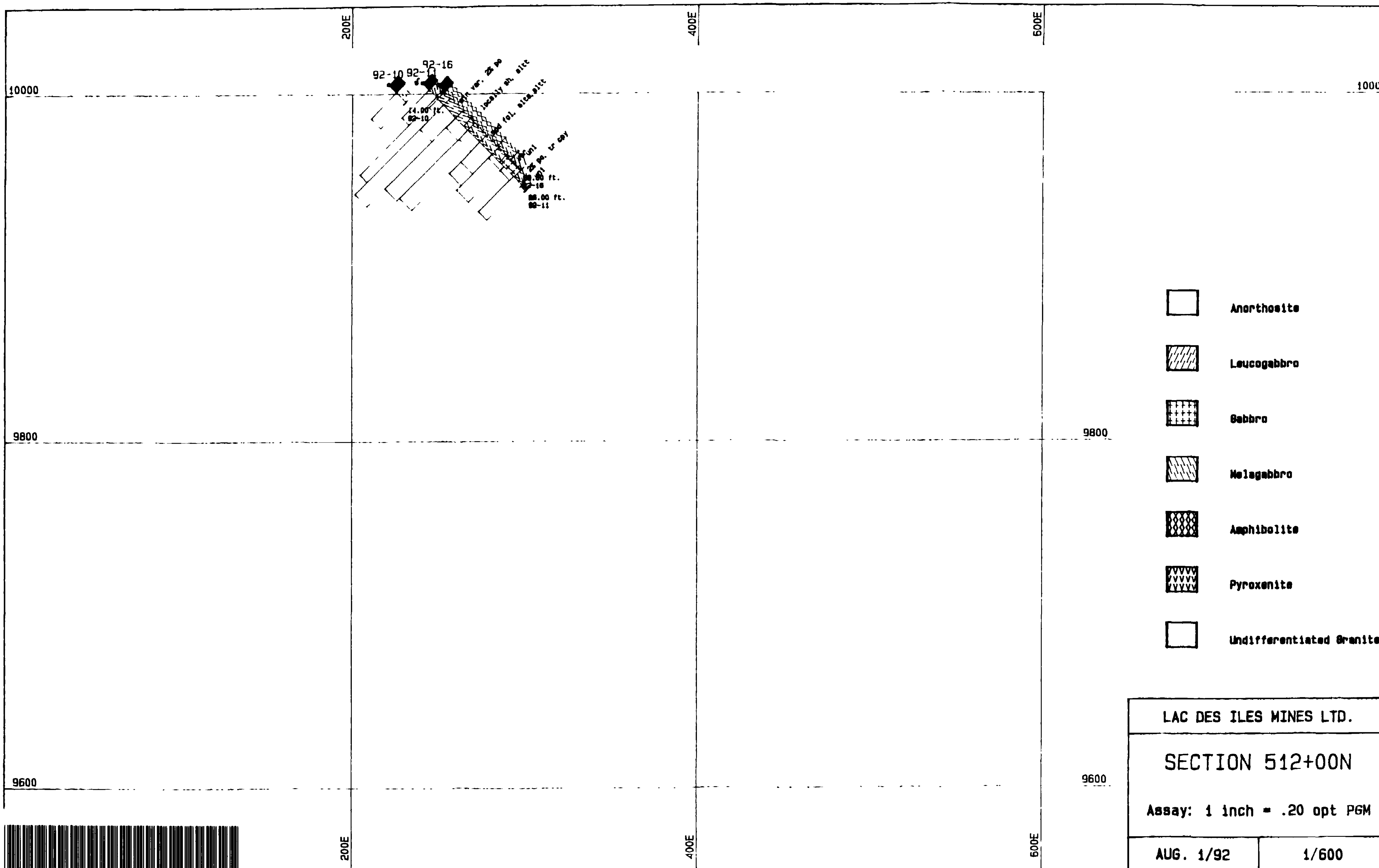
52H04NE0015 OM92-113 LAC DES ILES



200E
400E
600E
92-8
10000
10000
9800
9800
9600
9600
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
SECTION 511+00N
ASSAY: 1 Inch = .20 opt PGM
AUG. 1/92
1/600

