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ALTERNATE SOURCES AND USES OF WATER FOR AMINE FLOTATION

Prepared By

Edmund P. Finch

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FIPR

Florida Institute of Phosphate Research

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Research Staff

Florida Institute of Phosphate Research
1855 West Main Street
Bartow, Florida 33830
(941) 534-7160
Fax: (941) 534-7165

ALTERNATE SOURCES AND USES OF WATER FOR AMINE FLOTATION

Final Report
(FIPR Contract No. 93-02-095R)

Submitted by:

Edmund P. Finch
6324 Christina Parkway
Lakeland, FL 33813

Prepared for:

FLORIDA INSTITUTE OF PHOSPHATE RESEARCH
1855 West Main Street
Bartow, FL 33830

Contract Manager: Jinrong (Patrick) Zhang

December 1994

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PERSPECTIVE

By Patrick Zhang
Director of Beneficiation Research

Although the phosphate mining industry in Florida has recently made significant progress in reducing its usage of deep well water, large volumes of fresh water is still being pumped in the phosphate processing plants. According to a report by the Florida Phosphate Council, the industry used 3400 gallons of deep well water for each ton of phosphate produced in 1970. That number was reduced to 1280 gallons by 1980, using the following measures: capture of rainfall in reservoirs, return channels from settling ponds, and reduction in acid rinsing.

Current practice in the industry is to recycle as much water as possible. But there remain two areas where significant reduction in water withdrawal could be achieved if appropriate technologies were developed. One is rapid dewatering of phosphatic clays so that the water entrained in the clay could be reused more rapidly. The other is using alternate water sources (such as surficial or mine recycle water) for the amine flotation step. However, the former is restricted by the high cost of available dewatering techniques, and the later is precluded by the general belief that only fresh water can give satisfactory amine flotation results.

Because of the general shortage of fresh water and decline of the surface of the Floridan aquifer, the pumping rate of deep wells is becoming of great concern. SWFWMD (The Southwest Florida Water Management District) has emphasized that over withdrawal of fresh water causes salt water intrusion into the Florida aquifer in the coastal regions. Therefore, any study that might show the potential to replace fresh water is important. Fresh water savings by using recycled water for amine flotation is approximately 20 billion gallons/year.

Although all of the companies practice water management as it relates to aquifer withdrawal and property discharge, few have ever attempted to attack the amine flotation step. As a result, little information has been published on the subject. In an effort to fill this gap and supply the industry with information on the effect of water type on amine flotation and hopefully, a tool to reduce the use of deep well water, FIPR and SWFWMD co-funded this project.

The most encouraging and paramount important conclusion of this investigation is that it is both technically and economically feasible to conduct amine flotation with a significantly reduced usage of fresh water. FIPR would encourage every phosphate miner in Florida to test the closed loop recycle scheme proposed in this report in its plants for improved water economics and reagent usage.

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ACKNOWLEDGEMENTS

This project was carried out under Contract Number FIPR 93-02-095R and was co-funded equally by the Florida Institute of Phosphate Research (FIPR) and the Southwest Florida Water Management District (SWFWMD). The author expresses his appreciation for their support of the study.

The author also wishes to express his appreciation to Mr. Steve Neas (Digitech) for his contribution to the project in the area of capital and operating costs and to Mrs. Barbara McQuaig (Warner-McQuaig, Ltd.) for her contribution in the areas of data acquisition and mine water balances. The help provided by Dr. Francisco Sotillo (University of California, Berkeley), who structured and conducted many of the flotation tests, is gratefully acknowledged. Finally, special appreciation is extended to Mrs. Earlene Boyington, Mrs. Brenda Bailey Brady and to Mrs. Debora Finch for their efforts in typing the initial and final drafts.

EXECUTIVE SUMMARY

BACKGROUND

Within the phosphate industry, it is estimated that mining and beneficiation require about 60-80 MGD of aquifer water, depending on production, to extract and produce upgraded products that are suitable for conversion to fertilizers in today's market. Expressed as a unit of consumption, aquifer water usage is in the range of 800-900 gal per ton of total product.

The overall water balance for a given mine is "site specific" and is dependent upon a number of inherent physical factors:

- Production rates
- Matrix composition - % clay, % concentrate, % moisture
- Water table drainage - overburden and pit water
- Deep well pumping
- Rainfall
- Evaporation/transportation - % vegetation, open water, etc.
- Seepage
- Waste Storage - moisture in clays and sand tailings
- Product moisture

Aquifer, or deep well, water is primarily needed for system make up; mainly to replace water lost within the clays. It is used to best advantage as a consistent clean water source in the amine circuit for the final stage of acid rinsing and for sand flotation. Historically, direct substitution of other water sources for aquifer water in the amine circuit has not been successful.

OBJECTIVE AND SCOPE

The objective of this project was to investigate potential alternate sources and uses of water for amine flotation in an effort to determine the practicality for reducing deep well pumping requirements. More specifically, the use of three substitute waters from each of four mines and an outside water source were evaluated on a laboratory scale as potential direct substitutes for aquifer water and as candidates for various recycling techniques. The scope of work was as follows:

- Collection and analysis of amine feed and water samples from each of four mines. Deep well water, process water, surface water and pit water were mine samples while Bartow Sewage Treatment Plant effluent was an outside water source.

- Open circuit, single cycle, flotation tests to establish baseline conditions, to investigate various water treatment techniques (overburden neutralization, sandtailings and charcoal filtration and several water modifiers) and to quantify the effects of various anions, cations, and other process variables.

- Closed circuit, locked cycle, flotation tests to establish baseline conditions and to investigate two recycle water systems (both 60 and 93% recycle systems) using substitute waters as replacements for aquifer water.

- Estimates of system potential to quantify possible aquifer water reductions and to calculate the capital and differential operating costs associated with the two recycle systems.

METHODS

About 200 lb of amine flotation feed and 40 gal of each water sample were taken from each of four mines on two separate occasions and stored in plastic bags or containers for further use. All flotation testing was conducted in a 2-liter laboratory Denver flotation cell. The open circuit tests were conducted by rinsing and floating the samples with the same water. The locked cycle tests were conducted by recovering water from a given stage and using it for the succeeding stage in order to simulate the effects of recycling water in a closed system. Generally, 10-14 cycles were required to reach equilibrium. Two types of recycle systems were evaluated; a tightly closed system whereby 93% of the water was recycled and used for flotation, and a more open system whereby 60% of the water was recycled and used for both rinsing and flotation. Production, deep well pumping, and property discharge data for estimates of system potential were obtained directly from each mine.

FINDINGS

The major findings developed during this project are presented following:

- With the exception of turbidity and suspended solids content, most of the waters from a given mine did not substantially differ from each other and were of the same order of magnitude.
- Deep well water was superior to all other waters for a given mine and only two waters (process water from Mines 1 and 4) exhibited the potential for being directly substitutable.
- With one exception (overburden neutralization of Bartow Sewage Treatment Plant effluent on Mine 1 feed), none of the "quick fix" water treatment techniques were successful in upgrading the quality of waters equal to that of aquifer water.
- Amine usage and concentrate insolubles were found to be more sensitive to chemical species in the water than was BPL recovery.
- For the 93% recycle tests using substitute waters, BPL recoveries were within 0.5% of those achieved in deep well water for three of the four mines for the first sampling and two of the three mines for the second sampling.
- For the 60% recycle tests using substitute waters, BPL recoveries essentially equaled, or exceeded, those achieved in deep well water for all three mines tested.
- Amine reagent requirements for both closed circuit recycle systems ranged from 53 to 97% of those obtained with aquifer water in an open circuit system.
- For the four mines studied, the average actual aquifer usage was 1890 gal per ton of concentrate. The estimated average potential aquifer usage as determined in the laboratory was computed to be 493 gal per ton for the 60% recycle system and 46 gal per ton for the 93% recycle system.
- Assuming no influence from external sources and the availability of water for water management, it was estimated that potential deep well savings would range from 2.30 to 3.52 MGD per mine for the 60 and 93% recycle systems respectively. The use of substitute waters would potentially increase deep well water savings to 3.65 MGD per mine.
- Capital costs to implement the 93 and 60% recycle systems were estimated to be $221,000 and $261,000 respectively.
- Differential operating cost savings for the 93 and 60% recycle systems were estimated to be $87,500 and $65,800 respectively.
- A payback of 4.0 years and an ROI of 7% was computed for the 60% recycle system, while a payback of 2.5 years and an ROI of 26% was computed for the 93% recycle system.

CONCLUSIONS

Laboratory flotation studies on samples from four mines demonstrated the viability of using alternate water sources within the framework of recycle water systems to reduce the amount of aquifer water presently required for beneficiation. Potential advantages in implementing an amine water recycle system are as follows:

- A separate amine flotation water recycle system can isolate this circuit from the variability of the overall mine water balance i.e.; seasonal changes.
- A number of substitute, or alternate, water sources can be utilized i.e.; whatever is available.
- Potential for start up of new mines since recycling can begin immediately.

Additional studies in the areas of fundamental scientific aspects, water variability, optimization, confirmation, and fatty acid testing, benefit/risk economic analyses, and pilot scale tests were recommended.

1.0 INTRODUCTION

1.1 BACKGROUND

The Florida aquifer is a porous bed of rock that underlies the entire state and retains an almost limitless supply of fresh water. Water that is withdrawn from the aquifer for a myriad of reasons is essentially replenished through percolation of surface water above. In 1990 it was estimated that users in the sixteen county jurisdiction of the Southwest Florida Water Management District (SWFWMD) consumed 1,388 MGD of aquifer water. A consumption of 83 MGD (5.97%) was attributed to the mining industry as a whole, most of which was used in the phosphate industry.[(1)]

Within the phosphate industry, it was estimated that mining and beneficiation required about 63 MGD of aquifer water in 1993 to extract and produce upgraded products which were suitable for conversion to fertilizers in today's market. Expressed as a unit of consumption, aquifer water usage was 830 gallons per ton of total product.[(2)]

This level of consumption was not always so. As late as 1970 the industry required as much as 3,400 gallons of aquifer water to produce a single ton of phosphate rock product. Water management practice within the industry (primarily rainfall catchment and acid rinsing reductions) resulted in a reported usage of 1,280 gallons per ton by 1980.[(2)] More recent programs established by CF Industries in the 1980's, and later by IMC-Agrico and others, resulted in reported usages ranging from 910 to 800 gallons per ton for the years 1991-1993 respectively.[(3)]

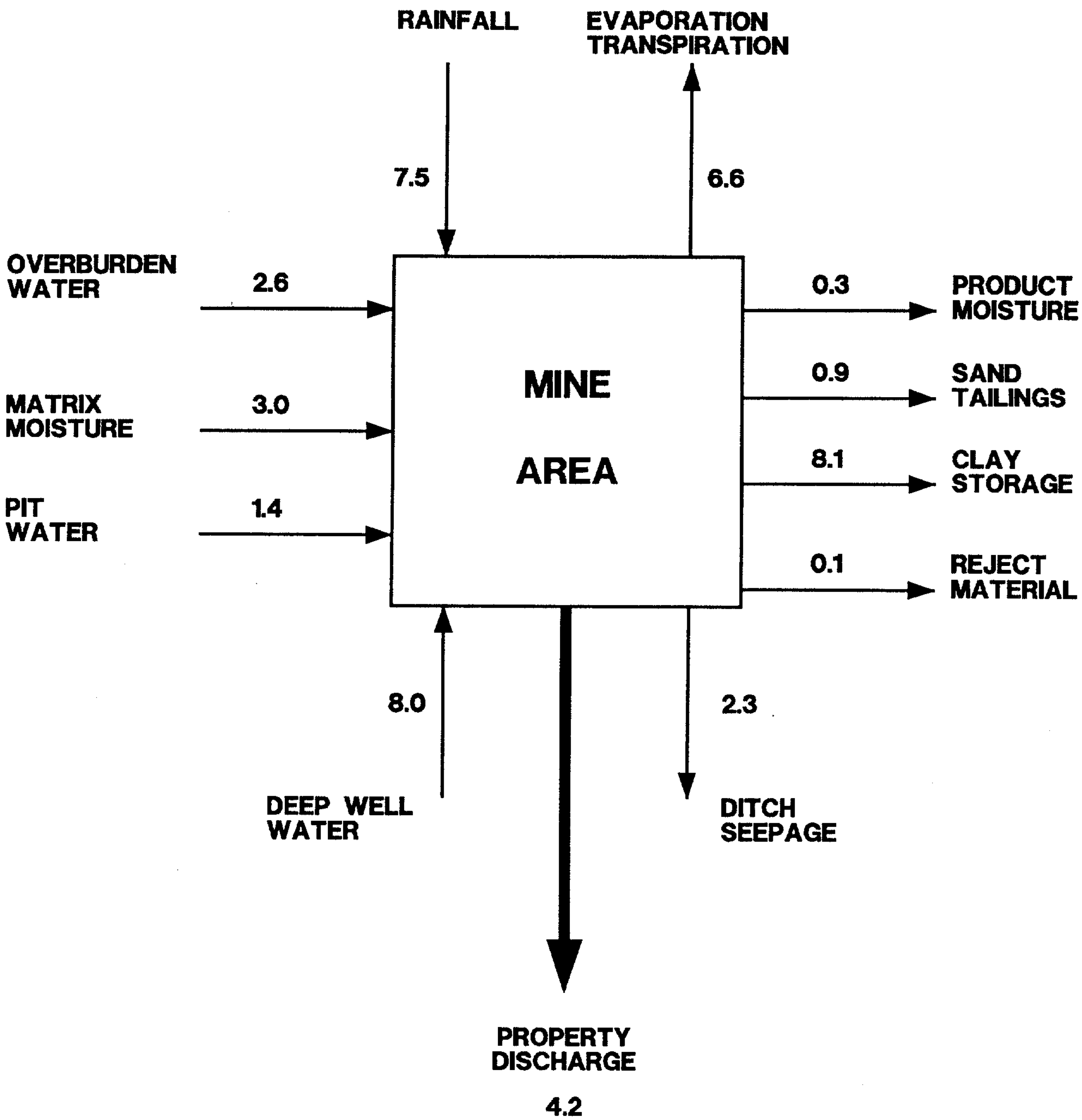
1.2 PHOSPHATE MINING WATER REQUIREMENTS

The overall water balance for a particular mine is "site-specific" and is dependent upon a number of inherent physical factors:

- Production rates
- Matrix composition - % clay, % moisture, % concentrate
- Water table drainage - overburden water and pit water
- Deep well pumping
- Rainfall
- Evaporation/Transpiration - % open water, vegetation, etc.
- Seepage
- Waste storage - moisture in clays and sand tailings
- Product moisture

The net resultant of these factors manifests itself in a theoretical property discharge. The relationship of these factors to each other is illustrated in Figure 1 in simplified form. The numbers in the diagram represent an average of all phosphate mines in Florida during the period 1979-1980[(4)]; 2.25 MM TPY average annual production. For most mines, all factors considered, the amount of discharge is proportional and of the same magnitude as the amount of aquifer water pumped.

A simplified water recirculation system for a typical phosphate mine is presented in Figure 2. The solid lines represent material slurry flows while the dotted lines represent water flows. Briefly, mine recycle water is used to transport the solids in the matrix through the beneficiation process. This water ends up associated with either the clays or the sand tailings and is decanted and recycled for further use. In general, the mine recycle water stream for a typical phosphate mine will approach 100,000 gpm flow. Surface water generally reports to the recycle stream after one use, while aquifer water is used for amine flotation prior to reporting to the recycle water stream.



NOTE: ALL FLOWS ARE EXPRESSED IN MGD

Figure 1. Water Balance For Typical Phosphate Mine

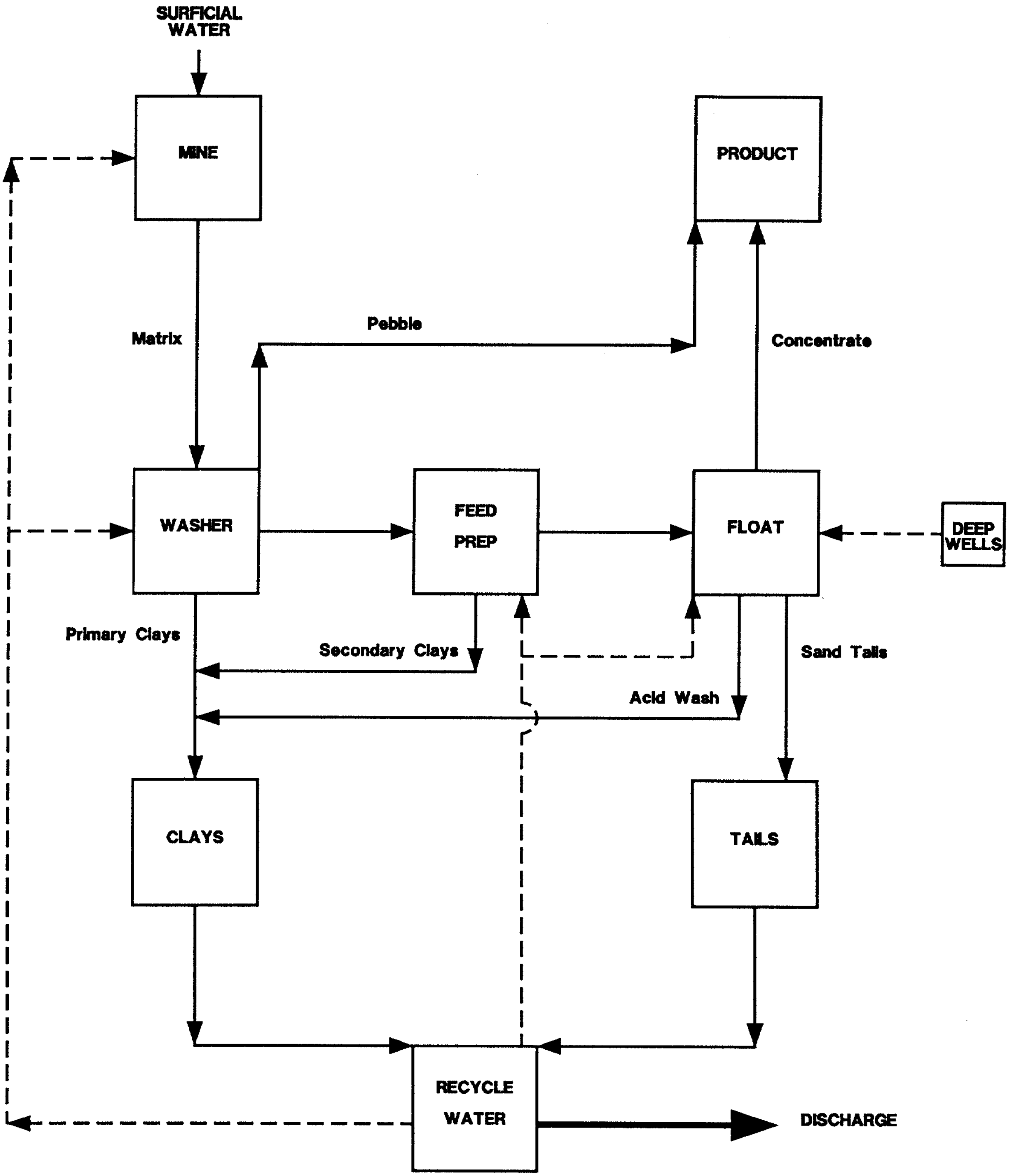


Figure 2. Simplified Mine Water Recirculation System

Other than use as a convenient supply of sealing water for matrix and tailings pumping systems and use for reagent mixing, aquifer water is primarily needed for system make up; mainly to replace water lost within the clays. Aquifer water is used to best advantage as a consistent clean water source in the amine circuit for the final stage of acid rinsing and sand flotation. Historically, substitution of surface water and mine recycle water for aquifer water in the amine circuit has not been successful due to the deleterious nature of these waters (objectional cations, tannins, and turbidity) on amine flotation response.

Based on the use of aquifer water only for the amine circuit (one final stage of acid rinsing and sand flotation) it is estimated that a minimum limit of 1200-1400 gallons of aquifer water per ton of concentrate (approximately 600-700 gallons per ton of total product based on 1/1 pebble and concentrate) would be necessary. Further reduction in the estimated minimum limit for aquifer water usage in the amine circuit will have to be gained from substitute water sources or from the utilization of alternate recycling techniques. The amount of water over and above the minimum limit for amine flotation (that required for system make up) will have to be gained from substitute water sources. Successful utilization of these techniques will lead to a reduction in aquifer withdrawal along with a corresponding reduction in property discharge.

1.3 OBJECTIVE AND SCOPE

The objective of this project was to investigate potential alternate sources and uses of water for amine flotation in an effort to determine the practicality of reducing deep well pumping requirements. More specifically, the use of surface water, pit water, and recirculated process water from each of four mines and a sewage treatment plant effluent were evaluated on a laboratory scale as potential direct substitutes for aquifer water and as candidates for various recycling techniques.

The scope of work under which this objective was investigated was as follows:

1. Project Samples - Collection and analysis of the following samples from each of four mines to characterize the types of water under investigation.

- Deep well water
- Process water
- Surface water
- Pit water
- Bartow Sewage Treatment Plant effluent - outside source
- Deionized water - for comparative purposes.

2. Open circuit flotation tests on amine feeds from four mines to establish baseline conditions and to investigate the effects of various anions and cations and other water treatment process variables.

- Baseline tests - substitute water comparisons

- Water treatment tests - to overcome effects of various substitute waters using overburden neutralization, sand tailings and charcoal filtration, and starch, soda ash, and kerosene reagent addition water treatment techniques.

- Statistical designs - to investigate the effects of several water treatment techniques and to identify and quantify chemical species causing deleterious effects on amine flotation response.

- Water variability tests - flotation response with respect to time

3. Closed circuit (locked cycle) flotation tests on amine feeds from the four mines to establish alternate recycle water systems utilizing substitute waters as replacement for aquifer water.

- Baseline tests - basis of comparison for recycling (~100% recycle) substitute waters
- Optimum substitute water tests -basis for assessing aquifer water replacement with substitute waters for both tight loop (93% recycle) and loose loop (60% recycle) closed systems.

4. Estimate of system potential to assess possible aquifer water reductions and of implementation costs associated with a substitute water recycle system.

- Data collection - aquifer pumping, property discharge, and production from each of the four mines.
- Potential aquifer water savings estimates
- Calculation of capital and differential operating costs for the substitute water recycle system.

1.4 POTENTIAL IMPACTS AND BENEFITS

The underlying thesis of this project is that segregation of waters for separate use in the amine flotation system within the beneficiation process is a potentially viable method of utilizing alternate water resources and ultimately reducing aquifer withdrawal and property discharge. Successful application of the recycling techniques investigated in this study would impact the following areas:

- The phosphate industry's water management practices on ground-water quality and quantity
- The economic implications of imposing strict water quality standards on the phosphate industry

It should be emphasized that substitution of alternate water sources and recycling of pertinent existing water sources are both necessary to achieve a solution to the overall water balance constraints facing phosphate mines. Successful application of the recycling techniques used in this study would produce the following benefits:

- Decrease aquifer pumping levels below those practiced today thereby conserving Florida's precious groundwater resource.
- Decrease the quantity of property discharge, and possibly increase the quality, thereby reducing the risk of impact on Florida's receiving streams.
- Development of a water management tool for phosphate mines whereby deep well pumping and property discharge can be more tightly controlled.
- Potential benefit of metallurgical improvement of P_2O_5 recoveries and reagent costs for the phosphate industry.

2.0 RESEARCH SAMPLES AND PROCEDURES

2.1 PROCEDURES

Detailed descriptions of all sample preparation procedures are presented in Exhibit 1 of the Appendix. Procedure summaries for each of the sample types (Amine Flotation Feeds, Water Samples, Overburden and Sand Tailings Samples, and Reagents) are presented in the following sections of the report. All samples were analyzed according to the procedures used by the Florida Phosphate Chemists Association. The following laboratories were used on this project:

- BCD Inc. - Flotation laboratory and sample preparation equipment
- CMI Inc. - Analytical laboratory. All solids samples analyses and routine water analyses.
- Advanced Separation Technologies, Inc. - Water samples for TOC, dissolved oxygen, and tannin.
- FIPR - Analytical laboratory - Complete analyses for initial water samples

2.2 SAMPLES

With one exception (Mine 2), amine flotation feed samples and the four water samples (aquifer water, process water, surface water, and pit water) were taken from each of the four mines on two occasions. The effluent sample from the Bartow Sewage Treatment Plant was also taken on two separate occasions. Overburden and sand tailings samples were taken one time as were the flotation reagents samples.

2.11 Amine Flotation Feed Samples

Amine flotation feed samples were taken in the plants at a point just after the final stage of rinsing and just prior to the addition of reagents. The samples ranged from about 175 to 200 lb. (dry basis). The moist samples were reduced in size by successive stages of coning and quartering and a 4000g sample was removed for analysis. The 4000g sample was oven dried and weighed to determine the moisture content and riffled into quarters; one-eighth was screened on a RoTap for 20 minutes using 28 through 150-mesh sieves, while another eighth was designated as the head sample. All screen fractions and the head sample were weighed, ground to minus 65 mesh using a Bico Pulverizer and submitted for analysis.

The chemical analysis of the project amine feed samples are shown in Table 1. The analyses for each feed sample with respect to particle size are presented in Tables 2-5 for Mines 1-4 respectively. BPL values for the feed samples ranged from a low of 35.7% (Mine 1, Sample 1) to a high of 66.7 (Mine 4, Sample 2). Size consists for the feed samples ranged from a low of 2.95% +35m (Mine 4, Sample 1) to a high of 18.03% +35m (Mine 1, Sample 2). None of the mines utilized separate sized flotation feeds for their operations.

2.12 Water Samples

Both the aquifer water and process water samples were taken in the four plants at their respective use points. Pit water samples were taken directly from the mining cuts (lift pump discharge) for Mines 1, 2 and 4 and from a transfer ditch for Mine 3. Surface water samples for Mines 1, 2 and 3 were taken from ditches carrying run-off water, while surface water from Mine 4 was obtained from a swampy area. The Bartow Sewage Treatment Plant effluent sample was taken from the tertiary clarifier overflow as it entered into the discharge pond. Deionized water was

TABLE 1: Project Amine Feed Analyses

Mine	Sample Period	Chemical Analysis, % BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist %	Weight %+35m
1	1st	35.70	48.13	24.86	0.83	0.59	0.37	17.55	4.08
	2nd	48.24	33.00	32.50	1.00	0.74	0.45	19.00	18.03
2	1st	52.29	29.20	34.91	0.81	0.99	0.32	18.07	15.05
3	1st	52.77	27.38	35.30	1.05	1.08	0.37	17.77	5.97
	2nd	52.33	28.48	34.31	0.93	0.97	0.35	17.78	7.47
4	1st	59.56	20.00	39.20	1.13	1.14	0.35	19.04	2.95
	2nd	66.73	9.68	44.16	1.08	0.80	0.41	16.56	16.77

TABLE 2: Mine 1 Amine Feed Size Distribution and Analysis

Screen Size (Tyler Mesh)	Weight %	Analysis % BPL	Analysis % Insol	Percent Distribution BPL
Sample 1 (Assay)		35.70	48.13	
Sample 1 (Calc)	100.00	(36.97)	(47.04)	100.00
+28	1.46	69.26	4.60	2.74
28/35	2.62	67.04	6.65	4.75
35/48	6.66	65.55	8.89	11.81
48/65	11.55	57.57	19.05	17.98
65/100	40.18	35.86	48.13	38.96
100/150	28.40	22.48	66.80	17.27
-150	9.13	26.26	62.35	6.49
Sample 2 (Assay)		48.24	33.00	
Sample 2 (Calc)	100.00	(48.83)	(32.07)	100.00
+28	5.91	62.40	12.84	7.55
28/35	12.12	63.51	12.98	15.77
35/48	22.01	56.98	21.58	25.69
48/65	24.10	49.68	30.92	24.52
65/100	20.11	41.27	41.44	17.00
100/150	12.18	30.11	57.56	7.51
-150	3.57	26.92	61.46	1.96

TABLE 3: Mine 2 Amine Feed Size Distribution and Analysis

Screen Size (Tyler Mesh)	Weight %	Analysis % BPL	Analysis % Insol	Percent Distribution BPL
Sample 1 (Assay)		52.59	29.20	
Sample 1 (Calc)	100.00	(52.14)	(29.10)	100.00
+28	5.59	71.93	3.40	7.71
28/35	9.46	69.16	5.38	12.55
35/48	17.51	67.15	9.25	22.55
48/65	26.22	59.34	18.98	29.85
65/100	23.63	41.69	43.03	18.89
100/150	12.66	24.76	66.55	6.01
-150	4.93	25.80	65.15	2.44

TABLE 4: Mine 3 Amine Feed Size Distribution and Analysis

Screen Size (Tyler Mesh)	Weight %	Analysis % BPL	Analysis % Insol	Percent Distribution BPL
Sample 1 (Assay)		52.77	27.38	
Sample 1 (Calc)	100.00	(52.09)	(28.80)	100.00
+28	0.59	71.36	4.05	0.81
28/35	5.38	71.08	3.73	7.34
35/48	29.32	70.31	4.45	39.58
48/65	31.18	59.74	18.35	35.76
65/100	25.90	29.06	59.55	14.45
100/150	5.95	14.01	80.45	1.60
-150	1.68	14.38	79.75	0.46
Sample 2 (Assay)		52.33	28.48	
Sample 2 (Calc)	100.00	(54.63)	(25.91)	100.00
+28	1.92	68.54	6.42	2.41
28/35	5.55	71.14	4.02	7.23
35/48	19.34	70.33	4.80	24.90
48/65	35.79	63.91	13.42	41.86
65/100	24.45	38.32	47.62	17.15
100/150	8.46	27.55	62.72	4.27
-150	4.49	26.46	64.20	2.18

TABLE 5: Mine 4 Amine Feed Size Distribution and Analysis

Screen Size (Tyler Mesh)	Weight %	Analysis % BPL	Analysis % Insol	Percent Distribution BPL
Sample 1 (Assay)		59.56	20.00	
Sample 1 (Calc)	100.00	(59.25)	(20.15)	100.00
+28	0.48	71.84	3.43	0.58
28/35	2.47	71.84	3.43	3.00
35/48	9.02	69.96	6.15	10.05
48/65	16.54	66.03	10.85	18.43
65/100	39.00	61.40	17.48	40.41
100/150	22.50	54.04	27.35	20.52
-150	9.99	38.00	47.33	6.41
Sample 2 (Assay)		66.73	9.68	
Sample 2 (Calc)	100.00	(66.59)	(10.11)	100.00
+28	5.57	73.08	2.88	6.11
28/35	11.20	72.69	3.10	12.23
35/48	18.83	71.40	4.18	20.19
48/65	26.22	67.19	8.76	26.46
65/100	21.90	63.56	13.58	20.91
100/150	12.01	59.39	19.60	10.71
-150	4.27	52.92	27.86	3.39

obtained from the CMI Inc. analytical laboratory. All samples were stored in sealed plastic drums. One-gallon samples were taken from the drum with a two-inch plastic pipe after thoroughly mixing. The one-gallon samples were submitted for the analyses shown in Table 6.

With the exception of turbidity and suspended solids, most of the waters from a given mine did not differ substantially from each other and chemical analyses were of the same order of magnitude. The pit water from Mine 1 and the pit and surface waters from Mine 4 contained suspended solids levels in excess of 100 ppm and later proved to be the most troublesome waters to substitute for aquifer water. The Bartow Sewage Treatment Plant effluent sample contained elevated levels of dissolved solids along with an order of magnitude level increase of NH_4 (12.5 ppm).

2.13 Other Project Samples

Samples of overburden and sand tailings were obtained from each of the four mines for later use in mine water neutralization and filtration studies. Sample weights were about 50 lb. each. The samples were riffled to obtain representative portions, wet screened on 150 mesh to remove slimes, when present, dried, screened on 28 through 150-mesh sieves, and weighed. A second portion of each sample was weighed , dried, weighed, pulverized, and submitted for analysis. The analyses and size distributions for each of the samples are presented in Table 7.

2.14 Reagents

With the exception of the amine samples, all chemicals used during the project were reagent-grade. The amine samples were taken from each plant and stored in a plastic container at full strength. Dilutions to 5% for laboratory use were made up on a weekly basis. The following types of amine were used for each plant.

- Mine 1 - ARR MAZ 130-93
- Mine 2 - ARR MAZ MG 3016
- Mine 3 - Westvaco Custamine 738
- Mine 4 - ARR MAZ

TABLE 6: Project Water Analysis

Mine	Water Type	PH	P	Ca	Mg	Fe	NH_4	F
		Chemical Analysis, PPM						
1	Deep Well	8.15	ND	65.8	19.5	<0.1	1.73	0.28
	Process	7.90	ND	43.5	23.2	<0.1	0.80	2.70
	Surface	7.69	2.38	23.3	12.3	0.1	1.00	1.23
	Pit	7.86	0.30	29.0	16.1	0.3	0.77	1.70
2	Deep Well	7.91	ND	31.3	18.4	<0.1	0.83	0.32
	Process	8.43	ND	32.3	11.3	<0.1	0.78	1.90
	Surface	7.91	ND	22.6	12.0	<0.1	0.95	0.53
	Pit	7.61	ND	15.4	6.2	<0.1	0.46	0.47
3	Deep Well	8.21	ND	61.0	27.8	<0.1	0.43	0.30
	Process	7.72	ND	53.1	18.5	<0.1	0.78	2.10
	Surface	7.68	6.54	64.1	35.8	<0.1	0.81	1.20
	Pit	7.77	ND	17.3	7.5	<0.1	0.40	0.42
4	Deep Well	7.99	ND	58.7	18.2	<0.1	0.39	0.46
	Process	7.76	1.23	64.6	18.2	<0.1	0.52	2.50
	Surface	6.40	12.1	19.3	4.8	4.7	1.01	0.57
	Pit	7.66	ND	22.9	7.9	0.3	0.52	0.47
	Deionized	7.00	ND	2.0	-0-	-0-	0.46	--
	Bartow Sewage Effluent	7.72	ND	85.6	21.1	<0.1	12.54	--

Mine	Water Type	SO_4	TSS	TDS	Turbid	Cond.	Hard.	TOC	D.O.
		Chemical Analysis, PPM							
1	Deep Well	121	-0-	316	<0.1	695	244	0.92	9.3
	Process	165	32	338	2	722	260	1.85	9.2
	Surface	ND	4.8	126	4	407	108	2.16	9.1
	Pit	36	126	384	40	668	138	1.85	9.0
2	Deep Well	126	0	240	<0.1	472	153	1.23	9.3
	Process	90	4.0	276	0.5	539	127	1.23	9.2
	Surface	43	2.0	182	<0.1	362	105	1.54	9.2
	Pit	26	5.0	247	<0.1	253	64	0.92	9.3
3	Deep Well	4	0	321	<0.1	685	266	1.21	9.4
	Process	210	ND	375	<0.1	721	270	0.91	9.2
	Surface	233	4.0	560	10	888	307	2.10	9.3
	Pit	ND	8.0	76	8	203	74	2.10	9.3
4	Deep Well	96	0	334	<0.1	629	221	1.80	9.3
	Process	192	ND	393	1.0	694	292	2.70	9.4
	Surface	ND	338	353	200	230	68	3.61	9.1
	Pit	26	138	246	45	275	89	1.80	9.4
	Deionized	ND	--	--	--	--	0.5	--	--
	Bartow Sewage Effluent	185	ND	663	--	--	339	2.10	3.8

TABLE 7: Size Distribution and Analysis of Other Project Samples

Screen Size (Tyler Mesh)	Mine 1 OB	Mine 1 Sand Tails	Mine 2 OB	Mine 2 Sand Tails	Mine 3 OB	Mine 3 Sand Tails	Mine 4 OB	Mine 4 Sand Tails
Head	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
+28	1.47	0.13	2.30	5.12	5.37	11.36	2.87	9.27
28/35	2.39	0.35	4.66	13.09	3.26	16.66	4.10	15.99
35/48	7.06	2.18	13.71	28.14	9.04	28.33	10.15	31.57
48/65	10.92	11.42	19.47	32.07	20.47	26.10	14.10	28.79
65/100	14.72	28.29	31.39	16.64	17.50	12.43	15.58	10.17
100/150	30.01	37.05	12.36	4.04	9.20	3.97	22.45	3.17
-150	33.43	20.58	16.11	0.90	35.16	1.15	30.75	1.04
Other Data								
% BPL	2.47	1.90	5.42	3.04	3.78	4.33	4.13	7.32

3.0 OPEN CIRCUIT FLOTATION STUDIES

Open circuit, or single stage, flotation tests were conducted in order to assess aquifer water substitutes, water treatment techniques, deleterious chemical species and water variability aspects prior to studying recycling methods using locked cycle testing. A complete listing of all the open circuit tests is presented in Exhibit 2 of the Appendix.

3.1 PROCEDURES

For open circuit testing, individual test charges were obtained by mixing the stored material from a given bag and weighing out 610 to 625g charges, depending upon the moisture content, to arrive at 500g charges dry basis. In general, an entire bag (usually 50-60 lb) was consumed at one time. The individual test charges were stored in separate plastic bags.

The test charge was transferred onto a 200 mesh screen and submersed in the water to be used for the particular test; one minute submergence time was used. The rinsed material was transferred to a 2-liter Denver Laboratory Flotation cell with the test water. More test water was added to bring the liquid level in the cell to within one inch from the overflow lip (20% solids). The feed material was conditioned in the cell with the desired amount of amine (5% solution) at 1200-1250 RPM by closing the air intake valve for 15 seconds. Modifiers, extenders, depressants, etc., if required, were added in a similar manner during a 15-second preconditioning stage. The pH of the conditioned pulp was measured, the air valve was opened, and the sand froth was skimmed off for 60 seconds. The terminal flotation pH was measured. Both the froth and concentrate (non-float) products were decanted, dried in a gas-fired oven, weighed, riffled, pulverized to minus 65 mesh, and submitted for chemical analysis.

3.2 BASELINE TESTS - SUBSTITUTE WATER COMPARISONS

Open circuit baseline tests were conducted to determine the relative differences between aquifer water and the other potential substitute waters for a given mine. Bartow Sewage Treatment Plant effluent and deionized water were also included in this phase of work. For these tests, a four-point amine reagent addition series was conducted for each water. The results for each series were normalized to a given concentrate insoluble level by interpolation of insol data points nearest the desired level. The desired concentrate insol level for each mine was selected as a point on the concentrate insol - BPL recovery curve where the recovery losses began to increase disproportionately with reduced insoluble levels. Complete details of these tests are presented in Exhibit 2 of the Appendix, Tests 1-81, 158-160, and 244-246. The results are summarized in Table 8 and presented graphically in Figures 3, 4 and 5.

The following statements were derived from analysis of the baseline substitute water comparison tests.

1. In general, deep well water was superior to all other waters from a given mine. These results were not unexpected since similar studies within the phosphate industry have produced similar results in the past.

2. Only two mine waters (process water from Mine 1 and from Mine 4) were sufficiently close to deep well water in terms of amine usage and BPL recovery to exhibit the potential for being directly substitutable. Two other waters (pit water from Mine 2 and from Mine 3) approached deep well water results.

