PELHAM BAY LANDFILL
CLOSURE AND FINAL REMEDIATION

CONSTRUCTION CERTIFICATION REPORT

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Prepared for

New York City Department of Environmental Protection
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1.0 INTRODUCTION

This report is submitted per the New York State Department of Environmental Conservation (NYSDEC) Record of Decision (ROD) for the Pelham Bay Landfill (August 31, 1993), and per 6 NYCRR Part 360, Solid Waste Management Facilities, effective December 31, 1988 (revised May 28, 1991). The funding source for this project is the Environmental Quality Bond Act (EQBA), 1986, Title 3, Reimbursement Contract Number C300458.

The purpose and scope of this report is to describe the design, construction, inspection, and certification of the closure and final remediation of the Pelham Bay Landfill, located in Bronx County, New York City, New York.

The project owner is the City of New York, Department of Environmental Protection (NYCDEP). Woodward-Clyde Consultants, Inc. (WCCI, now known as URS Corporation) was the owner's Design Engineer as authorized under Contract No. 0159235668. The NYCDEP provided the Resident Engineer and Quality Assurance Inspector for all construction projects related to the closure and final remediation of Pelham Bay Landfill (herein referred to as the Site or the Landfill).

The report is organized to present the original project design, authorized modifications to the design, contractually required document submittals, and the project's construction and inspection procedures.

The major components of this capping and closure project are described as follows:

1. In 1990, a "150-day leachate collection system" was designed and constructed under Contract Nos. HP-867 and HP-868.

2. On March 27, 1992, WCCI was retained by NYCDEP to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the site. The Final Remedial Investigation Report (RI) was submitted in April of 1993. A Record of Decision (ROD) was issued by NYSDEC in August of 1993.

Additional remedial activities were instituted on-site under Contract Nos. HP-875, HP-876, and HP-877 in accordance with the ROD, including the following major components of the remedial action:

- Regrading of the Site to provide proper site drainage and minimize erosion.

- Installation and operation of a groundwater/leachate management system consisting of:

    1. A cut-off wall and an upgradient collector drain along the southwestern edge of the Site adjacent to Pelham Bay Park.

    2. A downgradient collector drain along the southwestern edge of the Site (landfill side of the cut-off wall).

    3. In addition, a portion of the above-ground leachate force main, installed under Contract No. HP-867, was dismantled and replaced with a below-grade force main.

- Installation and operation of an active gas collection system to collects gas from the landfill and convey it through piping to a flare station located at the base of the landfill.

- Installation of a stormwater collection system including drainage ditches, subdrains, conveyance piping, manholes, baffled outlets, inlet/outlet structures, sedimentation basins and outfalls.

- Installation of an actively vented impermeable final cover, consistent with NYCRR Part 360 regulations for Solid Waste Management Facilities, to minimize surface infiltration of precipitation and to collect gases generated by the waste material.

- Installation of a single-sided geosynthetic gas venting layer below the geomembrane on the top portion of the landfill.

- Limitation of use of the Site to reduce the risk of the remedial action being damaged or compromised.

- Construction of additional on-site groundwater extraction wells, in the future, if required.

1.1 PROJECT CONTRACTORS

The following project contractors were responsible for the construction activities at the site, as identified by DEP contract designations:

- Contract HP-875 - Barbella Environmental Technologies;
- Contract HP-876 - Breco Mechanical Group; and,
- Contract HP-877 - Centrum Construction.

The following additional sub-contractors provided specialized construction and quality assurance (QA) testing services:

- Moretrench, Inc., a subcontractor to Breco Mechanical Group, Inc., performed drilling for gas extraction well installation;
- Environmental Laboratories, Inc. (ELI), a subcontractor to Breco Mechanical Group, provided testing and maintenance service for the gas collection system;

- Chemtech, an Environmental Protection Agency (EPA) Certified Laboratory Program (CLP) certified facility, provided analytical services for the condensate samples;
- Inquip Associates, Inc. (McLean, Virginia), a subcontractor to BET, provided all technical work pertaining to the slurry wall construction;
- Mueser-Rutledge Consulting Engineers (New York), conducted permeability testing on the piston tube samples from the backfill material along the slurry wall; and,
- Gundle Corporation was the installer of the geomembrane material.

2.0 PROJECT DESIGN

The design engineer, WCCI, issued three (3) NYSDEC approved construction contract documents for the remediation and closure of the Pelham Bay Landfill. These were identified as Contract Nos. HP-875, HP-876, and HP-877. The primary remedial actions undertaken under each of these contracts are further identified as follows:

Contract HP-875

- Installation of a soil-bentonite cut-off wall along the southwest portion of the landfill; and,
- Installation of leachate and groundwater collector drain systems.

Contract HP-876

- Construction of a gas management system including piping and ancillary structures;
- Construction of a stormwater management system including sedimentation ponds;
- Construction of a Part 360 Final Cover System composed of soil subgrade material, 60-mil HDPE geomembrane, geocomposite drainage layer, loamy soil barrier protection layer, and a vegetated topsoil layer; and,
- Construction of permanent access roads including preparation of subgrade and placement of crushed aggregate base course material.

Contract HP-877

- Construction of the off-site leachate force main, including the placement of stone bedding, geotextile filter fabric, air release valve, blow-off valve, and pressure relief manholes, piping and fittings.

An overview of each of these contract construction components is briefly described in this section. Additional construction details are provided in the following sections:

Section 3: Groundwater and Leachate Management Systems Construction;

Section 4: Landfill Gas Management System Construction;

Section 5: Stormwater Management System Construction;

Section 6: Part 360 Final Cover System Construction; and,

Section 7: All Other Components of the Remedial Action.

2.1 GROUNDWATER AND LEACHATE MANAGEMENT SYSTEMS

2.1.1 Groundwater Management

The groundwater management system included the construction of a low-permeability vertical barrier cut-off wall and a collector drain located on the park side of the cut-off wall to control groundwater gradients.

A soil-bentonite barrier cut-off wall, approximately 1,300 ft in length, was installed at the southern and southwestern portions of the Site between the landfill and Pelham Bay Park (see Figure G-1). The cut-off wall was constructed using slurry trench methods and was backfilled with a mixture of existing soils and bentonite which produced a low permeability backfill material. The wall was installed to depths ranging from approximately 6 ft to 14 ft below ground surface, and terminates at the top of the underlying bedrock surface. The cut-off wall is approximately 3 to 5 ft wide (see Figure G-2).

A groundwater collection drain was constructed on the Pelham Bay Park side of the cut-off wall. The up-gradient drain was designed to intercept groundwater flowing from the Pelham Bay Park toward the landfill and divert the flow via a buried 8-inch diameter HDPE pipe (slotted and solid) to an existing storm sewer which outlets directly into Eastchester Bay.

Nineteen (19) groundwater monitoring wells are used to measure groundwater elevations. There are fifteen (15) wells within the limits of the Landfill. There are an additional four (4) wells outside the Landfill in Pelham Bay Park. Currently, nineteen (19) wells remain at the Site.

In addition, six (6) cut-off wall piezometers were installed as part of the cut-off wall construction (three (3) on the landfill side and three (3) on the Park side). Currently, two (2) piezometers remain at the Site. These were installed to monitor the groundwater and leachate levels on either side of the cut-off wall (upgradient and downgradient, respectively).

2.1.2 Leachate Collection and Disposal System

The leachate collection and disposal system is comprised of a number of separate components installed over the 10-year construction period of the landfill remediation, and consists of the following components:

- Downgradient Collection Drain, Collection Manholes and Collection Sumps;
- Curtain Drain;
- Lift Stations Nos. 1 and 2;
- Leachate Storage Tanks; and,
- Force Main Discharge (to the Hunt's Point Water Pollution Control Plant).

The downgradient collector drains consist of 8-inch diameter slotted HDPE pipes embedded in sand and gravel. The collector drains intercept leachate migrating from the landfill, ultimately directing the leachate into Collection Sump D-1. This flow discharges into a NYC sewer manhole at Burr Avenue via an off-site force main (see Figure G-3).

Five (5) 20,000 gallon reinforced fiberglass above ground leachate storage tanks, originally constructed to store leachate on site, are now used to store leachate during rain events, when direct pumping to the Burr Avenue sewer manhole is not permitted. A telemetric communication system has been constructed in order to control the discharge of leachate into the Burr Avenue combined sewer system. Storm events which create a combined sewer overflow condition will be detected by a high level sensor located on Brush Avenue just south of the intersection with Bruckner Boulevard, causing leachate pumping to cease until normal sewer flow rates resume.

2.2 LANDFILL GAS MANAGEMENT SYSTEM

The landfill gas management system is comprised of two main components: the landfill gas collection system; and the blower/gas flare system. These combined systems work together to collect, monitor and control gas emissions associated with the landfill. Figure G-1 shows the layout of the landfill gas collection system and the location of the gas flare system.

2.2.1 Landfill Gas Collection

The principal components of the landfill gas collection system are:

- Twenty-two (22) gas extraction wells, consisting of 4-inch diameter PVC perforated and solid piping extending into the refuse. Each well head includes an isolation valve and fitting for pressure gauges and a flexible hose connection to a 3-inch diameter solid polyethylene pipe which conveys the extracted landfill gas to the gas transmission header (see Figure G-1a);

- Transmission headers originating at a high point on the east side of the landfill and sloping continuously around the landfill to a low point adjacent to the blowers and flare station at the base of the landfill. The transmission header is constructed of solid HDPE pipe;

- A gas venting layer (single-sided geocomposite and 9" sub-base soils) and horizontal collection piping which conveys the gas that may accumulate near the surface of the landfill to the transmission headers;

- Horizontal collection piping around the periphery of the landfill conveys the gas that may accumulate at the base of the landfill to the flaring station. This limits the off-site migration of the gas;

- A gas/condensate separator located adjacent to the landfill gas flare station. As condensate is the liquid that forms in the landfill gas collection system when the gas

cools, it is considered to be a leachate. The landfill gas/condensate separator is connected to an 8-inch diameter HDPE inspection pipe riser, which allows the condensate to flow by gravity, through double wall containment piping, to Manhole D-2 of the downgradient leachate collection drain system; and,

- Flare station blowers that are able to convey up to 1500 cfm of landfill gas for oxidation via combustion in the 7-foot diameter by 40-foot high enclosed gas flare stack.

2.3 STORMWATER MANAGEMENT SYSTEM

The stormwater management system on the landfill surface is designed to convey runoff from the 25-year, 24-hour event (approximately 6 inches of rain in a 24-hour period) within the drainage swales and stormwater collection piping. Figure G-4 shows the layout of the stormwater management system for the Site.

Stormwater runoff on the landfill surface is collected by drainage swales located alongside the access roads, which transfer the runoff to buried 24-inch diameter corrugated HDPE pipes. At the base of the landfill, runoff in the pipes is discharged through concrete baffled outlets, and is then conveyed via perimeter drainage swales to one of three sedimentation ponds located at the base of the landfill. Sedimentation Ponds A and B are hydraulically connected by 30-inch diameter HDPE pipes to Sedimentation Pond C. The stormwater is then discharged from Pond C into Eastchester Bay through a 24-inch diameter Reinforced Concrete Pipe (RCP) and/or over the Pond C Spillway. Figures G-4a through G-4e show the layout of the above described stormwater management system components.

An infiltration drainage trench, including 6-inch diameter corrugated HDPE piping (sub-drain piping), is also part of the stormwater system. The drainage trenches collect water which has infiltrated from the top of the landfill cover system down to the geocomposite drainage layer. The water is transported by sub-drain piping to the stormwater collection manholes.

Two portions of the sub-drain system do not tie into the stormwater collection manholes. The first portion discharges via a transfer pipe to manhole MH-3A, which empties into an existing storm sewer and discharges into Eastchester Bay. The second portion discharges directly to Eastchester Bay at the 6-inch diameter infiltration drainage pipe outfall located at the northern tip of the site.

2.4 LANDFILL COVER SYSTEM

The landfill cover system is comprised of the following elements, presented in order (see Figure G-5):

- Sub-base layer (9-inch thick);
- Gas venting layer;
- HDPE geomembrane liner (60 mil thick);
- Double-sided geocomposite drainage layer;
- Barrier protection layer (24-inch thick); and,
- Vegetated topsoil layer (6-inch thick).

Sub-Base Layer

A soil sub-base layer was placed on top of the existing daily cover to provide a smooth subgrade on which to place the geomembrane. The specified thickness of the sub-base layer is nine (9) inches. The soil consists of on-site cover soil material and imported soil free from debris, landfill waste and frozen material. All imported soil had a maximum particle size of one (1) inch.