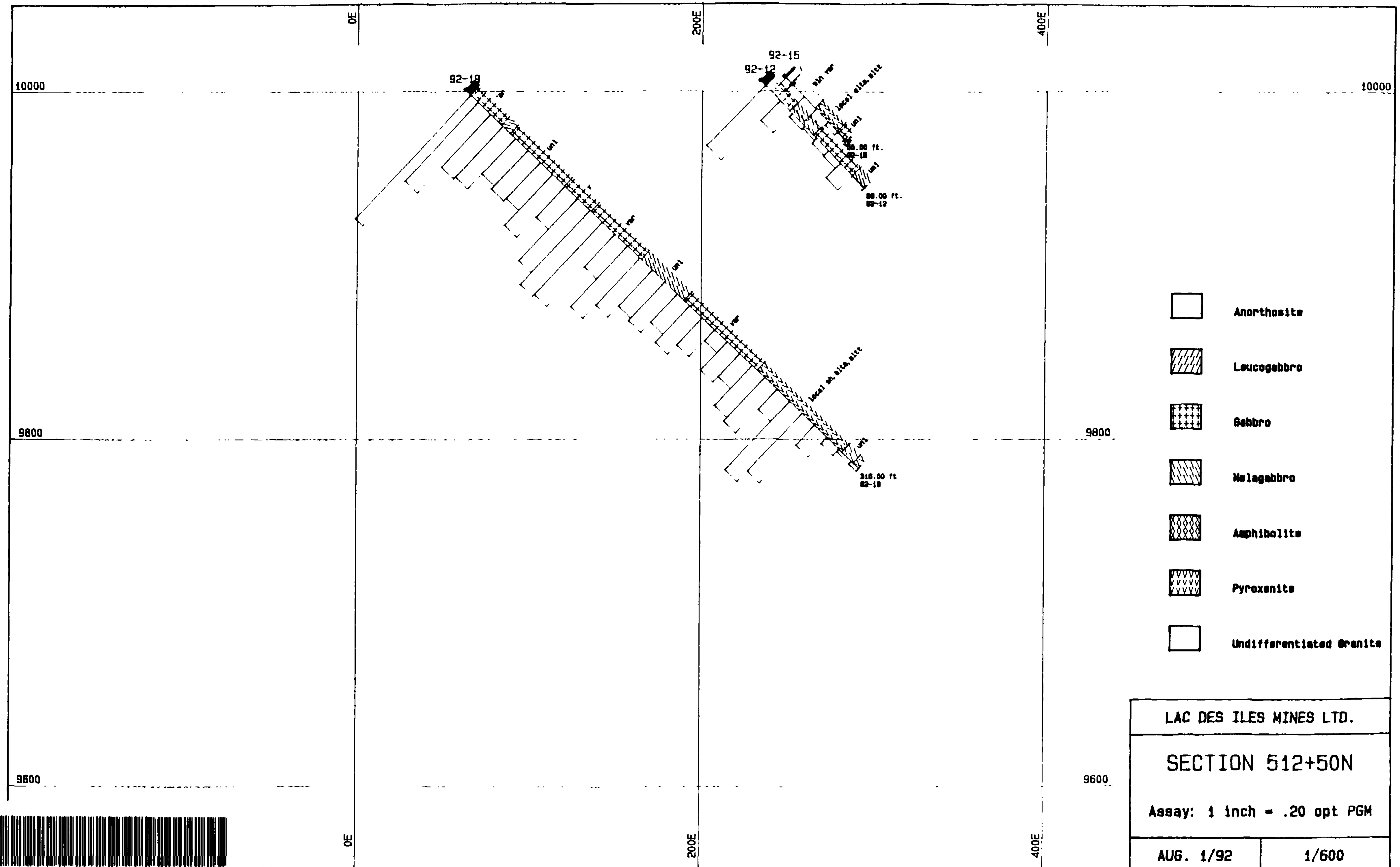

200E
400E
600E
10000
9800
9600
92-9
92-17
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
SECTION 511+50N
ASSAY: 1 Inch = .20 opt PGM
AUG. 1/92
1/600

