Final Report
PROPAT® as Dredged Material Stabilizing Agent
Claremont Channel Deepening Project

Prepared for
Hugo Neu Schnitzer East

June 22, 2005
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Final Report
PROPAT® as Dredged Material Stabilizing Agent
Claremont Channel Deepening Project

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EXECUTIVE SUMMARY

As part of the Claremont Channel Deepening Project conducted between 2000 and 2003, Hugo Neu Schnitzer East (HNSE) conducted a study to demonstrate innovative means for conditioning dredged sediments so they may be used as fill material in an upland environment. To be suitable for this use, the material must be able to be handled with standard earth moving equipment and not pose a threat to the environment. The dredged sediment was amended with PROPAT®, a trademarked product of Hugo Neu Schnitzer East, and pozzolanic materials. PROPAT® is manufactured from non-metallic materials recovered from shredding of scrap automobiles, white goods, and other discarded objects, which are combined with a proprietary mix of additives.

This study included bench-scale testing, a pilot test, and field demonstration and monitoring of a test cell. The sediment amending process was based on standard bulk material processing technologies. For the field demonstration, the PROPAT® amended dredged material (ADM) was processed by Clean Earth Dredging Technologies, Inc. (CEDT) at its Claremont Channel facility. The test cell was constructed with about 5,000 cubic yards (cy) of PROPAT®-ADM. Geotechnical testing and long-term environmental monitoring were conducted on the test cell.

During construction of the test cell, PROPAT®-ADM proved amenable to placement and working with standard earth-moving equipment at full scale. Bulk chemical analyses indicate that PROPAT®-ADM met most of the cleanup criteria listed by New Jersey Department of Environmental Protection for direct contact of non-residential soils (NRDCSCC). Six samples of PROPAT®-ADM were analyzed during bench-scale testing. Of these, the NRDCSCC for arsenic was exceeded in five samples, copper in three samples, thallium in one sample, zinc in four samples, and total PCBs in two samples.

Results of field sampling and analyses of water from the test cell indicate concentrations below New Jersey Ground Water Quality Standards (GWQS) for most analytes. Exceedances of GWQS for aluminum, arsenic, and nickel were noted in every round of sampling. Iron also exceeded GWQS in one well on seven of the eight sampling events. Phenol was above its GWQS in two wells, one during five of the eight sampling rounds and one during a single round.

PROPAT®-ADM was developed for use as fill material at sites anticipated to have engineering and/or institutional controls and in areas where groundwater quality, as it pertains to potable use, is not of concern. Examples of such sites are regulated landfills, brownfield sites, and certain industrial properties. Appropriate controls may include means to avoid direct contact of the material

by humans and biota, such as caps of clean soils, pavement, or overlying buildings. Site access may also be limited by fences and similar measures. Institutional controls may include deed notices, declarations of environmental restriction, closure plans, and ongoing permit requirements.

Based on the data collected, the use of PROPAT®-ADM with marginal exceedances of NRDCSCC will not pose a risk to human health or the environment. In regard to potential effects on groundwater, the exceedances of GWQS noted for some metals detected during this demonstration would be expected to be diluted and/or attenuated in actual applications. Based upon the data collected, the use of PROPAT®-ADM as fill will not pose a risk to human health or the environment via groundwater.

This project has demonstrated the suitability of PROPAT® as a stabilizing agent for dredged sediments, based on environmental and geotechnical factors. Its use would also provide economic benefits by reducing costs of managing dredged materials and costs of managing shredder residue (i.e., PROPAT®). Exorbitant landfill disposal fees for shredder residue can be avoided and offset by more reasonable "tipping fees" paid to dredge material processors and/or to owners of upland sites in need of fill materials. The use of PROPAT®-ADM for upland fill will reduce the overall costs of dredging projects, thereby reducing the costs of maintaining our ports and channels.

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FINAL REPORT
PROPAT® AS DREDGED MATERIAL
STABILIZING AGENT
CLAREMONT CHANNEL DEEPENING PROJECT

INTRODUCTION

Background

Hugo Neu Schnitzer East (HNSE), in conjunction with the New Jersey Department of Transportation, Office of Maritime Resources, dredged the state-owned Claremont Channel to provide improved access and safe navigation for vessels calling on the Claremont Channel Terminal. According to a design by the Port Authority of New York and New Jersey, between 2000 and 2003 approximately 750,000 cubic yards (cy) of sediment were dredged to provide a navigational depth of 30 feet below mean low water. Chemical analysis of the Claremont Channel sediment indicated that the dredged material was unsuitable for ocean disposal and required alternative placement locations (Hart Crowser 1999). Because of the large volume of sediment to be dredged, various options for placement of the material were considered.

One option was to use dredged material as non-structural bulk fill at the brownfield remediation project located at the nearby Port Liberté site. Plans for remediation of this site included placement of fill atop contaminated soil to construct a golf course. New Jersey Maritime Resources suggested combining the Claremont Channel deepening project with the Port Liberté restoration project by using the dredged sediment as non-structural bulk fill. The dredged material would undergo conditioning and stabilization to minimize the potential for leaching of contaminants, to increase its strength, and to lower its hydraulic conductivity.

Bench-scale testing of pozzolanic stabilizing materials such as cement kiln dust, lime kiln dust, coal fly ash, and cement were conducted. HNSE suggested refining this approach by adding PROPAT® as a conditioning and stabilizing additive. PROPAT® is a trademarked product of HNSE. It is manufactured from non-metallic materials recovered from shredding of scrap automobiles, white goods, and other discarded objects, which are combined with a proprietary mix of additives. PROPAT® has been approved as interim daily landfill cover in several states and was approved for “cushion” material above a liner at the landfill in Pennsauken, New Jersey.

A program was initiated to study PROPAT®-amended dredged material (PROPAT®-ADM). This program, as described below, included further bench-scale testing, a pilot test, and field demonstration and monitoring of a test cell. The pilot test involved placement of approximately 500 cy of PROPAT®-ADM with geotechnical and environmental testing. The field demonstration test cell was constructed with about 5,000 cy of PROPAT®-ADM. Geotechnical testing and long-term environmental monitoring were conducted on the field demonstration test cell.

Purpose

This program was implemented to determine means for amending dredged sediments (e.g., from the Claremont Channel) such that the amended sediments can be beneficially reused as fill material in an upland environment. This concept also provides for the beneficial reuse of PROPAT® and other amending agents that may otherwise be discarded as wastes. PROPAT®-ADM must be able to be handled with standard earth moving equipment, meet certain geotechnical criteria, and not pose a threat to the environment to be acceptable for this use.

PROJECT DESIGN AND METHODS

Performance Goals

The objective of the project was to develop and demonstrate a process to amend dredged sediments into a usable, non-structural fill material that could be handled with standard earth-moving equipment and would be protective of the environment. The dredged sediment was amended with PROPAT® and other additives to produce a material meeting certain geotechnical and environmental performance criteria.

The project included a range of activities from bench-scale testing of various mixes of sediment and additives through pilot-scale testing to a full-scale field demonstration and monitoring stage. A variety of analyses were conducted to document the characteristics of the materials at each stage.

Geotechnical Criteria

The geotechnical properties established for the amended sediment were such that it would be workable and manageable by standard earth-moving equipment and have sufficient strength and elasticity to be suitable as fill material. Preliminary quantitative specifications for the bulk fill material, as provided by

Liberty National Development Corporation (LNDC), included an unconfined compressive strength greater than 30 pounds per square inch (psi) and an unit weight greater than 85 pounds per cubic foot (pcf).

During the course of the study, criteria for fill at other sites in northern New Jersey were sought. Dredged material is typically used as a "controlled fill material" subject only to requirements for compaction, moisture, and density. The only additional material-specific, numerical criterion that was identified is for material to be used for landfill closure by the New Jersey Meadowlands Commission. Soil for this purpose is required to have an unconfined compressive strength greater than 14 psi.

Environmental Criteria

Bulk concentrations of constituents in the amended sediment, as well as the concentrations at which they could leach from the sediment into the groundwater, had to be low enough to be protective of the environment in the settings where the material was to be used. Bulk chemical concentrations of raw and amended sediments were compared to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (NJDEP 1999). Concentrations of materials in sediment leachates were compared to the New Jersey Groundwater Quality Standards (GWQS) (NJAC 7:9-6). Synthetic leachates were derived from several standard laboratory procedures (e.g., modified elutriate test, Synthetic Precipitate Leaching Procedure (SPLP), and multiple extraction procedure) and actual water from the test cell was sampled and analyzed during the field demonstration from wells installed within the test cell.

Amendment Process Technology

The sediment amendment process used for the program was based on standard bulk material processing technologies. For the field demonstration, the PROPAT®-ADM was processed by Clean Earth Dredging Technologies, Inc. (CEDT) at its Claremont Channel facility. Sediment was dredged from Claremont Channel and stored in barges at the CEDT facility. The barges were decanted with the water passing through a series of tanks with filters before discharge back into Claremont Channel.

The sediment was transferred from the barges into the intake hopper of a coarse vibrating screen, which removed debris larger than 4 inches. The screened material was then transferred to a conveyor belt through an adjustable feed discharge hopper fitted with augers. The conveyor carried the sediment to the PROPAT® feeder conveyor. The rate of discharge from the hopper was adjusted and measured with load cells integrated with the conveyor belt. The weight data were used by the computerized controls to adjust the quantities of additives and maintain the proper ratios.

The combined materials were mixed in a pug mill. A diagram of the process flow is shown on Figure 1.

Bench-Scale Tests

A phased, bench-scale testing program was implemented to determine the proportions of the mix of dredged material, PROPAT®, and pozzolanic additives that would meet the geotechnical and environmental criteria for use as bulk fill at non-residential sites.

Bench-scale tests completed in 2000 included four phases. First, sediment with pozzolanic additives, but without PROPAT®, was evaluated for strength and leachability. Second, sediment with PROPAT® and pozzolanic additives was subjected to preliminary geotechnical testing to determine whether the material behaved as a soil or grout (flowable versus non-flowable) mix. Third, the geotechnical and chemical properties of various PROPAT®-amended mixes were evaluated. Fourth, an optimum mix was developed and tested for use in later pilot and field demonstration work (Hart Crowser 2000a).

Supplemental testing was conducted in 2001 on raw sediment from Claremont Channel and on PROPAT®-amended mixes. Samples were tested for geotechnical properties and environmental chemistry (Hart Crowser 2001).

Pilot Test

The pilot program included the placement of approximately 500 cy of PROPAT®-ADM on a prepared plot. The sediment was dredged from the Claremont Channel, amended using full-scale mixing methods, and placed using standard earth moving equipment and techniques. The original work plan proposed evaluating three mixing methods, including in-barge mixing, pug mill mixing, and *in situ* mixing. Based on bench-scale results, additional practical experience with mixing, equipment availability, and regulatory concerns, only pug mill mixing was retained for the pilot work.

Sediment was dredged by clamshell on April 27, 2000, loaded onto a barge, and transported to the CEDT facility for processing. The material was allowed to settle for a day and then the barge was dewatered. Large pieces of debris were removed from the barge with a grapple mounted on a hydraulic excavator. Then the dewatered dredged material was removed from the barge with a hydraulic material handler/ excavator and placed in the feed hopper at the top of the coarse vibrating screen to remove large debris. The sediment was mixed with PROPAT® through the conveyor system.

The dry pozzolanic ingredients, coal fly ash and KS60, were added to the mixture within and at the head of the pug mill. Delivery rates were metered and adjusted based on the measured weight of the sediment on the conveyor. The material was stockpiled on the paved storage area for testing and loading. Several trial batches were mixed to test the process components and calibrate the equipment. The mixes were sampled and tested.

The PROPAT®-ADM was moved to a nearby test site by truck and placed in lifts of 10 to 12 inches thickness by a front end loader. Each lift was graded and then compacted with a rubber-tired vibratory drum roller. A test pad totaling 55 by 85 feet and 2.5 feet high was constructed by this means. Geotechnical and environmental tests were conducted on material from the test pad (Hart Crowser 2000b).

Field Demonstration and Monitoring

A test cell was constructed of PROPAT®-ADM to allow monitoring this material under full-scale conditions. Geotechnical and environmental testing were conducted on the PROPAT®-ADM placed in the test cell.

Location

The test cell was constructed on the Claremont Terminal Scrap Metal Recycling Facility of Hugo Neu Schnitzer East. The facility is located on Linden Avenue East and Tropicana Way in Jersey City (Figure 2). The test cell was located at the northwest end of a 7-acre parcel that lies west of Tropicana Way and is part of Tax Lots 7 and 18 of Block 1507.

Processing of Dredged Material

The PROPAT®-ADM was produced by CEDT at its Claremont Channel facility. Sediment was dredged from Claremont Channel during December 2002 and was stored in scows at the CEDT facility. The barges were decanted in accordance with HNSE's water quality certificate issued by NJDEP. Decant water passed through a series of tanks with filters before discharging back into Claremont Channel.

The dredged material was transferred by clamshell crane from the barges to the hopper of a coarse vibrating screen capable of removing debris larger than 4 inches. The screened material was then transferred to a conveyor belt through an adjustable feed hopper.

The sediment was amended with 30 percent PROPAT®, 18 percent coal fly ash, and 18 percent KS60 (CEDT proprietary pozzolanic additive) by weight of wet sediment. The additives were metered and added on the conveyor belt on the way to the pug mill for mixing. The material exiting the pug mill was stockpiled before transport to the test site.

Site Preparation

Site preparation began on March 6, 2003, with the contouring and leveling of the test cell area. CEDT operators excavated the test cell's rectangular basin with an excavator and a bulldozer. These two machines were used for the majority of construction work on the test cell.

Markers set by surveyors from LGA Engineering (LGA) established the excavation area for the test cell basin. The completed basin measured approximately 75 by 103 feet on the bottom and 95 by 123 feet on top of the basin. The average depth of the basin's bottom was approximately 4.5 feet below the existing grade.

The bottom of the test cell was prepared for installation of a low permeability containment liner by proof rolling with a smooth drum roller. The basin was then inspected and cleared by hand of any debris that could damage the liner. The low-density polyethylene (LDPE) liner was installed by hand on March 8, 2003. Utility sand was placed on the edges of the liner to temporarily restrain it. The basin and liner were surveyed by LGA on March 10, 2003. The resulting topography is shown on Figure 3.

Fine sand was placed over the center portion of the liner at an average depth of approximately 7 inches. The sand was inspected for debris, which was removed by hand. Three monitoring wells and four settlement plates were installed at locations shown on Figure 3. The wells were constructed of 4-inch-diameter polyvinylchloride (PVC) pipes with 14-inch slotted screens attached at the bottom with rubber pipe clamps. The wells were 13 feet 6 inches long overall. Coarse clean sand was placed around the screens as filter packs. Small squares (18 inches) of conveyor belt material were placed beneath each well to protect the liner.

Four settlement plates were installed above the liner to determine settlement of the underlying foundation soils over the life of the test cell. Each assembly consisted of an aluminum rod welded to a 1-foot square aluminum plate. The

LDPE liner was protected from the plates with 18-inch squares of conveyor belt material.

Material Placement

Stock piling of processed PROPAT®-ADM from the CEDT facility commenced on March 10, 2003. Transfer of the PROPAT®-ADM material to the test cell area was completed on April 2, 2003.

The first lift of PROPAT®-ADM was placed into the test cell on March 17, 2003. This and subsequent lifts measured approximately 18 inches thick and were compacted with the bulldozer. Areas around the wells and settlement rods were compacted with a vibratory compactor. Melick-Tully and Associates of South Bound Brook, New Jersey, was contracted to take density measurements of the first, third, and sixth lifts upon placement and tracking with the bulldozer.

Six lifts were used to construct the test cell to a final height of approximately 6 feet above the existing grade. The average thickness of PROPAT®-ADM within the test cell was 10 feet. The final lift was placed on April 25, 2003. Based on surveys performed by LGA, the total volume of PROPAT®-ADM placed in the test cell was approximately 5,000 cy.

A 6-inch cover of topsoil was placed over the PROPAT®-ADM. The topsoil was contoured to provide a final surface side slope of 2 feet horizontal for every 1-foot rise on the southern, eastern and western slopes. The northern slope was 3 feet horizontal for every 1-foot rise. The top of the cell was inclined at a slope of 3 percent from the south downward to the north. An erosion control mat was placed over the topsoil and subsequently sprayed with hydroseed. LGA surveyed the test cell on May 7, 2003 (Figure 3).