TABLE 8: Baseline Substitute Water Comparisons

			Concentrate			Percent		Difference	
Mine	Water Type	Amine lb/TF	%BPL	%AI	Froth %BPL	BPL Rec.	AI Rej.	Amine lb/TF	%BPL Rec.
1	Deep Well	0.85	66.33	7	5.55	92.9	92.4	-0-	-0-
	Process	0.85	66.49	7	5.88	92.5	92.4	-0-	-0.4
	Surface	0.99	66.35	7	6.97	90.8	92.5	0.14	-2.1
	Pit	1.71	66.46	7	6.42	91.6	92.5	0.86	-1.3
	Deionized	1.20	66.32	7	11.52	84.1	93.0	0.35	-8.8
	Bartow Eff.	1.28	66.86	7	6.74	91.2	92.7	0.43	-1.7
2	Deep Well	0.20	70.44	5	10.46	94.4	87.8	-0-	-0-
	Process	0.51	70.81	5	11.19	93.9	87.5	0.31	-0.5
	Surface	0.62	70.83	5	10.83	94.5	87.6	0.42	0.1
	Pit	0.34	71.22	5	8.99	95.3	87.6	0.14	0.9
	Deionized	0.67	70.75	5	48.04	39.4	95.1	0.47	-55.0
	Bartow Eff.	0.64	70.67	5	8.83	95.5	87.6	0.44	1.1
3	Deep Well	0.36	69.86	5	6.33	96.7	86.6	-0-	-0-
	Process	0.57	69.76	5	6.72	96.5	86.8	0.21	-0.2
	Surface	0.75	69.98	5	7.32	96.1	86.8	0.39	-0.6
	Pit	0.42	69.70	5	6.71	96.5	86.7	0.06	-0.2
	Deionized	0.25	70.52	5	7.07	96.3	86.7	-0.11	-0.4
4	Deep Well	0.74	70.82	5	18.61	93.6	79.9	-0-	-0-
	Process	0.78	70.88	5	19.71	93.3	80.0	0.04	-0.3
	Surface	1.62	65.81	12	25.91	94.2	48.8	0.88	0.6
	Pit	1.59	69.97	5	22.81	91.3	80.4	0.85	-2.3
	Deionized	0.59	71.34	5	22.09	92.2	80.2	-0.15	-1.4

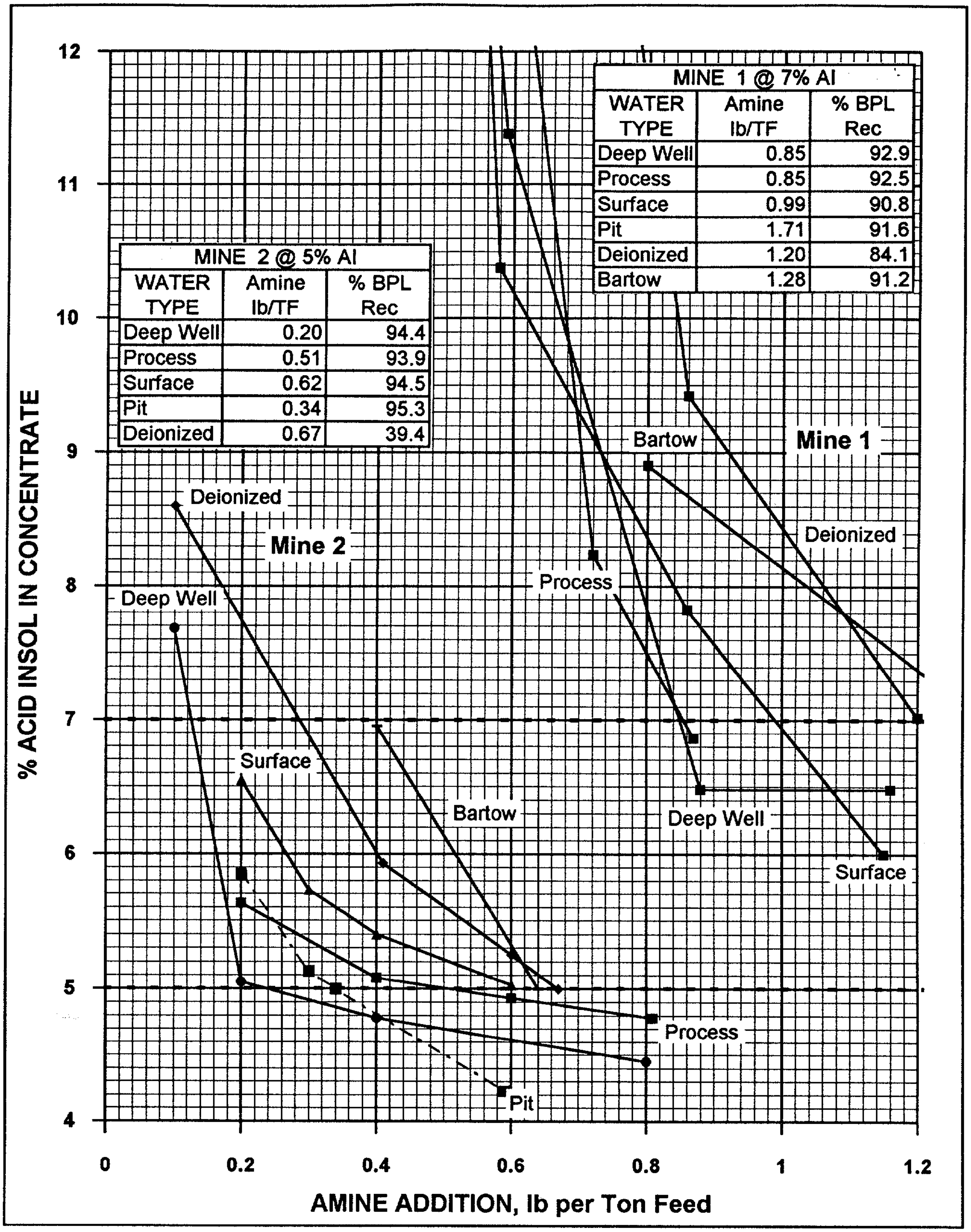


Figure 3. Baseline Substitute Water Comparisions for Mines 1 and 2

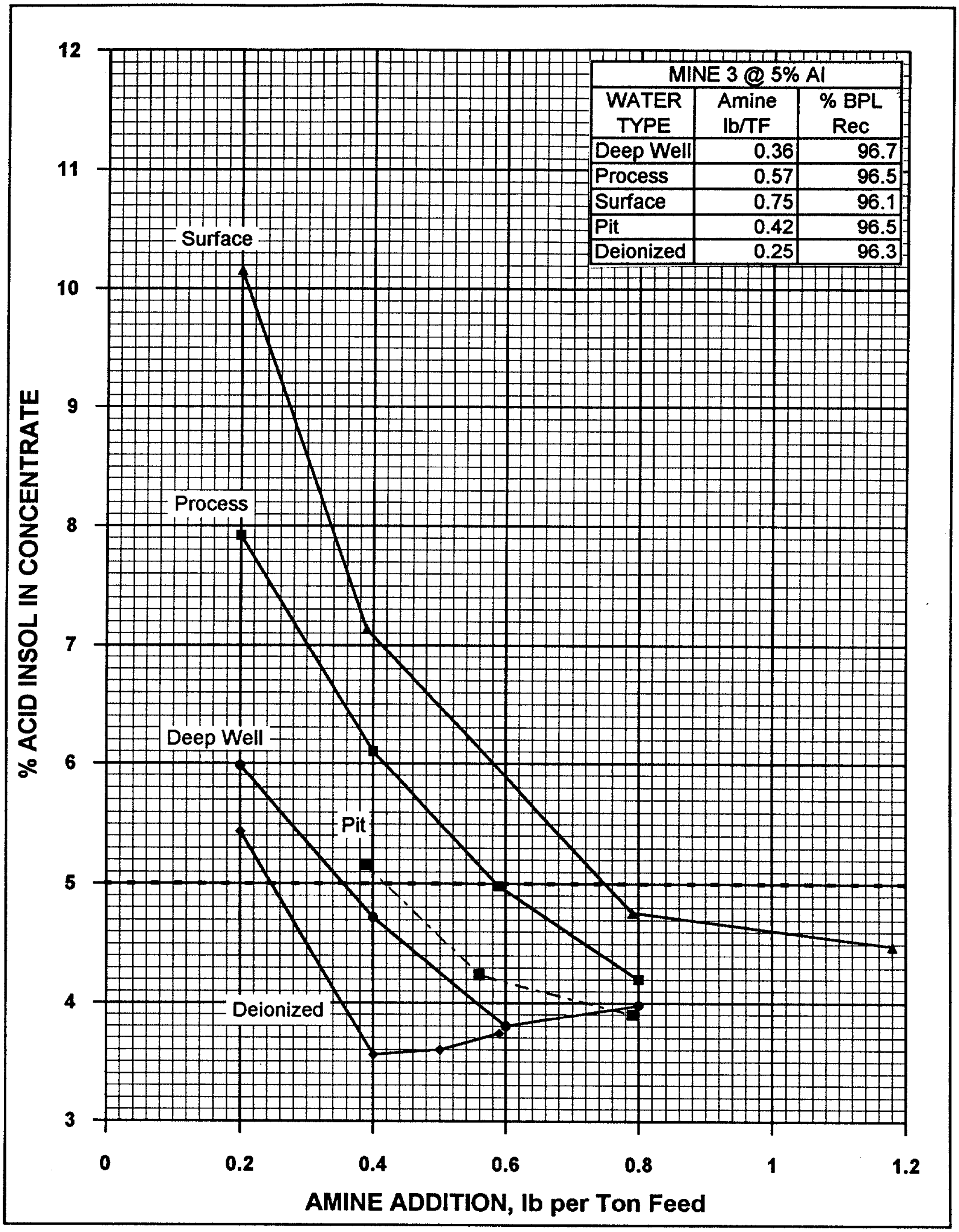


Figure 4. Baseline Substitute Water Comparisions for Mine 3

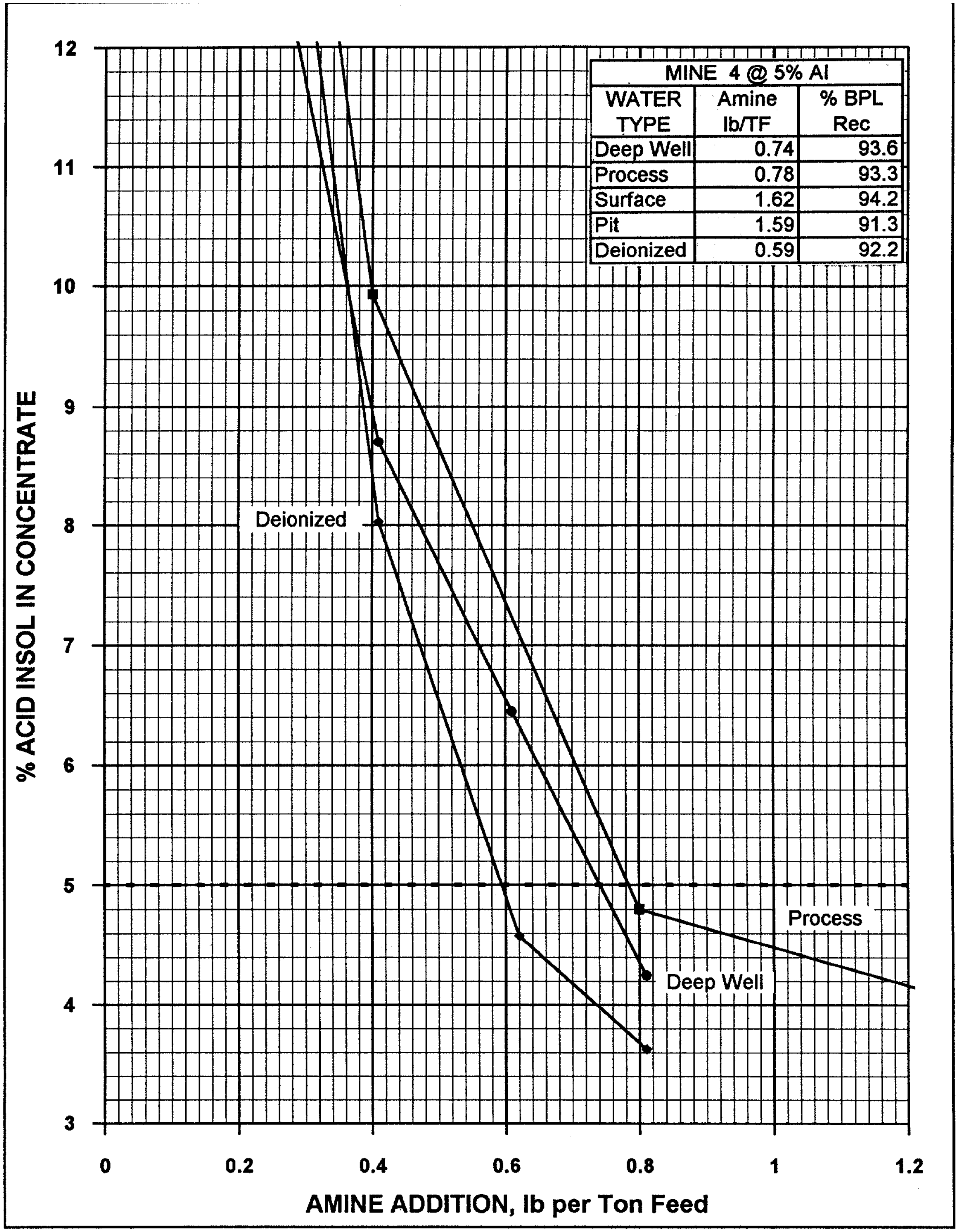


Figure 5. Baseline Substitute Water Comparisions for Mine 4

3. The remaining mine waters performed poorly as compared with deep well water; amine reagent requirements were double to triple those for deep well water and BPL recoveries were generally 1-2% less. The particularly poor performances of pit water from Mine 1 and both pit and surface waters from Mine 4 were attributed primarily to high suspended solids contents; excess of 100 ppm.

4. Bartow Sewage Treatment Plant effluent was as selective as most of the other waters but required elevated amounts of amine reagent; 60-200% more. This result was possibly due to the relatively high NH_4 content of the sewage effluent which interfered with the NH_3-based amine collector.

5. Deionized water exhibited the poorest performance when tested with Mine 1 and Mine 2 feeds but produced the best results when tested with Mine 3 and Mine 4 feeds. The overall performance differences for deionized water were not understood.

3.3 WATER TREATMENT TESTS - SINGLE VARIABLE

The most troublesome waters encountered during the baseline substitute water tests were subjected to various water treatment techniques in an attempt to overcome any deleterious effects with a single step, "quick-fix" method. Surface water and Bartow Sewage Treatment Plant effluent were tested with Mine 1 feed, Bartow Sewage Treatment Plant effluent with Mine 2 feed, surface and pit water with Mine 3 feed, and pit water with Mine 4 feed. Overburden neutralization, sand tailings filtration, charcoal absorption, and reagent additives (starch, soda ash and kerosene) were the water techniques employed.

Overburden neutralization of the mine waters was accomplished by adding 4000g of overburden material to 10 liters of the mine water and gently stirring by hand for 2 minutes. The pulp was allowed to settle for 24 hours and the clear supernatant was decanted as neutralized water for flotation tests. Sand tailings filtration of mine waters was accomplished by placing 4000g of sand tailings on a 200-mesh sieve approximately 3 inches thick and allowing 10 liters of mine water to percolate through over a period of 15 minutes. The filtrate was allowed to settle for 24 hours and the clear filtrate was decanted as water for flotation tests. A model 5Oc NSA activated carbon filter was used to remove impurities from various mine waters. The unit was gravity fed at a rate of 1 liter per minute. The filtered water was immediately used for flotation tests. The starch, soda ash, and kerosene reagents were added during a preconditioning stage as described previously.

3.31 <u>Mine 1</u>

Complete details of the water treatment tests on Mine 1 feed are presented in Exhibit 2 of the Appendix, Tests 110-139, 155-160, and 200-202. The results are summarized in Table 9 for various water treatments on both surface water and Bartow Sewage Treatment Plant effluent. The following statements were derived from analysis of Table 9.

1. None of the water treatment techniques were successful in producing deep well quality water from surface water; BPL recoveries were 0.4-3.3% lower and amine requirements were 0.13 - 0.48 lb/TF higher.

2. Overburden neutralization of Bartow Sewage Treatment Plant effluent produced results similar to those achieved in deep well water; BPL recovery was 1.2% higher while the amine requirement was only 0.04 lb/TF more. None of the other water treatments were successful in producing deep well quality water from Bartow Sewage Treatment Plant effluent.

3. Sand tailings filtration of both waters produced detrimental results. The presence of old fatty acid and fuel oil reagents in the sand tailings is suspected as the cause.

TABLE 9: Water Treatment Tests on Mine 1 Feed

Mine	Water Type	Water Treatment	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
1	Deep Well	None	0.77	66.84	7	4.77	94.1	92.2	---	---
	Surface	None (Std.)	0.75	67.24	7	5.16	93.4	92.3	-0-	-0-
	Surface	Sand Tails Filt.	0.84	53.56	25	26.72	80.1	65.1	Not Calc.	
	Surface	OB Neutral	0.90	66.83	7	5.56	92.8	92.4	0.15	-0.6
	Surface	Charcoal Filt	0.98	66.71	7	5.19	93.7	92.2	0.23	0.3
	Surface	Starch (1 lb/TF)	1.25	66.72	7	5.16	93.5	92.9	0.50	0.1
	Surface	Soda Ash (1 lb/TF)	0.99	66.35	7	6.97	90.8	92.5	0.24	-2.6
1	Deep Well	None	0.77	66.84	7	4.77	94.1	92.2	---	---
	Bartow Eff.	None (Std.)	1.28	66.86	7	6.74	91.2	92.7	-0-	-0-
	Bartow Eff.	Sand Tails Filt.	0.82	58.38	18	26.33	56.3	86.2	Not Calc.	
	Bartow Eff.	OB Neutral.	0.81	66.62	7	3.78	95.3	92.1	-0.47	4.1
	Bartow Eff.	Charcoal Filt.	1.11	66.63	7	5.10	93.5	92.4	-0.19	2.3
	Bartow Eff.	Starch (1 lb/TF)	1.26	66.12	7	6.25	92.9	94.6	-0.02	1.7
	Bartow Eff.	Soda Ash (1 lb/TF)	1.02	66.21	7	6.40	92.1	92.3	-0.26	0.9

3.32 Mine 2

Complete details of the water treatment tests on Mine 2 feed are presented in Exhibit 2 of the Appendix, Tests 140-154, 203-205, and 244-246. The results are summarized in Table 10 for various water treatments on Bartow Sewage Treatment Plant effluent. The following statements were derived from analysis of Table 10.

1. Charcoal filtration of Bartow Sewage Treatment Plant effluent was partially effective in improving the quality of water for flotation. BPL recovery was 1.1% less than that achieved with deep well water and amine requirements were 0.16 lb/TF higher.

2. None of the other water treatment techniques were successful in producing deep well quality water from Bartow Sewage Treatment Plant effluent.

3.33 Mine 3

Complete details of the water treatment tests on Mine 3 feed are presented in Exhibit 2 of the Appendix, Tests 161-184 and 206-208. The results are summarized in Table 11 for various water treatments on both surface water and pit water. Reagent treatments only were used. The following statements were derived from analysis of Table 11.

1. The use of kerosene when using both surface and pit waters reduced amine reagent requirements to ± 0.05 lb/TF of those obtained with deep well water. However, BPL recoveries were 1.0 - 2.1% less than those achieved with deep well water.

2. The use of both soda ash and starch produced near equivalent BPL recoveries at elevated amine requirements as compared with those achieved in deep well water.

3.34 Mine 4

Complete details of the water treatment tests on Mine 4 feed are presented in Exhibit 2 of the Appendix, Tests 185-199, 209-211, and 247-249. The results are summarized in Table 12 for various water treatments of pit water. None of the water treatment techniques were successful in producing deep well quality water from pit water; BPL recoveries were 3.2 - 12.4% less and amine reagent usage was 0.45 - 0.94 lb/TF more.

3.35 Treated Water Comparisons

Water analyses of mine waters before and after various neutralizations are presented in Table 13 along with the corresponding flotation results. Metallurgically, the most promising techniques were seen to be overburden neutralization of Bartow Sewage Treatment Plant effluent for Mine 1 and charcoal filtration of Bartow Sewage Treatment Plant effluent for Mine 2. Other than reductions in hardness (7-20%) and sulfate (16-29%) no correlations were evident.

3.36 Summary of Water Treatment Tests

In general, most of the water treatment techniques were unsuccessful in upgrading the quality of water to produce results equal to those achieved in deep well water. Exceptions were as follows:

1. Overburden neutralization of Bartow Sewage Treatment Plant effluent produced results similar to those achieved in deep well water for Mine 1.

2. Charcoal filtration was partially effective for treatment of Bartow Sewage Treatment Plant effluent for Mine 2.

TABLE 10: Water Treatment Tests on Mine 2 Feed

				Concentrate			Percent		Difference	
Mine	Water Type	Water Treatment	Amine lb/TF	%BPL	%AI	Froth %BPL	BPL Rec.	AI Rej.	Amine lb/TF	%BPL Rec.
2	Deep Well	None	0.20	71.26	5	5.55	97.3	87.3	---	---
	Bartow Eff.	None (Std.)	0.64	70.70	5	8.83	95.5	87.6	-0-	-0-
	Bartow Eff.	Sand Tails Filt.	0.65	71.01	5	7.45	96.1	87.7	0.01	0.6
	Bartow Eff.	OB Neutral	0.48	71.49	5	14.22	91.9	88.0	-0.16	-3.6
	Bartow Eff.	Charcoal Filt	0.36	70.88	5	7.40	96.2	87.4	-0.28	0.7
	Bartow Eff.	Starch (1 lb/TF)	0.67	71.05	5	5.48	97.5	87.3	0.03	2.0
	Bartow Eff.	Soda Ash (1 lb/TF)	0.73	71.30	5	7.35	96.3	87.6	0.09	-0.8

TABLE 11: Water Treatment Tests on Mine 3 Feed

Mine	Water Type	Water Treatment	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
3	Deep Well	None	0.45	70.61	4	5.84	96.9	89.5	---	---
	Surface	None (Std.)	0.64	70.71	4	8.21	95.4	89.6	-0-	-0-
	Surface	Kerosene (0.2 lb/TF)	0.50	70.66	4	7.57	95.9	89.5	-0.14	0.5
	Surface	Starch (1 lb/TF)	0.98	70.89	4	4.38	97.7	89.6	0.34	2.3
	Surface	Soda Ash (1 lb/TF)	0.72	70.65	4	6.27	96.6	89.5	0.08	1.2
3	Deep Well	None	0.45	70.61	4	5.84	96.9	89.5	---	---
	Pit	None (Std.)	0.48	70.75	4	9.90	94.3	89.8	-0-	-0-
	Pit	Kerosene (0.2 lb/TF)	0.40	70.60	3.78	9.05	94.8	90.3	-0.08	0.5
	Pit	Starch (1 lb/TF)	0.77	69.57	5.46	3.91	98.0	85.3	0.29	3.7
	Pit	Soda Ash (1 lb/TF)	0.78	70.64	4.48	6.21	96.7	88.2	0.30	2.4

TABLE 12: Water Treatment Tests on Mine 4 Feed

Mine	Water Type	Water Treatment	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
4	Deep Well	None	0.41	71.79	4	10.00	97.6	83.6	---	---
	Pit	None (Std.)	1.35	70.60	5	20.00	93.2	81.5	-0-	-0-
	Pit	Sand Tails Filt.	0.99	71.30	5	21.26	92.6	80.2	-0.36	-0.6
	Pit	OB Neutral	1.21	70.97	5	17.58	94.4	81.4	-0.14	1.2
	Pit	Charcoal Filt.	0.86	71.07	5	33.05	85.2	81.7	-0.49	-8.0
	Pit	Starch (1 lb/TF)	1.07	71.20	5	37.33	85.5	81.7	-0.28	-7.7
	Pit	Soda Ash (1 lb/TF)	0.94	71.02	5	21.64	93.1	79.8	-0.41	-0.1

TABLE 13: Water Analysis and Flotation Response for Various Types of Neutralization

Mine	Water Type	Neutralization	Chemical Analysis, PPM Hardness	TSS	TDS	SO_4	Ph	Flotation Results Amine Lb/TF	%BPL Rec.
1	Surface	None	108	5	126	ND	7.69	0.75	93.4
		Sand Tails	144	12	225	ND	7.82	0.84	80.1
		Overburden	95	35	194	ND	7.52	0.90	92.8
		Charcoal	110	ND	190	ND	8.08	0.98	93.7
2	Bartow Eff.	None	339	ND	663	185	7.72	1.28	91.2
		Sand Tails	318	ND	778	156	7.45	0.82	56.3
		Overburden	269	ND	743	156	7.86	0.81	95.3
		Charcoal	315	ND	745	131	8.12	1.11	93.5
3	Bartow Eff.	None	339	ND	663	185	7.72	0.64	95.5
		Sand Tails	313	ND	775	155	6.95	0.65	96.1
		Overburden	263	ND	701	147	7.07	0.48	91.9
		Charcoal	315	ND	745	131	8.12	0.36	96.2
4	Pit	None	89	138	246	26	7.66	1.35	93.2
		Sand Tails	82	ND	134	ND	6.92	0.99	92.6
		Overburden	54	70	109	ND	6.54	1.21	94.4
		Charcoal	211	ND	288	ND	7.07	0.86	85.2

3.4 WATER TREATMENT EFFECTS - STATISTICAL DESIGN

Additional water treatment tests were conducted using process water from each of the four mines to gain insight as to the magnitude of effects of the variables tested. An 8-test Plackett-Burman Series was conducted for each mine in which five process variables were examined and two dummy variables were used as a measure of experimental error. Complete details of these tests are presented in Exhibit 2 of the Appendix, Tests 212-219, 220-227, 228-235, and 236-243. The following variable levels (low and high) were used for the tests.

- Conditioning solids - 19.2 and 23.8%
- Kerosene - 0 and 0.20 lb/TF
- Causticized Starch - 0 and 1.00 lb/TF
- Soda Ash - 0 and 1.00 lb/TF
- Overburden Neutralization (Mines 1, 3 and 4) - No and yes
- Sand Tailings Filtration (Mine 2 only) - No and yes
- Amine - constant at 0.8 lb/TF for Mine 1, 0.3 lb/TF for Mine 2, 0.4 lb/TF for Mine 3, and 0.7 lb/TF for Mine 4

The results of the statistical design water treatment tests are presented in Table 14. The following statements were derived from analysis of these tests:

1. Causticized starch was the most significant water treatment variable for Mines 2, 3 and 4. In all cases, BPL recoveries were improved but concentrate insoluble values were increased due to the addition of starch to process water.

2. None of the process variables exhibited the desired characteristic of improving BPL recoveries while decreasing insolubles in the concentrate.

3. Overburden neutralization exhibited the largest effects on both BPL recovery and concentrate insol for Mine 1. However, the effects were highly detrimental and were due to the large amount of suspended solids (376 ppm) that were present in the neutralized water. Average results at base level conditions were 86.75% BPL recovery and 19.01% concentrate insol and were well off the desired range of 6-8% insol.

TABLE 14: Statistical Design Water Treatment Effects

	Percent BPL Recovery			Percent AI in Concentrate		
Mine	Process Variable	Effect %	Sgfn. Level	Process Variable	Effect %	Sgfn. Level
1	Overburden Neut.	-6.7	0.20	Overburden Neut.	22.0	0.02
	Condition % Solids	5.2	0.30	Condition % solids	5.3	0.20
	Soda Ash	-3.8	0.30	Soda Ash	-3.7	0.30
2	Starch	0.8	0.02	Sand Tails Filt.	9.9	0.02
	Condition % solids	-0.3	0.20	Starch	4.9	0.05
	Soda Ash	0.3	0.20	Condition % solids	-2.6	0.20
				Soda Ash	2.3	0.20
3	Starch	1.5	0.05	Starch	5.6	0.20
	Soda Ash	1.3	0.05	Soda Ash	4.4	0.30
	Kerosene	1.0	0.10			
4	Starch	2.1	0.05	Starch	1.5	0.10
	Soda Ash	1.5	0.10	Kerosene	0.8	0.20
	Kerosene	1.2	0.20			

3.5 EFFECTS OF DELETERIOUS CHEMICAL SPECIES

In order to gain additional insight into which anions and cations might exhibit a deleterious effect on flotation response, a statistical design was used to measure the effect of adding various chemical species to a known "good water" source. For these tests, two fractional factorial designs for resolution III (Two-2 7-4 III) were combined. This 16-test design allowed the examination of seven variables from which the main effects of each were computed along with various combinations of first-order interactions. Complete details for the statistical design are presented in Exhibit 2 of the Appendix, Test 319.

Mine 1 amine feed and Mine 1 deep well water were used for the test series. The low levels for the variables in the test design were zero, while the high levels were 250 ppm in the water. Amine addition was 0.8 lb/TF for all tests. The results are summarized in Table 15 for all variables with respect to both BPL recovery and concentrate insol. The following statements were derived from analysis of these tests.

1. Clay, as derived from overburden material, exhibited the largest main effect in terms of both BPL recovery and concentrate insol. It is speculated that the clay particles essentially tied up the amine collector and retarded flotation. As a consequence, less sand was floated and more reported with the concentrate.

2. BPL recovery was seen to be insensitive to the chemical species tested in that only one main effect (clay) or interaction was greater than 0.45%. Concentrate insol was more sensitive since all main effects and six of seven interactions were greater than 0.45%.

3. Experimental error as measured by one standard deviation was calculated to be 0.07% for concentrate insol and 0.29% for BPL recovery.

3.6 PRELIMINARY WATER VARIABILITY TESTS

During the course of the project, monthly samples of process water were taken from Mine 4 to gain insight into the variability of this water source. These tests were to be used as preliminary information from which to design future test programs. Three-point test series were conducted on the monthly water sample and the data were normalized to 4% insol. Complete details of these tests are presented in Exhibit 2 of the Appendix, Tests 66-69, 106-109, 262-264, and 316-318. The results are summarized in Table 16. The following statements were derived from analysis of these tests.

1. The first test (10 Nov. 93) was significantly different than the three other tests; higher amine usage, higher concentrate insol, and lower BPL recovery. No explanation is presented.

2. The second test (20 Dec 93) was conducted in cloudy water but the results were similar to the third and fourth series which were conducted in clear water.

TABLE 15: Effects of Chemical Species on Flotation Response

Variable Designation	Variable Type	Main Effect %	Interactions Designation	Interactions %
BPL Recovery ($\bar{x}$ = 97.51%)				
A	Fatty Acid & Fuel Oil	0.05	BE+CF+DG	-0.08
B	Clay (OB)	1.26	AE+CG+DF	-0.10
C	K_2SO_4	0.22	AF+BG+DE	0.14
D	$CaCl_2$	0.18	CE+BF+AG	0.03
E	NaF	0.44	AB+CD+FG	-0.07
F	Na_2HPO_4	-0.45	AC+BD+EG	-0.34
G	$MgSO_4$	0.20	BC+AD+EF	0.30
Concentrate Insol ($\bar{x}$ = 7.59%)				
A	Fatty Acid & Fuel Oil	-1.04	BE+CF+DG	1.18
B	Clay (OB)	5.46	AE+CG+DF	-2.11
C	K_2SO_4	0.84	AF+BG+DE	0.53
D	$CaCl_2$	-0.70	CE+BF+AG	-0.14
E	NaF	0.62	AB+CD+FG	-1.24
F	Na_2HPO_4	-0.47	AC+BD+EG	-0.59
G	$MgSO_4$	0.74	BC+AD+EF	1.21

TABLE 16: Preliminary Water Variability Tests

Date	Amine lb/TF	Concentrate Weight %	Concentrate BPL %	AI %	Froth BPL %	Percent BPL Rec.	Percent AI Rej.
10 Nov 93	0.78	79.65	70.89	5	19.71	93.3	80.0
20 Dec 93	0.61	81.63	72.10	4	9.81	97.0	83.9
10 Jan 94	0.60	81.10	72.21	4	13.94	95.7	83.8
10 Feb 94	0.64	81.39	72.22	4	13.08	96.0	83.7

4.0 LOCKED CYCLE FLOTATION TESTS

Locked cycle, or closed circuit multiple stage, flotation tests were conducted in order to assess the viability of establishing alternate recycle systems using substitute waters to replace aquifer water for amine circuit rinsing and flotation. A complete listing of all closed circuit tests is presented in Exhibit 2 of the Appendix.

4.1 CONCEPT DESCRIPTION

In general, deep well water is used in most mines for the final stage of rinsing and for cell dilution prior to sand flotation. Typical usages of deep well water required to process 100 tph of amine feed ore shown in Figure 6. For this example, it is calculated that 1600 gpm (2.3 MGD) of deep well water is required to produce 70 tph of concentrate from 100 tph of amine feed; 1370 gal of deep well water per ton of concentrate. Referring again to Figure 6, it is seen that 920 gpm of deep well type water (used one time only) is present in the final concentrate and that 870 gpm (770 gpm classified as easily recoverable and 100 gpm classified as recoverable) is available for reuse. In a like manner, another 140 gpm of water in the amine tailings is classified as available for reuse. On this basis, it is estimated that a total of 1010 gpm of water (63% of the deep well water used) is available for reuse with a corresponding reduction of aquifer water. Further deep well reductions would have to be derived from the use of substitute waters.

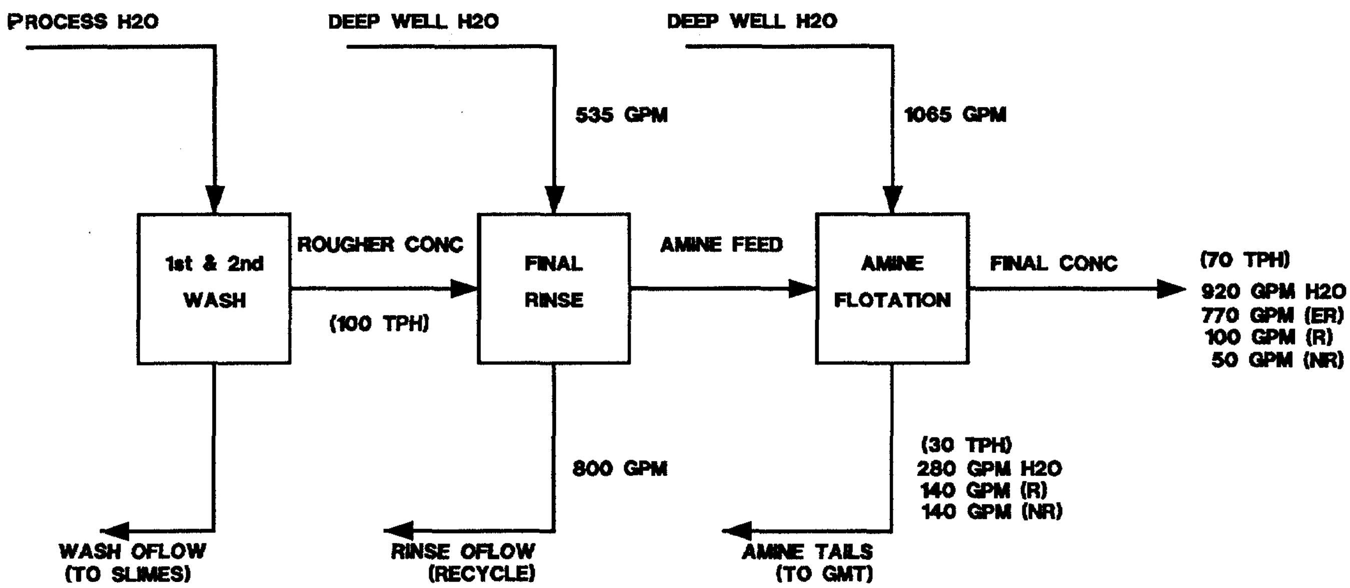
Two proposed types of amine water recycle systems based upon recovery of water from concentrates and amine tailings are presented in Figure 7. An amine water recycle pond is common to both systems. The first system is designated as a closed, or tight, recycle loop and utilizes process or other substitute waters for the final stage of rinsing and for system make up. On this basis, 5.2% make up water is required and the potential deep well water requirements are 0-55 gpm, or, 0-47 gal per ton of concentrate. The second system is designed as an open, or loose, recycle loop and utilizes amine recycle water for both the final stage of rinsing and amine flotation. Deep well water or substitute waters are used for system make up. On this basis, 36.9% make up water is required and the potential deep well water requirements are 0-590 gpm, or, 0-505 gal per ton of concentrate. Both systems were evaluated during the project.

4.2 PROCEDURES

For locked cycle testing, the first cycle was carried out in the same manner as for open circuit testing. Upon completion of the first stage, the froth and concentrate products were dewatered on a 200 mesh screen to recover as much water as possible. A new test charge, amine feed for cycle 2, was rinsed with either the initial water (for all tight loop tests) or the recovered water from stage 1 (for all loose loop tests) in the same manner as for the open circuit procedure. The desired amount and type of make up water was added prior to the rinsing step. The rinsed amine feed was added to the recovered water from Stage 1 and a second cycle of conditioning and flotation was carried out. Each cycle took about 15 minutes to complete. The froth and concentrate products for each cycle were dried and weighted immediately. Test cycles were conducted generally until the concentrate weight % for three successive cycles were within 1% of each other. Two process changes (generally amine addition) were made during each test so that a two or three point BPL recovery-concentrate insoluble curve could be established.

4.3 BASELINE TESTS - INDIVIDUAL WATERS

Baseline tests were conducted with amine feeds from the four mines using the four mine waters (deep well water, process water, surface water, and pit water and the Bartow Sewage Treatment Plant effluent as a basis of comparison for recycling substitute waters. As much water as possible



DEEP WELL USAGE = 1600 GPM
= 2.3 MGD
= 1370 GAL PER TON CONC

Figure 6. Typical Use of Deep Well Water for Amine Flotation

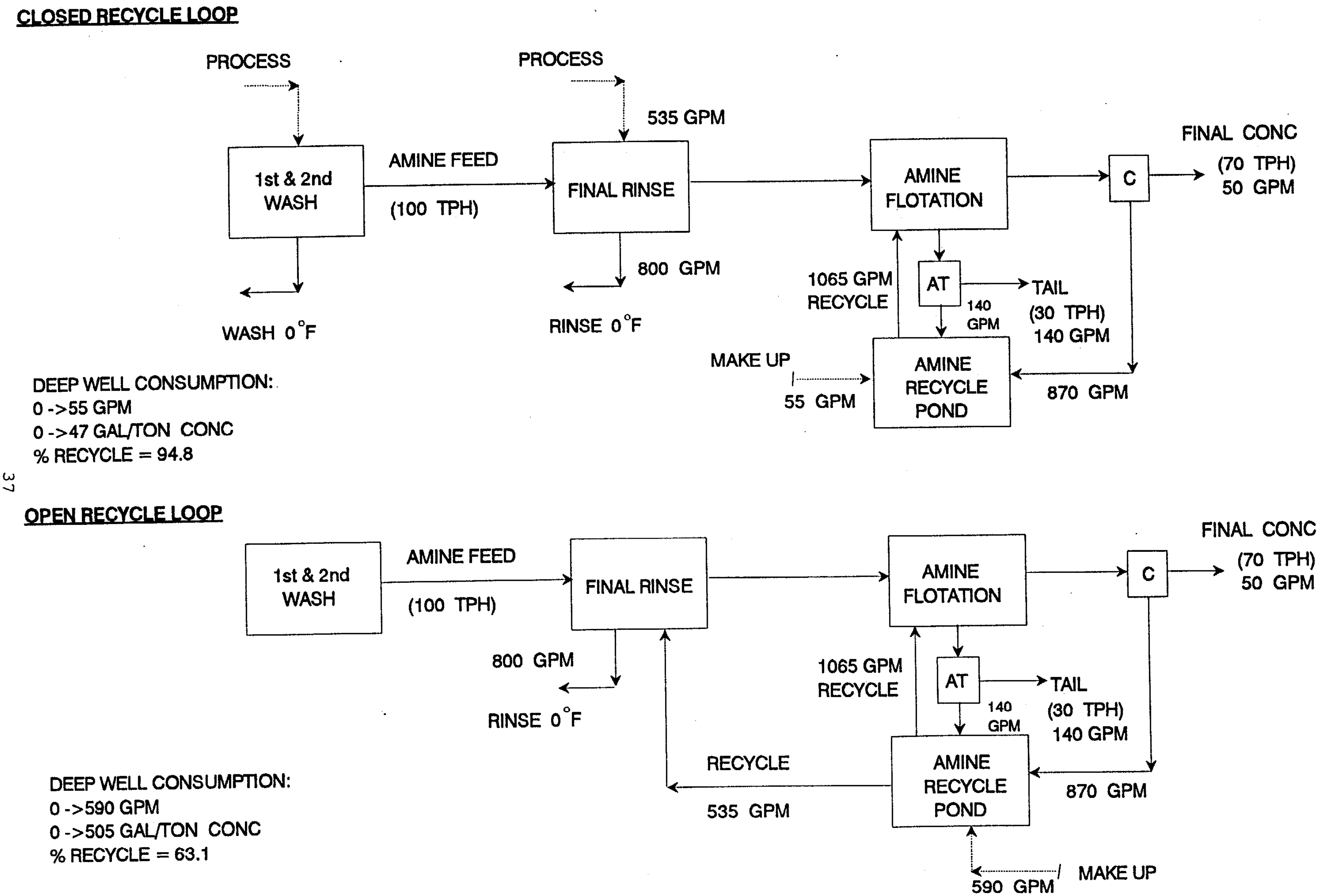


Figure 7. Proposed Amine Water Recycle Systems

(98%) was recycled for these tests in order to determine the maximum effect from recycling.

4.31 Mine 1

Complete details of the baseline locked cycle tests on Mine 1 feed are presented in Exhibit 2 of the Appendix, Tests 86-90. The results are summarized in Table 17 along with corresponding open circuit test results. The following statements were derived from analysis of Table 17.

1. Both process water and pit water proved to be excellent candidates for recycling. The BPL recoveries obtained for both waters in closed circuit exceeded those obtained in corresponding open circuit testing and were within 0.2% of those achieved with deep well water in open circuit. Amine usages for closed circuit testing in process water and pit water were 0.23 and 0.24 lb/TF less respectively than those required for open circuit deep well testing.

2. Both surface water and Bartow Sewage Treatment Plant effluent performed poorly when tested in closed circuit; BPL recoveries were 4.6-5.0% less than for open circuit deep well testing and 2.4-3.6% less than for corresponding open circuit testing.

4.32 Mine 2

Complete details of the baseline locked circuit tests on Mine 2 feed are presented in Exhibit 2 of the Appendix, Tests 91-95. The results are summarized in Table 18. The following statements were derived from analysis of Table 18.

1. Both process water and surface water produced BPL recoveries within 0.6% of those achieved with deep well water in open circuit. Amine usage was equal in surface water and 0.21 lb/TF less in process water than that required for deep well water.

2. Pit water required less amine but exhibited poorer BPL recovery while Bartow Sewage Treatment Plant effluent exhibited nearly equal BPL recovery (0.4% less) but required twice as much amine in closed circuit as compared with open circuit deep well water tests.

4.33 Mine 3

Complete details of the baseline locked circuit tests on Mine 3 feed are presented in Exhibit 2 of the Appendix, tests 96-100. The results are summarized in Table 19. For Mine 3 all waters tested exhibited lower BPL recoveries (1.8-3.6% less) than those achieved in open circuit with deep well water and required elevated levels of amine (0.20 to 0.32 lb/TF more).

4.34 Mine 4

Complete details of the baseline locked circuit tests on Mine 4 feed are presented in Exhibit 2 of the Appendix, tests 101-105. The results are summarized in Table 20. The following statements were derived from analysis of Table 20.

1. Process water, surface water, and Bartow Sewage Treatment Plant effluent produced results during closed circuit testing that were similar to those achieved in deep well water during open circuit testing. Further, closed circuit results from these waters exceeded those derived from open circuit tests on corresponding waters in terms of both BPL recovery and amine requirements.

2. BPL recovery for closed circuit testing of pit water was 1.7% less than that for open circuit testing in deep well water. The amine requirements were equal.

TABLE 17: Mine 1 Baseline Locked Cycle of Individual Waters

Test Type	Water Type	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
Open	Deep Well	0.88	66.71	6.48	5.75	92.6	93.0	0	0
Closed	Deep Well	0.63	67.17	6.48	6.23	91.9	93.1	-0.25	-0.7
Open	Deep Well	0.86	66.42	6.88	5.60	92.8	92.5	0	0
Open	Process	0.87	66.58	6.88	5.99	92.3	92.6	0.01	-0.5
Closed	Process	0.63	67.12	6.88	5.86	92.6	92.6	-0.23	-0.2
Open	Deep Well	0.86	66.42	6.88	5.60	92.8	92.5	0	0
Open	Surface	1.01	66.43	6.88	7.14	90.6	92.7	0.15	-2.2
Closed	Surface	1.05	67.06	6.88	8.96	88.2	92.9	0.19	-4.6
Open	Deep Well	0.87	66.59	6.64	5.69	92.7	92.8	0	0
Open	Pit	1.73	66.71	6.64	6.53	91.4	92.9	0.86	-1.3
Closed	Pit	0.63	67.12	6.64	5.77	92.6	92.8	-0.24	-0.1
Open	Deep Well	0.83	66.11	7.30	5.44	93.1	92.0	0	0
Open	Bartow	1.21	66.66	7.30	6.40	91.7	92.3	0.38	-1.4
Closed	Bartow	1.06	66.77	7.30	8.78	88.1	92.5	0.23	-5.0

TABLE 18: Mine 2 Baseline Locked Cycle of Individual Waters

Test Type	Water Type	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
Open	Deep Well	0.20	70.47	4.94	10.57	94.3	88.0	0	0
Closed	Deep Well	0.20	70.53	4.94	17.65	89.7	88.4	0	-4.6
Open	Deep Well	0.41	70.46	4.68	10.53	94.3	87.9	0	0
Open	Process	0.95	71.07	4.68	30.03	79.1	90.7	0.54	-15.2
Closed	Process	0.20	70.86	4.68	11.41	93.9	88.6	-0.21	-0.4
Open	Deep Well	0.20	70.45	4.98	10.49	94.3	87.9	0	0
Open	Surface	0.63	70.85	4.98	11.02	94.4	87.7	0.43	0.1
Closed	Surface	0.20	70.68	4.98	11.60	93.7	87.9	0	-0.6
Open	Deep Well	0.31	70.50	4.86	10.72	94.2	88.2	0	0
Open	Pit	0.39	71.16	4.86	10.53	94.3	88.0	0.08	0.1
Closed	Pit	0.20	70.73	4.86	14.97	91.5	88.5	-0.11	-2.7
Open	Deep Well	0.20	70.46	4.96	10.53	94.3	87.9	0	0
Open	Bartow	0.65	70.70	4.96	8.92	95.5	87.7	0.45	1.2
Closed	Bartow	0.41	70.36	4.96	11.49	93.9	87.8	0.21	-0.4

TABLE 19: Mine 3 Baseline Locked Cycle of Individual Waters

Test Type	Water Type	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
Open	Deep Well	0.40	70.18	4.72	6.95	96.4	87.5	0	0
Closed	Deep Well	0.39	69.83	4.72	9.75	94.6	87.8	-0.01	-1.8
Open	Deep Well	0.38	70.04	4.84	6.68	96.5	87.1	0	0
Open	Process	0.63	69.78	4.84	7.51	95.0	87.2	0.25	-0.5
Closed	Process	0.60	69.99	4.84	10.88	93.9	87.6	0.22	-2.6
Open	Deep Well	0.38	70.04	4.84	6.68	96.5	87.1	0	0
Open	Surface	0.78	70.11	4.84	7.61	95.9	87.3	0.40	-0.6
Closed	Surface	0.59	70.09	4.84	9.79	94.6	87.4	0.21	-1.9
Open	Deep Well	0.54	70.49	4.04	9.05	95.1	89.5	0	0
Open	Pit	0.71	70.47	4.04	12.70	92.5	89.8	0.17	-2.6
Closed	Pit	0.39	70.55	4.04	14.27	91.5	89.9	0.32	-3.6
Open	Deep Well	0.40	70.16	4.74	6.91	96.4	87.5	0	0
Closed	Bartow	0.60	69.92	4.74	10.71	93.9	87.9	0.20	-2.5

TABLE 20: Mine 4 Baseline Locked Cycle of Individual Waters

Test Type	Water Type	Amine lb/TF	Concentrate %BPL	Concentrate %AI	Froth %BPL	Percent BPL Rec.	Percent AI Rej.	Difference Amine lb/TF	Difference %BPL Rec.
Open	Deep Well	0.75	70.96	4.86	19.10	93.4	80.6	0	0
Closed	Deep Well	0.80	70.77	4.86	24.10	91.1	81.1	0.05	-2.3
Open	Deep Well	0.81	71.57	4.22	21.37	92.2	83.6	0	0
Open	Process	1.16	71.32	4.22	28.25	87.7	84.4	0.35	-4.5
Closed	Process	0.81	71.25	4.22	22.22	91.8	83.6	0	-0.4
Open	Deep Well	0.82	71.63	4.16	21.58	92.1	83.8	0	0
Open	Surface		No comparison -- Turbid Water						
Closed	Surface	0.80	71.45	4.16	21.35	92.1	83.8	-0.02	0
Open	Deep Well	0.80	71.44	4.36	20.87	92.5	82.9	0	0
Open	Pit	1.64	70.09	4.36	22.46	91.0	83.7	0.84	-1.5
Closed	Pit	0.80	71.45	4.36	23.73	90.8	83.3	0	-1.7
Open	Deep Well	0.70	70.37	5.48	16.90	94.5	77.7	0	0
Closed	Bartow	0.81	70.40	5.48	17.94	94.5	77.7	0.11	0

4.35 Flotation Test Water Comparisons

Water analyses of mine waters before and after recycling (essentially the first and last stages) are presented in Tables 21 and 22 along with the corresponding flotation results. In general, the hardness and the suspended solids for a given water tended to increase during recycling, while the total dissolved solids and sulfate constituents tended to decrease. For the parameters studied, none were seen to directly influence either amine usage or BPL recovery by themselves. Suspended solids levels in the water, originally thought to cause problems above 100 ppm, were probably increased somewhat during closed circuit testing by recycling of both soft material fines (a negative) and amine reagent (a positive). Consequently, a direct correlation was difficult to ascertain.

