827420

RECLAMATION PROPOSAL

FOR THE

LARA WASTE/ORE PILES

LARA PROPERTY

Victoria Mining Division
NTS 92 B/13

August 21, 1989

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SUMMARY

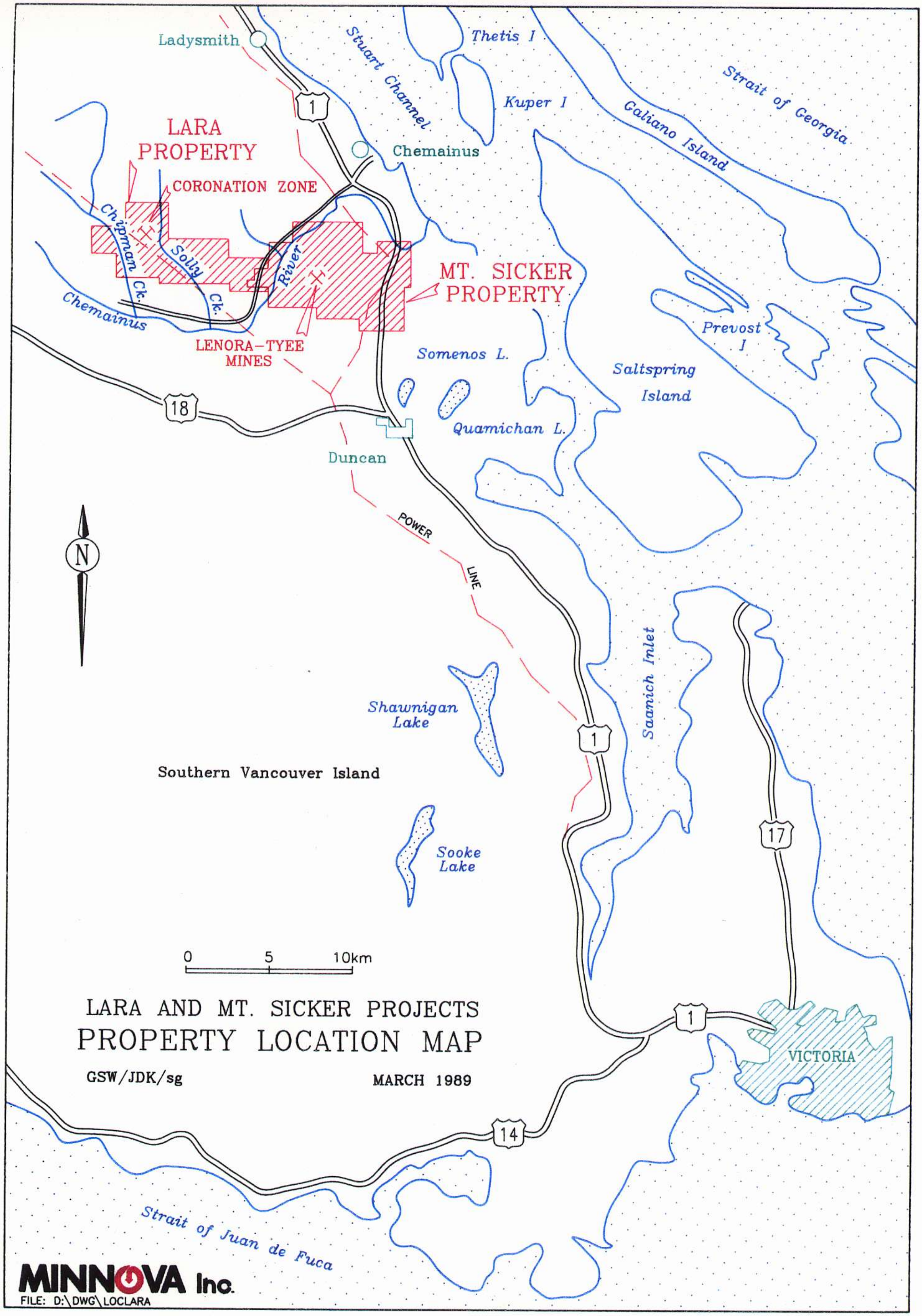
In 1988, Abermin Corporation removed 12,000 tonnes of material during an underground exploration program on the Lara property that evaluated the Coronation massive sulphide zone. This material was placed on an elevated, impermeable pad with controlled drainage. Of the total material on the pad, 500 tonnes consists of massive to semi-massive sulphides which have the potential to generate acid if they are exposed to the natural elements (i.e. air and water) for a prolonged period of time. To date, water quality monitoring has indicated that there is no acid generation due to the degradation of the sulphide-rich material and that there has been no impact on the surrounding environment and Solly Creek. However, in order to prevent this potential problem, Minnova proposes to encapsulate the 500 tonnes of sulphide-rich material in limestone and waste rock. As well, a 1 meter thick layer of compacted clay will be placed over the entire contoured pile in order to provide an impermeable cap. Subject to government approval, Minnova will complete this reclamation work before the winter of 1989-90.

1. Introduction

The Lara property is located in south-central Vancouver Island, 15 km west of Chemainus (Figure 1). In 1984, Abermin Corporation discovered a polymetallic massive sulphide zone which was subsequently named the Coronation Zone. After 3 years of diamond drill testing to define the extent of the sulphides, an underground program was undertaken in 1988 to extract a bulk sample for metallurgical testing and to test the continuity of the mineralization. Mining operations commenced on April 25, 1988 and were completed on September 9, 1988.

In accordance with the work permit, Abermin placed all of the sulphide ore and adjacent waste rock on a plastic-lined impermeable pad. In order to prevent any potential acid drainage caused by degradation of the sulphide material from reaching Solly Creek, a monitoring/treatment pond was installed to treat the leachate from this pad. A comprehensive water quality monitoring program was initiated and all of this data was submitted to the Ministry of Energy, Mines and Petroleum Resources on a quarterly basis.

On November 1, 1988, Abermin Corporation sold their interest in the Lara property to their joint venture partner - Laramide Resources. In order to finance this transaction, Laramide entered into an agreement with Minnova Inc., a mining and exploration company which has been actively evaluating the massive sulphide potential of southern Vancouver Island since 1983. For cash and certain expenditure guarantees, Minnova was granted exclusive exploration rights on the Lara property. Since November 1, 1988, linecutting, geological, lithogeochemical and geophysical surveys and diamond drilling have been carried out on the property. Further drilling is scheduled for September - November, 1989 and 1990. In addition to the exploration work, Minnova has continued to carry out the water quality monitoring associated with Abermin's underground program.


