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**Third Quarterly Technical Progress Report
(April 1, 1993 through June 30, 1993)**

**Bench-Scale Testing of On-Line Control of Column Flotation
Using a Novel Analyzer
(Contract No. DE-AC22-92PC92207)**

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Third Quarterly Technical Progress Report (April 1, 1993 through June 30, 1993)

Bench-Scale Testing of On-Line Control of Column Flotation Using a Novel Analyzer (Contract No. DE-AC22-92PC92207)

Executive Summary

This document contains the third quarterly technical progress report for PTI's Bench-Scale Testing Project of a circuit integrating PTI's KEN-FLOTE™ Column Flotation Technology and PTI's On-Line Quality Monitor and Control System. The twelve-month project involves installation and testing of a 200-300 lb/hr. bench-scale flotation circuit at PETC's Coal Preparation Process Research Facility (CPPRF) for two bituminous coals (Upper Freeport and Pittsburgh No. 8 Seam Raw Coals). Figure 1 contains the project plan, as well as the approach to completing the major tasks within the twelve-month project schedule. The project is broken down into three phases, which include:

- **Phase I - Preparation:** The preparation phase was performed principally at PTI's Calumet offices from October through December, 1992. It involved building of the equipment and circuitry, as well as some preliminary design and equipment testing.
- **Phase II - ET Circuit Installation and Testing:** This installation and testing phase of the project was performed at PETC's CPPRF from January through June, 1993, and was the major focus of the project. It involved testing of the continuous 200-300 lb/hr. circuit.
- **Phase III - Project Finalization:** The project finalization phase is occurring from July through September, 1993, at PTI's Calumet offices and involves finalizing analytical work and data evaluation, as well as final project reporting.

This Third Quarterly Technical Progress Report principally summarizes the results from the bench-scale testing with the second coal (Pittsburgh No. 8 Seam Coal), which occurred in April through June, 1993. It also contains preliminary economic evaluations that will go into the Final Report, as well as the plan for the final reporting task.

Figure 2 contains the project schedule timeline by task series for the twelve month project, as it was laid out in the original Project Work Plan. At the present time, Tasks 200 through 800 have all been completed, as well as Task 1000, the circuit decommissioning. The remaining tasks include completion of PTI's analytical during the month of July, as well as the final data evaluation and project reporting.

Figure 3 contains the ET Circuit flow sheet, including flow balances for the circuit that was installed at PETC's CPPRF in January and early February. The major pieces of equipment include:

- The agitated feed sump and pump to accept product from the existing CPPRF comminution circuit and feed it to the KEN-FLOTE™ Column at the desired capacity (GPM and Wt% solids). PTI and PETC staff targeted a nominal 100M topsize grind (95% passing 100M) for the project.
- The 12" diameter x 14' high KEN-FLOTE™ Column which was equipped with inner sleeves which were used to test PTI's dual cylinder design option.

Figure 1
PROJECT PLAN AND APPROACH
(Twelve Months)

Figure 2
PROJECT SCHEDULE TIMELINE
(By Month)

Figure 3
NET CIRCUIT FLOWSHEET AND FLOW BALANCES

- The column tailings pump which was used to control the froth/pulp interface level within the column.
- PTI's Multiplexer Sampling System which collected samples of column feed, product and tailings and divided the samples into a split for PTI's Quality Monitor and a bypass split for ASTM analyses (five gallon bucket).
- PTI's On-Line Quality Monitor which made nuclear measurements on the sample splits reporting to the monitor and correlated the resultant measurements to compositions obtained from the bypass split (ASTM analyses). This information was then used to determine calibration relationships which were eventually used to control the column performance (yield and product quality) during the control testing.
- Circuit discharge sump and pump which pumped the circuit product streams to the CPPRF thickener or sludge tank for solid/liquid separation and water recycling.

The circuit shown in Figure 3, also contained state-of-the-art instrumentation which tightly controlled the material balance within the circuit from PTI's control room computer, which is not illustrated in the diagram.

As mentioned, the circuit equipment, as well as the skid modules and frames on which the equipment was mounted, were constructed during the October through December time frame at PTI's Calumet facilities and Lincoln Contracting's Boswell, Pennsylvania facilities. PTI subcontracted Lincoln Contracting to do the mechanical and electrical installation of the ET Circuit at the CPPRF site. As mentioned, PTI and Lincoln Contracting began installation on December 28, 1992. The schedule of events that occurred from the beginning of commissioning through the June 18th completion of the decommissioning, are as follows:

- December 28, 1992 through January 20, 1993 - PTI and Lincoln Contracting completed mechanical and electrical installation of the ET Circuit at the CPPRF, including all PTI's control room equipment and Mobile Laboratory.
- January 25 through February 5, 1993 - PTI completed functionality testing and water commissioning of the ET Circuit to insure that there were not circuit leaks and that the circuit could be accurately monitored and balanced using the existing plant instrumentation.
- February 8 through February 26, 1993 - PTI conducted the initial coal/water slurry commissioning of the ET Circuit using the Upper Freeport Seam Coal (Coal #1).
- February 26 through March 30, 1993 - PTI conducted the multivariable testing for the Upper Freeport Seam Coal (Coal #1). A vast range of test conditions were implemented during this testing matrix to obtain final calibrations for the ash monitor control testing.
- April 19 through April 30, 1993 - After a two week exodus from the facility, to allow PETC to perform emergency repairs on the system, PTI then conducted the control testing for the Upper Freeport Seam Coal (Coal #1).
- May 3 through May 28, 1993 - PTI completed the multivariable testing for the Pittsburgh No. 8 Seam Coal (Coal #2).
- June 1 through June 16, 1993 - PTI completed the control testing for the Pittsburgh No. 8 Seam Coal (Coal #2).

- June 17 through June 23, 1993 - PTI, PETC and Gilbert and Commonwealth staff completed decommissioning of the ET Circuit.

The Second Quarterly Technical Progress Report (January 1 through March 31, 1993) summarized all efforts involved in the installation, commissioning and Upper Freeport Seam multivariable testing. Based on the fact that the Upper Freeport Seam control testing was not very successful, due to problems incurred with accuracy of On-Line Monitoring measurements, the remainder of this Third Quarterly Technical Progress Report (April 1 through June 30, 1993) will focus on the Pittsburgh No. 8 Seam multivariable and control testing results, as well as the decommissioning efforts that were completed by the end of June.

Section 1

Task 100 - Project Planning and Management

Prior to discussing project management and planning tasks completed during the third quarter of the project, it is worthwhile to first review the project team and structure for the bench-scale testing project. The project team had been put together to ensure that all expertise to successfully complete the project were accounted for within the organization. The team also takes advantage of existing license agreements and commercial teaming arrangements that have worked well in past commercial installations, and are being further organized for the future. Figure 4 contains the project team organization chart, including the PETC/CPPRF personnel involved in the project. The key organizations within the project team include:

- DOE PETC project and site management staff.
- PTI management and site personnel, as well as laboratory technicians for required analytical work.
- Gilbert Commonwealth (G/C) Engineers and Technicians who operated the existing CPPRF circuit and provide feed coal to PTI's ET Circuit. G/C staff will also be utilized in the decommissioning effort.
- Lincoln Contracting and Equipment Company who was subcontracted to install and commission PTI's ET Circuit at the CPPRF site.
- University of Kentucky engineers and consultants who have assisted in the KEN-FLOTE™ Column debugging and operation, and will also perform dewatering tests to obtain economic information for the final report.
- Stockhausen Mining Chemical technical consultants who have provided guidance on flotation reagent additions and flotation control, and will also provide assistance in developing a market strategy for the technology at the end of the project.

As Figure 4 illustrates, PTI's Project Manager is Peter Suardini, PTI's Vice President of Research and Development. He is stationed in Calumet, Michigan and is responsible for all project reporting and technical project management, as well as management of PTI's laboratory efforts. He is also responsible for all communications, reporting and contracting requirements with DOE's Technical Project Manager (Carl Maronde) and DOE's Contract Specialist (Eric Bell). Mr. Suardini also substituted as Site Manager on the project on certain occasions to give Robert Greenlund a break from on-site work.

Figure 4
PROJECT TEAM ORGANIZATION CHART
(Including Key Project Personnel)

As mentioned, PTI's Site Manager was Robert Greenlund, PTI's Senior Engineer and KEN-FLOTE™ Column Manager. As PTI's Site Manager, Mr. Greenlund managed the majority of the day-to-day engineering and technical aspects of the project, including overseeing Lincoln's subcontract and PTI's engineers and technicians that were stationed at the CPPRF during the second phase of the project. PTI decided to split these responsibilities for overall project management and project task management because both responsibilities are often too much for one person to handle. Thus far, this approach has worked out well in coordinating the project and minimizing schedule slippages and miscommunications.

Table 1 contains a listing of the project reporting requirements which include:

Part I - A number of routine contract reporting requirements (monthly).

Part II - A number of technical reporting requirements (weekly, monthly and quarterly).

Part III - A number of special reporting requirements which needed to be submitted at certain times during the project.

With the submission of this Third Quarterly Technical Progress Report, the routine contract and technical reporting requirements shown in Part I and Part II of Table 1 have all been completed for the months of October 1992 through June, 1993 (the first 9 months of the project). The project spending and task accomplishments to date also closely match the cost and schedule plan submitted at the beginning of the project.

Although some of the special reporting requirements, shown in Part III, were submitted slightly behind schedule, PTI has submitted all the Items 1 through 15 in the special reporting requirements during the October, 1992 through June, 1993 time frame. PTI still plans to submit the draft Final Report (Item 16) on August 30, 1993, and hopes of having the revised Final Report approved by the end of September.

Section 2

Task 200 - Equipment and Circuit Design and Procurement

The equipment and circuit design and procurement task was completed during the months of October and November, 1992. Therefore, there were no efforts to report on this task during this third quarterly period (April through June, 1993).

Section 3

Task 300 - Equipment Fabrication, Construction and Shakedown

The equipment fabrication, construction and shakedown task was principally completed during the months of October through December 1992. Therefore, there are no activities to report on Task 300 during the third quarterly reporting period.

Section 4

Task 400 - Software Development

As with Task 200 and Task 300, the software development task (Task 400) was mostly completed prior to this reporting period. However, PTI's staff engineers did work on altering the software during the Pittsburgh No. 8 Seam multivariable testing and control testing to allow for the extended (6 to 10 hours) regulatory and supervisory comparison tests that were performed during the Pittsburgh No. 8 Seam control testing. The control logic, which was written for the regulatory and supervisory control testing is discussed in more detail during the Data Evaluation Section (Task 1100).

Table 1
PROJECT REPORTING REQUIREMENTS

I. Routine Contract Reporting Requirements:

<u>Description</u>	<u>Frequency</u>	<u>Target Variance</u>
1. Project Invoice	Monthly	± 5 Days
2. Cost Management Report (Form)	Monthly	± 5 Days
3. Milestone Schedule/Status (Form)	Monthly	± 5 Days
4. Summary Report (Report and Form)	Monthly	± 5 Days

II. Routine Technical Reporting Requirement:

<u>Description</u>	<u>Frequency</u>	<u>Target Variance</u>
1. Schedule/Status Sheet	Weekly	None (Every Friday)
2. Project Status Report	Monthly	± 5 Days
3. Key Personnel Staffing Report	Quarterly	± 15 Days
4. Technical Progress Report	Quarterly	± 15 Days

I. Special Technical Reporting Requirements

<u>Description</u>	<u>Proposed Delivery Date</u>	<u>Proposed DOE Review/Approval Date</u>
1. Notice of Energy R&D Project	October 9, 1992	October 16, 1992
2. Draft Project Work Plan (ESH & QA/QC)	October 9, 1992	October 23, 1992
3. Final Project Work Plan (ESH & QA/QC)	October 30, 1992	November 13, 1992
4. Hazardous Substance Plan	October 9, 1992	October 30, 1992
5. NEPA Categorical Exclusion Licensing & Environmental Assessment Questions	October 9 1992	October 30, 1992
6. Milestone Schedule and Cost Plans (Forms)	October 16, 1992	October 23, 1992
7. Project Management Plan	October 16, 1992	October 30, 1992
8. Draft ET Circuit Design Report (two SSA's)	October 16, 1992	October 30, 1992
9. Final ET Circuit Design Report (two SSA's)	November 17, 1992	November 30, 1992
10. Procurement and Fabrication Plan	October 23, 1992	November 06, 1992
11. Installation and Shakedown Plan	November 13, 1992	November 27, 1992
12. Coal Procurement, Handling & Logistics Plan	November 27, 1992	December 11, 1992
13. Operation and Maintenance Manual	December 11, 1992	December 25, 1992
14. Test, Sampling and Analytical Plan	January 15, 1993	January 29, 1993
15. Decommissioning Plan (Equipment Lists)	June 02, 1993	June 11, 1993
16. Draft Final Report	August 30, 1993	September 17, 1993
17. Revised Project Final Report	September 24, 1993	October 01, 1993
18. DOE Property Report	September 24, 1993	October 01, 1993
19. Hazardous Waste Report	September 24, 1993	October 01, 1993

Section 5

Task 500 - Circuit Fabrication and Installation

The circuit fabrication and installation task was completed by Lincoln Contracting during the months of December, 1992 and January, 1993. Therefore, there were no efforts to report on Task 500 during this third quarterly reporting period.

Section 6

Task 600 - Coal Procurement

PTI procured two test coals for the bench-scale testing portion of the project. Based on PTI's previous experience with other DOE-sponsored projects, PTI selected two coals that have the proper characteristics required for the bench-scale testing project. The two coals were Upper Freeport Seam Raw Coal from Valley Camp's Helen Mine in Homer City, PA., and Pittsburgh No. 8 Seam Raw Coal from Ohio Valley Coal Company's preparation plant in Southeastern Ohio. The table below shows their anticipated compositions that were obtained by sampling done at the beginning of the project.

RAW COAL ANALYSES (Dry Basis, Except Moisture)

<u>Coal Seam</u>	<u>Size Content</u>	<u>Quantity Obtained</u>	<u>Moisture (Wt%)</u>	<u>Ash (Wt%)</u>	<u>Sulfur (Wt%)</u>	<u>Pyritic Sulfur (Wt%)</u>	<u>Heating Value (Btu/lb.)</u>
Upper Freeport	3/4" x 0	54 tons	7.0	27.09	2.48	1.77	11,080
Pittsburgh No. 8	2" x 0	50 tons	7.0	28.40	5.17	2.94	10,318

The composition of the various lots of Pittsburgh No. 8 Seam Raw Coal used in the testing, which occurred during the third quarterly reporting period (April through June, 1993), as well as the variability from test-to-test obtained through the blending and feeding system will be discussed as part of the Data Evaluation Task Summary (Section 11).

Section 7

Task 700 - Circuit Commissioning and Shakedown

The circuit commissioning and shakedown task was completed during the period from January 22 through February 25, 1993, and the results were recorded in the Second Quarterly Technical Progress Report. Therefore, no efforts on this task are to be reported during this third quarterly reporting period.

Section 8

Task 800 - ET Circuit Testing And Sample Preparation

Table 2 contains the test matrix for both the Upper Freeport and Pittsburgh No. 8 Seam Coals. The first two portions of the Upper Freeport Seam testing (preliminary and primary multivariable testing) were completed in the months of February and March, and the results were recorded in the Second Quarterly Technical Progress Report. PTI was also fairly unsuccessful in the control testing for the Upper Freeport Seam Coal, due to logistical problems that were incurred with the On-Line Monitor during the Upper Freeport control testing (i.e., inconsistent sample size and foaming within the monitor). Therefore, no discussion of the Upper Freeport multivariable or control testing will be incorporated into this report.

For the Pittsburgh No. 8 Seam Coal testing, beginning in April, 1993, the decision was made to move directly into the primary multivariable testing, and eliminate the preliminary multivariable testing, due to schedule slippage that occurred during the commissioning period. The initial planned matrix in Table 2 had outlined 82 multivariable tests and 20 control tests for the Pittsburgh No. 8 Seam Coal. In actuality PTI only conducted 46 multivariable tests with the Pittsburgh No. 8 Seam Coal, due to the fact that the polyacrylic acid depressant and cylinder configuration options were dropped from the test matrix (see Table 2). These multivariable tests were performed during the period from May 3 to May 28, 1993. The control testing for the Pittsburgh No. 8 Seam Coal was conducted during the period from June 1 to June 16, 1993. The control testing only involved 10 tests done in regulatory (uncontrolled) or supervisory (controlled) conditions. This was also less tests than were originally planned in the control testing portion of Table 2. However, the 6 to 10 hour test duration for the Pittsburgh No. 8 Seam control testing were much longer than the 2 to 4 hour test duration planned in the original test work scope.

Appendices G and H contain the Pittsburgh No. 8 Seam multivariable testing results and control testing results, respectively. The results and conclusions from these tests will be discussed in more detail in Section 11 on the data evaluation task.

Prior to discussing the analytical that PTI has performed at its Calumet facilities, it is worthwhile to note the sample preparation procedures that were utilized at site to obtain samples and run moisture and ash content, both for the feed lot samples as well as the slurry samples taken with PTI's Multiplexer Sampling System. Table 3 contains the procedures used for sampling the individual feed lots, which were brought in in 6-ton increments for the testing. Table 4 contains the slurry sampler procedures for the various feed, concentrate and tailings samples that were collected during the multivariable and control tests. Table 5 contains the sample preparation procedures utilized in PTI's Mobile Laboratory to obtain total solids content on all samples, and to obtain a pulverized split that could be analyzed for sulfur, pyritic sulfur and Btu/lb., if necessary. Sample preparation and the determination of solids and ash content were done for all samples taken during the testing at the CPPRF facility, and was incorporated into the labor hours and billing for the Task 800 ET Circuit Testing portion of the project.

The next section contains a discussion of the analytical that was performed at PTI's Calumet offices and billed separately by analysis.

Table 2

TEST PLAN FOR EACH OF TWO COALS

Upper Freeport Seam Raw and Pittsburgh No. 8 Seam Raw Coals

(142 Tests For Upper Freeport and 102 Tests for Pittsburgh)

I. Preliminary Multivariable Testing: Determine Best Froth Height. (Only for Upper Freeport Seam Raw Coal).

<u>Variable</u>	<u>Number of Options</u>	<u>Description</u>	<u>Total Tests</u>
Collector Dosage (No. 2 Fuel Oil)	2	1.3X, 1.6X #/Ton	2
Frother Dosage (Betz M-150)	2	X, 1.3X #/Ton	4
Froth Height	2	24, 32 Inches	8
Air Rate	2	2, 3 SCFM (at 40 PSI)	16
Cylinder Configuration	2	None, 11 3/8" OD	32
Plus 8 Duplicates	---	---	40

II. Primary Multivariable Testing (Both Coals): Optimize Cylinder Configuration and Reagent Dosages, Generate Control Algorithms, and Calibrate On-Line Monitor.

<u>Variable</u>	<u>Number of Options</u>	<u>Description</u>	<u>Total Tests</u>
Collector Dosage (No. 2 Fuel Oil)	2	1.3X, 1.6X #/Ton	2
Frother Dosage (Betz M-150)	2	X, 1.3X #/Ton	4
Depressant Dosage (Polyacrylic Acid)	3	0, X, 2X #/Ton	12
Cylinder Configuration	3	None, 11 3/8", 11 3/4" OD	36
Froth Height	1	Optimum	36
Air Rate	2	2, 3 SCFM (at 40 PSI)	72
Plus 10 Duplicates	---	---	82

III. Control Testing (Both Coals): Optimize and Control Performance of Flotation Column

<u>Variable</u>	<u>Number of Options</u>	<u>Description</u>	<u>Total Tests</u>
Collector Dosage	1	Controlled	1
Frother Dosage	1	Controlled	1
Depressant Dosage	1	Controlled	1
Air Rate	1	Controlled	1
Froth Height	1	Optimized	1
Grinds Topsize	2	65M, 150M	2
Cylinder Configuration	1	Best	2
Feeds Solids Content	2	5%, 7%	4
Yield Target	2	Low Yield, High Yield	8
Product Ash Override	2	Tight Range, Loose Range	16
Plus 4 Duplicates	---	---	20

Notes: Unless Specified Differently, All Tests Will Be Run at 6.0% Wt% Solids, and 300 lb./hr. Solids Feed Rates, Using Nominal 100M Topsize Feed Coal (90-95% Passing 100M).

Table 3
FEED LOT SAMPLING AND SAMPLE PREPARATION PROCEDURES

1. When feeding 5-6 ton lots into the product bin, get 35-50 lb. sample of crushed to 1/4 inch topsize material using CPPRF sampling system.
2. Riffle down to 30 lbs. Dry at 40° C and get surface moisture content. Return remainder to product bin.
3. Riffle out 15 lbs. and send to PTI.
4. Pulverize remaining 15 lbs. Riffle down to envelope quantity. Bag and label. Put remainder into product bin.
5. Run residual moisture and ash on envelope portion (see Table 2 in Appendix C).
6. Send envelope and 15 lb. bag to PTI.

Table 4
SLURRY SAMPLING PROCEDURES

1. Computer Operator notifies the Field Operator that sampling will soon begin.
2. Field Operator places a 5-gallon sample bucket in position above the circuit discharge sump.
3. Computer Operator activates sampling of a desired stream (concentrate, tailings, feed) through computer software and keyboard control.
- 3B. Feed Sampled manually prior to PTI's feed sump for control testing.
4. Automatically the desired stream is diverted in the multiplexer to the Quality Monitor via three-way valve.
5. The desired stream then flows to a three-way valve in the monitor that toggles alternate full stream cuts to the Quality Monitor and sample bucket.
6. When the monitor is full for operation a pressure switch automatically activates the multiplexer to its normal operating position. Control Room Operator informs Field Operator that sampling is complete.
7. The Quality Monitor cycles this sample portion it received then generates count data for multivariable tests or quality data for control tests.
8. The split in the sample bucket is labeled and covered with a lid by the Field Operator.
9. The Quality Monitor automatically discharges its sample to the circuit discharge sump.
10. The Quality Monitor and associated multiplexer line is then automatically flushed clean by spray water into the circuit discharge sump.
11. The Field Operator sets the next sample bucket in place and the sequence is repeated until concentrate, tailings and feed samples (if required) have been obtained for each test condition.
12. After that test condition the circuit is readied for the next test condition.
13. As the circuit attempts to reach steady state, the Sample Prep Technician begins weighing and filtering samples.
14. Filter cakes are then taken to the Mobile Lab for drying, sample prep and ash analysis (see Tables 1 and 2 in Appendix C).

TABLE 5
PRDA SLURRY SAMPLE PREP PROCEDURE

1. Work in kilograms with buckets (big scale) and grams with pans (small scale).
2. Number buckets. Tare with lids (T_B).
3. Record Test No., Sample, Bucket No. and T_B in Table 1.
4. Take Sample and cover.
5. Record Sample plus Bucket Weight (GW_1).
6. Calculate Slurry Sample Weight (W_1).

$$W_1 = GW_1 - T_B$$

7. Filter sample and discard water.
8. Select a pan. Tare pan include one filter paper (T_P). Record Pan No. and T_P in Table 1.
9. Put sample in pan. Sample should include one filter paper just like when you tared pan.
10. Dry sample at temperature between 40-65°C, until weight stabilizes. If drying overnight, dry at 40°C. If drying 2-3 hours, dry at 65°C. Alter this approach as you learn how long it takes for weights to stabilize.
11. Weigh pan plus surface dry sample, two towels, and filter paper (GD_1).
12. Calculate Surface Dried Sample Weight (D_1).

$$D_1 = GD_1 - T_P$$

13. Note all weights in Table 1 and calculate Surface Solids Content.

$$\text{Surface Solids (Wt\%)} = \frac{D_1 \times 0.1}{W_1}$$

14. Clean all sample off of filter paper and push through 16M screen. If pulverizing is necessary, follow Step 15. If pulverizing is not necessary, follow Step 16.
15. A. Split out approximately 1/2 of sample and pulverize. Riffle out approximately 50 grams and envelope and label. Discard remaining pulverized portion. Run ash analysis on enveloped sample.
B. Bag, label and store unpulverized portion. Send all bags and envelopes to Pete after enveloped portions have been analyzed for ash.
16. A. Riffle out approximately 50 grams and envelope and label. Run ash analysis on enveloped sample.
B. Bag, label, and store unused portions. Send all bags and envelopes to Pete after enveloped portions have been analyzed for ash.

Section 9

Task 900 - PTI Analytical

PTI's Calumet facility's analytical efforts occurred over the entire duration of the ET Circuit testing period. They will also continue through the month of July, to allow longer lead time analyses (i.e., flotation release analyses and washabilities) to be completed. A detailed initial estimate of PTI's analytical requirements was included in the Final Project Work Plan, as well as the Test, Sampling and Analytical Plan, which were submitted in late December, 1992 and the first week of January, 1993, respectively. The initial analytical estimate was \$49,000. However, PTI estimates that streamlined testing that was done on the Pittsburgh No. 8 Seam Coal the total analytical effort for the project to only approximately \$43,000.

PTI's analytical efforts for the project have focused on six main areas for both the Upper Freeport and Pittsburgh No. 8 Seam Coals, which include:

- Conducting 2" column tests and comparing the results for samples ground at PTI's Calumet facilities and PETC's PRF circuit. The results for these tests form a basis of performance to which this plant circuit could be compared, and provided information as to anticipated impacts of various process variables. All 2" column test results for the Pittsburgh No. 8 Seam Coal are listed in Appendix D.
- Head analysis, including moisture, ash, sulfur, pyritic sulfur and heating values of the various 6-ton feed lots that were utilized during the testing portion of the project.
- Head analysis, in particular sulfur and pyritic sulfur, on optimum samples obtained during the multivariable and control testing portions of the project. The results from these head analyses are included in Appendices G and H for the multivariable and control testing, respectively, for the Pittsburgh No. 8 Seam Coal.
- Size analysis on some of the optimum separations performed in the 2" lab column and 12" plant column during the multivariable portion of the project.
- Flotation release analysis on ground composites of each of the test coals to determine the optimum performance that could be anticipated in any flotation separation. These release analyses were performed using both PTI's laboratory grind and the PETC plant grind.
- Washability analysis on ground samples of the two test coals to determine the degree of impurities liberation within the coals (i.e., the optimum separation that could be expected in a perfect density separation). The washability analysis were also done with PTI's laboratory grind, as well as a representative sample of PETC's plant grind.

The results from all of these analytical efforts for the Pittsburgh No. 8 Seam Coal will be discussed in the Data Evaluation Section (Section 11) of this report. The flotation release analysis and washability analysis are being done during the months of July and early August, 1993, and have been included in incomplete form in Appendices E and F. Therefore, the discussion on the flotation release analysis and washability analysis will be somewhat incomplete.

PTI performed all routine coal analysis at their Calumet facilities, using ASTM procedures. PTI also performed a QA/QC to insure that all results met ASTM reproducibility with other laboratories (Geochemical Testing and Standard Laboratories). PTI used the optimum float/sink procedures, determined by PTI as part of a Phase II SBIR Project, to determine the washability results on all feed samples. The flotation release analysis used in the project were developed based on consulting with VPI and University of Kentucky's Center for Applied Energy Research (UK CAER) on their past release analysis procedures.

Section 10

Task 1000 - Circuit Decommissioning

As mentioned, PTI decommissioned the circuit during the period of June 17 through June 23, 1993. The effort was supervised by Bob Greenlund, with PTI providing one technician (Jerry Norkol). Gilbert Commonwealth also provided two technicians, who worked under Bob Greenlund's supervision during the decommissioning. All equipment was tagged and removed to the desired location by the decommissioning crew (either Building 920 for long-term storage, or to the contractor trailer for use by VPI). All process piping and electrical installations were also removed and discarded at termination points specified by VPI and Roberts and Scheafer personnel for the next project. The decommissioning crew then loaded all PTI equipment into the Mobile Laboratory and PTI's company pick-up truck. Bob Greenlund and Jerry Norkol used those trucks to transport that equipment to PTI's Columbus and Calumet offices at the end of the project.

Appendix I includes the final equipment list, including the tag numbers and location of each piece of equipment, that PTI compiled as part of the Decommissioning Plan.

Section 11

Task 1100 - Data Evaluation

The Data Evaluation Task occurred over the entire duration of the circuit commissioning, testing and analytical periods and will form the basis for the Project Final Report. During the ET Circuit testing, PTI's site manager compiled information on operating conditions within the circuit for every test, as well as solids and ash content results from the testing, and faxed the results to PTI's Calumet offices. These results were put onto spread sheets along with the analytical results that PTI obtained from its Calumet laboratories. The major results and recommendations were submitted to DOE on weekly and monthly basis through the Weekly Status Sheets and Monthly Technical Status Reports, as a means of altering the test plan as the project progressed. Calibration and performance results from PTI's Ash Monitor were compiled and modemed to PTI by PTI's staff engineer, and formed the basis of the control testing matrices that were performed. The control testing results will form the basis for the financial evaluation in the final report.

The following discussion focuses on the Pittsburgh No. 8 Seam Coal multivariable and control testing, as well as the 2" laboratory column results, feed coal washabilities, and release analysis for the Pittsburgh No. 8 Seam Coal. The discussion is broken down into a number of sub-sections which include:

- Initial 2" laboratory column tests performed at PTI's Calumet laboratories.
- Pittsburgh No. 8 Seam feed sample analyses from CPPRF facility.
- 12" bench-scale column test results, focusing on impacts of key process variables and column performance optimization.
- Comparison of 2" laboratory and 12" bench-scale column results, including release analysis and washabilities.
- Pittsburgh No. 8 Seam Control Testing approach.
- Pittsburgh No. 8 Seam Control Testing results.
- On-Line Monitoring System economics.

The results discussed in the remainder of this section will form the main basis for the Project Final Report, particularly since the results for the Upper Freeport Seam Coal (first coal tested) were not as conclusive as the results for the Pittsburgh No. 8 Seam Coal testing (second coal tested).

Section 11.1 - 2" Laboratory Column Test Results (Pittsburgh No. 8 Seam Raw Coal)

Appendix D contains the results from 2" laboratory column tests that were performed during February and March, 1993, with the Pittsburgh No. 8 Seam Coal and PTI's Laboratory Dry Grind. The main focus was to determine the anticipated reagent addition dosages and product qualities that could be obtained for this coal at a nominal 100M topsize grind. In addition to those main testing goals, secondary goals were to evaluate the comparative performance of three frothers (MIBC, Betz M-150 and Betz CM-670) and determine whether a polyacrylic acid depressant had any impact on improving pyritic sulfur removal in the laboratory applications.

The results in Appendix D are very voluminous and difficult to decipher. Because of this, certain optimum data has been transferred into Table 6 for the basis of comparison. The first three rows of data in Table 6 compares the optimum separations for the three frothers, with frother dosages of 0.45 #/T and Fuel Oil collector dosages of 0.60 #/T. For the Pittsburgh No. 8 Seam Coal, the M-150 and MIBC performed very similar, giving yields in the range of 76-78% and product qualities of 10.92% ash for feeds ranging from 25-26% ash. The CM-670 frother was less selective, giving a higher product ash content (14.3%), while only promoting the same tailings ash content as the other two frothers.

The pyritic sulfur and total sulfur removals were also in the same range for the M-150 and MIBC frothers. However, the CM-670 was less selective. One small advantage of the MIBC over the M-150 was that it provided a higher solids content in the product than the M-150 frother (42 Wt% vs. 33 Wt%). This was of particular importance for the plant testing column, where the low solids content of the concentrate presented some logistical problems in the Upper Freeport testing. Therefore, the decision was made to use the MIBC for the Pittsburgh No. 8 Seam multivariable and control testing.

The lower part of Table 6 contains the testing results for additional tests done with, and without, the polyacrylic acid pyritic sulfur depressant. When the results for MIBC in the lower part of Table 6 are compared to the results for MIBC in the upper portion of Table 6, it can be observed that there is no significant improvement in pyritic sulfur removal resulting from the polyacrylic acid depressant addition. This, coupled with the inability of the polyacrylic acid depressant to promote improved pyritic sulfur removals during the earlier Upper Freeport Seam Coal bench-scale testing led to the decision to drop the polyacrylic acid depressant addition from the testing matrix for the Pittsburgh No. 8 Seam Coal bench-scale testing.

The dual-cylinder column option was also dropped from the Pittsburgh No. 8 Seam Coal bench-scale testing matrix, due to the poor results obtained with the dual-cylinders for the Upper Freeport Seam Coal testing.

Table 6
OPTIMUM 2" LABORATORY COLUMN RESULTS
PTI LABORATORY DRY GRIND
(Pittsburgh No. 8 Seam Raw Coal)

Batch Number	Test Number	Appendix C Table Number	Frother Dosage		Collector Dosage		Poly Acid Dosage		Sample	Actual Solids Content (Wt%)	Total Flow Rate (g/min)	Solids Flow Rate (g/min)	Column Performance (Dry Basis)			
			Type	#/T	Type	#/T	Type	#/T					Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
7	3	18.D.8	MIBC	0.45	Fuel Oil	0.60	---	---	Recon. Feed	5.95	800	47.6	100.0	25.12	4.45	2.49
									Product	42.39	88	37.3	78.4	10.92	4.57	2.24
11	3	18.D.12	M-150	0.45	Fuel Oil	0.60	---	---	Tailings	1.13	912	10.3	21.6	76.65	4.02	3.40
									Recon. Feed	6.26	836	52.3	100.0	26.19	4.53	2.76
13	3	18.D.14	CM-670	0.45	Fuel Oil	0.60	---	---	Product	32.89	121	39.8	76.1	10.92	4.71	2.33
									Tailings	1.37	915	12.5	23.9	74.80	3.96	4.13
	3	18.D.14	CM-670	0.45	Fuel Oil	0.60	---	---	Recon. Feed	6.10	816	49.8	100.0	25.29	4.63	2.72
									Product	19.95	205	40.9	82.1	14.32	4.93	2.66
8	3	18.D.9	MIBC	0.45	Fuel Oil	0.60	Pure	0.80	Tailings	1.10	811	8.9	17.9	75.58	3.28	3.01
									Recon. Feed	6.00	793	47.6	100.0	25.48	4.60	2.65
12	3	18.D.13	M-150	0.45	Fuel Oil	0.60	Pure	0.80	Product	43.45	84	36.5	76.7	11.39	4.67	2.33
									Tailings	1.22	909	11.1	23.3	71.86	4.36	3.70
	3	18.D.13	M-150	0.45	Fuel Oil	0.60	Pure	0.80	Recon. Feed	6.15	806	49.6	100.0	24.82	4.52	2.50
									Product	35.09	112	39.3	79.2	11.66	4.75	2.31
	3	18.D.13	M-150	0.45	Fuel Oil	0.60	Pure	0.80	Tailings	1.15	894	10.3	20.8	74.94	3.63	3.22

Notes: - All tests performed in 2" diameter by 6' high column, with nominal 100M grind feed coal.
- All tests done with 200 ml/min. froth wash, 14" froth thickness, and 1.5-2.0 CFM air rate @ 40 PSI.

Section 11.2 - PETC CPPRF Feed Sample Analysis (Pittsburgh No. 8 Seam Coal)

During the multivariable testing for the Pittsburgh No. 8 Seam Coal, various 6-ton lots of feed coal were brought over from Dillner Storage for each two-week testing period. During the testing, the feed lot coal was gradually fed from the product bins, to the circuit, and individual multivariable tests were run over 40 minute increments. During the one month multivariable testing period (May 3 through May 28, 1993) for the Pittsburgh No. 8 Seam Coal, two feed lots were utilized for the testing.

Table 7 contains a comparison of the feed lot analyses for the two feed lots utilized for the multivariable testing. The table contains the feed lot analysis obtained from a composite sample collected as the coal was charged into the CPPRF system. The first column of the table also contains the average analyses, minimum analyses and maximum analyses for the individual feed samples that were taken for the 46 multivariable tests (VT#1 through VT#46) occurring over the duration of the Pittsburgh No. 8 Seam multivariable testing.