Gas Venting Layer

At the top portion of the landfill, a geosynthetic gas venting layer was installed above the soil sub-base layer. The gas venting layer is comprised of a single-sided geocomposite (which consists of a geotextile, heat-bonded to one side of a drainage geonet), crushed stone-filled trenches, and corrugated and perforated HDPE horizontal gas collection pipes. The layer is connected, via solid HDPE pipes, to the remainder to the active gas collection system.

On the sideslopes, the gas venting system consists of a 9-inch thick layer of soils underlying the geomembrane. The purpose of the gas venting layers is to collect the gases at the surface of the landfill and channel them to the active gas collection system. The gas collection system is intended to passively vent to the atmosphere only when the active gas venting system has been decommissioned.

HDPE Geomembrane Liner

The geomembrane liner consists of a 60-mil thick textured high-density polyethylene (HDPE) geomembrane on the side slopes of the landfill, and a 60-mil thick smooth HDPE geomembrane on the top portion of the landfill. The purpose of the geomembrane is to prevent rainfall infiltration into the landfill and landfill gas migration into the atmosphere.

Double-Sided Geocomposite Drainage Layer

A geocomposite drainage layer, consisting of geotextiles, heat-bonded to both sides of a drainage geonet, underlies the loamy soil barrier protection layer. The purpose of the geocomposite layer is to collect water infiltration through the soil layer and divert it to the infiltration drainage trenches, where it is transported through a sub-drain pipe system to the stormwater sedimentation ponds (described in Section 2.3).

Barrier Protection Layer

The barrier protection layer is a 24-inch thick loamy soil protective barrier, which protects the geomembrane layer from infiltration of stormwater, frost, exposure to the elements, and pressure from heavy surface loads. The barrier protection layer is composed of existing cover soil and natural soil borrow fill that meets the classification of SP-SM, SM, SC or ML and has a specified maximum particle size of three (3) inches.

Vegetated Topsoil Layer

The topsoil layer was constructed to support vegetative growth over the landfill surface and consists of a minimum 6-inch thick soil layer having a loamy texture, with a specified pH range of 7-8 in order to promote proper vegetative growth. Wildflower seeding of the topsoil layer was specified to achieve a more natural habitat for wildlife.

Additionally, 26 planting islands were constructed as an integral component of the landfill final cover system. These islands are approximately 2.5 feet in depth and are planted with a mixture of trees and shrubs.

3.0 GROUNDWATER AND LEACHATE MANAGEMENT SYSTEMS

The groundwater and leachate management systems for the landfill consist of a soil-bentonite slurry wall, a leachate collection system and force main, leachate collection pumping units, and a leachate control system. These are described in further detail in the following sections.

3.1 SLURRY WALL

To install a seepage cut-off wall for groundwater management, the slurry trench method was used which included the use of soil-bentonite along the southwest portion of the landfill.

The 3-foot wide, 1276-foot long slurry trench was excavated to bedrock in accordance with Contract Documents. When bedrock was encountered, both Inquip and NYCDEP took depth measurements at 10-ft intervals. QC and QA measurements for the excavation depths are shown in Appendices A-1 and A-2, respectively.

As the trench was excavated, bentonite slurry was pumped into the trench. Fresh slurry and slurry-in-trench testing was conducted in accordance with Contract requirements. Typical physical and chemical properties of the soil bentonite backfill, as well as completed design mix testing, are shown in Appendix A-3.

The Resident Engineering staff observed the installation of the slurry wall from material handling to backfill placement and testing. BET subcontracted all work pertaining to the slurry wall construction to Inquip Associates, Inc. based in McLean, Virginia.

Flexible wall permeability tests were performed on six (6) piston tube samples taken from the backfill material at locations chosen by the Resident Engineer staff. Test data is reported in Appendix A-4. When the laboratory results on the piston samples confirmed that the required permeability was achieved, the cut-off wall was deemed acceptable. In October 1994, a concrete cap was installed over the cut-off wall. Piezometer wells were installed on both sides of the cut-off wall for monitoring of ground water.

3.2 LEACHATE COLLECTION SYSTEM AND FORCE MAIN

The leachate collection system is comprised predominantly of a gravity collection drain and an off-site force main. The components of the leachate collection system are discussed in the following sub-sections.

3.2.1 Leachate Collection Trench

The leachate collection trench excavation and piping was concentrated predominantly in the southwest perimeter of the landfill. Excavated areas were backfilled using crushed stone base material. The method of backfill placement did not disturb or damage collector drain trench piping, force main, or other utilities in the trenches.

3.2.2 Collector Drain Systems

In August and September of 1994, pipes, manholes, associated electrical conduits, sumps, and pumps were installed for two leachate collector drain systems: upgradient (groundwater) and downgradient (leachate) collector drain trenches (see Figure G-6). The Contract Drawings, as well as subsurface information available from the design phase, indicated bedrock at elevations well below actual bedrock elevations. As a result, the invert elevations and associated slopes of the two collector drains were changed (raised) within allowable limits at various locations to account for actual field conditions. The collector drain trenches were backfilled with Select Backfill Type A and Aggregate Type C.

3.2.3 Construction For IRM Force Main

An existing Interim Remedial Measures (IRM) system is located near the entrance to the landfill and consists of a leachate extraction system and five (5) above ground storage tanks (ASTs), each having 20,000-gallon storage capacity. The IRM system is currently active and remained active during the period of construction.

An extension to the existing IRM force main from the landfill to the sewer at Burr Avenue was completed in accordance with the Contract Documents. A connection from the force main to the existing collection sump D-1 was made. The off-site force main sections crossing underneath the Bruckner Expressway (I-95) entrance and exit ramps were installed by jacking method as described under Contract HP-877.

The new below grade IRM force main, along with its associated electrical conduits, pumps, and ancillary structures, replaced the existing above grade IRM force main. The new IRM system was connected to the existing pumping wells and discharge location.

3.2.3.1 Force Main and Pressurized Piping Backfill

For pipe bedding, well-graded crushed stone or crushed gravel was used which met the requirements of ASTM C33, Gradation 67. For Crushed Stone Base material, hard and durable particles of crushed stone or gravel was used conforming to Section 703-02 of the NYSDOT Standard Specifications.

Field quality control for Pipe Bedding and Crushed Stone Base consisted of a sieve analysis which was specified and performed at frequencies of one (1) per 200 linear feet conforming to ASTM C136.

3.3 LEACHATE COLLECTION PUMPING UNITS

Pumps are used to transport the leachate from the landfill leachate collection system to the IRM force main, and then to the New York City sewer system. The pumps are located at Lift Station No.1, Lift Station No.2, and Collection Sumps D-1, D-8 and D-10.

Leachate flow enters Sump D-1 from Lift Station No.2, the downgradient collector drain, and leachate collection tank area, which includes: Lift Station No.1, the containment field sump, and the decontamination area sump. The leachate is then pumped into the force main for discharge into the New York City sewer system. All leachate collection pumps were tested in accordance with the Contract Documents.

3.4 LEACHATE CONTROL SYSTEM

The leachate discharges into the New York City Sewer System at Burr Avenue/Pelham Parkway South via the off-site force main. The leachate combines with wastewater and stormwater and flows into overflow chamber CSO 22. During heavy precipitation events, the combined wastewater, stormwater and leachate volume can exceed the capacity of the chamber CSO 22 and overflow directly into Westchester Creek. In order to prevent the leachate portion of this flow from entering the creek, a control system was designed that stops pumping from

Collection Sump D-1, and further down the system if necessary, prior to the onset of overflow conditions at CSO 22.

4.0 GAS COLLECTION AND CONTROL SYSTEMS

The purpose of this construction was to provide long term stable operation of landfill gas extraction and its controlled thermal destruction. The integrated system was designed with the following objectives:

- maintain effective gas emission control;
- provide an anaerobic atmosphere within the landfill;
- eliminate nuisance odor emissions; and,
- prevent gas migration off the landfill.

4.1 GAS EXTRACTION WELLS

Moretrench Inc., a subcontractor to Breco Mechanical Group, Inc., performed drilling for gas extraction well installation. Twenty-two (22) gas extraction wells were installed in January 1995. The wells vary in depth from 42 to 82 feet, and are placed every 4 acres, on average, across the Landfill (see Figure G-1).

4.2 GAS MONITORING WELLS

Three (3) gas monitoring wells were installed in the northwest perimeter of the landfill by Moretrench, Inc. as required by the Contract Documents. The gas monitoring wells were installed using a methodology similar to that followed for gas extraction well installation (see Figure G-1a).

4.3 GAS COLLECTION PIPING

The gas extraction wells were tied into a gas collection piping system terminating with a flare station at the base of the landfill. All gas extraction wells terminate to a common underground header collection system which, in turn, conveys the landfill gas to the gas flaring system. All well connections and header pipes slope toward the flare to allow condensate to collect at the landfill base for discharge. A 4-inch diameter High-Density Polyethylene (HDPE) horizontal perforated and corrugated gas collection pipe was installed

along the perimeter base of the landfill below grade and below the 60-mil geomembrane. The purpose was to capture landfill gas that might migrate off the landfill.

The collection and flare systems became operational on August 14, 1996. Installation of this system was in strict accordance with the manufacturer's standard recommended installation procedure.

4.4 CONDENSATE MANAGEMENT

The condensate removal system was designed for the collection of the landfill gas condensate and its final disposal. This removal system consists of:

- A gas condensate separator;
- A gas collection rider connection; and,
- A solid 2-inch diameter HDPE carrier pipe encased by a solid 4-inch diameter containment pipe for condensate water removal.

The landfill gas condensate was sampled on March 5, 1997 using the sampling methods from 6 NYCRR Part 371. Chemtech, an Environmental Protection Agency (EPA) Certified Laboratory Program (CLP) certified facility, analyzed the samples. Based on the analytical results, the samples did not exhibit any hazardous characteristics as defined under 6 NYCRR Part 371.3. Therefore, the condensate was managed as non-hazardous.

4.5 FLARE STATION

The flare system consists of two (2) Lamson Centrifugal LFG blowers discharging into a single enclosed John Zinc Flare System. Both have separate but interfacing controls. The flare system has a series of key safety interlocks, which include:

- High flame temperature;
- Flame failure;
- Low purge air flow; and,
- Low temperature.

The blowers draw landfill gas from the collection header and discharge it into the flare system. Each blower is capable of supporting flare operation requirements at a rated capacity of 1300 CFM and 6 inches Hg. The flare system can accommodate 1500 CFM at 1600°F to 1800°F and 2 to 4 inches Hg.

Compliance testing of the flare was performed after the gas extraction system achieved relative stability. Operational data on the flare system was collected concurrently with the monitoring of the gas extraction wells. Environmental Laboratories, Inc. (ELI), subcontractor to Breco Mechanical Group, was responsible for the following flare monitoring activities:

- balance of the gas collection system;
- weekly monitoring;
- routine maintenance; and,
- test flare emissions for compliance.

Breco prepared and submitted a testing protocol for NYSDEC approval, had independent testing confirm conduct performance tests in accordance with protocols approved by NYSDEC, and provided certified testing results to demonstrate the attainment of the NYSDEC approved emissions limitations based on landfill gas design flows and composition.

Beginning with the first day of operation, August 14, 1996, ELI has submitted quarterly reports on the flare system operation to Breco. The flare unit performance criteria was presented to NYCDEP in quarterly monitoring performance reports.

5.0 STORMWATER MANAGEMENT STRUCTURES

The stormwater management for the Landfill consists of the following major components: infiltration drainage trenches, sedimentation ponds, stormwater conveyance system, as well as all associated piping and fill material relating to these structures.

5.1 INFILTRATION DRAINAGE TRENCH

For the infiltration drainage trench and curtain drains, 6-inch diameter corrugated HDPE slotted pipes were used. These met the requirements of AASHTO M294 and ASTM F405. Geotextile filter fabric was placed for riprap underlayment, stormwater drainage ditches, access roads, and infiltration drainage trenches.

During shipment and storage of the geotextile proper precautions (i.e., protection from ultraviolet light exposure, precipitation, dirt, puncture, etc.) were taken to ensure the integrity of the geotextile material. The QA Inspector examined rolls upon delivery to the site, and any deviation from the Contract specified requirements were reported to the Resident Engineer. Any damaged rolls were rejected and replaced.

The Installer handled and placed all geotextile in a manner to prevent damage of any type and in accordance with the procedures outlined in the Contract Documents. The QA Inspector noted any non-compliance and reported such to the Resident Engineer. The geotextile(s) were overlapped a minimum of two (2) feet. Any holes or tears in the geotextile were repaired by patching using the same geotextile material. The patch was placed with a minimum overlap of 24 inches in all directions.