Ladysmith
Stuart Channel
Thetis I
Kuper I
Strait of Georgia
Galiano Island
1
Chemainus
LARA
PROPERTY
CORONATION ZONE
Chipman Ck.
Solly Ck.
River
Chemainus
MT. SICKER
PROPERTY
LENORA-TYEE
MINES
Somenos L.
Prevost
I
Saltspring
Island
18
Quamichan L.
Duncan
POWER
LINE
N
Saanich Inlet
Shawnigan
Lake
1
Southern Vancouver Island
17
Sooke
Lake
0
5
10km
LARA AND MT. SICKER PROJECTS
PROPERTY LOCATION MAP
GSW/JDK/sg
MARCH 1989
1
VICTORIA
14
Strait of Juan de Fuca
MINNOVA Inc.
FILE: D:\DWG\LOCLARA

The objectives of this report are to:

a) describe the current state and acid generation potential of material removed during the underground program,

b) summarize and comment on the water quality monitoring program results and,

c) propose a technical solution to the problem of potential acid generation of the sulphide-rich material that is present on the impermeable pad.

2. Current Site Conditions

During the underground program all material mined near or within the ore zone was placed on an elevated 60 meter square, impermeable pad (Figures 2, 3, 4). The bulk of the material removed is low-grade, sulphide-poor, non-economic "waste" rock taken from drifts in the footwall and hanging wall of the sulphide zone. This material is present on the pad in 2 large piles with estimated tonnages of 9145 and 2351 respectively. (Figures 5, 6). Five small sulphide-rich "ore" piles totalling 529 tonnes have been placed on the northwestern corner of the pad (Figures 5, 7).

Runoff water is controlled around the site by a series of diversion and collection ditches (Figure 2). Two diversion ditches upslope of the portal and storage pad areas prevent runoff water from entering the site area and two collection ditches around the portal and storage pad divert any water that is possibly contaminated to the monitoring/treatment pond. The only water found on the storage pad is due to direct rain or snowfall.