Table 7
FEED SAMPLE COMPARISON
AND TEST SAMPLE VARIABILITY
Pittsburgh No. 8 seam Raw Coal
(Results are Dry Basis)

	Feed Lot Analysis	<u>Individual Test Feed Samples</u>		
		<u>Average Analysis</u>	<u>Minimum Analysis</u>	<u>Maximum Analysis</u>
<u>Feed Lot #1 (VT#1-VT#35)</u>				
Ash (Wt%)	24.45	23.12	17.22	27.64
Sulfur (Wt%)	4.55	4.41	4.00	5.38
Pyritic Sulfur (Wt%)	2.77	2.75	2.30	3.82
Heating Value (Btu/lb.)	10955	---	---	---
MAF Heating Value (Btu/lb.)	14500	---	---	---
<u>Feed Lot #2 (VT#36-VT#46)</u>				
Ash (Wt%)	23.27	23.24	21.48	26.31
Sulfur (Wt%)	4.64	4.76	4.07	5.56
Pyritic Sulfur (Wt%)	2.57	2.87	2.26	3.65
Heating Value (Btu/lb.)	11138	---	---	---
MAF Heating Value (Btu/lb.)	14516	---	---	---

The table illustrates that the two feed lots had a fairly similar compositions, with only about 1.0 Wt% difference in ash content. The feed samples for the individual test varied fairly significantly (17.22 to 27.64% ash) for the Feed Lot #1 testing. However, this variation was still less than the 15-20% ash variation that was often observed for the Upper Freeport Seam Coal, due to the improved blending

approach with the Pittsburgh No. 8 Seam Coal. For the second feed lot (tests VT#36-VT#46), the project team altered the feeding approach to try to maintain the product bins at about half full. This reduced the variation in feed composition to only 21.48 to 26.31% ash variation from test-to-test. This allowed for a better evaluation of the impact of process variables on column performance during the tests performed using the second feed lot (VT#36-VT#46). The following section (Section 11.3) contains a discussion of the impacts of key process variables, focusing on the test results for VT#36-VT#46.

During the multivariable testing, PTI also collected a composite of the CPPRF ground feed coal, which was fed to PTI's circuit for the entire multivariable test program. Table 8 contains the size analysis of the composite sample, whose composition closely matched the average composition of Feed Lot #1 and Feed Lot #2 (see Table 7). PTI and PETC staff decided to use a coarser screen (1/4") and lower RPM (4912 RPM) in the Hammermill for the Pittsburgh No. 8 Seam testing to try to reduce the amount of 400M x 0 created in the grinding circuit.

Table 8 illustrates that less than 50% of the feed coal was ground to -400M for the Pittsburgh No. 8 Seam testing. This compares to approximately 80-90% -400M that occurred during the Upper Freeport Seam testing. The move to the coarser grind had the advantage of reducing the dependency of column performance on feed composition, which dramatically deterred the conclusions of the Upper Freeport Seam Coal testing. However, there was a significant loss in yield (approximately 3%) due to the inability of the column to efficiently recover the 4.3 Wt% +50M that was present in the feed (see Table 8). This compromise had to be made due to the limitations of PETC's open loop dry grinding circuit. In actual plant application, the +50M would be removed from the flotation circuit and would be treated in some other unit operation.

Table 8
PRF GROUND FEED SIZE ANALYSIS
(Pittsburgh No. 8 Seam Raw Coal)
(Dry Basis)

Size Fraction (USA Mesh)	Weight (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
Top x 30M	1.0	28.68	5.19	3.10
30M x 50M	3.3	28.68	5.19	3.10
50M x 70M	3.5	21.50	4.64	2.59
70M x 100M	5.4	18.74	4.74	2.89
100M x 200M	16.0	14.98	5.00	2.96
200M x 400M	22.6	14.08	5.25	3.49
400M x 0	48.2	32.43	3.83	2.45
TOTAL	100.0	24.21	4.47	2.82
HEAD	100.0	23.40	4.51	2.69

The composite ground feed sample, which was subjected to the size analysis in Table 8, was also the sample used for feed coal washability and release analysis for the Pittsburgh No. 8 Seam Coal.

Section 11.3 - Multivariable Test Results (Pittsburgh No. 8 Seam Coal)

Appendix G contains the test results and conditions for the 46 multivariable tests that were performed using the CPPRF bench-scale column testing circuit between May 3, 1993, and May 28, 1993. Each 45 minute test included a 25-30 minute stabilization period, followed by a 15-20 minute sampling and ash monitor counting period. Once the circuit had stabilized, the sampling period encompassed collecting samples of concentrates, tailings and feed for both a by-pass sample bucket (lab analysis) and a spilt for the On-Line Monitor (nuclear counts). The goal of the testing was to determine the optimum test conditions for reasonable column performance, as well as determine the impact of some key process variables on column performance. The variables that gave the best sensitivity would then be used to control the column performance, in the upcoming control testing.

Early in the multivariable testing, PTI determined that it was best to use a 1/4" screen and 4912 RPM's in the Hammermill to minimize the 400M x 0 in the column feed. PTI also determined that the column could be operated efficiently at solids feed rates of 200-300 #/Hr., provided the feed solids content was kept fairly high (7-10%), to allow a reasonable retention time. Optimum froth wash and launder water additions were found to be approximately 3.5 and 3.0 GPM, respectively, for column feed rates in a range of 6-8 GPM.

Later in the multivariable testing program PTI conducted an eight-test matrix to determine the relative impacts of three main potential column variables, which seemed to have the greatest impact on column performance. They included:

- Reagent Dosages (both MIBC frother and No. 2 Fuel Oil collector),
- Froth Thickness, in inches from the top of the column, and
- Air Rate through the static aspirator, determined in CFM @ 50 Psi.

Table 9 contains the results from this eight-test matrix (VT#39 through VT#46). Note that there were some differences in feed composition, which makes the evaluation somewhat difficult. However, in general, it can be observed that the largest difference in composition and yield was caused by the change in reagent dosages from 0.7 and 1.4 #/T of MIBC and No. 2 Fuel Oil, respectively, to 1.3 and 2.6 #/T of MIBC and No. 2 Fuel Oil, respectively. The other two changes (froth thickness changes from 30" to 18", and air rate changes from 1.7 CFM to 2.3 CFM) had a less significant and consistent impact on yield and product quality. Lower froth thickness and higher air rates led to slightly higher yields and higher concentrate ash contents for similar feed composition.

Based on the results of the multivariable testing, PTI decided that the principle variable that would be used to control column performance would be the MIBC frother and No. 2 Fuel Oil collector addition rates. The decision was made to keep these reagents at a 1:2 ratio of MIBC to Fuel Oil for the control testing. The second and third level variables, which would be altered in the case where MIBC and Fuel Oil reach maximum or minimum acceptable dosages, would be air rate and froth thickness, respectively. The logic and approach to this control testing strategy is discussed in more detail in a later sub-section.

As part of the multivariable testing, PTI also conducted size analysis on the feed, concentrate and tailings samples from one of the optimum separations obtained during the multivariable testing. Table 10 contains the performance and quality results, by size, for one of the optimum tests (VT#23), which was performed at the following conditions:

Table 9
DETAILED TEST RESULTS
Pittsburgh No. 8 Seam Multivariable Testing
(Dry Basis)

Test Number	Reagents (#/T)		Froth Thickness (Inches)	Air Rate @ 50 Psi (CFM)	Actual Feed Sample			Concentrate Sample			Tailings Sample			
	MIBC	No. 2 F.O.			Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
VT#39	0.70	1.40	30	1.7	23.50	4.99	3.13	62.3	7.07	3.92	1.73	50.63	4.90	—
VT#40	0.70	1.40	30	2.3	24.29	4.44	2.44	64.4	7.94	3.99	1.84	53.83	5.36	—
VT#41	0.70	1.40	18	1.7	22.72	4.07	2.26	67.0	8.96	3.73	1.68	50.66	3.81	—
VT#42	0.70	1.40	18	2.3	24.95	4.57	2.91	65.5	10.06	3.93	1.99	53.27	4.80	—
VT#43	1.30	2.60	30	1.7	24.79	4.87	3.12	74.5	9.84	4.46	2.36	68.34	4.29	3.55
VT#44	1.30	2.60	30	2.3	21.98	4.71	2.63	78.3	9.71	4.42	2.24	66.20	4.91	—
VT#45	1.30	2.60	18	1.7	22.22	4.86	2.81	79.9	11.43	4.58	2.38	65.15	4.70	3.96
VT#46	1.30	2.60	18	2.3	26.31	5.56	3.65	73.3	13.37	4.89	2.88	61.85	5.72	—

Note: - All tests performed targeting 250 #/Hr. feed rate and 25.0 Wt% feed solids to PTI's feed sump (undiluted).

- All tests performed with column feed rate of 6.1 GPM at 8.0 Wt% solids with no inner sleeves or polyacrylic acid addition.

- All tests performed with Hammermill set at 4912 RPM with 1/4" screen.

- All tests performed with froth wash bar set at 12", 3.5 GPM froth wash and 3.0 GPM launder water wash.

Table 10
PRIMARY MULTIVARIABLE TEST MATRIX
OPTIMUM TESTS, SIZE ANALYSIS RESULTS
(Pittsburgh No. 8 Seam Coal)

Test Number	Size Fraction	Reconstituted Feed			Actual Feed Sample			Concentrate Sample				Tailings Sample		
		Weight (WT%)	Ash (WT%)	Sulfur (WT%)	Weight (WT%)	Ash (WT%)	Sulfur (WT%)	Yield (WT%)	Weight (WT%)	Ash (WT%)	Sulfur (WT%)	Weight (WT%)	Ash (WT%)	Sulfur (WT%)
VT#23	USA Mesh	0.5	—	—	0.6	—	—	0.0	0.0	—	—	2.2	—	—
VT#23	Top x 30M	3.0	—	—	3.4	—	—	28.1	1.1	—	—	9.1	—	—
VT#23	30M x 50M	8.5	—	—	8.9	—	—	67.6	7.5	—	—	11.8	—	—
VT#23	50M x 100M													
VT#23	Top x 100M	12.0	18.31	4.24	12.9	17.26	4.80	54.9	8.6	6.96	3.54	23.1	32.12	5.10
VT#23	100M x 200	15.5	13.74	4.40	16.8	14.36	4.50	85.5	17.3	7.58	3.76	9.6	50.08	8.20
VT#23	200M x 400	22.8	14.47	5.30	24.1	13.88	5.01	88.7	26.4	7.97	4.48	11.2	65.48	11.77
VT#23	400M x 0	49.7	31.11	4.07	46.2	32.66	3.95	73.5	47.7	13.52	4.40	56.1	79.90	3.16
VT#23	Total	100.0	23.09	4.42	100.0	23.07	4.41	76.6	100.0	10.46	4.24	100.0	64.39	5.06
VT#23	Heads	100.0	22.37	4.43	100.0	22.38	4.33	77.3	100.0	10.02	4.21	100.0	64.44	5.18

- 300 #/Hr. solids feed rate.
- 6.5 GPM column feed rate, at 9.0 Wt% solids.
- 18" froth thickness and 1.8 CFM air rate @ 50 psi.
- Froth Wash and launder wash water additions of 3.0 GPM.
- MIBC frother dosage of 1.0 #/T and No. 2 Fuel Oil collector dosage of 2.0 #/T.
- 1/4" screen in Hammermill, operated at 4912 RPM.

More details on the VT#23 test conditions and results are included in Appendix G.

Table 10 illustrates the low yield occurring in the Top x 30M and 30M x 50M size fraction, where approximately 3.0 Wt% of the feed coal is lost. The results in Table 10 also show that a yield of approximately 77 Wt% could be obtained at 10.0 - 10.5 Wt% ash for the 23 Wt% ash feed coal. The high ash content of 13.52 Wt% for the 400M x 0 size fraction of the concentrate, also illustrates why it is important to keep the proportion of 400M x 0 to a reasonable amount (less than 50 Wt%) when trying to obtain an acceptable concentrate quality (less than 12 Wt% ash). The upcoming sub-section compares some of the optimum multivariable test results obtained with the 12" diameter bench-scale column to the 2" laboratory column results, as well as the washability and release analysis for similar size consist and composition feed samples of the Pittsburgh No. 8 Seam Coal.

Section 11.4 - Comparison of 2" Laboratory and 12" Pilot-Plant Column Results

Table 11 contains a comparison of the optimum column results for the Pittsburgh No. 8 Seam Raw Coal, for both the 2" laboratory and 12" bench-scale column tests. For feed coals with similar ash contents (22.0 - 22.5 Wt%) the yields and product ash contents for the 2" diameter laboratory column and 12" diameter plant column were very similar, with only a slight decrease in yield being observed upon scale-up to the 12" diameter. The main difference between the results was that the 2" diameter column gave a much higher concentrate solids content (28.0 Wt%) than the 12" diameter column (12.8 Wt%). This may be somewhat due to merely scale-up dynamics that occur on larger columns. However, PTI feels that the air distribution and air aspirator system may also have something to do with the drop in concentrate solids content for the 12" diameter. The bench-scale column had a lower aspirator cross-sectional area -to-column cross-sectional area ratio than the 2" diameter column, and therefore had higher air velocities required to meet the air volume targets. This may have contributed to the lower concentrate solids content. This is a phenomena that PTI desires to research further in the future, as it leads to some detrimental side affects, such as requiring much higher froth wash water to obtain a positive bias.

Despite the solids content concerns, the optimum 12" diameter column results for the Pittsburgh Seam Coal seemed to closely match the optimum 2" diameter column results. Concentrate ash contents of approximately 10 Wt% were achieved at both scales, with the plant column leading to only slightly lower yields than the 2" diameter column (77.3 Wt% vs. 80.3 Wt%). One final observation worth noting in Table 11 is that the 12" diameter column seemed to have better sulfur and pyritic sulfur removals than the 2" diameter column. This behavior was also observed for the Upper Freeport Seam Coal testing, and may be due to the fact that the greater froth wash required in the plant column enhanced the removal of entrained pyrite. This behavior will need to be researched further in the future scale-up testing.

Table 11
SCALE-UP PERFORMANCE COMPARISON
OPTIMUM 2" LABORATORY AND 12" PILOT-PLANT COLUMN TESTS
(Pittsburgh No. 8 Seam Coal)

Column Size (D x H)	Sample	Solids (Wt%)	Dry Basis Results			
			Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
2" x 6'	Feed	5.9	100.0	22.1	3.99	2.30
	Concentrate	28.0*	80.3	10.3	4.25	2.27
	Tailings	1.1	19.7	69.9	2.92	2.42
12" x 14'	Feed	9.1	100.0	22.4	4.43	2.74
	Concentrate	12.8*	77.3	10.0	4.21	2.22
	Tailings	2.2	22.7	64.4	5.18	4.52

* Major Scale-up Performance Difference

Notes: - Optimum 2" Laboratory KEN-FLOTE™ Column test conditions and results are for Batch #14, Test #3, summarized in Table 18.D.16 of Appendix D.

- Optimum 12" Pilot-Plant KEN-FLOTE™ Column test conditions and results are for multivariable test VT#23, summarized in Table 18.G.6 of Appendix G.

As a further comparison, Figure 5 contains the ash vs. yield relationship plots for some of the optimum 2" diameter laboratory column tests and optimum 12" diameter bench-scale column tests. Figure 5 also contains the washability analysis results and flotation release analysis results for the Pittsburgh No. 8 Seam Raw Coal. All the test results shown in Figure 5 were performed with feed coal samples obtained from PETC's open-loop dry grinding circuit. As expected, the results illustrate that the best separations were obtained with the washability, and the flotation release analysis was slightly less efficient (lower yields at a given product quality). Figure 5 also verifies that the 2" laboratory column results were slightly more efficient than the 12" diameter bench-scale column results.

The curves connecting the optimum test results for the 12" diameter and column began to break and flatten out at approximately 10% ash content. Therefore, yields in the range of 70-80 Wt% at approximately 10 Wt% ash content was the target for the control testing performed later with the Pittsburgh No. 8 Seam Coal.

Appendix F contains the complete feed coal washability and release analysis results for the Pittsburgh No. 8 Seam Coal, as well as the procedure utilized for the release analysis work.

Figure 5
ASH VERSUS YIELD RELATIONSHIP COMPARISON
OPTIMUM 2" LABORATORY COLUMN AND 12" PLANT COLUMN TESTS
AND WASHABILITY AND FLOTATION RELEASE ANALYSES
 (Pittsburgh No. 8 Seam Raw Coal)

Note: Only tests with feed ash contents between 22.0 Wt% and 24.0 Wt% were eligible for consideration as optimum for 2" laboratory and 12" pilot-plant column tests.

Section 11.5 - Pittsburgh No. 8 Seam Control Testing Approach

During the period from June 1st to June 16th, PTI's on-site efforts focused on conducting the Pittsburgh No. 8 Seam control testing. PTI conducted 10 extended control testing runs (WT#1 through WT#10) during this period, with a duration of 6 to 10 hours each. Each run was either a regulatory test (uncontrolled) where reagents, air and froth height were held constant, or a supervisory test (controlled) where the computer altered those variables to target 10 Wt% concentrate ash content. The control testing results are summarized in Appendix H.

Table 12 contains a listing of the control testing approach for the two types of tests that were performed (regulatory tests and supervisory tests). As with the Upper Freeport Seam Coal, the feed composition and solids feed rate were varied randomly by Gilbert Commonwealth personnel using the weigh belt feeders from the two product bins. One product bin contained raw coal and the other product bin contained a raw/precleaned coal mix, so the subsequent feed coal ash content could be varied to the circuit by changing the blend from the bins.

Table 12 also illustrates that column feed rate, launder wash water rate and froth wash water rate were held constant for all tests. For the regulatory tests, the reagent dosages, air rates and froth thicknesses were also held constant at the levels shown in Table 12. However, in the supervisory tests the reagent dosages, air rates and froth thicknesses were altered to target setpoint concentrate quality (10 Wt% ash) and column yield (65-85 Wt%). The methodology of the supervisory control is presented later in the discussion.

Table 12
CONTROL TESTING APPROACH
(Pittsburgh No. 8 Seam Coal)

	Regulatory Tests	Supervisory Tests
Column Feed Rate	Constant, 6.1 GPM	Constant, 6.1 GPM
Launder Wash Water	Constant, 3.0 GPM	Constant, 3.0 GPM
Froth Wash Water	Constant, 3.5 GPM	Constant, 3.5 GPM
Raw/Precleaned Mix	G/C Vary, 100/0 - 70/30%	G/C Vary, 100/0 - 70/30%
Solids Feed Rate	G/C Vary, 220-280 #/hr.	G/C Vary, 220-280 #/hr.
Frother (MIBC)	Constant, 1.0 #/T	Level #1 Control, 0.7-1.3 #/T
Collector (No. 2 Fuel Oil)	Constant, 2.0 #/T	Level #1 Control, 1.4-2.6 #/T
Air Rate (50 PSI)	Constant, 2.0 CFM	Level #2 Control, 1.7-2.3 CFM
Froth Thickness	Constant, 24"	Level #3 Control, 30"-18"

As mentioned, Gilbert Commonwealth used a blending strategy from the two product bins to obtain various feed rates and feed compositions. Table 13 shows the blending approach for a 6-hour run schedule that was used during the testing. This approach focused on utilizing a blended feed from two product bins that had various compositions. This approach is the same as was used during the Upper Freeport Seam Coal control testing. However, the periods from each bin were extended to two hours to obtain a more consistent and dramatic variation in feed quality.

Table 13
FEED COMPOSITION AND FEED RATE VARIATIONS
(6 Hour Schedule)

Run Hour	Bin #1 Raw/Precleaned Mix Average 19% Ash (Feed Rate, #/hr.)	Bin #2 Raw Coal Average 25% Ash (Feed Rate, #/hr.)
1	0	250
2	0	280
3	220	0
4	280	0
5	0	220
6	0	250

** Repeat If Necessary **

Lastly, Table 14 shows a simplified version control logic for the supervisory (controlled) testing. The On-Line Control System was used to collect concentrate and tailings samples on 20-minute increments during the testing, and compared the On-Line Monitor readings to the concentrate ash content target (10 Wt%) and yield target range (65-85 Wt%). The control software then made step changes on 20-minute intervals based on the measured variables and the desired setpoints, as shown by the responses in Table 14.

Table 14
SUPERVISORY CONTROL LOGIC (SIMPLIFIED)
(Step Changes on 20-Minute Intervals)

Control Variable	Low	Med. Low	Target	Med. High	High
Main: Conc. Ash Content (Wt%)	<8.5	8.5-9.5	9.5-10.5	10.5-11.5	>11.5
#1 Override: Low Yield (Wt%)	<60	60-65	NA	NA	NA
#2 Override: High Yield (Wt%)	NA	NA	NA	85-90	>90
Response	++	+	0	-	--
Level #1: MIBC (0.7-1.3 #/T)	+2	+1	0	-1	-2
Level #1: No. 2 F.O. (1.4-2.6 #/T)	+4	+2	0	-2	-4
Level #2: Air Rate (1.7-2.3 CFM)	+2	+1	0	-1	-2
Level #3: froth Thickness (30"-18")	-3.0	-1.5	0	+1.5	+3.0

NOTE: Control Logic also adjusts response based on convergence/divergence.

In the control logic, the Level #1 control adjusted both MIBC and Fuel Oil between ranges 0.7-1.3 #/T for MIBC, and 1.4-2.6 #/T for Fuel Oil. In essence, the Fuel Oil-to-MIBC ratio was kept at 2:1 and the two reagents were adjusted up and down proportionally. When the Level #1 control reached the maximum or minimum shown in Table 14, the control system then jumped into Level #2 control to adjust air rate. If the air rate then reached maximum or minimum, the control system would then jump into Level #3, froth thickness, control. In the case where the concentrate qualities or yields began to reverse themselves, the control system worked its way out of Level #3 and Level #2 control, sequentially, back into Level #1 control to stabilize the circuit. This approach worked fairly well for the Pittsburgh No. 8 Seam control testing and often lead to significant yield improvements as a result of supervisory control. The next sub-section contains a discussion of the calibration results and ash content tracking plots from the Pittsburgh No. 8 Seam control testing.

Section 11.6 - Pittsburgh No. 8 Seam Control Testing Results

During the control testing, PTI used the regulatory test daily runs to obtain calibration data for the supervisory tests which followed on subsequent days. The calibrations involved correlating nuclear count results to actual solids and ash content of the concentrate and tailings samples to develop an empirical correlation, which was later used to predict solids and ash contents during the supervisory

testing. During the supervisory testing, the control system would then compare the predicted concentrate ash contents to the target values during supervisory testing and alter the circuit operating variables to hone in on the desired concentrate quality. The predicted concentrate and tailings solids contents were also combined with the tailings and concentrate flow rates (measured with magnetic flow meters) to determine the solids yield within the circuit. The concentrate yield would override the target concentrate ash content, and provide the control, if yield ranges outside of 65-85% were observed (see Table 14).

Based on this control approach, it was very important that PTI obtain accurate and reliable calibration results from day-to-day to allow the control system to accurately monitor and control the circuit. Figure 6 and Figure 7 contain the calibration results for concentrate solids and ash content, respectively, from the Pittsburgh No. 8 Seam Coal for one of the later regulatory tests that were performed during the project (WT#9). The RMS errors of 0.28 Wt% and 0.33 Wt%, respectively, indicate a good correlation between the predicted and actual concentrate solids and ash content results, respectively.

Similarly, Figure 8 and Figure 9 contain the calibration results from WT#9 for the tailings solids and ash content, respectively. For the tailings sample, the RMS errors between predicted and actual solids and ash content were 0.30 Wt% and 3.49 Wt%, respectively. The RMS errors for the tailings ash content were higher than PTI had experienced in conventional flotation control circuits. However, the tailings ash content measurement was not used within the control logic, as yields were determined from solids contents and flow rates. Therefore, the higher RMS error did not lead to any inaccuracies within the control.

Lastly, Figure 10 and Figure 11 contain tracking plots for concentrate ash and tailings ash content for the last regulatory and supervisory test combination that were conducted during the project (WT#9 and WT#10). Once again, it can be observed that, for concentrate ash content, the predicted ash contents tracked fairly closely with the actual ash contents. However, the magnitude of the differences between the actual and predicted values were much greater for the tailings ash content tracking plot (Figure 11). In certain cases, the predicted values were moving in the opposite direction of the actual values. Fortunately, the overall correlation was fairly strong for these tests occurring later in the project after various problems that had made the calibration of the monitor difficult (i.e., foaming problems and inconsistent sample size) had been corrected.

Figure 6
CONCENTRATE SOLIDS CORRELATION
(Pittsburgh No. 8 Seam Coal)

WT#9 Results
(6/15/93)

RMS Error
= 0.28 Wt%

Figure 7
CONCENTRATE ASH CORRELATION
(Pittsburgh No. 8 Seam Coal)

WT#9 Results
(6/15/93)

RMS Error
= 0.33 Wt%

Figure 8
TAILINGS SOLIDS CORRELATION
(Pittsburgh No. 8 Seam Coal)

WT#9 Results
(6/15/93)

RMS Error
= 0.30 Wt%

Figure 9
TAILINGS ASH CORRELATION
(Pittsburgh No. 8 Seam Coal)

WT#9 Results
(6/15/93)

RMS Error
= 3.49 Wt%

Figure 10
CONCENTRATE ASH TRACKING PLOT
(Pittsburgh No. 8 Seam Control Testing)

WT#9 - #10 Results: (6/15/93 - 6/16/93)

Figure 11
TAILINGS ASH TRACKING PLOT
(Pittsburgh No. 8 Seam Coal Control Testing)

WT#9 - #10 Results: (6/15/93 - 6/16/93)

SECTION 11.7 - On-Line Monitoring System Economics

Table 15 contains a summary comparison between regulatory test results and supervisory test results for two of the tests performed during the early part of the Pittsburgh No. 8 Seam control testing (WT#3 and WT#5). These two tests provide a good evaluation of the benefits of the supervisory control (i.e., On-Line Monitoring System), based on the fact that they both had about the same average feed ash content (24.2 Wt% vs. 24.3 Wt%) and feed ash content range (21-31 Wt%). In addition, the average concentrate ash content were also very close (9.7 Wt% vs. 9.8 Wt%) and slightly less than the control testing target (10.0 Wt% ash).

Table 15
SUMMARY CONTROL TESTING COMPARISONS
(Pittsburgh No. 8 Seam Control)

	WT#3 Regulatory Test (6/01/93 - 10 Hr. Run)	WT#5 Supervisory Test (6/07/93 - 6 Hr. Run)
Average Feed Ash (Wt%)	24.3	24.2
Feed Ash Range (Wt%)	21.1-30.7	21.0-29.1
Average Conc. Ash (Wt%)	9.7	9.8
Conc. Ash Range (Wt%)	8.7-11.2	8.6-12.0
Average Yield (Wt%)	70.8	73.6
Yield Range (Wt%)	64.3-75.6	62.8-78.7

During the supervisory test (WT#5), the control system gradually increased reagents to attempt to reach the 10 Wt% ash target, and therefore an approximate 2.8 Wt% yield improvement was observed (73.6 Wt% vs. 70.8 Wt%). Due to the difficulty in obtaining comparable tests from day-to-day, these results could not be verified on some of the later testing. However, the results in Table 15 do illustrate the advantages of supervisory control for obtaining an increased yield. It seems feasible that a supervisory control involving PTI's On-Line Solids and Ash Content Monitoring System could increase yields in the range of 2 to 5 Wt%, provided that the readings from the monitor have acceptable RMS errors (0.5 Wt%) for concentrate ash content, as well as concentrate and tailings solids content.

Table 16 contains an example of the economics for installing a flotation column supervisory control, based on PTI's On-Line Monitoring System. The economics assume a plant with four 8' diameter by 22' high columns, which are treating 50 TPH of 100M x 0 feed coal. The economics also assume that a yield improvement of 3.0 Wt%, over-and-above regulatory control, could be achieved by adopting the supervisory control. Based on those estimates, and assuming the operating schedule and clean coal price shown in Table 16, the additional revenues for the supervisory control would be \$158,000 per year. When these revenues are compared to the On-Line Monitoring System cost of \$150,000, which includes purchase and installation of the On-Line Monitor, Control Panel and Multiplexer Sampling System, it appears that the system has a payback period of about one year.

Table 16
ON-LINE MONITORING SYSTEM ECONOMICS
(Comparing Regulatory to Supervisory Control)

ASSUMPTIONS

- Plant With Four 8' Diameter x 22' High Columns
- Columns Treat 50 TPH of 100M x 0 Feed Coal
- Operate 14 Hrs./Day, 5 Days/Wk., 50 Wks./Yr. (3,500 Hrs./Yr.)
- Yield Increase of 3.0 Wt% Due to Supervisory Control (1.5 TPH)
- Clean Coal Price of \$30 Per Ton (Dry Basis)

SUPERVISORY SYSTEM PAYBACK PERIOD

- On-Line Monitoring System Cost \$150K (Including Installation)
- Additional Revenues of \$158K Per Year
- Payback Period of One Year

The technical results from the control testing, as well as the economic evaluations will be discussed in more detail in the Project Final Report.

Section 12 - Final Reporting

The remaining project finalization efforts are now being conducted at PTI's Calumet offices for the last three months of the project (July through September, 1993). The major tasks that still need to be completed include:

- Complete Project Analytical Work. The only remaining efforts in the analytical portion of the project are to finalize the flotation release analysis for the Upper Freeport Seam Coal. This will occur during the months of July and August.
- Complete Data Evaluation during July and August and prepare the draft Final Report, including the Hazardous Waste Report and DOE Property Report, during the month of August; then submit them for DOE review by August 30th.
- Submit the Revised Project Final Report, including the Hazardous Waste Report and DOE Property Report, by September, 30, 1993, and close out the project on budget within the original 12-month schedule (October, 1992 through September, 1993).

This will hopefully allow PTI and DOE to close out the contract within the DOE's 1993 fiscal year. However, PTI has obtained a 1-1/2 month extension (through October 1993), just in case some of the reviews of the remaining reports become delayed.

APPENDICES

Appendix D: 2" Laboratory Column Rest Results (Pittsburgh No. 8 Raw Seam Coal)

Appendix E: Feed Coal Washabilities and Release Analyses (Upper Freeport Seam Coal)

Appendix F: Feed Coal Washabilities and Release Analyses (Pittsburgh No. 8 Raw Seam Coal)

Appendix G: Multivariable Testing Results (Pittsburgh No. 8 Raw Seam Coal)

Appendix H: Control Testing Summary Results (Pittsburgh No. 8 Seam Raw Coal)

Appendix I: Project DOE-Owned Capital Equipment Listing

Appendix D

2" LABORATORY COLUMN TEST RESULTS (Pittsburgh No. 8 Seam Raw Coal)

Table 18.D.1: Batch 1-13 Head Analysis (Old Coal and PTI Grind)

Table 18.D.2: Batch #1 Feed Sump Mixing Tests (12" Recirculator Depth)

Table 18.D.3: Batch #2 Feed Sump Mixing Tests (9" Recirculator Depth)

Table 18.D.4: Batch #3 Tests, 0.80 #/T M-150, 0.80 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.5: Batch #4 Tests, 0.80 #/T M-150, 0.80 #/T Fuel Oil, 0.40 #/T Polyacrylic Acid

Table 18.D.6: Batch #5 Tests, 0.60 #/T M-150, 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.7: Batch #6 Tests, 0.60 #/T M-150, 0.60 #/T Fuel Oil, 0.30 #/T Polyacrylic Acid

Table 18.D.8: Batch #7 Tests, 0.45 #/T MIBC, 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.9: Batch #8 Tests, 0.45 #/T MIBC, 0.60 #/T Fuel Oil, 0.300 #/T Polyacrylic Acid

Table 18.D.10: Batch #9 Tests, 0.60 #/T CM-670, 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.11: Batch #10 Tests, 0.60 #/T CM-670, 0.60 #/T Fuel Oil, 0.30 #/T Polyacrylic Acid

Table 18.D.12: Batch #11 Tests, 0.45 #/T M-150 (Site), 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.13: Batch #12 Tests, 0.45 #/T M-150 (Site), 0.60 #/T Fuel Oil, 0.30 #/T Polyacrylic Acid

Table 18.D.14: Batch #13 Tests, 0.45 #/T CM-670, 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.15: Batch #14-#15 Head Analysis (New Coal and PETC Grind)

Table 18.D.16: Batch #14 Tests, 0.45 #/T MIBC, 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.17: Batch #15 Tests, 0.45 #/T MIBC, 0.60 #/T Fuel Oil, 0.00 #/T Polyacrylic Acid

Table 18.D.1
 2" KEN-FLOTE™ COLUMN TESTS
 BATCH 1-13, FEED COMPOSITE, HEAD AND SCREEN ANALYSIS
 Pittsburgh No. 8 Seam Raw Coal
 (Dried at 40° C and Pulverized)

I. Head Analysis: Batch 1-13 Feed Composite

	<u>As-Determined</u>	<u>Dry Basis</u>
Moisture (Wt%)	1.26	---
Ash (Wt%)	28.75	29.12
Sulfur (Wt%)	5.20	5.27
Pyritic Sulfur (Wt%)	2.86	2.90

II. Screen Analysis (Dry Basis): Batch 1-13 Composite

<u>Size Fraction</u> <u>(USA Mesh)</u>	<u>Direct</u> <u>(Wt%)</u>	<u>Cum. Passing</u> <u>(Wt%)</u>
Top x 30M	0.0	100.0
30M x 50M	0.4	99.6
50M x 70M	4.3	95.3
70M x 100M	11.1	84.2
100M x 200M	26.6	57.6
200M x 400M	21.2	36.4
400M x 0	<u>36.4</u>	0.0
	100.0	

Table 18.D.2
2" KEN-FLOTE™ LAB COLUMN
FEED SUMP MIXING TESTS
PITTSBURGH NO. 8 SEAM RAW COAL (Batch #1)
(Recirculator Discharging 12" Down into Sump)

Conditions: - 6.0 Wt% Feed Solids
 - 0.80 #/Ton Betz M-150 Frother
 - 0.80 #/Ton No. 2 Fuel Oil Collector
 - Put 10 GPM Recirculator Pump on Bottom of Sump
 - Moved Feed Suction Point 10" Up Into Sump Directly Under Agitator
 - Feed At 800 ml/min. and Compared 10 Minute Feed Increments Over Entire Feed Period
 - Head Split was 28.38 Wt% Dry Ash, and 5.26 Wt% Dry Sulfur.

Sample #	Description	Recirc. Pump (%scale)	Feed Pump (%scale)	Final Sump Level (in. down)	Feed Sample Composition				
					Slurry Weight (lbs.)	Solids Content (Wt%)	Dry Ash (Wt%)	Dry Sulfur (Wt%)	Filtrate pH
1	Time zero to 10 minutes	100	19	3.00	17.91	5.62	25.45	—	—
2	Time 10 to 20 minutes	100	18	3.50	17.28	5.69	25.27	4.31	7.94
3	Time 20 to 30 minutes	100	18	4.00	17.43	5.91	24.45	—	—
4	Time 30 to 40 minutes	100	18	5.00	16.79	5.98	24.59	4.55	7.87
5	Time 40 to 50 minutes	100	18	5.50	16.64	5.99	24.44	—	—
6	Time 50 to 60 minutes	100	18	6.50	17.37	6.00	26.02	4.54	8.00
7	Time 60 to 70 minutes	100	18	7.50	18.01	5.68	28.07	—	—
8	Time 70 to 80 minutes	100	18	8.50	17.95	5.46	30.69	4.79	8.03
9*	Time 80 to 90 minutes	100	18	10.00	18.05	5.43	31.83	—	—
10	Time 90 to 100 minutes	100	18	12.00	18.18	5.53	31.33	5.11	7.91
11	Time 100 to 110 minutes	70	18	13.50	18.27	5.38	33.72	—	—
12	Time 110 to 114 minutes	70	18	16.50	7.64	5.34	32.24	5.16	8.05
13	Leftover in Sump	---	---	19.00	13.62	9.43	27.10	—	—

Notes: - * Feed was fairly consistent through Sample #9. We have only 90 minutes (1 hour and 30 minutes) to complete all tests when we are doing batch testing.

Table 18.D.3
2" KEN-FLOTE™ LAB COLUMN
FEED SUMP MIXING TESTS
PITTSBURGH NO. 8 SEAM RAW COAL (Batch #2)
(Recirculator Discharging 9" Down into Sump)

Conditions: - 6.0 Wt% Feed Solids
 - 0.80 #/Ton Betz M-150 Frother
 - 0.80 #/Ton No. 2 Fuel Oil Collector
 - Put 10 GPM Recirculator Pump on Bottom of Sump
 - Moved Feed Suction Point 10" Up Into Sump Directly Under Agitator
 - Feed At 800 ml/min. and Compared 10 Minute Feed Increments Over Entire Feed Period
 - Head Split was 29.74 Wt% Dry Ash, and 5.22 Wt% Dry Sulfur.

