

MAR 19990010: ATHABASCA

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APR 13 1999
19990010

PERMIT No. 9395010001

ASSESSMENT WORK REPORT

PERIOD JANUARY 24, 1997 TO JANUARY 23, 1999

SUBMITTED BY:
SOLV-EX CORPORATION
ALDO CORTI, P. ENG.

SUBMITTED TO:
ALBERTA ENERGY

APRIL 1999

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1. SUMMARY

Solv-Ex Corporation is the holder of the Metallic & Industrial Minerals Permit No. 9395010001.

Solv-Ex has carried out drilling programs during the period 1995 and 1996 over a 60 Ha area within the boundaries of the permit No. 9395010001.

Early results of the drilling programs indicated the presence of a thick layer of Clearwater Clays in the overburden deposit topping the McMurray formation.

In the reporting period ending January 1999, Solv-Ex has carried out additional overburden excavation and bulk sample collection, analytical and testing work on the Clearwater Clay layer with the scope of characterization and resources estimates.

In total, the expenditures during the reporting period were Canadian dollars \$32,500.

Solv-Ex will continue to implement activities and programs aiming at additional characterization of the reserves, both in terms of quantity and processability.

2. INTRODUCTION

Solv-Ex Corporation is the legal holder of the Metallic & Industrial Minerals Permit No. 9395010001.

During 1996 and early 1997 Solv-Ex started an experimental program to test proprietary technologies in the field of bitumen and mineral recovery from the McMurray formation at Lease 5 in the Athabasca region. In parallel, Solv-Ex also initiated a smaller program aiming at characterize the overburden layer in general, and the Clearwater Clays layer in particular.

In the course of the studies, of the analyses of the cores and of the development work, both with regard to the process and with regard to the resources associated with the overburden clay deposit, it was determined that the clay formations in the overburden have characteristics similar to those of the clays in the oil sands.

Pursuing the program to better characterize these clay layers for future potential commercial development plans, an effort to evaluate the extent of the resources and to determine the processing characteristics was initiated in the spring of 1997. The plan included obtaining a sample for chemical analysis followed by mining a bulk sample of several 45 gallon drums and shipping to Albuquerque at Solv-Ex R&D Center. Solv-Ex was assisted on site by Clifton & Associates, by Oil Sands Evaluation Ltd. and by Metis Corporation, to ensure appropriate mapping of the area and collection of representative samples.

The material was used for analytical work as well as for clay beneficiation and leaching tests. This work has not been completed yet at the end of the reporting period.

3. ANALYTICAL WORK PERFORMED

In May 1997 a bulk sample of several 45 gallons drums of the Clearwater Clay formation was collected from two different locations as chosen by Clifton & Associates (after clearing part of the site nearby the Athabasca River). The sample was transported to the Solv-Ex Albuquerque New Mexico R&D Center. The sample represented the upper, middle and lower portions of the Clearwater Clay formation. The sample was collected using a combination of power hoe and manual labor, and it was labeled for transport in early June, 1997.

The attached table shows the composition of the clay sample in two of the drums, along with an analysis of a sample of extraction tailings published by an oil sands operator in an earlier study.

4. CLEARWATER CLAY CHARACTERIZATION

Clay beneficiation is the first step in the characterization of the Clearwater Clay. Two clay beneficiation tests were performed during the reporting period. The first was a qualitative step to observe the behavior of the material when mixed with water in order to make a slurry. The test, carried out at the lab, showed that, while the Clearwater Clay did not disperse immediately, the level of energy input required did not appear to be large.

The second test involved the use of hydrocyclones to concentrate the alumina fraction and to monitor the increase of the ratios alumina to magnesium and alumina to iron. The attached report indicate that only small improvements in these ratios were observed.

Clay leaching is the second step in the characterization of the Clearwater Clay. The tests were carried out also with the scope of comparing the Clearwater Clays to the clay fractions found in other layers and formations (i.e. in the McMurray formation). In studying the Clearwater Clays, the work shifted to single and two stage pressure leaching. In order to maintain continuity with the previous work, the initial leach test was done using Syncrude tailings. From the analyses referenced above, it appears that the two clay sources are similar. However, one notable difference is in the magnesium content.

Five pressure leach tests were performed during the reporting period. The results show that in the single stage leaching, the quantity of water required to maintain a pumpable slurry resulted in a dilute solution, as the acid was consumed. A two stage leaching yielded higher alumina recovery. Future R&D work will focus on

activities aiming at defining the parameters applicable to the Clearwater Clays for two stage leaching.

Additional tests were done using weak acid wash to characterize the remaining components in the Clearwater Clays, in particular those components more soluble than alumina. The results indicate that iron separation is feasible but more work is required to determine the behavior of magnesium and other compounds.

Evaluation work associated with Clearwater Clays included the development of a strategy to separate alumina from other compounds, magnesium and iron in particular, as well as the best way to handle the leachate.

5. EXTENT OF RESOURCES ESTIMATES

The recovery of Clearwater Clays as a resource separate from the clays associated with the oil sands is being considered. Geological sections required for estimating the resources are limited at this time to the 60 Ha area of Lease 5 by the Athabasca River. A study carried out by Oil Sands Evaluation Ltd. of the data available in this area shows that the Clearwater Clays formation averages approximately ten meters thick and it could therefore be mined as a separate unit. With an estimated volume of 5,000,000 bank cubic meters, this resource could be mined at rates indicated below:

Rate per day cu.m./day	Volume per year cu.m./year	Resource life years
1,000	365,000	13.7
2,500	912,500	5.5
5,000	1,825,000	2.7

6. EXPENDITURES

Although no specific account was set up, Solv-Ex has kept track of the time, material and resources related to the Clearwater Clays exploration and characterization program. The following table includes the outside lab work, the time spent by external consultants and contractors as well as Solv-Ex resources involved at Albuquerque R&D center. All the costs are in Canadian dollars.

Laboratory analysis	1,700.
Bulk samples:	
selection of the two locations	
clearing and excavation	
drums preparation	
shipment to Albuquerque	
total	9,600
Beneficiation tests	7,400
Pressure leach tests	9,000
Extent of Resources Estimates	4,800
Overhead (10%)	3,200
<u>TOTAL</u>	<u>35,700.</u>

7. APPENDIX

3 10 17 24 31 38 45

ANALYTICAL CHEMISTRY LABORATORY
 DEPARTMENT OF EARTH AND PLANETARY SCIENCES
 UNIVERSITY OF NEW MEXICO
 ALBUQUERQUE, NM 87131
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Date: July 2, 1997

To: SOLV-EX CORPORATION; Attn: Massoud Abghar
 From: John Husler
 Subject: X-Ray Fluorescence Analyses

Al-2 Calc 3/3 Al-2 Calc 3/3 PL-240-SyN
 6-19-97

QP-97-16C
 CORRECTED

	REF P-5	REF P-6	REF P-7		
SiO ₂	69.27	66.92	63.12	65.89	
TiO ₂	0.602	0.330	1.41	1.47	
AlO ₃	13.42	6.78	22.11	23.07	
Fe ₂ O ₃	6.94	15.09	4.71	4.92	
FeO	—	—	—		
MnO	0.008	0.071	0.114	0.119	
MgO	1.81	2.71	0.20	0.83	
CaO	1.01	2.15	0.46	0.48	
Na ₂ O	0.41	0.26	0.55	0.57	
K ₂ O	2.66	1.52	2.45	2.56	
H ₂ O(?)					
H ₂ O(+) + CO ₂					
P ₂ O ₅	0.16	0.13	0.093	0.0971	
TOTAL	96.29	95.96	95.82		
TOTAL Fe (as Fe ₂ O ₃)					
LOI					
FeO after LOI					


Report No. 97-16C
Table 1. AA Analysis

Conditions	Sample ID	Initial Sample Wt. (g)	Head Conc. (%)	g element 100% Theoretical	Conc. (mg/L)	Comp. Vol. (L)	Rec. Wt. (g)	Rec. in aqueous phase %	Liquor Color	pH
Fe Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 200 ^o C leach, 5min RX Time	PRS-L-E	160	3.44%	5.51	4691.57	0.6026	2.83	51.30	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 200 ^o C leach, 10min RX Time	PRS-L-F	160	3.44%	5.51	4971.83	0.5483	2.73	49.47	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 200 ^o C leach, 20min RX Time	PRS-L-G	160	3.44%	5.51	5289.06	0.5609	2.97	53.84	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 200 ^o C leach, 30min RX Time, high rpm's	PRS-L-H	160	3.44%	5.51	6739.74	0.4837	3.26	59.16	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 200 ^o C leach, 30min RX Time	PRS-L-I	120	3.44%	4.13	6499.69	0.3388	2.20	53.29	DK green	-0.38
Al Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	12.21%	19.54	13558.80	0.6026	8.17	41.81	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	12.21%	19.54	13114.90	0.5483	7.19	36.80	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	12.21%	19.54	14264.00	0.5609	8.00	40.94	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	12.21%	19.54	14769.70	0.4837	7.14	36.56	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	12.21%	14.66	17954.80	0.3388	6.08	41.51	DK green	-0.38
K Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	2.12%	3.40	1824.49	0.6026	1.10	32.35	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	2.12%	3.40	1623.77	0.5483	0.89	26.20	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	2.12%	3.40	1430.57	0.5609	0.80	23.61	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	2.12%	3.40	647.37	0.4837	0.31	9.21	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	2.12%	2.55	1697.77	0.3388	0.58	22.57	DK green	-0.38
Mg Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	0.50%	0.80	700.69	0.6026	0.42	52.99	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	0.50%	0.80	711.12	0.5483	0.39	48.94	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	0.50%	0.80	772.32	0.5609	0.43	54.37	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	0.50%	0.80	912.23	0.4837	0.44	55.38	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	0.50%	0.60	907.10	0.3388	0.31	51.43	DK green	-0.38
Na Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	0.21%	0.34	575.34	0.6026	0.35	102.47	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	0.21%	0.34	531.82	0.5483	0.29	86.19	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	0.21%	0.34	538.61	0.5609	0.30	89.29	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	0.21%	0.34	528.14	0.4837	0.26	75.51	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	0.21%	0.25	602.08	0.3388	0.20	80.40	DK green	-0.38
Ca Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	0.34%	0.55	504.43	0.6026	0.30	55.41	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	0.34%	0.55	496.15	0.5483	0.27	49.59	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	0.34%	0.55	505.69	0.5609	0.28	51.71	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	0.34%	0.55	549.57	0.4837	0.27	48.46	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	0.34%	0.41	563.14	0.3388	0.19	46.38	DK green	-0.38

Report No. 97-16C
Table 1. AA Analysis

Conditions	Sample ID	Initial Sample Wt. (g)	Head Conc. (%)	g element 100% Theoretical	Conc. (mg/L)	Comp. Vol. (L)	Rec. Wt. (g)	Rec. in aqueous phase %	Liquor Color	pH
Ti Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	0.88%	1.41	45.56	0.6026	0.03	1.95	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	0.88%	1.41	54.29	0.5483	0.03	2.11	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	0.88%	1.41	47.19	0.5609	0.03	1.88	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	0.88%	1.41	48.51	0.4837	0.02	1.66	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	0.88%	1.06	87.76	0.3388	0.03	2.81	DK green	-0.38
Si Recovery in the Leach phase										
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 5min RX Time	PRS-L-E	160	30.74%	49.18	148.60	0.6026	0.09	0.18	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135.81 g, 2000 C leach, 10min RX Time	PRS-L-F	160	30.74%	49.18	135.70	0.5483	0.07	0.15	green	0.06
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 20min RX Time	PRS-L-G	160	30.74%	49.18	154.20	0.5609	0.09	0.18	green	0.12
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time, high rpm's	PRS-L-H	160	30.74%	49.18	118.90	0.4837	0.06	0.12	DK green	0.04
20.0% clay slurry 800g, 96% H2SO4 135 g, 2000 C leach, 30min RX Time	PRS-L-I	120	30.74%	36.89	102.30	0.3388	0.03	0.09	DK green	-0.38

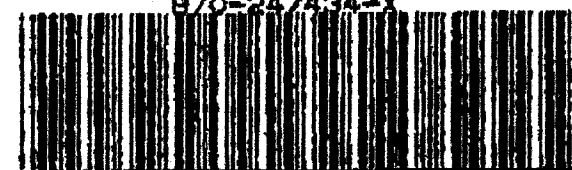
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Padraic Mulloy
Myke Wallace

Report # ?

Solv-Ex
Massoud Ahghar
Jerry Fox
Confidential

06/20/97

- Objective:**
1. To determine the solids dispersion of Clearwater Shale from Lease 5 in 80 degree Celsius water and room temperature water with agitation in 10 percent and 20 percent solids in water.
 2. To determine the particle size distribution of each drum sample.
 3. To determine the percent bitumen of each drum sample.

Procedure: Approximately 50 g of Clearwater Shale clay of $\frac{3}{4}$ to 1 inch in size were placed into a beaker with approximately 450 g of water with an agitator set at 400 RPM's. The dispersion was timed and the quality of dispersion was noted. These dispersed samples were then measured for particle size distribution. Meanwhile samples were calcined and crushed for XRF and samples were taken for percent bitumen.

Results and Observations:

Solids Dispersion: See table 1. Readily dispersed means almost all of the sample is dispersed with only 1/16 inch or less size pieces. Mostly easy is only pieces less than $\frac{1}{4}$ inch to $\frac{1}{8}$ inch in size. Some pieces difficult is pieces of sample $\frac{1}{4}$ inch or larger left in slurry.

Particle Size Distribution:

Pit #	Drum #	Mean Particle Volume	Particle Size Range	50 Percentile Particle Size
1	1\3	5.404	0.486-37.0	3.691
1	2\3	7.892	0.688-52.33	5.12
1	3\3	7.158	0.688-52.33	5.198
2	1\3	13.46	0.688-74.0	7.024
2	2\3	15.59	0.578-296.0	4.796
2	3\3	16.44	0.818-104.7	9.212

Bitumen Extraction:

Pit #	Drum #	% bitumen	% bitumen in solids	% solids	% water
2	1\3	0.01%	0.02%	76.45%	23.54%
2	2\3	0.08%	0.10%	81.55%	18.37%
2	3\3	0.91%	1.02%	89.40%	9.69%

Samples from Pit 1 did not contain any bitumen.

Padraic Mulloy
Myke Wallace

Report

Solv-Ex
Massoud Ahghar
Jerry Fox
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06/20/97

Conclusion:

The Clearwater Shale clay samples for the most part dispersed well in hot water. Pit 1 Drums 1/3, 2/3 and 3/3 and Pit 2 1/3 and 2/3 dispersed in hot water with agitation within 10 minutes. Pit 2 Drum 3/3 mostly dispersed with several very hard rock like pieces of about 1/2 inch in size left. The sample dispersed at room temperature did not disperse as easily or as quickly. The same can be said for the 20% solids in hot water. Samples from Pit 1 have a smaller particle size than those from Pit 2.

Padraic Mulloy
Myke Wallace

Table 1
Solids Dispersion

Solv-Ex
R D Center
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6/20/97

Pit #	Drum #	percent wt. solids	Water Temp. (degrees Celsius)	Sample weight	Water Weight	RPM	Observations	
							Time	Time
1	1\3	10%	80 C	50.47	450.6	400	6 min - readily dispersed	
1	2\3	10%	80 C	50.87	450	400	8 min - readily dispersed	
1	3\3	10%	80 C	50.35	453.1	400	6.5 min - mostly easy	10 min - readily dispersed
2	1\3	10%	80 C	50.74	450	400	6 min - mostly easy	10 min - readily dispersed
2	2\3	10%	80 C	50.63	450.1	400	9 min - readily dispersed	
2	3\3	10%	80 C	50.38	456.2	400	10 min - some pieces difficult-rest easy	
1	1\3	10%	24 C	50.37	450	400	7 min - some pieces difficult	10 min - mostly easy
1	1\3	20%	80 C	100.11	402.6	400	6 min - some pieces difficult- mostly dispersed	10 min - mostly easy

MICROTRAC - X100

Ver:3.03

Pit 1 - 1/3 Lease 5

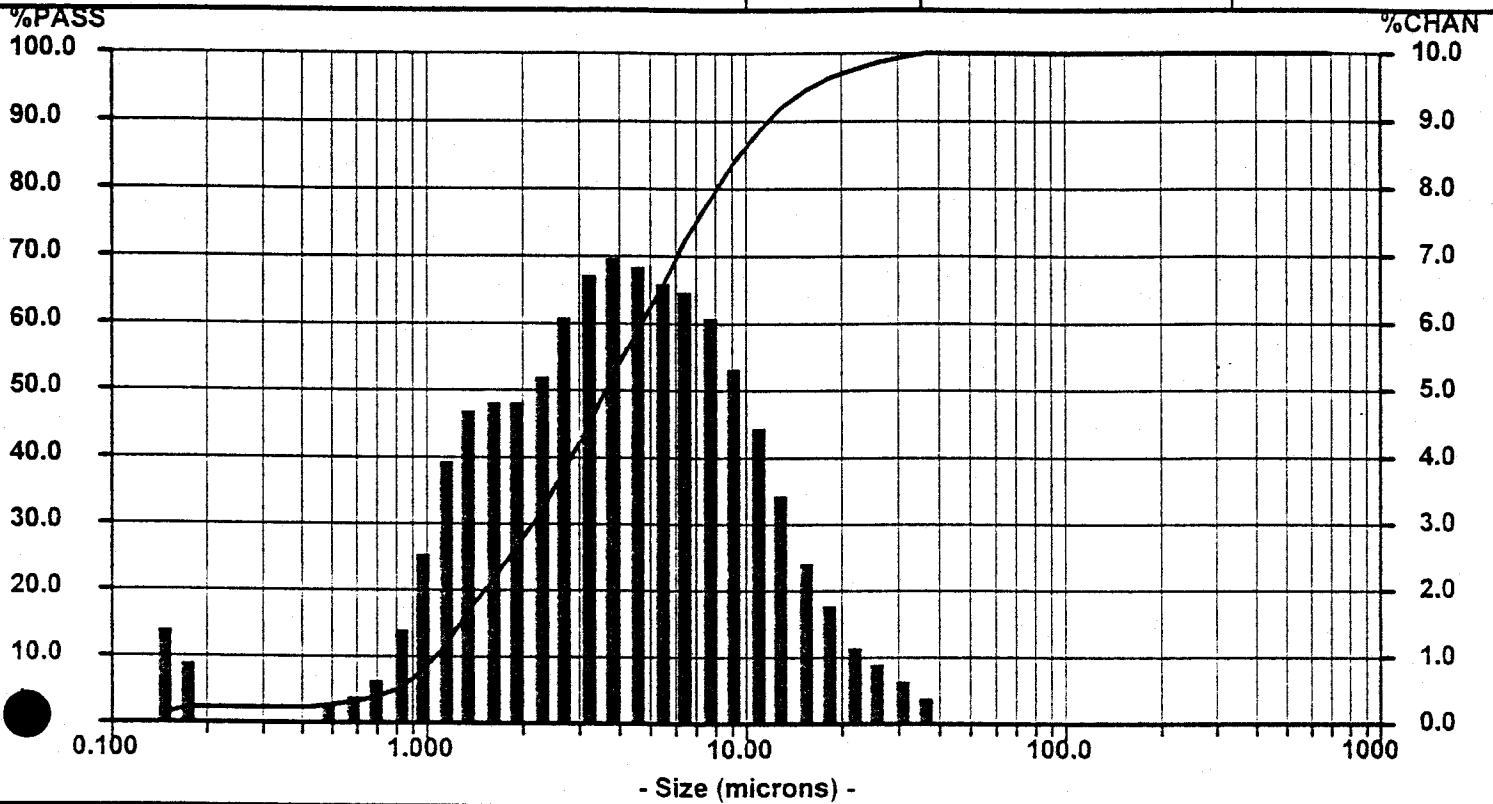
Pit 1-1/3
SAMPLE #2

Date: 06/18/97 Meas #:05163
Time: 15:34 Pres #: 01

Clay from Pit 1 Drum 1/3 Lease 5

6/18/97

Summary		Percentiles		Dia	Vol%	Width
mv = 5.404	10% = 1.064	60% = 4.737		3.804	98%	7.937
mn = 0.164	20% = 1.532	70% = 6.134		0.143	2%	0.027
ma = 1.832	30% = 2.163	80% = 8.118				
cs = 3.276	40% = 2.879	90% = 11.76				
sd = 3.953	50% = 3.691	95% = 16.02				



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	84.04	5.46						
592.0	100.00	0.00	7.778	78.58	6.17						
497.8	100.00	0.00	6.541	72.41	6.57						
418.6	100.00	0.00	5.500	65.84	6.77						
352.0	100.00	0.00	4.625	59.07	6.94						
296.0	100.00	0.00	3.889	52.13	7.06						
248.9	100.00	0.00	3.270	45.07	6.81						
209.3	100.00	0.00	2.750	38.26	6.12						
176.0	100.00	0.00	2.312	32.14	5.35						
148.0	100.00	0.00	1.945	26.79	4.94						
124.5	100.00	0.00	1.635	21.85	4.93						
104.7	100.00	0.00	1.375	16.92	4.84						
88.00	100.00	0.00	1.156	12.08	4.02						
74.00	100.00	0.00	0.972	8.06	2.61						
62.23	100.00	0.00	0.818	5.45	1.42						
52.33	100.00	0.00	0.688	4.03	0.77						
44.00	100.00	0.00	0.578	3.26	0.47						
37.00	100.00	0.58	0.486	2.79	0.35						
31.11	99.42	0.71	0.409	2.44	0.00						
26.16	98.71	0.93	0.344	2.44	0.00						
22.00	97.78	1.29	0.289	2.44	0.00						
18.50	96.49	1.84	0.243	2.44	0.00						
15.56	94.65	2.59	0.204	2.44	0.00						
13.08	92.06	3.51	0.172	2.44	0.98						
11.00	88.55	4.51	0.145	1.46	1.46						

Distribution: Volume	RunTime: 30 seconds	Fluid: Water
Progression: Standard	Run Number 1 of 1 runs	Fluid Refractive Index: 1.33
Upper Edge: 704.0	Particle: Kaolin Clay	Loading Factor: 0.0401
Lower Edge: 0.122	Particle Transparency: Trans	Transmission: 0.90
Residuals: Disabled	Particle Refractive Index: 1.64	Above Residual: 0.00
Number Of Channels: 50	Particle Shape: Irregular	Below Residual: 0.00
High Resolution: N/A		
Filter On: On		