4.36 Summary of Baseline Tests

In summary, two waters from Mine 1 (process water and pit water), two waters from Mine 2 (process water and surface water), and all three waters from Mine 4 proved to be excellent candidates for recycling. The BPL recoveries achieved with these waters in closed circuit were within 0.6% of those achieved in open circuit with deep well water, and for the most part, exceeded the BPL recoveries obtained in open circuit with corresponding waters. In addition, amine requirements for these waters were less than required in open circuit with deep well water. Recycling was not effective for Mine 3.

4.4 RECYCLING OF SUBSTITUTE WATERS

The remaining tests on the project were directed toward developing recycle systems using substitute mine waters for make up. As described previously, both "tight" (7% make up water) and "loose" (40% make up water) systems were evaluated. Testing was conducted on both the original samples (first sampling) and new, fresh samples (second sampling).

4.41 Original Samples at 93% Recycle

The objective of these series of tests was to eliminate the use of deep well water altogether by using process water for rinsing and either process water, surface water, or pit water for system make up. Process water for Mine 2 was used up prior to these tests and no more was available, so surface water was used in its place. Complete details of these tests are presented in Exhibit 2 of the Appendix, Tests 250-261. The results are summarized in Table 23 and are compared with corresponding open circuit deep well tests. The following statements were derived from analysis of Table 23.

1. Mine 1 amine feed responded very well to recycling of original substitute waters. BPL recoveries for the closed circuit tests were within 0.4% of those achieved with deep well water in open circuit. Amine usage for the closed circuit tests averaged 59% (0.52 lb/TF) of that required using deep well water (0.88 lb/TF).

2. Results for Mine 2 were very similar to those achieved for Mine 1. BPL recoveries for the closed circuit tests were all higher than those achieved with deep well water in open circuit; 0.9% higher on average. Amine usages for the closed circuit tests were similar to those for Mine 1; 62% (0.20 lb/TF) of that required when using deep well water.

3. Open circuit flotation using deep well water produced higher BPL recoveries (0.6% more) than an average of the closed circuit tests for Mine 3. These results substantiated those obtained previously for Mine 3. Again, amine reagent usage for the closed system tests was less; 54% of that required for deep well water.

4. Results for Mine 4 were similar to those achieved for Mine 3; reduced BPL recoveries (1.0% less) and reduced amine reagent usage (54%) for closed circuit testing as compared with open circuit testing in deep well water.

TABLE 21: Mines 1 & 2 Baseline Locked Cycle Water Comparisons

								Flotation Results	
	Water	Test	Chemical Analysis, PPM					Amine	%BPL
Mine	Type	Cycle	Hardness	TSS	TDS	SO_4	Ph	lb/TF	Rec.
1	Deep well	0	244	0	316	121	8.15	0.88	92.6
1	Deep well	14	266	54	300	98	7.54	0.63	91.9
1	Process	0	260	32	338	165	7.90	0.87	92.3
1	Process	10	249	76	320	114	7.50	0.63	92.6
1	Surface	0	108	5	126	ND	7.69	1.01	90.6
1	Surface	10	185	70	252	33	7.69	1.05	88.2
1	Pit	0	138	126	384	36	7.86	1.73	91.4
1	Pit	10	210	52	296	54	7.72	0.63	92.6
1	Bartow Eff.	0	339	ND	663	185	7.72	1.28	91.2
1	Bartow Eff.	10	337	66	608	138	7.69	1.06	92.5
2	Deep Well	0	153	0	240	126	7.91	0.20	94.3
2	Deep Well	16	196	26	224	96	7.13	0.20	89.7
2	Process	0	127	4	276	90	8.43	0.95	79.1
2	Process	8	147	44	228	67	7.26	0.20	93.9
2	Surface	0	105	2	182	43	7.91	0.63	94.4
2	Surface	8	130	42	148	46	7.18	0.20	93.7
2	Pit	0	64	5	247	26	7.61	0.39	94.3
2	Pit	10	110	16	136	26	7.27	0.20	91.5
2	Bartow Eff.	0	339	ND	663	185	7.72	0.20	94.3
2	Bartow Eff.	10	349	62	588	147	7.01	0.40	93.9

TABLE 22: Mines 3 & 4 Baseline Locked Cycle Water Comparisons

Mine	Water Type	Test Cycle	Chemical Analysis, PPM Hardness	TSS	TDS	SO_4	Ph	Flotation Results Amine lb/TF	%BPL Rec.
3	Deep well	0	266	0	321	4	8.21	0.40	96.4
3	Deep well	14	265	70	268	24	7.28	0.39	94.6
3	Process	0	270	ND	375	210	7.72	0.63	96.0
3	Process	10	263	76	348	144	7.20	0.60	93.9
3	Surface	0	307	4	560	233	7.68	0.78	95.9
3	Surface	10	333	64	428	188	6.96	0.59	94.6
3	Pit	0	74	8	76	ND	7.77	0.71	92.5
3	Pit	13	142	78	132	14	7.18	0.39	91.5
3	Bartow Eff.	0	339	ND	663	185	7.72	----	----
3	Bartow Eff.	10	348	82	632	146	7.17	0.60	93.9
4	Deep Well	0	221	ND	334	96	7.99	0.75	93.4
4	Deep Well	14	241	130	308	94	6.97	0.80	91.1
4	Process	0	292	ND	393	192	7.76	1.16	87.7
4	Process	8	281	66	328	148	6.99	0.81	91.8
4	Surface	0	68	338	353	ND	6.40	----	----
4	Surface	11	179	110	212	59	6.89	0.80	92.1
4	Pit	0	89	138	246	26	7.66	1.64	91.0
4	Pit	10	177	138	188	51	6.89	0.80	90.8
4	Bartow Eff.	0	339	ND	663	185	7.72	----	----
4	Bartow Eff.	8	379	34	608	162	7.13	0.80	94.5

TABLE 23: 93% Recycling of Substitute Waters - Original Samples

				Concentrate				Percent		Δ	
Mine	Test Type	Water Type[1]	Amine lb/TF	% Wt	% BPL	% AI	Froth % BPL	BPL Rec	AI Rej	Amine %	% BPL Rec
1	Open	Deep Well	0.88	51.84	67.62	6.0	5.34	93.1	93.5	----	----
1	Closed	Process/Process	0.55	51.81	67.25	6.0	5.27	93.2	93.5	62.5	0.1
1	Closed	Process/Surface	0.58	51.53	67.52	6.0	5.66	92.7	93.6	65.9	-0.4
1	Closed	Process/Pit	0.44	52.10	67.22	6.0	5.18	93.4	93.5	50.0	0.3
Av.	Closed		(0.52)	(51.81)	(67.33)	(6.0)	(5.37)	(93.1)	(93.5)	(59.1)	(0.0)
2	Open	Deep Well	0.42	72.30	71.91	4.0	9.22	95.3	90.1	----	----
2	Closed	Surface/Surface	0.27	72.77	71.91	4.0	7.36	96.2	90.0	64.3	0.9
2	Closed	Surface/Pit	0.24	73.00	71.64	4.0	7.83	96.1	90.0	57.1	0.8
2	Closed	Surface/Bartow	0.27	72.58	71.92	4.0	7.04	96.4	90.0	64.3	1.1
Av.	Closed		(0.26)	(72.78)	(71.82)	(4.0)	(7.41)	(96.2)	(90.0)	(61.9)	(0.9)
3	Open	Deep Well	0.45	72.07	70.61	4.0	5.84	96.9	89.5	----	----
3	Closed	Process/Process	0.25	71.69	70.79	4.0	6.37	96.6	89.5	55.6	-0.3
3	Closed	Process/Surface	0.23	71.72	70.90	4.0	6.77	96.4	89.5	51.1	-0.5
3	Closed	Process/Pit	0.25	71.51	70.73	4.0	7.38	96.0	89.5	55.6	-0.9
Av.	Closed		(0.24)	(71.64)	(70.81)	(4.0)	(6.84)	(96.3)	(89.5)	(54.1)	(-0.6)
4	Open	Deep Well	0.61	79.72	72.41	3.52	15.45	94.9	86.0	----	----
4	Closed	Process/Process	0.41	79.36	72.64	4.0	18.40	93.8	84.1	67.2	-1.1
4	Closed	Process/Surface	0.41	81.69	71.45	5.54	17.20	94.9	77.4	No Comparison	
4	Closed	Process/Pit	0.41	80.01	72.47	4.0	18.80	93.9	84.0	67.2	-1.0
Av.	Closed		(0.41)	(80.35)	(72.19)	(4.51)	(18.13)	(94.2)	(81.3)	(67.2)	(-1.0)

[1] The 2nd listed water represents the 6.8% make-up portion of the recycle loop.

4.42 Analysis of Recycle Waters

Water analyses of mine waters before and after recycling are presented in Table 24 for informative purposes only.

4.43 New Samples

The final phase of testing on recycling of substitute waters was conducted on new samples from the mines. Fresh amine feed and water samples were obtained from Mines 1, 3, and 4 (Mine 2 was shut down at the time) and fresh effluent was obtained from the Bartow Sewage Treatment Plant. The samples were prepared for testing in the manner previously described. Analyses are presented in Exhibit 1 of the Appendix and summarized in Tables 1 and 6.

4.431 Tight Loop (93% Recycle).

The tight loop, 7% make up water, test series was conducted using process water as the base for each of the three mines. Deep well water, process water, surface water, pit water, and Bartow Sewage Treatment Plant effluent were all used as substitute waters. Rinsing was conducted in process water with the exception of one test; a closed circuit deep well water test conducted for comparative purposes. Complete details of all tests are presented in Exhibit 2 of the Appendix, Tests 271-297. The results are summarized in Table 25.

The following statements were derived from analysis of Table 25.

1. Both Mine 1 and Mine 4 amine feeds responded well to all substitute recycle waters in the tight, 7% make up water, recycle system. The average BPL recovery for the 5 substitute waters was only 0.2% less than the open circuit deep well water comparison for Mine 1 and was equal to the open circuit deep well water comparison for Mine 4. Amine reagent usages for the Mine 1 and Mine 4 closed circuit tests were 54 and 78% respectively of those required for open circuit deep well water testing.

2. The average BPL recovery for the 5 closed circuit substitute water tests on Mine 3 was 1.6% less than the open circuit deep well water comparison. Individual waters ranged from 1.1 to 2.6% less. The BPL recovery for the closed circuit deep well water comparison was 3.9% less than the open circuit test. This difference suggests that something other than the effects of the substitute waters was responsible for the reduced closed circuit BPL recoveries associated with the Mine 3. The type of amine, different from the other 3 mines, and the nature of the amine feed are possible explanations.

4.432 Loose Loop (60% Recycle Loop).

The loose loop, 40% make up water, test series was conducted using deep well water, process water, surface water, pit water, and Bartow Sewage Treatment Plant effluent substitute waters from the three mines. For this system, both rinsing and flotation were conducted in the recycle water. Complete details of all tests are presented in Exhibit 2 of the Appendix, Tests 271-279 and 298-315. The results are summarized in Table 26.

TABLE 24: Analysis of Recycle Waters

Mine	Water Type	Test Cycle	Water Chemical Analysis, PPM: Hardness	TSS	TDS	SO_4	Test Results: Ph	Amine lb/TF	Conc. % AI	%BPL Rec.
1	Deep Well	0	244	0	316	121	8.15	0.88	6	93.1
	Process/Process	14	258	152	383	106	6.87	0.55	6	93.2
	Process/Surface	14	214	76	371	65	7.34	0.58	6	92.7
	Process/Pit	12	238	78	351	75	7.43	0.44	6	93.4
	Av. Process		(237)	(102)	(368)	(82)	(7.21)	(0.52)	(6)	(93.1)
2	Deep Well	0	153	0	240	126	7.91	0.42	4	95.3
	Surface/Surface	14	137	24	190	32	7.13	0.27	4	96.2
	Surface/Pit	12	121	98	179	29	7.06	0.24	4	96.1
	Surface/Bartow	12	215	92	435	66	7.32	0.27	4	96.4
	Av. Surface		(158)	(71)	(268)	(42)	(7.17)	(0.26)	(4)	(96.2)
3	Deep Well	0	266	0	321	4	8.21	0.45	4	96.9
	Process/Process	12	258	74	352	148	7.32	0.25	4	96.6
	Process/Surface	12	291	96	374	36	7.24	0.23	4	96.4
	Process/Pit	12	184	30	249	59	7.30	0.25	4	96.0
	Av. Process		(244)	(67)	(325)	(81)	(7.29)	(0.24)	(4)	(96.3)
4	Deep Well	0	221	0	334	96	7.99	0.61	3.5	94.9
	Process/Process	12	270	136	330	130	7.22	0.41	4	93.8
	Process/Surface	10	219	158	281	86	7.23	0.41	5.5	94.9
	Process/Pit	10	238	142	296	95	7.26	0.41	4	93.9
	Av. Process		(242)	(145)	(302)	(104)	(7.24)	(0.41)	(4.5)	(94.2)

TABLE 25: 93% Recycling of Substitute Waters - Second Samples

Mine	Test Type	Water Type[1]	Amine lb/TF	Concentrate % Wt	Concentrate % BPL	Concentrate % AI	Froth % BPL	Percent BPL Rec	Percent AI Rej	Δ Amine %	Δ % BPL Rec
1	Open	Deep Well	1.05	69.47	69.47	5	6.76	95.9	89.5	--	--
1	Closed	Deep Well/Deep Well	0.59	69.42	69.57	5	7.22	95.6	89.5	56.2	-0.3
1	Closed	Process/Deep Well	0.54	68.75	69.38	5	6.60	95.8	89.5	51.4	-0.1
1	Closed	Process/Process	0.54	68.95	69.44	5	7.06	95.6	89.5	51.4	-0.3
1	Closed	Process/Surface	0.57	68.96	69.32	5	7.01	95.6	89.5	54.3	-0.3
1	Closed	Process/Pit	0.58	68.51	69.30	5	7.28	95.4	89.6	55.2	-0.5
1	Closed	Process/Bartow	0.59	69.45	69.29	5	6.47	96.1	89.5	56.2	0.2
	Av. 3-7		(0.56)	(68.92)	(69.35)	(5)	(6.88)	(95.7)	(89.5)	(53.7)	(-0.2)
3	Open	Deep Well	0.37	76.22	71.41	3.5	7.71	96.8	90.6	--	--
3	Closed	Deep Well/Deep Well	0.36	72.40	71.95	3.5	14.24	92.9	91.1	97.3	-3.9
3	Closed	Process/Deep Well	0.39	72.79	71.32	3.5	11.84	94.2	91.1	105.4	-2.6
3	Closed	Process/Process	0.34	74.00	71.27	3.5	9.32	95.6	90.9	91.9	-1.2
3	Closed	Process/Surface	0.34	74.36	71.42	3.5	10.89	95.0	90.9	91.9	-1.8
3	Closed	Process/Pit	0.31	74.12	71.18	3.5	9.43	95.6	90.9	83.8	-1.2
3	Closed	Process/Bartow	0.41	74.11	71.17	4	9.13	95.7	89.6	110.8	-1.1
	Av 3-7		(0.36)	(73.88)	(71.27)	(3.6)	(10.12)	(95.2)	(90.7)	(97.3)	(-1.6)
4	Open	Deep Well	0.40	91.23	72.58	2.7	15.31	98.0	74.6	--	--
4	Closed	Deep Well/Deep Well	0.30	90.56	72.71	2.7	16.21	97.7	74.7	75.0	-0.3
4	Closed	Process/Deep Well	0.31	90.59	72.74	2.7	15.41	97.9	74.7	77.5	-0.1
4	Closed	Process/Process	0.31	91.19	72.37	2.7	14.10	98.2	74.6	77.5	0.2
4	Closed	Process/Surface	0.33	90.49	72.74	2.7	15.46	97.8	74.8	82.5	-0.2
4	Closed	Process/Pit	0.31	91.26	72.91	2.7	11.97	98.4	74.9	77.5	0.4
4	Closed	Process/Bartow	0.31	90.97	72.54	2.7	15.43	97.9	74.6	77.5	-0.1
	Av 3-7		(0.31)	(90.90)	(72.66)	(2.7)	(14.47)	(98.0)	(74.7)	(77.5)	(0.0)

[1] The 2nd listed water represents the 6.8% make-up portion of the recycle loop.

The following statements were derived from analysis of Table 26.

1. With the exception of the Bartow Sewage Treatment Plant effluent for Mine 1 and pit water from Mine 1 (poor results due to incorrect amine reagent addition decision during testing), all substitute waters produced acceptable results. The average BPL recoveries for the closed circuit tests on a given mine were within 0.2% (Mine 3) or exceeded (0.5% for Mine 1 and 1.7% for Mine 4) those obtained in open circuit with deep well water.

2. Amine reagent usages for the closed circuit tests on the three mines ranged from 58 to 92% of those required in open circuit with deep well water.

4.44 Summary of Substitute Recycle Waters

In summary, Mine 1, 2, and 4 amine feeds responded well to closed circuit recycling of substitute waters in a 7% make up water system.

- Mine 1 - Average BPL recoveries were within 0.2% of those obtained with deep well water in open circuit for both sets of samples.

- Mine 2 - Average BPL recoveries were 0.9% higher than those obtained with deep well water in open circuit.

- Mine 4 - Average BPL recoveries for the second set of samples were equal to those obtained in open circuit with deep well water.

- Amine reagent usages for Mine 1, 2, and 4 ranged from 54-77% of those required with deep well water in open circuit.

All amine feeds tested (Mine 1, 3, and 4) responded well to closed circuit recycling of substitute waters in a 40% make up water system.

TABLE 26: 60% Recycling of Substitute Waters - Second Samples

				Concentrate				Percent		Δ	
Mine	Test Type	Water Type[1]	Amine lb/TF	% Wt	% BPL	% AI	Froth % BPL	BPL Rec	AI Rej	Amine %	% BPL Rec
1	Open	Deep Well	1.05	69.47	69.47	5	6.76	95.9	89.5	--	--
1	Closed	Recycle/Deep Well	0.68	69.27	68.49	5	5.46	96.9	89.6	64.8	1.0
1	Closed	Recycle/Process	0.69	68.96	68.32	5	5.62	97.0	89.6	65.7	1.1
1	Closed	Recycle/Surface	0.59	69.04	68.27	5	5.51	96.5	89.5	58.5	0.6
1	Closed	Recycle/Pit	0.39	72.16	67.12	7.5	4.81	97.3	83.6	Not Comparable	
1	Closed	Recycle/Bartow Eff.	0.98	67.04	68.00	5	8.71	94.5	90.3	93.0	-1.4
	Av. Recycle		(0.67)	(69.29)	(68.04)	(5.5)	(6.02)	(96.4)	(88.5)	(63.8)	(0.5)
3	Open	Deep Well	0.62	74.44	71.91	3	10.17	95.4	92.2	--	--
3	Closed	Recycle/Deep Well	0.49	72.65	71.30	3	11.25	94.4	92.4	79.0	-1.0
3	Closed	Recycle/Process	0.57	73.59	71.49	3	10.15	95.2	92.3	91.9	-0.2
3	Closed	Recycle/Surface	0.64	73.02	71.05	3	10.46	94.9	92.3	103.2	-0.5
3	Closed	Recycle/Pit	0.63	73.07	71.47	3	8.41	95.9	92.4	101.6	0.5
3	Closed	Recycle/Bartow Eff.	0.53	73.83	71.66	3	9.76	95.4	92.2	85.5	0.0
	Av Recycle		(0.57)	(73.23)	(71.39)	(3.0)	(10.01)	(95.2)	(92.3)	(91.9)	(-0.2)
4	Open	Deep Well	0.64	89.45	72.69	2.5	22.09	96.5	76.9	--	--
4	Closed	Recycle/Deep Well	0.30	91.38	72.46	2.5	13.52	98.3	76.4	46.9	1.8
4	Closed	Recycle/Process	0.36	91.20	72.71	2.5	13.16	98.3	76.4	56.3	1.8
4	Closed	Recycle/Surface	0.47	90.74	71.83	2.5	14.32	98.0	77.0	73.4	1.5
4	Closed	Recycle/Pit	0.36	91.12	72.71	2.5	14.26	98.1	76.5	56.3	1.6
4	Closed	Recycle/Bartow Eff.	0.36	91.31	72.60	2.5	13.75	98.2	76.4	56.3	1.7
	Av Recycle		(0.37)	(91.15)	(72.46)	(2.5)	(13.80)	(98.2)	(76.5)	(57.8)	(1.7)

[1] The 2nd listed water represents the 40% make-up portion of the recycle loop.

5.0 ESTIMATE OF SYSTEM POTENTIAL

The remainder of the report is directed toward assessing the potential of closed circuit recycling of substitute waters as an alternate to using deep well water for amine flotation. Projected potential deep well water savings, system implementation costs, and estimated differential operating costs will be addressed.

5.1 SOURCE OF DATA

Data for estimates of the system potential were derived from two sources;

- Actual rock production, deep well pumping, and property discharge numbers were obtained from each of the four participating mines.

- Estimates of deep well water savings and differential operating costs were derived from data generated in the laboratory.

5.2 ACTUAL PRODUCTION AND DEEP WELL USAGE

Actual rock production, deep well pumping, property discharge and other data were obtained from each of the four mines for the period 1989-1993. These data are presented in Table 27 along with computed deep well usage (gal per ton of product) for each mine. As seen in Table 27, the data, especially deep well pumping, property discharge, and deep well usage, varied widely from mine to mine and within a given mine. Explanation of these variations was outside the scope of the project. However, the following comments are worth mentioning.

1. Mine 1 was very consistent with this use of water over the five year period. The average deep well usage of 754 gal per ton of concentrate was well below the industry average and is indicative of the fact that aquifer water was not used for the final stage of rinsing in the plant.

2. Mine 2 was the most prudent user of aquifer water as evidenced by its usage of 74 gal per ton of concentrate; undoubtedly the lowest in the industry for this time period.

3. Mine 3 exhibited the most variable data for all the mines. As a consequence, only the last two years were used to compute deep well consumption; 681 gal per ton of concentrate.

4. Mine 4 used aquifer water at a rate of 6052 gal per ton of concentrate which was an order of magnitude higher than Mine 1 and 3 and two orders higher than Mine 2.

5.3 PROJECTED POTENTIAL DEEP WELL SAVINGS

Since the water balance for a given mine is influenced by time, it is considered to exhibit dynamic characteristics. As such, other factors also arise which influence deep well pumping requirements on a short term basis:

- Seasonal variations - wet and dry seasons
- Time of reclamation
- Type of reclamation - clay versus sand/clay mix

Control of these dynamic factors is primarily related to the ability of a mine to hold or "retain" water for future reuse (system holding capacity) and to the ability of the operation to effectively manage its water system. The projected deep well savings projections in this report are based on the assumption that these dynamic factors are controlled and will not influence deep well pumping.

TABLE 27: Actual Production and Aquifer Usage Data

Mine	Quantity (MGD) Deep Well	Prop. Disch.	Production MM Tons Total	Conc.	Deep Well Usage Gal/ton Prod. Total	Conc.	Oper.Hr.	Flotation Plant Conc TPH	DW GPM
Mine 1									
1989	2.162	1.10	2.978	0.795	265	993	7870	101	1671
1990	1.930	1.02	2.758	0.949	255	742	7537	126	1558
1991	2.039	4.40	2.715	1.171	274	636	7562	155	1640
1992	1.746	2.77	3.190	1.048	200	608	7286	144	1458
1993	1.619	7.57	1.751	0.634	337	932	5624	113	1751
(Av)	(1.899)	(3.37)	(2.678)	(0.919)	(259)	(754)	(7176)	(128)	(1610)
Mine 2									
1989	0.03	2.64	0.548	0.267	20	41	1767	151	103
1990	0.04	1.11	0.548	0.214	27	68	1830	117	133
1991	0.06	0	0.513	0.205	43	107	1929	106	189
1992	0.05	2.79	0.481	0.197	38	93	2048	96	149
1993	0.02	2.13	0.282	0.103	26	71	1012	102	120
(Av)	(0.04)	(1.73)	(0.474)	(0.197)	(31)	(74)	(1717)	(115)	(142)
Mine 3									
1989	11.98	3.925	NA	1.681	NA	2601	2634	638	27,668
1990	11.95	10.283	NA	1.065	NA	4096	1711	622	42,487
1991	8.51	51.325	NA	1.422	NA	2184	2489	571	20,799
1992	5.10	31.666	NA	2.507	NA	743	4575	548	6781
1993	3.55	23.866	NA	2.137	NA	606	4575	467	4720
(Av 92-93)	(4.33)	(27.766)	NA	(2.322)		(681)	(4575)	(508)	(5758)
Mine 4									
1989	9.70	NA	1.455	0.487	2433	7270	NA	--	--
1990	8.20	NA	1.433	0.483	2089	6197	4799	101	10,395
1991	9.00	15.34	1.755	0.569	1872	5773	5088	112	10,761
1992	8.30	13.88	1.317	0.475	2300	6378	3821	124	13,214
1993	6.50	8.41	1.247	0.502	1903	4726	3646	138	10,845
(Av)	(8.34)	(12.54)	(1.441)	(0.503)	(2112)	(6052)	(4339)	(119)	(11,304)

The projected potential aquifer water savings for the four mines are presented in Table 28. This table was prepared by applying the deep well usage factors (gal deep well water per ton of concentrate) derived in the laboratory for each mine and each recycle system to the yearly concentrate production in order to calculate an estimated deep well water consumption. The estimated deep well consumption was subtracted from the amount of aquifer water available, or actually pumped, to compute the potential deep well savings for each of three cases. Potential savings averaged 2.3 MGD per mine for the 60% recycle system, 3.52 MGD per mine for the 95% recycle system, and 3.65 MGD per mine if only substitute waters were recycled.

5.4 ESTIMATED SYSTEM IMPLEMENTATION COSTS

Estimates of the capital costs required to implement both tight-loop (7% make up water) and loose-loop (40% make up water) recycle systems were derived from the base case water balances (refer to Figure 7, Proposed Amine Water Recycle Systems), the deep well water usage factors developed in the laboratory, and assumed levels of production. The flowsheets used to estimate the capital costs for the tight (closed) recycle loop and the loose (open) recycle loop are presented in Figures 8 and 9 respectively. Other assumptions and capital cost criteria are presented following.

- Concentrate production - 982,800 tpy based on the average of the four mines
- Concentrate weight % - 70% of amine feed (the four-mine average was 73%)
- Operating time - 7800 hours per year
- Amine recycle pond retention time - five days
- Amine recycle pond size - 4.2 acres and 10 ft deep (68,400 yd^3) for the tight loop configuration and 6.4 acres and 10 ft deep (103,000 yd^3) for the loose loop configuration
- Amine recycle pond location - 2640 ft from plant
- Misc piping - 300 ft for the tight loop and 500 ft for the open loop

Capital cost estimates for both systems are presented in Table 29. It was estimated that $221,500 would be required to implement the 93% recycle system (tight loop) and $261,100 would be required to implement the 60% recycle system (loose loop).

5.5 ESTIMATED DIFFERENTIAL OPERATING COSTS

The following assumptions were used to estimate the differential operating costs associated with the two amine recycle systems.

- Base case deep well consumption - used 750 gal per ton of concentrate rather than 1370 gal per ton as shown in Figure 6 to be conservative; similar to Mine 1 usage
- Base case amine usage - 0.7 lb/TF, average for all laboratory tests
- Amine usage reduction - 30%, or 0.21 lb/TF which was the average for all mines
- Unit costs - $0.045 per KWH for power
- $0.30 per lb for amine

Differential operating cost estimates for both systems are presented in Table 30. It was estimated that $87,500 per year would be saved with the tight loop (93% recycle) system and $65,800 per year would be saved with the loose loop (60% recycle) system.

5.6 SUMMARY OF SYSTEM POTENTIAL

A summary of the economics associated with recycling of substitute waters is presented in Table 31 for both the open loop (60% recycle) and closed loop (93% recycle) systems. The payback was 4.0 years and the ROI was 7% for the open loop system, while the payback was 2.5 years and the ROI was 26% for the closed loop system. In summary, the concept of recycling substitute waters for amine flotation is a potentially viable method for reducing present aquifer water usage.

TABLE 28: Projected Potential Aquifer Water Savings

	Est. Deep Well Usage (gal/ton)				Estimated D.W. Consumed (MGD)		D.W. Avail	Potential Deep Well Savings in MGD Using Recycle		
	@60% Recycle		@93% Recycle							
Mine	Total	Conc	Total	Conc	60%	93%	MGD	@60%	@93%	@100%
Mine 1										
1989	156	585	15	55	1.274	0.120	1.100	0	0.980	1.100
1990	201	585	19	55	1.521	0.143	1.020	0	0.877	1.020
1991	252	585	24	55	1.877	0.176	2.039	0.162	1.863	2.039
1992	192	585	18	55	1.680	0.158	1.746	0.066	1.588	1.746
1993	212	585	20	55	1.016	0.096	1.619	0.603	1.523	1.619
(Av)	(201)	(585)	(19)	(55)	(1.473)	(0.138)	(1.505)	(0.032)	(1.367)	(1.505)
Mine 2										
1989	237	486	22	45	0.356	0.033	0.03	0	0	0.03
1990	190	486	18	45	0.285	0.026	0.04	0	0.014	0.04
1991	194	486	18	45	0.273	0.025	0.06	0	0.035	0.06
1992	199	486	18	45	0.262	0.024	0.05	0	0.026	0.05
1993	178	486	16	45	0.137	0.013	0.02	0	0.007	0.02
(Av.)	(202)	(486)	(19)	(45)	(0.262)	(0.024)	(0.04)	(0)	(0.016)	(0.04)
Mine 3										
1989	489	489	46	46	2.252	0.211	3.925	1.673	3.714	3.925
1990	489	489	46	46	1.426	0.134	10.283	8.857	10.149	10.283
1991	489	489	46	46	1.905	0.179	8.510	6.605	8.331	8.510
1992	489	489	46	46	3.359	0.316	5.100	1.741	4.784	5.100
1993	489	489	46	46	2.863	0.269	3.550	0.687	3.281	3.550
(Av.)	(489)	(489)	(46)	(46)	(3.110)	(0.293)	(4.325)	(1.215)	(4.032)	(4.325)
Mine 4										
1989	138	413	13	38	0.551	0.051	9.70	9.149	9.649	9.700
1990	139	413	13	38	0.547	0.050	8.20	7.653	8.150	8.200
1991	134	413	12	38	0.643	0.059	9.00	8.357	8.941	9.000
1992	149	413	14	38	0.537	0.049	8.30	7.763	8.251	8.300
1993	166	413	15	38	0.568	0.052	6.50	5.932	6.448	6.500
(Av.)	(144)	(413)	(13)	(38)	(0.569)	(0.052)	(8.34)	(7.771)	(8.288)	(8.340)

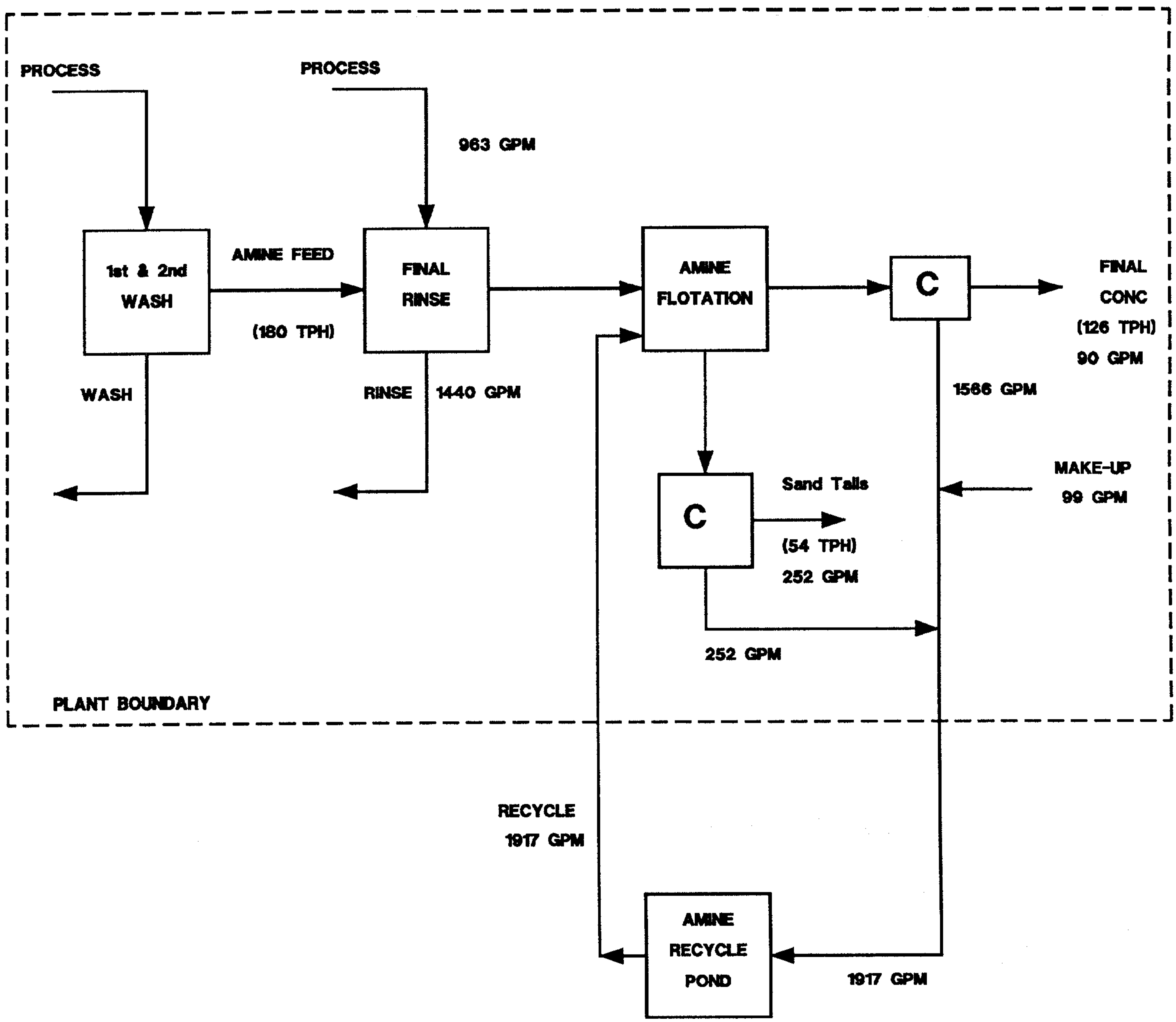


Figure 8. Closed Recycle Loop Flowsheet

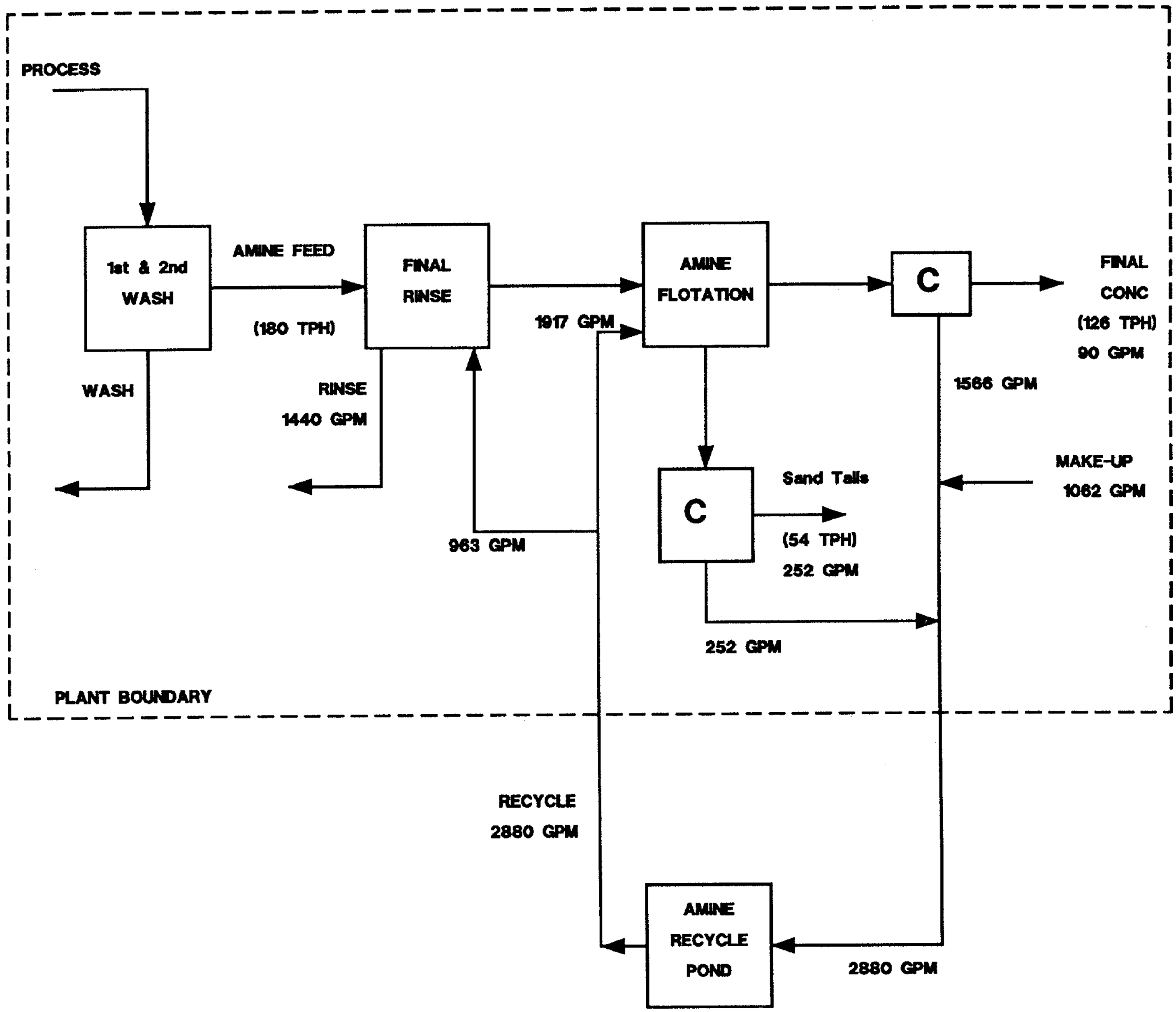


Figure 9. Open Recycle Loop Flowsheet

TABLE 29. Capital Costs for 60% and 93% Recycle Systems

Cost Element	Costs, 1994 $ 60% Recycle Loop	Costs, 1994 $ 93% Recycle Loop
Recycle water pipe to and from pond - installed	58,100	58,100
Return pump - installed at pond	87,500	87,500
Pond Construction	103,000	68,400
Misc piping changes at plant - installed	12,500	7,500
Total	261,100	221,500

TABLE 30. Operating Costs for 60% and 93% Recycle Systems

Cost Element	Costs, 1994 $	
	60% Recycle Loop	93% Recycle Loop
Savings:		
Deep Well Water Pumping	6,600	18,800
Amine Reagent Savings	117,900	117,900
Subtotal Savings	124,500	136,700
Additional Costs:		
Pumping from Amine Pond	46,700	31,300
Additional Maintenance	12,000	17,900
Subtotal Additional Costs	58,700	49,200
Net Savings	**65,800**	**87,500**

TABLE 31. Economics for Recycling of Substitute Waters

Open Recycle Loop

Payback =	261,100	Capital Cost
	65,800	Annual Operating Cost Savings
	4.0	Years Payback

Closed Recycle Loop

Payback =	221,500	Capital Cost
	87,500	Annual Operating Cost Savings
	2.5	Years Payback

Open Recycle Loop
5 Year Operation Cash Flow

Year	1	2	3	4	5
Capital Cost	261,100	0	0	00	
Annual Savings	65,800	65,800	65,800	65,80065,800	
Tax Depreciation	52,220	52,220	52,220	52,22052,200	
Taxable Income	13,580	13,580	13,580	13,58013,580	
Income Taxes @ 48%	6,518	6,518	6,518	6,5186,518	
After Tax Income	-201,818	59,282	59,282	59,28259,282	
ROI	7%				

Closed Recycle Loop
5 Year Operation Cash Flow

Year	1	2	3	4	5
Capital Cost	221,500	0	0	00	
Annual Savings	87,500	87,500	87,500	87,50087,500	
Tax Depreciation	44,300	44,300	44,300	44,30044,300	
Taxable Income	43,200	43,200	43,200	43,20043,200	
Income Taxes @ 48%	20,736	20,736	20,736	20,73620,736	
After Tax Income	-154,736	66,764	66,764	66,76466,764	
ROI	26%				

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Laboratory flotation studies on water and amine feed samples from four phosphate mines demonstrated the potential viability of using substitute water sources (process water, surface water, pit water, and Bartow Sewage Treatment Plant effluent) within the framework of two types of water recycle systems to reduce the amount of aquifer water presently required for amine flotation. Estimates of potential aquifer water reductions based on four-mine averages ranged from 2.3 to 3.5 MGD per mine for 60 and 93% recycle systems. Estimates of capital required to implement an amine water recycle system ranged from approximately $220,000 - $260,000, and coupled with potential savings from reduced deep well pumping and amine reagent usage, indicated a payback of 2.5-4 years with an ROI of 7-26% depending upon the type of recycle system.

Some of the potential advantages for implementing an amine water recycle system are presented following.

- Isolation - A separate amine flotation water recycle system isolates this circuit from the variability of the overall mine water balance i.e.: seasonal water variations or make up water required for clays. As a consequence, amine flotation will not be affected.

- Substitute waters - A number of available alternate sources can be used for system make up i.e.; whatever is available.

- New mines - This system has potential during the start up of new mines since recycling can begin immediately.

- Water management - Provides a tool for the overall management of water since aquifer water is not required for amine flotation.

6.2 RECOMMENDATIONS

The potential viability of utilizing substitute water sources within the framework of an amine recycle water system to replace deep well water requirements for amine flotation was demonstrated during the project. The potential benefits in terms of aquifer water reductions are substantial and more extensive studies are warranted. The following items are presented as areas that require further study before implementation of a plant scale system can be realized.

- Fundamental scientific aspects - studies to identify and quantify water characteristics on flotation response

- Water variability - tests to determine the range of variation for various mine waters

- Optimization studies - evaluation of various amines, modifiers, pond retention times, etc.

- Confirmation testing - additional water and amine feed samples

- Fatty acid circuit testing - recycle studies on rougher flotation to isolate this system from the overall mine water balance

- Benefit/risk economic analyses

- Pilot plant or plant scale confirmation

7.0 REFERENCES

1. Palmer, T., Feb. 16, 1993. "Polk Tops in Turning on the Tap", The Ledger, p. 7A

2. Florida Phosphate Council, "Water, One Industry's View", circa 1980

3. Hazen and Sawyer, Aug. 1994. "Economic Impact Statement". SWFWMD Project No. P2Cl

4. Zellars-Williams, Inc., 1982. "Phosphate Water Use". Final Report for Alafia, Manasota, and Peace River Basin Boards, SWFWMD, 51p.