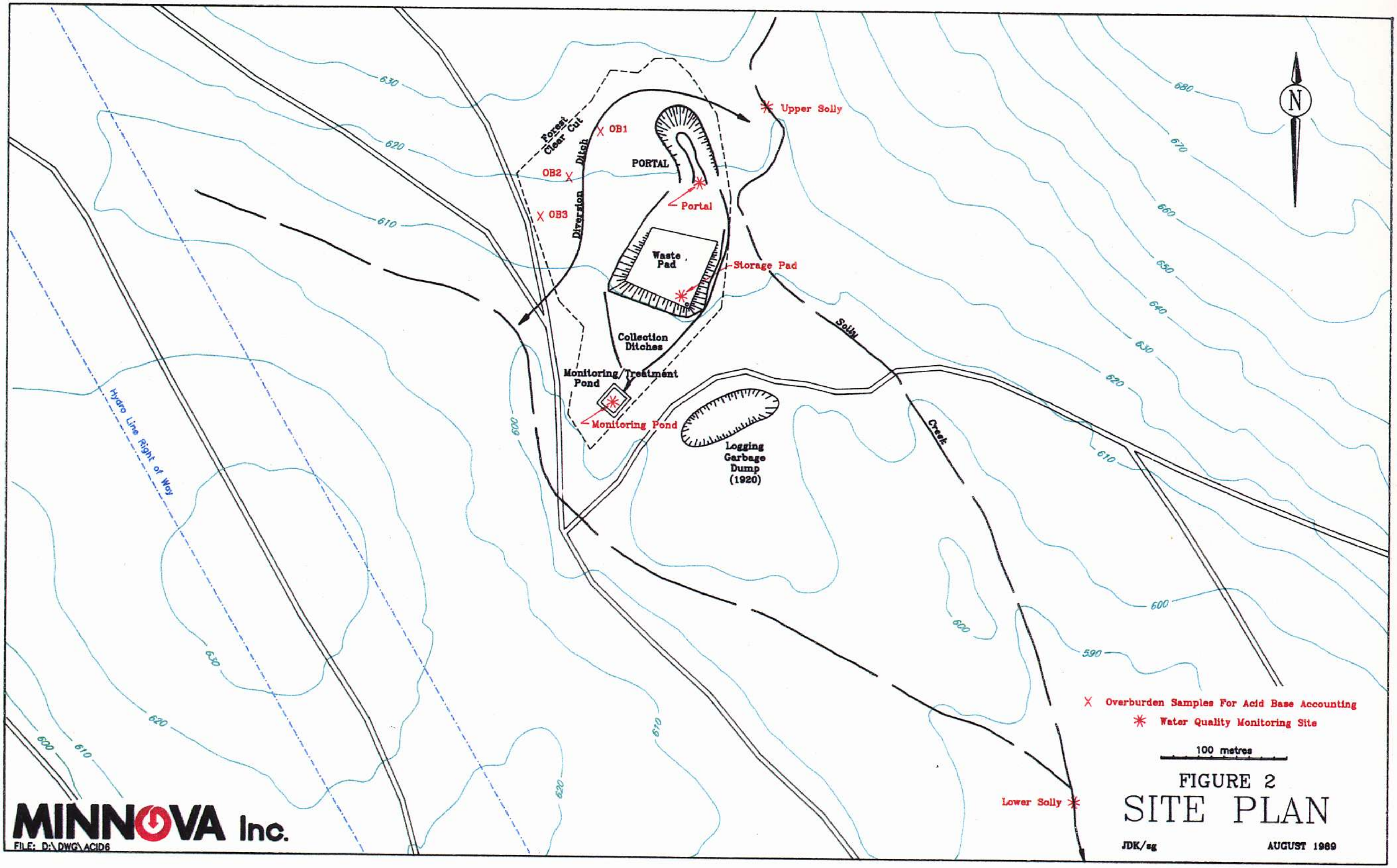


FIGURE 2
SITE PLAN

FIGURE 3: VIEW OF PAD AND WASTE PILES FROM MONITORING PAD

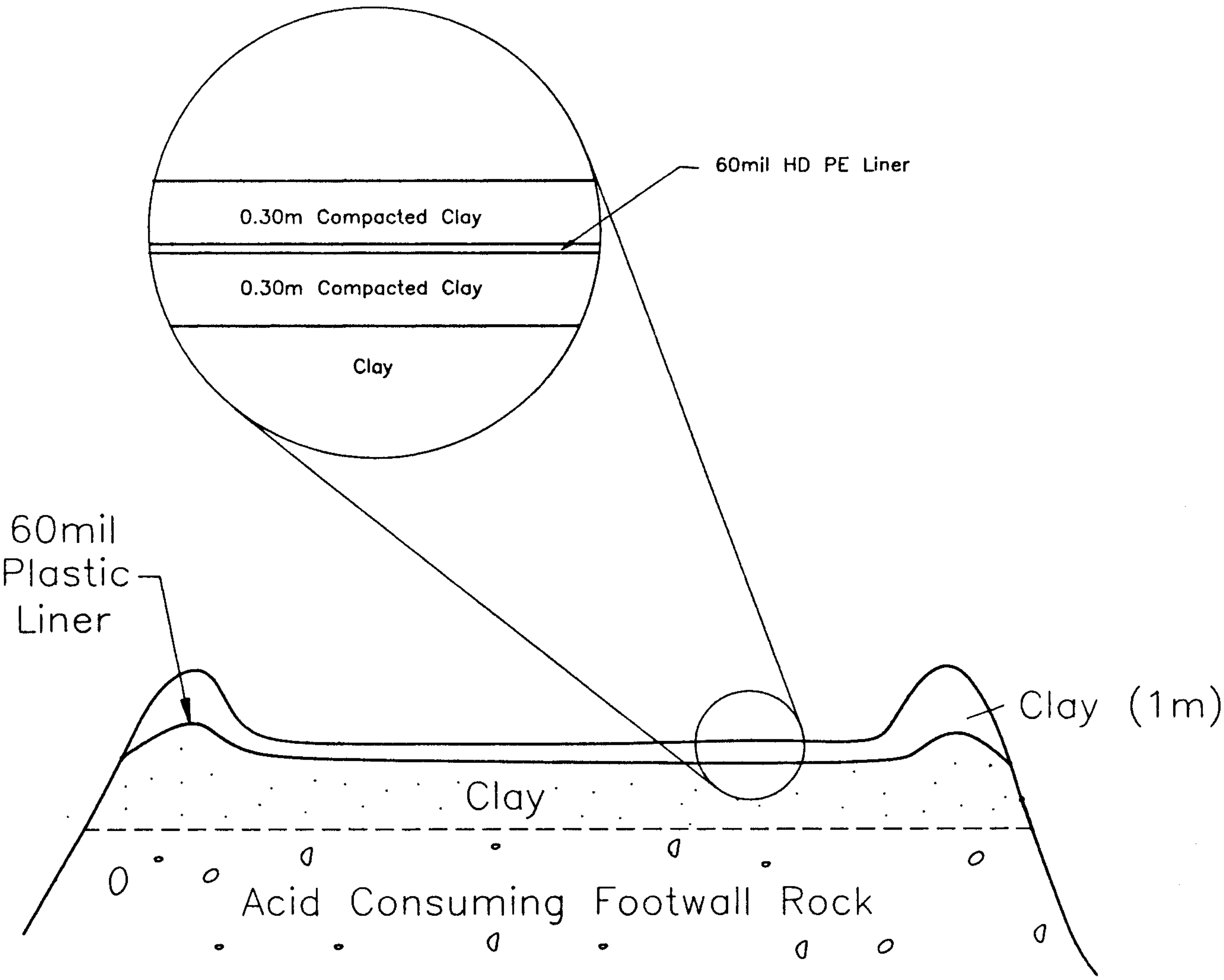
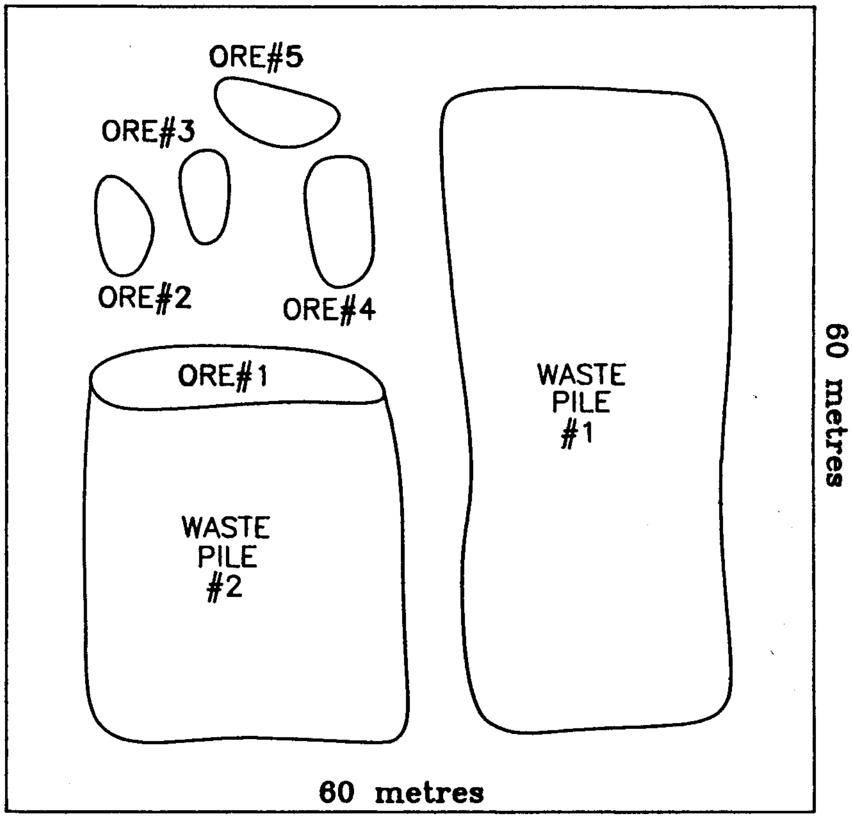