Sample #	Description	Recirc. Pump (%scale)	Feed Pump (%scale)	Final Sump Level (in. down)	Feed Sample Composition				Filtrate pH
					Slurry Weight (lbs.)	Solids Content (Wt%)	Dry Ash (Wt%)	Dry Sulfur (Wt%)	
1	Time zero to 10 minutes	100	18	3.00	17.80	5.59	25.09	--	--
2	Time 10 to 20 minutes	100	18	3.50	17.93	5.69	25.36	4.43	7.94
3	Time 20 to 30 minutes	100	19	4.00	17.66	5.92	24.40	--	--
4	Time 30 to 40 minutes	100	19	5.00	17.92	6.11	24.41	4.48	7.93
5	Time 40 to 50 minutes	100	19	5.50	18.27	6.09	24.93	--	--
6	Time 50 to 60 minutes	100	19	6.50	18.60	5.91	26.92	4.63	7.84
7	Time 60 to 70 minutes	100	19	7.50	17.89	5.39	31.33	--	--
8	Time 70 to 80 minutes	100	18	9.00	18.45	5.19	32.75	5.20	7.98
9*	Time 80 to 90 minutes	70	18	10.00	18.36	5.40	32.77	--	--
10	Time 90 to 100 minutes	70	18	12.00	18.03	5.70	32.41	5.24	8.01
11	Time 100 to 110 minutes	70	18	13.50	18.10	5.37	36.84	--	--
12	Leftover in Sump	--	--	19.00	14.34	10.49	24.78	6.33	8.00

Notes: - * Feed was fairly consistent through Sample #9. We have only 90 minutes (1 hour and 30 minutes) to complete all tests when we are doing batch testing.

Table 18.D.4
BATCH #3, 2" KEN-FLOTE™ COLUMN TESTS
Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
Batch Frother Dosage = 0.8 #/T Betz M-150 Frother
Batch Collector Dosages = 0.8 #/T No. 2 Fuel Oil
Batch Pyrite Depressant Dosage = 0.0 #/T Polyacrylic Acid

Batch	Test	Feed Rate		Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)		Launder Water		Froth Wash Water		Retention Time (min.)	
		(g/min.)	(#/hr. ft.2)	(g/min)	(#/hr. ft.2)	inches	% height	CFM	CFM/ft.2	ml/min.	% prod. flow	ml/min.	% feed flow	rel. to feed	actual
3	1	799	295	49.2	295	10	14	.053	2.41	400	203	200	25	4.7	3.0
3	2	802	298	49.7	298	10	14	.070	3.18	400	120	200	25	4.6	3.0
3	3	819	285	47.5	285	14	19	.070	3.18	400	151	200	24	4.5	2.9
3	4	838	292	48.6	292	14	19	.053	2.41	400	360	200	24	4.4	2.9

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Launder Water (ml/min.)	Column Performance (Dry Basis)			
							Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
3	—	—	—	—	—	—	—	29.26	5.31	2.90
3	—	—	—	—	—	—	—	24.52	4.31	2.40
3	1	1.5	10	5	200	400	100.00	23.46	4.49	2.40
				Recon. Feed Product			82.90	13.16	4.75	2.37
				Tailings			17.10	73.40	3.21	2.52
3	2	2.0	10	5	200	400	100.00	24.07	—	—
				Recon. Feed Product			84.50	14.62	4.80	—
				Tailings			15.50	75.60	—	—
3	3	2.0	14	7	200	400	100.00	27.77	—	—
				Recon. Feed Product			78.30	15.24	—	—
				Tailings			21.70	75.10	—	—
3	4	1.5	14	7	200	400	100.00	28.35	4.84	—
				Recon. Feed Product			73.20	12.12	4.96	2.42
				Tailings			26.80	72.66	4.53	—
3	—	—	—	—	—	—	—	30.76	4.82	2.83
				End Feed			—	—	—	—

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
- Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
- Diluted solids content includes launder water addition for product samples.
- Actual solids content reflects product sample prior to launder water addition.

BATCH #4, 2" KEN-FLOTE™ COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.8 #/T Betz M-150 Frother
 Batch Collector Dosages = 0.8 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.4 #/T Polyacrylic Acid

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Lauder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
4	1	799	50.7	304	10	14	.053	2.41	15.8	400	190	200	25	4.7	3.0
4	2	832	50.4	302	10	14	.070	3.18	21.0	400	119	200	24	4.5	2.9
4	3	784	49.9	299	14	19	.070	3.18	21.3	400	127	200	26	4.7	3.0
4	4	856	48.8	293	14	19	.053	2.41	16.5	400	336	200	23	4.3	2.8

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Column Performance (Dry Basis)						
									Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)	
4	—	—	—	—	—	—	—	—	—	—	—	—	28.66	5.28	2.90
4	—	—	—	—	—	—	—	5.65	—	—	—	—	24.69	4.41	2.90
4	1	1.5	10	5	200	400	7.15	6.35	799	50.70	100.00	22.67	14.15	4.82	2.39
							—	0.90	789	7.10	14.00	75.03	—	—	—
4	2	2.0	10	5	200	400	—	6.06	832	50.40	100.00	24.08	15.69	—	—
							5.95	13.04	335	43.70	86.17	15.69	78.81	—	—
							—	0.96	697	6.70	13.30	78.81	—	—	—
4	3	2.0	14	7	200	400	—	6.36	784	49.90	100.00	24.84	15.83	—	—
							5.98	13.60	314	42.70	85.60	15.83	78.43	—	—
							—	1.07	670	7.20	14.40	78.43	—	—	—
4	4	1.5	14	7	200	400	—	5.70	856	48.8	100.00	28.97	13.91	4.90	3.03
							7.09	30.92	119	36.8	75.40	13.91	75.12	5.02	2.65
							—	1.28	937	12.0	24.60	75.12	4.55	4.20	4.20
4	—	—	—	—	—	—	—	5.53	—	—	—	—	30.62	4.93	—

* After Test #2, We increased polyacrylic acid dosage for 0.4 #/T to approximately 1.0 #/T for Tests #3 and #4.

- Notes:
- Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes lauder water addition for product samples.
 - Actual solids content reflects product sample prior to lauder water addition.

BATCH #5, 2" KEN-FLOTE™ COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.6 #/T Betz M-150 Frother
 Batch Collector Dosages = 0.6 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.0 #/T Polyacrylic Acid

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Lauder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
5	1	801	44.0	264	10	14	.053	2.41	18.3	400	278	200	25	4.6	3.0
5	2	834	47.8	287	10	14	.070	3.18	22.2	400	161	200	24	4.5	2.9
5	3	825	46.4	278	14	19	.070	3.18	22.9	400	231	200	24	4.5	2.9
5	4	825	48.1	289	14	19	.053	2.41	16.7	400	377	200	24	4.5	2.9

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)				
											Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)	
5	—	—	—	—	—	—	—	—	—	—	29.22	5.43	2.90	—	—
5	—	—	—	—	—	—	—	5.22	—	—	26.08	—	—	—	—
5	1	1.5	10	5	200	400	—	5.49	801	44.0	100.0	24.56	12.35	—	—
							6.36	24.03	144	34.6	78.6	69.40	—	—	—
							—	1.10	857	9.4	21.4	—	—	—	—
5	2	2.0	10	5	200	400	—	5.73	834	47.8	100.0	24.20	12.86	—	—
							6.00	15.62	249	38.9	81.4	73.85	—	—	—
							—	1.13	785	8.9	18.6	—	—	—	—
5	3	2.0	14	7	200	400	—	5.62	825	46.4	100.0	26.34	12.11	—	—
							6.23	20.64	173	35.7	76.9	73.70	—	—	—
							—	1.26	852	10.7	23.1	—	—	—	—
5	4	1.5	14	7	200	400	—	5.83	825	48.1	100.0	27.79	10.52	—	—
							6.80	32.45	106	34.4	71.5	71.10	—	—	—
							—	1.49	919	13.7	28.5	—	—	—	—
5	—	—	—	—	—	—	—	5.56	—	—	26.92	—	—	—	—

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes lauder water addition for product samples.
 - Actual solids content reflects product sample prior to lauder water addition.

BATCH #6, 2" KEN-FLOTE™ COLUMN TESTS
Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.60 #/T Betz M-150 Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.30 #/T Polyacrylic Acid at Start

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Launder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
6	1	767	42.6	256	10	14	.053	2.41	18.9	400	315	200	26	4.8	3.1
6	2	786	45.9	275	10	14	.070	3.18	23.1	400	192	200	25	4.7	3.0
6	3	794	48.9	293	14	19	.070	3.18	21.7	400	216	200	25	4.7	3.0
6	4	833	50.4	302	14	19	.053	2.41	15.9	400	408	200	24	4.5	2.9

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Launder Water (ml/min.)	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)				
											Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)	
6	—	—	—	—	—	—	—	—	—	—	29.12	5.16	2.90	—	—
6	—	—	—	—	—	—	—	5.09	—	—	26.79	—	—	—	—
6	1	1.5	10	5	200	400	6.38	5.55	767	42.6	100.0	25.23	—	—	—
							—	26.46	127	33.6	78.9	12.83	—	—	—
							—	1.07	840	9.0	21.1	71.58	—	—	—
6	2	2.0	10	5	200	400	—	5.84	786	45.9	100.0	24.74	—	—	—
							6.17	18.03	208	37.5	81.7	13.30	—	—	—
							—	1.08	778	8.4	18.3	75.83	—	—	—
6	3*	2.0	14	7	200	400	—	6.16	794	48.9	100.0	24.21	—	—	—
							6.77	21.41	185	39.6	81.0	12.28	—	—	—
							—	1.15	809	9.3	19.0	75.06	—	—	—
6	4	1.5	14	7	200	400	—	6.05	833	50.4	100.0	25.78	—	—	—
							7.63	38.76	98	38.0	75.4	10.89	—	—	—
							—	1.33	935	12.4	24.6	71.40	—	—	—
6	—	—	—	—	—	—	—	5.72	—	—	28.13	—	—	—	—

* After Test #2 we increased Polyacrylic Acid addition from 0.30 #/T to approximately 0.80 #/T for Tests #3 and #4.

- Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes launder water addition for product samples.
 - Actual solids content reflects product sample prior to launder water addition.

BATCH #7, 2" KEN-FLOTE™ COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T MIBC Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.0 #/T Polyacrylic Acid

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)		Launder Water		Froth Wash Water		Retention Time (min.)		
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
7	1	771	42.7	256	10	14	.053	2.41	18.8	400	465	200	26	4.8	3.1
7	2	783	45.7	274	10	14	.070	3.18	23.2	400	357	200	26	4.7	3.0
7	3	800	47.6	286	14	19	.070	3.18	22.3	400	455	200	25	4.6	3.0
7	4	820	45.0	270	14	19	.053	2.41	17.8	400	588	200	24	4.5	2.9

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Launder Water (ml/min.)	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
											Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
7	—	—	—	—	—	—	—	—	—	—	28.99	5.10	2.90	
7	—	—	—	—	—	—	—	5.12	—	—	26.62	4.32	2.31	
7	1	1.5	10	5	200	400	7.14	5.54	771	42.7	100.0	25.48	—	—
							—	40.35	86	34.7	81.3	12.63	—	—
							—	0.90	885	8.0	18.7	81.34	—	—
7	2	2.0	10	5	200	400	7.29	5.84	783	45.7	100.0	24.26	—	—
							—	33.30	112	37.3	81.6	11.69	—	—
							—	0.96	871	8.4	18.4	79.98	—	—
7	3	2.0	14	7	200	400	7.64	5.95	800	47.6	100.0	25.12	4.45	2.49
							—	42.39	88	37.3	78.4	10.92	4.57	2.24
							—	1.13	912	10.3	21.6	76.65	4.02	3.40
7	4	1.5	14	7	200	400	6.94	5.49	820	45.0	100.0	28.18	4.46	—
							—	47.79	68	32.5	72.2	10.08	4.64	2.32
							—	131.00	952	12.5	27.8	75.20	3.99	—
7	—	—	—	—	—	—	—	5.73	—	—	27.88	4.51	2.78	

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes launder water addition for product samples.
 - Actual solids content reflects product sample prior to launder water addition.

BATCH #8, 2" KEN-FLOTE™ COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T MIBC Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.30 #/T Polyacrylic Acid at Start

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Lauder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
8	1	744	43.0	258	10	14	.053	2.41	18.7	400	513	200	27	5.0	3.1
8	2	775	45.4	272	10	14	.070	3.18	23.4	400	444	200	26	4.8	3.0
8	3	793	47.6	286	14	19	.070	3.18	22.3	400	476	200	25	4.7	3.0
8	4	820	46.3	278	14	19	.053	2.41	17.3	400	678	200	24		
Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Sample Head	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
												Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
8	—	—	—	—	—	—	—	—	—	—	—	—	28.28	5.23	2.90
8	—	—	—	—	—	—	Start Feed	—	5.25	—	—	—	26.57	—	—
8	1	1.5	10	5	200	400	Recon. Feed Product Tailings	7.49	45.90	744	43.0	100.0	24.27	—	—
								—	0.83	78	35.8	83.3	13.20	—	—
								—	—	866	7.2	16.7	79.49	—	—
8	2	2.0	10	5	200	400	Recon. Feed Product Tailings	—	5.86	775	45.4	100.0	24.65	—	—
								7.55	41.11	90	37.0	81.5	12.46	—	—
								—	0.95	885	8.4	18.5	78.37	—	—
8	3*	2.0	14	7	200	400	Recon. Feed Product Tailings	—	6.00	793	47.6	100.0	25.48	4.60	2.65
								7.54	43.45	84	36.5	76.7	11.39	4.67	2.33
								—	1.22	909	11.1	23.3	71.86	4.36	3.70
8	4	1.5	14	7	200	400	Recon. Feed Product Tailings	—	5.65	820	46.3	100.0	28.37	—	—
								7.08	55.08	59	32.5	70.2	10.64	4.76	2.33
								—	1.44	961	13.8	29.8	70.15	—	—
8	—	—	—	—	—	—	End Feed	—	5.80	—	—	—	27.87	4.77	2.83

* After Test #2 we increased Polyacrylic Acid addition from 0.30 #/T to approximately 0.80 #/T for Tests #3 and #4.
 Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes lauder water addition for product samples.
 - Actual solids content reflects product sample prior to lauder water addition.

BATCH #9, 2" KEN-FLOTE™ COLUMN TESTS
Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
Batch Frother Dosage = 0.60 #/T CM-670 Frother
Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
Batch Pyrite Depressant Dosage = 0.0 #/T Polyacrylic Acid

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)		Lauder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	ml/min.	% prod. flow	ml/min.	% feed flow	rel. to feed	actual
9	1	768	45.6	274	10	14	.053	2.41	400	255	200	26	4.8	3.1
9	2	750	47.5	285	10	14	.070	3.18	400	119	200	27	5.0	3.1
9	3	772	47.9	287	14	19	.070	3.18	400	148	200	26	4.8	3.1
9	4	804	45.6	274	14	19	.053	2.41	400	417	200	25	4.6	3.0

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Sample Head	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
												Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
9	—	—	—	—	—	—	—	—	—	—	—	—	28.87	5.23	2.90
9	—	—	—	—	—	—	Start Feed	—	5.28	—	—	—	26.43	—	—
9	1	1.5	10	5	200	400	Recon. Feed Product Tailings	—	5.94	768	45.6	100.0	24.04	—	—
								6.91	24.52	157	38.5	84.4	14.66	—	—
								—	0.88	811	7.1	15.6	74.78	—	—
9	2	2.0	10	5	200	400	Recon. Feed Product Tailings	—	6.33	750	47.5	100.0	23.86	—	—
								5.61	12.30	335	41.2	86.7	15.66	—	—
								—	1.02	615	6.3	13.3	77.32	—	—
9	3	2.0	14	10	200	400	Recon. Feed Product Tailings	—	6.20	772	47.9	100.0	25.18	—	—
								5.98	14.80	271	40.1	83.7	15.01	—	—
								—	1.11	701	7.8	16.3	77.39	—	—
9	4	1.5	14	10	200	400	Recon. Feed Product Tailings	—	5.67	804	45.6	100.0	28.28	—	—
								6.98	36.04	96	34.6	75.9	13.37	—	—
								—	1.21	908	11.0	24.1	75.24	—	—
9	—	—	—	—	—	—	End Feed	—	5.59	—	—	—	29.69	—	—

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
- Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
- Diluted solids content includes lauder water addition for product samples.
- Actual solids content reflects product sample prior to lauder water addition.

BATCH #10, 2" KEN-FLOTE™ COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.60 #/T Betz CM-670 Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.30 #/T Polyacrylic Acid at Start

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Launder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
10	1	803	47.5	285	10	14	.053	2.41	16.9	400	227	200	25	4.6	3.0
10	2	797	50.9	305	10	14	.070	3.18	20.8	400	114	200	25	4.7	3.0
10	3	833	48.2	289	14	19	.070	3.18	22.0	400	141	200	24	4.5	2.9
10	4	824	48.8	293	14	19	.053	2.41	16.5	400	348	200	24	4.5	2.9

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Launder Water (ml/min.)	Sample Head	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
												Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
10	1	1.5	10	5	200	400	Recon. Feed Product Tailings	7.05	5.92	803	47.5	100.0	23.68	—	—
10	2	2.0	10	5	200	400	Recon. Feed Product Tailings	—	6.39	797	50.9	100.0	23.20	—	—
10	3*	2.0	14	7	200	400	Recon. Feed Product Tailings	5.89	12.76	833	48.2	88.2	15.76	—	—
10	4	1.5	14	7	200	400	Recon. Feed Product Tailings	—	0.93	750	8.0	11.8	78.75	—	—
10	—	—	—	—	—	—	End Feed	—	5.79	824	48.8	100.0	25.98	—	—
10	—	—	—	—	—	—	End Feed	—	14.20	283	40.2	83.4	15.66	—	—
10	—	—	—	—	—	—	End Feed	—	1.07	909	10.4	16.6	77.83	—	—
10	—	—	—	—	—	—	End Feed	—	5.92	824	48.8	100.0	26.92	—	—
10	—	—	—	—	—	—	End Feed	—	33.39	115	38.4	78.7	13.73	—	—
10	—	—	—	—	—	—	End Feed	—	1.14	909	10.4	21.3	75.64	—	—
10	—	—	—	—	—	—	End Feed	—	5.51	—	—	—	28.79	—	—

* After Test #2 we increased Polyacrylic Acid addition from 0.30 #/T to approximately 0.80 #/T for Tests #3 and #4.

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.

- Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.

- Diluted solids content includes launder water addition for product samples.

- Actual solids content reflects product sample prior to launder water addition.

BATCH #11, 2" KEN-FLOTE™ COLUMN TESTS
Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T Betz M-150 Frother (Site)
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.0 #/T Polyacrylic Acid

Batch	Test	Feed Rate		Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)		Lauder Water		Froth Wash Water		Retention Time (min.)	
		(g/min.)	(g/min.)	g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	% feed flow	rel. to feed
11	1	827	47.5	285	.053	10	14	2.41	16.9	400	404	24	200	24	4.5
11	2	835	50.3	302	.070	10	14	3.18	21.1	400	267	24	200	24	4.5
11	3	836	52.3	314	.070	14	19	3.18	20.3	400	331	24	200	24	4.5
11	4	805	50.7	304	.053	14	19	2.41	15.8	400	533	25	200	25	4.6
Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Sample Head	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
												Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
11	—	—	—	—	—	—	—	—	—	—	—	—	29.37	5.07	2.90
11	—	—	—	—	—	—	Start Feed	—	5.36	—	—	—	26.20	4.36	2.23
11	1	1.5	10	5	200	400	Recon. Feed Product Tailings	7.37	5.74	827	47.5	100.0	24.57	—	—
								—	37.17	99	36.8	77.5	10.91	—	—
								—	1.15	928	10.7	22.5	71.63	—	—
11	2	2.0	10	5	200	400	Recon. Feed Product Tailings	—	6.02	835	50.3	100.0	25.56	—	—
								7.20	26.40	150	39.6	78.7	11.94	—	—
								—	1.21	885	10.7	21.3	75.89	—	—
11	3	2.0	14	7	200	400	Recon. Feed Product Tailings	—	6.26	836	52.3	100.0	26.19	4.53	2.76
								7.64	32.89	121	39.8	76.1	10.92	4.71	2.33
								—	1.37	915	12.5	23.9	74.80	3.96	4.13
11	4	1.5	14	7	200	400	Recon. Feed Product Tailings	—	6.30	805	50.7	100.0	27.18	—	—
								7.60	48.13	75	36.1	71.2	9.53	4.88	2.32
								—	1.57	930	14.6	28.8	70.83	—	—
11	—	—	—	—	—	—	End Feed	—	6.03	—	—	—	28.79	4.67	2.92

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes lauder water addition for product samples.
 - Actual solids content reflects product sample prior to lauder water addition.

BATCH #12, 2" KEN-FLOTE™ COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T Betz M-150 Frother (Site)
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.30 #/T Polyacrylic Acid at Start

Batch	Test	Feed Rate		Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)		Laundry Water		Froth Wash Water		Retention Time (min.)	
		(g/min.)	(#/hr. ft.2)	(g/min)	(#/hr. ft.2)	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	% feed flow	rel. to feed
12	1	777	44.9	269	10	14		.053	2.41	17.9	400	526	200	26	4.8
12	2	818	48.2	289	10	14		.070	3.18	22.0	400	303	200	24	4.5
12	3	806	49.6	298	14	19		.070	3.18	21.4	400	357	200	25	4.6
12	4	819	49.1	295	14	19		.053	2.41	16.4	400	625	200	24	4.5

Batch	Test	Air Rate (L/min.)	Froth		Froth Wash		Laundry Water (ml/min.)	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)			Column Performance (Dry Basis)		
			Height (inches)	Wash (inches)	Depth (inches)	Water (ml/min.)				Sample Head	Solids Flow Rate (g/min.)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
12	—	—	—	—	—	—	—	—	—	—	—	—	30.26	5.14	2.90
12	—	—	—	—	—	—	—	—	5.26	Start Feed	—	—	26.27	—	—
12	1	1.5	10	5	200	400	—	7.18	5.78	Recon. Feed Product	44.9	100.0	25.37	—	—
							—	—	1.19	Tailings	34.2	76.2	11.72	—	—
							—	—	—	—	10.7	23.8	69.07	—	—
12	2	2.0	10	5	200	400	—	—	5.89	Recon. Feed Product	48.2	100.0	24.62	—	—
							—	7.24	29.17	Tailings	38.5	79.9	12.20	—	—
							—	—	1.09	—	9.7	20.1	73.98	—	—
12	3*	2.0	14	7	200	400	—	—	6.15	Recon. Feed Product	49.6	100.0	24.82	4.52	2.50
							—	7.68	35.09	Tailings	39.3	79.2	11.66	4.75	2.31
							—	—	1.15	—	10.3	20.8	74.94	3.63	3.22
12	4	1.5	14	7	200	400	—	—	6.00	Recon. Feed Product	49.1	100.0	27.01	4.72	—
							—	7.76	56.25	Tailings	36.0	73.3	10.51	4.79	2.28
							—	—	1.37	—	13.1	26.7	72.31	4.52	—
12	—	—	—	—	—	—	—	—	5.73	End Feed	—	—	28.55	4.92	3.05

- After Test #2 we increased Polyacrylic Acid addition from 0.30 #/T to approximately 0.80 #/T for Tests #3 and #4.
- Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
- Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
- Diluted solids content includes laundry water addition for product samples.
- Actual solids content reflects product sample prior to laundry water addition.

BATCH #13, 2" KEN-FLOTE™ COLUMN TESTS
Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T CM-670 Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.0 #/T Polyacrylic Acid

Batch	Test	Feed Rate (g/min.)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Launder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
13	1	781	44.8	269	10	14	.053	2.41	17.9	400	364	200	26	4.8	3.0
13	2	825	48.8	293	10	14	.070	3.18	21.7	400	159	200	24	4.5	2.9
13	3	816	49.8	299	14	19	.070	3.18	21.3	400	195	200	25	4.6	2.9
13	4	845	46.2	277	14	19	.053	2.41	17.4	400	533	200	24	4.4	2.8

Batch	Test	Air Rate (L/min.)	Froth Height (inches)	Froth Wash Depth (inches)	Froth Wash Water (ml/min.)	Launder Water (ml/min.)	Sample Head	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
												Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
13	—	—	—	—	—	—	—	—	—	—	—	29.71	5.02	2.90	
13	—	—	—	—	—	—	Start Feed	—	5.26	—	—	25.40	—	—	—
13	1	1.5	10	5	200	400	Recon. Feed Product Tailings	7.25	5.74	781	44.8	100.0	23.99	—	—
								—	33.64	110	37.0	82.6	12.08	—	—
								—	0.90	871	7.8	17.4	75.79	—	—
13	2	2.0	10	5	200	400	Recon. Feed Product Tailings	6.30	5.92	825	48.8	100.0	24.33	—	—
								—	16.31	252	41.1	84.2	14.25	—	—
								—	1.00	773	7.7	15.8	78.06	—	—
13	3	2.0	14	7	200	400	Recon. Feed Product Tailings	6.76	6.10	816	49.8	100.0	25.29	4.63	2.72
								—	19.95	205	40.9	82.1	14.32	4.93	2.66
								—	1.10	811	8.9	17.9	75.58	3.28	3.01
13	4	1.5	14	7	200	400	Recon. Feed Product Tailings	7.24	5.47	845	46.2	100.0	29.53	—	—
								—	45.87	75	34.4	74.5	13.45	—	—
								—	1.22	970	11.8	25.5	76.51	—	—
13	—	—	—	—	—	—	End Feed	—	5.58	—	—	—	29.72	—	—

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes launder water addition for product samples.
 - Actual solids content reflects product sample prior to launder water addition.

18.D.15
2" KEN-FLOTE COLUMN TESTS
BATCH 14-15, FEED COMPOSITE, HEAD AND SCREEN ANALYSIS
Pittsburgh No. 8 Seam Raw Coal
(Dried at 40 C and Pulverized)

I. Head Analysis: PETC Grind Composite

	<u>As-Determined</u>	<u>Dry Basis</u>
Moisture (Wt%)	1.72	---
Ash (Wt%)	23.00	23.40
Sulfur (Wt%)	4.43	4.51
Pyritic Sulfur (Wt%)	2.64	2.69

II. Screen Analysis (Dry Basis): PETC Grind Composite

Size Fraction (USA Mesh)	Direct (Wt%)	Cum. Passing (Wt%)
Top x 30M	1.0	99.0
30M x 50M	3.4	95.6
50M x 70M	3.8	91.8
70M x 100M	5.6	86.2
100M x 200M	15.3	70.9
200M x 400M	22.6	48.3
400M x 0	<u>48.3</u>	0.0
	100.0	

BATCH #14, 2" KEN-FLOTE COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T MIBC Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.00 #/T Polyacrylic Acid

Batch	Test	Feed Rate		Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)		Lauder Water		Froth Wash Water		Retention Time (min.)	
		(g/min)	(g/min)	g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% feed flow	ml/min.	rel. to feed	actual
14	1	788	42.8	257	14	10	14	0.053	2.41	18.8	400	25	200	4.7	3.0
14	2	762	45.4	272	14	10	14	0.070	3.18	23.4	400	26	200	4.9	3.1
14	3	847	49.6	298	14	10	14	0.070	3.18	21.4	400	24	200	4.4	2.8
14	4	818	44.5	267	14	10	14	0.053	2.41	18.0	400	24	200	4.5	2.9
14	5	844	49.4	296	14	10	14	0.053	2.41	16.3	400	24	200	4.4	2.8

Batch	Test	Air Rate (L/min.)	Number of Aspirations	Froth Height (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
											Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
14	1	1.5	1	10	200	400	6.88	5.43	788	42.8	100.0	22.12	3.80	—
							—	32.62	107	34.9	81.5	11.30	4.14	—
							—	0.90	881	7.9	18.5	69.76	2.30	—
14	2	2.0	2	10	200	400	—	5.96	762	45.4	100.0	21.26	—	—
							7.29	29.39	132	38.8	85.4	11.43	—	—
							—	0.80	830	6.6	14.6	78.75	—	—
14	3	2.0	1	10	200	400	—	5.86	847	49.6	100.0	22.06	3.99	2.30
							7.35	28.03	142	39.8	80.3	10.33	4.25	2.27
							—	1.08	905	9.8	19.7	69.87	2.92	2.42
14	4	1.5	2	10	200	400	—	5.44	818	44.5	100.0	23.47	3.92	2.40
							6.67	30.09	114	34.3	77.0	9.54	4.13	2.23
							—	1.13	904	10.2	23.0	70.11	3.22	2.99
14	5	1.5	1	10	200	400	—	5.85	844	49.4	100.0	22.39	—	—
							7.29	29.69	130	38.6	78.2	9.60	—	—
							—	1.18	914	10.8	21.8	68.25	—	—
14	—	—	—	—	—	—	—	5.78	—	—	—	22.66	4.25	2.49

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes lauder water addition for product samples.
 - Actual solids content reflects product sample prior to lauder water addition.

BATCH #14, 2" KEN-FLOTE COLUMN TESTS

Pittsburgh No. 8 Seam Raw Coal

Batch Feed Solids = 6.0 Wt%
 Batch Frother Dosage = 0.45 #/T MIBC Frother
 Batch Collector Dosages = 0.60 #/T No. 2 Fuel Oil
 Batch Pyrite Depressant Dosage = 0.00 #/T Polyacrylic Acid

Batch	Test	Feed Rate (g/min)	Solids Feed Rate		Froth Height		Compressed Air Use (40 PSI)			Lauder Water		Froth Wash Water		Retention Time (min.)	
			g/min	#/hr. ft.2	inches	% height	CFM	CFM/ft.2	CFM/TPH	ml/min.	% prod. flow	ml/min.	%feed flow	rel. to feed	actual
15	1	746	42.9	257	14	19	0.035	1.59	12.4	400	430	200	27	5.0	3.1
15	2	772	44.8	269	14	19	0.070	3.18	23.7	400	348	200	26	4.8	3.0
15	3	749	45.5	273	14	19	0.070	3.18	23.3	400	348	200	27	5.0	3.1
15	4	797	44.5	267	14	19	0.035	1.59	11.9	400	426	200	25	4.7	3.0
15	5	848	45.4	272	14	19	0.035	1.59	11.7	400	449	200	24	4.4	2.8
Batch	Test	Air Rate (L/min.)	Number of Aspirations	Froth Height (inches)	Froth Wash Water (ml/min.)	Lauder Water (ml/min.)	Sample Head	Diluted Solids Content (Wt%)	Actual Solids Content (Wt%)	Total Flow Rate (g/min.)	Solids Flow Rate (g/min.)	Column Performance (Dry Basis)			
												Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. Sulfur (Wt%)
15	—	—	—	—	—	—	—	—	—	—	—	23.44	4.51	2.69	—
15	—	—	—	—	—	—	Start Feed	—	5.47	—	—	21.81	—	—	—
15	1	1.0	1	14	200	400	Recon. Feed Product Tailings	7.13	5.75	746	42.9	100.0	21.86	—	—
								—	0.91	853	7.8	18.1	10.01	—	—
15	2	2.0	2	14	200	400	Recon. Feed Product Tailings	—	5.80	772	44.8	100.0	21.85	—	—
								7.23	32.43	115	37.3	83.2	10.21	—	—
15	3	2.0	1	14	200	400	Recon. Feed Product Tailings	—	0.88	857	7.5	16.8	79.48	—	—
								—	6.07	749	45.5	100.0	21.83	—	—
15	4	1.0	2	14	200	400	Recon. Feed Product Tailings	7.15	32.09	115	36.9	81.1	9.59	—	—
								—	1.03	834	8.6	18.9	74.35	—	—
15	5	1.0	1	14	200	400	Recon. Feed Product Tailings	—	5.58	797	44.5	100.0	22.79	3.91	—
								6.94	36.49	94	34.3	77.1	8.38	4.06	—
15	—	—	—	—	—	—	End Feed	—	1.13	903	10.2	22.9	71.30	3.41	—
								—	5.35	848	45.4	100.0	24.31	—	—
15	—	—	—	—	—	—	End Feed	—	34.49	89	30.7	67.6	6.46	3.62	1.65
								—	1.53	959	14.7	32.4	61.55	—	—
15	—	—	—	—	—	—	End Feed	—	5.84	—	—	—	23.78	—	—

Notes: - Retention time "relative to feed" is total column volume divided by volume feed rate.
 - Retention time "actual" is 80% of total column volume divided by volume feed rate and froth wash water rate.
 - Diluted solids content includes lauder water addition for product samples.
 - Actual solids content reflects product sample prior to lauder water addition.