ALTERNATE SOURCES AND USES OF WATER
FOR AMINE FLOTATION
FIPR Project No. 93-02-095R

APPENDIX

EXHIBIT 1 - SAMPLE DESCRIPTION AND PREPARATION

EXHIBIT 2 - FLOTATION TESTS

By

Edmund P. Finch
Principal Investigator

October 1994

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

Listing of Samples:

Solids Samples			Water Samples		
Sample No.	**Mine**	**Description**	**Sample No.**	**Mine**	**Description**
1	1	Amine Feed	5	1	Deep well
2	2	Amine Feed	6	1	Process water
3	3	Amine Feed	7	1	Surface water
4	4	Amine Feed	8	1	Pit water
			9	2	Deep well
23	1	Sand	10	2	Process water
24	1	Overburden	11	2	Surface water
25	2	Sand	12	2	Pit water
26	2	Overburden	13	3	Deep well
27	3	Sand	14	3	Process water
28	3	Overburden	15	3	Surface water
29	4	Sand	16	3	Pit water
30	4	Overburden	17	4	Deep well
			18	4	Process water
			19	4	Surface water
			20	4	Pit water
			21	--	Deionized
			22	--	Bartow sewage plant

METHOD OF PREPARATION

Solids Samples: Each of the solids samples were brought to the laboratory after being obtained from either the mine or the plant. The samples were weighed and divided into fourths by mixing four times with alternate sequences of chopping and coning and quartering. A l000-gram portion was taken from each of the quarters and mixed by hand; 1000 grams were dried in a gas oven and weighed (moisture). The dried sample was split in half with a Jones splitter; one half was subjected to a screen analysis using 28 through 150 mesh screens, while the other half was pulverized to 65 mesh with a Bico pulverizer and submitted for chemical analysis.

Water Samples: Each of the water samples were stored in 40-gallon plastic drums after being obtained from either the mine or the plant. Samples for chemical analysis were obtained from each drum after stirring for 3 minutes with a canoe paddle; one gallon was taken from each drum for analysis. The remainder of each sample was stored covered in its respective drum.

INDIVIDUAL SAMPLE RESULTS

Summarized in Tables 1 and 2 and presented individually on the following pages.

TABLE 1

PROJECT AMINE FEED ANALYSES

Mine	Sample Period	Chemical Analysis, % BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist %	Weight %+35m
1	1st	35.70	48.13	24.86	0.83	0.59	0.37	17.55	4.08
	2nd	48.24	33.00	32.50	1.00	0.74	0.45	19.00	18.03
2	1st	52.29	29.20	34.91	0.81	0.99	0.32	18.07	15.05
3	1st	52.77	27.38	35.30	1.05	1.08	0.37	17.77	5.97
	2nd	52.33	28.48	34.31	0.93	0.97	0.35	17.78	7.47
4	1st	59.56	20.00	39.20	1.13	1.14	0.35	19.04	2.95
	2nd	66.73	9.68	44.16	1.08	0.80	0.41	16.56	16.77

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 1

Designation:	Mine 1 Amine Feed
Date Obtained:	12 November 1993 and 4 January 1994
Location Obtained:	Amine Feed Screw Classifier Discharge
Sample Weight:	231 lb. (wet) 1st sampling 265 lb. (wet) 2nd sampling
Sample Description:	Fine-grained, black in color
Method of Preparation:	As written

Sample Analysis:

Chemical Analysis %

Sample	BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist
1 - 1st	35.70	48.13	24.86	0.83	0.59	0.37	17.55
1 - 2nd	48.24	33.00	32.50	1.00	0.74	0.45	19.00

SAMPLE NO. 1 (continued)

SAMPLE: 405 g Sample 1 - 1st sampling

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	**Direct**	**Cum. Ret.**	**BPL**	**Insol.**	**BPL**	**Insol**
Head (Assay)	----		35.70	48.13	----	----
Head (Calc)	100.00		(36.97)	(47.04)	100.0	100.0
+28	1.46	1.46	69.26	4.60	2.74	0.14
28x35	2.62	4.08	67.04	6.65	4.75	0.37
35x48	6.66	10.74	65.55	8.89	11.81	1.26
48x65	11.55	22.29	57.57	19.05	17.98	4.68
65x100	40.18	62.47	35.86	48.13	38.96	41.12
100x150	28.40	90.87	22.48	66.80	17.27	40.33
-150	9.13		26.26	62.35	6.49	12.10
+35 (Calc)	4.08	4.08	67.83	5.92	7.49	0.51
-35 (Calc)	95.92	----	35.66	48.79	92.51	99.49

REMARKS: None

SAMPLE NO. 1 (continued)

SAMPLE: 405 g Sample 1 - 2nd Sampling

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	**Direct**	**Cum. Ret.**	**BPL**	**Insol.**	**BPL**	**Insol**
Head (Assay)	----		48.24	33.00	----	----
Head (Calc)	100.00		(48.83)	(32.07)	100.0	100.0
+28	5.91	5.91	62.40	12.84	7.55	2.37
28x35	12.12	18.03	63.51	12.98	15.77	4.91
35x48	22.01	40.04	56.98	21.58	25.69	14.81
48x65	24.10	64.14	49.68	30.92	24.52	23.23
65x100	20.11	84.25	41.27	41.44	17.00	25.98
100x150	12.18	96.43	30.11	57.56	7.51	21.86
-150	3.57		26.92	61.46	1.96	6.84
+35 (Calc)	18.03	18.03	63.15	12.93	23.52	7.28
-35 (Calc)	81.97	----	45.68	36.28	76.68	92.72

REMARKS: Coarser than sample from 1st sampling.

EXHIBIT 1

SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 2

Designation:	Mine 2 Amine Feed
Date Obtained:	31 May 1993
Location Obtained:	Bottom wash box discharge
Sample Weight:	227 lb. (wet)
Sample Description:	Coarse-grained, black in color
Method of Preparation:	Same as for Sample 1

Sample Analysis:

Chemical Analysis %

Sample	BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist
2	52.29	29.20	34.91	0.81	0.99	0.32	18.07

SAMPLE NO. 2 (continued)

SAMPLE: 378 g Sample 2

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	Direct	Cum. Ret.	BPL	Insol.	BPL	Insol
Head (Assay)	----		52.29	29.20	----	----
Head (Calc)	100.00		(52.14)	(29.10)	100.0	100.0
+28	5.59	5.59	71.93	3.40	7.71	0.65
28x35	9.46	15.05	69.16	5.38	12.55	1.75
35x48	17.51	32.56	67.15	9.25	22.55	5.57
48x65	26.22	50.78	59.34	18.98	29.85	17.10
65x100	23.63	82.41	41.69	43.03	18.89	34.94
100x150	12.66	95.07	24.76	66.55	6.01	28.95
-150	4.93		25.80	65.15	2.44	11.04
+35 (Calc)	15.05	15.05	70.19	4.65	20.26	2.40
-35 (Calc)	84.95	---	48.94	33.43	79.74	97.60

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 3

Designation:	Mine 3 Amine Feed
Date Obtained:	11 November 1993 and 6 January 1994
Location Obtained:	Acid rinse washbox discharge
Sample Weight:	212 lb. (wet) 1st sampling 236 lb. (wet) 2nd sampling
Sample Description:	Fine-grained, light brown in color
Method of Preparation:	Same as for Sample 1

Sample Analysis:

Chemical Analysis %

Sample	BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist.
3 - 1st	52.77	27.38	35.30	1.05	1.08	0.37	17.77
3 - 2nd	52.33	28.48	34.31	0.93	0.97	0.35	17.78

SAMPLE NO. 3 (continued)

SAMPLE: 422 g Sample 3 - 1st sampling

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	**Direct**	**Cum. Ret.**	**BPL**	**Insol.**	**BPL**	**Insol**
Head (Assay)	----		52.77	27.38	----	----
Head (Calc)	100.00		(52.09)	(28.80)	100.0	100.0
+28	0.59	0.59	71.36	4.05	0.81	0.08
28x35	5.38	5.97	71.08	3.73	7.34	0.70
35x48	29.32	35.29	70.31	4.45	39.58	4.53
48x65	31.18	66.47	59.74	18.35	35.76	19.87
65x100	25.90	92.37	29.06	59.55	14.45	53.55
100x150	5.95	98.32	14.01	80.45	1.60	16.62
-150	1.68		14.38	79.75	0.46	4.65
+35 (Calc)	5.97	5.97	71.11	3.76	8.15	0.78
-35 (Calc)	94.03	---	50.88	30.39	91.85	99.22

REMARKS: None

SAMPLE NO. 3 (continued)

SAMPLE: 411 g SAMPLE: 3 - 2nd Sampling

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol.	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----		52.33	28.48	----	----
Head (Calc)	100.00		(54.63)	(25.91)	100.0	100.0
+28	1.92	1.92	68.54	6.42	2.41	0.48
28x35	5.55	7.47	71.14	4.02	7.23	0.86
35x48	19.34	26.81	70.33	4.80	24.90	3.58
48x65	35.79	62.60	63.91	13.42	41.86	18.54
65x100	24.45	87.05	38.32	47.62	17.15	44.93
100x150	8.46	95.51	27.55	62.72	4.27	20.48
-150	4.49		26.46	64.20	2.18	11.13
+35 (Calc)	7.47	7.47	70.47	4.64	9.64	1.34
-35 (Calc)	92.53	----	53.35	27.63	90.36	98.66

REMARKS: Similar to 1st sampling sample.

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 4

Designation:	Mine 4 Amine Feed
Date Obtained:	10 November 1993 and 5 January 1994
Location Obtained:	Amine Feed Screw Classifier Discharge
Sample Weight:	215 lb. (wet) 1st sampling 232 lb. (wet) 2nd sampling
Sample Description:	Fine-grained, brown in color
Method of Preparation:	Same as for Sample 1

Sample Analysis:

Chemical Analysis %

Sample	BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist.
4 - 1st	59.56	20.00	39.20	1.13	1.14	0.35	19.04
4 - 2nd	66.73	9.68	44.16	1.08	0.80	0.41	16.56

SAMPLE NO. 4 (continued)

SAMPLE: 353 g Sample 4 - 1st sampling

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol.	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----		59.56	20.00	----	----
Head (Calc)	100.00		(59.25)	(20.15)	100.0	100.0
+28	0.48	0.48	71.84	3.43	0.58	0.08
28x35	2.47	2.95	71.84	3.43	3.00	0.42
35x48	9.02	11.97	69.96	6.15	10.65	2.75
48x65	16.54	28.51	66.03	10.85	18.43	8.91
65x100	39.00	67.51	61.40	17.48	40.41	33.83
100x150	22.50	90.01	54.04	27.35	20.52	30.54
-150	9.99		38.00	47.33	6.41	23.47
+35 (Calc)	2.95	2.95	71.84	3.43	3.58	0.50
-35 (Calc)	97.05	----	58.87	20.66	96.42	99.50

REMARKS: None

SAMPLE NO. 4 (continued)

SAMPLE: 417 g Sample 4 - 2nd sampling

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol.	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----		66.73	9.68	----	----
Head (Calc)	100.00		(66.59)	(10.11)	100.0	100.0
+28	5.57	5.57	73.08	2.88	6.11	1.59
28x35	11.20	16.77	72.69	3.10	12.23	3.44
35x48	18.83	35.60	71.40	4.18	20.19	7.79
48x65	26.22	61.82	67.19	8.76	26.46	22.72
65x100	21.90	83.72	63.56	13.58	20.91	29.41
100x150	12.01	95.73	59.39	19.60	10.71	23.28
-150	4.27		52.92	27.86	3.39	11.77
+35 (Calc)	16.77	16.77	72.82	3.03	18.34	5.03
-35 (Calc)	83.23	----	65.33	11.54	81.66	94.97

REMARKS: Much coarser than 1st sampling sample.

TABLE 2: PROJECT WATER ANALYSIS

Mine	Water Type	Chemical Analysis, PPM						
		PH	P	Ca	Mg	Fe	NH_4	F
1	Deep Well	8.15	ND	65.8	19.5	<0.1	1.73	0.28
	Process	7.90	ND	43.5	23.2	<0.1	0.80	2.70
	Surface	7.69	2.38	23.3	12.3	0.1	1.00	1.23
	Pit	7.86	0.30	29.0	16.1	0.3	0.77	1.70
2	Deep Well	7.91	ND	31.3	18.4	<0.1	0.83	0.32
	Process	8.43	ND	32.3	11.3	<0.1	0.78	1.90
	Surface	7.91	ND	22.6	12.0	<0.1	0.95	0.53
	Pit	7.61	ND	15.4	6.2	<0.1	0.46	0.47
3	Deep Well	8.21	ND	61.0	27.8	<0.1	0.43	0.30
	Process	7.72	ND	53.1	18.5	<0.1	0.78	2.10
	Surface	7.68	6.54	64.1	35.8	<0.1	0.81	1.20
	Pit	7.77	ND	17.3	7.5	<0.1	0.40	0.42
4	Deep Well	7.99	ND	58.7	18.2	<0.1	0.39	0.46
	Process	7.76	1.23	64.6	18.2	<0.1	0.52	2.50
	Surface	6.40	12.1	19.3	4.8	4.7	1.01	0.57
	Pit	7.66	ND	22.9	7.9	0.3	0.52	0.47
	Deionized	7.00	ND	2.0	-0-	-0-	0.46	--
	Bartow Sewage Effluent	7.72	ND	85.6	21.1	<0.1	12.54	--

Mine	Water Type	Chemical Analysis, PPM							
		SO_4	TSS	TDS	Turbid	Cond.	Hard.	TOC	D.O.
1	Deep Well	121	-0-	316	<0.1	695	244	0.92	9.3
	Process	165	32	338	2	722	260	1.85	9.2
	Surface	ND	4.8	126	4	407	108	2.16	9.1
	Pit	36	126	384	40	668	138	1.85	9.0
2	Deep Well	126	0	240	<0.1	472	153	1.23	9.3
	Process	90	4.0	276	0.5	539	127	1.23	9.2
	Surface	43	2.0	182	<0.1	362	105	1.54	9.2
	Pit	26	5.0	247	<0.1	253	64	0.92	9.3
3	Deep Well	4	0	321	<0.1	685	266	1.21	9.4
	Process	210	ND	375	<0.1	721	270	0.91	9.2
	Surface	233	4.0	560	10	888	307	2.10	9.3
	Pit	ND	8.0	76	8	203	74	2.10	9.3
4	Deep Well	96	0	334	<0.1	629	221	1.80	9.3
	Process	192	ND	393	1.0	694	292	2.70	9.4
	Surface	ND	338	353	200	230	68	3.61	9.1
	Pit	26	138	246	45	275	89	1.80	9.4
	Deionized	ND	--	--	--	--	0.5	--	--
	Bartow Sewage Effluent	185	ND	663	--	--	339	2.10	3.8

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 5

Designation:	Mine 1 Deep Well Water
Date Obtained:	12 November 1993 and 4 January 1994
Location Obtained:	At deep well booster pump
Sample Weight:	40 gal.
Sample Description:	Clear
Method of Preparation:	As written

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
5 - 1st	8.15	ND	65.8	19.5	<0.1	1.73	0.28	121
5 - 2nd	8.06							150
	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**	
5 - 1st	0	316	<1	695	244	0.92	9.3	
5 - 2nd	0	382			241			

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 6

Designation: Mine 1 Process Water

Date Obtained: 12 November 1993 and 4 January 1994

Location Obtained: At plant hydraulic station

Sample Weight: 40 gal.

Sample Description: Clear

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
6 - 1st	7.90	ND	43.5	23.2	<0.1	0.8	2.70	165
6 - 2nd	8.02							168
	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**	
6 - 1st	32	338	2	722	260	1.85	9.2	
6 - 2nd	ND	418			291			

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 7

Designation: Mine 1 Surface Water

Date Obtained: 12 November 1993 and 4 January 1994

Location Obtained: Drainage ditch from reclaimed area

Sample Weight: 40 gal.

Sample Description: Slightly turbid

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
7 - 1st	7.69	2.38	23.2	12.3	0.1	1.0	1.23	ND
7 - 2nd	8.04							8

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
7 - 1st	4.8	126	4	407	108	2.16	9.1
7 - 2nd	ND	195			139		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 8

Designation: Mine 1 Pit Water

Date Obtained: 12 November 1993

Location Obtained: End of dragline cut

Sample Weight: 40 gal.

Sample Description: Fairly turbid

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
8	7.86	0.30	29.0	16.1	0.3	0.77	1.70	36

Sample	**TSS**	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
8	126	384	40	668	138	1.85	9.0

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 9

Designation:	Mine 2 Deep Well Water
Date Obtained:	31 May 1993
Location Obtained:	At deep well pumping station
Sample Weight:	30 gal.
Sample Description:	Clear
Method of Preparation:	Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
9	7.91	ND	31.3	18.4	<0.1	0.83	0.32	126
	TSS	**TDS**	**Turbid.**	**Conduct.**		**Hard.**	**TOC**	**DO**
9	0	240	<0.1	472		153	1.23	9.3

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 10

Designation:	Mine 2 Process Water
Date Obtained:	31 May 1993
Location Obtained:	At plant hydraulic station
Sample Weight:	30 gal.
Sample Description:	Clear with faint yellow
Method of Preparation:	Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
10	8.43	ND	32.3	11.3	<0.1	0.78	1.90	90

Sample	**TSS**	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
10	4	276	0.5	539	127	1.23	9.2

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 11

Designation:	Mine 2 Surface Water
Date Obtained:	31 May 1993
Location Obtained:	Drainage ditch from reclamation area
Sample Weight:	30 gal.
Sample Description:	Clear but yellow-green in color
Method of Preparation:	Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
11	7.91	ND	22.6	12.0	<0.1	0.95	0.53	43

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
11	2.4	182	<0.1	362	105	1.54	9.2

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 12

Designation: Mine 2 Pit Water

Date Obtained: 31 May 1993

Location Obtained: Several cuts away from dragline

Sample Weight: 30 gal.

Sample Description: Clear

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
12	7.61	ND	15.4	6.2	<0.1	0.46	0.47	26

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
12	4.6	247	<0.1	253	64	0.92	9.3

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 13

Designation: Mine 3 Deep Well Water

Date Obtained: 11 November 1993 and 6 January 1994

Location Obtained: At deep well booster pump

Sample Weight: 40 gal.

Sample Description: Clear

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
13 - 1st	8.21	ND	61.0	27.8	<0.1	0.43	0.30	4
13 - 2nd	8.35							ND

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
13 - 1st	0	321	<0.1	685	266	1.21	9.4
13 - 2nd	ND	417			315		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 14

Designation:	Mine 3 Process Water
Date Obtained:	11 November 1993 and 6 January 1994
Location Obtained:	At plant hydraulic station
Sample Weight:	40 gal.
Sample Description:	Clear
Method of Preparation:	Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
14 - 1st	7.72	ND	53.1	18.5	<0.1	0.78	2.10	210
14 - 2nd	7.60							187
	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**	
14 - 1st	ND	375	<0.1	721	270	0.91	9.2	
14 - 2nd	ND	347			263			

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 15

Designation: Mine 3 Surface Water

Date Obtained: 11 November 1993 and 6 January 1994

Location Obtained: Drainage from swampy area

Sample Weight: 40 gal.

Sample Description: Slightly milky

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
15 - 1st	7.68	6.54	64.1	35.8	<0.1	0.81	1.20	233
15 - 2nd	7.97							308

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
15 - 1st	4.3	560	10	888	307	2.10	9.3
15 - 2nd	2	510			373		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 16

Designation: Mine 3 Pit Water

Date Obtained: 11 November 1993 and 6 January 1994

Location Obtained: Pool of pumped pit water

Sample Weight: 40 gal.

Sample Description: Slightly turbid

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
16 - 1st	7.77	ND	17.3	7.5	<0.1	0.40	0.42	ND
16 - 2nd	8.06							4

Sample	TSS	TDS	Turbid.	Conduct.	Hard.	TOC	DO
16 - 1st	7.8	76	8	203	74	2.10	9.3
16 - 2nd	20	93			86		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 17

Designation:	Mine 4 Deep Well Water
Date Obtained:	10 November 1993 and 5 January 1994
Location Obtained:	Deep well booster at the plant
Sample Weight:	40 gal.
Sample Description:	Sampling 1 was clear. Sampling 2 was bright yellow.
Method of Preparation:	Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
17 - 1st	7.99	ND	58.7	18.2	<0.1	0.39	0.46	96
17 - 2nd	7.51							76

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
17 - 1st	0	334	<0.1	629	221	1.8	9.3
17 - 2nd	ND	292			229		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 18

Designation:	Mine 4 Process Water
Date Obtained:	10 November 1993 and 5 January 1994
Location Obtained:	At the plant hydraulic station
Sample Weight:	40 gal.
Sample Description:	Clear
Method of Preparation:	Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
18 - 1st	7.76	1.23	64.6	18.2	<0.1	0.52	2.50	192
18 - 2nd	7.22							202

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
18 - 1st	ND	393	1	694	292	2.70	9.4
18 - 2nd	ND	408			316		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 20

Designation: Mine 4 Pit Water

Date Obtained: 10 November 1993 and 5 January 1994

Location Obtained: End of current mining cut

Sample Weight: 40 gal.

Sample Description: Both samplings were fairly turbid

Method of Preparation: Same as for Sample 5

Sample Analysis:

	Analysis, PPM							
Sample	**pH**	**P**	**Ca**	**Mg**	**Fe**	**NH_4**	**F**	**SO_4**
20 - 1st	7.66	ND	22.9	7.9	0.3	0.52	0.47	26
20 - 2nd	7.74							57

	TSS	**TDS**	**Turbid.**	**Conduct.**	**Hard.**	**TOC**	**DO**
20 - 1st	138	246	45	275	89	1.80	9.4
20 - 2nd	204	165			67		

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 21

Designation: Deionized Water

Date Obtained: 10 November 1993

Location Obtained: Coronet Laboratory

Sample Weight: 15 gal.

Sample Description: Clear

Method of Preparation: None

Sample Analysis:

	Analysis, PPM							
Sample	pH	P	Ca	Mg	Fe	NH_4	F	SO_4
21	7.0	ND	2.0	0	0	0.46	--	ND

	TSS	TDS	Turbid.	Conduct.	Hard.	TOC	DO
21	--	--	--	--	0.5	--	--

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 22

Designation: Bartow Sewage Treatment Plant Effluent

Date Obtained: 23 November 1993

Location Obtained: Tertiary overflow - discharge pool after chlorination

Sample Weight: 40 gal.

Sample Description: Foggy with odor

Method of Preparation: Same as for Sample 5

Sample Analysis:

Sample	Analysis, PPM							
	pH	P	Ca	Mg	Fe	NH_4	F	SO_4
22	7.72	ND	85.6	21.1	<0.1	12.54	--	185
	TSS	TDS	Turbid.	Conduct.	Hard.	TOC	DO	
22	ND	663	--	--	339	2.10	3.8	

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 23

Designation:	Mine 1 Sand Tailings
Date Obtained:	4 January 1994
Location Obtained:	Sand tailings disposal area
Sample Weight:	50 lb. (wet)
Sample Description:	Fine-grained white sand
Method of Preparation:	Same as for Sample 1

Sample Analysis:

	Chemical Analysis %						
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
23	1.90						

SAMPLE NO. 23 (continued)

SAMPLE: 376 g Sample 23

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	**Direct**	**Cum. Ret.**	**BPL**	**Insol.**	**BPL**	**Insol**
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	0.13	0.13				
28x35	0.35	0.48				
35x48	2.18	2.66				
48x65	11.42	14.08				
65x100	28.29	42.37				
100x150	37.05	79.42				
-150	20.58					
+35 (Calc)	0.48					
-35 (Calc)	99.52					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 24

Designation: Mine 1 Overburden

Date Obtained: 4 January 1994

Location Obtained: Current mining area

Sample Weight: 215 lb. (wet)

Sample Description: Grayish, fine sand with some lumps

Method of Preparation: Same as for Sample 1 except material was wet screened on 150 mesh and dried prior to 28 through 150 mesh dry screening.

Sample Analysis:

	Chemical Analysis %						
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
24	2.47						

SAMPLE NO. 24 (continued)

SAMPLE: 368 g Sample 24

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	**Direct**	**Cum. Ret.**	**BPL**	**Insol**	**BPL**	**Insol**
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	1.47	1.47				
28x35	2.39	3.86				
35x48	7.06	10.92				
48x65	10.92	21.84				
65x100	14.72	36.56				
100x150	30.01	66.57				
-150	33.43					
+35 (Calc)	3.86					
-35 (Calc)	96.14					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 25

Designation: Mine 2 Sand Tailings

Date Obtained: 4 January 1994

Location Obtained: Sand Tailings Pile

Sample Weight: 50 lbs. (wet)

Sample Description: Coarse-grained white sand with some black phosphate

Method of Preparation: Same as for Sample 1

Sample Analysis:

			Chemical Analysis %				
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
25	3.04						

SAMPLE NO. 25 (continued)

SAMPLE: 389 g Sample 25

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	5.12	5.12				
28x35	13.09	18.21				
35x48	28.14	46.35				
48x65	32.07	78.42				
65x100	16.64	95.06				
100x150	4.04	99.10				
-150	0.90					
+35 (Calc)	18.21					
-35 (Calc)	81.79					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 26

Designation: Mine 2 Overburden

Date Obtained: 4 January 1994

Location Obtained: From mining area

Sample Weight: 45 lbs. (wet)

Sample Description: White sand with gray clay lumps

Method of Preparation: Same as for Sample 24

Sample Analysis:

				Chemical Analysis %			
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
26	5.42						

SAMPLE NO. 26 (continued)

SAMPLE: 457 g Sample 26

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol.	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	2.30	2.30				
28x35	4.66	6.96				
35x48	13.71	20.67				
48x65	19.47	40.14				
65x100	31.39	71.53				
100x150	12.36	83.89				
-150	16.11					
+35 (Calc)	6.96					
-35 (Calc)	93.04					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 27

Designation:	Mine 3 Sand Tailings
Date Obtained:	6 January 1994
Location Obtained:	Sand tailings disposal area
Sample Weight:	34 lbs. (wet)
Sample Description:	White coarse-grained sand with visible phosphate
Method of Preparation:	Same as for Sample 1

Sample Analysis:

Chemical Analysis %							
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
27	4.33						

SAMPLE NO. 27 (continued)

SAMPLE: 355 g Sample 27

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	**Direct**	**Cum. Ret.**	**BPL**	**Insol**	**BPL**	**Insol**
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	11.36	11.36				
28x35	16.66	28.02				
35x48	28.33	56.35				
48x65	26.10	82.45				
65x100	12.43	94.88				
100x150	3.97	98.85				
-150	1.15					
+35 (Calc)	28.02					
-35 (Calc)	71.98					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 28

Designation: Mine 3 Overburden

Date Obtained: 6 January 1994

Location Obtained: At existing mining area

Sample Weight: 39 lbs. (wet)

Sample Description: Fine brownish and with chalky lumps

Method of Preparation: Same as for Sample 24

Sample Analysis:

Chemical Analysis %

Sample	BPL	Insol	CaO	Fe_2O_3	Al_2O_3	MgO	Moist.
28	3.78						

SAMPLE NO. 28 (continued)

SAMPLE: 417 g Sample 28

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

	Weight %		Chemical Analysis		Percent Distribution	
Screen Size (Tyler Mesh)	Direct	Cum. Ret.	BPL	Insol	BPL	Insol
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	5.37	5.37				
28x35	3.26	8.63				
35x48	9.04	17.67				
48x65	20.47	38.14				
65x100	17.50	55.64				
100x150	9.20	64.84				
-150	35.16					
+35 (Calc)	8.63					
-35 (Calc)	91.37					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 29

Designation:	Mine 4 Sand Tailings
Date Obtained:	5 January 1994
Location Obtained:	Sand tailings disposal area (old)
Sample Weight:	54 lbs. (wet)
Sample Description:	Coarse sand with visible phosphate
Method of Preparation:	Same as for Sample 1

Sample Analysis:

Chemical Analysis %							
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
29	7.32						

SAMPLE NO. 29 (continued)

SAMPLE: 388 g Sample 29

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	9.27	9.27				
28x35	15.99	25.26				
35x48	31.57	56.83				
48x65	28.79	85.62				
65x100	10.17	95.79				
100x150	3.17	98.96				
-150	1.04					
+35 (Calc)	25.26					
-35 (Calc)	74.74					

REMARKS: None

EXHIBIT 1
SAMPLE DESCRIPTION AND PREPARATION

SAMPLE NO. 30

Designation: Mine 4 overburden

Date Obtained: 5 January 1994

Location Obtained: Old overburden area

Sample Weight: 29 lbs. (wet)

Sample Description: Very hard and lumpy. Dark brown in color.

Method of Preparation: Same as for Sample 24

Sample Analysis:

				Chemical Analysis %			
Sample	**BPL**	**Insol**	**CaO**	**Fe_2O_3**	**Al_2O_3**	**MgO**	**Moist.**
30	4.13						

SAMPLE NO. 30 (continued)

SAMPLE: 390 g Sample 30

PROCEDURE: Standard dry screen analysis tapped for 20 minutes on RO tap. Individual fractions were weighed, reduced to minus 100-mesh with a Bico pulverizer and submitted for analysis.

RESULTS:

Screen Size (Tyler Mesh)	Weight % Direct	Weight % Cum. Ret.	Chemical Analysis BPL	Chemical Analysis Insol.	Percent Distribution BPL	Percent Distribution Insol
Head (Assay)	----				----	----
Head (Calc)	100.00				100.0	100.0
+28	2.87	2.87				
28x35	4.10	6.97				
35x48	10.15	17.12				
48x65	14.10	31.22				
65x100	15.58	46.80				
100x150	22.45	69.25				
-150	30.75					
+35 (Calc)	6.97					
-35 (Calc)	83.03					

REMARKS: Very dark brown wet slimes

EXHIBIT 2
FLOTATION TESTS

Listing of Tests:

Open Circuit Tests

Test #	Mine	Description
Baseline Tests		
1-4	1	Deep well water
5-9	1	Process water
10-13	1	Surface water
14-16	1	Pit water
17-20	1	Deionized water
21-24	2	Deep well water
25-29	2	Process water
30-33	2	Surface water
34-37	2	Pit water
38-41	2	Deionized water
42-45	3	Deep well water
46-49	3	Process water
50-53	3	Surface water
54-57	3	Pit water
58-61	3	Deionized water
62-65	4	Deep well water
66-69	4	Process water
70-73	4	Surface water
74-77	4	Pit water
78-81	4	Deionized water
Grade-Recovery Curves		
82	1	Tree analysis
83	2	Tree analysis
84	3	Tree analysis
85	4	Tree analysis
Process Water Variability		
106-109	4	Process water variabil.
110-112	1	Sand tails filt-surface
113-115	1	Sand tails filt-sewage
116-118	1	Oveburden Neut-surface
119-121	1	Overburden Neut.-sewage
122-124	1	Charcoal filt.-surface
125-127	1	Charcoal filt.-sewage
128-130	1	Starch-surface water
131-133	1	Starch-sewage effluent
134-136	1	Soda ash - surface
137-139	1	Soda ash - sewage
140-142	2	Sand tails filt.-sewage
143-145	2	Overburden neut.-sewage
146-148	2	Charcoal filt.-sewage
149-151	2	Starch - sewage
152-154	2	Soda ash - sewage
Standard of Comparison Tests		
155-157	1	Surface standard
158-160	1	Sewage standard
161-163	3	Surface standard
164-166	3	Pit water standard
Water Treatment Tests		
167-169	3	Kerosene - Surface
170-172	3	Kerosene - Pit water
173-175	3	Starch - surface

Locked Cycle Tests

Test #	Mine	Description
Baseline Tests		
86	1	Deep well water
87	1	Process water
88	1	Surface water
89	1	Pit water
90	1	Bartow sewage effluent
91	2	Deep well water
92	2	Process water
93	2	Surface water
94	2	Pit water
95	2	Bartow sewage effluent
96	3	Deep well water
97	3	Process water
98	3	Surface water
99	3	Pit water
100	3	Bartow sewage effluent
101	4	Deep well water
102	4	Process water
103	4	Surface water
104	4	Pit water
105	4	Bartow sewage effluent
Substitute Waters - 1st Samples		
250	1	Process (93%)-Process (7%)
251	1	Prodess (93%)-Surface (7%)
252	1	Process (93%)-Pit (7%)
253	2	Surface (93%)-Surface (7%)
254	2	Surface (93%)-Pit (7%)
255	2	Surface (93%)-Sewage (7%)
256	3	Process (93%)-Process (7%)
257	3	Process (93%)-Surface (7%)
258	3	Process (93%)-Pit (7%)
259	4	Process (93%)-Process (7%)
260	4	Process (93%)-Surface (7%)
261	4	Process (93%)-Pit (7%)
Final Optim.@ 93% Recycle-2nd Samples		
280	1	Deep well- Deep well water
281	1	Process - Deep well water
282	1	Process - Process water
283	1	Process - Surface water
284	1	Process - Pit water
285	1	Process - Sewage effluent
286	3	Deep well - Deep well water
287	3	Process - Process water
288	3	Process - Deep well water
289	3	Process - surface water
290	3	Process - pit water
291	3	Process - Sewage Effluent
292	4	Deep well - Deep well water
293	4	Process - Deep well water
294	4	Process - Process water
295	4	Process - Surface water
296	4	Process - Pit water
297	4	Process - Sewage effluent

EXHIBIT 2
FLOTATION TESTS

Listing of Tests - continued:

Open Circuit Tests

Test #	Mine	Description
Water Treatment Tests (continued)		
176-178	3	Starch - pit water
179-181	3	Soda ash - surface
182-184	3	Soda ash - pit water
185-187	4	Sand tails filt.-pit
188-190	4	Overburden neut.-pit
191-193	4	Charcoal filt.-pit
194-196	4	Starch - pit water
197-199	4	Soda ash - pit water
Standard of Comparison Tests		
200-202	1	Deep well standard
203-205	2	Deep well standard
206-208	3	Deep well standard
209-211	4	Deep well standard
Water Treatment Tests		
212-219	1	Statistical design
220-227	2	Statistical design
228-235	3	Statistical design
236-243	4	Statistical design
Standard of Comparison Tests		
244-246	2	Sewage standard
247-249	4	Surface standard
Process Water Tests		
262-264	4	Process water variabil.
265-267	4	Process RPM
268-270	4	Process RPM
Standard of Comparison Tests		
271-273	1	Deep well-2nd samples
274-276	3	Deep well-2nd samples
277-279	4	Deep well-2nd samples
Process Water Variability		
316-318	4	Process water variabil.
Water Contaminants		
319	1	Statistical Design

Locked Cycle Tests

Test #	Mine	Description
Final Optim.@ 60% Recycle-2nd Samples		
298	1	Recycle - Deep well water
299	1	Recycle - Process water
300	1	Recycle - Surface water
301	1	Recycle - Surface, kerosene
302	1	Recycle - Pit water
303	1	Recycle - Sewage effluent
304	3	Recycle - Deep well water
305	3	Recycle - Process Water
306	3	Recycle - Surface water
307	3	Recycle - surface, kerosene
308	3	Recycle - Pit water
309	3	Recycle - Sewage effluent
310	4	Recycle - Deep well water
311	4	Recycle - Process water
312	4	Recycle - Process, kerosene
313	4	Recycle - Surface water
314	4	Recycle - Pit water
315	4	Recycle - Sewage effluent

EXHIBIT 2 (Continued)

LABORATORY FLOTATION PROCEDURES

Open Circuit Testing - Individual test charges were obtained by mixing the stored material from a given bag and weighing out 610 to 625 gm. charges, depending on moisture, to arrive at 500 gm. charges dry basis. In general, an entire bag (usually 50-60 lbs) was consumed at one time. The individual test charges were stored in separate plastic bags.

The test charge was dumped onto a 200-mesh screen and submersed in the water to be used for the particular test. One minute submergence time was used. The rinsed material was transferred to a 2000 ml. Denver Laboratory flotation cell with the test water. The amine feed was conditioned at 1200-1250 RPM for 15 seconds with the desired amount of amine (5% solution) by closing the intake air valve. Modifiers, extenders, depressants, etc., if required, were added in a similar manner during a 15-second pre-conditioning stage. The pH of the conditioned material was measured, the air was turned on, and the froth was removed for 60 seconds. The terminal flotation pH was measured. Both the froth and concentrates were decanted, dried in a gas-fired oven, weighed, riffled, pulverized to 65 mesh and submitted for chemical analysis.

Locked Cycle Testing - The first cycle of locked testing (recycling of flotation water) was carried out in the same manner as for open circuit testing. Upon completion of the first stage, the froth and concentrate products were dewatered on a 200-mesh screen to recover as much water as possible. A new test charge, feed to cycle 2, was rinsed with the initial water as for the open circuit procedure. The rinsed feed was added to the recovered water from stage 1 and a second cycle of conditioning and flotation was carried out. Test cycles were conducted generally until the concentrate weight % for three successive cycles were within 1% of each other.

Individual test results shown on following pages.

EXHIBIT 2

FLOTATION TESTS

TEST: 1-4

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 1 to 20.

SAMPLES: Feed Num.: 1 Mine: 1 BPL, %: 35.70 AI, %: 48.1
Water Num.: 5 Type: Deep Well

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.31	15	20	7.2	60	16.49	7.4
2	.59	15	20	7.2	60	11.55	7.4
3	.88	15	20	7.2	60	10.74	7.4
4	1.16	15	20	7.2	60	10.42	7.5

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
1	.31	87.56	42.76	39.46	3.10	37.83	98.98	28.21
2	.59	56.18	63.12	11.38	3.91	37.17	95.39	86.72
3	.88	51.86	66.71	6.48	5.75	37.37	92.59	93.02
4	1.16	49.86	66.56	6.48	8.48	37.44	88.64	93.29

TEST NOTES AND OBSERVATIONS:

White froths for Tests 1 and 2, light brown froths for Tests 3 and 4.

EXHIBIT 2

FLOTATION TESTS

TEST: 5-9

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 1 to 20.

SAMPLES: Feed Num.: 1 Mine: 1 BPL, %: 35.70 AI, %: 48.13
Water Num.: 6 Type: Process

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
5	.44	15	20	7.5	60	15.67	7.4
6	.58	15	20	7.4	60	12.13	7.5
7	.72	15	20	7.4	60	11.28	7.5
8	.87	15	20	7.4	60	10.89	7.6
9							

RESULTS:

Test No.	Amine lb/TF	CONC. (non float) Weight %	CONC. (non float) BPL %	CONC. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
5	.44	77.41	47.87	32.30	2.82	37.69	98.31	48.05
6	.58	58.36	61.49	14.12	4.37	37.70	95.17	82.88
7	.72	53.98	65.48	8.24	4.74	37.53	94.19	90.76
8	.87	51.99	66.60	6.86	6.01	37.51	92.31	92.59
9								

TEST NOTES AND OBSERVATIONS:

Tests 5-8 froths light brown.
Test 9 products not analyzed due to error in procedure.

EXHIBIT 2

FLOTATION TESTS

TEST: 10-13

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 1 to 20.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	7	Type:	Surficial		

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
10	.43	15	20	7.5	60	13.94	7.5
11	.58	15	20	7.5	60	11.55	7.6
12	.86	15	20	7.4	60	11.02	7.5
13	1.15	15	20	7.6	60	10.47	7.5

RESULTS:

Test No.	Amine lb/TF	CONC. (non float) Weight %	CONC. (non float) BPL %	CONC. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
10	.43	67.63	53.42	24.84	3.19	37.16	97.22	65.10
11	.58	55.36	63.91	10.38	4.37	37.33	94.78	88.06
12	.86	52.46	65.83	7.82	5.83	37.30	92.57	91.48
13	1.15	49.52	66.99	6.00	8.37	37.40	88.70	93.83

TEST NOTES AND OBSERVATIONS:

Tests 10-13 froths light brown.

EXHIBIT 2

FLOTATION TESTS

TEST: 14-16

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 1 to 20.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	8	Type:	Pit		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
14	.58	15	20	7.6	60	19.05	7.7
15	1.15	15	20	7.6	60	12.15	7.6
16	1.74	15	20	7.8	60	10.64	7.8

RESULTS:

		CONC. (non float)					Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
14	.58	95.93	38.54	45.88	4.28	37.15	99.53	8.55
15	1.15	58.26	60.81	14.86	4.20	37.18	95.29	82.01
16	1.74	51.01	66.80	6.52	6.56	37.29	91.38	93.09

TEST NOTES AND OBSERVATIONS:

Very little froth for Test 14.
Turbid water for all tests.

EXHIBIT 2

FLOTATION TESTS

TEST: 17-20

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 1 to 20.

SAMPLES:

Feed	Num.: 1	Mine:	1	BPL, %:	35.70	AI, %:	48.1[illegible]
Water	Num.: 21	Type:	Deionized				

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
17	.29	15	20	7.0	60	17.35	7.0
18	.58	15	20	7.1	60	12.89	7.1
19	.86	15	20	6.9	60	11.33	6.9
20	1.20	15	20	6.9	60	9.74	6.9

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
17	.29	88.01	42.56	40.08	2.91	37.81	99.08	26.71
18	.58	62.27	57.62	19.56	4.00	37.39	95.96	74.69
19	.86	53.79	64.79	9.42	5.64	37.46	93.04	89.47
20	1.20	47.90	66.31	7.02	11.47	37.74	84.17	93.01

TEST NOTES AND OBSERVATIONS:

Similar to deep well water Tests 1-4.

EXHIBIT 2

FLOTATION TESTS

TEST: 21-24

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 21 to 41.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %:	52.29	AI, %: 29.2(
Water	Num.:	9	Type:	Deep Well			

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
21	.10	15	20	7.7	60	15.52	7.5
22	.20	15	20	7.6	60	14.47	7.5
23	.40	15	20	7.7	60	13.73	7.6
24	.80	15	20	7.7	60	10.90	7.6

RESULTS:

		CONC. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
21	.10	76.29	69.29	7.68	5.33	54.12	97.66	79.94
22	.20	71.29	70.42	5.05	10.36	53.18	94.41	87.67
23	.40	66.08	70.75	4.78	20.17	53.59	87.23	89.18
24	.80	51.65	70.94	4.45	37.52	54.78	66.89	92.13

TEST NOTES AND OBSERVATIONS:

Tests 21 and 22 white froths.
Test 23 froth light brown.
Test 24 visable phosphate floating.

EXHIBIT 2

FLOTATION TESTS

TEST: 25-29

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 21 to 41.

SAMPLES:

Feed	Num.: 2	Mine:	2	BPL, %:	52.29	AI, %:	29.20
Water	Num.: 10	Type:	Process				

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
25	.20	15	20	8.9	60	15.23	8.8
26	.30	15	20	8.9	60	15.17	8.8
27	.40	15	20	8.9	60	15.06	8.7
28	.60	15	20	8.9	60	14.39	8.7
29	.81	15	20	8.9	60	13.20	8.7

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
25	.20	74.22	70.55	5.63	5.70	53.83	97.27	85.69
26	.30	74.02	70.23	5.88	6.16	53.58	97.01	85.10
27	.40	73.02	70.75	5.08	7.93	53.80	96.02	87.30
28	.60	69.47	~~71.03~~ 70.87	~~5.18~~ 4.93	14.05	53.64	92.00	87.68
29	.81	64.06	70.99	4.78	23.64	53.97	84.26	89.51

TEST NOTES AND OBSERVATIONS:

Tests 25-27 froths light brown.
Tests 28 and 29 visable phosphate floating.

EXHIBIT 2

FLOTATION TESTS

TEST: 30-33

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 21 to 41.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	11	Type:	Surficial		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
30	.20	15	20	9.2	60	15.49	8.9
31	.30	15	20	9.1	60	15.22	8.8
32	.40	15	20	9.1	60	15.17	8.9
33	.60	15	20	9.1	60	14.80	8.8

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
30	.20	74.87	69.99	6.55	5.59	53.80	97.39	83.21
31	.30	74.22	70.38	5.73	5.88	53.75	97.18	85.43
32	.40	73.48	70.34	5.40	7.06	53.56	96.50	86.41
33	.60	72.36	70.79	5.03	10.55	54.14	94.61	87.54

TEST NOTES AND OBSERVATIONS:

Tests 30-32 froths light brown.
Test 33 visable phosphate floating.

EXHIBIT 2

FLOTATION TESTS

TEST: 34-37

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 21 to 41.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	12	Type:	Pit		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
34	.20	15	20	8.6	60	15.38	8.7
35	.30	15	20	8.6	60	14.97	8.2
36	.40	15	20	8.6	60	14.84	8.3
37	.59	15	20	8.6	60	14.39	8.6

RESULTS:

		CONC. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
34	.20	74.27	69.90	5.85	7.10	53.74	96.60	85.12
35	.30	72.92	71.27	5.13	7.56	54.02	96.21	87.19
36	.40	71.92	70.47	5.38	10.64	53.67	94.43	86.75
37	.59	68.69	70.90	4.23	17.46	54.17	89.91	90.05

TEST NOTES AND OBSERVATIONS:

Tests 34-36 froths light brown.
Test 37 visable phosphate floating.