FIGURE 4

STORAGE PAD
EAST-WEST CROSS SECTION



ROCK PILE	tonnes
WASTE#1	9145
WASTE#2	2351
Sub Total	11496
ORE#1	55
ORE#2	119
ORE#3	157
ORE#4	72
ORE#5	126
Sub Total	529
TOTAL	12025

FIGURE 5

SKETCH OF WASTE/ORE STOCKPILE – PLAN VIEW

FIGURE 6: VIEW OF WASTE/ORE PILES AND PAD

FIGURE 7: VIEW OF ORE PILES

The contoured nature of the pad allows this water to accumulate at the southeastern corner of the pad (Figure 8) prior to release to the monitoring/treatment pond (Figure 2, 9). After a period of heavy rainfall, the monitoring/treatment pond is designed such that it overflows into the forest area between the pond and Solly Creek (Figure 10, 11). To date, overflow has only been noted in late fall and early spring. There has been little or no drainage from the waste/ore pad to the monitoring/treatment pond since March and no release of water from the monitoring/treatment pond to the forest since March. The storage pad, monitoring/treatment pond and interceptor ditches were designed so that there is no direct discharge of water from around the site into Solly Creek.

The underground workings are presently flooded (Figure 12). However, they may be useful for any future development and mining of the Coronation sulphide zone.

3. Acid Generation Studies of Waste/Ore Piles

Prior to the bulk sampling program in 1988, and in compliance with requirements of the Province of British Columbia, Ministry of Energy, Mines and Petroleum Resources, Abermin Corporation undertook an acid-base accounting study of the mineralized Coronation Zone and of its associated footwall. The results are presented in Table 1. The Coronation Zone ore samples are high in sulphur, ranging from 5.0% to 13.7%, and based on the acid-base accounting work undertaken, have the potential to generate acid. On the other hand, the footwall material has a very low sulphur content (i.e., it ranged from 0.089% to 0.470%) and, based upon acid-base accounting techniques, appears to be acid consuming. The government approval to undertake a bulk sampling program at the Lara Property took into consideration these results.

FIGURE 8: DRAINAGE CULVERT AT LOW CORNER OF WASTE/ORE PAD (JULY 27. 1989)

FIGURE 9: MONITORING POND AS SEEN FROM WASTE/ORE PAD

FIGURE 10: OVERFLOW DRAIN FROM MONITORING POND

FIGURE 11: DRAINAGE AREA AS SEEN FROM MONITORING POND

FIGURE 12: PORTAL SITE (JULY 27, 1989)

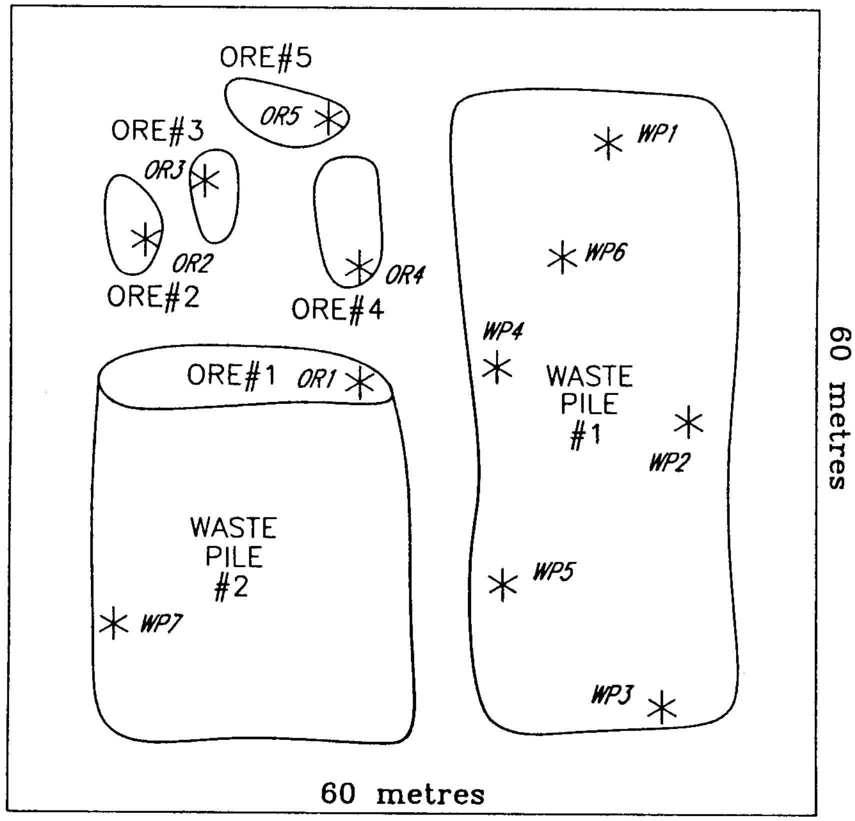
TABLE 1

ACID-BASE ACCOUNTING TEST RESULTS FOR WASTE ROCK AND ORE FROM THE LARA PROPERTY

			(kg/tonne)		
Sample Origin	Paste pH	% Total Sulphur	Theoretical Acid Production	Theoretical Neutral Potential	Net Neutral Potential
Ore	8.0	5.0	156	48.6	-107.4
	8.0	13.3	416	59.12	-356.9
	7.6	13.7	428	225.2	-202.8
	7.8	12.1	378	29.79	-348.2
Footwall Waste					
	8.5	0.470	14.69	63.71	+49.0
	8.7	0.089	2.78	55.19	+52.4

Analyses performed by Chemex Labs, EPA Acid-Base Accounting

An evaluation of the acid generation potential of material stored on the impermeable storage pad is important to the determination of the procedures to be implemented to address the long-term storage of the material on the pad. Figure 13 illustrates both the location of the material on the pad and also the location of the sites from which samples were collected for acid-base accounting. In Table 2, the results of the acid-base accounting tests are presented. The tonnages of material within each of the storage piles illustrated in Figure 13 has been presented in Figure 5.



* *WP7* Location of Sample for Acid Generation Potential Tests

FIGURE 13

LOCATION OF SAMPLES FOR ACID GENERATION POTENTIAL TESTS

Of the seven samples collected in Waste piles 1 and 2, based upon acid-based accounting techniques, four of the samples collected appear to be acid generating and three of the samples appear to be acid consuming. With respect to the five small ore piles, all five results indicate that all of this material has the potential to generate acid.