Materials Testing

Grab samples of the PROPAT®-ADM were taken on those days when lifts were being added to the test cell. Samples were analyzed for grain size, moisture content, and total solids content.

Air Monitoring

During construction of the test cell, dust was monitored with a Thermo Anderson MIE DataRAM 4 model DR-4000 monitor. Readings were taken on March 18 and 19, 2003.

Field Densometer Tests

Melick-Tully and Associates conducted field density tests on the PROPAT®-ADM in accordance with ASTM Method D 2922-96. Measurements were taken on the first, third, and sixth lifts of PROPAT®-ADM using a Humboldt 5001 model nuclear density gauge. The tests provided information on the wet density and dry density of material in the test cell.

Infiltrometer Test

French & Parrello Associates performed a double-ring infiltrometer test to estimate the rate of infiltration of the PROPAT®-ADM. Tests were performed on December 16 and 17, 2003, pursuant to procedures outlined in ASTM D 3385-94 (1994). Test results provided an estimate of the average steady state flow rate of water through the PROPAT®-ADM.

Monitoring Well and Runoff Sampling

During the monitoring phase of the project, water from the monitoring wells and from the runoff trough on the north side of the test cell was sampled. Beginning in July 2003, samples were collected monthly for the first four months. In January 2004, quarterly sampling began. The last samples were collected in October 2004.

During each well sampling event, water was purged from the wells and samples were collected. Both hand bailers and peristaltic pumps were used for purging and sampling.

Analytical results for each sampling event were previously reported in the semi-annual monitoring reports submitted to the NJDEP. A summary of the results of the analysis is presented below.

Temperature Measurements

Information was gathered relative to the possible significance of the cycle of freezing and thawing on the material in the test cell. Information included temperature of the ambient air and temperature of the material within the test cell.

Air temperature readings from the National Weather Service station at Newark Airport were obtained for the period of October 2003 through February 2004. This location is approximately 5 miles west of the test cell and at a similar elevation. Therefore, temperatures at the airport would be expected to be representative of those at the test cell.

On December 16, 2003, soil was observed and temperature was measured during the excavation to install the double ring infiltrometer. On January 7, 2004, soil temperatures were measured at five locations on the test cell with a Reotemp 12-inch soil thermometer. Temperatures were recorded for depths of 6 and 12 inches. On January 29, the Reotemp thermometer was installed at a depth of 12 inches on the top of the test cell west of Well 1. Soil temperature was measured on that day and weekly thereafter through February.

Test Cell Removal and Disposal

The Certificate to Operate a Research, Development and Demonstration (RD&D) project issued by the NJDEP Division of Solid and Hazardous Waste for the Field Demonstration and Monitoring Stage of the PROPAT®-ADM project required that, upon completion of the monitoring phase, the test cell materials and the PROPAT®-ADM be removed and disposed of at a Subtitle-D landfill.

In preparation for removal of the test cell, bulk samples of PROPAT®-ADM were collected from the cell and analyzed to provide data relative to landfill disposal. On November 4 and 8, 2004, samples were collected at depths of 10 to 16 inches, which were below the topsoil cap. Samples were sent to Severn Trent Laboratories for analyses. Another sample was collected on December 8, 2004, and sent to Long Island Analytical Laboratories for analysis.

On November 30, 2004, the test cell was resurveyed by LGA. Elevations of the settlement plates and the top of the test cell were measured.

The test cell was excavated between December 2004 and early February 2005. The PROPAT®-ADM was transported by rail from Jersey City to Michigan and then by truck to the Allied Waste-Rockwood Landfill in Berlin Township, Michigan. Transportation and disposal were arranged by the Industrial Waste Group of Exton, Pennsylvania. The landfill approval form is provided in Appendix A.

QUALITY ASSURANCE

Quality assurance procedures were followed to assess the precision, accuracy, completeness, and representiveness of the data generated during the study. Quality control procedures were implemented in the sampling, handling, and shipping of samples and during laboratory analyses. Laboratory criteria that were evaluated include the following:

- Holding times;
- Method and rinse blanks;
- Surrogate recoveries;
- Internal standard recoveries;
- Laboratory control sample and duplicate recoveries;
- Matrix spike and duplicate recoveries;
- Laboratory duplicate relative percent difference;
- Continuing calibration verification; and
- Reporting limits.

Summaries of quality assurance information on the various stages of the study are presented in Appendix B. The data were valid for their use, that is, to assess the acceptability of the processed material as fill. Specifically, some lab results were compared to NJDEP environmental criteria, such as groundwater quality standards and soil cleanup criteria.

RESULTS AND DISCUSSION

Bench-Scale Tests

Bench-scale testing demonstrated that the addition of PROPAT® improves the geotechnical and environmental properties of amended dredged sediments. Sediments amended with PROPAT® and various pozzolanic materials had significantly higher strengths than sediments amended with pozzolanic materials alone. Other geotechnical properties, such as density and moisture content, were also improved. This suggests improved workability with conventional earth moving equipment (Hart Crowser 2000a).

Raw sediment dredged from Claremont Channel, sediment amended with pozzolanic materials, and PROPAT®-ADM have some analytes at concentrations in excess of NRDCSCC. Raw sediment results are shown in Table 1. PROPAT® does not exacerbate the exceedances. Two samples of PROPAT®-ADM were analyzed. One exceeded NRDCSCC for arsenic and total PCBs. The other exceeded copper, lead, zinc, and total PCBs criteria (Table 2).

Both PROPAT®-ADM and sediment amended with pozzolanics alone leach some metals at concentrations above GWQS during leachability tests. These metals included aluminum and lead (Table 3). It is likely that some of the metals in the leachates are from the pozzolanic additives, since these were detected in the additives alone at concentrations of the same order of magnitude as those in the raw sediment. Multiple extraction procedure (MEP) leaching tests of PROPAT®-ADM (Table 4) and sediment amended with pozzolanics alone (Table 5) showed similar results.

During supplemental bench-scale testing, four samples of PROPAT®-ADM were analyzed for bulk constituents. These four samples had concentrations of arsenic and zinc above NRDCSCC. Two exceeded the criteria for copper, and one exceeded the criteria for thallium. None of the samples exceeded the criteria for total PCBs.

Leachate samples generated from PROPAT®-ADM via the multiple extraction procedure (MEP) contained aluminum, arsenic, copper, nickel, and total PCBs at concentrations above GWQS (Hart Crowser 2001).

Pilot Tests

Results of the pilot test demonstrated that, in field conditions, PROPAT®-ADM generally met the geotechnical and environmental criteria established for this program. Both the unconfined compressive strength and unit weight of the PROPAT®-ADM met the respective criteria. Resilient modulus results are presented in Table 6. While there is considerable variability, average results fall within the range of "fair" for roadbed soil. The PROPAT®-ADM was also workable and manageable by standard earth-moving equipment and appears to have sufficient strength and elasticity to be suitable as fill material (Hart Crowser 2000b).

Samples of PROPAT®-ADM were subjected to the modified MEP and the American National Standard Institute (ANSI) Method 16.1 leaching procedure. Results are shown in Tables 7 and 8. Samples of leachate generated from these procedures were analyzed for a range of parameters. The results for these samples met GWQS, except for several metals. The GWQS for sodium was exceeded in all leachate samples. Except for one, these sample had concentrations of aluminum above its GWQS. The GWQS for arsenic was exceeded by some samples extracted by either method. The GWQS for antimony was exceeded only by some of the samples extracted by the ANSI method.

Field Demonstration and Monitoring Stage

A variety of tests were conducted during the construction of the test cell and over the period that it was in place. Results of those tests are discussed below.

Materials Testing

Grab samples from the lifts of PROPAT®-ADM were analyzed for grain size, moisture content, and total solids content. The grain size determinations ranged from 3 to 19 percent gravel, 13 to 27 percent sand, and 63 to 82 percent fines (silt and clay). The results of the water content determinations ranged from 49 to 67 percent. Total percent solids testing provided results ranging from 60 to 67 percent (Hart Crowser, 2003). These geotechnical classification test results provide a basis for comparison with other soils. In general, increase in moisture has a detrimental effect on the strength of fine-grained soils.

Air Monitoring

During 2 days of the construction of the test cell, dust was monitored with a Thermo Anderson MIE DataRAM 4 model DR-4000 monitor. The time-weighted averages of dust concentration were very low; 100 and 138 micrograms per liter (ug/L). For comparison, the action level under the project health and safety plan was 5,000 ug/L (Hart Crowser 2003).

Field Densometer Tests

The results of the field density tests on the test cell by Melick-Tully and Associates demonstrate an average wet density of 97 pounds per cubic-foot (pcf). The average dry density was 71 pcf. Soil density affects bearing strength; denser soils provide greater strength.

Infiltrometer Test

Results for the double-ring infiltrometer test of the test cell by French & Parrello Associates indicate that the average steady state flow rate is 6.75×10^{-6} centimeter per second. Naturally occurring clays typically exhibit values between 10^{-9} and 10^{-6} centimeters per second. Naturally occurring silts and tills typically exhibit values between 10^{-6} and 10^{-4} centimeters per second. Therefore, the value for PROPAT®-ADM is consistent with low permeability materials at the overlap between these two broad soil classifications.

Monitoring Well Results

A number of metals were quantified or estimated in water samples collected from the monitoring wells, as well as several pesticides, semivolatile organic compounds, and cyanide. No PCB was detected. Results from analyses of the eight rounds of well sampling are summarized in Tables 9 through 16. In the tables, results are compared to New Jersey groundwater quality criteria and practical quantitation levels as presented in NJAC 7:9-6 and known as the ground water quality standards (GWQS).

In the first round (Table 9), concentrations of metals in water from Well No. 2 were generally higher than those in the other wells. This is probably related to the sediment observed in the samples from this well. In the August, September and October 2003 rounds, results were generally consistent among the three wells. In the January 2004 sampling, some results from Well No. 2 were higher, but not to the degree observed during the first round.

Concentrations from the three wells regularly exceeded GWQS for aluminum, arsenic, and nickel throughout the entire study period. With the exception of the July 2003 and January 2004 round findings for Well No. 2, as discussed above, no pattern was apparent in the results for these compounds over the study period. Aluminum results were generally between 2 and 5 times the GWQS. Arsenic results were most frequently about 5 times the GWQS. Nickel results were generally between 2 and 5 times the GWQS.

Iron also exceeded GWQS in Well No. 2 except for the October 2003 sampling event. Iron results for this well showed great variability among rounds. Results for Well No. 2 during the July 2003 sampling also show concentrations of cadmium, chromium, manganese, and lead above GWQS (Table 9). These compounds were below GWQS by October 2003 and remained that way throughout.

No pesticides were detected above GWQS until the September 2003 sampling, when alpha-BHC was estimated to exceed GWQS in Well No. 2, dieldrin was estimated to exceed GWQS in the three wells, and 4,4′-DDD and 4,4′-DDT were detected above GWQS in Well No. 1 (Table 11). Neither alpha-BHC, 4,4′-DDD, nor 4,4′-DDT were detected in October samples, but dieldrin was estimated to exceed GWQS in the three wells (Table12). These exceedances were at very low concentrations, i.e., fractional ug/L. By the April 2004 sampling, no pesticides were detected above GWQS.

The only semivolatile organic compounds detected were phenolics. Phenol shows a possible increasing trend through the study period and is slightly above GWQS for Well No. 1 and Well No. 2 in October 2003 (Table 12) and Well No. 2 in January 2004 (Table 13). Phenol continues to exceed GWQS in Well No. 2 by as much as 50 percent throughout the remainder of the study period.

Cyanide was quantified in some samples. No finding exceeded GWQS.

Runoff Results

A number of metals were quantified or estimated in samples from the runoff trough. Five different semivolatile organic compounds were detected throughout the study period, but never above their respective GWQS. A pesticide, Dieldrin, was detected, below GWQS, in the first round of sampling, but didn't reappear throughout the rest of the study period. Cyanide was detected during all sampling events, but never above GWQS. Insufficient sample volume prevented analysis of cyanide in July 2004. No PCB was detected during any of the sampling events. Results of analytes detected during the six rounds of runoff sampling are summarized in Table 17.

Concentrations of material in runoff are unlikely to be related to components of the PROPAT®-ADM of the test cell. Precipitation falling on the test cell did not contact PROPAT®-ADM, but was separated by the topsoil covering the cell. Material in the runoff is related to the material in the topsoil, atmospheric fallout, and dust.

Due to lack of appropriate regulatory standards for runoff and to provide consistency with the well results, Table 17 includes GWQS for comparison with runoff results. During the July 2004 runoff sampling, low water levels in the runoff trough may have led to increased suspended sediment concentrations in the runoff sample. This increased suspended sediment is believed to have caused the analytical results to be skewed, and higher than normal.

Concentrations of aluminum and iron exceeded GWQS throughout the entire study period. Manganese also exceeded GWQS for five of the six sampling events. Results commonly showed arsenic and lead above GWQS as well. Cadmium chromium, nickel, and mercury were detected periodically throughout the study, but only exceeded GWCS during the July 2004 sampling event.

No pesticide, semivolatile, or cyanide results exceeded GWQS.

Temperature Measurements

Gradients of soil temperature were observed to range between 8 and 12 degrees Fahrenheit per foot. Near the end of the most prolonged period of sub-freezing temperatures (late January), the soil temperature at a depth of 12 inches was 32ºF. Therefore, soil freezing occurred only to a depth of about 12 inches. The upper 6 inches of the test cell was a topsoil cover; therefore, only about 6 inches of amended dredge material was frozen and any effects of freeze-thaw cycle are expected to be insignificant.

Test Cell Removal

Bulk samples S1, S2, and S3 from the test cell were analyzed for metals, pesticides, PCB, semivolatile organic compounds, and cyanide. No values exceeded NRDCSCC. In addition, S2 and S3 were analyzed for reactive cyanide and reactive sulfide. No values exceeded USEPA/ NJDEP hazardous waste criteria. Sample S4 was analyzed for volatile organic compounds, lead, and chromium via the toxicity characteristic leaching procedure (TCLP). No values exceeded hazardous waste criteria.

On November 30, 2004, the test cell topography was resurveyed by LGA. Elevations of the settlement plates and the top of the test cell were measured. Results indicated that displacement of the PROPAT®-ADM was only about 0.2 foot and limited to the interior of the cell. No notable displacement was indicated on the side slopes. The LGA report is provided in Appendix C.

The test cell was excavated between December 28, 2004, and early February 2005. The work was done with standard equipment and no unusual conditions were noted.

CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Conclusions

Bench-scale testing demonstrated that the addition of PROPAT® to dredged sediment improves its geotechnical properties. Due to the fibrous nature of PROPAT®, sediment samples with PROPAT® and pozzolanic materials had significantly higher strengths than samples with pozzolanic materials alone. Other geotechnical properties, such as density and moisture content, were also improved.

PROPAT®-ADM was handled successfully with standard earth-moving equipment during the pilot testing. The material was also observed to meet the geotechnical criteria for unconfined compressive strength (greater than 30 psi) and unit weight (greater than 85 pcf).

During construction of the test cell, PROPAT®-ADM proved amenable to placement and working with standard earth-moving equipment at full scale. As it was placed in lifts, samples were collected and analyzed for water content, grain size, and percent total solids. Results were well within standard operating parameters as water content ranged from 49 to 67 percent and solids ranged from 60 to 67 percent. Grain size analyses indicated 3 to 19 percent gravel, 13 to 27 percent sand, and 63 to 82 percent fines (silt and clay). Topographic surveys of the test cell spanning more than 20 months indicated minimal displacement of the PROPAT®-ADM during that period.

Bulk chemical analyses indicate that PROPAT®-ADM met most of the cleanup criteria listed by NJDEP for direct contact of non-residential soils (NRDCSCC). Six samples of PROPAT®-ADM were analyzed during bench-scale testing. Of these, the NRDCSCC for arsenic was exceeded in five samples, copper in three samples, thallium in one sample, zinc in four samples, and total PCBs in two samples.

Results of field sampling and analyses of water from the test cell indicate concentrations below GWQS for most analytes. We note that the GWQS are very stringent, since these are for Class II-A groundwaters , whose primary use is defined as potable water. Exceedances of GWQS for aluminum, arsenic, and nickel were noted in every round of sampling. Iron also exceeded GWQS in one well (W2) for seven of the eight sampling events. Results for that well, which showed evidence of more particulates than the other wells, also showed concentrations of cadmium, chromium, manganese, and lead above GWQS during the first sampling round.

Pesticide results showed low concentrations with some variability. Several pesticides were detected above their respective GWQS for some wells during some sampling rounds, with no apparent pattern.