Appendix E

FEED COAL WASHABILITY AND FLOTATION RELEASE ANALYSIS (Upper Freeport Seam Raw Coal)

Table 18.E.1 - Feed Coal Washability Analysis (PETC Grind)

Table 18.E.2 - Feed Coal Washability Analysis (PTI Grind)

Figure 18.E.3 - Release Analysis Procedure

Table 18.E.3 - Release Analysis Test Data (PETC Grind)

Table 18.E.4 - Summary Release Analysis Data (PETC Grind)

Table 18.E.5 - Release Analysis Test Data (PTI Grind)

Table 18.E.6 - Summary Release Analysis Data (PTI Grind)

Table 18.E.1
 PETC GRIND
 MULTIVARIABLE TESTING MATRIX
 UPPER FREEPORT SEAM RAW COAL WASHABILITY
 Lot #3-#5 Feed Composite (PT#8, FT #1, FT #69, FT #71)
 (Dry Basis)

Top x 400M size fraction representing 24.2 Wt.% of total sample

<u>Gravity Fraction</u>		<u>Direct Analysis</u>				<u>Cumulative Analysis</u>			
<u>Sink</u>	<u>Float</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	34.9	1.96	0.73	0.06	34.9	1.96	0.73	0.06
	1.30 x 1.40	17.0	10.64	1.07	0.45	51.9	4.80	0.84	0.19
	1.40 x 1.50	8.2	21.19	1.31	0.79	60.1	7.04	0.91	0.27
	1.50 x 1.60	4.4	42.22	2.41	2.13	64.5	9.44	1.01	0.40
	1.60 x 1.80	4.7	42.22	2.41	2.13	69.2	11.67	1.10	0.51
	1.80 x 2.20	4.6	42.22	2.41	2.13	73.8	13.57	1.18	0.62
	2.20 x Sink	26.2	84.78	9.06	9.00	100.0	32.23	3.25	2.81
Total		100.0	32.23	3.25	2.81				
Head		100.0	32.57	3.13	2.88				

Table 18.E.1 (cont.)
 PETC GRIND
 MULTIVARIABLE TESTING MATRIX
 UPPER FREEPORT SEAM RAW COAL WASHABILITY
 Lot #3-#5 Feed Composite (PT#8, FT #1, FT #69, FT #71)
 (Dry Basis)

400M x 0 size fraction representing 75.8 Wt% of total sample

Gravity Fraction		Direct Analysis				Cumulative Analysis			
<u>Sink</u>	<u>Float</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	46.4	1.84	0.68	0.01	46.4	1.84	0.68	0.01
	1.30 x 1.40	18.3	7.71	0.77	0.15	64.7	3.50	0.71	0.05
	1.40 x 1.50	6.0	16.07	0.90	0.43	70.7	4.57	0.72	0.08
	1.50 x 1.60	2.9	28.59	1.58	1.23	73.6	5.51	0.76	0.13
	1.60 x 1.80	2.2	28.59	1.58	1.23	75.8	6.18	0.78	0.16
	1.80 x 2.20	3.9	58.54	1.72	1.44	79.7	8.75	0.83	0.22
	2.20 x Sink	20.3	85.66	7.51	7.44	100.0	24.36	2.18	1.69
Total		100.0	24.36	2.18	1.69				
Head		100.0	24.21	2.21	1.75				

Table 18.E.1 (cont.)
 PETC GRIND
 MULTIVARIABLE TESTING MATRIX
 UPPER FREEPORT SEAM RAW COAL WASHABILITY
 Lot #3-#5 Feed Composite (PT#8, FT #1, FT #69, FT #71)
 (Dry Basis)

Top x 0 size fraction representing 100.0 Wt% of total sample

Gravity Fraction		Direct Analysis				Cumulative Analysis			
<u>Sink</u>	<u>Float</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	43.6	1.86	0.69	0.02	43.6	1.86	0.69	0.02
	1.30 x 1.40	18.0	8.37	0.84	0.22	61.6	3.76	0.73	0.08
	1.40 x 1.50	6.5	17.71	1.03	0.54	68.1	5.10	0.76	0.12
	1.50 x 1.60	3.3	32.67	1.83	1.51	71.4	6.36	0.81	0.19
	1.60 x 1.80	2.8	34.18	1.92	1.59	74.2	7.41	0.85	0.24
	1.80 x 2.20	4.1	53.67	1.89	1.62	78.3	9.82	0.91	0.31
	2.20 x Sink	21.7	85.51	7.97	7.91	100.0	26.26	2.44	1.96
Total		100.0	26.26	2.44	1.96				
Head		100.0	26.15	2.47	1.89				

Table 18.E.2
PTI GRIND USED FOR
UPPER FREEPORT SEAM RAW COAL WASHABILITY
Lot #1 Feed Composite
(Dry Basis)

Top x 400M size fraction representing 53.3 Wt.% of total sample

<u>Gravity Fraction</u>		<u>Direct Analysis</u>				<u>Cumulative Analysis</u>			
<u>Sink</u>	<u>Float</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	41.5	1.75	0.77	0.08	41.5	1.75	0.77	0.08
	1.30 x 1.40	17.3	10.19	1.19	0.65	58.8	4.23	0.89	0.25
	1.40 x 1.50	7.0	20.06	1.68	0.94	65.8	5.92	0.98	0.32
	1.50 x 1.60	3.7	27.92	2.34	1.81	69.5	7.09	1.05	0.40
	1.60 x 1.80	3.7	38.34	3.28	2.67	73.2	8.67	1.16	0.52
	1.80 x 2.20	3.5	55.74	4.34	3.70	76.7	10.82	1.31	0.66
	2.20 x Sink	23.3	84.66	8.42	8.42	100.0	28.02	2.96	2.47
Total		100.0	28.02	2.96	2.47				
Head		100.0	29.55	3.29	2.60				

Table 18.E.2 (cont.)
PTI GRIND USED FOR
UPPER FREEPORT SEAM RAW COAL WASHABILITY
Lot #1 Feed Composite
(Dry Basis)

400M x 0 size fraction representing 46.7 Wt% of total sample

Gravity Fraction		Direct Analysis				Cumulative Analysis			
<u>Sink</u>	<u>Float</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	37.5	2.51	0.73	0.06	37.5	2.51	0.73	0.06
1.30	x 1.40	24.6	7.91	0.79	0.27	62.1	4.65	0.75	0.14
1.40	x 1.50	9.5	15.40	0.91	0.32	71.6	6.08	0.77	0.17
1.50	x 1.60	4.3	19.87	1.10	0.60	75.9	6.86	0.79	0.19
1.60	x 1.80	2.0	30.48	2.39	1.95	77.9	7.46	0.83	0.24
1.80	x 2.20	3.5	51.16	2.62	2.09	81.4	9.34	0.91	0.32
2.20	x Sink	18.6	85.44	7.33	6.95	100.0	23.50	2.10	1.55
Total		100.0	23.50	2.10	1.55				
Head		100.0	23.81	2.09	1.53				

Table 18.E.2 (cont.)
PTI GRIND USED FOR
UPPER FREEPORT SEAM RAW COAL WASHABILITY
Lot #1 Feed Composite
(Dry Basis)

Top x 0 size fraction representing 100.0 Wt% of total sample

<u>Gravity Fraction</u>		<u>Direct Analysis</u>				<u>Cumulative Analysis</u>			
<u>Sink</u>	<u>Float</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	39.6	2.09	0.75	0.07	39.6	2.09	0.75	0.07
1.30	x 1.40	20.7	8.93	0.97	0.44	60.3	4.43	0.83	0.20
1.40	x 1.50	8.2	17.53	1.26	0.60	68.5	5.99	0.88	0.25
1.50	x 1.60	4.0	23.86	1.71	1.20	72.5	6.98	0.92	0.30
1.60	x 1.80	2.9	35.81	2.99	2.44	75.4	8.09	1.00	0.38
1.80	x 2.20	3.5	53.60	3.54	2.95	78.9	10.11	1.12	0.49
2.20	x Sink	21.1	84.98	7.97	7.81	100.0	25.91	2.56	2.04
Total		100.0	25.91	2.56	2.04				
Head		100.0	26.41	2.58	2.09				

Figure 18.E.3
RELEASE ANALYSIS PROCEDURAL DIAGRAM

Table 18.E.3
FLOTATION RELEASE ANALYSIS

Test No: UFF#1 Coal: Upper Freeport
Date: 8/6/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.4	0.0	3	60	1400	9
1st Cleaner	0.2	0.0	3	60	1400	8
2nd Cleaner	0.2	0.0	3	60	1400	8
C1	0.2	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	153.5	0.77	152.3	54.3	9.01	54.3	9.01
C2	59.3	0.66	58.9	21.0	13.58	75.3	10.28
C3	17.4	0.60	17.3	6.2	34.40	81.5	12.11
C4	5.4	0.59	5.4	1.9	65.88	83.4	13.33
TF	6.1	1.01	6.0	2.1	86.43	85.5	15.13
<u>T1</u>	<u>40.8</u>	<u>0.84</u>	<u>40.5</u>	<u>14.5</u>	<u>89.18</u>	<u>100.0</u>	<u>25.87</u>
Total	282.5	---	280.4	100.0	25.87	---	---
Head	---	0.54	---	100.0	26.28	---	---

Table 18.E.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UFF#2 Coal: Upper Freeport
Date: 8/11/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.4	0.4	3	60	1400	10
1st Cleaner	0.2	0.0	3	60	1400	8
2nd Cleaner	0.2	0.0	3	60	1400	7
C1	0.2	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	196.4	0.74	194.9	67.3	10.31	67.3	10.31
C2	38.9	0.68	38.6	13.3	19.17	80.6	11.77
C3	8.2	0.69	8.1	2.8	52.80	83.4	13.15
C4	4.4	0.68	4.4	1.5	77.12	84.9	14.28
TF	5.5	0.97	5.4	1.9	86.30	86.8	15.86
<u>T1</u>	<u>38.5</u>	<u>1.08</u>	<u>38.1</u>	<u>13.2</u>	<u>89.53</u>	<u>100.0</u>	<u>25.58</u>
Total	291.9	---	289.5	100.0	25.58	---	---
Head	---	0.54	---	100.0	26.28	---	---

Table 18.E.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UFF#3 Coal: Upper Freeport
Date: 8/11/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.5	0.0	3	60	1400	9
1st Cleaner	0.25	0.0	3	60	1400	8
2nd Cleaner	0.25	0.0	3	60	1400	7
C1	0.25	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	186.2	0.35	185.5	63.6	9.08	63.6	9.08
C2	44.2	0.49	44.0	15.1	18.17	78.7	10.82
C3	11.3	0.62	11.2	3.8	46.63	82.5	12.47
C4	4.4	0.62	4.4	1.5	73.33	84.0	13.56
TF	6.0	0.92	5.9	2.0	87.29	86.0	15.27
<u>T1</u>	<u>41.2</u>	<u>0.95</u>	<u>40.8</u>	<u>14.0</u>	<u>89.37</u>	<u>100.0</u>	<u>25.64</u>
Total	293.3	---	291.8	100.0	25.65	---	---
Head	---	0.54	---	100.0	26.28	---	---

Table 18.E.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UFF#4 Coal: Upper Freeport
Date: 8/12/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.5	0.5	3	60	1400	7
1st Cleaner	0.25	0.0	3	60	1400	7
2nd Cleaner	0.25	0.0	3	60	1400	6
C1	0.25	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	172.3	0.74	171.0	59.0	9.70	59.0	9.70
C2	62.5	0.90	61.9	21.3	17.03	80.3	11.64
C3	7.8	0.81	7.7	2.7	53.13	83.0	12.99
C4	3.4	0.90	3.4	1.2	78.47	84.2	13.92
TF	4.3	1.19	4.2	1.4	87.50	85.6	15.12
<u>T1</u>	<u>42.0</u>	<u>1.05</u>	<u>41.6</u>	<u>14.4</u>	<u>90.12</u>	<u>100.0</u>	<u>25.92</u>
Total	292.3	—	289.8	100.0	25.93	---	---
Head	---	0.54	---	100.0	26.28	---	---

Table 18.E.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UFF#5 Coal: Upper Freeport
Date: 8/16/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.45	0.0	3	60	1400	7
1st Cleaner	0.225	0.0	3	60	1400	7
2nd Cleaner	0.225	0.0	3	60	1400	6
C1	0.225	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	144.6	0.87	143.3	49.4	9.13	49.4	9.13
C2	72.7	0.81	72.1	24.9	12.50	74.3	10.26
C3	19.0	0.72	18.9	6.5	27.98	80.8	11.69
C4	6.6	0.67	6.6	2.3	63.55	83.1	13.13
TF	5.4	0.63	5.4	1.9	83.21	85.0	14.70
<u>T1</u>	<u>43.9</u>	<u>0.83</u>	<u>43.5</u>	<u>15.0</u>	<u>89.42</u>	<u>100.0</u>	<u>25.91</u>
Total	292.2	---	289.8	100.0	25.90	---	---
Head	---	0.54	---	100.0	26.28	---	---

Table 18.E.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UFF#6 Coal: Upper Freeport
Date: 8/17/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.6	0.0	3	60	1400	8
1st Cleaner	0.3	0.0	3	60	1400	8
2nd Cleaner	0.3	0.0	3	60	1400	7
C1	0.3	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	173.7	0.75	172.4	59.2	9.82	59.2	9.82
C2	54.9	0.73	54.5	18.7	14.70	77.9	10.99
C3	12.1	0.73	12.0	4.1	36.96	82.0	12.29
C4	4.5	0.76	4.5	1.6	69.56	83.6	13.39
TF	4.3	1.01	4.3	1.5	86.80	85.1	14.68
<u>T1</u>	<u>43.8</u>	<u>1.01</u>	<u>43.4</u>	<u>14.9</u>	<u>89.73</u>	<u>100.0</u>	<u>25.86</u>
Total	293.3	---	291.1	100.0	25.86	---	---
Head	---	0.54	---	100.0	26.28	---	---

Table 18.E.4
SUMMARY RELEASE ANALYSIS DATA
Upper Freeport Seam Raw Coal
(PETC Grind)

Test Number	Reagents (Rougher) (MIBC #/T) (F.O. #/T)	Sample	Direct Analysis (Dry Basis)				Cumulative Analysis (Dry Basis)			
			Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
UFF #3	---	Head	100.0	26.28	2.57	1.83	---	---	---	---
	0.5	Recon. Feed	100.0	25.65			---	---	---	---
	0.25	Conc. #1	63.6	9.08			63.6	9.08		
	0.25	Conc. #2	15.1	18.17			78.7	10.82		
	0.25	Conc. #3	3.8	46.63			82.5	12.47		
	0.0	Conc. #4	1.5	73.33			84.0	13.56		
	0.0	Tail Final	2.0	87.29			86.0	15.27		
UFF #6	0.0	Tail #1	14.0	89.37			100.0	25.64		
	---	Head	100.0	26.28	2.57	1.83	---	---	---	---
	0.6	Recon. Feed	100.0	25.86			---	---	---	---
	0.3	Conc. #1	59.2	9.82			59.2	9.82		
	0.3	Conc. #2	18.7	14.70			77.9	10.99		
	0.3	Conc. #3	4.1	36.96			82.0	12.29		
	0.0	Conc. #4	1.6	69.56			83.6	13.39		
UFF #6	0.0	Tail Final	1.5	86.80			85.1	14.68		
	0.0	Tail #1	14.9	89.73			100.0	25.86		

Table 18.E.5
FLOTATION RELEASE ANALYSIS

Test No: UF#1 Coal: Upper Freeport
Date: 7/27/93 Grind: PTI Grind
Feed (g): 300g

	MIBC	F.O.	Cond. Time	Air	Agitator	Float Time
<u>Flotation</u>	<u>(#/T)</u>	<u>(#/T)</u>	<u>(min.)</u>	<u>(%)</u>	<u>(RPM)</u>	<u>(min.)</u>
Rougher	0.4	0.0	2	60	1400	9
1st Cleaner	0.2	0.0	2	60	1400	7
2nd Cleaner	0.2	0.0	2	60	1400	5
C1	0.2	0.0	2	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

	Surface Dry Wt.	Inh. Water	Final Dry Wt.	Yield	Ash	Cum. Yield	Cum. Ash
<u>Sample</u>	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>
C1	163.1	0.67	162.0	56.2	9.40	56.2	9.40
C2	66.1	0.62	65.7	22.8	15.03	79.0	11.02
C3	16.5	0.67	16.4	5.7	42.38	84.7	13.13
C4	4.2	0.83	4.2	1.5	75.99	86.2	14.22
TF	1.5	1.02	1.5	0.5	86.52	86.7	14.63
<u>T1</u>	<u>38.7</u>	<u>1.09</u>	<u>38.3</u>	<u>13.3</u>	<u>88.49</u>	<u>100.0</u>	<u>24.45</u>
Total	290.1	---	288.1	100.0	24.47	---	---
Head	---	0.70	---	100.0	26.41	---	---

Table 18.E.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UF#2 Coal: Upper Freeport
Date: 7/28/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.4	0.4	3	60	1400	7
1st Cleaner	0.2	0.0	3	60	1400	6
2nd Cleaner	0.2	0.0	3	60	1400	4
C1	0.2	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	168.7	0.56	167.8	57.5	9.93	57.5	9.93
C2	64.7	0.59	64.3	22.0	16.93	79.5	11.87
C3	14.2	0.62	14.1	4.8	46.09	84.3	13.82
C4	3.5	0.79	3.5	1.2	77.11	85.5	14.71
TF	2.1	1.06	2.1	0.7	87.24	86.2	15.30
<u>T1</u>	<u>40.6</u>	<u>0.92</u>	<u>40.2</u>	<u>13.8</u>	<u>88.80</u>	<u>100.0</u>	<u>25.44</u>
Total	293.8	---	292.0	100.0	25.43	---	---
Head	---	0.70	---	100.0	26.41	---	---

Table 18.E.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UF#3 Coal: Upper Freeport
Date: 7/28/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.4	0.8	3	60	1400	6
1st Cleaner	0.2	0.0	3	60	1400	6
2nd Cleaner	0.2	0.0	3	60	1400	6
C1	0.2	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	161.1	0.39	160.5	55.0	9.86	55.0	9.86
C2	77.4	0.50	77.0	26.3	16.85	81.3	12.12
C3	9.4	0.73	9.3	3.2	49.10	84.5	13.52
C4	2.9	0.88	2.9	1.0	76.48	85.5	14.26
TF	2.5	0.77	2.5	0.9	87.51	86.4	15.02
<u>T1</u>	<u>40.1</u>	<u>0.89</u>	<u>39.7</u>	<u>13.6</u>	<u>88.39</u>	<u>100.0</u>	<u>25.00</u>
Total	293.4	---	291.9	100.0	25.00	---	---
Head	---	0.70	---	100.0	26.41	---	---

Table 18.E.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UF#4 Coal: Upper Freeport
Date: 8/2/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.5	0.0	3	60	1400	8
1st Cleaner	0.25	0.0	3	60	1400	8
2nd Cleaner	0.25	0.0	3	60	1400	7
C1	0.25	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	153.7	0.37	153.1	52.0	9.68	52.0	9.68
C2	81.6	0.33	81.3	27.6	16.34	79.6	11.99
C3	13.2	0.40	13.1	4.4	46.72	84.0	13.81
C4	3.7	0.54	3.7	1.3	77.34	85.3	14.78
TF	3.1	0.67	3.1	1.0	88.12	86.3	15.63
<u>T1</u>	<u>40.4</u>	<u>0.54</u>	<u>40.2</u>	<u>13.7</u>	<u>87.94</u>	<u>100.0</u>	<u>25.54</u>
Total	295.7	---	294.5	100.0	25.53	---	---
Head	---	0.70	---	100.0	26.41	---	---

Table 18.E.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UF#5 Coal: Upper Freeport
Date: 8/2/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.5	0.5	3	60	1400	8
1st Cleaner	0.25	0.0	3	60	1400	7
2nd Cleaner	0.25	0.0	3	60	1400	6
C1	0.25	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	177.1	0.20	176.7	60.0	9.84	60.0	9.84
C2	66.5	0.23	66.3	22.5	19.49	82.5	12.47
C3	5.9	0.25	5.9	2.0	60.54	84.5	13.61
C4	3.0	0.30	3.0	1.0	80.21	85.5	14.39
TF	2.8	0.87	2.8	1.0	87.12	86.5	15.23
<u>T1</u>	<u>40.0</u>	<u>0.77</u>	<u>39.7</u>	<u>13.5</u>	<u>88.92</u>	<u>100.0</u>	<u>25.18</u>
Total	295.3	---	294.4	100.0	25.18	---	---
Head	---	0.70	---	100.0	26.41	---	---

Table 18.E.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: UF#6 Coal: Upper Freeport
Date: 8/5/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.3	0.0	3	60	1400	7
1st Cleaner	0.15	0.0	3	60	1400	6
2nd Cleaner	0.15	0.0	3	60	1400	5
C1	0.15	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	151.9	0.57	151.0	52.8	8.68	52.8	8.68
C2	68.2	0.60	67.8	23.7	14.12	76.5	10.37
C3	16.5	0.60	16.4	5.7	35.67	82.2	12.12
C4	5.2	0.72	5.2	1.8	66.52	84.0	13.29
TF	3.3	0.99	3.3	1.2	86.76	85.2	14.32
<u>T1</u>	<u>42.7</u>	<u>0.83</u>	<u>42.3</u>	<u>14.8</u>	<u>88.90</u>	<u>100.0</u>	<u>25.36</u>
Total	287.8	---	286.0	100.0	25.36	---	---
Head	---	0.70	---	100.0	26.41	---	---

Table 18.E.6
SUMMARY RELEASE ANALYSIS DATA
Upper Freeport Seam Raw Coal
(PTI Grind)

Test Number	Reagents (Rougher) (MIBC #/T) (F.O. #/T)	Sample	Direct Analysis (Dry Basis)				Cumulative Analysis (Dry Basis)			
			Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
UF1	0.4	Head	100.0	26.41	2.58	2.09	—	—	—	—
		Recon. Feed	100.0	24.47	2.59	2.01	—	—	—	—
		Conc. #1	56.2	9.40	1.77	1.05	56.2	9.40	1.77	1.05
		Conc. #2	22.8	15.03	2.62	2.04	79.0	11.02	2.02	1.34
		Conc. #3	5.7	42.38	5.52	4.74	84.7	13.13	2.26	1.57
		Conc. #4	1.5	75.99	8.18	7.99	86.2	14.22	2.36	1.68
		Tail Final	0.5	86.52	3.75	3.75	86.7	14.63	2.37	1.69
		Tail #1	13.3	88.49	4.09	4.09	100.0	24.45	2.60	2.01
UF6	0.3	Head	100.0	26.41	2.58	2.09	—	—	—	—
		Recon. Feed	100.0	25.36	2.58	2.00	—	—	—	—
		Conc. #1	52.8	8.68	1.76	1.05	52.8	8.68	1.76	1.05
		Conc. #2	23.7	14.12	2.55	1.85	76.5	10.37	2.00	1.30
		Conc. #3	5.7	35.67	5.13	4.57	82.2	12.12	2.22	1.53
		Conc. #4	1.8	66.52	6.74	6.74	84.0	13.29	2.32	1.64
		Tail Final	1.2	86.76	3.62	3.24	85.2	14.32	2.34	1.66
		Tail #1	14.8	88.90	3.98	3.98	100.0	25.36	2.58	2.00

Appendix F

FEED COAL WASHABILITY AND FLOTATION RELEASE ANALYSIS (Pittsburgh No. 8 Seam Raw Coal)

Table 18.F.1 - Feed Coal Washability Analysis (PETC Grind)

Table 18.F.2 - Feed Coal Washability Analysis (PTI Grind)

Figure 18.F.3 - Release Analysis Procedure

Table 18.F.3 - Release Analysis Test Data (PETC Grind)

Table 18.F.4 - Summary Release Analysis Data (PETC Grind)

Table 18.F.5 - Release Analysis Test Data (PTI Grind)

Table 18.F.6 - Summary Release Analysis Data (PTI Grind)

Table 18.F.1
 PETC GRIND
 MULTIVARIABLE TESTING MATRIX
 PITTSBURGH NO. 8 SEAM RAW COAL WASHABILITY
 Lot #1 Feed Composite
 (Dry Basis)

Top x 400M size fraction representing 51.7 Wt% of total sample

<u>Gravity Fraction</u>			<u>Direct Analysis</u>				<u>Cumulative Analysis</u>			
<u>Sink</u>	<u>Float</u>		<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x	1.30	56.0	2.76	2.42	0.16	56.0	2.76	2.42	0.16
1.30	x	1.40	20.2	8.69	3.12	1.03	76.2	4.33	2.61	0.39
1.40	x	1.50	5.5	18.53	4.52	2.68	81.7	5.29	2.73	0.54
1.50	x	1.60	2.5	36.58	6.70	5.22	84.2	6.22	2.85	0.68
1.60	x	1.80	2.2	36.58	6.70	5.22	86.4	6.99	2.95	0.80
1.80	x	2.20	1.8	36.58	6.70	5.22	88.2	7.59	3.03	0.89
2.20	x	Sink	11.8	77.45	16.96	16.03	100.0	15.84	4.67	2.68
Total			100.0	15.84	4.67	2.68				
Head			100.0	16.91	4.94	2.98				

Table 18.F.1 (cont.)
 PETC GRIND
 MULTIVARIABLE TESTING MATRIX
 PITTSBURGH NO. 8 SEAM RAW COAL WASHABILITY
 Lot #1 Feed Composite
 (Dry Basis)

400M x 0 size fraction representing 48.3 Wt% of total sample

Gravity Fraction		Direct Analysis				Cumulative Analysis			
<u>Sink</u>	<u>Float</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	35.3	2.75	2.24	0.05	35.3	2.75	2.24	0.05
1.30	x 1.40	20.3	7.49	2.04	0.17	55.6	4.48	2.17	0.09
1.40	x 1.50	7.4	16.27	1.85	0.38	63.0	5.87	2.13	0.13
1.50	x 1.60	2.4	31.05	2.60	1.57	65.4	6.79	2.15	0.18
1.60	x 1.80	1.8	31.05	2.60	1.57	67.2	7.44	2.16	0.22
1.80	x 2.20	4.4	60.84	1.78	1.40	71.6	10.72	2.14	0.29
2.20	x Sink	28.4	85.64	7.41	7.18	100.0	32.00	3.63	2.25
Total		100.0	32.00	3.63	2.25				
Head		100.0	32.13	3.76	2.26				

Table 18.F.1 (cont.)
 PETC GRIND
 MULTIVARIABLE TESTING MATRIX
 PITTSBURGH NO. 8 SEAM RAW COAL WASHABILITY
 Lot #1 Feed Composite
 (Dry Basis)

Top x 0 size fraction representing 100.0 Wt% of total sample

Gravity Fraction		Direct Analysis				Cumulative Analysis			
<u>Sink</u>	<u>Float</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Weight</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	46.0	2.76	2.35	0.12	46.0	2.76	2.35	0.12
1.30	x 1.40	20.2	8.13	2.60	0.62	66.2	4.40	2.43	0.27
1.40	x 1.50	6.4	17.32	3.04	1.40	72.6	5.54	2.48	0.37
1.50	x 1.60	2.5	33.31	4.67	3.43	75.1	6.46	2.55	0.47
1.60	x 1.80	2.0	34.30	4.94	3.65	77.1	7.18	2.62	0.56
1.80	x 2.20	3.1	52.69	3.23	2.53	80.2	8.94	2.64	0.63
2.20	x Sink	19.8	83.19	10.36	9.91	100.0	23.64	4.17	2.47
Total		100.0	23.64	4.17	2.47				
Head		100.0	23.83	4.42	2.62				

Table 18.F.2
PTI GRIND
2" COLUMN TESTS AND RA
PITTSBURGH NO. 8 SEAM RAW COAL WASHABILITY
Lot #1 Feed Composite
(Dry Basis)

Top x 400M size fraction representing 60.2 Wt% of total sample

Gravity Fraction		Direct Analysis				Cumulative Analysis			
<u>Sink</u>	<u>Float</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	54.1	2.64	2.43	0.18	54.1	2.64	2.43	0.18
1.30	x 1.40	18.8	8.72	3.31	1.14	72.9	4.21	2.66	0.43
1.40	x 1.50	4.8	17.81	4.84	2.83	77.7	5.05	2.79	0.58
1.50	x 1.60	2.6	26.25	5.62	4.14	80.3	5.73	2.88	0.69
1.60	x 1.80	2.2	44.65	8.03	6.66	82.5	6.77	3.02	0.85
1.80	x 2.20	2.2	44.65	8.03	6.66	84.7	7.76	3.15	1.00
2.20	x Sink	15.3	78.33	14.72	14.72	100.0	18.55	4.92	3.10
Total		100.0	18.55	4.92	3.10				
Head		100.0	19.71	5.47	3.49				

Table 18.F.2 (cont.)
PTI GRIND
2" COLUMN TESTS AND RA
PITTSBURGH NO. 8 SEAM RAW COAL WASHABILITY
Lot #1 Feed Composite
(Dry Basis)

400M x 0 size fraction representing 39.8 Wt% of total sample

<u>Gravity Fraction</u>		<u>Direct Analysis</u>				<u>Cumulative Analysis</u>			
<u>Sink</u>	<u>Float</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	34.0	2.04	2.27	0.05	34.0	2.04	2.27	0.05
1.30	x 1.40	19.0	5.97	2.07	0.17	53.0	3.45	2.20	0.09
1.40	x 1.50	4.8	12.95	1.92	0.53	57.8	4.24	2.18	0.13
1.50	x 1.60	2.2	19.31	2.06	0.94	60.0	4.79	2.17	0.16
1.60	x 1.80	4.4	61.66	3.26	2.43	64.4	8.68	2.25	0.31
1.80	x 2.20	2.2	61.66	3.26	2.43	66.6	10.43	2.28	0.38
2.20	x Sink	33.4	86.76	5.64	5.25	100.0	35.92	3.40	2.01
Total		100.0	35.92	3.40	2.01				
Head		100.0	36.29	3.45	2.10				

Table 18.F.2 (cont.)
PTI GRIND
2" COLUMN TESTS AND RA
PITTSBURGH NO. 8 SEAM RAW COAL WASHABILITY
Lot #1 Feed Composite
(Dry Basis)

Top x 0 size fraction representing 100.0 Wt% of total sample

<u>Gravity Fraction</u>		<u>Direct Analysis</u>				<u>Cumulative Analysis</u>			
<u>Sink</u>	<u>Float</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>	<u>Yield</u> <u>(Wt%)</u>	<u>Ash</u> <u>(Wt%)</u>	<u>Sulfur</u> <u>(Wt%)</u>	<u>Pyr. S.</u> <u>(Wt%)</u>
Float	x 1.30	46.1	2.46	2.38	0.14	46.1	2.46	2.38	0.14
1.30	x 1.40	18.9	7.62	2.81	0.75	65.0	3.96	2.51	0.32
1.40	x 1.50	4.8	15.88	3.68	1.91	69.8	4.78	2.59	0.43
1.50	x 1.60	2.4	23.76	4.34	2.99	72.2	5.41	2.64	0.51
1.60	x 1.80	3.1	54.34	5.31	4.25	75.3	7.43	2.75	0.67
1.80	x 2.20	2.2	51.42	6.13	4.98	77.5	8.67	2.85	0.79
2.20	x Sink	22.5	83.31	9.36	9.13	100.0	25.47	4.31	2.67
Total		100.0	25.46	4.32	2.67				
Head		100.0	25.95	4.58	2.90				

Figure 18.F.3
RELEASE ANALYSIS PROCEDURAL DIAGRAM

Table 18.F.3
FLOTATION RELEASE ANALYSIS

Test No: PP1 Coal: Pittsburgh No. 8 Lot #1
Date: 7/12/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.5	1.0	3	22	1400	9
1st Cleaner	0.25	0.0	3	22	1400	8
2nd Cleaner	0.25	0.0	3	22	1400	7
C1	0.25	0.0	3	4	900	1
C2	0.0	0.0	0	8	1000	1
C3	0.0	0.0	0	12	1100	1
C4	0.0	0.0	0	16	1300	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	118.2	0.98	117.0	40.7	6.38	40.7	6.38
C2	96.2	0.97	95.7	33.3	8.78	74.0	7.46
C3	16.1	1.09	15.9	5.5	21.11	79.5	8.40
C4	4.3	1.72	4.2	1.5	39.20	81.0	8.97
TF	6.6	1.72	6.5	2.3	60.04	83.3	10.38
<u>T1</u>	<u>48.8</u>	<u>1.51</u>	<u>48.1</u>	<u>16.7</u>	<u>83.86</u>	<u>100.0</u>	<u>22.65</u>
Total	290.6	---	287.4	100.0	22.65	---	---
Head	---	1.76	---	100.0	23.51	---	---

Table 18.F.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: PP2 Coal: Pittsburgh No. 8 Lot #1
Date: 7/13/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.3	0.6	3	60	1400	9
1st Cleaner	0.15	0.0	3	60	1400	8
2nd Cleaner	0.15	0.0	3	60	1400	6
C1	0.15	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	96.1	1.18	95.0	33.3	6.11	33.3	6.11
C2	86.6	1.16	85.6	30.0	7.90	63.3	6.96
C3	38.6	1.23	38.1	13.3	13.77	76.6	8.14
C4	12.4	1.41	12.2	4.3	30.08	80.9	9.31
TF	6.6	1.70	6.5	2.3	65.41	83.2	10.86
<u>T1</u>	<u>48.7</u>	<u>1.53</u>	<u>48.0</u>	<u>16.8</u>	<u>82.08</u>	<u>100.0</u>	<u>22.82</u>
Total	289.0	---	285.4	100.0	22.82	---	---
Head	---	1.76	---	100.0	23.51	---	---

Table 18.F.3 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: PP3 Coal: Pittsburgh No. 8 Lot #1
Date: 7/13/93 Grind: PETC Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.7	1.4	3	60	1400	11
1st Cleaner	0.35	0.0	3	60	1400	10
2nd Cleaner	0.35	0.0	3	60	1400	8
C1	0.35	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	152.4	1.22	150.5	52.8	6.69	52.8	6.69
C2	68.9	1.15	68.1	23.9	9.97	76.7	7.71
C3	11.6	1.21	11.5	4.0	24.09	80.7	8.52
C4	3.0	1.15	3.0	1.1	38.38	81.8	8.92
TF	5.5	1.62	5.4	1.9	62.90	83.7	10.15
<u>T1</u>	<u>47.2</u>	<u>1.62</u>	<u>46.4</u>	<u>16.3</u>	<u>84.24</u>	<u>100.0</u>	<u>22.23</u>
Total	288.6	---	284.9	100.0	22.23	---	---
Head	---	1.76	---	100.0	23.51	---	---

Table 18.F.4
SUMMARY RELEASE ANALYSIS DATA
Pittsburgh No. 8 Seam Raw Coal
(PETC Grind)

Test Number	Reagents (Rougher) (MIBC #/T) (F.O. #/T)	Sample	Direct Analysis (Dry Basis)				Cumulative Analysis (Dry Basis)			
			Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
—	—	Head	100.0	23.51	4.54	2.59	—	—	—	—
PP1	0.5 1.0	Recon. Feed	100.0	22.65	4.25	2.48	—	—	—	—
		Conc. #1	40.7	6.38	3.34	1.17	40.7	6.38	3.34	1.17
		Conc. #2	33.3	8.78	3.97	1.85	74.0	7.46	3.62	1.48
		Conc. #3	5.5	21.11	6.40	4.37	79.5	8.40	3.81	1.68
		Conc. #4	1.5	39.20	7.54	7.54	81.0	8.97	3.88	1.79
		Tail Final	2.3	60.04	7.12	5.12	83.3	10.83	3.97	1.88
		Tail #1	16.7	83.86	5.60	5.48	100.0	22.65	4.24	2.48
—	—	Head	100.0	23.51	4.54	2.59	—	—	—	—
PP2	0.3 0.6	Recon. Feed	100.0	22.82	4.26	2.51	—	—	—	—
		Conc. #1	33.3	6.11	3.19	1.10	33.3	6.11	3.19	1.10
		Conc. #2	30.0	7.90	3.71	1.61	63.3	6.96	3.44	1.34
		Conc. #3	13.3	13.77	4.88	3.00	76.6	8.14	3.69	1.63
		Conc. #4	4.3	30.08	7.41	5.57	80.9	9.31	3.89	1.84
		Tail Final	2.3	65.41	8.40	7.56	83.2	10.86	4.01	2.00
		Tail #1	16.8	82.08	5.52	5.03	100.0	22.82	4.26	2.51

Table 18.F.5
FLOTATION RELEASE ANALYSIS

Test No: P1 Coal: Pittsburgh No. 8 Lot #1
Date: 7/10/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	1.0	1.5	---	22	1400	---
1st Cleaner	0.5	0.0	---	22	1400	---
2nd Cleaner	0.5	0.0	---	22	1400	---
C1	0.5	0.0	---	4	900	---
C2	0.0	0.0	---	8	1000	---
C3	0.0	0.0	---	12	1100	---
C4	0.0	0.0	---	16	1300	---

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	182.0	1.06	180.1	62.9	6.00	62.9	6.00
C2	34.9	0.96	34.6	12.1	10.74	75.0	6.76
C3	5.1	1.15	5.0	1.8	19.15	76.8	7.05
C4	2.2	1.00	2.2	0.8	33.95	77.6	7.33
TF	3.0	0.81	3.0	1.0	54.97	78.6	7.94
<u>T1</u>	<u>62.2</u>	<u>1.23</u>	<u>61.4</u>	<u>21.4</u>	<u>76.93</u>	<u>100.0</u>	<u>22.70</u>
Total	289.4	---	286.3	100.0	22.70	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P2	Coal: Pittsburgh No. 8 Lot #1
Date: 7/02/93	Grind: PTI Grind
	Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	1.0	2.0	3	10	1400	20
1st Cleaner	0.5	0.0	3	10	1400	15
2nd Cleaner	0.5	0.0	3	10	1400	8
C1	0.5	0.0	3	2	900	0.5
C2	0.0	0.0	---	4	1000	1
C3	0.0	0.0	---	6	1100	1
C4	0.0	0.0	---	8	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	121.4	1.49	119.6	41.3	7.03	41.3	7.03
C2	91.4	1.37	90.1	31.1	8.49	72.4	7.66
C3	17.9	1.43	17.6	6.1	13.59	78.5	8.12
C4	6.6	1.42	6.5	2.3	21.41	80.8	8.50
TF	6.4	1.29	6.3	2.2	53.71	83.0	9.70
<u>T1</u>	<u>50.1</u>	<u>1.50</u>	<u>49.3</u>	<u>17.0</u>	<u>83.41</u>	<u>100.0</u>	<u>22.23</u>
Total	293.8	---	289.4	100.0	22.23	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P3 Coal: Pittsburgh No. 8 Lot #1
Date: 7/06/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	1.5	1.5	3	12	1400	15
1st Cleaner	0.75	0.0	3	12	1400	9
2nd Cleaner	0.75	0.0	3	12	1400	8
C1	0.0	0.0	3	2.5	900	0.5
C2	0.0	0.0	0	5	1000	1
C3	0.0	0.0	0	7	1100	1
C4	0.0	0.0	0	10	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	99.5	1.05	98.5	33.9	6.41	33.9	6.41
C2	91.7	1.03	90.8	31.3	7.82	65.2	7.09
C3	32.9	1.12	32.5	11.2	11.56	76.4	7.75
C4	11.9	1.08	11.8	4.1	20.55	80.5	8.40
TF	6.1	1.20	6.0	2.1	55.21	82.6	9.59
<u>T1</u>	<u>51.1</u>	<u>0.95</u>	<u>50.6</u>	<u>17.4</u>	<u>83.17</u>	<u>100.0</u>	<u>22.39</u>
Total	293.2	---	290.2	100.0	22.39	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P4 Coal: Pittsburgh No. 8 Lot #1
Date: 7/07/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	1.0	1.5	3	14	1400	16
1st Cleaner	0.5	0.0	3	12	1400	8
2nd Cleaner	0.5	0.0	3	12	1400	7
C1	0.0	0.0	3	2.5	900	0.5
C2	0.0	0.0	0	5	1000	1
C3	0.0	0.0	0	7	1100	1
C4	0.0	0.0	0	10	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	74.0	1.34	73.0	25.1	5.99	25.1	5.99
C2	101.2	1.23	100.0	34.4	7.18	59.5	6.68
C3	49.9	1.26	49.3	16.9	10.29	76.4	7.48
C4	13.3	1.35	13.1	4.5	21.26	80.9	8.25
TF	4.7	1.37	4.6	1.6	65.26	82.5	9.36
<u>T1</u>	<u>51.8</u>	<u>1.57</u>	<u>51.0</u>	<u>17.5</u>	<u>85.28</u>	<u>100.0</u>	<u>22.65</u>
Total	294.9	---	291.0	100.0	22.64	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P5
Date: 7/08/93
Tech: Jerry