MICROTRAC - X100

Ver:3.03

Pit 1 - 2/3 Lease 5

Pit 1-2/3
SAMPLE #2

Date: 06/18/97 Meas #:05165
Time: 15:59 Pres #: 01

Clay from Pit 1 Drum 2/3 Lease 5

6/18/97

Summary

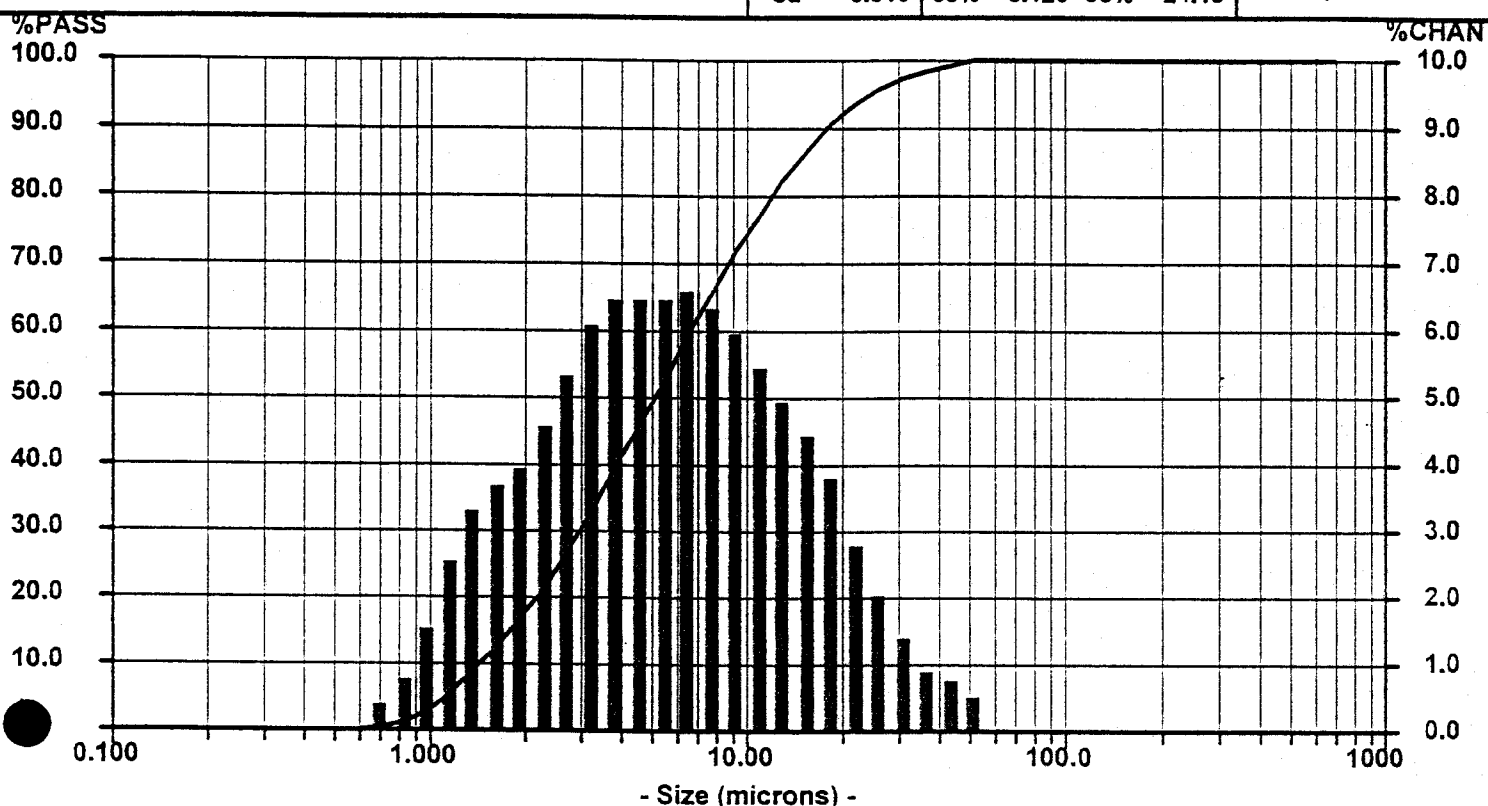
Percentiles

Dia Vol% Width

mv = 7.892
mn = 1.239
ma = 3.412
cs = 1.758
sd = 6.010

10% = 1.444
20% = 2.196
30% = 3.005
40% = 3.932
50% = 5.120

60% = 6.658
70% = 8.773
80% = 12.04
90% = 17.85
95% = 24.19



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	71.80	6.03						
592.0	100.00	0.00	7.778	65.77	6.43						
497.8	100.00	0.00	6.541	59.34	6.60						
418.6	100.00	0.00	5.500	52.74	6.59						
352.0	100.00	0.00	4.625	46.15	6.56						
296.0	100.00	0.00	3.889	39.59	6.51						
248.9	100.00	0.00	3.270	33.08	6.17						
209.3	100.00	0.00	2.750	26.91	5.45						
176.0	100.00	0.00	2.312	21.46	4.64						
148.0	100.00	0.00	1.945	16.82	4.08						
124.5	100.00	0.00	1.635	12.74	3.77						
104.7	100.00	0.00	1.375	8.97	3.40						
88.00	100.00	0.00	1.156	5.57	2.63						
74.00	100.00	0.00	0.972	2.94	1.63						
62.23	100.00	0.00	0.818	1.31	0.86						
52.33	100.00	0.69	0.688	0.45	0.45						
44.00	99.31	0.83	0.578	0.00	0.00						
37.00	98.48	1.08	0.486	0.00	0.00						
31.11	97.40	1.51	0.409	0.00	0.00						
26.16	95.89	2.16	0.344	0.00	0.00						
22.00	93.73	2.99	0.289	0.00	0.00						
18.50	90.74	3.85	0.243	0.00	0.00						
15.56	86.89	4.53	0.204	0.00	0.00						
13.08	82.36	5.04	0.172	0.00	0.00						
11.00	77.32	5.52	0.145	0.00	0.00						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
High Resolution: N/A
Filter On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0351
Transmission: 0.93
Above Residual: 0.00
Below Residual: 0.00

MICROTRAC - X100

Ver:3.03

Pit 1 - 3/3 Lease 5

Pit 1-3/3
SAMPLE #1

Date: 06/19/97 Meas #:05166
Time: 09:28 Pres #: 01

Clay from Pit 1 Drum 3/3 Lease 5

6/17

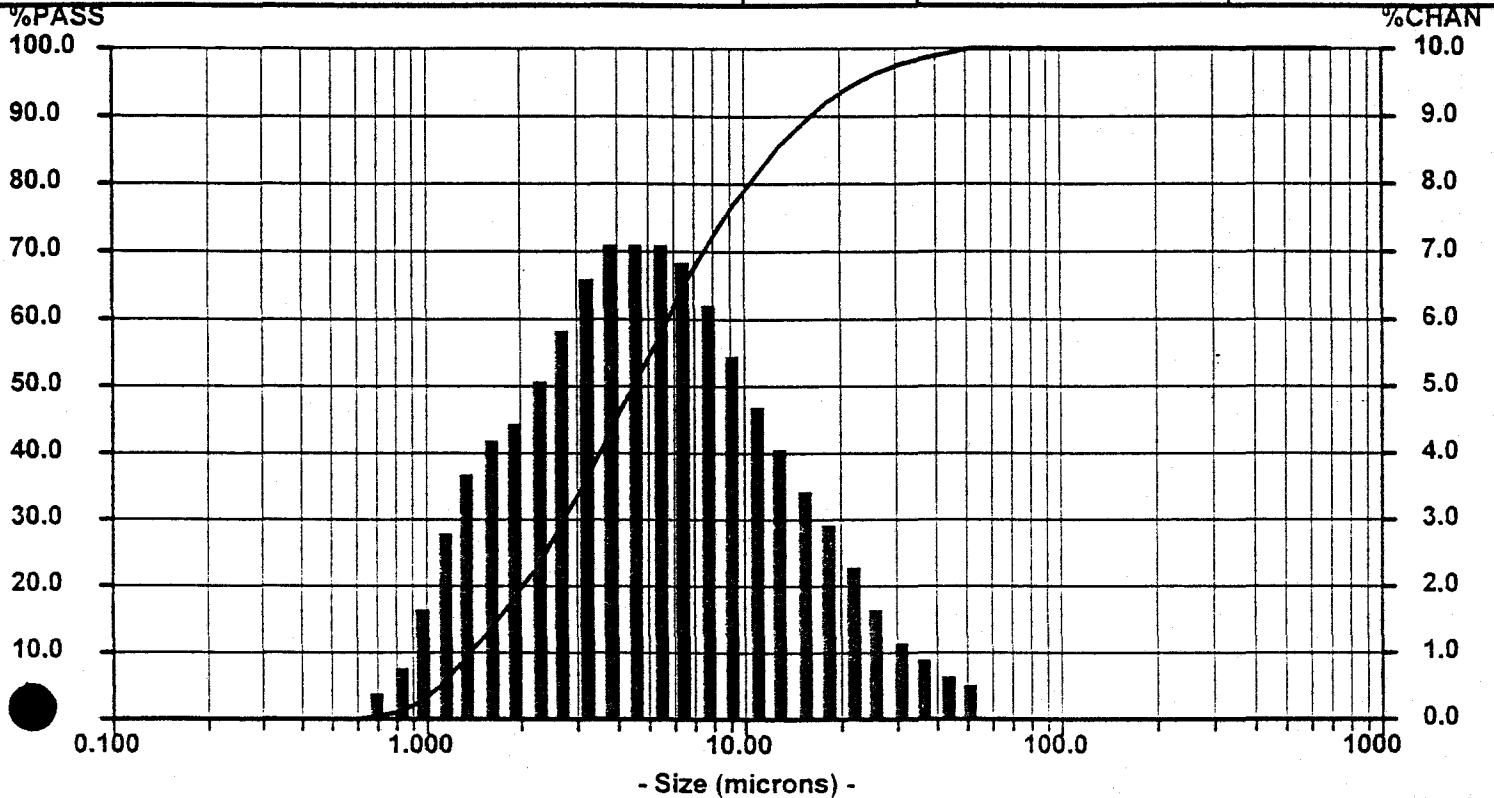
Summary

mv = 7.158
mn = 1.249
ma = 3.195
cs = 1.878
sd = 5.198

Percentiles

10% = 1.391 60% = 5.782
20% = 2.056 70% = 7.513
30% = 2.784 80% = 10.37
40% = 3.574 90% = 16.20
50% = 4.538 95% = 22.73

Dia Vol% Width
4.538 100% 10.40



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	76.77	5.55						
592.0	100.00	0.00	7.778	71.22	6.34						
497.8	100.00	0.00	6.541	64.88	6.90						
418.6	100.00	0.00	5.500	57.98	7.17						
352.0	100.00	0.00	4.625	50.81	7.28						
296.0	100.00	0.00	3.889	43.53	7.19						
248.9	100.00	0.00	3.270	36.34	6.79						
209.3	100.00	0.00	2.750	29.55	5.99						
176.0	100.00	0.00	2.312	23.56	5.11						
148.0	100.00	0.00	1.945	18.45	4.51						
124.5	100.00	0.00	1.635	13.94	4.20						
104.7	100.00	0.00	1.375	9.74	3.78						
88.00	100.00	0.00	1.156	5.96	2.88						
74.00	100.00	0.00	0.972	3.08	1.74						
62.23	100.00	0.00	0.818	1.34	0.89						
52.33	100.00	0.63	0.688	0.45	0.45						
44.00	99.37	0.75	0.578	0.00	0.00						
37.00	98.62	0.95	0.486	0.00	0.00						
31.11	97.67	1.28	0.409	0.00	0.00						
26.16	96.39	1.76	0.344	0.00	0.00						
22.00	94.63	2.37	0.289	0.00	0.00						
18.50	92.26	3.01	0.243	0.00	0.00						
15.56	89.25	3.58	0.204	0.00	0.00						
13.08	85.67	4.13	0.172	0.00	0.00						
11.00	81.54	4.77	0.145	0.00	0.00						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
High Resolution: N/A
Filter On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0488
Transmission: 0.90
Above Residual: 0.00
Below Residual: 0.00

MICROTRAC - X100

Ver:3.03

Pit 2 - 1/3 Lease 5

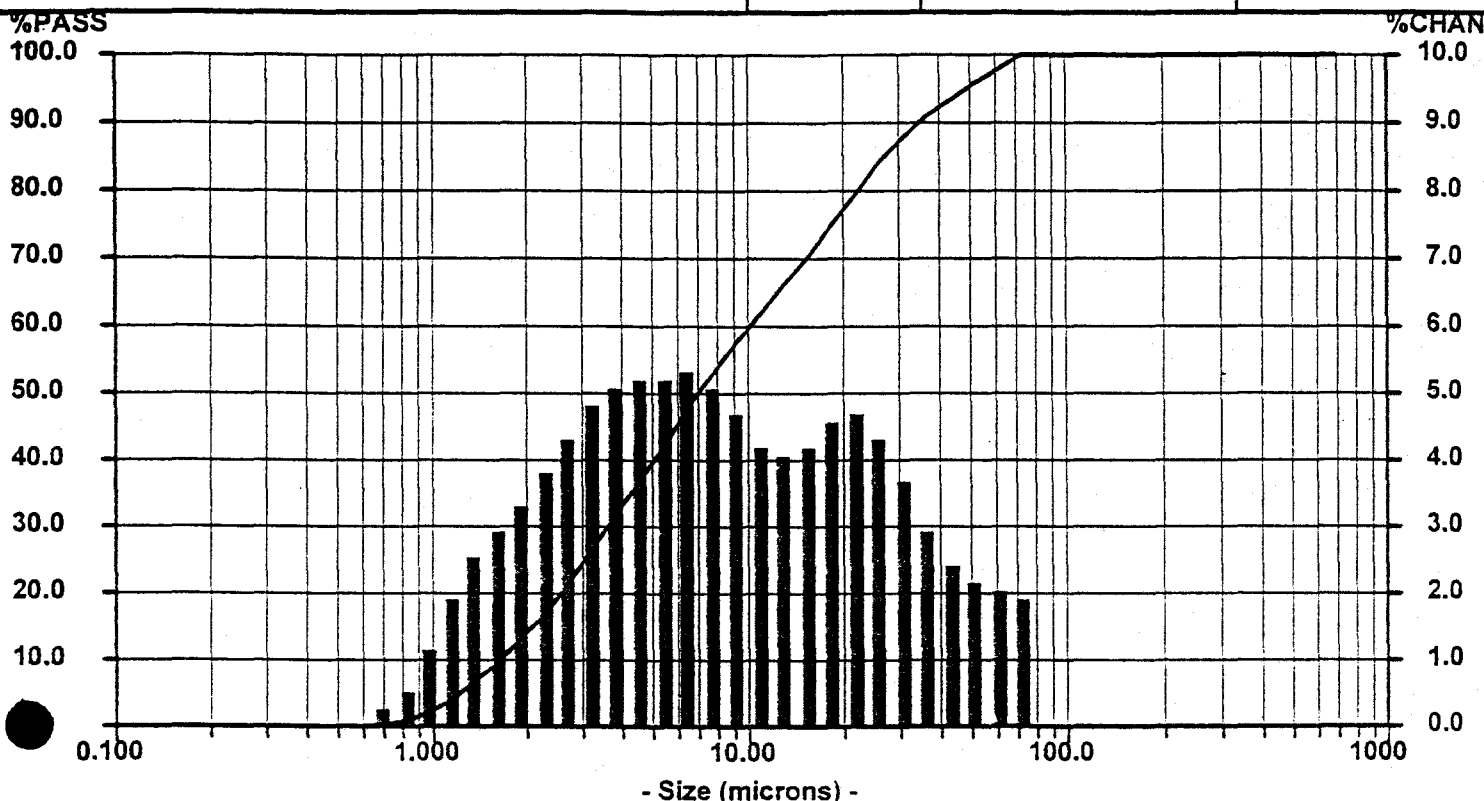
Pit 2-1/3
SAMPLE #1

Date: 06/19/97 Meas #:05168
Time: 10:41 Pres #: 01

Clay from Pit 2 Drum 1/3 Lease 5

6/19/97

Summary		Percentiles		Dia	Vol%	Width
mv = 13.46	10% = 1.647	60% = 10.13	23.07	38%	31.00	
mn = 1.259	20% = 2.588	70% = 15.31	3.789	62%	5.895	
ma = 4.164	30% = 3.664	80% = 22.21				
cs = 1.441	40% = 5.087	90% = 34.91				
sd = 11.90	50% = 7.024	95% = 49.01				



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	57.74	4.72						
592.0	100.00	0.00	7.778	53.02	5.19						
497.8	100.00	0.00	6.541	47.83	5.40						
418.6	100.00	0.00	5.500	42.43	5.36						
352.0	100.00	0.00	4.625	37.07	5.27						
296.0	100.00	0.00	3.889	31.80	5.19						
248.9	100.00	0.00	3.270	26.61	4.97						
209.3	100.00	0.00	2.750	21.64	4.49						
176.0	100.00	0.00	2.312	17.15	3.88						
148.0	100.00	0.00	1.945	13.27	3.40						
124.5	100.00	0.00	1.635	9.87	3.05						
104.7	100.00	0.00	1.375	6.82	2.64						
88.00	100.00	0.00	1.156	4.18	1.97						
74.00	100.00	2.05	0.972	2.21	1.21						
62.23	97.95	2.11	0.818	1.00	0.65						
52.33	95.84	2.28	0.688	0.35	0.35						
44.00	93.56	2.58	0.578	0.00	0.00						
37.00	90.98	3.09	0.486	0.00	0.00						
31.11	87.89	3.74	0.409	0.00	0.00						
26.16	84.15	4.40	0.344	0.00	0.00						
22.00	79.75	4.72	0.289	0.00	0.00						
18.50	75.03	4.62	0.243	0.00	0.00						
15.56	70.41	4.29	0.204	0.00	0.00						
13.08	66.12	4.11	0.172	0.00	0.00						
11.00	62.01	4.27	0.145	0.00	0.00						

Distribution: Volume
 Progression: Standard
 Upper Edge: 704.0
 Lower Edge: 0.122
 Residuals: Disabled
 Number Of Channels: 50
 High Resolution: N/A
 Filter On: On

RunTime: 30 seconds
 Run Number 1 of 1 runs
 Particle: Kaolin Clay
 Particle Transparency: Trans
 Particle Refractive Index: 1.64
 Particle Shape: Irregular

Fluid: Water
 Fluid Refractive Index: 1.33
 Loading Factor: 0.0504
 Transmission: 0.91
 Above Residual: 0.00
 Below Residual: 0.00

SOXHLET EXTRACTION DATA

**SOLV-EX
R & D CENTER**

NON-FILTERABLE SOLIDS:

- 15. Centrifuge tube weight..... _____ g
- 16. Centrifuge & dry Solids weight..... _____ g
- 17. Weight of solids in tube (#13-#12)..... _____ g

CALCULATIONS:

Bitumen percent by Evaporation:

$$\text{Bitumen Wt.} = \left[\frac{\text{Wt. of Bitumen (\#13)}}{\text{mL of Solution in dish}} \right] \times \text{Volume of Solution} = \underline{0.556} \text{ g (Eq1)}$$

$$\% \text{ Bitumen} = \left[\frac{\text{Wt. of Bitumen (Eq1)}}{\text{Wt. of Raw Sample (\#3)}} \right] \times 100 = \underline{0.91} \% \text{ (Eq2)}$$

$$\% \text{ Bitumen in Solids} = (\% \text{ Bitumen} \times \text{sample wt. / g Solids}) \times 100 = \underline{1.02} \%$$

$$\% \text{ Solids} = \left[\frac{\text{Wt. of Solids in Thimble (\#9) + (NF)[solids in tube (\#17)]}{\text{Wt. of Raw Sample (\#3)}} \right] \times 100 = \underline{89.40} \% \text{ (Eq3)}$$

5.76 + 0.95 = 6.71

11.03%

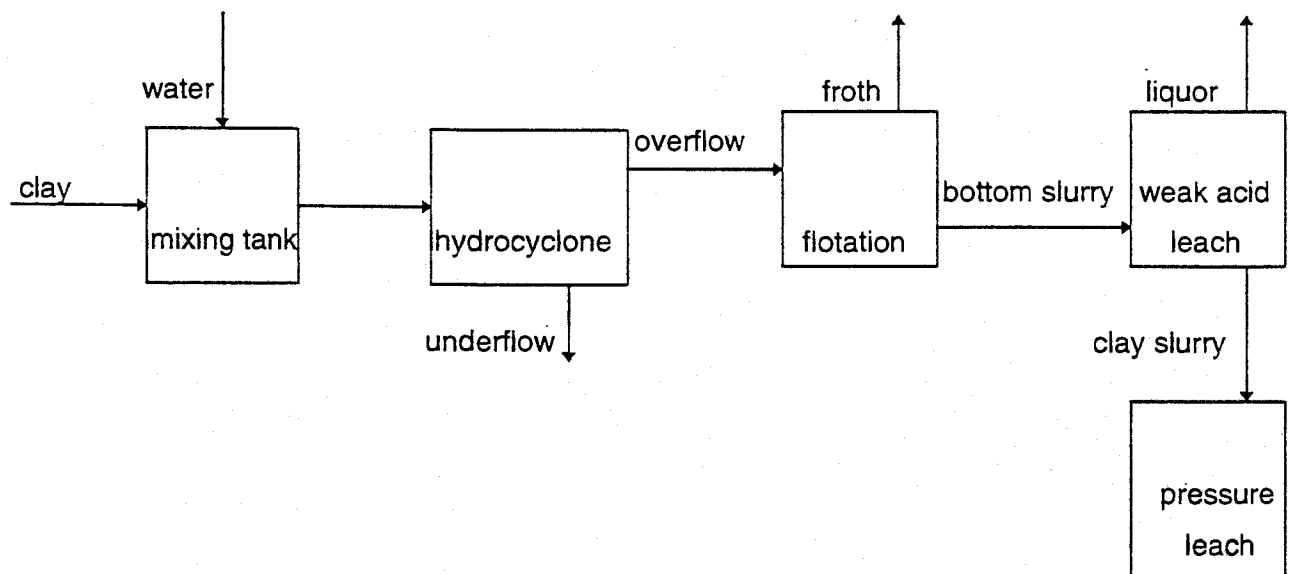
$$\% \text{ Water} = \% \text{ Bitumen (Eq2)} - \% \text{ Solids (Eq3)} = \underline{9.69} \%$$

(Note: NF = the Total Bitumen -Toluene Solution Volume / Volume in Centrifuge tube)

MEMORANDUM

DATE: June 10, 1997
TO: Massoud Ahghar
FROM: Jianzhi Ge
RE: Pretreatment of the clay from lease 5
CC:

The XRF and PSD analyses from lease 5 clay is attached. The alumina concentration is around 15%. This clay can be preprocessed before it goes to the leach. Hydrocyclone classification process is proposed as the first step treatment. According to the previous tests, 1" hydrocyclone will be used. Solid concentration of the slurry will be controlled within 15% to 20% by weight. The feed pressure will be around 65 psi. Flotation will be recommended following the hydrocyclone to remove iron and magnesium. It is said that Mountain States has done some research work. Their work need to be reviewed. If the weak acid leach does work out to be good, a weak acid leach process will be used follow the flotation. The last step will be pressure leach. A block flow diagram is shown below:



SOXHLET EXTRACTION DATA

SOLV-EX
R & D CENTER

NON-FILTERABLE SOLIDS:

15. Centrifuge tube weight.....g

16. Centrifuge & dry Solids weight.....g

17. Weight of solids in tube (#13-#12).....g

CALCULATIONS:

Bitumen percent by Evaporation:

$$\text{Bitumen Wt.} = \left[\frac{\text{Wt. of Bitumen (\#13)}}{\text{mL of Solution in dish}} \right] \times \text{Volume of Solution} = \underline{0.008} \text{ g (Eq1)}$$

$$\% \text{ Bitumen} = \left[\frac{\text{Wt. of Bitumen (Eq1)}}{\text{Wt. of Raw Sample (\#3)}} \right] \times 100 = \underline{0.01} \% \text{ (Eq2)}$$

$$\% \text{ Bitumen in Solids} = (\% \text{ Bitumen} \times \text{sample wt. / g Solids}) \times 100 = \underline{0.02} \%$$

$$\% \text{ Solids} = \left[\frac{\text{Wt. of Solids in Thimble (\#9)} + \text{(NF)[solids in tube (\#17)]}}{\text{Wt. of Raw Sample (\#3)}} \right] \times 100 = \underline{76.45} \% \text{ (Eq3)}$$

14225 1.95

$$\% \text{ Water} = \% \text{ Bitumen (Eq2)} - \% \text{ Solids (Eq3)} = \underline{23.54} \%$$

25.77%

(Note: NF = the Total Bitumen -Toluene Solution Volume / Volume in Centrifuge tube)

SOXHLET EXTRACTION DATA

SOLV-EX
R & D CENTER

NON-FILTERABLE SOLIDS:

15. Centrifuge tube weight.....
 16. Centrifuge & dry Solids weight.....
 17. Weight of solids in tube (#13-#12).....

CALCULATIONS:

Bitumen percent by Evaporation:

$$\text{Bitumen Wt.} = \left[\frac{\text{Wt. of Bitumen (\#13)}}{\text{mL of Solution in dish}} \right] \times \text{Volume of Solution} = \underline{0.049} \text{ g (Eq1)}$$

$$\% \text{ Bitumen} = \left[\frac{\text{Wt. of Bitumen (Eq1)}}{\text{Wt. of Raw Sample (\#3)}} \right] \times 100 = \underline{0.08} \% \text{ (Eq2)}$$

$$\% \text{ Bitumen in Solids} = (\% \text{ Bitumen} \times \text{sample wt. / g Solids}) \times 100 = \underline{0.10} \%$$

$$\% \text{ Solids} = \left[\frac{\text{Wt. of Solids in Thimble (\#9) + (NF)[solids in tube (\#17)]}{\text{Wt. of Raw Sample (\#3)}} \right] \times 100 = \underline{81.55} \% \text{ (Eq3)}$$

13.76 + 2.22
01.55%

$$\% \text{ Water} = \% \text{ Bitumen (Eq2)} - \% \text{ Solids (Eq3)} = \underline{18.37} \%$$

(Note: NF = the Total Bitumen -Toluene Solution Volume / Volume in Centrifuge tube)

MICROTRAC - X100

Ver:3.03

Pit 2 - 3/3 Lease 5

Pit 2-3/3
SAMPLE #2

Date: 06/19/97 Meas #:05173

Time: 15:21 Pres #: 01

Clay from Pit 2 Drum 3/3 Lease 5

Summary

mv = 16.44
mn = 1.380
ma = 4.982
cs = 1.204
sd = 13.68

Percentiles

10% = 1.926 60% = 13.33
20% = 3.151 70% = 18.54
30% = 4.684 80% = 25.67
40% = 6.593 90% = 40.35
50% = 9.212 95% = 57.85