The only semivolatile organic compounds detected were phenolics. Phenol was detected above its GWQS in two wells, one during five of the eight sampling rounds (W2) and one during a single round.

The low permeability of the PROPAT®-ADM, as observed in the test cell, severely limits infiltration of precipitation. The liner below the cell prevented liquid from flowing out of it. These two factors suggest that there was little dilution of the water within the cell and that there was a long residence time while water was in contact with the material. Therefore, concentrations of analytes (especially those not prone to degradation) are expected to be higher in the test cell water than those in groundwater under more normal conditions, where there would be less contact with the material.

PROPAT®-ADM was developed for use as fill material at sites anticipated to have engineering and/or institutional controls and in geographical areas where groundwater quality, as it pertains to potable use, is not of concern. Examples of such sites are regulated landfills, brownfield sites, and certain industrial properties. Appropriate controls may include means to avoid direct contact of the material by humans and biota, such as caps of clean soils, pavement, or overlying buildings. Site access may also be limited by fences and the like. Institutional controls may include deed notices, declarations of environmental restriction, closure plans, and ongoing permit requirements. Based on these limitations and the data collected to date, the use of PROPAT®-ADM with marginal exceedances of NRDCSCC will not pose a risk to human health or the environment.

In regard to potential effects on groundwater, the exceedances of GWQS noted for some metals in water collected from the monitoring wells and tested during this demonstration would be expected to be diluted and/or attenuated by groundwater in actual applications. Based upon the data collected, the use of PROPAT®-ADM as fill will not pose a risk to human health or the environment via groundwater.

Economic Implications

This report has documented the suitability of Propat® as a stabilizing agent for dredged sediments, based on both environmental and geotechnical factors. Its use would also provide economic benefits by reducing costs of managing dredged materials <u>and</u> costs of managing shredder residue (i.e., Propat®).

Propat® is a trademarked product manufactured by Hugo Neu Schnitzer East from the non-metallic materials recovered from shredding automobiles, white goods, and other discarded metal objects. Untreated shredder residue has usually been managed as a waste material requiring disposal in Subtitle D landfills. Waste disposal costs in the New York/New Jersey region typically range from $50 to $90 per ton.

Propat® was initially developed by HNSE for use as daily cover at solid waste landfills. Many landfills lack sufficient quantities and sources of soil suitable for daily cover. The cost of purchasing or mining cover soil can range up to $10 per ton; whereas, HNSE has paid landfill operators tipping fees of as much as $20 per ton of Propat® used as alternative cover material. Thus, landfill operators can generate revenue in lieu of costs and, at the same time, conserve valuable disposal capacity. By this means, HNSE can also reduce its operating costs by paying a lower tipping fee than typically charged for landfill disposal. Therefore, both landfill operators and HNSE have benefited economically by using Propat® as an alternate cover material. Propat® has been beneficially used for years in this fashion.

The type of economic benefit provided the use of Propat® for landfill cover can also apply to the management and beneficial use of dredged materials. HNSE can pay a tipping fee to dredged material processors and/or to owners of upland sites in need of fill material for Propat® used in processing sediment. Dredged material processors in need of stabilizing amendments and/or those in need of fill material can avoid the cost of purchasing other amendments or fill materials and can realize revenue. HNSE will also benefit from lower tipping fees. The use of Propat®-amended dredged material will reduce the overall cost of managing dredged material, thereby reducing the costs of maintaining our ports and channels.

Recommendations for Future Research

This research has demonstrated the benefits of amending sediments dredged from Claremont Channel with PROPAT®. These benefits are expected to apply to other sediments from the New York Harbor area. PROPAT® is considered a solid waste under NJDEP regulations. Therefore, any dredging project that is proposed to use PROPAT® to amend sediment for upland use will be subject to NJDEP requirements for a beneficial use determination (BUD) and obtaining a certificate of authority to operate (CAO) a BUD. Use of dredged material also requires an acceptable use determination (AUD) from the NJDEP Office of Dredging and Sediment Technology. These requirements are administered by the agency on a case-by-case basis.

In addition, sites that would be considered for this use (landfills, brownfield sites, and certain industrial properties) are subject to other NJDEP regulations developed to control exposure to and migration of contaminants. These interlocking requirements will provide safeguards as well as additional data on any upland use of PROPAT®-ADM. Therefore, no additional research is recommended relative to this use at this time.

REFERENCES

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TABLES

Table 1 - Bulk Analytical Results for Raw (Non-amended) Sediments

Lab ID: Sample ID: Sample Date:	NRSCC	C1B120137001 COMPOSITE C 2/9/2001		C1B120137002 COMPOSITE D 2/9/2001		C1B120137003 COMPOSITE E 2/9/2001		C1B120137004 COMPOSITE F 2/9/2001		C1B150288001 CORE 9 BOTTOM 2/9/2001	
Conventionals											
Percent Solids		43		42.2		41.4		41.3		85.5	
Total Cyanide in mg/kg	21000	0.58	U	0.67		0.62		0.66		0.58	U
Total Organic Carbon in mg/kg		33500		43000		42000		37200		4900	
Metals in mg/kg											
Aluminum		14300		17400		17200		15900		3150	
Antimony	340	0.58	J	1.1	J	1.4	J	1.1	J	1.2	U
Arsenic	20	13.4		22.7		21.3		18.4		2.4	
Barium	47,000	69		137		133		106		15.1	J
Beryllium	2	0.77		0.97		0.94		0.88		0.3	J
Cadmium	100	2.9	J	6.7	J	6.9	J	5.4	J	0.14	J
Calcium		5440		6280		6450		6710		487	J
Chromium		116		273		263		203		10.8	
Cobalt		12.5		14.4		14.6		14.4		6	
Copper	600	132		294		286		224		6.9	
Iron		31000		36700		36500		34900		7720	
Lead	600	127		260		259		217		4.3	
Magnesium		7610		8920		8880		8600		1750	
Manganese		398		469		496		555		79.3	J
Mercury	270	1.8		5		4.4		3.3		0.039	U
Nickel	2,400	32.3		46.9		48.7		42.7		9	
Potassium		2970		3690		3730		3390		573	J
Selenium	3,100	1.7		2.6		2.5		2.3		0.59	U
Silver	4,100	4.5		10.3		10.1		8.3		0.59	U
Sodium		10500		12400		12900		12400		1450	
Thallium	2	0.86	J	0.74	J	1.2	J	1.2	U	0.68	U J
Vanadium	7,100	36.4		54.5		54.9		46.3		11.4	
Zinc	1,500	262		461		469		398		24.7	
Pesticide/PCBs in µg/kg											
4,4'-DDD	12000	1.7	J	4.9		4.9		2.2		2	U
4,4'-DDE	9000	2.7		10		9.3		4.2		2	U
4,4'-DDT	9000	2.5		5.5		6.5		3.6		2	U
Aroclor 1248		81		130		200		81		39	U
Aroclor 1254		51		100		130		56		39	U
Aroclor 1260		39	U	70		88		45		39	U
Total PCBs	2000	132		300		418		182		39	U
Dieldrin	180	0.94	J	2.7		4.1		0.83	J	2	U
Endosulfan II		1.1	J	1.4	J	3.2		0.77	J	2	U
Endrin aldehyde		0.91	J	1.5	J	3.1		0.9	J	2	U
Endrin ketone		1.5	J	1.1	J	0.98	J	0.31	J	2	U
alpha-BHC		2	U J	0.1	J	0.14	J	0.12	J	2	U
alpha-Chlordane		1.2	J	2.7		3.3		1.5	J	2	U
beta-BHC		2	U J	2	U J	2.1	U J	2.1	U J	2	U
delta-BHC		0.28	J	0.21	J	0.3	J	0.16	J	2	U
gamma-BHC (Lindane)	2200	2	U J	2	U J	2.1	U J	2.1	U J	2	U
gamma-Chlordane		0.44	J	1.5	J	1.7	J	0.66	J	2	U

Table 1 - Bulk Analytical Results for Raw (Non-amended) Sediments (cont.)

Lab ID:		C1B120137001		C1B120137002		C1B120137003		C1B120137004		C1B150288001	
Sample ID:	NRSCC	COMPOSITE C		COMPOSITE D		COMPOSITE E		COMPOSITE F		CORE 9 BOTTOM	
Sample Date:		2/9/2001		2/9/2001		2/9/2001		2/9/2001		2/9/2001	
Semivolatiles in µg/kg											
2-Methylnaphthalene		380	U	85	J	64	J	59	J	390	U
Acenaphthene	10000000	380	U J	45	J	400	U J	400	U J	390	U
Acenaphthylene		52	J	99	J	110	J	100	J	390	U
Anthracene	10000000	31	J	110	J	99	J	83	J	390	U
Fluorene	10000000	380	U	48	J	400	U	43	J	390	U
Naphthalene	4200000	380	U	130	J	80	J	66	J	390	U
Phenanthrene		100	J	240	J	230	J	230	J	390	U
Benzo(a)anthracene	4000	150	J	270	J	300	J	290	J	390	U
Benzo(a)pyrene	660	93	J	390	U	260	J	400	U	58	J
Benzo(b)fluoranthene	4000	180	J	390	U	280	J	260	J	390	U
Benzo(ghi)perylene		140	J	130	J	400	U	200	J	390	U
Benzo(k)fluoranthene	4000	140	J	390	U	300	J	250	J	390	U
Chrysene	40000	210	J	350	J	390	J	360	J	390	U
Dibenz(a,h)anthracene	660	39	J	38	J	400	U	52	J	390	U
Fluoranthene	10000000	260	J	510		580		490		390	U
Indeno(1,2,3-cd)pyrene	4000	120	J	120	J	71	J	180	J	390	U
Pyrene	10000000	270	J	470		460		490		390	U
Butyl benzyl phthalate	10000000	59	J	81	J	71	J	62	J	390	U
Di-n-butyl phthalate	10000000	30	J	390	U	400	U	400	U	390	U
bis(2-Ethylhexyl) phthalate	210000	930		2400		1900		2000		68	J
Phenol	10000000	380	U R	67	J	400	U	400	U	390	U
1,4-Dichlorobenzene	10000000	380	U	55	J	400	U	400	U	390	U
Carbazole		380	U	42	J	400	U	26	J	390	U

Notes:

U Not detected at indicated detection limit.

J Estimated value.

Values that exceed screening criteria are shaded gray.

Table 2 - Bulk Analytical Results for PROPAT®-Amended Sediments

Sample ID:	NRSCC	J1-CTI-7		J3-PORT-7	
Sample Date:		11/29/1999		11/29/1999	
Percent Solids		97.8		96.3	
Conventionals in mg/kg					
Total Organic Carbon		31500		28800	
Metals in mg/kg					
Aluminum		13800	J	9890	J
Antimony	340	4	J	149	J
Arsenic	20	24.8		17.3	
Barium	47000	273	J	267	J
Beryllium	1	0.84	U	0.43	U
Cadmium	100	7	J	17.9	J
Calcium		92100		170000	
Chromium		635		194	
Cobalt		13.2	UJ	9.4	UJ
Copper	600	173	J	1460	J
Iron		22900		24900	
Lead	600	404	J	665	J
Magnesium		6470		6210	
Manganese		302		268	
Mercury	270	4.7	J	3.2	J
Nickel	2400	259		62.4	
Potassium		5590	J	2090	UJ
Selenium	3100	5.7		2.2	
Silver	4100	5.2		7.1	
Sodium		6690		4460	
Thallium	2	1		1	U
Vanadium	7100	39		33.7	
Zinc	1500	957	J	1620	J
PCBs in µg/kg					
Total PCBs	2000	6900		6400	
Semivolatiles in µg/kg					
bis(2-Ethylhexyl) phthalate	210000	190000		67000	U
Pentachlorophenol	24000	16000	U	17000	U
Total TCDD Equivalent (1/2 NDs)		165.02		207.34	

Notes:
U Not detected at indicated detection limit.
J Estimated value.
Value exceeding screening criteria are shaded gray.
Detection limits that exceed the screening criteria are italicized.
NRSCC - NJDEP Non-Residential Soil Cleanup Criteria.

Table 3 - Analytical Results for Leachates via Synthetic Precipitation Leaching Procedure (SPLP)

Sample ID: / Sample Date:	GWQS	J1-CTI-7 (1) 11/29/1999		J3-PORT-7 (2) 11/29/1999		CCQ-J (3) 11/29/1999		PROPAT 11/29/1999	
Conventionals in mg/L									
Total Organic Carbon		52.9		81		9		33.4	
Total Suspended Solids		4	U	4		4	U	4	
Metals in µg/L									
Aluminum	200	900	J	19	UJ	1700	J	320	J
Antimony	20	2.5	J	10	U	10	U	24	J
Arsenic	8	8	J	8.3	J	2.5	J	3.3	J
Barium	2000	48	J	89	J	22	J	27	J
Beryllium	20	5	U	5	U	5	U	5	U
Cadmium	4	0.57	UJ	1.3	UJ	3.4	UJ	2.5	U
Calcium		221000		990000		51000		66700	
Chromium	100	30		35		13		5	
Cobalt		2.7	UJ	6	UJ	7.1	UJ	50	U
Copper	1000	630		980		15	J	94	
Iron	300	13	UJ	17	UJ	1800		900	
Lead	10	3	U	120		11		220	
Magnesium		38	UJ	5000	U	34100		6700	
Manganese	50	15	U	15	U	1600		46	
Mercury	2	0.2	U	0.2	U	0.2	U	0.48	
Nickel	100	100		220		29	J	24	J
Potassium		129000		23700		17400		45600	
Selenium	50	16		2.4	J	5	U	5	U
Silver		5	U	5	U	0.98	J	5	U
Sodium	50000	187000		189000		193000		153000	
Thallium	10	10	U	10	U	10	U	7.2	J
Vanadium		23	J	50	U	50	U	50	U
Zinc	5000	20	U	80		130		470	
PCBs in µg/L									
Total PCBs	0.5	*1*	*U*	*1*	*U*	*1*	*U*	*1*	*U*
Semivolatiles in µg/L									
bis(2-Ethylhexyl) phthalate	30	10	U	20	U	10	U	10	U
Pentachlorophenol	1	*51*	*U*	*100*	*U*	*50*	*U*	*50*	*U*
Dioxins in pg/L									
TCDD Equivalent (1/2 NDs)		1.50		0.84		1.41		1.34	

Notes:
(1) Sediment with 15% Fly ash, 20% KS40, 15% lime, and 30% PROPAT®
(2) Sediment with 20% LKD, 10% Portland Cement, and 30% PROPAT®
(3) Sediment with 15% Fly ash, 10% KS40, and 5% lime
U Not detected at indicated detection limit.
 J Estimated value.
Value exceeds the screening criteria are shaded gray.
Detection limits that exceed the screening criteria are italicized.
GWQS - NJDEP Ground Water Quality Standards.

Table 4 - Analytical Results for Leachates from PROPAT®-Amended Sediment via Multiple Extraction Procedure (MEP)

Lab ID:	GWQS	D7CEG		D7DVX		D7G0C		D7H1H		D7JJ3		D7KPF		D7MC2	
Sample ID:		J2-CTI-28		J2-CTI-28		J2-CTI-28		J2-CTI-28		J2-CTI-28		J2-CTI-28		J2-CTI-28	
Sample Date:		1/10/00		1/10/00		1/10/00		1/10/00		1/10/00		1/10/00		1/10/00	
		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7	
Conventionals															
Total Organic Carbon in mg/L		36.9		8.4		3.5		3.2		3.4		2.9		2.4	
Total Suspended Solids in mg/L		4	U	4	U	4	U	4	U	4	U	4	U	4	U
Metals in µg/L															
Aluminum	200	289		1560		2470		2070		2280		2400		2390	
Antimony	20	14.2		11.8		9	J	9.9	J	11		10.1		10.3	
Arsenic	8	5.8	J	3.1	J	10	U	3	UJ	4.5	J	3.3	J	2.3	J
Barium	2000	20.6	J	4.5	J	4	J	2.7	J	3	J	2.5	J	2	J
Beryllium	20	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	4	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Calcium		244000		72700		62100		47500		43200		40700		37400	
Chromium	100	13.7		9	J	6.6	J	8.6	J	10.6		9.7	J	7.6	J
Cobalt		6.7	B	3.4	J	50	U	2	UJ	1.7	UJ	50	U	2	J
Copper	1000	455		126		46.2		38.9		38.9		32.6		23.7	J
Iron	300	22	UJ	12.5	UJ	7.3	UJ	17.3	UJ	20.4	UJ	18.5	UJ	19.1	UJ
Lead	10	3	U	3	U	3	U	3	U	3	U	3	U	3	U
Magnesium		1810	J	130	J	59.8	J	110	J	101	J	88.3	J	91	J
Manganese	50	2	J	15	U	15	U	15	U	15	U	15	U	15	U
Mercury	2	0.072	J	0.06	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	100	38.3	J	11.9	J	40	U	40	U	40	U	40	U	40	U
Potassium		130000		22900		6010		3470	J	2840	J	2280	J	1620	J
Selenium	50	19.9		9.6		6.3		7.4		5.5		6.1		7.3	
Silver		10	U	10	U	10	U	10	U	10	U	10	U	10	U
Sodium	50000	204000		22800		17500		14600		15500		12400		10100	
Thallium	10	10	U	4.8	J	10	U	10	U	10	U	10	U	10	U
Vanadium		57		51.5		29.4	J	30.2	J	30.5	J	26	J	25.3	J
Zinc	5000	20	U	20	U	20	U	20	U	20	U	20	U	20	U
PCBs in µg/L															
Total PCBs	0.5	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Semivolatiles in µg/L															
bis(2-Ethylhexyl) phthalate	30	10	U	10	U	10	U	10	U	10	U	10	U	7.9	J
Pentachlorophenol	1	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Dioxins in pg/L															
Total TCDD Equivalent (1/2 NDs)		2.6													

Notes:
U Not detected at indicated detection limit.
J Estimated value.
Value exceeds the screening criteria are shaded gray.
Detection limits that exceed the screening criteria are italicized.
GWQS - NJDEP Ground Water Quality Standards.