Coal: Pittsburgh No. 8 Lot #1
Grind: PTI Grind
Feed (g): 300g

	MIBC	F.O.	Cond.	Air		Float
<u>Flotation</u>	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>@40 psi</u>	<u>gitat</u>	<u>Time</u>
			<u>(min.)</u>	<u>(%)</u>	<u>RPM</u>	<u>(min.)</u>
Rougher	0.5	1.0	3	60	1400	12
1st Cleaner	0.25	---	3	60	1400	10
2nd Cleaner	0.25	---	3	60	1400	8
C1	0.25	---	3	12	900	1
C2	---	---	---	24	1000	1
C3	---	---	---	36	1100	1
C4	---	---	---	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>				<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>Yield</u>	<u>Ash</u>	<u>Ash</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Units</u>	<u>(Wt%)</u>	<u>(Wt%)</u>
C1	180.8	1.07	178.0	61.6	6.61		61.6	6.61
C2	50.4	1.12	49.8	17.2	12.40		78.8	7.87
C3	7.3	1.20	7.2	2.5	29.96		81.3	8.55
C4	2.4	1.02	2.4	0.8	50.82		82.1	8.96
TF	3.9	1.29	3.8	1.3	77.08		83.4	10.02
<u>T1</u>	<u>48.4</u>	<u>1.23</u>	<u>47.8</u>	<u>16.6</u>	<u>86.90</u>		<u>100.0</u>	<u>22.78</u>
Total	293.2	---	289.0	100.0	22.79		---	---
Head	---	1.33	---	100.0	23.36		---	---

2 of 2

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P6 Coal: Pittsburgh No. 8 Lot #1
Date: 7/08/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.3	0.6	3	60	1400	8
1st Cleaner	0.15	0.0	3	60	1400	7
2nd Cleaner	0.15	0.0	3	60	1400	5
C1	0.15	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	92.5	1.09	91.5	31.5	5.21	31.5	5.21
C2	81.1	1.26	80.1	27.5	7.12	59.0	6.10
C3	44.6	1.42	44.0	15.1	11.44	74.1	7.19
C4	18.0	1.49	17.7	6.1	20.03	80.2	8.17
TF	6.0	1.50	5.9	2.0	54.05	82.2	9.29
<u>T1</u>	<u>52.4</u>	<u>1.38</u>	<u>51.7</u>	<u>17.8</u>	<u>84.64</u>	<u>100.0</u>	<u>22.70</u>
Total	294.6	---	290.9	100.0	22.70	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P7 Coal: Pittsburgh No. 8 Lot #1
Date: 7/08/93 Grind: PTI Grind
Feed (g): 300g

	MIBC	F.O.	Cond. Time	Air	Agitator	Float Time
<u>Flotation</u>	<u>(#/T)</u>	<u>(#/T)</u>	<u>(min.)</u>	<u>(%)</u>	<u>(RPM)</u>	<u>(min.)</u>
Rougher	0.7	1.4	3	60	1400	8
1st Cleaner	0.35	0.0	3	60	1400	6
2nd Cleaner	0.35	0.0	3	60	1400	5
C1	0.35	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

	Surface	Inh.	Final			Cum.	Cum.
<u>Sample</u>	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>Yield</u>	<u>Ash</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>(Wt%)</u>
C1	170.4	1.12	168.5	58.3	7.72	58.3	7.72
C2	58.6	1.07	57.8	20.0	12.44	78.3	8.93
C3	7.8	1.08	7.7	2.7	28.79	81.0	9.59
C4	1.2	0.89	1.2	0.4	52.34	81.4	9.80
TF	3.5	1.27	3.5	1.2	79.08	82.6	10.81
<u>T1</u>	<u>50.6</u>	<u>1.01</u>	<u>50.1</u>	<u>17.4</u>	<u>86.78</u>	<u>100.0</u>	<u>24.03</u>
Total	292.1	---	288.8	100.0	24.02	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.5 (cont.)
FLOTATION RELEASE ANALYSIS

Test No: P8 Coal: Pittsburgh No. 8 Lot #1
Date: 7/11/93 Grind: PTI Grind
Feed (g): 300g

<u>Flotation</u>	<u>MIBC</u>	<u>F.O.</u>	<u>Cond.</u>	<u>Air</u>	<u>Agitator</u>	<u>Float</u>
	<u>(#/T)</u>	<u>(#/T)</u>	<u>Time</u>	<u>(%)</u>	<u>(RPM)</u>	<u>Time</u>
			<u>(min.)</u>			<u>(min.)</u>
Rougher	0.4	0.8	3	60	1400	7
1st Cleaner	0.2	0.0	3	60	1400	5
2nd Cleaner	0.2	0.0	3	60	1400	4
C1	0.2	0.0	3	12	900	1
C2	0.0	0.0	0	24	1000	1
C3	0.0	0.0	0	36	1100	1
C4	0.0	0.0	0	48	1250	2

<u>Sample</u>	<u>Surface</u>	<u>Inh.</u>	<u>Final</u>	<u>Yield</u>	<u>Ash</u>	<u>Cum.</u>	<u>Cum.</u>
	<u>Dry Wt.</u>	<u>Water</u>	<u>Dry Wt.</u>	<u>(Wt%)</u>	<u>(Wt%)</u>	<u>Yield</u>	<u>Ash</u>
	<u>(g)</u>	<u>(%)</u>	<u>(g)</u>			<u>(Wt%)</u>	<u>(Wt%)</u>
C1	120.5	1.19	119.1	41.0	6.99	41.0	6.99
C2	102.3	1.16	101.1	34.8	10.48	75.8	8.59
C3	9.0	1.21	8.9	3.1	29.33	78.9	9.40
C4	2.4	1.09	2.4	0.8	51.33	79.7	9.82
TF	3.3	1.18	3.3	1.1	73.31	80.8	10.68
<u>T1</u>	<u>56.4</u>	<u>1.11</u>	<u>55.8</u>	<u>19.2</u>	<u>85.46</u>	<u>100.0</u>	<u>25.04</u>
Total	293.9	---	290.6	100.0	25.05	---	---
Head	---	1.33	---	100.0	23.36	---	---

Table 18.F.6
SUMMARY RELEASE ANALYSIS DATA
Pittsburgh No. 8 Seam Raw Coal
(PTI Grind)

Test Number	Reagents (Rougher)		Sample	Direct Analysis (Dry Basis)				Cumulative Analysis (Dry Basis)			
	(MIBC #/T)	(F.O. #/T)		Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)
P5	---	---	Head	100.0	23.36	4.39	2.61	---	---	---	---
	0.5	1.0	Recon. Feed	100.0	22.79	4.36	2.65	---	---	---	---
			Conc. #1	61.6	6.61	3.61	1.44	61.6	6.61	3.61	1.44
			Conc. #2	17.2	12.40	4.58	2.64	78.8	7.87	3.82	1.70
			Conc. #3	2.5	29.96	7.22	5.94	81.3	8.55	3.92	1.83
			Conc. #4	0.8	50.82	10.48	10.40	82.1	8.96	3.98	1.91
			Tail Final	1.3	77.08	9.61	9.61	83.4	10.02	4.07	2.03
			Tail #1	16.6	86.90	5.76	5.76	100.0	22.78	4.35	2.65
P6	---	---	Head	100.0	23.36	4.39	2.61	---	---	---	---
	0.3	0.6	Recon. Feed	100.0	22.70	4.35	2.61	---	---	---	---
			Conc. #1	31.5	5.21	3.28	0.95	31.5	5.21	3.28	0.95
			Conc. #2	27.5	7.12	3.72	1.61	59.0	6.10	3.49	1.26
			Conc. #3	15.1	11.44	4.50	2.61	74.1	7.19	3.70	1.54
			Conc. #4	6.1	20.03	5.97	4.01	80.2	8.17	3.87	1.73
			Tail Final	2.0	54.05	8.60	7.53	82.2	9.29	3.98	1.87
			Tail #1	17.8	84.64	6.08	6.05	100.0	22.70	4.35	2.61

Appendix G

MULTIVARIABLE TEST RESULTS AND CONDITIONS Pittsburgh No. 8 Seam Coal

Table 18.G.1 - VT#1-VT#3 Test Results and Conditions (5/06//93)

Table 18.G.2 - VT#4-VT#6 Test Results and Conditions (5/07//93)

Table 18.G.3 - VT#7-VT#8 Test Results and Conditions (5/10//93)

Table 18.G.4 - VT#10-VT#15 Test Results and Conditions (5/11//93)

Table 18.G.5 - VT#16-VT#21 Test Results and Conditions (5/12//93)

Table 18.G.6 - VT#22-VT#25 Test Results and Conditions (5/13//93)

Table 18.G.7 - VT#26-VT#34 Test Results and Conditions (5/17//93)

Table 18.G.8 - VT#36-VT#38 Test Results and Conditions (5/24//93)

Table 18.G.9 - VT#39-VT#46 Test Results and Conditions (5/25//93)

Table 18.G.10 - Detailed Sample Results (Dry Basis)

Table 18.G.1
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/06/93
Tests: VT#1-VT#3

Time	Sample Number	Feed Solids (#/Hr.)	F&T F.B. Yield (Wt%)	C&T F.B. Yield (Wt%)	A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
						Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
1722	VT#1	226	66.1	74.8	75.1	6.3	6.95	20.70	5.8	4.99	7.21	8.0	1.22	61.40
1805	VT#2	207	73.1	72.2	70.2	6.3	6.37	21.49	5.8	5.06	8.80	7.5	1.51	51.41
1900	VT#3	224	52.5	52.2	49.2	6.2	7.00	22.13	5.1	4.47	7.69	8.1	2.58	36.13
							VT#3 Conc. Grab:			4.11	7.70			

Table 18.G.1 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/06/93
Feed Lot: 1 Pittsburgh

	<u>VT#1</u>	<u>VT#2</u>	<u>VT#3</u>
Water Type	City	City	City
Feed Rate (#/Hr)	225	225	225
Feed Solids (Wt%)	7.0	7.0	7.0
Feed Rate (GPM)	6.3	6.3	6.3
Froth Bar Depth (In)	15	15	15
Froth Depth (In)	36	24	24
Froth Setpoint (In)	36	24	24
Air rate (CFM) @ 50 Psi	1.2	1.8	1.5
Froth Wash (GPM)	4.0	3.5	3.5
Launder Wash (GPM)	3.5	3.5	3.5
Hammermill Screen (In)	1/4	1/4	1/4
Inner Sleeve (O.D.)	None	None	None
Conc. Sample Time	17:22	18:05	19:00
MIBC Frother (#/T)	1.0	1.0	0.5
MIBC Frother (g/min.)	0.851	0.851	0.426
F.O. Collector (#/T)	2.0	2.0	1.0
F.O. Collector (g/min.)	1.702	1.702	0.851

Table 18.G.2
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/07/93
Tests: VT#4-VT#6

Time	Sample Number	Feed Solids (#/Hr.)	F&T		C&T		A.B.		Diluted Feed			Diluted Concentrate			Tailings		
			F.B. Yield (Wt%)	F.B. Yield (Wt%)	F.B. Yield (Wt%)	F.B. Yield (Wt%)	Yield (Wt%)	Yield (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
930	VT#4	230	31.5	31.3	35.0	35.0	35.0	23.91	6.3	7.09	23.91	4.3	3.27	5.96	8.0	3.86	33.59
1030	VT#5	186	52.4	52.4	63.9	63.9	63.9	23.43	4.5	8.00	23.43	4.5	4.19	8.26	6.5	2.36	50.30
1200	VT#6	275	64.5	66.3	65.4	65.4	65.4	25.77	5.8	9.19	25.77	6.5	5.29	10.02	6.3	2.78	55.49

Note: Flows are best estimate, database crashed.

Table 18.G.2 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/07/93
Feed Lot: 1 Pittsburgh

	<u>VT#4</u>	<u>VT#5</u>	<u>VT#6</u>
Water Type	City	City	City
Feed Rate (#/Hr)	225	150	300
Feed Solids (Wt%)	7.0	6.5	10.0
Feed Rate (GPM)	6.3	4.5	5.8
Froth Bar Depth (In)	15	15	15
Froth Depth (In)	36	30	30
Froth Setpoint (In)	36	35	33
Air rate (CFM) @ 50 Psi	1.8	1.8	1.8
Froth Wash (GPM)	2.5	3.0	3.5
Launder Wash (GPM)	3.5	3.5	3.5
Hammermill Screen (In)	1/4	1/4	1/4
Inner Sleeve (O.D.)	None	None	None
Conc. Sample Time	9:30	10:30	12:00
MIBC Frother (#/T)	0.36	0.71	0.70
MIBC Frother (g/min.)	0.298	0.397	0.794
F.O. Collector (#/T)	0.70	0.70	1.40
F.O. Collector (g/min.)	0.596	0.397	1.589

Table 18.G.3
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/10/93
Lot #1

ByPass Samples

Time	Test Number	Solids Feed (#/Hr.)	F&T F.B.		C&T F.B.	Yield (Wt%)	A.B.			Diluted Feed			Diluted Concentrate			Tailings		
			Yield (Wt%)	Yield (Wt%)	Yield (Wt%)	Yield (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
1430	VT#7	146	82.6	82.9	81.8	81.8	4.4	6.44	18.56	5.2	4.61	10.01	5.2	4.61	10.01	5.2	0.95	51.10
1555	VT#8	150	67.3	66.9	66.4	66.4	9.8	2.96	17.22	5.1	3.76	8.76	10.2	0.93	33.92	10.2	0.93	33.92

Note: Yields match very well, indicating good closure and sampling approach.

Analyzer Drain & Rinse

Time	Test Number	Solids Feed (#/Hr.)	F.B.		Yield (F&T) (Wt%)	Yield (C&T) (Wt%)	A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
			Yield (F&T) (Wt%)	Yield (C&T) (Wt%)				Drain (GPM)	Solids (Wt%)	Ash (Wt%)	Drain (GPM)	Solids (Wt%)	Ash (Wt%)	Drain (GPM)	Solids (Wt%)	Ash (Wt%)
1430	VT#7	** Same As Above **	80.4	80.4	80.4	80.4	5.0	—	18.51	5.5	—	9.95	5.5	—	*53.63	
1555	VT#8	** Same As Above **	65.5	65.5	65.5	65.5	5.5	—	17.59	5.5	—	8.96	5.5	—	34.01	

* Did not match bypass, probably due to small sample amount (3.0 gallons).
Problem with level prove for tailings sample, otherwise all are good.

Grab Samples

Time	Test Number	Solids Feed (#/Hr.)	S.B.		F.B.		A.B.		S.B.		Undiluted Feed			Diluted Concentrate			Tailings		
			Yield (F&T) (Wt%)	Yield (C&T) (Wt%)	Yield (C&T) (Wt%)	Yield (Wt%)	Yield (C&T) (Wt%)	Yield (Wt%)	Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	
1430	VT#7	158	85.4	83.6	80.4	83.3	22.32	18.31	5.2	4.39	9.21	5.2	0.86	55.54					
1555	VT#8	145	80.3	71.7	58.6	76.5	22.68	18.55	5.1	3.86	8.39	10.2	0.76	32.91					

Test	Sample	Ash (Wt%)
VT#7	Bin #2A	19.24
VT#8	Bin #2B	19.10
VT#7	Lock Hopper A	19.21
VT#8	Lock Hopper A	18.42

Table 18.G.3 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/10/93

Feed Lot: #1

	<u>VT#7</u>	<u>VT#8</u>
Water Type	City	City
Feed Rate (#/Hr)	150	150
Feed Solids (Wt%)	6.5	3.0
Feed Rate (GPM)	4.5	9.9
Froth Bar Depth (In)	15	12
Froth Depth (In)	30	24
Froth Setpoint (In)	32	28
Air rate (CFM) @ 50 Psi	1.2	1.7
Froth Wash (GPM)	2.5	2.0
Launder Wash (GPM)	3.5	3.5
Hammermill Screen (In)	1/4	1/4
Inner Sleeve (O.D.)	None	None
Conc. Sample Time	14:30	15:55
MIBC Frother (#/T)	1.0	1.0
MIBC Frother (g/min.)	0.568	0.568
F.O. Collector (#/T)	2.0	2.0
F.O. Collector (g/min.)	1.135	1.135

Table 18.G.4
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/11/93
Lot #1 (93-95)

ByPass Samples

Time	Test Number	Solids Feed (#/Hr.)	F&T		C&T		A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
			F.B. Yield (Wt%)		F.B. Yield (Wt%)			Yield (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)
1320	VT#10	220	65.0		63.0		60.5	6.2	6.87	21.21	5.7	4.45	9.21	7.5	1.99	39.61
1425	VT#11	220	80.1		80.6		78.8	6.2	6.87	21.27	6.2	5.67	10.75	5.6	1.51	60.28
1510	VT#12	213	73.3		73.6		69.2	4.4	9.37	22.50	5.2	6.11	8.31	4.7	2.43	54.43
1555	VT#13	214	54.5		57.0		55.6	8.8	4.72	22.62	5.0	5.01	7.03	9.3	2.03	42.11
1655	VT#14	294	72.8		72.8		72.8	5.7	10.00	22.79	6.7	6.20	10.22	4.5	3.45	56.48
1740	VT#15	312	70.9		70.0		66.7	5.7	10.63	24.43	5.8	7.09	8.70	5.4	3.26	55.88

Analyzer Drain & Rinse

Time	Test Number	Solids Feed (#/Hr.)	Yield (F&T) (Wt%)	Yield (C&T) (Wt%)	A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
						Drain (GPM)	Solids (Wt%)	Ash (Wt%)	Drain (GPM)	Solids (Wt%)	Ash (Wt%)	Drain (GPM)	Solids (Wt%)	Ash (Wt%)
1740	VT#15				65.6	3.7	10.81	24.80	4.5	7.27	8.93	3.6	3.35	55.04
			** Same As Above **											

Grab Samples

Time	Test Number	S.B.		F.B.		A.B.		S.B.		Solids Feed		Undiluted Feed				Diluted Concentrate				Tailings						
		Yield (F&T) (Wt%)	73.0	Yield (C&T) (Wt%)	69.4	Yield (Wt%)	67.6	Yield (C&T) (Wt%)	69.1	Feed Rate (#/Hr.)	332	Solids (Wt%)	24.15	Ash (Wt%)	24.28	Flow (GPM)	5.8	Solids (Wt%)	6.92	Ash (Wt%)	8.42	Flow (GPM)	5.4	Solids (Wt%)	3.27	Ash (Wt%)
1740	VT#15																									

Lock Hopper Samples

Bin # 2 Samples			Ash		
Test	Time	Yield (Wt%)	Time	Yield (Wt%)	
VT#10	1315-1345	23.76	1330	23.52	
VT#12	1500-1530	23.08	1511	23.17	
VT#13	1600-1615	24.12	1600	24.28	
VT#15	1740-1755	25.88	1750	25.39	

Table 18.G.4 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/11/93

Feed Lot: #1

	<u>VT#10</u>	<u>VT#11</u>	<u>VT#12</u>	<u>VT#13</u>	<u>VT#14</u>	<u>VT#15</u>
Water Type	City	City	City	City	City	City
Feed Rate (#/Hr)	225	225	225	225	300	300
Feed Solids (Wt%)	7.0	7.0	10.0	5.0	10.0	10.0
Feed Rate (GPM)	6.3	6.3	4.4	8.8	5.8	5.8
Froth Bar Depth (In)	18	12	15	15	15	18
Froth Depth (In)	36	24	30	30	30	36
Froth Setpoint (In)	40	28	34	34	34	40
Air rate (CFM) @ 50 Psi	1.5	2.0	1.7	1.7	2.0	1.4
Froth Wash (GPM)	3.5	2.5	2.5	2.5	2.5	2.5
Launder Wash (GPM)	3.5	3.0	3.0	3.0	3.0	3.0
Hammermill Screen (In)	1/4	1/4	1/4	1/4	1/4	1/4
	(6090 RPM)	(6090 RPM)	(6090 RPM)	(6090 RPM)	(6090 RPM)	(6090 RPM)
Inner Sleeve (O.D.)	None	None	None	None	None	None
Conc. Sample Time	13:20	14:25	15:10	15:55	16:55	17:40
MIBC Frother (#/T)	1.0	1.5	0.7	1.0	1.0	0.7
MIBC Frother (g/min.)	0.851	1.277	0.596	0.851	1.135	0.795
F.O. Collector (#/T)	2.0	2.5	1.4	1.0	2.0	2.0
F.O. Collector (g/min.)	1.702	2.128	1.191	0.851	2.270	2.270

Table 18.G.5
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/12/93
Lot: #1 (93-97)

Time	Test Number	Solids Feed (#/Hr.)	F&T F.B. Yield (Wt%)	C&T F.B. Yield (Wt%)	A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
						Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
905	VT#16	295	82.7	82.7	80.2	5.7	10.02	22.17	7.0	6.74	10.87	4.2	2.35	67.98
955	VT#17	305	71.3	71.0	68.4	7.7	7.69	22.68	5.8	7.17	7.64	7.4	2.30	55.16
1100	VT#18	327	76.2	75.6	72.3	7.8	8.12	23.68	6.5	7.18	9.28	6.8	2.22	61.27
1150	VT#19	236	82.0	81.1	80.4	4.4	10.38	23.80	5.9	5.98	12.13	4.0	2.05	71.53
1240	VT#20	221	72.5	74.6	69.8	5.8	7.38	25.34	4.9	7.07	9.32	6.4	1.84	62.36
1335	VT#21	222	77.3	77.0	73.5	5.7	7.56	26.13	5.3	6.20	10.56	5.9	1.66	69.32

Lock Hopper Samples

Bin #2 Samples		
Test	Time	Ash (Wt%)
VT#16	900-920	22.72
VT#18	1055-1115	25.59
VT#20	1240-1300	26.26

Lock Hopper Samples		
Time	Time	Ash (Wt%)
910	22.63	
1105	24.03	
1250	26.67	

Table 18.G.5 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/12/93

Feed Lot: #1

	<u>VT#16</u>	<u>VT#17</u>	<u>VT#18</u>	<u>VT#19</u>	<u>VT#20</u>	<u>VT#21</u>
Water Type	City	City	City	City	City	City
Feed Rate (#/Hr)	300	300	300	225	225	225
Feed Solids (Wt%)	10.0	7.5	7.5	10.0	7.5	7.5
Feed Rate (GPM)	5.8	7.3	7.8	4.4	5.8	5.8
Froth Bar Depth (In)	12	15	18	12	15	18
Froth Depth (In)	24	30	36	24	30	36
Froth Setpoint (In)	26	32	40	26	34	42
Air rate (CFM) @ 50 Psi	2.2	1.4	1.8	2.2	1.4	1.8
Froth Wash (GPM)	2.5	2.5	2.5	2.5	2.5	2.5
Launder Wash (GPM)	3.0	3.0	3.0	3.0	3.0	3.0
Hammermill Screen (In)	1/4	1/4	1/4	1/4	1/4	1/4
	(6090 RPM)	(6090 RPM)	(6090 RPM)	(6090 RPM)	(6090 RPM)	(6090 RPM)
Inner Sleeve (O.D.)	None	None	None	None	None	None
Conc. Sample Time	9:05	9:55	11:00	11:50	12:40	13:35
MIBC Frother (#/T)	1.5	0.7	1.0	1.5	0.7	1.0
MIBC Frother (g/min.)	1.703	0.795	1.135	1.277	0.596	0.851
F.O. Collector (#/T)	2.5	1.5	2.0	2.5	1.5	2.0
F.O. Collector (g/min.)	2.838	1.703	2.270	2.128	1.191	1.702

Table 18.G.6
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/13/93
Lot #1 (93-98)

Time	Test Number	Solids Feed (#/Hr.)	F&T F.B.		C&T F.B.		A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
			Yield (Wt%)	F.B. Yield (Wt%)	Yield (Wt%)	Flow (GPM)		Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	
1150	VT#22	310	73.1	73.1	73.1	71.9	6.4	9.39	27.64	6.9	6.37	13.12	5.5	2.94	64.74	
1255	VT#23	301	77.2	76.6	73.1	77.3	6.4	9.12	22.38	6.4	6.82	10.02	6.0	2.22	64.44	
1340	VT#24	226	73.9	73.1	74.0	71.6	8.2	5.35	22.44	5.6	5.55	8.02	8.6	1.33	58.73	
1430	VT#25	204	71.9	74.0	75.1	75.1	8.3	4.77	22.11	5.6	5.66	8.16	8.7	1.28	64.11	
<div><div><div>Bin #2 Samples</div><div><div>Test</div><div>Time</div><div>Ash (Wt%)</div></div><div><div>VT#23</div><div>1300-1315</div><div>22.09</div></div><div><div>VT#25</div><div>1430-1440</div><div>23.44</div></div></div><div><div>Lock Hopper Samples</div><div><div>Time</div><div>Ash (Wt%)</div></div><div><div>1300</div><div>22.17</div></div><div><div>1435</div><div>22.73</div></div></div></div>																

Note: Feed Lot #1 Composite was 24.45 Wt% Ash.

Table 18.G.6 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/13/93

Feed Lot: #1 (93-98)

	<u>VT#22</u>	<u>VT#23</u>	<u>VT#24</u>	<u>VT#25</u>
Water Type	City	City	City	City
Feed Rate (#/Hr)	300	300	300	225
Feed Solids (Wt%)	9.0	9.0	5.3	5.3
Feed Rate (GPM)	6.5	6.5	8.3	8.3
Froth Bar Depth (In)	14	9	9	14
Froth Depth (In)	28	18	18	28
Froth Setpoint (In)	30	17	17	29
Air rate (CFM) @ 50 Psi	2.2	1.8	1.8	2.2
Froth Wash (GPM)	3.0	3.0	3.0	3.0
Launder Wash (GPM)	3.0	3.0	3.0	3.0
Hammermill Screen (In)	1/4	1/4	1/4	1/4
	(4910 RPM)	(4910 RPM)	(4910 RPM)	(4910 RPM)
Inner Sleeve (O.D.)	None	None	None	None
Conc. Sample Time	11:50	12:55	13:40	14:30
MIBC Frother (#/T)	1.5	1.0	1.0	1.5
MIBC Frother (g/min.)	1.703	1.135	0.851	1.277
F.O. Collector (#/T)	2.5	2.0	2.0	2.5
F.O. Collector (g/min.)	2.838	2.270	1.703	2.129

Test	Bin #2 Samples		Lock Hopper Samples	
	Time	Ash (Wt%)	Time	Ash (Wt%)
VT#27	1040-1100	26.43	1043	26.79
VT#29	1240-1300	23.47	1243	22.78
VT#31	1415-1430	22.00	1417	24.67

Table 18.G.7 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/17/93
Feed Lot: #1 (93-100)

	<u>VT#26</u>	<u>VT#27</u>	<u>VT#28</u>	<u>VT#29</u>	<u>VT#30</u>	<u>VT#31</u>	<u>VT#32</u>	<u>VT#33</u>	<u>VT#34</u>
Water Type	City	City	City	City	City	City	City	City	City
Feed Rate (#/Hr)	250	250	250	250	250	300	300	Same	Same
Feed Solids (Wt%)	8.0	8.0	8.0	8.0	9.0	9.0	9.0	As	As
Feed Rate (GPM)	6.1	6.1	6.1	6.1	5.4	6.4	6.4	VT#32	VT#32
Froth Bar Depth (In)	12	12	12	10	10	12	12	But	But
Froth Depth (In)	24	24	24	20	20	24	24	No	No
Froth Setpoint (In)	26	26	25	22	22	26	26	H2SO4	H2SO4
Air rate (CFM) @ 50 Psi	1.8	1.8	1.4	2.3	2.3	2.3	1.4	No	No
Froth Wash (GPM)	3.0	2.5	2.5	2.0	3.5	3.0	3.0	Bypass	Bypass
Launder Wash (GPM)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	Sample	Sample
Hammermill Screen (In)	1/4	1/4	1/4	1/4	1/4	1/4	1/4		
	(4190 RPM)	(4190 RPM)	(4190 RPM)	(4190 RPM)	(4190 RPM)	(4190 RPM)	(4190 RPM)		
Inner Sleeve (O.D.)	None	None	None	None	None	None	None		
Conc. Sample Time	9:15	10:40	11:30	12:40	13:25	14:15	15:00		
MIBC Frother (#/T)	1.2	0.4	1.2	1.2	1.2	1.2	1.2		
MIBC Frother (g/min.)	1.135	0.378	1.135	1.135	1.135	1.362	1.362		
F.O. Collector (#/T)	2.4	0.8	2.4	2.4	2.4	2.4	2.4		
F.O. Collector (g/min.)	2.270	0.757	2.270	2.270	2.270	2.724	2.724		

Table 18.G.8
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/24/93
Lot: #2

Time	Test Number	Solids Feed (#/Hr.)	F&T F.B. Yield (Wt%)	C&T F.B. Yield (Wt%)	A.B. Yield (Wt%)	Diluted Feed Flow (GPM)	Undiluted Feed			Diluted Concentrate			Tailings		
							Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
1500	VT#36	236	—	67.9	67.7	6.0	23.80	21.48	5.1	5.1	6.53	7.81	6.9	2.28	50.10
1547	VT#37	244	—	67.9	67.4	6.0	23.24	21.65	5.5	5.5	5.88	7.44	6.5	2.35	51.00
1629	VT#38	254	—	N/A	69.6	N/A	24.55	21.75	N/A	N/A	6.17	8.82	N/A	2.19	56.30

Table 18.G.8 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/24/93

Feed Lot: #2

	<u>VT#36</u>	<u>VT#37</u>	<u>VT#38</u>
Water Type	City	City	City
Feed Rate (#/Hr)	250	250	250
Feed Solids (Wt%)	8.0	8.0	8.0
Feed Rate (GPM)	6.1	6.1	6.1
Froth Bar Depth (In)	12	12	12
Froth Depth (In)	30	30	18
Froth Setpoint (In)	30	30	18
Air rate (CFM) @ 50 Psi	1.7	2.3	1.7
Froth Wash (GPM)	3.0	3.0	3.0
Launder Wash (GPM)	3.0	3.0	3.0
Hammermill Screen (In)	1/4	1/4	1/4
Inner Sleeve (O.D.)	None	None	None
Conc. Sample Time	15:00	15:47	16:29
MIBC Frother (#/T)	0.7	0.7	0.7
MIBC Frother (g/min.)	0.660	0.660	0.660
F.O. Collector (#/T)	1.4	1.4	1.4
F.O. Collector (g/min.)	1.320	1.320	1.320

Table 18.G.9
MANUAL SAMPLE RESULTS
Pittsburgh No. 8 Multivariable Testing

Date: 5/25/93
Lot: #2

Time	Test Number	Solids Feed (#/Hr.)	F&T F.B. Yield (Wt%)	C&T F.B. Yield (Wt%)	A.B. Yield (Wt%)	Diluted Feed Flow (GPM)	Undiluted Feed			Diluted Concentrate			Tailings		
							Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
1250	VT#39	270	—	67.5	62.3	6.0	25.28	23.50	5.3	5.3	6.33	7.07	6.7	2.41	50.60
1335	VT#40	252	—	64.9	64.4	6.0	24.90	24.29	5.2	5.2	6.13	7.84	6.8	2.53	53.80
1520	VT#41	259	—	69.2	67.0	6.1	24.93	22.72	5.4	5.4	6.15	8.96	7.2	2.05	50.60
1605	VT#42	263	—	68.3	65.5	6.0	25.36	24.95	5.8	5.8	5.52	10.06	6.7	2.22	53.20
1655	VT#43	264	—	74.7	74.5	6.0	25.66	24.79	5.3	5.3	7.30	9.84	7.2	1.82	68.30
1741	VT#44	266	—	78.2	78.3	6.0	24.91	21.98	5.8	5.8	6.77	9.71	6.7	1.63	66.20
1830	VT#45	241	—	79.7	79.9	6.0	25.11	22.22	5.7	5.7	6.89	11.43	6.8	1.47	65.15
1915	VT#46	275	—	75.7	73.3	6.1	25.25	26.31	6.1	6.1	6.23	13.37	6.5	1.88	61.85

Table 18.G.9 (cont.)
PRIMARY MULTIVARIABLE TESTS
(Pittsburgh No. 8 Seam Raw Coal)

Date: 05/25/93

Feed Lot: #2

	<u>VT#39</u>	<u>VT#40</u>	<u>VT#41</u>	<u>VT#42</u>	<u>VT#43</u>	<u>VT#44</u>	<u>VT#45</u>	<u>VT#46</u>
Water Type	City	City	City	City	City	City	City	City
Feed Rate (#/Hr)	250	250	250	250	250	250	250	250
Feed Solids (Wt%)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Feed Rate (GPM)	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Froth Bar Depth (In)	12	12	12	12	12	12	12	12
Froth Depth (In)	30	30	18	18	30	30	18	18
Froth Setpoint (In)	30	30	18	18	30	30	18	18
Air rate (CFM) @ 50 Psi	1.7	2.3	1.7	2.3	1.7	2.3	1.7	2.3
Froth Wash (GPM)	3.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Launder Wash (GPM)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Hammermill Screen (In)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
	(4912 RPM)	(4912 RPM)	(4912 RPM)	(4912 RPM)	(4912 RPM)	(4912 RPM)	(4912 RPM)	(4912 RPM)
Inner Sleeve (O.D.)	None	None	None	None	None	None	None	None
Conc. Sample Time	12:50	13:35	15:20	16:05	16:55	17:41	18:30	19:45
MIBC Frother (#/T)	0.7	0.7	0.7	0.7	1.3	1.3	1.3	1.3
MIBC Frother (g/min.)	0.660	0.660	0.660	0.660	1.230	1.230	1.230	1.230
F.O. Collector (#/T)	1.4	1.4	1.4	1.4	2.6	2.6	2.6	2.6
F.O. Collector (g/min.)	1.320	1.320	1.320	1.320	2.460	2.460	2.460	2.460

Table 18.G.10
DETAILED SAMPLE RESULTS
Pittsburgh No. 8 Seam Coal Multivariable Testing
(Dry Basis)

Test Number	Reconstituted Feed				Actual Feed				Concentrate				Tailings			
	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)		Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)		Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S. (Wt%)	
VT#1	20.70	3.99	2.26		20.70	4.04	2.25		75.1	7.21	3.88	1.77	61.40	4.31	3.75	
VT#4	23.92	4.45	2.78		23.91	4.31	2.69		35.0	5.96	3.39	1.29	33.59	5.02	3.58	
VT#10	21.22	3.89	2.24		21.21	4.00	2.30		60.5	9.21	3.65	1.71	39.61	4.27	3.04	
VT#11	21.25	4.08	—		21.27	4.12	2.42		78.8	10.75	4.21	2.10	60.28	3.61	—	
VT#18	23.68	—	—		23.68	4.42	—		72.3	9.28	4.30	—	61.27	—	—	
VT#19	23.77	4.46	2.75		23.80	4.44	2.59		80.4	12.13	4.66	2.66	71.53	3.63	3.11	
VT#21	26.13	4.50	—		26.13	4.70	3.21		73.5	10.56	4.61	2.64	69.32	4.21	—	
VT#22	27.63	—	—		27.64	5.38	3.82		71.9	13.12	4.60	2.70	64.74	—	—	
VT#23	22.37	4.43	2.74		22.38	4.33	2.67		77.3	10.02	4.21	2.22	64.44	5.18	4.52	
VT#26	23.38	—	—		23.40	4.06	—		73.8	9.76	4.05	1.99	61.76	—	—	
VT#27	26.66	4.74	3.13		26.65	4.49	2.80		50.8	8.48	3.82	1.79	45.44	5.68	4.52	
VT#29	23.63	4.50	—		23.64	4.63	—		78.4	12.77	4.41	2.44	63.04	4.81	—	
VT#39	23.49	4.29	—		23.50	4.99	3.13		62.3	7.07	3.92	1.73	50.63	4.90	—	
VT#40	24.28	4.48	—		24.29	4.44	2.44		64.4	7.94	3.99	1.84	53.83	5.36	—	
VT#41	22.72	3.76	—		22.72	4.07	2.26		67.0	8.96	3.73	1.68	50.66	3.81	—	
VT#42	24.97	4.23	—		24.95	4.57	2.91		65.5	10.06	3.93	1.99	53.27	4.80	—	
VT#43	24.76	4.42	2.66		24.79	4.87	3.12		74.5	9.84	4.46	2.36	68.34	4.29	3.55	
VT#44	21.97	4.53	—		21.98	4.71	2.63		78.3	9.71	4.42	2.24	66.20	4.91	—	
VT#45	22.23	4.60	2.70		22.22	4.86	2.81		79.9	11.43	4.58	2.38	65.15	4.70	3.96	
VT#46	26.31	5.11	—		26.31	5.56	3.65		73.3	13.37	4.89	2.88	61.85	5.72	—	

Appendix H

CONTROL TESTING SUMMARY RESULTS Pittsburgh No. 8 Seam Raw Coal

Table 18.H.1 - WT#1 Uncontrolled (5/27/93)

Table 18.H.2 - WT#2 Controlled (5/28/93)

Table 18.H.3 - WT#3 Uncontrolled (6/01/93)

Table 18.H.4 - WT#4 Controlled (6/04/93)

Table 18.H.5 - WT#5 Controlled (6/07/93)

Table 18.H.6 - WT#7 Controlled (6/09/93)

Table 18.H.7 - WT#8 Controlled (6/10/93)

Table 18.H.8 - WT#9 Uncontrolled (6/15/93)