EXHIBIT 2

FLOTATION TESTS

TEST: 38-41

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 21 to 41.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	21	Type:	Deionized		

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
38	.10	15	20	7.4	60	15.57	7.4
39	.20	15	20	8.3	60	13.69	7.5
40	.41	15	20	6.9	60	11.79	7.1
41	.60	15	20	7.0	60	7.96	7.1

RESULTS:

Test No.	Amine lb/TF	CONC. (non float) Weight %	CONC. (non float) BPL %	CONC. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
38	.10	75.82	68.63	8.60	5.59	53.39	97.47	77.67
39	.20	66.96	71.19	5.58	18.07	53.64	88.87	87.20
40	.41	57.01	70.42	5.93	31.40	53.64	74.84	88.42
41	.60	37.12	70.66	5.25	43.57	53.63	48.91	93.33

TEST NOTES AND OBSERVATIONS:

Tests 38 and 39 froths light brown.
Tests 40 and 41 visable phosphate floating.

EXHIBIT 2

FLOTATION TESTS

TEST: 42-45

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 42 to 61.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	13	Type:	Deep Well			

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
42	.20	15	20	7.8	60	15.54	7.8
43	.40	15	20	7.8	60	14.93	7.7
44	.60	15	20	7.7	60	14.70	7.7
45	.80	15	20	7.8	60	14.40	7.8

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
42	.20	75.18	68.76	5.98	4.15	52.73	98.05	83.58
43	.40	72.39	70.18	4.72	6.95	52.72	96.36	87.52
44	.60	71.00	70.60	3.80	9.79	52.96	94.64	90.15
45	.80	69.49	70.51	3.98	14.57	53.44	91.68	89.90

TEST NOTES AND OBSERVATIONS:

Tests 42-44 froths from white to light brown.
Test 45 visable phosphate floating.
Tests 42-45 increasing foamy froths.

EXHIBIT 2

FLOTATION TESTS

TEST: 46-49

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 42 to 61.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	14	Type:	Process			

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
46	.20	15	20	7.8	60	15.75	7.7
47	.40	15	20	7.7	60	15.17	7.3
48	.59	15	20	7.3	60	15.03	7.5
49	.80	15	20	7.7	60	14.80	7.8

RESULTS:

		CONC. (non float)					Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
46	.20	76.54	68.00	7.92	2.71	52.68	98.79	77.86
47	.40	74.60	69.81	5.18	5.48	53.47	97.40	85.89
48	.59	72.30	69.75	4.98	6.86	52.33	96.37	86.85
49	.80	71.69	69.90	4.20	10.47	53.08	94.42	89.00

TEST NOTES AND OBSERVATIONS:

Tests 46-48 froths from white to light brown.
Test 49 visable phosphate floating.
Tests 46-49 increasing foamy froths.

EXHIBIT 2

FLOTATION TESTS

TEST: 50-53

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 42 to 61.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water	Num.:	15	Type:	Surficial				

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
50	.20	15	20	7.6	60	16.39	7.7
51	.39	15	20	7.5	60	15.56	7.6
52	.79	15	20	7.5	60	14.97	7.6
53	1.18	15	20	7.8	60	14.54	7.7

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
50	.20	79.50	65.92	10.16	2.36	52.89	99.09	70.50
51	.39	74.79	68.19	7.14	3.36	51.85	98.37	80.50
52	.79	71.60	70.18	4.76	7.76	52.45	95.80	87.55
53	1.18	69.30	70.51	4.48	11.62	52.43	93.20	88.66

TEST NOTES AND OBSERVATIONS:

Tests 50-53 froths from white to light brown.
Tests 50-53 floats slowly, froths slightly foamy.
Water color: brown greenish.

EXHIBIT 2

FLOTATION TESTS

TEST: 54-57

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 42 to 61.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water	Num.:	16	Type:	Pit				

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
54	.20	15	20	7.5	60	15.76	7.3
55	.39	15	20	7.1	60	15.32	7.5
56	.59	15	20	7.4	60	14.74	7.5
57	.79	15	20	7.7	60	14.29	7.4

RESULTS:

		CONC. (non float)					Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
54	.20	76.03	67.87	7.66	3.04	52.33	98.61	78.73
55	.39	72.99	69.60	5.16	6.01	52.42	96.90	86.25
56	.59	70.63	70.18	4.24	10.03	52.52	94.39	89.06
57	.79	68.25	70.68	3.90	14.57	52.87	91.25	90.28

TEST NOTES AND OBSERVATIONS:

Tests 54-56 froths from white to brown with visable phosphate.
Tests 54-57 floats fast, froths slightly foamy.
Turbid water.

EXHIBIT 2

FLOTATION TESTS

TEST: 58-61

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 42 to 61.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %: 52.77	AI, %: 27.38
Water	Num.:	21	Type:	Deionized		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
58	.20	15	20	7.4	60	15.18	7.4
59	.40	15	20	7.9	60	14.58	8.1
60	.50	15	20	7.6	60	14.25	7.7
61	.59	15	20	8.1	60	13.72	7.3

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
58	.20	73.26	70.31	5.44	5.90	53.09	97.03	85.44
59	.40	69.89	71.21	3.56	10.88	53.05	93.82	90.91
60	.50	68.21	71.12	3.60	14.86	53.23	91.12	91.03
61	.59	65.27	70.75	3.74	19.05	52.79	87.47	91.08

TEST NOTES AND OBSERVATIONS:

Tests 58-61 froths from white to brown with visable phosphate.
Tests 58-61 floats fast, froths foamy.

EXHIBIT 2

FLOTATION TESTS

TEST: 62-65

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 62 to 81.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.0(
Water	Num.:	17	Type:	Deep Well		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
62	.20	15	20	7.6	60	18.37	7.6
63	.41	15	20	7.9	60	17.27	7.6
64	.61	15	20	7.5	60	16.65	7.6
65	.81	15	20	8.0	60	15.79	7.7

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
62	.20	93.49	64.57	14.38	11.86	61.14	98.74	32.78
63	.41	87.00	68.61	8.70	10.75	61.09	97.71	62.15
64	.61	83.28	69.44	6.45	13.46	60.08	96.25	73.14
65	.81	78.05	71.54	4.25	21.26	60.50	92.29	83.41

TEST NOTES AND OBSERVATIONS:

Tests 62-65 froths from white to brown with visable phosphate.
Tests 62-65 floats slowly.

EXHIBIT 2

FLOTATION TESTS

TEST: 66-69

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 62 to 81.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.0(
Water	Num.:	18	Type:	Process		

TEST CONDITIONS:

		Conditioning			Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
66	.20	15	20	7.7	60	19.51	7.7
67	.40	15	20	7.3	60	17.36	7.7
68	.80	15	20	7.4	60	16.15	7.6
69	1.22	15	20	7.3	60	14.86	7.3

RESULTS:

		CONC. (non float)					Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
66	.20	98.13	61.18	18.10	20.12	60.41	99.38	11.19
67	.40	86.75	67.39	9.93	13.81	60.29	96.96	56.93
68	.80	79.36	71.03	4.80	19.95	60.49	93.19	80.95
69	1.22	73.19	71.36	4.13	29.54	60.15	86.83	84.89

TEST NOTES AND OBSERVATIONS:

Tests 66-69 froths from white to brown with visable phosphate.
Tests 66-69 floats slowly.

EXHIBIT 2

FLOTATION TESTS

TEST: 70-73

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 62 to 81.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %: 20.00
Water	Num.:	19	Type:	Surficial			

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Time sec.	Solids %	pH	Flotation Time sec.	Solids %	pH
70	.21	15	20	6.5	60	19.18	6.8
71	.81	15	20	6.8	60	17.77	7.3
72	1.21	15	20	6.8	60	17.48	6.9
73	1.62	15	20	6.9	60	17.25	6.9

RESULTS:

Test No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
70	.21	99.38	61.18	18.45	30.70	60.99	99.69	8.32
71	.81	89.40	65.55	12.25	20.95	60.82	96.35	45.24
72	1.21	87.17	65.68	11.55	22.90	60.19	95.12	49.66
73	1.62	86.47	65.81	11.85	25.91	60.41	94.20	48.76

TEST NOTES AND OBSERVATIONS:

Tests 70-73 froths from white to slightly brown.
Tests 70-73 floats slowly.
Water color: black and turbid (presence of organic material).

EXHIBIT 2

FLOTATION TESTS

TEST: 74-77

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 62 to 81.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.00
Water	Num.:	20	Type:	Pit				

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
74	.20	15	20	7.9	60	19.58	7.5
75	.40	15	20	8.2	60	19.39	7.6
76	.80	15	20	8.2	60	18.75	7.6
77	1.61	15	20	8.3	60	15.67	8.1

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
74	.20	99.23	60.83	18.43	47.28	60.73	99.40	8.56
75	.40	98.38	60.55	18.75	40.58	60.23	98.91	7.77
76	.80	94.07	62.49	15.90	28.75	60.49	97.18	25.22
77	1.61	77.02	69.85	4.73	22.66	59.01	91.17	81.78

TEST NOTES AND OBSERVATIONS:

Tests 74-77 froths from white to brown with visable phosphate.
Tests 74-77 floats slowly.
Water color: gray brownish and turbid.

EXHIBIT 2

FLOTATION TESTS

TEST: 78-81

PURPOSE: To investigate the flotation response of amine feeds from various mines in different types of water. See also Tests 62 to 81.

SAMPLES: Feed Num.: 4 Mine: 4 BPL, %: 59.56 AI, %: 20.0(
Water Num.: 21 Type: Deionized

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
78	.21	15	20	9.3	60	18.70	8.9
79	.41	15	20	7.7	60	16.85	7.6
80	.62	15	20	8.1	60	15.55	7.6
81	.81	15	20	8.4	60	14.27	8.2

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
78	.21	96.60	62.73	16.43	16.65	61.16	99.08	20.64
79	.41	84.16	69.09	8.03	15.62	60.62	95.92	66.21
80	.62	78.00	71.65	4.58	22.99	60.94	91.70	82.14
81	.81	70.12	72.66	3.63	32.78	60.74	83.87	87.27

TEST NOTES AND OBSERVATIONS:

Tests 78-81 froths from white to brown with visable phosphate.
Tests 78-81 floats slowly.

EXHIBIT 2

FLOTATION TESTS

TESTS: 82

PURPOSE: To determine the flotation response of amine feed from various mines in deep well water. See also tests 82-85.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.13
Water	Num.:	5	Type:	Deep Well				

TEST CONDITIONS:

	Conditioning				Flotation		
Product	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
Conc. 1	1.2	15	19	7.2	60	12	7.2
Conc. 2	0.0	15	2	7.3	60	2	7.3
Froth 2	0.0	15			60		
Conc. 3	0.0	15	13	7.4	60	13	7.4
Froth 4	0.0	15			60		
Conc. 4	0.0	15	5	7.4	60	5	7.4

RESULTS:

Product	YIELD %	CUMULATI YIELD, %	BPL %	CUMULA BPL, %	Insol. %	CUMULA Insol., %	RECOVERY BPL, %	REJECTIO BPL, %	RECOVERY Insol., %	REJECTION Insol., %
Conc. 1	51.44	51.44	66.03	66.03	7.78	7.78	89.78	10.22	8.53	91.47
Conc. 2	3.71	55.15	38.30	64.16	45.90	10.34	93.53	6.47	12.16	87.84
Froth 2	1.00	56.15	11.06	63.22	82.80	11.63	93.82	6.18	13.93	86.07
Conc. 3	28.25	84.40	6.31	44.17	90.86	38.15	98.54	1.46	68.64	31.36
Froth 4	2.79	87.19	5.20	42.92	91.92	39.87	98.92	1.08	74.11	25.89
Conc. 4	12.81	100.00	3.19	37.83	94.82	46.91	100.00	0.00	100.00	0.00
			37.83		46.91					

TEST NOTES AND OBSERVATIONS:
Tree Analysis Procedure for the evaluation of the flotability. See experimental scheme.

EXHIBIT 2

FLOTATION TESTS

TESTS: 83

PURPOSE: To determine the flotation response of amine feed from various mines in deep well water. See also tests 82-85.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %:	52.29	AI, %:	29.20
Water	Num.:	9	Type:	Deep Well				

TEST CONDITIONS:

	Conditioning				Flotation		
Product	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
Conc. 2	0.8	15	5	7.8	60	5	7.8
Conc. 1	0.0	15	20	7.6	60	12	7.6
Conc. 3	0.0	15	9	8.0	60	9	8.1
Froth 2	0.0	15			60		
Conc. 4	0.0	15	8	8.2	60	8	8.2
Froth 4	0.0	15			60		

RESULTS:

Product	YIELD %	CUMULATI YIELD, %	BPL %	CUMULA BPL, %	Insol. %	CUMULA Insol., %	RECOVERY BPL, %	REJECTIO BPL, %	RECOVERY Insol., %	REJECTION Insol., %
Conc. 2	11.38	11.38	70.03	70.03	5.40	5.40	15.23	84.77	2.14	97.86
Conc. 1	54.07	65.45	69.92	69.94	4.96	5.04	87.50	12.50	11.47	88.53
Conc. 3	4.00	69.45	59.52	69.34	19.80	5.89	92.05	7.95	14.23	85.77
Froth 2	4.88	74.33	57.55	68.57	22.48	6.98	97.42	2.58	18.04	81.96
Conc. 4	1.04	75.37	49.36	68.30	33.20	7.34	98.40	1.60	19.25	80.75
Froth 4	24.63	100.00	3.39	52.31	94.22	28.74	100.00	0.00	100.00	0.00
			52.31		28.74					

TEST NOTES AND OBSERVATIONS:
Tree Analysis Procedure for the evaluation of the flotability. See experimental scheme.

EXHIBIT 2

FLOTATION TESTS

TESTS: 84

PURPOSE: To determine the flotation response of amine feed from various mines in deep well water. See also tests 82-85.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	13	Type:	Deep Well			

TEST CONDITIONS:

	Conditioning				Flotation		
Product	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
Conc. 1	0.8	15	20	7.4	60	15	7.4
Conc. 2	0.0	15	1	7.5	60	1	7.5
Conc. 3	0.0	15	9	7.4	60	9	7.4
Froth 2	0.0	15			60		
Conc. 4	0.0	15	8	7.5	60	8	7.5
Froth 4	0.0	15			60		

RESULTS:

Product	YIELD %	CUMULATI YIELD, %	BPL %	CUMULA BPL, %	Insol. %	CUMULA Insol., %	RECOVERY BPL, %	REJECTIO BPL, %	RECOVERY Insol., %	REJECTION Insol., %
Conc. 1	68.17	68.17	69.90	69.90	4.32	4.32	93.22	6.78	10.13	89.87
Conc. 2	2.24	70.41	63.56	69.70	13.32	4.61	96.01	3.99	11.15	88.85
Conc. 3	3.15	73.56	40.18	68.43	44.10	6.30	98.49	1.51	15.93	84.07
Froth 2	1.04	74.60	26.70	67.85	62.78	7.08	99.03	0.97	18.18	81.82
Conc. 4	2.77	77.37	13.35	65.90	79.54	9.68	99.75	0.25	25.75	74.25
Froth 4	22.63	100.00	0.56	51.11	95.40	29.08	100.00	0.00	100.00	0.00
			51.11		29.08					

TEST NOTES AND OBSERVATIONS:
Tree Analysis Procedure for the evaluation of the flotability. See experimental scheme.

EXHIBIT 2

FLOTATION TESTS

TESTS: 85

PURPOSE: To determine the flotation response of amine feed from various mines in deep well water. See also tests 82-85.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %:	20.00
Water	Num.:	17	Type:	Deep Well			

TEST CONDITIONS:

	Conditioning				Flotation		
Product	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
Conc. 1	0.8	15	20	7.3	60	16	7.6
Conc. 2	0.0	15	2	7.5	60	2	7.6
Conc. 3	0.0	15	5	7.5	60	5	7.6
Froth 2	0.0	15			60		
Conc. 4	0.0	15	3	7.7	60	3	7.7
Froth 4	0.0	15			60		

RESULTS:

Product	YIELD %	CUMULATI YIELD, %	BPL %	CUMULA BPL, %	Insol. %	CUMULA Insol., %	RECOVERY BPL, %	REJECTIO BPL, %	RECOVERY Insol., %	REJECTION Insol., %
Conc. 1	79.96	79.96	70.12	70.12	5.74	5.74	93.38	6.62	24.27	75.73
Conc. 2	3.85	83.81	41.52	68.81	38.40	7.24	96.05	3.95	32.08	67.92
Conc. 3	7.65	91.46	23.58	65.02	67.76	12.30	99.05	0.95	59.49	40.51
Froth 2	0.61	92.07	20.93	64.73	71.16	12.69	99.26	0.74	61.79	38.21
Conc. 4	5.40	97.47	6.86	61.53	89.62	16.95	99.88	0.12	87.37	12.63
Froth 4	2.53	100.00	2.84	60.04	94.40	18.91	100.00	0.00	100.00	0.00
			60.04		18.91					

TEST NOTES AND OBSERVATIONS:
Tree Analysis Procedure for the evaluation of the flotability. See experimental scheme.

EXHIBIT 2

FLOTATION TESTS

TEST: 86

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in different types of water. See also tests 86-105.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	5	Type:	Deep Well		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
1	.63	15	20	7.3	60	11.20	7.3
2	.63	15	20	7.3	60	10.88	7.6
3	.62	15	20	7.5	60	10.70	7.6
4	.63	15	20	7.6	60	10.58	7.8
5	.63	15	20	7.6	60	10.40	7.7
6	.63	15	20	7.6	60	10.34	7.8
7	.84	15	20	7.6	60	10.18	7.8
8	.86	15	20	7.5	60	10.02	7.5
9	.84	15	20	7.5	60	9.99	7.6
10	.83	15	20	7.5	60	10.10	7.5
11	1.11	15	20	7.5	60	9.41	7.7
12	1.06	15	20	7.5	60	9.67	7.6
13	1.03	15	20	7.5	60	9.92	7.6
14	1.02	15	20	7.5	60	9.99	7.6
5-6	.63	15	20	7.6	60	10.37	7.7
9-10	.83	15	20	7.5	60	10.05	7.6
12-14	1.04	15	20	7.5	60	9.86	7.6

TEST: 86 Continued

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.63	55.52						
2	.63	53.62						
3	.62	52.39						
4	.63	52.38						
5	.63	51.66						
6	.63	51.17						
7	.84	50.22						
8	.86	50.32						
9	.84	49.51						
10	.83	49.00						
11	1.11	48.64						
12	1.06	48.06						
13	1.03	48.00						
14	1.02	47.70						
5-6	.63	51.41	67.17	6.48	6.23	37.56	91.94	93.08
9-10	.83	49.25	67.87	5.46	8.24	37.61	88.88	94.41
12-14	1.04	47.92	68.06	4.96	10.38	38.02	85.78	95.06

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 87

PURPOSE: To investigate the flotation response of amine feed from Mine 1 to recycling in different types of water. See also tests 86-90.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.13
Water	Num.:	6	Type:	Process				

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.62	15	20	7.0	60	11.25	7.3
2	.62	15	20	7.2	60	10.84	7.4
3	.62	15	20	7.3	60	10.81	7.5
4	.64	15	20	7.3	60	10.53	7.4
5	.63	15	20	7.4	60	10.43	7.5
6	.63	15	20	7.5	60	10.48	7.8
7	1.08	15	20	7.5	60	9.88	7.6
8	1.06	15	20	7.6	60	9.78	7.7
9	1.07	15	20	7.6	60	9.73	7.6
10	1.08	15	20	7.6	60	9.54	7.8
5-6	.63	15	20	7.5	60	10.46	7.7
8-10	1.07	15	20	7.6	60	9.68	7.7

RESULTS:

		CONC. (non float)				Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
1	.62	55.14						
2	.62	53.15						
3	.62	52.66						
4	.64	53.06						
5	.63	51.87						
6	.63	52.20						
7	1.08	49.96						
8	1.06	48.69						
9	1.07	48.83						
10	1.08	48.34						
5-6	.63	52.04	67.12	6.88	5.86	37.74	92.55	92.56
8-10	1.07	48.62	67.45	6.28	9.42	37.63	87.14	93.66

EXHIBIT 2

FLOTATION TESTS

TEST: 88

PURPOSE: To investigate the flotation response of amine feed from Mine 1 to recycling in different types of water. See also tests 86-90.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %: 48.13
Water	Num.:	7	Type:	Surficial			

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.64	15	20	7.4	60	11.62	7.4
2	.64	15	20	7.3	60	10.92	7.3
3	.63	15	20	7.4	60	10.83	7.4
4	.64	15	20	7.4	60	10.61	7.5
5	.64	15	20	7.5	60	10.64	7.5
6	.62	15	20	7.4	60	10.59	7.5
7	1.06	15	20	7.5	60	10.48	7.5
8	1.05	15	20	7.5	60	10.35	7.5
9	1.07	15	20	7.4	60	10.08	7.5
10	1.03	15	20	7.4	60	10.20	7.6
4-5	.64	15	20	7.5	60	10.62	7.5
9-10	1.05	15	20	7.4	60	10.14	7.6

RESULTS:

		CONC. (non float)				Head	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
1	.64	59.09						
2	.64	54.80						
3	.63	53.58						
4	.64	53.16						
5	.64	53.40						
6	.62	51.97						
7	1.06	52.51						
8	1.05	51.24						
9	1.07	50.57						
10	1.03	49.39						
4-5	.64	53.28	66.73	7.66	5.03	37.90	93.80	91.52
9-10	1.05	49.97	67.06	6.88	8.96	37.99	88.20	92.86

TEST NOTES AND OBSERVATIONS

EXHIBIT 2

FLOTATION TESTS

TEST: 89

PURPOSE: To investigate the flotation response of amine feed from Mine 1 to recycling in different types of water. See also tests 86-90.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.13
Water	Num.:	8	Type:	Pit				

TEST CONDITIONS:

Stage No.	Conditioning: Amine lb/TF	Conditioning: Time sec.	Conditioning: Solids %	Conditioning: pH	Flotation: Time sec.	Flotation: Solids %	Flotation: pH
1	.62	15	20	7.5	60	16.90	7.6
2	.63	15	20	7.5	60	11.81	7.6
3	.63	15	20	7.7	60	10.90	7.7
4	.64	15	20	7.6	60	10.74	7.7
5	.63	15	20	7.7	60	10.54	7.7
6	.64	15	20	7.7	60	10.35	7.8
7	1.08	15	20	7.7	60	9.95	7.8
8	1.06	15	20	7.8	60	9.81	7.9
9	1.05	15	20	7.9	60	10.00	8.3
10	1.06	15	20	7.9	60	9.91	8.0
5-6	.63	15	20	7.7	60	10.45	7.8
8-10	1.06	15	20	7.9	60	9.90	8.1

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	CONC. (non float) BPL %	CONC. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
1	.62	86.53						
2	.63	59.03						
3	.63	54.07						
4	.64	53.81						
5	.63	52.04						
6	.64	51.84						
7	1.08	50.24						
8	1.06	48.54						
9	1.05	49.46						
10	1.06	49.13						
5-6	.63	51.94	67.12	6.64	5.77	37.64	92.63	92.83
8-10	1.06	49.05	67.41	6.08	9.70	38.01	87.00	93.80

EXHIBIT 2

FLOTATION TESTS

TEST: 90

PURPOSE: To investigate the flotation response of amine feed from Mine 1 to recycling in different types of water. See also tests 86-90.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	22	Type:	Bartow sewage effluent		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.64	15	20	7.2	60	12.26	7.3
2	.63	15	20	7.5	60	11.59	7.4
3	.63	15	20	7.5	60	11.18	7.5
4	.63	15	20	7.6	60	11.11	7.6
5	.65	15	20	7.6	60	10.78	7.6
6	.64	15	20	7.6	60	10.72	7.6
7	1.05	15	20	7.6	60	10.35	7.6
8	1.04	15	20	7.6	60	10.36	7.6
9	1.07	15	20	7.5	60	9.86	7.6
10	1.05	15	20	7.5	60	10.02	7.6
4-6	.64	15	20	7.6	60	10.87	7.6
9-10	1.06	15	20	7.5	60	9.94	7.6

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.64	62.36						
2	.63	58.18						
3	.63	55.61						
4	.63	54.89						
5	.65	54.99						
6	.64	53.90						
7	1.05	51.20						
8	1.04	50.64						
9	1.07	49.32						
10	1.05	49.47						
4-6	.64	54.59	65.18	9.78	4.48	37.62	94.59	88.91
9-10	1.06	49.39	66.77	7.30	8.78	37.42	88.12	92.51

EXHIBIT 2

FLOTATION TESTS

TEST: 91

PURPOSE: To investigate the flotation response of amine feed from Mine 2 to recycling in different types of water. See also tests 91-95.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.40
Water	Num.:	9	Type:	Deep Well		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.61	15	20	8.1	60	13.66	7.9
2	.60	15	20	7.9	60	12.54	7.6
3	.60	15	20	7.5	60	11.79	7.5
4	.61	15	20	7.3	60	11.19	7.3
5	.61	15	20	7.2	60	11.36	7.2
6	.60	15	20	7.3	60	11.24	7.3
7	.61	15	20	7.3	60	10.87	7.4
8	.61	15	20	7.2	60	10.75	7.2
9	.41	15	20	7.2	60	12.54	7.3
10	.41	15	20	7.2	60	12.97	7.5
11	.41	15	20	7.3	60	12.99	7.4
12	.41	15	20	7.5	60	12.93	7.6
13	.20	15	20	7.5	60	13.93	7.4
14	.20	15	20	7.5	60	14.23	7.4
15	.20	15	20	7.3	60	14.09	7.5
16	.20	15	20	7.3	60	13.94	7.4
7-8	.61	15	20	7.3	60	10.81	7.3
10-12	.41	15	20	7.3	60	12.96	7.5
15-16	.20	15	20	7.3	60	14.02	7.4

TEST: 91 Continued

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.61	66.80						
2	.60	60.22						
3	.60	56.15						
4	.61	53.67						
5	.61	54.53						
6	.60	53.34						
7	.61	51.78						
8	.61	51.29						
9	.41	60.69						
10	.41	63.00						
11	.41	63.45						
12	.41	62.89						
13	.20	68.66						
14	.20	69.85						
15	.20	68.53						
16	.20	68.62						
7-8	.61	51.53	70.25	5.44	35.79	53.55	67.61	90.46
10-12	.41	63.11	70.49	5.32	26.50	54.26	81.98	88.58
15-16	.20	68.57	70.53	4.94	17.65	53.91	89.71	88.48

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 92

PURPOSE: To investigate the flotation response of amine feed from Mine 2 to recycling in different types of water. See also tests 91-95.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	10	Type:	Process		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.40	15	20	8.6	60	14.94	8.5
2	.41	15	20	8.5	60	14.42	8.2
3	.41	15	20	7.9	60	14.16	7.8
4	.40	15	20	7.9	60	14.04	7.6
5	.20	15	20	7.5	60	14.36	7.5
6	.20	15	20	7.4	60	14.31	7.5
7	.20	15	20	7.5	60	14.58	7.4
8	.20	15	20	7.4	60	14.82	7.4
4	.40	15	20	7.9	60	14.04	7.6
6-8	.20	15	20	7.4	60	14.57	7.4

RESULTS:

		CONC. (non float)					Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
1	.40	73.33						
2	.41	70.86						
3	.41	69.60						
4	.40	68.47						
5	.20	70.52						
6	.20	70.66						
7	.20	71.19						
8	.20	71.23						
4	.40	68.47	70.82	4.70	16.37	53.65	90.38	88.98
6-8	.20	71.02	70.86	4.68	11.41	53.63	93.83	88.62

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 93

PURPOSE: See also tests 91-95.
to recycling in different types of water. See also tests 91-95.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	11	Type:	surficial		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Time sec.	Solids %	pH	Flotation Time sec.	Solids %	pH
1	.40	15	20	8.5	60	15.30	8.6
2	.40	15	20	8.3	60	14.80	8.2
3	.40	15	20	7.9	60	14.52	7.8
4	.40	15	20	7.6	60	14.11	7.7
5	.20	15	20	7.4	60	14.58	7.4
6	.20	15	20	7.3	60	14.44	7.4
7	.20	15	20	7.4	60	14.64	7.4
8	.20	15	20	7.3	60	14.34	7.4
4	.40	15	20	7.6	60	14.11	7.7
6-8	.20	15	20	7.3	60	14.48	7.4

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	73.84						
2	.40	72.02						
3	.40	69.67						
4	.40	68.45						
5	.20	70.69						
6	.20	70.46						
7	.20	71.55						
8	.20	71.04						
4	.40	68.45	70.68	4.98	16.74	53.66	90.16	88.33
6-8	.20	71.02	70.68	5.20	11.60	53.56	93.72	87.35

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 95

PURPOSE: To investigate the flotation response of amine feed from Mine 2 to recycling in different types of water. See also tests 91-95.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	22	Type:	Bartow sewage effluent		

TEST CONDITIONS:

Stage No.	Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
1	.41	15	20	7.2	60	15.17	7.2
2	.41	15	20	7.2	60	14.82	7.1
3	.40	15	20	7.5	60	14.92	7.4
4	.40	15	20	7.2	60	14.92	7.3
5	.40	15	20	7.3	60	14.73	7.3
6	.41	15	20	7.3	60	14.37	7.3
7	.60	15	20	7.4	60	13.87	7.4
8	.61	15	20	7.3	60	13.34	7.2
9	.61	15	20	7.3	60	13.11	7.2
10	.61	15	20	7.3	60	13.10	7.4
5-6	.41	15	20	7.3	60	14.55	7.3
9-10	.61	15	20	7.3	60	13.11	7.3

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	CONC. (non float) BPL %	CONC. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
1	.41	74.74						
2	.41	73.27						
3	.40	72.76						
4	.40	72.76						
5	.40	71.89						
6	.41	71.43						
7	.60	67.32						
8	.61	65.22						
9	.61	64.12						
10	.61	64.21						
5-6	.41	71.66	70.36	4.96	11.49	53.67	93.93	87.83
9-10	.61	64.16	70.58	4.98	23.27	53.63	84.45	89.06

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 96

PURPOSE: To investigate the flotation response of amine feed from Mine 3 to recycling in different types of water. See also tests 96-100.

SAMPLES: Feed Num.: 3 Mine: 3 BPL, %: 52.77 AI, %: 27.38
Water Num.: 13 Type: Deep Well

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.60	15	20	7.2	60	14.67	7.4
2	.60	15	20	7.3	60	14.57	7.6
3	.60	15	20	7.5	60	14.44	7.5
4	.61	15	20	7.6	60	14.35	7.6
5	.60	15	20	7.6	60	14.38	7.8
6	.60	15	20	7.6	60	14.31	7.8
7	.40	15	20	7.7	60	14.49	7.9
8	.40	15	20	7.5	60	14.58	7.7
9	.40	15	20	7.5	60	14.79	7.5
10	.39	15	20	7.8	60	14.82	7.6
11	.79	15	20	7.9	60	14.03	7.6
12	.79	15	20	8.0	60	13.68	8.0
13	.80	15	20	7.5	60	13.51	8.0
14	.80	15	20	7.5	60	13.54	8.0
5-6	.39	15	20	7.6	60	14.80	7.6
9-10	.60	15	20	7.6	60	14.31	7.8
12-14	.80	15	20	7.7	60	13.58	8.0

TEST: 96 Continued

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.60	70.89						
2	.60	70.43						
3	.60	69.82						
4	.61	70.00						
5	.60	69.63						
6	.60	69.76						
7	.40	70.39						
8	.40	70.72						
9	.40	71.14						
10	.39	70.52						
11	.79	66.93						
12	.79	65.09						
13	.80	64.77						
14	.80	64.98						
9-10	.39	70.81	69.83	4.72	9.75	52.30	94.56	87.79
5-6	.60	69.63	70.16	4.44	11.49	52.34	93.33	88.71
12-14	.80	64.94	70.12	4.46	20.60	52.76	86.31	89.42

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 97

PURPOSE: To investigate the flotation response of amine feed from Mine 3 to recycling in different types of water. See also tests 96-100.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %: 52.77	AI, %: 27.38
Water	Num.:	14	Type:	Process		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.59	15	20	7.4	60	14.85	7.4
2	.60	15	20	7.4	60	14.60	7.4
3	.60	15	20	7.4	60	14.64	7.4
4	.59	15	20	7.8	60	14.68	7.6
5	.60	15	20	7.6	60	14.55	7.8
6	.60	15	20	7.5	60	14.42	7.6
7	.79	15	20	7.6	60	13.82	7.7
8	.80	15	20	7.6	60	13.63	7.7
9	.79	15	20	7.8	60	13.49	7.7
10	.79	15	20	7.7	60	13.57	7.7
5-6	.60	15	20	7.6	60	14.48	7.7
9-10	.79	15	20	7.8	60	13.53	7.7

RESULTS:

		CONC. (non float)					Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
1	.59	71.13						
2	.60	70.75						
3	.60	70.46						
4	.59	70.16						
5	.60	70.45						
6	.60	70.22						
7	.79	66.14						
8	.80	65.25						
9	.79	64.21						
10	.79	64.31						
5-6	.60	70.33	69.99	4.84	10.88	52.45	93.85	87.57
9-10	.79	64.26	70.09	4.50	21.68	52.79	85.32	89.44

EXHIBIT 2

FLOTATION TESTS

TEST: 98

PURPOSE: To investigate the flotation response of amine feed from Mine 3 to recycling in different types of water. See also tests 96-100.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %: 52.77	AI, %: 27.38
Water	Num.:	15	Type:	Surficial		

TEST CONDITIONS:

		Conditioning			Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.59	15	20	7.5	60	15.06	7.6
2	.60	15	20	7.6	60	14.79	7.6
3	.60	15	20	7.7	60	14.72	7.7
4	.60	15	20	7.8	60	14.67	7.8
5	.59	15	20	7.6	60	14.91	7.6
6	.59	15	20	7.7	60	14.95	7.6
7	.81	15	20	7.4	60	14.30	7.4
8	.81	15	20	7.5	60	14.02	7.6
9	.78	15	20	7.7	60	14.15	7.8
10	.78	15	20	7.8	60	14.14	7.8
5-6	.59	15	20	7.6	60	14.93	7.6
9-10	.78	15	20	7.7	60	14.15	7.8

RESULTS:

		CONC. (non float)					Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
1	.59	72.50						
2	.60	71.20						
3	.60	70.97						
4	.60	71.19						
5	.59	70.97						
6	.59	71.29						
7	.81	69.80						
8	.81	68.49						
9	.78	66.44						
10	.78	66.91						
5-6	.59	71.12	70.09	4.84	9.79	52.68	94.63	87.43
9-10	.78	66.67	70.66	3.94	15.82	52.38	89.94	90.41

EXHIBIT 2

FLOTATION TESTS

TEST: 99

PURPOSE: To investigate the flotation response of amine feed from Mine 3 to recycling in different types of water. See also tests 96-100.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %: 52.77	AI, %: 27.38
Water	Num.:	16	Type:	Pit		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.60	15	20	7.9	60	14.44	7.9
2	.61	15	20	7.6	60	13.93	7.7
3	.59	15	20	7.5	60	14.29	7.8
4	.59	15	20	7.6	60	13.97	8.0
5	.59	15	20	7.9	60	13.93	7.9
6	.59	15	20	7.7	60	13.43	8.0
7	.79	15	20	8.3	60	12.71	8.2
8	.81	15	20	7.7	60	12.37	8.0
9	.79	15	20	7.8	60	12.37	8.3
10	.39	15	20	8.1	60	13.57	8.3
11	.39	15	20	7.1	60	14.25	7.3
12	.39	15	20	7.3	60	14.53	7.4
13	.40	15	20	7.4	60	14.26	7.5
4-5	.59	15	20	7.8	60	13.95	8.0
12-13	.39	15	20	7.4	60	14.40	7.5

TEST: 99 Continued

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.60	70.05						
2	.61	67.81						
3	.59	67.60						
4	.59	66.46						
5	.59	66.26						
6	.59	63.88						
7	.79	60.23						
8	.81	59.93						
9	.79	58.57						
10	.39	64.11						
11	.39	66.97						
12	.39	68.37						
13	.40	68.20						
4-5	.59	66.35	70.55	4.00	18.29	52.97	88.38	90.31
12-13	.39	68.43	70.55	4.04	14.27	52.78	91.46	89.90

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 100

PURPOSE: To investigate the flotation response of amine feed from Mine 3 to recycling in different types of water. See also tests 96-100.

SAMPLES: Feed Num.: 3 Mine: 3 BPL, %: 52.77 AI, %: 27.38
Water Num.: 22 Type: Bartow Sewage Effluent

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.60	15	20	7.3	60	15.16	7.4
2	.59	15	20	7.4	60	15.06	7.5
3	.59	15	20	7.5	60	15.09	7.5
4	.59	15	20	7.6	60	14.97	7.6
5	.59	15	20	7.6	60	14.65	7.6
6	.60	15	20	7.6	60	14.54	7.7
7	.79	15	20	7.7	60	14.32	7.7
8	.79	15	20	7.7	60	14.33	7.7
9	.79	15	20	7.6	60	14.33	7.7
10	.79	15	20	7.6	60	14.04	7.7
5-6	.60	15	20	7.6	60	14.59	7.7
8-10	.79	15	20	7.6	60	14.23	7.7

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.60	74.15						
2	.59	72.43						
3	.59	71.86						
4	.59	71.36						
5	.59	70.36						
6	.60	69.90						
7	.79	68.32						
8	.79	68.04						
9	.79	68.11						
10	.79	67.01						
5-6	.60	70.12	69.92	4.74	10.71	52.23	93.87	87.86
8-10	.79	67.72	70.42	3.98	15.36	52.65	90.58	90.16

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 101

PURPOSE: To investigate the flotation response of amine feed from Mine 4 to recycling in different types of water. See also tests 101-105.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	17	Type:	Deep Well		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.81	15	20	7.3	60	16.09	7.4
2	.81	15	20	7.3	60	15.85	7.5
3	.80	15	20	7.3	60	15.78	7.4
4	.79	15	20	7.3	60	16.13	7.4
5	.80	15	20	7.3	60	15.65	7.6
6	.81	15	20	7.4	60	15.44	7.5
7	.80	15	20	7.4	60	15.50	7.4
8	.80	15	20	7.3	60	15.73	7.4
9	.79	15	20	7.5	60	16.12	7.4
10	.81	15	20	7.4	60	15.22	7.4
11	.81	15	20	7.4	60	15.85	7.4
12	.80	15	20	7.4	60	15.96	7.6
13	.80	15	20	7.5	60	15.85	7.4
14	.80	15	20	7.5	60	15.89	7.3
12-14	.80	15	20	7.5	60	15.87	7.4

TEST: 101 Continued

RESULTS:

Stage No.	Amine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.81	79.82						
2	.81	78.42						
3	.80	76.82						
4	.79	78.35						
5	.80	76.65						
6	.81	75.84						
7	.80	75.99						
8	.80	77.07						
9	.79	77.94						
10	.81	74.79						
11	.81	78.77						
12	.80	77.73						
13	.80	77.74						
14	.80	77.53						
12-14	.80	77.62	70.77	4.86	24.10	60.33	91.06	81.14

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 102

PURPOSE: To investigate the flotation response of amine feed from Mine 4 to recycling in different types of water. See also tests 101-105.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	18	Type:	Process		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.82	15	20	6.8	60	15.48	7.2
2	.81	15	20	7.0	60	15.70	7.0
3	.81	15	20	7.1	60	15.72	7.1
4	.81	15	20	7.2	60	15.80	7.1
5	.81	15	20	7.0	60	15.62	7.1
6	.81	15	20	7.4	60	15.66	7.5
7	.81	15	20	7.2	60	15.62	7.2
8	.81	15	20	7.3	60	15.67	7.2
6-8	.81	15	20	7.3	60	15.65	7.3

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.82	76.97						
2	.81	77.66						
3	.81	78.12						
4	.81	77.72						
5	.81	76.94						
6	.81	77.56						
7	.81	77.54						
8	.81	77.61						
6-8	.81	77.57	71.25	4.22	22.22	60.25	91.73	83.63

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 103

PURPOSE: To investigate the flotation response of amine feed from Mine 4 to recycling in different types of water. See also tests 101-105.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	19	Type:	Surficial		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.81	15	20	6.9	60	17.76	7.0
2	.80	15	20	7.1	60	18.48	7.1
3	.79	15	20	7.0	60	17.72	7.3
4	.80	15	20	7.3	60	16.30	7.4
5	.80	15	20	7.2	60	16.31	7.3
6	.80	15	20	7.3	60	16.02	7.2
7	.80	15	20	7.4	60	16.23	7.2
8	.79	15	20	7.1	60	16.16	7.2
9	.80	15	20	7.6	60	15.82	7.4
10	.80	15	20	7.3	60	15.85	7.2
11	.80	15	20	7.3	60	15.95	7.3
9-11	.80	15	20	7.4	60	15.87	7.3

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.81	89.01						
2	.80	92.43						
3	.79	87.17						
4	.80	80.22						
5	.80	80.04						
6	.80	78.40						
7	.80	79.97						
8	.79	78.45						
9	.80	77.66						
10	.80	77.35						
11	.80	78.31						
9-11	.80	77.77	71.45	4.16	21.35	60.31	92.13	83.82

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 104

PURPOSE: To investigate the flotation response of amine feed from Mine 4 to recycling in different types of water. See also tests 101-105.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	20	Type:	Pit		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.80	15	20	7.4	60	16.66	7.5
2	.80	15	20	7.2	60	15.74	7.4
3	.80	15	20	7.2	60	14.91	7.2
4	.80	15	20	7.2	60	15.76	7.2
5	.81	15	20	7.2	60	15.45	7.2
6	.79	15	20	7.1	60	15.80	7.1
7	.80	15	20	7.1	60	15.87	7.1
8	.80	15	20	7.2	60	15.78	7.1
9	.80	15	20	7.2	60	15.55	7.2
10	.80	15	20	7.2	60	15.66	7.2
8-10	.80	15	20	7.2	60	15.66	7.2

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.80	81.98						
2	.80	77.00						
3	.80	72.50						
4	.80	76.79						
5	.81	76.31						
6	.79	76.61						
7	.80	77.84						
8	.80	76.96						
9	.80	76.11						
10	.80	76.59						
8-10	.80	76.55	71.45	4.36	23.73	60.26	90.77	83.31

TEST NOTES AND OBSERVATIONS:

EXHIBIT 2

FLOTATION TESTS

TEST: 105

PURPOSE: To investigate the flotation response of amine feed from Mine 4 to recycling in different types of water. See also tests 101-105.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	22	Type:	Bartow Sewage Effluent		

TEST CONDITIONS:

	Conditioning				Flotation		
Stage No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
1	.81	15	20	7.1	60	17.36	7.4
2	.81	15	20	7.3	60	17.01	7.3
3	.81	15	20	7.4	60	16.68	7.3
4	.80	15	20	7.3	60	16.59	7.3
5	.80	15	20	7.3	60	16.79	7.3
6	.80	15	20	7.3	60	16.44	7.3
7	.80	15	20	7.3	60	16.52	7.3
8	.81	15	20	7.3	60	16.39	7.2
6-8	.81	15	20	7.3	60	16.45	7.3

RESULTS:

		CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.81	86.45						
2	.81	84.36						
3	.81	82.52						
4	.80	81.80						
5	.80	82.49						
6	.80	81.14						
7	.80	81.38						
8	.81	81.59						
6-8	.81	81.37	70.40	5.48	17.94	60.63	94.49	77.70

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 106-109

To investigate the flotation response of amine feed in process water with respect to time. See also Tests 66 to 69.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	18	Type:	Process (20 Dec 1993)		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
106	.41	15	20	6.2	60	18.14	6.2
107	.60	15	20	6.3	60	16.59	6.3
108	.81	15	20	6.0	60	16.36	6.0
109	1.02	15	20	6.5	60	16.02	6.6

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
106	.41	91.49	64.83	13.50	7.91	59.99	98.88	38.24
107	.60	82.09	71.76	4.44	9.72	60.65	97.13	81.78
108	.81	80.85	72.37	4.40	13.26	61.05	95.84	82.21
109	1.02	80.16	72.21	4.10	17.85	61.43	94.24	83.57

TEST NOTES AND OBSERVATIONS:

Turbid,cloudy water for all tests.