Dia

23.46
4.248

Vol%

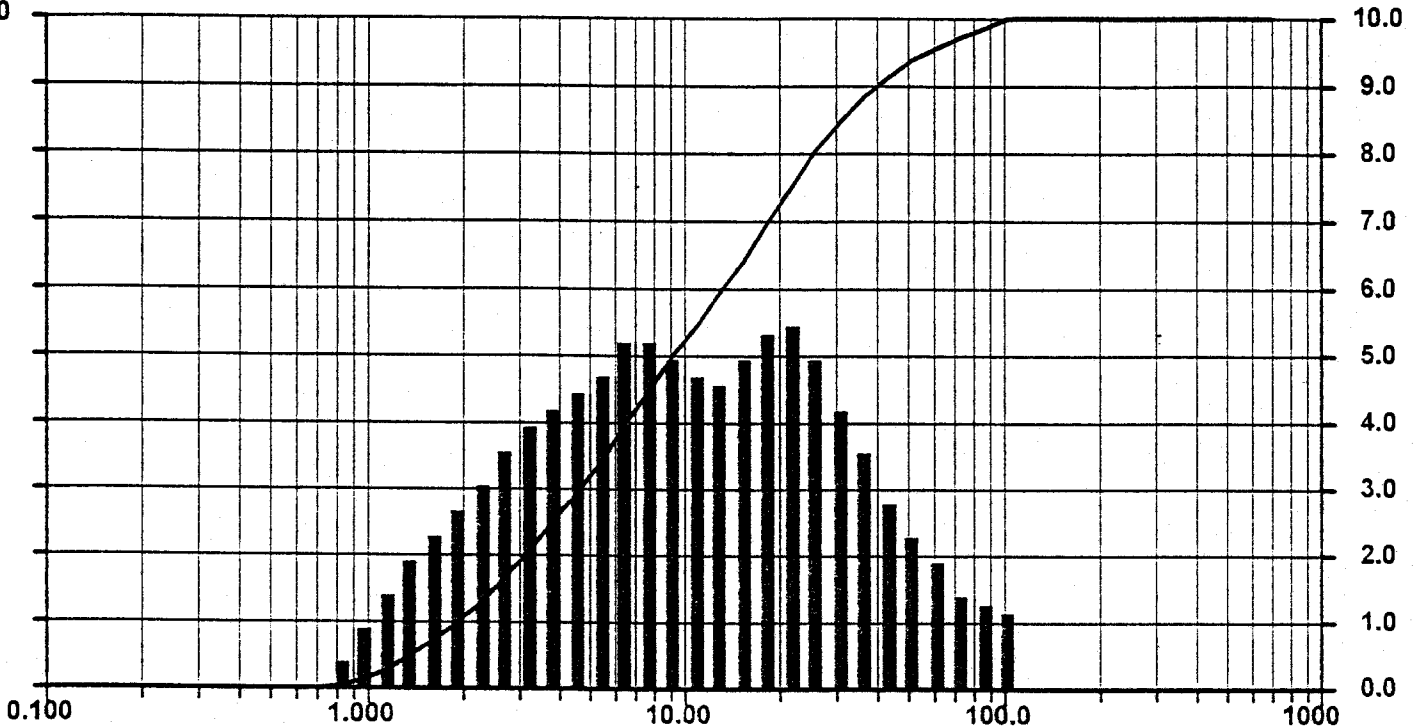
45%
55%

Width

33.96
6.251

%PASS

%CHAN



- Size (microns) -

SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	50.12	5.04						
592.0	100.00	0.00	7.778	45.08	5.32						
497.8	100.00	0.00	6.541	39.76	5.23						
418.6	100.00	0.00	5.500	34.53	4.87						
352.0	100.00	0.00	4.625	29.66	4.51						
296.0	100.00	0.00	3.889	25.15	4.26						
248.9	100.00	0.00	3.270	20.89	4.00						
209.3	100.00	0.00	2.750	16.89	3.60						
176.0	100.00	0.00	2.312	13.29	3.13						
148.0	100.00	0.00	1.945	10.16	2.73						
124.5	100.00	0.00	1.635	7.43	2.41						
104.7	100.00	1.26	1.375	5.02	2.04						
88.00	98.74	1.38	1.156	2.98	1.52						
74.00	97.36	1.59	0.972	1.46	0.94						
62.23	95.77	1.94	0.818	0.52	0.52						
52.33	93.83	2.42	0.688	0.00	0.00						
44.00	91.41	2.97	0.578	0.00	0.00						
37.00	88.44	3.50	0.486	0.00	0.00						
31.11	84.84	4.31	0.409	0.00	0.00						
26.16	80.53	5.07	0.344	0.00	0.00						
22.00	75.46	5.53	0.289	0.00	0.00						
18.50	69.93	5.45	0.243	0.00	0.00						
15.56	64.48	5.00	0.204	0.00	0.00						
13.08	59.48	4.66	0.172	0.00	0.00						
11.00	54.82	4.70	0.145	0.00	0.00						

Distribution: Volume
 Progression: Standard
 Upper Edge: 704.0
 Lower Edge: 0.122
 Residuals: Disabled
 Number Of Channels: 50
 High Resolution: N/A
 Filter On: On

RunTime: 30 seconds
 Run Number 1 of 1 runs
 Particle: Kaolin Clay
 Particle Transparency: Trans
 Particle Refractive Index: 1.64
 Particle Shape: Irregular

Fluid: Water
 Fluid Refractive Index: 1.33
 Loading Factor: 0.0459
 Transmission: 0.93
 Above Residual: 0.00
 Below Residual: 0.00

MICROTRAC - X100

Ver:3.03

Pit 2 - 2/3 Lease 5

Pit 2-2/3
SAMPLE #2

Date: 06/19/97 Meas #:05171
Time: 13:34 Pres #: 01

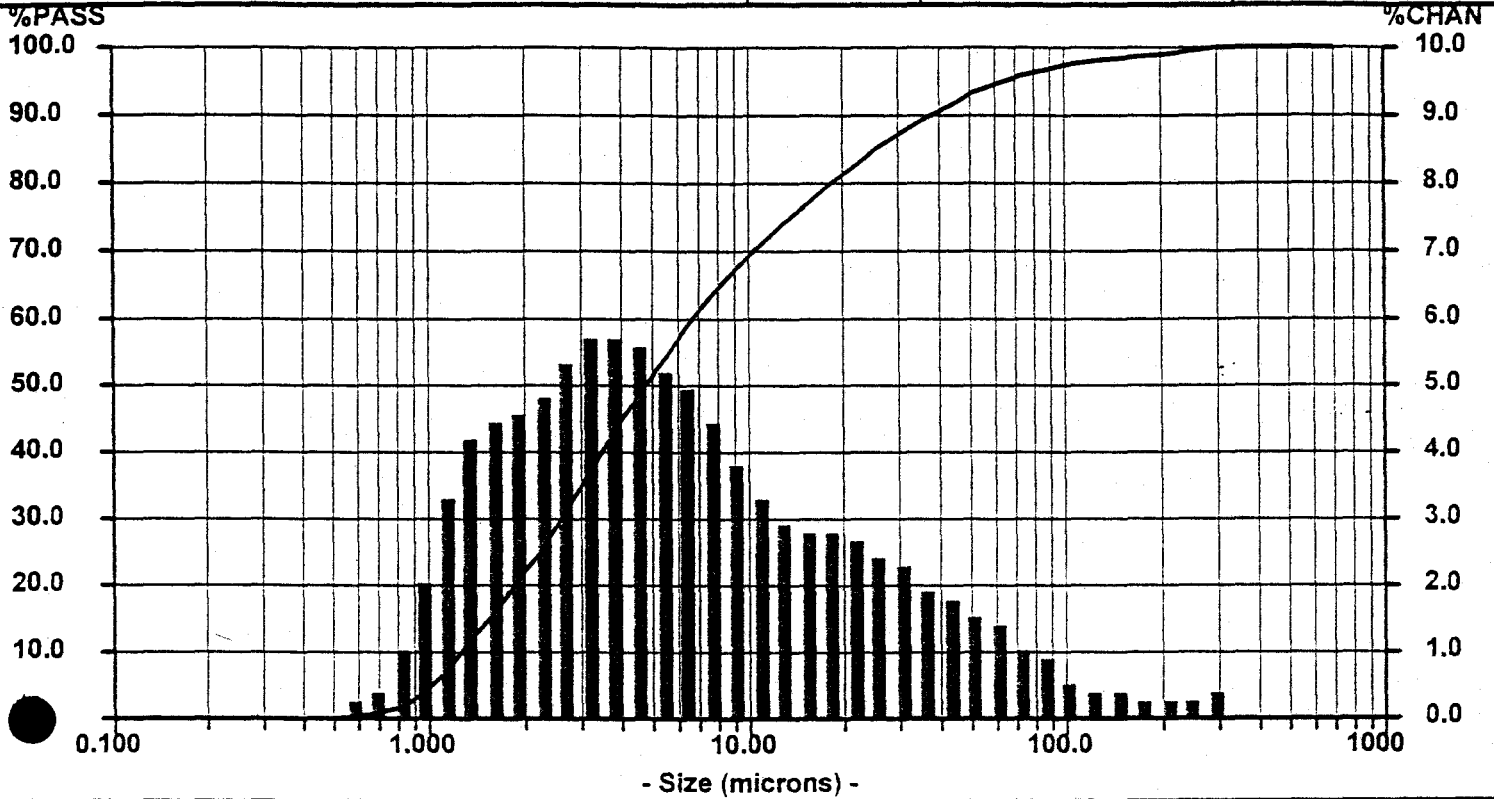
Clay from Pit 2 Drum 2/3 Lease 5

6/19/97

Summary
mv = 15.59
mn = 1.097
ma = 3.165
cs = 1.895
sd = 11.11

Percentiles
10% = 1.282 60% = 6.725
20% = 1.874 70% = 10.32
30% = 2.628 80% = 18.43
40% = 3.535 90% = 37.80
50% = 4.796 95% = 64.38

Dia Vol% Width
4.796 100% 22.22



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	67.79	3.98						
592.0	100.00	0.00	7.778	63.81	4.57						
497.8	100.00	0.00	6.541	59.24	5.03						
418.6	100.00	0.00	5.500	54.21	5.35						
352.0	100.00	0.00	4.625	48.86	5.63						
296.0	100.00	0.47	3.889	43.23	5.89						
248.9	99.53	0.37	3.270	37.34	5.86						
209.3	99.16	0.34	2.750	31.48	5.49						
176.0	98.82	0.35	2.312	25.99	4.98						
148.0	98.47	0.41	1.945	21.01	4.66						
124.5	98.06	0.52	1.635	16.35	4.55						
104.7	97.54	0.69	1.375	11.80	4.27						
88.00	96.85	0.92	1.156	7.53	3.38						
74.00	95.93	1.18	0.972	4.15	2.11						
62.23	94.75	1.44	0.818	2.04	1.12						
52.33	93.31	1.67	0.688	0.92	0.58						
44.00	91.64	1.88	0.578	0.34	0.34						
37.00	89.76	2.09	0.486	0.00	0.00						
31.11	87.67	2.32	0.409	0.00	0.00						
26.16	85.35	2.56	0.344	0.00	0.00						
22.00	82.79	2.73	0.289	0.00	0.00						
18.50	80.06	2.84	0.243	0.00	0.00						
15.56	77.22	2.91	0.204	0.00	0.00						
13.08	74.31	3.08	0.172	0.00	0.00						
11.00	71.23	3.44	0.145	0.00	0.00						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
High Resolution: N/A
Filter On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0384
Transmission: 0.93
Above Residual: 0.00
Below Residual: 0.00

ANALYTICAL CHEMISTRY LABORATORY
 DEPARTMENT OF EARTH AND PLANETARY SCIENCES
 UNIVERSITY OF NEW MEXICO
 ALBUQUERQUE, NM 87131
 (505) 277-4624
 FAX: (505) 277-3843

Date: MAY 11, 1997

To: SOLV-EX CORPORATION; Attn: Massoud Ahghar
 From: John Husler
 Subject: X-Ray Fluorescence Analyses

Lease 5 Clay Layer

Q1-CS-329

Weight %	L-C-S-1	PDS-CP 41997	- LFT B		
SiO ₂	59.20	42.09	28.33		
TiO ₂	0.658	0.298	0.799		
Al ₂ O ₃	14.66	3.50	6.94		
Fe ₂ O ₃	4.36	4.50	35.74		
FeO	-	-	-		
MnO	0.011	0.032	0.355		
MgO	2.39	0.74	4.58		
CaO	1.94	1.25	8.42		
Na ₂ O	0.38	0.26	0.27		
K ₂ O	2.68	1.21	1.47		
H ₂ O(-)					
H ₂ O(+) + CO ₂	13.36	4.22	N.D.		
P ₂ O ₅	0.16	0.17	1.29		
TOTAL	99.80	98.27	88.19		
TOTAL Fe (as Fe ₂ O ₃)					
LOI + H ₂ O(-)	13.36	4.22	N.D.		
FeO after LOI					

N.D. = Not Determined

MICROTRAC - X100

Ver:3.03

L-C-S-1

L-C-S-1
SAMPLE #1

Date: 06/09/97 Meas #:05147
Time: 09:37 Pres #: 01

L-C-S-1

6/9/97

Lease 5 Top Clay Layer
without dispersant.

Summary

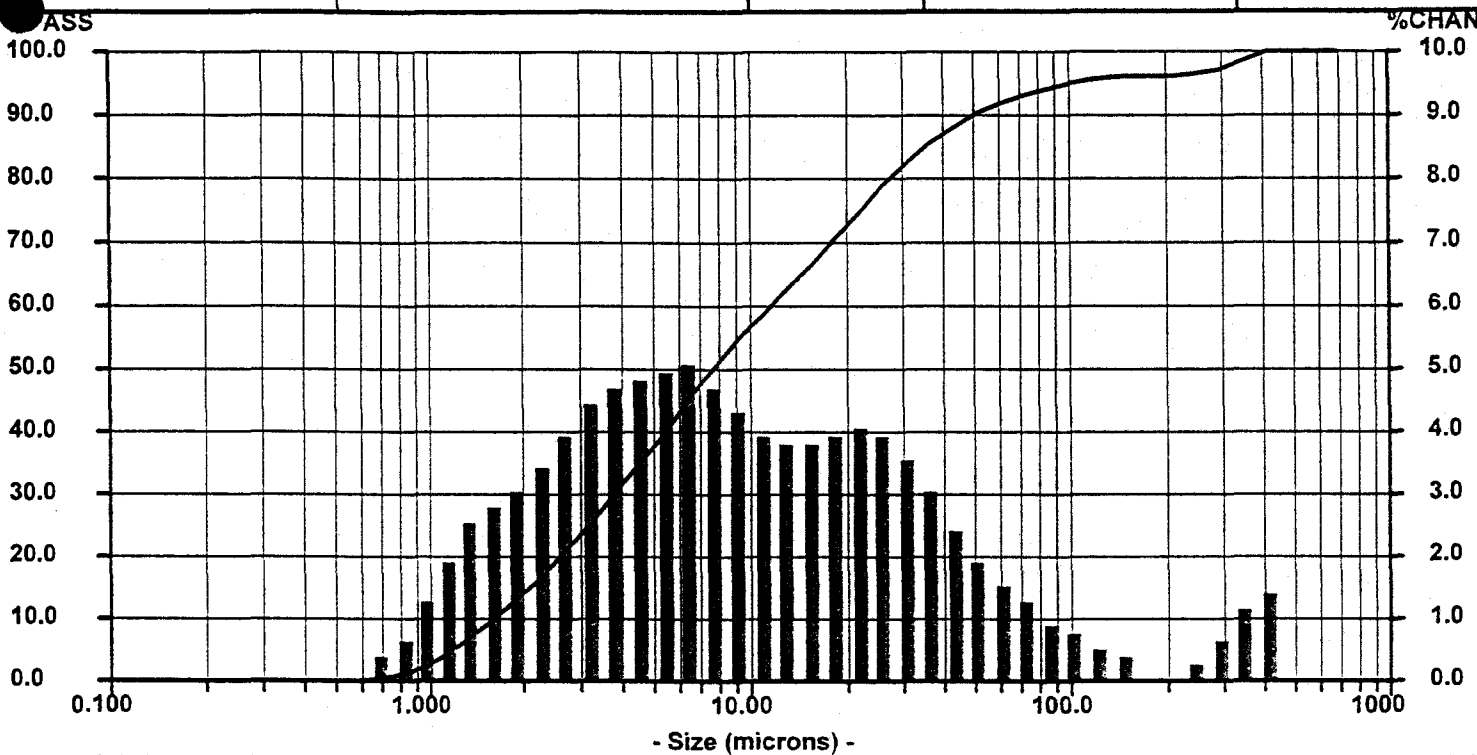
mv = 27.54
mn = 1.201
ma = 4.282
cs = 1.401
sd = 15.70

Percentiles

10% = 1.623 60% = 11.62
20% = 2.647 70% = 18.03
30% = 3.851 80% = 27.54
40% = 5.447 90% = 50.73
50% = 7.697 95% = 101.5

Dia Vol% Width

334.3 4% 118.3
24.62 37% 37.18
3.769 59% 5.958



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
1000.0	100.00	0.00	9.250	54.75	4.46						
750.0	100.00	0.00	7.778	50.29	4.89						
497.8	100.00	0.00	6.541	45.40	5.11						
418.6	100.00	1.49	5.500	40.29	5.06						
352.0	98.51	1.26	4.625	35.23	4.95						
296.0	97.25	0.71	3.889	30.28	4.80						
248.9	96.54	0.38	3.270	25.48	4.54						
209.3	96.16	0.00	2.750	20.94	4.08						
176.0	96.16	0.00	2.312	16.86	3.56						
148.0	96.16	0.42	1.945	13.30	3.17						
124.5	95.74	0.61	1.635	10.13	2.92						
104.7	95.13	0.82	1.375	7.21	2.61						
88.00	94.31	1.04	1.156	4.60	2.05						
74.00	93.27	1.30	0.972	2.55	1.34						
62.23	91.97	1.63	0.818	1.21	0.77						
52.33	90.34	2.07	0.688	0.44	0.44						
44.00	88.27	2.59	0.578	0.00	0.00						
37.00	85.68	3.15	0.486	0.00	0.00						
31.11	82.53	3.66	0.409	0.00	0.00						
26.16	78.87	4.05	0.344	0.00	0.00						
22.00	74.82	4.19	0.289	0.00	0.00						
18.50	70.63	4.10	0.243	0.00	0.00						
15.56	66.53	3.90	0.204	0.00	0.00						
13.08	62.63	3.84	0.172	0.00	0.00						
11.00	58.79	4.04	0.145	0.00	0.00						

Distribution: Volume Progression: Standard Upper Edge: 704.0 Lower Edge: 0.122 Residuals: Disabled Number Of Channels: 50 High Resolution: N/A Filter On: On	RunTime: 30 seconds Run Number 1 of 1 runs Particle: Kaolin Clay Particle Transparency: Trans Particle Refractive Index: 1.64 Particle Shape: Irregular	Fluid: Water Fluid Refractive Index: 1.33 Loading Factor: 0.0707 Transmission: 0.89 Above Residual: 0.00 Below Residual: 0.00
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MICROTRAC - X100

Ver:3.03

L-C-S-1

L-C-S-1
SAMPLE #1

Date: 06/09/97 Meas #:05145
Time: 09:14 Pres #: 01

L-C-S-1

Lease 5 Top Clay Layer

6/9/97

WITH DISPERSANT

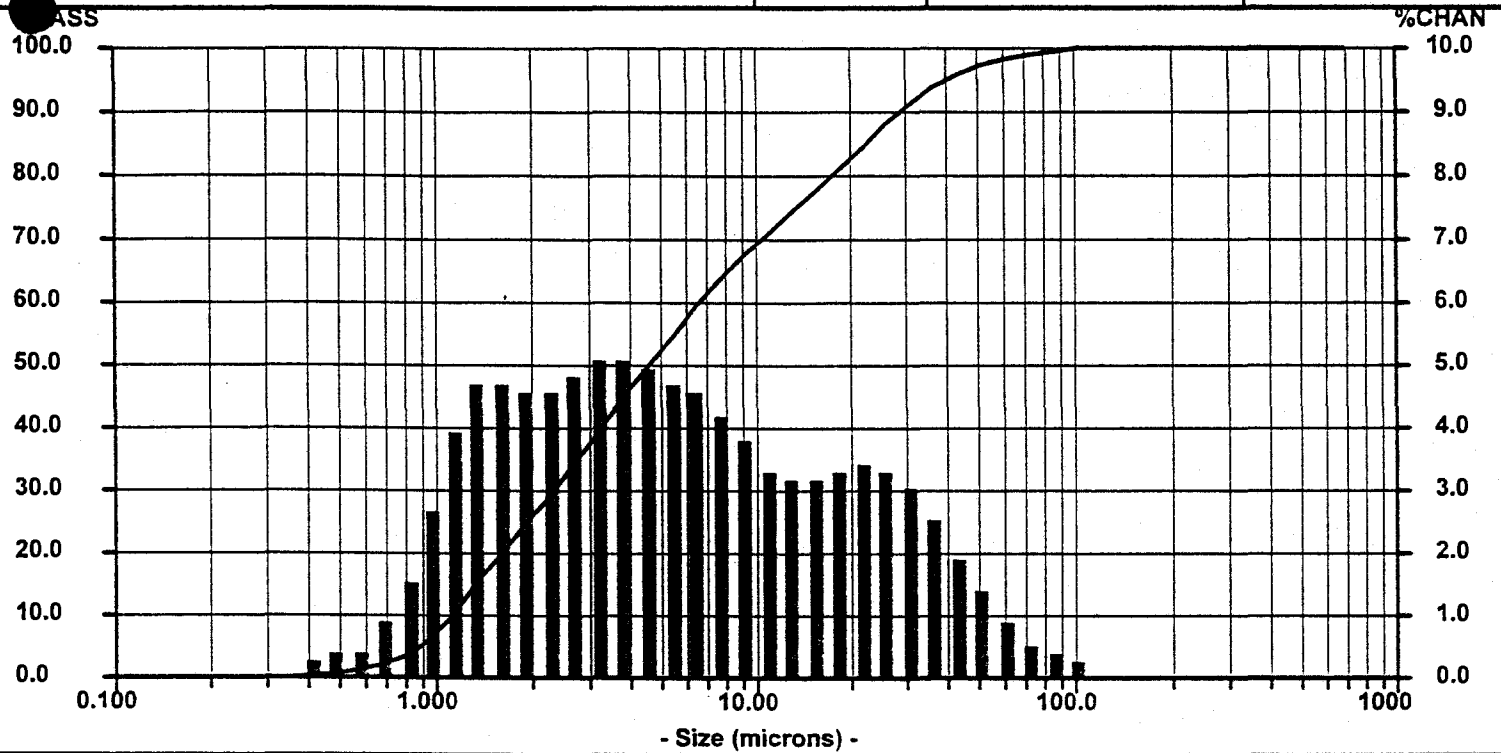
Summary

mv = 10.71
mn = 0.811
ma = 2.766
cs = 2.169
sd = 9.991

Percentiles

10% = 1.124 60% = 6.673
20% = 1.613 70% = 10.39
30% = 2.338 80% = 17.55
40% = 3.289 90% = 29.02
50% = 4.628 95% = 40.33

Dia	Vol%	Width
23.07	29%	27.60
3.993	51%	5.305
1.132	20%	0.681



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
700.0	100.00	0.00	9.250	67.66	3.85						
500.0	100.00	0.00	7.778	63.81	4.32						
497.8	100.00	0.00	6.541	59.49	4.66						
418.6	100.00	0.00	5.500	54.83	4.85						
352.0	100.00	0.00	4.625	49.98	5.00						
296.0	100.00	0.00	3.889	44.98	5.15						
248.9	100.00	0.00	3.270	39.83	5.19						
209.3	100.00	0.00	2.750	34.64	4.95						
176.0	100.00	0.00	2.312	29.69	4.68						
148.0	100.00	0.00	1.945	25.01	4.63						
124.5	100.00	0.00	1.635	20.38	4.82						
104.7	100.00	0.37	1.375	15.56	4.82						
88.00	99.63	0.49	1.156	10.74	4.09						
74.00	99.14	0.69	0.972	6.65	2.77						
62.23	98.45	1.01	0.818	3.88	1.60						
52.33	97.44	1.48	0.688	2.28	0.91						
44.00	95.96	2.06	0.578	1.37	0.58						
37.00	93.90	2.67	0.486	0.79	0.43						
31.11	91.23	3.17	0.409	0.36	0.36						
26.16	88.06	3.47	0.344	0.00	0.00						
22.00	84.59	3.53	0.289	0.00	0.00						
18.50	81.06	3.43	0.243	0.00	0.00						
15.56	77.63	3.27	0.204	0.00	0.00						
13.08	74.36	3.25	0.172	0.00	0.00						
11.00	71.11	3.45	0.145	0.00	0.00						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
High Resolution: N/A
Filter On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0494
Transmission: 0.90
Above Residual: 0.00
Below Residual: 0.00

MASSOCT
JOAN GE
J

JUNE 20, 1997

Jerry V. Fox

INITIAL EXPLORATORY HYDROCYCLONE TEST - CLEARWATER SAMPLES

Prepare a uniform, well mixed slurry of approximately 25 percent solids (calculate the weight based upon the weight as is in the sample drum. Use the sample in drum 2 of Pit # 1. Use steam to heat to approximately 130 °F to help in the mixing process.