5.2 SEDIMENTATION PONDS

Three sedimentation ponds (A, B, and C) were constructed along the north and southwest perimeter of the landfill to detain silt-laden stormwater and allow fine sediments to be captured prior to discharge. The sedimentation pond consist of the following layers, from the ground up:

- riprap;
- geotextile filter fabric;
- loamy soil barrier protection layer; and,
- 60-mil textured HDPE geomembrane.

Stormwater runoff on the landfill surface is collected by drainage swales located alongside the access roads, which transfer the runoff to buried 24-inch diameter corrugated HDPE pipes (see Figure G-4a). At the base of the landfill, runoff in the pipes is discharged through concrete baffled outlets, and is then conveyed via perimeter drainage swales to one of three sedimentation ponds located at the base of the landfill (see Figures G-4b and G-4c). 30-inch diameter HDPE pipes are used to convey the collected stormwater runoff from Pond A to B and from Pond B to C (see Figure G-4d). From Pond C the stormwater is slowly discharged into Pelham Bay via a concrete spillway structure (see Figure G-4e).

5.2.1 Structural Backfill

Structural backfill consisted of imported or on-site natural sandy soils which passed the gradation and material classification requirements, and were free from debris, frozen material, and gravel greater than 3/4-inch measured in any direction. Structural backfill was used for Sedimentation Pond C, baffled outlets, and under the inlet and outlet structures of Sedimentation Pond C. The structural backfill was tested during construction in accordance with Contract requirements.

5.2.2 Riprap Bedding Material

Riprap bedding material consisted of crushed stone or gravel which was free of soft, non-durable particles, organic materials, and thin elongated particles which passed the gradation requirements of the Contract Documents. Riprap bedding was placed in Sedimentation Pond C Spillway and Outlet.

5.3 PIPING

The HDPE pipes and appurtenances and piping installation methods were in accordance with the requirements outlined in the Contract Documents. The QA Inspector observed all phases of installation to confirm that required materials and techniques were used.

The Contractor provided the QA Inspector with the Manufacturer's guaranteed properties of the HDPE pipes and appurtenances to be used on this project. Material properties and dimensions were in accordance with the Contract Documents. The QA Inspector examined all pipes and appurtenances upon delivery and prior to placement. Any non-compliance with the requirements were reported to the Resident Engineer.

Geomembrane perforation boots were constructed with the same material and in accordance with installation procedures for the geomembrane in order that infiltration of water between boot and pipe does not occur. The Resident Engineer reviewed and approved boot details prior to installation. Seaming operations used the same procedures used for the geomembrane. Field testing and inspection were performed in the same manner where possible. Destructive test specimens were not taken due to the nature of the fabrication of the boots. However, continuous non-destructive testing was performed and observed by the QA Inspector.

6.0 FINAL COVER SYSTEM

The Final Cover System is a critical component of this remediation. The Final Cover System is composed of (bottom to top of system):

- Geomembrane;
- Geocomposite;
- Barrier Protection Material (loamy soil); and,
- Vegetated Topsoil Layer (see Figure G-5).

The QA Inspectors continuously observed the installation of the Final Cover System components to assure compliance with the Contract Documents. The Installer and the Manufacture(s) retained ownership and responsibility for the geosynthetics in the landfill cover system until acceptance by the Owner. The geosynthetic lining system was accepted by the Owner, when:

- The installation was completed;
- Verification that seams and repairs, including associated testing, was completed; and,
- All documentation of the installation as completed including the Record Drawings.

HDPE geomembrane panel placement as-built locations are identified in Appendix G-7. Prior to the construction of the Final Cover System, the existing landfill surface was regraded and covered with a protective soil fill layer. The following sections describe in further detail the installation of the various landfill cover components.

6.1 GENERAL CONSTRUCTION ITEMS (SOILS)

6.1.1 Excavation And Grading (Random Soil Class I)

Prior to performing any placement of Random Soil Class II, the existing soil and waste in the landfill was excavated in accordance with the guidelines given in the Contract Documents. This waste was relocated to areas of the landfill that required filling. This fill was known as Random Soil Class I. Any existing cover soil or topsoil found on the landfill meeting the requirements of Random Soil Class I could be used for this purpose.

During excavation, QA personnel observed and confirmed that roots, rocks, rubbish and other off-spec materials were removed. They also evaluated the slopes and bottom subgrade for proper grade and soil condition. No QA or QC testing was performed on this material.

6.1.2 Random Soil Class II

Random Soil Class II material was used as fill for the first nine inches below the geomembrane. This material consists of non-angular particles less than one (1) inch in diameter. This layer provides cushioning between the waste material and the geomembrane, and assures that no deleterious material comes into contact with the geomembrane. In accordance with Contract requirements, all Random Soil Class II was tested as follows:

- Continuous screening at the borrow source, or on-site inspection of delivered material by the Resident Engineer, to verify acceptable particle size (i.e., <1 inch); and,
- During construction QC tests consisted of both field and laboratory tests. Specific tests included Maximum Dry Density (ASTM D698) and In-Place Density (ASTM D1556 or D2922).

6.1.3 Multipurpose Soils And Fill Materials

Specific soils and fill materials were used repeatedly in different locations for distinct purposes throughout the landfill. These materials included pipe and manhole bedding, trench backfill, crushed stone base, riprap material, and concrete. All materials were tested in accordance with requirements specified in the Contract Documents.

6.2 GEOMEMBRANE

6.2.1 Manufacturer's/Conformance Properties Testing

The Resident Engineer confirmed that the selected geomembrane met the Contract Document requirements. He examined the Manufacturer's product data and affidavits obtained by the Installer from the resin producer and geomembrane manufacturer and performed visual inspections on the delivered material. The Resident Engineer confirmed the following:

- Property values were certified by the Manufacturer and that they met or exceeded all of the requirements given in the Contact Documents;
- Measurements of properties by the Manufacturer were properly documented and that the test methods used were acceptable; and,
- The QC certificates were provided at the required frequency and that each certificate identified the related rolls.

6.2.2 Placement

6.2.2.1 Anchor Trench

The anchor trench was excavated by the Contractor to the lines and widths shown on the drawings prior to geomembrane placement. The Resident Engineer confirmed that the anchor trench was constructed according to the Contract Documents. Slightly rounded corners/edges were provided to avoid sharp bends in the geomembrane. No loose soil was allowed to underlie the geomembrane.

The anchor trench was adequately drained, to prevent ponding or otherwise softening of soils while the trench was open. The anchor trench was backfilled and compacted as outlined in the Contract Documents. Care was taken when backfilling to prevent damage to the geosynthetics. The Resident Engineer observed the backfilling operation.

6.2.2.2 Subgrade

Prior to installation, the Contractor prepared the supporting surface out of Random Soil Class II material according to the Contract Documents. The Resident Engineer confirmed that:

- A New York State registered land surveyor verified all lines and grades;
- The supporting surface met the requirements outlined in the Contract Documents;
- The supporting surface was rolled and compacted so as to be free of irregularities, protrusions, loose soil, and abrupt changes in grade;
- The supporting surface soil did not contain stones; and,
- The supporting surface was not softened by high water content, nor was it desiccated.

The Resident Engineer obtained certification from the Installer that the subgrade on which the geomembrane was to be placed was acceptable. Table 1 presents the QC testing procedures used during construction.

Table 1: Random Soil Class II During Construction QC Testing

Type of Test	*Location*	*Test Method*	*Frequency Specified*	*Frequency Performed*
Maximum Dry Density	Laboratory	ASTM D698	1 per 10,000 cubic yards and when material changed.	1 per 10,000 cubic yards and when material changed.
In-Place Density	Field	ASTM D1556 or ASTM D2922	1 per 10,000 square feet per lift.	1 per 10,000 square feet per lift.

6.2.2.3 Panels

Panel placement was in accordance with the Contract Documents. The Resident Engineer observed installation procedures to confirm that they conformed to these requirements. The Resident Engineer confirmed that panels were installed in the locations indicated on the Panel Layout Plan and approved any variations from the Plan.

The QA Inspector recorded the identification number, location, date, time, ambient temperature, and repair for each panel installed.

Geomembrane placement did not proceed at an ambient temperature above 104°F, during any rain, in the presence of excessive moisture, in an area of ponded water, or in the presence of excessive winds. If the ambient temperature fell bellow 32°F, cold weather seaming procedures described in Section 6.2.2.5 were used.

The Resident Engineer inspected panels for damage after placement and during the entire installation process. Damaged panels or portions of panels, which were rejected were marked and removed from the work area. All seams and non-seam areas of the geomembrane were examined by the Resident Engineer to identify defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane was cleaned at the time of examination.

If repair of the damaged panel area was appropriate, one or more of the following repair procedures were utilized, depending on the type and location of the defect: patching, spot extrusion, capping, topping, removal and replacement (of seams). Every repair was made in accordance with contract specifications and was observed and documented by the Resident Engineer. No-destructive testing was performed on each repair.

6.2.2.4 Seaming

An automated wedge welder that was equipped for reading of applicable temperatures, was use for seaming. Careful control was maintained of the seaming technician's experience and the conditions (including temperatures) under which the seaming was performed. Non-destructive seam testing was conducted at Contract specified intervals. The geomembrane seaming log, and the non-destructive seam continuity test log are provided in Appendices B-3 and B-4, respectively. The QA Inspector verified that all seam defects were identified, repaired, and retested in accordance with the procedures outlined in the Contract Documents.

Trial seams were made in accordance with conditions and a frequency specified in the Contract Documents in order to assure that the seaming equipment was functioning correctly. A log of the trial seams performed is shown in Appendix B-5.

The Resident Engineer witnessed the field tests and, as required, marked all samples and portions with their number and documented the locations, date and time, ambient temperature, equipment, technician name, seam number, and test result. QC destructive test results are shown in Appendix B-6. A QA log of the Contractor's QC destructive tests is

shown in Appendix B-7. Appropriate actions (i.e., seam reconstruction or additional testing to limit the length of seam to be reconstructed) were taken in the vent of a field test failure.

A log for the placement of smooth HDPE geomembrane is shown in Appendix B-1. A log for the placement of textured HDPE geomembrane is shown in Appendix B-2.

6.2.2.5 Cold Weather Seaming

Cold weather seaming was performed at Pelham Bay Landfill in accordance with the approved cold weather-seaming plan. This plan was necessary to ensure that seam integrity was maintained during winter or cold weather installations, since environmental regulations (6 NYCRR Section 360-2.13) require special procedures for field seaming of geomembrane, when either air or sheet temperature is below 32°F. The applicable temperature range for the cold weather seaming plan was from 32°F to 5°F. Geomembrane seaming at temperatures below 5°F was not conducted due to material, equipment, and personnel considerations. The cold weather seaming procedures focussed on thermal seaming methods, which included fusion wedge welding and extrusion welding. Details on cold weather seaming procedures are provided in the cold weather-seaming plan.

The frequency of field testing and destructive testing was increased during cold weather seaming in accordance with the Contract Specifications and, additionally, at the discretion of the Resident Engineer.

6.2.2.6 Laboratory Testing

The Goesynthetics QA laboratory performed QA laboratory destructive testing with the approval of the Resident Engineer. The tests performed included " Seam Strength" and " Peel Adhesion". The minimum acceptable values were outlined in the Contract Documents. Test results of the QA Laboratory destructive testing is shown in Appendix B-8.

6.2.3 Special Circumstances

On February 26, 1996, hurricane force winds damaged numerous panels of geomembrane material placed at the top of the landfill. The extent of the damaged material was determined by cutting samples of the geomembrane and testing both the physical properties and the seam strength. Once the extent of damage was determined, it was delineated, surveyed and the

damaged portion was cut out. New geomembrane panels were placed over the area and tested in conformance with the Contract Documents.

The subgrade was re-inspected and new acceptance forms signed. Backup up data on the delineation of the damaged area is provided in Appendix B-9. All destructive test results, seams and placement logs and manufacturer's property testing data on the new geomembrane panels are included in their respective appendices and designated with an "R." The geomembrane installation certificate is located in Appendix B-10. The geomembrane as-built drawing, Appendix G-7, reflects the final placement locations of the geomembrane panels.

6.3 GEOCOMPOSITE

The Installer was responsible for providing a geocomposite product that met the requirements described in the Contract Documents. Certification to this effect was provided by the Manufacturer(s). The manufacturer's certificates are shown in Appendix C-1.

The Resident Engineer examined all Manufacturers' certification(s) to confirm that the property values listed on the certification(s) met or exceeded those required. Any non-compliance was reported to the Installer.

The geocomposite was installed in accordance with procedures and requirements specified in the Contract Documents. The Resident Engineer and the QA Inspector were responsible for proper installation.