EXHIBIT 2

FLOTATION TESTS

TEST: 110-112

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	7	Type:	Surficial		
Sample:	Num.:	23	Type:	Mine 1 Sand Tailings		

Method: Sand Tailings Filtration.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
110	.62	15	20	7.1	60	10.79	7.1
111	.84	15	20	7.2	60	13.31	7.1
112	1.00	15	20	7.2	60	13.66	7.2

RESULTS:

		Conc. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
110	.62	52.25	44.60	37.06	22.33	33.97	68.60	59.77
111	.84	66.77	53.36	25.16	26.72	44.51	80.05	65.10
112	1.00	65.66	43.50	38.84	27.49	38.00	75.16	47.01

TEST NOTES AND OBSERVATIONS:

Heavy flocculated froth for Test 110.
Poor balance for Tests 110 and 111.

EXHIBIT 2

FLOTATION TESTS

TEST: 113-115

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	22	Type:	Bartow Sewage Effluent		
Sample:	Num.:	23	Type:	Mine 1 Sand Tailings		

Method: Sand Tailings Filtration.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
113	.62	15	20	7.0	60	10.24	7.0
114	.82	15	20	7.0	60	7.73	7.0
115	1.02	15	20	7.1	60	5.03	7.1

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
113	.62	49.37	52.79	26.18	24.47	38.45	67.78	73.14
114	.82	36.73	58.38	18.06	26.33	38.10	56.28	86.22
115	1.02	23.25	56.85	20.34	32.05	37.82	34.96	90.17

TEST NOTES AND OBSERVATIONS:

Visable phosphate in all froths.

EXHIBIT 2

FLOTATION TESTS

TEST: 116-118

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	7	Type:	Surficial		
Sample:	Num.:	24	Type:	Mine 1 Overburden		

Method: Overburden Neutralization

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
116	.62	15	20	7.1	60	11.72	7.1
117	.82	15	20	7.1	60	10.93	7.0
118	1.02	15	20	7.0	60	10.39	6.9

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
116	.62	57.57	62.62	12.70	4.11	37.80	95.39	84.81
117	.82	52.79	65.99	8.14	4.87	37.14	93.81	91.07
118	1.02	50.05	68.06	5.32	6.58	37.35	91.20	94.47

TEST NOTES AND OBSERVATIONS:

None.

EXHIBIT 2

FLOTATION TESTS

TEST: 119-121

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques. See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	22	Type:	Bartow Sewage Effluent		
Sample:	Num.:	24	Type:	Mine 1 Overburden		

Method: Overburden Neutralization

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
119	.62	15	20	7.1	60	11.76	7.0
120	.84	15	20	6.9	60	10.68	6.9
121	1.05	15	20	6.9	60	10.51	6.6

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
119	.62	58.14	62.95	12.26	3.23	37.95	96.44	85.19
120	.84	52.98	67.21	6.16	3.87	37.43	95.14	93.22
121	1.05	51.94	67.78	5.44	5.81	38.00	92.65	94.13

TEST NOTES AND OBSERVATIONS:

None.

EXHIBIT 2

FLOTATION TESTS

TEST: 122-124

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	7	Type:	Surficial		

Method: Charcoal Filtration

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
122	.62	15	20	7.1	60	11.67	7.1
123	.84	15	20	7.3	60	11.00	7.3
124	1.06	15	20	7.3	60	10.72	7.3

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
122	.62	57.61	64.09	10.76	3.43	38.38	96.21	87.12
123	.84	54.60	65.75	8.34	4.39	37.89	94.74	90.54
124	1.06	53.39	67.30	6.18	5.68	38.58	93.14	93.14

TEST NOTES AND OBSERVATIONS:

None.

EXHIBIT 2

FLOTATION TESTS

TEST: 125-127

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES: Feed Num.: 1 Mine: 1 BPL, %: 35.70 AI, %: 48.13
Water Num.: 22 Type: Bartow Sewage Effluent

Method: Charcoal Filtration

TEST CONDITIONS:

		Conditioning			Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
125	.61	15	20	7.5	60	12.31	7.5
126	.80	15	20	7.6	60	11.37	7.5
127	1.00	15	20	7.5	60	11.14	7.5

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
125	.61	59.61	61.62	13.88	3.32	38.08	96.48	82.81
126	.80	53.58	64.94	9.20	4.59	36.92	94.23	89.76
127	1.00	52.69	66.03	7.78	4.92	37.12	93.73	91.48

TEST NOTES AND OBSERVATIONS:

None.

EXHIBIT 2

FLOTATION TESTS

TEST: 128-130

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	7	Type:	Surficial		

Method: Chemical Modification (Starch)

TEST CONDITIONS:

Test No.	Conditioning: Starch lb/TF	Conditioning: Time sec.	Conditioning: Amine lb/TF	Conditioning: Time sec.	Conditioning: Solids %	Conditioning: pH	Flotation: Time sec.	Flotation: Solids %	Flotation: pH
128	1.04	15	.63	15	20	8.4	60	15.13	8.2
129	1.03	15	.82	15	20	8.3	60	12.13	8.0
130	1.04	15	1.04	15	20	8.2	60	11.35	7.9

RESULTS:

Test No.	Amine lb/TF	Conc. (non float): Weight %	Conc. (non float): BPL %	Conc. (non float): Insol. %	Froth BPL %	Head Calc. BPL %	Percent: BPL Recovery	Percent: Insol. Reject
128	.63	76.77	49.40	30.14	4.06	38.87	97.57	51.93
129	.82	59.46	61.53	13.92	4.26	38.31	95.49	82.80
130	1.04	55.77	64.17	10.40	4.72	37.87	94.49	87.95

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 131-133

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	22	Type:	Bartow Sewage Effluent		

Method: Chemical Modification (Starch)

TEST CONDITIONS:

Test No.	Conditioning						Flotation		
	Starch lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
131	1.02	15	.61	15	20	7.2	60	18.05	7.1
132	1.01	15	.81	15	20	7.1	60	13.66	7.1
133	1.02	15	1.02	15	20	7.1	60	12.44	7.1

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
131	.61	91.78	42.19	39.74	3.78	39.03	99.20	24.22
132	.81	66.59	54.67	22.72	3.78	37.67	96.65	68.56
133	1.02	60.45	59.96	15.46	4.92	38.19	94.91	80.58

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 134-136

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.13
Water	Num.:	7	Type:	Surficial				

Method: Chemical Modification (Soda Ash)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Sod.Ash lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
134	1.01	15	.61	15	20	8.2	60	12.02	7.9
135	1.01	15	.81	15	20	8.2	60	11.48	7.7
136	1.01	15	1.01	15	20	8.2	60	11.15	8.2

RESULTS:

		Conc. (non float)					Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
134	.61	57.75	63.23	11.76	3.87	38.15	95.71	85.89
135	.81	54.82	65.70	8.36	4.15	37.89	95.05	90.48
136	1.01	53.52	64.94	7.18	4.83	37.00	93.93	92.02

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 137-139

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 110 to 139.

SAMPLES: Feed Num.: 1 Mine: 1 BPL, %: 35.70 AI, %: 48.13
Water Num.: 22 Type: Bartow Sewage Effluent

Method: Chemical Modification (Soda Ash)

TEST CONDITIONS:

Test No.	Conditioning Sod.Ash lb/TF	Conditioning Time sec.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	pH	Flotation Time sec.	Flotation Solids %	Flotation pH
137	1.05	15	.63	15	20	7.5	60	12.07	7.3
138	1.01	15	.81	15	20	7.5	60	11.55	7.4
139	1.04	15	1.04	15	20	7.6	60	10.77	7.3

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
137	.63	60.23	60.39	15.90	3.32	37.69	96.50	80.10
138	.81	55.58	65.18	8.70	4.54	38.24	94.73	89.95
139	1.04	52.75	66.31	6.84	6.58	38.09	91.84	92.50

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 140-142

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 140 to 154.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	22	Type:	Bartow Sewage Effluent		
Sample:	Num.:	25	Type:	Mine 2 Sand Tailings		

Method: Sand Tailings Filtration.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
140	.21	15	20	7.2	60	16.94	7.3
141	.41	15	20	7.4	60	15.09	7.4
142	.60	15	20	6.8	60	14.91	6.9

RESULTS:

		Conc. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
140	.21	85.93	61.72	17.08	2.53	53.39	99.33	49.74
141	.41	75.02	70.03	6.34	5.90	54.01	97.27	83.71
142	.60	72.79	70.79	5.30	7.10	53.46	96.39	86.79

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 143-145

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 140 to 154.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %: 29.20
Water	Num.:	22	Type:	Bartow Sewage Effluent		
Sample:	Num.:	26	Type:	Mine 2 Overburden		

Method: Overburden Neutralization

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
143	.20	15	20	7.2	60	17.04	7.0
144	.40	15	20	7.1	60	14.61	7.0
145	.60	15	20	7.1	60	13.79	7.1

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
143	.20	84.65	61.55	15.96	5.94	53.02	98.28	53.73
144	.40	71.60	71.27	5.74	12.15	54.48	93.67	85.92
145	.60	67.00	71.80	3.92	17.24	53.79	89.42	91.01

TEST NOTES AND OBSERVATIONS:

Visable phosphate in Test 145 froth.

EXHIBIT 2

FLOTATION TESTS

TEST: 146-148

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 140 to 154.

SAMPLES: Feed Num.: 2 Mine: 2 BPL, %: 52.29 AI, %: 29.20
Water Num.: 22 Type: Bartow Sewage Effluent

Method: Charcoal Filtration

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
146	.20	15	20	7.3	60	15.65	7.2
147	.41	15	20	7.4	60	14.55	7.3
148	.61	15	20	7.3	60	14.11	7.4

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
146	.20	76.66	68.78	7.98	4.52	53.78	98.04	79.05
147	.41	71.72	71.60	3.98	8.39	53.72	95.58	90.22
148	.61	69.09	71.65	4.02	13.94	53.81	91.99	90.49

TEST NOTES AND OBSERVATIONS:

None.

EXHIBIT 2

FLOTATION TESTS

TEST: 149-151

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques. See also Tests 140 to 154.

SAMPLES:

Feed Num.: 2 Mine: 2 BPL, %: 52.29 AI, %: 29.20
Water Num.: 22 Type: Bartow Sewage Effluent

Method: Chemical Modification (Starch)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Starch lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
149	1.00	15	.20	15	20	8.1	60	18.07	7.8
150	1.00	15	.40	15	20	8.3	60	15.89	8.0
151	1.02	15	.61	15	20	8.0	60	15.24	7.7

RESULTS:

		Conc. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
149	.20	89.84	58.86	21.52	3.26	53.21	99.38	33.79
150	.40	77.50	68.13	8.80	4.52	53.82	98.11	76.64
151	.61	75.41	70.42	5.82	5.27	54.40	97.62	84.97

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 152-154

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 140 to 154.

SAMPLES:

Feed Num.: 2 Mine: 2 BPL, %: 52.29 AI, %: 29.20
Water Num.: 22 Type: Bartow Sewage Effluent

Method: Chemical Modification (Soda Ash)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Soda.Ash lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
152	1.00	15	.20	15	20	8.2	60	16.70	8.2
153	1.00	15	.40	15	20	8.9	60	15.43	8.7
154	1.00	15	.60	15	20	8.5	60	15.16	8.7

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
152	.20	81.87	64.70	13.70	2.82	53.48	99.04	61.59
153	.40	74.83	70.03	6.10	5.22	53.71	97.55	84.37
154	.60	73.51	70.79	5.44	6.49	53.76	96.80	86.30

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 155-157

PURPOSE: Standard of comparison for water treatment tests.(No treatment) See also Tests 155 to 166 and Tests 244 to 249.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.13
Water	Num.:	7	Type:	Surficial				

Method: None.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
155	.60	15	20	9.4	60	11.61	8.8
156	.80	15	20	8.4	60	10.92	8.5
157	1.00	15	20	8.4	60	10.70	8.3

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
155	.60	55.32	65.42	9.52	4.81	38.34	94.39	89.06
156	.80	51.29	67.89	6.10	5.29	37.40	93.11	93.50
157	1.00	50.29	68.26	5.40	6.64	37.63	91.23	94.36

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 158-160

PURPOSE: Standard of comparison for water treatment tests.(No treatment)
See also Tests 155 to 166 and Tests 244 to 249.

SAMPLES: Feed Num.: 1 Mine: 1 BPL, %: 35.70 AI, %: 48.13
Water Num.: 22 Type: Bartow Sewage Effluent

Method: None.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
158	.60	15	20	7.8	60	12.32	8.0
159	.80	15	20	7.9	60	11.39	8.0
160	.99	15	20	7.9	60	11.19	8.0

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
158	.60	58.42	61.70	14.12	3.95	37.69	95.64	82.86
159	.80	53.90	65.55	8.92	4.52	37.42	94.43	90.01
160	.99	52.59	66.07	8.16	5.40	37.31	93.14	91.08

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 161-163

PURPOSE: Standard of comparison for water treatment tests.(No treatment) See also Tests 155 to 166 and Tests 244 to 249.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water	Num.:	15	Type:	Surficial				

Method: None.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
161	.41	15	20	8.5	60	14.79	8.3
162	.61	15	20	8.3	60	14.49	8.2
163	.80	15	20	8.2	60	14.07	8.1

RESULTS:

		Conc. (non float)				Head	Percent	
					Froth	Calc.		
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
161	.41	72.73	69.96	5.10	6.07	52.54	96.85	86.45
162	.61	71.37	70.71	4.18	7.52	52.62	95.91	89.10
163	.80	68.04	71.73	3.16	11.45	52.47	93.03	92.15

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 164-166

PURPOSE: Standard of comparison for water treatment tests.(No treatment)
See also Tests 155 to 166 and Tests 244 to 249.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water	Num.:	16	Type:	Pit				

Method: None.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
164	.40	15	20	8.5	60	14.48	8.4
165	.60	15	20	8.3	60	14.11	8.3
166	.81	15	20	8.2	60	13.26	8.2

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
164	.40	70.57	70.51	4.30	9.05	52.42	94.92	88.92
165	.60	68.56	71.08	3.58	11.08	52.21	93.33	91.04
166	.81	64.77	71.12	3.54	18.29	52.51	87.73	91.63

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 167-169

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 155 to 184.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water	Num.:	15	Type:	Surficial				

Method: Chemical Modification (Kerosine)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Kerosine lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
167	.20	15	.41	15	20	8.4	60	14.59	8.1
168	.20	15	.61	15	20	8.2	60	14.30	7.9
169	.20	15	.82	15	20	7.4	60	14.11	6.8

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
167	.41	72.44	70.38	4.56	6.45	52.76	96.63	87.94
168	.61	70.14	71.01	3.28	9.00	52.50	94.88	91.60
169	.82	69.67	70.79	3.38	12.80	53.20	92.70	91.40

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 170-172

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 155 to 184.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	16	Type:	Pit			

Method: Chemical Modification (Kerosine)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Kerosine lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
170	.20	15	.40	15	20	8.0	60	14.42	8.0
171	.20	15	.59	15	20	8.1	60	14.07	8.0
172	.20	15	.78	15	20	7.9	60	13.50	8.0

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
170	.40	70.21	70.60	3.78	9.05	52.26	94.84	90.31
171	.59	67.30	70.71	3.56	14.44	52.31	90.97	91.25
172	.78	63.55	70.71	3.26	20.41	52.37	85.79	92.43

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 173-175

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 155 to 184.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %: 52.77	AI, %: 27.38
Water	Num.:	15	Type:	Surficial		

Method: Chemical Modification (Starch)

TEST CONDITIONS:

Test No.	Conditioning Starch lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Flotation Time sec.	Solids %	pH
173	1.00	15	.40	15	20	8.8	60	15.62	8.6
174	1.00	15	.60	15	20	8.9	60	15.40	8.7
175	1.00	15	.80	15	20	8.9	60	15.08	8.7

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
173	.40	76.56	68.24	7.02	2.80	52.90	98.76	80.37
174	.60	74.88	68.61	6.32	2.69	52.05	98.70	82.72
175	.80	73.28	69.81	5.10	3.58	52.11	98.16	86.35

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 176-178

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 155 to 184.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %: 52.77	AI, %: 27.38
Water	Num.:	16	Type:	Pit		

Method: Chemical Modification (Starch)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Starch lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
176	.97	15	.39	15	20	9.1	60	15.88	9.1
177	.98	15	.59	15	20	9.1	60	15.50	8.9
178	.96	15	.77	15	20	9.1	60	15.69	8.9

RESULTS:

		Conc. (non float)					Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	BPL Recovery	Insol. Reject
176	.39	75.43	69.24	5.92	2.53	52.85	98.82	83.69
177	.59	74.25	69.42	5.54	3.67	52.49	98.20	84.98
178	.77	73.72	69.57	5.46	3.91	52.31	98.04	85.30

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 179-181

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 155 to 184.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	15	Type:	Surficial			

Method: Chemical Modification (Soda Ash)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Sod.Ash lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
179	1.02	15	.41	15	20	9.1	60	15.07	8.9
180	1.01	15	.60	15	20	9.1	60	14.89	9.0
181	1.00	15	.80	15	20	9.1	60	14.64	8.9

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
179	.41	74.56	69.70	5.50	2.82	52.69	98.64	85.02
180	.60	72.85	70.36	4.60	5.09	52.64	97.37	87.76
181	.80	71.11	70.84	3.60	7.06	52.41	96.11	90.65

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 182-184

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 155 to 184.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	16	Type:	Pit			

Method: Chemical Modification (Soda Ash)

TEST CONDITIONS:

Test No.	Conditioning Sod.Ash lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Flotation Time sec.	Solids %	pH
182	.98	15	.39	15	20	9.3	60	15.69	9.1
183	.98	15	.59	15	20	9.3	60	15.35	9.1
184	.98	15	.78	15	20	9.3	60	15.18	9.1

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
182	.39	74.97	69.61	5.46	2.82	52.89	98.67	85.05
183	.59	73.16	70.44	4.64	4.52	52.74	97.70	87.60
184	.78	72.26	70.64	4.48	6.21	52.77	96.74	88.18

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 185-187

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 185 to 199.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	20	Type:	Pit		
Sample:	Num.:	29	Type:	Mine 4 Sand Tailings		

Method: Sand Tailings Filtration.

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
185	.61	15	20	8.0	60	17.36	7.8
186	.82	15	20	8.2	60	16.51	8.2
187	1.01	15	20	7.6	60	15.89	8.3

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
185	.61	87.14	66.99	10.28	17.55	60.63	96.28	55.21
186	.82	83.26	69.05	8.04	20.58	60.94	94.35	66.53
187	1.01	78.31	71.54	4.68	21.33	60.65	92.37	81.68

TEST NOTES AND OBSERVATIONS:

Turbid,murky water for all tests.

EXHIBIT 2

FLOTATION TESTS

TEST: 188-190

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques. See also Tests 185 to 199.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	20	Type:	Pit		
Sample:	Num.:	30	Type:	Mine 4 Overburden		

Method: Overburden Neutralization

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
188	.62	15	20	7.6	60	18.03	8.3
189	.80	15	20	7.8	60	17.94	8.1
190	1.00	15	20	8.2	60	17.11	8.6

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
188	.62	92.25	65.27	12.80	14.53	61.34	98.16	40.96
189	.80	89.43	66.71	10.84	14.36	61.17	97.52	51.53
190	1.00	84.77	68.81	7.96	15.95	60.76	96.00	66.26

TEST NOTES AND OBSERVATIONS:

Very turbid, murky water for all tests.

EXHIBIT 2

FLOTATION TESTS

TEST: 191-193

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 185 to 199.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %: 20.00
Water	Num.:	20	Type:	Pit			

Method: Charcoal Filtration

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
191	.59	15	20	8.2	60	16.74	8.1
192	.79	15	20	8.6	60	15.45	8.4
193	.99	15	20	8.1	60	14.64	8.0

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
191	.59	81.10	68.91	7.86	26.33	60.86	91.83	68.13
192	.79	74.35	70.77	5.50	31.66	60.74	86.63	79.55
193	.99	70.36	71.58	4.16	35.40	60.86	82.76	85.36

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 194-196

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 185 to 199.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.00
Water	Num.:	20	Type:	Pit				

Method: Chemical Modification (Starch)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Starch lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
194	.99	15	.59	15	20	8.7	60	18.98	9.0
195	.99	15	.79	15	20	9.0	60	17.01	9.1
196	1.01	15	1.01	15	20	9.0	60	15.57	9.0

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
194	.59	93.75	63.30	15.50	25.39	60.93	97.40	27.34
195	.79	82.68	65.31	12.72	31.25	59.41	90.89	47.42
196	1.01	76.89	70.01	6.56	36.10	62.17	86.58	74.78

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 197-199

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques.See also Tests 185 to 199.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %: 20.0(
Water	Num.:	20	Type:	Pit			

Method: Chemical Modification (Soda Ash)

TEST CONDITIONS:

	Conditioning						Flotation		
Test No.	Sod.Ash lb/TF	Time sec.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
197	.99	15	.59	15	20	10.3	60	17.37	10.1
198	1.00	15	.80	15	20	10.5	60	16.80	10.3
199	.99	15	.99	15	20	10.1	60	16.37	10.0

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
197	.59	84.69	66.64	10.84	20.10	59.51	94.83	54.10
198	.80	82.77	69.72	6.74	20.58	61.25	94.21	72.11
199	.99	79.71	71.45	4.42	21.99	61.41	92.73	82.38

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 200-202

To investigate the flotation response of amine feeds from various mines in Deep Well water.Repeat of Tests 1-4.See also Tests 200-211.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	5	Type:	Deep Well		

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
200	.62	15	20	9.0	60	11.19	8.8
201	.83	15	20	9.3	60	10.72	8.9
202	1.04	15	20	9.1	60	10.19	8.8

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
200	.62	54.84	65.35	8.90	4.37	37.81	94.78	89.86
201	.83	52.38	67.45	6.22	4.94	37.68	93.76	93.23
202	1.04	49.92	68.22	5.22	6.77	37.44	90.94	94.59

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 203-205

To investigate the flotation response of amine feeds from various mines in Deep Well water.Repeat of Tests 21-24.See also Tests 200-211.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29		AI, %: 29.20
Water	Num.:	9	Type:	Deep Well			

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
203	.20	15	20	9.0	60	14.97	8.8
204	.40	15	20	9.0	60	14.84	8.9
205	.61	15	20	8.9	60	14.22	8.9

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
203	.20	74.07	71.19	5.10	5.18	54.08	97.52	87.06
204	.40	72.46	71.84	4.10	8.85	54.49	95.53	89.83
205	.61	70.21	71.84	4.02	11.78	53.95	93.50	90.33

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 206-208

To investigate the flotation response of amine feeds from various mines in Deep Well water.Repeat of Tests 42-45.See also Tests 200-211.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %: 27.38
Water	Num.:	13	Type:	Deep Well			

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
206	.40	15	20	8.9	60	14.85	9.6
207	.61	15	20	9.1	60	14.25	9.2
208	.80	15	20	9.2	60	14.09	9.2

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
206	.40	72.67	70.42	4.22	4.89	52.51	97.45	88.80
207	.61	70.22	71.19	3.32	8.76	52.60	95.04	91.49
208	.80	67.80	71.27	3.26	12.72	52.42	92.19	91.93

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 209-211

To investigate the flotation response of amine feeds from various mines in Deep Well water.Repeat of Tests 62-65.See also Tests 200-211.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	17	Type:	Deep Well		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
209	.61	15	20	8.2	60	16.06	8.2
210	.80	15	20	8.0	60	15.67	8.0
211	1.01	15	20	8.0	60	14.78	8.0

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
209	.61	79.72	72.41	3.52	15.45	60.86	94.85	85.97
210	.80	76.91	73.00	3.06	20.67	60.92	92.17	88.23
211	1.01	72.67	73.18	2.40	28.32	60.92	87.30	91.28

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 212-219

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques using a statistical design. See also Tests 212 to 243.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %: 35.70	AI, %: 48.13
Water	Num.:	6	Type:	Process		
Sample Number:		24	Type:	Mine 1 Overburden		

TEST CONDITIONS:

Constant:

Amine:	0.8 lb/TF
Conditioning Time:	15 sec.
Flotation Time:	60 sec.

Variable:

Test No.	Water Treatment OB Neut.	Conditioning Solids %	Conditioning Kerosine lb/TF	Conditioning Starch lb/TF	Conditioning Soda Ash lb/TF	Conditioning pH	Flotation Solids %	Flotation pH
212	no	23.8	.20	0	1.00	9.0	11.13	9.0
213	no	19.2	.20	1.00	0	9.2	11.20	9.0
214	yes	19.2	0	1.00	1.00	8.9	9.96	8.7
215	no	23.8	.20	1.00	1.00	9.4	11.28	9.2
216	yes	19.2	0	0	1.00	8.5	11.13	7.9
217	yes	23.8	.20	0	0	7.4	14.43	6.7
218	yes	23.8	0	1.00	0	7.4	12.37	7.2
219	no	19.2	0	0	0	8.1	10.32	8.0

RESULTS:

Test No.	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
212	55.12	65.09	8.56	3.50	37.45	95.81	90.20
213	55.05	64.89	9.80	3.69	37.38	95.56	88.79
214	48.89	56.07	22.14	20.06	37.67	72.78	77.51
215	55.00	64.98	9.14	3.50	37.32	95.78	89.55
216	54.65	50.58	28.90	20.39	36.89	74.93	67.19
217	72.41	45.30	35.74	17.22	37.55	87.35	46.23
218	61.43	46.50	33.16	20.47	36.46	78.35	57.67
219	50.82	68.57	4.62	5.00	37.30	93.41	95.12

TEST NOTES AND OBSERVATIONS:

None

STATISTICAL SCREENING OF VARIABLES

Line:

Date: 29, 30 ... 93

	Factors Studies	A	B	C	D	E	F	G	Error Effects Calculation
1		A	B	C	D	E	F	G	
2		Cond % Sol.	Kerosine	Dummey	Caust. Starch	Soda Ash	Dummey	OB Neut.	
3	Base Level	21.5	0.10	—	0.50	0.50	—	—	
4	Unit	2.3	0.10	—	0.50	0.50	—	—	
5	High Level	23.8	0.20	—	1.00	1.00	—	Yes	
6	Low Level	19.2	0	—	0	0	—	No	
7	Test No. 212	23.8	0.20		0	1.00		No	
8	213	19.2	0.20		1.00	0		No	
9	214	19.2	0		1.00	1.00		YES	
10	215	23.8	0		1.00	1.00		No	
11	216	19.2	0.20		0	1.00		YES	
12	217	23.8	0		0	0		YES	
13	218	23.8	0.20		1.00	0		YES	
14	219	19.2	0		0	0		No	
15	Σ High Level Data	357.29 86.60	344.65 80.42	351.50 76.24	342.47 74.24	339.30 68.74	353.62 83.58	313.41 119.94	Rec Insol
16	Σ Low Level Data	336.68 65.46	349.32 71.64	342.47 75.82	351.50 77.82	354.67 83.32	340.35 68.48	340.35 32.12	
17	$E = \frac{⑮ - ⑯}{4}$	5.15 5.29	-1.17 2.20	2.26 0.11	-2.26 -0.90	-3.84 -3.65	3.32 3.78	-6.73 21.96	Error Effects Calculation
18	$\Sigma(E_{dummy})^2$								16.13 14.30
19	$V = \frac{\Sigma(E_{dummy})^2}{\text{No. Dum. Variables}}$								8.07 7.15
20	$\sigma = \sqrt{V} = \sqrt{⑲}$								2.84 2.67
21	$t = \frac{E}{\sigma} = \frac{⑰}{⑳}$	1.81 1.98	-0.41 0.82		-0.80 -0.34	-1.35 -1.37		-2.37 8.22	
22	P = Significance Level	0.30 0.20	<0.50 <0.50		<0.50 <0.50	0.30 0.30		0.20 0.02	
23	Rank (BPL Rec / % Insol)	2 2				3 3		1 1	
24									
25									
26									
27									

Test Conditions:

Feed = Mine 1 @ 35.70% BPL
Water = Process - OB Neutralized
Reagents = Amine @ 0.8 lb/TF

DATA

Test No.	% BPL Recovery	% Insol in Conc.		
212	95.81	8.56		
213	95.56	9.80		
214	72.78	22.14		
215	95.78	9.14		
216	74.93	28.90		
217	87.35	35.74		
218	78.35	33.16		
219	93.41	4.62		

TABLE VALUES OF t

Significance Level	Degrees of Freedom 1	2	3
0.01	63.657	9.925	5.841
0.02	31.821	6.965	4.541
0.05	12.706	4.303	3.182
0.10	6.314	2.920	2.353
0.20	3.078	1.886	1.638
0.30	1.963	1.386	1.250
0.50	1.000	0.816	0.765
0.70	0.510	0.445	0.424

REMARKS:

Ave Results at Base Level Conditions

Recovery = 86.75%
% Insol = 19.01%

Chemical Analysis, PPM

Water	Hardness	TSS	TDS	SO_4	pH
Process	260	32	338	183	7.94
Process/OB	202	376	368	113	8.11

Notes: Process water neutralized with overburden was murky. Suspended solids would not settle even after 24 hours.

EXHIBIT 2

FLOTATION TESTS

TEST: 220-227

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques using a statistical design. See also Tests 212 to 243.

SAMPLES:

Feed	Num.: 2	Mine:	2	BPL, %:	52.29	AI, %:	29.2
Water	Num.: 10	Type:	Process				
Sample Number:	25	Type:	Mine 2 Sand Tails				

TEST CONDITIONS:

Constant:

Amine:	0.3 lb/TF
Conditioning Time:	15 sec.
Flotation Time:	60 sec.

Variable:

Test No.	Water Treatment OB Neut.	Conditioning Solids %	Conditioning Kerosine lb/TF	Conditioning Starch lb/TF	Conditioning Soda Ash lb/TF	Conditioning pH	Flotation Solids %	Flotation pH
220	no	23.8	.20	0	1.00	10.0	14.99	10.2
221	no	19.2	.20	1.00	0	9.9	15.64	9.9
222	yes	19.2	0	1.00	1.00	10.0	17.97	10.1
223	no	23.8	.20	1.00	1.00	9.9	15.61	9.9
224	yes	19.2	0	0	1.00	10.1	17.03	9.9
225	yes	23.8	.20	0	0	9.7	16.22	9.7
226	yes	23.8	0	1.00	0	10.1	17.17	10.0
227	no	19.2	0	0	0	9.8	15.10	9.7

RESULTS:

Test No.	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
220	74.06	70.79	5.20	3.87	53.43	98.12	86.81
221	76.92	68.28	8.80	2.27	53.04	99.01	76.82
222	91.76	57.62	22.62	5.40	53.32	99.17	28.91
223	77.37	68.72	8.10	2.56	53.75	98.92	78.54
224	84.02	62.91	15.68	6.90	53.96	97.96	54.88
225	78.93	66.12	11.28	5.48	53.34	97.84	69.51
226	86.16	61.49	17.26	6.53	53.88	98.32	49.07
227	74.28	71.32	5.02	3.61	53.90	98.28	87.23

TEST NOTES AND OBSERVATIONS:

STATISTICAL SCREENING OF VARIABLES

Line:

Date: 29, 30 [illegible] 93

	Factors Studies	A	B	C	D	E	F	G	
1 2		COND % SOLIDS	Kerosine	DUMMEY	Caust. Starch	SODA ASH	DUMMEY	ST Neut	
3	Base Level	21.5	0.05	—	0.50	0.50	—	—	
4	Unit	2.3	0.05	—	0.50	0.50	—	—	
5	High Level	23.8	0.10	—	1.00	1.00	—	YES	
6	Low Level	19.2	0	—	0	0	—	No	
7	Test No. 220	23.8	0.10		0	1.00		No	
8	221	19.2	0.10		1.00	0		No	
9	222	19.2	0		1.00	1.00		YES	
10	223	23.8	0		1.00	1.00		No	
11	224	19.2	0.10		0	1.00		YES	
12	225	23.8	0		0	0		YES	
13	226	23.8	0.10		1.00	0		YES	
14	227	19.2	0		0	0		No	
15	Σ High Level Data	393.20 41.84	393.41 46.94	394.14 47.90	395.42 56.78	394.53 51.60	393.73 43.86	393.29 66.84	Rec Insol
16	Σ Low Level Data	394.42 52.12	394.21 47.02	393.48 46.06	392.20 37.18	393.45 42.36	393.59 50.10	394.33 27.12	
17	$E = \frac{⑤ - ⑯}{4}$	-0.31 -2.57	-0.20 -0.02	0.17 0.46	0.81 4.90	0.27 2.31	-0.04 -1.56	-0.26 9.93	Error Effects Calculation
18	$\Sigma (E_{dummy})^2$								0.03 2.65
19	$V = \frac{\Sigma (E_{dummy})^2}{\text{No. Dum. Variables}}$								0.015 1.33
20	$\sigma = \sqrt{V} = \sqrt{⑲}$								0.12 1.15
21	$t = \frac{E}{\sigma} = \frac{⑰}{⑳}$	2.58 2.23	1.67 0.02		6.75 4.26	2.25 2.01		2.17 8.63	
22	P = Significance Level	0.20 0.20	0.30 <0.50		0.02 0.05	0.20 0.20		0.20 0.02	
23	Rank BPL Rec % Insol	2 3	5 —		1 2	3 4		4 1	
24									
25									
26									
27									

Test Conditions:

Feed: Mine 2 @ 32.29 % BPL
Water: Process - Sand Tails Filtered
Reagents: Amine ~0.31 lb/TF

DATA

Test No.	% BPL Recovery	% Insol in Conc		
220	98.12	5.20		
221	99.01	8.20		
222	99.17	22.62		
223	98.92	8.10		
224	97.96	15.68		
225	97.84	11.28		
226	98.32	17.26		
227	98.28	5.02		

TABLE VALUES OF t

Significance Level	Degrees of Freedom 1	2	3
0.01	63.657	9.925	5.841
0.02	31.821	6.965	4.541
0.05	12.706	4.303	3.182
0.10	6.314	2.920	2.353
0.20	3.078	1.886	1.638
0.30	1.963	1.386	1.250
0.50	1.000	0.816	0.765
0.70	0.510	0.445	0.424

REMARKS:

Average Results at Base Level Conditions

Recovery: 98.45 %

% Insol: 11.75

Chemical Analysis, PPM

Water	Hardness	TSS	TDS	SO4	PH
Process	128	6	258	111	10.13
Process/S.Tails	101	102	315	111	9.32

Notes: Process water neutralized with overburden was too murky after 24 hours to use for tests. Sand Tails water was substituted

EXHIBIT 2

FLOTATION TESTS

TEST: 228-235

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques using a statistical design. See also Tests 212 to 243.

SAMPLES:

Feed Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water Num.:	14	Type:	Process				
Sample Number:	28	Type:	Mine 3 Overburden				

TEST CONDITIONS:

Constant:

Amine:	0.4 lb/TF
Conditioning Time:	15 sec.
Flotation Time:	60 sec.

Variable:

Test No.	Water Treatment OB Neut.	Conditioning Solids %	Conditioning Kerosine lb/TF	Conditioning Starch lb/TF	Conditioning Soda Ash lb/TF	Conditioning pH	Flotation Solids %	Flotation pH
228	no	23.8	.20	0	1.00	9.2	15.31	8.9
229	no	19.2	.20	1.00	0	8.9	15.59	8.6
230	yes	19.2	0	1.00	1.00	7.5	16.08	7.1
231	no	23.8	.20	1.00	1.00	9.9	17.04	9.4
232	yes	19.2	0	0	1.00	7.3	15.57	7.1
233	yes	23.8	.20	0	0	5.7	14.75	5.4
234	yes	23.8	0	1.00	0	6.5	15.50	6.2
235	no	19.2	0	0	0	8.0	14.63	7.7

RESULTS:

Test No.	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
228	74.59	69.33	5.78	2.49	52.35	98.79	84.25
229	76.53	68.26	7.32	1.60	52.62	99.29	79.54
230	77.88	67.34	8.20	1.60	52.80	99.33	76.68
231	85.84	58.41	20.06	2.08	50.43	99.42	37.11
232	74.97	69.66	5.58	2.36	52.82	98.88	84.72
233	71.46	70.42	4.42	5.55	51.91	96.95	88.46
234	75.79	68.72	6.40	2.73	52.74	98.75	82.28
235	71.14	70.75	3.72	6.97	52.34	96.16	90.34

TEST NOTES AND OBSERVATIONS:

STATISTICAL SCREENING OF VARIABLES

Line:

Date: 29, 30 [illegible] 93

		A	B	C	D	E	F	G	DATA			
1 2	Factors Studies	COND %SOLIDS	Kerosine	DUMMY	Caust Starch	SODA ASH	DUMMY	OB Neut	% BPL Recovery	% Insol in Conc		
3	Base Level	21.5	0.05	—	0.50	0.50	—	—				
4	Unit	2.3	0.05	—	0.50	0.50	—	—				
5	High Level	23.8	0.10	—	1.00	1.00	—	YES				
6	Low Level	19.2	0	—	0	0	—	No				
7	Test No. 228	23.8	0.10		0	1.00		No	98.79	5.78		
8	229	19.2	0.10		1.00	0		No	99.29	7.32		
9	230	19.2	0		1.00	1.00		YES	99.33	8.20		
10	231	23.8	0		1.00	1.00		No	99.42	20.06		
11	232	19.2	0.10		0	1.00		YES	98.88	5.58		
12	233	23.8	0		0	0		YES	96.95	4.42		
13	234	23.8	0.10		1.00	0		YES	98.75	6.40		
14	235	19.2	0		0	0		No	96.16	3.72		
15	Σ High Level Data	393.91 36.66	395.71 25.08	394.36 25.72	396.79 41.98	396.42 39.62	394.54 37.38	393.91 24.60	Rec Insol			
16	Σ Low Level Data	393.66 24.52	391.86 36.40	393.21 35.76	390.78 19.50	391.15 21.86	393.03 24.10	393.03 36.88				
17	$E = \frac{⑮ - ⑯}{4}$	0.06 2.96	0.96 -2.83	0.29 -2.51	1.50 5.62	1.32 4.44	0.38 3.32	0.22 -3.07	Error Effects Calculation			
18	$\Sigma (E_{dummy})^2$								0.23 17.32			
19	$V = \frac{\Sigma (E_{dummy})^2}{\text{No. Dum. Variables}}$								0.11 8.66			
20	$\sigma = \sqrt{V} = \sqrt{⑲}$								0.33 2.94			
21	$t = \frac{E}{\sigma} = \frac{⑰}{⑳}$	0.18 1.01	2.91 -0.96		4.55 1.91	4.00 1.51		0.67 -1.04				
22	P = Significance Level	<0.50 0.50	0.10 0.50		0.05 0.20	0.05 0.30		<0.50 0.50				
23	Rank BPL Rec %Insol		3		1 1	2 2						
24												
25												
26												
27												

Test Conditions:

Feed: Mine 3 @ 52.77% BPL
Water: Process - OB Neutralized
Reagents: Amine @ 0.4 lb/TF

TABLE VALUES OF t

Significance Level	Degrees of Freedom 1	2	3
0.01	63.657	9.925	5.841
0.02	31.821	6.965	4.541
0.05	12.706	4.303	3.182
0.10	6.314	2.920	2.353
0.20	3.078	1.886	1.638
0.30	1.963	1.386	1.250
0.50	1.000	0.816	0.765
0.70	0.510	0.445	0.424

REMARKS:

Ave Results at Base level Conditions

Recovery: 98.45%

% Insol = 7.69%

Chemical Analysis, PPM

Water	Hardness	TSS	TDS	SO4	PH
Process	270	ND	375	233	7.97
Process/OB	202	80	310	238	7.66

EXHIBIT 2

FLOTATION TESTS

TEST: 236-243

PURPOSE: To investigate the flotation response of amine feeds from various mines to different water treatment techniques using a statistical design. See also Tests 212 to 243.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.0
Water	Num.:	18	Type:	Process		
Sample Number:		30	Type:	Mine 4 Overburden		

TEST CONDITIONS:

Constant:

Amine:	0.7 lb/TF
Conditioning Time:	15 sec.
Flotation Time:	60 sec.

Variable:

Test No.	Water Treatment OB Neut.	Conditioning Solids %	Conditioning Kerosine lb/TF	Conditioning Starch lb/TF	Conditioning Soda Ash lb/TF	Conditioning pH	Flotation Solids %	Flotation pH
236	no	23.8	.20	0	1.00	8.7	16.61	8.5
237	no	19.2	.20	1.00	0	8.5	17.33	8.2
238	yes	19.2	0	1.00	1.00	7.5	17.11	7.1
239	no	23.8	.20	1.00	1.00	8.9	17.43	8.6
240	yes	19.2	0	0	1.00	5.3	16.88	5.1
241	yes	23.8	.20	0	0	8.2	16.33	8.0
242	yes	23.8	0	1.00	0	8.3	17.25	8.0
243	no	19.2	0	0	0	7.7	16.05	7.6

RESULTS:

Test No.	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
236	83.04	71.36	5.08	8.15	60.64	97.72	78.91
237	85.14	70.75	5.98	8.00	61.42	98.06	74.54
238	84.76	70.42	5.84	6.03	60.60	98.48	75.25
239	85.62	70.18	6.30	6.36	61.00	98.50	73.03
240	83.46	70.66	5.76	9.42	60.53	97.43	75.96
241	80.13	72.37	3.48	12.52	60.48	95.89	86.06
242	85.04	70.09	6.48	7.34	60.70	98.19	72.45
243	78.71	71.23	4.34	17.24	59.73	93.85	82.92

TEST NOTES AND OBSERVATIONS:

None

STATISTICAL SCREENING OF VARIABLES

Line:

Date: 29, 30 - - 93

	Factors Studies	A	B	C	D	E	F	G	% BPL Recovery	% Insol in Conc		
1		A	B	C	D	E	F	G				
2		COND % Solids	Kerosine	Dummey	Caust. Starch	Soda Ash	Dummey	OB Neut.				
3	Base Level	21.5	0.05	—	0.50	0.50	—	—				
4	Unit	2.3	0.05	—	0.50	0.50	—	—				
5	High Level	23.8	0.10	—	1.00	1.00	—	YES				
6	Low Level	19.2	0	—	0	0	—	NO				
7	Test No. 236	23.8	0.10		0	1.00		No	97.72	5.08		
8	237	19.2	0.10		1.00	0		No	98.06	5.48		
9	238	19.2	0		1.00	1.00		YES	98.48	5.34		
10	239	23.8	0		1.00	1.00		No	98.50	6.30		
11	240	19.2	0.10		0	1.00		YES	97.43	5.76		
12	241	23.8	0		0	0		YES	95.89	3.48		
13	242	23.8	0.10		1.00	0		YES	98.19	6.48		
14	243	19.2	0		0	0		No	93.85	4.34		
15	Σ High Level Data	390.30 21.34	391.40 23.50	390.15 20.38	393.23 24.60	392.13 22.98	389.88 21.52	389.99 21.56	Rec Insol			
16	Σ Low Level Data	387.52 21.92	386.72 19.96	387.97 22.88	384.89 18.66	385.99 20.28	388.24 21.74	388.13 21.70				
17	E = ⑮ − ⑯ / 4	0.62 -0.15	1.17 0.84	0.55 -0.63	2.09 1.49	1.54 0.68	0.41 -0.06	0.47 -0.04	Error Effects Calculation			
18	$\Sigma(E_{dummy})^2$								0.47 0.40			
19	$V = \frac{\Sigma(E_{dummy})^2}{\text{No. Dum. Variables}}$								0.235 0.20			
20	$\sigma = \sqrt{V} = \sqrt{⑲}$								0.485 0.447			
21	$t = \frac{E}{\sigma} = \frac{⑰}{⑳}$	1.28 0.34	2.41 1.88		4.31 3.33	3.17 1.52		0.97 0.09				
22	P = Significance Level	0.50 <0.50	0.20 0.20		0.05 0.10	0.10 0.30		0.50 <0.50				
23	Rank		3 2		1 1	2 3						
24												
25												
26												
27												

Test Conditions:

Feed = Mine 4 @ 59.56% BPL

Water = Process - OB Neutralized

Reagents = Amine @ 0.7 lb/TF

DATA

TABLE VALUES OF t

Significance Level	Degrees of Freedom 1	2	3
0.01	63.657	9.925	5.841
0.02	31.821	6.965	4.541
0.05	12.706	4.303	3.182
0.10	6.314	2.920	2.353
0.20	3.078	1.886	1.638
0.30	1.963	1.386	1.250
0.50	1.000	0.816	0.765
0.70	0.510	0.445	0.424

REMARKS:

Average Results at Base Level Conditions

Recovery: 97.27%

% Insol: 5.41 %

Chemical Analysis, ppm

Water	Hardness	TSS	TDS	SO_4	PH
Process	292	ND	393	215	7.97
Process/OB	225	42	303	238	7.61

EXHIBIT 2

FLOTATION TESTS

TEST: 244-246

PURPOSE: Standard of comparison for water treatment tests.(No treatment) See also Tests 155 to 166 and Tests 244 to 249.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %:	52.29	AI, %: 29.20
Water	Num.:	22	Type:	Bartow Sewage Effluent			

Method: None.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
244	.20	15	20	7.7	60	17.34	7.9
245	.40	15	20	7.9	60	15.56	8.0
246	.61	15	20	7.9	60	14.79	8.0

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
244	.20	85.35	62.45	16.16	2.95	53.73	99.20	52.77
245	.40	75.38	69.16	6.98	4.46	53.23	97.94	81.98
246	.61	73.08	70.47	5.26	8.26	53.73	95.86	86.83

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 247-249

PURPOSE: Standard of comparison for water treatment tests.(No treatment) See also Tests 155 to 166 and Tests 244 to 249.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.00
Water	Num.:	19	Type:	Surficial				

Method: None.