Table 5 - Analytical Results for Leachates from Amended Sediment without PROPAT® via Multiple Extraction Procedure (MEP)

Lab ID: Sample ID: Sample Date:	GWQS	C9E070220008 CC-Q-J LEACH #1 5/6/99		C9E100115008 CC-Q-J LEACH #2 5/6/99		C9E100116008 CC-Q-J LEACH #3 5/6/99		C9E110207008 CC-Q-J LEACH #4 5/6/99		C9E120109008 CC-Q-J LEACH #5 5/6/99		C9E130222008 CC-Q-J LEACH #6 5/6/99		C9E140223008 CC-Q-J LEACH #7 5/6/99	
Conventionals															
Total Organic Carbon in mg/L		50.61		7		3.7		3.7		3		2.8		2	
Metals in µg/L															
Aluminum	200	281		3040		4560		6050		5260		4610		4490	
Antimony	20	3	J	4.4	J	6	J	5.6	J	5.6	J	4	J	5	J
Arsenic	8	7.7	J	2.5	J	4.2	J	3.4	J	4.4	J	4.4	J	5.4	J
Barium	2000	58.1	J	14	J	9.5	J	7.6	J	7.5	J	5.4	J	9.1	J
Beryllium	20	0.05	U	0.05	U	0.05	U	0.05	U	0.13	UJ	0.18	UJ	0.16	UJ
Cadmium	4	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U	0.25	U	0.32	J
Calcium		162000		75000		68700		66100		59400		46400		42600	
Chromium	100	26.8		38.6		43.2		40.3		40.7		31.1		30.3	
Cobalt		6.3	J	1.4	U	1.9	UJ	1.4	U	1.4	U	1.4	U	1.4	U
Copper	1000	1090		133		66		51.7		45.5		39		41.9	
Iron	300	9	J	17.6	J	11.3	UJ	12.6	J	75	J	88.1	J	384	
Lead	10	1.1	U	1.1	U	1.1	U	1.1	U	1.4	J	1.1	J	3.6	
Magnesium		196	J	95.9	J	42	J	38.6	J	91.2	J	104	J	215	J
Manganese	50	1.1	U	1.1	U	1.1	U	1.1	U	1.4	J	1.6	J	4.6	J
Mercury	2	0.1	U	0.1	U	0.1	U	0.11	J	0.11	J	0.12	J	0.1	U
Nickel	100	223		20.4	J	8.1	U	8.1	U	11.2	J	8.1	U	9	J
Potassium		196000		29100		11000		6280		1650	J	1880	J	1530	J
Selenium	50	13.2		6.9		6.5		8.3		8.2	UJ	8.3	U	8	
Silver		0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	7	0.7	U
Sodium	50000	193000		26100		12500		5790		26800		12600		11500	
Thallium	10	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U
Vanadium		35.4	J	29.3	J	28	J	26.9	J	26.7	J	26.7	J	25.6	J
Zinc	5000	6.1	U	6.1	U	6.1	U	6.1	U	6.1	U	6.1	U	16.3	J
PCBs in µg/L															
Total PCBs	0.5	1.1	*U*	1	*U*	1	*U*	1	*U*	1	*U*	1	*U*	1	*U*
Semivolatiles in µ/L															
bis(2-Ethylhexyl) phthalate	30	10	U	10	U	10	U	10	U	3.4	U	10	U	11	J
Pentachlorophenol	1	50	U	50	U	50	U	50	U	50	U	50	U	50	U
Dioxins in pg/L															
Total TCDD Equivalent (1/2 NDs)		3.1												3.3	

Notes:
U Not detected at indicated detection limit.
J Estimated value.
☐ Value exceeds the screening criteria.
Detection limits that exceed the screening criteria are italicized.
GWQS - NJDEP Ground Water Quality Standards.
Complete data results in Table C-2.

Table 6 - PROPAT® Amended Sediment Pilot Program Resilient Modulus Results

7-Day Cure - OVEN dried

Sample ID				Mix	Days Cured	Resilient Mod.	Wet Density in pcf	Dry Density in pcf
P	0502	B	1	30:16:16	7	6,400	66.4	96.3
P	0502	B	2	30:16:16	7	2,400	76.0	96.2
P	0502	B	3	30:16:16	7	6,200	77.7	97.9
P	0503	B	6	30:20:20	7	1,600	71.1	84.8
P	0503	B	7	30:20:20	7	5,900	76.5	90.4
P	0503	B	8	30:20:20	7	3,800	78.8	91.3
					Average:	4,383		
					Std Dev.	2,083		

28-Day Cure

Sample ID				Mix	Days Cured	Resilient Mod.	Wet Density in pcf	Dry Density in pcf
P	0502	B	1	30:16:16	28	5,088	70.8	84.7
P	0502	B	2	30:16:16	28	3,838	78.7	88.1
P	0502	B	3	30:16:16	28	3,384	78.8	85.7
P	0503	B	6	30:20:20	28	5,864	76.1	90.0
P	0503	B	7	30:20:20	28	4,720	72.0	88.3
P	0503	B	8	30:20:20	28	3,717	77.9	91.9
					Average:	4,435		
					Std Dev.	951		

Notes:

1) 30:16:16 - 30% PROPAT® by weight of sediment
16% KS40 by weight of PROPAT® and Sediment
16% Fly ash by weight of PROPAT® and Sediment

2) 30:20:20 - 30% PROPAT® by weight of sediment
20% KS60 by weight of PROPAT® and Sediment
20% Fly ash by weight of PROPAT® and Sediment

Table 7 - PROPAT® Amended Sediment Pilot Program Analytical Results for MEP Leachate Samples

Lab ID: Sample ID: Sample Date:	GWQS	C0F130163001 P-0503-G-1 5/3/2000 Day 1		C0F130163002 P-0503-G-5 5/3/2000 Day 1		C0F130163003 P-0503-G-8 5/3/2000 Day 1		C0F140259001 P-0503-G-1 5/3/2000 Day 2		C0F140259002 P-0503-G-5 5/3/2000 Day 2	
Conventionals											
Total Organic Carbon in mg/L		41.1		50.3		45.6		9.7		8.9	
Metals in µg/L											
Aluminum	200	5940		2510		3720		4690		5300	
Antimony	20	9.6		8.6		10.1		7.7		9	
Arsenic	8	4.5		4.9		3.9		2.9		2.8	
Barium	2000	223		138		184		81.7		64.3	
Calcium		125000		102000		109000		89900		76300	
Chromium	100	34.9		49.5		40.6		29.3		21.6	
Copper	1000	384		423		564		167		105	
Iron	300	100	U	8.8		10.3		10.8		16.9	
Magnesium		22		45.3		29.3		5000	U	36.7	
Manganese	50	15	U	1.2		15	U	15	U	15	U
Nickel	100	68.9		77.8		92.2		9.9		6.9	
Potassium		69200		64500		73600		9170		7060	
Selenium	50	10.7		8.7		11		9.2		4.7	
Silver		0.97		10	U	1	U	10	U	10	U
Sodium	50000	161000		156000		186000		17600		14800	
Vanadium		26.3		42.5		36.8		29.5		35.1	
Zinc	5000	7.3	U	8.4	U	3.1	U	5.3		3.3	
Pesticide/PCBs in µg/L											
4,4'-DDD	0.1	0.022	J	0.05	UJ	0.05	UJ	0.05	U	0.05	U
Aldrin	0.04	0.05	UJ	0.024	J	0.032	J	0.017	J	0.021	J
alpha-BHC	0.02	0.05	UJ	0.05	UJ	0.05	UJ	0.05	U	0.05	U
delta-BHC		0.05	UJ	0.05	UJ	0.05	UJ	0.05	U	0.05	U
Endrin	2	0.067	J	0.09	J	0.078	J	0.05	U	0.05	U
Endrin aldehyde		0.05	UJ	0.05	UJ	0.05	UJ	0.05	U	0.05	U
gamma-Chlordane		0.0087	J	0.05	UJ	0.05	UJ	0.05	U	0.05	U
Heptachlor	0.4	0.05	UJ	0.037	J	0.05	UJ	0.05	U	0.05	U
Semivolatiles in µg/L											
bis(2-Ethylhexyl) phthalate	30	10	UJ	10	UJ	10	UJ	10	U	10	U
Butyl benzyl phthalate	100	10	UJ	10	UJ	10	UJ	10	U	10	U
Naphthalene	300	10	UJ	3.3	J	10	UJ	10	U	10	U
Phenol	4000	13	J	13	J	10	J	10	U	10	U
Total TCDD Equivalent (1/2 NDs)		4.41		12.68		4.62					

Table 7 - PROPAT® Amended Sediment Pilot Program Analytical Results for MEP Leachate Samples (cont.)

Lab ID:	C0F140259003		C0F150298001		C0F150298002		C0F150298003		C0F160278001		C0F160278002	
Sample ID:	P-0503-G-8		P-0503-G-1		P-0503-G-5		P-0503-G-8		P-0503-G-1		P-0503-G-5	
Sample Date:	5/3/2000		5/3/2000		5/3/2000		5/3/2000		5/3/2000		5/3/2000	
	Day 2		Day 3		Day 3		Day 3		Day 4		Day 4	
Conventionals												
Total Organic Carbon in mg/L	10.5		6		5.3		6.4		5.5		4.9	
Metals in µg/L												
Aluminum	2930		4370		5750		2990		3880		5220	
Antimony	9.5		8.1	U	9.6		10.2		9.5		10.2	
Arsenic	4.2		4.6		10	U	4.1		4.8		3.4	
Barium	88.3		67.7	U	50	U	53.9	U	61		44.4	
Calcium	81900		83500		69300		76100		78500		63600	
Chromium	23.1		22		16.1		18.2		20.3		15.7	
Copper	140		107		62		89		109		60.7	
Iron	100	U	100	U	100	U	100	U	45.6		100	U
Magnesium	24		25.3	U	31.3	U	34.7	U	30		36.7	
Manganese	15	U	15	U	15	U	15	U	0.89		15	U
Nickel	14.1		40	U	40	U	40	U	7.3	U	40	U
Potassium	7780		2210		1450		2520		1400		797	
Selenium	7.7		9.4		8.3		8.1		8.2		9.2	
Silver	10	U	10	U	10	U	10	U	10	U	10	U
Sodium	22100		7940	U	6910	U	9540		9040		6500	
Vanadium	32.9		30.3		31.5		33.8		34.8		30.4	U
Zinc	8.8		26.6	U	10.5	U	9.1	U	10.3		5.7	
Pesticide/PCBs in µg/L												
4,4'-DDD	0.05	UJ	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Aldrin	0.024	J	0.021	J	0.019	J	0.0035	J	0.043	J	0.032	J
alpha-BHC	0.0059	J	0.05	U	0.05	U	0.05	U	0.0065	J	0.0035	J
delta-BHC	0.05	UJ	0.0039	J	0.05	U	0.05	U	0.05	U	0.05	U
Endrin	0.01	J	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Endrin aldehyde	0.038	J	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
gamma-Chlordane	0.05	UJ	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Heptachlor	0.05	UJ	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Semivolatiles in µg/L												
bis(2-Ethylhexyl) phthalate	10	U	10	U	10	U	10	U	10	U	10	U
Butyl benzyl phthalate	10	U	10	U	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U	10	U	10	U
Total TCDD Equivalent (1/2 NDs)												

Table 7 - PROPAT® Amended Sediment Pilot Program Analytical Results for MEP Leachate Samples (cont.)

Lab ID:	C0F160278003		C0F190178001		C0F190178002		C0F190178003		C0F210276001		C0F210276002	
Sample ID:	P-0503-G-8		P-0503-G-1		P-0503-G-5		P-0503-G-8		P-0503-G-1		P-0503-G-5	
Sample Date:	5/3/2000		5/3/2000		5/3/2000		5/3/2000		5/3/2000		5/3/2000	
	Day 4		Day 5		Day 5		Day 5		Day 6		Day 6	
Conventionals												
Total Organic Carbon in mg/L	5.6		3.4		3.2		3.5		5.1		4.6	
Metals in µg/L												
Aluminum	2700		3520		4480		2420		1830		2790	
Antimony	11.9		8.1		9.8		13.3		9.1		7.6	
Arsenic	4.7		4.3		5.5		5		7.1		7.2	
Barium	53.5		47.6		33.5		39.2		35		22.8	
Calcium	69400		64200		50600		57600		55400		43400	
Chromium	17.1		14.8		12.5		13.9		19		16	
Copper	84.8		56.9		30.8		47.5		104		60.3	
Iron	100	U	9.8		100	U	100	U	100	U	100	U
Magnesium	30		36.7		34.7		56		57.3		72	
Manganese	15	U	15	U	15	U	15	U	15	U	0.9	
Nickel	40	U	40	U	40	U	40	U	40	U	40	U
Potassium	1110		641		5000	U	585		5000	U	5000	U
Selenium	9.8		10.9		10.1		10.3		9.7		8.8	
Silver	10	U	10	U	10	U	1		10	U	10	U
Sodium	8090		11200		4860		6730		9660		8270	
Vanadium	36.3		35.6		28.8		37.1		41.7		30	
Zinc	4		4.4	U	3.5	U	3.7	U	5.6	U	20	U
Pesticide/PCBs in µg/L												
4,4'-DDD	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
Aldrin	0.031	J	0.015	J	0.014	J	0.024	J	0.014	J	0.013	J
alpha-BHC	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.004	J
delta-BHC	0.05	U	0.0052	J	0.0031	J	0.05	U	0.05	U	0.05	U
Endrin	0.05	U	0.05	U	0.05	U	0.052		0.05	U	0.05	U
Endrin aldehyde	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
gamma-Chlordane	0.05	U	0.0045	J	0.05	U	0.05	U	0.0062	J	0.05	U
Heptachlor	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.011	J
Semivolatiles in µg/L												
bis(2-Ethylhexyl) phthalate	10	U	10	U	18		10	U	9.6	J	8.2	J
Butyl benzyl phthalate	10	U	10	U	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U	10	U	10	U
Phenol	10	U	6.5	J	10	U	4.8	J	10	U	10	U
Total TCDD Equivalent (1/2 NDs)												

Table 7 - PROPAT® Amended Sediment Pilot Program Analytical Results for MEP Leachate Samples (cont.)