1.0 Test #1

- 1.1 Transfer the slurry to the hydrocyclone test feed tank. Turn on the pump and circulate while bypassing the hydrocyclone and turn on the mixer.
- 1.2 Using steam heat the contents to 160 °F.
- 1.3 Open the flow to the hydrocyclone and close the bypass valve until 50 psig is obtained on the flow to the hydrocyclone.
- 1.4 Run for a minimum of 5 minutes.
- 1.5 Divert the overflow line to a 5 gallon bucket and record the time to fill. Return the flow to the unit.
- 1.6 Divert the underflow line to a 5 gallon bucket and record the time to fill. Return the flow to the unit.
- 1.7 Collect one gallon samples of the feed, overflow, and underflow streams
- 1.8 Record pressure and flow rate data as well as any unusual observations..

2.0 Test # 2

- 2.1 Open the bypass valve until the pressure reaches 30 psig.
- 2.2 Use steam to adjust temperature to 160 °F.
- 2.3 Repeat steps 1.4 through 1.8.

3.0 Using the bypass valve adjust the pressure to 50 psig.

- 3.1 Using a hose clamp, adjust the overflow rate to roughly 1/3 to 1/2 as determined by visual inspection.
- 3.2 Repeat steps 1.4 through 1.8.

4.0 Laboratory Tests

- 4.1 Determine percent solids all samples
- 4.2 Determine PSD all samples.
- 4.3 Retain samples for further study or instruction to dispose.

CYCLONE TESTS

6/24/97

TEST ONE

50 PSI ORIFICE TOP 5-5 BOTTOM 3-2

70 lbs 700 lbs water

GPM - OFF THE TOP OF CYCLONE, 3 GALLONS PER MINUTE. OFF BOTTOM OF CYCLONE, 1 GALLON PER MINUTE AND 40 SECONDS.

TEST TWO

30 PSI

GPM - OFF THE TOP OF THE CYCLONE, 2 1/2 GALLONS PER MINUTE. BOTTOM 1 GALLON PER 2 MINUTE

TEST THREE

50 PSI ORIFICE TOP 3-0 BOTTOM 3-2

CYCLONE TOP GPM 1 GAL PER 1 MINUTE 10 SECONDS, BOTTOM 1 GAL PER MINUTE

TEST FOUR

30 PSI

CYCLONE TOP GPM 1 GAL PER 1 MINUTE 30 SECONDS, BOTTOM 1 GAL PER 1 MINUTE 10 SECONDS.

Fd - TEST PIT #1 Drum 2/3?

100 lbs 700 lbs water

MICROTRAC - X100

Ver:3.03

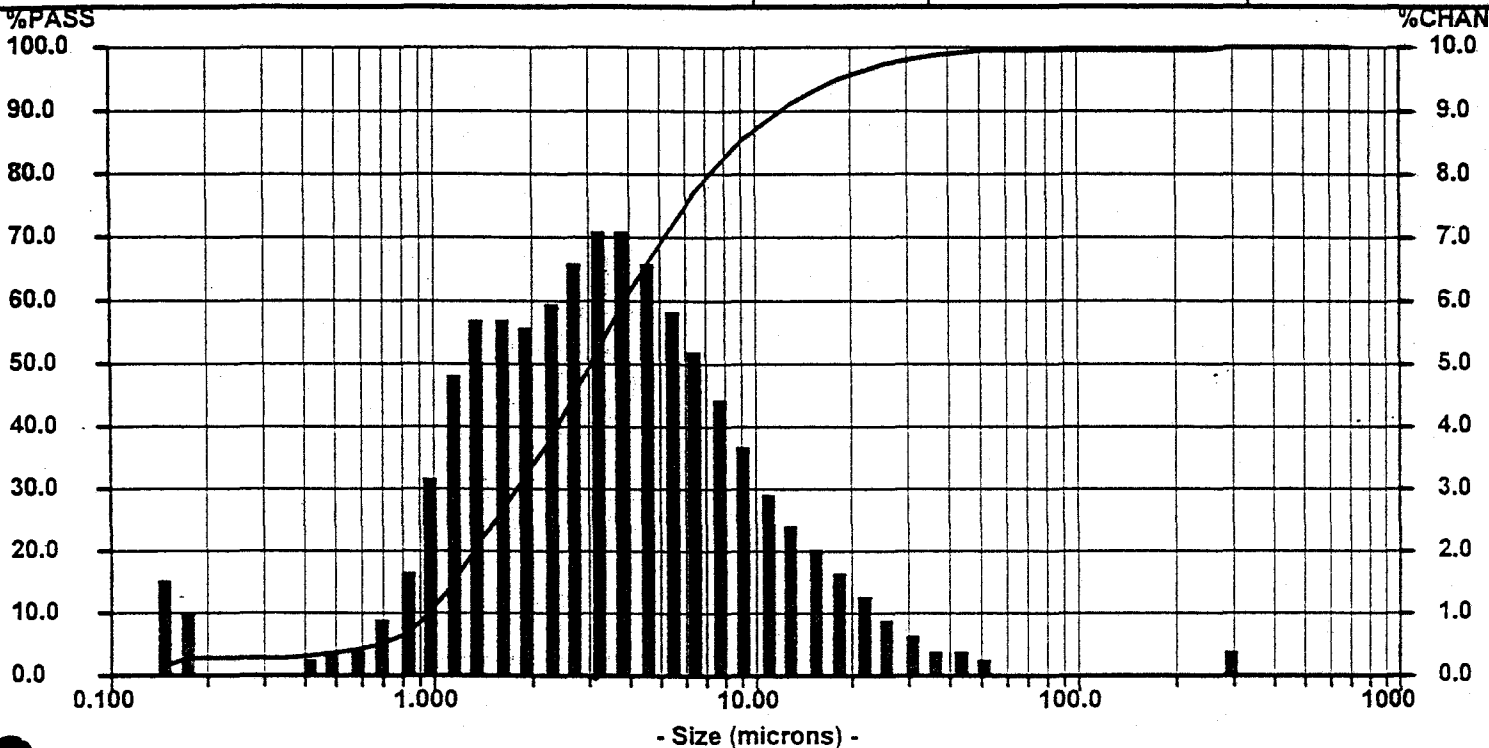
Hydrocyclone MIX TANK

PP-HCT-2T
SAMPLE #3

Date: 06/24/97 Meas #: 05184
Time: 12:11 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST
SAMPLE MIXING TANK
Test Pit 1. Lease 5
6/24/97

Summary	Percentiles	Dia	Vol%	Width	
mv = 6.263	10% = 0.963	60% = 3.948	4.311	73%	8.488
mn = 0.165	20% = 1.337	70% = 5.183	1.145	24%	0.657
ma = 1.597	30% = 1.803	80% = 7.247	0.144	3%	0.027
cs = 3.757	40% = 2.409	90% = 12.07			
sd = 3.704	50% = 3.096	95% = 18.46			



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	85.51	3.75						
592.0	100.00	0.00	7.778	81.76	4.51						
497.8	100.00	0.00	6.541	77.25	5.27						
418.6	100.00	0.00	5.500	71.98	5.96						
352.0	100.00	0.00	4.625	66.02	6.61						
296.0	100.00	0.40	3.889	59.41	7.11						
248.9	99.60	0.00	3.270	52.30	7.16						
209.3	99.60	0.00	2.750	45.14	6.65						
176.0	99.60	0.00	2.312	38.49	6.00						
148.0	99.60	0.00	1.945	32.49	5.69						
124.5	99.60	0.00	1.635	26.80	5.82						
104.7	99.60	0.00	1.375	20.98	5.83						
88.00	99.60	0.00	1.156	15.15	4.93						
74.00	99.60	0.00	0.972	10.22	3.25						
62.23	99.60	0.00	0.818	6.97	1.78						
52.33	99.60	0.33	0.688	5.19	0.96						
44.00	99.27	0.44	0.578	4.23	0.59						
37.00	98.83	0.58	0.486	3.64	0.42						
31.11	98.25	0.79	0.409	3.22	0.35						
26.16	97.46	1.06	0.344	2.87	0.00						
22.00	96.40	1.38	0.289	2.87	0.00						
18.50	95.02	1.75	0.243	2.87	0.00						
15.56	93.27	2.13	0.204	2.87	0.00						
13.08	91.14	2.55	0.172	2.87	1.17						
11.00	88.59	3.08	0.145	1.70	1.70						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
High Resolution: N/A
Filter On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0762
Transmission: 0.84
Above Residual: 0.00
Below Residual: 0.00

MICROTRAC - X100

Ver:3.03

Hydrocyclone Test #1 TOP

PP-HCT-1T
SAMPLE #1

Date: 06/24/97 Meas#: 05174
Time: 11:06 Pres#: 01

PILOT PLANT HYDROCYCLONE TEST

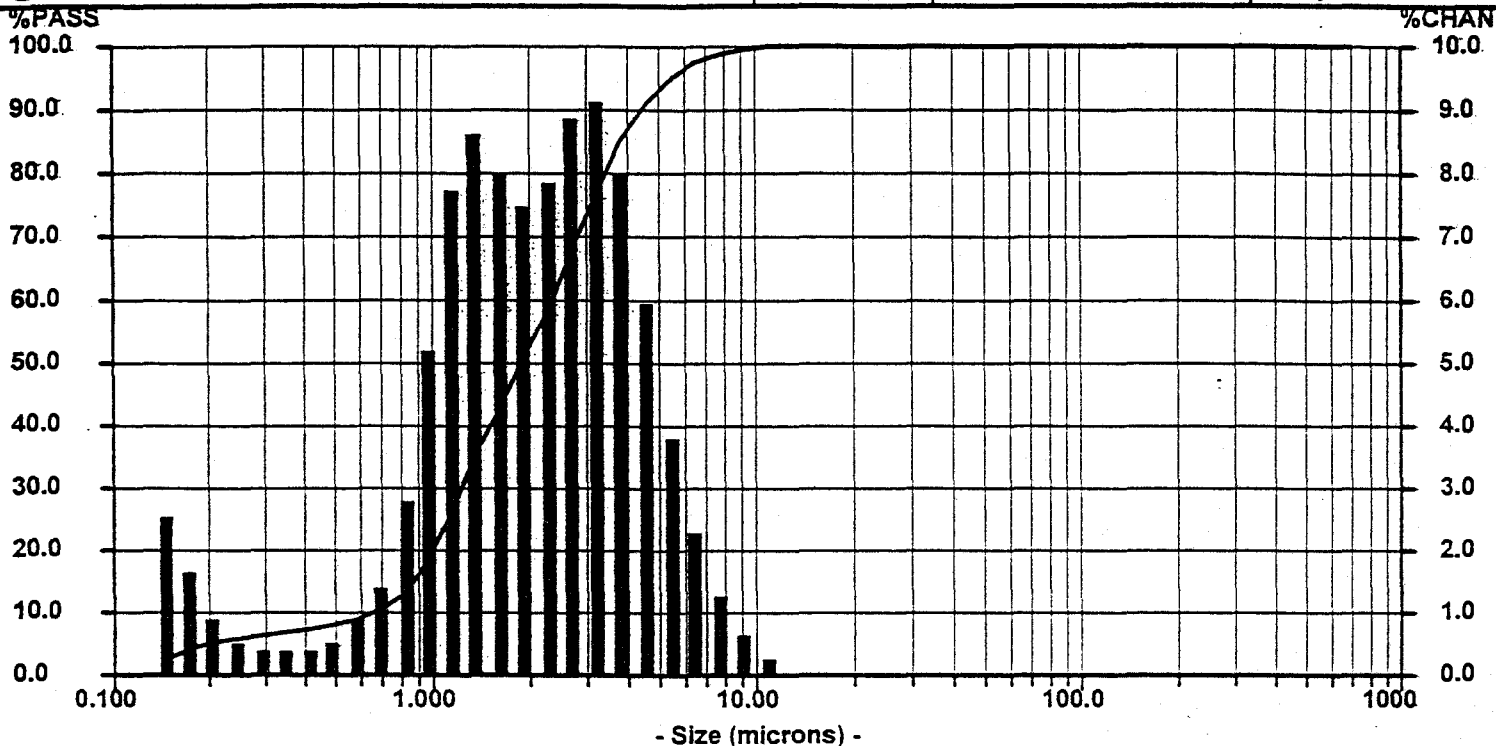
SAMPLE #1: TOP: 50psi 3gal.-1min.

Test Pit: 1: Lease 5

Before Ultrasound

6/24/97

Summary	Percentiles:		Dia:	Vol%:	Width:
mv = 2.301	10% = 0.646	60% = 2.364	2.956	57%	2.576
mrr = 0.170	20% = 1.001	70% = 2.863	1.116	37%	0.666
ma = 1.013	30% = 1.236	80% = 3.468	0.156	6%	0.077
cs = 5.921	40% = 1.516	90% = 4.445			
sd = 1.443	50% = 1.902	95% = 5.460			



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
700.0	100.00	0.00	9.250	99.61	0.73						
592.0	100.00	0.00	7.778	98.88	1.35						
497.8	100.00	0.00	6.541	97.53	2.39						
418.6	100.00	0.00	5.500	95.14	3.95						
352.0	100.00	0.00	4.625	91.19	6.00						
296.0	100.00	0.00	3.889	85.19	8.11						
248.9	100.00	0.00	3.270	77.08	9.25						
209.3	100.00	0.00	2.750	67.83	8.92						
176.0	100.00	0.00	2.312	58.91	7.94						
148.0	100.00	0.00	1.945	50.97	7.53						
124.5	100.00	0.00	1.635	43.44	8.06						
104.7	100.00	0.00	1.375	35.38	8.73						
88.00	100.00	0.00	1.156	26.65	7.85						
74.00	100.00	0.00	0.972	18.80	5.28						
62.23	100.00	0.00	0.818	13.52	2.87						
52.33	100.00	0.00	0.688	10.65	1.54						
44.00	100.00	0.00	0.578	9.11	0.95						
37.00	100.00	0.00	0.486	8.16	0.69						
31.11	100.00	0.00	0.409	7.47	0.55						
26.16	100.00	0.00	0.344	6.92	0.48						
22.00	100.00	0.00	0.289	6.44	0.49						
18.50	100.00	0.00	0.243	5.95	0.61						
15.56	100.00	0.00	0.204	5.34	0.98						
13.08	100.00	0.00	0.172	4.36	1.73						
11.00	100.00	0.39	0.145	2.63	2.63						

Distribution: Volume Progression: Standard Upper Edge: 704.0 Lower Edge: 0.122 Residuals: Disabled Number Of Channels: 50 High Resolution: N/A Filter On: On	RunTime: 30 seconds Run Number 1 of 1 runs Particle: Kaolin Clay Particle Transparency: Trans Particle Refractive index: 1.64 Particle Shape: Irregular	Fluid: Water Fluid Refractive Index: 1.33 Loading Factor: 0.0376 Transmission: 0.89 Above Residual: 0.00 Below Residual: 0.00
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MICROTRAC-X100

Ver.3.03

Hydrocyclone Test #1 BOTT

PP-HCT-1T
SAMPLE #1

Date: 06/24/97 Meas #: 05176
Time: 11:23 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST

SAMPLE #1 BOTTOM: 50psi 1gal.-1min. 40SEC

Test Pit 1 Lease 5
Before Ultrasound
6/24/97

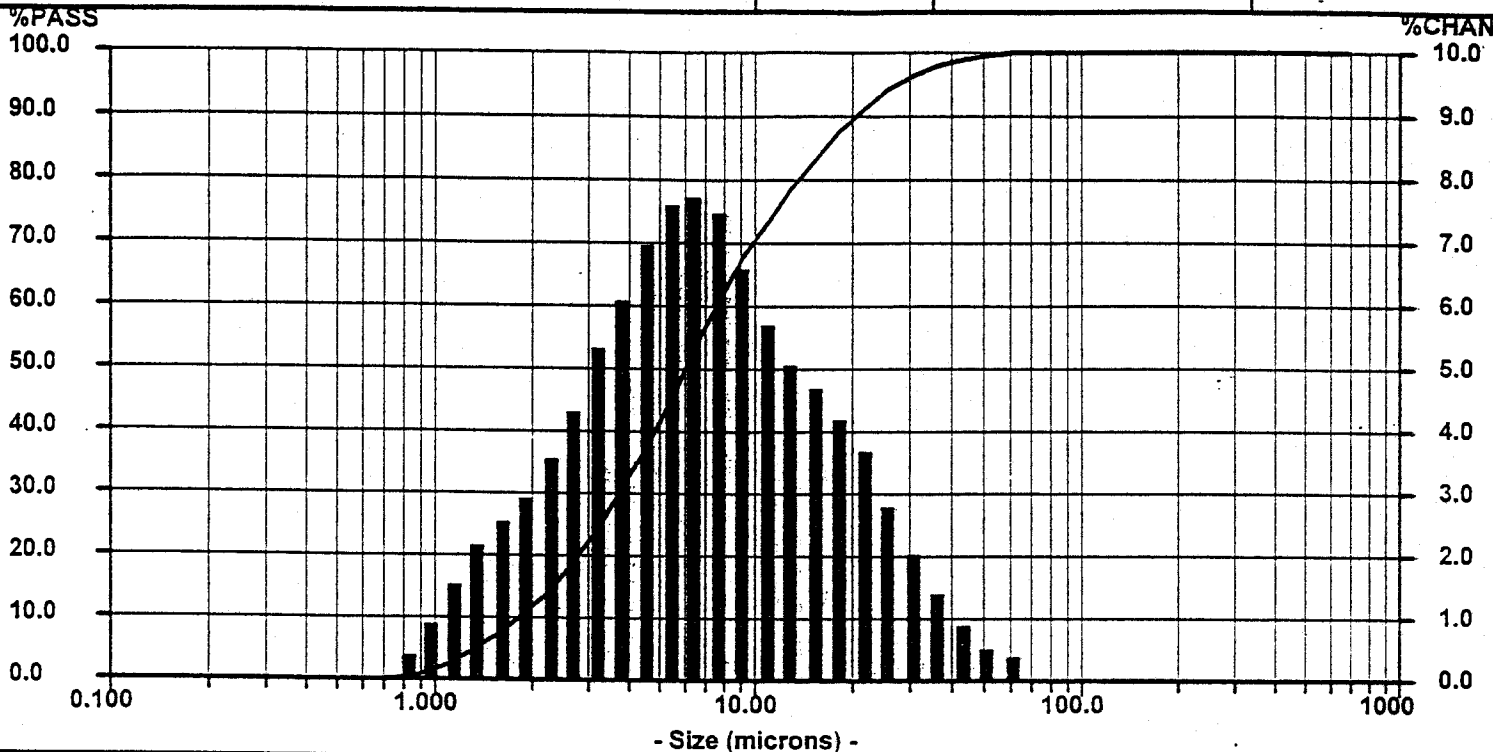
Summary

mv = 9.126
mn = 1.469
ma = 4.183
cs = 1.434
sd = 6.770

Percentiles

10% = 1.842 60% = 7.605
20% = 2.839 70% = 9.891
30% = 3.808 80% = 13.76
40% = 4.862 90% = 20.58
50% = 6.073 95% = 27.51

Dia Vol% Width
6.073 100% 13.54



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
707.0	100.00	0.00	9.250	67.68	6.72						
592.0	100.00	0.00	7.778	60.96	7.57						
497.8	100.00	0.00	6.541	53.39	7.90						
418.6	100.00	0.00	5.500	45.49	7.64						
352.0	100.00	0.00	4.625	37.85	7.04						
296.0	100.00	0.00	3.889	30.81	6.30						
248.9	100.00	0.00	3.270	24.51	5.43						
209.3	100.00	0.00	2.750	19.08	4.46						
176.0	100.00	0.00	2.312	14.62	3.62						
148.0	100.00	0.00	1.945	11.00	3.05						
124.5	100.00	0.00	1.635	7.95	2.68						
104.7	100.00	0.00	1.375	5.27	2.26						
88.00	100.00	0.00	1.156	3.01	1.62						
74.00	100.00	0.00	0.972	1.39	0.93						
62.23	100.00	0.44	0.818	0.46	0.46						
52.33	99.56	0.66	0.688	0.00	0.00						
44.00	98.90	0.99	0.578	0.00	0.00						
37.00	97.91	1.47	0.486	0.00	0.00						
31.11	96.44	2.13	0.409	0.00	0.00						
26.16	94.31	2.95	0.344	0.00	0.00						
22.00	91.36	3.73	0.289	0.00	0.00						
18.50	87.63	4.33	0.243	0.00	0.00						
15.56	83.30	4.71	0.204	0.00	0.00						
13.08	78.59	5.12	0.172	0.00	0.00						
11.00	73.47	5.79	0.145	0.00	0.00						

Distribution: Volume Progression: Standard Upper Edge: 704.0 Lower Edge: 0.122 Residuals: Disabled Number Of Channels: 50 High Resolution: N/A Filter On: On	RunTime: 30 seconds Run Number 1 of 1 runs Particle: Kaolin Clay Particle Transparency: Trans Particle Refractive Index: 1.64 Particle Shape: Irregular	Fluid: Water Fluid Refractive Index: 1.33 Loading Factor: 0.0900 Transmission: 0.86 Above Residual: 0.00 Below Residual: 0.00
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MICROTRAC - X100

Ver:3.03

Hydrocyclone TEST #4 TOP

PP-HCT-4T
SAMPLE #1

Date: 06/24/97 Meas#: 05189
Time: 12:42 Pres#: 01

PILOT PLANT HYDROCYCLONE TEST

SAMPLE#4- TOP 50psi 1gal-lmin 10sec 3.0-3.2

Test Pit 1 Lease 5

6/24/97

Summary

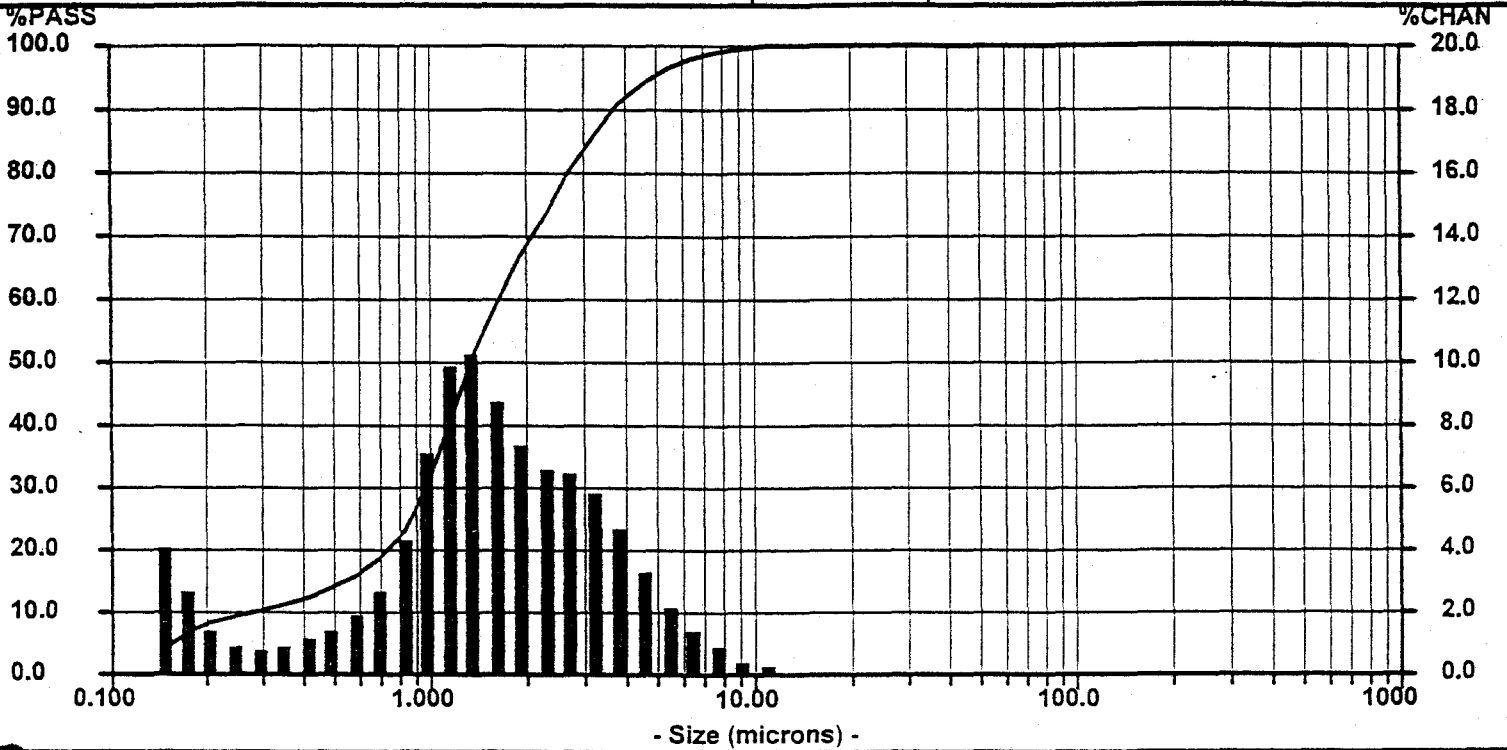
mv = 1.809
mn = 0.168
ma = 0.738
cs = 8.132
sd = 1.237