6.4 LOAMY SOIL LAYER (BARRIER PROTECTION MATERIAL)

The loamy soil layer is located immediately above the geosynthetics. This layer was composed of existing cover soil and natural soil borrow fill classified as SP-SM, SM, or SC with no stone larger than three (3) inches in any direction. This layer protects the geosynthetics from infiltration of stormwater, frost, exposure to the elements, and pressure from heavy surface loads. The minimum thickness of the loamy soil layer is 24 inches, with a thicker cross-section in more heavily trafficked areas and areas requiring particular slopes such as the road and drainage features.

6.4.1 Pre-construction QA/QC

The QC laboratory testing for Loamy Soil (also referred to as 3" minus) was done at the Fairway office in Stony Point, New York. The appropriateness of the material for use on this project was determined by an examination of the material and continuous visual identification or (sit) visits performed by the Resident Engineer (of) his designated representative as well as by laboratory testing.

6.4.2 During Construction QA/QC

QC laboratory tests were performed at the specified frequencies during installation and submitted to the Resident Engineer in accordance with the Contract Documents. Field soil testing was done by Fairway personnel at the specified frequencies, under the direction of Breco's QC Supervisory Engineer. All field tests were put on the Fairway Soil Test Report and submitted to Breco at the end of each day.

Material from the approved borrow sources was delivered to and temporarily stockpiled at the site. Maximum dry density samples were taken as the material was placed in the field, along each constructed road, rather than by borrow source. This was done because taking borrow source samples would not have yielded useful results due to the inevitable mixing of materials that occurs as the material is stockpiled. Therefore, by taking samples as the material is being placed a representative sample is obtained. As specified in the Contract Documents the tests listed in Table 2, as well as environmental cleanliness tests, were conducted on the Loamy Soil.

Maximum dry density and in-place density field reports are shown in Appendix D-1.

Table 2: Loamy Soil During Construction QC Testing

Type of Test	*Location*	*Test Method*	*Frequency Specified*	*Frequency Performed*
Sieve Analysis	Laboratory	ASTM D422	1 per 5,000 cubic yards and when material changed.	Screened and Inspected Continously
Maximum Dry Density	Laboratory	ASTM D698	1 per 1,000 linear feet and when material changed.	1 per 1,000 linear feet and when material changed.
In-Place Density	Field	ASTM D1556 or ASTM D2922	1 per 200 linear feet per lift.	1 per 200 linear feet per lift as shown in.

Placement of soil material was in accordance with the requirements outlined in the Contract Documents. Any non-compliance was noted by the QA Inspectors and reported to the Resident Engineer.

6.5 VEGETATED TOPSOIL LAYER

The 6-inch thick topsoil layer was constructed during the Fall of 1996. Seeding as per the contract specifications was performed immediately after topsoiling activities were completed.

Due to unsatisfactory vegetative growth during the spring of 1997, pH testing of the topsoil material was performed. These tests indicated that the high pH (low acidity) levels of the in-place topsoil may have hindered the establishment of the desired vegetative growth. In order to increase acidity, sulfur was applied to the topsoil surface in July 1997. Tests taken afterward indicated that topsoil pH levels had been lowered, but had not consistently reached the desired pH range of 7-8. Additional sulfur was therefore applied during the Fall of 1997. Soil samples taken afterwards indicated a further reduction of pH levels over most of the landfill topsoil surface. For those areas deemed unsatisfactory, an additional 6 inches of topsoil was added in order to proceed with seeding activities at the site.

As of May 2002, Pelham Bay Landfill has produced adequate vegetative growth for the purpose of reducing the erosion potential of the site.

Topsoil pH, total organic content (TOC), and grain size analysis test results are presented in Appendix E-1. Topsoil nutrient analysis and pH adjustment results are presented in Appendices E-2 and E-3, respectively.

6.5.1 Landscaping

In addition to the wildflower seeding of the topsoil layer, 26 planting islands were constructed as an integral component of the landfill final cover system (see Figure G-8). These islands are approximately 2.5 feet in depth and are planted with a mixture of trees and shrubs as indicated in Tables 3 and 4.

Table 3: Planting Island Tree Mixture

BOTANICAL NAME/COMMON NAME	*Quantity*	*Size*
Pinus rigida/Pitch Pine	49	5'-6' b&b
Quercus illicifolia/Scrub Oak	73	1.5" caliper
Juniperus virginina/Eastern Red Cedar	40	4'-5' b&b
Prunus serotina/Black Cherry	20	2" caliper
Betula populifolia/Gray Birch	65	2" caliper
Celtis occidentalis/Hackberry	53	1.5" caliper
Populus tremuloides/Quaking Aspen	24	6'-8' b&b
Populus grandidentata/Big-Tooth Aspen	36	6'-8' b&b
Quercus montana/Chestnut Oak	45	1.5" caliper

Table 4: Planting Island Shrub Mixture

BOTANICAL NAME/COMMON NAME	*Quantity*	*Size*
Prunus maritima/Beach Plum	87	2 gallon cont.
Rhus typhina/Staghorn Sumac	36	2 gallon cont.
Viburnum dentatum/Arrowwood Viburnum	73	40@2 gallon, 33@3 gallon
Myrica pensylvanica/Northern Bayberry	73	45@2 gallon, 28@3 gallon
Sambucus canadensis/American	73	50@2 gallon, 23@3 gallon
Vaccinium angustifolium/Lowbush	109	1 gallon cont.
Ceanothus americanus/New Jersey Tea	146	1 gallon cont.
Cornus racemosa/Gray Dogwood	87	2 gallon cont.
Gaylussacia baccata/Black Huckleberry	52	1 gallon cont.

For a vegetative survey performed of the Landfill in September 1999, 5 distinct vegetation communities were noted, comprised of warm and cool season grasses and wildflowers. Coverage rates were noted to be between 60-90% for each vegetation community.

7.0 ANCILLARY CONSTRUCTION

Additional project components are described in this section. These components include: reconstruction of sewers, road construction, utilities, well and piezometer abandonment, and fencing.

7.1 RECONSTRUCTION OF SEWERS

Reconstruction of existing sewers was conducted by the insertion of a flexible polyester felt liner. Flow bypass was provided during the reconstruction activities. A satisfactory written guarantee of compliance with the ASTM Standards for all materials and techniques used in the liner process was submitted to the Resident Engineer. Shop drawings, including details of the proposed flow bypassing system and a Service Connection Plan, were submitted to the Resident Engineer. Installation of the liner was in accordance with the Contract Documents.

The finished liner incorporated thermosetting materials which are able to withstand the corrosive effects of the normal existing effluent and groundwater/leachate on the outside of the sewer. The polyester felt tubing, including the polyurethane covered felt and the thermosetting resin, met the requirements of ASTM F1216. The cured lining material conformed to minimum structural standards (tensile stress, flexural stress and modulus of elasticity) as specified in the Contract Documents.

7.2 ROAD CONSTRUCTION

There are four main access roads at the Site: "A", "B", "C", and the IRM road located along the southwest boundary of the Landfill (see Figure G-9). The IRM access road was constructed of crushed stone material meeting requirements of New York State Department of Transportation (NYSDOT) specifications with a maximum stone size of 2 inches.

The cut-off wall was constructed roughly along the alignment of the IRM road. In order to protect the cut-off wall from damage and prevent excessive pumping and rutting along the

IRM road due to heavy traffic crossing the cut-off wall, a reinforced concrete slab was constructed spanning the wall along its entire length. The concrete slab is approximately 15 feet wide and centered over the cut-off wall (see Figure G-2). In addition, a geogrid fabric was installed within the stone layer over the concrete slab.

Access roads "A," "B," and "C" consisted of a loamy soil subgrade with a crushed aggregate base material having a maximum stone size of 2 inches. The minimum thickness of the crushed stone base was approximately three (3) inches. The access roads on the landfill have reflecting roadway delineators for nighttime visibility. They are located along the exterior edge of the road and spaced approximately 25 feet apart.

The crushed aggregate base course material met the gradation requirements outlined in the QC plan. Pre-construction and during construction testing was conducted in accordance with ASTM C136 at a frequency of 1 per source and 1 per 300 yd^3 (or 1 per 3500 ft^2 of road surface), respectively. The material was placed in one lift and compacted with a 10-ton smooth-drum vibratory roller.

7.3 UTILITIES

Abandoned utilities encountered during excavation were cut and capped. In June 1994, the Resident Engineering staff observed the cutting and capping of seven abandoned utilities ranging from two to twelve inches in diameter. The existing utilities that remained (66-inch and 72-inch diameter reinforced concrete storm sewer pipes) were maintained and protected.

7.4 WELL AND PIEZOMETER ABANDONMENT

Forty-five (45) groundwater monitoring wells and piezometers were in place on the landfill prior to the implementation of abandonment procedures. Eighteen of the thirty-seven (37) groundwater monitoring wells were abandoned. Six (6) of the eight (8) piezometers were abandoned. Nineteen (19) groundwater monitoring wells and two (2) piezometers remain in place.

Well/piezometer abandonment was completed by the drilling contractor. Well abandonment reports were submitted to the Resident Engineer which provided detailed information on each abandoned well/piezometer.

7.5 FENCING

An eight-foot high chain link security fence surrounds the perimeter of the Site. Two 24-ft wide double leaf gates and one 12-ft wide single leaf gate are located near the main entrance to the facility. A fourth gate is located along Shore Road just south of Sedimentation Pond C. Other fenced areas at the Site include:

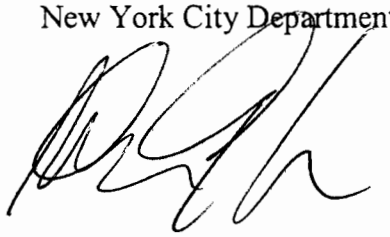
- Gas Flare Unit;
- IRM fenced-in complex and two adjacent fenced enclosures surrounding leachate pumping wells;
- Twenty-two (22) gas extraction well enclosures;
- Motor Control Center;
- Decontamination Trailer; and,
- Leachate Storage Tank Area.

I hereby certify, as a Professional Engineer registered in the State of New York, that the quality assurance/quality control testing performed for the final cover installation at the Pelham Bay Landfill Closure and Final Remediation Project during the period of March 6, 1992 to July 6, 1998 was in accordance with accepted standards of practice and that the geomembrane cover and cover system soils meet the permeability requirements of 6 NYCRR Part 360-2.13 (r) and the approved engineering plans and specifications.

I also certify that the remaining "non-cap" related construction substantially conforms to or exceeds the requirements of the approved engineering plans and specifications.

Respectfully Submitted,

New York City Department of Environmental Protection



Warren Gordon, PE

Licensed Professional Engineer

New York State License No. 070452-1

APPENDIX A
SLURRY TRENCH DATA

A-1 Slurry Trench QC Backfill Depth Measurements

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/12 Elev of Ground

Report No.

	Station	Time	~~Depth to Key~~	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
0+00	0.25		7.94	13				
+10	0.50			13		130		
+20	0.75		7.06	13		130		
+30	1.00			13.5		132.5		
+40	1.25		7.02	14		137.5		
+50	1.50			13		135		
+60	1.75		6.65	13		130		
+70	2.00			13		130		
+80	2.25		6.60	13		130		
+90	2.50			13.5		132.5		
1+00	2.75		6.65	14		137.5		
+10	3.00			13.5		137.5		
+20	3.25		6.66	13.5		135		
+30	3.50			14.5		140		
+40	3.75		6.72	13.5		140		
+50	4.00			14		137.5		
+60	4.25		6.65	13		135		
+70	4.50			13.5		132.5		
+80	4.75		6.80					
+90	5.00							
2+00	5.25		6.78					
	5.50							
	5.75							
	6.00							
	6.25							
	6.50							
	6.75							
	7.00							
	7.25							
	7.50							
	7.75							
	8.00							
	8.25					2282.5		

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during th reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: [illegible] Q/C

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/13/94 Report No.

Station	Time	Depth to Key	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
0.25	1470		13.5				
0.50	+80		12.5		130		
0.75	+90		13		127.5		
1.00	2400		12		125		
1.25	+10		12		120		
1.50	+20		10.5		112.5		
1.75	+30		13		117.5		
2.00	+38		10 1/2		92		
2.25	+47		12/9		13.5		
2.50	+50		8		25.5		
2.75	+60		12		100		
3.00	+70		12		120		
3.25	+80		12		120		
3.50	+90		8		100		
3.75	3+00		6 1/2		72.5		
4.00	+10		8 1/2		75		
4.25	+20		8 1/2		85		
4.50							
4.75							
5.00							
5.25							
5.50							
5.75							
6.00							
6.25							
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25					1,536.0		

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: YZH Q/C

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/14 Report No.