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
247	.61	15	20	8.0	60	18.04	7.7
248	.81	15	20	7.4	60	17.29	7.3
249	1.00	15	20	7.3	60	16.90	7.2

RESULTS:

		Conc. (non float)				Head	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
247	.61	90.81	65.55	12.62	16.91	61.08	97.46	42.70
248	.81	86.22	67.52	9.92	16.10	60.44	96.33	57.23
249	1.00	83.54	68.61	8.18	17.48	60.19	95.22	65.83

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 250

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:									
Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.1[illegible]
Water	Num.:	6	Type:	Process	%	93.20		
	Num.:	6	Type:	Process	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Starch lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	8.0	1	60	13.28	8.1
2	.39	.00	15	20	8.0	2	60	12.57	8.2
3	.42	.00	15	20	8.1	2	60	11.58	8.2
4	.41	.00	15	20	8.2	2	60	11.39	8.2
5	.41	.00	15	20	8.3	3	60	11.32	8.3
6	.41	.00	15	20	8.2	3	60	11.20	8.3
7	.59	.00	15	20	8.4	4	60	10.83	8.3
8	.59	.00	15	20	8.4	4	60	10.90	8.3
9	.61	.00	15	20	8.4	3	60	10.60	8.4
10	.62	.00	15	20	8.4	3	60	10.50	8.3
11	.62	.41	15	20	9.0	2	60	10.50	9.0
12	.61	.41	15	20	8.9	2	60	10.78	8.9
13	.61	.41	15	20	9.0	2	60	10.75	9.0
14	.62	.42	15	20	9.1	2	60	10.66	9.0
6	.41	.00	15	20	8.2	3	60	11.20	8.3
9-10	.61	.00	15	20	8.4	3	60	10.55	8.3
12-14	.62	.41	15	20	9.0	2	60	9.97	9.0

TEST: 250 Continued

RESULTS:

Stage No.	Amine lb/TF	Starch lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	64.14						
2	.39	.00	58.97						
3	.42	.00	58.06						
4	.41	.00	55.10						
5	.41	.00	54.91						
6	.41	.00	53.96						
7	.59	.00	50.28						
8	.59	.00	51.02						
9	.61	.00	50.77						
10	.62	.00	50.76						
11	.62	.41	50.83						
12	.61	.41	51.83						
13	.61	.41	51.78						
14	.62	.42	52.29						
6	.41	.00	53.96	65.55	8.54	4.37	37.38	94.62	90.43
9-10	.61	.00	50.77	68.06	4.78	5.70	37.36	92.49	94.96
12-14	.62	.41	51.96	67.54	6.00	5.42	37.70	93.09	93.52

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 251

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.1
Water	Num.:	6	Type:	Process	%	93.20		
	Num.:	7	Type:	Surficial	%	6.80		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Soda Ash lb/TF	Time sec.	Solids %	pH	Turbid.	Flotation Time sec.	Solids %	pH
1	.41	.00	15	20	8.5	1	60	13.11	8.3
2	.40	.00	15	20	8.4	1	60	12.07	8.3
3	.40	.00	15	20	8.4	2	60	12.10	8.3
4	.41	.00	15	20	8.4	2	60	11.81	8.4
5	.41	.00	15	20	8.4	2	60	11.46	8.3
6	.41	.00	15	20	8.4	3	60	11.04	8.3
7	.62	.00	15	20	8.4	3	60	10.68	8.3
8	.61	.00	15	20	8.3	2	60	10.67	8.3
9	.61	.00	15	20	8.3	2	60	10.74	8.3
10	.62	.00	15	20	8.3	2	60	10.48	8.3
11	.62	.41	15	20	8.9	2	60	10.43	8.8
12	.62	.41	15	20	9.0	2	60	10.62	9.0
13	.63	.42	15	20	9.1	2	60	10.62	9.0
14	.62	.42	15	20	9.2	2	60	10.73	9.2
6	.41	.00	15	20	8.4	3	60	11.04	8.3
9-10	.61	.00	15	20	8.3	2	60	10.61	8.3
13-14	.63	.42	15	20	9.1	2	60	10.67	9.1

TEST: 251 Continued

RESULTS:

Stage No.	Amine lb/TF	Soda Ash lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.41	.00	63.74						
2	.40	.00	57.70						
3	.40	.00	58.12						
4	.41	.00	56.93						
5	.41	.00	55.37						
6	.41	.00	53.86						
7	.62	.00	52.26						
8	.61	.00	51.19						
9	.61	.00	51.20						
10	.62	.00	50.88						
11	.62	.41	50.92						
12	.62	.41	51.34						
13	.63	.42	52.55						
14	.62	.42	52.70						
6	.41	.00	53.86	65.33	8.48	4.09	37.07	94.91	90.51
9-10	.61	.00	51.04	67.98	5.48	5.99	37.63	92.21	94.19
13-14	.63	.42	52.62	67.32	6.10	4.85	37.72	93.91	93.33

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 252

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	1	Mine:	1	BPL, %:	35.70	AI, %:	48.13
Water	Num.:	6	Type:	Process	%	93.20		
	Num.:	8	Type:	Pit	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.41	.00	15	20	8.8	1	60	11.90	8.6
2	.41	.00	15	20	8.6	2	60	11.83	8.5
3	.41	.00	15	20	8.5	2	60	11.21	8.4
4	.41	.00	15	20	8.3	2	60	11.07	8.3
5	.41	.00	15	20	8.3	2	60	10.98	8.3
6	.41	.00	15	20	8.3	2	60	10.76	8.3
7	.41	.00	15	20	8.3	2	60	10.77	8.3
8	.41	.00	15	20	8.3	2	60	10.77	8.3
9	.52	.00	15	20	8.7	2	60	10.51	8.7
10	.52	.00	15	20	8.6	2	60	10.53	8.6
11	.52	.00	15	20	8.6	2	60	10.49	8.7
12	.52	.00	15	20	8.6	2	60	10.31	8.7
6-8	.41	.00	15	20	8.3	2	60	10.77	8.3
12	.52	.00	15	20	8.7	2	60	10.31	8.7

TEST: 252 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.41	.00	58.41						
2	.41	.00	57.60						
3	.41	.00	54.94						
4	.41	.00	53.63						
5	.41	.00	53.15						
6	.41	.00	52.48						
7	.41	.00	52.44						
8	.41	.00	52.58						
9	.52	.00	51.55						
10	.52	.00	51.37						
11	.52	.00	51.38						
12	.52	.00	50.76						
6-8	.41	.00	52.50	67.04	6.24	4.89	37.52	93.81	93.19
12	.52	.00	50.76	67.82	5.20	6.14	37.45	91.93	94.52

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 253

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %:	52.29	AI, %:	29.20
Water	Num.:	11	Type:	Surficial	%	93.20		
	Num.:	11	Type:	Surficial	%	6.80		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Flotation Time sec.	Solids %	pH
1	.21	.00	15	20	10.1	1	60	18.10	10.0
2	.19	.00	15	20	9.5	1	60	17.72	9.3
3	.19	.00	15	20	9.1	2	60	16.92	8.9
4	.20	.00	15	20	8.6	2	60	16.06	8.5
5	.19	.00	15	20	8.3	3	60	16.72	8.3
6	.19	.00	15	20	8.2	3	60	16.62	8.2
7	.20	.00	15	20	8.2	3	60	15.31	8.2
8	.20	.00	15	20	8.2	3	60	15.29	8.3
9	.29	.00	15	20	7.9	1	60	15.70	7.9
10	.29	.00	15	20	7.9	2	60	15.66	7.9
11	.31	.00	15	20	7.9	2	60	14.60	8.0
12	.31	.00	15	20	8.0	2	60	14.25	8.1
13	.30	.00	15	20	8.3	2	60	14.60	8.1
14	.30	.00	15	20	8.1	2	60	14.66	8.2
7-8	.20	.00	15	20	8.2	3	60	15.30	8.2
12-14	.31	.00	15	20	8.1	2	60	14.50	8.1

TEST: 253 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.21	.00	92.95						
2	.19	.00	81.91						
3	.19	.00	78.59						
4	.20	.00	78.28						
5	.19	.00	77.79						
6	.19	.00	77.44						
7	.20	.00	75.30						
8	.20	.00	75.39						
9	.29	.00	74.08						
10	.29	.00	73.94						
11	.31	.00	72.33						
12	.31	.00	71.24						
13	.30	.00	71.83						
14	.30	.00	71.15						
7-8	.20	.00	75.35	70.55	5.36	3.89	54.12	98.23	86.17
12-14	.31	.00	71.40	72.63	3.28	9.20	54.49	95.17	91.98

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 254

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %:	52.29	AI, %:	29.20
Water	Num.:	11	Type:	Surficial	%	93.20		
	Num.:	12	Type:	Pit	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.19	.00	15	20	9.7	1	60	18.73	9.6
2	.20	.00	15	20	9.3	1	60	16.52	9.2
3	.20	.00	15	20	8.7	2	60	15.57	8.6
4	.19	.00	15	20	8.5	2	60	16.55	8.4
5	.19	.00	15	20	8.2	3	60	16.82	8.0
6	.20	.00	15	20	7.9	3	60	15.29	7.8
7	.20	.00	15	20	7.9	3	60	15.11	7.8
8	.20	.00	15	20	7.9	3	60	14.97	7.9
9	.29	.00	15	20	8.1	2	60	15.52	8.1
10	.30	.00	15	20	8.0	2	60	14.64	8.1
11	.29	.00	15	20	8.0	2	60	15.26	8.1
12	.29	.00	15	20	8.1	2	60	15.19	8.1
7-8	.20	.00	15	20	7.9	3	60	15.04	7.9
10-12	.29	.00	15	20	8.0	2	60	15.03	8.1

TEST: 254 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.19	.00	89.43						
2	.20	.00	80.21						
3	.20	.00	76.79						
4	.19	.00	76.67						
5	.19	.00	78.81						
6	.20	.00	75.29						
7	.20	.00	74.92						
8	.20	.00	73.67						
9	.29	.00	72.35						
10	.30	.00	71.39						
11	.29	.00	72.09						
12	.29	.00	71.26						
7-8	.20	.00	74.30	71.32	4.64	5.70	54.45	97.31	88.19
10-12	.29	.00	71.58	72.00	3.30	10.16	54.42	94.69	91.91

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 255

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	2	Mine:	2	BPL, %: 52.29	AI, %:	29.20
Water	Num.:	11	Type:	Surficial	% 93.20		
	Num.:	22	Type:	Bartow	% 6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.20	.00	15	20	9.3	1	60	17.13	9.6
2	.20	.00	15	20	8.9	1	60	16.08	9.2
3	.20	.00	15	20	8.6	2	60	15.76	8.6
4	.20	.00	15	20	8.7	2	60	15.40	8.4
5	.20	.00	15	20	8.8	2	60	15.10	8.0
6	.20	.00	15	20	8.9	2	60	15.15	7.8
7	.20	.00	15	20	9.1	2	60	15.09	7.8
8	.20	.00	15	20	9.2	2	60	15.33	7.9
9	.29	.00	15	20	9.2	1	60	15.67	8.1
10	.30	.00	15	20	9.1	2	60	14.70	8.1
11	.30	.00	15	20	9.1	2	60	14.85	8.1
12	.30	.00	15	20	9.1	2	60	14.84	8.1
6-8	.20	.00	15	20	9.1	2	60	15.19	7.8
10-12	.30	.00	15	20	9.1	2	60	14.80	8.1

TEST: 255 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.20	.00	82.61						
2	.20	.00	78.94						
3	.20	.00	76.08						
4	.20	.00	75.03						
5	.20	.00	74.55						
6	.20	.00	74.69						
7	.20	.00	75.03						
8	.20	.00	74.77						
9	.29	.00	73.02						
10	.30	.00	71.46						
11	.30	.00	71.83						
12	.30	.00	71.65						
6-8	.20	.00	74.83	71.21	5.16	4.52	54.42	97.91	86.78
10-12	.30	.00	71.65	72.21	3.52	8.08	54.03	95.76	91.36

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 256

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.3[illegible]
Water	Num.:	14	Type:	Process	%	93.20		
	Num.:	14	Type:	Process	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.30	.00	15	20	8.4	1	60	14.86	8.4
2	.31	.00	15	20	8.3	1	60	14.59	8.2
3	.31	.00	15	20	8.3	2	60	14.58	8.3
4	.30	.00	15	20	8.3	2	60	14.78	8.2
5	.30	.00	15	20	8.4	2	60	14.53	8.3
6	.31	.00	15	20	8.3	2	60	14.48	8.2
7	.30	.00	15	20	8.3	2	60	14.67	8.2
8	.30	.00	15	20	8.2	2	60	14.61	8.2
9	.20	.00	15	20	8.5	2	60	15.13	8.4
10	.20	.00	15	20	8.5	2	60	14.61	8.3
11	.20	.00	15	20	8.4	2	60	14.94	8.4
12	.20	.00	15	20	8.4	2	60	14.64	8.4
6-8	.30	.00	15	20	8.3	2	60	14.59	8.2
10-12	.20	.00	15	20	8.4	2	60	14.73	8.4

TEST: 256 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.30	.00	73.11						
2	.31	.00	71.88						
3	.31	.00	72.00						
4	.30	.00	71.55						
5	.30	.00	71.30						
6	.31	.00	71.28						
7	.30	.00	71.31						
8	.30	.00	71.35						
9	.20	.00	72.52						
10	.20	.00	71.95						
11	.20	.00	71.97						
12	.20	.00	72.19						
6-8	.30	.00	71.31	70.84	3.80	6.97	52.52	96.19	90.10
10-12	.20	.00	72.04	70.75	4.18	5.81	52.59	96.91	89.00

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 257

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:										
	Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
	Water	Num.:	14	Type:	Process	%	93.20		
		Num.:	15	Type:	Surficial	%	6.80		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Flotation Time sec.	Solids %	pH
1	.30	.00	15	20	8.5	1	60	14.96	8.4
2	.30	.00	15	20	8.3	1	60	14.67	8.3
3	.29	.00	15	20	8.3	2	60	15.00	8.3
4	.30	.00	15	20	8.3	2	60	14.80	8.3
5	.29	.00	15	20	8.3	2	60	14.94	8.3
6	.29	.00	15	20	8.3	2	60	14.83	8.3
7	.29	.00	15	20	8.3	2	60	15.16	8.3
8	.29	.00	15	20	8.4	2	60	14.89	8.4
9	.20	.00	15	20	8.4	2	60	14.63	8.4
10	.21	.00	15	20	8.4	3	60	14.69	8.4
11	.20	.00	15	20	8.4	3	60	14.75	8.4
12	.20	.00	15	20	8.4	3	60	14.73	8.4
6-8	.29	.00	15	20	8.3	2	60	14.96	8.3
11-12	.20	.00	15	20	8.4	3	60	14.74	8.4

TEST: 257 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.30	.00	72.59						
2	.30	.00	71.14						
3	.29	.00	70.67						
4	.30	.00	70.78						
5	.29	.00	70.23						
6	.29	.00	70.39						
7	.29	.00	70.48						
8	.29	.00	70.58						
9	.20	.00	71.99						
10	.21	.00	73.61						
11	.20	.00	72.47						
12	.20	.00	72.18						
6-8	.29	.00	70.48	71.52	3.34	7.91	52.74	95.57	91.40
11-12	.20	.00	72.32	70.60	4.32	6.21	52.78	96.74	88.59

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 258

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	3	Mine:	3	BPL, %:	52.77	AI, %:	27.38
Water	Num.:	14	Type:	Process	%	93.20		
	Num.:	16	Type:	Pit	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.31	.00	15	20	8.5	1	60	14.93	8.5
2	.30	.00	15	20	8.4	1	60	14.72	8.3
3	.31	.00	15	20	8.3	2	60	14.39	8.3
4	.30	.00	15	20	8.3	2	60	14.71	8.3
5	.31	.00	15	20	8.3	2	60	14.42	8.3
6	.30	.00	15	20	8.3	2	60	14.69	8.3
7	.30	.00	15	20	8.3	2	60	14.43	8.3
8	.30	.00	15	20	8.4	2	60	14.48	8.3
9	.20	.00	15	20	8.6	2	60	14.94	8.4
10	.20	.00	15	20	8.5	2	60	14.79	8.4
11	.21	.00	15	20	8.4	2	60	14.62	8.3
12	.20	.00	15	20	8.4	2	60	14.72	8.5
7-8	.30	.00	15	20	8.3	2	60	14.45	8.3
11-12	.20	.00	15	20	8.4	2	60	14.67	8.4

TEST: 258 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.31	.00	73.96						
2	.30	.00	71.82						
3	.31	.00	71.32						
4	.30	.00	71.06						
5	.31	.00	71.11						
6	.30	.00	70.90						
7	.30	.00	70.29						
8	.30	.00	70.56						
9	.20	.00	72.56						
10	.20	.00	73.20						
11	.21	.00	72.87						
12	.20	.00	72.70						
7-8	.30	.00	70.42	71.03	3.26	8.87	52.65	95.02	91.61
11-12	.20	.00	72.78	70.38	4.86	5.64	52.76	97.09	87.08

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 259

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.00
Water	Num.:	18	Type:	Process	%	93.20		
	Num.:	18	Type:	Process	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	9.3	1	60	17.09	9.3
2	.40	.00	15	20	9.3	1	60	16.79	9.3
3	.40	.00	15	20	9.3	2	60	16.49	9.3
4	.40	.00	15	20	9.3	2	60	16.61	9.3
5	.40	.00	15	20	9.4	2	60	16.44	9.4
6	.40	.00	15	20	9.4	2	60	16.23	9.4
7	.41	.00	15	20	9.4	3	60	16.06	9.5
8	.41	.00	15	20	9.4	3	60	15.96	9.4
9	.30	.00	15	20	9.3	2	60	16.08	9.3
10	.30	.00	15	20	9.2	2	60	16.47	9.2
11	.30	.00	15	20	9.1	3	60	16.23	9.1
12	.30	.00	15	20	9.0	3	60	16.46	9.0
6-8	.40	.00	15	20	9.4	2	60	16.09	9.4
11-12	.30	.00	15	20	9.1	3	60	16.35	9.1

TEST: 259 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	84.62						
2	.40	.00	83.12						
3	.40	.00	81.44						
4	.40	.00	80.75						
5	.40	.00	80.14						
6	.40	.00	79.70						
7	.41	.00	80.57						
8	.41	.00	79.17						
9	.30	.00	79.83						
10	.30	.00	80.31						
11	.30	.00	80.76						
12	.30	.00	81.22						
6-8	.40	.00	79.44	72.54	4.10	18.42	61.41	93.83	83.72
11-12	.30	.00	80.99	70.68	5.98	18.73	60.80	94.14	75.78

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 260

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.0(
Water	Num.:	18	Type:	Process	%	93.20		
	Num.:	19	Type:	Surficial	%	6.80		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Flotation Time sec.	Solids %	pH
1	.41	.00	15	20	8.3	1	60	16.87	8.2
2	.40	.00	15	20	8.2	2	60	16.89	8.2
3	.41	.00	15	20	8.3	2	60	16.54	8.2
4	.40	.00	15	20	8.3	3	60	16.74	8.2
5	.41	.00	15	20	8.3	2	60	16.31	8.3
6	.41	.00	15	20	8.3	2	60	16.16	8.2
7	.30	.00	15	20	8.3	3	60	16.47	8.2
8	.31	.00	15	20	8.3	3	60	16.03	8.2
9	.31	.00	15	20	8.3	3	60	16.28	8.3
10	.31	.00	15	20	8.3	3	60	16.69	8.3
5-6	.41	.00	15	20	8.3	2	60	16.23	8.3
10	.31	.00	15	20	8.3	3	60	16.69	8.3

TEST: 260 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.41	.00	85.95						
2	.40	.00	83.98						
3	.41	.00	83.12						
4	.40	.00	81.38						
5	.41	.00	81.43						
6	.41	.00	81.96						
7	.30	.00	81.62						
8	.31	.00	80.07						
9	.31	.00	81.71						
10	.31	.00	83.68						
5-6	.41	.00	81.69	71.45	5.54	17.20	61.52	94.88	77.37
10	.31	.00	83.68	70.73	5.90	13.68	61.42	96.37	75.31

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 261

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.See also Tests 250-261.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.0C
Water	Num.:	18	Type:	Process	%	93.20		
	Num.:	20	Type:	Pit	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.41	.00	15	20	8.4	1	60	16.74	8.4
2	.41	.00	15	20	8.4	1	60	16.37	8.5
3	.40	.00	15	20	8.5	2	60	16.23	8.6
4	.41	.00	15	20	8.6	2	60	15.97	8.6
5	.41	.00	15	20	8.5	2	60	16.01	8.4
6	.40	.00	15	20	8.3	3	60	16.20	8.3
7	.31	.00	15	20	8.3	2	60	16.25	8.2
8	.31	.00	15	20	8.3	2	60	16.35	8.3
9	.31	.00	15	20	8.3	3	60	16.28	8.3
10	.31	.00	15	20	8.3	3	60	16.56	8.3
5-6	.41	.00	15	20	8.4	2	60	16.11	8.4
10	.31	.00	15	20	8.3	3	60	16.56	8.3

TEST: 261 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.41	.00	84.14						
2	.41	.00	82.98						
3	.40	.00	80.38						
4	.41	.00	79.94						
5	.41	.00	80.15						
6	.40	.00	79.93						
7	.31	.00	81.68						
8	.31	.00	81.64						
9	.31	.00	81.20						
10	.31	.00	83.39						
5-6	.41	.00	80.04	72.41	4.06	18.62	61.67	93.97	83.75
10	.31	.00	83.39	70.88	5.70	13.68	61.38	96.30	76.23

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 262-264

To investigate the flotation response of amine feed in process water with respect to time. See also Tests 66-69 & 106-109.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	18	Type:	Process (10 Jan 1994)		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
262	.42	15	20	8.9	60	16.61	8.9
263	.61	15	20	8.9	60	16.16	8.9
264	.82	15	20	8.8	60	15.58	8.8

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
262	.42	84.71	70.53	6.94	11.25	61.46	97.20	70.61
263	.61	81.00	72.26	3.92	14.01	61.19	95.65	84.12
264	.82	77.57	73.09	3.12	20.43	61.28	92.52	87.90

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 265-267

To investigate the flotation response of amine feed in process water with respect to RPM. See also Testts 265-270.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %:	59.56	AI, %:	20.00
Water	Num.:	18	Type:	Process (10 Nov 1993)				
RPM:	1250							

TEST CONDITIONS:

		Conditioning			Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
265	.41	15	20	8.8	60	16.64	8.9
266	.61	15	20	8.8	60	16.29	8.9
267	.81	15	20	8.8	60	15.87	9.0

RESULTS:

		Conc. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
265	.41	83.55	70.77	5.70	13.61	61.37	96.35	76.19
266	.61	80.92	71.97	3.92	15.60	61.21	95.14	84.14
267	.81	78.47	72.45	3.34	20.15	61.19	92.91	86.90

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 268-270

To investigate the flotation response of amine feed in process water with respect to RPM. See also Testts 265-270.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	18	Type:	Process (10 Nov 1993)		
RPM:	1200					

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
268	.61	15	20	9.0	60	16.40	9.0
269	.83	15	20	9.0	60	15.60	9.0
270	1.02	15	20	9.0	60	15.03	9.2

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
268	.61	81.91	73.59	4.86	13.90	62.79	95.99	80.10
269	.83	78.52	73.18	3.18	20.28	61.82	92.95	87.51
270	1.02	74.56	73.57	2.86	26.57	61.61	89.03	89.34

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 271-273

PURPOSE: Standard of comparison for optimum locked tests.
See also Tests 271 to 279.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %: 48.24	AI, %: 33.00
Water	Num.:	5-2nd	Type:	Deep Well		

TEST CONDITIONS:

Test No.	Conditioning Amine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Flotation Time sec.	Flotation Solids %	Flotation pH
271	.60	15	20	8.9	60	14.93	8.6
272	.80	15	20	8.5	60	14.67	8.6
273	.99	15	20	8.6	60	14.54	8.6

RESULTS:

Test No.	Amine lb/TF	Conc. (non float) Weight %	Conc. (non float) BPL %	Conc. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
271	.60	72.36	67.92	7.00	3.78	50.19	97.92	84.65
272	.80	70.72	68.89	5.34	4.92	50.16	97.13	88.56
273	.99	69.83	69.28	5.20	6.34	50.29	96.20	89.00

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 274-276

PURPOSE: Standard of comparison for optimum locked tests.
See also Tests 271 to 279.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	13-2nd	Type:	Deep Well				

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
274	.42	15	20	8.7	60	14.98	8.6
275	.62	15	20	8.6	60	14.74	8.6
276	.83	15	20	8.6	60	14.57	8.6

RESULTS:

		Conc. (non float)			Froth	Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
274	.42	75.86	71.51	3.40	8.20	56.23	96.48	90.94
275	.62	74.44	71.91	3.00	10.17	56.13	95.37	92.16
276	.83	73.02	71.86	2.78	11.45	55.56	94.44	92.87

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 277-279

PURPOSE: Standard of comparison for optimum locked tests.
See also Tests 271 to 279.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %: 66.73	AI, %: 9.68
Water	Num.:	17-2nd	Type:	Deep Well		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
277	.40	15	20	8.4	60	18.16	8.2
278	.61	15	20	8.0	60	17.74	8.1
279	.81	15	20	8.0	60	17.57	8.0

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
277	.40	91.23	72.58	2.70	15.31	67.55	98.01	74.55
278	.61	89.71	72.69	2.56	21.28	67.40	96.75	76.28
279	.81	88.15	72.69	2.20	26.15	67.18	95.39	79.97

TEST NOTES AND OBSERVATIONS:

Water was bright yellow.

EXHIBIT 2

FLOTATION TESTS

TEST: 280

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.0(
Water	Num.:	5-2nd	Type:	Deep Well	%	93.20		
	Num.:	5-2nd	Type:	Deep Well	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	8.7	1	60	16.07	8.6
2	.40	.00	15	20	8.6	1	60	15.37	8.6
3	.40	.00	15	20	8.7	2	60	15.14	8.7
4	.40	.00	15	20	8.7	2	60	15.09	8.6
5	.40	.00	15	20	8.6	3	60	14.97	8.5
6	.40	.00	15	20	8.6	2	60	14.90	8.5
7	.40	.00	15	20	8.6	2	60	14.95	8.6
8	.40	.00	15	20	8.5	3	60	14.88	8.5
9	.50	.00	15	20	8.7	2	60	14.70	8.6
10	.50	.00	15	20	8.6	3	60	14.84	8.6
11	.49	.00	15	20	8.6	3	60	14.86	8.5
12	.49	.00	15	20	8.6	3	60	14.69	8.6
13	.60	.00	15	20	8.5	2	60	14.61	8.5
14	.58	.00	15	20	8.6	3	60	14.70	8.6
15	.58	.00	15	20	8.6	3	60	14.82	8.6
16	.59	.00	15	20	8.6	3	60	14.55	8.6
7-8	.40	.00	15	20	8.6	2	60	14.92	8.6
11-12	.49	.00	15	20	8.6	3	60	14.77	8.6
14-16	.59	.00	15	20	8.6	3	60	14.69	8.6

TEST: 280 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	78.76						
2	.40	.00	74.80						
3	.40	.00	73.71						
4	.40	.00	72.54						
5	.40	.00	72.89						
6	.40	.00	72.47						
7	.40	.00	72.51						
8	.40	.00	71.90						
9	.50	.00	70.92						
10	.50	.00	71.43						
11	.49	.00	70.64						
12	.49	.00	70.47						
13	.60	.00	70.23						
14	.58	.00	69.16						
15	.58	.00	70.06						
16	.59	.00	69.18						
7-8	.40	.00	72.21	68.28	6.96	4.78	50.63	97.38	84.77
11-12	.49	.00	70.55	68.98	5.94	5.97	50.43	96.51	87.30
14-16	.59	.00	69.47	69.55	5.04	7.17	50.50	95.67	89.39

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 281

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.0(
Water	Num.:	6-2nd	Type:	Process	%	93.20		
	Num.:	5-2nd	Type:	Deep Well	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.39	.00	15	20	8.6	1	60	16.12	8.5
2	.40	.00	15	20	8.5	1	60	15.46	8.5
3	.40	.00	15	20	8.4	2	60	15.33	8.4
4	.40	.00	15	20	8.9	2	60	15.25	8.6
5	.40	.00	15	20	8.7	2	60	15.11	8.6
6	.39	.00	15	20	8.6	3	60	15.19	8.6
7	.40	.00	15	20	8.7	3	60	14.93	8.6
8	.39	.00	15	20	8.6	3	60	15.00	8.7
9	.58	.00	15	20	8.0	2	60	15.02	8.0
10	.59	.00	15	20	7.9	3	60	14.39	8.0
11	.57	.00	15	20	7.9	3	60	14.64	8.1
12	.57	.00	15	20	8.1	2	60	14.91	8.2
7-8	.39	.00	15	20	8.6	3	60	14.96	8.6
11-12	.57	.00	15	20	8.0	3	60	14.78	8.2

TEST: 281 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.39	.00	77.69						
2	.40	.00	74.96						
3	.40	.00	74.03						
4	.40	.00	73.78						
5	.40	.00	72.82						
6	.39	.00	72.52						
7	.40	.00	71.99						
8	.39	.00	71.49						
9	.58	.00	70.19						
10	.59	.00	68.75						
11	.57	.00	67.98						
12	.57	.00	68.29						
7-8	.39	.00	71.74	68.04	7.14	4.44	50.06	97.49	84.48
11-12	.57	.00	68.14	69.66	4.56	7.05	49.71	95.48	90.58

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 282

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	6-2nd	Type:	Process	%	93.20		
	Num.:	6-2nd	Type:	Process	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	8.5	1	60	15.91	8.4
2	.40	.00	15	20	8.4	1	60	15.46	8.4
3	.41	.00	15	20	8.3	2	60	15.03	8.3
4	.40	.00	15	20	8.8	2	60	15.09	8.5
5	.39	.00	15	20	8.6	3	60	15.13	8.5
6	.40	.00	15	20	8.5	3	60	14.97	8.5
7	.39	.00	15	20	8.6	3	60	15.01	8.5
8	.39	.00	15	20	8.5	3	60	15.10	8.6
9	.58	.00	15	20	7.3	2	60	14.56	7.4
10	.58	.00	15	20	7.4	3	60	14.78	7.5
11	.57	.00	15	20	7.3	3	60	14.79	7.5
12	.57	.00	15	20	7.3	3	60	14.82	7.5
6-8	.39	.00	15	20	8.5	3	60	15.02	8.5
11-12	.57	.00	15	20	7.3	3	60	7.22	7.5

TEST: 282 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	77.02						
2	.40	.00	74.59						
3	.41	.00	74.21						
4	.40	.00	73.11						
5	.39	.00	72.36						
6	.40	.00	71.97						
7	.39	.00	71.98						
8	.39	.00	72.20						
9	.58	.00	67.91						
10	.58	.00	68.86						
11	.57	.00	68.32						
12	.57	.00	68.37						
6-8	.39	.00	72.05	68.13	6.74	5.05	50.50	97.21	85.28
11-12	.57	.00	68.34	69.70	4.66	7.45	49.99	95.28	90.35

TEST NOTES AND OBSERVATIONS:

pH meter problems for this test.

EXHIBIT 2

FLOTATION TESTS

TEST: 283

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.0(
Water	Num.:	6-2nd	Type:	Process	%	93.20		
	Num.:	7-2nd	Type:	Surface	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.39	.00	15	20	8.5	1	60	16.21	8.4
2	.39	.00	15	20	8.4	1	60	15.62	8.4
3	.39	.00	15	20	8.3	2	60	15.28	8.3
4	.41	.00	15	20	8.8	2	60	15.19	8.5
5	.39	.00	15	20	8.6	3	60	15.42	8.5
6	.39	.00	15	20	8.5	3	60	15.12	8.5
7	.39	.00	15	20	8.6	3	60	15.26	8.5
8	.39	.00	15	20	8.5	3	60	15.12	8.6
9	.59	.00	15	20	8.5	3	60	14.48	8.6
10	.59	.00	15	20	8.6	3	60	14.35	8.6
11	.59	.00	15	20	8.6	3	60	14.42	8.6
12	.60	.00	15	20	8.6	3	60	14.30	8.6
7-8	.39	.00	15	20	8.5	3	60	15.19	8.5
10-12	.59	.00	15	20	8.6	3	60	14.36	8.6

TEST: 283 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.39	.00	77.84						
2	.39	.00	73.52						
3	.39	.00	72.45						
4	.41	.00	76.58						
5	.39	.00	73.14						
6	.39	.00	72.59						
7	.39	.00	71.86						
8	.39	.00	71.27						
9	.59	.00	68.73						
10	.59	.00	68.69						
11	.59	.00	68.74						
12	.60	.00	68.58						
7-8	.39	.00	71.56	68.08	6.46	5.16	50.19	97.08	85.99
10-12	.59	.00	68.67	69.46	4.84	7.21	49.96	95.48	89.93

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 284

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.0(
Water	Num.:	6-2nd	Type:	Process	%	93.20		
	Num.:	8-2nd	Type:	Pit	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.39	.00	15	20	7.5	1	60	16.12	7.5
2	.39	.00	15	20	7.4	1	60	15.56	7.4
3	.40	.00	15	20	7.4	2	60	14.89	7.4
4	.40	.00	15	20	7.3	2	60	14.58	7.4
5	.40	.00	15	20	7.3	2	60	14.67	7.2
6	.40	.00	15	20	7.2	3	60	14.63	7.2
7	.40	.00	15	20	7.3	3	60	14.72	7.3
8	.39	.00	15	20	7.1	3	60	15.03	7.1
9	.60	.00	15	20	7.0	3	60	14.38	7.2
10	.60	.00	15	20	7.1	3	60	14.28	7.3
11	.59	.00	15	20	7.1	3	60	14.30	7.3
12	.60	.00	15	20	7.1	4	60	14.31	7.2
6-8	.39	.00	15	20	7.2	3	60	14.79	7.2
11-12	.59	.00	15	20	7.1	3	60	14.31	7.2

TEST: 284 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.39	.00	76.93						
2	.39	.00	73.90						
3	.40	.00	72.23						
4	.40	.00	70.99						
5	.40	.00	70.52						
6	.40	.00	70.75						
7	.40	.00	70.47						
8	.39	.00	71.00						
9	.60	.00	69.50						
10	.60	.00	68.94						
11	.59	.00	68.20						
12	.60	.00	68.64						
6-8	.39	.00	70.74	68.57	6.00	5.72	50.18	96.67	87.14
11-12	.59	.00	68.42	69.33	4.96	7.34	49.75	95.34	89.72

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 285

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	6-2nd	Type:	Process	%	93.20		
	Num.:	22	Type:	Bartow E.	%	6.80		

TEST CONDITIONS:

Stage No.	Conditioning: Amine lb/TF	Conditioning: Other lb/TF	Conditioning: Time sec.	Conditioning: Solids %	Conditioning: pH	Conditioning: Turbid.	Flotation: Time sec.	Flotation: Solids %	Flotation: pH
1	.39	.00	15	20	7.2	1	60	15.79	7.3
2	.39	.00	15	20	7.0	1	60	15.56	7.0
3	.40	.00	15	20	7.1	2	60	14.66	7.1
4	.40	.00	15	20	7.1	2	60	14.64	7.1
5	.40	.00	15	20	7.0	3	60	14.79	7.1
6	.40	.00	15	20	7.0	2	60	14.65	7.1
7	.40	.00	15	20	7.1	3	60	14.57	7.2
8	.40	.00	15	20	7.1	3	60	14.47	7.2
9	.60	.00	15	20	7.0	3	60	14.45	7.1
10	.59	.00	15	20	6.9	3	60	14.60	7.0
11	.60	.00	15	20	6.9	4	60	14.40	7.0
12	.60	.00	15	20	6.9	4	60	14.42	7.0
7-8	.40	.00	15	20	7.1	3	60	14.52	7.2
11-12	.60	.00	15	20	6.9	4	60	14.41	7.0

TEST: 285 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.39	.00	75.65						
2	.39	.00	73.13						
3	.40	.00	71.28						
4	.40	.00	71.53						
5	.40	.00	71.34						
6	.40	.00	70.91						
7	.40	.00	70.78						
8	.40	.00	70.28						
9	.60	.00	69.88						
10	.59	.00	69.98						
11	.60	.00	69.55						
12	.60	.00	69.25						
7-8	.40	.00	70.53	68.50	6.24	6.01	50.09	96.46	86.66
11-12	.60	.00	69.40	69.33	4.94	6.49	50.10	96.04	89.61

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 286

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	13-2nd	Type:	Deep Well	%	93.20		
	Num.:	13-2nd	Type:	Deep Well	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.42	.00	15	20	7.2	1	60	14.86	7.1
2	.41	.00	15	20	7.0	1	60	14.69	7.0
3	.41	.00	15	20	6.9	1	60	14.51	6.9
4	.41	.00	15	20	6.9	2	60	14.58	6.9
5	.42	.00	15	20	6.9	2	60	14.17	7.0
6	.42	.00	15	20	6.9	2	60	14.03	6.9
7	.42	.00	15	20	7.0	3	60	13.92	7.0
8	.41	.00	15	20	7.0	3	60	14.33	7.1
9	.21	.00	15	20	6.9	2	60	15.00	6.7
10	.20	.00	15	20	6.6	2	60	15.13	6.6
11	.21	.00	15	20	6.6	2	60	15.07	6.6
12	.20	.00	15	20	6.6	2	60	14.95	6.6
7-8	.42	.00	15	20	7.0	3	60	14.13	7.0
10-11	.21	.00	15	20	6.6	2	60	15.10	6.6

TEST: 286 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.42	.00	75.89						
2	.41	.00	73.45						
3	.41	.00	72.23						
4	.41	.00	72.42						
5	.42	.00	71.34						
6	.42	.00	70.59						
7	.42	.00	71.11						
8	.41	.00	71.37						
9	.21	.00	74.91						
10	.20	.00	75.22						
11	.21	.00	75.37						
12	.20	.00	73.96						
7-8	.42	.00	71.24	72.19	3.18	15.36	55.85	92.09	92.05
10-11	.21	.00	75.29	71.36	4.30	11.45	56.56	95.00	88.63

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 287

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	14-2nd	Type:	Process	%	93.20		
	Num.:	13-2nd	Type:	Deep Well	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.41	.00	15	20	7.2	1	60	15.14	7.1
2	.41	.00	15	20	7.0	1	60	14.95	7.0
3	.41	.00	15	20	7.0	2	60	15.00	7.0
4	.41	.00	15	20	6.9	2	60	14.81	6.9
5	.41	.00	15	20	6.9	2	60	14.70	6.9
6	.42	.00	15	20	6.9	2	60	14.57	6.9
7	.41	.00	15	20	6.9	3	60	14.61	6.9
8	.41	.00	15	20	6.8	3	60	14.49	6.9
9	.20	.00	15	20	6.6	2	60	15.69	6.5
10	.20	.00	15	20	6.5	2	60	15.48	6.5
11	.20	.00	15	20	6.5	2	60	15.20	6.5
12	.20	.00	15	20	6.5	2	60	15.24	6.5
7-8	.41	.00	15	20	6.9	3	60	14.55	6.9
11-12	.20	.00	15	20	6.5	2	60	15.22	6.5

TEST: 287 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	CONC. (non float) BPL %	CONC. (non float) Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Percent Insol. Reject
1	.41	.00	75.80						
2	.41	.00	75.08						
3	.41	.00	74.04						
4	.41	.00	74.03						
5	.41	.00	73.16						
6	.42	.00	73.50						
7	.41	.00	72.74						
8	.41	.00	72.64						
9	.20	.00	75.04						
10	.20	.00	74.61						
11	.20	.00	73.70						
12	.20	.00	73.35						
7-8	.41	.00	72.69	71.41	3.36	12.00	55.19	94.06	91.42
11-12	.20	.00	73.53	70.66	4.58	10.64	54.77	94.86	88.18

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 288

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	14-2nd	Type:	Process	%	93.20		
	Num.:	14-2nd	Type:	Process	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.31	.00	15	20	6.9	1	60	15.24	6.8
2	.31	.00	15	20	6.4	1	60	14.92	6.3
3	.31	.00	15	20	6.3	2	60	14.86	6.3
4	.31	.00	15	20	6.3	2	60	14.63	6.3
5	.31	.00	15	20	6.3	3	60	14.88	6.2
6	.31	.00	15	20	6.2	2	60	14.89	6.2
7	.31	.00	15	20	6.3	3	60	14.77	6.2
8	.30	.00	15	20	6.2	3	60	15.14	6.2
9	.20	.00	15	20	6.9	2	60	15.57	6.7
10	.20	.00	15	20	6.5	3	60	15.34	6.5
11	.19	.00	15	20	6.5	3	60	15.86	6.4
12	.19	.00	15	20	6.4	3	60	15.80	6.3
8	.30	.00	15	20	6.2	3	60	15.14	6.2
11-12	.19	.00	15	20	6.5	3	60	15.83	6.4

EXHIBIT 2

FLOTATION TESTS

TEST: 289

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	14-2nd	Type:	Process	%	93.20		
	Num.:	15-2nd	Type:	Surface	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.30	.00	15	20	6.2	1	60	15.56	6.2
2	.31	.00	15	20	6.3	1	60	15.10	6.2
3	.30	.00	15	20	6.2	2	60	15.22	6.2
4	.30	.00	15	20	6.2	2	60	15.46	6.2
5	.30	.00	15	20	6.2	2	60	15.23	6.2
6	.31	.00	15	20	6.2	3	60	15.19	6.2
7	.31	.00	15	20	6.2	3	60	15.10	6.3
8	.31	.00	15	20	6.3	3	60	14.79	6.2
9	.21	.00	15	20	6.7	2	60	15.46	6.7
10	.20	.00	15	20	6.5	3	60	15.54	6.5
11	.20	.00	15	20	6.4	3	60	15.36	6.4
12	.20	.00	15	20	6.4	3	60	15.15	6.4
8	.31	.00	15	20	6.3	3	60	14.79	6.2
11-12	.20	.00	15	20	6.4	3	60	15.25	6.4

EXHIBIT 2

FLOTATION TESTS

TEST: 291

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	14-2nd	Type:	Process	%	93.20		
	Num.:	22	Type:	Bartow	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.30	.00	15	20	6.4	1	60	15.40	6.3
2	.30	.00	15	20	6.3	2	60	15.21	6.2
3	.30	.00	15	20	6.2	2	60	15.51	6.2
4	.29	.00	15	20	6.3	2	60	15.57	6.3
5	.30	.00	15	20	6.2	2	60	15.19	6.2
6	.30	.00	15	20	6.2	3	60	15.38	6.2
7	.30	.00	15	20	6.5	2	60	15.30	6.6
8	.30	.00	15	20	6.5	2	60	15.36	6.5
9	.20	.00	15	20	6.5	3	60	15.52	6.4
10	.20	.00	15	20	6.4	3	60	15.50	6.3
11	.20	.00	15	20	6.4	3	60	15.34	6.4
12	.20	.00	15	20	6.4	3	60	15.49	6.3
6-8	.30	.00	15	20	6.4	2	60	15.35	6.4
11-12	.20	.00	15	20	6.4	3	60	15.41	6.3