Percentiles

10% = 0.269 60% = 1.650
20% = 0.727 70% = 2.095
30% = 0.962 80% = 2.723
40% = 1.148 90% = 3.735
50% = 1.358 95% = 4.824

Dia Vol% Width

1.482 90% 2.360
0.153 10% 0.060



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	99.65	0.58						
592.0	100.00	0.00	7.778	99.07	0.94						
497.8	100.00	0.00	6.541	98.13	1.49						
418.6	100.00	0.00	5.500	96.64	2.28						
352.0	100.00	0.00	4.625	94.36	3.38						
296.0	100.00	0.00	3.889	90.98	4.71						
248.9	100.00	0.00	3.270	86.27	5.90						
209.3	100.00	0.00	2.750	80.37	6.53						
176.0	100.00	0.00	2.312	73.84	6.80						
148.0	100.00	0.00	1.945	67.04	7.44						
124.5	100.00	0.00	1.635	59.60	8.86						
104.7	100.00	0.00	1.375	50.74	10.31						
88.00	100.00	0.00	1.156	40.43	9.91						
74.00	100.00	0.00	0.972	30.52	7.25						
62.23	100.00	0.00	0.818	23.27	4.46						
52.33	100.00	0.00	0.688	18.81	2.77						
44.00	100.00	0.00	0.578	16.04	1.96						
37.00	100.00	0.00	0.486	14.08	1.53						
31.11	100.00	0.00	0.409	12.55	1.21						
26.16	100.00	0.00	0.344	11.34	0.97						
22.00	100.00	0.00	0.289	10.37	0.87						
18.50	100.00	0.00	0.243	9.50	1.00						
15.56	100.00	0.00	0.204	8.50	1.57						
13.08	100.00	0.00	0.172	6.93	2.77						
11.00	100.00	0.35	0.145	4.16	4.16						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
High Resolution: N/A
Filter On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0199
Transmission: 0.93
Above Residual: 0.00
Below Residual: 0.00

MICROTRAC - X100

Ver:3.03

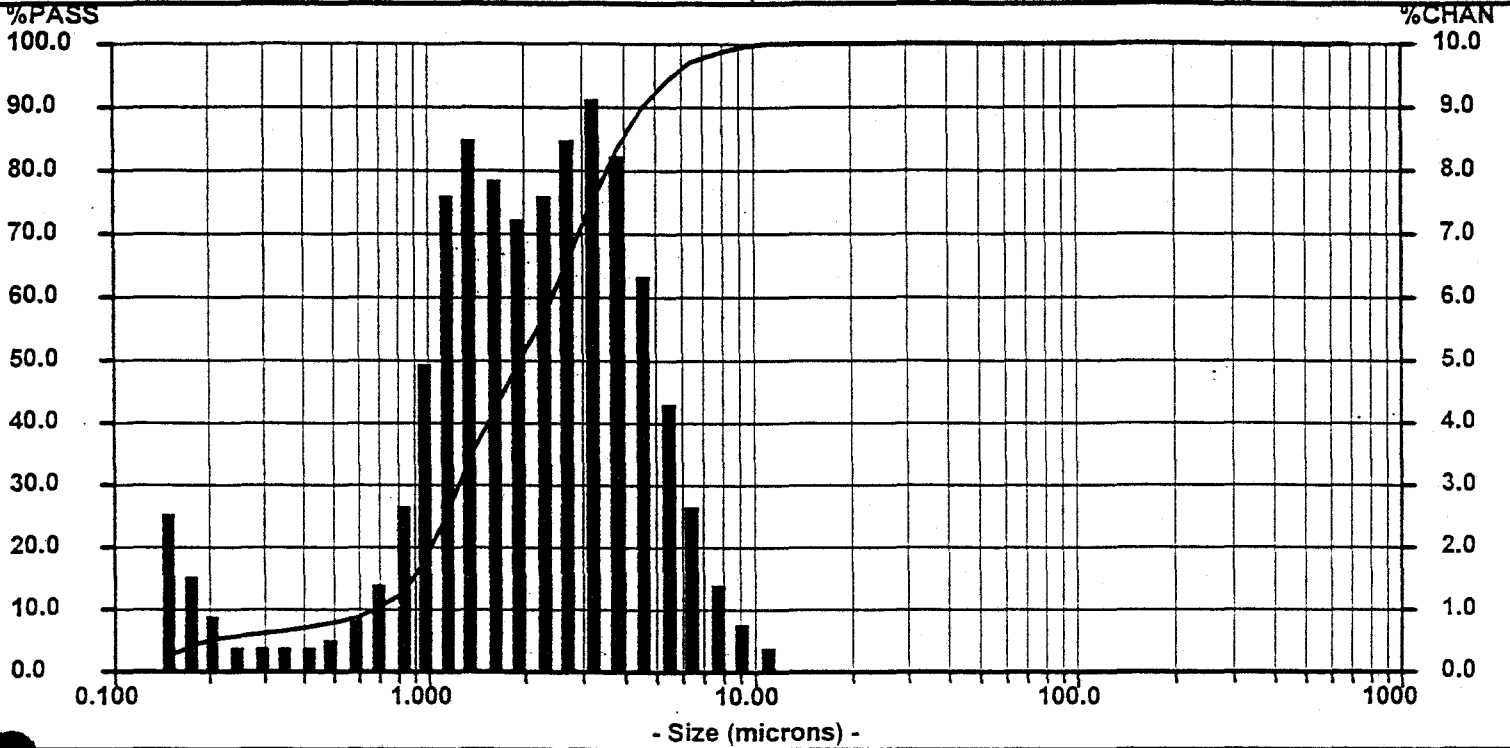
Hydrocyclone Test #2 TOP

PP-HCT-2T
SAMPLE #1

Date: 06/24/97 Meas #: 05180
Time: 11:42 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST
SAMPLE #2 TOP 30psi 2 1/2gal.-1min.
Test Pit 1 Lease 5
6/24/97

Summary	Percentiles			Dia	Vol%	Width
mv = 2.379	10% = 0.665	60% = 2.448		3.033	58%	2.713
mn = 0.170	20% = 1.018	70% = 2.969		1.120	36%	0.664
ma = 1.033	30% = 1.259	80% = 3.604		0.156	6%	0.077
cs = 5.809	40% = 1.554	90% = 4.625				
sd = 1.511	50% = 1.964	95% = 5.676				



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	99.54	0.85						
592.0	100.00	0.00	7.778	98.69	1.56						
497.8	100.00	0.00	6.541	97.13	2.72						
418.6	100.00	0.00	5.500	94.41	4.41						
352.0	100.00	0.00	4.625	90.00	6.48						
296.0	100.00	0.00	3.889	83.52	8.39						
248.9	100.00	0.00	3.270	75.13	9.20						
209.3	100.00	0.00	2.750	65.93	8.66						
176.0	100.00	0.00	2.312	57.27	7.67						
148.0	100.00	0.00	1.945	49.60	7.33						
124.5	100.00	0.00	1.635	42.27	7.91						
104.7	100.00	0.00	1.375	34.36	8.55						
88.00	100.00	0.00	1.156	25.81	7.63						
74.00	100.00	0.00	0.972	18.18	5.08						
62.23	100.00	0.00	0.818	13.10	2.75						
52.33	100.00	0.00	0.688	10.35	1.47						
44.00	100.00	0.00	0.578	8.88	0.91						
37.00	100.00	0.00	0.486	7.97	0.66						
31.11	100.00	0.00	0.409	7.31	0.53						
26.16	100.00	0.00	0.344	6.78	0.46						
22.00	100.00	0.00	0.289	6.32	0.47						
18.50	100.00	0.00	0.243	5.85	0.59						
15.56	100.00	0.00	0.204	5.26	0.96						
13.08	100.00	0.00	0.172	4.30	1.70						
11.00	100.00	0.46	0.145	2.60	2.60						

Distribution: Volume	RunTime: 30 seconds	Fluid: Water
Progression: Standard	Run Number 1 of 1 runs	Fluid Refractive Index: 1.33
Upper Edge: 704.0	Particle: Kaolin Clay	Loading Factor: 0.0373
Lower Edge: 0.122	Particle Transparency: Trans	Transmission: 0.89
Residuals: Disabled	Particle Refractive Index: 1.64	Above Residual: 0.00
Number Of Channels: 50	Particle Shape: Irregular	Below Residual: 0.00
High Resolution: N/A		
Filter On: On		

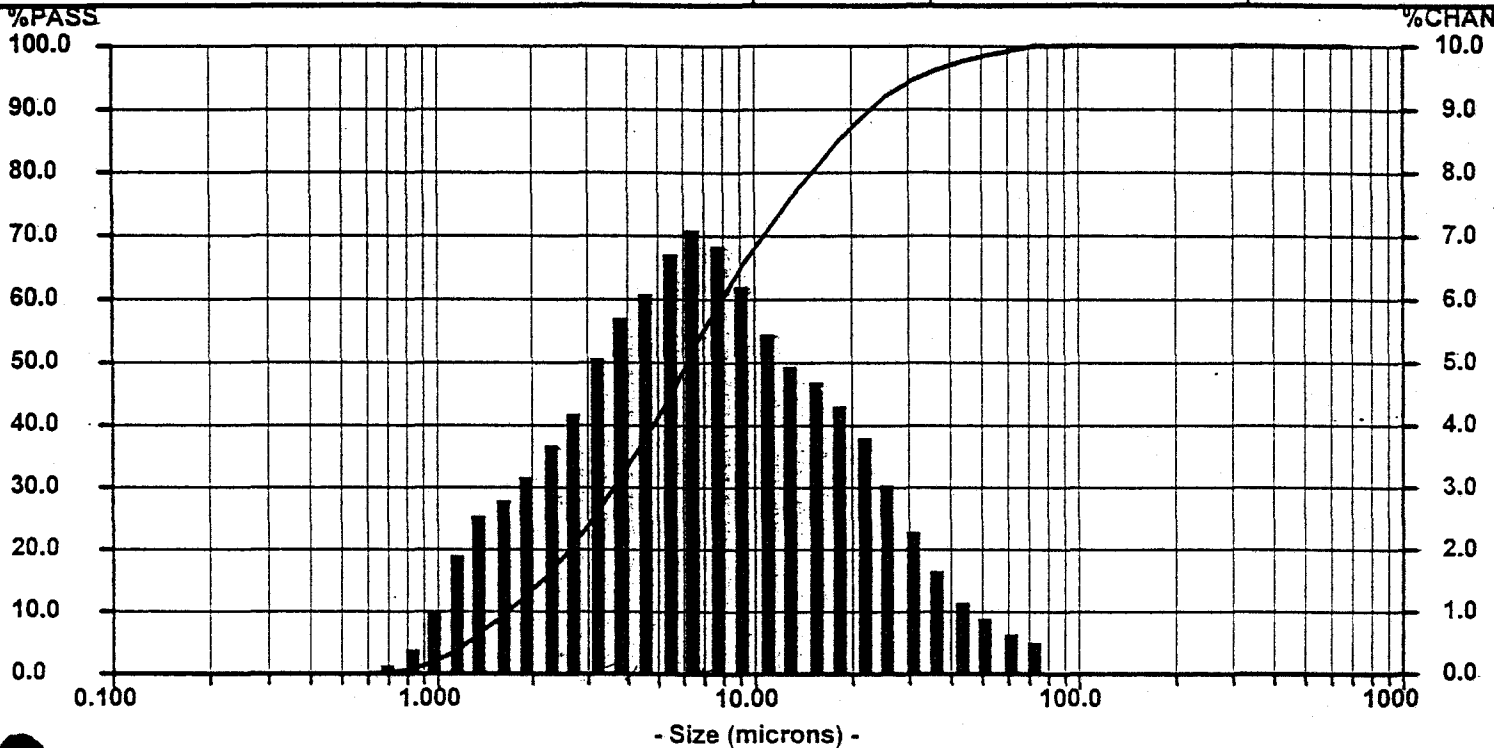
Hydrocyclone Test #2 BOT

PP-HCT-2T
SAMPLE #1

Date: 06/24/97 Meas #: 05178
Time: 11:34 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST
SAMPLE #2 BOTTOM 30psi 1gal-2min.
Test Pit 1 Lease 5
6/2/97

Summary	Percentiles			Dia	Vol%	Width
mv = 10.04	10% = 1.679	60% = 7.989		6.229	100%	15.40
mr = 1.302	20% = 2.659	70% = 10.68				
ma = 4.020	30% = 3.695	80% = 15.16				
cs = 1.493	40% = 4.865	90% = 23.02				
sd = 7.701	50% = 6.229	95% = 32.10				



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	65.32	6.33						
592.0	100.00	0.00	7.778	58.99	6.97						
497.8	100.00	0.00	6.541	52.02	7.14						
418.6	100.00	0.00	5.500	44.88	6.82						
352.0	100.00	0.00	4.625	38.06	6.30						
296.0	100.00	0.00	3.889	31.76	5.74						
248.9	100.00	0.00	3.270	26.02	5.11						
209.3	100.00	0.00	2.750	20.91	4.39						
176.0	100.00	0.00	2.312	16.52	3.72						
148.0	100.00	0.00	1.945	12.80	3.27						
124.5	100.00	0.00	1.635	9.53	2.98						
104.7	100.00	0.00	1.375	6.55	2.60						
88.00	100.00	0.00	1.156	3.95	1.92						
74.00	100.00	0.63	0.972	2.03	1.14						
62.23	99.37	0.76	0.818	0.89	0.59						
52.33	98.61	0.96	0.688	0.30	0.30						
44.00	97.65	1.27	0.578	0.00	0.00						
37.00	96.38	1.73	0.486	0.00	0.00						
31.11	94.65	2.38	0.409	0.00	0.00						
26.16	92.27	3.18	0.344	0.00	0.00						
22.00	89.09	3.93	0.289	0.00	0.00						
18.50	85.16	4.46	0.243	0.00	0.00						
15.56	80.70	4.75	0.204	0.00	0.00						
13.08	75.95	5.05	0.172	0.00	0.00						
11.00	70.90	5.58	0.145	0.00	0.00						

Distribution: Volume	RunTime: 30 seconds	Fluid: Water
Progression: Standard	Run Number 1 of 1 runs	Fluid Refractive Index: 1.33
Upper Edge: 704.0	Particle: Kaolin Clay	Loading Factor: 0.0762
Lower Edge: 0.122	Particle Transparency: Trans	Transmission: 0.87
Residuals: Disabled	Particle Refractive Index: 1.54	Above Residual: 0.00
Number Of Channels: 50	Particle Shape: Irregular	Below Residual: 0.00
High Resolution: N/A		
Filter On: On		

MICROTRAC - X100

Ver:3.03

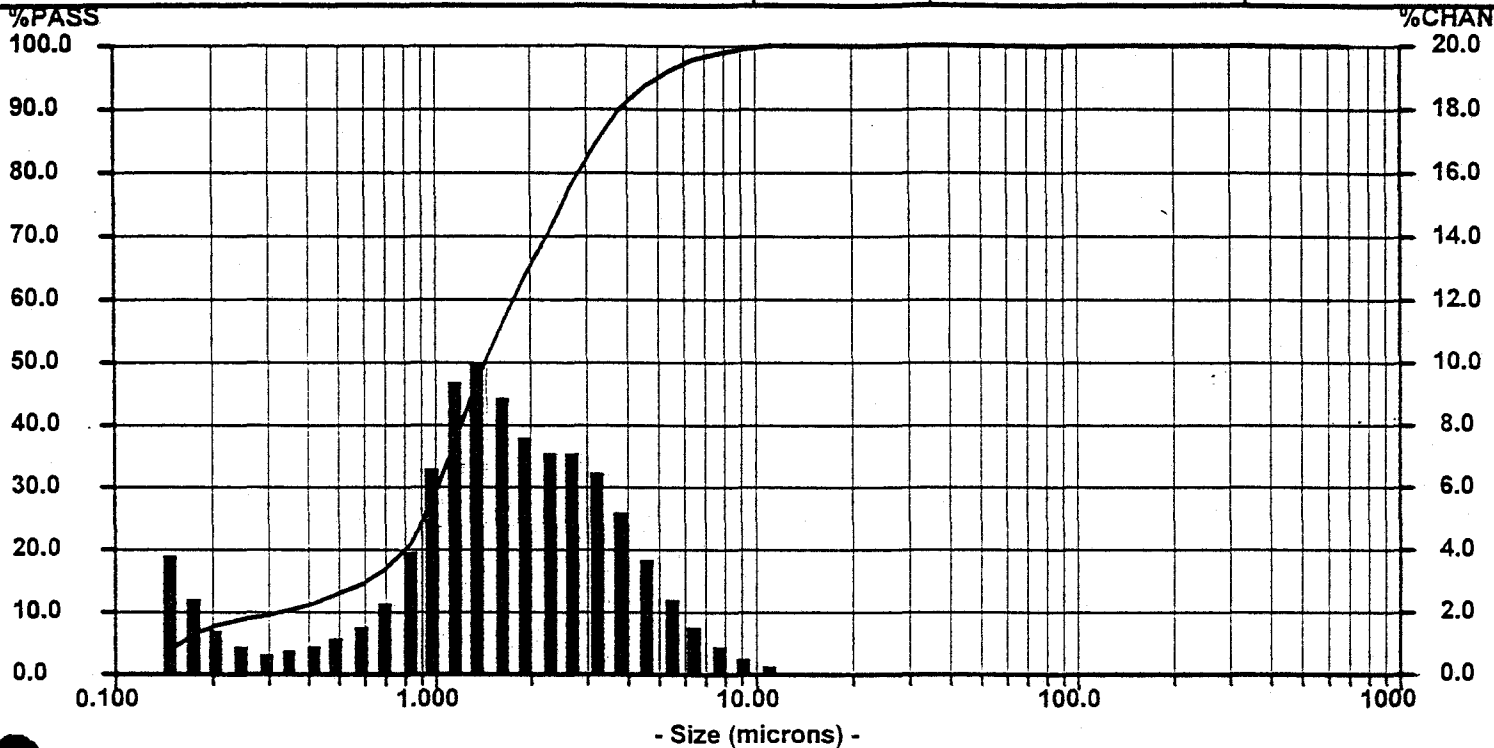
Hydrocyclone TEST #3 TOP

PP-HCT-3T
SAMPLE #1

Date: 06/24/97 Meas #: 05187
Time: 12:35 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST
SAMPLE #3 TOP 30psi 1gal/min: 3.0-3.2
Test Pit 1 Lease 5
6/24/97

Summary	Percentiles		Dia	Vol%	Width
mv = 1.908	10% = 0.310	60% = 1.781	1.581	91%	2.458
mn = 0.168	20% = 0.790	70% = 2.254	0.152	9%	0.060
ma = 0.780	30% = 1.017	80% = 2.877			
cs = 7.695	40% = 1.214	90% = 3.889			
sd = 1.278	50% = 1.449	95% = 4.989			



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	99.62	0.63						
592.0	100.00	0.00	7.778	98.99	1.03						
497.8	100.00	0.00	6.541	97.96	1.65						
418.6	100.00	0.00	5.500	96.31	2.54						
352.0	100.00	0.00	4.625	93.77	3.77						
296.0	100.00	0.00	3.889	90.00	5.25						
248.9	100.00	0.00	3.270	84.75	6.54						
209.3	100.00	0.00	2.750	78.21	7.14						
176.0	100.00	0.00	2.312	71.07	7.27						
148.0	100.00	0.00	1.945	63.80	7.71						
124.5	100.00	0.00	1.635	56.09	8.90						
104.7	100.00	0.00	1.375	47.19	10.06						
88.00	100.00	0.00	1.156	37.13	9.42						
74.00	100.00	0.00	0.972	27.71	6.72						
62.23	100.00	0.00	0.818	20.99	4.03						
52.33	100.00	0.00	0.688	16.96	2.44						
44.00	100.00	0.00	0.578	14.52	1.68						
37.00	100.00	0.00	0.486	12.84	1.29						
31.11	100.00	0.00	0.409	11.55	1.03						
26.16	100.00	0.00	0.344	10.52	0.84						
22.00	100.00	0.00	0.289	9.68	0.78						
18.50	100.00	0.00	0.243	8.90	0.92						
15.56	100.00	0.00	0.204	7.98	1.46						
13.08	100.00	0.00	0.172	6.52	2.59						
11.00	100.00	0.38	0.145	3.93	3.93						

Distribution: Volume	RunTime: 30 seconds	Fluid: Water
Progression: Standard	Run Number 1 of 1 runs	Fluid Refractive Index: 1.33
Upper Edge: 704.0	Particle: Kaolin Clay	Loading Factor: 0.0199
Lower Edge: 0.122	Particle Transparency: Trans	Transmission: 0.93
Residuals: Disabled	Particle Refractive Index: 1.64	Above Residual: 0.00
Number Of Channels: 50	Particle Shape: Irregular	Below Residual: 0.00
High Resolution: N/A		
Filter On: On		

MICROTRAC - X100

Ver:3.03

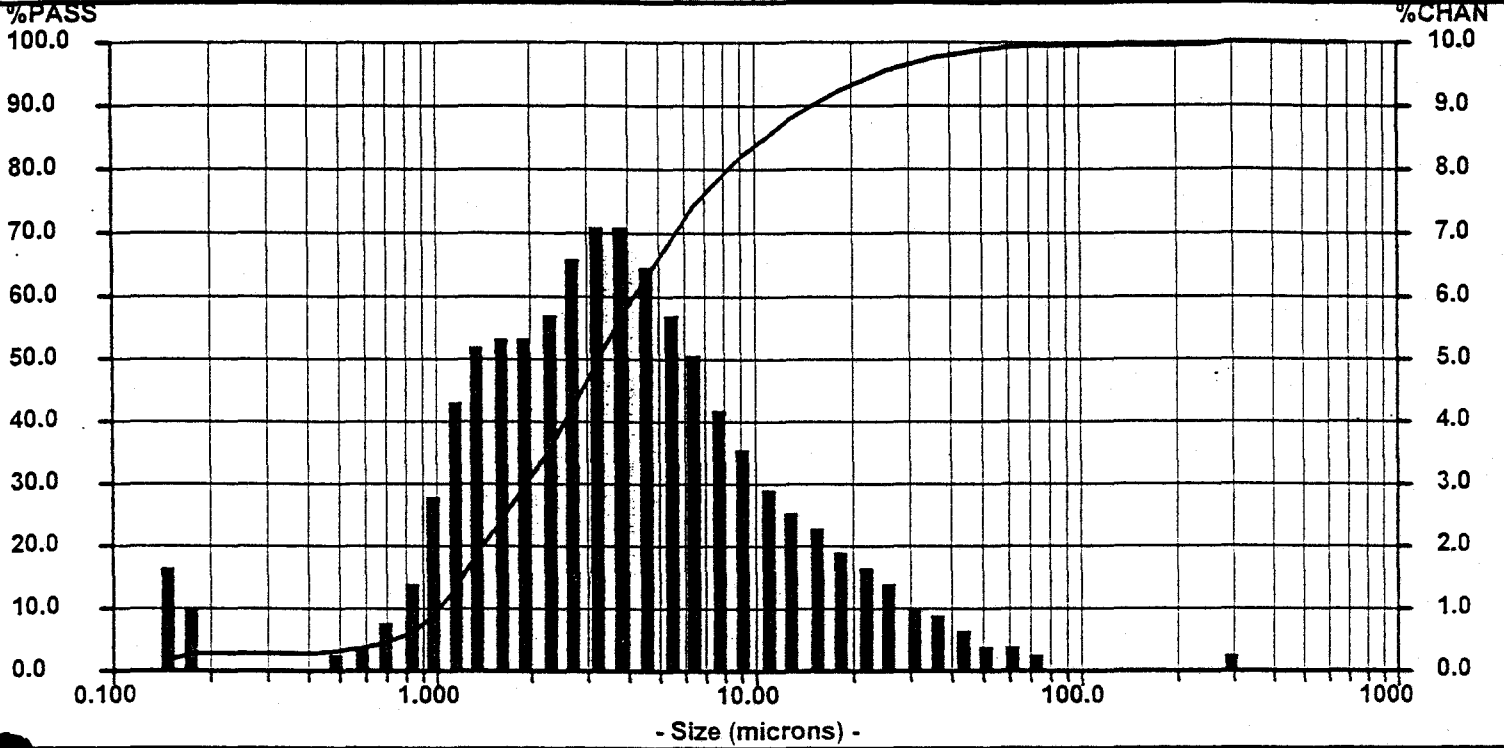
Hydrocyclone TEST #3 BOTT

PP-HCT-3T
SAMPLE #1

Date: 06/24/97 Meas #: 05191
Time: 13:05 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST
SAMPLE#3 BOTTOM 30psi 1gal-l/min 10sec 3.0-3.2
Test Pit 1 Lease 5
6/24/97