340



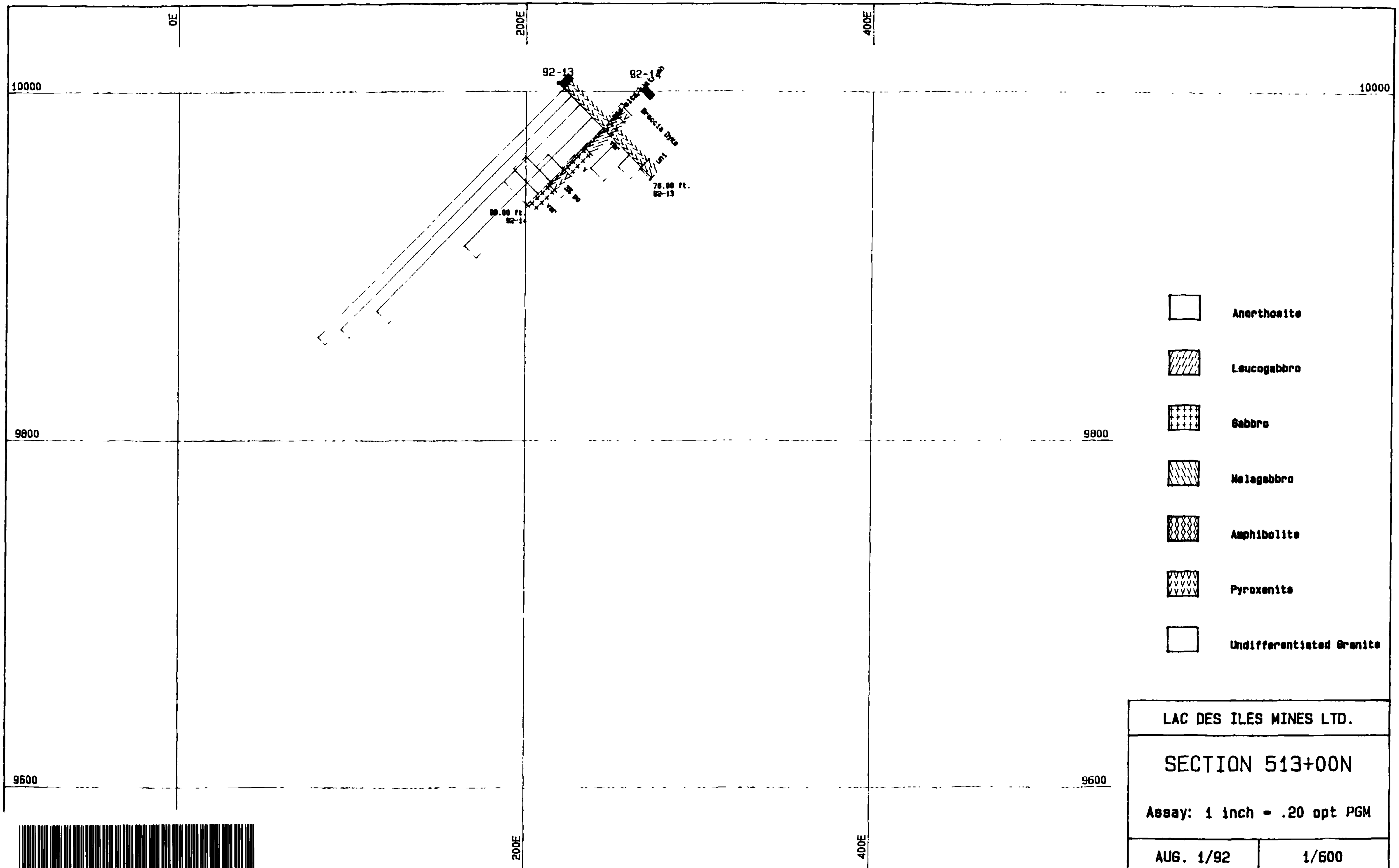
52I04NF0015 OM92-113 LAC DES ILES

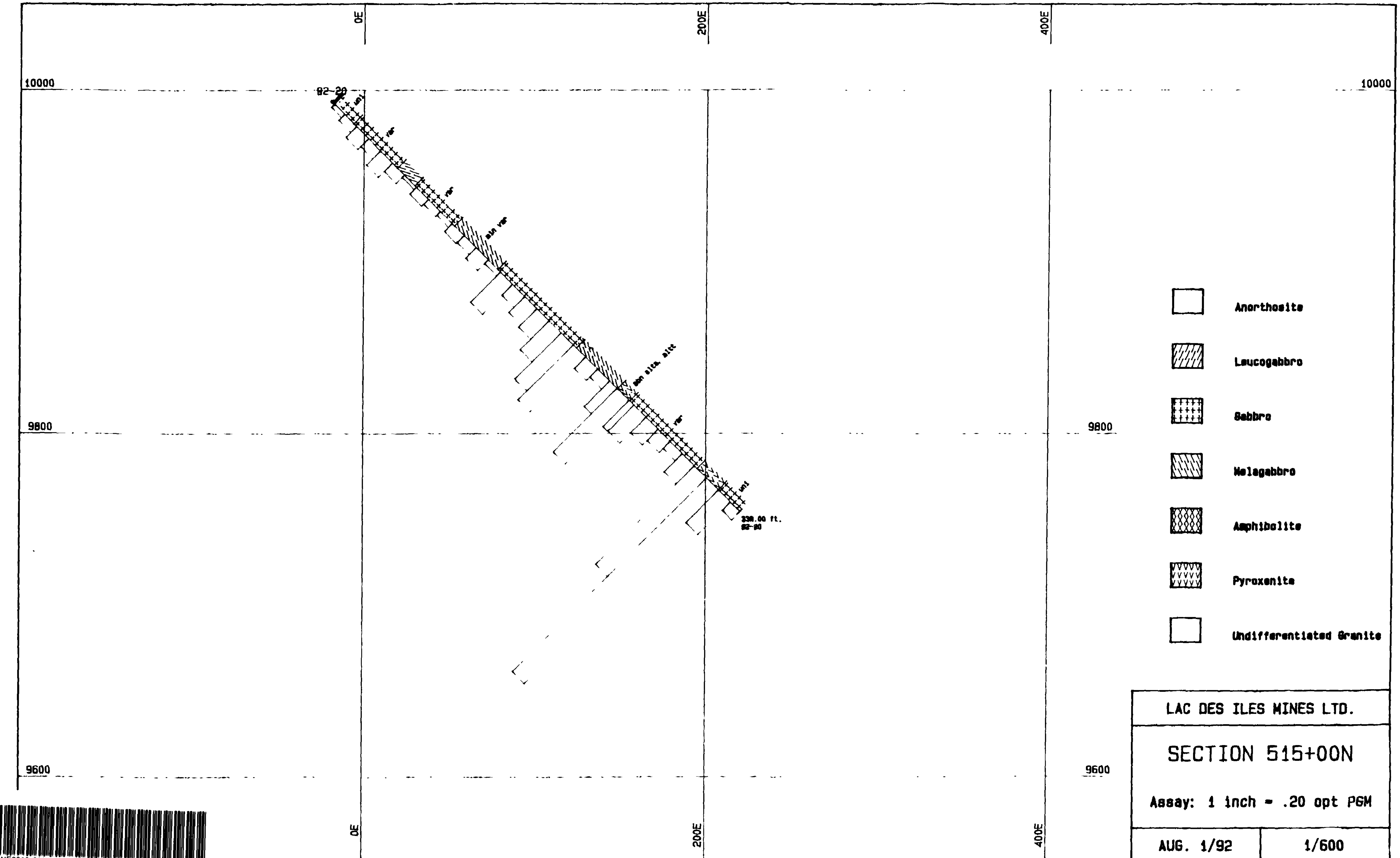
350

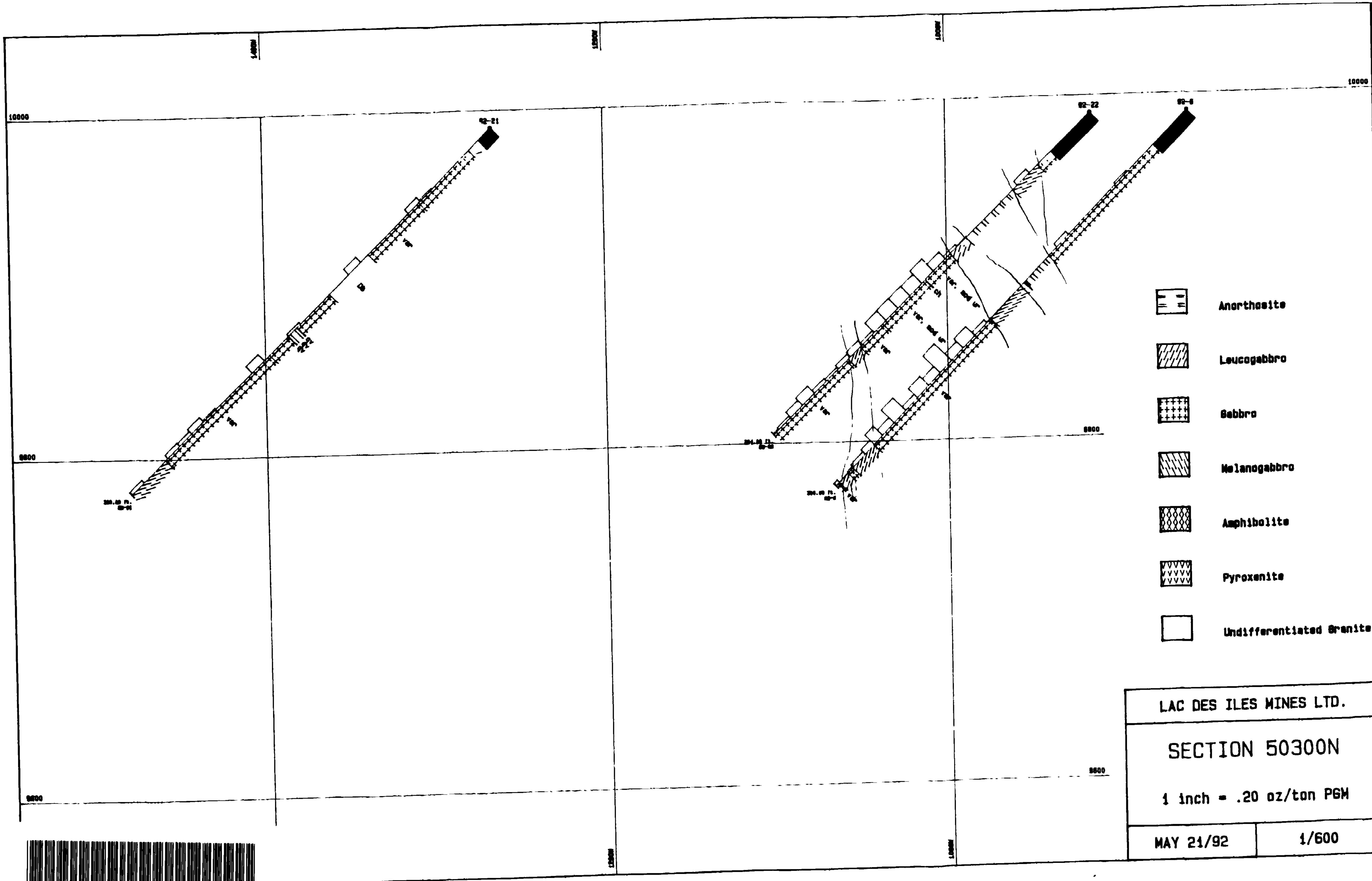


0E
200E
400E
10000
9800
9600
92-15
92-12
92-18
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
SECTION 512+50N
Assay: 1 inch = .20 opt PGM
AUG. 1/92
1/600

360


0E
200E
400E
10000
9800
9600
92-13
92-14
Breccia Dyke
78.00 ft.
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
SECTION 513+00N
Assay: 1 inch = .20 opt PGM
AUG. 1/92
1/600


0E
200E
400E
10000
9800
9600
82-20
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
SECTION 515+00N
Assay: 1 inch = .20 opt PGM
AUG. 1/92
1/600