Lab ID:	C0F210276003		C0F230315001		C0F230315002		C0F230315003	
Sample ID:	P-0503-G-8		P-0503-G-1		P-0503-G-5		P-0503-G-8	
Sample Date:	5/3/2000		5/3/2000		5/3/2000		5/3/2000	
	Day 6		Day 7		Day 7		Day 7	
Conventionals								
Total Organic Carbon in mg/L	5.4		3.3		3		3.7	
Metals in µg/L								
Aluminum	1250		1730		2640		1060	
Antimony	9.9		9.1		12		11.9	
Arsenic	8.6		9		9.3		10.4	
Barium	33.6		30.5		20.6		37.9	
Calcium	50500		51200		39500		42800	
Chromium	17.8		13.8		11.7		13.2	
Copper	91.5		61.1		35		50.7	
Iron	100	U	9.3		100	U	100	U
Magnesium	76		76		82.6		84.6	
Manganese	15	U	0.93		0.91		15	U
Nickel	40	U	40	U	40	U	40	U
Potassium	1120	U	5000	U	647		5000	U
Selenium	8.5		11.4		9.5		9.3	
Silver	10	U	1.4	U	10	U	10	U
Sodium	13200		11900		12200		14600	
Vanadium	45.3		38.3		33.6		43	
Zinc	20	U	20	U	20	U	4.5	
Pesticide/PCBs in µg/L								
4,4'-DDD	0.05	U	0.05	U	0.05	U	0.05	U
Aldrin	0.011	J	0.021	J	0.019	J	0.017	J
alpha-BHC	0.05	U	0.05	U	0.05	U	0.05	U
delta-BHC	0.05	U	0.05	U	0.05	U	0.05	U
Endrin	0.05	U	0.05	U	0.05	U	0.05	U
Endrin aldehyde	0.05	U	0.05	U	0.05	U	0.05	U
gamma-Chlordane	0.05	U	0.05	U	0.05	U	0.05	U
Heptachlor	0.017	J	0.014	J	0.019	J	0.023	J
Semivolatiles in µg/L								
bis(2-Ethylhexyl) phthalate	8.8	J	23		10	U	10	U
Butyl benzyl phthalate	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U
Total TCDD Equivalent (1/2 NDs)			4.67		5.38		4.39	

Notes:
U Not detected at indicated detection limit.
J Estimated value.
Values exceeding the screening criteria are shaded gray.
Detection limits that exceed the screening criteria are italicized.

Table 8 - PROPAT® Amended Sediment Pilot Program Analytical Results for ANSI 16.1 Leachate Samples

Lab ID:	GWQS	C0F280120004		C0F270174001		C0F280120001		C0F300221001		C0F300221004	
Sample ID:		C4-PB		C1-L1		C1-L2		C1-L3		C1-L4	
Sample Date:		6/27/00		6/26/00		6/27/00		6/28/00		6/29/00	
Conventionals in mg/L											
Total Organic Carbon		1.5		19.7	J	21.4		12.4		9.8	
Metals in µg/L											
Aluminum	200	200	U	265		792		1310		771	
Antimony	20	13.3		14.4	B	35.3	B	42.9	B	25.3	B
Arsenic	8	*10*	*U*	*10*	*U*	3.7		5.9		4.1	
Barium	2000	135		241	B	103	B	64.4	B	47.6	B
Beryllium	20	5	U	0.08	U	5	U	0.08		5	U
Calcium		193	U	42300		49700		36000		14100	
Chromium	100	1.2		8.3		12.9		8.6		3.8	B
Cobalt		50	U	3.5		3.9		4.6		50	U
Copper	1000	25	U	106		141		123		46.2	
Iron	300	100	U	19	U	67.3		18.2	U	11.2	U
Magnesium		5000	U	339		334		174		56.4	
Manganese	50	1.3		2.3	B	2.1	B	1	B	15	U
Nickel	100	40	U	23		24.8	U	25.2		7.6	
Potassium		5000	U	49300		69700		64600		25000	
Selenium	50	5	U	3.3		10		11.7		4.9	
Silver		10	U	1.2	U	10	U	10	U	10	U
Sodium	50000	162		104000		151000		126000		47000	
Vanadium		2.6		6.9	B	17.8		31.2		13.3	
Zinc	5000	24.8	U	26.4	U	25.6	U	10.8	U	6.9	U
Pesticide/PCBs in µg/L											
Aldrin	0.04	*0.05*	UR	*0.05*	*U*	0.0053	J	0.0066	J	0.011	J
alpha-BHC	0.02	*0.05*	UR	*0.05*	*U*	0.0046	J	0.0046	J	0.0046	J
gamma-Chlordane		0.05	UR	0.0055	J	0.016	J	0.021	J	0.025	J
Heptachlor epoxide	0.4	0.05	UR	0.05	U	0.05	UR	0.003	J	0.05	UJ
Semivolatiles in µg/L											
2-Methylphenol		10	UR	10	U	10	UR	10	UJ	10	UJ
bis(2-Ethylhexyl) phthalate	30	10	UR	10	U	5.5	J	10	UJ	10	UJ
Diethyl phthalate	5000	4.7	J	8.2	JB	4.6	JB	10	UJ	10	UJ
Pentachlorophenol	1	50	UR	50	U	50	UR	50	UJ	50	UJ
Phenol	4000	13	J	29	B	26	JB	22	JB	18	JB
Total TCDD Equivalent (1/2 NDs)		1.74		1.43							

Table 8 - PROPAT® Amended Sediment Pilot Program Analytical Results for ANSI 16.1 Leachate Samples (cont.)

Lab ID:	C0G010138001		C0G180137001		C0H160223001		C0I260217001		C0F270174002		C0F280120002	
Sample ID:	**C1-L5**		**C1-L6**		**C1-L7**		**C1-L8**		**C2-L1**		**C2-L2**	
Sample Date:	**6/30/00**		**7/17/00**		**8/16/00**		**9/25/00**		**6/26/00**		**6/27/00**	
Conventionals in mg/L												
Total Organic Carbon	7.4		38.4		15.4	J	8		17.3	J	20.9	
Metals in µg/L												
Aluminum	764		2690		2240		1360		335		461	
Antimony	20.8	B	221		115		77.6		18.7	B	24	B
Arsenic	3.1		11.8		9.7		6.7		3.8		3.5	
Barium	40.3	B	153	B	71.1	B	54.4	B	251	B	100	B
Beryllium	5	U	5	U	5	U	0.22	U	0.13		5	U
Calcium	12000		40700		31200		34000		85700		42400	
Chromium	2.7	B	2.2	B	2.4	B	3.9	U	14.2		8.4	
Cobalt	50	U	3.6		50	U	3.8		7.4		50	U
Copper	35.9		259		125		49.3		203		94	
Iron	13.9	U	19.3		13		100	U	26.1	U	54.1	U
Magnesium	67.2		25.3		120		314		858		370	
Manganese	1	B	0.98	B	0.97	B	15	U	2.6	B	1	B
Nickel	7.3		73.5		45.5		33.6		38.3		10.7	U
Potassium	18800		70300		34100		21900		70500		46600	
Selenium	4.1		17.7		5.5		4.7		5.3		4.3	
Silver	10	U	10	U	10	U	10	U	1.7		10	U
Sodium	33700		136000		38700		14100		172000		110000	
Vanadium	17		71.1		60		43.8		9.5	B	11.8	B
Zinc	9	U	7.6		4		20	U	17.9	U	10.1	U
Pesticide/PCBs in µg/L												
Aldrin	0.006	J	0.0046	J	0.05	U			*0.05*	*U*	0.0044	J
alpha-BHC	0.0041	J	*0.05*	*U*	*0.05*	*U*			0.003	J	0.0033	J
gamma-Chlordane	0.025	J	0.089		0.024	J			0.05	U	0.0071	J
Heptachlor epoxide	0.05	UJ	0.05	U	0.05	U			0.05	U	0.05	UR
Semivolatiles in µg/L												
2-Methylphenol	10	UJ	23		10	U			10	U	10	UR
bis(2-Ethylhexyl) phthalate	10	UJ	6	J	10	U			10	U	10	UR
Diethyl phthalate	10	UJ	20	U	10	U			4.5	JB	3.2	JB
Pentachlorophenol	50	UJ	38	J	8.6	J			50	U	50	UR
Phenol	11	JB	160		57	B			35	B	26	JB
Total TCDD Equivalent (1/2 NDs)			2.47						1.34			

Table 8 - PROPAT® Amended Sediment Pilot Program Analytical Results for ANSI 16.1 Leachate Samples (cont.)

Lab ID:	C0F300221002		C0F300221005		C0G010138002		C0G180137002		C0H160223002		C0I260217002	
Sample ID:	C2-L3		C2-L4		C2-L5		C2-L6		C2-L7		C2-L8	
Sample Date:	6/28/00		6/29/00		6/30/00		7/17/00		8/16/00		9/25/00	
Conventionals in mg/L												
Total Organic Carbon	14.2		10.8		7.9		39.9		15.3	J	7.8	
Metals in µg/L												
Aluminum	455		438		553		1590		1410		853	
Antimony	19.6	B	15.7	B	15.6	B	85.1		74.3		71	
Arsenic	2.7		2.9		4.3		8.2		9.9		9.5	
Barium	61.2	B	50.9	B	40.1	B	215	B	76.4	B	50.7	B
Beryllium	0.09	U	5	U	5	U	5	U	5	U	0.17	U
Calcium	20900		12900		12400		32800		26100		36200	
Chromium	4.4	B	2.7	B	3.2	B	1.9	B	1.4	B	2.4	U
Cobalt	3.9		3.6		50	U	3.9		50	U	50	U
Copper	53.4		34.8		38.4		204		82.9		20.4	
Iron	100	U	100	U	13.4	U	23.6		13.1		17.1	U
Magnesium	170		87.6		76		63.1		135		325	
Manganese	1.3	B	15	U	15	U	0.98	B	1.2	B	0.99	B
Nickel	40	U	6.2		40	U	51.8		36.3		20.9	
Potassium	26800		17000		15200		43900		23700		15700	
Selenium	2.4		3.7		5	U	11.9		4.9		4.4	
Silver	10	U	10	U	0.94		10	U	10	U	10	U
Sodium	57800		37300		33100		97700		26700		9650	
Vanadium	13.4		11.5	B	10.5	B	52.6		52.7		38.9	
Zinc	9.8	U	4.9	U	8.7	U	5		3.7		20	U
Pesticide/PCBs in µg/L												
Aldrin	0.0054	J	0.0081	J	*0.05*	UJ	*0.05*	*U*	0.05	U		
alpha-BHC	0.0043	J	0.0041	J	0.0035	J	0.006	J	*0.05*	*U*		
gamma-Chlordane	0.017	J	0.02	J	0.019	J	0.053		0.017	J		
Heptachlor epoxide	0.0025	J	0.05	UJ	0.05	UJ	0.05	U	0.05	U		
Semivolatiles in µg/L												
2-Methylphenol	10	UJ	10	UJ	10	UJ	16	J	10	U		
bis(2-Ethylhexyl) phthalate	10	UJ	10	UJ	10	UJ	20	U	4.6	J		
Diethyl phthalate	10	UJ	10	UJ	10	UJ	20	U	10	U		
Pentachlorophenol	50	UJ	50	UJ	50	UJ	*100*	*U*	50	U		
Phenol	26	JB	20	JB	13	JB	88	B	40	B		
Total TCDD Equivalent (1/2 NDs)									1.93			

Table 8 - PROPAT® Amended Sediment Pilot Program Analytical Results for ANSI 16.1 Leachate Samples (cont.)

Lab ID:	C0F270174003		C0F280120003		C0F300221003		C0F300221006		C0G010138003		C0G180137003	
Sample ID:	C3-L1		C3-L2		C3-L3		C3-L4		C3-L5		C3-L6	
Sample Date:	6/26/00		6/27/00		6/28/00		6/29/00		6/30/00		7/17/00	
Conventionals in mg/L												
Total Organic Carbon	22.6	J	23.3		15.2		10.7		8.3		45.1	
Metals in µg/L												
Aluminum	437		359		550		582		631		2150	
Antimony	17.8	B	21.5	B	24.1	B	21.2	B	17.9	B	149	
Arsenic	3.4		*10*	*U*	3.8		4.2		4.1		10	
Barium	254	B	95	B	61.7	B	52.8	B	42.2	B	223	B
Beryllium	5	U	5	U	5	U	5	U	5	U	5	U
Calcium	82500		23200		18500		12700		10800		31900	
Chromium	18.6		7.6		5	B	2.7	B	3.2	B	2.3	B
Cobalt	6		50	U	50	U	50	U	50	U	3.2	
Copper	198		53.6		50.9		37.9		34.6		208	
Iron	14.4	U	11.7	U	12	U	100	U	11.7	U	18.7	
Magnesium	889		200		118		70.6		63.8		40.5	
Manganese	3.9	B	1	B	1	B	1.3	B	15	U	0.98	B
Nickel	51.8		40	U	40	U	40	U	40	U	61.8	
Potassium	85800		32600		29500		21300		17100		61200	
Selenium	5.8		2.5		5		3.6		3.8		14.4	
Silver	1.3		0.96		10	U	10	U	1	U	10	U
Sodium	184000		64000		57100		39900		31500		122000	
Vanadium	10.1	B	6.2	B	12.5	B	10.7	B	13.2		61	
Zinc	12.2	U	10.1	U	17.2	U	6.1	U	4.5	U	20	
Pesticide/PCBs in µg/L												
Aldrin	*0.05*	*U*	0.0075	J	0.0066	J	*0.05*	UJ	*0.05*	UJ	*0.05*	*U*
alpha-BHC	0.0034	J	0.0038	J	0.0036	J	0.0036	J	0.0034	J	0.013	J
gamma-Chlordane	0.05	U	0.014	J	0.018	J	0.02	J	0.021	J	0.06	
Heptachlor epoxide	0.05	U	0.05	UR	0.0025	J	0.05	UJ	0.05	UJ	0.05	U
Semivolatiles in µg/L												
2-Methylphenol	10	U	10	UR	10	UJ	10	UJ	10	UJ	21	
bis(2-Ethylhexyl) phthalate	10	U	12	J	10	UJ	10	UJ	10	UJ	20	U
Diethyl phthalate	6.2	JB	4.2	JB	10	UJ	10	UJ	10	UJ	20	U
Pentachlorophenol	50	U	50	UR	50	UJ	50	UJ	50	UJ	*100*	*U*
Phenol	32	B	26	JB	24	JB	19	JB	12	JB	120	B
Total TCDD Equivalent (1/2 NDs)	1.32											

Table 8 - PROPAT® Amended Sediment Pilot Program Analytical Results for ANSI 16.1 Leachate Samples (cont.)

Lab ID:	C0H160223003		C0I260217003	
Sample ID:	C3-L7		C3-L8	
Sample Date:	8/16/00		9/25/00	
Conventionals in mg/L				
Total Organic Carbon	19.1	J	9.9	
Metals in µg/L				
Aluminum	1710		1290	
Antimony	170		110	
Arsenic	8.7		6.5	
Barium	97.2	B	52.9	B
Beryllium	5	U	0.16	U
Calcium	21800		30700	
Chromium	2.3	B	2.4	U
Cobalt	50	U	50	U
Copper	92.6		35.1	
Iron	29.8		9.5	U
Magnesium	126		234	
Manganese	2.2	B	15	U
Nickel	33.7		27.1	
Potassium	30400		19600	
Selenium	5		5	U
Silver	10	U	10	U
Sodium	34100		12200	
Vanadium	51.6		44.1	
Zinc	8.6		20	U
Pesticide/PCBs in µg/L				
Aldrin	0.05	U		
alpha-BHC	*0.05*	*U*		
gamma-Chlordane	0.025	J		
Heptachlor epoxide	0.05	U		
Semivolatiles in µg/L				
2-Methylphenol	10	U		
bis(2-Ethylhexyl) phtha	10	U		
Diethyl phthalate	10	U		
Pentachlorophenol	50	U		
Phenol	52	B		
Total TCDD Equivalent	2.89			

Notes:
U Not detected at indicated detection limit.
J Estimated value.
R Data rejected as a result of extraction holding time exceedence.
B Concentration less than five times (ten times for phthalates) concentration in procedure blank.
Values exceeding the screening criteria are shaded gray.
Detection limits that exceed the screening criteria are italicized.