Summary:	Percentiles:	Dia	Vol%	Width
mv = 7.179	10% = 1.010	60% = 4.234	3.421	97% = 9.087
mn = 0.162	20% = 1.422	70% = 5.653	0.143	3% = 0.027
ma = 1.678	30% = 1.953	80% = 8.265		
cs = 3.575	40% = 2.590	90% = 15.21		
sd = 4.457	50% = 3.304	95% = 24.20		



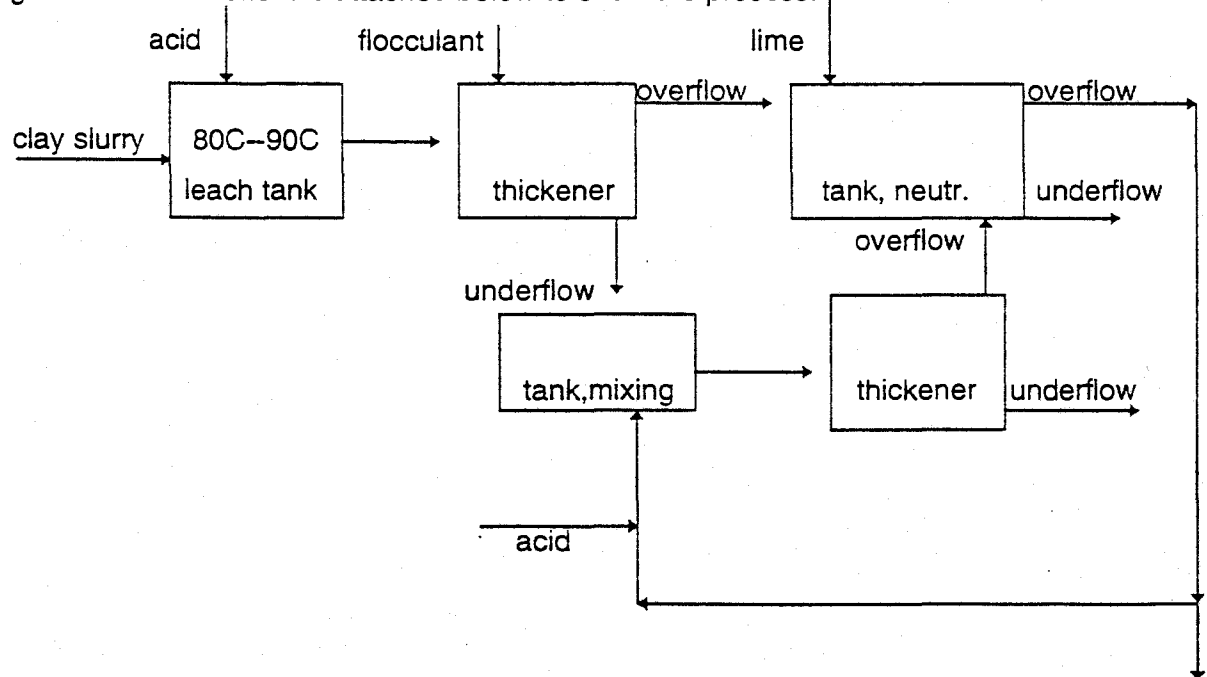
SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	82.29	3.63						
592.0	100.00	0.00	7.778	78.66	4.37						
497.8	100.00	0.00	6.541	74.29	5.14						
418.6	100.00	0.00	5.500	69.15	5.88						
352.0	100.00	0.00	4.625	63.27	6.58						
296.0	100.00	0.34	3.889	56.69	7.12						
248.9	99.66	0.00	3.270	49.57	7.19						
209.3	99.66	0.00	2.750	42.38	6.63						
176.0	99.66	0.00	2.312	35.75	5.88						
148.0	99.66	0.00	1.945	29.87	5.46						
124.5	99.66	0.00	1.635	24.41	5.46						
104.7	99.66	0.00	1.375	18.95	5.36						
88.00	99.66	0.00	1.156	13.59	4.47						
74.00	99.66	0.32	0.972	9.12	2.91						
62.23	99.34	0.41	0.818	6.21	1.59						
52.33	98.93	0.54	0.688	4.62	0.85						
44.00	98.39	0.70	0.578	3.77	0.51						
37.00	97.69	0.91	0.486	3.26	0.37						
31.11	96.78	1.16	0.409	2.89	0.00						
26.16	95.62	1.46	0.344	2.89	0.00						
22.00	94.16	1.78	0.289	2.89	0.00						
18.50	92.38	2.08	0.243	2.89	0.00						
15.56	90.30	2.34	0.204	2.89	0.00						
13.08	87.96	2.63	0.172	2.89	1.16						
11.00	85.33	3.04	0.145	1.73	1.73						

Distribution: Volume Progression: Standard Upper Edge: 704.0 Lower Edge: 0.122 Residuals: Disabled Number Of Channels: 50 High Resolution: N/A Filter On: On	RunTime: 30 seconds Run Number 1 of 1 runs Particle: Kaolin Clay Particle Transparency: Trans Particle Refractive Index: 1.64 Particle Shape: Irregular	Fluid: Water Fluid Refractive Index: 1.33 Loading Factor: 0.1014 Transmission: 0.80 Above Residual: 0.00 Below Residual: 0.00
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MEMORANDUM

DATE: June 10, 1997
TO: Massoud Ahghar
FROM: Jianzhi Ge
RE: Weak acid leach of the clay slurry
CC:

Report #96, Report #119B, and current Report #97-15D show that directly leaching the clay slurry with acid at strength of 3% can remove about 30% -- 40% iron. Report #97-15D shows that magnesium will be removed as well. These results give us a method to pretreat the clay and get rid of iron and magnesium. A flow sheet is attached below to show the process:



The clay slurry is leached with acid at about 3% acid strength. This leached slurry is then pumped to the thickener tank. The overflow goes to the neutralization tank to be neutralized and the iron, magnesium can be removed at high pH (around pH 10 for magnesium). The underflow from thickener tank goes to the next stage washing. The solids from this washing will be used for next process. The washing water will be put into the neutralization tank. The liquid from the neutralization can be either put back to the mixing tank for washing purpose or pumped out of the process.

In view of the above process, the following tests are proposed:

Test No. 97-96

Procedure for weak acid leach

Recipe for the tests:

test No.	water (g)	solid (g)	acid (g)	leach temp. ($^{\circ}$ C)	leach time (hr)
1	450	50	13.9	85-95	2
2	450	50	13.9	85-95	1
3	450	50	13.9	85-95	0.5
4	400	100	12.4	85-95	1
5	350	150	10.8	85-95	1
6	300	200	9.3	85-95	1
7	300	200	9.3	85-95	0.5
8	450	50	13.9	85-95	0.5

Procedure:

1. put the agitator in the beaker
2. put the cold water in the beaker
3. turn on the agitator
4. **slowly** pour the acid into the beaker while the agitator is on. (be careful, when sulfuric acid mixes with water, lots of heat will be generated)
5. turn on the hot plate
6. monitor the temperature until it reaches 90° C
7. put the dry fines (SYN-1S3,1S4) into the above liquid
8. keep the temperature of the above slurry around 90° C for a period of time as specified in the above table
9. filter the slurry
10. keep the liquor for AA analysis
11. put the filter cake back to the beaker and add twice as much of the water to the beaker as to the solids used, i.e. 100 g of water for 50 g of solids.
12. well mixing the slurry for another 10 minutes.
13. filter the above slurry
14. keep the liquor for AA analysis
15. put the cake in the oven.
16. data to be collected:

weight of initial water (g), weight of initial solids (g), weight of initial acid (g), leach time, weight of filtered liquor (first filtration) (g) (name it test No.-L, i.e. 1-L, 2-L etc.), its pH, density, color, weight of filtered washing liquor (second filtration) (g) (name it test No.-W, i.e. 1-W, 2-W etc.), its pH, density, color, weight of the wet cake (g).

Questions: Jianzhi Ge 858-2575
Myke Wallace 293-7614

MEMORANDUM

DATE: July 9, 1997
TO: Massoud Ahghar
FROM: Jianzhi Ge, Myke Wallace
RE: Pressure leach of the overflow with sulfuric acid
CC: Jerry Fox

Myke Wallace has finished three leaches on the overflow of the hydrocyclone. Here is the summary of the ratio of aluminum to iron and aluminum to magnesium:

Test No.	Overflow No.	Al/Fe	Al/Mg
1	50 psi, 6-28-97	2.85	8.53
2	50 psi, Top 2.3	2.84	8.87
3	50 psi, 3-3.2	2.77	8.78
<i>REF - 1</i>		<i>2.44</i>	<i>7.31</i>
<i>REF - 2</i>		<i>2.62</i>	<i>6.96</i>

Basically, there are no big differences between the three sample tested. Even the concentration is almost the same (see the AA analyses attached).

Analyst HM
Date Started 30 Jun 1997, 07:35
Worksheet AA063097
Comment Fe, Al, K, Na, Ca, Mg, Ti
Methods Fe,Al,K,Na,Ca,Ti,Mg,K,K,Cu,Al,Ti

Method: Fe (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
PL-HCT-Leach-1	4245.65	0.8	0.0577
PL-HCT-Wash-1	586.25	0.8	0.0798
PL-HCT-Leach-2	4594.56	0.4	0.0625
PL-HCT-Wash-2	576.84	0.5	0.0785
PL-HCT-Leach-3	4434.97	0.8	0.0611
PL-HCT-Wash-3	574.12	0.6	0.0791

Method: Al (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
PL-HCT-Leach-1	12096.5	0.3	0.0602
PL-HCT-Wash-1	1668.00	0.5	0.0829
PL-HCT-Leach-2	13030.1	0.7	0.0648
PL-HCT-Wash-2	1614.25	0.5	0.0802
PL-HCT-Leach-3	12284.9	0.6	0.0611
PL-HCT-Wash-3	1542.10	0.4	0.0776

No 1 50 psi 6-28-97
No 2 50 psi Top 2.3
No 3 50 psi Top 3.2

Analyst HM
Date Started 30 Jun 1997, 07:35
Worksheet AA063097
Comment Fe, Al, K, Na, Ca, Mg, Ti
Methods Fe,Al,K,Na,Ca,Ti,Mg,K,K,Cu,Al,Ti

Method: Ca (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
PL-HCT-Leach-1	710.906	0.3	0.0759
PL-HCT-Wash-1	123.913	1.2	0.1323
PL-HCT-Leach-2	689.872	0.5	0.0737
PL-HCT-Wash-2	116.222	0.5	0.1241
PL-HCT-Leach-3	749.825	0.4	0.0801
PL-HCT-Wash-3	99.082	0.2	0.1052

Method: Mg (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
PL-HCT-Leach-1	1417.49	0.4	0.2919
PL-HCT-Wash-1	207.023	0.5	0.4133
PL-HCT-Leach-2	1468.81	1.0	0.3018
PL-HCT-Wash-2	192.029	0.5	0.3865
PL-HCT-Leach-3	1399.32	0.8	0.2883
PL-HCT-Wash-3	185.938	0.2	0.3754

MICROTRAC - X100

Ver:3.03

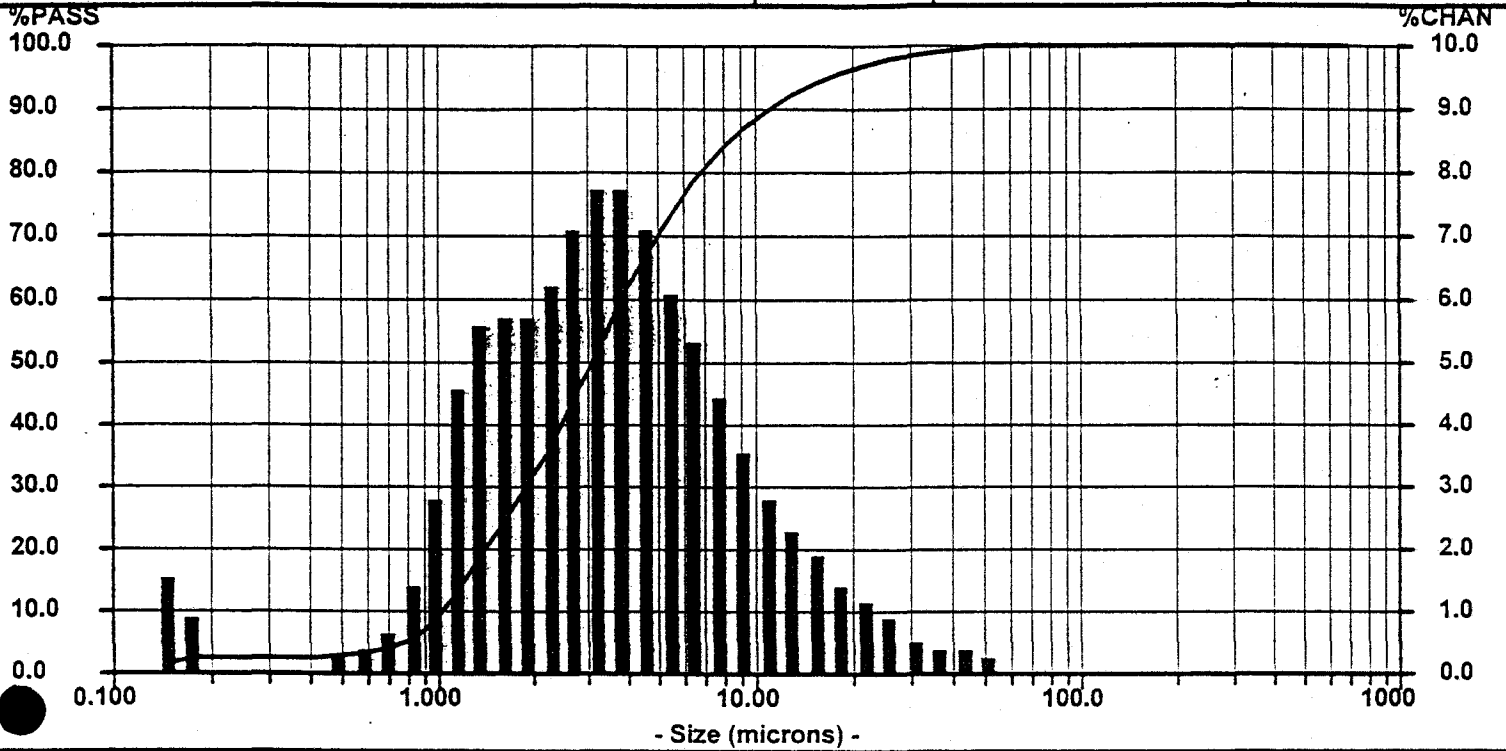
Hydrocyclone TEST #4BOTT

PP-HCT-4T
SAMPLE #1

Date: 06/24/97 Meas.#:05194
Time: 13:13 Pres #: 01

PILOT PLANT HYDROCYCLONE TEST
SAMPLE#4 BOTTOM: 50psi 1gal/min: 10sec 3.0-3.2
Pit 1 Lease: 5
6/24/97

Summary:	Percentiles		Dia	Vol%	Width
mv = 5.109	10% = 1.032	60% = 3.895	3.218	97%	6.825
mn = 0.163	20% = 1.423	70% = 4.999	0.143	3%	0.027
ma = 1.682	30% = 1.915	80% = 6.832			
cs = 3.567	40% = 2.495	90% = 11.08			
sd = 3.379	50% = 3.126	95% = 16.83			



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00	9.250	86.96	3.66						
592.0	100.00	0.00	7.778	83.30	4.52						
497.8	100.00	0.00	6.541	78.78	5.41						
418.6	100.00	0.00	5.500	73.37	6.29						
352.0	100.00	0.00	4.625	67.08	7.15						
296.0	100.00	0.00	3.889	59.93	7.84						
248.9	100.00	0.00	3.270	52.09	7.89						
209.3	100.00	0.00	2.750	44.20	7.28						
176.0	100.00	0.00	2.312	36.92	6.38						
148.0	100.00	0.00	1.945	30.54	5.86						
124.5	100.00	0.00	1.635	24.68	5.82						
104.7	100.00	0.00	1.375	18.86	5.67						
88.00	100.00	0.00	1.156	13.19	4.62						
74.00	100.00	0.00	0.972	8.57	2.88						
62.23	100.00	0.00	0.818	5.69	1.49						
52.33	100.00	0.39	0.688	4.20	0.76						
44.00	99.61	0.45	0.578	3.44	0.44						
37.00	99.16	0.54	0.486	3.00	0.32						
31.11	98.62	0.69	0.409	2.68	0.00						
26.16	97.93	0.91	0.344	2.68	0.00						
22.00	97.02	1.21	0.289	2.68	0.00						
18.50	95.81	1.57	0.243	2.68	0.00						
15.56	94.24	1.95	0.204	2.68	0.00						
13.08	92.29	2.39	0.172	2.68	1.06						
11.00	89.90	2.94	0.145	1.62	1.62						

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.122
Residuals: Disabled
Number Of Channels: 50
Resolution: N/A
Water On: On

RunTime: 30 seconds
Run Number 1 of 1 runs
Particle: Kaolin Clay
Particle Transparency: Trans
Particle Refractive Index: 1.64
Particle Shape: Irregular

Fluid: Water
Fluid Refractive Index: 1.33
Loading Factor: 0.0553
Transmission: 0.87
Above Residual: 0.00
Below Residual: 0.00

1. check the acid concentration and solid concentration to the effect of iron, magnesium, and aluminum removal:

According to the test results we have so far, 3% acid leach shows a good result in terms of the removal of iron and aluminum. The solid concentration is around 10%. The leaching time is two hours. The following tests are designed to keep the acid strength and change the solid concentration up to 40%.

test no.	acid	solid	temp. (C)	time (h)
1	3%	10%	85-95	2
2	3%	10%	85-95	1
3	3%	10%	85-95	0.5
4	3%	20%	85-95	according to above results
5	3%	30%	85-95	according to above results
6	3%	40%	85-95	according to above results

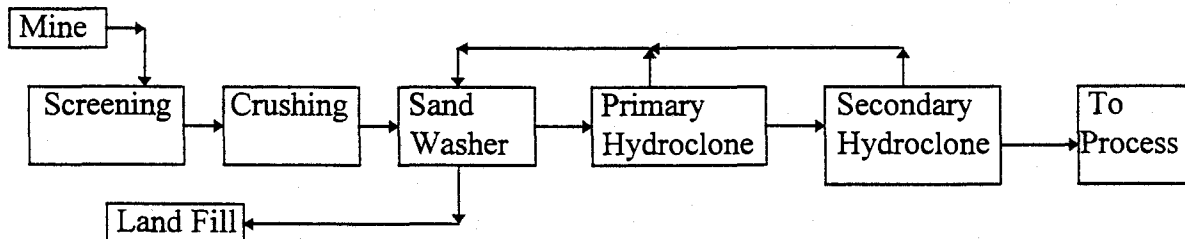
| 1 hr.

The purpose for the above tests are to try to use minimum leaching time and acid.

2. other test:

Once we have satisfied with the above tests, we can design tests for the following process, i.e. flocculation, settling, and neutralization.

WASH



Material Balance:

Based upon the initial clay analysis, every 10,000 lb/hr of feed would contain 1,466 lb/hr Alumina. Approximate fourteen percent of this alumina will be lost in the beneficiation process. Thus, the alumina available to the process will be reduced to 1,261 lb per 10,000 lb of mined clay. The total material [dry basis] going to the process area will be 5,255 lb per 10,000 lb of mined material. The remaining 4,745 lb per 10,000 lb will be returned to the land fill.

	Feed	Process	Land Fill
SiO ₂ , lb	6,849	3,368	3,481
TiO ₂ , lb	76	66	10
Al ₂ O ₃ , lb	1,696	1,459	237
Fe ₂ O ₃ , lb	506	434	72
MnO, lb	1	1	0
MgO, lb	276	237	39
CaO, lb	224	193	31
Na ₂ O, lb	44	38	6
K ₂ O, lb	310	267	43
H ₃ O ⁺ , H ₂ O, CO ₂ , lb	0*	0*	0*
P ₂ O ₅ , lb	18	16	2
total, lb	10,000	6,079	3,921

The solids going to landfill will contain approximately eight per cent [8%] free water. For every 10,000 lb/hr clay feed required, the required overburden would be 11,569 lb/hr*.

Analyst HM
Date Started 30 Jun 1997, 07:35
Worksheet AA063097
Comment Fe, Al, K, Na, Ca, Mg, Ti
Methods Fe,Al,K,Na,Ca,Ti,Mg,K,K,Cu,Al,Ti

Method: Na (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
PL-HCT-Leach-1	542.236	0.4	0.1095
PL-HCT-Wash-1	116.409	0.4	0.2322
PL-HCT-Leach-2	532.871	0.4	0.1076
PL-HCT-Wash-2	107.542	0.4	0.2151
PL-HCT-Leach-3	551.191	0.5	0.1115
PL-HCT-Wash-3	114.413	0.6	0.2289

Analyst HM
Date Started 30 Jun 1997, 07:35
Worksheet AA063097
Comment Fe, Al, K, Na, Ca, Mg, Ti
Methods Fe,Al,K,Na,Ca,Ti,Mg,K,K,Cu,Al,Ti

Method: K (Flame)

Sample ID	Conc mg/L	%RSD	Mean Abs
PL-HCT-Leach-1	2712.84	1.3	0.0198
PL-HCT-Wash-1	391.484	0.2	0.0286
PL-HCT-Leach-2	2771.34	0.4	0.0202
PL-HCT-Wash-2	360.965	1.1	0.0263
PL-HCT-Leach-3	2612.76	1.2	0.0191
PL-HCT-Wash-3	345.446	0.8	0.0261

Please Copy for M.A.