Table 18.H.9 - WT#10 Controlled (6/16/93)

Table 18.H.10 - Detailed Sample Analyses (WT#3-WT#9)

Table 18.H.1
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 5/27/93
Tests: Uncontrolled WT#1

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Diluted Feed			Diluted Concentrate			Tailings		
					Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
8:40 AM	1	247	—	66.01	6.1	23.99	27.84	NA	5.37	10.54	NA	2.08	61.40
9:20 AM	3	284	71.01	71.25	6.1	23.86	26.11	5.8	6.82	11.49	6.7	2.41	61.10
10:00 AM	5	287	73.81	70.78	6.1	24.64	25.35	5.4	6.80	9.23	7.2	1.81	64.30
10:40 AM	7	210	74.54	74.86	6.1	23.99	23.55	5.0	6.14	10.47	7.6	1.38	62.49
11:20 AM	9	293	74.96	66.99	6.1	24.54	22.41	6.1	6.50	8.94	6.4	2.07	49.79
12:00 PM	11	296	76.98	72.37	6.1	24.71	20.22	6.0	6.63	8.87	6.5	1.83	49.95
12:40 PM	13	249	74.63	72.93	6.1	24.54	20.53	5.7	6.41	8.58	6.9	1.80	52.73
1:20 PM	15	224	74.55	72.95	6.1	24.92	23.92	5.1	6.03	9.24	7.5	1.40	63.51
2:00 PM	17	225	72.60	70.09	6.1	24.61	25.61	5.1	6.00	9.55	7.5	1.54	63.25

Table 18.H.1 (cont.)
WT#1 SUMMARY ACTUAL VS. PREDICTED

<u>Time</u>	<u>Product Ash</u>		<u>Product Solids</u>		<u>Tails Ash</u>		<u>Tails Solids</u>	
	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>
8:40 AM	10.54	13.44	5.37	6.58	61.44	80.55	2.08	1.50
9:20 AM	11.99	14.21	6.82	6.71	61.10	82.97	2.41	1.38
10:00 AM	9.23	14.66	6.80	6.51	64.39	81.39	1.81	1.27
10:40 AM	10.47	13.35	6.14	6.82	62.49	80.26	1.38	1.43
11:20 AM	8.94	14.10	6.50	7.01	49.74	83.22	2.07	1.38
12:00 PM	8.87	14.86	6.63	7.10	49.95	78.77	1.83	1.24
12:40 PM	8.58	14.81	6.41	7.04	52.73	84.97	1.80	1.91
1:20 PM	9.24	13.48	6.03	7.14	63.51	80.03	1.40	1.40
2:00 PM	9.55	14.53	6.00	6.52	63.25	86.75	1.54	1.08

Table 18.H.1 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 5/27/93

Test: Uncontrolled WT#1

Feed Rate: 6.1 GPM

Launder Water: 3.0 GPM

Froth Wash: 3.5 GPM

Spray Bar: 12 Inches

Sump Level: 30%

Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate		Froth Ht.		Concentrate		Tailings		F.B. Yield (Wt%)
					Target (CFM)	Target (In)	Target (In)	Target (In)	Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
8:20 AM	0	Uncontrolled	1.0	2.0	2.0	24	24	24	6.52	14.42	1.52	83.85	---
8:40 AM	1	Uncontrolled	1.0	2.0	2.0	24	24	24	6.58	13.44	1.50	80.55	---
9:00 AM	2	Uncontrolled	1.0	2.0	2.0	24	24	24	6.60	15.10	---	---	---
9:20 AM	3	Uncontrolled	1.0	2.0	2.0	24	24	24	6.79	14.21	1.38	82.97	81.12
9:40 AM	4	Uncontrolled	1.0	2.0	2.0	24	24	24	6.76	14.15	1.43	83.31	80.50
10:00 AM	5	Uncontrolled	1.0	2.0	2.0	24	24	24	6.51	14.66	1.27	81.39	79.22
10:20 AM	6	Uncontrolled	1.0	2.0	2.0	24	24	24	7.01	12.79	1.33	81.89	73.05
10:40 AM	7	Uncontrolled	1.0	2.0	2.0	24	24	24	6.82	13.35	1.43	80.26	75.60
11:00 AM	8	Uncontrolled	1.0	2.0	2.0	24	24	24	6.83	12.94	1.36	83.77	79.92
11:20 AM	9	Uncontrolled	1.0	2.0	2.0	24	24	24	7.01	14.10	1.38	83.22	82.80
11:40 AM	10	Uncontrolled	1.0	2.0	2.0	24	24	24	6.83	13.46	1.36	80.86	84.10
12:00 PM	11	Uncontrolled	1.0	2.0	2.0	24	24	24	7.10	14.86	1.24	78.77	84.20
12:20 PM	12	Uncontrolled	1.0	2.0	2.0	24	24	24	6.83	14.14	1.20	80.88	82.10
12:40 PM	13	Uncontrolled	1.0	2.0	2.0	24	24	24	7.04	14.81	1.91	84.97	75.30
1:00 PM	14	Uncontrolled	1.0	2.0	2.0	24	24	24	6.84	14.86	1.27	77.85	79.90
1:20 PM	15	Uncontrolled	1.0	2.0	2.0	24	24	24	7.14	13.48	1.40	80.03	77.60
1:40 PM	16	Uncontrolled	1.0	2.0	2.0	24	24	24	6.81	14.12	1.20	83.60	79.60
2:00 PM	17	Uncontrolled	1.0	2.0	2.0	24	24	24	6.52	14.53	1.08	86.75	80.50

Table 18.H.1 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 5/27/93
Test: Uncontrolled Wt#1

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Launder Water (GPM)
		(g/min.)	(#/T)	(g/min.)	(#/T)				
8:25 AM	1	0.914	0.96	1.850	1.96	2.05	23.0	3.6	3.0
8:45 AM	2	0.944	1.00	1.867	1.97	2.05	23.0	3.7	3.2
9:05 AM	3	0.930	0.98	1.892	2.00	2.05	23.0	3.7	3.0
9:25 AM	4	0.932	0.99	1.867	1.97	2.05	23.0	3.6	3.2
9:45 AM	5	0.928	0.98	1.880	1.99	2.05	24.0	3.6	3.1
10:05 AM	6	0.936	0.99	1.880	1.99	2.05	24.0	3.5	3.1
10:25 AM	7	0.946	1.00	1.880	1.99	2.05	24.0	3.6	3.1
10:45 AM	8	0.932	0.99	1.880	1.99	2.05	24.0	3.7	3.0
11:05 AM	9	0.948	1.00	1.880	1.99	2.05	24.0	3.7	3.1
11:25 AM	10	0.920	0.97	1.896	2.00	2.05	25.0	3.6	3.0
11:45 AM	11	0.926	0.98	1.892	2.00	2.05	24.5	3.7	3.1
12:05 PM	12	0.916	0.97	1.874	1.98	2.05	24.5	3.5	3.1
12:25 PM	13	0.924	0.98	1.884	1.99	2.05	24.5	3.8	3.1
12:45 PM	14	0.945	1.00	1.910	2.02	2.05	25.5	3.5	3.0
1:05 PM	15	0.928	0.98	1.880	1.99	2.05	23.0	3.7	3.2
1:25 PM	16	0.930	0.98	1.900	2.01	2.05	23.5	3.6	3.1
1:45 PM	17	0.926	0.98	1.900	2.01	2.05	23.5	3.5	3.1
2:05 PM	18	0.960	1.01	1.880	1.99	2.05	23.5	3.6	3.0

Table 18.H.2
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 5/28/93
Tests: Controlled WT#2

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed Flow (GPM)	Undiluted Feed			Diluted Concentrate			Tailings		
						Feed Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
10:20 AM	1	244	73.99	70.18	6.1	6.1	23.77	24.58	5.2	6.75	8.32	7.3	1.69	62.85
11:00 AM	3	238	77.50	76.50	6.1	6.1	23.34	21.48	5.2	6.96	7.91	7.4	1.42	65.66
11:40 AM	5	270	77.62	75.42	6.1	6.1	23.61	21.86	5.6	7.11	8.58	7.0	1.64	62.61
12:20 PM	7	226	76.59	78.22	6.1	6.1	24.33	20.34	4.8	6.56	7.98	7.7	1.25	64.73
1:00 PM	9	210	80.36	79.67	6.1	6.1	23.33	20.24	5.3	6.67	9.06	7.2	1.20	64.04
1:40 PM	11	286	73.95	77.28	6.1	6.1	23.57	21.41	5.4	6.70	9.37	7.2	1.77	62.37
2:20 PM	13	215	81.18	80.75	6.1	6.1	23.36	18.57	5.5	6.18	9.40	7.1	1.11	57.03
3:00 PM	15	252	77.37	73.26	6.1	6.1	23.69	20.95	5.8	6.73	9.14	6.6	1.73	53.00
3:40 PM	17	269	71.68	71.50	6.1	6.1	22.99	22.68	5.8	6.41	9.02	6.8	2.16	56.95

Table 18.H.2 (cont.)
WT#2 SUMMARY ACTUAL VS. PREDICTED

<u>Time</u>	<u>Concentrate Ash</u>		<u>Concentrate Solids</u>		<u>Tails Ash</u>		<u>Tails Solids</u>		<u>F.B. Yields</u>	
	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>	<u>Actual</u>	<u>Predicted</u>
10:20 AM	8.32	9.12	6.75	4.24	62.85	59.71	1.69	2.42	73.99	55.00
11:00 AM	7.91	9.65	6.96	4.32	65.66	57.53	1.42	2.29	77.50	57.10
11:40 AM	8.58	9.09	7.11	4.51	62.61	61.49	1.64	2.22	77.62	61.80
12:20 PM	7.98	10.46	6.56	4.66	64.73	55.68	1.25	2.26	76.59	56.50
1:00 PM	9.06	9.74	6.67	5.33	64.04	59.38	1.20	2.15	80.36	64.60
1:40 PM	9.37	8.85	6.70	5.29	62.37	56.56	1.77	2.50	73.95	61.30
2:20 PM	9.40	9.52	6.18	4.74	57.03	64.10	1.11	1.82	81.18	66.80
3:00 PM	9.14	10.03	6.73	5.16	53.30	58.54	1.73	2.16	77.37	67.70
3:40 PM	9.02	10.03	6.41	5.19	56.95	54.04	2.16	2.30	71.68	65.40

Table 18.H.2 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 5/28/93
Test: Controlled WT#2

Feed Rate: 250 #/Hr. Froth Wash: 3.5 GPM Sump Level: 30%
Launder Water: 3.0 GPM Spray Bar: 12 Inches

Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate Target (CFM)	Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
							Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
9:40 AM	-1	Auto	1.00	2.00	2.00	24	4.98	9.60	2.47	59.66	62.83
10:00 AM	0	Auto	1.00	2.00	2.00	24	4.33	8.90	2.49	53.61	58.00
10:20 AM	1	Auto	1.16	2.33	2.00	24	4.24	9.12	2.42	59.71	55.60
10:40 AM	2	Auto	1.15	2.29	2.00	24	4.60	8.97	2.04	63.92	61.90
11:00 AM	3	Auto	1.22	2.44	2.00	24	4.32	9.65	2.29	57.53	57.10
11:20 AM	4	Auto	1.19	2.38	2.00	24	4.89	9.76	2.36	55.92	60.60
11:40 AM	5	Auto	1.29	2.59	2.00	24	4.51	9.09	2.22	61.49	61.80
12:00 PM	6	Auto	1.30	2.60	2.00	24	4.62	8.93	2.22	55.78	58.90
12:20 PM	7	Auto	1.30	2.60	2.09	24	4.66	10.46	2.26	55.68	56.50
12:40 PM	8	Auto	1.30	2.60	2.11	24	4.91	10.20	2.18	60.08	59.90
1:00 PM	9	Auto	1.30	2.60	2.12	24	5.33	9.74	2.15	59.38	64.60
1:20 PM	10	Auto	1.30	2.60	2.20	24	5.54	9.51	2.30	54.18	67.30
1:40 PM	11	Auto	1.30	2.60	2.30	24	5.29	8.85	2.50	56.56	61.30
2:00 PM	12	Auto	1.30	2.60	2.30	21.68	4.82	8.47	2.14	57.71	63.10
2:20 PM	13	Auto	1.00	2.00	2.00	24	4.74	9.52	1.82	64.10	66.90
2:40 PM	14	Auto	1.00	2.00	2.00	24	5.55	9.54	2.40	56.74	62.50
3:00 PM	15	Auto	1.00	2.00	2.00	24	5.16	10.03	2.16	58.54	67.70
3:20 PM	16	Auto	1.03	2.05	2.00	24	5.07	8.93	2.56	57.53	61.50
3:40 PM	17	Auto	0.93	1.87	2.00	24	5.19	10.03	2.30	54.04	65.40
4:00 PM	18	Auto	0.93	1.86	2.00	24	5.39	9.22	2.92	46.49	59.20

Table 18.H.2 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 5/28/93

Test: Controlled Wt#2

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Laundry Water (GPM)
		(g/min.)	(#/T)	(g/min.)	(#/T)				
9:45 AM	-1	0.90	0.95	1.90	2.00	2.05	23.0	3.5	3.3
10:05 AM	0	0.90	0.95	1.90	2.00	2.05	22.0	3.7	3.1
10:25 AM	1	0.92	0.97	1.89	2.00	2.05	24.0	3.7	3.1
10:45 AM	2	1.08	1.14	2.19	2.32	2.05	24.0	3.6	3.1
11:05 AM	3	1.06	1.12	2.20	2.33	2.05	23.5	3.6	3.1
11:25 AM	4	1.13	1.18	2.37	2.51	2.05	25.0	3.7	3.1
11:45 AM	5	1.12	1.18	2.26	2.39	2.05	24.0	3.7	3.1
12:05 PM	6	1.21	1.28	2.47	2.61	2.05	24.5	3.6	3.2
12:25 PM	7	1.22	1.29	2.46	2.60	2.05	24.5	3.7	3.1
12:45 PM	8	1.23	1.30	2.52	2.66	2.15	24.0	3.6	2.8
1:05 PM	9	1.22	1.29	2.52	2.66	2.20	23.5	3.6	3.1
1:25 PM	10	1.23	1.30	2.52	2.66	2.20	24.0	3.7	3.1
1:45 PM	11	1.22	1.29	2.46	2.60	2.30	25.0	3.6	3.0
2:05 PM	12	1.20	1.27	2.46	2.60	2.40	24.0	3.7	3.1
2:25 PM	13	1.20	1.27	2.46	2.60	2.40	21.0	3.5	3.0
2:45 PM	14	0.92	0.97	1.89	2.00	2.05	22.0	3.6	3.1
3:05 PM	15	0.90	0.95	1.89	2.00	2.05	25.5	3.6	3.1
3:25 PM	16	0.91	0.96	1.92	2.03	2.05	25.0	3.7	3.1
3:45 PM	17	0.93	0.98	1.95	2.06	2.05	25.0	3.6	3.0
4:05 PM	18	0.86	0.91	1.71	1.81	2.05	24.5	3.6	3.1

Table 18.H.3
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 6/01/93
Tests: Uncontrolled WT#3

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed			Undiluted Feed			Diluted Concentrate			Tailings		
					Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
8:40 AM	1	240	64.59	65.64	6.1	27.15	24.22	5.2	5.53	8.82	7.3	2.16	53.61	7.3	2.16	53.61
9:20 AM	3	266	67.28	67.73	6.1	23.52	27.00	5.6	6.31	10.10	6.9	2.49	62.47	6.9	2.49	62.47
10:00 AM	5	300	70.43	72.26	6.1	24.06	25.68	5.0	6.66	9.18	7.6	1.84	68.66	7.6	1.84	68.66
10:40 AM	7	210	77.47	75.58	6.1	23.30	22.86	5.6	5.89	8.74	6.9	1.39	66.56	6.9	1.39	66.56
11:20 AM	9	228	76.16	70.77	6.1	23.74	22.96	5.9	6.04	9.17	6.6	1.69	56.35	6.6	1.69	56.35
12:00 PM	11	235	74.76	72.39	6.1	23.43	21.31	6.0	5.84	9.35	6.5	1.82	52.67	6.5	1.82	52.67
12:40 PM	13	244	75.92	75.32	6.1	24.27	21.09	6.2	6.15	9.49	6.3	1.92	56.50	6.3	1.92	56.50
1:20 PM	15	284	71.66	69.53	6.1	24.50	24.21	6.2	6.50	9.51	6.4	2.49	57.75	6.4	2.49	57.75
2:00 PM	17	291	69.39	68.02	6.1	25.20	27.94	5.2	6.65	9.79	7.3	2.09	66.54	7.3	2.09	66.54
2:40 PM	19	219	74.53	70.33	6.1	24.59	25.95	5.2	6.12	9.66	7.4	1.47	64.57	7.4	1.47	64.57
3:20 PM	21	257	74.94	72.33	6.1	24.81	22.17	6.1	6.15	10.04	6.5	1.93	53.88	6.5	1.93	53.88
4:00 PM	23	266	75.55	73.07	6.1	25.05	21.10	6.1	5.90	10.10	6.4	1.82	50.94	6.4	1.82	50.94
4:40 PM	25	213	75.54	75.62	6.1	24.31	21.88	5.4	5.93	9.85	7.2	1.44	59.21	7.2	1.44	59.21
5:20 PM	27	290	70.77	69.13	6.1	24.19	25.59	6.2	6.52	10.32	6.3	2.65	59.73	6.3	2.65	59.73
6:00 PM	29	314	64.51	64.33	6.1	25.19	30.70	6.0	6.36	11.17	6.5	3.23	65.92	6.5	3.23	65.92

Table 18.H.3 (cont.)
WT#3 SUMMARY ACTUAL VS. PREDICTED

Time	Concentrate Ash		Concentrate Solids		Tails Ash		Tails Solids		F.B. Yields	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
8:40 AM	8.82	8.44	5.53	6.83	53.64	66.23	2.16	1.34	64.59	78.26
9:20 AM	10.10	7.78	6.31	7.10	62.47	63.19	2.49	1.85	67.28	75.94
10:00 AM	9.18	8.43	6.66	6.69	68.66	61.73	1.84	1.71	70.43	72.09
10:40 AM	8.74	7.85	5.89	6.88	66.56	67.39	1.39	1.22	77.47	82.08
11:20 AM	9.17	8.01	6.04	7.07	56.35	66.56	1.69	1.25	76.16	83.46
12:00 PM	9.35	8.41	5.84	7.21	52.67	60.20	1.82	1.62	74.76	80.44
12:40 PM	9.49	9.01	6.15	7.16	56.50	64.54	1.92	1.48	75.92	82.79
1:20 PM	9.51	8.41	6.50	7.22	57.75	68.46	2.49	1.54	71.66	81.94
2:00 PM	9.79	8.16	6.65	7.09	66.54	62.68	2.07	1.70	69.39	74.63
2:40 PM	9.66	8.32	6.12	6.73	64.57	58.50	1.47	1.70	74.53	73.88
3:20 PM	10.04	8.77	6.15	7.19	53.88	56.93	1.93	1.93	74.94	78.00
4:00 PM	10.10	9.01	5.90	7.32	50.94	63.56	1.82	1.31	75.55	84.11
4:40 PM	9.85	8.27	5.93	6.94	59.20	65.92	1.44	1.38	75.54	79.23
5:20 PM	10.32	8.57	6.52	7.12	59.78	68.28	2.65	1.66	70.77	80.82
6:00 PM	11.17	7.65	6.36	7.19	65.92	61.31	3.23	2.61	64.51	71.65

* Predicted values using density as an independent variable.

Table 18.H.3 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/01/93

Test: Uncontrolled WT#3

Feed Rate: 6.1 GPM

Launder Water: 3.0 GPM

Froth Wash: 3.5 GPM

Spray Bar: 12 Inches

Sump Level: 30%

Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate Target (CFM)	Froth Ht. Target (in)	Concentrate		Tailings		F.B. Yield (WT%)
							Solids (WT%)	Ash (WT%)	Solids (WT%)	Ash (WT%)	
8:40 AM	1	Manual	1.0	2.0	2.0	24	6.83	8.44	1.34	66.23	78.26
9:00 AM	2	Manual	1.0	2.0	2.0	24	6.89	7.75	1.70	66.35	76.00
9:20 AM	3	Manual	1.0	2.0	2.0	24	7.10	7.78	1.85	63.99	75.90
9:40 AM	4	Manual	1.0	2.0	2.0	24	7.08	8.09	1.95	61.60	75.30
10:00 AM	5	Manual	1.0	2.0	2.0	24	6.69	8.43	1.71	61.73	72.09
10:20 AM	6	Manual	1.0	2.0	2.0	24	6.95	7.86	1.07	70.74	82.56
10:40 AM	7	Manual	1.0	2.0	2.0	24	6.88	7.85	1.22	67.39	82.08
11:00 AM	8	Manual	1.0	2.0	2.0	24	6.99	7.94	1.52	62.60	77.01
11:20 AM	9	Manual	1.0	2.0	2.0	24	7.07	8.01	1.25	66.56	83.46
11:40 AM	10	Manual	1.0	2.0	2.0	24	7.44	8.00	1.61	62.55	81.50
12:00 PM	11	Manual	1.0	2.0	2.0	24	7.21	8.41	1.62	60.20	80.40
12:20 PM	12	Manual	1.0	2.0	2.0	24	7.13	8.57	1.26	67.58	84.88
12:40 PM	13	Manual	1.0	2.0	2.0	24	7.16	9.01	1.48	64.54	82.70
1:00 PM	14	Manual	1.0	2.0	2.0	24	7.27	8.79	1.69	63.21	79.70
1:20 PM	15	Manual	1.0	2.0	2.0	24	7.22	8.41	1.54	68.46	81.90
1:40 PM	16	Manual	1.0	2.0	2.0	24	7.06	8.90	1.89	61.80	78.20
2:00 PM	17	Manual	1.0	2.0	2.0	24	7.09	8.16	1.70	62.68	74.60
2:20 PM	18	Manual	1.0	2.0	2.0	24	7.13	7.83	1.27	70.40	78.50
2:40 PM	19	Manual	1.0	2.0	2.0	24	6.73	8.32	1.70	58.50	73.80
3:00 PM	20	Manual	1.0	2.0	2.0	24	6.84	8.74	1.23	66.26	81.75
3:20 PM	21	Manual	1.0	2.0	2.0	24	7.19	8.77	1.93	56.93	78.00
3:40 PM	22	Manual	1.0	2.0	2.0	24	7.26	8.86	1.81	56.10	80.42
4:00 PM	23	Manual	1.0	2.0	2.0	24	7.32	9.01	1.31	63.56	84.11
4:20 PM	24	Manual	1.0	2.0	2.0	24	6.74	8.80	1.38	65.95	80.31
4:40 PM	25	Manual	1.0	2.0	2.0	24	6.94	8.27	1.38	65.92	79.20
5:00 PM	26	Manual	1.0	2.0	2.0	24	7.01	8.37	1.69	63.84	79.00
5:20 PM	27	Manual	1.0	2.0	2.0	24	7.12	8.57	1.66	68.28	—
5:40 PM	28	Manual	1.0	2.0	2.0	24	6.98	9.28	2.26	57.64	75.40
6:00 PM	29	Manual	1.0	2.0	2.0	24	7.19	7.65	2.61	61.31	71.60

Table 18.H.3 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/01/93
Test: Uncontrolled Wt#3

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Launder Water (GPM)
		(g/min.)	(#/T)	(g/min.)	(#/T)				
8:40 AM	1	0.90	0.95	1.85	1.96	2.05	23.0	3.6	3.1
9:00 AM	2	0.92	0.97	1.86	1.97	2.05	25.0	3.6	3.1
9:20 AM	3	0.93	0.98	1.86	1.97	2.05	24.0	3.6	3.1
9:40 AM	4	0.93	0.98	1.89	2.00	2.05	24.0	3.8	3.0
10:00 AM	5	0.95	1.00	1.86	1.97	2.05	23.0	3.5	3.2
10:20 AM	6	0.94	0.99	1.86	1.97	2.05	23.0	3.9	3.0
10:40 AM	7	0.93	0.98	1.87	1.98	2.05	24.0	3.8	3.1
11:00 AM	8	0.93	0.98	1.89	2.00	2.05	24.0	3.5	3.0
11:20 AM	9	0.92	0.97	1.86	1.97	2.05	24.5	3.4	3.2
11:40 AM	10	0.92	0.97	1.86	1.97	2.05	24.0	3.6	3.1
12:00 PM	11	0.91	0.96	1.86	1.97	2.05	25.0	3.5	3.1
12:20 PM	12	0.93	0.98	1.86	1.97	2.05	24.0	3.6	3.0
12:40 PM	13	0.90	0.95	1.83	1.93	2.05	24.0	3.7	2.9
1:00 PM	14	0.91	0.96	1.90	2.01	2.05	24.5	3.6	3.1
1:20 PM	15	0.93	0.98	1.90	2.01	2.05	24.5	3.7	3.1
1:40 PM	16	0.95	1.00	1.89	2.00	2.05	24.0	3.6	3.1
2:00 PM	17	0.93	0.98	1.82	1.92	2.05	24.5	3.5	3.1
2:20 PM	18	0.93	0.98	1.85	1.96	2.05	24.0	3.6	3.1
2:40 PM	19	0.93	0.98	1.86	1.97	2.05	23.5	3.5	3.0
3:00 PM	20	0.93	0.98	1.89	2.00	2.05	24.5	3.6	3.1
3:20 PM	21	0.93	0.98	1.88	1.99	2.05	23.5	3.7	3.2
3:40 PM	22	0.93	0.98	1.83	1.93	2.05	24.0	3.6	3.1
4:00 PM	23	0.91	0.96	1.92	2.03	2.05	24.0	3.6	3.1
4:20 PM	24	0.92	0.97	1.87	1.98	2.05	24.5	3.7	3.1
4:40 PM	25	0.94	0.99	1.84	1.95	2.05	24.0	3.6	3.1
5:00 PM	26	0.92	0.97	1.86	1.97	2.05	24.0	3.6	3.1
5:20 PM	27	0.94	0.99	1.86	1.97	2.05	24.0	3.7	3.2
5:40 PM	28	0.95	1.00	1.87	1.98	2.05	25.5	3.6	3.1
6:00 PM	29	0.92	0.97	1.87	1.98	2.05	24.5	3.6	3.1

Table 18.H.4
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 6/04/93
Tests: Controlled WT#4

Sample No.	Time	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed			Undiluted Feed			Diluted Concentrate			Tailings		
					Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
1	9:00 AM	237	67.64	68.55	6.1	23.99	26.46	5.3	6.19	10.71	7.2	2.18	60.77	7.2	2.18	60.77
2	9:20 AM	256	66.57	65.26	6.1	23.63	25.96	5.5	6.35	10.08	7.1	2.47	55.70	7.1	2.47	55.70
3	9:40 AM	277	66.24	65.48	6.1	23.90	25.17	5.3	6.45	9.20	7.2	2.42	55.40	7.2	2.42	55.40
4	10:00 AM	266	69.16	70.60	6.1	23.82	24.00	4.8	6.67	8.52	7.8	1.83	61.17	7.8	1.83	61.17
5	10:20 AM	208	70.11	71.92	6.1	23.67	23.20	4.4	6.26	7.87	8.1	1.45	62.46	8.1	1.45	62.46
6	10:40 AM	193	72.03	71.36	6.1	23.81	22.78	4.8	6.11	8.03	7.8	1.46	59.50	7.8	1.46	59.50
7	11:00 AM	209	68.66	67.61	6.1	24.43	24.89	4.8	5.87	8.45	7.7	1.67	59.20	7.7	1.67	59.20
8	11:20 AM	297	61.03	56.66	6.1	25.10	27.71	5.2	6.31	8.67	7.3	2.87	52.60	7.3	2.87	52.60
9	11:40 AM	284	68.45	64.61	6.1	24.21	24.76	5.8	6.54	8.89	6.7	2.61	55.73	6.7	2.61	55.73
10	12:00 PM	---	71.47	68.43	6.1	23.94	25.23	5.3	6.59	9.85	7.3	1.91	53.57	7.3	1.91	53.57
11	12:20 PM	245	73.03	74.83	6.1	23.97	22.57	5.0	6.54	9.84	7.5	1.61	60.41	7.5	1.61	60.41
12	12:40 PM	246	76.22	75.86	6.1	24.28	22.74	5.2	6.84	9.82	7.3	1.52	63.35	7.3	1.52	63.35
13	1:00 PM	248	76.45	76.68	6.1	23.68	22.69	4.9	6.53	9.46	7.7	1.28	66.20	7.7	1.28	66.20
14	1:20 PM	211	76.07	76.27	6.1	23.74	22.87	5.0	6.33	9.46	7.6	1.31	65.98	7.6	1.31	65.98
15	1:40 PM	208	75.42	77.75	6.1	23.53	22.93	4.9	6.14	9.96	7.6	1.29	68.25	7.6	1.29	68.25
16	2:00 PM	215	75.02	74.29	6.1	23.81	24.35	5.0	5.99	9.74	7.5	1.33	66.57	7.5	1.33	66.57

Table 18.H.4 (cont.)
WT#4 SUMMARY ACTUAL VS. PREDICTED

Time	Concentrate Ash			Concentrate Solids			Tails Ash			Tails Solids			F.B. Yields	
	Actual	Predicted	Predicted*	Actual	Predicted		Actual	Predicted	Predicted*	Actual	Predicted		Actual	Predicted
9:00 AM	10.71	10.57	9.41	6.19	5.80		60.79	54.91	55.76	2.18	0.67		67.64	86.41
9:20 AM	10.80	10.66	9.06	6.35	5.66		55.79	49.41	56.19	2.47	1.75		66.57	71.24
9:40 AM	9.20	10.76	9.33	6.45	5.71		55.46	48.04	56.89	2.42	1.69		66.24	71.36
10:00 AM	8.52	11.63	9.18	6.67	5.36		61.17	43.03	61.07	1.83	1.20		69.16	73.27
10:20 AM	7.87	10.82	9.24	6.26	5.66		62.46	40.73	63.52	1.45	0.91		70.11	77.27
10:40 AM	8.03	10.77	9.06	6.11	5.62		59.53	44.14	62.48	1.46	0.97		72.03	77.83
11:00 AM	8.45	10.81	9.08	5.87	5.61		59.21	47.28	61.55	1.67	1.04		68.66	77.05
11:20 AM	8.67	11.39	9.08	6.31	5.41		52.60	45.48	57.22	2.87	1.76		61.03	69.61
11:40 AM	8.89	9.51	9.36	6.54	5.46		53.73	41.92	59.03	2.61	1.53		68.45	75.76
12:00 PM	9.85	9.11	9.23	6.59	5.55		53.57	43.55	61.03	1.91	1.20		71.47	77.23
12:20 PM	9.84	8.77	9.44	6.54	5.74		60.41	41.92	62.21	1.61	0.97		73.03	79.90
12:40 PM	9.82	8.63	9.56	6.84	5.83		63.35	46.54	60.97	1.52	1.13		76.22	78.50
1:00 PM	9.46	8.93	9.09	6.53	5.57		66.20	43.90	63.75	1.28	0.83		76.45	80.98
1:20 PM	9.46	8.95	9.36	6.33	5.65		65.98	49.47	60.47	1.31	1.11		76.07	77.10
1:40 PM	9.96	8.48	9.66	6.14	5.91		68.25	44.34	62.90	1.29	0.91		75.42	80.81
2:00 PM	9.74	8.74	9.24	5.99	5.69		66.57	38.68	68.62	1.33	0.22		75.02	94.44

* Predicted values using density as an independent variable.

Table 18.H.4 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/04/93			Feed Rate: 6.1 GPM			Froth Wash: 3.5 GPM			Sump Level: 30%		
Test: Controlled WT#4			Launder Water: 3.0 GPM			Spray Bar: 12 Inches					
Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate Target (CFM)	Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
							Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
8:20 AM	-1	Controlled	1.00	2.00	2.00	24	5.28	11.65	0.30	46.21	91.90
8:40 AM	0	Controlled	1.00	2.00	2.00	24	5.95	10.51	0.40	49.75	90.85
9:00 AM	1	Controlled	0.83	1.66	2.00	24	5.80	10.57	0.67	54.91	86.41
9:20 AM	2	Controlled	0.73	1.46	2.00	24	5.66	10.66	1.75	49.41	71.24
9:40 AM	3	Controlled	0.70	1.40	2.00	24	5.71	10.76	1.69	48.04	71.36
10:00 AM	4	Controlled	0.70	1.40	1.83	24	5.36	11.63	1.20	43.03	73.27
10:20 AM	5	Controlled	0.70	1.40	1.73	24	5.66	10.82	0.91	40.73	77.27
10:40 AM	6	Controlled	0.70	1.40	1.70	24	5.62	10.77	0.97	44.14	77.83
11:00 AM	7	Controlled	0.70	1.40	1.70	25	5.61	10.81	1.04	47.28	77.05
11:20 AM	8	Controlled	0.70	1.40	1.70	26.82	5.41	11.39	1.70	45.48	69.61
11:40 AM	9	Controlled	1.00	2.00	2.00	24	5.46	9.51	1.53	41.92	75.76
12:00 PM	10	Controlled	1.20	2.00	2.00	24	5.55	9.11	1.20	43.55	77.23
12:20 PM	11	Controlled	1.17	2.34	2.00	24	5.74	8.77	0.97	41.92	79.90
12:40 PM	12	Controlled	1.29	2.59	2.00	24	5.83	8.63	1.13	46.54	78.50
1:00 PM	13	Controlled	1.30	2.60	2.00	24	5.57	8.93	0.83	43.90	80.98
1:20 PM	14	Controlled	1.30	2.60	2.10	24	5.65	8.95	1.11	49.47	77.10
1:40 PM	15	Controlled	1.30	2.60	2.22	24	5.91	8.48	0.91	44.34	80.81
2:00 PM	16	Controlled	1.30	2.60	2.04	24	5.69	8.74	0.22	38.68	94.44

Table 18.H.4 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/04/93

Test: Controlled Wt#4

<u>Time</u>	<u>Sample</u>	<u>MIBC Dose</u>		<u>F.O. Dose</u>		<u>Air Rate</u> (CFM)	<u>Froth Height</u> (In.)	<u>Froth Wash Water</u> (GPM)	<u>Laundry Water</u> (GPM)
		<u>(g/min.)</u>	<u>(#/T)</u>	<u>(g/min.)</u>	<u>(#/T)</u>				
8:20 AM	-1	0.94	0.99	1.84	1.95	2.05	23.5	3.7	3.1
8:40 AM	0	0.92	0.97	1.84	1.95	2.05	23.0	3.6	3.1
9:00 AM	1	0.92	0.97	1.84	1.95	2.05	23.0	3.6	3.0
9:20 AM	2	0.78	0.83	1.60	1.69	2.05	24.0	3.7	3.2
9:40 AM	3	0.67	0.71	1.35	1.42	2.05	23.5	3.5	3.1
10:00 AM	4	0.64	0.68	1.31	1.38	2.05	24.0	3.6	3.1
10:20 AM	5	0.63	0.67	1.28	1.35	1.85	23.5	3.6	3.0
10:40 AM	6	0.63	0.67	1.31	1.38	1.75	23.5	3.6	3.0
11:00 AM	7	0.65	0.69	1.30	1.37	1.72	24.0	3.4	3.0
11:20 AM	8	0.64	0.68	1.31	1.38	1.72	25.5	3.6	3.0
11:40 AM	9	0.92	0.97	1.87	1.98	2.05	24.0	3.6	3.1
12:00 PM	10	0.92	0.97	1.89	2.00	2.05	23.5	3.7	3.0
12:20 PM	11	0.93	0.98	1.92	2.03	2.05	24.0	3.6	3.1
12:40 PM	12	1.08	1.14	2.22	2.35	2.05	24.5	3.7	3.1
1:00 PM	13	1.17	1.24	2.42	2.56	2.05	24.0	3.6	3.1
1:20 PM	14	1.20	1.27	2.44	2.58	2.05	23.5	3.7	3.1
1:40 PM	15	1.22	1.29	2.42	2.56	2.15	24.0	3.6	3.1
2:00 PM	16	1.19	1.26	2.44	2.58	2.25	24.0	3.7	3.1

Table 18.H.5 (cont.)
WT#5 SUMMARY ACTUAL VS. PREDICTED

Time	Concentrate Ash			Concentrate Solids			Tails Ash		Tails Solids		F.B. Yields	
	Actual	Predicted	Predicted*	Actual	Predicted	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
10:00 AM	8.57	8.13	8.97	7.23	6.53	6.53	64.08	50.90	2.35	2.74	71.70	66.34
10:40 AM	9.01	8.96	9.29	6.52	6.58	6.58	70.65	60.10	1.26	1.75	75.56	69.24
11:20 AM	9.08	7.41	8.52	6.46	6.32	6.32	68.60	57.71	1.43	2.07	75.83	67.85
12:00 PM	9.53	7.87	8.71	6.14	6.32	6.32	63.41	58.40	1.52	1.95	77.04	72.95
12:40 PM	9.64	10.11	10.08	6.38	7.02	7.02	62.95	58.12	1.77	1.98	77.40	72.18
1:20 PM	10.61	8.48	8.96	6.63	6.38	6.38	66.87	66.32	2.16	1.06	74.23	84.86
2:00 PM	11.97	9.40	9.49	6.78	6.64	6.64	57.86	---	3.05	---	62.51	---

* Predicted values using density as an independent variable.