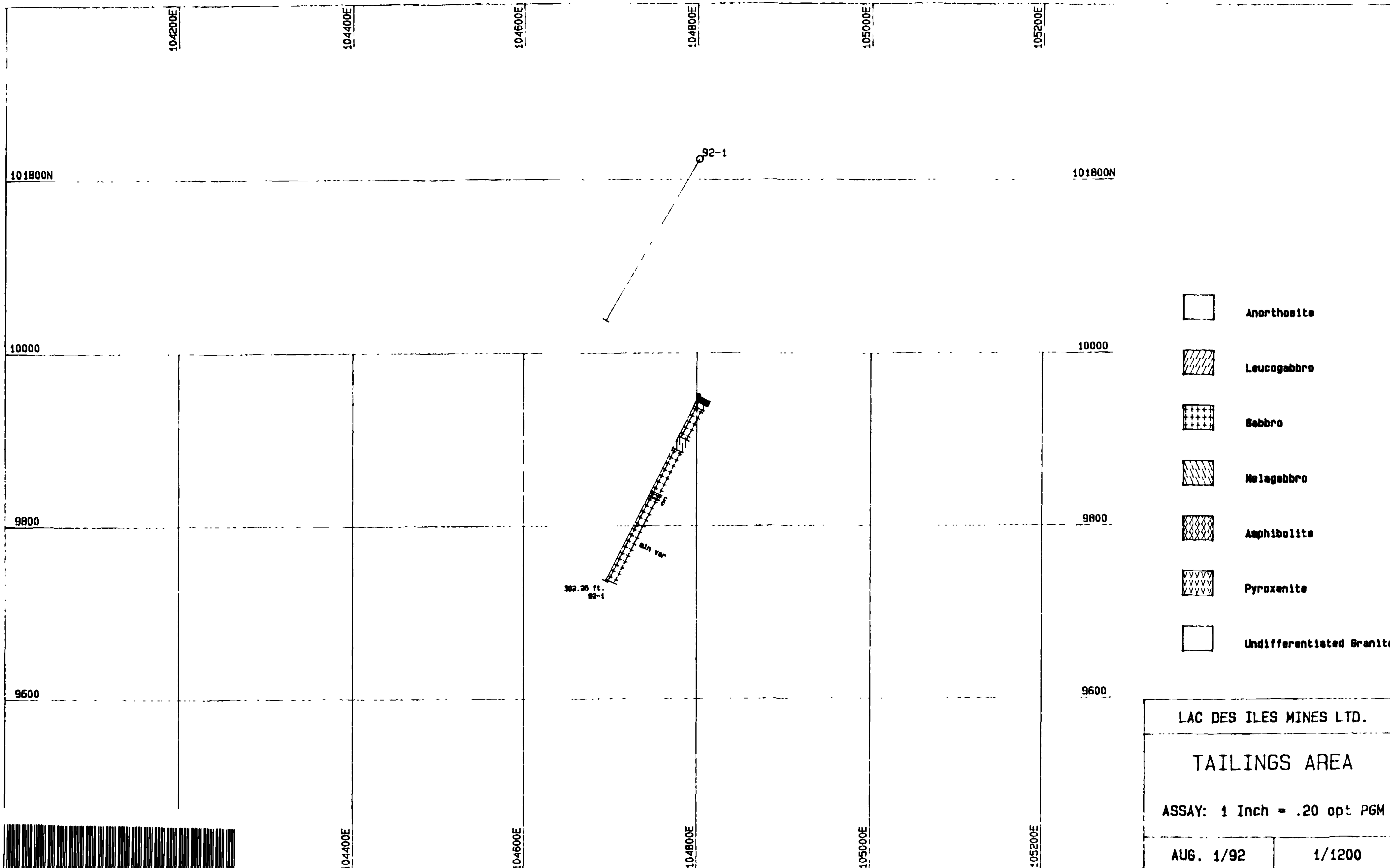


LAC DES ILES MINES LTD.