SOLV-EX CORPORATION

750, 101-5th Ave. S.W., Calgary, Alberta T2P 3P4

Tel. (403) 233-9254 Fax. (403) 233-8932

FACSIMILE COVER PAGE

To: Solv-Ex Corporation, Lease 5 Office Fax No. (403) 743-3388
 Solv-Ex Corporation, Mine Operations Fax No. (403) 743-8777
 Other: Solv-Ex Fax No.: (505) 883-0871

Solv-Ex Corporation, Albuquerque Fax No. (505) 243-7705
 Solv-Ex Corporation, Pilot Plant/Lab Fax No. (505) 863-0391

Attention: Gerry Fox CC: _____ Pages: 1 of 13
 From: Gary Mailloux Date: May 22/97
 Subject: Clearwater Information

This facsimile might contain information that is privileged confidential and exempt from disclosure under applicable law and is intended only for the use of the individual or entity to which it is addressed. If the reader of this facsimile is not the intended recipient, or the employee or agent responsible for delivering the facsimile to the intended recipient, you are hereby notified that any dissemination or distribution or copying of this facsimile is strictly prohibited. If you have received this facsimile in error, please notify us immediately by telephone at (403) 233-9254. Thank you

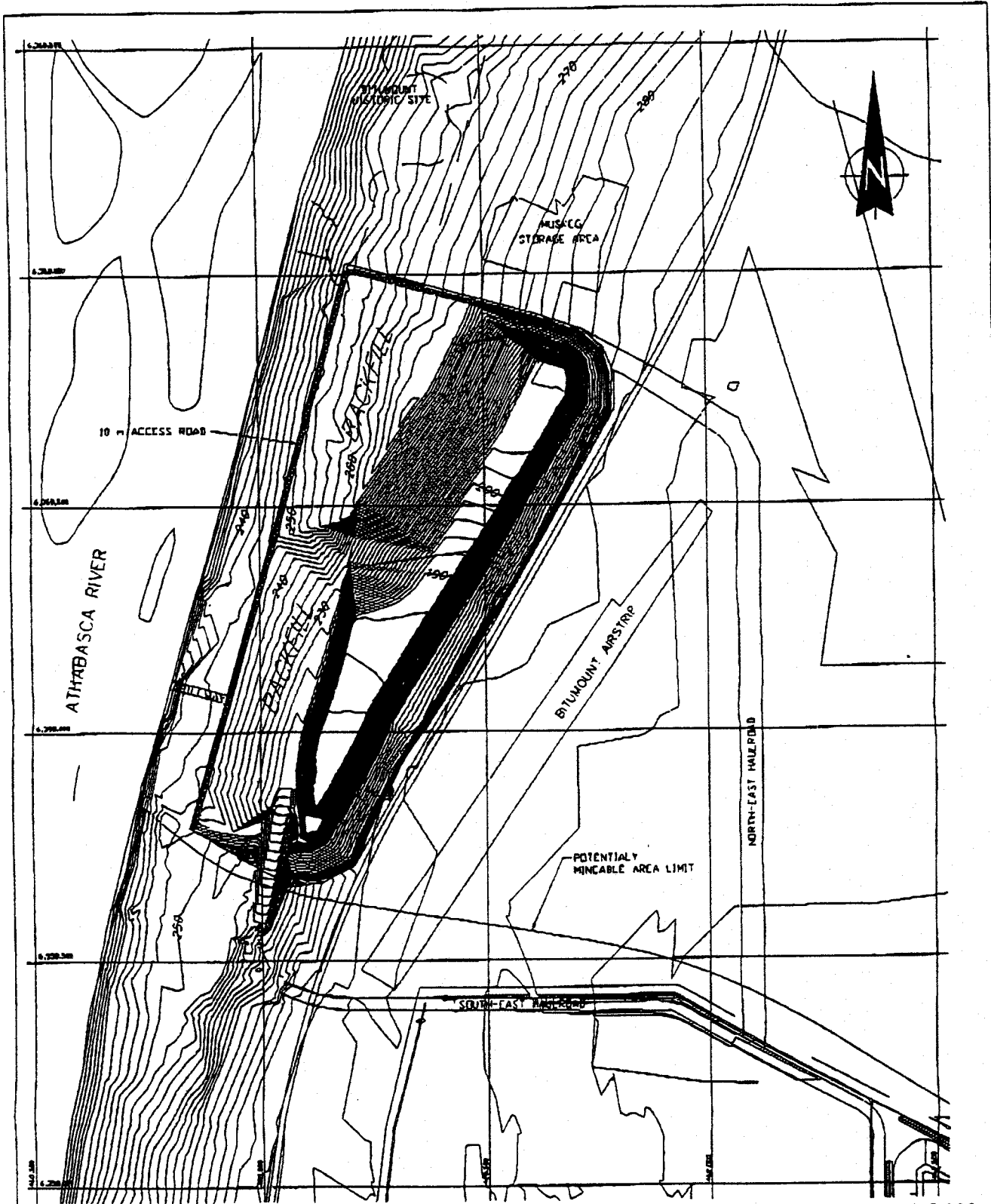
The information covers only the Co-Production experimental mine area. We do not have overburden information, including Clearwater, for any other areas at this time.

As you can see from the enclosed sections, the Clearwater probably averages 10 m. where present and it could be mined as a separate unit.

With a volume of ≈ 5 million bank cubic meters, mining rates could be:

<u>Rate/Day</u>	<u>Volume/Year</u>	<u>Resource Life</u>
1,000 m ³	365,000 m ³	10.7 yrs.
2,500 m ³	912,500 m ³	5.5 yrs.
5,000 m ³	1,825,000 m ³	2.7 yrs.

If you have any questions, please give me a call
 A.M.



Scale: 1:5,000

Produced by Oil Sands Evaluations Ltd for:

SOLV-EX CORPORATION

END OF LIFE
MINE AREA

EXCAVATION VOLUMES

SURFACE SANDS	3,658,240
CLAY	1,048,943
SILTY SAND TILL	2,848,933
CLEARWATER	4,943,841
CENTRE REJECT	2,641,640
TOTAL WASTE	15,741,597
ORE	14,186,174

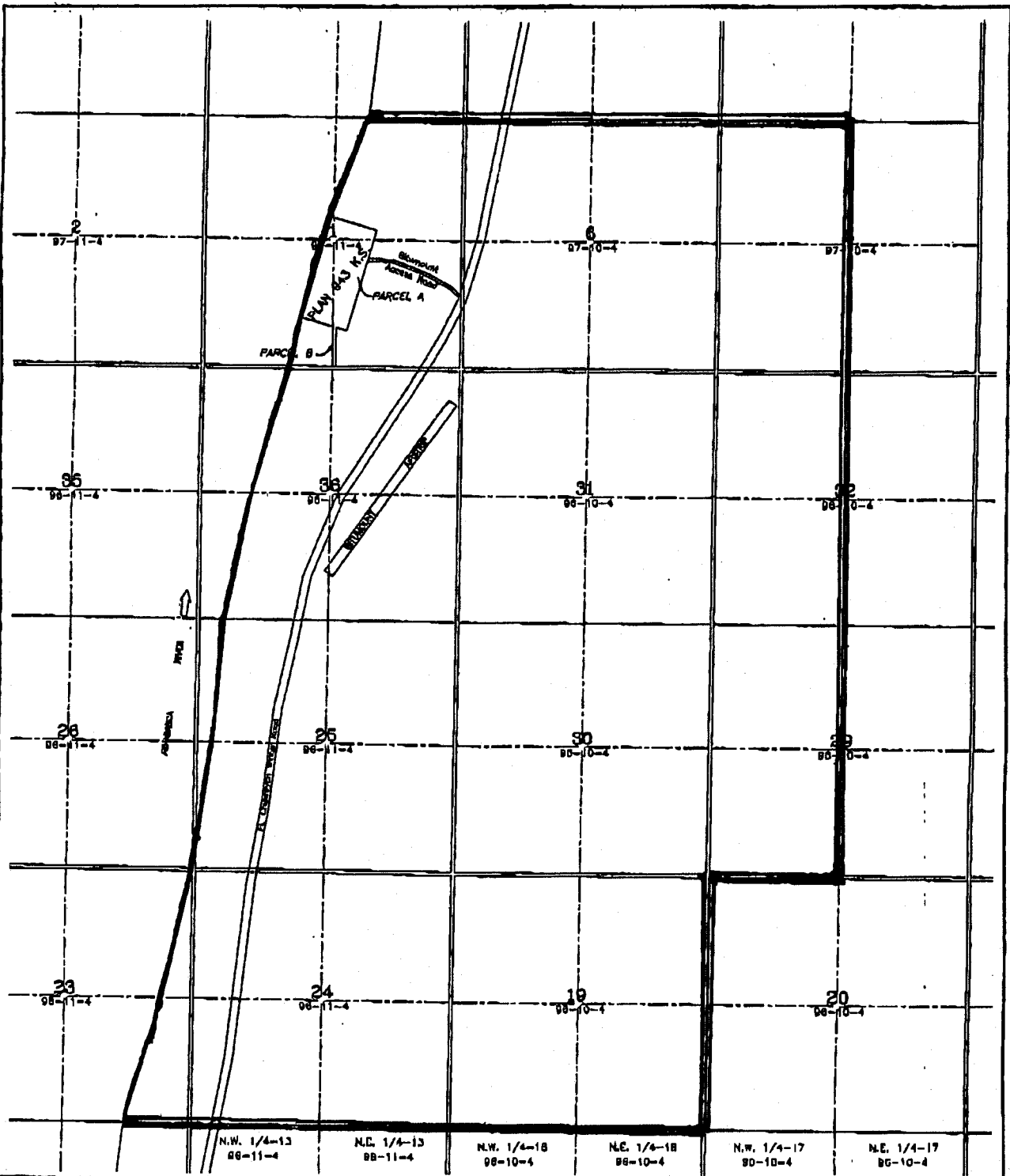


TABLE 1
ANNUAL MINE PRODUCTION
(BCM's X 1000)

YEAR	EXTRACTION FEED	UPPER SAND, SAND & GRAVEL			CLAY TILL			SILTY, SANDY TILL			CLEARWATER SHALE			CENTRE REJECT			TOTAL PER YEAR		
		TO DUMP	BACKFILL	TOTAL	TO DUMP	BACKFILL	TOTAL	TO DUMP	BACKFILL	TOTAL	TO DUMP	BACKFILL	TOTAL	TO DUMP	BACKFILL	TOTAL	TO DUMP	BACKFILL	TOTAL
1997	1,259	1,205		1,205	338		338	592		592	922		922				3,057		3,057
1998	3,361	384		384	564		564	822		822	1,090		1,090	675		675	3,535		3,535
1999	3,361	243	302	545	358	64	422	522	151	673	692	370	1,062	428	295	683	2,243	1,142	3,385
2000	3,370		829	829		176	176		414	414		1,016	1,016		698	698		3,133	3,133
2001	2,828		696	696		148	148		348	348		853	853		566	566		2,831	2,831
Total	14,189	1,832	1,827	3,659	1,280	388	1,648	1,936	913	2,849	2,704	2,239	4,843	1,103	1,639	2,642	8,835	8,906	15,741

2001	533
2002	2,241
Total	16,963

MINE EXPANSION WOULD BE REQUIRED TO SUPPLY THIS FEED



NOTES:

- Area situated by this plan is shown based on three consecutive readings 23391.8 feet (7091.8 m)
- Any dimensions are measured by stadia and checked through.
- Township information is 98 and is designated from Alberta Township System-174 Coordinates.
- Position of Right Bank of Allouane River determined from aerial photography.

SURVEYOR'S AFFIDAVIT:

I certify that the survey represented by this plan is correct and true to the best of my knowledge and was completed on the 05th day of Sept, 1998.

B.A.M.
ALBERTA LAND SURVEYOR



SOLV-EX CORPORATION:

PLAN **MINERAL PERMIT**
SHOWING **No 9395010001**

WITHIN
Twp's. 98 and 97, in Rge's. 10 and 11,
West of The 4th Mer.
Including Adjoining Road Allowances
MUNICIPALITY OF WOOD BUFFALO
ALBERTA

B.A. MURRAY, A.L.S.

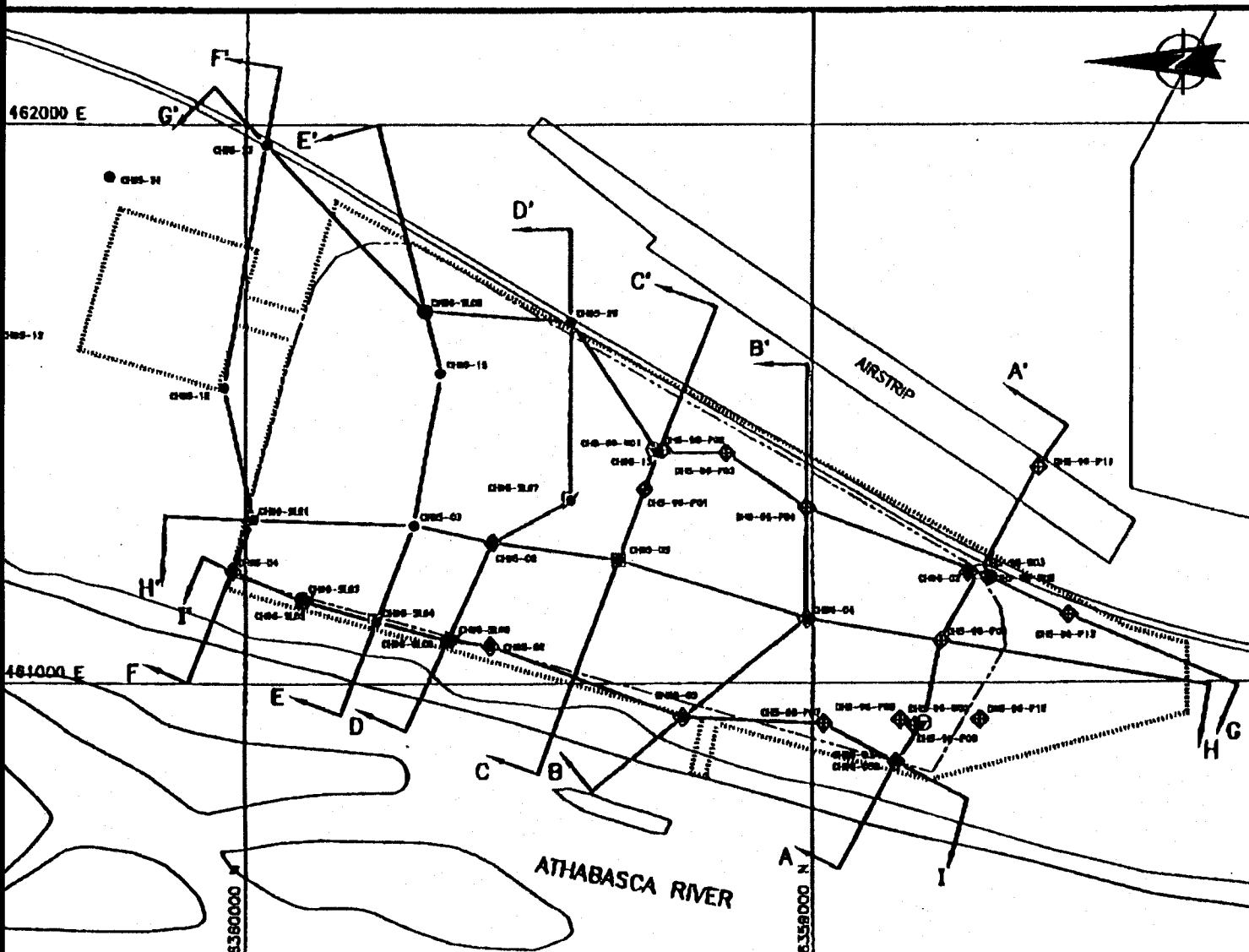
1998



Murray Associates Surveys Ltd.

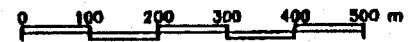
FORT McMURRAY - ALBERTA

BOOK 98-11-4
DWG: 98/09/31
DATE: 05/09-1998
FILE: 6071-MP



- LEGEND:**
- COREHOLE
 - ◆ COREHOLE w/ STAND PIPE PIEZOMETER
 - COREHOLE w/ PNEUMATIC PIEZOMETER
 - ▤ COREHOLE w/ HEAVE GAUGING/SLOPE INDICATOR
 - COREHOLE w/ VIBRATING WIRE PIEZOMETER
 - COREHOLE w/ NESTED VIBRATING WIRE PIEZOMETERS
 - ◆ DRILL HOLE w/ STAND PIPE PIEZOMETER
 - ⊙ DRILL HOLE w/ WATER WELL
 - MINE FOOTPRINT
 - - - M.S.L. BOUNDARY
 - PLANT BOUNDARY

- NOTES:**
- 1 DRAWING COMPILED FROM DIGITAL DRAWINGS SUPPLIED BY SOLV-EX CORPORATION & SITE INVESTIGATION INFORMATION.
 - 2 ALL ORDS, FEATURES & DRILLING LOCATIONS ARE TIED TO UTM KAD27.
 - 3 SEE DWGS 2 THROUGH 10 FOR CROSS SECTIONS.
 - 4 SEE DWG 11 FOR DETAIL OF MINE INSTRUMENTATION LOCATIONS.



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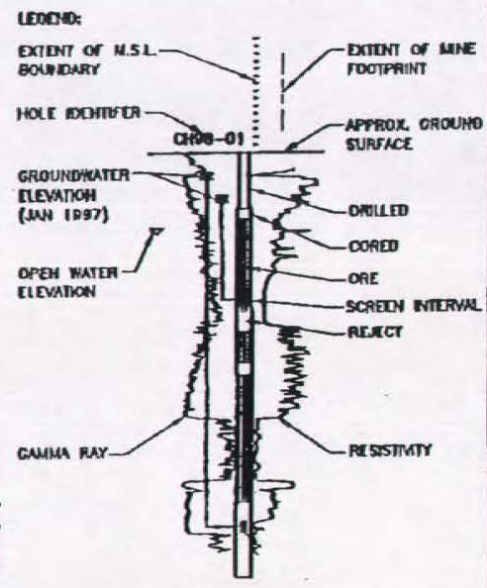
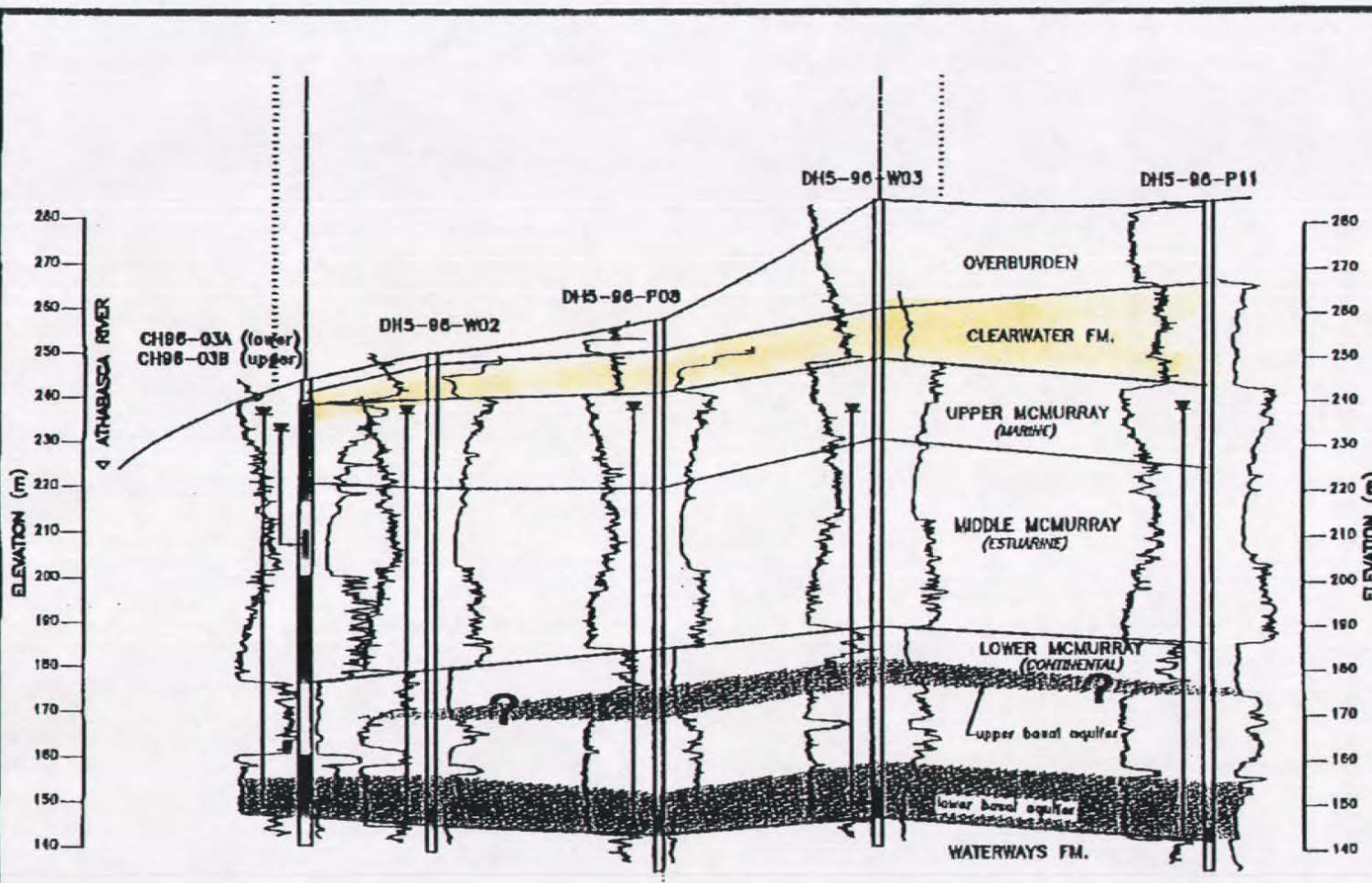
CLIENT
SOLV-EX CORPORATION

PROJECT
LEASE 5 MINE AREA

TITLE
COREHOLE, DRILL HOLE & CROSS SECTION LOCATIONS

DATE 07/03/04 APPR. BY FILE NO. CC47019D
SCALE NTS DRW. BY SEC DRW. NO. GEOL. 2

REV	DESCRIPTION	BY	APP	DATE



EVALUATION CRITERIA:
 CUT-OFF GRADE - 60% BITUMEN
 MINIMUM ORE THICKNESS >3 m
 MINIMUM REJECT THICKNESS >3 m

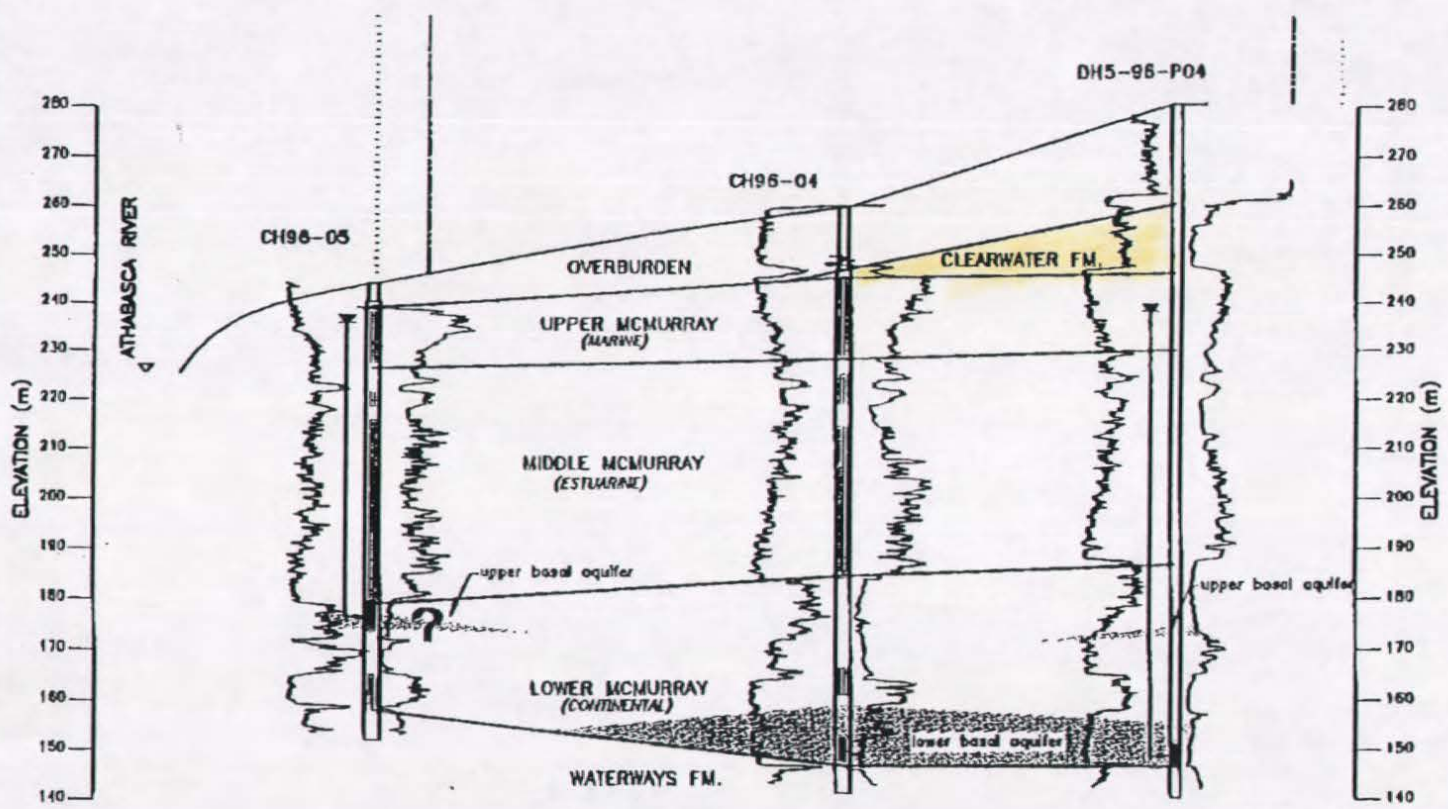
NOTES:
 1 SEE DWG NO. 1 FOR LOCATION OF CROSS SECTION
 2 ALL GRIDS & ELEVATIONS ARE UTM NAD27
 3 ORE & REJECT INTERVALS ON CROSS SECTION SUPPLIED BY SOLV-EX CORPORATION.