Three samples were also collected of local overburden composed of clay and glacial till since this material has the potential to be used for a cap on the waste rock and ore storage area (discussed further in the final section of this report). Acid-base accounting was also carried out on each of these samples and the results are also presented in Table 2. This material is neither acid generating nor consuming.

TABLE 2

ACID-BASE ACCOUNTING RESULTS FOR WASTE ROCK AND ORE FROM THE VARIOUS STORAGE PILES LOCATED ON THE IMPERMEABLE PAD

			(kg/tonne)		
Sample Description	Paste pH	% Total Sulphur	Theoretical Acid Production	Theoretical Neutral Potential	Net Neutral Potential
WP-1	8.3	2.85	89	44	-45
WP-2	8.5	2.63	82	48	-34
WP-3	8.8	3.02	94	58	-36
WP-4	9.0	2.45	76	104	+28
WP-5	9.1	0.848	26	34	+8
WP-6	9.0	0.129	4	36	+32
WP-7	8.4	3.73	117	78	-39
OR1	8.2	8.90	278	58	-220
OR2	8.0	16.80	525	103	-422
OR3	8.0	5.53	173	86	-87
OR4	8.2	6.31	197	78	-119
OR5	8.2	5.13	160	79	-81
OB1	6.9	0.012	0	0	0
OB2	7.8	0.016	0	4	+4
OB3	7.7	0.001	0	4	+4

Analyses performed by Chemex Labs, EPA Acid-Base Accounting.

In summarizing, it is apparent that all five ore piles contain potentially acid generating material. The two large waste piles are a combination of both potentially acid generating material and potentially acid consuming material. The overburden is essentially neither acid generating nor acid consuming.

4. Water Quality Results and Interpretation

Water quality samples have been collected on a number of occasions between May, 1988 and August, 1989. The location of all sampling sites are illustrated in Figure 2. The results obtained are presented in the tables that follow. Table 3 contains data from samples collected at the portal site. It should be noted that effluent from the portal discharges via a ditch to the monitoring /treatment pond. It should also be noted that at times there is no discharge from the portal site and that, when this occurred, samples of stagnant water from the entrance to the portal were collected.

Table 4 contains data from Solly Creek above the exploration site (i.e. this station is considered to be a control site not influenced by on-site activities). Table 5 contains data from Solly Creek downstream of the location of the effluent discharge from the monitoring/treatment pond. Table 6 contains the monitoring/treatment pond water quality information. It should be noted that the monitoring/treatment pond contains the discharge from both the portal and the overflow from the storage pads. Table 7 contains waste storage leachate quality data. Some of the samples from the waste rock storage pad are indicative of the effluent discharge from the pad to the monitoring/treatment pond and some are indicative of standing pools of water on the pad. A brief discussion of the water quality monitoring data follows.

TABLE 3: LARA PROPERTY WATER QUALITY ANALYSES: PORTAL SITE.

	1988											1989		
PARAMETER (mg/L)	MAY 12	JUNE 6	JUNE 15	JULY 21	AUG. 11	SEPT. 8	OCT. 11	NOV. 8	NOV. 14	DEC. 14	DEC. 29	MAY 15	JUNE 1	AUG. 3
pH	6.86	6.49	7.61	7.20	7.00	6.61	7.56	7.74	8.09	7.74	7.44	7.11	7.20	7.47
Alkalinity $CaCO_3$	13.60	5.33	117.0	119.0	85.0	72.0	102.0	95.4	530.0	58.7	56.7	17.0	43.5	59.0
Sulphate SO_4	L1.0	L1.0	15.0	18.0	19.0	40.3	57.5	39.8	12.8	8.2	13.8	2.6	4.4	9.3
Total Metals														
Aluminum	L0.04	0.085	20.6	68.6	12.3	5.92	0.63	0.039	-	p	0.022	0.041	0.022	0.14
Arsenic	L0.0001	L0.0001	0.24	2.14	0.098	0.048	0.016	0.0093	-	0.0022	0.0036	0.0005	0.0002	0.0008
Copper	L0.002	0.008	0.14	7.00	0.15	0.26	0.009	0.002	-	0.001	L0.001	0.002	0.001	0.001
Iron	0.019	0.019	23.7	191.00	9.93	6.54	0.66	L0.03	-	L0.015	L0.015	0.044	0.12	0.39
Lead	0.062	L0.05	0.60	11.6	0.33	0.66	0.63	0.004	-	0.001	0.001	0.001	L0.001	0.003
Zinc	0.030	L0.003	1.37	56.6	1.00	2.01	0.15	0.11	-	0.028	0.033	0.21	0.65	0.29
Dissolved Metals														
Aluminum	L0.04	0.083	0.054	0.21	0.12	0.074	0.021	0.024	-	p	0.007	0.007	0.005	0.015
Arsenic	L0.0001	L0.0001	0.021	0.029	0.0060	0.0035	0.0052	0.0089	-	0.0018	0.0032	0.0003	L0.0001	0.0006
Copper	0.002	0.005	0.004	L0.005	L0.005	L0.005	0.002	0.002	-	L0.001	L0.001	0.002	0.001	L0.001
Iron	0.010	0.006	0.05	L0.03	L0.03	L0.03	L0.03	L0.03	-	L0.015	L0.015	L0.015	L0.015	L0.03
Lead	L0.05	L0.05	L0.001	0.001	0.004	0.008	0.031	0.001	-	0.001	L0.001	L0.001	L0.001	L0.001
Zinc	0.025	L0.003	L0.005	L0.005	L0.005	0.027	0.10	0.11	-	0.028	0.032	0.16	0.58	0.21

L = Less than

Results are expressed in mg/L except for pH.

TABLE 4: LARA PROPERTY WATER QUALITY ANALYSES: SOLLY CREEK ABOVE EXPLORATION SITE.