EXHIBIT 2

FLOTATION TESTS

TEST: 292

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	17-2nd	Type:	Deep Well	%	93.20		
	Num.:	17-2nd	Type:	Deep Well	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.29	.00	15	20	6.5	2	60	18.70	6.4
2	.29	.00	15	20	6.4	2	60	18.73	6.3
3	.30	.00	15	20	6.3	3	60	18.43	6.3
4	.29	.00	15	20	6.4	3	60	19.02	6.3
5	.30	.00	15	20	6.4	3	60	18.30	6.3
6	.29	.00	15	20	6.4	4	60	18.54	6.3
7	.30	.00	15	20	6.3	4	60	18.33	6.3
8	.30	.00	15	20	6.4	4	60	18.21	6.3
9	.19	.00	15	20	6.8	3	60	18.78	6.6
10	.20	.00	15	20	6.6	3	60	18.74	6.6
11	.20	.00	15	20	6.6	4	60	18.75	6.6
12	.20	.00	15	20	6.6	4	60	18.83	6.6
7-8	.30	.00	15	20	6.4	4	60	18.27	6.3
12	.20	.00	15	20	6.6	4	60	18.83	6.6

TEST: 292 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.29	.00	91.36						
2	.29	.00	91.21						
3	.30	.00	91.30						
4	.29	.00	91.13						
5	.30	.00	91.13						
6	.29	.00	90.66						
7	.30	.00	90.67						
8	.30	.00	90.43						
9	.19	.00	88.66						
10	.20	.00	92.01						
11	.20	.00	91.67						
12	.20	.00	92.12						
7-8	.30	.00	90.55	72.74	2.66	16.26	67.40	97.72	75.12
12	.20	.00	92.12	71.89	3.92	14.57	67.37	98.30	62.69

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 293

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	18-2nd	Type:	Process	%	93.20		
	Num.:	17-2nd	Type:	Deep Well	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.29	.00	15	20	6.2	1	60	19.00	6.0
2	.29	.00	15	20	6.0	2	60	18.87	6.0
3	.30	.00	15	20	6.0	2	60	18.25	6.0
4	.30	.00	15	20	6.1	3	60	18.60	6.1
5	.30	.00	15	20	6.1	3	60	18.55	6.1
6	.29	.00	15	20	6.2	4	60	18.71	6.1
7	.30	.00	15	20	6.2	4	60	18.36	6.2
8	.29	.00	15	20	6.3	4	60	18.68	6.2
9	.19	.00	15	20	6.7	3	60	19.12	6.7
10	.20	.00	15	20	6.7	4	60	18.92	6.7
11	.19	.00	15	20	6.7	4	60	18.89	6.7
12	.19	.00	15	20	6.7	5	60	18.94	6.7
7-8	.30	.00	15	20	6.3	4	60	18.52	6.2
11-12	.19	.00	15	20	6.7	5	60	18.92	6.7

TEST: 293 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.29	.00	92.77						
2	.29	.00	91.71						
3	.30	.00	91.38						
4	.30	.00	91.33						
5	.30	.00	91.02						
6	.29	.00	91.22						
7	.30	.00	90.65						
8	.29	.00	90.83						
9	.19	.00	92.60						
10	.20	.00	92.61						
11	.19	.00	91.93						
12	.19	.00	91.92						
7-8	.30	.00	90.74	72.65	2.78	15.23	67.33	97.91	73.94
11-12	.19	.00	91.92	71.97	3.40	13.81	67.27	98.34	67.71

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 294

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	18-2nd	Type:	Process	%	93.20		
	Num.:	18-2nd	Type:	Process	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.29	.00	15	20	6.1	1	60	19.10	6.0
2	.29	.00	15	20	6.0	2	60	18.96	6.0
3	.29	.00	15	20	6.2	2	60	18.84	6.1
4	.30	.00	15	20	6.1	3	60	18.59	6.1
5	.29	.00	15	20	6.1	3	60	18.71	6.0
6	.29	.00	15	20	6.2	4	60	19.04	6.1
7	.29	.00	15	20	6.1	4	60	18.83	6.1
8	.29	.00	15	20	6.1	4	60	18.84	6.1
9	.20	.00	15	20	7.3	4	60	18.63	7.3
10	.20	.00	15	20	7.2	4	60	18.62	7.2
11	.20	.00	15	20	7.1	5	60	18.79	7.1
12	.20	.00	15	20	7.1	5	60	18.70	7.1
7-8	.29	.00	15	20	6.1	4	60	18.84	6.1
11-12	.20	.00	15	20	7.1	5	60	18.74	7.1

TEST: 294 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.29	.00	92.86						
2	.29	.00	91.85						
3	.29	.00	91.70						
4	.30	.00	91.40						
5	.29	.00	91.22						
6	.29	.00	91.17						
7	.29	.00	91.46						
8	.29	.00	91.23						
9	.20	.00	91.85						
10	.20	.00	91.84						
11	.20	.00	92.16						
12	.20	.00	92.19						
7-8	.29	.00	91.35	72.26	2.88	14.01	67.22	98.20	72.82
11-12	.20	.00	92.17	71.69	3.82	13.55	67.14	98.42	63.63

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 295

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	18-2nd	Type:	Process	%	93.20		
	Num.:	19-2nd	Type:	Surface	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.29	.00	15	20	6.6	1	60	19.14	6.5
2	.29	.00	15	20	6.5	2	60	19.03	6.5
3	.30	.00	15	20	6.5	3	60	18.69	6.5
4	.29	.00	15	20	6.6	3	60	19.09	6.6
5	.29	.00	15	20	6.7	4	60	18.95	6.7
6	.30	.00	15	20	7.2	4	60	18.65	7.0
7	.29	.00	15	20	7.0	4	60	18.65	7.0
8	.29	.00	15	20	6.9	5	60	18.86	6.9
9	.19	.00	15	20	7.3	5	60	19.47	7.3
10	.20	.00	15	20	7.3	5	60	18.95	7.3
11	.19	.00	15	20	7.2	5	60	19.43	7.2
12	.20	.00	15	20	7.2	5	60	18.91	7.2
7-8	.29	.00	15	20	7.0	4	60	18.75	7.0
11-12	.19	.00	15	20	7.2	5	60	19.17	7.2

TEST: 295 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.29	.00	92.74						
2	.29	.00	92.15						
3	.30	.00	91.72						
4	.29	.00	92.02						
5	.29	.00	91.94						
6	.30	.00	91.57						
7	.29	.00	91.21						
8	.29	.00	91.06						
9	.19	.00	91.75						
10	.20	.00	92.44						
11	.19	.00	92.53						
12	.20	.00	92.74						
7-8	.29	.00	91.14	72.54	3.10	15.08	67.45	98.02	70.81
11-12	.19	.00	92.63	72.08	4.02	14.20	67.82	98.46	61.53

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 296

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	18-2nd	Type:	Process	%	93.20		
	Num.:	20-2nd	Type:	Pit	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.29	.00	15	20	7.9	1	60	19.28	7.9
2	.29	.00	15	20	7.9	2	60	19.22	8.0
3	.29	.00	15	20	7.9	3	60	19.45	8.1
4	.29	.00	15	20	8.0	3	60	19.12	8.2
5	.29	.00	15	20	8.2	4	60	19.24	8.4
6	.29	.00	15	20	8.1	4	60	19.06	8.3
7	.29	.00	15	20	8.2	5	60	19.24	8.4
8	.30	.00	15	20	8.3	5	60	18.74	8.5
9	.20	.00	15	20	8.3	5	60	19.08	8.5
10	.20	.00	15	20	8.5	5	60	19.39	8.6
11	.20	.00	15	20	8.6	5	60	19.30	8.7
12	.20	.00	15	20	8.6	5	60	19.30	8.6
6-8	.29	.00	15	20	8.2	5	60	19.01	8.4
11-12	.20	.00	15	20	8.6	5	60	19.30	8.6

TEST: 296 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.29	.00	92.72						
2	.29	.00	92.25						
3	.29	.00	92.72						
4	.29	.00	92.74						
5	.29	.00	93.24						
6	.29	.00	92.03						
7	.29	.00	92.01						
8	.30	.00	92.12						
9	.20	.00	93.49						
10	.20	.00	94.73						
11	.20	.00	95.40						
12	.20	.00	95.83						
6-8	.29	.00	92.05	72.37	3.42	12.81	67.64	98.49	67.48
11-12	.20	.00	95.62	69.92	6.68	16.63	67.58	98.92	34.02

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 297

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	18-2nd	Type:	Process	%	93.20		
	Num.:	22-2nd	Type:	Bartow	%	6.80		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.30	.00	15	20	8.5	1	60	18.90	8.5
2	.30	.00	15	20	8.4	2	60	18.60	8.5
3	.29	.00	15	20	8.3	2	60	18.68	8.4
4	.29	.00	15	20	8.5	3	60	18.56	8.3
5	.29	.00	15	20	8.3	3	60	18.69	8.3
6	.29	.00	15	20	8.3	3	60	18.87	8.3
7	.29	.00	15	20	8.2	4	60	18.68	8.2
8	.29	.00	15	20	8.2	4	60	18.67	8.2
9	.20	.00	15	20	8.2	4	60	18.83	8.2
10	.19	.00	15	20	8.2	4	60	18.83	8.2
11	.19	.00	15	20	8.2	4	60	19.17	8.2
12	.19	.00	15	20	8.2	4	60	18.85	8.2
7-8	.29	.00	15	20	8.2	4	60	18.67	8.2
11-12	.19	.00	15	20	8.2	4	60	19.01	8.2

TEST: 297 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.30	.00	93.10						
2	.30	.00	91.84						
3	.29	.00	91.28						
4	.29	.00	90.84						
5	.29	.00	91.05						
6	.29	.00	91.49						
7	.29	.00	91.26						
8	.29	.00	90.95						
9	.20	.00	91.69						
10	.19	.00	91.48						
11	.19	.00	91.81						
12	.19	.00	91.66						
7-8	.29	.00	91.11	72.45	2.82	15.32	67.37	97.98	73.46
11-12	.19	.00	91.73	72.08	3.34	14.84	67.35	98.18	68.35

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 298

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	5-2nd	Type:	Deep Well	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.38	.00	15	20	7.6	1	60	15.81	7.1
2	.38	.00	15	20	7.0	1	60	15.45	6.9
3	.39	.00	15	20	7.0	2	60	15.33	7.0
4	.39	.00	15	20	7.1	2	60	15.14	7.1
5	.39	.00	15	20	7.0	2	60	15.09	7.1
6	.38	.00	15	20	7.1	2	60	15.27	7.2
7	.38	.00	15	20	7.1	3	60	15.38	6.9
8	.38	.00	15	20	6.7	3	60	15.46	6.8
9	.60	.00	15	20	6.8	3	60	14.40	6.8
10	.60	.00	15	20	6.8	3	60	14.27	6.8
11	.60	.00	15	20	6.8	3	60	14.32	6.8
12	.60	.00	15	20	6.8	3	60	14.46	6.8
7-8	.38	.00	15	20	6.9	3	60	15.42	6.9
11-12	.60	.00	15	20	6.8	3	60	14.39	6.8

TEST: 298 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.00	73.20						
2	.38	.00	71.95						
3	.39	.00	72.32						
4	.39	.00	71.84						
5	.39	.00	71.61						
6	.38	.00	71.38						
7	.38	.00	70.99						
8	.38	.00	71.28						
9	.60	.00	69.72						
10	.60	.00	69.46						
11	.60	.00	69.71						
12	.60	.00	69.78						
7-8	.38	.00	71.14	68.26	6.02	5.33	50.10	96.93	87.02
11-12	.60	.00	69.75	68.43	5.26	4.94	49.22	96.96	88.88

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 299

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:									
	Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
	Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
		Num.:	6-2nd	Type:	Process	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.38	.00	15	20	6.8	1	60	15.80	6.7
2	.39	.00	15	20	6.8	1	60	15.30	6.7
3	.39	.00	15	20	6.7	2	60	15.12	6.7
4	.38	.00	15	20	6.7	2	60	15.43	6.7
5	.38	.00	15	20	6.7	2	60	15.30	6.7
6	.38	.00	15	20	6.7	2	60	15.16	6.7
7	.39	.00	15	20	6.7	3	60	15.00	6.6
8	.38	.00	15	20	6.6	3	60	15.36	6.6
9	.58	.00	15	20	6.8	3	60	14.92	6.7
10	.61	.00	15	20	6.8	3	60	14.32	6.7
11	.60	.00	15	20	6.8	3	60	14.40	6.7
12	.60	.00	15	20	6.8	3	60	14.33	6.7
7-8	.38	.00	15	20	6.7	3	60	15.18	6.6
12	.60	.00	15	20	6.8	3	60	14.33	6.7

TEST: 299 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.00	73.47						
2	.39	.00	71.98						
3	.39	.00	71.42						
4	.38	.00	71.60						
5	.38	.00	70.85						
6	.38	.00	70.74						
7	.39	.00	70.40						
8	.38	.00	71.40						
9	.58	.00	70.35						
10	.61	.00	69.88						
11	.60	.00	69.83						
12	.60	.00	69.53						
7-8	.38	.00	70.90	67.98	5.82	5.42	49.78	96.83	87.50
12	.60	.00	69.53	68.22	5.24	4.94	48.94	96.92	88.96

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 300

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	7-2nd	Type:	Surface	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.38	.00	15	20	6.8	1	60	16.51	6.7
2	.38	.00	15	20	6.7	2	60	15.90	6.7
3	.39	.00	15	20	6.7	2	60	15.37	6.7
4	.39	.00	15	20	6.8	2	60	15.33	6.6
5	.38	.00	15	20	6.6	3	60	15.61	6.6
6	.39	.00	15	20	6.5	3	60	15.27	6.5
7	.38	.00	15	20	6.6	3	60	15.58	6.6
8	.38	.00	15	20	6.6	3	60	15.39	6.6
9	.58	.00	15	20	6.7	3	60	14.76	6.7
10	.60	.00	15	20	6.7	4	60	14.21	6.7
11	.60	.00	15	20	6.7	4	60	14.20	6.7
12	.59	.00	15	20	6.7	4	60	14.49	6.7
7-8	.38	.00	15	20	6.6	3	60	15.48	6.6
12	.59	.00	15	20	6.7	4	60	14.49	6.7

TEST: 300 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.00	77.07						
2	.38	.00	74.05						
3	.39	.00	73.06						
4	.39	.00	72.45						
5	.38	.00	72.04						
6	.39	.00	71.63						
7	.38	.00	72.09						
8	.38	.00	72.05						
9	.58	.00	69.56						
10	.60	.00	68.96						
11	.60	.00	68.35						
12	.59	.00	69.06						
7-8	.38	.00	72.07	66.80	7.56	5.51	49.68	96.90	83.49
12	.59	.00	69.06	68.26	5.02	5.51	48.85	96.51	89.49

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST:	301
PURPOSE:	To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	7-2nd	Type:	Surface	%	40.00		
Other:	Kerosine							

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Kerosine lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.38	.19	15	20	6.7	1	60	16.01	6.7
2	.39	.19	15	20	6.7	2	60	15.41	6.6
3	.39	.19	15	20	6.6	2	60	15.18	6.6
4	.38	.19	15	20	6.6	3	60	15.49	6.6
5	.39	.19	15	20	6.6	3	60	15.13	6.6
6	.39	.19	15	20	6.6	3	60	15.09	6.6
7	.39	.19	15	20	6.6	3	60	15.15	6.6
8	.38	.19	15	20	6.6	3	60	15.30	6.6
9	.58	.19	15	20	6.6	3	60	14.89	6.6
10	.59	.20	15	20	6.6	3	60	14.55	6.6
11	.59	.20	15	20	6.6	3	60	14.53	6.6
12	.58	.19	15	20	6.6	3	60	14.60	6.6
7-8	.38	.19	15	20	6.6	3	60	15.23	6.6
11-12	.58	.19	15	20	6.6	3	60	14.56	6.6

TEST: 301 Continued

RESULTS:

Stage No.	Amine lb/TF	Kerosine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.19	75.29						
2	.39	.19	72.44						
3	.39	.19	71.83						
4	.38	.19	72.23						
5	.39	.19	71.55						
6	.39	.19	71.33						
7	.39	.19	71.16						
8	.38	.19	71.31						
9	.58	.19	69.52						
10	.59	.20	69.03						
11	.59	.20	68.81						
12	.58	.19	68.51						
7-8	.38	.19	71.24	67.12	6.94	6.25	49.61	96.38	85.02
11-12	.58	.19	68.66	68.67	5.30	8.12	49.69	94.88	88.97

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 302

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	8-2nd	Type:	Pit	%	40.00		

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Flotation Time sec.	Solids %	pH
1	.38	.00	15	20	7.0	2	60	17.63	6.9
2	.39	.00	15	20	6.9	2	60	16.09	6.8
3	.39	.00	15	20	6.8	3	60	15.55	6.9
4	.38	.00	15	20	6.9	3	60	15.62	6.8
5	.38	.00	15	20	6.9	3	60	15.71	6.8
6	.39	.00	15	20	6.8	4	60	15.42	6.8
7	.38	.00	15	20	6.8	4	60	15.43	6.8
8	.39	.00	15	20	6.8	4	60	15.27	6.8
9	.60	.00	15	20	6.9	4	60	14.53	6.8
10	.60	.00	15	20	6.8	5	60	14.77	6.7
11	.60	.00	15	20	6.8	5	60	14.76	6.7
12	.61	.00	15	20	6.8	5	60	14.65	6.7
7-8	.39	.00	15	20	6.8	4	60	15.35	6.8
10-12	.60	.00	15	20	6.8	5	60	14.73	6.7

TEST: 302 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.00	82.38						
2	.39	.00	75.88						
3	.39	.00	73.04						
4	.38	.00	73.05						
5	.38	.00	72.90						
6	.39	.00	72.86						
7	.38	.00	72.26						
8	.39	.00	72.06						
9	.60	.00	70.67						
10	.60	.00	71.96						
11	.60	.00	71.71						
12	.61	.00	71.90						
7-8	.39	.00	72.16	67.12	7.52	4.81	49.77	97.31	83.56
10-12	.60	.00	71.85	66.80	7.80	4.57	49.29	97.39	83.02

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 303

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	22-2nd	Type:	Bartow	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	6.5	1	60	15.60	6.5
2	.40	.00	15	20	6.6	2	60	15.30	6.6
3	.40	.00	15	20	6.6	2	60	15.26	6.6
4	.40	.00	15	20	6.7	2	60	14.75	6.6
5	.40	.00	15	20	6.6	2	60	14.81	6.6
6	.40	.00	15	20	6.6	3	60	14.83	6.6
7	.40	.00	15	20	6.6	3	60	15.06	6.6
8	.40	.00	15	20	6.6	3	60	15.09	6.5
9	.60	.00	15	20	6.6	3	60	14.82	6.6
10	.60	.00	15	20	6.6	4	60	14.78	6.6
11	.60	.00	15	20	6.6	4	60	14.76	6.6
12	.59	.00	15	20	6.6	4	60	14.83	6.6
7-8	.40	.00	15	20	6.6	3	60	15.07	6.6
11-12	.59	.00	15	20	6.6	4	60	14.79	6.6

TEST: 303 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	75.67						
2	.40	.00	74.44						
3	.40	.00	73.36						
4	.40	.00	72.39						
5	.40	.00	72.06						
6	.40	.00	72.48						
7	.40	.00	73.01						
8	.40	.00	73.30						
9	.60	.00	71.52						
10	.60	.00	71.26						
11	.60	.00	71.17						
12	.59	.00	71.14						
7-8	.40	.00	73.15	66.69	8.36	3.82	49.81	97.94	81.47
11-12	.59	.00	71.15	67.12	7.26	5.42	49.32	96.83	84.35

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 304

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	13-2nd	Type:	Deep Well	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	7.0	1	60	15.27	6.9
2	.40	.00	15	20	6.9	1	60	15.08	6.8
3	.40	.00	15	20	6.8	2	60	14.93	6.7
4	.39	.00	15	20	6.8	2	60	15.22	6.7
5	.40	.00	15	20	6.8	2	60	14.93	6.7
6	.40	.00	15	20	6.7	2	60	14.91	6.7
7	.39	.00	15	20	6.8	2	60	15.59	6.7
8	.39	.00	15	20	6.7	2	60	15.47	6.7
9	.49	.00	15	20	6.9	2	60	15.27	6.8
10	.49	.00	15	20	6.9	2	60	15.15	6.8
11	.49	.00	15	20	6.9	3	60	15.25	6.8
12	.50	.00	15	20	6.9	3	60	14.94	6.8
7-8	.39	.00	15	20	6.8	2	60	15.53	6.7
10-12	.49	.00	15	20	6.9	3	60	15.12	6.8

TEST: 304 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	75.10						
2	.40	.00	73.18						
3	.40	.00	72.86						
4	.39	.00	72.63						
5	.40	.00	73.31						
6	.40	.00	72.36						
7	.39	.00	73.36						
8	.39	.00	73.54						
9	.49	.00	73.46						
10	.49	.00	72.61						
11	.49	.00	72.63						
12	.50	.00	72.71						
7-8	.39	.00	73.45	71.12	3.20	10.88	55.13	94.76	91.75
10-12	.49	.00	72.65	71.30	3.00	11.25	54.88	94.39	92.35

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 305

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	14-2nd	Type:	Process	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	7.5	1	60	15.51	7.4
2	.40	.00	15	20	7.0	2	60	15.37	6.9
3	.39	.00	15	20	6.9	2	60	15.50	6.8
4	.40	.00	15	20	6.9	2	60	14.97	6.8
5	.41	.00	15	20	6.9	2	60	14.87	6.7
6	.40	.00	15	20	6.7	3	60	15.39	6.6
7	.39	.00	15	20	6.6	3	60	15.49	6.5
8	.40	.00	15	20	6.6	3	60	14.95	6.5
9	.49	.00	15	20	6.7	3	60	15.52	6.7
10	.50	.00	15	20	6.7	4	60	15.13	6.7
11	.49	.00	15	20	6.7	4	60	15.30	6.7
12	.50	.00	15	20	6.7	4	60	15.29	6.7
7-8	.40	.00	15	20	6.6	3	60	15.22	6.5
10-12	.50	.00	15	20	6.7	4	60	15.24	6.7

TEST: 305 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	74.88						
2	.40	.00	74.27						
3	.39	.00	73.90						
4	.40	.00	73.56						
5	.41	.00	73.39						
6	.40	.00	74.09						
7	.39	.00	74.17						
8	.40	.00	73.49						
9	.49	.00	74.11						
10	.50	.00	73.83						
11	.49	.00	73.50						
12	.50	.00	73.75						
7-8	.40	.00	73.84	71.01	3.20	9.85	55.01	95.32	91.70
10-12	.50	.00	73.69	71.30	3.08	10.03	55.18	95.22	92.03

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 306

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:									
Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.43
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	15-2nd	Type:	Surface	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.39	.00	15	20	6.7	2	60	16.11	6.6
2	.39	.00	15	20	6.6	3	60	15.74	6.6
3	.40	.00	15	20	6.6	3	60	15.39	6.5
4	.39	.00	15	20	6.6	3	60	15.72	6.5
5	.41	.00	15	20	6.6	3	60	15.15	6.6
6	.40	.00	15	20	6.6	4	60	15.60	6.5
7	.40	.00	15	20	6.6	4	60	15.54	6.5
8	.40	.00	15	20	6.6	4	60	15.33	6.5
9	.49	.00	15	20	6.7	4	60	15.65	6.6
10	.50	.00	15	20	6.7	5	60	15.35	6.6
11	.49	.00	15	20	6.7	5	60	15.49	6.6
12	.50	.00	15	20	6.7	5	60	15.14	6.6
7-8	.40	.00	15	20	6.6	4	60	15.44	6.5
10-12	.50	.00	15	20	6.7	5	60	15.32	6.6

TEST: 306 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.39	.00	76.72						
2	.39	.00	75.89						
3	.40	.00	75.05						
4	.39	.00	75.26						
5	.41	.00	74.64						
6	.40	.00	75.27						
7	.40	.00	74.92						
8	.40	.00	74.77						
9	.49	.00	74.72						
10	.50	.00	74.04						
11	.49	.00	74.07						
12	.50	.00	74.12						
7-8	.40	.00	74.84	71.17	3.72	9.09	55.55	95.88	90.22
10-12	.50	.00	74.08	71.12	3.42	9.66	55.19	95.46	91.10

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 307

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	15-2nd	Type:	Surface	%	40.00		
Other:	Kerosine							

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Conditioning Kerosine lb/TF	Conditioning Time sec.	Conditioning Solids %	Conditioning pH	Conditioning Turbid.	Flotation Time sec.	Flotation Solids %	Flotation pH
1	.40	.20	15	20	7.0	2	60	15.27	7.0
2	.40	.20	15	20	6.7	3	60	14.85	6.7
3	.40	.20	15	20	6.7	3	60	14.92	6.7
4	.38	.19	15	20	6.7	3	60	15.44	6.7
5	.39	.19	15	20	6.7	4	60	15.17	6.7
6	.38	.19	15	20	6.7	4	60	15.19	6.7
7	.40	.20	15	20	6.6	4	60	14.72	6.6
8	.39	.19	15	20	6.6	5	60	15.06	6.6
9	.50	.20	15	20	6.6	5	60	14.70	6.6
10	.50	.20	15	20	6.6	5	60	14.46	6.6
11	.49	.20	15	20	6.6	5	60	14.66	6.6
12	.48	.19	15	20	6.6	5	60	14.72	6.6
7-8	.40	.20	15	20	6.6	4	60	14.89	6.6
11-12	.49	.20	15	20	6.6	5	60	14.69	6.6

TEST: 307 Continued

RESULTS:

Stage No.	Amine lb/TF	Kerosine lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.20	73.77						
2	.40	.20	72.44						
3	.40	.20	72.39						
4	.38	.19	71.53						
5	.39	.19	71.58						
6	.38	.19	70.79						
7	.40	.20	71.67						
8	.39	.19	71.36						
9	.50	.20	70.96						
10	.50	.20	70.12						
11	.49	.20	70.31						
12	.48	.19	69.08						
7-8	.40	.20	71.52	71.12	3.38	14.16	54.90	92.65	91.51
11-12	.49	.20	69.69	71.58	2.90	17.68	55.24	90.30	92.90

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 308

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	16-2nd	Type:	Pit	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.38	.00	15	20	7.4	2	60	16.33	7.2
2	.39	.00	15	20	7.1	1	60	15.98	7.0
3	.39	.00	15	20	7.1	2	60	15.98	7.1
4	.39	.00	15	20	7.1	2	60	15.88	7.2
5	.38	.00	15	20	7.2	3	60	16.17	7.2
6	.39	.00	15	20	7.3	3	60	15.87	7.3
7	.38	.00	15	20	7.3	3	60	16.26	7.3
8	.39	.00	15	20	7.4	3	60	15.83	7.4
9	.49	.00	15	20	7.5	4	60	15.79	7.5
10	.49	.00	15	20	7.5	4	60	15.76	7.5
11	.48	.00	15	20	7.6	4	60	16.07	7.6
12	.48	.00	15	20	7.6	4	60	16.01	7.6
6-8	.39	.00	15	20	7.4	3	60	15.99	7.4
10-12	.48	.00	15	20	7.6	4	60	15.95	7.6

TEST: 308 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.00	76.65						
2	.39	.00	76.56						
3	.39	.00	76.13						
4	.39	.00	75.28						
5	.38	.00	75.50						
6	.39	.00	76.39						
7	.38	.00	75.91						
8	.39	.00	75.59						
9	.49	.00	75.26						
10	.49	.00	74.76						
11	.48	.00	74.89						
12	.48	.00	74.97						
6-8	.39	.00	75.96	70.73	4.06	6.66	55.33	97.11	89.17
10-12	.48	.00	74.87	71.01	3.66	7.32	55.01	96.66	90.38

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 309

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	3-2nd	Mine:	3	BPL, %:	52.33	AI, %:	28.48
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	22	Type:	Bartow	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	7.3	1	60	15.68	7.3
2	.39	.00	15	20	7.3	1	60	15.78	7.3
3	.39	.00	15	20	7.1	2	60	15.94	7.1
4	.39	.00	15	20	7.2	2	60	15.78	7.1
5	.39	.00	15	20	7.1	2	60	15.79	7.0
6	.40	.00	15	20	7.0	3	60	15.42	6.9
7	.39	.00	15	20	7.0	3	60	15.57	6.9
8	.39	.00	15	20	7.0	3	60	15.80	6.9
9	.49	.00	15	20	7.1	3	60	15.49	7.0
10	.49	.00	15	20	7.0	3	60	15.50	6.9
11	.49	.00	15	20	7.0	3	60	15.42	6.9
12	.49	.00	15	20	7.0	3	60	15.56	6.9
7-8	.39	.00	15	20	7.0	3	60	15.68	6.9
10-12	.49	.00	15	20	7.0	3	60	15.49	6.9

TEST: 309 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	76.51						
2	.39	.00	75.90						
3	.39	.00	75.67						
4	.39	.00	75.42						
5	.39	.00	75.20						
6	.40	.00	75.09						
7	.39	.00	74.88						
8	.39	.00	75.54						
9	.49	.00	74.28						
10	.49	.00	74.45						
11	.49	.00	74.25						
12	.49	.00	73.90						
7-8	.39	.00	75.21	70.73	3.90	8.63	55.33	96.13	89.70
10-12	.49	.00	74.20	71.41	3.24	9.46	55.43	95.60	91.56

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 310

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	17-2nd	Type:	Deep Well	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	7.7	3	60	18.50	7.4
2	.40	.00	15	20	7.3	3	60	18.35	7.2
3	.39	.00	15	20	7.3	4	60	18.66	7.2
4	.40	.00	15	20	7.4	4	60	18.44	7.5
5	.39	.00	15	20	7.5	4	60	18.73	7.5
6	.39	.00	15	20	7.5	4	60	18.54	7.6
7	.39	.00	15	20	7.6	5	60	18.55	7.7
8	.39	.00	15	20	7.7	5	60	18.48	7.8
9	.30	.00	15	20	7.7	5	60	18.68	7.8
10	.29	.00	15	20	7.8	5	60	19.26	7.9
11	.28	.00	15	20	7.8	5	60	19.23	7.9
12	.30	.00	15	20	7.8	5	60	18.46	7.9
6-8	.39	.00	15	20	7.6	5	60	18.52	7.7
11-12	.29	.00	15	20	7.8	5	60	18.84	7.9

TEST: 310 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	91.32						
2	.40	.00	91.03						
3	.39	.00	90.58						
4	.40	.00	90.80						
5	.39	.00	90.86						
6	.39	.00	90.48						
7	.39	.00	90.79						
8	.39	.00	90.43						
9	.30	.00	91.83						
10	.29	.00	91.72						
11	.28	.00	91.43						
12	.30	.00	91.57						
6-8	.39	.00	90.56	72.91	2.36	13.68	67.32	98.08	77.92
11-12	.29	.00	91.50	72.39	2.52	13.50	67.38	98.30	76.18

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 311

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:									
Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	18-2nd	Type:	Process	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	8.0	1	60	18.62	8.1
2	.40	.00	15	20	7.9	2	60	18.58	8.1
3	.39	.00	15	20	8.0	2	60	18.64	8.1
4	.40	.00	15	20	8.1	3	60	18.30	8.2
5	.40	.00	15	20	8.2	3	60	18.47	8.3
6	.40	.00	15	20	8.2	3	60	18.32	8.3
7	.39	.00	15	20	8.3	3	60	18.92	8.4
8	.40	.00	15	20	8.3	4	60	18.32	8.4
9	.30	.00	15	20	8.3	4	60	18.37	8.4
10	.28	.00	15	20	8.4	4	60	19.44	8.5
11	.29	.00	15	20	8.4	4	60	18.80	8.5
12	.30	.00	15	20	8.4	4	60	18.69	8.5
6-8	.39	.00	15	20	8.3	3	60	18.52	8.4
11-12	.29	.00	15	20	8.4	4	60	18.74	8.5

TEST: 311 Continued

RESULTS:

			CONC. (non float)				Head	Percent	
Stage No.	Amine lb/TF	Other lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	Calc. BPL %	BPL Recovery	Insol. Reject
1	.40	.00	92.05						
2	.40	.00	91.52						
3	.39	.00	91.19						
4	.40	.00	90.82						
5	.40	.00	90.85						
6	.40	.00	91.10						
7	.39	.00	91.20						
8	.40	.00	90.70						
9	.30	.00	91.89						
10	.28	.00	91.92						
11	.29	.00	91.64						
12	.30	.00	91.82						
6-8	.39	.00	91.00	72.87	2.36	13.26	67.51	98.23	77.81
11-12	.29	.00	91.73	72.30	2.86	12.89	67.39	98.42	72.90

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 312

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4.0	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	18-2nd	Type:	Process	%	40.00		
Other:	Kerosine							

TEST CONDITIONS:

Stage No.	Conditioning Amine lb/TF	Kerosine lb/TF	Time sec.	Solids %	pH	Turbid.	Flotation Time sec.	Solids %	pH
1	.38	.19	15	20	7.3	1	60	19.01	7.2
2	.40	.20	15	20	7.1	2	60	18.43	7.0
3	.40	.20	15	20	7.0	2	60	18.25	7.0
4	.39	.20	15	20	7.0	3	60	18.50	6.9
5	.40	.20	15	20	7.1	3	60	18.14	7.2
6	.40	.20	15	20	7.1	3	60	18.27	7.2
7	.40	.20	15	20	7.2	3	60	18.27	7.3
8	.39	.20	15	20	7.2	4	60	18.49	7.3
9	.29	.19	15	20	7.3	4	60	19.02	7.4
10	.30	.20	15	20	7.3	4	60	18.10	7.4
11	.30	.20	15	20	7.3	4	60	18.31	7.4
12	.30	.20	15	20	7.3	4	60	18.40	7.4
7-8	.39	.20	15	20	7.2	3	60	18.38	7.3
11-12	.30	.20	15	20	7.3	4	60	18.35	7.4

TEST: 312 Continued

RESULTS:

			CONC. (non float)			Froth	Head Calc.	Percent	
Stage No.	Amine lb/TF	Kerosine lb/TF	Weight %	BPL %	Insol. %	BPL %	BPL %	BPL Recovery	Insol. Reject
1	.38	.19	91.22						
2	.40	.20	90.60						
3	.40	.20	90.32						
4	.39	.20	90.78						
5	.40	.20	90.03						
6	.40	.20	89.99						
7	.40	.20	90.08						
8	.39	.20	90.20						
9	.29	.19	90.50						
10	.30	.20	90.68						
11	.30	.20	90.77						
12	.30	.20	91.12						
7-8	.39	.20	90.14	72.67	2.36	18.31	67.31	97.32	78.02
11-12	.30	.20	90.95	72.43	2.82	15.69	67.29	97.89	73.51

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 313

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	19-2nd	Type:	Surface	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	7.0	5	60	19.61	6.8
2	.40	.00	15	20	6.8	5	60	19.23	6.8
3	.39	.00	15	20	6.8	5	60	19.17	6.8
4	.40	.00	15	20	6.7	5	60	18.80	6.8
5	.38	.00	15	20	6.7	5	60	19.35	6.8
6	.38	.00	15	20	6.7	5	60	19.27	6.7
7	.39	.00	15	20	6.7	5	60	18.85	6.7
8	.39	.00	15	20	6.7	5	60	19.24	6.7
9	.29	.00	15	20	6.7	5	60	19.72	6.6
10	.29	.00	15	20	6.6	5	60	19.79	6.6
11	.30	.00	15	20	6.6	5	60	18.96	6.5
12	.29	.00	15	20	6.5	5	60	19.70	6.5
7-8	.39	.00	15	20	6.7	5	60	19.04	6.7
11-12	.29	.00	15	20	6.6	5	60	19.33	6.5

TEST: 313 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	97.79						
2	.40	.00	95.53						
3	.39	.00	94.11						
4	.40	.00	93.37						
5	.38	.00	92.72						
6	.38	.00	92.59						
7	.39	.00	92.27						
8	.39	.00	92.72						
9	.29	.00	95.40						
10	.29	.00	95.03						
11	.30	.00	94.97						
12	.29	.00	94.28						
7-8	.39	.00	92.50	71.45	3.58	13.92	67.13	98.44	65.79
11-12	.29	.00	94.62	70.99	4.88	13.44	67.89	98.93	52.30

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 314

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	20-2nd	Type:	Pit	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.40	.00	15	20	6.6	1	60	18.51	6.5
2	.40	.00	15	20	6.6	2	60	18.47	6.5
3	.39	.00	15	20	6.5	2	60	18.53	6.5
4	.40	.00	15	20	6.5	3	60	18.23	6.4
5	.39	.00	15	20	6.4	3	60	18.57	6.4
6	.39	.00	15	20	6.4	3	60	18.55	6.5
7	.40	.00	15	20	6.6	3	60	18.43	6.6
8	.39	.00	15	20	6.6	4	60	18.54	6.6
9	.29	.00	15	20	6.6	4	60	18.85	6.6
10	.29	.00	15	20	6.6	4	60	18.94	6.6
11	.29	.00	15	20	6.6	4	60	18.74	6.6
12	.30	.00	15	20	6.6	4	60	18.62	6.6
6-8	.39	.00	15	20	6.5	3	60	18.51	6.6
10-12	.29	.00	15	20	6.6	4	60	18.77	6.6

TEST: 314 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.40	.00	91.54						
2	.40	.00	91.14						
3	.39	.00	90.94						
4	.40	.00	90.57						
5	.39	.00	90.65						
6	.39	.00	90.81						
7	.40	.00	91.05						
8	.39	.00	90.71						
9	.29	.00	92.29						
10	.29	.00	91.85						
11	.29	.00	91.47						
12	.30	.00	91.66						
6-8	.39	.00	90.85	72.87	2.40	14.71	67.55	98.01	77.47
10-12	.29	.00	91.66	72.39	2.70	13.35	67.47	98.35	74.43

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 315

PURPOSE: To investigate the flotation response of amine feeds from various mines to recycling in Process water with various amounts and types of Substitute waters.Fresh samples.Final optimization tests.See also Tests 280-315.

SAMPLES:

Feed	Num.:	4-2nd	Mine:	4	BPL, %:	66.73	AI, %:	9.68
Water	Num.:	Am.Rec.	Type:	Am.Rec.	%	60.00		
	Num.:	22	Type:	Bartow	%	40.00		

TEST CONDITIONS:

	Conditioning						Flotation		
Stage No.	Amine lb/TF	Other lb/TF	Time sec.	Solids %	pH	Turbid.	Time sec.	Solids %	pH
1	.38	.00	15	20	6.5	1	60	19.28	6.6
2	.39	.00	15	20	6.5	1	60	18.84	6.6
3	.39	.00	15	20	6.6	2	60	18.66	6.6
4	.38	.00	15	20	6.6	2	60	19.22	6.6
5	.40	.00	15	20	6.7	2	60	18.36	6.7
6	.38	.00	15	20	6.7	2	60	18.99	6.7
7	.40	.00	15	20	6.7	3	60	18.33	6.7
8	.40	.00	15	20	6.7	3	60	18.39	6.7
9	.29	.00	15	20	6.7	3	60	19.15	6.6
10	.30	.00	15	20	6.6	4	60	18.21	6.6
11	.30	.00	15	20	6.6	4	60	18.24	6.6
12	.29	.00	15	20	6.6	4	60	19.20	6.6
6-8	.39	.00	15	20	6.7	3	60	18.57	6.7
11-12	.30	.00	15	20	6.6	4	60	18.72	6.6

TEST: 315 Continued

RESULTS:

Stage No.	Amine lb/TF	Other lb/TF	CONC. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	.38	.00	92.03						
2	.39	.00	91.36						
3	.39	.00	91.07						
4	.38	.00	90.96						
5	.40	.00	91.21						
6	.38	.00	91.00						
7	.40	.00	91.04						
8	.40	.00	90.99						
9	.29	.00	91.33						
10	.30	.00	91.64						
11	.30	.00	91.89						
12	.29	.00	91.85						
6-8	.39	.00	91.01	72.87	2.24	14.01	67.58	98.14	78.94
11-12	.30	.00	91.87	72.11	2.98	13.26	67.33	98.40	71.72

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 316-318

To investigate the flotation response of amine feed in process water with respect to time. See also Tests 66-69,106-109 & 262-264.

SAMPLES:

Feed	Num.:	4	Mine:	4	BPL, %: 59.56	AI, %: 20.00
Water	Num.:	18	Type:	Process (10 Feb 1994)		

TEST CONDITIONS:

	Conditioning				Flotation		
Test No.	Amine lb/TF	Time sec.	Solids %	pH	Time sec.	Solids %	pH
316	.41	15	20	6.1	60	16.56	6.0
317	.62	15	20	6.3	60	16.23	6.2
318	.82	15	20	6.2	60	15.79	6.1

RESULTS:

		Conc. (non float)				Head Calc.	Percent	
Test No.	Amine lb/TF	Weight %	BPL %	Insol. %	Froth BPL %	BPL %	BPL Recovery	Insol. Reject
316	.41	84.26	70.58	6.68	9.66	60.99	97.51	71.86
317	.62	81.66	72.17	4.08	12.61	61.25	96.22	83.34
318	.82	78.67	72.67	3.20	17.75	60.95	93.79	87.41

TEST NOTES AND OBSERVATIONS:

None

EXHIBIT 2

FLOTATION TESTS

TEST: 319

PURPOSE: To investigate the flotation response of amine feeds in Deep Well water modified with different chemicals using a statistical design.

SAMPLES:

Feed	Num.:	1-2nd	Mine:	1	BPL, %:	48.24	AI, %:	33.00
Water	Num.:	5-2nd	Type:	Deep Well				

TEST CONDITIONS:

Constant:

Amine:	0.8 lb/TF
Conditioning Time:	15 sec.
Conditioning % Solids:	20
Flotation Time:	60 sec.
Flotation % Solids:	15

Variable:

Stage No.	Additions,ppm FA/FO	OB Clay	Potasium Sulfate	Calcium Chloride	Sodium Flouride	Sodium Phos.	Mag. Sulfate	pH Cond.	Float.
1	0	0	0	0	250	250	250	6.6	6.5
2	250	0	0	250	0	0	250	7.0	7.3
3	0	250	0	250	0	250	0	6.6	6.4
4	250	250	0	0	250	0	0	7.0	7.3
5	0	0	250	250	250	0	0	6.7	6.5
6	250	0	250	0	0	250	0	6.6	6.9
7	0	250	250	0	0	0	250	6.9	7.1
8	250	250	250	250	250	250	250	6.5	6.4
9	250	250	250	250	0	0	0	6.7	7.0
10	0	250	250	0	250	250	0	6.8	6.6
11	250	0	250	0	250	0	250	6.8	7.1
12	0	0	250	250	0	250	250	6.7	6.4
13	250	250	0	0	0	250	250	6.5	6.5
14	0	250	0	250	250	0	250	6.8	7.1
15	250	0	0	250	250	250	0	6.6	6.4
16	0	0	0	0	0	0	0	6.9	7.1

TEST: 319 Continued

RESULTS:

Test No.	Conc. (non float) Weight %	BPL %	Insol. %	Froth BPL %	Head Calc. BPL %	Percent BPL Recovery	Insol. Reject
1	69.49	69.31	4.76	5.75	49.92	96.49	89.98
2	70.84	68.50	5.74	5.00	49.98	97.08	87.68
3	70.49	68.04	5.96	5.05	49.45	96.99	87.27
4	72.60	67.39	7.36	3.82	49.97	97.91	83.81
5	69.84	69.35	4.40	4.39	49.76	97.34	90.69
6	69.41	69.11	4.94	6.62	49.99	95.95	89.61
7	77.12	64.04	11.16	3.45	50.18	98.43	73.92
8	74.27	66.01	8.78	3.54	49.93	98.18	80.24
9	75.45	64.65	10.34	3.17	49.55	98.43	76.36
10	80.17	61.33	15.08	3.65	49.89	98.55	63.37
11	70.67	69.20	4.72	4.57	50.25	97.33	89.89
12	70.14	69.07	4.64	5.46	50.07	96.74	90.14
13	74.68	64.98	10.24	3.91	49.52	98.00	76.83
14	79.08	62.36	13.64	3.28	50.00	98.63	67.32
15	69.99	69.11	4.44	4.30	49.66	97.40	90.58
16	70.37	68.83	5.24	5.55	50.08	96.72	88.83

TEST NOTES AND OBSERVATIONS:

None