CROSS SECTION A - A'
 SCALE HORIZ 1:3000
 VERT 1:1000

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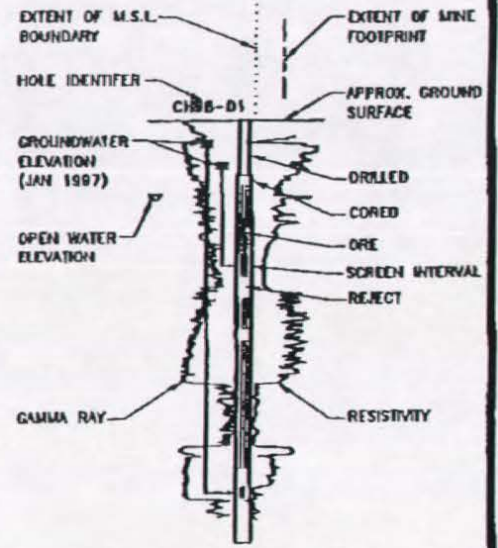
CLIENT	SOLV-EX CORPORATION		
PROJECT	MINE SLOPE STABILITY ASSESSMENT		
FILE	CROSS SECTION A - A'		
DATE	97/02/11	APPD BY	FILE NO. CG470J1A
SCALE	AS NOTED	DRAWN BY	SEC
			DRAW. NO. 2

REV	DESCRIPTION	BY	APP	DATE



CROSS SECTION B - B'
 SCALE HORIZ 1:3000
 VERT 1:1000
 0 50 100 150 200 m

LEGEND:



EVALUATION CRITERIA:
 CUT-OFF GRADE - 6%
 MINIMUM ORE THICKNESS > 3 m
 MINIMUM REJECT THICKNESS > 3 m

NOTES:

- 1 SEE DWG NO. 1 FOR LOCATION OF CROSS SECTION
- 2 ALL CROSS & ELEVATIONS ARE UTM NAD87
- 3 ORE & REJECT INTERVALS ON CROSS SECTION SUPPLIED BY SOLV-EX CORPORATION.

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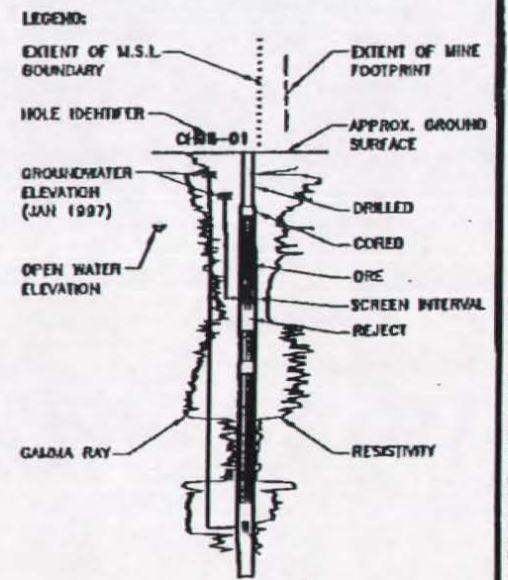
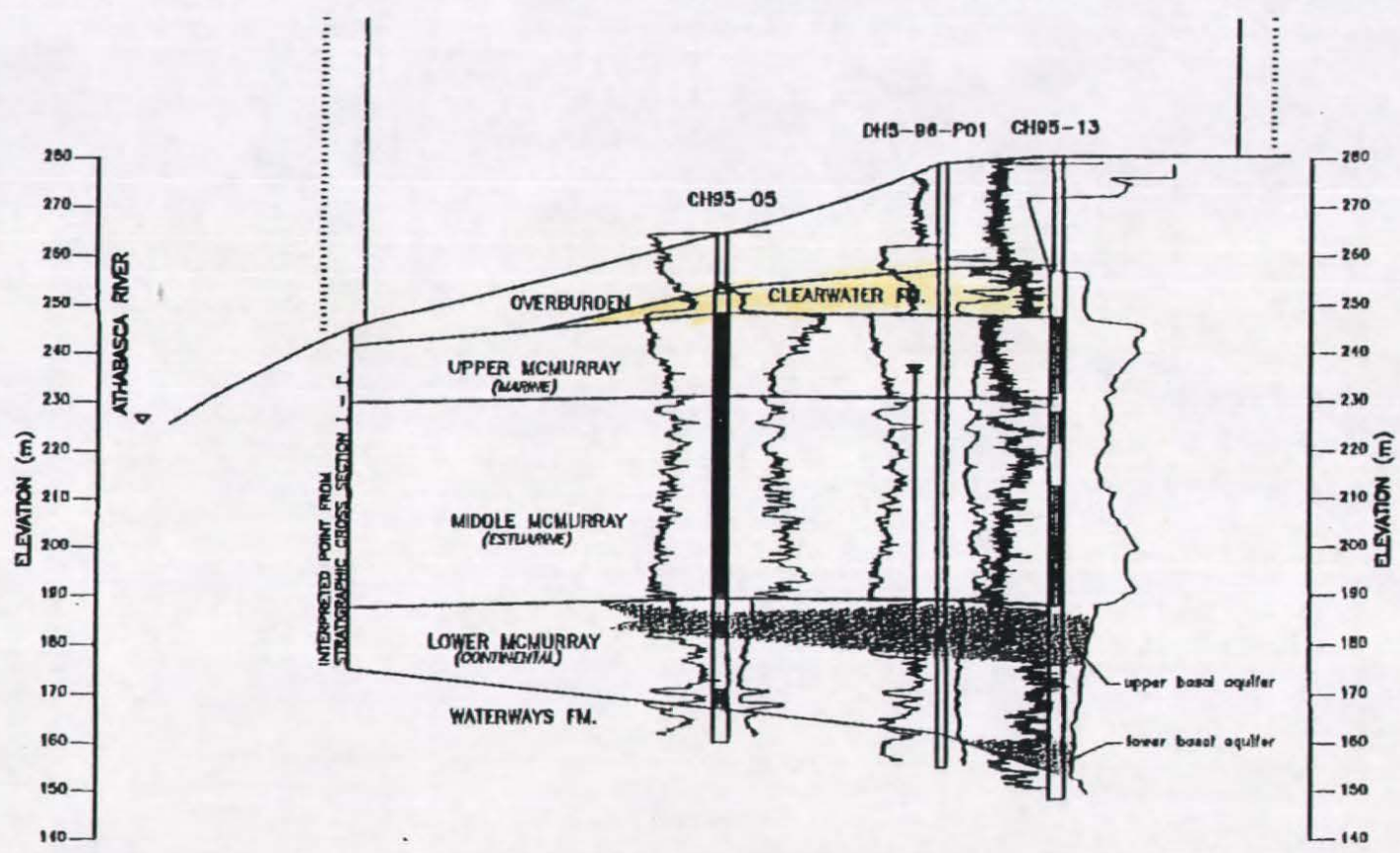
CLIENT
SOLV-EX CORPORATION

PROJECT
MINE SLOPE STABILITY ASSESSMENT

TITLE
CROSS SECTION B - B'

DATE 97/02/11 APPL BY FILE NO. CG470J2A
 SCALE AS NOTED DWG BY SEC DWG NO. 3

REV	DESCRIPTION	BY	APP	DATE



EVALUATION CRITERIA:
 CUT-OFF GRADE - 60% BITUMEN
 MINIMUM ORE THICKNESS >3 m
 MINIMUM REJECT THICKNESS >3 m

NOTES:
 1 SEE DWG NO. 1 FOR LOCATION OF CROSS SECTION
 2 ALL GRIDS & ELEVATIONS ARE UTM NAD87
 3 ORE & REJECT INTERVALS ON CROSS SECTION SUPPLIED BY SOLV-EX CORPORATION.

CROSS SECTION C - C'
 SCALE HORIZ 1:3000
 VERT 1:1000

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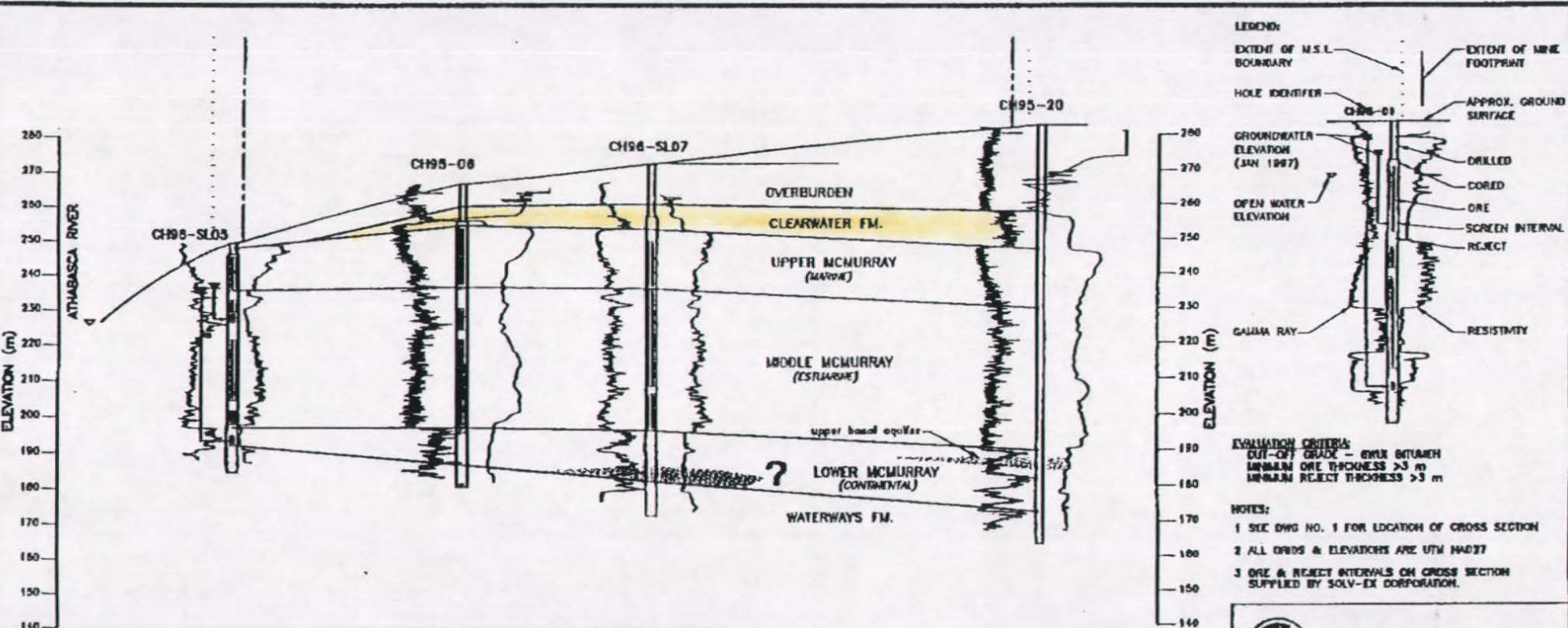
CLIENT: SOLV-EX CORPORATION

PROJECT: MINE SLOPE STABILITY ASSESSMENT

TITLE: CROSS SECTION C - C'

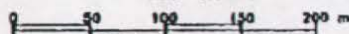
DATE	97/02/11	APP'D BY	FILE NO.	CG470J3A
SCALE	AS NOTED	DRAWN BY	SEC	DWG. NO. 4

REV	DESCRIPTION	BY	APP	DATE



CROSS SECTION D - D'

SCALE HORIZ 1:3000
VERT 1:1000



LEGEND:

- EXTENT OF M.S.L. BOUNDARY
- EXTENT OF MINE FOOTPRINT
- HOLE IDENTIFIER
- APPROX. GROUND SURFACE
- GROUNDWATER ELEVATION (JAN 1997)
- OPEN WATER ELEVATION
- GAMMA RAY
- DRILLED
- CORED
- ORE
- SCREEN INTERVAL
- REJECT
- RESISTIVITY

EVALUATION CRITERIA:

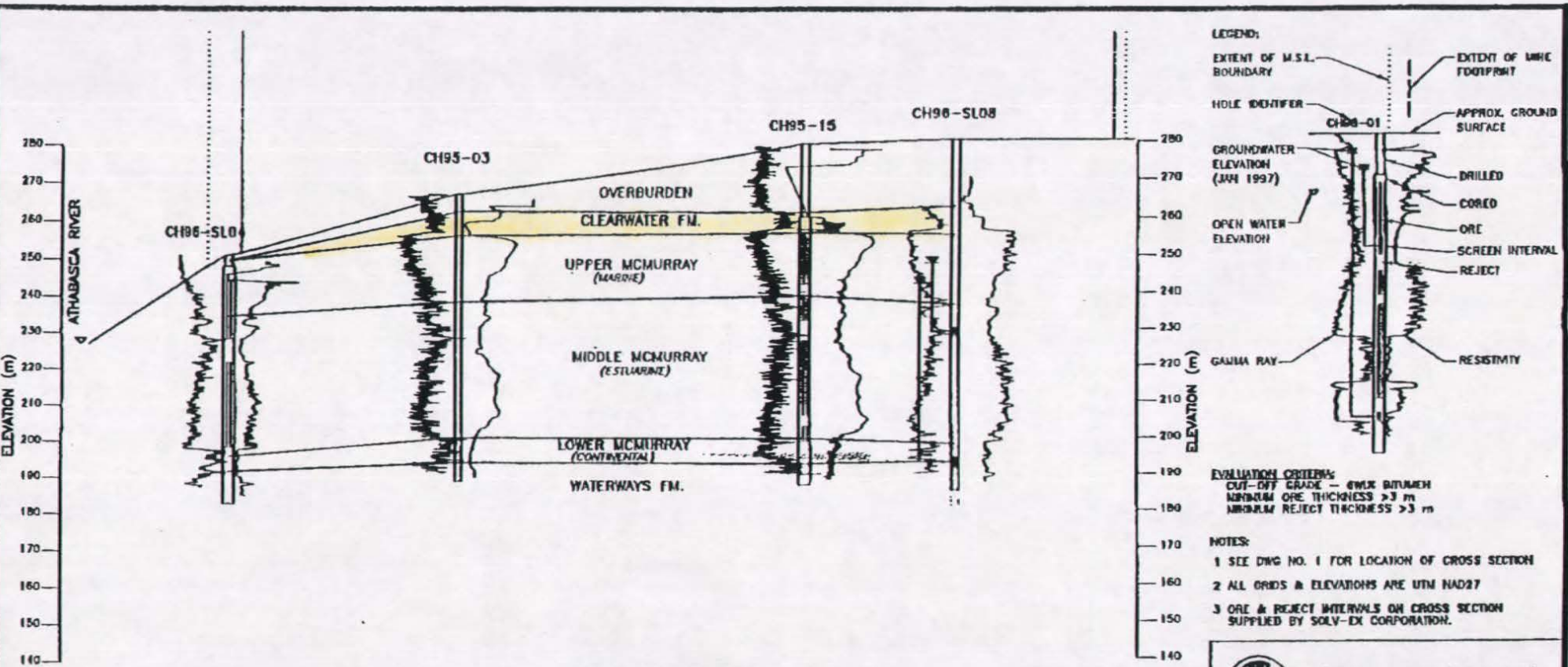
- DUT-OFF GRADE - ORE BITUMEN
- MINIMUM ORE THICKNESS >3 m
- MINIMUM REJECT THICKNESS >3 m

NOTES:


- SEE DWG NO. 1 FOR LOCATION OF CROSS SECTION
- ALL DRIDS & ELEVATIONS ARE UTM MAD37
- ORE & REJECT INTERVALS ON CROSS SECTION SUPPLIED BY SOLV-EX CORPORATION.

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CLIENT	SOLV-EX CORPORATION		
PROJECT	MINE SLOPE STABILITY ASSESSMENT		
DRAWN	CROSS SECTION D - D'		
DATE	07/02/11	APPR. BY	FILE NO. CG470J4A
SCALE	AS NOTED	DWG BY	SEC
REV	DESCRIPTION	BY	APP DATE



CROSS SECTION E - E'
 SCALE HORIZ 1:3000
 VERT 1:1000
 0 50 100 150 200 m



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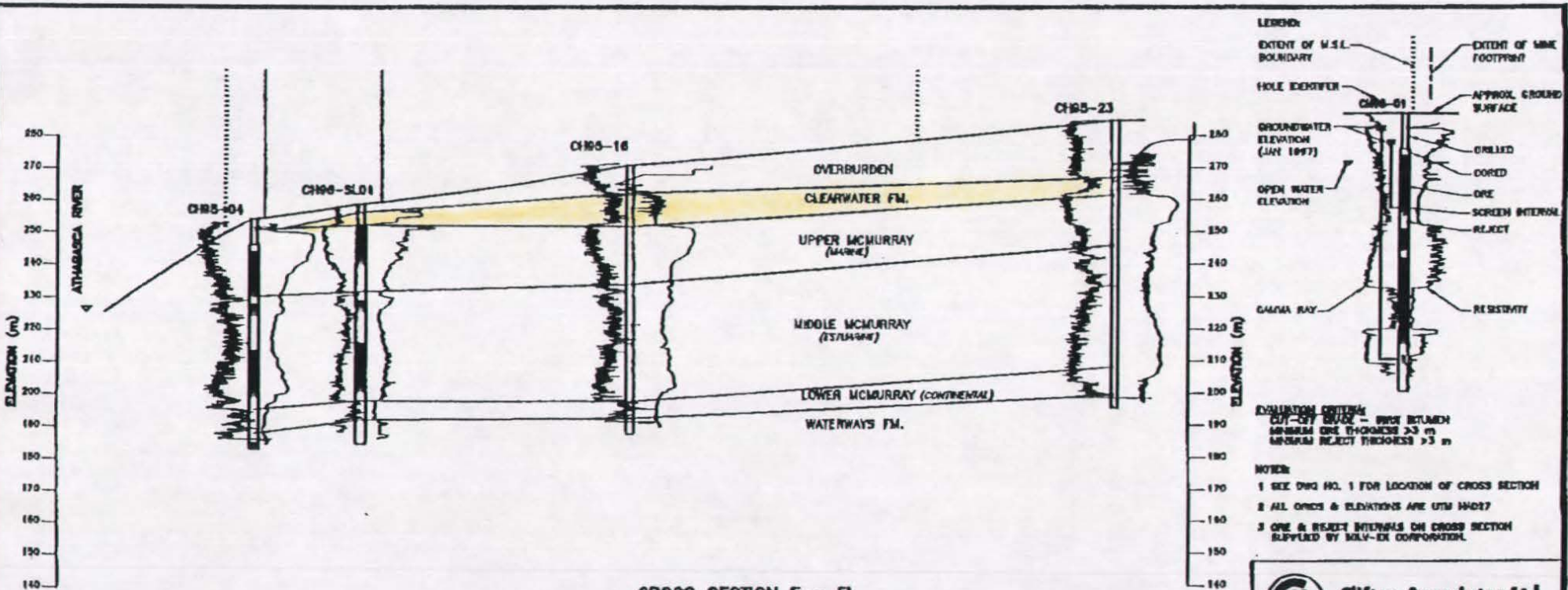
CLIENT
SOLV-EX CORPORATION

PROJECT
MINE SLOPE STABILITY ASSESSMENT

TITLE
CROSS SECTION E - E'

DATE 97/02/11 APPR. BY FILE NO. OG470J5A
 SCALE AS NOTED DWG. BY SEC DWG. NO. 6

REV	DESCRIPTION	BY	APP	DATE



GROSS SECTION F - F'
 SCALE HORIZ 1:3000
 VERT 1:1000

LEGEND:

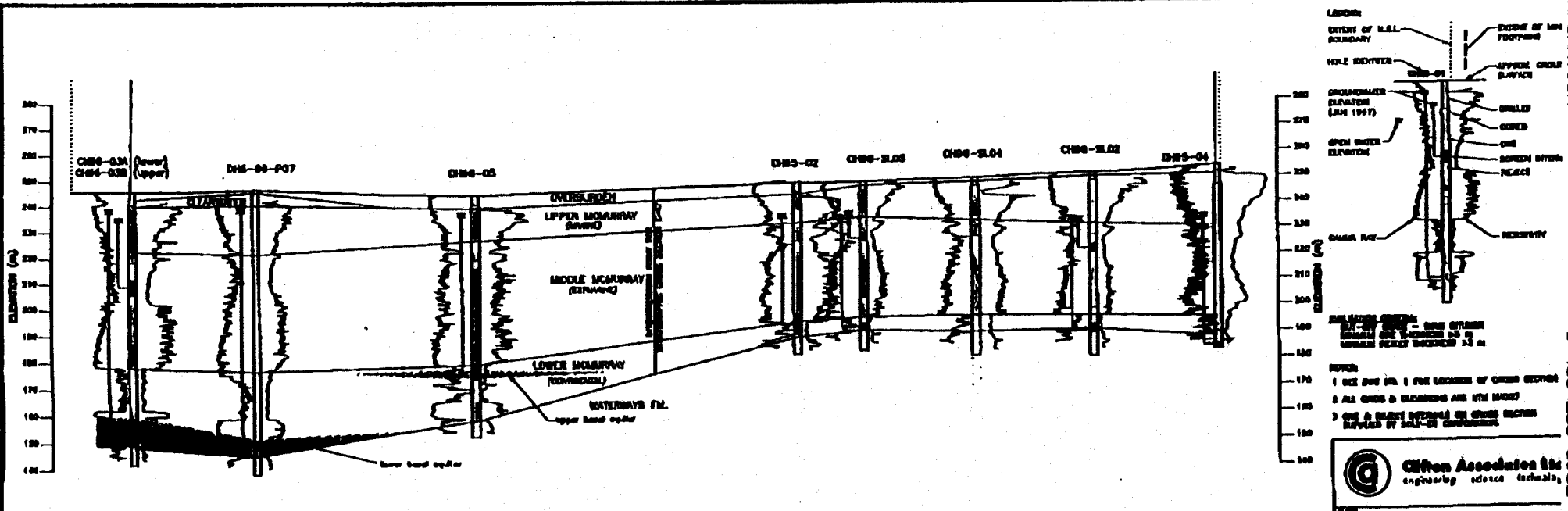
- EXTENT OF M.S.L. BOUNDARY
- EXTENT OF MINE FOOTPRINT
- APPROX. GROUND SURFACE
- DRILLED
- CORED
- SCREEN INTERNAL
- SCREEN
- RESISTIVITY
- GALVA RAY
- GROUNDWATER ELEVATION (JAN 1997)
- OPEN WATER ELEVATION

EXPLANATION SYMBOLS:
 CUT-OFF BEACH - SPACED BETWEEN
 MINIMUM CORE THICKNESS >3 m
 MINIMUM RESIST THICKNESS >3 m

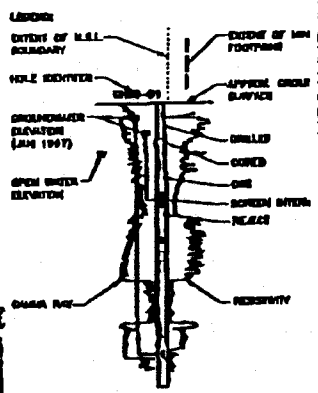
- NOTES:**
- SEE DRG NO. 1 FOR LOCATION OF CROSS SECTION
 - ALL CORES & ELEVATIONS ARE UTM 1987
 - ORE & RESIST INTERVALS ON CROSS SECTION SUPPLIED BY SOLV-EX CORPORATION.

Clifton Associates Ltd. engineering science technology	
CLIENT	SOLV-EX CORPORATION
PROJECT	MINE SLOPE STABILITY ASSESSMENT
FILE	CROSS SECTION F - F'
DATE	97/02/11
APPR BY	
FILE NO.	CC470JSA
SCALE	AS NOTED
DATE BY SEC	
DATE NO.	7

REV	DESCRIPTION	BY	APP	DATE



CROSS SECTION I - F
 SCALE HORIZ 1:3000
 VERT 1:1000
 0 100 200 300'



- 1 USE ONE OR 1 FOR LOCATION OF CROSS SECTION
- 2 ALL CROSS & ELEVATIONS ARE WITH MSL
- 3 ONE & HALF METERS ON CROSS SECTION SURFACE BY SOLV-EX CORPORATION

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SOLV-EX CORPORATION
MINE SLOPE STABILITY
ASSESSMENT
CROSS SECTION I - F

REV	DESCRIPTION	BY	APP	DATE	DATE OF	SCALE	DATE OF
01	AS NOTED			02/01/11	10		