PARAMETER (mg/L)	1988											1989			
	MAY 12	JUNE 6	JUNE 15	JULY 21	AUG. 11	SEPT. 8	OCT. 11	NOV. 8	NOV. 14	DEC. 14	DEC. 29	MAR. 14	MAY 15	JUNE 1	AUG. 3
pH	6.60	6.54	6.93	6.39	6.81	6.53	6.77	6.95	-	6.78	6.48	7.13	6.72	6.78	6.70
Alkalinity $CaCO_3$	2.27	5.33	6.4	6.8	9.0	12.0	12.0	12.0	-	5.1	6.2	7.4	6.0	4.1	10.0
Sulphate SO_4	L1.0	L1.0	L1.0	1.6	L1.0	L1.0	L1.0	L1.0	-	L1.0	L1.0	L1.0	L1.0	L1.0	L1.0
Total Metals															
Aluminum	0.140	0.150	0.089	0.05	0.075	0.092	0.15	0.029	-	p	0.056	0.068	0.083	0.15	0.065
Arsenic	L0.0001	L0.0001	L0.0001	L0.0001	L0.0001	L0.0001	0.0002	L0.0001	-	L0.0001	L0.0001	L0.0001	0.0002	0.0004	L0.0001
Copper	L0.002	0.008	0.011	L0.005	0.005	L0.010	L0.001	0.001	-	0.003	L0.001	L0.001	0.002	0.002	0.001
Iron	L0.003	0.010	L0.03	L0.03	L0.03	0.03	0.04	0.03	-	L0.015	L0.015	0.031	L0.015	0.017	L0.03
Lead	0.095	L0.05	L0.001	L0.001	L0.001	0.003	L0.001	L0.001	-	L0.001	L0.001	L0.001	L0.001	L0.001	L0.001
Zinc	L0.003	0.004	0.005	L0.005	L0.005	L0.005	0.007	L0.005	-	L0.005	0.008	0.007	L0.005	0.008	L0.005
Dissolved Metals															
Aluminum	0.067	0.100	0.087	0.05	0.069	0.083	0.029	0.029	-	p	0.031	0.056	0.070	0.12	0.048
Arsenic	L0.0001	L0.0001	L0.0001	L0.0001	L0.0001	L0.0001	0.0002	L0.0001	-	L0.0001	L0.0001	L0.0001	L0.0001	0.0003	L0.0001
Copper	L0.002	0.006	0.001	L0.005	L0.005	L0.005	L0.001	L0.001	-	0.001	L0.001	L0.001	0.002	0.001	L0.001
Iron	0.016	0.007	L0.03	L0.03	L0.03	L0.03	L0.03	L0.03	-	L0.015	L0.015	L0.015	L0.015	L0.015	L0.03
Lead	L0.05	L0.05	L0.001	L0.001	L0.001	L0.001	L0.001	L0.001	-	L0.001	L0.001	L0.001	L0.001	L0.001	L0.001
Zinc	L0.003	L0.003	L0.005	L0.005	L0.005	L0.005	L0.005	L0.005	-	L0.005	0.008	0.007	L0.005	0.008	L0.005

L = Less than

Results are expressed in mg/L except for pH.

TABLE 5: LARA PROPERTY WATER QUALITY ANALYSES: SOLLY CREEK BELOW EXPLORATION SITE.

	1988											1989		
PARAMETER (mg/L)	MAY 12	JUNE 6	JUNE 15	JULY 21	AUG. 11	SEPT. 8	OCT. 11	NOV. 8	NOV. 14	DEC. 14	DEC. 29	MAY 15	JUNE 1	AUG. 3
pH	6.08	6.59	6.33	6.53	6.50	dry	-	-	-	6.70	6.38	6.35	6.56	6.33
Alkalinity $CaCO_3$	6.81	5.33	5.30	6.8	13.0	creek	-	-	-	8.2	6.2	7.0	11.6	11.0
Sulphate SO_4	L1.0	L1.0	L1.0	1.1	L1.0	-	-	-	-	L1.0	L1.0	4.3	9.5	1.90
Total Metals														
Aluminum	0.090	0.093	0.088	0.07	0.074	dry	-	-	-	p	0.062	0.026	0.016	0.069
Arsenic	L0.0001	L0.0001	L0.0001	0.0003	L0.0001	creek	-	-	-	L0.0001	L0.0001	0.0002	0.0001	L0.0001
Copper	L0.002	0.006	L0.001	L0.005	0.007	-	-	-	-	L0.001	L0.001	0.001	0.001	0.002
Iron	L0.003	0.028	0.030	L0.03	L0.03	-	-	-	-	L0.015	L0.015	0.019	L0.015	L0.03
Lead	0.055	L0.050	L0.001	L0.001	L0.001	-	-	-	-	L0.001	L0.001	L0.001	L0.001	L0.001
Zinc	L0.003	0.004	L0.005	L0.005	L0.005	-	-	-	-	0.014	L0.005	L0.005	L0.005	L0.005
Dissolved Metals														
Aluminum	L0.04	0.093	0.069	0.06	0.065	dry	-	-	-	p	0.038	0.022	0.011	0.041
Arsenic	L0.0001	L0.0001	L0.0001	0.0003	L0.0001	creek	-	-	-	L0.0001	L0.0001	0.0001	L0.0001	L0.0001
Copper	L0.002	0.006	0.001	L0.005	0.001	-	-	-	-	L0.001	L0.001	0.001	0.001	L0.001
Iron	0.017	0.014	L0.030	L0.03	L0.03	-	-	-	-	L0.015	L0.015	L0.015	L0.015	L0.03
Lead	L0.05	L0.05	L0.001	L0.001	L0.001	-	-	-	-	L0.001	L0.001	L0.001	L0.001	L0.001
Zinc	L0.003	L0.003	L0.005	L0.005	L0.005	-	-	-	-	0.011	L0.005	L0.005	L0.005	L0.005

L = Less than
Results are expressed in mg/L except for pH.

TABLE 6: LARA PROPERTY WATER QUALITY ANALYSES: MONITORING POND.