Station	Time	Depth to Key	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
0.25	3+20	8.5					
0.50	+30	8			82.5		
0.75	+40	12			100		
1.00	+50	12			120		
1.25	+60	12.5			122.5		
1.50	+70	10			112.5		
1.75	+80	12			110		
2.00	+90	9.5			107.5		
2.25	4+00	7			82.5		
2.50	+10	8			75		
2.75	+20	8			80		
3.00	+30	10.5			92.5		
3.25	+40	12.5			115		
3.50	+50	11			117.5		
3.75	+60	13			120		
4.00	+70	12 1/2			127.5		
4.25	+80	11 1/2			120		
4.50	+90	10			107.5		
4.75	5+00	12			110		
5.00	+10	11			116		
5.25	+20	11			110		
5.50	+30	9			100		
5.75							
6.00							
6.25							
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25					2227.5		

Contractors Verification:
The above report is complete and correct and all materials and equipment used and work performed during reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: JEW Q/C

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/15 Report No. 12

Station	Time	Depth to Key	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
0.25	5+30		9				
0.50	+40		12		105		
0.75	+50		11		115		
1.00	+60		10		105		
1.25	+70		10		100		
1.50	+80		10		100		
1.75	+90		11		105		
2.00	6+00		13		120		
2.25	+10		12		125		
2.50	+20		11		115		
2.75	+30		11		110		
3.00							
3.25							
3.50							
3.75							
4.00							
4.25							
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4.75							
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5.25							
5.50							
5.75							
6.00							
6.25							
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25					1100		

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: [signature] Q/C

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/18/94 Report No. 13

Station	Time	Depth to Key	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
	6+30		11				
0.25	+40		9		100		
0.50	+~~30~~ 43		9/8 2		27		
0.75	+~~30~~ 53		2/8'		20		
1.00	+60		10		63		
1.25	+~~80~~		12.5		112.5		
1.50	+~~80~~		8.5		105		
1.75	6+00		8.5		85		
2.00	7+00		11		92.5		
2.25	+10		9		100		
2.50	+30		9.5		92.5		
2.75	+~~30~~		11		102.5		
3.00	+~~50~~		13		120		
3.25	+50		10		115		
3.50	+60		8		90		
3.75							
4.00							
4.25							
4.50							
4.75							
5.00							
5.25							
5.50							
5.75							
6.00							
6.25							
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25					~~1225~~		

1225 ft²

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during th reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: Q/C

Sat

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/19/94 Report No. 14

Station	Time	Depth to Key	Depth to Trench & Bottom	Elevetion of Trench Bottom	Square Foot		
	7+70		9		85		
0.25	+80		13		110		
0.50	+90		10		115		
0.75	8+00		9.5		97.5		
1.00	+10		10		97.5		
1.25	+20		8		90		
1.50	+30		6		70		
1.75	+40		9		75		
2.00	+50		10		95		
2.25	+60		12		110		
2.50	+70		10.5		112.5		
2.75	+80		9.5		100		
3.00							
3.25							
3.50							
3.75							
4.00							
4.25							
4.50							
4.75							
5.00							
5.25							
5.50							
5.75							
6.00							
6.25							
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25							
					1157.5		

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during thi reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: JH Q/C

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/20 Report No. 15

Station	Time	Depth to Key	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
	8+80		9.5				
0.25	+90		10		97.5		
0.50	9+00		10		100		
0.75	+10		8		90		
1.00	+20		11		95		
1.25	+30		8		95		
1.50	+40		10		90		
1.75	+50		7		85		
2.00	+60		8		75		
2.25	+70		7		75		
2.50	+80		7		70		
2.75	+90		7.5		72.5		
3.00	10+00		8		77.5		
3.25	+10		10		90		
3.50	+20		9.5		97.5		
3.75	+30		9		92.5		
4.00	+40		7.5		82.5		
4.25	+50		8		77.5		
4.50	+60		11		95		
4.75	+70		11		110		
5.00	+80		10		105		
5.25	+90		10		100		
5.50	11+00		12		110		
5.75	+10		11		115		
6.00	+20		10		105		
6.25	+30		11		105		
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25					2307.5		

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: +3H Q/C

INQUIP ASSOCIATES INC.

LOG OF CONSTRUCTION PROGRESS

Date: 7/21/94 Report No. 16

Station	Time	Depth to Key	Depth to Trench Bottom	Elevetion of Trench Bottom	Square Foot		
	11+30		11				
0.25	+40		8.5		97.5		
0.50	+50		11		97.5		
0.75	+60		11		110		
1.00	+70		11		110		
1.25	+80		12.5		117.5		
1.50	+90		13		127.5		
1.75	12+00		12		125		
2.00	+10		13.5		127.5		
2.25	+20		12.5		130		
2.50	+30		14		137.5		
2.75	+40		13		135		
3.00	+50		12.5		127.5		
3.25	+60		13		127.5		
3.50	+70		13		130		
3.75	+76.35		11		75.2		
4.00							
4.25							
4.50							
4.75							
5.00							
5.25							
5.50							
5.75							
6.00							
6.25							
6.50							
6.75							
7.00							
7.25							
7.50							
7.75							
8.00							
8.25							

1770.2

Contractors Verification:

The above report is complete and correct and all materials and equipment used and work performed during reporting period are in compliance with the contract plans and specifications except as noted above.

Submitted By: [illegible] Q/C

A-2 Slurry Trench QA Backfill Depth Measurements

Date : 7/12/94

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
0+00	9:45	13.0'			4.5'	
0+10	10:10	13.0'			4'	
0+20	1025	13.0'			5'	
0+30	1045	13.5'			5'	
0+40	1130	14'			5.5'	
0+50	1145	13'			5.5'	
0+60	1300	13'			5'	
0+70	1330	13'			5'	
0+80	1400	13'			4'	
0+90	1415	13'			3.5'	
1+00	1430	13.5'			4'	
1+10	1440	14'			4'	
1+20	1445	13.5'			4'	
1+30	1500	14.5'			3.5'	
1+40	1530	13.5'			3.5	

END OF DAY SUMMARY

Trench bottom completed form Sta. 0+00 to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date : 7/12

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
1+50	1540	14'			3.5'	
1+60	1600	13			6'	
1+70	1605	13.5			5'	
7/13 ✓ 1+80	720	12.5			4'	
1+90	720	13			4'	
2+00	745	12			4'	
2+10	745	12			5'	
2+20		10.5			6'	
2+30		13'			6'	
2+38	845	10'			5	
2+43	850	1.5'			4'	
2+47	1030	9			4'	
2+50	1030	8'			4'	
2+60	1130	12'			4'	
2+70	1130	12'			5	

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date : 7/13

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
2+80		12'			4.5'	
2+90	1300	8'			5'	
3+00	1330	6.5'			5	
3+10		8.5'			5	
3+20	1400	8.5'			4	
3+30	700	8			3.5	
3+40	700	12			4	
3+50	800	12			3.5	
3+60	800	12.5			4	
3+70	800	10			4	
3+80	840	12			3.5	
3+90	900	9.5			3.5	
4+00		7			4	
4+10		8'			4.5	
4+20		8'			5	

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date: 7/14

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
4+30	1000	10.5			3	
4+40	1040	12.5			3	
4+50	1130	11			3	
4+60	1130	13			3.5	
4+70	120	12.5			4	
4+80	120	11.5			5	
4+90	210	10			4	
5+00	225	12.			5	
5+10		11			5	
5+20		11			4	
5+30	340	9			4	
7/15 5+40	630	11			4	
5+50	700	10			4	
5+60	730	11			4.5	
5+70	845	10			4	

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date: 7/15

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
5+80	1000	11			4	
5+90	1020	11'			3.5	
6+00	1020	13.5'			3.5	
6+10	1045	12'			3.5	
6+20	1120	11'			3.5	
6+30	1120	11			6'	
6+40		10.5			6'	excavated up to concrete -
6+50		10.5			31	Incasement of 66" storm drain
6+60		10			6	
7/18 6+70		9			4	
6+80	815	8.5			3	
6+90	845	8.5			4	
7+00	845	11			4.5	
7+10		9			3	
7+20		9.5			3.5	

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date: 7/18

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
7+30	1000	11			4	
7+40	1000	13			4	
7+50						
7+60						
7+70						
7+80						
7+90						
8+00						
8+10						
8+20						
8+30						
8+40						
8+50						
8+60						
8+70						

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date : 7/19

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
7+50	1100	10			4'	
7+60	1100	8			4'	
7+70		9'			8'	width due to large rock in trench
7+80		13'			3.5	
7+90		10			4	
8+00	1400	9.5			17'*	extremly large rock in trench 10'*4'x6'
8+10	1400	10			5	
8+20		8			4	
8+30	1430	6			4	
8+40	1430	9			3	
8+50	1500	10			4.5	
8+60	1500	12			3.5	
8+70	1530	10.5				
8+80	1600	9.5				
8+90		10				

7/20

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date : 7/20

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
9+00	630	10			3	
9+10	700	~~10~~ 8			4.5	
9+20	700	~~8~~ 11			3.5	
9+30	730	~~8~~ 8			3.5	
9+40	730	10			4	
9+50	820	7			3.5	
9+60	820	8			5	
9+70	830	7			3	
9+80	840	7			3.5	
9+90		7.5			4	
10+00		8			4	
10+10	1000	10			3.5	
10+20	1000	9.5			3.5	
10+30	1100	9			3	10+35 large boulder 6x6x3
10+40		7.5			7	

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date: 7/20

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
10+50		8			3	
10+60	1130	11			4	
10+70	1530	11			3	
10+80	1530	10			3	
10+90	1630	10			4	
11+00	1630	12			3	
11+10	1715	11			3.5	
11+20	1715	10			5	
11+30	1730	11			4	
11+40	630	8.5			4	
11+50		11			3	
11+60	715	11			3.5	
11+70	715	11			4	
11+80		12.5			4.5	
11+90		13			4.5	

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

Date: 7/21

TABLE 3

92C4087

DAILY REPORT OF TRENCH SOUNDINGS

PELHAM BAY LANDFILL REMEDIATION
CONTRACT HP-875
BRONX, NEW YORK

Station	Trench Bottom				Trench Surface Width (ft)	Remarks
	Progress		Final			
	Time	Depth (ft)	Time	Depth (ft)		
12+00	1000	12			4	
12+10	1000	13.5			4.5	
12+20	1030	12.5			5	
12+30	1100	14			5	
12+40	1200	13			4	
12+50		12.5			3	
12+60	1300	13			3	
12+70	1345	13			5	
12+76	1345	11			4	end of slurry wall

END OF DAY SUMMARY

Trench bottom completed form Sta. _____ to Sta. _____

Approximate toe of excavation at Sta. _____

Approximate depth at toe _____ ft.

Top of excavation at Sta. _____

A-3 Slurry Wall Backfill Design Mix

BENTONITE Corporation

BARA-KADE® 90
Slurry Trench Soil Sealing Grade - 200 Mesh

Typical Physical and Chemical Properties*

X-RAY ANALYSIS

94%	Montmorillonite
4%	Quartz
1%	Feldspars
1%	Calcite

CHEMICAL ANALYSIS

SiO_2	63.31%
Al_2O_3	21.43%
Fe_2O_3	3.83%
CaO	0.63%
MgO	2.32%
Na_2O	2.45%
K_2O	0.31%
Bound Water	5.72%

SCREEN ANALYSIS	TYPICAL	SPECIFICATION
Dry Screen, percent minus 200 mesh	77	70 min
Wet Screen, percent plus 200 mesh	1.9	4 max
Wet Screen, percent plus 325 mesh	3.2	5 max

SLURRY PROPERTIES (6% Suspension)

Viscosity, FANN® 600 rpm	37	30 min
Apparent Viscosity, cps	18.5	
Plastic Viscosity (PV)	12	
Yield Point, lb/100 ft^2	13	3 x PV max
Filtrate, 30 minutes @ 100 psi	12	15.0 cm^3 max
Yield - 42 gal bbl of 15 cps slurry/ton	95	91 min
Filter Cake	3/32	
Marsh Funnel, seconds/quart	36	

OTHER PROPERTIES

Moisture, percent	8.0	10 max
Free Swell (ml)	25	
Specific Gravity	2.79	
pH, 6% suspension	9.2	
Bulk Density (lbs per ft^3) compacted	72	

* The typical physical and chemical values listed are not to be construed as rigid specifications. Metals listed in the chemical analysis are complexed in the mineral. They do not necessarily exist as free oxides.
BARA-KADE® 90 meets or exceeds API specification 13A, Section 4.

11/4/93.tpcp.23

1999 Broadway, Suite 4300 - Denver, Colorado 80202 - Phone (303) 291-2940 - Fax (303) 291-2950

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DAVID R. GOOD
Associates

JOSEPH N. COURTADE
Controller

July 1, 1994

Inquip Associates
P.O. Box 6277
McLean, VA. 22106

Att: Mr. James Edwards

Re: Pelham Bay Landfill Remediation, Bronx N.Y.
MRCE #8179

Gentlemen:

We have completed design mix testing of Soil Bentonite backfill for the referenced project. Results are as shown on attached Table 1.