Table 9 - Analytes Detected in Water Samples Collected from Test Cell on July 9, 2003

	Sample Designations					
	W1	W2	W3	W4	RB	GWQS
Metals in ug/L						
Silver	ND	5.1	ND	ND	ND	NA
Aluminum	613B	19800B	1130B	620B	19.0BJ	200
Arsenic	38.8	61.3	34.5	36.5	ND	8
Barium	602B	786B	510B	567B	1.2BJ	2000
Beryllium	ND	2.2BJ	ND	ND	0.45BJ	20
Calcium	1.12E+06	1.36E6B	9.53E+05	1.03E+06	274BJ	NA
Cadmium	ND	5.9	ND	ND	ND	4
Cobalt	9.9J	20.9	9.2J	8.7J	ND	NA
Chromium	1.8J	152	1.4J	1.8J	ND	100
Copper	18.2J	414	9.5J	22.2J	ND	1000
Iron	124	27100	212	177	ND	300
Potassium	1.99E+06	1.84E+06	1.90E+06	1.88E+06	258J	NA
Magnesium	78.3J	7770	46.5J	94.6J	ND	NA
Manganese	1.7J	482	2.8J	2.3J	0.20J	50
Sodium	6.85E+06	7.12E+06	6.28E+06	6.57E+06	1150J	NA
Nickel	696	453	659	663	ND	100
Lead	ND	296	ND	ND	ND	10
Selenium	41.2	46.5	38	38.2	ND	50
Thallium	ND	ND	ND	ND	ND	10
Antimony	ND	8.9J	ND	ND	ND	20
Vanadium	30.7J	97.2	33.1J	31.3J	ND	NA
Zinc	6.7J	711	6.0J	8.5J	2.4J	5000
Mercury	ND	ND	ND	ND	ND	2
Pesticides in ug/L						
Alpha-Chlordane	0.069P	0.11	0.086P	0.081P	ND	NA
Gamma-Chlordane	ND	ND	ND	ND	ND	NA
Alpha-BHC	ND	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	ND	NA
Dieldrin	ND	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	ND	2
Endrin aldehyde	ND	0.023JP	ND	ND	ND	NA
Endosulfan I	0.035JP	0.031JP	0.056P	0.044JP	ND	0.4
Endosulfan II	ND	ND	ND	ND	ND	NA
4-4' DDD	ND	ND	ND	ND	ND	0.1
4-4" DDT	ND	ND	ND	ND	ND	0.1
Heptachlor	0.058P	0.040JP	0.054P	0.058P	ND	0.4
Heptachlor epoxide	0.045JP	ND	0.053P	0.045JP	ND	0.2
Semivolatile Organics in ug/L						
2,4-Dimethylphenol	16J	16J	18J	20J	ND	100
2-Methylphenol	13J	14J	13J	15J	ND	NA
4-Methylphenol	500	500	510	590	ND	NA
Bis (2-ethylhexyl) phthalate	ND	12J	11J	ND	1.9J	30
Isophorone	ND	ND	ND	ND	ND	100
Phenol	1300	2700	1700	2000	ND	4000
4-Nitrophenol	ND	ND	ND	ND	ND	NA
Cyanide in ug/L						
	6.6J	5.7J	104	ND	ND	200

Notes:

B = Method blank contains analyte at a reportable level.

E = Scientific notation (e.g., E ^{6} = X 10^{6})

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W1 were labeled W4.

Table 10 - Analytes Detected in Water Samples Collected from Test Cell on August 14, 2003

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	1.4J	ND	ND	ND	NA
Aluminum	704B	746B	983B	957B	200
Arsenic	45.8	49	42.8	42.8	8
Barium	555B	610B	518B	497B	2000
Beryllium	ND	ND	ND	ND	20
Calcium	1.11E+06	1.30E+06	1.01E+06	9.59E+05	NA
Cadmium	ND	ND	ND	ND	4
Cobalt	5.6J	5.9J	5.7J	5.2J	NA
Chromium	1.4J	5.5	1.8J	1.9J	100
Copper	53.4	15.2J	6.1J	8.0J	1000
Iron	181B	619B	164B	160B	300
Potassium	2.01E+06	1.96E+06	2.01E+06	1.91E+06	NA
Magnesium	214JB	334JB	66.9JB	68.5JB	NA
Manganese	1.1J	11.2J	0.87J	0.96J	50
Sodium	6.34E+06	6.73E+06	5.76E+06	5.87E+06	NA
Nickel	541	368	529	514	100
Lead	ND	6.9	ND	ND	10
Selenium	40	48.9	39.9	36.7	50
Thallium	24.6J	ND	ND	ND	10
Antimony	ND	ND	ND	ND	20
Vanadium	32.5J	42.8J	36.4J	34.2J	NA
Zinc	25.4J	54.2J	ND	10.4J	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	0.016 JP	ND	0.021JP	0.031JP	NA
Gamma Chlordane	ND	ND	ND	ND	NA
Alpha-BHC	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	NA
Dieldrin	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	2
Endrin Aldehyde	ND	ND	ND	ND	NA
Endosulfan I	ND	ND	ND	ND	0.4
Endosulfan II	ND	ND	ND	ND	NA
4-4’DDD	ND	ND	ND	ND	0.1
4-4’ DDT	ND	ND	ND	ND	0.1
Heptachlor	ND	ND	ND	ND	0.4
Heptachlor epoxide	ND	ND	ND	ND	0.2
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	ND	28J	ND	ND	100
2-Methylphenol	40J	24J	ND	ND	NA
4-Methylphenol	730	720	610	640	NA
Bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	30
Isophorone	ND	ND	ND	ND	100
Phenol	2800	3800	2400	2600	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	14	20	14	15	200

Notes:

B = Method blank contains analyte at a reportable level.

E = Scientific notation (e.g., E ^{6} = X 10^6)

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W3 were labeled W4.

Table 11 - Analytes Detected in Water Samples Collected from Test Cell on September 17, 2003

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	ND	ND	ND	ND	NA
Aluminum	678B	633B	939 B	675 B	200
Arsenic	38.6	41.5	35.5	39.5	8
Barium	591B	659B	563 J	600 B	2000
Beryllium	0.31J,B	0.34 J,B	0.40 J, B	0.57 J, B	20
Calcium	1.17E6 B	1.42E+06	1.13E+06	1.19E+06	NA
Cadmium	ND	ND	ND	ND	4
Cobalt	4.5J	5.0 J	4.9 J	4.4 J	NA
Chromium	1.0J	3.9 J	0.98 J	1.3 J	100
Copper	21.5J	28.2	5.7 B	18.7 J	1000
Iron	144	574	113	157	300
Potassium	1.98E+06	1.93E+06	2.04E+06	2.03E+06	NA
Magnesium	197J	526 J	134 J	163 J	NA
Manganese	0.80J	6.6 J	0.62 J	0.71 J	50
Sodium	6.77E+06	7.22E+06	6.60E+06	6.81E+06	NA
Nickel	493	369	495	505	100
Lead	ND	3	ND	ND	10
Selenium	40.8	48.9	42	41.1	50
Thallium	ND	ND	ND	ND	10
Antimony	ND	ND	ND	ND	20
Vanadium	25.0 J	31.6 J	26.4 J	25.3 J	NA
Zinc	10.9 J,B	40.9 B	13.1 J, B	7.6 J, B	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	0.36	0.23 P	0.044 B, P	0.061 P	NA
Gamma- Chlordane	0.13 P	ND	0.044 B, P	0.055 P	NA
Alpha-BHC	ND	0.034 B, P	ND	ND	0.02
Delta-BHC	ND	ND	ND	0.24	NA
Dieldrin	0.23 P	0.087 P	0.081 P	0.10 P	0.03
Endrin	0.96	ND	0.13 P	0.43 P	2
Endrin aldehyde	ND	0.17	ND	ND	NA
Endosulfan I	ND	ND	ND	ND	0.4
Endosulfan II	0.30 P	0.13 P	ND	ND	NA
4,4'-DDD	0.39	ND	ND	ND	0.1
4,4'-DDT	0.26	0.018 B, P	0.023 B	ND	0.1
Heptachlor	ND	ND	ND	ND	0.4
Heptachlor epoxide	0.050 P	0.17	ND	ND	0.2
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	ND	ND	ND	ND	100
2-Methylphenol	6.5 B	ND	ND	ND	NA
4-Methylphenol	670	570 B	640	790	NA
Bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	30
Isophorone	7.7 B	ND	ND	ND	100
Phenol	3100	3800	3200	3600	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	ND	4.0J	8.0J	5.0J	200

Notes:

B = Method blank contains analyte at a reportable level.

E = Scientific notation (e.g., $E^6 = X 10^6$)

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W3 were labeled W4.

Table 12 - Analytes Detected in Water Samples Collected from Test Cell on October 15, 2003

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	ND	ND	ND	ND	NA
Aluminum	702	345	586	603	200
Arsenic	39	44	38.6	36.9	8
Barium	628	674	628	629	2000
Beryllium	ND	ND	ND	ND	20
Calcium	1.16E+06	1.43E+06	1.26E+06	1.26E+06	NA
Cadmium	ND	ND	ND	ND	4
Cobalt	4.0J	4.0 J	4.8 J	4.8 J	NA
Chromium	3.6J	2.2 J	0.72 J	1.2 J	100
Copper	19.4J	19.2 J	8.4 J	7.1 J	1000
Iron	152	291	62.6 J	68.0 J	300
Potassium	1.97E+06	1.94E+06	2.06E+06	2.07E+06	NA
Magnesium	155J	419 J	121 J	105 J	NA
Manganese	1.3J	4.2 J	0.62 J	0.51 J	50
Sodium	7.10E+06	7.52E+06	7.04E+06	7.12E+06	NA
Nickel	474	367	416	425	100
Lead	ND	ND	ND	ND	10
Selenium	36.5	44	47.3	43.9	50
Thallium	ND	ND	ND	ND	10
Antimony	ND	ND	ND	ND	20
Vanadium	24.5J	30.8 J	26.8 J	27.1 J	NA
Zinc	7.2J	36.4	4.7J	7.8 J	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	ND	ND	ND	ND	NA
Gamma- Chlordane	ND	ND	ND	ND	NA
Alpha-BHC	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	NA
Dieldrin	0.09 P	0.071 P	0.093 P	0.071 P	0.03
Endrin	ND	ND	ND	ND	2
Endrin aldehyde	ND	ND	ND	ND	NA
Endosulfan I	0.037J, P	ND	0.039J, P	0.027J, P	0.4
Endosulfan II	ND	ND	ND	ND	NA
4,4'-DDD	ND	ND	ND	ND	0.1
4,4'-DDT	ND	ND	ND	ND	0.1
Heptachlor	ND	ND	ND	ND	0.4
Heptachlor epoxide	0.03J,P	ND	0.027 J, P	ND	0.2
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	ND	ND	ND	ND	100
2-Methylphenol	ND	ND	ND	ND	NA
4-Methylphenol	700 J	550 J	420J	490	NA
Bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	30
Isophorone	ND	ND	ND	ND	100
Phenol	4300J	4600 J	3000	3400	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	ND	5.0 J	ND	ND	200

Notes:

E = Scientific notation (e.g., E 6 = X 10^6)

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W3 were labeled W4.

Table 13 - Analytes Detected in Water Samples Collected from Test Cell on January 29, 2004

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	ND	2.1 J	ND	ND	NA
Aluminum	368	1940	500	486	200
Arsenic	41.3	66.3	33	33.8	8
Barium	591	543	596	589	2000
Beryllium	ND	0.42 J,B	ND	ND	20
Calcium	1.52E+06	1.69E+06	1.28E+06	1.27E+06	NA
Cadmium	ND	ND	ND	ND	4
Cobalt	2.3 J	4.4 J	2.6 J	2.2 J	NA
Chromium	1.6 J	7.5	0.98 J	1.1 J	100
Copper	49	133	2.6 J	2.5 J	1000
Iron	86.2 J	4150	45.5 J	25.6 J	300
Potassium	1.88E6 MI	1.81E+06	1.97E+06	1.91E+06	NA
Magnesium	1210 J	2510 J	101 J	97.5 J	NA
Manganese	12.8 J,B,E	18.1 J	0.29 J,B	0.29 J,B	50
Sodium	7.08E+06	7.50E+06	6.84E+06	6.78E+06	NA
Nickel	261	339	344	329	100
Lead	ND	5	ND	ND	10
Selenium	26.4	38.8	34.5	30.7	50
Thallium	ND	ND	ND	ND	10
Antimony	ND	4.6 J	ND	ND	20
Vanadium	19.7 J	48.0 J	20.2 J	19.8 J	NA
Zinc	6.9 J	133	2.5 J	3.2 J	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	ND	ND	ND	ND	NA
Gamma- Chlordane	0.021 J,P	ND	0.021 J,P	0.017 J,P	NA
Alpha-BHC	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	NA
Dieldrin	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	2
Endrin aldehyde	ND	ND	ND	ND	NA
Endosulfan I	0.023 J,P	0.016 J,P	ND	ND	0.4
Endosulfan II	ND	ND	ND	ND	NA
4,4'-DDD	ND	ND	ND	ND	0.1
4,4'-DDT	ND	ND	ND	ND	0.1
Heptachlor	ND	ND	ND	0.024 J,P	0.4
Heptachlor epoxide	0.039 J,P	0.022 J,P	0.031 J,P	0.035 J,P	0.2
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	21 J	19 J	16 J	16 J	100
2-Methylphenol	15 J	15 J	11 J	11 J	NA
4-Methylphenol	570 C	570 C	590 E	590 C	NA
Bis (2-ethylhexyl) phthalate	6.6 J	ND	ND	ND	30
Isophorone	ND	ND	9.8 J	ND	100
Phenol	3200	4600	3700	3900	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	16	17	10	10	200

Notes:

E = Scientific notation (e.g., E ^{6} = X 10^{6})

C= Estimated result. Result concentration exceeds the calibration range.

MI= Matrix Interference

B= Method blank contamination. The associated method blank contains the target analyte at a reportable level.

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W3 were labeled W4.

Table 14 - Analytes Detected in Water Samples Collected from Test Cell on April 19, 2004

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	0.48 J	0.35 J	ND	1.8 J	NA
Aluminum	250	663	336	430	200
Arsenic	36.9	53.1	39.4	94.4	8
Barium	508	443	554	614	2000
Beryllium	ND	ND	ND	1.3 J	20
Calcium	1.50E+06	1.47E+06	1.39E+06	1.36E+06	NA
Cadmium	ND	ND	ND	1.3 J	4
Cobalt	2.5 J	4.6 J	4.7 J	23.1 J	NA
Chromium	1.7 J	4.3 J	1.2 J	6.5	100
Copper	28.7	35.1	4.0 J	12.8 J	1000
Iron	116	1450	48.2 J	77.4 J	300
Potassium	1.38E+6 MI	1.59E+06	1.66E+06	1.63E+06	NA
Magnesium	851 J	2010 J	309 J	1630 J	NA
Manganese	5.0 J	7.8 J	2.2 J	19.2	50
Sodium	6.47E+06	7.18E+06	6.71E+06	6.74E+06	NA
Nickel	178	306	235	263	100
Lead	ND	1.9 J	ND	12.9	10
Selenium	14.1	28.6	27.7	80	50
Thallium	ND	ND	ND	50.6	10
Antimony	ND	5.9 J	ND	15.3	20
Vanadium	14.2 J	45.6 J	16.9 J	30.3	NA
Zinc	11.6 J	54.7	11.3 J	23.5	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	ND	ND	ND	ND	NA
Gamma- Chlordane	ND	ND	ND	ND	NA
Alpha-BHC	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	NA
Dieldrin	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	2
Endrin aldehyde	ND	ND	ND	ND	NA
Endosulfan I	ND	ND	ND	ND	0.4
Endosulfan II	ND	ND	ND	ND	NA
4,4'-DDD	0.019 J,P	0.033 J	ND	ND	0.1
4-4' DDE	ND	ND	ND	ND	0.1
4,4'-DDT	0.024 J,P	0.031 J,P	0.026 J,P	0.026 J,P	0.1
Heptachlor	ND	ND	ND	ND	0.4
Heptachlor epoxide	ND	ND	ND	ND	0.2
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	ND	ND	ND	ND	100
2-Methylphenol	ND	ND	ND	ND	NA
4-Methylphenol	230 J	410 J	240 J	250 J	NA
Bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	30
Isophorone	ND	ND	ND	ND	100
Phenol	2400	5300	3100	2900	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	7.0 J	5.0 J	5.0 J	7.0 J	200

Notes:

E = Scientific notation (e.g., $E^{6} = X\ 10^{6}$)

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W3 were labeled W4.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W1 were labeled W4.