PARAMETER (mg/L)	1988								1989				
	JULY 21	AUG. 11	SEPT. 8	OCT. 11	NOV. 8	NOV. 14	DEC. 14	DEC. 29	JAN. 20	MAR. 14	MAY 15	JUNE 1	AUG. 3
pH	6.98	7.48	4.74	7.58	7.47	7.76	7.24	7.25	7.31	7.34	7.38	7.33	6.74
Alkalinity $CaCO_3$	73.1	88.0	4.0	80.0	49.0	61.0	51.5	55.6	61.8	59.9	51.0	38.9	18.0
Sulphate SO_4	260.0	29.0	37.5	79.6	303.0	6.2	638.0	391.0	579.0	504.0	689.0	1,080.0	996.0
Total Metals													
Aluminum	2.22	0.48	1.15	0.14	0.029	-	p	0.009	0.11	0.028	L0.005	L0.005	0.065
Arsenic	0.020	0.022	0.015	0.010	0.0033	-	0.0020	0.0014	0.0022	0.0013	0.0010	0.0035	0.0020
Copper	L0.005	0.008	0.032	0.003	0.002	-	0.004	0.002	0.007	0.008	0.005	0.007	0.002
Iron	0.40	0.37	0.89	0.20	0.04	-	0.021	L0.015	0.033	0.018	0.015	L0.015	L0.03
Lead	0.015	0.009	0.052	0.026	0.002	-	0.010	0.001	0.011	0.010	0.008	L0.001	0.007
Zinc	0.085	0.059	0.21	0.14	2.04	-	8.69	10.7	8.23	6.50	9.25	8.30	6.13
Dissolved Metals													
Aluminum	1.32	0.24	0.15	0.015	0.005	-	p	L0.005	0.014	L0.005	L0.005	L0.005	0.009
Arsenic	0.013	0.015	0.0038	0.0049	0.0024	-	0.0017	0.0012	0.0016	0.0013	0.0007	0.0029	0.0015
Copper	L0.005	L0.005	L0.005	L0.001	0.002	-	0.004	0.002	0.005	0.007	0.004	0.003	L0.001
Iron	L0.03	L0.03	L0.03	L0.03	L0.03	-	L0.015	L0.015	L0.015	L0.015	L0.015	L0.015	L0.03
Lead	0.002	L0.001	0.003	0.002	L0.001	-	0.016	0.001	0.010	0.008	0.006	L0.001	L0.001
Zinc	0.067	0.018	0.033	0.012	2.03	-	8.34	10.0	8.20	6.46	8.78	7.66	5.62

L = Less than
Results are expressed in mg/L except for pH.

TABLE 7: LARA PROPERTY WATER QUALITY ANALYSES: LEACHATE FROM THE WASTE STORAGE PAD.

PARAMETERS (mg/L)	1988				1989				
	OCT. 1	NOV. 8	DEC. 14	DEC. 29	JAN. 20	MAR. 14	MAY 15	JUNE 1	AUG. 3
pH	5.31	3.91	7.42	7.52	7.40	7.38	7.66	6.77	6.69
Alkalinity $CaCO_3$	8.0	L1.0	119.0	98.9	84.5	78.8	106.0	88.2	51.0
Sulphate SO_4	1,880.0	2,160.0	1,680.0	1,730.0	1,050.0	810.0	1,620.0	1,710.0	1,010.0
Total Metals									
Aluminum	0.18	0.016	p	0.013	0.060	0.024	0.009	0.022	0.095
Arsenic	0.0077	0.0022	0.0032	0.0028	0.0021	0.0017	0.0017	0.0040	0.0024
Copper	0.067	0.011	0.008	0.008	0.010	0.011	0.034	0.007	0.009
Iron	0.84	0.33	L0.015	0.39	L0.015	L0.015	0.13	0.021	0.07
Lead	0.25	0.18	0.016	0.011	0.016	0.016	0.021	0.011	0.024
Zinc	15.8	24.4	17.2	12.9	14.7	13.0	21.4	8.58	6.92
Dissolved Metals									
Aluminum	0.021	0.016	p	L0.005	0.020	0.005	0.006	0.005	0.015
Arsenic	0.0069	0.0018	0.0029	0.0023	0.0016	0.0017	0.0011	0.0037	0.0018
Copper	0.049	0.011	0.006	0.008	0.010	0.010	0.029	0.007	0.008
Iron	L0.03	0.04	L0.015	L0.015	L0.015	L0.015	L0.015	L0.015	L0.03
Lead	0.20	0.18	0.044	0.006	0.014	0.016	0.015	0.010	0.014
Zinc	11.4	23.9	16.7	12.9	12.6	12.8	19.9	8.58	6.90

L = Less than

Results are expressed in mg/L except for pH.

From a water quality perspective, in order to assess the effects of the overall activities on-site, it is important to compare the results from the upstream Solly Creek control station to the results for the downstream Solly Creek impact assessment monitoring station. A review of the data with respect to metal levels in these water samples indicates that there is no significant difference between metal levels in the upstream and downstream samples collected.

With respect to pH, the downstream Solly Creek pH is marginally lower than the upstream pH on most occasions. In no instances does the downstream pH in lower Solly Creek fall below 6.0 and only on one occasion has the pH dropped below 6.3. The reason for the slight difference in pH cannot be directly attributed to any particular undertaking.

The sulphate levels in upstream Solly Creek were less than 1 mg/L during all but one sampling events. Between May 1988 and early 1989, the lower Solly Creek sulphate levels were approximately the same as those for upper Solly Creek. However, two recent samples collected during the months of May and June exhibited increased sulphate levels (4.3 mg/L and 9.5 mg/L). Noting that there has been no discharge of effluent from the monitoring pond to lower Solly Creek during the period in which the more elevated sulphate levels occurred, the reason for the increased levels is unclear.

During the period from December 14, 1988 to August 3, 1989, the leachate from the waste storage pad had a pH ranging between 6.69 and 7.66. Sulphate levels ranged from 810 mg/L to 1,710 mg/L and alkalinity ranged from 51.0 mg/L to 119.0 mg/L. During that same period, the pH in the monitoring/treatment pond ranged between 6.74 and 7.34. Sulphate levels ranged from 391.0 mg/L and 1,080 mg/L and alkalinity remained within a range of 18.0 mg/L to 61.8 mg/L. Total zinc concentrations during the same time frame ranged from 6.92 mg/L to 17.2 mg/L in the waste storage pad leachate samples and from 6.13 mg/L to 10.7 mg/L in the monitoring/treatment pond. Most of the zinc present in the monitoring pond is in the form of dissolved metal. Despite elevated levels of zinc in the monitoring pond, there is no sign of any increases in the zinc levels in Solly Creek as a result of activities at the Lara site.