SECTION 50300N

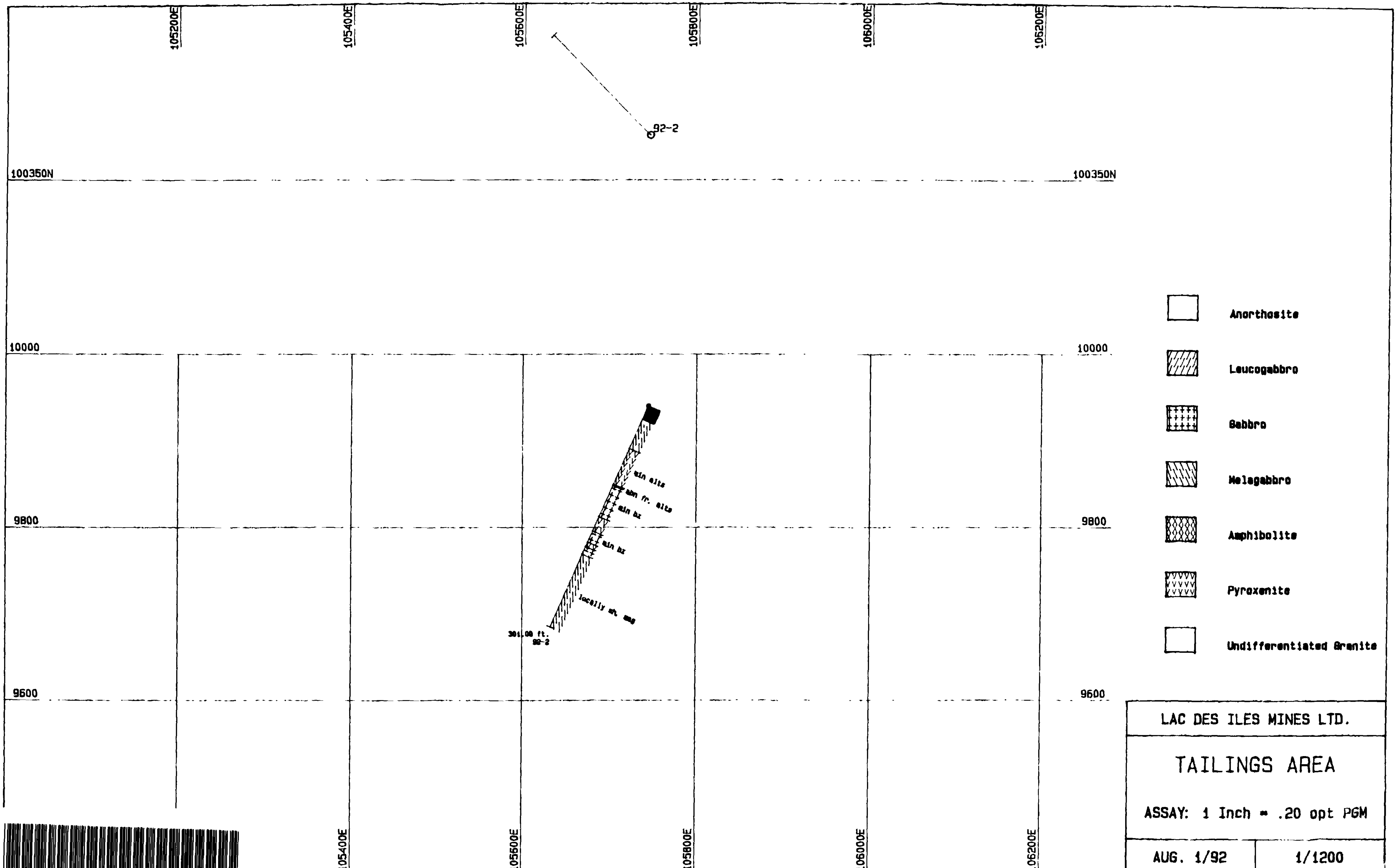
1 inch = .20 oz/ton PGM

MAY 21/92	1/600

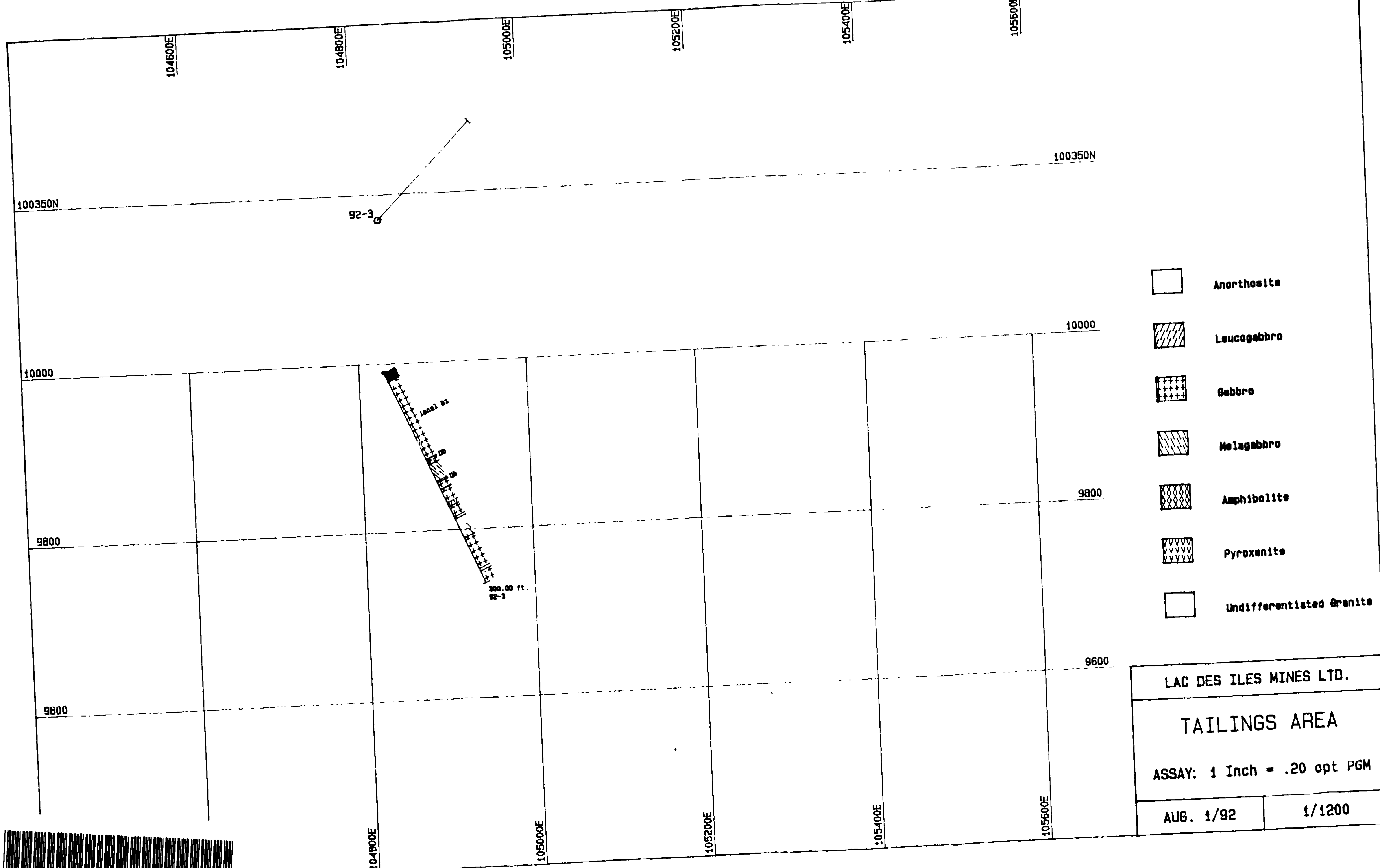


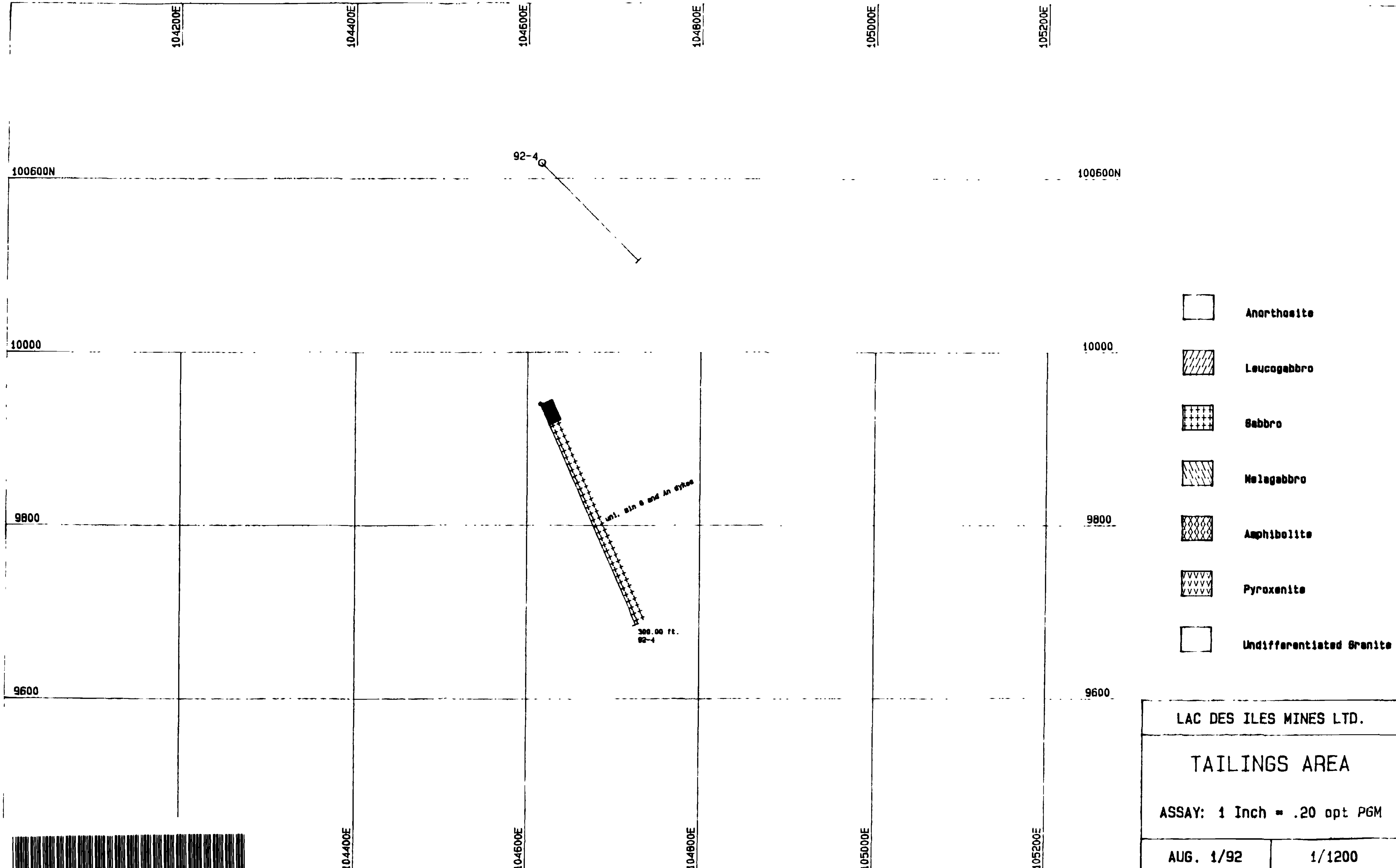
52H04NE0015 OM92 113 LAC DES ILES

400

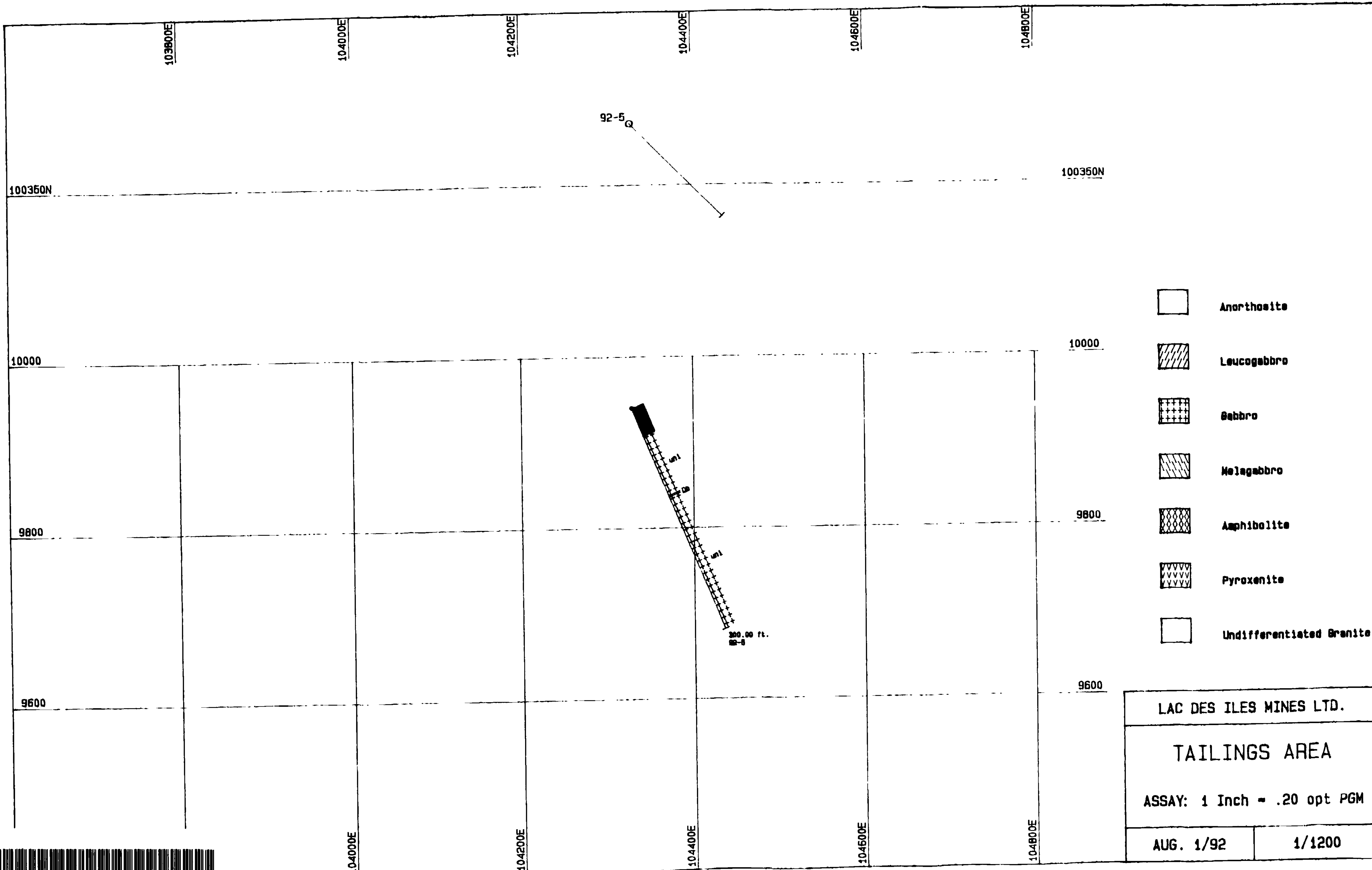


52H04NE0016 OM92-113 LAC DES ILES


104600E
104800E
105000E
105200E
105400E
105600E
100350N
92-3
10000
9800
9600
300.00 ft.
92-3
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
TAILINGS AREA
ASSAY: 1 Inch = .20 opt PGM
AUG. 1/92
1/1200



LAC DES ILES MINES LTD.	
TAILINGS AREA	
ASSAY: 1 Inch = .20 opt PGM	
AUG. 1/92	1/1200



103800E
104000E
104200E
104400E
104600E
104800E
92-5
100350N
10000
9800
9600
Anorthosite
Leucogabbro
Gabbro
Melagabbro
Amphibolite
Pyroxenite
Undifferentiated Granite
LAC DES ILES MINES LTD.
TAILINGS AREA
ASSAY: 1 Inch = .20 opt PGM
AUG. 1/92
1/1200