Table 15 - Analytes Detected in Water Samples Collected from Test Cell on July 21, 2004

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	0.32 J	0.36 J	ND	ND	NA
Aluminum	186 B,J	146 J,B	363 B	221 B	200
Arsenic	34.6	51.3	33.7	36.7	8
Barium	499	487	595	509	2000
Beryllium	ND	ND	ND	ND	20
Calcium	1.45E+06	1.34E+06	1.42E+06	1.49E+06	NA
Cadmium	ND	ND	ND	ND	4
Cobalt	2.3 J	2.9 J	2.5 J	2.2 J	NA
Chromium	1.2 J	6.7	1.2 J	1.6 J	100
Copper	12.5 J,B	12.9 J,B	4.5 J,B	15.6 J,B	1000
Iron	102	333	61.8 J	139	300
Potassium	1.58E+6, MI	1.71E+06	1.66E+06	1.63E+06	NA
Magnesium	346 J,B	1440 J,B	118 J,B	454 J,B	NA
Manganese	2.1 J	1.8 J	1.2 J	4.0 J	50
Sodium	6.57 E+6	6.91E+06	6.52E+06	6.60E+06	NA
Nickel	190	300	234	194	100
Lead	ND	ND	ND	ND	10
Selenium	11.7	20.8	19.2	13.4	50
Thallium	ND	ND	ND	ND	10
Antimony	ND	ND	ND	ND	20
Vanadium	14.4 J	63.9	14.5 J	15.5 J	NA
Zinc	9.8 J,B	5.4 J,B	37.9 B	13.0 J,B	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	ND	ND	ND	ND	NA
Gamma- Chlordane	0.037 J,P	0.072	ND	0.036 J, P	NA
Alpha-BHC	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	NA
Dieldrin	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	2
Endrin aldehyde	ND	ND	ND	ND	NA
Endosulfan I	ND	ND	ND	ND	0.4
Endosulfan II	ND	ND	ND	ND	NA
4,4'-DDD	ND	ND	ND	ND	0.1
4-4' DDE	0.024 J,P	ND	ND	0.034 J,P	0.1
4,4'-DDT	0.020 J,P	ND	0.033 J	0.036 J, P	0.1
Heptachlor	ND	ND	ND	ND	0.4
Heptachlor epoxide	ND	0.029 J,P	ND	ND	0.2
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	ND	ND	ND	ND	100
2-Methylphenol	ND	ND	ND	ND	NA
4-Methylphenol	190 J	350 J	210 J	210 J	NA
Bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	30
Isophorone	ND	ND	ND	ND	100
Phenol	2700	6000	3200	3000	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	11	7.0 J	46	8.0 J	200

Notes:

E = Scientific notation (e.g., E ^{6} = X 10^{6})

B= Method blank contamination. The associated method blank contains the target analyte at a reportable level.

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

NA = Not available.

ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W1 were labeled W4.

Table 16 - Analytes Detected in Water Samples Collected from Test Cell on October 13, 2004

	Sample Designations				
	W1	W2	W3	W4	GWQS
Metals in ug/L					
Silver	ND	0.56 J	ND	ND	NA
Aluminum	208 B	1120 B	429 B	206 B	200
Arsenic	36.3	38.9	31.8	37.1	8
Barium	487	542	569	489	2000
Beryllium	ND	ND	ND	ND	20
Calcium	1.34 E+6 B	1.40 E+6	1.33 E+6	1.34E+06	NA
Cadmium	ND	ND	ND	ND	4
Cobalt	1.7 J	2.2 J	1.7 J	1.8 J	NA
Chromium	1.7 J	6.9	2.6 J	1.5 J	100
Copper	6.2 J	29.9	5.0 J	5.9 J	1000
Iron	42.7 J,B	1250 B	125 B	34.8 J,B	300
Potassium	1.42 E+6	1.67 E+6	1.49 E+6	1.43 E+6	NA
Magnesium	333 J,B	1080 J,B	97.2 J,B	272 J,B	NA
Manganese	3.6 J,B	9.4 J,B	1.4 J,B	ND	50
Sodium	6.52 E+6	7.16 E+6	6.38 E+6	6.53 E+6	NA
Nickel	182 B	346 B	201 B	186 B	100
Lead	ND	1.8 J	ND	ND	10
Selenium	14.2	18.9	16.6	11.7	50
Thallium	ND	ND	ND	ND	10
Antimony	ND	ND	ND	ND	20
Vanadium	10 J	53.8	10.6 J	10.4 J	NA
Zinc	3.2 J,B	63.7	20.7 B	2.9 J,B	5000
Mercury	ND	ND	ND	ND	2
Pesticides in ug/L					
Alpha-Chlordane	ND	ND	ND	ND	NA
beta-BHC	0.23	0.15 P	0.092 P	ND	0.2
Gamma- Chlordane	ND	ND	ND	ND	NA
Alpha-BHC	ND	ND	ND	ND	0.02
Delta-BHC	ND	ND	ND	ND	NA
Dieldrin	ND	ND	ND	ND	0.03
Endrin	ND	ND	ND	ND	2
Endrin aldehyde	ND	ND	ND	ND	NA
Endosulfan I	ND	ND	ND	ND	0.4
Endosulfan II	ND	ND	ND	ND	NA
4,4'-DDD	ND	ND	ND	ND	0.1
4-4' DDE	ND	ND	ND	ND	0.1
4,4'-DDT	ND	0.020 J,P	0.028 J	ND	0.1
Heptachlor	ND	ND	ND	ND	0.4
Heptachlor epoxide	ND	ND	ND	ND	0.2
Methoxychlor	0.033 J	0.038 J, P	ND	ND	40
Semivolatile Organics in ug/L					
2,4-Dimethylphenol	ND	ND	ND	ND	100
2-Methylphenol	ND	ND	ND	ND	NA
4-Methylphenol	240 J	440 J	280 J	280 J	NA
Bis (2-ethylhexyl) phthalate	ND	ND	ND	ND	30
Isophorone	ND	ND	ND	ND	100
Phenol	2800	5500	3200	3100	4000
4-Nitrophenol	ND	ND	ND	ND	NA
Cyanide in ug/L					
	20	8.0 J	21	7.0 J	200

Notes:

E = Scientific notation (e.g., E+6 = X 10^6)

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC7:9-6.

J = Estimated result. Result is less than the reporting limit.

ND = Not detected.

B= Method blank contamination. Associted method blank contains the target analyte at a reprtable level.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

Duplicate samples from Well No. W1 were labeled W4.

Table 17 - Analytes Detected in Runoff Samples Collected from Test Cell

	Sampling Date						
	7/22/2003	**8/12/2003**	**9/16/2003**	**10/15/2003**	**5/11/2004**	**7/23/2004**	**GWQS**
Metals in ug/L							
Silver	0.81J	ND	ND	ND	0.34 J	7.1	NA
Aluminum	5810B	1720BM	394B	225	793 B,MI	1.42E+5 B	200
Arsenic	6.1J	8.5J	4.6J	9.5J	3.8 J	66.6	8
Barium	125BJ	229B	54.2J,B	57.6J	34.3 J	1730	2000
Beryllium	0.61J	3.0BJ	0.66J,B	ND	0.65 J	9.8	20
Calcium	1.84E+05	4.28E+05	1.79E5 B	1.73E+05	77400	2.11E+05	NA
Cadmium	0.99J	ND	ND	ND	ND	10.4	4
Cobalt	4.0J	2.9J	0.81J	1.3J	0.79 J	87.9	NA
Chromium	13.9	4.2BJ	3.5J	2.6J	3.4 J	324	100
Copper	52	32	30.7	45.8	19.9 J	893 B	1000
Iron	7830	2270B	510	332	974	1.95E+05	300
Potassium	4.65E+04	2.39E+05	3.77E+04	6.62E+04	13600	50000	NA
Magnesium	1.28E+04	3.30E+04	1.11E+04	1.58E+04	5340	51800 B	NA
Manganese	292	216B	92.5	184	33	3080	50
Sodium	2.19E+05	1.19E+06	1.38E+05	1.53E+05	49300	76100	NA
Nickel	11.6J	13.3B	4.8J	5.8J	4.1 J	234	100
Lead	73.3	18.4	7.2	5.1	11	2010 B	10
Antimony	ND	3.4J	4.1J	4.3J	4.8 J	ND	20
Selenium	ND	5	3.0J	2.4J	3.5 J	6.3	50
Thallium	ND	ND	ND	ND	ND	7.3 J	NA
Vanadium	18.4J	11.8BJ	5.9J	6.1J	7.2 J	377	NA
Zinc	106	23.6J	15.6J,B	17.6J	27.8	2260 B	5000
Mercury	0.16J	ND	ND	0.16J	ND	12.7	2
Pesticides in ug/L							
Dieldrin	0.020JP	ND	ND	ND	ND	ND	0.03
Semivolatile Organics in ug/L							
Bis (2-ethylhexyl) phthalate	8.2J	6.0J	1.2J,B	ND	ND	12	30
Flouranthene	ND	ND	ND	ND	ND	0.72 J	300
Naphthalene	ND	ND	ND	ND	ND	0.19 J	NA
Pyrene	ND	ND	ND	ND	ND	0.79 J	200
4- Nitrophenol	1.2J	ND	ND	ND	ND	ND	NA
Cyanide in ug/L							
	5.0J	5.0J	4.0J	4.0J	11	NS	200

Notes:

B = Method blank contains the analyte at a reportable concentration.

E = Scientific notation (e.g., E ^{6} = X 10^{6})

GWQS = The greater of New Jersey groundwater quality criteria and practical quantitation levels per NJAC 7:9-6.

J = Estimated result. Result is less than the reporting limit.

M = Matrix interference.

NA = Not available.

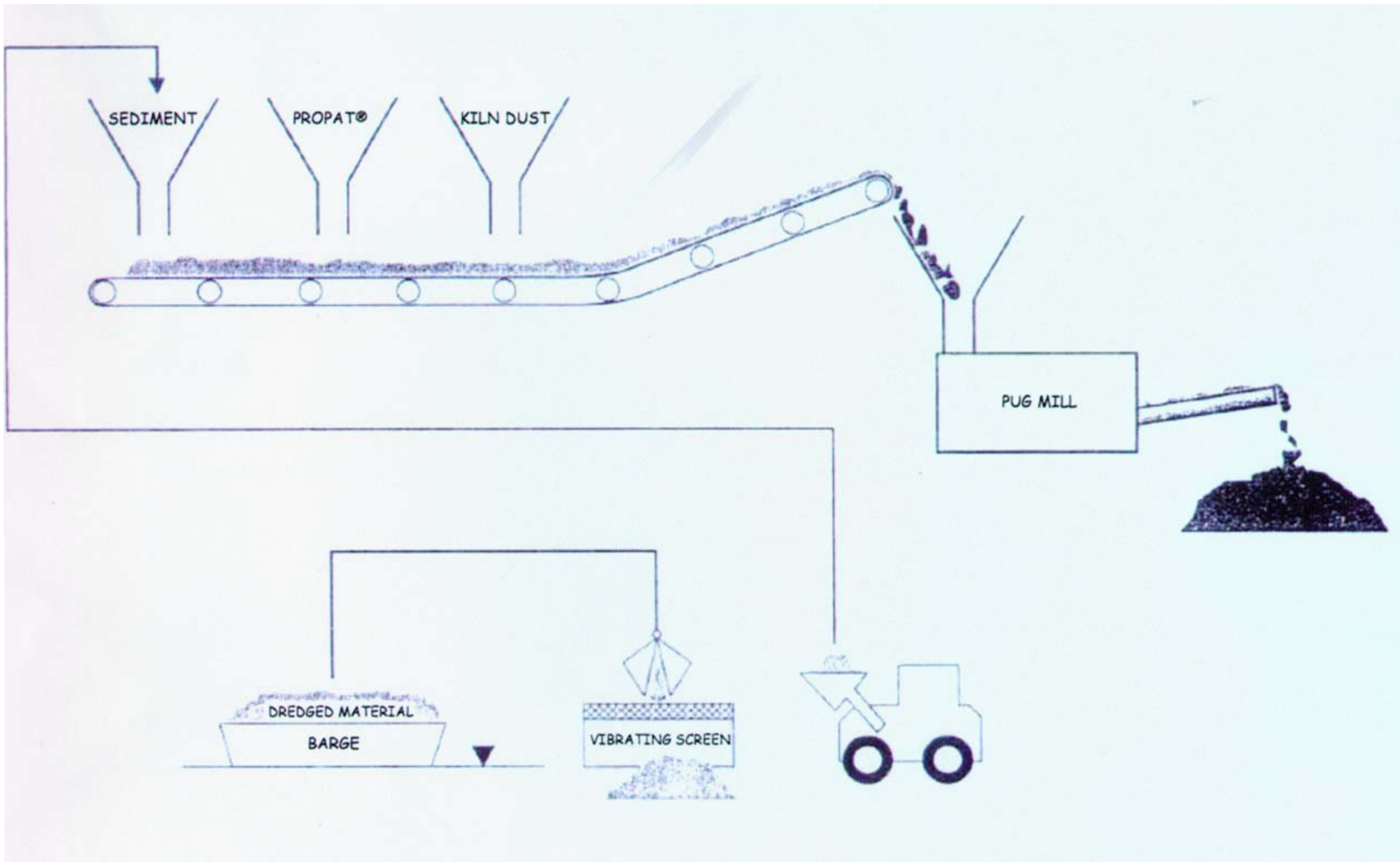
ND = Not detected.

P = Difference between original and confirmation analysis is greater than 40 percent.

Shaded results indicate exceedances of GWQS.

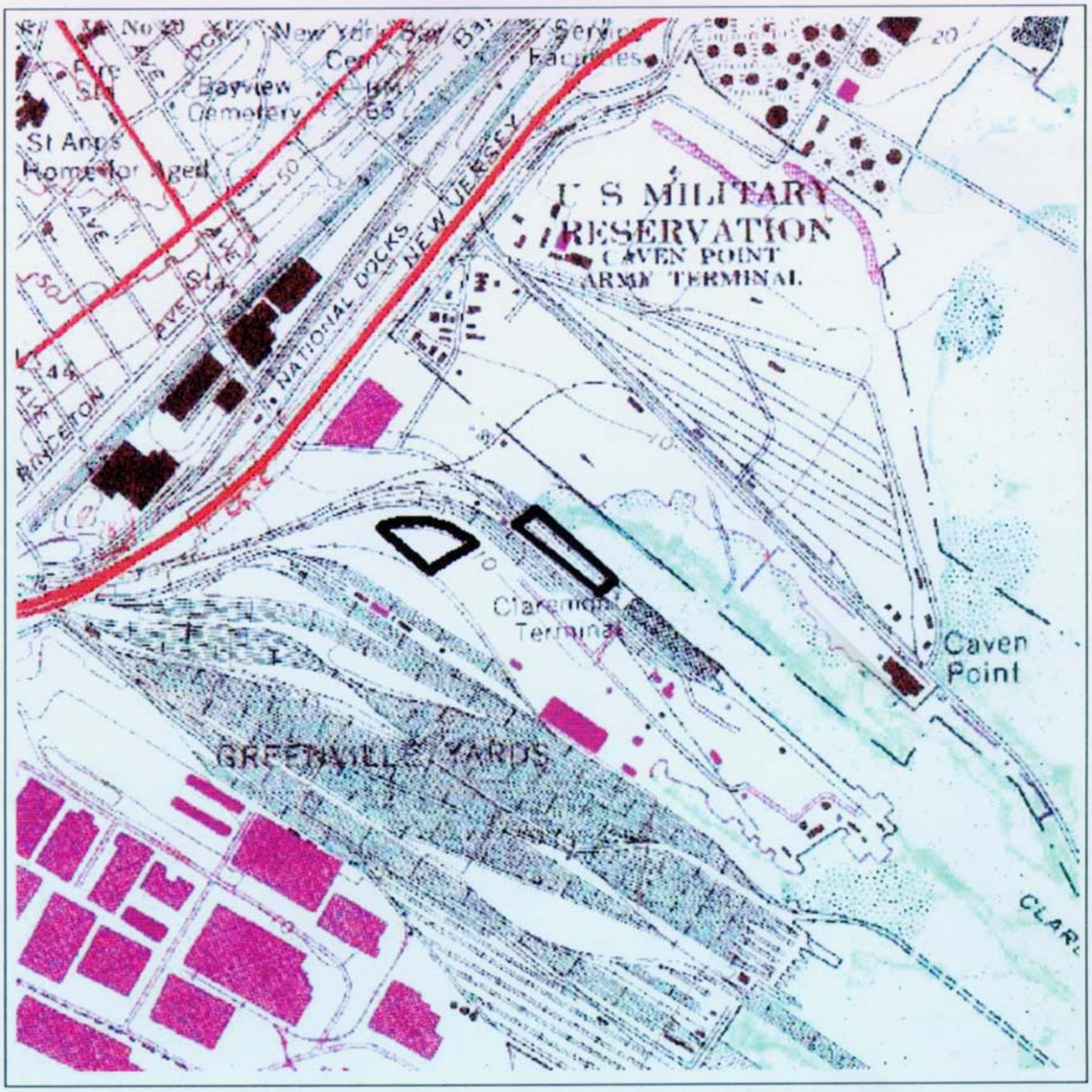
FIGURES

__Process Flow Diagram__



HARTCROWSER
4924-28
Figure 1
6/05

Project Location



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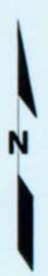