To date, the water quality results for the upstream and downstream Solly Creek monitoring stations indicate that the on-site acitivities have had a negligible influence on water quality in Solly Creek. Although there is not a water quality problem at this time, Minnova Inc. recognizes that the presence of acid generating material on-site must be dealt with in a manner to ensure that, over a long-term, degradation of Solly Creek does not occur. The procedures that Minnova Inc. propose to implement, to eliminate potential future environmental concerns, are addressed in the following section.

5. Proposed Reclamation

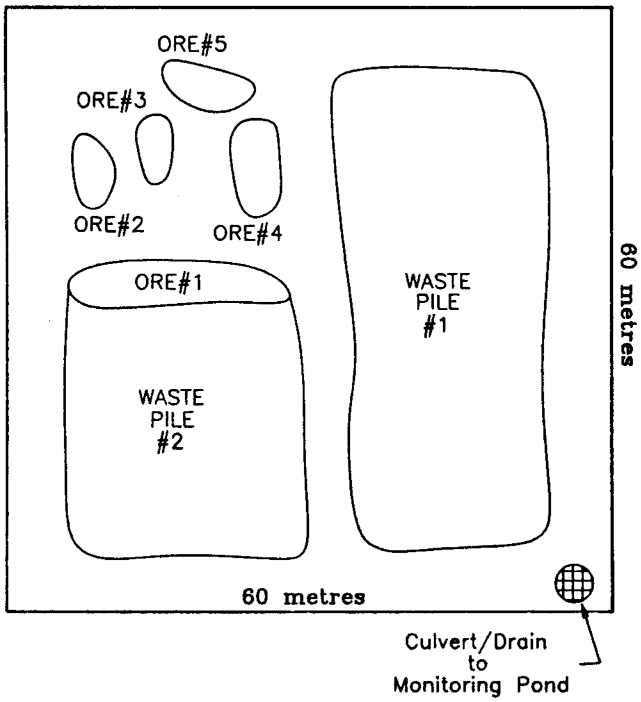
The exposure of potentially acid generating material to both water and air can result in the production of an acidic waste water that must be dealt with. Removal of air and/or water from the acid generating material will eliminate this potential problem. The waste and ore piles already sit on an impermeable pad which is underlain by acid consuming rock and area runoff from rain or melting snow is controlled by existing ditches. The reclamation plan that follows takes these factors into consideration.

The proposed reclamation plan is illustrated in Figure 14 and explained below:

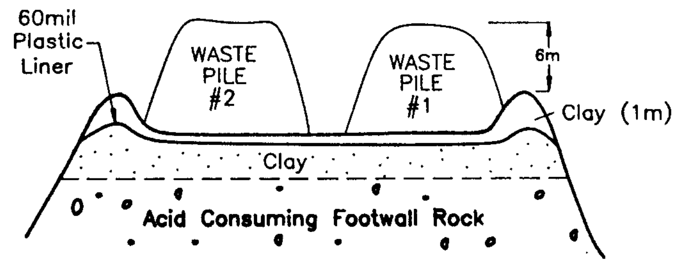
a) A 0.5m, thick layer of limestone which will provide a base for the sulphide-rich material is placed in the center of the pad between the 2 large "waste" piles.

b) The sulphide-rich ore material is moved onto this limestone layer.

A. Current Pad Configuration

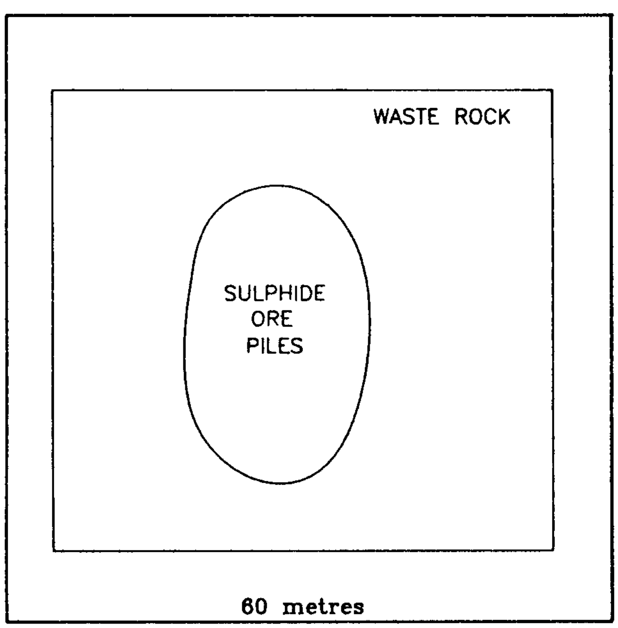


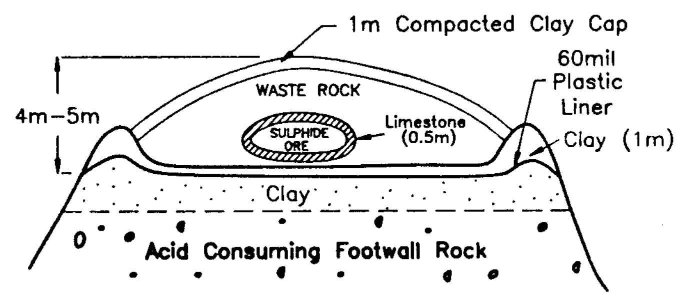
PLAN VIEW



EAST-WEST CROSS SECTION

B. After Proposed Reclamation





EAST-WEST CROSS SECTION

PLAN VIEW

FIGURE 14

SKETCH OF PROPOSED RECLAMATION

c) A 0.5 m thick layer of limestone is placed over the sulphide-rich material.

d) The waste material is contoured in such a way as to cover the limestone and sulphide-rich material and to encourage surface water runoff rather that seepage.

e) The contoured pile is then covered with 1 meter of compacted clay material which will provide an impermeable cap.

f) Maintain the monitoring/treatment pond in good working order to deal with the portal water.

Minnova feels that the proposed reclamation work will not allow water to come in contact with the sulphide-rich ore and consequently, no acid generation will occur. Subject to government approval, Minnova is prepared to carry out this reclamation work prior to the winter of 1989 - 90.