Table 18.H.5 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/07/93		Feed Rate: 6.1 GPM		Froth Wash: 3.5 GPM		Sump Level: 30%						
Test: Controlled WT#5		Launder Water: 3.0 GPM		Spray Bar: 12 Inches								
Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate		Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
					Target (CFM)	Target (In)		Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
9:20 AM	-1	Auto	1.00	2.00	2.00	24	6.73	9.58	2.04	57.95	70.54	
9:40 AM	0	Auto	---	---	---	24	6.36	8.08	2.46	54.42	69.75	
10:00 AM	1	Auto	1.17	2.34	2.00	24	6.53	8.13	2.74	50.90	66.34	
10:20 AM	2	Auto	1.28	2.55	2.00	24	6.64	8.44	1.97	58.71	69.47	
10:40 AM	3	Auto	1.30	2.60	2.00	24	6.58	8.96	1.75	60.10	69.24	
11:00 AM	4	Auto	1.30	2.60	2.10	24	6.55	8.47	1.56	62.04	72.43	
11:20 AM	5	Auto	1.30	2.60	2.27	24	6.32	7.91	2.07	57.71	67.85	
11:40 AM	6	Auto	1.30	2.60	2.30	24	6.26	7.58	2.03	58.05	71.69	
12:00 PM	7	Auto	1.30	2.60	2.30	23	6.32	7.87	1.95	58.40	72.95	
12:20 PM	8	Auto	1.30	2.60	2.30	22	6.70	7.83	1.96	58.98	76.55	
12:40 PM	9	Auto	1.30	2.60	2.30	22	7.02	10.11	1.98	58.12	77.18	
1:00 PM	10	Auto	1.30	2.60	2.30	21.25	6.63	8.83	2.01	57.88	76.31	
1:20 PM	11	Auto	1.30	2.60	2.30	19.67	6.38	8.48	1.06	66.32	84.86	
1:40 PM	12	Auto	1.30	2.60	2.30	18	6.45	8.42	2.27	56.33	71.43	
2:00 PM	13	Auto	1.30	2.60	2.30	18	6.64	9.40	-114.13	880.23	-4.55	
2:20 PM	14	Auto	1.30	2.60	2.30	18	6.58	8.62	-114.20	880.32	-3.16	

Table 18.H.5 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/07/93
Test: Controlled Wt#5

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Launder Water (GPM)	Weighted Averages	
		(g/min.)	(#/T)	(g/min.)	(#/T)					Ash	Yield
10:00 AM	1	0.91	0.96	1.91	2.02	2.05	23.0	3.7	3.2	8.35	68.18
10:20 AM	2	1.11	1.17	2.24	2.37	2.05	23.5	3.4	3.1	8.28	68.48
10:40 AM	3	1.22	1.29	2.40	2.54	2.05	24.5	3.6	3.1	8.65	68.84
11:00 AM	4	1.20	1.27	2.42	2.56	2.05	24.0	3.6	3.0	8.63	70.87
11:20 AM	5	1.22	1.29	2.46	2.60	2.15	23.5	3.5	3.0	8.03	69.61
11:40 AM	6	1.21	1.28	2.45	2.59	2.30	23.5	3.6	3.1	7.67	70.54
12:00 PM	7	1.22	1.29	2.44	2.58	2.35	23.0	3.7	3.2	7.70	71.60
12:20 PM	8	1.22	1.29	2.47	2.61	2.35	22.5	3.5	3.0	7.80	74.50
12:40 PM	9	1.21	1.28	2.49	2.63	2.35	22.0	3.6	3.1	8.98	76.20
1:00 PM	10	1.21	1.28	2.47	2.61	2.35	21.5	3.6	3.1	9.09	76.60
1:20 PM	11	1.21	1.28	2.49	2.63	2.35	21.0	3.7	3.1	8.87	80.70
1:40 PM	12	1.24	1.31	2.48	2.62	2.35	18.5	3.4	3.0	8.51	76.72
2:00 PM	13	1.19	1.26	2.42	2.56	2.35	18.0	3.6	3.1	8.92	35.60
2:20 PM	14	1.23	1.30	2.46	2.60	2.35	18.0	3.6	3.0	8.85	8.80

Table 18.H.6
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 6/09/93

Tests: Controlled WT#7

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed			Undiluted Feed			Diluted Concentrate			Tailings		
					Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
8:40 AM	1	248	70.46	67.72	6.0	23.34	21.91	5.5	5.89	8.89	7.0	1.94	49.20	7.0	1.94	49.20
9:20 AM	3	296	75.11	75.56	5.9	24.09	21.81	5.9	6.85	8.70	6.5	2.06	62.30	6.5	2.06	62.30
10:00 AM	5	286	79.76	78.31	6.0	23.68	23.74	5.3	7.39	8.00	7.2	1.38	71.30	7.2	1.38	71.30
10:40 AM	7	215	74.17	77.62	6.0	23.83	21.74	4.9	5.70	8.84	7.6	1.28	66.70	7.6	1.28	66.70
11:20 AM	9	248	76.87	70.30	6.0	25.08	22.59	6.0	5.87	9.27	6.5	1.63	54.10	6.5	1.63	54.10
12:00 PM	11	249	77.93	74.08	6.0	24.56	20.77	6.3	6.01	10.49	6.2	1.73	50.15	6.2	1.73	50.15
12:40 PM	13	240	78.24	75.26	6.1	23.93	20.89	6.0	6.21	9.79	6.6	1.52	54.65	6.6	1.52	54.65
1:20 PM	15	286	74.90	75.87	6.0	23.95	21.87	6.1	6.45	9.66	6.4	2.06	60.26	6.4	2.06	60.26
2:00 PM	17	277	71.82	74.53	6.2	24.01	24.49	5.0	6.71	9.64	7.7	1.71	67.95	7.7	1.71	67.95
2:40 PM	19	224	74.85	75.07	6.2	24.00	22.62	4.9	6.30	9.17	7.8	1.33	63.17	7.8	1.33	63.17
3:20 PM	21	231	78.00	75.39	6.1	23.88	21.51	5.5	6.27	9.80	7.1	1.37	57.39	7.1	1.37	57.39
4:00 PM	23	253	77.62	78.04	6.2	23.88	20.47	5.5	6.22	10.29	7.2	1.37	56.64	7.2	1.37	56.64
4:40 PM	25	211	77.81	77.70	6.2	23.53	20.07	5.2	6.02	9.56	7.5	1.19	56.68	7.5	1.19	56.68
5:20 PM	27	254	76.30	76.56	6.1	23.53	22.38	5.8	6.34	9.98	6.8	1.68	62.89	6.8	1.68	62.89
6:00 PM	29	261	75.44	72.10	6.1	23.69	25.09	6.2	6.66	10.18	6.4	2.10	63.63	6.4	2.10	63.63

Table 18.H.6 (cont.)
WT#7 SUMMARY ACTUAL VS. PREDICTED

Time	Concentrate Ash		Concentrate Solids		Tails Ash		Tails Solids		F.B. Yields	
	Actual	Predicted	Predicted*	Actual	Actual	Predicted	Actual	Predicted	Actual	Predicted
8:40 AM	8.89	7.90	---	5.89	49.22	58.14	1.94	1.93	70.46	73.66
9:20 AM	8.70	9.03	9.01	6.85	62.34	54.16	2.06	2.36	75.11	73.52
10:00 AM	8.00	8.85	8.42	7.39	71.34	57.72	1.38	1.94	79.76	72.86
10:40 AM	8.84	8.36	8.81	5.70	66.48	54.22	1.28	2.19	74.17	67.00
11:20 AM	9.27	8.92	9.29	5.87	54.12	50.24	1.63	1.88	76.87	77.69
12:00 PM	10.49	7.41	9.44	6.01	50.15	60.19	1.73	1.63	77.93	81.98
12:40 PM	9.79	7.98	9.42	6.21	54.65	62.57	1.57	1.46	78.24	81.91
1:20 PM	9.66	7.84	8.97	6.45	60.26	57.84	2.06	1.96	74.90	77.21
2:00 PM	9.64	8.18	8.69	6.71	67.95	52.79	1.71	2.42	71.82	64.25
2:40 PM	9.17	9.88	9.46	6.30	63.17	55.80	1.33	2.03	74.85	68.92
3:20 PM	9.80	7.68	8.96	6.27	57.39	58.82	1.37	1.81	78.00	74.97
4:00 PM	10.29	7.48	8.98	6.22	56.64	59.14	1.37	1.78	77.62	75.20
4:40 PM	9.56	8.92	9.43	6.02	56.68	58.49	1.19	1.79	77.81	72.79
5:20 PM	9.98	8.77	9.23	6.34	62.89	58.69	1.68	1.78	76.30	76.93
6:00 PM	10.18	8.79	9.13	6.66	63.63	57.22	2.10	2.09	75.44	75.97

* Predicted values using density as an independent variable.

Table 18.H.6 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/09/93		Feed Rate: 6.1 GPM			Froth Wash: 3.5 GPM			Sump Level: 30%				
Test: Controlled WT#7		Launder Water: 3.0 GPM			Spray Bar: 12 Inches							
Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate		Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
					Target (CFM)			Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
8:00 AM	-1	Auto	1.00	2.00	2.00		24	7.37	7.71	1.25	64.67	81.27
8:20 AM	0	Auto	—	—	—		—	6.96	8.47	2.07	56.46	72.75
8:40 AM	1	Auto	1.17	2.34	2.00		24	6.78	7.90	1.93	58.14	73.60
9:00 AM	2	Auto	1.28	3.56	2.00		24	7.20	7.79	2.71	50.23	70.39
9:20 AM	3	Auto	1.30	2.60	2.00		24	7.21	9.03	2.36	54.16	73.52
9:40 AM	4	Auto	1.30	2.60	2.10		24	6.77	8.19	2.57	52.94	69.38
10:00 AM	5	Auto	1.30	2.60	2.20		24	7.04	8.85	1.94	57.72	72.86
10:20 AM	6	Auto	1.30	2.60	2.30		24	6.78	8.17	1.76	59.49	73.26
10:40 AM	7	Auto	1.30	2.60	2.30		22.95	6.90	8.36	2.19	54.22	67.00
11:00 AM	8	Auto	1.30	2.60	2.30		20.39	6.66	6.78	1.31	62.28	53.39
11:20 AM	9	Auto	1.30	2.60	2.30		19.50	7.09	8.92	1.88	50.24	77.69
11:40 AM	10	Auto	1.30	2.60	2.30		18	6.84	6.62	1.95	57.72	77.67
12:00 PM	11	Auto	1.30	2.60	2.30		18	7.23	7.41	1.63	60.19	81.98
12:20 PM	12	Auto	1.30	2.60	2.30		18	7.39	7.69	1.80	59.20	80.44
12:40 PM	13	Auto	1.30	2.60	2.30		18	7.26	7.98	1.46	62.57	81.91
1:00 PM	14	Auto	1.30	2.60	2.30		18	7.22	8.46	1.94	57.66	76.66
1:20 PM	15	Auto	1.30	2.60	2.30		18	7.02	7.84	1.96	57.84	77.21
1:40 PM	16	Auto	1.30	2.60	2.30		18	7.17	8.18	1.93	57.54	77.40
2:00 PM	17	Auto	1.30	2.60	2.30		18	6.75	8.18	2.42	52.79	64.25
2:20 PM	18	Auto	1.30	2.60	2.30		18	6.85	7.54	1.58	60.54	74.72
2:40 PM	19	Auto	1.30	2.60	2.30		18	7.13	9.88	2.03	55.80	68.97
3:00 PM	20	Auto	1.30	2.60	2.30		18	6.98	7.61	1.89	56.43	72.30
3:20 PM	21	Auto	1.30	2.60	2.30		18	7.14	7.68	1.81	58.82	74.97
3:40 PM	22	Auto	1.30	2.60	2.30		18	6.95	8.05	1.64	59.84	78.43
4:00 PM	23	Auto	1.30	2.60	2.30		18	7.04	7.48	1.78	59.14	75.24
4:20 PM	24	Auto	1.30	2.60	2.30		18	7.06	8.47	1.66	58.96	75.30
4:40 PM	25	Auto	1.30	2.60	2.30		18	6.94	8.92	1.79	58.49	72.79
5:00 PM	26	Auto	1.30	2.60	2.30		18	6.87	8.77	1.17	64.68	83.10
5:20 PM	27	Auto	1.30	2.60	2.30		18	6.97	8.77	1.78	58.69	76.93
5:40 PM	28	Auto	1.30	2.60	2.30		18	6.96	8.69	2.09	56.99	75.40
6:00 PM	29	Auto	1.30	2.60	2.30		18	6.92	8.79	2.09	57.22	75.97

Table 18.H.6 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/09/93
Test: Controlled Wt#7

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash (GPM)	Laundry Water (GPM)	Weighted Averages	
		(g/min.)	(#/T)	(g/min.)	(#/T)					Ash	Yield
8:00 AM	-1	0.88	0.93	1.83	1.93	—	—	—	—	—	—
8:20 AM	0	0.91	0.96	1.92	2.03	—	—	—	—	—	—
8:40 AM	1	0.91	0.96	1.91	2.02	2.05	24.0	3.7	3.1	8.06	74.63
9:00 AM	2	1.09	1.15	2.22	2.35	2.05	24.0	3.6	3.1	7.94	71.87
9:20 AM	3	1.20	1.27	2.46	2.60	2.05	24.0	3.4	3.0	8.43	72.50
9:40 AM	4	1.19	1.26	2.50	2.64	2.05	25.0	3.6	3.1	8.40	70.93
10:00 AM	5	1.23	1.30	2.50	2.64	2.15	24.5	3.6	3.0	8.66	71.81
10:20 AM	6	1.23	1.30	2.50	2.64	2.25	24.5	3.6	3.1	8.40	72.48
10:40 AM	7	1.25	1.32	2.50	2.64	2.40	24.0	3.7	3.1	8.38	70.06
11:00 AM	8	1.26	1.33	2.51	2.65	2.35	23.0	3.6	3.0	7.54	61.24
11:20 AM	9	1.20	1.27	2.50	2.64	2.35	20.5	3.7	3.1	8.12	67.81
11:40 AM	10	1.21	1.28	2.50	2.64	2.35	19.0	3.6	3.1	7.41	73.60
12:00 PM	11	1.21	1.28	2.44	2.58	2.35	18.5	3.7	3.0	7.40	79.81
12:20 PM	12	1.21	1.28	2.50	2.64	2.35	18.5	3.7	3.1	7.42	80.48
12:40 PM	13	1.23	1.30	2.49	2.63	2.40	18.0	3.7	3.1	7.79	81.43
1:00 PM	14	1.23	1.30	2.44	2.58	2.40	18.5	3.7	3.1	8.17	79.54
1:20 PM	15	1.24	1.31	2.46	2.60	2.35	17.0	3.6	3.1	8.07	78.14
1:40 PM	16	1.19	1.26	2.44	2.58	2.35	17.0	3.6	3.1	8.11	77.38
2:00 PM	17	1.19	1.26	2.50	2.64	2.35	18.5	3.5	3.0	8.12	70.79
2:20 PM	18	1.20	1.27	2.49	2.63	2.40	18.5	3.7	3.2	7.86	71.68
2:40 PM	19	1.20	1.27	2.49	2.63	2.40	17.0	3.7	3.1	8.82	70.08
3:00 PM	20	1.22	1.29	2.50	2.64	2.40	17.0	3.9	3.0	8.36	71.62
3:20 PM	21	1.20	1.27	2.48	2.62	2.40	18.0	3.6	3.1	8.02	73.10
3:40 PM	22	1.22	1.29	2.46	2.60	2.35	18.5	3.7	3.2	7.85	76.22
4:00 PM	23	1.20	1.27	2.46	2.60	2.35	18.5	3.7	3.2	7.70	76.24
4:20 PM	24	1.21	1.28	2.48	2.62	2.35	18.0	3.6	3.2	8.07	75.83
4:40 PM	25	1.21	1.28	2.49	2.63	2.40	17.0	3.5	3.0	8.53	79.00
5:00 PM	26	1.23	1.30	2.48	2.62	2.35	18.0	3.6	3.1	8.77	78.40
5:20 PM	27	1.22	1.29	2.48	2.62	2.35	18.0	3.6	3.1	8.79	78.30
5:40 PM	28	1.23	1.30	2.50	2.64	2.35	18.5	3.6	3.1	8.73	77.20
6:00 PM	29	1.20	1.27	2.50	2.64	2.35	18.0	3.7	3.2	8.76	75.94

Table 18.H.7
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 6/10/93
Tests: Controlled WT#8

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed Flow (GPM)	Undiluted Feed			Diluted Concentrate			Tailings		
						Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
10:20 AM	1	217	70.56	66.91	6.1	6.1	23.07	25.51	5.1	5.92	8.74	7.5	1.68	59.42
11:00 AM	3	256	69.44	69.50	6.1	6.1	22.56	25.35	5.4	6.18	9.03	7.2	2.04	62.54
11:40 AM	5	234	70.40	69.17	6.0	6.0	22.29	20.82	4.8	6.41	9.24	7.7	1.68	66.26
12:20 PM	7	193	76.74	72.07	6.1	6.1	23.23	25.37	5.8	5.30	9.95	6.8	1.37	65.16
1:00 PM	9	247	75.29	70.96	5.9	5.9	24.16	23.97	5.5	6.46	8.90	6.9	1.69	60.79
1:40 PM	11	241	73.14	70.02	6.1	6.1	23.72	20.55	5.7	6.13	8.18	6.9	1.86	50.72
2:20 PM	13	259	67.10	63.63	6.1	6.1	24.73	21.89	5.5	5.74	7.95	7.1	2.18	46.28
3:00 PM	15	264	62.18	62.83	6.0	6.0	23.58	22.28	5.4	6.27	8.37	7.1	2.80	45.76
3:40 PM	17	269	65.36	64.07	6.0	6.0	23.61	23.64	5.1	6.46	8.77	7.4	2.36	50.16
4:20 PM	19	216	66.66	62.26	6.0	6.0	24.05	24.90	4.6	5.46	8.93	7.9	1.59	51.25
5:00 PM	21	236	63.40	58.34	6.0	6.0	23.71	24.87	4.8	5.64	9.00	7.7	2.12	47.09
5:40 PM	23	234	64.26	57.93	6.2	6.2	23.96	23.51	4.8	5.89	8.64	7.9	1.99	43.99
6:20 PM	25	215	64.14	63.26	6.1	6.1	23.35	22.53	5.0	5.03	9.41	7.6	1.85	45.12
7:00 PM	27	262	52.93	51.42	6.1	6.1	23.16	24.93	5.2	5.12	8.43	7.4	3.20	42.34
7:40 PM	29	267	49.42	44.63	5.9	5.9	23.15	28.93	5.0	4.96	8.41	7.4	3.43	45.41

Table 18.H.7 (cont.)
WT#8 SUMMARY ACTUAL VS. PREDICTED

Time	Concentrate Ash			Concentrate Solids			Tails Ash			Tails Solids		F.B. Yields	
	Actual	Predicted	Predicted*	Actual	Predicted	Predicted	Actual	Predicted	Predicted*	Actual	Predicted	Actual	Predicted
10:20 AM	8.74	8.79	9.11	5.92	7.16	57.98	59.42	60.00	57.98	1.63	1.30	90.56	78.72
11:00 AM	9.03	9.91	8.93	6.18	6.43	55.56	62.54	69.37	55.56	2.04	1.54	69.44	76.08
11:40 AM	9.24	9.24	8.83	6.41	6.85	58.99	66.26	68.30	58.99	1.68	1.52	70.40	74.00
12:20 PM	9.95	8.60	9.35	5.30	7.27	60.19	65.16	66.43	60.19	1.37	1.06	76.74	85.50
1:00 PM	8.90	10.66	8.68	6.46	5.90	58.55	60.79	73.32	58.55	1.69	1.32	75.29	78.05
1:40 PM	8.18	10.08	9.40	6.13	6.13	56.44	50.72	62.16	56.44	1.86	1.27	73.14	79.30
2:20 PM	7.85	11.16	9.79	5.74	5.30	52.99	46.28	68.22	52.99	2.18	1.26	67.10	76.49
3:00 PM	8.39	10.54	9.38	6.27	5.85	46.59	45.76	68.67	46.59	2.90	1.91	62.18	70.14
3:40 PM	8.77	8.99	8.98	6.46	6.98	52.72	50.16	70.90	52.72	2.36	1.39	65.36	77.47
4:20 PM	8.93	10.29	9.85	5.46	5.96	56.44	51.25	56.97	56.44	1.54	0.79	66.66	81.44
5:00 PM	9.00	10.70	9.56	5.64	5.75	55.84	47.09	72.75	55.84	2.12	1.45	63.40	71.21
5:40 PM	8.64	10.13	9.02	5.89	6.21	52.63	43.99	58.83	52.63	1.99	1.10	64.26	77.44
6:20 PM	9.41	9.32	9.61	5.03	6.71	55.12	45.12	61.41	55.12	1.85	1.13	64.14	79.52
7:00 PM	8.48	9.67	9.30	5.12	6.60	43.69	42.34	65.47	43.69	3.20	1.72	52.93	72.87
7:40 PM	8.41	10.16	9.72	4.96	6.10	41.60	45.47	53.07	41.60	3.43	2.00	49.42	67.20

* Predicted values using density as an independent variable.

Table 18.H.7 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/10/93			Feed Rate: 6.1 GPM			Froth Wash: 3.5 GPM			Sump Level: 30%				
Test: Controlled WT#8			Launder Water: 3.0 GPM			Spray Bar: 12 Inches							
Time	Sample	Mode	MIBC Target (#/T)	F.O.		Air Rate		Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
				Target (#/T)	Target (CFM)	Target (Wt%)	Target (Wt%)		Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
9:40 AM	-1	Auto	1.00	2.00	2.00	2.00	24	6.26	9.99	1.40	63.59	78.74	
10:00 AM	0	Auto	1.00	2.00	2.00	2.00	24	6.41	9.93	1.52	60.41	75.98	
10:20 AM	1	Auto	1.11	2.22	2.00	2.00	24	7.16	8.79	1.30	60.00	78.72	
10:40 AM	2	Auto	1.03	2.07	2.00	2.00	24	6.20	10.18	1.58	73.08	74.79	
11:00 AM	3	Auto	0.96	1.91	2.00	2.00	24	6.43	9.91	1.54	69.37	76.08	
11:20 AM	4	Auto	1.02	2.05	2.00	2.00	24	6.93	8.97	1.63	67.27	75.97	
11:40 AM	5	Auto	1.10	2.19	2.00	2.00	24	6.85	9.24	1.52	68.30	74.00	
12:00 PM	6	Auto	1.20	2.39	2.00	2.00	24	7.09	8.77	1.06	56.63	82.01	
12:20 PM	7	Auto	1.30	2.60	2.00	2.00	24	7.27	8.60	1.06	66.43	85.50	
12:40 PM	8	Auto	1.18	2.35	2.00	2.00	24	7.12	8.89	1.08	66.21	87.65	
1:00 PM	9	Auto	1.06	2.11	2.00	2.00	24	5.90	10.66	1.32	73.32	78.05	
1:20 PM	10	Auto	1.05	2.09	2.00	2.00	24	6.12	10.15	0.97	71.88	83.95	
1:40 PM	11	Auto	0.94	1.88	2.00	2.00	24	6.13	10.08	1.27	62.16	79.80	
2:00 PM	12	Auto	0.84	1.67	2.00	2.00	24	5.89	10.40	1.71	64.77	73.77	
2:20 PM	13	Auto	0.70	1.40	2.00	2.00	24	5.30	11.16	1.26	68.22	76.49	
2:40 PM	14	Auto	0.70	1.40	1.88	2.00	24	5.40	11.07	1.62	62.33	70.47	
3:00 PM	15	Auto	0.70	1.40	1.78	2.00	24	5.85	10.54	1.91	68.67	70.14	
3:20 PM	16	Auto	0.70	1.40	1.76	2.00	24	6.56	9.72	1.46	65.43	76.72	
3:40 PM	17	Auto	0.70	1.40	1.86	2.00	24	6.98	8.99	1.39	70.90	77.40	
4:00 PM	18	Auto	0.70	1.40	1.93	2.00	24	6.83	9.35	1.03	65.28	80.40	
4:20 PM	19	Auto	0.70	1.40	1.84	2.00	24	5.96	10.29	0.79	56.97	81.40	
4:40 PM	20	Auto	0.70	1.40	1.75	2.00	24	6.39	9.87	1.33	70.62	75.70	
5:00 PM	21	Auto	0.70	1.40	1.70	2.00	24	5.75	10.70	1.45	72.75	71.20	
5:20 PM	22	Auto	0.70	1.40	1.70	2.00	24.87	5.88	10.21	1.55	73.75	70.06	
5:40 PM	23	Auto	0.70	1.40	1.70	2.00	25.68	6.21	10.13	1.10	58.83	77.49	
6:00 PM	24	Auto	0.70	1.40	1.70	2.00	26.26	6.39	9.98	1.00	54.89	80.32	
6:20 PM	25	Auto	0.70	1.40	1.70	2.00	26.02	6.71	9.32	1.13	61.41	79.52	
6:40 PM	26	Auto	0.70	1.40	1.70	2.00	25.31	6.79	9.16	1.51	64.16	79.01	
7:00 PM	27	Auto	0.70	1.40	1.70	2.00	25.34	6.60	9.67	1.72	65.47	72.87	
7:20 PM	28	Auto	0.70	1.40	1.70	2.00	26.42	5.95	10.50	1.89	65.61	70.91	
7:40 PM	29	Auto	0.70	1.40	1.70	2.00	27.59	6.10	10.16	2.00	57.07	67.20	

NOTE: 9.5 Wt% Ash Target

Table 18.H.7 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/10/93
Test: Controlled Wt#8

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Laundry Water (GPM)	Weighted Averages	
		(g/min.)	(#/T)	(g/min.)	(#/T)					Ash	Yield
9:40 AM	-1	0.89	0.94	1.89	2.00	2.05	25.0	3.7	3.2	—	—
10:00 AM	0	0.93	0.98	1.91	2.02	2.05	24.5	3.6	3.1	—	—
10:20 AM	1	0.92	0.97	1.90	2.01	2.05	24.0	3.6	3.0	9.37	77.81
10:40 AM	2	1.02	1.08	2.14	2.26	2.05	24.0	3.7	3.0	9.67	76.30
11:00 AM	3	0.97	1.03	1.96	2.07	2.05	24.0	3.6	3.0	9.82	76.09
11:20 AM	4	0.90	0.95	1.84	1.95	2.05	24.5	3.6	3.1	9.49	75.81
11:40 AM	5	0.94	1.00	1.93	2.04	2.05	24.0	3.6	3.0	9.27	75.01
12:00 PM	6	1.00	1.06	2.06	2.18	2.05	24.5	3.7	3.1	8.96	78.33
12:20 PM	7	1.13	1.19	2.28	2.41	2.05	24.0	3.6	3.1	8.76	82.42
12:40 PM	8	1.23	1.30	2.48	2.62	2.05	24.0	3.6	3.0	8.78	85.99
1:00 PM	9	1.11	1.17	2.22	2.35	2.05	24.5	3.7	3.1	9.73	82.49
1:20 PM	10	0.96	1.01	1.96	2.07	2.05	24.5	3.5	3.0	10.11	82.60
1:40 PM	11	0.96	1.01	1.98	2.09	2.05	23.5	3.6	3.1	10.20	80.89
2:00 PM	12	0.84	0.89	1.80	1.90	2.05	25.0	3.7	3.0	10.25	77.48
2:20 PM	13	0.77	0.81	1.62	1.71	2.05	24.5	3.6	3.1	10.73	76.13
2:40 PM	14	0.64	0.68	1.36	1.44	2.05	24.0	3.7	3.1	10.99	73.03
3:00 PM	15	0.63	0.67	1.32	1.40	1.95	24.0	3.6	3.0	10.82	71.31
3:20 PM	16	0.62	0.66	1.32	1.40	1.85	25.0	3.7	3.1	10.22	73.51
3:40 PM	17	0.61	0.64	1.34	1.42	1.80	25.0	3.6	3.1	9.49	76.01
4:00 PM	18	0.63	0.67	1.33	1.41	1.90	23.5	3.7	3.2	9.29	78.85
4:20 PM	19	0.63	0.67	1.32	1.40	2.00	25.0	3.6	3.1	9.76	80.45
4:40 PM	20	0.64	0.68	1.34	1.42	1.95	23.5	3.6	3.2	9.93	78.42
5:00 PM	21	0.64	0.68	1.36	1.44	1.85	24.5	3.7	3.0	10.35	74.42
5:20 PM	22	0.62	0.66	1.33	1.41	1.75	24.0	3.4	3.1	10.31	71.30
5:40 PM	23	0.63	0.67	1.33	1.41	1.75	24.5	3.6	3.0	10.25	73.95
6:00 PM	24	0.62	0.66	1.32	1.40	1.75	26.0	3.5	3.1	10.07	77.65
6:20 PM	25	0.61	0.65	1.32	1.40	1.75	26.5	3.5	3.1	9.68	79.40
6:40 PM	26	0.60	0.64	1.34	1.42	1.75	26.5	3.7	3.1	9.35	79.39
7:00 PM	27	0.63	0.67	1.34	1.42	1.75	26.0	3.7	3.2	9.44	76.02
7:20 PM	28	0.62	0.66	1.33	1.41	1.75	26.0	3.7	3.2	10.00	72.91
7:40 PM	29	0.61	0.65	1.32	1.40	1.75	26.5	3.6	3.0	10.19	69.38

Table 18.H.8
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 6/15/93
Tests: Uncontrolled WT#9

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed Flow (GPM)	Undiluted Feed			Diluted Concentrate			Tailings		
						Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
1:40 PM	1	243	75.19	75.77	6.1	6.1	25.99	22.29	4.8	7.19	7.64	7.8	1.46	68.09
2:20 PM	3	251	75.82	74.24	6.1	6.1	24.32	22.67	5.2	7.23	7.72	7.4	1.62	65.76
3:00 PM	5	275	71.46	74.10	6.0	6.0	24.30	22.12	5.0	7.06	8.08	7.5	1.88	62.26
3:40 PM	7	198	76.10	76.96	6.1	6.1	23.84	21.09	4.8	6.78	7.89	7.8	1.31	65.15
4:20 PM	9	225	75.26	76.30	5.9	5.9	24.09	20.24	5.3	6.44	8.04	7.1	1.58	59.51
4:00 PM	11	252	79.39	76.32	6.1	6.1	24.11	19.22	6.3	6.32	8.15	6.3	1.77	54.90
5:40 PM	13	244	76.79	74.18	5.9	5.9	24.83	20.10	5.4	6.56	8.48	7.0	1.53	53.48
6:20 PM	15	300	73.44	74.35	6.0	6.0	23.89	21.21	5.9	6.93	8.76	6.6	2.24	57.29
7:00 PM	17	261	75.60	74.80	6.0	6.0	22.94	22.24	5.5	7.02	9.17	7.0	1.78	61.04

Table 18.H.8 (cont.)
WT#9 SUMMARY ACTUAL VS. PREDICTED

Time	Sample	Concentrate Ash			Concentrate Solids			Tails Ash			Tails Solids		F.B. Yields	
		Actual	Predicted	Predicted*	Actual	Predicted	Predicted	Actual	Predicted	Predicted*	Actual	Predicted	Actual	Predicted
1:40 PM	1	7.64	9.52	8.06	7.19	6.90		68.09	61.46	61.50	1.46	1.62	75.19	72.38
2:20 PM	3	7.72	9.94	8.18	7.23	6.98		65.76	71.99	62.12	1.62	1.84	75.82	72.72
3:00 PM	5	8.09	9.57	7.79	7.06	6.56		62.26	61.73	59.61	1.88	2.08	71.46	67.77
3:40 PM	7	7.89	9.92	8.05	6.78	6.47		65.15	68.78	64.99	1.31	1.30	76.10	75.39
4:20 PM	9	8.04	9.28	8.27	6.44	6.26		59.51	67.75	60.91	1.58	1.60	75.26	74.49
5:00 PM	11	8.15	9.91	8.36	6.82	6.40		54.90	62.00	53.94	1.77	1.78	79.39	78.24
5:40 PM	13	8.48	9.59	8.73	6.56	6.33		53.48	52.06	59.49	1.53	1.84	76.79	72.63
6:20 PM	15	8.76	9.63	8.36	6.93	6.04		57.29	78.75	59.50	2.24	2.57	73.44	67.75
7:00 PM	17	9.17	10.10	8.56	7.02	6.09		61.04	63.59	59.92	1.78	1.97	75.60	70.84

* Predicted values using density as an independent variable.

Table 18.H.8 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/15/93
Test: Uncontrolled WT#9

Feed Rate: 6.1 GPM Froth Wash: 3.5 GPM Sump Level: 30%
Launder Water: 3.0 GPM Spray Bar: 12 Inches

Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate Target (CFM)	Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
							Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
1:40 PM	1	Manual	1.0	2.0	2.0	24	6.90	9.52	1.62	61.46	72.41
2:00 PM	2	Manual	1.0	2.0	2.0	24	7.06	8.99	2.02	67.52	69.99
2:20 PM	3	Manual	1.0	2.0	2.0	24	6.98	9.94	1.84	71.99	72.57
2:40 PM	4	Manual	1.0	2.0	2.0	24	6.76	10.01	1.63	80.08	75.56
3:00 PM	5	Manual	1.0	2.0	2.0	24	6.56	9.57	2.08	61.73	67.73
3:20 PM	6	Manual	1.0	2.0	2.0	24	6.89	9.55	1.58	59.96	69.12
3:40 PM	7	Manual	1.0	2.0	2.0	24	6.47	9.92	1.30	68.78	75.58
4:00 PM	8	Manual	1.0	2.0	2.0	24	6.04	9.96	1.26	66.52	76.94
4:20 PM	9	Manual	1.0	2.0	2.0	24	6.26	9.28	1.60	67.75	74.52
4:40 PM	10	Manual	1.0	2.0	2.0	24	6.49	9.98	1.71	68.92	76.84
5:00 PM	11	Manual	1.0	2.0	2.0	24	6.40	9.91	1.78	62.00	78.40
5:20 PM	12	Manual	1.0	2.0	2.0	24	6.45	10.46	1.26	69.40	79.71
5:40 PM	13	Manual	1.0	2.0	2.0	24	6.33	9.59	1.84	52.06	72.69
6:00 PM	14	Manual	1.0	2.0	2.0	24	6.46	10.14	1.63	58.49	75.10
6:20 PM	15	Manual	1.0	2.0	2.0	24	6.04	9.63	2.57	78.75	67.80
6:40 PM	16	Manual	1.0	2.0	2.0	24	5.70	10.59	1.82	61.44	71.96
7:00 PM	17	Manual	1.0	2.0	2.0	24	6.09	10.10	1.97	63.59	71.05

Table 18.H.8 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/15/93

Test: Uncontrolled Wt#9

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Launder Water (GPM)
		(g/min.)	(#/T)	(g/min.)	(#/T)				
1:40 PM	1	0.88	0.93	1.86	1.97	2.00	24.0	3.7	3.1
2:00 PM	2	0.85	0.89	1.90	2.01	2.00	23.5	3.6	3.1
2:20 PM	3	0.90	0.95	1.86	1.97	2.00	23.5	3.7	3.0
2:40 PM	4	0.92	0.97	1.88	1.99	2.05	24.0	3.7	3.1
3:00 PM	5	0.92	0.97	1.89	2.00	2.05	24.5	3.6	3.0
3:20 PM	6	0.92	0.97	1.92	2.03	2.05	23.0	3.5	3.0
3:40 PM	7	0.91	0.96	1.90	2.01	2.05	25.0	3.6	3.1
4:00 PM	8	0.92	0.97	1.86	1.97	2.05	24.5	3.5	3.1
4:20 PM	9	0.93	0.98	1.92	2.03	2.05	24.0	3.6	3.2
4:40 PM	10	0.92	0.97	1.92	2.03	2.05	24.0	3.6	3.0
5:00 PM	11	0.92	0.97	1.89	2.00	2.05	23.5	3.5	3.0
5:20 PM	12	0.92	0.97	1.88	1.99	2.05	23.0	3.5	3.0
5:40 PM	13	0.92	0.97	1.89	2.00	2.05	23.5	3.6	3.1
6:00 PM	14	0.92	0.97	1.90	2.01	2.05	24.0	3.7	3.0
6:20 PM	15	0.91	0.96	1.90	2.01	2.05	24.5	3.6	3.1
6:40 PM	16	0.92	0.97	1.86	1.97	2.05	23.5	3.7	3.0
7:00 PM	17	0.90	0.95	1.86	1.97	2.05	24.0	3.6	3.2

Table 18.H.9
SUMMARY SHEET
Pittsburgh No. 8 Control Testing

Date: 6/16/93
Tests: Controlled WT#10

Time	Sample No.	Solids Feed (#/hr.)	F.B. Yield (Wt%)	A.B. Yield (Wt%)	Feed		Undiluted Feed		Diluted Concentrate			Tailings		
					Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)	Flow (GPM)	Solids (Wt%)	Ash (Wt%)
10:00 AM	1	263	74.26	72.18	6.2	25.32	21.36	7.05	5.9	7.05	8.48	6.8	2.12	54.77
10:40 AM	3	286	74.29	72.48	6.1	24.19	21.17	7.31	5.7	7.31	7.76	6.9	2.09	56.49
11:20 AM	5	215	76.13	75.57	6.0	24.31	21.22	6.52	4.5	6.52	7.38	8.0	1.15	64.03
12:00 PM	7	215	74.52	75.22	6.1	24.88	21.84	5.72	5.3	5.72	8.54	7.3	1.42	62.22
12:40 PM	9	247	78.14	77.45	6.0	24.24	20.64	6.74	5.6	6.74	8.86	6.9	1.53	61.10
1:20 PM	11	254	77.64	75.70	6.0	24.69	20.87	6.59	5.6	6.59	8.98	6.9	1.54	57.92
2:00 PM	13	211	76.18	75.11	6.0	24.31	21.83	6.92	5.5	6.92	8.66	7.0	1.70	61.57
2:40 PM	15	286	77.08	75.09	6.1	23.85	21.98	7.14	5.9	7.14	8.83	6.7	1.87	61.63

Table 18.H.9 (cont.)
WT#10 SUMMARY ACTUAL VS. PREDICTED

Time	Sample	Concentrate Ash			Concentrate Solids		Tails Ash		Tails Solids		F.B. Yields	
		Actual	Predicted	Predicted*	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
10:00 AM	1	8.48	8.98	8.23	7.05	7.07	54.77	69.94	2.12	1.57	74.26	79.52
10:40 AM	3	7.76	9.02	7.95	7.31	6.70	56.49	65.75	2.09	1.55	74.29	78.03
11:20 AM	5	7.38	9.15	---	6.52	7.22	64.03	58.69	1.15	0.99	76.13	80.30
12:00 PM	7	8.54	9.58	8.48	5.72	7.27	62.22	54.85	1.42	1.54	74.52	77.48
12:40 PM	9	8.86	10.13	8.62	6.74	6.83	61.10	63.16	1.53	1.16	78.14	82.60
1:20 PM	11	8.98	9.78	9.02	6.59	6.61	57.92	55.92	1.54	1.19	77.64	81.82
2:00 PM	13	8.66	9.84	8.76	6.92	6.72	61.57	68.90	1.70	1.28	76.18	80.42
2:40 PM	15	8.83	8.69	8.78	7.14	6.31	61.63	58.52	1.87	1.33	77.08	80.68

* Predicted values using density as an independent variable.