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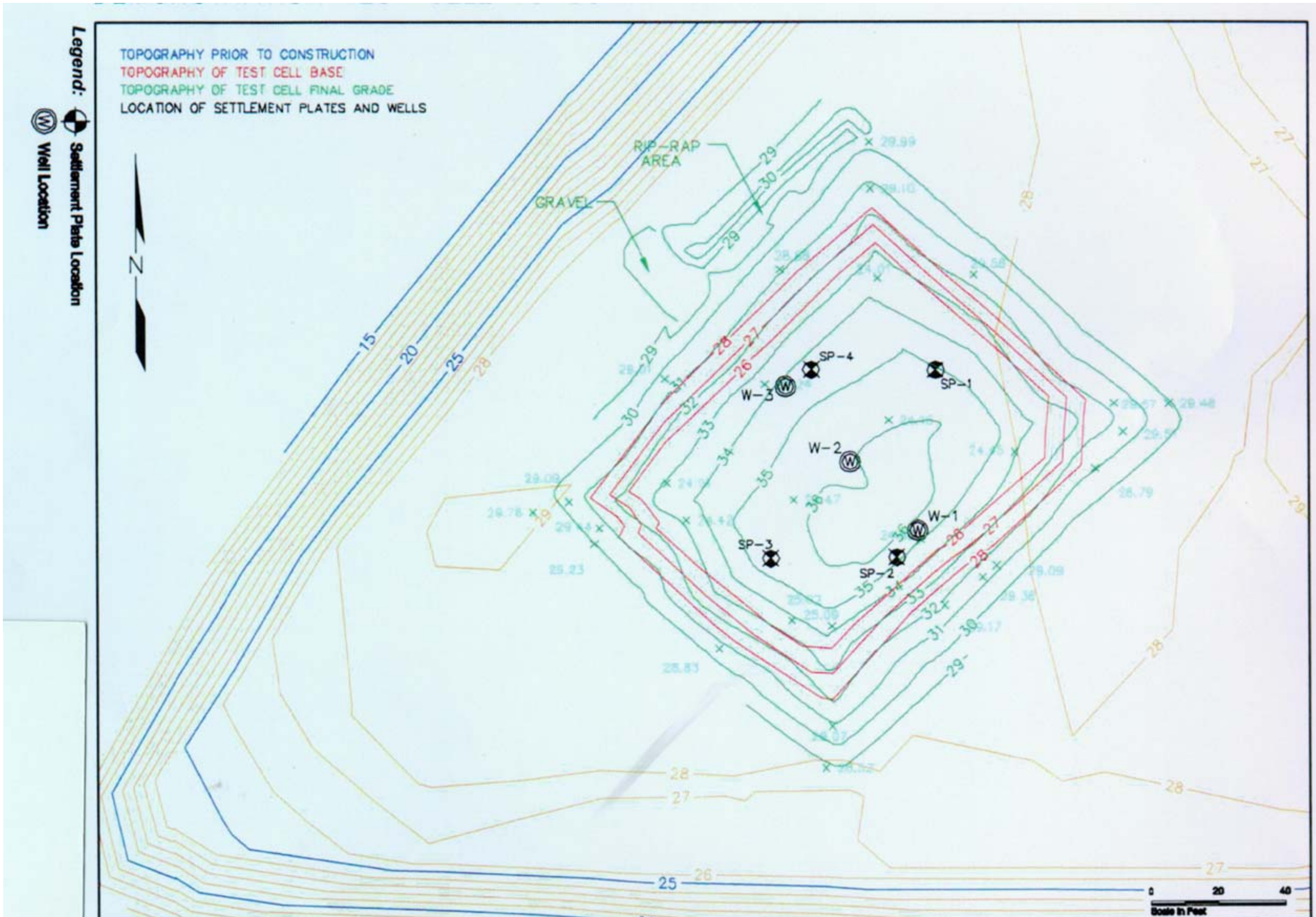
Figure 2

Demonstration Test Cell Topography



Note: Base map prepared from survey taken by LGA Engineering, Inc. on November 6 & 7, 2003. Topographies of the test cell base and final grade were surveyed by LGA on April 11, 2003 and May 7, 2003, respectively. Locations of the site instrumentation were also surveyed on May 7, 2003.

HARTCROWSER
4924-28 6/05
Figure 3

APPENDIX A
LANDFILL APPROVAL FORM

Appendix A is not available electronically.

APPENDIX B
QUALITY ASSURANCE SUMMARY

APPENDIX B
QUALITY ASSURANCE

Quality assurance procedures were followed to assess the precision, accuracy, completeness, and representiveness of the data generated during the study. Quality control procedures were implemented in the sampling, handling, and shipping of samples and during laboratory analyses. Laboratory criteria that were evaluated include the following:

- Holding times
- Method and rinse blanks
- Surrogate recoveries
- Internal standard recoveries
- Laboratory control sample and duplicate recoveries
- Matrix spike and duplicate recoveries
- Laboratory duplicate relative percent difference
- Continuing calibration verification
- Reporting limits

Summaries of quality assurance information on the various stages of the study are presented below. The data were found to be valid for their use, that is, to assess the acceptability of the processed material as fill. Specifically, some lab results were compared to NJDEP environmental criteria, such as groundwater quality standards and soil cleanup criteria.

Bench Tests

Bench scale tests were conducted in 1999 and early 2000. Samples of amended sediment, additives, and various synthetic leachates were analyzed.

Amended Sediment

Nine samples of amended sediment were analyzed by Quanterra Incorporated of Pittsburgh, Pennsylvania. Analyses included the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Percent solids (Plumb method 1981)

Some minor problems were reported for metals analyses. Some results were qualified as estimated values because of calibration blank contamination, reporting limits below screening criteria, recoveries of matrix spikes below control limits, or serial dilution differences for inductively coupled plasma (ICP) greater than control limits.

Detection limits for semivolatile organics were not met initially. Samples were reanalyzed, but outside of holding time limits. Because of these irregularities, data were reported as estimated values. Surrogate recoveries were zero for one sample as a result of dilution. Associated sample results were qualified as estimated values.

In the pesticide/PCB fraction, detection limits for toxaphene were not met initially. Samples were reanalyzed, but outside of holding time limits. Because of these irregularities, data were reported as estimated values. Some results were qualified as estimated values because of zero pesticide surrogate recoveries associated with dilution, PCB surrogate recoveries above control limits, or pesticide surrogate recoveries above control limits.

Results for dioxins/furans for one sample were qualified as estimated values because of internal standard below control limits. Due to a laboratory error, no matrix spike or matrix spike duplicates were analyzed for dioxins/furans.

Leachate from Amended Sediment

Nine aqueous samples derived from the amended sediment samples by means of the modified elutriate test (MET) were analyzed by Quanterra Incorporated of Pittsburgh, Pennsylvania. Analyses included the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290) (two samples only)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)

Some metals results were qualified as estimated values because of calibration blank contamination and detections in procedure blanks. Some results for semivolatile organics were qualified as estimated values because recoveries from laboratory control samples were above control limits. Some dioxin results were qualified as estimated values because of detection of target compounds in method blanks, detections in procedure blanks, and low recoveries of internal standards.

Task 4 Amended Sediment

Eleven aqueous samples were derived from the Task 4 amended sediment samples by the synthetic precitate leaching procedure (SPLP) and analyzed by Quanterra Incorporated of Pittsburgh, Pennsylvania. Analyses included the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Total suspended solids (USEPA Method 160.2)

Results for some metals were qualified as estimated values because of calibration blank contamination.

Task 4 Additives

Seven samples of additives (e.g., fly ash, lime, PROPAT®) were analyzed by Quanterra Incorporated of Pittsburgh, Pennsylvania. Analyses included the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Percent solids (Plumb method 1981)

Some metals results were qualified as estimated values because of calibration blank contamination, detections in procedure blanks, or matrix spike recoveries outside of control limits. Some results for semivolatile organic compounds were qualified because of zero surrogate recoveries associated with dilution or surrogate recoveries outside of control limits. Surrogate recoveries for PCB analyses of one sample were zero because of dilution. Associated results were qualified as estimated values.

Task 5 Amended Sediment

Two amended sediment samples were analyzed by Quanterra Incorporated for the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Percent solids (Plumb method 1981)

Results for some metals were qualified as estimated values because of calibration blank contamination or matrix spike recoveries outside of control limits.

Task 5 SPLP Leachate

Four aqueous samples were derived from two amended sediment samples, one sediment sample, and one PROPAT® sample by the synthetic precitate leaching procedure (SPLP). Leachate was analyzed by Quanterra Incorporated for the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Total suspended solids (USEPA Method 160.2)

Results for some metals were qualified as estimated values because of detection of analytes in procedure blanks or matrix spike recoveries above control limits.

Task 5 MEP Leachate

Seven aqueous samples were derived sequentially from an amended sediment sample by the multiple extraction procedure (MEP), as modified by NJDEP. Leachate was analyzed by Quanterra Incorporated for the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)

- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Total suspended solids (USEPA Method 160.2)

Results for some metals were qualified as estimated values because of detection of analytes in procedure blanks.

Pilot Tests

Pilot tests were conducted in 2000. Samples of various synthetic leachates were analyzed.

MEP Leachate

Aqueous samples were derived sequentially from three amended sediment samples by the multiple extraction procedure (MEP), as modified by NJDEP. Quanterra Incorporated completed the extraction procedure and analyzed the extracts for the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Total suspended solids (USEPA Method 160.2)

Results for some metals were qualified as estimated values because of calibration blank contamination or method blank contamination. The semivolatile extraction holding time was exceeded for some samples. The associated results were qualified as estimated values. Results for some pesticides were qualified as estimated values because of exceedances of holding times or low surrogate recoveries. Some PCB results were also qualified as estimated values because of exceedances of holding times or low surrogate recoveries.

ANSI 16.1 Leachate

Aqueous samples were derived from three amended sediment samples by the Hart Crowser laboratory using the American National Standard Institute Method

16.1. The resulting 25 aqueous samples were sent to Quanterra Incorporated, which analyzed the samples for the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Total suspended solids (USEPA Method 160.2)

Results for some metals were qualified as estimated values because of calibration blank contamination or method blank detection. Results for some semivolatile organics were qualified as estimated values because extraction holding time was exceeded or compounds were detected in the procedure blank. Results for some pesticides and PCBs were also qualified as estimated values because extraction holding time was exceeded.

Supplemental Bench Tests

In 2001, additional bench tests were conducted. Samples of raw sediment, PROPAT®, PROPAT®-amended sediment, and synthetic leachate were analyzed.

Sediment

Five composite samples of sediment were taken from Claremont Channel. Severn Trent laboratories, Inc. of Pittsburgh, Pennsylvania analyzed the samples for the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Percent solids (USEPA Method 160.3)

Results for some metals were qualified as estimated values because of blank contamination or matrix spike recoveries outside of control limits.

PROPAT®

Five samples of PROPAT® were taken at the Hugo Neu Schnitzer East Claremont facility. Severn Trent Laboratories analyzed the samples for the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides (USEPA Method 8081)
- PCB congeners (USEPA Method 3540C/8082A)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Percent solids (USEPA Method 160.3)

The heterogeneous nature of the PROPAT® samples and the materials of which it is composed made analyses difficult. Detection limits for some organic compounds were raised because of extraction solvents dissolving plastics within the PROPAT®. In some cases, detection limits exceeded the NJDEP soil cleanup criteria used for comparison of results.

Results for some metals were qualified as estimated values because matrix spike recoveries were above control limits. Some PCB results were qualified because the relative percent differences of continuing calibration verification were above control limits. Some dioxin and furan results were qualified because surrogate recoveries were below control limits or the lab was unable to rerun samples exceeding the upper calibration limit.

PROPAT® TCLP Analyses

Five samples of PROPAT® were also analyzed via methodology derived from the USEPA toxicity characteristic leaching procedure (TCLP). Severn Trent Laboratories synthesized leachate by USEPA method 1311 and analyzed the resulting aqueous samples for the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Herbicides (USEPA Method 8151A)
- Volatile organics (USEPA Method 8260B)

No quality assurance issues were identified relative to these analyses.

PROPAT®-Amended Dredged Material

Four samples of PROPAT®ADM were prepared. Severn Trent Laboratories analyzed these samples for the following fractions:

- Total Metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides (USEPA Method 8081)
- PCB congeners (USEPA Method 3540C)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)
- Percent solids (USEPA Method 160.3)

Results for some metals were qualified as estimated values because matrix spike recoveries were outside of control limits. Some PCB and dioxin analyses were qualified because of surrogate recoveries outside of control limits. Cyanide results were qualified because matrix spike findings were below control limits.

MEP Leachate

Aqueous samples were derived sequentially from four amended sediment samples by the multiple extraction procedure (MEP), as modified by NJDEP. Severn Trent completed the extraction procedure and analyzed the extracts for the following fractions:

- Total Metals (USEPA Method 200 series)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides (USEPA Method 8081)
- PCB congeners (USEPA Method 3540C)
- Dioxins and furans (USEPA Method 8290)
- Total organic carbon (Walkley-Black method)
- Cyanide (USEPA Method 9012A)

Some pesticide results metals were qualified because continuing calibration relative percent differences were outside of control limits. Some PCB results were qualified because of surrogate recoveries above control limits. Results for total organic carbon were qualified because of matrix spike findings below control limits.

Monitoring Well and Runoff Sampling

Aqueous samples were taken from the monitoring wells and the runoff trough of the test cell on multiple rounds. STL Laboratories of Pittsburgh, Pennsylvania analyzed all samples for the following fractions:

- Total metals (USEPA Method 6000/7000)
- Semivolatile organic compounds (USEPA Method 8270)
- Pesticides and PCBs (USEPA Method 8081/8082)
- Cyanide (USEPA Method 9012A)

Quality control information for the individual sampling events are summarized below.

July 9, 2003: Monitoring Well Sampling

Some metals results were qualified as estimated values because of analytes detected in the method blanks.

July 22, 2003: Runoff Sampling

The samples were received at the laboratory on July 23 at temperatures above guidelines. Some metals results were qualified as estimated values because of analytes detected in the method blanks.

August 12, 2003: Runoff Sampling

The samples were received at the laboratory at temperatures above guidelines. Some minor problems were reported for metals analyses. Some results were qualified as estimated values because the serial dilution percent difference was outside the control limits or analytes were detected in the method blanks.

August 14, 2003: Monitoring Well Sampling

The samples were received at the laboratory on August 15 at temperatures above guidelines. Some metals results were qualified as estimated values because serial dilutions were outside of control limits for percent differences or analytes were detected in method blanks.

September 16, 2003: Runoff Sampling

The sample temperature was above guidelines when received at the laboratory on September 17. Semi-volatile results for bis(2-ethylhexyl)phthalate were qualified because this compound was detected in the method blank. Some metals results were also qualified because of analytes detected in the method blank.

September 17, 2003: Monitoring Well Sampling

Some metals results were qualified as estimated values because analytes were detected in method blanks.

October 15, 2003: Monitoring Well and Runoff Sampling

Some metals were detected in method blanks; therefore, related results were qualified as estimated values.

January 29, 2004: Monitoring Well Sampling

Some metals results were qualified as estimated values because the serial dilution percent difference was outside the control limits or analytes were detected in the method blanks.

April 19, 2004: Monitoring Well Sampling

No results required being reported as qualified.

May 11, 2004: Runoff Sampling

Aluminum results were qualified because the serial dilution was outside the percent difference control limits. Some other metals results were qualified because analytes were detected in the method blanks. Cyanide results were also qualified because that compound was detected in the method blank.

July 21, 2004: Monitoring Well Sampling

Some metals results were qualified as estimated values because the serial dilution percent difference was outside the control limits or analytes were detected in the method blanks. The matrix spike and matrix spike duplicate for cyanide recovered outside the control limits.

July 23, 2004: Runoff Sampling

The cooler was outside the proper temperature range when received on July 26. Some metals results were qualified because analytes were detected in the method blanks.

October 13, 2004: Monitoring Well Sampling

Some metals results were qualified because analytes were detected in the method blanks.

APPENDIX C
PROJECT REPORT BY LGA ENGINEERING, INC.
MARCH 7, 2005

Appendix C is not available electronically.