If you have any questions please contact us.

Very truly yours,

David R. Good

DRG:GJT:drg
cc:Jim Hampton (Inquip-field)

MUESER RUTLEDGE CONSULTING ENGINEERS

SHEET 1
FILE NO. 8179
PERF. BY: DRG
DATE CALC: 6/29/94
INPUT CH'KD BY:
DATE CH'KD:

PROJECT: Pelham Bay Landfill

TOPIC: Preliminary results of trial backfill mixes

MIX I.D.	Percent Dry Bent. (%)	Total Bulk Sample Wet Wt. (gms)	Water Content (%)	Added 6% slurry (ml)	Percent Bent. from Slurry (%)	Minus #200 Sieve (%)	K (cm/sec)	Sample Dry Unit wt (pcf)	Status
1	2.0%	1000	40.0%	182	1.2%	37.4	na		Preliminary
1A	1.0%	1000	31.5%	186	1.2%	32.2	5E-08		Preliminary
2A	2.0%	1000	28.3%	186	1.2%	30.1	2E-08		Preliminary
3A	3.0%	1000	29.5%	198	1.3%	32.2	5E-08		Preliminary

Note
1. Mix 1 contained cinder fill . Mixes 1A, 2A and 3A contained sand.

MUESER RUTLEDGE CONSULTING ENGINEERS

SHEET
FILE NO. #8179
PERF. BY: DRG
DATE CALC: 7/1/94
INPUT CH'KD BY:
DATE CH'KD:

PROJECT: Pelham Bay Landfill

TOPIC: Preliminary results of trial backfill mixes

MIX I.D.	Percent Dry Bent. (%)	Total Bulk Sample Wet Wt. (gms)	Initial Water Content (%)	Added 6% slurry (ml)	Percent Bent. from Slurry (%)	Minus #200 Sieve (%)	K (cm/sec)	Sample Dry Unit wt. (pcf)	Final Water Content (%)	Status
1A	1.0%	1000	31.5%	186	1.2%	32.2	5E-08	113	21.6	Final
2A	2.0%	1000	28.3%	186	1.2%	30.1	3E-08	108	21.2	Final
3A	3.0%	1000	29.5%	198	1.3%	32.2	2E-08	102	22.2	Final

Note

Mix 1A,2A&3A - Components by dry weight
45% - Test Pit A
45% - Sand Sample 1 (Quartz sand)
10% - Clay Sample 2

TABLE 1

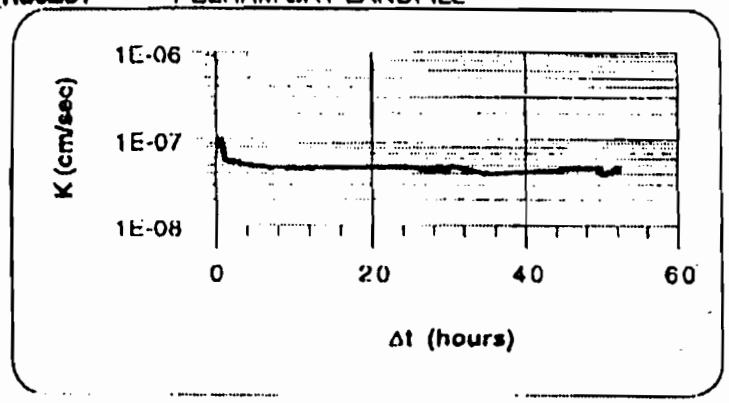
MUESER RUTLEDGE CONSULTING ENGINEERS

File No. 8179
Sample No. 1a

FALLING HEAD PERMEABILITY TEST
with superimposed air pressure

Setup by: GD Date: 6/23/94
Calc by: Date:
Ch'kd by: Date:

PROJECT PELHAM BAY LANDFILL



Cell Pres= 56 psi
Back Pres= 50 psi
Eff Stress= 6.0 psi 1% BENTONITE

SAMPLE DIMENSIONS
INITIAL
FINAL

$$K = \left(\frac{a.L.\ln(H_o/H_t)}{A.\Delta t_{sec}} \right) . Ct$$

Avg. Sample Length, L = 7.62 cm
Avg. Sample Dia.,D = 6.99 cm
Sample Area, A = 38.38 sq cm
Standpipe Area, a = 0.1437 sq cm

READING DATE	CLOCK TIME	ELAP. TIME Δt (hours)	TEMP (deg C)	VOL (cc)	RESET VOL (cc)	WATER HEAD h (cm)	WATER HEAD RESET h (cm)	Super-imposed Pressure P_{air} (cm)	FALLING HEAD H= h + P_{air} (cm)	ΔVOL in (cc)	ΔVOL out (cc)	PERMEABILITY K (cm/sec)	ΔVOL in - ΔVOL out
6/27/94	10:15		25	6.2		75.8		210.90	286.70				
6/27/94	10:40	0.42	25	6.5		74.1		210.90	285.00	0.2	0.3	1.01E-07	-0.06
6/27/94	11:30	1.25	25	6.8		72.2		210.90	283.10	0.3	0.3	5.69E-08	-0.03
6/27/94	13:35	3.33	24	7.4		68.0		210.90	278.90	0.6	0.6	5.21E-08	
6/27/94	16:56	6.66	24	8.2		62.0		210.90	272.90	0.9	0.8	4.74E-08	0.06
6/27/94	21:10	10.91	24	9.0		54.7		210.90	265.60	1.0	0.8	4.64E-08	0.25
6/28/94	9:00	22.74	25	11.8		33.0		210.90	244.80	3.0	2.8	4.89E-08	0.19
6/28/94	12:15	25.99	25	12.7		28.7		210.90	239.60	0.7	0.9	4.69E-08	0.15
6/28/94	14:30	28.24	23	13.8		25.5		210.90	236.40	0.5	1.1	4.45E-08	-0.64
6/28/94	15:00	28.74	23	13.8		24.7		210.90	235.60	0.1		5.04E-08	0.11
6/28/94	16:02	29.77	23	14.0		23.3		210.90	234.20	0.2	0.2	4.29E-08	
6/28/94	16:25	30.15	23	14.2		22.7		210.90	233.60	0.1	0.2	4.98E-08	-0.11
6/28/94	21:20	35.07	27	15.6		15.9		210.90	226.80	1.0	0.8	4.05E-08	0.18
6/28/94	21:20		27	15.6		64.5		210.90	275.40				
6/29/94	8:40	46.4	27	18.0		44.0		210.90	254.90	2.9	4.0	4.60E-08	-1.05
6/29/94	11:50	49.57	24	19.8		38.7		210.90	249.60	0.8	0.8	4.82E-08	-0.04
6/29/94	12:30	50.24	24	20.0		37.8		210.90	248.70	0.1	0.2	3.94E-08	-0.07
6/29/94	14:30	52.24	24	20.4		34.7		210.90	245.60	0.4	0.4	4.56E-08	0.05

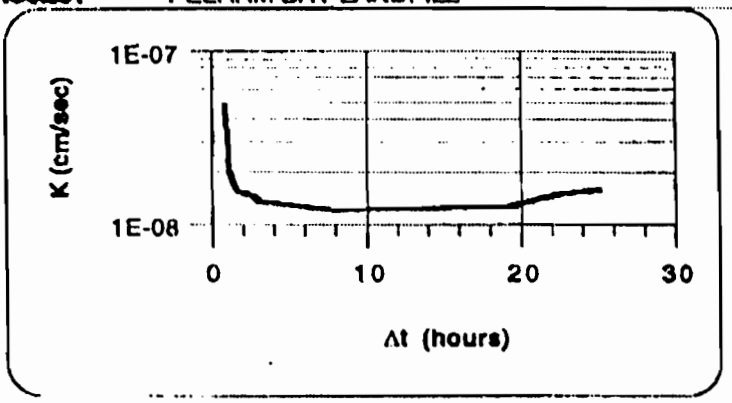
MUESER RUTLEDGE CONSULTING ENGINEERS

File No. 8179
Sample No. 2a

FALLING HEAD PERMEABILITY TEST
with superimposed air pressure

Setup by: GD Date: 6/28/94
Calc by: Date:
Ch'kd by: Date:

PROJECT PELHAM BAY LANDFILL



Cell Pres= 60 psi
Back Pres= 50 psi
Eff Stress= 6.0 psi 2% BENTONITE

SAMPLE DIMENSIONS
INITIAL X
FINAL

$$K = \frac{a.L.\ln(H_0/H_t)}{A.\Delta t_{sec}} . Ct$$

Avg. Sample Length, L = 7.62 cm
Avg. Sample Dia.,D = 6.99 cm
Sample Area, A = 38.38 sq cm
Standpipe Area, a = 0.1437 sq cm

READING DATE	CLOCK TIME	ELAP. TIME Δt (hours)	TEMP (deg C)	VOL (cc)	RESET VOL (cc)	WATER HEAD h (cm)	WATER HEAD RESET h (cm)	Super-Imposed Pressure P_{air} (cm)	FALLING HEAD H= h + P_{air} (cm)	ΔVOL in (cc)	ΔVOL out (cc)	PERMEABILITY K (cm/sec)	ΔVOL in - ΔVOL out
6/28/94	13:25		25	12.4		77.6		210.90	288.50				
6/28/94	14:15	0.83	25	12.3		76.0		210.90	286.90	0.2	0.2	4.73E-08	0.03
6/28/94	14:30	1.08	23	13.0		75.8		210.90	286.70		0.7	2.08E-08	-0.67
6/28/94	15:00	1.58	26	13.0		75.5		210.90	286.40			1.56E-08	0.04
6/28/94	15:31	2.1	23	13.2		75.2		210.90	286.10		0.2	1.51E-08	-0.16
6/28/94	16:03	2.63	23	13.3		74.9		210.90	285.80		0.1	1.46E-08	-0.06
6/28/94	16:26	3.01	25	13.3		74.7		210.90	285.60			1.36E-08	0.03
6/28/94	21:20	7.91	27	13.7		72.2		210.90	283.10	0.4	0.4	1.21E-08	-0.04
6/29/94	8:40	19.24	27	15.5		66.2		210.90	277.10	0.9	1.8	1.27E-08	-0.94
6/29/94	11:50	22.41	24	15.9		64.4		210.90	275.30	0.3	0.4	1.50E-08	-0.14
6/29/94	12:30	23.08	24	16.0		64.4		210.90	275.30		0.1		-0.10
6/29/94	14:30	25.08	24	16.8		63.2		210.90	274.10	0.2	0.8	1.59E-08	-0.63

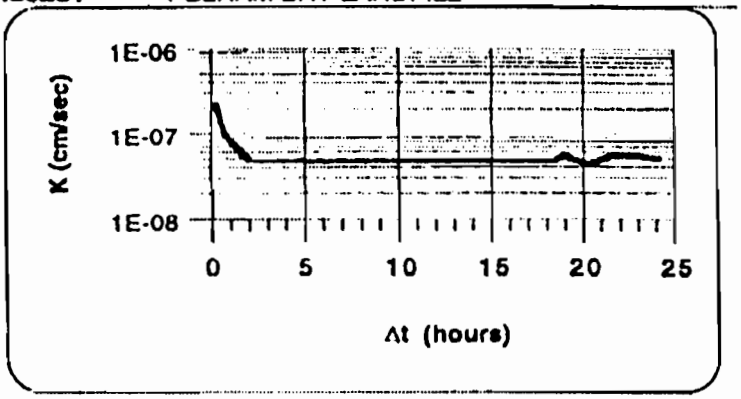
MUESER RUTLEDGE CONSULTING ENGINEERS

File No. 8179
Sample No. 3a

FALLING HEAD PERMEABILITY TEST
with superimposed air pressure

Setup by: GD Date: 6/23/04
Calc by: Date:
Ch'kd by: Date:

PROJECT PELHAM BAY LANDFILL



Cell Pres= 56 psi
Back Pres= 50 psi
Eff Stress= 6.0 psi 3% BENTONITE

SAMPLE DIMENSIONS
INITIAL
FINAL

$$K = \frac{a.L.\ln(H_o/H_t)}{A.\Delta t_{sec}} . Ct$$

Avg. Sample Length, L = 7.62 cm
Avg. Sample Dia.,D = 6.99 cm
Sample Area, A = 38.38 sq cm
Standpipe Area, a = 0.344 sq cm