Table 18.H.9 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Control Room Measurement)

Date: 6/16/93
Test: Controlled WT#10

Feed Rate: 6.1 GPM Froth Wash: 3.5 GPM Sump Level: 30%
Launder Water: 3.0 GPM Spray Bar: 12 Inches

Time	Sample	Mode	MIBC Target (#/T)	F.O. Target (#/T)	Air Rate Target (CFM)	Froth Ht. Target (In)	Concentrate		Tailings		F.B. Yield (Wt%)
							Solids (Wt%)	Ash (Wt%)	Solids (Wt%)	Ash (Wt%)	
9:20 AM	-1	Auto	1.00	2.00	2.00	24	6.87	9.72	0.88	61.41	85.06
9:40 AM	0	Auto	1.00	2.00	2.00	24	6.99	9.39	0.97	60.30	86.21
10:00 AM	1	Auto	0.90	1.79	2.00	24	7.07	8.98	1.57	69.94	79.58
10:20 AM	2	Auto	0.89	1.77	2.00	24	6.46	10.19	1.72	70.86	75.25
10:40 AM	3	Auto	0.99	1.98	2.00	24	6.70	9.02	1.55	65.75	78.03
11:00 AM	4	Auto	1.01	2.02	2.00	24	6.79	9.83	1.03	67.19	82.56
11:20 AM	5	Auto	1.12	2.23	2.00	24	7.22	9.15	0.99	58.69	80.30
11:40 AM	6	Auto	1.19	2.38	2.00	24	7.08	9.58	0.86	57.07	83.06
12:00 PM	7	Auto	1.28	2.56	2.00	24	7.27	9.58	1.54	54.85	77.48
12:20 PM	8	Auto	1.30	2.60	2.00	24	6.68	9.68	1.35	62.42	80.25
12:40 PM	9	Auto	1.28	2.56	2.00	24	6.83	10.13	1.16	63.16	82.60
1:00 PM	10	Auto	1.18	2.36	2.00	24	6.44	9.92	0.89	60.35	85.16
1:20 PM	11	Auto	1.17	2.35	2.00	24	6.61	9.78	1.19	55.92	81.82
1:40 PM	12	Auto	1.22	2.44	2.00	24	6.91	9.83	1.22	58.45	81.29
2:00 PM	13	Auto	1.26	2.51	2.00	24	6.72	9.84	1.28	68.90	80.42
2:20 PM	14	Auto	1.30	2.60	2.00	24	6.55	9.76	1.50	57.60	79.24
2:40 PM	15	Auto	1.30	2.60	2.12	24	6.31	8.69	1.33	58.52	80.68

Table 18.H.9 (cont.)
PITTSBURGH NO. 8 CONTROL TESTING
(Field Measurements)

Date: 6/16/93

Test: Controlled Wt#10

Time	Sample	MIBC Dose		F.O. Dose		Air Rate (CFM)	Froth Height (In.)	Froth Wash Water (GPM)	Launder Water (GPM)	Weighted Average	
		(g/min.)	(#/T)	(g/min.)	(#/T)					Ash	Yield
9:20 AM	-1	0.91	0.96	1.83	1.93	---	---	---	---	---	---
9:40 AM	0	0.93	0.98	1.86	1.97	---	---	---	---	---	---
10:00 AM	1	0.93	0.98	1.87	1.98	2.05	24.0	3.5	3.0	9.24	82.70
10:20 AM	2	0.84	0.89	1.69	1.79	2.05	24.0	3.6	3.1	9.65	78.52
10:40 AM	3	0.80	0.85	1.66	1.75	2.05	24.5	3.5	3.0	9.40	77.38
11:00 AM	4	0.89	0.94	1.89	2.00	2.05	23.5	3.7	3.0	9.62	79.83
11:20 AM	5	0.93	0.98	1.92	2.03	2.05	24.0	3.7	3.0	9.36	80.67
11:40 AM	6	1.04	1.10	2.15	2.27	2.05	25.0	3.6	3.0	9.48	82.05
12:00 PM	7	1.12	1.18	2.21	2.34	2.05	24.5	3.6	3.0	9.51	79.81
12:20 PM	8	1.18	1.25	2.49	2.63	2.05	24.0	3.6	3.1	9.63	79.80
12:40 PM	9	1.20	1.27	2.49	2.63	2.05	23.5	3.7	3.0	9.89	81.01
1:00 PM	10	1.16	1.23	2.43	2.57	2.05	24.0	3.5	3.2	9.95	83.52
1:20 PM	11	1.09	1.15	2.24	2.37	2.05	24.5	3.5	3.1	9.88	83.08
1:40 PM	12	1.10	1.16	2.22	2.35	2.05	24.5	3.7	3.1	9.83	82.11
2:00 PM	13	1.13	1.19	2.35	2.48	2.05	23.5	3.7	3.1	9.82	80.95
2:20 PM	14	1.14	1.21	2.42	2.56	2.05	24.0	3.6	3.0	9.80	79.97
2:40 PM	15	1.22	1.29	2.46	2.60	2.05	25.0	3.6	3.1	9.24	80.15

Table 18.H.10
DETAILED SAMPLE ANALYSIS
Pittsburgh No. 8 Seam Coal Control Testing
(Dry Basis)

Test Number	Actual Feed			Concentrate				Tailings
	Ash (Wt%)	Sulfur (Wt%)	Pyr. S (Wt%)	Yield (Wt%)	Ash (Wt%)	Sulfur (Wt%)	Pyr. S (Wt%)	Ash (Wt%)
WT#3 T#3	27.00	4.90	3.09	67.73	10.10	4.33	2.27	62.47
WT#3 T#5	25.68	5.41	3.74	72.26	9.18	4.05	1.97	68.66
WT#3 T#7	22.86	4.40	2.33	75.58	8.74	4.04	1.89	66.56
WT#3 T#15	24.21	4.76	2.76	69.53	9.51	4.13	2.05	57.75
WT#3 T#19	25.95	---	---	70.33	9.66	4.20	1.99	64.57
WT#3 T#23	21.10	4.83	2.91	73.07	10.10	4.09	1.80	50.94
WT#3 T#29	30.70	5.83	4.01	64.33	11.17	4.55	2.34	65.92
WT#5 T#1	24.67	4.60	3.00	71.00	8.57	4.05	1.91	64.08
WT#5 T#3	24.55	---	---	74.79	9.01	4.03	1.92	70.65
WT#5 T#5	23.80	4.55	2.71	75.27	9.08	4.08	2.06	68.60
WT#5 T#7	20.99	4.47	2.52	78.73	9.53	4.18	1.95	63.41
WT#5 T#9	21.47	---	---	77.81	9.64	4.05	1.80	62.95
WT#5 T#11	24.78	4.72	2.74	74.81	10.61	4.32	2.13	66.87
WT#5 T#13	29.05	5.41	3.62	62.78	11.97	4.63	2.45	57.86
WT#7 T#5	21.74	4.46	2.38	78.31	8.00	3.83	1.68	71.34
WT#7 T#7	21.74	---	---	77.62	8.84	4.01	1.83	66.48
WT#7 T#9	22.59	---	---	70.30	9.27	4.07	1.86	54.12
WT#7 T#11	20.77	4.97	2.80	74.08	10.49	4.14	1.99	50.15
WT#7 T#17	24.49	---	---	74.53	9.64	4.09	1.92	67.95
WT#7 T#19	22.62	4.63	2.54	75.07	9.17	4.09	1.95	63.17
WT#7 T#23	20.47	---	---	78.04	10.29	4.19	2.09	56.64
WT#7 T#25	20.07	4.55	2.67	77.70	9.56	4.14	2.03	56.68
WT#7 T#29	25.09	5.07	3.15	72.10	10.18	4.26	2.18	63.63
WT#9 T#1	22.29	---	---	75.77	3.98	3.98	1.82	68.09
WT#9 T#3	22.67	4.40	2.52	74.24	4.07	4.07	1.84	65.76
WT#9 T#5	22.12	---	---	74.10	3.94	3.94	1.87	62.26
WT#9 T#7	21.08	---	---	76.96	4.10	4.10	1.83	65.15
WT#9 T#9	20.24	4.69	2.74	76.30	3.94	3.94	1.81	59.51
WT#9 T#11	19.22	4.46	2.60	76.32	3.94	3.94	1.72	54.90
WT#9 T#13	20.10	---	---	74.18	4.00	4.00	1.80	53.48
WT#9 T#15	21.21	4.63	2.62	74.35	4.12	4.12	1.91	57.29
WT#9 T#17	22.24	4.79	2.92	74.80	4.15	4.15	1.98	61.04

Appendix I

**PROJECT DOE-OWNED CAPITAL EQUIPMENT LISTING
(From Decommissioning Report)**

PREVIOUS EDITION USABLE

A

Item Number: 92207-001 Date Purchased: 10/15/92 Capitol Equipment: O
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$923.00

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Model Number: B-24543-4 Serial Number:
Manufacturer: LIGHTNING
Description: VARIABLE SPEED MIXER, 36" LONG, 110VAC, 35 POUNDS

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Item Number: 92207-002 Date Purchased: 10/15/92 Capitol Equipment: O
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$255.00

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Model Number: L-7553-12 Serial Number: F92000968
Manufacturer: COLE-PARMER
Description: MOTORS, 1/100RPM, 110VAC, 5"x10", .06-6ml/MIN

A

Item Number: 92207-003 Date Purchased: 10/15/92 Capitol Equipment: O
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$255.00

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Model Number: L-7553-12 Serial Number: F92001007
Manufacturer: COLE-PARMER
Description: MOTORS, 1/100RPM, 110VAC, 5"x10", .06-6ml/MIN

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Item Number: 92207-004 Date Purchased: 10/15/92 Capitol Equipment: O
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$255.00

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Model Number: L-7553-12 Serial Number: F92000969
Manufacturer: COLE-PARMER
Description: MOTORS, 1/100RPM, 110VAC, 5"x10", .06-6ml/MIN

Item Number: 92207-005 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$255.00

Model Number: L-7553-12 Serial Number: F92001087

Manufacturer: COLE-PARMER

Description: MOTORS, 1/100RPM, 110VAC, 5"x10", .06-6ml/MIN

Item Number: 92207-006 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$35.00

Model Number: L-07553-03 Serial Number:

Manufacturer: COLE-PARMER

Description: MOTOR APP. KIT

Item Number: 92207-007 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$35.00

Model Number: L-07553-03 Serial Number:

Manufacturer: COLE-PARMER

Description: MOTOR APP. KIT

Item Number: 92207-008 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$35.00

Model Number: L-07553-03 Serial Number:

Manufacturer: COLE-PARMER

Description: MOTOR APP. KIT

Item Number: 92207-009 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$35.00

Model Number: L-07553-03 Serial Number:

Manufacturer: COLE-PARMER

Description: MOTOR APP. KIT

Item Number: 92207-010 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$385.00

Model Number: L-07553-05 Serial Number: H92005162

Manufacturer: MASTER FLEX

Description: CONTROLLER, 4-20mA, 110V

Item Number: 92207-011 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$385.00

Model Number: L-07553-05 Serial Number: H92005192

Manufacturer: MASTER FLEX

Description: CONTROLLER, 4-20mA, 110V

Item Number: 92207-012 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$385.00

Model Number: L-07553-05 Serial Number: H92005185

Manufacturer: MASTER FLEX

Description: CONTROLLER, 4-20mA, 110V

Item Number: 92207-013 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$130.00

Model Number: L-07013-52 Serial Number:

Manufacturer: MASTER FLEX

Description: PUMP HEADS, ROLLAR TYPE FOR SIZE 13 HOSE

Item Number: 92207-014 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$130.00

Model Number: L-07013-52 Serial Number:

Manufacturer: MASTER FLEX

Description: PUMP HEADS, ROLLAR TYPE FOR SIZE 13 HOSE

Item Number: 92207-015 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$130.00

Model Number: L-07013-52 Serial Number:

Manufacturer: MASTER FLEX

Description: PUMP HEADS, ROLLAR TYPE FOR SIZE 13 HOSE

Item Number: 92207-016 Date Purchased: 10/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$130.00

Model Number: L-07013-52 Serial Number:

Manufacturer: MASTER FLEX

Description: PUMP HEADS, ROLLAR TYPE FOR SIZE 13 HOSE

Item Number: 92207-017 Date Purchased: 10/15/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$236.00

Model Number: AT14707 Serial Number:

Manufacturer: AQUA MATIC

Description: FLOWMETER, 3/4" NPT, 2-11 GPM

Item Number: 92207-018 Date Purchased: 10/15/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$230.00

Model Number: AT20384 Serial Number:

Manufacturer: AQUA MATIC

Description: FLOWMETER, 1/2" NPT, 1.2-6.8 GPM

Item Number: 92207-019 Date Purchased: 10/15/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$230.00

Model Number: AT2012 Serial Number:

Manufacturer: AQUA MATIC

Description: FLOWMETER, 1/2" NPT, 0.8-4.2 GPM

Item Number: 92207-020 Date Purchased: 10/15/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$230.00

Model Number: AT2012 Serial Number:

Manufacturer: AQUA MATIC

Description: FLOWMETER, 1/2" NPT, 0.8-4.2 GPM

Item Number: 92207-021 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$550.00

Model Number: FEED SUMP Serial Number:

Manufacturer: PTI

Description: 42 GAL, 250 LB, 3/8" MILD STEEL, 20"Lx20"Wx54"H

Item Number: 92207-022 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$375.00

Model Number: DISCHARGE SUMP Serial Number:

Manufacturer: PTI

Description: 100 LB, 3/16" STEEL, 30"Lx20"Wx20"H

Item Number: 92207-023 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$325.00

Model Number: COLUMN BRACKET Serial Number:

Manufacturer: PTI

Description: 1-1/2" ANGLE IRON, 42"Wx36"Lx52"H, 100 LB

Item Number: 92207-024 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$450.00

Model Number: REAGENT RACK Serial Number:

Manufacturer: PTI

Description: 1" ANGLE IRON, 3/16 STEEL, 46"Lx20"Wx40"H, 125 LB

Item Number: 92207-025 Date Purchased: 10/20/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$275.00

Model Number: MULTIPLEXER RACK Serial Number:

Manufacturer: PTI

Description: 2" ANGLE IRON, 37"Wx37"Lx26"H, 80 LB

Item Number: 92207-026 Date Purchased: 10/20/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$225.00

Model Number: LAUNDRY WATER RACK Serial Number:

Manufacturer: PTI

Description: 1" ANGLE IRON, 30"Wx30"Lx21"H, 40 LB

Item Number: 92207-027 Date Purchased: 10/20/92 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$45,000.00

Model Number: SLURRY ASH MONITOR Serial Number:

Manufacturer: PTI

Description: SLURRY ASH MONITOR, 36"Wx36"Lx72"H, 110V, 80PSI, 0-5 GPM, 1000 LB

Item Number: 92207-028 Date Purchased: 10/20/92 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$45,000.00

Model Number: CONTROL PANEL Serial Number:

Manufacturer: PTI

Description: 36"Wx36"Lx72"H, 110V, 4-20mA, 750 LB

Item Number: 92207-029 Date Purchased: 10/20/92 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$9,000.00

Model Number: MULTIPLEXER Serial Number:

Manufacturer: PTI

Description: 36"Wx36"Lx42"H, 20 GPM, 110V, 80 PSI AIR OPERATED, 400 LB

Item Number: 92207-030 Date Purchased: 10/20/92 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$9,000.00

Model Number: PYRITE GAUGE Serial Number:

Manufacturer: PTI

Description: PYRITE GAUGE FOR ASH MONITOR

Item Number: 92207-031 Date Purchased: 10/20/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$647.00

Model Number: SR4B5-31633 Serial Number: 92J-2141

Manufacturer: ILI INDELAC CONTROL INC

Description: 3/4" PT VALVE W/ INDELAC CONTROL, 110V, 4-20mA, 200 IN TORQUE

Item Number: 92207-032 Date Purchased: 10/20/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$638.00

Model Number: SR4B5-31655 Serial Number: 92J-2137

Manufacturer: ILI INDELAC CONTROL INC

Description: 1/2" PT VALVE W/ INDELAC CONTROL, 110V, 4-20mA, 200 IN TORQUE

Item Number: 92207-033 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$638.00

Model Number: SR4B5-31655 Serial Number: 92J-2138

Manufacturer: ILI INDELAC CONTROL INC

Description: 1/2" PT VALVE W/ INDELAC CONTROL, 110V, 4-20mA, 200 IN TORQUE

Item Number: 92207-034 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$638.00

Model Number: SR4B5-31655 Serial Number: 92J-2139

Manufacturer: ILI INDELAC CONTROL INC

Description: 1/2" PT VALVE W/ INDELAC CONTROL, 110V, 4-20mA, 200 IN TORQUE

Item Number: 92207-035 Date Purchased: 10/20/92 Capitol Equipment: ☐

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$638.00

Model Number: SR4B5-31655 Serial Number: 92J-2140

Manufacturer: ILI INDELAC CONTROL INC

Description: 1/2" PT VALVE W/ INDELAC CONTROL, 110V, 4-20mA, 200 IN TORQUE

Item Number: 92207-036 Date Purchased: 10/21/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$34.54

Model Number: 1/4-HHSJ-SS6013 Serial Number:

Manufacturer: SPRAYING SYSTEMS CO

Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-037 Date Purchased: 10/21/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$34.54

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Model Number: 1/4-HHSJ-SS6013 Serial Number:

Manufacturer: SPRAYING SYSTEMS CO

Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-038 Date Purchased: 10/21/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$34.54

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Model Number: 1/4-HHSJ-SS6013 Serial Number:

Manufacturer: SPRAYING SYSTEMS CO

Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-039 Date Purchased: 10/21/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$34.54

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Model Number: 1/4-HHSJ-SS6013 Serial Number:

Manufacturer: SPRAYING SYSTEMS CO

Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-040 Date Purchased: 10/21/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$38.08

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Model Number: 3/8-HHSJ-SS6040 Serial Number:

Manufacturer: SPRAYING SYSTEMS CO

Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-041 Date Purchased: 10/21/92 Capitol Equipment: 0
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$38.08

Model Number: 3/8-HHSJ-SS6040 Serial Number:
Manufacturer: SPRAYING SYSTEMS CO
Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-042 Date Purchased: 10/21/92 Capitol Equipment: 0
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$38.08

Model Number: 3/8-HHSJ-SS6040 Serial Number:
Manufacturer: SPRAYING SYSTEMS CO
Description: SPIRAL JET SPRAY NOZZLES

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Item Number: 92207-043 Date Purchased: 10/21/92 Capitol Equipment: 0
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,125.00

Model Number: 847DF-MILNKE Serial Number: 92440113
Manufacturer: FOXBORO
Description: DP CELL, 4-20mA, 110V, 0-25" H2O

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Item Number: 92207-044 Date Purchased: 10/21/92 Capitol Equipment: 0
Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,125.00

Model Number: 847DF-MILNKE Serial Number: 92440114
Manufacturer: FOXBORO
Description: DP CELL, 4-20mA, 110V, 0-25" H2O

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Item Number: 92207-045 Date Purchased: 10/23/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,750.00

Model Number: 743CA-AP Serial Number: 92F374852-2

Manufacturer: FOXBORO

Description: CLASS I DIV II CONTROLLER, 4-20mA, 110V, 50/60 Hz

Item Number: 92207-046 Date Purchased: 10/23/92 Capitol Equipment: ☐

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$1,750.00

Model Number: 743CA-AP Serial Number: 92F374852-1

Manufacturer: FOXBORO

Description: CLASS I DIV II CONTROLLER, 4-20mA, 110V, 50/60 Hz

Item Number: 92207-047 Date Purchased: 10/23/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,457.00

Model Number: 823DP-13KINLI Serial Number: 92440115

Manufacturer: FOXBORO

Description: 0-12" TRANSMITTER, 4-20mA, 12.5-65 VDC, MWP 3010 PSI

Item Number: 92207-048 Date Purchased: 10/23/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,331.00

Model Number: 823DP-1SKINMI Serial Number: 92440116

Manufacturer: FOXBORO

Description: 0-30" TRANSMITTER, 4-20mA, 12.5-65 VDC, MWP 3010 PSI

Item Number: 92207-049 Date Purchased: 10/23/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,331.00

Model Number: 823DP-13KINMI Serial Number: 92440117

Manufacturer: FOXBORO

Description: 0-42" TRANSMITTER, 4-20mA, 12.5-65 VDC, MWP 3010 PSI

Item Number: 92207-050 Date Purchased: 10/23/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,331.00

Model Number: 823DP-13KINMI Serial Number: 92440118

Manufacturer: FOXBORO

Description: 0-60" TRANSMITTER, 4-20mA, 12.5-65 VDC, MWP 3010 PSI

Item Number: 92207-051 Date Purchased: 10/23/92 Capitol Equipment: 0

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$1,331.00

Model Number: 823DP-13KINMI Serial Number: 92440119

Manufacturer: FOXBORO

Description: 0-60" TRANSMITTER, 4-20mA, 12.5-65 VDC, MWP 3010 PSI

Item Number: 92207-052 Date Purchased: 10/23/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,230.00

Model Number: 99661405 Serial Number: 92W445645

Manufacturer: FISCHER & PORTER

Description: MAG FLOWMETER 25mm SIZE, 0-20 GPM, 740 PSI MAX, 4-20mA, 110V, 60 Hz

Item Number: 92207-053 Date Purchased: 10/23/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,230.00

Model Number: 99661405 Serial Number: 92W445646

Manufacturer: FISCHER & PORTER

Description: MAG FLOWMETER 25mm SIZE, 0-20 GPM, 740 PSI MAX, 4-20mA, 110V, 60 Hz

Item Number: 92207-054 Date Purchased: 10/23/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,230.00

Model Number: 99661405 Serial Number: 92W445647

Manufacturer: FISCHER & PORTER

Description: MAG FLOWMETER 25mm SIZE, 0-20 GPM, 740 PSI MAX, 4-20mA, 110V, 60 Hz

Item Number: 92207-055 Date Purchased: 10/23/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,230.00

Model Number: 9966X0005 Serial Number: 92W445573

Manufacturer: FISCHER & PORTER

Description: MAG FLOWMETER 15mm SIZE, 0-10 GPM, 740 PSI MAX, 4-20mA, 110V, 60 Hz

Item Number: 92207-056 Date Purchased: 10/23/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,230.00

Model Number: 9966X0005 Serial Number: 92W445574

Manufacturer: FISCHER & PORTER

Description: MAG FLOWMETER 15mm SIZE, 0-10 GPM, 740 PSI MAX, 4-20mA, 110V, 60 Hz

Item Number: 92207-057 Date Purchased: 10/23/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,605.00

Model Number: 9965Y0166 Serial Number: 92W140598

Manufacturer: FISCHER & PORTER

Description: AIR FLOW METER, 1/2" NPT

Item Number: 92207-058 Date Purchased: 11/3/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$165.00

Model Number: 502-189 Serial Number:

Manufacturer: PROGRAMMERS SHOP

Description: MICROSOFT VISUAL BASIC SOFTWARE

Item Number: 92207-059 Date Purchased: 11/3/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$99.00

Model Number: 502-321 Serial Number:

Manufacturer: PROGRAMMERS SHOP

Description: MICROSOFT VISUAL BASIC PRO KIT SOFTWARE

Item Number: 92207-060 Date Purchased: 11/3/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$115.00

Model Number: 4373-021 Serial Number:

Manufacturer: PROGRAMMERS SHOP

Description: CRYSTAL COMM SOFTWARE

Item Number: 92207-061 Date Purchased: 11/3/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$99.00

Model Number: 1327-005 Serial Number:

Manufacturer: PROGRAMMERS SHOP

Description: AGILITY/VISUAL BASIC SOFTWARE

Item Number: 92207-062 Date Purchased: 11/3/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$219.00

Model Number: 5474-001 Serial Number:

Manufacturer: PROGRAMMERS SHOP

Description: WIN-LINK

Item Number: 92207-063 Date Purchased: 11/5/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,950.00

Model Number: 2224-B08-8-A00-10-AB Serial Number:

Manufacturer: MOTT METALLURGICAL

Description: SPARGER ELEMENTS, 1/2" NPT STAINLESS STEEL

Item Number: 92207-064 Date Purchased: 11/5/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,950.00

Model Number: 2224-B08-8-A00-10-AB Serial Number:

Manufacturer: MOTT METALLURGICAL

Description: SPARGER ELEMENTS, 1/2" NPT STAINLESS STEEL

Item Number: 92207-065 Date Purchased: 11/10/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$755.00

Model Number: TPX101/XE/BE5 Serial Number: 9211-12

Manufacturer: TGM DETECTORS

Description: X-RAY PROPORTIONAL COUNTERS

Item Number: 92207-066 Date Purchased: 11/10/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$755.00

Model Number: TPX101/XE/BE5 Serial Number: 9211-13

Manufacturer: TGM DETECTORS

Description: X-RAY PROPORTIONAL COUNTERS

Item Number: 92207-067 Date Purchased: 11/11/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,517.00

Model Number: 56701 Serial Number: 10/92

Manufacturer: HYDRO POWER MOYNO

Description: HP 1.5, 230/460 VOLTS, 1725 RPM. 4.2/2.1 AMPS, 150 LB, 29"Lx12"Wx9"H, 25 GPM

Item Number: 92207-068 Date Purchased: 11/11/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$2,517.00

Model Number: 56701 Serial Number: 10/92

Manufacturer: HYDRO POWER MOYNO

Description: HP 1.5, 230/460 VOLTS, 1725 RPM. 4.2/2.1 AMPS, 150 LB, 29"Lx12"Wx9"H, 25 GPM

Item Number: 92207-069 Date Purchased: 11/11/92 Capitol Equipment: 0

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$69.75

Model Number: 340-3506-120 Serial Number:

Manufacturer: HYDRO POWER MONYO

Description: STATOR

Gone (Used)

Item Number: 92207-070 Date Purchased: 11/11/92 Capitol Equipment: 0

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$296.80

Model Number: 320-6511-000 Serial Number:

Manufacturer: HYDRO POWER MOYNO

Description: PUMP SEAL

Item Number: 92207-071 Date Purchased: 11/11/92 Capitol Equipment: 0

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$137.27

Model Number: 320-1749-000 Serial Number:

Manufacturer: HYDRO POWER MOYNO

Description: FLEX JOINT

Item Number: 92207-072 Date Purchased: 11/11/92 Capitol Equipment: 0

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$486.00

Model Number: SA-1A Serial Number: 396143

Manufacturer: WARREN RUPP

Description: SANDPIPER PUMP, 30 GPM, 35 CFM, 70 PSI, 11"Lx10"Wx14"H, 50 LB

Item Number: 92207-073 Date Purchased: 11/13/92 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$7,200.00

Model Number: COLUMN Serial Number:

Manufacturer: CALUMET MACHINE

Description: 12"Wx15"H W/ 2-INTERNAL CYLINDERS, 2 SETS ALIGNMENT FLANGES, 12 GPM, 40 PSI, 1300 LB

Item Number: 92207-074 Date Purchased: 11/20/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$99.00

Model Number: Serial Number:

Manufacturer: PROGRAMMERS SHOP

Description: VISUAL BASIC UPGRADE KIT SOFTWARE

Item Number: 92207-075 Date Purchased: 12/3/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$550.00

Model Number: 8150 Serial Number: 8196311

Manufacturer: PITNEY BOWES

Description: FAX MACHINE, 115V, 6.5 AMP

Item Number: 92207-076 Date Purchased: 12/9/92 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$495.00

Model Number: TC-174 Serial Number:

Manufacturer: OXFORD TENNELEC NUCLEOUS

Description: FET PREAMP

Gone (Used)

Item Number: 92207-077 Date Purchased: 12/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$1,589.00

Model Number: AI-0008 Serial Number:

Manufacturer: TRANSITION TECHNOLOGY

Description: ANALOG IN, 18 CHANNELS VDL

Item Number: 92207-078 Date Purchased: 12/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$230.00

Model Number: TE-07 Serial Number:

Manufacturer: TRANSITION TECHNOLOGY

Description: BASE 8/16 CHANNEL

Item Number: 92207-079 Date Purchased: 12/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$1,589.00

Model Number: AO-42008 Serial Number:

Manufacturer: TRANSITION TECHNOLOGY

Description: ANALOG OUT 8 CHANNEL

Item Number: 92207-080 Date Purchased: 12/15/92 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$182.00

Model Number: TE-03 Serial Number:

Manufacturer: TRANSITION TECHNOLOGY

Description: BASE 8 OR 16 CHANNEL

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: 92207-089 Date Purchased: 12/18/92 Capitol Equipment: ☐

Quantity: 1 Condition: P5 Asset Code: 780 Price: \$49.72

Model Number: 8299T24 Serial Number:

Manufacturer: McMASTER CARR

Description: 5 CHANNEL, 49MHz, HEADSET

Item Number: 92207-090 Date Purchased: 12/18/92 Capitol Equipment: ☐

Quantity: 1 Condition: P5 Asset Code: 780 Price: \$49.72

Model Number: 8299T24 Serial Number:

Manufacturer: McMASTER CARR

Description: 5 CHANNEL, 49MHz, HEADSET

Item Number: 92207-091 Date Purchased: 1/12/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$76.00

Model Number: VCIN-40 Serial Number:

Manufacturer: HYDRO POWER MOYNO

Description: 4-20mA BOARD FOR PUMPS VC150-EC

Item Number: 92207-092 Date Purchased: 1/12/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$76.00

Model Number: VCIN-40 Serial Number:

Manufacturer: HYDRO POWER MOYNO

Description: 4-20mA BOARD FOR PUMPS VC150-EC

Item Number: 92207-093 Date Purchased: 1/15/93 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$6,772.00

Model Number: SKID MODULES Serial Number: -

Manufacturer: LINCOLN CONTRACTING

Description: FABRICATION OF MODULES, 12'x10'x10'

Item Number: 92207-094 Date Purchased: 1/15/93 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$6,772.00

Model Number: SKID MODULES Serial Number:

Manufacturer: LINCOLN CONTRACTING

Description: FABRICATION OF MODULES, 12'x10'x10'

Item Number: 92207-095 Date Purchased: 1/15/93 Capitol Equipment: C

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$6,772.00

Model Number: SKID MODULES Serial Number:

Manufacturer: LINCOLN CONTRACTING

Description: FABRICATION OF MODULES, 10'x8'x10'

Item Number: 92207-096 Date Purchased: 1/27/93 Capitol Equipment: O

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$242.00

Model Number: AT-20698 Serial Number:

Manufacturer: AQUA MATIC

Description: FLOW METER 3.5-18 GPM

Item Number: 92207-097 Date Purchased: 1/28/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 770 Price: \$350.00

Model Number: 7031 Serial Number: 12811153259

Manufacturer: ACER

Description: COMPUTER MONITOR, 11 INCH, W/VGA ADAPTER CARD

Item Number: 92207-098 Date Purchased: 1/29/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$1,136.00

Model Number: 2G410D10AA Serial Number: 0193368

Manufacturer: JAMESBURY

Description: 232 RAD GLOBE VALVE, 25 PSI, 5/6" 2-15 PSI

Item Number: 92207-099 Date Purchased: 2/1/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$225.00

Model Number: TAG-6000-41 Serial Number:

Manufacturer: FAIRCHILD PRODUCTS

Description: 4-20mA, 5-15 PSI, 110V TRANSDUCER

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: Date Purchased: Capitol Equipment:

Quantity: Condition: Asset Code: Price:

Model Number: Serial Number:

Manufacturer:

Description:

Item Number: 92207-104 Date Purchased: 3/4/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$370.00

Model Number: RH1CTC-LF Serial Number: 44941-7

Manufacturer: FLUID METERING INC

Description: PUMP HEAD, PISTON TYPE, HIGH FLOW

Item Number: 92207-105 Date Purchased: 3/4/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$32.00

Model Number: RHM Serial Number:

Manufacturer: FLUID METERING INC

Description: MASTER FLEX PUMP HEAD KIT

Item Number: 92207-106 Date Purchased: 3/4/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$32.00

Model Number: RHM Serial Number:

Manufacturer: FLUID METERING INC

Description: MASTER FLEX PUMP HEAD KIT

Item Number: 92207-107 Date Purchased: 3/4/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$32.00

Model Number: RHM Serial Number:

Manufacturer: FLUID METERING INC

Description: MASTER FLEX PUMP HEAD KIT

Item Number: 92207-108 Date Purchased: 3/4/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$190.00

Model Number: PD 60-F Serial Number: 05575

Manufacturer: FLUID METERING INC

Description: PULSE DAMPENER REGULATOR

Item Number: 92207-109 Date Purchased: 3/4/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$190.00

Model Number: PD 60-F Serial Number: 05576

Manufacturer: FLUID METERING INC

Description: PULSE DAMPENER REGULATOR

Item Number: 92207-110 Date Purchased: 3/11/93 Capitol Equipment: ☐

Quantity: 1 Condition: P4 Asset Code: 735 Price: \$190.00

Model Number: PD 60-F Serial Number: 05577

Manufacturer: FLUID METERING INC

Description: PULSE DAMPENER REGULATOR

Item Number: 92207111 Date Purchased: 3/24/93 Capitol Equipment: ☐

Quantity: 1 Condition: P1 Asset Code: 735 Price: \$90.00

Model Number: 476-083-365 Serial Number:

Manufacturer: MOYNO RUPP

Description: WETTEN END KIT

**DATE
FILMED**

12 / 30 / 93

END