READING DATE	CLOCK TIME	ELAP. TIME Δt (hours)	TEMP (deg C)	VOL (cc)	RESET VOL (cc)	WATER HEAD h (cm)	WATER HEAD RESET h (cm)	Super-imposed Pressure P_{air} (cm)	FALLING HEAD H= h + P_{air} (cm)	ΔVOL in (cc)	ΔVOL out (cc)	PERMEABILITY K (cm/sec)	ΔVOL in - ΔVOL out
6/28/04	14:20		25	28.0		87.0		210.90	297.90				
6/28/04	14:36	0.27	23	28.5		86.0		210.90	296.90	0.3	0.5	2.25E-07	-0.16
6/28/04	16:02	0.7	23	28.5		85.3		210.90	296.20	0.2		9.70E-08	0.24
6/28/04	15:32	1.2	23	28.6		84.7		210.90	295.60	0.2		7.22E-08	0.21
6/28/04	16:04	1.73	23	28.7		84.2		210.90	295.10	0.2	0.2	5.65E-08	-0.03
6/28/04	16:27	2.11	23	28.7		83.9		210.90	294.80	0.1		4.73E-08	0.10
6/28/04	20:20	6.99	22	29.1		79.8		210.90	290.70	1.4	1.0	4.63E-08	0.41
6/29/04	6:40	18.32	25	29.9		70.9		210.90	281.80	3.1	1.2	4.66E-08	1.86
6/29/04	8:20	18.99	26	29.4		70.3		210.90	281.20	0.2	-0.5	5.43E-08	0.71
6/29/04	10:40	20.32	24	29.6		69.4		210.90	280.30	0.3	0.2	4.18E-08	0.11
6/29/04	11:50	21.49	24	29.7		68.4		210.90	279.30	0.3	0.1	5.33E-08	0.24
6/29/04	12:30	22.16	24	29.8		67.8		210.90	278.70	0.2	0.1	5.61E-08	0.11
6/29/04	14:30	24.16	24	29.9		66.2		210.90	277.10	0.6	0.7	5.01E-08	-0.15

CC: [illegible]

ATTN: MR. JIM EDWARDS

INQUIP ASSOCIATES

PRODUCT: BARA-KADE 90

1994

SHIPPED FROM: BENTONITE PERFORMANCE MINERALS
HWY 69, BOX 112
COLOGNE PLANT
BELLE FOURCHE, SD. USA. 57717

TRUCK NUMBER	SHIP DATE	LOT NUMBER(S)	% MOISTURE 10 MAX	% MESH % -200 70 MIN	FANN 600-AGED 30 MIN	pH	FLUID LOSS 15 MAX
DAVIX 328-0745	06-24-94	1062341	7.2	72.4	43.0	8.8	12.4

YEAR TO DATE NUMBER of TRUCKS		% MOISTURE 10 MAX	% MESH % -200 70 MIN	FANN 600-AGED 30 MIN	pH	FLUID LOSS 15 MAX
1	M. AVG.	7.20	72.40	43.00	8.80	12.40
	STD. DEV.	0.00	0.00	0.00	0.00	0.00

SOLD TO: INQUIP ASSOCIATES, INC.
MCCLEAN, VA 22106
C of A ATTN: MR. JIM EDWARDS
FAX: (703) 442-0188

QUALITY ASSURANCE SUPERVISOR
MARSHAL L SUDRALA
06/27/94

SHIPPED TO: INQUIP ASSOCIATES, INC.
C/O PELHAM LANDFILL
BRONX, NY

CC: BILL MILES
CHARLES McAUGHAN
FILE

CERTIFICATE OF ANALYSIS

INQUIP ASSOCIATES

ATTN: MR. JIM EDWARDS

PRODUCT: BARA-KADE 90

1994

SHIPPED FROM: BENTONITE CORPORATION
HCR 69, BOX 112
COLONY PLANT
BELLE FOURCHE, SO. DAK. 57717

TRUCK NUMBER	SHIP DATE	LOT NUMBER(S)	% MOISTURE 10 MAX	MESH % -200 70 MIN	FANN 600-AGED 30 MIN	pH	FLUID LOSS 15 MAX
MH31-MHT31	06-27-94	1062441	7.4	72.4	43.0	8.8	12.4
	06-27-94	1062442	6.5	75.8	39.5	8.9	12.0

YEAR TO DATE NUMBER of TRUCKS		% MOISTURE 10 MAX	MESH % -200 70 MIN	FANN 600-AGED 30 MIN	pH	FLUID LOSS 15 MAX
2	M. AVG.	7.03	73.53	41.83	8.82	12.27
	STD. DEV.	0.39	1.60	1.65	0.03	0.19

SOLD TO: INQUIP ASSOCIATES, INC.
MCCLEAN, VA 22106
C of A ATTN: MR. JIM EDWARDS
FAX: (703) 442-0188

SHIPPED TO: INQUIP ASSOCIATES, INC.
C/O PELHAM LANDFILL
BRONX, NY

QUALITY ASSURANCE SUPERVISOR
MARSHAL L SUDRALA
06/28/94

CC: BILL MILES
CHARLES McHUGHAM
FILE

A-4 Slurry Wall Backfill Piston Tube Permeability Testing

MUESER RUTLEDGE CONSULTING ENGINEERS

JAMES P. GOULD
ELMER A. RICHARDS
GEORGE J. TAMARO
WARREN H. ANDERSON
PETER H. EDINGER
ALFRED H. BRAND
HUGH S. LACY
TONY FENNIMORE
Partners

EDMUND M. BURKE
DOMINIC A. ZARRELLA
JOHN W. FOWLER
J. PATRICK POWERS
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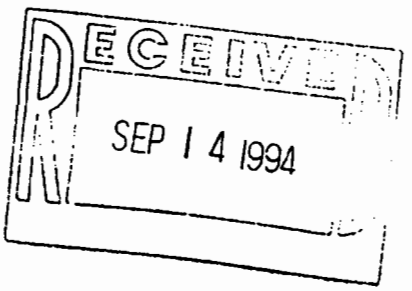
SERGIO L. TELLO
JAMES L. KAUFMAN
JOEL MOSKOWITZ
DANIEL M. HAHN
RAYMOND J. POLETTO
PETER W. DEMING
DAVID M. CACOILO
Senior Associates

RODERIC A. ELLMAN, JR.
THOMAS R. WENDEL
THEODORE POPOFF
VINCENT TIROLO
DAVID R. GOOD
Associates

JOSEPH N. COURTADE
Controller

September 8, 1994

Inquip Associates
P.O. Box 6277
McLean, Virginia 22106



Attention: Mr. James Edwards

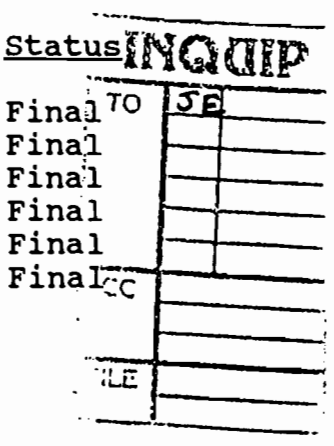
Re: Laboratory Testing
Pelham Bay Landfill Remediation
Bronx, New York
MRCE File No. 8179

Gentlemen:

Provided herein are the final results of permeability testing of samples taken from the slurry trench. The testing program consisted of six samples obtained by your personnel in the field. We arranged transportation for the samples from the site to our laboratory.

Six thin walled shelby tube samples were received on August 25. The samples were identified according to their stationing along the slurry trench and the depth at which the sample was taken. The samples were extruded in our laboratory and permeability testing was performed under ASTM D5084, "Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter." Prior to permeation the specimens were saturated and consolidated under an effective pressure of 6 pounds per square inch. The final results reported to one significant figure are:

Station No.	Depth of Sample	Permeability (cm/sec)	Status
0+30	5'-7'	8×10^{-8}	Final
2+20	8'-10'	8×10^{-8}	Final
4+10	5'-7'	9×10^{-8}	Final
6+53	5'-7'	1×10^{-7}	Final
10+35	4'-6'	5×10^{-8}	Final
11+84	5'-7'	4×10^{-8}	Final



We have not performed any field inspection services related to this project.

Please contact us if you have any questions.

Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

By: Walter Kaeck
Walter Kaeck

WK:AHB:mv\8179\LTR-1.1

APPENDIX B
HDPE GEOMEMBRANE DATA

B-1 HDPE Smooth Geomembrane Placement Log

B-2 HDPE Textured Geomembrane Placement Log

B-3 HDPE Geomembrane QA Seaming Log

B-4 HDPE Geomembrane Nondestructive Seam Continuity Test Log

B-5 HDPE Geomembrane Trial Seam Log

B-6 HDPE Geomembrane Contractor Destructive Seam Strength Testing

B-7 HDPE Geomembrane QA Destructive Seam Field Test Log

B-8 HDPE Geomembrane Independent Laboratory Seam Strength Testing

B-9 Backup Information on Damaged HDPE Geomembrane Area

B-10 HDPE Geomembrane Installation Certification

B-1 HDPE Smooth Geomembrane Placement Log

Sheet 1 of 25

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

SMOOTH

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA SQ. FT
9/20/95	12:50	S-1	32993	by Resident						206/22	4,576
	1:10	S-2	32993							188/22	4,136
	1:25	S-3	32996							191/22	4,202
	1:40	S-4	32996							184/22	4,048
	2:00	S-5	32989							168/22	3,696
	3:25	S-6	32989							133/22	2,926
	3:40	S-7	32989							61/22	1,342
	3:50	S-8	34684							35/22	770
	4:00	S-9	34684							66/22	1,452

Total This Sheet	27,148
From Sheet #	—
Cumulative Total	27,148

COMMENTS

* B - Bent, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul DeMeo

SIGNATURE: [signature]

B-1 HDPE Smooth Geomembrane Placement Log

Sheet 1 of 25

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

SMOOTH

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SURGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA LAW	AREA SQ. FT
9/20/95	12:50	S-1	32993	by Resident						208/22	4,576
	1:10	S-2	32993							188/22	4,136
	1:25	S-3	32996							191/22	4,202
	1:40	S-4	32996							184/22	4,048
	2:00	S-5	32989							168/22	3,696
	3:25	S-6	32989							133/22	2,926
	3:40	S-7	32989							61/22	1,342
	3:50	S-8	34684							35/22	770
	4:00	S-9	34684							66/22	1,452

Total This Sheet	27,148
From Sheet # —	—
Cumulative Total	27,148

COMMENTS

* B - Bent, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul DeMeo

SIGNATURE

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR. AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
9/21/95	7:50	S-10	34684	R.E.	HANDLING	3	P	Y	V	214/22	4708
	8:10	S-11	34657							225/22	4,950
	8:30	S-12	34657		HANDLING	2	P, B	Y	V	165/22	3,630
	8:45	S-13	32995							65/22	1,430
	8:50	S-14	32995							229/22	5,038
	9:05	S-15	32995		SUBGRADE	1	P	Y	V	98/22	2,156
	10:30	S-16	34636		HANDLING	1	B	Y	V	118/22	2,596
	10:40	S-17	34636							200/22	4,400
	11:05	S-18	34636							68/22	1,496
	11:45	S-19	32994							122/22	2,684
	12:40	S-20	32994							87/176	2,893
	12:50	S-21	32994							22/87	957
	1:00	S-22	32994							79/22	1,738
	1:15	S-23	34685							104/22	2,288

COMMENTS: 1:30 S-24 34685

190/22 4,180 Total This Sheet	45,144
From Sheet #	27,148
Cumulative Total	72,292

87 87 57 174 174 45 87 2893 244 244 176

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: [signature]

SIGNATURE: [signature]

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR APV'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA SQ. FT
9/21/95	2:50	S-25	34685	R.E.						2,420	
	3:00	S-26	34681							1,870	
	3:08	S-27	↓							4,290	
	3:20	S-28	↓							2,662	
	3:30	S-29	32991							1,453	
↓	3:40	S-30	↓	↓						4,356	

COMMENTS

TOTAL TODAY = 62,195
27,292
89,487

Total This Sheet	17,051
From Sheet #	72,292
Cumulative Total	89,343

* B - Bead P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mueller

SIGNATURE:

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP — 723/725 715/716

DATE	TIME	PANEL #	ROLL #	SUBGR. AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
9/28/95	8:05	S-31	34639	P.C.	HANDLING	3	B.	Y	√	188/22	4,136
"	8:20	S-32	↓							184/22	4,048
	8:45	S-33	34630		HANDLING	4	B	Y	√	184/22	4,048
	9:00	S-34	↓							181/22	3,982
	10:30	S-35	32982							176/22	3,872
	11:20	S-36	↓							172/22	3,784
	11:30	S-37	32986		HANDLING	1	B	Y	√	172/22	3,784
	11:45	S-38	↓							171/22	3,762

COMMENTS:

Total This Sheet	31,416
From Sheet #	89,343
Cumulative Total	120,759

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mele — SIGNATURE: [signature]

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA SQ. FT
10/10/95	8:30	S-39	32988	Y						148/22	3,256
	8:45	S-40	32988							40/12 170	1,860
	9:00	S-41	32988							91'/22	2,000
	10:15	S-42	34678							54/22	1,188
	10:30	S-43	↓							138/22	3,036
	10:45	S-44	↓							130/22	2,860
	10:50	S-45	↓							56/22	1,232
	11:20	S-46	34658							72/22	1,584
	11:35	S-47	↓							132/22	2,904
	12:40	S-48	↓							136/22	2,992
	12:50	S-49	↓							61/22	1,342
	1:20	S-50	34643							75/22	1,650
	1:30	S-51	↓							137/22	3,014
↓	1:35	S-52R	↓	↓						154/22	3,398

Total This Sheet	32,316
From Sheet # 4	120,759
Cumulative Total	153,075

COMMENTS:

UPPER ROAD "C"

P-40 P-39 P-42 P-40 P-43 P-44 P-45 P-46 P-47

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mark

SIGNATURE:

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10/10/95	1:40	S-53	34643	Y						32/22	704
	2:05	S-54	34647							135/22	2,970
	2:15	S-55	↓							175/22	3,850
	2:20	S-56	↓							97/22	2,134
	2:40	S-57	34665							77/22	1,694
	3:00	S-58	↓							180/22	3,960
	3:15	S-59	↓							141/22	2,013
	3:30	S-60	32987							46/22	1,012
	3:45	S-61	↓							193/22	4,246
↓	4:05	S-62	↓	↓						171/22	3,762

COMMENTS:

Total This Sheet	26,345
From Sheet #	153,075
Cumulative Total	179,420

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mark

SIGNATURE:

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10/11/95	7:30	S-63 1/2	34630	Y						25/22	550
	7:45	S-64	34630							180/22	3,960
	8:15	S-65	34628							172/22	3,784
	8:30	S-66 1/2	34628							41/22	902
	9:00	S-67 1/2	34645		crimp	2	B	Y	V	123/22	2,706
	9:15	S-68	34645							154/22	3,388
	10:15	S-69	34645							113/22	2,486
	10:40	S-70	32982							33/22	726
	10:55	S-71	34644		crimp	2	B	Y	V	143/22	3,146
	11:10	S-72	34644							142/22	3,124
	11:25	S-73	34644							25/22	550
	11:35	S-74	32986							113/22	2,486
	12:45	S-75	34671		MANUFACT	10	B	Y	V	132/22	2,964
	1:00	S-76	34671							129/22	2,838
COMMENTS:	1:15	S-77	34671	V						123/22	2,706

Total This Sheet	36,256
From Sheet #	179,420
Cumulative Total	215,676

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mark

SIGNATURE:

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10/16/95	8:15	S-78	34661	Y	—	—	—	—	—	176/22	3,872
	8:30	S-79	34661		—	—	—	—	—	173/22	3,806
	9:00	S-80	34661		—	—	—	—	—	48/22	1,056
↓	9:15	S-81	34656	↓	HANDLING	1	B	Y	V	120/22	2,640
—		S-82	—								

COMMENTS:

Total This Sheet	11,374
From Sheet #	215,678
Cumulative Total	227,052

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mele — SIGNATURE: [signature]

Sheet 9 of 25

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA SQ. FT
10/16/25		~~S00~~									
		797	19234		REPLACEMENT PANELS						
		798	19251		ORIGINALS WERE DAMAGED						
	9:55	S-82	34656							140 100	2,640
	10:05	S-83								100 56	1,716
	10:10	S-84 A B								39/18½	825
	10:15	S-85								20	700
	10:30	S-86	34637							138/22	3,036
	10:45	S-87								148/22	3,256
	11:25	S-88								117/22	2,574
	11:35	S-89	34642							28/22	616
	12:55	S-90								147/22	3,234
	1:15	S-91								144/22	3,168

COMMENTS:

Total This Sheet	21,165
From Sheet #	227,050
Cumulative Total	248,215

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mark

SIGNATURE:

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10/23/95	10:35	S-92	32985	Y	LIGNDLNG	10	B	Y	V	38/80	885
	10:45	S-93	32985							80+A33	532
	10:55	S-94	32985							182/22	4,004
	11:05	S-95	32985							118/22	2,596
	11:25	S-96	34654							65/22	1,430
	11:35	S-97	↓							185/22	4,070
	11:45	S-98	↓							185/22	4,070
	11:50	S-99	↓							37/22	814
	1:00	S-100	34651							148/22	3,256
	1:07	S-101	↓							180/22	3,960
	1:20	S-102	↓							83/22	1,826
	1:40	S-103	34638							100/22	2,200
	1:50	S-104	↓							183/22	4,026
	1:55	S-105	↓							115/22	2,530

COMMENTS

Total This Sheet	36,199
From Sheet #	248,215
Cumulative Total	284,414

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mark — SIGNATURE:

Sheet 11 of 25

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10/23/95	2:15	S-106	34646	Y	HANDLING	2	B	Y	V	77/22	1,694
	2:25	S-107	↓							190/22	4,180
	2:35	S-108	↓							136/22	2,992
	2:45	S-109	34675		HANDLING	4	B, P	Y	V	50/22	1,100
	2:55	S-110	↓							173/22	3,806
	3:05	S-111	↓							65/39	2,244

Total This Sheet	16,016
From Sheet #	285,512 284,414
Cumulative Total	~~300,428~~ 300,430

COMMENTS:

92 - 36,159
14,916
51,115

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mark — SIGNATURE:

NYC Department of Environmental Protection

PANEL PLACEMENT LOG
SMOOTH LINER

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10-24	1:00 PM	S-112	34634	✓						178'/22	3,916
	1:25 PM	S-113	34634	✓						205/22	4,510
	1:50 PM	S-114	32992	N	*					200/22	4,400
	2:30 PM	S-115	32992	✓						194/22	4,268

COMMENTS: * AT CORNER OF SEAM 113/114 & DIRT IS ABOVE COMPOSITE, UNDER LINER
MUST BE PATCHED AND CLEANED

Total This Sheet	17,094
From Sheet #	300,430
Cumulative Total	317,524

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

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SIGNATURE: [signature]

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10-25	PM	130	32943	Y						160 /22	3520
		131	34640							160/22	3520
		132	34642							157 /22	3454
		133	34640							91 /22	2002
		134	34650							68 / 22	1496
		135	34650							155 / 22	3410
		136	34650							153 / 22	3366
		137	34650							22 / 22	484
		138	? TBD								

COMMENTS:

Total This Sheet	21252
From Sheet #	317,524
Cumulative Total	338,776

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

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56600

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10-25	710	S-116	32992	Y						22 / 22	484
	730	117	32990	Y						172 / 22	3784
	735	118	↓	Y						185 / 22	4070
	750	119	↓	Y						60 / 22	1320
	800	120	34635	Y						120 / 22	2640
	805	121	↓	Y						171 / 22	3762
		122	34648	Y						46 / 22	1012
		123	34635	Y						120 / 22	2640
		124	34648	Y						158 / 22	3476
		125	34645							40 / 22	880
		126	34645							117 / 22	2574
		127	34645							86 / 22	1892
		128	32982							75 / 22	1650
		129	32982							160 / 22	3520

COMMENTS:

35354

3520
484
4004

Total This Sheet	35,354
From Sheet #	338,776
Cumulative Total	374,130

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY:

SIGNATURE:

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10-26		139	34641	Y						72/22	1584
"		140	34641	"						72/22	1584
"		141	34641	"						73/22	1606
"		142	34641	"						76/22	1672
"		143	34641	"						78/22	1716
"		144	34649	"						79/22	1738
"		145	34649	"						83/22	1826
"		146	34649	"						83/22	1826
"		147	34649	"						83/22	1826
"		148	34641	"						13/22	286
"		149	34649	"						65/22	1430
"		150	34675	"						4/22	88
"		151	34652	"						83/22	1826
"		152	34652	"						83/22	1826

COMMENTS: 111 | 116 | 139

20834
34286
17182
20834
3452

Total This Sheet	20834
From Sheet #	374,130
Cumulative Total	394,964

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: _____ SIGNATURE: _____

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA SQ. FT
10-26		153	34652	Y						84	1848
"		154	34652	"						86	1892
"		155	34652	"						48	1056
"		156	34632	"						41	902
"		157	34632	"						88	1936
"		158	34632	"						90	1780
"		159	34632	"						90	1980
"		160	34632	"						84	1848
"		161	34682	"						8 1/2	176

COMMENTS:

Total This Sheet	13618
From Sheet #	394,964
Cumulative Total	408,582
	34,286

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: [signature] SIGNATURE: [signature]

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
10/27/95		S-162		Y						60/22	1,320
↓		S-163		↓						56/22	1,232
↓		S-164		↓						44/22	968
	SMOOTH HALVES			OF	P-824	THRU 827					
10/30/95	1:00	P-874	21656	Y						41/22	2,530
↓	1:19	P-875	21654	↓						41/22	
↓	1:40	P-876	21654	↓						23/22	
↓	2:15	P-877	21655	↓						10/22	

COMMENTS:

112 112 85 54

Total This Sheet	6,050
From Sheet #	408,582
Cumulative Total	414,632

9.5 Acres

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Marks

SIGNATURE:

Sheet 12 of 25

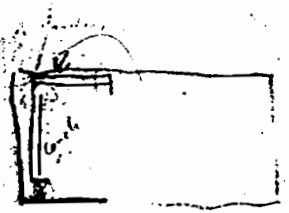
NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
11/2/95	9:15	S-165	34672	Y						231/17	2,882
↓	10:15	S-166	↓	↓						155/22	3,410
11/3/95	1:00	S-167	34673							60/22	1,320
↓	1:45	S-168	↓							62/22	1,364
11/3/95	1:15	S-169								43/22	946
11/6/95	8:30	S-170	[illegible]							121/22	2,662
↓	9:00	S-171	32981	↓						232/22	5,104
	9:20	S-172	↓							178/22	3,916
	11:00	S173	32984							40/22	880
	11:30	S174	↓							204/238	4,862
	11:50	S175	↓							85/122	2,277
	1:00	S-176	34668							54/85	1,529
	1:10	S-177	↓							22/54	836
↓	1:30	S-178	32984	↓						14/22	154

Total This Sheet	32,142
From Sheet #	414,632
Cumulative Total	446,774

COMMENTS:



* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mallee — SIGNATURE:

NYC Department of Environmental Protection

PANEL PLACEMENT LOG

PROJECT NAME: Pelham Bay Landfill

PROJECT NO.: 876-BP

DATE	TIME	PANEL #	ROLL #	SUBGR AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
11/6/95	1:45	S-179	34668	Y						255/22	5,610
	2:00	S-180	↓							39/22	858
	2:30	S-181	34670							206/22	4,532
	3:00	S-182	↓							177/22	3,894
	3:15	S-183	↓							25/22	550
	3:40	S-184	34680							212/22	4,664

COMMENTS:

Total This Sheet	20,108
From Sheet #	446,774
Cumulative Total	466,882

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Mahr

SIGNATURE:

NYC Department of Environmental Protection — **PANEL PLACEMENT LOG**

PROJECT NAME: Pelham Bay Landfill — PROJECT NO.: 876-HP

DATE	TIME	PANEL #	ROLL #	SUBGR. AP'D (Y/N)	DEFICIENCIES TYPE	DEFICIENCIES NUMBER	REPAIR METHOD*	REPAIR TEST Y/N	REPAIR TEST TYPE**	AREA L/W	AREA ±SQ. FT
11/9/95	~~34627~~ 8:00	S-185	34627	Y						139/22	3,058
11/9/95	~~34627~~ 8:15	S-186	↓							29/22	638
11/10/95	7:30	S-187								109/22	2,398
	7:45	S-188								53/22	1,166
	8:00	S-189								85/22	1,870
	8:15	S-190	↓							131/22	2,882
	8:35	S-191	34653							87/22	1,914
	8:45	S-192	↓							51/22	1,122
	8:50	S-193								142/22	3,124
	9:00	S-194	↓							116/22	2,552
	9:30	S-195	34653							30/22	660
	10:00	S-196	34653							113/125	2,618
	10:15	S-197	↓							37/22	814
	10:30	S-198	↓							162/27	3,564

COMMENTS:

Total This Sheet	28,380
From Sheet #	466,882
Cumulative Total	495,262

226 226 132 615

* B - Bead, P - Patch, CS - Cap Strip

** V-Vacuum, S-Spark, AP-Air Pressure, VI-Visual, I-Impact, AL-Air Lance

CHK'D BY: Paul Martin — SIGNATURE: