prepared for:

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Volume 12: Operations and Maintenance Manual

Cherry Island Landfill Expansion Project Wilmington, Delaware

prepared by:

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road
Columbia, Maryland 21046

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Cherry Island Landfill
Plan of Operation

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DELAWARE SOLID WASTE AUTHORITY
CHERRY ISLAND LANDFILL
PLAN OF OPERATION

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- SWA-99/10, Yard Waste Recycling approval letter
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- Clean Earth, Slag and Barrier approval letter dated May 9, 2000
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Delaware Solid Waste Authority
Cherry Island Landfill

PLAN OF OPERATION

1.01 Facility Description

The Cherry Island Landfill (CIL) is owned and managed by the DSWA. The facility is located in the City of Wilmington, Delaware on the north side of the Christina River at its junction with the Delaware River. The landfill is readily accessible from I-495 and 12th Street in Wilmington. Currently, DSWA contracts with an operations contractor (Contractor) to operate CIL. This document frequently refers to the Contractor's responsibilities to describe the facility plan of operations. However, DSWA is ultimately responsible to ensure that landfill operations (whether by a Contractor or by DSWA personnel) are in compliance with permit terms and conditions.

The CIL consist of approximately 350 acres, and is used for the disposal of municipal waste. Each phase within the CIL consists of approximately 30-40 acres. The facility began to receive municipal waste in 1985. The facility includes scalehouse(s), maintenance/office facilities, a small load drop-off area, and a pumping station(s).

The disposal area was previously constructed by the Army Corps of Engineers for containment of dredge spoil. Dredge spoil now serves as a natural liner for the CIL. DNREC regulations require a minimum of 5-foot thick natural liner with a permeability of less than or equal to 1 x 10-7cm/sec. Corps of Engineers operations have resulted in a dredge spoil thickness ranging from 10 to 55 feet thick in the area, which have been constructed.

1:02 Operating Schedule

The CIL shall be open to facility users six days per week during the hours of 7:00 a.m. to 5:00 p.m., Monday through Friday and 7:00 a.m. to 3:00 p.m. on Saturday. In addition, CIL shall be open to facility users during the hours of 6:00 a.m. to 5:00 p.m. on the next operating day following the holidays listed below. In order to accommodate facility users, the Contractor's operating hours shall be from 6:30 a.m. (5:30 a.m. on the day following a holiday) to as late as necessary to properly landfill and cover waste brought in by facility users.

DSWA shall solely make the determination on whether to close the landfill due to emergencies, inclement weather or any other reason, as it deems necessary. The Contractor is responsible for insuring that a minimum of three (3) operating personnel arrive by 5:00 a.m. to clear the haul roads and scales in the event of overnight snow in excess of 2-inches (by 5:00 a.m.)

For the purposes of this Contract, the landfill will be closed on the following holidays:
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

1:03 Acceptable Wastes

The CIL shall be operated in accordance with permits issued by the Department of Natural Resources and Environmental Control (DNREC). This permit expires prior to the start of the new contract. It is anticipated that a new permit will be issued prior to the start of the new contract as well. The facility is permitted to accept mixed municipal solid waste, asbestos, and on a case-by-case basis, certain non-hazardous special wastes, or other related wastes not included in a mixed municipal solid waste. Special waste acceptance will be in accordance with the Special Waste Policy. The Special Waste Acceptance Policy may be revised by DSWA at any time. Examples of special wastes that have been and may continue to be landfilled are, sludges, contaminated soils, spoiled food, and sandblast residue. Special wastes may require the Contractor to use special handling and disposal procedures.

Asbestos Containing Materials (ACM) shall be landfilled in the designated area of Phase IA in accordance with the contract requirements and in full compliance with the DNREC Asbestos Permit and DSWA's Asbestos Policy.

Mixed municipal solid waste shall be as defined by the Delaware Regulations Governing Solid Waste (DRGSW) (DRGSW Section 3.Definitions attached) including residential, commercial, institutional and industrial solid wastes such as garbage, rubbish, construction debris, oversize-bulky wastes, ashes and small quantities of dead animals.

Unacceptable Wastes

"Hazardous wastes," "radioactive wastes," or "infectious wastes" as defined by the United States Environmental Protection Agency (USEPA) or the Delaware Department of Natural Resources and Environmental Control (DNREC) shall not be accepted at CIL unless otherwise exempted such as household hazardous waste (HHW).

The Contractor shall be responsible for inspecting all loads received at the landfill to check for unacceptable wastes. If the Contractor spots a suspected unacceptable waste, he shall immediately inform the Facility Manager who shall make the final determination as to its acceptability. If the Facility Manager is not immediately available, the Contractor shall set the waste aside and not landfill it. The waste shall be staked and flagged. The Contractor shall also identify the truck that had carried the waste in question, list the generator of the waste, and request the ticket number from DSWA's Weighmaster. At their earliest convenience, the Facility Manager shall inspect the waste to determine its acceptability and whether it can be landfilled or whether the customer must return to pick it up and take it away.

Waste Screening shall be conducted in accordance with the DSWA's Waste Screening Program dated September 19, 1997.

1:04 Site Security

The Contractor will be provided with keys to all gates. The Contractor will be required to open entrance gates at the beginning of the workday, and lock them at the conclusion of the workday.

Certain U.S. Army Corps of Engineers (COE) personnel may have keys to the gates to allow this agency emergency access to the dredge disposal areas south of Phase I. COE personnel also shall be required to lock this gate upon leaving the site. The Contractor shall cooperate with the COE and other authorized parties with respect to access to the extent possible without interfering with landfill operations.

Visitors or customers must stop at the scalehouse(s) to have their vehicles weighed or to register in a "visitor log". Visitors may also register at the office facility.

The Contractor shall be responsible for the secure storage of his equipment and materials. DSWA shall not be responsible for any damage to or loss of the Contractor's equipment or supplies.

The site has security monitoring by ADT who has a contract with the DSWA. The Contractor shall immediately respond to any calls by the monitoring company.

1:05 Health & Safety

Applicable local, State and Federal health and safety guidelines, including those established by the Occupational Safety and Health Administration will be followed by DSWA personnel and the Contractor's personnel. Contractors working on site are required to submit a Health and Safety Plan, including confined space entry, before any activities are initiated.

A comprehensive DSWA safety manual encompassing all DSWA facilities is currently being developed.

The Contractor shall be responsible for the health of its employees and the safety of the landfill. The Contractor shall designate an individual in their organization as the Safety Coordinator for the site.

The Safety Coordinator shall evaluate the site to determine what safety equipment is required and what measures or procedures should be followed by the Contractor. The Safety Coordinator shall develop a Health and Safety Plan (HASP) delineating these.

First Aid kits are to be located and maintained in the weigh station, the maintenance building, and on all pieces of operating equipment. Telephone numbers of nearby ambulance services and the hospital in New Castle shall be prominently displayed, along with police and fire numbers, at each telephone.

The Contractor shall at a minimum provide personnel with the following training/qualifications:

All personnel employed shall be required to attend first aid and CPR training classes offered by the American Red Cross or other recognized agency and shall have refresher training at least once per year. Copies of the first aid and CPR certificates shall be submitted to the Facility Manager prior to beginning operations with updates as they are conducted. All personnel must be trained in waste screening in accordance with the Waste Screening Program. The Site Supervisor, all operators and all inspector/spotters must receive waste screening training prior to the award of the contract.

During all operating hours, the Contractor shall have on-site enough trained personnel to make up a crew for confined space entry. Associated equipment such as a tripod, safety harness, air monitor, SCBA and blowers are to be on-site at all times. It is anticipated that personnel may need to enter permit required confined spaces such as pump stations or valve vaults to maintain equipment or make adjustments. Copies of permits shall be submitted to DSWA. Copies of the confined space training records shall be supplied to DSWA within eight weeks of beginning operations.

The Site Supervisor shall possess Manager of Landfill Operations (MOLO) certification issued by the Solid Waste Association of North America (SWANA). In addition, the Site Supervisor and the operators must have OSHA 40 hours hazmat training. This training shall be provided within six (6) months after beginning operations.

At least three (3) individuals ((2) heavy equipment operators and the site supervisor) must have undergone and passed Asbestos Worker's Training Class A. These persons shall be qualified to operate the asbestos disposal area. All follow-up health care for the asbestos workers is the Contractor's responsibility. A minimum of one (1) person must be certified as a class A worker prior to beginning operations. The remaining two (2) must be certified within eight (8) weeks of beginning operations.

In addition, the following training should be provided to all Contractor personnel:

(1) Operational and contingency procedures
(2) Health and Safety procedures
(3) Fire prevention and protection

Protective clothing and footgear (steel toe and steel shank) are to be worn by all Contractor personnel at the working areas of the landfill. Spotters will wear fluorescent vests. The working areas include, but are not limited to, the working face, the maintenance building, stockpile areas, manholes, sampling pits, pump stations, leachate storage tanks, gas vents, recharge wells, and areas under construction. Dust masks or suitable breathing equipment must be worn by operating personnel who are exposed to high dust conditions on the landfill. Hardhats, ear protection and safety goggles shall be utilized as necessary. Personal protective equipment (PPE) shall be supplied to those working in the asbestos areas, and other areas as necessary.

Smoking shall not be permitted on or near the disposal area, manholes, pump station or fuel storage areas.

No hunting or shooting will be permitted. "No Trespassing" and "No Hunting" signs shall be posted and maintained along the periphery of the site by the Contractor.

"Accident Reports" are to be prepared by the Contractor for each incident, which occurs involving injury to operating personnel, customers, or visitors (personal injury requiring medical attention) and/or damage to vehicles, equipment and facilities. Maintenance of accident records is a necessary part of the safety program for several reasons:

To determine responsibility;
To dispose of claims, including workmen's compensation;

For supervision and control of workers
To identify conditions and practices that cause accidents; and
To fulfill governmental requirements for accident reporting.

1:06 Personnel

Minimum DSWA staffing for the Cherry Island Landfill is one (1) weighmaster. Additional DSWA staff consists of a Facility Manager and secretary. The typical working hours of the Facility Manager and secretary are Monday through Friday, 8:00 a.m. to 4:30 p.m. The Facility Manager and secretary may not be on site at all times.

The Facility Manager shall be responsible for the general oversight and management of the Contractor and all landfill operations. The Facility Manager will ensure that operations are in compliance with permit terms and conditions. The Facility Manager will receive the following training:

- CPR and First Aid
- Manager of Landfill Operations (MOLO) certification
- Waste Screening

The Weighmaster will record the weights of all waste disposal vehicles that enter the facility. The Weighmaster will receive the following training:

- CPR and First Aid
- Waste Screening

Unless otherwise specified by a nationally recognized training provider (for example, the American Red Cross as a training provider for First Aid), training shall be performed initially and annually thereafter. Initial training for waste screening shall be completed within 60 days of hiring and all other initial training shall be completed within 180 days of hiring.

The Contractor shall provide a qualified and experienced work force that is capable of operating the site in accordance with these Specifications, any conditions of the applicable DNREC permit and applicable State and Federal regulations.

The Contractor shall provide as a minimum the following separate and distinct operating personnel:

1. Site Supervisor

This person shall be the Contractor's designated on-site representative who shall have full authority to run the landfill operation for the Contractor. The Site Supervisor shall be responsible for maintaining all records of the landfill operation. The Site Supervisor shall be the primary point of communication between DSWA and the Contractor. The Site Supervisor shall have a minimum of four (4) years of supervisory experience and shall have all of the qualifications required for a Heavy Equipment Operator as described below. Landfill operation experience is desired. The Site Supervisor(s) shall meet the approval of DSWA. The primary site supervisor shall be onsite during the hours that DSWA's Facility Manager is onsite (Monday – Friday, 8:00 a.m. – 5:00 p.m.)

The Contractor must designate a back-up Site Supervisor to cover all hours that the primary Site Supervisor is not onsite. The back-up Site Supervisor shall have all of the qualifications, training and certification required of the primary Site Supervisor. A Site Supervisor must be on site during all operating hours until the daily cover has been placed and the last customer has left.

2. Heavy Equipment Operator(s)

This person shall have at least three (3) years experience operating equipment similar to that which is specified in this Contract. The Heavy Equipment Operator shall be capable of operating all of the equipment the Contractor has on site. A minimum of four (4) Heavy Equipment Operators must be on site during all operating hours. One operator shall be dedicated to asbestos disposal area at all times. The asbestos operator shall also serve as inspector for that area.

3. Mechanic/Heavy Equipment Operator

This person shall have three (3) years experience in the maintenance of equipment and meet the requirements of Heavy Equipment Operator above. This person shall attend pump preventative maintenance training. This person will be expected to provide the pump and general facility maintenance. A Mechanic/Heavy Equipment Operator shall be on site a minimum of five (5) days per week, 10 hours per day. This person must meet the approval of DSWA.

4. Skilled Laborer/Truck Driver

This person shall have knowledge and experience with dump trucks, lawn mowers, trimmers, tractors, small power tools, related tools, equipment and machinery. Two (2) years of experience in construction work, safety training, and knowledge of the hazards and safety precautions associated with this position will be required. Three (3) skilled laborers/truck drivers must be on site during all operating hours. The skilled laborers may also be required to assist the unskilled laborers in providing litter control.

5. Unskilled Laborer

This person shall be responsible for daily litter control and grounds maintenance. The laborer shall be qualified to run equipment including tractors, lawn cutting apparatus, roadway sweepers, centrifugal and trash pumps and the water truck. Two (2) laborers must be on site during all operating hours.

6. Inspector/Spotters

The inspector/spotters shall be responsible for inspecting waste, waste screening and spotting anywhere on the landfill as directed by the Facility Manager. They shall direct vehicles at the working face, monitor all dumping, refuse non-acceptable waste, direct special wastes to appropriate locations and oversee its dumping. In addition, the inspector/spotters shall identify customers who require special waste approvals. A minimum of four (4) spotter/inspector with radio communications must be on-site

during all operating hours. One (1) inspector/spotter must be stationed in the white goods/tires/C&D area during all operating hours.

At the beginning of the contract and updated as requested by the Facility Manager, the Contractor shall supply a list of the Contractor's employees, their monthly schedules, and their assigned positions. The Contractor's CIL personnel list shall include at least two (2) employees that possess a Class B CDL. These two (2) employees shall meet the qualifications for Heavy

Equipment Operator or Skilled Laborer/Truck Driver. All operating personnel assigned to CIL shall meet the approval of DSWA. If in the sole opinion of DSWA, a Contractor's employee is not qualified or is not performing his job in accordance with the requirements of landfill operations or for any other reason is not satisfactory performing his job, the Contractor shall replace the employee with one satisfactory to DSWA within one week after receipt of written request from DSWA to do so.

If DSWA directs the Contractor to perform extra work beyond the scope of the Contract, (time and material work) all work shall be performed by the Contractor utilizing non-operating personnel. DSWA shall not be charged for extra work performed by personnel designated by the Contractor as landfill operating personnel.

1:07 Communications Equipment

DSWA maintains a telephone in the Weigh Station for its use only. The Contractor shall provide a separate phone for his use in the Maintenance Building. It is important for safety and security reasons to maintain communication between the Contractor's operating personnel and DSWA's Weighmasters at all times. The Contractor shall provide and equip all of his operating equipment and vehicles stationed at the CIL with two-way radio systems. In addition, the Site Supervisor's office in the Maintenance Building shall have a radio system. All of the Contractor's units shall be kept in good working order at all times.

The Contractor shall also supply and maintain six (6) radio units for DSWA use in the following locations: Scalehouse 1, Scalehouse 2, Facility Manager's vehicle, Facility Manager's office, Facility Manager's Secretary's office and one spare. CIL currently has six (6) DSWA owned radios in the scalehouses and office building. The Contractor is responsible for all repairs/replacement cost associated with these radios. It is the responsibility of the Contractor to install and maintain the radio systems including the repeater rental for the DSWA and Contractor's radios.

In addition, the Site Supervisor shall have a computer in his office in the Maintenance Building that shall be tied into DSWA's LAN system for e-mail. The Contractor shall provide a second dedicated phone line for the e-mail modem. The Site Supervisor shall check e-mail at least once in the morning and once in the afternoon, Monday through Friday. The computer system shall be capable of using DSWA's software for the LAN connection. The Site Supervisor shall carry a cellular phone at all times while on site (see Paragraph 1:16 Emergency Response for off site communication equipment requirements). At a minimum, the Contractor must have access to Microsoft Word and Microsoft Excel.

1:08 Equipment

The Contractor shall provide equipment in suitable numbers and types to provide the landfilling services as required by State or Federal Regulation and/or these Specifications, whichever is more stringent. As a minimum, the Contractor shall provide the following equipment, which shall be on site at all times. The equipment may be new or used.

1. Three (3) landfill compactors, Model 826G as manufactured by Caterpillar Corporation or approved equal. The cab must be enclosed and equipped with heating and air conditioning. The cab shall be sound-suppressed and meet current OSHA standards for operator sound. The operating weight shall be at least 70,000 pounds, excluding any wheel ballast. The units shall be equipped with wheel cleaners. The compactors shall be equipped with a landfill package consisting of Caron wheels and Freeman cable cutters, or approved equal.

2. Two (2) bulldozers:

   One Model D-6R as manufactured by the Catepillar Corporation, or approved equal. Wide tracks and a landfill package are required.

   The second bulldozer shall be a Model D-4C as manufactured by Caterpillar Corporation or approved equal. The dozer shall have an airtight cab equipped with an outside source of oxygen or a HEPA filter. It will be utilized at the asbestos disposal area. The dozer shall have wide tracks.

3. One (1) motor grader, Model 12H as manufactured by the Caterpillar Corporation or approved equal.

4. One (1) track loader, Model 963B, as manufactured by Caterpillar Corporation with quickcouplers, grapples and a 3-1/2 yard bucket, or approved equal.

5. One (1) water truck with a minimum 2000 gallon capacity tank, pump and spray bar for watering haul roads, fighting fires, and hose for watering trees, flowers and shrubs.

6. One (1) 4-wheel drive backhoe, Model 426C with extended boom, forklift, 24 inch and 12 inch buckets as manufactured by Caterpillar Corporation or approved equal.

7. Two (2) tractors (minimum 35 hp) with a ditchbank cutter, 7 foot bushhog, and hydraulic broom. The equipment will be capable of safely mowing the landfill areas including ditches, swales, and slopes and sweeping all paved roads.

8. One (1) portable Hydrotek 30005 high pressure hot water cleaner, or approved equal, for cleaning equipment and scales.

9. One (1) 10 Wheel Dump Truck to be used for transporting cover from the onsite stockpiles, transporting shredded yard waste, etc.

10. One (1) Goosen VV20000 Versa Vac Portable Litter Control Eqipment or approved equal.

11. Automatic Tarping Machine – One (1) New standard 40' automatic tarping machine including spool assembly as manufactured by Tarp-o-matic, or approved equal.

Included shall be all setup, delivery, materials, and training required to use machine for tarping the working face. The machine shall include a remote control unit for use in the piece of equipment used to move the tarping machine. A total of at least 6,400 sq. ft. of tarps (four - 40ft. x 40 ft. tarps) shall be included and at least two (2) spool assemblies. This piece of equipment shall be new.

The Contractor shall also provide, or be able to secure, backup equipment for the performance of required tasks within twenty-four (24) hours of the breakdown of any piece of equipment.

The Contractor shall also have available for use as necessary: trash pumps, small generator, power tools, conductivity meters, four gas meter (Oxygen, hydrogen sulfide, methane and carbon monoxide), etc.

1:09 CIL Operations

The Contractor is required to receive waste, direct the waste to the active landfill face, inspect the waste, landfill the waste in lifts, compact the waste, and cover the waste. The Contractor shall assist users with unloading frozen loads. This requires the Contractor to clean out the users vehicle with a backhoe, gradall or similar piece of heavy equipment.

The Contractor is also required to coordinate receipt of asbestos and special wastes. A separate asbestos disposal area, approved by DNREC, shall be operated by the Contractor. The Contractor shall receive the asbestos, document the loads, receive and check the manifest, and bury the asbestos. The Contractor shall operate the small load collection area.

After the perimeter foundation improvements have been implemented, waste will be placed sequentially from existing elevation to El. 195 feet mean sea level (ft-msl). The approximate sequence of waste placement is shown in Drawings 81 through 85A. The actual sequence of waste placement will depend upon the information collected by the geotechnical monitoring devices (see the Geotechnical Monitoring Plan in Appendix G).

On an annual basis the closed areas of the landfill shall receive applications of fertilizer and lime at the rate of application specified based on testing the soil. Each year prior to the planned application, soil samples will be sent by the Contractor to an appropriate testing facility to determine proper fertilization and lime application rates. Any fertilizer or lime required as a result of the testing will be provided by the Contractor and applied by the Contractor. Crown vetch shall be planted on bare areas of the finished sideslopes.

The Contractor shall install and maintain portable litter control fencing as directed by the Facility Manager on and around the active landfill cell(s) and in intermediate areas. The fencing shall be capable of collecting all trash, which may be blown from the active area(s).

Landfill Operations include the following: (1) Tipping Areas; (2) Construction of Lifts; (3) Daily Cover; (4) Intermediate Cover; (5) Alternate Covers; (6) Field Layout/Topographical Control/Survey; (7) Density Requirement & Measurement; (8) Leachate Management; (9) Litter Control; (10) Small Load Collection Station; (11) Asbestos; (12) Trenching At Slopes To Prevent Seeps; (13) White Goods Area; (14) Construction and Demolition Material (C&D); (15) Tire Stockpile Area; (16) Yard Waste Area; (17) Topsoil; (18) Salvaging; (19) Temporary Exposed Geomembrane. A description of each of these activities is presented below.

1. Tipping Areas

The Contractor shall provide tipping areas that are safe, convenient, and reliable to provide users all-weather access to the working face. The tipping area is defined as the area in front of the working face of the landfill on which the solid waste hauling vehicles maneuver to dump their cargo as close to the working face as possible. At all times, the Contractor shall maintain two (2) immediately usable tipping areas. One tipping area shall be for normal operations. The other shall be made ready and held in reserve for use when the normal tipping area is inaccessible due to inclement weather.

The exact size and configuration of the tipping areas will be left to the Contractor's discretion. The tipping areas shall be sized to accommodate traffic with minimal delays in unloading of solid wastes. No refuse hauling vehicles shall be required to wait more than 15 minutes after weighing before being allowed to begin unloading. The normal tipping area shall be divided into two separate areas, one for commercial vehicles and one for non-commercial vehicles.

The reserve tipping area shall be located adjacent to a permanent haul road. The reserve area shall be used only under the most adverse weather conditions. The reserve area shall not be used without prior approval from DSWA. Such approval shall be given or denied by DSWA within one hour of the receipt of the request by the Contractor. The Contractor shall be responsible for constructing and maintaining a reserve tipping area. The area shall be underlain by geotextile material and a stone base or other approved materials. All aggregate shall be provided by DSWA. The Contractor shall remove all of the wet weather pad stone (or stone ramp) prior to landfilling over the area. The Contractor shall reuse (recycle) the stone in another area. The installation and reuse of the materials will be the responsibility of the Contractor.

The tipping areas shall be constructed and/or maintained by the Contractor to meet the performance requirements expressed in the following paragraph.

The Contractor shall be solely responsible for the maintenance of all tipping areas. This maintenance responsibility shall include but shall not necessarily be limited to such items as scarification, leveling, placement of geotextile fabric, placement of aggregate road material, compacting, patching, removing debris and litter, and generally keeping the surface in a condition where user vehicles can safely drive upon. The Contractor shall be required to keep the tipping area free of large ruts, potholes, mud, snow, and ice such that a sound, negotiable surface exists for those vehicles using the tipping area under all weather conditions. It shall be the Contractor's responsibility to spot and control traffic at the working face and within the tipping area. He shall see to it that dumped solid waste materials are not allowed to cover the tipping area such that vehicles are forced to drive on uncompacted and uncovered solid waste. The Contractor shall immediately take the necessary steps to improve, repair, or correct such conditions to the satisfaction of the Facility Manager.

2. Construction of Lifts

Lifts shall be constructed in two (2) foot thick compacted layers. Solid waste shall be spread and compacted in layers up the active slope. Solid waste lift heights shall be

approximately ten foot unless otherwise directed by DSWA due to geotechnical considerations or other height is necessary to meet the permitted grades. The width of each day's cell shall be kept as small as practically possible. In no event shall the width exceed the maximum that can be covered at the end of the workday. As much as possible, the top of the lift shall be graded to avoid surface ponding of rainfall and/or snowmelt.

3. Daily Cover

The Contractor shall place a minimum of six (6) inches of compacted soil or DSWA approved alternate material cover (daily cover) over the solid waste at the end of each workday. No solid waste shall remain exposed after the end of an operating day. It is the Contractor's responsibility to cover and keep ALL of the landfilled waste covered.

A. Soil Cover

DSWA will contract with supplier(s) to provide daily cover. The supplier will be required to deliver the soil close to the working face. The Contractor shall maintain stockpile(s) not greater than fifteen feet in height immediately adjacent to the site, which are of sufficient size to provide soil cover for one full week of operation. The Contractor shall comply with restrictions placed on stockpile locations as determined by DSWA's geotechnical engineer.

Each morning, prior to the start of landfilling, the Contractor shall remove all of the cover (daily and/or intermediate) in the area to be landfilled over. Any soil shall be recycled and used to supplement the cover needed for that day's end of day cover operations. The Contractor shall use daily cover tarps on a routine basis (described below). Daily Cover Soil will be used to supplement the use of daily cover tarps as approved by the Facility Manager.

The Facility Manager shall occasionally check the depth of the compacted soil cover. This shall determine whether the Contractor is placing the minimum depth of compacted soil cover as required. The Contractor shall provide laborers to dig holes in locations designated by the Facility Manager.

B. Daily Cover Tarps

The Contractor shall be required to provide a Tarp-o-matic Cover System and tarps as described in the Section 1:08 Equipment. The Contractor shall place daily cover tarps on the active working face in accordance with DNREC's approval letter. The Contractor shall supply and maintain four 40'x40' tarps for this purpose. DSWA may require the Contractor to cover the entire working face with tarps. Only whole, undamaged tarps may be used (minor wear and tear excepted). If the Tarp-o-matic is not operational for any reason, the Contractor shall be required to place tarps on the working face by other means. Contractor personnel may not walk on the uncovered waste in order to place the tarps. Tarps shall be replaced by the Contractor as necessary. The tarps shall be placed in a manner, which facilitates the movement of stormwater off the working face area. The Contractor shall use whatever methods are necessary to ensure the tarps stay in place over the waste even during high winds. Anchoring, storing, and moving tarps are the Contractor's responsibility. The maintenance/repairs to the Tarp-o-matic is the Contractor's responsibility for the duration of the contract.

4. Intermediate Cover

The Contractor shall place an additional six (6) inches of compacted soil or alternate cover material over existing daily cover uniformly level over areas which will not receive additional lifts of solid waste for periods longer than six (6) months as directed by the Facility Manager. Alternative cover materials may be placed at depths less than six (6) inches as directed by the Facility Manager and as approved by DNREC. The Facility Manager shall approve the footprint for receiving the intermediate cover prior to placement.

5. Alternate Covers

Alternate daily and/or intermediate covers as approved by DNREC may be used as site conditions permit. Alternate daily and/or intermediate covers shall be stored, handled and maintained in a manner to protect health, safety and the environment. Special requirements and conditions detailed in approval letters shall be implemented, and all current and applicable approval letters for the use of the alternate daily and/or intermediate covers at the facility shall be maintained in Appendix K of this Plan of Operations.

A. Stabilized Sludge

DSWA has an existing contract with the City of Wilmington (COW) to accept all stabilized sludge from the wastewater treatment plant that the COW is unable to market. Should this material be received, the Contractor shall utilize it as daily cover placing 6" down at the end of the work day. Stabilized sludge shall be used for daily cover in the asbestos area unless otherwise directed by the Facility Manager. In the asbestos area, sufficient quantity of stabilized sludge shall be placed to completely cover all the asbestos, which shall be no less than 6". The Contractor shall be responsible for maintaining the stabilized sludge stockpiles well graded and away from the sideslopes. This material will be stored in an amount that can be used within two weeks.

Suppliers will provide DSWA with a certification for each sludge shipment, indicating, as a minimum, that the stabilized sludge delivered to the site meets the standards of the Guidance and Regulations Governing the Land Treatment of Wastes, Part III, Land Treatment of Sludges and Sludge Products for Ceiling Concentrations and Average Concentrations for the pollutants listed in Table 402.2 and 402.3, respectively. In addition, the certification shall indicate that the maximum concentration for PCB is 5 ppm. The certification will also include a statement that the testing was performed in accordance with sampling and analytical procedures outlined in the DNREC Sludge Regulations. Copies of test results will be required to be submitted by the stabilized sludge provider in accordance with their Distributing Marketing Permit (included in Appendix K) as the test results become available.

If any of these requirements are not met, the shipment will be rejected and any further shipment will not be accepted until the supplier demonstrates that the reasons causing the failures have been identified and corrected, and such correction is approved by the DNREC.

B. Shredded Construction Demolition Debris (CDD)

CDD delivered to the site for use as daily cover shall not have large pieces of concrete, wood, and similar materials. The Contractor shall utilize it as daily cover placing 6" down at the end of the work day. The Contractor shall be responsible for maintaining the shredded CDD stockpiles well graded and away from the sideslopes. This material will be stored in an amount that can be used within two weeks.

CDD will be tested prior to delivery to the site. Each shipment of CDD will be accompanied by a certificate signed by the supplier with a copy of the analytical results of the composite samples taken from the lot being delivered to the site. DSWA's personnel will review these analyses and will not allow CDD to be unloaded unless the analytical results indicate that: (i) it has a minimum inert material content of 65% (dry weight); (ii) it contains less than 3 ppm of PCBs; (iii) it contains less than 1% by weight of asbestos; and (iv) it is non-hazardous as determined by the Toxicity Characteristics Leaching Procedure (TCLP) testing. If any of these requirements are not met, the shipment will be rejected and any further shipment will not be accepted until the supplier can demonstrate that the reasons causing the failures have been identified and corrected, and such correction is approved by the DSWA.

The material will be transported in enclosed or tarped vehicles and unloaded in such a manner that prevents migration of dust beyond the boundary of the landfill (i.e., wetted if necessary). This material will be stored in an amount that can be used within two weeks.

C. Treated Soils

Treated petroleum contaminated soils may be used as daily/intermediate cover. The use of these materials will be restricted to the terms of the Beneficial Use Determination (BUD) for each source issued by the Solid and Hazardous Waste Management Branch. Prior to delivery, the supplier will provide DSWA with a certificate verifying conformance with DRGSW requirements and applicable analytical results of samples indicating that: (i) total petroleum hydrocarbon (TPH) is less than 1,000 ppm; (ii) total BTEX is less than 10 ppm with specific maximum limits of 0.5, 10, 5, and 5 ppm for benzene, toluene, ethylbenzene, and xylene, respectively; (iii) PCB is less than 3 ppm (iv) it is non-hazardous as determined by the TCLP testing; and (v) soils are sampled at least every 4,000 tons (composite of grab samples taken at least every 1,000 tons). If these results do not meet the standards listed above, the shipment of the material will be rejected and DNREC notified of any noncompliance in the material characteristics. Any modifications to a BUD will be evaluated by DSWA and additional parameters required to be tested for, if any, will be added to the list provided above. Copies of all test results required by the most recent BUD will be reported to and evaluated by DSWA and the material will be rejected if it does not meet the BUD requirements.

To minimize fugitive dust, the material will be transported and delivered to the site in enclosed or tarped vehicles. This material will be stored in an amount that can be used within two weeks.

The use of the alternative cover materials will be limited to daily and intermediate cover on the relatively flat slopes atop the expansion area. If treated soils are used as

intermediate cover, a fertility test will be required to verify that these soils can sustain temporary vegetation. If necessary, treated soils will be amended to improve its ability to sustain temporary vegetation prior to seeding and mulching. Unstabilized intermediate cover soils will be seeded and mulched semi-annually to minimize erosion potential.

6. Field Layout/Topographical Control/Survey

The Contractor shall be responsible for field layout of disposal phases. He shall control the disposal operation to insure that sideslopes, terracing, top slope, and drainage swales are developed in accordance with the current DNREC permits. The edge of the disposal areas shall be identified by the use of suitable markers to insure that landfilling does not occur beyond these areas, in particular, the asbestos area. The markers should be made of sturdy material or protected in some manner to prevent destruction by landfill traffic and equipment.

The Contractor shall utilize a GPS or similar device to record the horizontal limits of the working face on a daily basis. This information shall be provided to DSWA in the monthly reports. In addition, the Contractor shall provide vertical limits of the waste disposed for the previous week on a weekly basis. The accuracy shall be within two feet.

Solid waste disposal beyond the established limits shall not be permitted. Solid waste disposed and associated cover material deposited beyond these limits must be removed and redisposed within the disposal area immediately after discovery at no cost to DSWA.

Each lift of solid waste shall be graded so that when daily cover is placed there is no ponding of water on the fill area. Depressions, which do occur, shall be backfilled immediately with solid wastes (or other suitable material approved by DSWA) and cover material.

7. Density Requirement & Measurement

The Contractor shall run the landfill compactors over the solid waste in enough passes (a minimum of three) to achieve the maximum in-place density of the solid waste. An optimum in-place density of the solid waste deposits of 1200 lbs/cy is sought. The Contractor must achieve a minimum, in-place solid waste density of 1100 lbs/cy. No minimum density is required for asbestos.

DSWA shall conduct monthly density measurements to verify that the Contractor is meeting the minimum, 1100 lb/cy density requirement for solid waste disposal. These measurements shall account for settlement based on the existing settlement plate readings. The density measurement will also deduct the volume of any cover soil placed.

8. Leachate Management

The Contractor shall check all pump station wetwells and valve vaults on a daily basis to ensure that they are operating correctly and to record the totalizer and hour readings from all pumpstations. The Contractor shall maintain all air release valves and pumps.

The pumpstations are monitored by a SCADA system and autodialers. The Contractor shall respond to all alarms and take appropriate action in response to the alarms.

During construction of the perimeter berm, submersible pumps shall be installed at MH-14, MH-16, MH-18, and MH-20 and the leachate pumped into MH-13.

DSWA or its contractor shall check each valve vault every three months to verify that the valve vaults are not collecting leachate and the floats are properly working.

9. Litter Control

Daily, the Contractor shall clean up the litter around the entire site and along 12th street from Hay Road to the 495 interchange. Snow fencing or other portable (movable) fencing shall be employed adjacent to the working face (no more than 500 feet from all sides of the working face) and at other locations as necessary to prevent on-site and off-site migration of windblown litter. The Contractor shall employ additional personnel on a temporary, as needed basis to clean up litter as soon as possible to the satisfaction of DSWA. The litter collected will be landfilled at the working face before the application of the daily cover for that operation day. DSWA has a forty- foot high litter control fence surrounding the site. The Contractor shall also be responsible for cleaning this fence on a daily basis.

10. Small Load Collection Station

The Contractor shall be responsible for tamping the materials in the roll-off containers with a backhoe as often as is necessary and at the direction and according to the method required by the Facility Manager. The Contractor shall make every reasonable effort not to damage the roll-off containers provided by DSWA. The Contractor will be required to haul both containers over the scales to the working face on a daily basis. Only small loads of non-commercial waste are sent to the small load collection station. The Contractor shall pick up trash and clean the entire area on a daily basis. The Small Load Collection Facility must be kept clean so as not to attract vermin and vectors.

DSWA anticipates constructing a larger small load drop-off area that will likely contain additional roll-off containers. The Contractor shall haul the roll-off containers as often as necessary. All other above-mentioned requirements shall apply to the new area.

11. Asbestos

The Contractor shall be responsible for properly managing and disposing of asbestos in a segregated area as directed by DSWA in compliance with all applicable regulations and permits and DSWA's asbestos policy. The D-4 bulldozer described in the Section 1:08 Equipment, is intended for use in this area. In addition, all personnel working in the asbestos disposal area shall be trained and licensed in the handling of asbestos material with Asbestos Worker's Class A Training. Proof of training and certifications shall be supplied to DSWA prior to beginning operations.

The stabilized sludge must be utilized in the asbestos area. It is the Contractor's responsibility to place enough stone, slag, crushed concrete, etc. on top of the stabilized sludge so that vehicles may drive over the stabilized sludge. DSWA will provide the cover, stone, slag, etc.

Category 1 and 2 non-friable asbestos received from DSWA's Central and Southern Solid Waste Management Centers shall be unloaded by the Contractor.

The Contractor should be aware that there is an active gas collection system in the asbestos area (Phases I, IA and II). The Contractor shall coordinate landfilling activities with Cereza Energy (DSWA's landfill gas contractor). Cereza Energy will be responsible for raising all gas wells provided that the Contractor give Cereza Energy sufficient notice regarding all wells that need to be raised as a result of landfilling activity.

12. Trenching at Slopes to Prevent Leachate Seeps

The Contract Operator shall cut a trench at least two (2) feet wide and two (2) feet deep through the daily cover when filling occurs along final slopes. The trench shall be cut so that there is a direct connection between the solid waste of the lower lift and the new lift. The exact location of the trench shall be determined by the Facility Manager. This trench shall be cut at the beginning of each operating day. The trench shall be cut only long enough to coincide with the width of the solid waste cell expected for that day. If the trench is too long, it shall be backfilled at the end of the day to cover all exposed solid waste. Under no circumstance shall any solid waste be left uncovered at the end of the operating day.

The trenches shall be excavated (cut) only with proper equipment such as backhoes, or excavators. Bulldozers and compactors are not to be utilized for this work.

13. White Goods Area

The Contractor shall maintain the white goods area in an orderly manner. The Contractor shall maintain separate areas for CFC and non-CFC white goods and provide adequate signs delineating each area. The areas shall be maintained to allow DSWA personnel access for refrigerant removal or to allow room for users to unload. All units must be maintained in an upright position. The Contractor shall load the white goods for removal from the facility as directed by the Facility Manager. The Contractor shall clean the area as directed by the Facility Manager. The Contractor shall provide 2'x2' yellow signs with 6" black lettering identifying each area.

The white goods area is currently located in Phase IA. DSWA anticipates that the white goods area may be relocated to another area on Phase IA as a result of asbestos landfilling activities. The cost to relocate the white goods area will be the Contractor's responsibility.

Non-CFC white goods will be picked up from CIL as needed and transported by a Contractor to a facility for recycling. White goods containing CFCs will be picked up from CIL as needed by an appropriately licensed Contractor and transported to an appropriately licensed facility for CFC removal and recycling.

14. Construction and Demolition Material (C&D)

The Contractor shall maintain the C&D area in an orderly manner. The Contractor shall load C&D material for removal from the facility as directed by the Facility Manager. The Contractor shall clean the area as directed by the Facility Manager. The Contractor shall provide 2'x2' yellow signs with 6" black lettering identifying each area.

The C&D material area is currently located in Phase IA. DSWA anticipates that the C&D material area may be relocated to another area on Phase IA as a result of asbestos landfilling activities. The cost to relocate the C&D material area will be the Contractor's responsibility.

C&D material will be picked up from CIL as needed and transported by a Contractor to a facility for recycling.

15. Tire Stockpile Area

The Contractor shall be responsible for maintaining the tire loading area and stockpiles. Any debris or trash shall be picked up and discarded at the landfill working face daily. The tires shall be sorted into piles of regular and oversized. The Contractor shall comply with the Delaware State Fire Prevention Regulations for Outdoor Tire Storage and Disposal Sites; including, but not limited to the following requirements:

1. The piles must be less than 14 ft in height.
2. Pile width and length shall not exceed 25 ft x 100 ft.
3. Aisle width between piles shall be a minimum of 24 ft.
4. Smoking shall be prohibited in the tire storage area.
5. No more than 10,000 tires shall be stockpiled onsite.

The Contractor shall provide 2'x2' yellow signs with 6" black lettering for each stockpile. The Contractor shall ensure that the facility users have access for disposing of tires. The Contractor shall ensure that the company responsible for removing the tires (which DSWA hires) has access to the tires. This may include assistance in moving piles. The Contractor shall load the tires for removal. The tire piles shall be sprayed with insecticide approved by DSWA at least twice a year at the direction of the Facility Manager to control insects.

The Contractor shall visually inspect each load dumped at the working face for tires. The Contractor shall remove all tires and transport them to the stockpile. In addition, any tires appearing on the sideslopes or at the top of the landfill, after having been landfilled, shall be relocated to the tire stockpile by the Contractor.

The Contractor shall enforce DSWA's tire policy. The Contractor shall inform the weighmasters via radio of all tire loads. The Contractor shall alert customers of the policy and provide the customers with the option of removing the tires from their loads before directing the weighmasters to charge the customer as a tire load. If a customer elects to remove the tires at the working face, the customer must return to the scales with the tires and be reweighed prior to disposing the tires in the tire stockpile. If the customer fails to comply, the customer shall be charged the tire disposal rate for the entire load.

The tire stockpile area is currently located in Phase IA. DSWA anticipates that the tire stockpile area may be relocated to another area on Phase IA as a result of asbestos landfilling activities. The cost to relocate the tire stockpile area will be the Contractor's responsibility.

16. Yard Waste Area

The Contractor shall be responsible for maintaining and relocating (as directed by the Facility Manager) the yard waste area and stockpiles. Any debris or trash in the yard waste area shall be picked up and discarded at the landfill working face daily. The Contractor shall ensure that all yard waste greater than 6 inches in diameter be disposed at the landfill working face, not the yard waste stockpile area. The Contractor shall provide the labor and equipment necessary for the operation of the yard waste area except for a tub grinder and tub grinder operator. The tub grinder and tub grinder operator will be provided by DSWA via a subcontract. The Contractor is also responsible for providing signage identifying the location of the yard waste area. The Contractor shall provide 2'x2' yellow signs with 6" black lettering for the yard waste area.

Yard waste stockpiling and processing shall be done in accordance with the Plan of Operation for a Statewide Yardwaste Recycling Program dated July 23, 1999.

The Contractor shall be paid the disposal fee for "Solid Waste Disposal Services" for all yard waste placed in the yard waste area. He shall show as a separate column and deduct the tonnage of all yard waste that is shred from the monthly tonnage landfilled during the month that the yard waste was shred in his operations report. The Contractor is responsible for providing trucks to transport shredded yard waste over the scales and to the shredded yard waste stockpile.

The Contractor will be responsible for relocating the yard waste area if landfilling activity needs to occur where the yard waste stockpile is located. DSWA attempts to locate the yard waste stockpile in areas where landfilling will not occur for some time.

17. Topsoil

The Contractor will be responsible for hauling and placing all topsoil in accordance with the recommended placement procedures.

18. Salvaging

Salvaging operations will be organized so as not to interfere with proper disposal of solid waste. Salvage operations, which create unsightliness, will not be allowed.

19. Temporary Exposed Geomembrane

The Temporary Exposed Geomembrane (TEG) shall be monitored during normal site inspection on a monthly basis and repaired as necessary. Monitoring shall include the evaluation of the integrity of the TEG as well as sandbags. Sandbags spacing shall be also monitored to evaluate that spacing is in accordance with construction specifications. So as landfilling operations approach the points where the TEG will be overfilled, the TEG shall be removed in stages to allow waste placement. Under no circumstances shall

the existing temporary cover shall be left in place. Driving over exposed portions of the temporary cover shall be limited to all-terrain vehicles (ATV) to avoid damaging the temporary cover.

1:10 General Facility Maintenance

1. Maintenance of Contractor's Equipment

The Contractor shall be required to maintain all of his landfill equipment in good working order by following the recommendations of the equipment's manufacturer regarding maintenance and upkeep. In addition, the Contractor shall clean the equipment periodically. This is especially important for the landfill compactors which must have their radiators cleaned using a high-pressure hot water cleaner at least once per week. Primary equipment shall be maintained and backup equipment shall be available within twenty-four hours to ensure continuous operation of the CIL in compliance with these Specifications, any conditions of the DNREC permit and any applicable State and Federal Regulation. The maintenance building shall be available for repair of equipment.

2. Maintenance of Buildings/Equipment

The Contractor shall have use of the maintenance building for storage and for repair of equipment. The Contractor shall keep the appearance of the building inside and out neat and clean. Any damage done to the building by the Contractor shall be repaired to the satisfaction of DSWA and in a timely manner. The Contractor shall maintain the Maintenance Building including periodic adjustments and repairs to the overhead doors, HVAC system, plumbing, etc. DSWA may direct the Contractor to clean or organize the maintenance building at any time.

The Contractor shall provide weekly cleaning service for the Maintenance Building, office facilities and scalehouse(s) to include at a minimum the following:

- wipe blinds;
- vacuum carpeted areas;
- sweep and mop vinyl areas;
- dust equipment, furniture and all ledges;
- remove trash;
- clean all windows (interior and exterior);
- clean and restock bathrooms.

The Contractor shall ensure that trash is emptied and bathrooms restocked as often as necessary. The exterior of the scalehouses, office trailer, maintenance building and main pumpstation shall be pressure washed monthly. Also, carpets are to be shampooed once quarterly. DSWA anticipates that during the contract period, a new, 2000-sf office will be constructed for the Facility Manager. The Contractor's responsibilities for the new office will be the same as for the field trailer.

The Contractor shall provide maintenance services for all on-site electrical, mechanical and plumbing per the manufacturer's recommendations excluding the scales. They shall keep up-to-date maintenance records and summarize activities in the monthly operations report.

3. Maintenance of Landfill Area

The Contractor shall be responsible for maintenance of the landfill including all active and inactive areas of Phases I through V, which shall include, but not be limited to the following tasks in accordance with the schedule listed in Section 1:17 Operating Reports and Records:

a) Cleaning out stormwater pipes, stormwater detention basins, and maintaining all swales and ditches including topsoil, seeding and mulching as directed by DSWA;
b) Reburying waste that may have worked its way to the surface;
c) Grading the haul roads on the landfill and perimeter roads a minimum of once per week and as directed by DSWA;
d) Inspecting the site for leachate seeps and repairing seeps;
e) Repairing erosion damage to the landfill areas;
f) Constructing and maintaining all-weather access roads and wet weather dumping area;
g) Inspecting leachate collection system for proper function and recording leachate levels;
h) Maintenance on pumps every quarter or every 2,000 hours whatever comes first and in accordance with manufacturers recommendations. Maintaining pump stations shall include cleaning walls and floors, maintaining pumps as recommended by the manufacturer, removing rust or accumulated debris, changing bulbs in the control panels, and maintaining valves, etc.
i) Exercising of all valves on site on a monthly basis. The Contractor shall review procedures for exercising each valve with DSWA's Facility Manager prior to beginning work. Only valves which are capable of being opened/closed without adversely impacting operations will be exercised. The Contractor shall prepare a comprehensive list of all valves on site. The checklist shall be submitted with the Contractor's monthly report.
j) Maintaining geotechnical instrumentation protective casing and any associated exposed portions of the instruments.

4. Maintenance of Grounds at CIL

The Contractor shall be responsible for maintenance of the grounds of the entire CIL site, which shall include, but not be limited to the following tasks:

a) Cutting grass, vegetation, and phragmites on the entire site a minimum of eight times per year at the direction of the Facility Manager and once per week at the entrance area from April through November;
b) Spraying phragmites twice per year;

c) Reseeding and fertilizing completed slopes of the landfill where vegetation may have died;
d) Grading the perimeter access roads as directed by the Facility Manager;
e) Cleaning out and regrading the ditches, including the ditch along 12th Street, at least twice per year or as directed by the Facility Manager;
f) Sweeping all paved site roads and parking areas daily with the tractor and broom followed by spraying the paved surface with water from the water truck. In addition, the paved roads and 12th Street from the exit ramp on I-95 to Hay Road shall be swept and vacuumed with a sweeper/vacuum truck once per week. Debris shall be removed from these areas daily.

g) Cleaning the surface and underneath of the scales (using a broom and followed by steam cleaning) at least once per week, or more often, as directed by the Facility Manager;
h) Picking up litter and debris around the entire site particularly along the forty foot high permanent litter fence located around Phases III, IV and V and at the small load collection station, working face and 12th Street, from the exit ramp of I-495 to Hay Rd., every day or more often as directed by the Facility Manager;
i) Weeding and watering landscaped areas including grass, flowers and shrubs planted at the entrance, weigh station, maintenance building, and Facility Manager's trailer office, and trees planted along the perimeter fence, access road, and other areas, on an as needed basis as directed by the Facility Manager;
j) Controlling vine growth on the site perimeter fencing and forty foot high litter control fencing as directed by the Facility Manager;
k) Fertilizing and liming grassed areas at the entrance area and along the entry access road;
l) Driving the fully loaded water truck over each of the scales once per day or as directed by the Facility Manager to verify proper scale calibration; and
m) Providing vehicular access to all instrumentation including cutting vegetation.

5. Protection of Instrumentation

The Contractor shall take care to avoid damaging instrumentation located on the landfill and around the perimeter and shall notify the DSWA immediately upon damaging or discovering a damaged instrument. The instruments serve to collect landfill gas, provide data on the groundwater quality, or the geotechnical stability of the site. In addition, the areas around the instruments shall be graded to prevent water from ponding around the instrumentation pads or manholes. Damaged instruments will be evaluated and, if appropriate, replaced by a qualified professional.

1:11 Environmental Control and Monitoring

Environmental monitoring associated with groundwater sampling and analysis, gas sampling and analysis and leachate sampling and analysis shall be the responsibility of DSWA.

1. Vector Control

The Contractor shall develop a vector control plan and submit it to DSWA for approval. Any vector extermination or control project shall be carried out only under the direction of qualified personnel and with adequate safeguards and warning for the local population and disposal site users. In regard to this, the area should be posted at the inception of the project. No hunting will be permitted.

The Contractor shall also provide monthly insect and pest control for all buildings.

2. Fire Prevention and Control

The Contractor shall be responsible for the control and extinguishing of all types of fires which may occur at the CIL including the immediate reporting of all fires to local fire-fighting offices, the Facility Manager and DNREC.

If a collection truck arrives at the CIL with a "hot load", that is, with its contents on smoldering or on fire, such a vehicle shall be directed to a point designated by the Contractor and as approved by DSWA, which is away from the working face. This area shall have a minimum twelve (12) inches of soil cover material over the underlying solid waste. The burning material can be dumped at the designated area and extinguished by Contractor personnel.

Most fires at sanitary landfills are caused by hot loads or carelessness. To combat fires, each piece of equipment owned by the Contractor shall be provided and maintained with a fire extinguisher capable of controlling and extinguishing all classes of small fires. In addition, extinguishers of a size not less than 25 lbs. are to be provided and maintained in the maintenance building, the Facility Manager's office, and the weigh stations. The weigh station and office extinguishers shall be the type, which does not damage sensitive data and processing equipment.

Large landfill surface fires shall be isolated or kept from spreading using earth from the daily cover soil stockpile, either to create a fire break by covering solid waste which has not caught fire or by using it to smother the solid waste which is on fire. The operator of the landfill compactor will have to use his judgment as to what immediate course of action to take. For any fire, however, he must contact the weigh station via the radio installed in his cab and report the seriousness of the fire. The Contractor's Site Supervisor shall then dispatch the Contractor's water truck that is equipped with suitable apparatus to control a fire until the nearest fire department has an opportunity to respond. Immediately after dispatching on-site equipment, the Contractor shall summon the nearest fire department for help. The Facility Manager shall then be notified of the fire.

Fires, which occur deep within solid waste deposits, can only be brought under control by excavating the area to expose the fire and then extinguishing it. Such fires, however, are rare in a well compacted and covered landfill. If a deep-seated fire is detected within deposited solid waste, the removal of the overburden of soil and solid waste and subsequent excavation of the burning materials probably would be too dangerous to handle with dozers, front-end loaders, and like equipment. The Contractor shall have a drag-line brought to the site to excavate the burning materials in this situation.

3. Surface Runoff Control

One of the primary considerations in landfill design and operation is routing of rainfall runoff and snow melt around and off the fill areas and leachate management facilities. The Contractor shall provide for surface water control to diminish, if not eliminate, problems associated with erosion, the infiltration of this water into the solid waste or the inflow of such water into sumps or manholes. The Contractor shall be responsible for constructing and maintaining ditches (swales), berms, culverts, or velocity check dams, as appropriate, to control runoff on and around the landfill area. The solid waste fill area shall be graded so that ponding of water on the landfill surface is minimized. Unstabilized side slopes will be seeded and mulched semi-annually to minimize erosion potential.

The Contractor shall also be responsible for providing, moving and placing tarps to limit the amount of rainwater contributing to the production of leachate. Tarps shall be placed in locations as directed by the Facility Manager. Surface Runoff Control is also required around the perimeter of the cell as described in Section 1:09 (2) Construction of Lifts.

The top surface of the disposal area shall be graded and bermed to divert surface runoff to locations where stormwater collection systems, installed by the Contractor, will convey the runoff water down the side slopes to the peripheral stormwater drainage ditches.

During waste placement over the Phases III to V, the existing Phase Va area on the southwest corner of the landfill will be used as a sediment pond. Water accumulated in the sediment pond will be pumped to the nearby stormwater outlet which discharges directly into the Delaware River using appropriate sediment control Best Management Practices (BMPs) such as: (i) allowing sediment to settle before pumping; (ii) removing water from the upper surface of the basin using skimmers; or (iii) reducing turbidity by addition of flocculants (i.e., polyacrylamide (PAM)). In order to preserve the Phase Va area as a sediment pond during construction of the foundation improvement in the pond area, the improvements will be performed in stages. After construction of the perimeter berm, DSWA will continue to use the Phase Va area as a sediment pond. During the later filling stages, when most of the surface runoff is handled by the stormwater management features around the facility, filling sequence of the landfill will be such that appropriate BMPs shall be employed for stormwater quality management. These practices include: temporary, lined sediment traps located on the landfill; check dams along ditch lines around the landfill perimeter; and inlet protection devices at manhole inlets.

4. Erosion Control

Appropriate sediment control BMPs will be used at the CIL site throughout its operating life. Erosion of the protective cover material on all landfill areas is to be repaired as soon as possible to maintain the required depth of cover. The establishment and maintenance of a good stand of vegetation on the finished slopes is important in maintaining erosion control. It may be necessary to use silt fences, straw bales, ditches or berms in addition to help prevent erosion. All erosion control measures/devices necessary shall be supplied by the Contractor. All new seeding and all reseeding shall be hydroseeded and mulched. The Contractor shall take whatever measures are necessary to prevent and correct erosion problems on the site. The inactive unstabilized/unseeded landfill areas must be protected with silt fence.

5. Dust Control

The Contractor shall develop and implement a dust control program satisfactory to DSWA.

Gravel and unpaved roads dust may be controlled by the use of water, and/or moisture absorbing chemicals such as calcium chloride. The use of moisture absorbing chemicals must be first cleared with appropriate State and Federal regulatory agencies.

Dust shall be controlled on paved surfaces by daily sweeping and watering of the pavement with the tractor and broom and shall be cleaned weekly with a street sweeper/vacuum truck. The site entrance, entrance road, access roads, and parking areas can be cleaned with the tractor and broom or with the street sweeper. Other paved areas such as those adjacent to the weigh station and scales shall be cleaned by hand, if necessary.

6. Snow Removal

The Contractor shall be responsible for clearing snow and/or ice accumulations from the entrance road, access roads to the disposal area, the small load collection station, scales, weighstation and Facility Manager's trailer office, and parking and walkway areas at the CIL. Snow removal may be required outside normal operating hours in order to have the facility open on time. The Contractor is responsible for insuring that a minimum of three (3) operating personnel arrive by 5:00 a.m. to clear the haul roads and scales in the event of overnight snow in excess of 2-inches (by 5:00 a.m.) A stockpile of sand, cinders, and/or salt shall be maintained at the CIL for spreading on roadway surfaces to improve traction and prevent accidents. The Contractor shall also clear snow and ice from sidewalks and

footpaths, stairs, and other pedestrian accesses.

7. Scavenging

Scavenging by the Contractor or facility users shall not be allowed at any time.

8. Landfill Gas Control and Monitoring

Biological decomposition of solid waste produces landfill gas (LFG). The control of LFG is a part of landfill operations. LFG is generally comprised of methane, carbon dioxide, nitrogen and oxygen. A small percentage of other gases make up the balance of LFG. If landfill gas is not properly controlled, methane may accumulate in confined spaces and exist in the air at higher concentrations. Methane is a colorless, odorless gas that is explosive at concentrations between 5 and 15% volume in air.

LFG controls shall be installed by the Contractor with each new lift in the manner and location shown on the Drawings. The LFG controls include horizontal collectors, vertical extraction wells, internal and perimeter header pipe, laterals, valves, and condensate drains. Components of the LFG system shall be installed at such a time when they are necessary to maintain adequate control of LFG in the landfill or when further waste placement will prohibit later installation of the component.

The Contractor shall be responsible for the cost to repair any damaged LFG lines or wells. The Contractor shall immediately alert the LFG contractor and DSWA of any damage to the LFG system. Should the Contractor need the LFG contractor to modify his system in any way to ensure continuous landfill operations, the Contractor shall inform the LFG contractor at least one week in advance.

1:12 Permanent and Temporary Haul Roads/Perimeter Access Roads

The Contractor shall maintain the permanent haul roads and perimeter access roads. He shall also construct and maintain the temporary haul roads necessary for safe and convenient traffic flows between the permanent haul roads and the tipping areas, and between the borrow stockpile areas and the tipping areas.

Temporary haul roads shall be constructed upon approval of DSWA, and in a manner satisfactory to DSWA. The roads shall be crowned to allow for stormwater runoff and shall be

sufficiently wide to accommodate anticipated traffic. In general, temporary haul roads will be constructed with geotextile fabric, slag, stone or other DSWA approved material. All materials for road construction shall be supplied by DSWA. Roads will typically be twenty-four feet wide and twelve inches thick. The Contractor shall construct temporary haul roads in the locations and manner as directed by the Facility Manager.

All roads shall be maintained to provide safe and convenient access to users of the facility. They shall be kept free of debris, ruts, holes, ponding of water; be cleared of snow and ice; and shall provide a sound driving surface under all weather conditions. Maintenance shall include periodic scarifying, reshaping, addition of materials, and compaction as directed by DSWA. Paved surfaces shall have any potholes filled with hot mix.

1:13 Traffic Control

Traffic control is necessary to maintain an orderly vehicle flow, minimize accidents, and avoid delays in unloading time. All incoming traffic is directed by signs to the weigh station and scale for weighing. Incoming and outgoing trucks are controlled at the weigh station by means of traffic signals or gates located adjacent to the scale and controlled by DSWA's Weighmaster. Signs, pylons, and/or barricades shall be provided by the Contractor to insure that when the solid waste vehicles leave the scale, the drivers can find their way to the working face of the landfill, the asbestos disposal area, the white goods dropoff area, the tire dropoff area, or the small load dropoff area. All signs, pylons, etc. must be of good quality and be constructed based on specifications approved by DSWA. It is anticipated that the signs shall be aluminum and similar in design to DSWA's existing signage at the front of the facility. The Contractor is responsible for spotting and controlling traffic at the working face. DSWA's Facility Manager shall determine whether signage is adequate. The Contractor is responsible for directing traffic using their personnel and traffic control devices as required when the scales are down for temporary maintenance.

1:14 Seeding and Mulching

Seeding and mulching to promote stabilization of the sideslopes shall be accomplished as soon as weather permits. Seeding and mulching operations including application of necessary nutrients shall follow the Delaware Erosion and Sedimentation Control Handbook for Development, 1989, or the latest revision thereof. Semi-annually, DSWA shall seed and mulch during April-June and during August-October. The amount and type of seed, lime, paper mulch, tack, etc. shall be specified by the Facility Manager. The seed mixture is expected to Contractor's blend. All hydroseeding must be followed immediately by a 2" layer of straw mulch. The straw mulch must be anchored using a DSWA approved erosion netting.

Although the establishment of a healthy growth of vegetation should minimize the formation of erosion gullies, any eroded areas that do occur shall be repaired as directed by the Facility Manager. In order to protect the perimeter roads, silt fence shall be placed and maintained between the perimeter haul road and landfill slope until a suitable vegetative growth has been established. If treated soils are used as intermediate cover, a fertility test will be required to verify that these soils can sustain temporary vegetation. If necessary, treated soils will be amended to improve its ability to sustain temporary vegetation.

1:15 Emergency Action Plan

The proper operation of the CIL should not result in any event detrimental to the environment under normal or certain abnormal conditions.

The response of Contractor personnel to any serious emergency situation such as but not limited to a fire, injury of landfill personnel/facility users, leachate spill or fuel spill shall be as follows:

1. Notification of Site Supervisor, Facility Manager and Weighmaster by the Contractor.

2. Notification of emergency service (fire department, ambulance) by Site Supervisor.

3. Notification of designated official(s) of DSWA by Site Supervisor, Facility Manager or Weighmaster.

4. As appropriate, notification of DNREC and other State or Federal regulatory agency by DSWA official.

   This notification procedure augmented with names of responsible personnel shall be posted next to each telephone at the site. It shall be followed with written accounts of each incidence submitted to DSWA within twenty-four (24) hours of occurrence.

1:16 Emergency Response

The Contractor's Site Supervisors shall be "On Call" twenty-four (24) hours per day, seven (7) days per week. Each person must have a portable cellular phone. At least one (1) Site Supervisor must be within the reception range of the cellular phone at all times. The Site Supervisors may be called to the facility during any hour for an emergency. The Site Supervisor shall proceed to the facility immediately after receiving an emergency call. DSWA has several "Autodialers" which call DSWA and Contractor personnel during certain facility conditions as well as security monitoring system for the buildings. The Contractor's Site Supervisor(s) home telephone, and cellular phone numbers will be programmed into these systems.

The autodialer may also call DSWA's Facility Manager. However, this is for information only. It is the Contractor's responsibility to answer and address all on-site emergencies. The Contractor shall keep DSWA's Facility Manager informed (immediately, if warranted) as to the nature of the emergency and the actions taken to address it. The Facility Manager shall be third on the call list.

An autodialer system is operational for high and low level alarm conditions at the North Central Pump Station (NCPS) and the Main Pump Station (MPS). Pump set points may be modified as necessary, current pump set points are as follows:

NCPS

Lead pump on:	3.0 ft.
Lag pump on:	3.5 ft.
Lag pump off:	1.5 ft.
Lead pump off:	1.5 ft.
High level alarm:	5.1 ft
Low level alarm:	1.0 ft.

MPS

Lead pump on:	4.0 ft.
Lag pump on:	5.8 ft.
Lag pump off:	3.5 ft.
Lead pump off:	2.0 ft.
High level alarm:	6.0 ft
Low level alarm:	1.0 ft

Monday – Friday (6 a.m. to 6 p.m.) and Saturday (6 a.m. to 4 p.m.) the Autodialer calling order is as follows:

Facility Manager office phone
Facility Manager cell phone
Site Supervisor office phone
Site Supervisor cell phone

Monday – Friday (6 p.m. to 6 a.m.) and 4 p.m. Saturday through 6 a.m. Monday the autodialer calling order is as follows:

Site Supervisor cell phone
Site Supervisor home phone
Facility Manager cell phone
Facility Manager home phone

All alarm conditions should be responded to and the appropriate corrective actions should be taken as necessary.

APPENDIX A
ASBESTOS POLICY

RECEIVED
APR 2 2 2002
DSWA

DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

DELAWARE SOLID WASTE AUTHORITY

ASBESTOS POLICY AND PROCEDURES

Effective Date: April 1, 1995
Revised: April 15, 2002

The Department of Natural Resources and Environmental Control *("DNREC")* and the Delaware Solid Waste Authority *("DSWA")* have established the following Policy concerning the handling and disposal of Asbestos-Containing Material *("ACM")*.

ANY TYPE OF ASBESTOS-CONTAINING MATERIAL MAY BE TRANSPORTED TO AN AUTHORIZED ASBESTOS LANDFILL OUT-OF-STATE, OR DISPOSED OF AT AN APPROVED DSWA FACILITY.

Asbestos-Containing Material to be landfilled out of state:

- The asbestos material must be packaged in accordance with State of Delaware regulations or the regulations of other affected states, whichever are the more stringent. Furthermore, the out-of-state destination must be approved by *DNREC*[1] as part of the permitting procedure for a transporter Permit.

Asbestos-Containing Material to be landfilled in Delaware:

- ***Friable***[1] asbestos material must be wetted, packaged in leak-proof containers and labeled in accordance with *DNREC* regulations. This material may be landfilled at the Northern Solid Waste Management Center, ***only***. The *DSWA* charges a special disposal fee for this material.

- Category I ***non-friable*** Asbestos-Containing Material *ACM* and Category II ***non-friable*** Asbestos-Containing Material *ACM* may be landfilled at any of the Delaware Solid Waste Authority Facilities at DSWA's standard disposal fee with the following packaging requirements:

  - Northern Solid Waste Management Center: Category I ***non-friable*** *ACM*[2] must be wetted and may be removed and transported in covered dumpsters or trucks and landfilled unpackaged in the designated asbestos disposal area. Category II ***non-friable*** *ACM*[3] must be wetted and packaged in sealed, leakproof clear plastic wrap and labeled as asbestos. At the landfill it must be placed in the designated asbestos disposal area. Disposal of ***bulk*** shipments of Category I & II ***non-friable*** asbestos will be accepted at the Northern Solid Waste Management Center ***only***.

  - Central and Southern Solid Waste Management Centers: Category II ***non-friable*** *ACM*[3] destined for these Facilities must be wetted and packaged in sealed, leak-proof clear plastic wrap, and labeled as asbestos. At the landfill, it must be placed in a roll-off container specifically dedicated for this purpose. Category I ***non-friable*** *ACM*[2] may be transported to these Facilities *unpackaged* in a covered vehicle, and off-loaded into a roll-off container specifically dedicated for this purpose.

Packaging of Category I, ***non-friable*** *ACM*[2] in the same manner as Category II non-friable *ACM*[3] is preferred but is not required.

In order to be exempt from the packaging requirements, any *ACM* classified and handled as Category I ***non-friable*** *ACM*[2] must be certified as such by a licensed Delaware Certified Professional Service Firm. This certification shall include a description of the material, where the sample originated and the date the material was sampled. This certification must be sent along with the **NOTIFICATION OF DEMOLITION/RENOVATION** to the Department of Natural Resources and Environmental Control. A copy of the Category I, ***non-friable*** *ACM*[2] certification must accompany the material to the landfill. All *ACM* must be removed by a licensed Delaware Asbestos Abatement Contractor[4], unless a written waiver has been issued by the Department of Natural Resources and Environmental Control, Air Quality Management Section, Engineering and Compliance Branch. A copy of this waiver must accompany the material to the landfill.

In addition to the above requirements, disposal of all asbestos material at *DSWA* Facilities is subject to the *DSWA* Asbestos Disposal Procedures, which require at least 24-hour prior notice to the landfill of any deliveries of asbestos.

Nicholas A. DiPasquale, Secretary,
Department of Natural Resources and
Environmental Control

N.C. Vasuki
Delaware Solid Waste Authority

[1]***Friable*** asbestos material means any material containing more than one (1) percent asbestos, as determined using the method specified in Appendix A, Subpart F, 40 CFR, Part 763, Section 1, *Polarized Light Microscopy*, that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. If the asbestos content is less than ten (10) percent, as determined by a Method other than point-counting by *Polarized Light Microscopy* ("PLM"), verify the asbestos content by point-counting using "PLM."

[2]Category I ***non-friable*** Asbestos-Containing Material ("ACM") means asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than one (1) percent asbestos, as determined using the method specified in Appendix A, Subpart F, 40 CFR, Part 763, Section I, *Polarized Light Microscopy*.

[3]Category II ***non-friable*** Asbestos-Containing Material ("ACM") means any material, excluding Category I, ***non-friable*** ACM, containing more than one (1) percent asbestos as determined using the methods specified in Appendix A, Subpart F, 40 CFR, Part 763, Section I, *Polarized Light Microscopy* ("PLM") that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

NOTE: asphalt/vinyl floor tiles, mastic/adhesive, transite materials and house siding are considered Category II materials.

[4]Homeowners are exempt from this requirement.

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Modification Synopsis

March 18, 2002: The Asbestos Policy was modified to allow for the removal of category I non-friable ACM by a general contractor, provided a licensed Delaware certified Professional Service Firm has certified that the material is Category I non-friable ACM. A written waiver would be issued by the Department of Natural Resources and Environmental Control, Air Quality Management Section, Engineering and Compliance Branch to allow for this.

APPENDIX B
SPECIAL WASTE POLICY

RMC

Policy Adopted 12/07/95
Revised 1/22/03

JAN 29 2003

DELAWARE SOLID WASTE AUTHORITY

POLICY ON

SPECIAL SOLID WASTES

All Generators of Special Solid Wastes* in Delaware who wish to dispose their Special Solid Waste at a Delaware Solid Waste Authority (DSWA) facility shall meet the requirements of this policy.

1. Generators shall not deliver and DSWA will not approve disposal of any waste from a Federal Superfund site.

2. Generators shall not deliver and DSWA will not approve disposal of any Special Solid Waste that is hazardous excepting household hazardous waste.

3. Generators shall not deliver and DSWA will not approve disposal of any Special Solid Waste, which is strictly prohibited by any applicable law, regulation, or permit.

4. Generators may deliver and DSWA will approve disposal of NON-HAZARDOUS solid waste from State of Delaware Hazardous Substance Cleanup Act (HSCA) sites in accordance with the Memorandum of Agreement between DSWA and DNREC dated November 15, 2002.

5. Generators may deliver and DSWA will approve disposal of Asbestos-Containing Material in accordance with the most current revision of the Asbestos Policy and Procedures adopted and signed by the Delaware Solid Waste Authority and the Department Natural Resources and Environmental Control.

6. Generators shall request, in writing, approval for disposal of the Special Solid Waste and shall provide, at a minimum, the following information in this order:

   a. The location of the Special Solid Waste generation site
   b. A description of the Special Solid Waste
   c. A statement that the waste is not from a Federal Superfund Site
   d. A statement that the waste is also not hazardous as provided herein
   e. A description of how and where a representative sample(s) of the Special Solid Waste was taken
   f. A copy of all required test results as further described in this policy below

**Special Solid Wastes are defined by the Department of Natural Resources and Environmental Control's Regulations Governing Solid Waste as "...those wastes that require extraordinary management. They include, but are not limited to, abandoned automobiles, white goods, used tires, waste oil, sludges, dead animals, agricultural and industrial wastes, infectious waste, municipal ash, septic tank pumpings, and sewage residues."*

g. Documentation that the laboratory is duly certified to perform the required environmental analysis
h. An estimate of the total quantity of Special Solid Waste to be disposed of (in tons)
i. A proposed delivery schedule for the Special Solid Waste disposal (tons per day) and frequency (days per week, month, and year)

7. At his own expense, the Generator shall arrange to have the sampling, testing, and reporting completed in accordance with the conditions and requirements of this Special Solid Waste Policy and as directed by DSWA.

8. All sampling and testing shall be done in accordance with the most recent version of U.S. EPA Test Methods for Evaluating Solid Waste, SW-846 or other method, which shall be approved by DSWA. Testing must be performed by a duly certified laboratory.

9. A representative sample of the Special Solid Waste shall be subjected to the following testing:

   a. The Toxicity Characteristic Leaching Procedure (TCLP). The resulting leachate must be tested for the TCLP constituents listed in SW-846 or others required by DSWA. No constituent can exceed its respective regulatory level to obtain approval for disposal.
   b. Ignitibility – The Special Solid Waste must be determined to be non-ignitable.
   c. Corrosivity – The Special Solid Waste must be determined to be non-corrosive.
   d. Reactivity – The Special Solid Waste must be determined to be non-reactive.
   e. Benzene, Toluene, Ethylbenzene, Xylene (BTEX) – The Special Solid Waste must not have a concentration greater than any of the following:
      Benzene 0.5 ppm
      Toluene 10 ppm
      Ethylbenzene 5 ppm
      Xylene 5 ppm
   f. Polychlorinated biphenyls (PCBs) - The Special Solid Waste must have a concentration of PCBs less than 50.0 mg/kg.
   g. Solids Content - The Special Solid Waste must be a minimum of 20% solids by weight and not contain free liquids (as determined by the Paint Filter Liquids Test (SW-846)).

10. At DSWA's request the Generator shall provide DSWA with split samples of the Special Solid Wastes. DSWA or its designated representative shall be allowed to be present when such split samples are taken.

11. DSWA, at its sole discretion, reserves the right to require additional testing of the Special Solid Waste at the Generator's expense or may, at its sole discretion, waive certain testing or other requirements.

12. DSWA reserves the right to accept or reject the Special Solid Waste regardless of whether the above requirements are met. Consideration and approval will be made on a case-by-case basis. Approval/denials shall be issued by DSWA in letter form.

13. For all approved Special Solid Wastes that will be disposed of on a continuous basis, the Generator shall follow the sampling, analysis, and reporting requirements established by the DSWA for their Special Solid Waste.

14. DSWA, at its sole discretion, for any reason whatsoever, reserves the right to withdraw approval given to a Generator of Special Solid Waste.

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APPENDIX C
WASTE SCREENING POLICY

DELAWARE SOLID WASTE AUTHORITY
SOLID WASTE SCREENING PROGRAM
SEPTEMBER 19, 1997

PURPOSE: Owners and Operators of Municipal Solid Waste facilities are required by the "Delaware Regulations Governing Solid Waste" (DRGSW) to implement procedures to detect and prevent the disposal of regulated hazardous waste, infectious waste and polychlorinated biphenyl (PCB) waste in their facilities. Compliance with this requirement is accomplished by training the appropriate personnel and implementing the procedures described in this document which are designed to help prevent and detect to the maximum extent possible, the improper disposal of hazardous, PCB and infectious waste in DSWA facilities. This program must include as a minimum:

1) Random inspection of incoming loads.
2) Records of any waste screening inspections performed.
3) Training of facility personnel to recognize hazardous, PCB and other prohibited waste.
4) Notification of the Department of Natural Resources and Environmental Control (the Department) if a regulated hazardous waste or PCB waste is discovered at the facility. Notification regarding the discovery of "other prohibited waste," as described later in this text, should also be made when they are discovered.

DEFINITIONS

Hazardous Waste - means a solid waste, or a combination of solid wastes, which because of its quantity, concentration, or physical characteristics may cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating irreversible illness, or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed. A waste is hazardous if it is listed as a hazardous waste or if it meets one or more of the following criteria: ignitability, corrosivity, reactivity, toxicity as defined by the "Delaware Regulations Governing Hazardous Waste." Any material contaminated by a hazardous waste is also deemed a hazardous waste and must be managed as such.

Infectious Waste - means those solid waste which may cause human disease and may reasonably be suspected of harboring human pathogenic organisms, or may pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

Municipal Solid Waste (MSW) Facilities - are landfills, transfer stations and material recovery facilities which are permitted to accept solid waste.

PCB Waste - PCBs belong to a family of chlorinated organic compounds called Polychlorinated biphenyls (PCBs). PCBs are a mixture of chemicals that are clear to yellow oily liquids or solids. They were sold for use as dielectric fluids (insulating liquids) in electrical transformers and capacitors and have several names including: Arclor, Askarel, Pyroclor, Sanotherm and Pyranol. Although federal law prohibits the manufacture of PCBs, many electrical transformers and capacitors filled with PCBs are still in service.

Solid Waste - means any garbage, refuse, rubbish, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including solid, liquid, semi-solid or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under 7 Del. Code, Chapter 60, as amended, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended.

Waste Screening - is the daily process of examining waste coming into a MSW facility to detect and prevent the improper disposal of hazardous, regulated medical and PCB wastes.

PREPARATION FOR WASTE SCREENING

Training

In order to detect and exclude hazardous, infectious and PCB waste from disposal at DSWA facilities, incoming waste must be subject to thorough inspections by trained personnel. These personnel include facility managers, landfill supervisors, compliance officers, equipment operators, weigh masters and spotters. At a minimum, the training shall comply with the SWANA Waste Screening course. The SWANA Waste Screening course to be given to DSWA staff, by DSWA staff, must incorporate field training into the course work. All facility managers, landfill supervisors and compliance officers will be Manager of Landfill Operations (MOLO) certified. **A complete list of trained personnel, with the dates of the most recent training must be submitted to the DNREC's Solid Waste Management Branch by January 30 each year.** The training program shall focus on appropriate health and safety procedures, identification of hazardous waste labels and containers, appropriate waste handling and record keeping requirements and proper operation, maintenance and decontamination of field equipment and instrumentation. Documentation of personnel training shall be maintained as part of the facility records.

General Site Safety

There are four routes of entry by which chemicals and infectious waste can gain access to the body:

1. Ingestion
2. Inhalation
3. Skin Absorption
4. Injection

Protective clothing to aid in the prevention of exposure during waste screening must include a hard hat, steel toe boots, eye protection, orange vest, coveralls, gloves, and dust masks. Cleanliness and common sense will help avoid exposures. Ingestion can be prevented by washing exposed parts of the body thoroughly after work and always before eating. Chemicals and infectious waste can be introduced directly into the bloodstream through the contamination of wounds. This can be prevented from occurring by protecting cuts and broken skin while working. In the event of an exposure, immediately leave the area, warn others, decontaminate the personal area of exposure and contact emergency personnel as described in this document.

POTENTIAL HAZARDS AND OTHER PROHIBITED WASTE

Personnel responsible for waste screening must be aware of the potential hazards they may be faced with when encountering hazardous waste. They are:

1) PCB Wastes

The Toxic Substance Control Act (TSCA) is a federal law which is designed to manage the phase-out and safe disposal of PCBs; however, as a result of the historic PCBs, their presence is still prevalent. PCBs persist in the environment and take decades to slowly decompose. PCBs are an environmental and health threat even at low concentration. Health effects include cancer, damage to reproductive systems, liver and nervous systems. PCBs must be handled with extreme caution. Regulated PCB waste does not include small quantities of PCBs found in fluorescent light ballast, capacitor, household appliances or other common consumer electrical products. **Any liquid or solid with a PCB concentration greater than or equal to 50 parts per million (ppm) is a regulated material and must be disposed of at a facility permitted to accept PCB wastes. The DSWA's "Special Waste Policy" prohibits the acceptance of waste with a PCB concentration greater than 1 ppm.**

2) Hazardous Waste may present one or more of the following hazards.

A. Explosives and Compressed gases

The possible hazards of explosives are:

1. Blast-over pressure
2. Shock Waves
3. Scattering fragments
4. Fires

The possible hazards of compressed gases are:

1. Explosion
2. Asphyxiation
3. Toxicity
4. Corrosiveness
5. Frost bite
6. Reactivity

B. Ignitable Liquids, Solids, Oxidizers and Poisons

The possible hazards of ignitable liquids are:

1. Fire
2. Combustion explosion
3. Toxicity
4. Corrosiveness
5. Reactivity
6. Contamination of water

The possible hazards of ignitable solids are:

1. Ignite easily and burn explosively
2. Reactive with air and water
3. Spontaneously Combustible
4. Toxicity and Corrosiveness

The possible hazards of oxidizers are:

1. Supply oxygen as a reactive or fire fuel source. In a fire driven by pure oxygen almost anything, including steel, will burn.
2. Sensitive to heat, shock and friction
3. Spontaneously react with organic material
4. Can form ignitable mixtures

The possible hazards of corrosives are:

1. Destroys living tissue
2. Violent ruptures can occur
3. Can splatter in contact with water
4. Vapors may be toxic or irritating

Note: In the case of a chemical fire do not assume that the fire can be extinguished with water. Water may react with the material or spread the fire. Remember, make no assumptions when managing a potentially hazardous waste. If in doubt, exercise extreme caution and seek expert help.

Other Prohibited Waste:

Infectious Waste - As defined, infectious waste are those solid waste which may cause human disease. Some examples of infectious waste are: blood and blood products, human tissue, cultures and serums, animal bedding and tissue, sharps such as syringes, scalpels, IV tubing and glassware, and discarded or outdated pharmaceuticals. All infectious waste, other than sharps, must be double bagged and disposed of in red bags which are marked biohazard and carry the universal biological hazard symbol or words infectious waste; however, **red bag waste may not be disposed in a MSW facility.** All infectious waste must then be enclosed in a double-walled corrugated box before transportation off of the site of generation. All infectious waste must be properly labeled as infectious or pathological waste. Sharps must be contained in a leakproof, rigid, puncture resistant containers that are tightly lidded. No infectious waste may be disposed of in a sanitary landfill unless it has been rendered non-infectious and non-recognizable by a permitted infectious waste treatment facility. Infectious waste discovered during waste screening must be removed from the waste stream and properly managed.

Radioactive Waste - Inspection personnel should be properly trained in the use of radiation detection equipment if screening for radioactive waste is going to occur.

Asbestos - See existing procedure.

Pesticides - are prohibited from landfill disposal except for those generated at the household level. Disposal of empty containers is prohibited unless they have been triple rinsed and punctured.

Liquids-that fail the paint filter test are prohibited from disposal in the landfill.

Lead Acid Batteries - should be recycled whenever possible through existing means.

Used oil - is prohibited from disposal in the landfill and should be recycled at igloos or collection centers.

Ash and Incinerator Residue - must be verified as non-hazardous through TCLP testing before it can be disposed of in the landfill.

Other items to look for include:

- transformers and capacitors
- fluorescent light fixtures in quantities greater than 24
- cathode ray tubes
- filters
- compressors
- electric circuit boards

Other hazards include traffic, exposure to dust, and avoiding injury from slips, trips, or falls and jagged or sharp objects in the waste which could cause injury. These hazards also require that appropriate caution be taken to avoid injury.

Hauler Notification

The DSWA will continue to notify all haulers that hazardous, infectious and PCB waste are not accepted at DSWA facilities. Haulers will be notified of the consequences of delivering inappropriate waste to these facilities, (i.e. fines, remedial and disposal cost, loss of DSWA facility use, etc.) Each hauler will also be notified that they will be subject to random screening of their waste loads for hazardous, regulated medical and PCB waste.

Signs

Notification that mandatory random waste screening is practiced at DSWA facilities and that hazardous wastes are unacceptable shall be made by posting signs throughout the facility. The signs should state the consequences of disposal of hazardous waste and that any questionable waste should be pre-approved before bringing it to a DSWA facility.

Source Identification

All waste screening personnel shall be aware of the attached hazardous and infectious waste generator list. Evidence of an inappropriate waste found as a result of waste screening and the information found in these lists may lead to the identification of the generator.

A "last stop" or "origin" survey may be used to identify the generator when trying to determine the origin of an inappropriate waste. This survey is conducted by asking the hauler to identify the origin of his waste. This survey should include the haulers:

- Vehicle type.
- Time of arrival and departure.
- Vehicle identification (company and license).
- Area of collection, weight of load and date.

With experience, facility personnel may be able to identify the potential for hazardous waste by knowing the origin and characteristics of the wastes from previously know problem areas.

Note: **An unfamiliar hauler should always be subject to greater scrutiny.**

Laboratory Contract - DSWA will maintain a laboratory contract with a laboratory to have waste data analyzed and data reported. This contract should provide for rush analyses, i.e. 24 to 48 hour turn around time for samples submitted.

WASTE SCREENING

Weigh Masters - The first line of defense is the weigh masters ability to identify a questionable hauler. Signs to look for include but are not limited to:

- DNREC Solid Waste Transporters permit. Vehicles with a gross vehicle weight of 26,000 pounds or greater must have a valid solid waste transporters permit issued by the Solid Waste Management Branch of the DNREC. Permits are issued by the DNREC's Solid Waste Management Branch and can obtained by calling 739-3820.
- Large cash payments
- If possible, view the waste vehicle for signs such as obviously inappropriate waste, waste with an unusual odor, waste leaking from the vehicle or waste with a large amount of soil mixed with it.

Any evidence of the aforementioned signs should result in further investigation before allowing the vehicle in question to unload. The weigh masters should notify the landfill supervisor or facility manager and a determination regarding the acceptability of the waste must be made.

Equipment and Instrumentation

The DSWA must provide waste screening personnel training in the proper operation, maintenance and decontamination of all waste screening equipment and instrumentation. Basic equipment and instrumentation will include the following:

EQUIPMENT	INSTRUMENTATION
Rake	Explosive gas meter
Trowel or large spoon to obtain samples *	Volatile Organic meter
Sample jars and labels for transport to lab	pH meter
Flags to mark locations of inappropriate waste	PCB indicator
Camera	HAZMAT analysis kit
Field notebook to record findings	Heavy metals analysis kit
Updated list of hazardous and infectious waste generators and transporters.	Radioactivity measurement device

* Must be decontaminated between samples.

Random Load Selection

The waste screening effort should focus on commercial and industrial sources of waste. While household waste loads should still be inspected, they are less likely to contain wastes of concern. At a minimum, 1% of the vehicles using the facility should be screened on a monthly basis. One percent of all vehicles using a facility must be screened on an annual basis. It is very important that the load selected for inspection is totally random. The random method used will be

determined by the DSWA Compliance Officer conducting the waste screening and noted on the inspection form. Vehicles from companies under investigation or those vehicles deemed to be of suspicious nature may be inspected without following a random method.

Waste Screening Area

The waste screening area shall be located to prevent interference with vehicles in the main dumping area. For example, the use of the edge of the working face could serve as the screening location at the DSWA landfills. The tipping floor can be used at the Pine Tree Corners Transfer Station.

Physical and Sensory Examination of the Waste

Sensory examination relies on visual and olfactory (smell) observations of the waste. Watch the waste as it is being unloaded. After the waste has been spread out using hand tools and/or heavy equipment, the waste must be inspected for possible prohibited materials. The basic clues used in detecting hazardous waste are:

Location - where did the truck come from?
Containers - are the containers drums, cylinders, canisters, or lead boxes?
Markings- do any of the containers contain hazard labels, placards, markings or colors? Refer to the attached hazard placard marking information to determine what the coding means; however, never assume that a container label accurately indicates its contents.
Senses- Are there any hissing noises, do you see vapors or smoke, feel hot or cold sensations or smell unusual odors, are your eyes, nose or skin irritated?

The risk of personal exposure to a waste runs from low to high based on the above levels of detection. When the above senses detect a waste the risk of exposure is very high and the appropriate cautionary measures and notifications must be implemented immediately. Never deliberately inhale vapors from a suspicious material. Anyone that is conducting waste screening that becomes dizzy, feels sick to their stomach, or their skin, eyes, nose or throat itches, burns or become irritated or if unusual symptoms of illness develop, should notify the supervisor immediately and seek medical attention if necessary.

Waste that has an unusual appearance, creates an offensive odor, or appears to contain high moisture levels are good candidates for closer examination. Enclosed containers such as barrels, drums, pails, and cans with hazard shipping placards indicating explosive, flammable or poisonous contents require closer, yet cautious, examination. Empty containers should be punctured in the top, bottom and sides prior to disposal. Loads or mixed loads of finely divided or granular materials, powders, dusts, bright or unusual colors or dried solids should also be closely investigated. Most toxic heavy metals are found in powders or granular materials. Special consideration should be given to loads of soil or waste mixed with soil. Any stained soils should have the source identified and samples taken to verify the material as non-hazardous. Large quantities of small containers should always be investigated.

Notification of the delivery of pre-approved industrial waste and communication between the scale house and the working face may avoid potential confusion regarding the examination of approved industrial waste. This notification can also serve as preparation for obtaining samples from an industrial waste stream.

Liquids

Unknown liquids are also a major concern. Liquids in containers, sludges or saturated soils should be flagged for investigation. Ignitable, explosive and corrosive wastes are usually found in liquid form. Toxic organic wastes occur as liquids and PCBs are commonly found in oils. The air above liquids can be monitored using a gas explosion meter or volatile organic meter by personnel who have been properly trained in the use of this equipment. Caution should be used to make sure the visible or audible indicators used on the gas meters can be detected under the conditions they are being used (i.e. Noise, bright sun, etc.). If explosive levels in the area of the waste pile are detected at 25 percent or greater of the lower explosive limit, the area should be evacuated and emergency personnel contacted.

Testing for free liquids

The DRGSW prohibit the disposal of free liquids in DSWA facilities. Paint filter test method 9095 should be used to determine if a waste contains free liquids. The procedure is as follows:

- Obtain standard 400 micron paint filters
- Place a properly sized funnel in a ring stand or similar holding device
- Fold the paint filter and line the funnel with it
- Place a 100 milliliter sample of the waste into the funnel
- Place a clean dry container under the funnel
- Check in exactly 5 minutes to see if there any liquids in the container

If liquid passes through the filter in 5 minutes or less, it is considered to contain free liquids and may not be disposed of in the landfill.

Odors

Fresh MSW has a slightly citrus odor while older MSW has a rotten egg or hydrogen sulfide odor. Chemical and unusual odors warrant further investigation. It is important for waste screening personnel to know that some landfill gasses have no odor but in confined spaces can and have resulted in suffocation and explosion hazards.

Hazardous Characterization for Unknown Materials.

If a material is detected which cannot be identified, a technique known as HAZMAT is used for field categorization to identify the hazards of a suspicious material according to RCRA or DOT categories. HAZMAT can be used to identify basic physical and chemical characteristics of an unknown waste. To set up a HAZMAT program at least one person per DSWA facility must be

trained. Safety is the most important consideration when performing HAZMAT testing. If you do not know what it is, assume it is hazardous.

Managing Unacceptable Wastes

If regulated hazardous, infectious or PCB containing wastes are found, the generator or transporter has violated federal and/or state law by sending these wastes to a facility not permitted to accept them. These wastes cannot simply be returned to the hauler. State law requires notification of the Department when such wastes have been found. **DSWA and/or its contracted personnel must contact the State Emergency Response Team (SERT) at 1-800-662-8802 immediately after unacceptable wastes have been detected. Detailed procedures are in Attachment 'A'; Section VII - Solid Waste Screening from DSWA's Compliance SOP.**

The regulated wastes and all other contaminated wastes will have to be handled in the appropriate manner and disposed of at a permitted facility. If the generator can be identified, the generator will be responsible for providing management and disposal of the waste including all associated costs, as well as possibly being subject to criminal and civil penalties. The responsibility of the hauler will vary depending on the situation; however, the hauler is responsible for providing maximum assistance in identifying and locating the generator. In cases where the hauler does not cooperate in attempting to identify the generator, then the burden for the cost of managing the unacceptable waste must be placed on the hauler.

The landfill owner and operator has the responsibility to:

- Provide the required notification to the DNREC SERT
- Secure the waste to keep the contamination from spreading
- Unknown materials that are still undergoing analysis need to be properly segregated and protected against the weather, secured from unauthorized removal and isolated from other waste activities.
- Maintain the necessary records
- Cooperate with state and federal agencies
- The screening area must be appropriately cleaned whenever a regulated waste is found.
- Hazardous waste storage must comply with RCRA subtitle C requirements.

If the generator cannot be found or does not have the resources to properly manage the waste it may be the responsibility of the hauler or of the DSWA.

When an inappropriate waste is discovered and the generator cannot be determined, all future loads from that collection route should be inspected to try and determine the source of the waste and to assure that the problem has been corrected.

Event Reporting

In the event that a regulated waste is discovered, the agencies that must be contacted are:

Medical Emergency - To be provided by DSWA and be facility specific.
State Emergency Response Branch - 1-800-662-8802. Contact should be immediate.
Solid Waste Management Branch - 1-302-739-3820.
Hazardous Waste Management Branch - 1-302-739-3689.

The Solid and Hazardous Waste offices should be contacted as soon as emergency plans have been implemented and contact must be made as soon as practical and no later than the close of the next business day.

At minimum, the following information should be recorded in the event that a hazardous material is discovered:

- Drivers name, company name, vehicle license number and transporters permit number
- Waste(s) detected
- Generators if identifiable
- Date and time of Department notification
- Efforts taken if an extremely toxic or hazardous substance was discovered
- Landfill employee in charge

Record Keeping

Records of the number of inspections, procedures employed, findings and actions taken should be kept on file by DSWA. These records must be maintained in good condition for 30 years or for the interval approved by DNREC and shall include the signature of the person responsible for conducting the waste screening activity.

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APPENDIX D
PLAN OF OPERATION FOR A STATEWIDE YARD WASTE RECYCLING PROGRAM

REVISED: July 08, 1999
July 14, 1999
July 23, 1999

PLAN OF OPERATION FOR A STATEWIDE YARD WASTE RECYCLING PROGRAM

The Delaware Solid Waste Authority (DSWA) proposes diverting yard waste from the incoming waste stream entering our facilities, stockpiling the yard waste, and processing the material for use or distribution at each facility. All yard waste stockpiling and processing will take place on DSWA owned property.

Stockpile/Processing Locations

The DSWA may maintain yard waste stockpile/storage at each of the following locations:

Delaware Recycling Center (DRC)
Cherry Island Landfill (CIL)
Central Solid Waste Management Center (CSWMC)
Southern Solid Waste Management Center (SSWMC)
Pine Tree Corners Transfer Station (PTCTS)
DSWA Collection Stations

Acceptable Materials

The DSWA will accept grass, leaves, and branches at each of the facilities' stockpile/storage locations. Storage of yard waste may occur at DSWA collection stations in roll-off boxes or other similar containers.

Stockpiles

The stockpiles will be inspected at least once per operating day to insure that unwanted materials (such as trash) have not been deposited. Unwanted materials will be taken to the landfill. Bagged yard waste will not be accepted at the stockpiles. The size of the stockpiles will be limited to an area of 150' x 150'. The height of the stockpiles will be limited to 15'. A maximum of three (3) stockpiles will be maintained at each site. Access will be maintained on the perimeter of each stockpile (at least three (3) sides) for the purposes of fighting fires. Stockpiles located on the landfill surface will be placed at a location with at least intermediate cover.

Shredding

Approximately three (3) times each year (a minimum of twice per year) the DSWA will have the stockpiled yard waste shredded using a tub grinder or similar equipment. The shredded material will be used for various processes at each facility (described below). Note that stockpiled yard waste at the PTCTS is hauled to CIL for shredding. Yard waste stored

at DSWA collection stations will also be hauled to a landfill location to be shredded.

Processing/End Uses

The DSWA's Yard Waste Recycling Pilot Program demonstrated several possible uses of the shredded yard waste. We propose to continue to use the material at each facility in accordance with one or more of the following processes:

Composting

The shredded material will be windrowed in piles approximately five (5) feet high and ten (10) feet wide. Access will be maintained on the perimeter of the windrows (at least three (3) sides) for the purposes of fighting fires. The material will be turned by a loader (or similar equipment) at a frequency sufficient to aid the composting process and minimize odors. The completed compost will be used in one of the following ways:

- Marketed/given away to customers
- Used for onsite landscaping work
- Mixed with soil and used onsite for topsoil

Mulch

The shredded material will be used onsite for landscaping work or marketed/given away to customers. The size of the stockpiles for the shredded material will be limited to an area of 150' x 150'. The height of the stockpiles will be limited to 15 feet. A maximum of three (3) stockpile areas will be maintained at each site. Stockpiles located on the landfill surface will be placed at a location with at least intermediate cover.

Wet Weather Pads

Shredded yard waste will be placed on the landfill surface to form wet weather pads. These pads are created to provide a suitable driving surface during inclement weather. The use of this material will be in place of stone pads and will reduce the amount of stone used in the operation of the landfill cell.

Daily Cover

Shredded yard waste will be used in place of soil to cover the waste at the end of the day. The total thickness of shredded yard waste will be at least 6". The material may be placed directly or blended with soil or digester sludge prior to using it as daily cover. At least once per week, soil will be used as daily cover to create a fire break.

Intermediate Cover

Shredded yard waste will be used in place of 6 inches of intermediate cover soil. The shredded yard waste may be placed directly or blended with soil or digester sludge, and applied to the landfill surface.

APPENDIX E
ENVIRONMENTAL MONITORING PLAN

MONITORING PROGRAM
FOR THE
NORTHERN SOLID WASTE MANAGEMENT CENTER AT CHERRY ISLAND

I. FIELD & LABORATORY PROTOCOLS

All samples shall be collected, prepared, shipped, and analyzed using the methods provided in the following publications:

A. SW-846 (Most Recent Edition)	**To be used first;**
B. 40 CFR-136 (Most Recent Edition)	**to be used only if methods are not available in A above;**
C. Standard Methods (Most Recent Edition)	**to be used only if methods are not available in A or B above;**
D. Other methods as jointly approved by DSWA and DNREC	**to be used only if methods are not available in A, B, or C above.**

All groundwater, leachate, and surfacewater samples shall be collected in a manner that minimizes sample turbidity. All wells shall be maintained as necessary so that they will produce low turbidity water. All groundwater samples exceeding 10 NTUs shall be field filtered.

II. LEACHATE MONITORING PROGRAM

A. Leachate Monitoring

1. DSWA shall monitor all collection systems, wet-wells, pumps, flowmeters, controls and recording devices each operating day to insure proper operation. DSWA shall inspect all connections to valves, pipes, flow meters, at riser houses and pump stations for leaks. The results of monitoring and inspections shall be recorded in the facility log.

2. DSWA shall measure and record the quantities of leachate pumped to the City of Wilmington's wastewater treatment plant on a daily basis. DSWA shall also record the quantity of all leachates being transferred from the CSWMC and SSWMC to CIL for disposal. These records shall include the date of the event, the origin of the leachate, quantity of leachate, and the destination of the leachate.

3. Monthly, leachate samples shall be collected from the CIL Master Pump Station. These samples shall be analyzed in accordance with the schedules provided in Appendix B, Table 1.

B. Collection Line Maintenance

1. Annually, all accessible leachate collection pipes shall be cleaned with a self propelled, high pressure jetting system. DSWA shall identify any assess any blockages or areas that are inaccessible during the annual cleanings.

2. At least once every four years, DSWA shall have all accessible leachate collection systems video inspected to assess their condition. Upon completion DSWA shall generate a report discussing the condition of the leachate collection pipes including the condition of the pipes, clogging of the pipe perforations, locations and cause of blockages, and any effects the blockages on operation of the system.

C. Spill Contingency

1. DSWA shall immediately notify DNREC regarding any incident of a leachate release.
2. DSWA shall immediately cleanup any and all areas impacted by the leachate release.

III. SURFACEWATER/STORMWATER MONITORING PROGRAM

Surfacewater samples shall be collected and analyzed in accordance with the schedules provided in Appendix B, Table 1. Surfacewater samples shall be collected using standard grab methodology. Sample preservation, Chain-of-Custody, labeling, shipment, and equipment decontamination, shall follow the same procedures as outlined in DSWA's ***"Standardized Groundwater Sampling Procedures"*** (attached).

Stormwater samples shall be collected and analyzed in accordance with the schedules provided in Appendix B, Table 1 using the methods set forth in DSWA's **"Stormwater Monitoring Plan for the Cherry Island Landfill (CIL) Expansion"** (attached).

IV. GROUNDWATER MONITORING PROGRAM

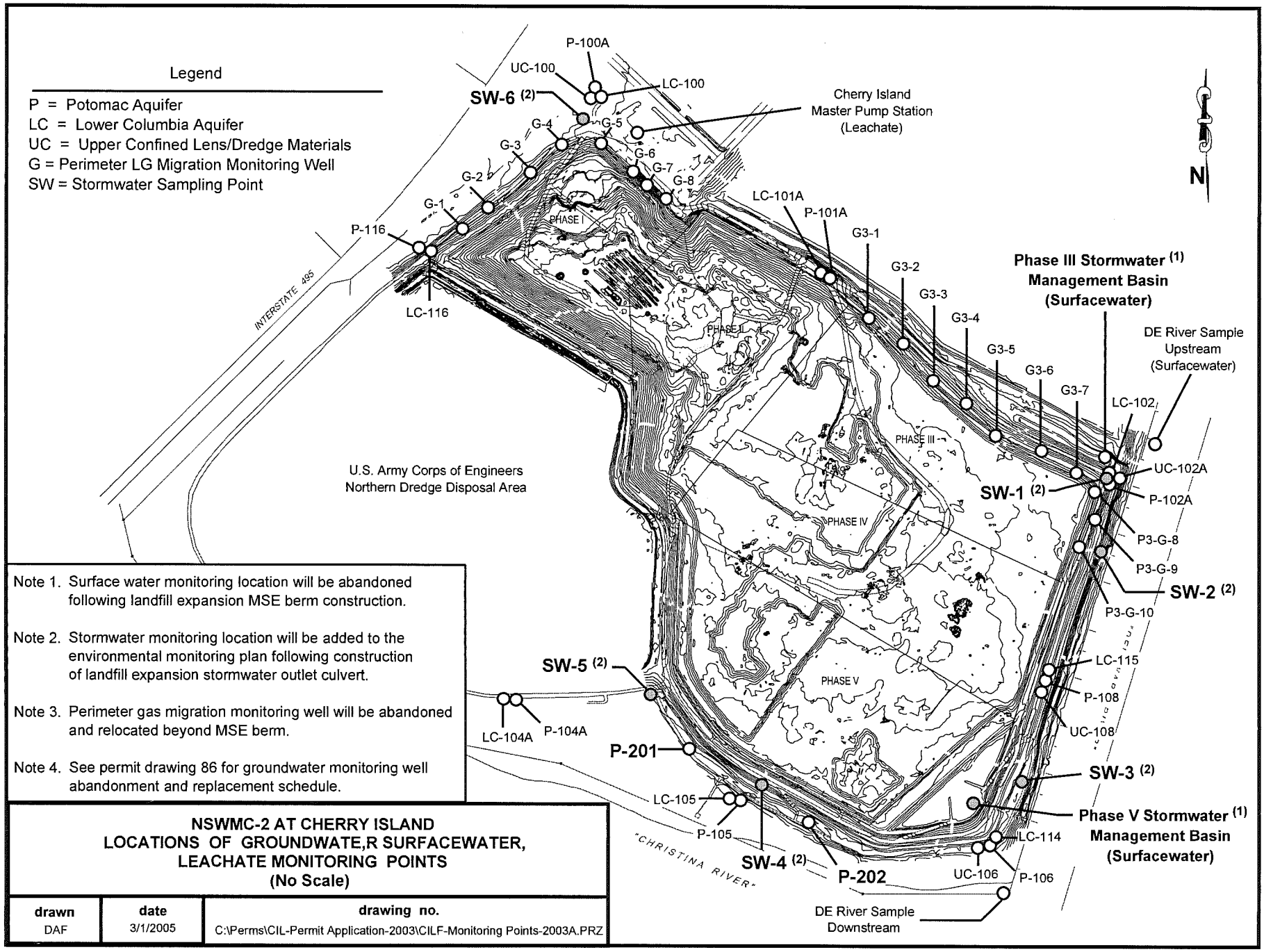
Groundwater samples shall be collected and analyzed in accordance with the schedules provided in Appendix B, Table 1 using the methods set forth in DSWA's ***"Standardized Groundwater Sampling Procedures"*** (attached).

V. GAS CONTROL AND MONITORING PROGRAM

Gas control and monitoring shall be in accordance with ***Title V Operating Permit No. AQM-003/00111***

ENVIRONMENTAL MONITORING PLAN

APPENDIX A
LOCATION MAP OF ALL MONITORING LOCATIONS AT THE NSWMC-2



Note 1. Surface water monitoring location will be abandoned following landfill expansion MSE berm construction.

Note 2. Stormwater monitoring location will be added to the environmental monitoring plan following construction of landfill expansion stormwater outlet culvert.

Note 3. Perimeter gas migration monitoring well will be abandoned and relocated beyond MSE berm.

Note 4. See permit drawing 86 for groundwater monitoring well abandonment and replacement schedule.

NSWMC-2 AT CHERRY ISLAND
LOCATIONS OF GROUNDWATE,R SURFACEWATER, LEACHATE MONITORING POINTS
(No Scale)

drawn	date	drawing no.
DAF	3/1/2005	C:\Perms\CIL-Permit Application-2003\CILF-Monitoring Points-2003A.PRZ

MONITORING PROGRAM
FOR THE
NORTHERN SOLID WASTE MANAGEMENT CENTER AT CHERRY ISLAND

APPENDIX B:

Table 1: Monitoring Points and Schedules

Table 2: Field Measurements - Leachates

Table 3: Field Measurements – Groundwaters and Surfacewaters

Table 4: Indicator Analytes

Table 5: Semi-Annual Stormwater Analysis

Table 6: DNREC TABLE1: Leachate Supplemental Parameters

Table 1: CIL Monitoring Points and Schedules

Leachate Collections Systems

Location I.D.	Jan/Feb/ Mar/May/Jun/Jul/Aug/Sep/Nov/Dec			Apr/Oct
Cherry Island Master Pump Station (CI-MPS)	F1, I			F1, I, T1

Surface water Monitoring Locations

Location I.D.	Jan	Apr	Jul	Oct
Delaware River	F2, I,	S,F2, I	F2, I	F2, I
Christina River	F2, I	S,F2, I	F2, I	F2, I
Phase III Stormwater Management Basin	D,F2, I	D,F2, I	D,F2, I	D,F2, I
Phase V Stormwater Management Basin	D,F2, I	D,F2, I	D,F2, I	D,F2, I
Perimeter Ditch & Stormwater Point Inspection	Jan	Apr	Jul	Oct

Location I.D.	Semi-Annual (60 Days Apart)	
Delaware River	SW-Ex	SW-Ex
Christina River	SW-Ex	SW-Ex
Phase III Stormwater Management Basin	SW-Ex	SW-Ex
Phase V Stormwater Management Basin	SW-Ex	SW-Ex
SW-1	SW-Ex	SW-Ex
SW-2	SW-Ex	SW-Ex
SW-3	SW-Ex	SW-Ex
SW-4	SW-Ex	SW-Ex
SW-5	SW-Ex	SW-Ex
SW-6	SW-Ex	SW-Ex
Perimeter Ditch & Stormwater Point Inspection	Semi-Annual	Semi-Annual

Groundwater Monitoring Wells

Location I.D.	Jan	Apr	Jul	Oct
UC-100	D	D	D	D
LC-100 (Formerly P-100)	D, F2	D, F2, I	D, F2	D, F2
P-100A	D, F2	D, F2, I	D, F2	D, F2
LC-101A	D, F2	D, F2, I	D, F2	D, F2
P-101	D, F2	D, F2, I	D, F2	D, F2
UC-102	D, F2	D, F2, I	D, F2	D, F2
LC-102	D, F2	D, F2, I	D, F2	D, F2
P-102	D, F2	D, F2, I	D, F2	D, F2
LC-104	D, F2	D, F2, I	D, F2	D, F2
P-104A	D, F2	D, F2, I	D, F2	D, F2
LC-105	D, F2	D, F2, I	D, F2	D, F2
P-105	D, F2	D, F2, I	D, F2	D, F2
UC-106	D, F2	D, F2, I	D, F2	D, F2
LC-114	D, F2	D, F2, I	D, F2	D, F2
P-106	D, F2	D, F2, I	D, F2	D, F2
UC-108	D, F2	D, F2, I	D, F2	D, F2
LC-115	D, F2	D, F2, I	D, F2	D, F2
P-108	D, F2	D, F2, I	D, F2	D, F2
LC-116	D, F2	D, F2, I	D, F2	D, F2
P-116	D, F2	D, F2, I	D, F2	D, F2

Table 1: CIL Monitoring Points and Schedules (Continued)

Perimeter Gas Migration Monitoring Wells

Location I.D.	Jan	Apr	Jul	Oct
Well G-1	D, M	D, M	D, M	D, M
Well G-2	D, M	D, M	D, M	D, M
Well G-3	D, M	D, M	D, M	D, M
Well G-4	D, M	D, M	D, M	D, M
Well G-5	D, M	D, M	D, M	D, M
Well G-6	D, M	D, M	D, M	D, M
Well G-7	D, M	D, M	D, M	D, M
Well G-8	D, M	D, M	D, M	D, M
Well G3-1	D, M	D, M	D, M	D, M
Well G3-2	D, M	D, M	D, M	D, M
Well G3-3	D, M	D, M	D, M	D, M
Well G3-4	D, M	D, M	D, M	D, M
Well G3-5	D, M	D, M	D, M	D, M
Well G3-6	D, M	D, M	D, M	D, M
Well G3-7	D, M	D, M	D, M	D, M
Well G3-8	D, M	D, M	D, M	D, M
Well G3-9	D, M	D, M	D, M	D, M
Well G3-10	D, M	D, M	D, M	D, M

S = USGS Staff Gauge at the confluence of the Christina and Delaware
D = Depth to Water Measurement
M = Methane
F1 = Leachate Field Measurements (Attached Table 2)
F2 = Groundwater/Surfacewater Field Measurements (Attached Table 3)
I = Indicator Analytes (Attached Table 4)
SW-Ex = Surfacewater Expanded Listing (Attached Table 5)
T1 = DNREC Table 1 Leachate Analytes (Attached Table 6)

TABLE 2: Field Measurements: Leachates

1. Temperature
2. pH
3. Specific Conductance
4. Oxidation/Reduction Potential

TABLE 3: Field Measurements: Groundwaters & Surfacewaters

1. Temperature
2. pH
3. Specific Conductance
4. Oxidation-Reduction Potential
5. Dissolved Oxygen
6. Turbidity

TABLE 4: Field Measurements, Indicator Analytes and Measurements

1. pH (Lab Check)	10. Dissolved Silica
2. Specific Conductance (Lab Check)	11. Calcium
3. Ammonia-Nitrogen	12. Iron
4. Nitrate Nitrogen	13. Magnesium
5. Total Alkalinity	14. Manganes
6. Phenolphthalein Alkalinity	15. Potassium
7. Total Dissolved Solids	16. Sodium
8. Chemical Oxygen Demand	17. Sulfate
9. Chloride	18. Total Organic Carbon

TABLE 5: Semi-Annual Stormwater Analysis

1. pH	12. Total Suspended Solids	23. Iron
2. Specific Conductance	13. Total Dissolved Solids	24. Lead
3. Total Phosphorus	14. Total Alkalinity	25. Magnesium
4. Ortho-Phosphate	15. Phenolphthalein Alkalinity	26. Manganese
5. Nitrate Nitrogen	16. Sulfate	27. Mercury
6. Ammonia Nitrogen	17. Arsenic	28. Nickel
7. Organic Nitrogen	18. Cadmium	29. Potassium
8. Total Kjeldahl Nitrogen	19. Calcium	30. Sodium
9. Biochemical Oxygen Demand	20. Chromium	31. Zinc
10. Chemical Oxygen Demand	21. Chromium (Hex)	32. Primary Aroclors
11. Total Organic Carbon	22. Copper	33. Oil and Grease

Table 6: DNREC TABLE 1 - Leachate Supplemental Parameters Modified January 2002

1) Antimony
2) Arsenic
3) Barium
4) Beryllium
5) Cadmium
6) Chromium (Total)
7) Cobalt
8) Copper
9) Lead, Total
10) Magnesium
11) Mercury
12) Molybdenum
13) Nickel
14) Silver
15) Selenium
16) Thallium
17) Tin
18) Vanadium
19) Zinc
20) Cyanide (Total)
21) Sulfides
22) Phenols (Total)
23) Acetone
24) Acetophenone
25) Acrylonitrile
26) Benzene
27) Benzyl Alcohol
28) Bromochloromethane
29) Bromoform
30) Bromomethane
31) Dibromochloromethane
32) Dichlorobromomethane
33) 2-Butanone
34) Carbon disulfide
35) Carbon tetrachloride
36) Chlorobenzene
37) Chloroethane
38) Chloroform
39) 1,2-Dibromo-3-chloropropane
40) 1,2-Dibromoethane
41) 1,2-Dichlorobenzene (ortho)
42) 1,3-Dichlorobenzene (meta)
43) 1,4-Dichlorobenzene (para)
44) trans-1,4-Dichloro-2-butene
45) 1,1-Dichloroethane
46) 1,2-Dichloroethane
47) 1,1-Dichloroethene
48) 1,2-Dichloroethene
49) cis-1,2-Dichloroethene
50) trans-1,2-Dichloroethene
51) 1,2-Dichloropropane
52) 1,3-Dichloropropane
53) cis-1,3-Dichloropropene
54) trans-1,3-Dichloropropene
55) Diethyl Ether
56) Ethylbenzene
57) 2-Hexanone (Methyl butyl ketone)
58) Methylene bromide (Dibromomethane)
59) Methyl chloride (Chloromethane)
60) Methylene chloride (Dichloromethane)
61) Methyl Iodide (Iodomethane)
62) 4-methyl-2-pentanone
63) Styrene
64) 1,1,2,2-Tetrachloroethane
65) 1,1,1,2-Tetrachloroethane
66) Tetrachloroethene
67) Tetrahydrofuran
68) Toluene
69) 1,1,1-Trichloroethane
70) 1,1,2-Trichloroethane
71) Trichloroethene
72) Trichlorofluoromethane
73) 1,2,3-Trichloropropane
74) Vinyl Acetate
75) Vinyl chloride
76) Tot. Xylenes
77) 3,3'-Dichlorobenzidene
78) 1,2-Diphenylhydrazine
79) Acenaphthene
80) Anthracene
81) Benzidine
82) Benzo (a) anthracene
83) Benzo (a) pyrene
84) Benzo (g,h,i) perylene
85) Benzo (k) fluoranthene
86) 4-Bromophenyl phenyl ether
87) Butylbenzyl Phthalate
88) Ideno (1,2,3-cd) pyrene
89) Bis (2-chloroethoxy) methane
90) Bis (2-chloroethyl) ether
91) Bis (2-chloroisopropyl) ether
92) 2-Chloronaphthalene
93) 2-Chlorophenol
94) 4-Chlorophenyl Phenyl Ether
95) Chrysene
96) Di-n-Butylphthalate
97) Di-n-octyl Phthalate
98) Dibenz (a,h) anthracene
99) 2,4-Dichlorophenol
100) Diethylphthalate
101) 2,4-Dimethylphenol
102) Dimethylphthalate
103) 2-Methyl-4,6-Dinitrophenol
104) 2,4-Dinitrophenol
105) 2,4-Dinitrotoluene
106) 2,6-Dinitrotoluene
107) Bis(2-ethylhexyl)phthalate
108) Fluoranthene
109) Fluorene
110) Hexachlorobenzene
111) Hexachlorobutadiene
112) Hexachlorocyclopentadiene
113) Hexachloroethane
114) Isophorone
115) 2-Methylnaphthalene
116) 2-Methylphenol (o-Cresol)
117) 3/4 Methylphenol (m/p-Cresol)
118) 4-Chloro-3-methylphenol
119) 2-Naphthylamine
120) N-Nitrosodi-n-propylamine
121) N-Nitrosodimethylamine
122) N-Nitrosodiphenylamine
123) Naphthalene
124) Nitrobenzene
125) Benzo (b) fluoranthene
126) 2-Nitrophenol
127) 4-Nitrophenol
128) Pentachlorophenol
129) Phenanthrene
130) Phenol
131) Pyrene
132) Pyridine
133) 1,2,4-Trichlorobenzene
134) 2,4,6-Trichlorophenol (2,4,6 T)
135) Acrolein
136) o,p'-DDD
137) p,p'-DDD
138) 4,4'-DDE
139) 4,4'-DDT
140) 2,4,5-T
141) 2,4,5-TP (Silvex)
142) 2,4-D
143) Aldrin
144) alpha-BHC
145) delta BHC
146) beta-BHC
147) gamma BHC (Lindane)
148) alpha Endosulfan
149) beta Endosulfan
150) Endosulfan Sulfate
151) 2,4,5 Trichlorophenol
152) Chlordane
153) Dieldrin
154) Dimethoate
155) Heptachlor
156) Heptachlor epoxide
157) Endrin
158) Endrin Aldehyde
159) Methoxychlor
160) PCB-1016
161) PCB-1221
162) PCB-1232
163) PCB-1242
164) PCB-1248
165) PCB-1254
166) PCB-1260
167) Toxaphene
168) 2-Chloroethyl vinyl ether
169) 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)

DSWA GROUNDWATER SAMPLING PROCEDURES

DSWA GROUNDWATER SAMPLING PROCEDURES

Procedures adopted by DSWA for collection, preparation, and shipping of groundwater samples collected from DSWA landfill facilities

Abstract

Due to the presence of fine sands, silts, and clays in the aquifers being monitored at the all Delaware Solid Waste Authority Management Centers, DSWA has Implemented a "Common Sense" approach for the collection and preparation of groundwater samples for analysis. Using guidance provided by DNREC, in 1993, DSWA began using slow-purge or micropurge techniques to collect groundwater samples. These techniques or sampling protocols were implemented to accomplish the following:

1. Reduce the heavy pieces of field equipment, purge pumps, steam cleaners, and generators needed to purge wells and decontaminate equipment;
2. Reduce the number of wells being sampled;
3. Eliminate hand bailing;
4. Significantly reduce time spent purging wells;
5. Reduce or eliminate field filtering as required by 40 CFR-258;

Both the DNREC and the DSWA understand that these methods may vary significantly from many of the currently accepted methods. However, the hydrogeologic conditions which exist on the Delmarva Peninsula (and many other locations where the primary aquifers were formed by weathering and tidal deposition) make certain requirements of 40 CFR-258 difficult to meet without modification.

Well Head Protection/Security

Well heads at all DSWA facilities meet exceed the standards set forth in *DNREC's Delaware Regulations Governing the Construction and Use of Wells*. All monitoring wells are constructed of PVC or stainless steel with protective outer steel casings and locking caps. Additionally, most DSWA wells have additional outer protective casings made of concrete or steel, or concrete pads enclosed by bollards (See Figure 1). All protective steel casings have been outfitted with a locking cap, are kept locked using tamper resistant, hardened steel locks. All locks at the major landfill facilities have been keyed alike.

Well Construction

All DSWA wells have been constructed and installed in a manner consistent with the existing specifications required by DNREC at the time of construction.

Well Locations

The inner well casings of all GMW's being monitored at DSWA facilities have been surveyed by a land surveyor licensed in the State of Delaware. All groundwater monitoring wells have been tied in to the National Geodetic Vertical Datum and Delaware State Coordinate plane using standard land surveying practices (See Table 1).

Well Modifications for Current Sampling Protocols

No modifications have been made to groundwater monitoring wells with average DTWs greater than 25 feet.

All wells with an average DTW of 25 feet or less have been modified through the installation of a 3/16" Teflon™ tube extending the entire length of the casing and screen. The tube is plugged at the lower end to prevent uptake of solids during sampling, and is solid except for a liberally perforated 2-3 foot section located at mid screen of the well casing. The tube is secured to the outer steel casing by way of nylon cord and straps (See Figure 2).

Sample Collection Procedures

The following presents the methods by which DSWA collects or has it's Environmental monitoring contractors collect groundwater samples from DSWA solid waste management centers. It is believed that these methods allow for uniform sampling of the aquifers without drawing in fine sediments from the surrounding aquifer, or disturbing sediments present in the well casings.

I. Field Preparation: Mobilization/Demobilization

The following outlines those procedures DSWA requires of it's environmental monitoring contractors for preparation for the sampling of groundwaters at the DSWA facilities:

A. Standard QA/QC required by the sampling contractor include:

1. External audits through certification programs.
2. External audits through acceptance of blind samples and round robin testing.
3. Internal audits through splitting samples and shipping samples to other local and regional laboratories.
4. Performance audits of all laboratory personnel and stations.

B. Many times, the bottles used by a contractor for sample collection, shipment, and storage are purchased pre-cleaned and (some with preservatives added) by an independent company. However, all sampling and field equipment is usually cleaned and maintained by the contractor. Therefore, as a part of standard quality checks, all bottle shipments should be tested by the contracted sample contract on a routine basis for contamination. If the sampling company elects to clean their own bottles, quality checks should be standard protocol, and should be run on every lot washed. As a minimum, the following should be done prior to any bottles going into the field:

1. Fresh disposable Nitrile gloves should be worn whenever handling the glassware (prior to and after cleaning).
2. All labels should be affixed to the bottles prior to issuance to field crews.
3. All sample preservatives which can be placed in bottles prior to sample collection should be done so before the bottles are issued to the field crews. The type and amount of preservative should be placed on the label immediately prior to or after addition to the bottle.
4. Specific analytes and sample locations should be placed on the labels in indelible ink prior to the bottles leaving the laboratory. Note that all caps for volatile organic samples should be screwed down tightly prior to labeling to eliminate any airborne volatile contaminants from the label glues or ink

from indelible markers, pens, or type.

C. Preparation of field equipment should include the following:

1. Cleaning of all manual sampling equipment should include the following procedures:

   a. A general rinse with water to remove debris and solids.
   b. An Alconox Wash.
   c. Sterile rinses with Deionized/distilled water.
   d. Acid Wash.
   e. Sterile rinses with Deionized/distilled water.
   f. Hexane Wash.
   g. 3 sterile rinses with Deionized/distilled water.

   All acids and chemical rinses used should be GCMS grade or better. The field sampling crew is required to carry the necessary chemicals and deionized/distilled water into the field in order to clean any materials which may become contaminated during sampling

2. All pumps and field meters should be cleaned and calibrated prior to each sampling event using chemicals and standard procedures recommended by the manufacturer. The equipment should undergo the same protocols when it is returned to the lab.
3. Maintenance and parts replacement should be performed as required by the manufacturers suggested schedule.
4. The sampling company is required to retain records of maintenance and calibration certification. These records are periodically checked by the DSWA.
5. All field equipment should be inspected and tested for proper operation prior to being sent into the field.
6. The sampling crew is required to carry duplicates of all major pieces of sampling equipment.

II. GROUNDWATER SAMPLE COLLECTION

A. General

During all phases of groundwater monitoring at DSWA facilities, field sampling crews are required to:

1. Follow the OSHA regulations governing personal health and safety. (Since there have been no indication of hazardous constituents present in any of the groundwater samples collected at the DSWA Facilities, personal protection has been maintained at Level D requirements. Hard hats, safety glasses, safety shoes with steel toes, and protective gloves are the only safety equipment required at the present time. However, should samples show any indication of being hazardous, the sampling crew is required to move to a more stringent health and safety program before going further in the sampling event.) Generally, **a minimum of** one pair of Nitrile gloves (two are recommended) are to be used while handling equipment and all

phases of the collection, preparation, and shipment of samples. Gloves are changed between sampling locations. (e.g. gloves are changed prior to sample collections and after equipment decontamination.) This insures minimal opportunity for contamination through handling of samples and equipment by operators.

2. At least one member of the sampling crew collecting samples at DSWA facilities must carry the following valid certifications:

   a. 40 hour OSHA Emergency Response Program
   b. Confined Space Entry
   c. First Aid and CPR.

3. All sampling events must be overseen by an individual with a minimum of three years field experience in the collection, preparation, and shipping of groundwater samples.
4. The sampling company must conduct annual audits of the procedures and equipment being used by their field crews.
5. DSWA conducts random inspections of the field crews sampling protocols during each sampling event.

B. Gauging

Prior to the collection of any groundwater samples from a DSWA facility, the field sampling crew is required to measure the static groundwater levels to 1/100 of a foot in all GMW's around the site. The contractor is required to use an electronic water level indicator dedicated specifically for this purpose. The inner well casings of all GMW's being monitored at DSWA facilities have been surveyed by a land surveyor licensed in the State of Delaware. Each is marked with a reference point that is tied into the National Geodetic Vertical Datum (NGVD). All depth to water readings are to be measured from these reference points. The following procedures are used by environmental monitoring contractor's field sampling crews for gauging the groundwater monitoring wells (GMW) prior to collection of samples from DSWA facilities:

1. The following protocols are to be used by the field sampling crew whenever groundwater elevations are taken:

   a. All measurements at a DSWA site are to be taken on the same day.
   b. All GMWs are to be inspected externally and internally for damage, and notations of physical well inspection entered in the field log prior to and after opening the well casing.
   c. Well casings are to be re-locked after measurements have been completed on the well.
   d. Measurements are to be taken from a reference point marked on the inner casing.
   e. A minimum of three measurements are to taken from each well. The location of the well, and the three measurements are to be recorded in a field log along with the time and date. These readings are to be averaged. The average of these measurements will be used for:

1. Mapping the potentiometric head elevations of each aquifer.
2. Tracking groundwater elevation fluctuations in the aquifers.
3. Calculating the flow directions and hydraulic gradients of the aquifers.
4. Entry into a data base for engineering applications as well as possible fate-transport modeling.

2. Between each well being sampled, the field sampling crew is required to rinse the electronic water level indicator thoroughly with deionized-distilled water. If any procedural or well contamination is suspected, the field sampling crew is required to use the following protocols to decontaminate the water level indicator:

   a. A general rinse with water to remove debris and solids.
   b. An Alconox Wash.
   c. Sterile rinses with Deionized/distilled water.
   d. Acid Wash.
   e. Sterile rinses with Deionized/distilled water.
   f. Hexane Wash.
   g. 3 sterile rinses with Deionized/distilled water.

C. Purging

After all wells have been gauged, the field sampling crew is to use the following procedures to collect the groundwater samples:

1. a. For wells with DTW's equal to or less than 25 feet:

The field sampling crew attaches a sterile piece of silicone tubing to the Teflon™ tube installed in the well. The sample crew attaches a fresh piece of dedicated piece Teflon™ tubing between the outflow of the peristaltic pump and a decontaminated flow-through sample chamber. The sample chamber contains the following probes and meters:

1. pH
2. Dissolved Oxygen
3. Temperature
4. Specific Conductance
5. Oxidation/Reduction Potential

Turbidity is also measured initially at the outflow from the sample cell.

1. b. For wells with DTW's greater than 25 feet:

The field sampling crew lowers the pump head of an adjustable speed low flow pump down to the middle of the GMW screen and ties off, clips off, or sets the brake on the hose spool to maintain the preferred depth. The sample crew affixes a piece of Teflon™ tubing between the outlet of the pump and a decontaminated flow-through sample chamber. The sample chamber contains the following probes and meters:

1. pH
2. Dissolved Oxygen
3. Temperature
4. Specific Conductance
5. Oxidation/Reduction Potential

Turbidity is also measured initially at the outflow from the sample cell.

2. The field sampling crew begins the purge by recording the following:

   a. Date
   b. Start Time
   c. Location
   d. Location Description:

      1. Well Diameter
      2. Casing Type
      3. Top of Casing
      4. Depth of Well
      5. Depth to Water
      6. Standing Water in Casing
      7. Land Surface Elevation (if necessary)
      8. Sample Methods (Grab, Bailer, Pump, etc...)

3. The field sampling crew starts the purge at a flow rate of 1L/Min or less, and records the following in the field log:

   a. The flow rate setting of the peristaltic pump.
   b. Initial pH
   c. Initial Dissolved Oxygen
   d. Initial Temperature
   e. Initial Specific Conductance
   f. Initial Oxidation/Reduction Potential
   g. Initial Turbidity

   Stabilization of these indicator parameters (except Turbidity) is indicative of uniform water being drawn in from the aquifer. Therefore, the well is considered purged after stabilization has occurred. The field sampling crew is required to purge at least 5 minutes and longer than 10 minutes at each sampling point.

4. After purging is complete, the field sampling crew records the following in the field log.

   a. Final pH
   b. Final Dissolved Oxygen
   c. Final Temperature
   d. Final Specific Conductance
   e. Final Oxidation/Reduction Potential
   f. Final Turbidity
   g. Stop time of purge

h. Total amount of water purged (Gallons), and the number of well volumes removed

i. Any problems encountered during purging including:

B. Mechanical problems/calibration problems.

C. Any strange color, clarity, or odor problems with the samples.

D. Any notes on problems with the wells such as the presence of roots, or gravel pack in the wells, or damage to the well and casing.

D. Well Closeout

1. Upon completion of sampling, the field crew is to rinse off the well plug or expansion cap prior to replacement in the inner casing, replace or close the outer protective well lid, and re-lock the well.
2. The field crew is required to use decontamination procedures recommended by the equipment manufacturer.
3. Readings from all equipment are verified 3X before final acceptance. If readings cannot be verified, re-calibration is required. If re-calibration does not result in verification, the sampling company is required to switch to the back-up meter. Although they are generally done more frequently, calibration checks are required every three samples for most field meters.

Note: If the sampling event only requires field analytes, instruments, sample cells, and sample tubes may be decontaminated between GMWs by flushing thoroughly with deionized-distilled water. All pump heads, and hosing of the variable speed pump must be thoroughly rinsed with deionized-distilled water between sampling points.

E. GMW Sampling

If the sampling event requires indicators or indicators/Table 1 samples to be collected, the sample crew is required to use fresh or decontaminated/dedicated sample tubing in the peristaltic pump. Low flow variable speed pumps must undergo decontamination procedures recommended by the manufacturer. All sample cells are to be decontaminated using the procedures described in I.C.1. above.

The following procedures are to be used by the field sampling crew to collect samples from DSWA GMW wells during a sampling event which requires indicators or indicator/Table 2 analysis to be run on GMW samples.

1. After purging is completed, the field sampling crew are to collect Volatile and Semi-Volatile Organic samples using the peristaltic pump or variable speed pump at a flow rate of 100 mL/Min or less. This is done to insure that:

a. Volatiles are not stripped from the samples.

b. Light silts, flocculants, and fine precipitates are not drawn into the sample.

4. Sample are collected directly into the bottle.

5. No contact is allowed between sample bottle or tubing from the pump.
6. VOA vials are to be checked for air bubbles. Is any are present, the sample must be retaken.
7. After the Volatile and Semi-Volatile Organics samples have been collected, the field crew can increase the flow rate of the pump to expedite the sampling of the remaining sample types which could include:

    a. Heavy Metals and Indicator Metals
    b. Cyanide
    c. Sulfate and Chloride
    d. Nitrate and Ammonia
    e. Radionuclides
    f. All other parameters of interest

5. The Metals fraction of the samples is to be collected after the Volatile and Semi volatile samples have been collected. Metals samples are the only type of sample that will be considered for filtration. Filtration of Metal samples is to be used as a last resort, and will only be allowed under the following conditions:

    a. The turbidity of the sample is >10 NTU's.
    b. Reduction in flow rates fail to decrease the Turbidity below 10 NTU's.

    If filtration is necessary, the field crew are required to filter the samples through a 0.45 micron mesh cellulose or glass fiber filter.
6. After the sample is collected, the field crew is to record flow rate from the peristaltic pump in the field logs.
7. After collection of each type of sample is completed, the field crew is required to add any preservatives not added during the bottle prep.
8. Labels are affixed to any extra bottles that were not prepared in the laboratory, and filled out in indelible ink. Each label is to include the following information:

    a. Customer Name or Identification
    b. Facility Location
    c. Sample Collection Location
    d. Time
    e. Date
    f. Analysis Required
    g. Preservatives Used
    h. Flow rates used for sample collection.
    i. Name of Person that collected the sample.
    j. Parameters being analyzed for.

9. After the labels are completed, all samples are to be wrapped in bubble wrap, and placed in shipping boxes containing ice, dry ice, or freezer packs, and preserved at 4° C for shipment.
10. Chain of Custody forms (COC's) are then filled out with the same information listed above. Each time the sample is transferred, the sample must have a signature of the individual who releases the sample, and one for the individual who receives the sample.
11. The field sampling crew then packages the samples and hand delivers, or

ships by overnight express to the contracted analytical laboratory for testing.

12. As the samples arrive at the laboratory, they are to be logged into a laboratory information system where:

    1. They are given sample identification numbers (This number is to be noted on the COC).
    2. Their pH and Specific conductance is measured and noted on the COC.
    3. They are stored or dispersed to the various laboratory stations for analysis.

13. After the samples are logged in, copies of all completed COC's are to be posted to the DSWA.

III QUALITY ASSURANCE/QUALITY CONTROL

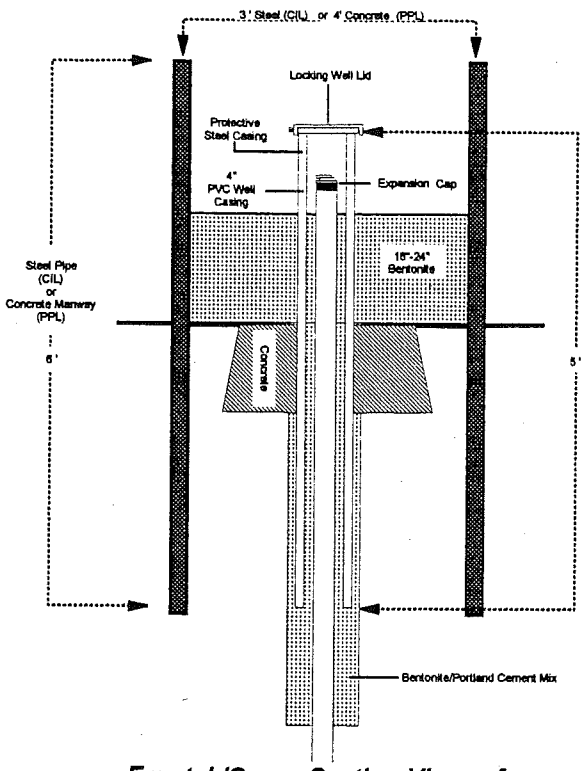
As a minimum, during each sampling event, the following QA/QC samples are collected, or prepared and analyzed for the parameters requirement by State Permits/Regulatory Requirements and Federal Requirements under 40 CFR-258.

A.	Trip Blanks:	One per sampling day per facility
B.	Field Blanks:	One per sampling day per facility
C.	Laboratory Duplicates:	One per 10 samples analyzed
D.	Surrogate Standards:	One per sample set
E.	Surrogate Spike:	One per 20 samples
F.	Lab Method Blanks:	One per sample set

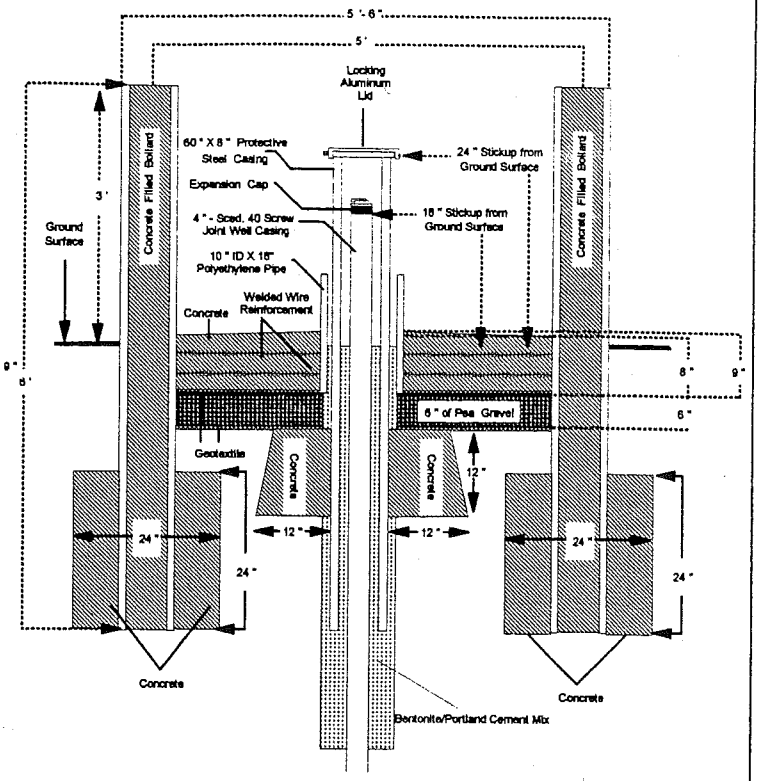
This analysis is done to insure:

1. Procedures or equipment being used in the sampling, preparation, and shipment train do not cause degradation of the samples.
2. Procedures or equipment being used in the analysis train do not cause degradation of the samples.
3. Samples are not contaminated through outside sources.
4. Methods being used for analysis are conducive to the sample matrix.

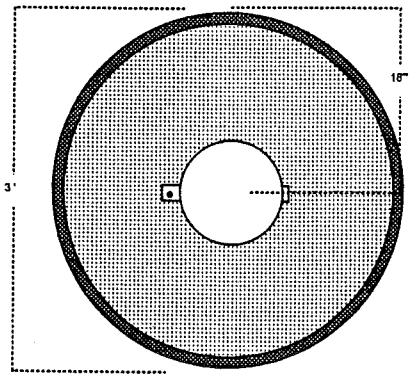
As a final note, the sampling and company providing analysis of samples is required to retain all field and laboratory records in hard copy format for a minimum of five years, with magnetic media storage for thirty years.



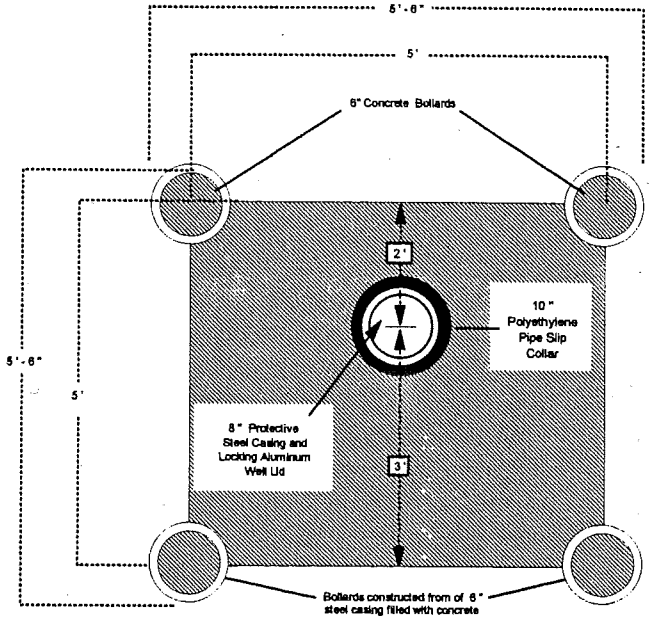
Frontal /Cross-Section View of Older Style Well Terminus - Typical at CIL and PPL only



Frontal /Cross-SectionView of Graded Protective Working Pad Common to All New Well Construction



Plan View of Older Monitoring Well (Typical of CIL and PPL only)



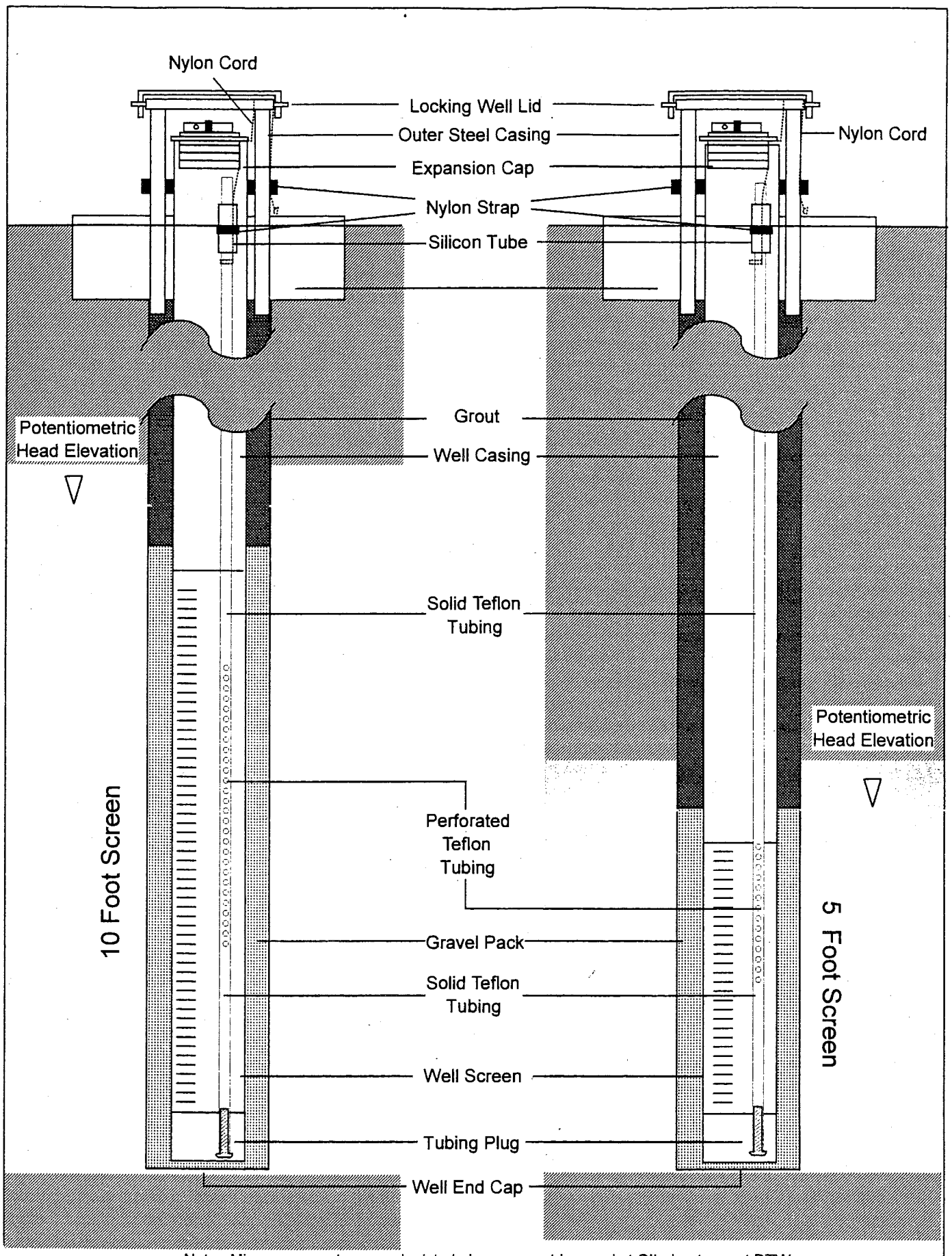
Front of pad off roadway where well access will take place

Plan View of Graded Protective Working Pad

Note: Concrete has a minimum 28 day compressive strength of 3,000 psi. The conrcrete pad is be sloped at least 1/4" per foot away from the well to shed rainwater.

Note: Working pad may have slighty different bollard/concrete set-up depending on surrounding topography and land-use.

Figure 1: Terminus of Well Heads at DSWA Sites



Note: Micropurge systems as depicted above cannot be used at CIL due to most DTW being greater than 20 feet.

Figure 2: DSWA Micropurge Set-up Typical of Wells with a DTW of Less than 20 Feet.

Table 1: Northern Solid Waste Management Center at Cherry Island - Locations of Groundwater & LFG Monitoring Wells

Location I.D.	Type	Status	Aquifer	Northing	Easting	Top of Inner Casing FT-NGVD
UC-100 Old (LC-100)	GMW	Active	Recent Deposits/Dredge Spoils	631,435.00	470,752.00	18.42
LC-101	GMW	Abandoned	Lower Unconfined Columbia	630,194.50	472,365.60	50.07
LC-101A	GMW	Active	Lower Unconfined Columbia	630,212.70	472,355.40	49.29
LC-101B[1]	GMW	Proposed	Lower Unconfined Columbia	TBD	TBD	TBD
UC-102	GMW	Abandoned	Old Perimeter. Dike Road	628,860.80	474,291.80	28.95
UC-102A	GMW	Active	Old Perimeter. Dike Road	628,849.00	474,293.60	29.90
UC-102B[1]	GMW	Proposed	???	TBD	TBD	TBD
LC-102	GMW	Active	Lower Unconfined Columbia	628,853.90	474,284.02	29.78
LC-102A[1]	GMW	Proposed	Lower Unconfined Columbia	TBD	TBD	TBD
LC-103	GMW	Abandoned	Recent Deposits/Dredge Spoils	628,642.50	467,859.00	13.13
LC-104	GMW	Abandoned May-01	Lower Unconfined Columbia	627,283.60	470,193.80	16.98
LC-104A	GMW	Active	Lower Unconfined Columbia	627,321.23	470,177.86	24.96
LC-105	GMW	Active	Lower Unconfined Columbia	626,680.20	471,740.60	24.21
LC-105A[1]	GMW	Proposed	Lower Unconfined Columbia	TBD	TBD	TBD
UC-106	GMW	Active	Old Perimeter. Dike Road	626,324.30	473,450.50	30.07
LC-107	GMW	Abandoned	Recent Deposits/Dredge Spoils	630,213.30	469,133.10	13.17
UC-108	GMW	Active	Old Perimeter. Dike Road	627,436.90	473,867.10	29.45
LC-109	GMW	Abandoned	Lower Unconfined Columbia	629,945.50	470,236.60	36.85
LC-110	GMW	Abandoned	Lower Unconfined Columbia	629,885.40	470,946.60	35.00
LC-111	GMW	Abandoned	Lower Unconfined Columbia	628,584.20	471,173.70	46.05
LC-112	GMW	Abandoned	Isolated Sand Lense	627,485.50	473,235.00	51.57
LC-113	GMW	Abandoned	Lower Unconfined Columbia	NA	NA	NA
LC-113A	GMW	Abandoned Apr-03	Lower Unconfined Columbia	629,524.40	470,976.20	43.19
LC-114	GMW	Active	Lower Unconfined Columbia	626,354.90	473,483.80	30.02
LC-115	GMW	Active	Lower Unconfined Columbia	627,470.60	473,871.00	32.41
LC-115A[1]	GMW	Proposed	Lower Unconfined Columbia	TBD	TBD	TBD
LC-116	GMW	Active	Lower Unconfined Columbia	630,369.10	469,610.90	28.59
LC-100 (Old P-100)	GMW	Active	Lower Unconfined Columbia	631,435.90	470,763.60	18.24
P-100A	GMW	Active	Confined Potomac	631,461.25	470,755.99	17.81
P-101	GMW	Abandoned	Confined Potomac	630,184.20	472,382.00	49.35
P-101A	GMW	Active	Confined Potomac	630,194.40	472,376.70	49.30
P101B[1]	GMW	Proposed	Confined Potomac	TBD	TBD	TBD
P-102	GMW	Abandoned	Confined Potomac	628,859.80	474,300.60	27.98
P-102A	GMW	Active	Confined Potomac	628,838.10	474,298.10	30.11
P-102B[1]	GMW	Proposed	Confined Potomac	TBD	TBD	TBD
P-103	GMW	Abandoned	Lower Unconfined Columbia	628,661.30	467,861.50	14.28
P-104	GMW	Abandoned	Confined Potomac	627,285.30	470,173.90	10.40
P-104A	GMW	Active	Confined Potomac	627,320.86	470,188.00	25.46
P-105	GMW	Active	Confined Potomac	626,673.40	471,754.00	23.86
P-105A[1]	GMW	Proposed	Confined Potomac	TBD	TBD	TBD
P-106	GMW	Active	Confined Potomac	626,338.90	473,471.70	29.56
P-107	GMW	Abandoned	Lower Unconfined Columbia	630,202.40	469,113.50	12.60
P-108	GMW	Active	Confined Potomac	627,451.40	473,870.90	29.97
P-113	GMW	Abandoned Apr-03	Confined Potomac	629,489.86	470,963.04	41.22
P-116	GMW	Active	Confined Potomac	630,385.93	469,591.75	26.38
P-201[1]	GMW	Proposed	Confined Potomac	TBD	TBD	TBD
P-202[1]	GMW	Proposed	Confined Potomac	TBD	TBD	TBD
G-1	LFGMW	Active	Dredge Spoils	630,536.00	469,803.00	22.10
G-2	LFGMW	Active	Dredge Spoils	630,679.00	470,001.00	19.72
G-3	LFGMW	Active	Dredge Spoils	630,912.00	470,282.00	17.68
G-4	LFGMW	Active	Dredge Spoils	631,103.00	470,508.00	15.16
G-5	LFGMW	Active	Dredge Spoils	631,126.00	470,766.00	15.63
G-6	LFGMW	Active	Dredge Spoils	630,922.00	470,988.00	26.98
G-7	LFGMW	Active	Dredge Spoils	630,824.00	471,092.00	27.31
G-8	LFGMW	Active	Dredge Spoils	630,715.00	471,210.00	23.71
P3G-1	LFGMW	Active	Dredge Spoils	629,935.00	472,578.00	46.60
P3G-2	LFGMW	Active	Dredge Spoils	629,756.00	472,852.00	40.54
P3G-3	LFGMW	Active	Dredge Spoils	629,509.00	473,025.00	45.23
P3G-4	LFGMW	Active	Dredge Spoils	629,335.00	473,253.00	41.50
P3G-5	LFGMW	Active	Dredge Spoils	629,133.00	473,479.00	43.01
P3G-6	LFGMW	Active	Dredge Spoils	629,020.00	473,763.00	42.43
P3G-7	LFGMW	Active	Dredge Spoils	628,872.00	474,018.00	44.66
P3G-8	LFGMW	Active	Dredge Spoils	628,745.00	474,154.00	44.67
P3G-9	LFGMW	Active	Dredge Spoils	628,551.00	474,138.00	39.42
P3G-10	LFGMW	Active	Dredge Spoils	628,385.00	474,044.00	42.97
USCOE - P1	GMW	Abandoned	Confined Potomac	471,131.08	630,320.33	31.90
USCOE - P2	GMW	Abandoned	Confined Potomac	471,220.83	628,127.66	35.10

Note:

1. See Permit Drawing 86 for groundwater monitoring well replacement schedule.

MEMORANDUM

DELAWARE SOLID WASTE AUTHORITY

May 23, 2000

TO: Richard P. Watson, P.E., DEE
Chief of Engineering

FROM: Daniel A. Fluman
Supervisor of Environmental Monitoring and Testing

SUBJECT: Future Cherry Island Monitoring Requirements

I have completed an extensive evaluation of all historical Organics, Pesticides, Cyanide and Metals data for all groundwater samples collected between the October 1983 site investigation and April 2000. The evaluation included filtering out all detects in the historical files, and then verifying these values against the hardcopies retained in our library. The results of this evaluation lead me to conclude that Table 2 analysis of groundwaters is unnecessary for CIL and that we should petition DNREC to remove this analysis from the groundwater monitoring program.

Applicable Regulatory Criteria

Since there are no potable water sources below Cherry Island, and use of any water is limited to industrial withdraw from the Potomac, this review was based on the possible effects of contaminated groundwater discharging to surrounding surfacewaters (i.e. the Christina and Delaware Rivers). DNREC has established surface water criteria in their regulations *State of Delaware Surface Water Quality Standards (amended 8/11/99)* (SWQS). The criteria presented in the SWQS are based on the chronic and acute effects certain organic compounds and metals have on freshwater and marine organisms. In the case of VOCs, SVOC's and BNAs, no discharge limits have been established for any of the organic compounds detected in groundwaters below the CIL. When considering metals, the levels for chronic freshwater criterion was chosen as a basis for data comparison as these levels are lower than many of the marine criterion.

Organics Review

The organics analysis run on groundwater samples over the past 18 years included the USEPA Priority Pollutants listing (prior to 1996) and DNREC Table 2 analytes (1996 – present). Due to the lack of freshwater discharge limits, low percentage of organics which have been detected over the past 18 years, and the low levels at which these have been

detected, evaluation of the data was based solely on presence or absence of the organic compound in the sample and it's concentration. The following summarizes the data review for organics analysis.

- Of the 9,230 organics tests run on groundwater samples from 25 existing or now abandoned wells, 9,174 (99.4%) were non-detect.
- 18 organic compounds were detected a total of 56 times of which 6 detects (10.7%) were at their mdl.
- With the exception of two locations (new wells C-113 & C-155) which show rapidly declining trends, there is no consistency to the location or concentration of the organics detected around the site.
- Twenty (20) of the detections (36%) were of common laboratory/field contaminants - Acetone, Methylene chloride and Bis(2-ethylhexyl)phthalate .

- Eight (8) of the detections (14%) probably resulted from weathering of fuels or degreasing agents, (Tetrachloroethylene, Ethylbenzene, Benzene and Toluene).
- Sixteen (16) of the detections (24%) were in locations upgradient to landfill, in areas far away from where landfilling activities were taking place, or were detected too early to be caused by filling activities.
- In only four cases (9%) did the concentration of an analyte exceed 0.1 mg/L. All such detects were common laboratory contaminants.
- 91% of detected analytes were less than 0.05 mg/L.
- 48% of the analytes detected were at or below 0.01 mg/L.

Metals and Cyanide Review

When evaluating metals detected over the past 18 years, the following technique was used to filter and evaluate metals data collected for samples taken from CIL wells:

1. Metals analyses were separated into "Common Metals" and "Criteria Metals" having an established Freshwater Chronic Criterion (FCC) level.

2. Common metals are those which normally show up in soils throughout Delaware. These metals include Ba, Ca, Co, Fe, Mg, Mn, K, and Na. Common metals accounted for 1,973 (32.7%) of the 6,027metals analysis run on groundwater samples from CIL. These were filtered from the data and not considered for this evaluation.

3. Criteria metals included, As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Zn. Additional metals reviewed and listed as "other metals" below, but which have no limits were Sb, Be, and Mo, Tl and V. Limits given for As, Cr, Cyanide, Hg, and Se were established values. Limits for Cd, Cr, Cu, Pb, Ni, Ag, and Zn were based on equations for each analyte listed in Table 1. The equations are based on the effects of Hardness on the criterion metal. In most cases, the average Hardness was used. In cases where

Hardness data was not available or could not be calculated. Total Alkalinity (as CaCO3) was substituted for Hardness. (comparisons indicate that the averages for Hardness and Total Alkalinity in the nominal range of 4.5 to 8.5 are very close). The following describes the results of the data review:

- After removal of the common metals from the data reviewed, 4,054 Criteria or "other" metals remained for review.
- Review of the Criteria and "other metals" indicated the results for 3,628 (89.5%) were non-detects.
- Of the 428 (10.5%) samples which resulted in detections, only 94 (22%) have concentrations of metals exceeding their FCC.
- Of the 94 values which exceeded their FCC, only 10 values (10.1%) did not have "pre-existing" levels of the metals. Pre-existing means:

  1. metals were detected during the initial site investigation;
  2. metals were detected in wells upgradient from landfilling activities;
  3. metals were detected in wells too far away at the time of detection to be caused by landfilling activities.

- Of the 428 detections, only 10 values (2.3% of the total detections) did not meet the pre-existing criteria above, and exceeded their FCC.
- Of the 4,054 Criteria Metals tests run over 18 years, only 0.25% tests did not meet the pre-existing criteria and resulted in exceedences of the FCC.
- Be and Mo were never detected in any samples tested.
- Sb was only detected once in the 323 times it was tested for.

- Pre-existing detections of Criteria Metals can be found in data for the Potomac, Columbia Aquifers, and dredge spoils.
- Criteria metals having a FCC have been detected only 11 times in the past five years.
- Historically, seventy-seven (77) CIL groundwater samples have been tested for Cyanide. To date it has been detected 4 times (5%), and has exceeded it's FCC of 0.0052 twice (0.006 and 0.009 mg/L).
- Except for recently installed wells, the background levels of Criteria Metals present in groundwater samples was considerably higher than levels of detects in recent years.

Conclusions

When considering this information, it is unlikely that landfilling activities at CIL are the source of organics detected in groundwater samples taken from Cherry Island. The data indicates that the organics were present prior to the site being used for the disposal of MSW, and are most likely coming from the dredge materials. Metals detected in the wells are most likely coming from the dredge spoils as well. The fine grained sediments making up the dredge spoils are primarily composed of silts, sands, and direct discharge

of waste from industries and POTWs which have been established along the Delaware and Christina Rivers over the past several hundred years. Up until the 1970s very few regulations existed to keep industries from directly discharging waste into the rivers.

Other considerations for elimination of DNREC Table 2 analytes include:

1. One of the reasons Cherry Island was selected for establishing a landfill was the groundwater was of poor quality and not potable.
2. The weight of the landfill is compressing dredge water from the spoil materials and forcing it up into the leachate collection systems of the cells. From there, the dredge water is transported to the Wilmington Wastewater Treatment Plant. Therefore, CIL is actually intercepting and removing potential contaminants from the spoils before they can reach the Delaware and Christina Rivers.
3. This compaction of the underlying spoils by the landfill is establishing the natural liner.
4. Due to the neutral to higher pH and availability of anions in established landfills, the landfill itself acts as a sink for most metals. Therefore, given some retention time, most of the heavy metals which can form salts will become permanently locked up within the landfill mass.
5. Eventually, sometime after landfilling at Cherry Island has been completed, the upward gradient caused by landfilling activities should reverse. The water from the spoils will begin to move downward towards the Columbia and Potomac aquifers again. With the natural liner established, the leachate will continue to be pumped to the City of Wilmington's wastewater treatment plant for disposal.

TABLE 1

WATER QUALITY CRITERIA FOR PROTECTION OF AQUATIC LIFE
(All Values Are Listed or Calculated in Micrograms Per Liter)

Parameter	Freshwater Acute Criterion	Freshwater Chronic Criterion	Marine Acute Criterion	Marine Chronic Criterion
Aldrin	3.0	--	1.3	--
Aluminum	750.	87.	--	--
Arsenic (III)	360.	190.	69.	36
Cadmium	$e^{(1.128[\ln(Hd)]-3.828)}$	$e^{(0.7852[\ln(Hd)]-3.490)}$	43.	9.3
Chlordane	2.4	0.0043	0.09	0.004
Chlorine	19	11.	13	7.5
Chlorpyrifos	0.083	0.041	0.011	0.0056
Chromium (III)	$e^{(0.8190[\ln(Hd)]+3.688)}$	$e^{(0.8190[\ln(Hd)]+1.561)}$	—	--
Chromium (VI)	16.	11.	1,100.	50
Copper	$e^{(0.9422[\ln(Hd)]-1.464)}$	$e^{(0.8545[\ln(Hd)]-1.465)}$	2.9	--
Cyanide[1]	22.	5.2	1.0	--

Parameter	Fresh Acute Criterion	Fresh Chronic Criterion	Marine Acute Criterion	Marine Chronic Criterion
DDT and Metabolites	1.1	0.0010	0.13	0.0010
Demeton	--	0.10	--	0.10
Dieldrin	2.5	0.0019	0.71	0.0019
Endosulfan	0.22	0.056	0.034	0.0087
Endrin	0.18	0.0023	0.037	0.0023
Guthion	--	0.01	--	0.01
Heptachlor	0.52	0.0038	0.053	0.0036
Hexachlorocylclohex	2.0	0.08	0.16	--
Iron	--	1000.	--	--
Lead	$e^{(1.273[\ln(Hd)]-1.460)}$	$e^{(1.273[\ln(Hd)]-4.705)}$	140.	5.6
Malathion	--	0.1	--	0.1
Mercury (II)	2.4	0.012	2.1	0.025
Methoxychlor	--	0.03	--	0.03
Mirex	--	0.001	--	0.001

Parameter	Fresh Acute Criterion	Fresh Chronic Criterion	Marine Acute Criterion	Marine Chronic Criterion
Nickel	$e^{(0.8460[\ln(Hd)]+3.3612)}$	$e^{(0.8460[\ln(Hd)]+1.1645)}$	75.	8.3
Total PCBs	2.0	0.014	10	0.03
Parathion	0.065	0.013	--	--
Pentachlorophenol	$e^{[1.005(pH)-4.830]}$	$e^{[1.005(pH)-5.290]}$	13	7.9
Selenium	20	5.0	300.	71
Silver	$e^{(1.72[\ln(Hd)]-6.52)}$	0.12	2.3	--
Toxaphene	0.78	0.0002	0.21	0.0002
Zinc	$e^{(0.8473[\ln(Hd)]+0.8604)}$	$e^{(0.8473[\ln(Hd)]+0.7614)}$	95.	86.

Notes.

[1]Cyanide measured as free cyanide at the lowest pH occurring in the receiving water, or cyanide amenable to chlorination

Specific numerical acute criteria as presented in this table are applied as one-hour average concentrations not to be exceeded more than once in any three-year period. Specific numerical chronic criteria as presented in this table are applied as four-day average concentrations not to be exceeded more than once in any three-year period.

ln = natural log base e

e=2.71828

Hd= hardness is expressed as mg/L as $CaCO_3$

pH is expressed as Standard Units

Example calculation: Fresh acute criterion for silver at hardness of 50 mg/L. Criterion in ug/L = e raised to the [1.72 ln(50) - 6.52] power. This is equal to e to the 0.21 power, or 1.23 ug/L.

AMENDMENT TO MONITORING PROGRAM FOR THE NORTHERN SOLID WASTE MANAGEMENT CENTER AT CHERRY ISLAND

The following table outlines existing monitoring wells that are scheduled to be decommissioned or have already been decommissioned, and their corresponding replacements. In addition, two borings along the Christina River will be performed at the locations shown in Drawing 86 (i.e., P-201 and P-202). Each boring will be drilled to weathered bedrock and, if a sand unit is found in the lower Potomac Formation, then: (i) a monitoring well will be installed at each location where sand is found; and (ii) Table 1 and the figure indicating the monitoring well locations will be updated to reflect these additional monitoring points. Otherwise, if sand is not found in the Potomac Formation, the borehole will be backfilled with grout and abandoned.

TABLE 1

MONITORING WELL REPLACEMENT SCHEDULE

Cherry Island Landfill Expansion Project
Wilmington, Delaware

Existing Monitoring Well[1]	Replacement Monitoring Well[2]
LC-101A	LC-101B
P-101A	P-101B
LC-102	LC-102A
UC-102A	UC-102B
P-102A	P-102B
LC-115	LC-115A
P-108	P-108A
UC-108	UC-108A
LC-105	LC-105A
p-105	P-105A
113	113A

Notes:

(1) Existing Monitoring Well Locations are shown on Drawing 12 - Demolition Plan.

(2) Proposed replacement monitoring well locations are shown on Drawing 86 - Environmental and Geotechnical Monitoring Plan.

STORMWATER / SURFACE WATER MONITORING PLAN

Stormwater/Surface Water Monitoring Plan
for the Cherry Island Landfill (CIL) Expansion

Introduction

The stormwater monitoring plan of the CIL has been divided into three stages, namely: (i) Initial Stage (Stage I) corresponds to the stormwater monitoring that will take place between the construction of the foundation enhancement and prior to filling of waste to the elevation of the top of the perimeter mechanically stabilized earth (MSE) berm; (ii) Transitional Stage (Stage II) corresponds to the stormwater monitoring that will take place after waste elevation in the vicinity of the perimeter MSE berm has reached and exceeded the elevation of the top of the perimeter MSE berm; and (iii) Final Stage (Stage III) corresponds stormwater monitoring that will take place after all the stormwater runoff is directed towards the perimeter discharge points SW-1 through SW-5. This stormwater sampling plan for CIL will be modified as operations move into different stages of waste filling. In what follows, a description of the three different stages outlined above is presented.

Stage I (Initial Stage)

This stage represents the stormwater monitoring plan that will take place during the construction of the MSE berm and before waste elevations in the vicinity of the MSE berm reaches the top of the MSE berm. During Stage I, grading of the landfill will direct stormwater to the following locations:

- Phase Va of the landfill which is the existing stormwater management basin (Phase Va); and
- Stage I Stormwater Swale Discharge Pipe (SW-6 on Figure 1)

In addition, sampling will take place along the Delaware River:

- an upstream sample shall be collected at the Northernmost property boundary just above Phase III; and
- a downstream sample shall be collected immediately below the existing Phase V Stormwater Management Basin outfall.

Each on-site location will be outfitted with:

- A weir system comprised of a square or v-notch weir, vault, visual scale and/or electronic data logging float system capable of measuring the flow of the stormwater exiting the site.

or

- A discharge pipe outfitted with a magnetic flow meter/data logging system capable of measuring the flow of the stormwater exiting the site.

Stage II (Transitional Stage)

At this stage, parts of the landfill near the MSE berm has reached the top of the MSE berm and surface water runoff is directed into one of the MSE berm discharge points SW-1

through SW-5, shown on Figure 1. At such time, each monitoring point will be added to the monitoring program described in Stage I above. Each of these new locations will be outfitted with flow monitoring instrumentation consistent with that listed for Stage I. Sampling at each new stormwater monitoring location will begin during the next scheduled stormwater sampling event.

Stage III (Final Stage)

At this stage all all the stormwater runoff is directed towards the perimeter discharge points SW-1 through SW-5. During Phase III, a total of eight (8) stormwater discharge points will be monitored. Phase Va will be abandoned as a monitoring point. Figure 1 shows the location of the final monitoring points.

Control of Stormwater Runoff and Sedimentation

As part of the stormwater monitoring plan, landfill operations staff will minimize suspended solids (i.e., sediment transport) from the stormwater runoff by constructing and maintaining berms and grading swales to direct stormwater running off the working surface along specific flow paths. Sediment basins and check dams will be used to reduce sediments in runoff reaching stormwater discharge points from CIL. In addition, areas that are not actively landfilled will be seeded and mulched.

System Maintenance

The stormwater conveyance and discharge system (SCDS) shall be kept free of debris, waste, and sediment build-up. When discovered, ponding water on the landfill surface shall be diverted to the SCDS. The SCDS shall be visually inspected at a minimum frequency of once per month, and immediately after severe meteorological events such a hurricanes or floods.

SCDS Inspection/Maintenance forms shall be completed on a monthly basis and included in the facility log. Inspections shall include the following:

- Berms and swales shall be inspected for erosion and sedimentation;
- Silt fences shall be inspected for holes, tears or separation from anchor posts;
- Culverts and pipes shall be inspected for siltation and blockage;
- Control structures shall be inspected for siltation, debris, and damage.

All sediments, waste or debris removed from the SCDS shall be placed back on the operational portion of the landfill surface. Any needed repairs discovered during SCDS inspections shall be noted in the SCDS Inspection/maintenance forms, and reported to the facility manager or designated DSWA representative. Any repairs or other remedial actions taken shall be scheduled by the facility manager and completed as necessary. Upon completion of repairs or remedial action, the facility manager or designated DSWA representative shall note the repairs on the original SCDS Inspection/Maintenance log along with the date of repairs or remedial action. A copy of the Inspection/Maintenance form is provided as Attachment A.

Swales designed to convey runoff to stormwater discharge points shall be maintained to provide the necessary depth to hold stormwater within the confines of the taper, and

necessary fall to keep stormwater from backing up within the SCDS. To reduce erosion and filter out sediments, in areas that will not be impacted by landfilling activities for six months, DSWA personnel shall install an intermediate cover, seed and mulch.

Field Monitoring and Sample Collection

Meteorological Monitoring

DSWA shall maintain a meteorological weather station at CIL. Data from this weather station shall be maintained in an electronic database. Pertinent meteorological data shall accompany stormwater sample data upon submission to DNREC.

Stormwater Flow Monitoring

DSWA shall maintain automated stormwater monitoring systems designed to measure the flow of stormwater during precipitation events. Either direct data transfer or remote logging capabilities shall be the basis for data collection.

Stormwater Sample Collection

Monitoring of discharges from the CIL stormwater control system shall take place on a semi-annual basis. Stormwater samples shall be bulk samples. Scow float or precipitation actuated auto samplers shall be placed at the stormwater discharge boxes a maximum of 24 hours prior to an expected meteorological event.

- Calibration for scow float actuated samplers shall be set so that the auto samplers activate when discharge reaches approximately 50 gpm. Calibration can be to a set point estimated by simulating elevation of discharge over a V-notch or square weir.

- Activation of a precipitation actuated auto sampler shall be tested for functionality by simulation of a 0.10" precipitation event over a 30-minute period.

The auto samplers shall be programmed to begin collection of a bulk sample at the calibrated actuation point. Bulk samples shall be the quantity necessary to perform testing for the analytes listed below.

Bulk samples shall be picked up and transported to an independent contracted laboratory within 18 hours of collection. Upon completion of sample collection, the auto samples shall be cleaned, inspected for damage, repaired as necessary, and placed in storage until the next sampling event. Sampling events shall be at least 60 days apart. No sampling event shall take place until after 72 hours of dry weather has occurred.

Sampling Protocols

General

All sampling events must be overseen by an individual with a minimum of three years field experience in the collection, preparation, and shipping of stormwater samples.

Generally, **a minimum of** one pair of Nitrile gloves (two are recommended) are to be used while handling equipment and all phases of the collection, preparation, and shipment of

samples. Gloves are changed between sampling locations. (e.g. gloves are changed prior to sample collections and after equipment decontamination.) This insures minimal opportunity for contamination through handling of samples and equipment by operators.

Health and Safety

During stormwater monitoring at DSWA facilities, field sampling crews are required to follow the OSHA regulations governing personal health and safety. Personal protection shall be maintained at Level D requirements. Hard hats (when overhead danger exists), safety glasses, safety shoes with steel toes, and protective gloves are the only safety equipment required at the present time. However, should samples show any indication of being hazardous, the sampling crew would be required to move to more stringent health and safety protocols before going further in the sampling event.

Field crews shall carry a basic first aid kit and a cell phone at all times to facilitate communications when needed. Any injuries sustained during sampling activities shall immediately be reported to the facility manager or authorized DSWA representative. An accident/incident report shall be filled out immediately upon reporting an accident or incident at a DSWA facility.

Field crews shall sign in at the appropriate location when entering the facility, and sign out immediately prior to leaving the site. At least one member of the sampling crew collecting stormwater samples at DSWA facilities must carry the following valid certifications:

a. 40 hour OSHA Emergency Response Program
b. First Aid and CPR.

Sample collection methodology

When retrieved from the auto sampler, the sampling crew shall move the bulk storage sample vessel(s) to a working surface away from any airborne emissions. The field crew shall then gently swirl the bulk storage sample vessel containing the stormwater sample and then extract 1 liter into a clean sterile vessel for collection of field measurements. Field measurements and observations shall include:

- Temperature
- PH
- Specific conductance
- Oxidation/Reduction Potential
- Dissolved Oxygen
- Turbidity
- Inches of water present below the weir at the sample collection pointColor and clarity of the sample
- Odor of the sample
- condition of the sampling location
- presence or absence of debris, waste, or sediments

These measurements and observations shall be entered into a bound field log along with the time and date of sample collection. This field log book shall be carried by the field crew whenever they are on site.

Upon completion of field measurements, the sampling crew shall separate out the remaining sample into pre-sterilized, pre-labeled bottles. Each bottle shall contain the necessary preservative required for the specified analysis. The field crew shall fill in all pertinent information as necessary to fully identify the sample.

As a minimum, the label on each bottle shall identify the following:

- Contracting Lab or Sampling Contractor
- DSWA
- Name of Person Collecting the Samples
- Sample Location
- Time and Date of Sample Collection
- The preservatives present in the bottle

After samples have been collected, all pertinent data regarding the samples shall be transcribed onto the proper Chain of Custody.

Samples will then be placed in coolers along with ice, dry ice, or cold packs, and chilled to 4° C for transportation to the laboratory.

If samples are to be shipped by a separate shipping company, all coolers shall be sealed with a custody seal to insure tampering has not occurred between the time the samples left the site and the time they are received at the contracted laboratory. Each time the samples change hands, the receiver shall inspect the condition of the shipping containers and sign off on the Chain of Custody to acknowledge receipt of the samples. Any aberrations in the custody seal or shipping container shall be noted on the Chain of Custody by the receiver of the samples.

Quality Control/Quality Assurance Samples

During each stormwater sampling event, the field crew shall provide one rinsate blank. In addition to the rinsate blank, the contracted laboratory shall provide one set of bottles that will act as the trip blank. Each trip blank shall be comprised of steam distilled, deionized water preserved with the same preservatives used for preservation of the stormwater samples and rinsate blank.

Additional Samples

During each stormwater sampling event, the sampling crew shall grab one upstream and one downstream sample from the Delaware River. The upstream sample shall be collected at the Northernmost property boundary just above Phase III. The downstream sample shall be collected immediately below the existing Phase V Stormwater Management Basin outfall. These samples shall be tested for the same analytes as the stormwater samples.

Supply Disposal

Non-hazardous expendable supplies and equipment used in the collection of samples can be disposed of at the small load collection station prior to the sampling crew leaving the site. Unused or excess sample that has not contacted sample preservatives can be disposed of at

the sample location. Disposal of hazardous expendable supplies such as excess preservatives are to be taken back to the laboratory by the sampling crew for proper disposal.

Analytical Methodology

All samples shall be analyzed using the methods provided in the following publications:

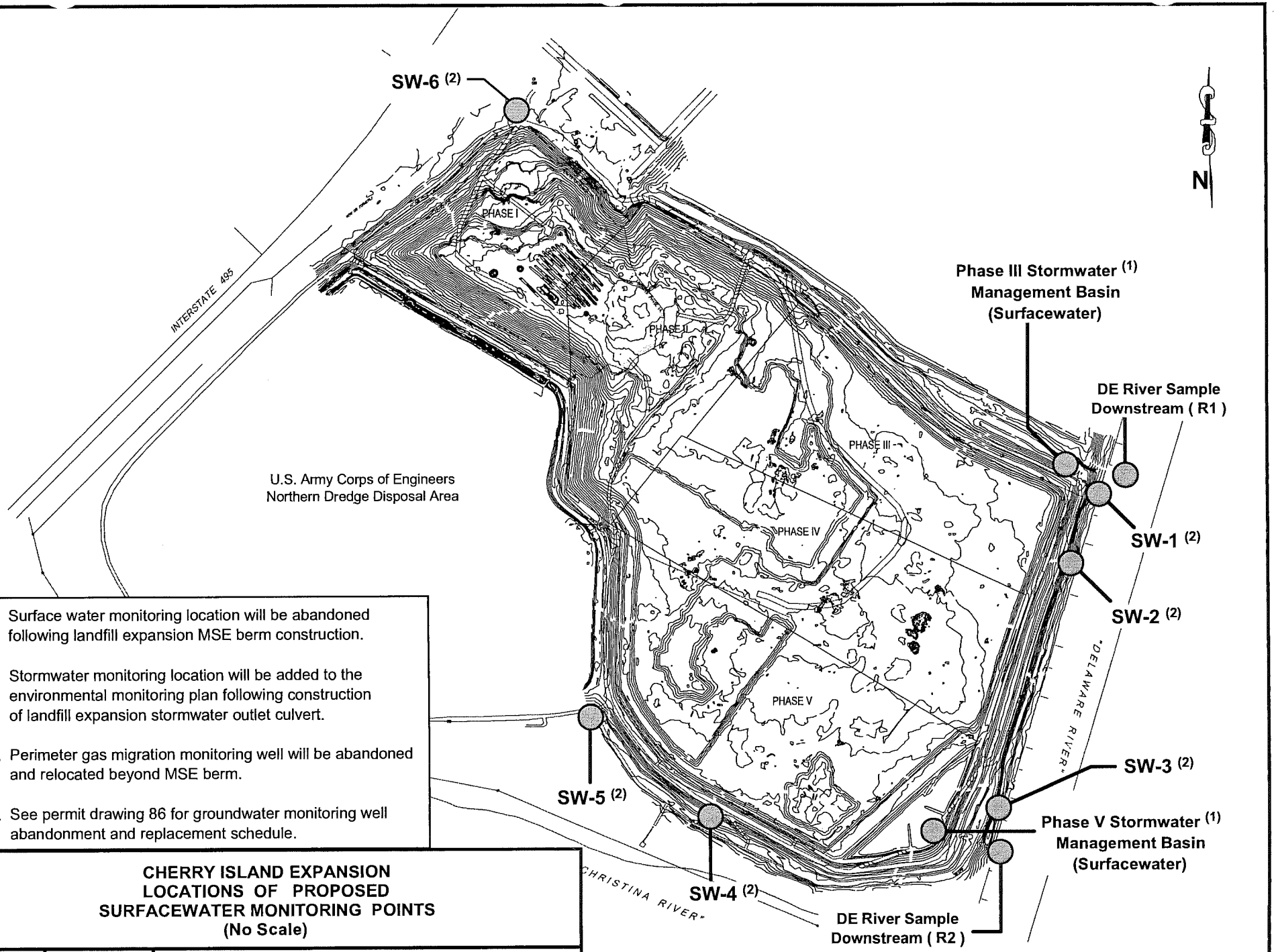
A. SW-846 (Most Recent Edition)	**To be used first;**
B. 40 CFR-136 (Most Recent Edition)	**to be used only if methods are not available in A above;**
C. Standard Methods (Most Recent Edition)	**to be used only if methods are not available in A or B above;**
D. Other methods as jointly approved by DSWA and DNREC	**to be used only if methods are not available in A, B, or C above.**

Analysis to be Performed

On a semi-annual basis, stormwater and Delaware River samples shall be sampled in accordance with the schedules presented in Appendix B -Table 1 of the ***"Monitoring Program for the Northern Solid Waste Management Center at Cherry Island".*** These samples shall be tested for those analytes outlined in Appendix B –Table 5 of that same document.

Reporting

Sample results must be received by DSWA and DSWA's environmental monitoring contractor within 30 days of the completion of the stormwater sampling event. Results of analysis and discussion of the stormwater monitoring activities shall be included in the first quarterly groundwater/surfacewater monitoring report generated following reception of the stormwater monitoring data.



Note 1. Surface water monitoring location will be abandoned following landfill expansion MSE berm construction.

Note 2. Stormwater monitoring location will be added to the environmental monitoring plan following construction of landfill expansion stormwater outlet culvert.

Note 3. Perimeter gas migration monitoring well will be abandoned and relocated beyond MSE berm.

Note 4. See permit drawing 86 for groundwater monitoring well abandonment and replacement schedule.

CHERRY ISLAND EXPANSION
LOCATIONS OF PROPOSED
SURFACEWATER MONITORING POINTS
(No Scale)

drawn	date	drawing no.
DAF	4/18/2005	C:\Perms\CIL-Permit Application-2003\CILF-EXP-Monitoring Points.PRZ

ATTACHMENT A

DSWA Cherry Island Landfill
Stormwater Conveyance and Discharge System Inspection Form

Date: _____ Time: _____

Meteorological Data at Time of Inspection

24 Hour Precipitation (Inches): _____
Temperature (°C): _____
Relative Humidity (%): _____
Barometric Pressure (Inches of Hg): _____
Solar Radiation (Watts/m^2): _____
Wind Speed (mph): _____
Wind Gust (mph): _____
Wind Direction (° True): _____

Is this inspection an emergency inspection following a significant meteorological event?
Yes _____ No _____

Duration of Event: _____ Hours

Total Precipitation: _____ Inches

Outfall SW-1

Presence of:	Debris/Waste/Sediment?	Obstructions/Blockage?	Damage to Outfall?
	Yes _____ No _____	Yes _____ No _____	Yes _____ No _____

Has remediation/repairs taken place? Yes _____ No _____

If "Yes", Explain below what actions have taken place to correct the problem, and when the actions took place.

Action Taken:	
Date of Action	

Outfall SW-2

Presence of:	Debris/Waste/Sediment?	Obstructions/Blockage?	Damage to Outfall?
	Yes _____ No _____	Yes _____ No _____	Yes _____ No _____

Has remediation/repairs taken place? Yes _____ No _____

If "Yes", Explain below what actions have taken place to correct the problem, and when the actions took place.

Action Taken:	
Date of Action	

Outfall SW-3

Presence of:	Debris/Waste/Sediment?	Obstructions/Blockage?	Damage to Outfall?
	Yes _____ No _____	Yes _____ No _____	Yes _____ No _____

Has remediation/repairs taken place? Yes _____ No _____

If "Yes", Explain below what actions have taken place to correct the problem, and when the actions took place.

Action Taken:	
Date of Action	

DSWA Cherry Island Landfill
Stormwater Conveyance and Discharge System Inspection Form

Outfall SW-4

Presence of: Debris/Waste/Sediment? Yes _____ No _____ Obstructions/Blockage? Yes _____ No _____ Damage to Outfall? Yes _____ No _____

Has remediation/repairs taken place? Yes _____ No _____

If "Yes", Explain below what actions have taken place to correct the problem, and when the actions took place.

Action Taken:	
Date of Action	

Outfall SW-5

Presence of: Debris/Waste/Sediment? Yes _____ No _____ Obstructions/Blockage? Yes _____ No _____ Damage to Outfall? Yes _____ No _____

Has remediation/repairs taken place? Yes _____ No _____

If "Yes", Explain below what actions have taken place to correct the problem, and when the actions took place.

Date of Action	

Outfall SW-6

Presence of: Debris/Waste/Sediment? Yes _____ No _____ Obstructions/Blockage? Yes _____ No _____ Damage to Outfall? Yes _____ No _____

Has remediation/repairs taken place? Yes _____ No _____

If "Yes", Explain below what actions have taken place to correct the problem, and when the actions took place.

Action Taken:	
Date of Action	

Inspection Completed By: _____
Signature and Company

I hereby certify that all actions listed above have been completed as of _____.

Authorized DSWA Representative or Facility Manager _____
Signature and Date

Stormwater Conveyance and Discharge System Inspection Form

Mark the location of maintenance and repairs needed.
Use additional maps as required. Fill in additional information on back.

1. Type of repair required: _____

   _____

   Action taken: _____

   _____

   _____

   Date Completed: _____

2. Type of repair required: _____

   _____

   Action taken: _____

   _____

   _____

   Date Completed: _____

3. Type of repair required: _____

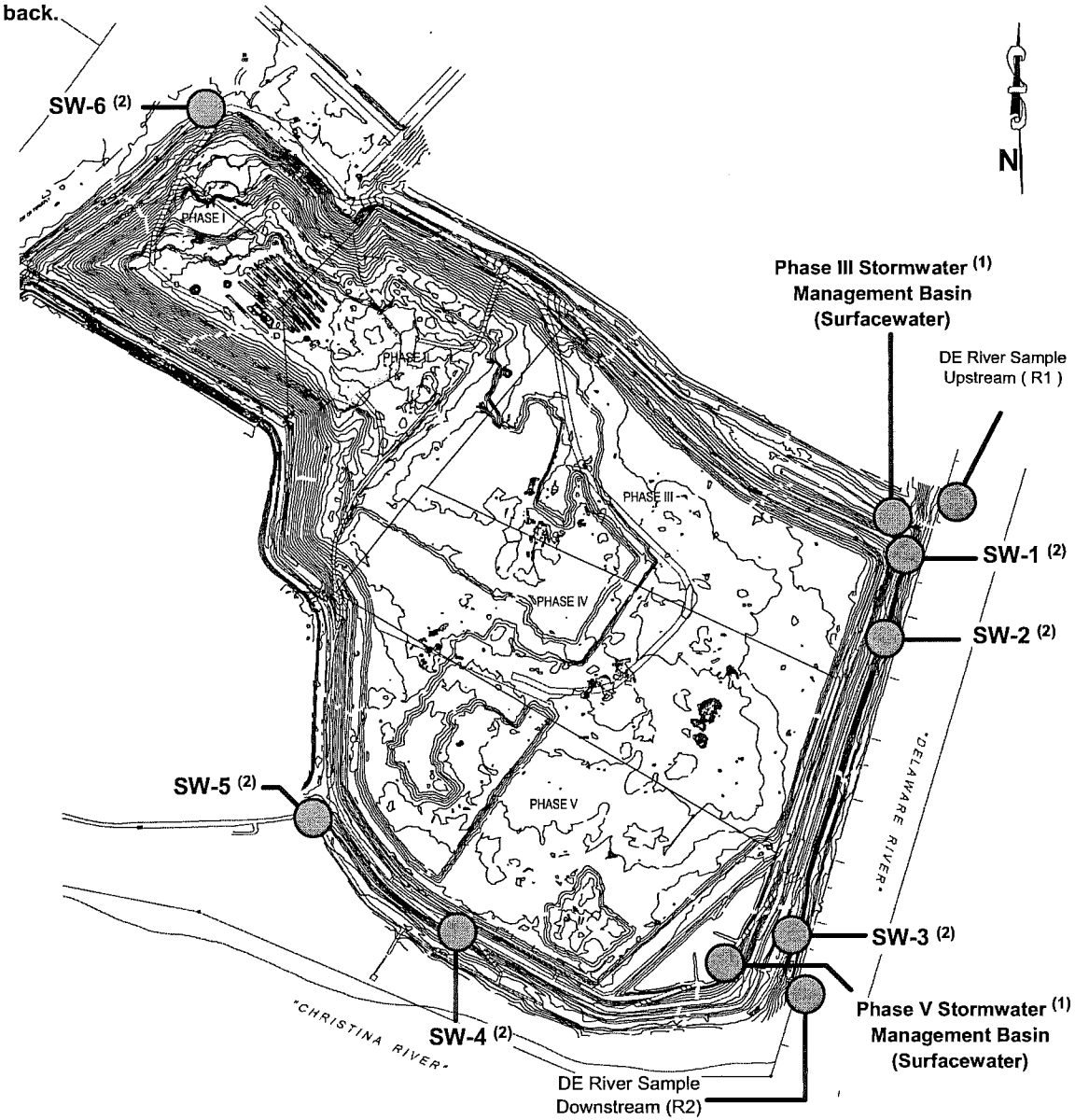
   _____

   Action taken: _____

   _____

   _____

   Date Completed: _____



Inspection By: _____

Company: _____

Date: _____

Confrmation of Repairs By: _____

DSWA Representative

Date: _____

APPENDIX F
LANDFILL GAS MONITORING PLAN

CHERRY ISLAND LANDFILL

GAS MONITORING PLAN
April 2000
August 2001 (revised)

Background

The Delaware Solid Waste Authority received it's Title V operating permit for the Cherry Island Landfill on December 2, 1998. This permit incorporates all of the operating and monitoring requirements of 40 CFR Part 60, Subpart Cc, *Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills.* The State of Delaware has adopted Subpart Cc into Regulation No. 20, Section 28, *Delaware State Plan to Regulate Air Emissions from Municipal Solid Waste Landfills.* Landfill gas monitoring is performed to comply with these regulations and to ensure the health and safety of all persons on or near the landfill.

Monitoring

Cereza Energy (CE) has the rights for all landfill gas generated at CIL and conducts all regulatory monitoring. CE operates and maintains all landfill gas system components and is responsible for all expansions of the active collection system. As a result of active gas extract through the leachate collection system, all passive vents in Phase III, IV and V will be abandoned to prevent air intrusion into the landfill. CE conducts the following monitoring in compliance with our Title V permit:

- Reference Method 22 observations performed every six months and daily visible emissions inspections when flares are operating

- Wellhead data recorded monthly for: CH_4, O_2, temperature and vacuum
  This information is recorded using a *Landtec Gem500 Gas Analyzer*
  The instrument is field calibrated daily when used and factory calibrated annually.

- Monitor surface concentrations of methane on a quarterly basis
  This monitoring is done in accordance with an approved surface monitoring plan.
  All areas of the landfill that have active gas collection are monitored.
  The instrument used is a *MicroFID* analyzer that is calibrated daily before use.

Additional gas monitoring includes:

- Installation of combustible gas alarms in the scalehouses and office building for continuous monitoring of explosive gas levels

- Quarterly monitoring of perimeter landfill gas migration wells for methane levels

- Confined Space monitoring – prior to entering a confined space air monitoring for oxygen, hydrogen sulfide and combustible gases is performed.

APPENDIX G
GEOTECHNICAL MONITORING PLAN

Prepared for

DELAWARE SOLID WASTE AUTHORITY
1128 South Bradford Street
Dover, Delaware 19903

GEOTECHNICAL MONITORING PLAN

for

CHERRY ISLAND LANDFILL EXPANSION PROJECT

Wilmington, Delaware

Prepared by

GEOSYNTEC CONSULTANTS
10015 Old Columbia Road, Suite A-200
Columbia, Maryland 21046

Project No. ME0250

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GEOTECHNICAL MONITORING PLAN

1. INTRODUCTION

The Delaware Solid Waste Authority (DSWA) proposes to increase the capacity of the Cherry Island Landfill (CIL) by a vertical expansion. In the proposed expansion, the maximum elevation of CIL in Phases III to V will be increased from approximately 85 ft-msl to 195 ft-msl. To provide an adequate factor of safety during and after waste placement, the following improvements to the stability of the soft dredge/alluvium soils along the perimeter of Phases III to V are proposed: (i) installation of prefabricated vertical drains (PVD) from the ground surface to the Columbia Formation; and (ii) construction of a mechanically stabilized earth (MSE) berm.

The purpose of PVDs is to allow the dredge/alluvium layer to consolidate and gain strength rapidly, and act drained during waste placement and thus allow the construction of the MSE berm in a relatively short period of time, while maintaining adequate stability factors. The purpose of the MSE berm is to provide a buttressing effect. The ability of the dredge/alluvium under the berm to mobilize its drained shear strength during waste placement is essential to the stability of the CIL because the drained shear strength is higher than the undrained shear strength, as described in the calculation package entitled "Landfill Stability Analysis" (Attachment V1b-D.2 of the Engineering Report). Also, critical to the stability analysis is the ability of the dredge/alluvium under existing waste to gain strength within a reasonable short time. As the dredge/alluvium consolidates under additional load, the shear strength of the foundation will increase. While a rapid consolidation is desirable because the shear strength is available early on, the magnitude and rate of slope movement must be kept below safe limits.

The purpose of the Geotechnical Monitoring Plan (GMP) to be implemented at the CIL is to provide: (i) "early warning" regarding slope movement; and (ii) information on the "long-term" foundation performance of the foundation improvement. The "early warning" would help detect the initiation of potential slope movement during construction of the MSE berm as well as during waste placement. Because the foundation soils (i.e., dredge/alluvium) at the CIL site are extremely soft, slope instability can occur if the landfill crest, side slopes, and/or foundation materials are loaded either excessively or too rapidly. An adequate field instrumentation program

[Ladd, 1991] such as the dredge/alluvium found at CIL. The long-term monitoring will help verify the performance of the landfill as planned. Hence, the GMP is expected to provide enough information to verify: (i) drained conditions of the dredge/alluvium in the PVD area (i.e., under the MSE berm area) during waste placement; and (ii) the adequate strength gain with time of the dredge/alluvium without PVDs (i.e., under the existing waste footprint).

The GMP provides: (i) an overview of the basis for instrumentation of soft soil foundations that are rapidly loaded by embankments; (ii) a description of the proposed instrumentation that meets the goals discussed above set for the GMP; (iii) a description of the parameters that required monitoring; and (iv) the general procedures and requirements associated with instrumentation monitoring and reporting. This GMP was prepared by R. David Espinoza, Ph.D., P.E., and Carlos A. Lazarte, Ph.D., P.E., both of GeoSyntec Consultants (GeoSyntec), and reviewed by Michael F. Houlihan, P.E., also of GeoSyntec.

2. OVERVIEW OF INSTRUMENTATION OF SOFT SOIL FOUNDATION

2.1 Introduction

The construction challenges during the CIL expansion are common to other projects in which embankments are rapidly constructed over soft soils. Although only a part (i.e., MSE wall) of the CIL expansion will be built over the relatively short period of time of two years, it is instructive to review successful monitoring practices used in the construction of embankments on soft clays. This review is performed to evaluate the performance of the embankments on soft foundation and identify the critical parameters to be monitored. Information from this review along with GeoSyntec's experience in this field is used to establish a framework for developing the GMP for CIL.

The principles underlying the monitoring and instrumentation of embankments on soft soil foundations rely on the so-called "observational method" [Peck, 1969] that set a rational basis for geotechnical monitoring. The observational method is a formal procedure that consists of the following steps:

a. subsurface exploration sufficient to establish general nature, pattern, and properties of deposits;

b. assessment of the most probable conditions, and the most unfavorable conceivable deviation from these conditions;

c. establishment of design based on a working hypothesis of behavior anticipating most probable conditions;

d. selections of quantities to be observed as construction proceeds and calculation of their anticipated values under the working hypothesis;

e. calculation of values of the same quantities under the most unfavorable conditions compatible with the available data;

f. selection in advance of a course of action or modification of the design for every foreseeable significant deviation of the observational findings from those predicted on the basis of the working hypothesis;

g. measurement of quantities to be observed and evaluation of actual conditions; and

h. modification of design to suit the conditions.

Some of these steps were already taken as part of the geotechnical characterization (see Volumes 2 through 6) and the Design Report (see Volumes 7 through 11). The remaining aspects of the methods related to the measurement of quantities are discussed in the next few sections.

2.2 Response of Deep Soft Soil to Embankment Loading

2.2.1 Introduction

Significant field investigations have been performed to evaluate the performance of non-enhanced soft foundation during the rapid construction of earth embankments [e.g., Tavenas et al., 1979; Matsuo and Kawamura, 1977; Leroueil et al., 1978a and 1978b]. Similarly, there are several studies on the performance of embankment construction over soft compressible soils that have been enhanced by the installation of PVDs [e.g., Almeida, et al., 2000; Holtz et al., 1991; Ladd, 1991]; and/or the placement of high strength geosynthetic materials at the base of the embankment [e.g., Rowe and Mylleville, 1990, Wu et. al. 1992]. A description of the results from relevant publications is presented below along with a discussion on its applicability to the CIL site.

2.2.2 Vertical Deformation and Lateral Subsurface Movements

Settlement records can be used to provide information regarding impending failure if they are significantly larger than expected consolidation settlements. The vertical displacement in excess of consolidation settlement may be caused by large shear deformation within the foundation under undrained conditions due to rapid embankment loading [Ladd, 1991]. In general, soil deformation can take place due to: (i) volumetric change (i.e., consolidation) and (ii) shear. The use of PVDs helps reduce the (vertical) deformation due to shear and increase the deformation due to consolidation. However, the interpretation of vertical displacements records in foundations with PVDs is difficult because the vertical displacement due to the accelerated consolidation and due to shear occur simultaneously.

In general, to evaluate the performance of embankments constructed over soft soils, the maximum settlement measured at the centerline of the embankment (s) and the maximum lateral (i.e., horizontal and outward from embankment slope) subsurface movement measured below the toe of the embankment (δ_m), and their variation with time are of interest (see inset in Figure 1). For the particular case of CIL, these displacements correspond respectively to the maximum settlement behind the crest of the MSE berm and the maximum horizontal displacement under the toe of the MSE berm.

Tavenas et al. [1979] reviewed 21 case histories of embankments constructed on soft clay foundations and observed the change of deformation ratio (δ_m/s) with time. As reported in that study, the deformation ratio (δ_m/s) exhibits a distinct response as a function of s during embankment construction, which can be attributed in part to the differences in the partially drained and undrained clay behaviors. This distinct response during embankment construction is shown schematically on Figure 1 (Case A, no PVDs). During initial embankment construction, portions of the foundation (particularly those close to the ground surface) are typically in an overconsolidated state, thus the coefficient of consolidation (c_v) of the foundation soil is significantly higher than when the soil becomes normally consolidated. As a result, foundation loading takes place under partially drained conditions. The partially drained conditions in this initial stage result in lateral movements that are significantly smaller than the corresponding settlement (approximately, $\delta_m < 0.2\ s$). During this stage, the clay responds "elastically" and therefore an almost linear relationship appears to exist between settlement and the load, characterized by the fill height (H). When the

embankment construction reaches a critical height, significant portions of the foundation become normally consolidated, undrained behavior is predominant, and the deformation ratio δ_m/s abruptly increases from an average slope of 0.18 to 0.91. Following the completion of embankment construction, the deformation ratio δ_m/s decreases to an average of 0.16. This rate tends to decrease with time.

Figure 1 also shows the effect of PVDs on the deformation ratio for cases where the foundation is drained by PVDs [Ladd, 1991]. The deformation shown in Figure 1 corresponds to stable embankments during construction [Ladd, 1991]. Case B represents a faster rate of filling and a higher embankment than Case A. Case C represents a case with an identical load history as Case A, but with significantly larger vertical displacement due to ongoing consolidation. Consequently, the factor of safety for Case C is higher than that of Case A.

Matsuo and Kawamura [1977] developed a semi-empirical diagram (δ_m/s vs. s) for control of embankment construction on soft ground. In this diagram, reproduced as Figure 2, the authors found that there appears to be a critical boundary beyond which embankment failure would occur. As fill height increases, the displacements increase and this boundary is approached. To approach this boundary implies that large shear stresses are being mobilized within the foundation and large lateral movements are induced. To move away from the boundary indicates that consolidation is the dominant response and that the embankment is trending to a "safer" state. Because the failure boundary proposed by Matsuo and Kawamura [1977] was developed for unreinforced embankments without PVDs, its applicability to the CIL MSE berm construction and waste placement will be further evaluated.

High-strength reinforcements placed at the base of soft/highly compressible embankments have been used to improve the overall stability [Rowe and Mylleville, 1990; Wu et al., 1992]. Results show that, in general, for the same embankment height, similar vertical displacements are obtained for both reinforced and unreinforced embankments. However, the lateral displacements for embankments reinforced at the base are significantly smaller than those of embankments without base reinforcement.

2.2.3 Excess Pore Pressure

During the initial embankment construction, the excess pore pressure (Δu) is expected to be less than the increment of vertical stress imposed by the embankment construction because portions of the foundation may be overconsolidated and faster drainage takes place during loading [Tavenas et al., 1980]. At some point during construction, when a significant portion of the foundation becomes normally consolidated and the critical height H_c is achieved, increases in excess pore pressure are expected to be approximately equal to or greater than increases in vertical stress, γH, (or equivalently, mean stress, see Volume 7 "Engineering Report"). This distinct behavior is represented schematically in Figure 3. However, if a significant portion of the clay foundation is normally consolidated before embankment construction, the initial measurements of excess pore pressure are expected to be approximately equal to the vertical stress roughly from the beginning of embankment construction. Excess pore pressure increments that are greater than vertical stress increments may be indicative of a potential instability. Similar findings were reported by D'Appolonia et al. [1971]. Plots of normalized pore pressures as a function of height provides additional information that can be used together with displacement information, although its interpretation is not always straightforward or clear [Ladd, 1991].

2.2.4 Shear Strength

In addition to periodical monitoring of these lateral and vertical deformations and excess pore pressures, direct (either via field or laboratory procedures) measurement of shear strength of the foundation at intermediate stages and at the end of embankment construction can be performed to help evaluate stability. Measured shear strength parameters can be compared to back-calculated values based on measured vertical deformations and/or pore pressures [e.g., D'Appolonia et al., 1971; Ladd, 1991]. The frequency of the shear strength measurement at CIL is described in Section 5 of this GMP.

2.2.5 Geotextile Strength

As described in the calculation package entitled, "Landfill Stability Analysis" (Attachment VIb-D.2), a high-strength geotextile will be used as base reinforcement for the construction of the MSE berm. Because the stability of the MSE berm depends

upon the ability of the geotextile to mobilize its strength as construction takes place, devices that allow measuring the mobilized geotextile strength (e.g., strain gages) should be installed in some reinforcement layers.

3. DESCRIPTION OF INSTRUMENTATION

3.1 General

As described in the preceding section, the parameters to be monitored at the CIL site to verify that the waste/MSE berm system is stable with an adequate factor of safety include: (i) pore pressures at specific locations in the dredge/alluvium; (ii) lateral subsurface movement of the dredge/alluvium at the toe of the MSE berm; (iii) vertical settlement of the dredge/alluvium in the MSE berm and waste area; (iv) the strength of the dredge/alluvium at various times; and (v) the strain of the high-strength geotextile. Attachment B shows a plan view of the proposed locations of slope inclinometers, piezometers, settlement devices, and strain gages to be installed at the CIL site. Also, Attachment B shows cross-sections with installation details. Table 1 shows the instrumentation nomenclature to be used.

Monitoring devices will be concentrated along seventeen (17) selected monitoring sections. A monitoring section is composed of inclinometers (2), settlement plates (3), piezometers (at three different locations and, at most, 3 different depths in each location), survey monuments (3 maximum). Strain gage (or extensometer) lines (1 with strain gages installed every 25 ft) will be installed at selected monitoring sections. During MSE berm construction, monitoring of the instruments under existing waste is not required. The plots recommended in Section 2.3 should be prepared for each monitoring section.

3.2 Pore Pressure Measuring Devices

Because of the low permeability of the dredge/alluvium, measuring devices that provide a fast response to changes in pore pressures are necessary. Vibrating-wire piezometers will be installed at the CIL site. A vibrating-wire piezometer consists of a tensioned wire attached to a metallic diaphragm that deflects as a result of pore water pressure. This deflection causes changes in the wire tension, and the magnitude of the pore pressure is correlated to this deflection. This pressure sensing device is

recommended for monitoring excess pore pressure at specific depths in the dredge/alluvium layer because: (i) it minimizes hydrodynamic time lag (i.e., time required for water to flow into or out of the piezometer); (ii) it is easy to read; and (iii) it does not interfere with construction. Minimizing hydraulic lag is very important to accurately assess the effect of loading on pore pressure generation. A narrative of piezometer installation details is presented in Attachment C. Large settlements are not expected to affect these devices. For the long period of time these devices are expected to provide data, it is desirable to install instruments with minimum zero drift.

3.3 Horizontal Displacement Measuring Devices

To evaluate the pattern of displacement within the dredge/alluvium and the development of slip failures, if any, a measuring device (e.g., inclinometers) that is capable of providing continuous reading with depth is recommended. Inclinometers are devices for monitoring horizontal displacements along 2 transferal vertical planes by means of a probe that is lowered and raised within an internally grooved casing. The probe measures the pipe inclination respect to the vertical. Casings are installed in boreholes or in fill. The major components of an inclinometer are: (i) a casing with grooves for controlling orientation of the probe; (ii) a probe; (iii) a portable read-out unit; and (iv) and a cable that link the probe to the read-out unit.

Most inclinometers provide inclination measurements along two perpendicular directions, such that the magnitude and direction of horizontal components of movement can be calculated. Because large horizontal deformations are expected at the CIL site, to minimize potential problems, inclinometers at the CIL site shall consist of vertical, 3.5-in. diameter, machine-grooved, acrylonitrile/butadiene/styrene (ABS), plastic casings grouted in a borehole. A narrative of inclinometer installation details is provided in Attachment C. The plastic casings shall be grouted in a borehole that is drilled into the Columbia Formation. The possibility that some of these instruments become inoperable due to crushing of casings because of excessive settlement must be contemplated. If this is the case, new additional inclinometers can be rapidly installed and the horizontal displacement monitoring can resume after a short time.

3.4 Vertical Deformation Measurement Devices

At the CIL site, there are already 25 settlement plates, located in Phases III, IV, and V, to measure the dredge/alluvium settlements during waste placement. These settlement plates may be replaced by sensors that allow automatic measurement of dredge/alluvium settlements. These devices will be located at approximately the same elevation as the existing settlement plates. Existing settlement plates will continue to be measured for a period of six months to one year prior to decommissioning. Automatic devices will be placed along the MSE berm to measure vertical displacements during berm construction. In addition, a number of settlement plates will be located on the ground surface above the PVD area, to provide a redundant system for measuring vertical deformations during berm construction. When the plate settles, the sensor detects this movement and it is interpreted as consolidation of the dredge/alluvium. The consolidation settlement can be related to the strength gain of the dredge/alluvium.

Several surveying monuments along the MSE berm will be surveyed throughout the active life of the landfill to provide indication of surface movement of the wall. Also, surveying will be routinely performed to estimate the volume of waste and daily cover placed into the landfill. These volumes can be used together with the weight of waste and cover material to calculate an overall density and evaluate if it falls within the expected range used in the design. Settlement sensors and surveying monuments are not affected by large settlements.

3.5 Strain Gages/Extensometers

The elongation strain of the reinforcement in the MSE berm can provide information on the level of deformation and stress in this material. Stability analyses presented in Volume 7 indicate that the most critical loading for the MSE and thereby the proposed high-strength geotextile is during construction. The monitoring of elongation strain of the geotextile during construction can provide an early warning of the MSE behavior.

Elongation strain in the high-strain geotextile can be measured by using either: (i) strain gages attached to the high-strength geotextile using silicone rubber [e.g., Leshchinsky and Fowler, 1990]; and/or (ii) extensometers attached to the high-strength geotextile [Zonberg et al., 1995]. Both type of devices have been successfully used for performance evaluation of high-strength geotextile during embankment construction.

3.6 Recommended Graphical Representation of Monitored Data

This section presents recommendations for the use of different graphical representations of the monitored data depending upon the particular problem to facilitate the interpretation. Measured data should be presented as discussed below. Examples of the recommended plots obtained during the pilot test at CIL (Test Area 2A with 6 ft × 6 ft PVD spacing) are presented in Attachment A.

Plot 1. Profiles of horizontal displacement (measured with inclinometers) at different times to measure the maximum horizontal displacement (δ_m) and detect potential weaker zones.

Plot 2. Fill height (H) versus time (from surveying).

Plot 3. Maximum horizontal displacement (δ_m) versus time. This plot is necessary because the ratio of increment of $\Delta\delta_m$ and increment of time Δt ($\delta_m/\Delta t$) should gradually decrease with time (constant load) indicating that vertical displacements are controlled by consolidation. An increasing rate may imply excessive undrained shear deformations and impending failure.

Plot 4. Vertical displacement (s) versus time.

Plot 5. Excess pore pressure (Δu) versus time.

Plot 6. Vertical displacement (s) versus fill height (H).

Plot 7. Maximum horizontal displacement (δ_m) versus fill height (H).

Plot 8. Maximum horizontal displacement (δ_m) versus vertical displacement (s) (e.g., Figure 1) to help detect partially drained versus undrained response and for comparison with prior behavior. Evaluation of the "instantaneous" deformation rate expressed as the derivative ($d\delta_m/ds$) can provide a measure of impending failure.

Plot 9. Plots of deformation ratio (δ_m/s) as a function of vertical displacement to compare with failure boundary (e.g., Figure 2).

Plot 10. Normalized excess pore pressure ($\Delta u/\gamma_{fill} H$) versus fill height (H) (e.g., Figure 3).

Plot 11. Survey Monument displacements (horizontal and vertical) at various times.

Plot 12. Mobilized force reinforcement at selected locations (using strain gages) at various times.

Accurate and complete construction records must be kept at all times (e.g., fill height as a function of time, unit weight). The interpretation of field deformation data to provide early warning of foundation instability requires considerable judgment.

Based on GeoSyntec's experience, it is recommended that the creation of these plots, as well as interpretation of the results, should be conducted by knowledgeable geotechnical engineers that are hired separately from the construction contract.

4. MONITORING PARAMETERS AT THE CIL SITE

4.1 <u>During MSE Berm Construction</u>

The stability of the MSE berm during construction depends on: (i) the ability of the PVDs to dissipate enough (e.g., 90 percent) of the pore pressures generated within the dredge/alluvium due to fill placement before the next lift is placed, and (ii) the ability of the high strength geotextile to provide the required stability forces. Based on the theory of radial consolidation [Holtz et. al., 1991], 90-percent consolidation for PVDs spaced every 4 ft will occur in approximately 5 months (Figure 4). As described in Section 2.2, the stability of embankments constructed on soft foundations can be monitored by measuring the following parameters.

- *Vertical deformations measured at the center of the MSE berm*: Measuring vertical deformations (with settlement plates, survey monuments) periodically and comparing it with the expected amount of vertical deformations due to radial consolidation can provide an indication of the degree of consolidation of the dredge/alluvium in the PVD zone.
- *Horizontal displacements measured at the toe of the MSE berm*: Because of the presence of PVDs, it is expected that loading will take place under partial drainage conditions. Hence, as discussed previously, if partial drainage is expected to take place, lateral deformations should be significantly less than the measured vertical deformations.

- *Pore pressures measured at the center of the embankment*: Pore pressure measurements provide direct information of the degree of consolidation of the underlying dredge/alluvium and indirectly whether local yielding is taking place.
- *High strength geotextile strain*: Measurement of geotextile strain during MSE berm construction will provide information on the contribution of the reinforcement to the stability of the MSE berm.

The information collected will be used to evaluate the degree of stability of the MSE berm during construction. Because the MSE berm will be constructed on soft dredge/alluvium with PVDs, large vertical displacements are expected to take place during MSE berm construction, whereas the expected lateral displacement should be significantly less. Because of the PVDs, the dredge/alluvium will not be fully drained during construction. Hence, based on the literature review presented above, the ratio of maximum horizontal displacement to vertical displacement during berm construction should be on the order of 0.2, (which is consistent with preliminary results obtained from the pilot test) and it can be as high as 0.4 without causing stability problems. Attachment B shows a plan view and instrumentation details of the proposed locations for the monitoring stability during MSE berm construction. Table 2 presents the proposed monitoring schedule. Adjustment to this monitoring plan may be made to incorporate the results of the pilot test and during MSE berm construction.

4.2 <u>During Waste Placement</u>

The landfill stability at the CIL site depends upon the ability of dredge/alluvium layer: (i) to act drained in the PVD zone during waste placement; and (ii) to gain strength with time in the zone under existing waste as waste placement takes place. In addition, the landfill stability depends upon the unit weight of waste. Hence, at minimum, the GMP has to provide enough information to verify that: (i) the dredge/alluvium in the PVD area acts drained during waste placement; (ii) the dredge/alluvium under the existing waste increases shear strength at the predicted rate; and (iii) the overall waste unit weight is within the predicted ranges. These can be accomplished by measuring the following parameters.

- *Pore Pressures in Dredge/Alluvium in the PVD Zone*: The ability of dredge/alluvium to act drained during waste placement can be verified by

measuring the resulting excess pore pressures in the PVD zone during waste placement. Based on preliminary estimates, the maximum induced excess pore pressure head is estimated to be approximately 4 ft for an average 10-ft thick layer per year of waste placed.

- *Pore Pressure in Dredge/Alluvium under Existing Waste*: Shear strength gain can be measured indirectly by measuring pore pressures generated during waste placement and subsequent pore pressure dissipation Δu_d. The strength gain (ΔS_u) can be estimated as follows:

$$\Delta S_u = 0.29 \Delta u_d \tag{2}$$

- Piezometers will be installed near settlement devices to correlate measured vertical deformation of the dredge/alluvium with dissipated pore pressures.
- *Vertical Displacement of Dredge/Alluvium under Waste*: Strength gain of the dredge/alluvium can be calculated by correlating measured settlement of the top of the dredge to the average pore pressure dissipated using a procedure similar to that used in Attachment VIb-D.1 of the Engineering Report.
- *Lateral Displacements at the Toe*: Lateral displacements measured at the toe of the landfill (outside and inside the MSE berm) can be used as an indication of drained conditions of the dredge/alluvium during waste placement. The inclinometers installed for monitoring MSE berm construction will be used for monitoring waste placement. If feasible, a limited number of the existing inclinometers will be extended to provide additional information of horizontal displacements immediately outside the existing waste footprint.
- *Waste Ground Surface*: The waste unit weight has a large degree of variability and a precise value is difficult to obtain for use in the evaluation of landfill stability. To calculate the average waste unit weight, topographic information at specified time intervals need to be obtained by a knowledgeable geotechnical/waste engineer. Topographic information can also be used to obtain the waste placement history for predicting shear strength. Water from rain can be taken into consideration in the evaluation by increasing the calculated unit weight by 10 percent.
- *Shear Strength of Dredge Alluvium under Waste*: Field investigation program that includes cone penetration tests and possibly field vane tests is also included to measure the strength in the dredge/alluvium.

The information collected (i.e., deformation and pore pressures) will be used to evaluate the degree of stability of the landfill during waste placement. Attachment B shows a plan view and instrumentation details of the proposed locations for monitoring stability of the landfill during waste placement. Attachment B also shows the location of the recommend field investigation program. Table 3 provides the proposed monitoring schedule. Adjustment to this monitoring plan will be made to incorporate the results of the pilot test as well as waste placement monitoring results.

5. MONITORING AND REPORTING

5.1 Overview

Geotechnical data shall be collected in accordance with this GMP. Data to be collected includes pore pressures, vertical and horizontal displacements, shear strength, geotextile strain and topographic information of Phases III to V. The data shall be stored electronically and interpreted by a qualified geotechnical engineer. A digital and graphical representation of the inclinometer data, piezometer data, settlement data, and topographical data shall be created. Results must be reviewed by a geotechnical engineer to verify that pore pressure changes, deflections, or settlements are within expected ranges. Plots of vertical and horizontal displacements as well as pore pressures will be presented in a format similar to the one presented in Attachment A. The performance monitoring devices shall be evaluated periodically to ensure that they are working properly.

5.2 Instrumentation Repair

One of the activities of the monitoring is to ensure that all instruments are working properly. Instrument malfunctioning can be observed during data analysis or by visual inspection. DSWA operations personnel are responsible for repairs associated with the proposed instrumentation. Such activity shall be supervised by a geotechnical engineer. The geotechnical engineer shall be notified prior to any repairs. DSWA shall inform the geotechnical engineer prior to decommissioning or relocating any geotechnical instrumentation. Decommissioning of existing settlement plates in Phases III to V will be done after verifying that the new settlement devices are working properly.

Vertical inclinometer casing(s) that are struck by an object (e.g., vehicle, construction equipment) or separate due to frost heave, will be repaired with a splint as described in the procedure outlined in Attachment D and inspected by a geotechnical engineer. Typically, during such occurrences, only the upper portion of ABS pipe becomes damaged, and installation of a new inclinometer is not necessary. If a new inclinometer is necessary, the new inclinometer shall be located within 10 ft of the existing one. Installation of the new inclinometer shall follow the installation guide presented in Attachment C.

5.3 Monitoring Frequency

Monitoring frequency depends on numerous factors including:

- construction sequence (i.e., during MSE berm construction or waste placement);
- construction area (i.e., within MSE berm footprint that is an active construction area, within MSE berm but not being constructed, and outside the MSE berm);
- levels of measured settlement and lateral displacement deformation (i.e., large, intermediate, and small for the active construction areas); and
- time elapsed since the end of construction (EOP) in any non active MSE berm area.

The monitoring frequencies are presented by construction area in Table 2 (during MSE berm construction) and Table 3 (after EOP and during waste placement. In general, under normal conditions (i.e., safe deformation and settlement rates), all instruments outside the active construction areas should be monitored on a quarterly basis. As described in Tables 2 and 3, increased monitoring frequencies are specified at locations where either construction or waste placement activities are taking place. However, assessment of the monitoring frequency and adjustment to the monitoring frequencies shall be performed by the geotechnical engineer due to changing site or construction conditions. Reassessment of monitoring frequency shall be performed by the geotechnical engineer in conjunction with geotechnical instrumentation's historical data and current horizontal/deformation, pore pressure, and vertical deformation rates.

Examples of events that may lead to monitoring frequency adjustment include large changes of inclinometer movement, pore pressures, and settlement rates.

Monitoring frequency is subject to change depending on changes to operational or construction activities within close proximity to the instrumentation. In addition, supplemental readings may be performed should the initial results reveal questionable data related to instrumentation errors or equipment problems. DSWA shall notify the Delaware Department of Natural Resources and Environmental Control (DNREC) prior to changing the proposed schedule of monitoring frequency.

5.4 Reporting

Monitoring summary reports shall be prepared by the geotechnical engineer and provided to DSWA on a quarterly basis. The report shall describe current and previous trends for the inclinometers and piezometers monitored during the active life of the CIL and shall provide a summary describing the most recent monitoring results. The original reports shall be kept on file. Data collected from settlement devices and piezometers located in the landfill mass will not be submitted to DNREC as part of the stability report. This data shall be maintained on file and shall be available upon request from DNREC. An outline of the monitoring report is presented in Attachment E.

5.5 Response Actions

Should horizontal displacement, settlement, or pore pressures exceed established criteria as set in Table 4 (during MSE berm construction) or Table 5 (after EOC and during waste placement), the steps outlined below shall be followed.

- Step 1. Ensure that all monitoring equipment is working properly. Additional instruments may be installed nearby if data collected from the existing instruments is determined to be questionable due to defective equipment or installation procedures.
- Step 2. Verify that survey monuments exceed acceptable magnitudes and rates.

- Step 3. After verification, a close evaluation of the nest of piezometers at the same monitoring section and possibly adjacent sections, may be required to determine if the vertical deformation is due to consolidation or due to shear movement.

- Step 4. *Perimeter Berm Construction* - Confirmed additional deflection, as well as increased pore pressures surpassing established criteria, may necessitate the temporary suspension of MSE berm construction to allow the underlying soils to consolidate and gain strength before the lift is completed. Should excessive movement rate continue after construction work has ceased, construction of a compacted berm adjacent to the toe of the MSE berm may be needed. Regardless, the solution will be executed with concurrence of DSWA, DNREC, and geotechnical consultant/personnel.

  Waste Placement: Confirmed additional deflection, as well as increased pore pressures surpassing established criteria, may necessitate the temporary suspension of waste placement or relocation of waste placement, in order to allow the underlying soils to consolidate and gain strength. Should movement continue after landfilling has ceased, waste excavation and/or construction of a compacted berm adjacent to the toe of the MSE berm may be needed. Regardless, the solution will be executed with concurrence of DSWA, DNREC, and geotechnical consultant/personnel.

6. REFERENCES

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TABLE 1

INSTRUMENTATION NOMENCLATURE

Phase	Phase ID	Instrument ID(1)	Section ID(2)	Horizontal Location ID(3)	Vertical Location ID(4)
III	P3	IC, PZ, SP, SG, SD, SM	12 – 17	1 – 3	A, B, C (applicable only for piezometers)
IV	P4		10 and 11		
V	P5		1 – 9		

Notes:

(1) IC = inclinometer;
PZ = piezometer;
SP = settlement plate;
SD = settlement device;
SG = strain gage; and
SM = survey monument.

(2) See plan locations of Section 1-17 in Attachment B.

(3) The horizontal location ID starts from the berm towards the landfill.

(4) If more than one piezometer is installed at the same horizontal coordinates and at various depths, a vertical location ID will be used for each instrument. If only one piezometer is installed, no vertical ID will be used and the piezometer will be installed at the center of the dredge/alluvium layer.

A = top;
B = middle; and
C = bottom.

Nomenclature used in identifying an instrument contains up to five parts: (a) phase ID; (b) instrument ID; (c) monitoring section ID (1 through 17); (d) horizontal location ID (1, 2, or 3); and (e) vertical location ID (A, B, or C only applicable for piezometers).

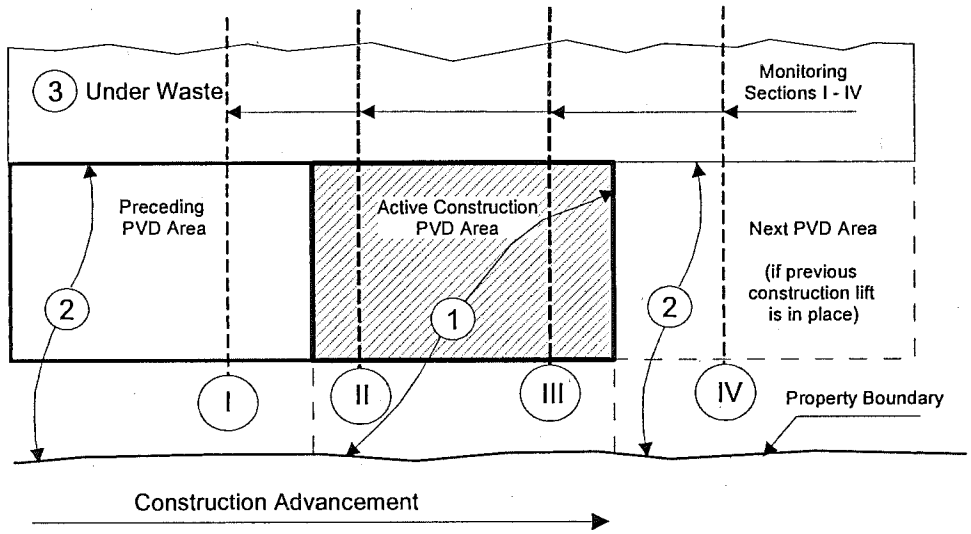
For example, a piezometer installed under the MSE berm in Phase V, at the top of the dredge layer, on Monitoring Section 8, is referred to as P5-PZ-08-1A.

TABLE 2

GEOTECHNICAL MONITORING FREQUENCY DURING MSE BERM CONSTRUCTION [1]

Within Active Construction Area ①			Outside Construction Area ②[2], [3]			Waste ③[2], [3]
Deformation Ratio, δ_m/s [4]			Time elapsed EOC [5], t_e (months)			
≥ 0.4	0.4 - 0.3	0.3 - 0	0 – 1	1-3	>3	
Multiple [6]	D [5]	W [5]	W	M [5]	Q [5]	Q

Schematic Plan View



Notes:

(1) Regardless of construction sequence, all instruments must be read as soon they are installed to provide a reference, zero-time reading. Monitoring sections are located approximately 500 ft. apart. During MSE berm construction, only the instruments outside the waste should be measured.

(2) The monitoring frequencies for areas ahead of the current construction area presented above are applicable if a previous construction lift is already in place; otherwise, no monitoring is necessary.

(3) The geotechnical engineer may require more frequent monitoring in areas 2 and/or 3 if the magnitude and/or rate of the displacements have increased since the last measurement cycle.

(4) δ = maximum lateral subsurface movement measured at toe of MSE berm by an inclinometer (i.e., inclinometer 1 in Attachment B), s = maximum settlement measured at the MSE berm crest by a settlement device (see Figure 1, or instrument cluster 1 in Attachment B).

(5) EOC = end of construction, D = at least once every day; W = at least once every week, M = at least once every month, Q = at least once every three months.

(6) The geotechnical engineer may require multiple readings per day if the magnitude and/or rate of displacements are deemed excessive.

TABLE 3

GEOTECHNICAL MONITORING FREQUENCY DURING WASTE PLACEMENT

Landfilling within 200 ft behind crest of MSE Berm				Landfilling within 200 ft behind crest of MSE Berm
Instruments under MSE Berm			Instruments outside MSE Berm (1)	All Instruments
Excess Pore Pressure, ft (3)				
> 8	8 - 4	4 - 0		
Multiple (3)	D (4)	W (4) (First Month) M (4) (Next two months)	Q (4)	Q

Notes:

(1) All instruments must be read as soon they are installed to provide a reference, zero-time reading.

(2) Excess pore pressures shall be measured with respect to the background pore pressures. The background pore pressure may change due to level fluctuations of the Christina and Delaware Rivers.

(3) The geotechnical engineer may require multiple readings per day if the magnitude and/or rate of displacements are deemed excessive.

(4) D = at least once every day; W = at least once every week, M = at least once every month, Q = at least once every three months. All instruments shall be monitored at least once every three months.

TABLE 4

EXCEEDANCE CRITERIA DURING MSE BERM CONSTRUCTION

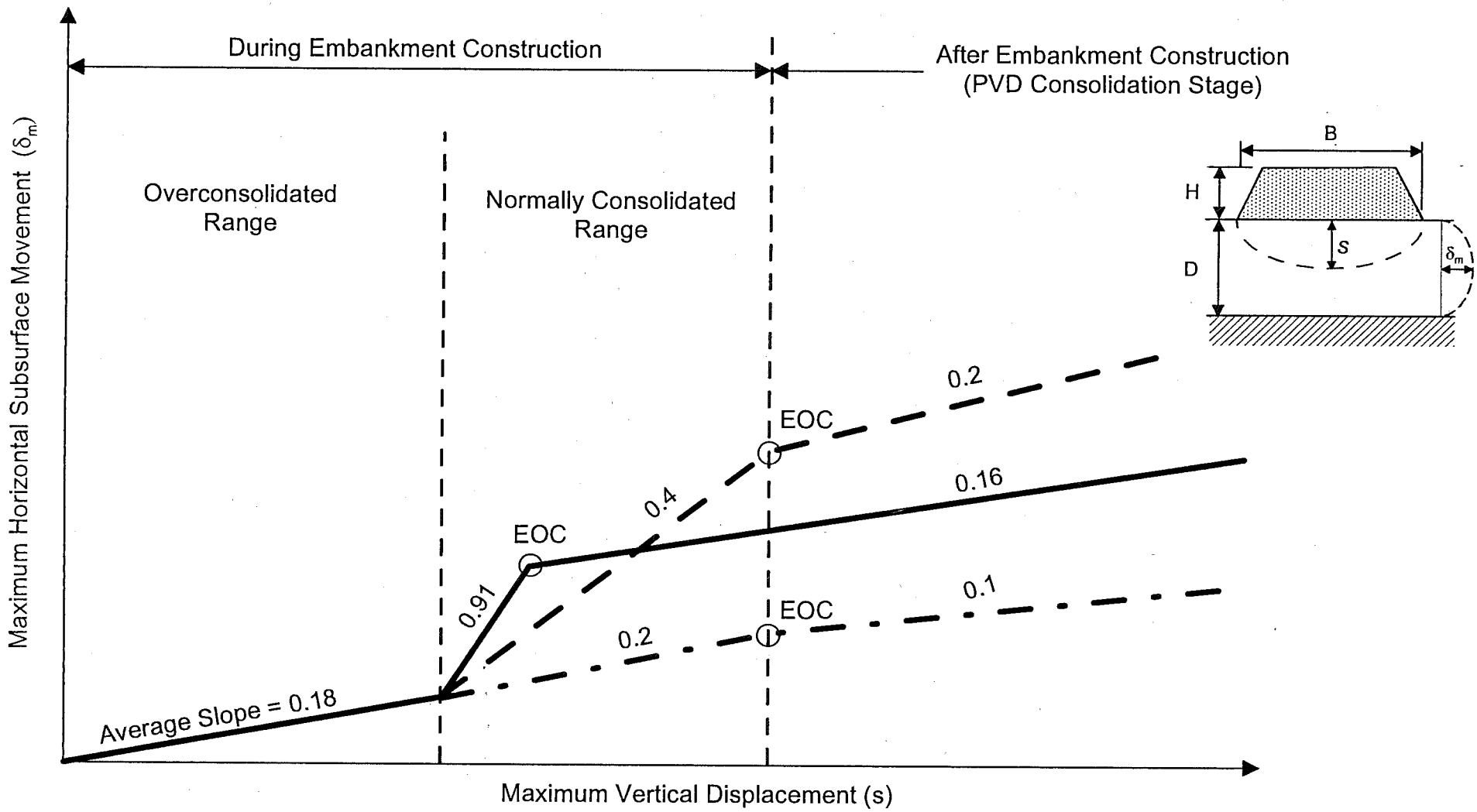
Parameter	Plot	Description
δ_m vs. s	8	Verify that deformation ratio (δ_m/s) is smaller than 0.4 during MSE berm construction. Verify that deformation ratio is smaller than 0.25 after MSE berm construction.
δ_m/s vs. s	9	Verify that deformation ratio vs. settlement is lower than failure boundary shown in Figure 2 (1).
δ_m vs. time	3	Evaluate time rate of δ_m variations(2).
Geotextile strains	TBD	Evaluate the maximum strain ratios and locations of occurrences and compare to allowable values.
Excess Pore Pressure vs. time	5	Stop construction if 90 percent dissipation is not achieved within 4 months (for a 4-ft PVD spacing).
Soil Shear Strength	TBD	If excessive displacement is measured, evaluate shear strength in dredge and perform analysis for existing conditions. Recommended testing methods include VST and CPT.

Notes: (1) Failure boundary may be redefined to take into consideration the PVDs and high-strength reinforcement.
(2) Time rate of δ_m is expected to decrease after a construction layer is placed.

TABLE 5

EXCEEDANCE CRITERIA DURING WASTE PLACEMENT

Parameter	Plot	Description
Excess Pore Pressure under MSE berm	5	Reduce waste placement rate in the vicinity of the monitored section if excess pore pressure is larger than 4 ft.
Shear Strength	TBD	Evaluate the shear strength in dredge and perform analysis for existing conditions. Recommended testing methods include VST and CPT.



EOC: End Of Construction

Not to scale

Case A (no PVDs) and FS=1.3) [after Tavanes et. al., 1979]
Case B (PVD and FS<1.3) [after Ladd,1991]
Case C (PVD and FS>1.3) [after Ladd, 1991]

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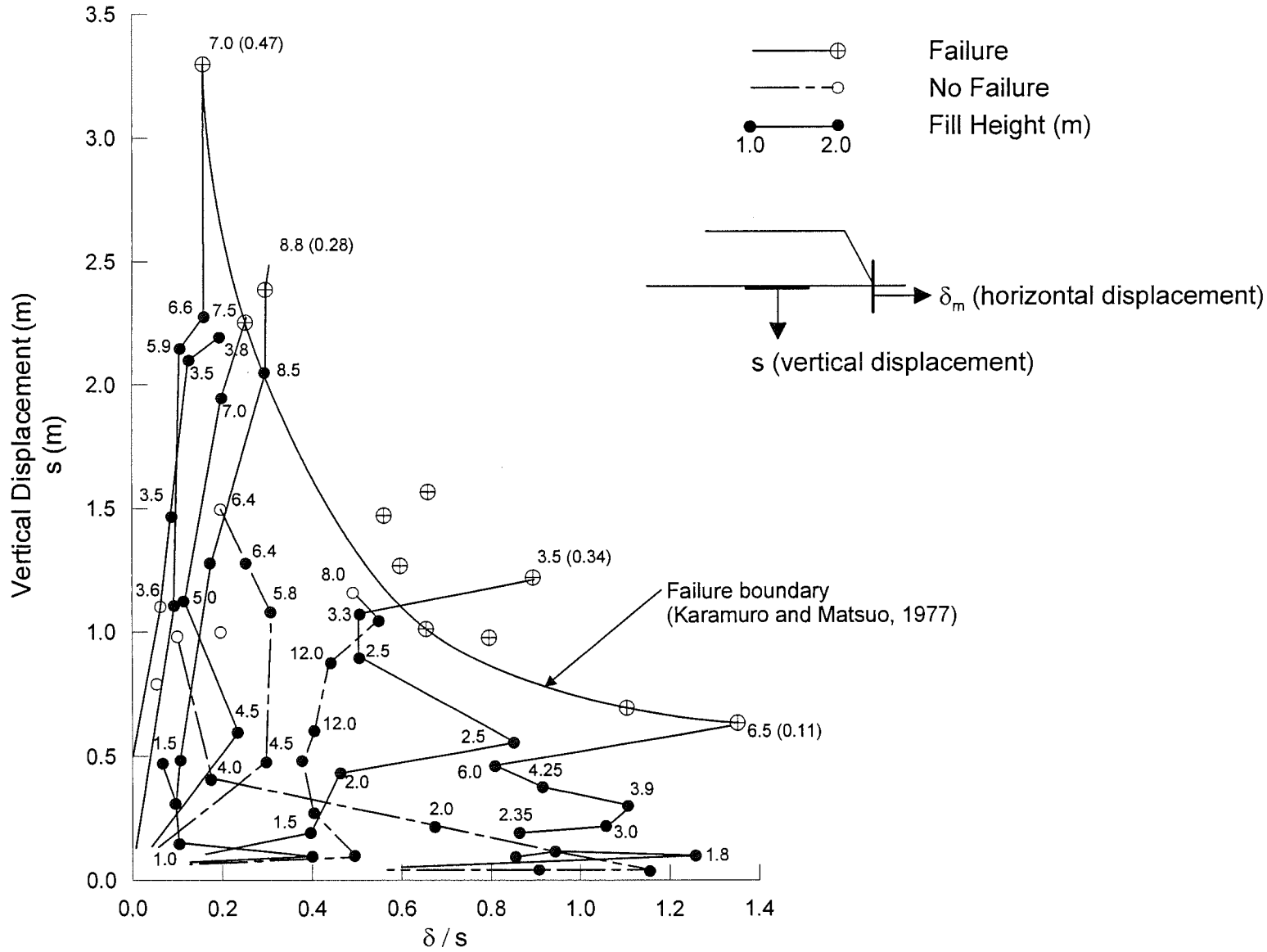
Maximum Horizontal Subsurface Movement versus Vertical Displacement

FIGURE 1

PROJECT ME0250
Cherry Island



0250gr02.grf

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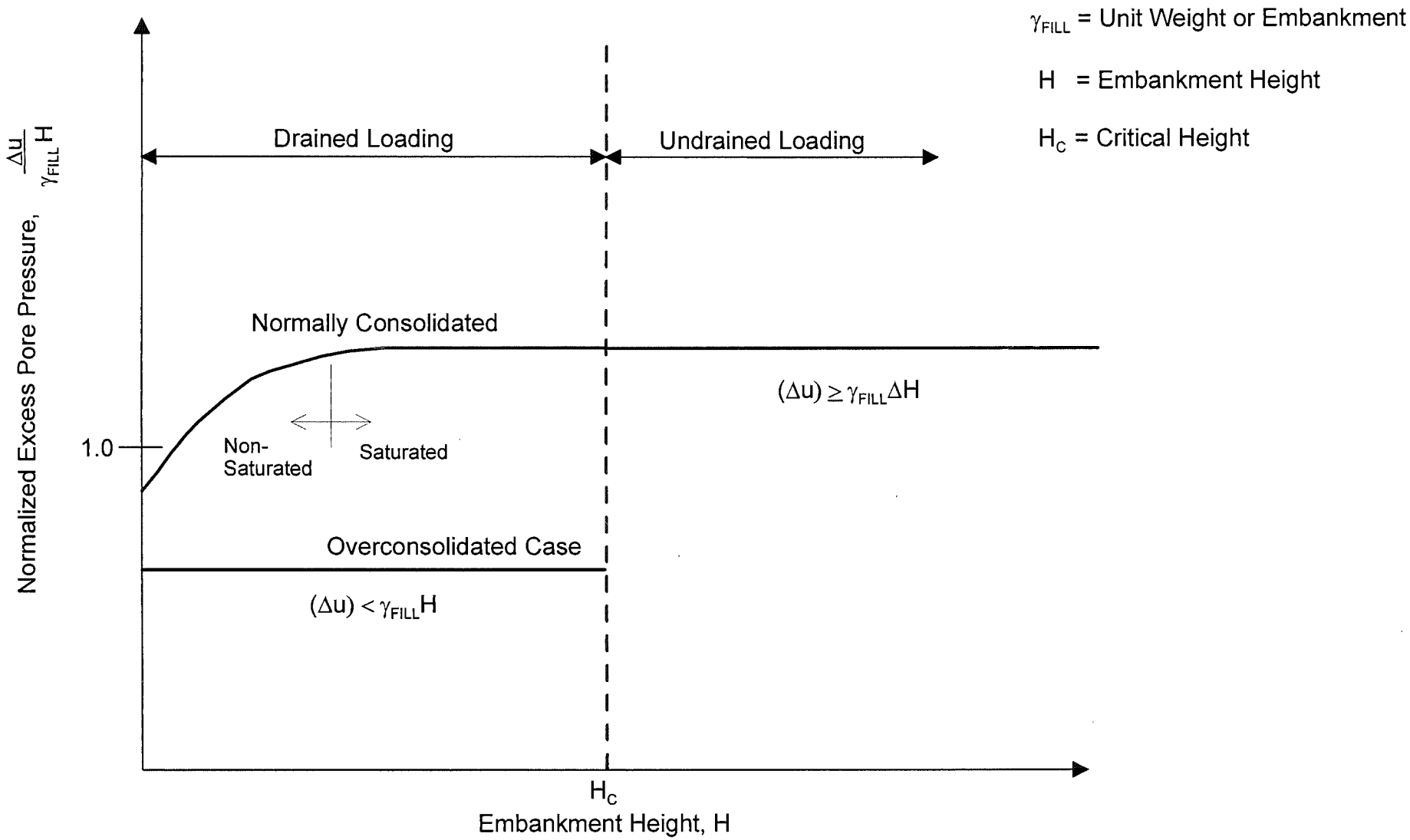
Failure Boundary for Embankments over Soft Foundations

FIGURE 2

PROJECT ME0250
Cherry Island



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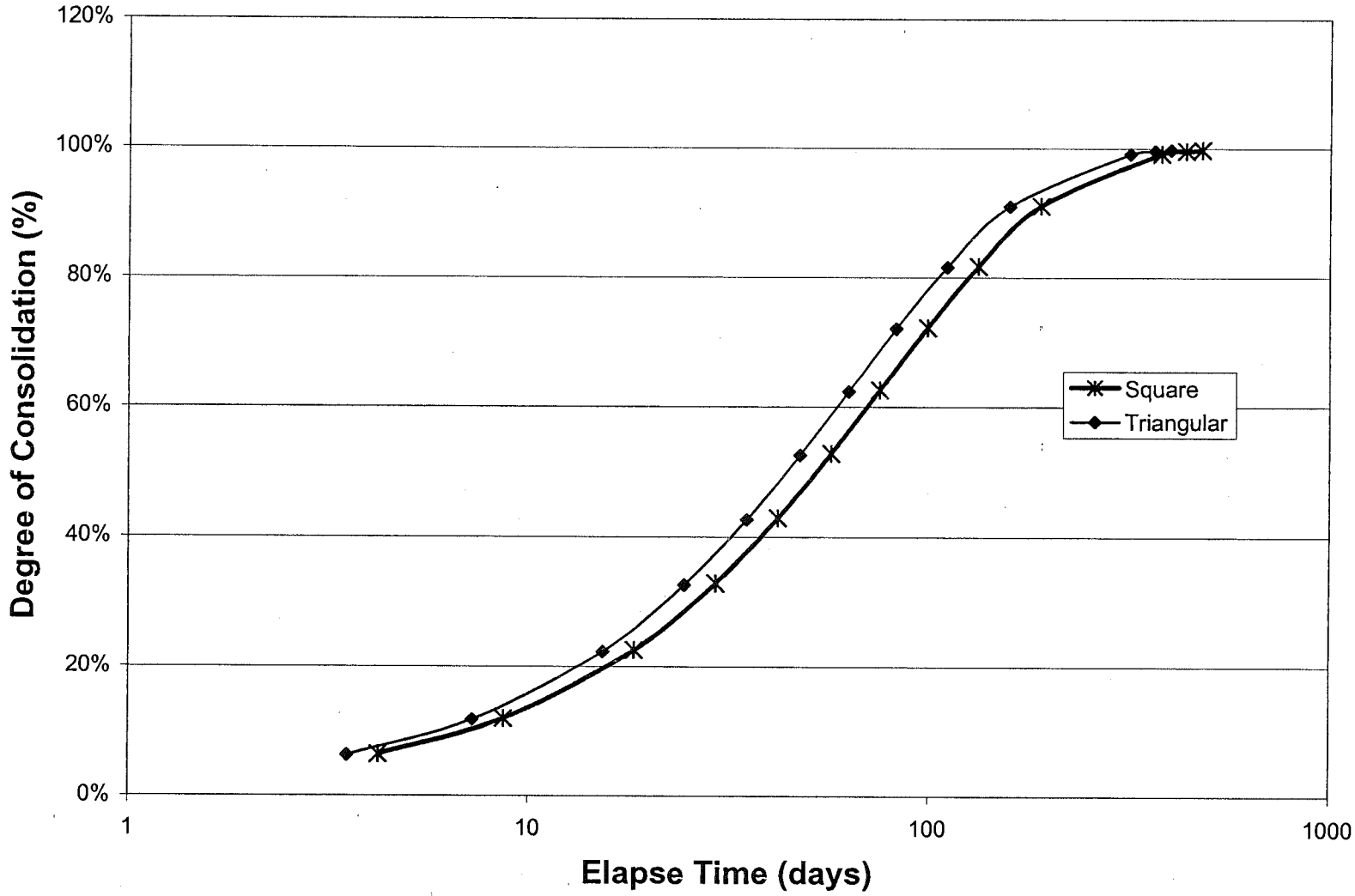
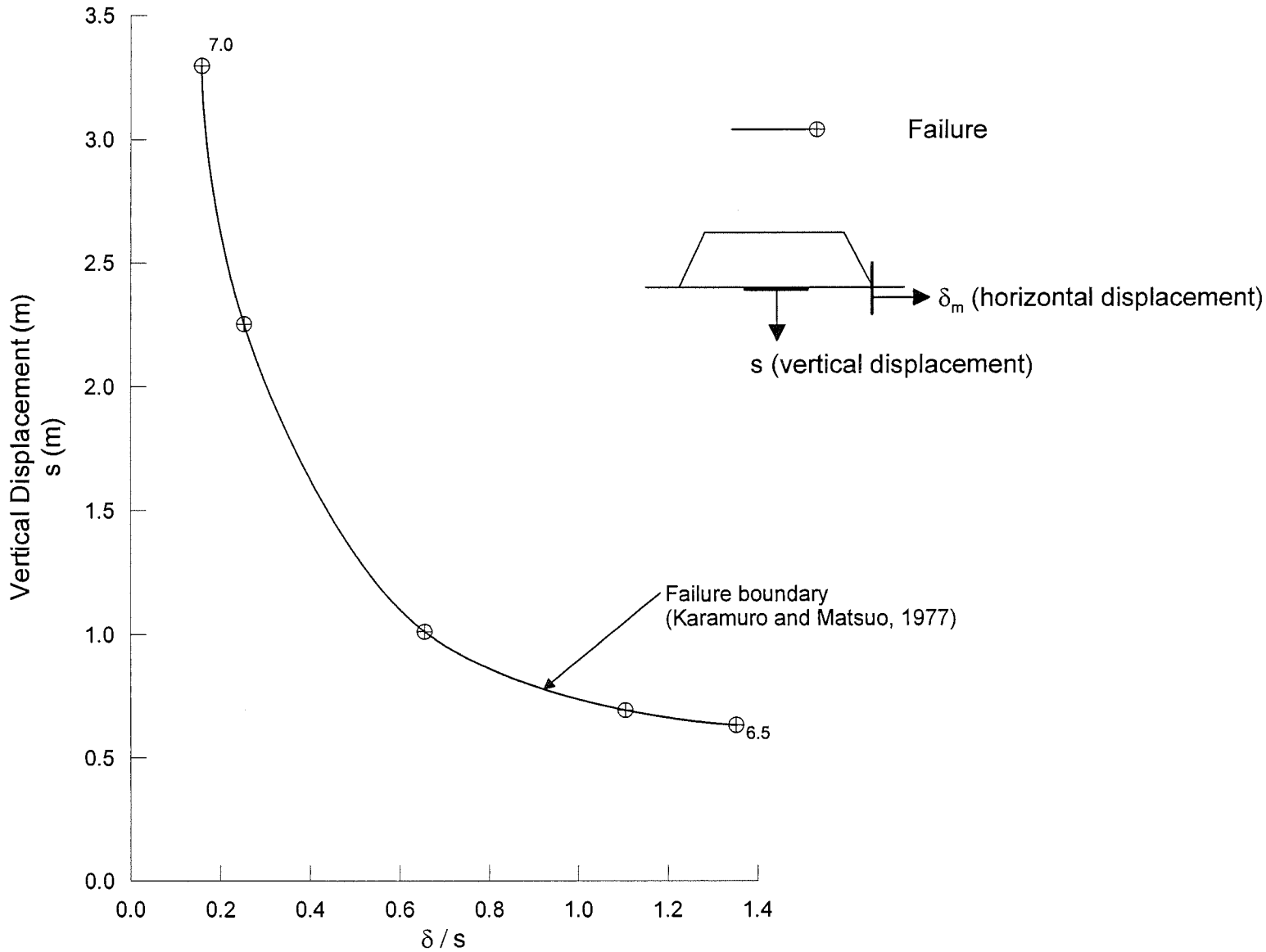
Excess Pore Pressure Development During Embankment Construction

FIGURE 3

PROJECT ME0250
Cherry Island

Figure 4 - Consolidation of MSE Berm on 4-ft PVD Spacing





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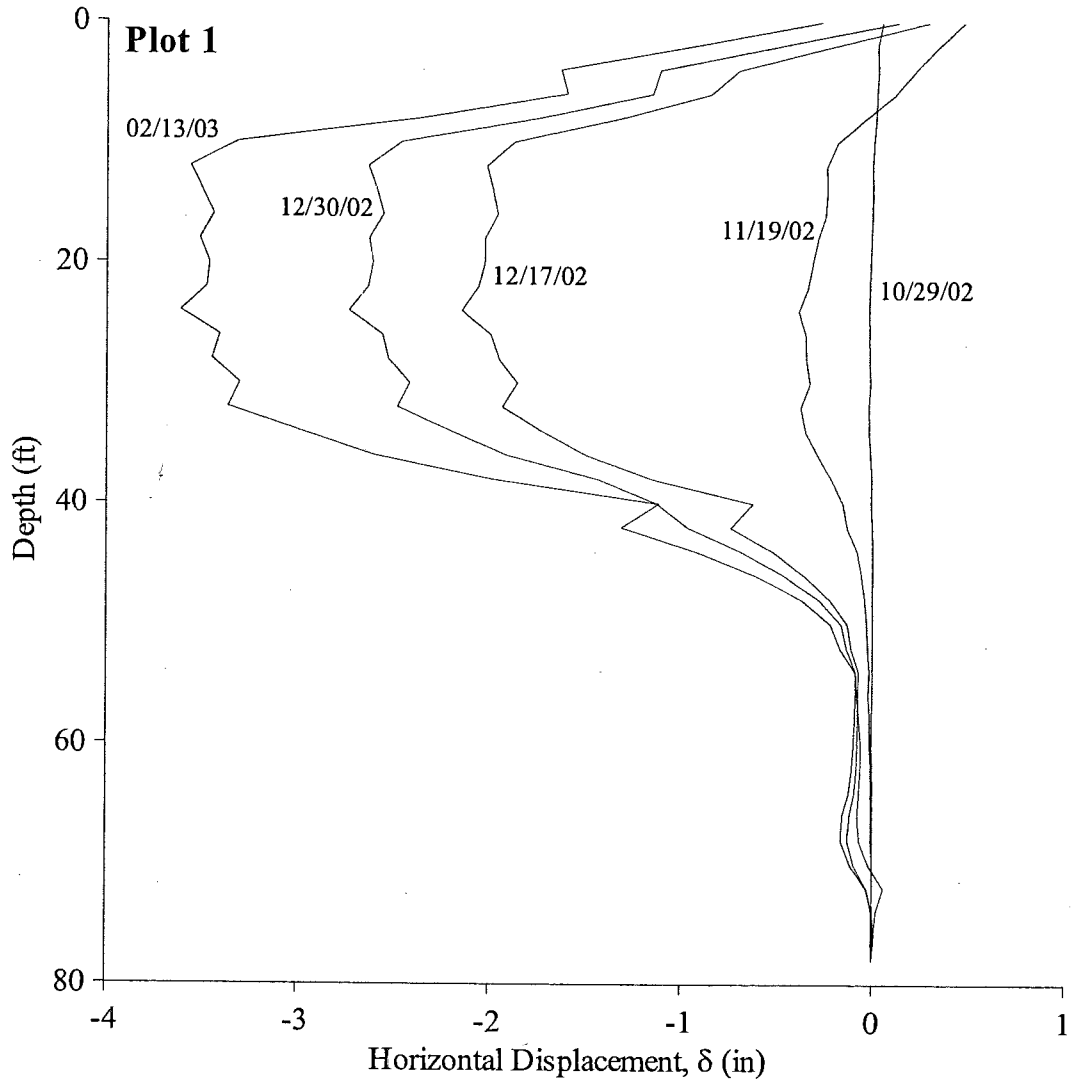
Failure Boundary for Embankments over Soft Foundations (Matsuo and Kawamuro, 1977)

FIGURE 5

PROJECT ME0250
Cherry Island

GEOTECHNICAL MONITORING PLAN

ATTACHMENT A
EXAMPLES OF GRAPHICAL REPRESENTATION OF MONITORED PARAMETERS
(FROM PILOT TEST AREA 2A)



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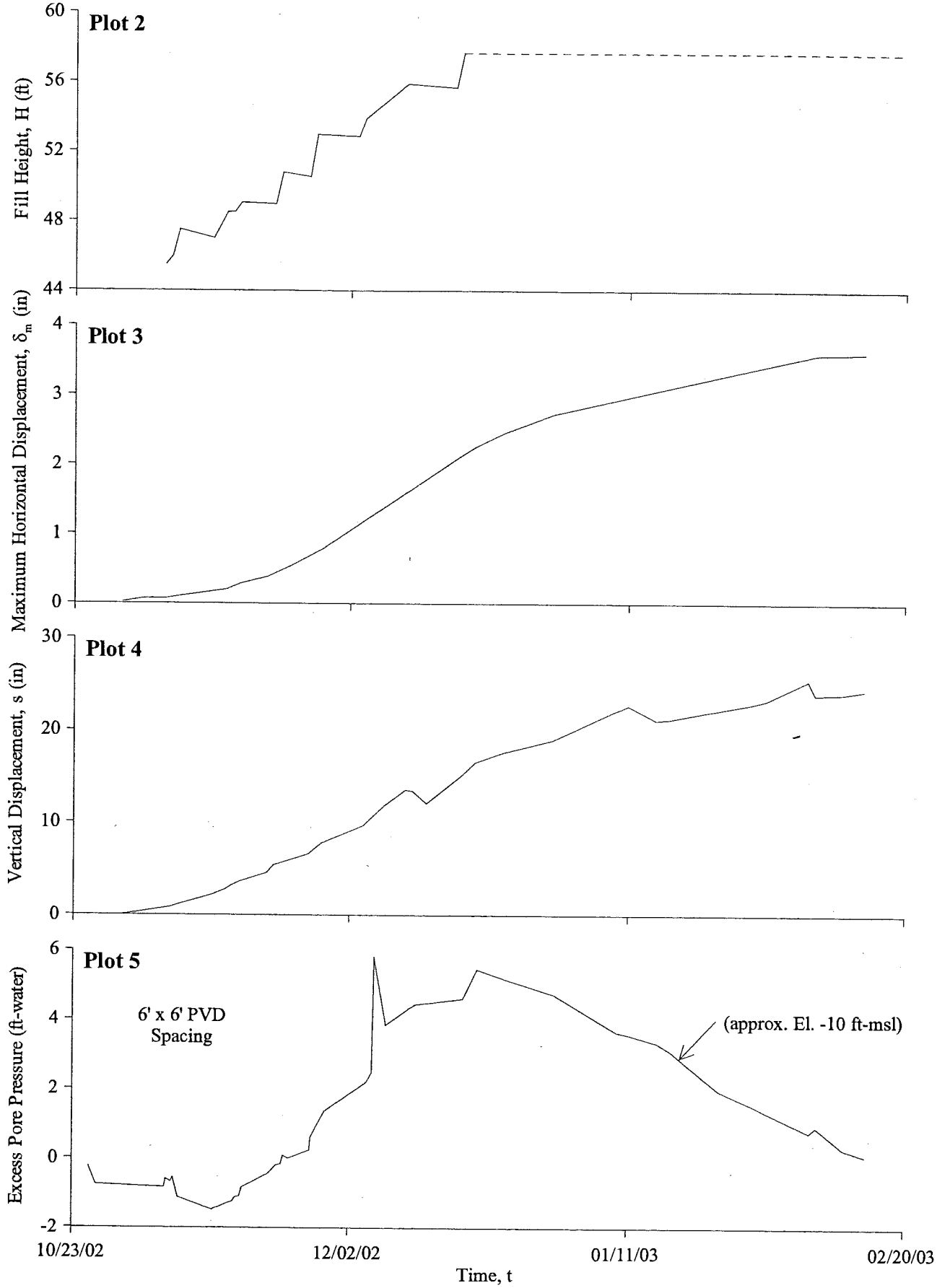
Inclinometer Data

FIGURE A.1

PROJECT ME0250
Cherry Island



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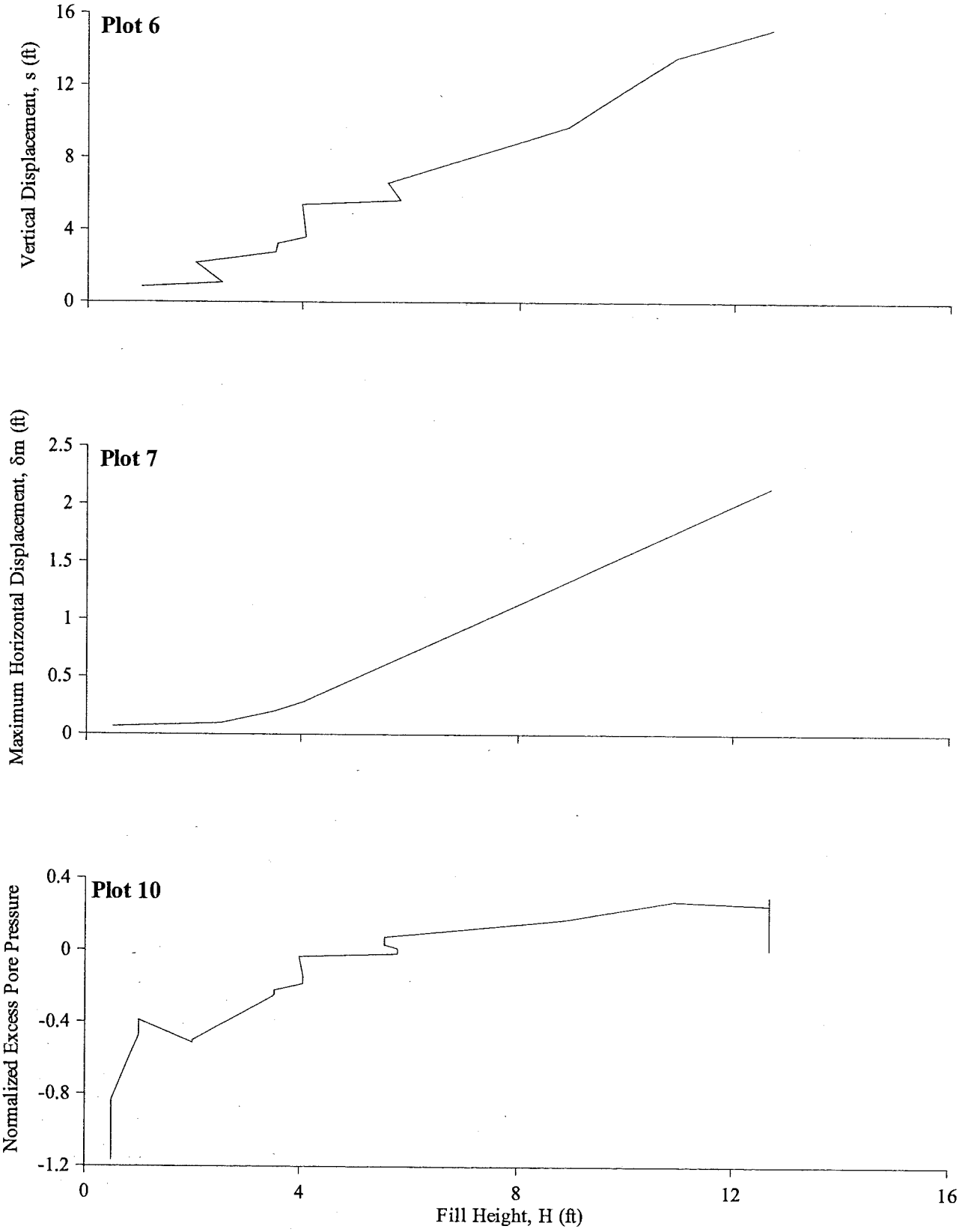
Parameter vs. Time

FIGURE A.2

PROJECT ME0250
Cherry Island



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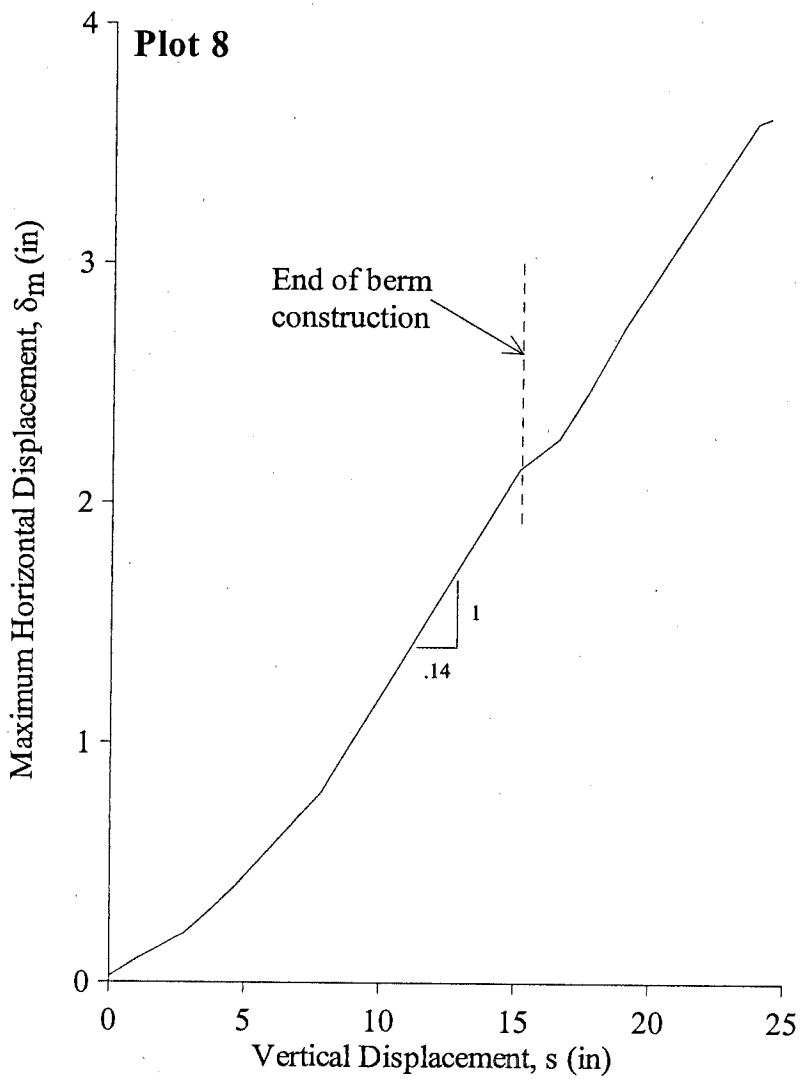
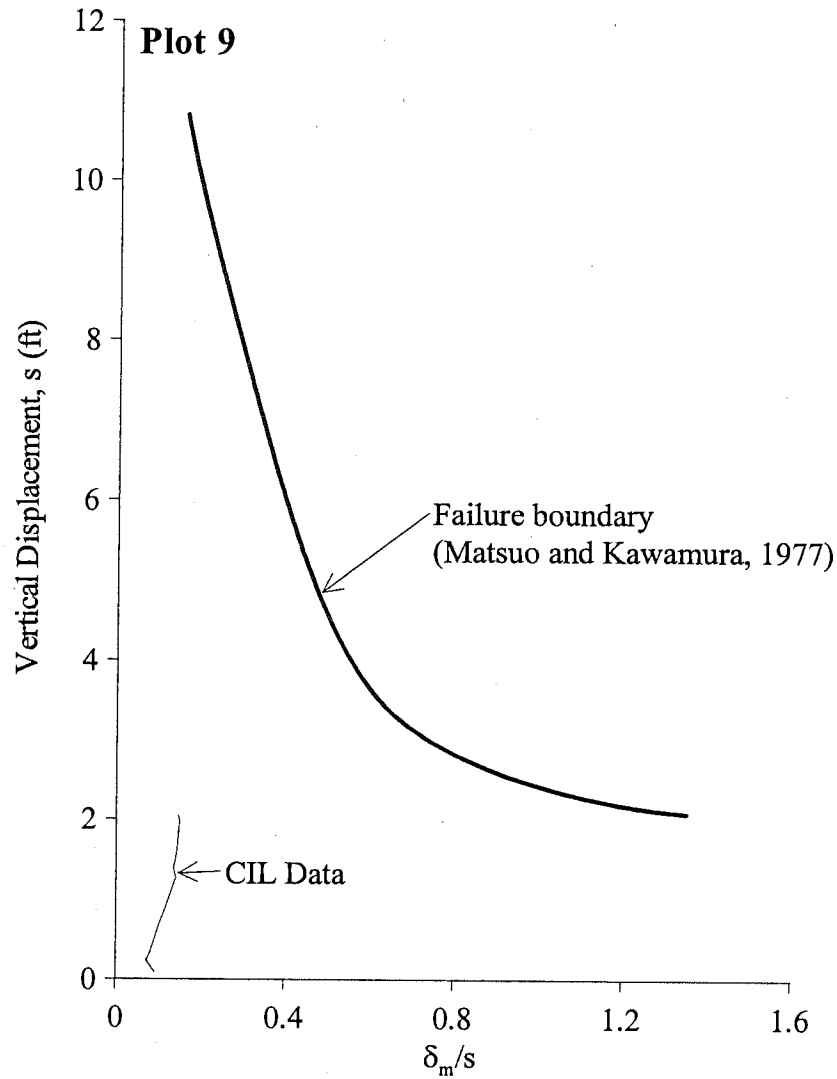
Parameter vs. Fill Height

FIGURE A.3

PROJECT ME0250
Cherry Island





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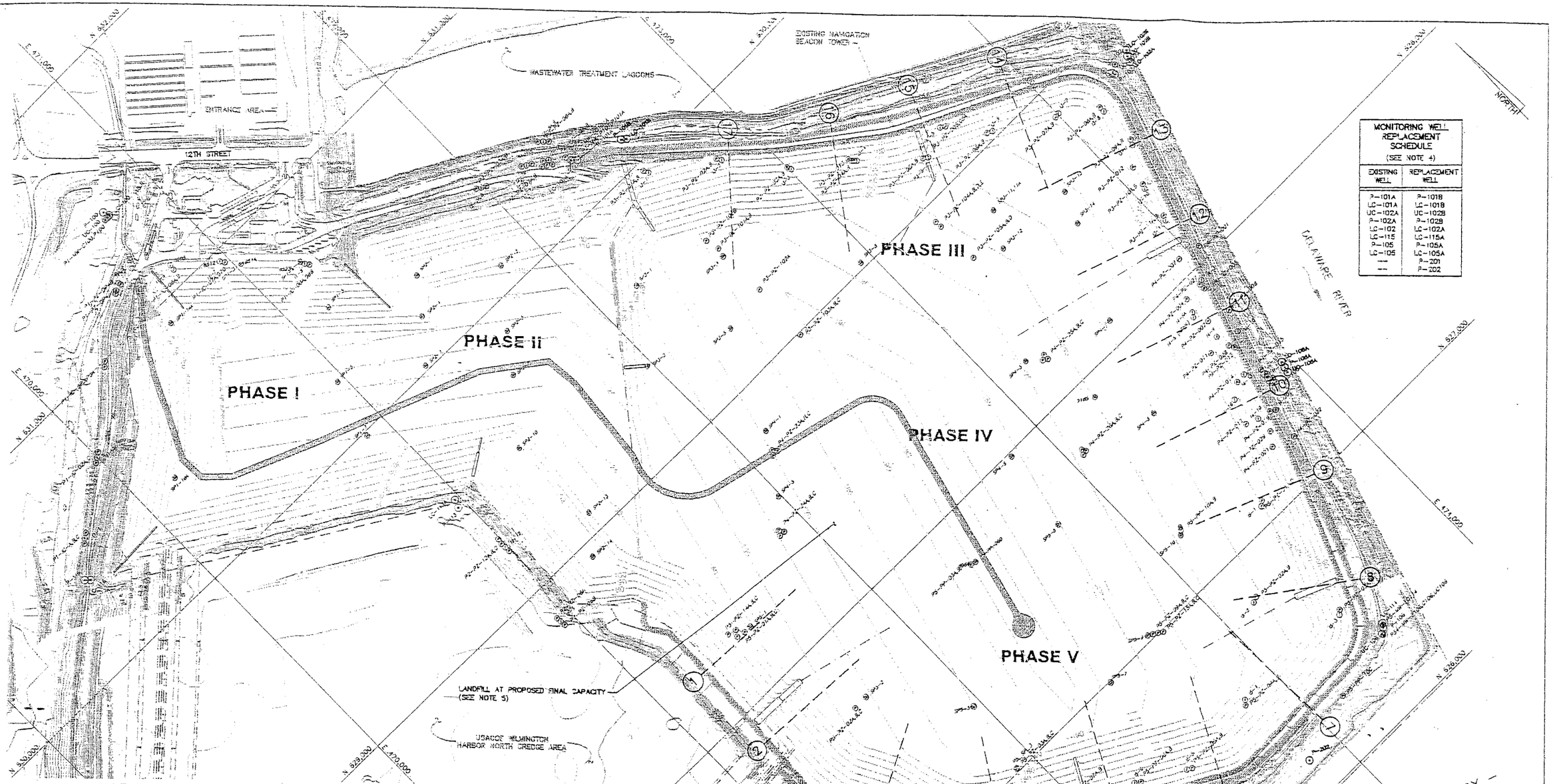
Vertical & Horizontal Displacements

FIGURE A.4

PROJECT: ME0250 Cherry Island

GEOTECHNICAL MONITORING PLAN

ATTACHMENT B
REDUCED DRAWINGS



MONITORING WELL REPLACEMENT SCHEDULE (SEE NOTE 4)	
EXISTING WELL	REPLACEMENT WELL
P-101A	P-101B
LC-101A	LC-101B
UC-102A	UC-102B
P-102A	P-102B
LC-102	LC-102A
LC-115	LC-115A
P-105	P-105A
LC-105	LC-105A
—	P-201
—	P-202

LEGEND

- PROPERTY BOUNDARY
- PROPOSED PHASE BOUNDARY (LIMIT OF DISPOSAL AREA)
- CONTOUR OF EXISTING GRADE (FEET, MSL)
- (1) MONITORING SECTION (INSTRUMENTS NOT SHOWN, SEE NOTE 2)
- PROPOSED ACCESS ROAD
- P-100 EXISTING GROUNDWATER MONITORING WELL
- PZ-09A,B,C EXISTING PIEZOMETER (SEE NOTE 3)
- SP-01 EXISTING SETTLEMENT PLATE (SEE NOTE 3)
- EXISTING INCLINOMETER (SEE NOTE 3)
- LC-105A NEW/REPLACED GROUND WATER MONITORING WELL

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. INSTRUMENTS (I.E., INCLINOMETERS, PIEZOMETERS, SETTLEMENT PLATES, SURVEY MONUMENTS, STRAIN GAUGES) SHALL BE INSTALLED ALONG PROPOSED MONITORING SECTIONS. DATA COLLECTED FROM THESE INSTRUMENTS SHALL BE USED TO EVALUATE THE STABILITY OF THE WASTE AND WSE BERM AS DESCRIBED IN THE GEOTECHNICAL MONITORING PLAN. DETAILS OF INSTRUMENT LOCATION ALONG EACH MONITORING SECTION IS PROVIDED IN DETAIL 1 ON DRAWING 38.
3. EXISTING MONITORING INSTRUMENTS (I.E., PIEZOMETERS, SETTLEMENT PLATES, INCLINOMETERS) MAY BE USED IF APPROPRIATE. OTHERWISE THEY WILL BE DECOMMISSIONED AFTER THE NEW INSTRUMENTS ARE INSTALLED AND WORKING PROPERLY.
4. EXISTING GROUNDWATER MONITORING WELLS SHALL BE REPLACED ACCORDING TO ATTACHED SCHEDULE. MONITORING WELLS P-201 AND P-202 WILL BE INSTALLED IN THE POTOMAC FORMATION PROVIDED THAT SAND IS FOUND IN THIS FORMATION.
5. UPON COMPLETION OF FINAL CONFIGURATION AN ADDITIONAL CAPACITY OF APPROXIMATELY 14.6 MILLION CUBIC YARDS WILL BE OBTAINED. BASED ON TOPOGRAPHIC DATA FROM APRIL 2003 AND CURRENT ESTIMATES OF FILLING (1 MILLION CUBIC YARDS OF WASTE PER YEAR), THIS ADDITIONAL CAPACITY SHOULD BE CONSUMED BY THE YEAR 2041.

PERMIT DRAWING

GEOSYNTEC CONSULTANTS
10015 OLD COLUMBIA ROAD, SUITE B-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY

DATE:	JUNE 2004	PROJECT NO. WE0250 SCALE: 1" = 200'
DES BY	PJB	JUN 04
DRN BY	JDC	JUN 04
CHK BY	RDE	JUN 04
REV BY	RDE	JUN 04
APP BY	WFH	JUN 04

PROJECT: CHERRY ISLAND LANDFILL EXPANSION
NEW CASTLE COUNTY, DELAWARE

SHEET TITLE: ENVIRONMENTAL AND GEOTECHNICAL MONITORING PLAN

SIGNATURE

DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501286

DRAWING NO: 36 OF 39

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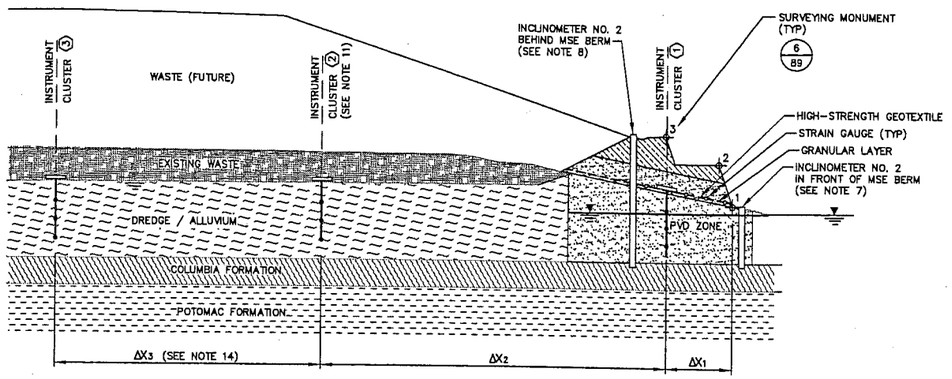
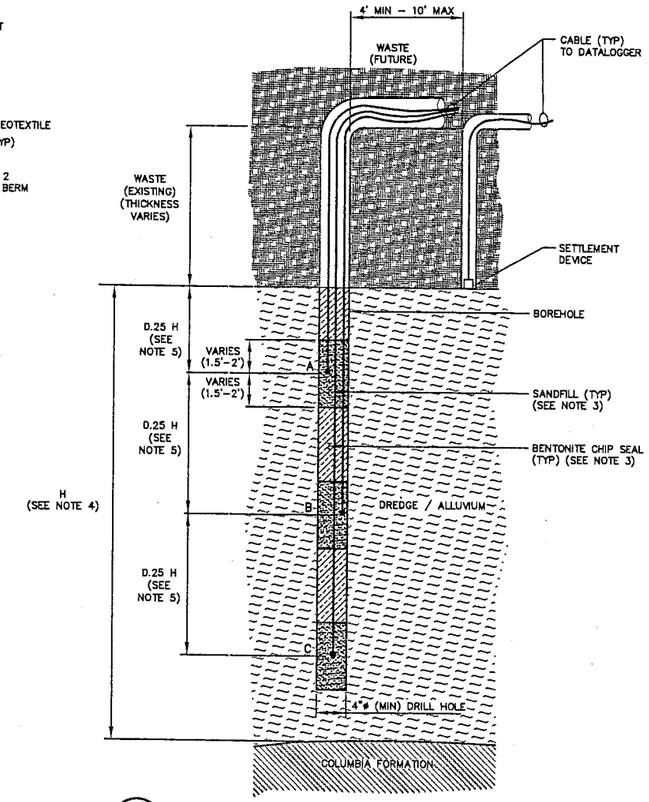
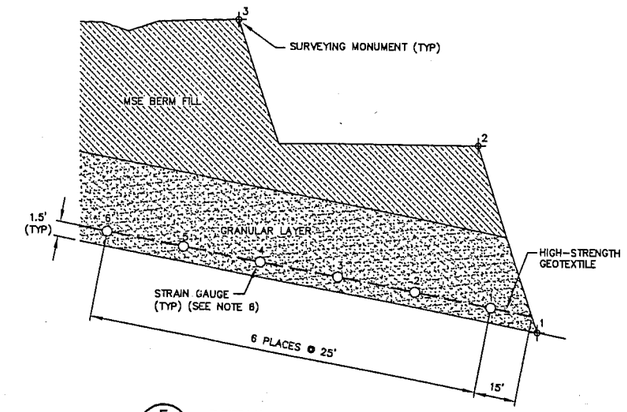


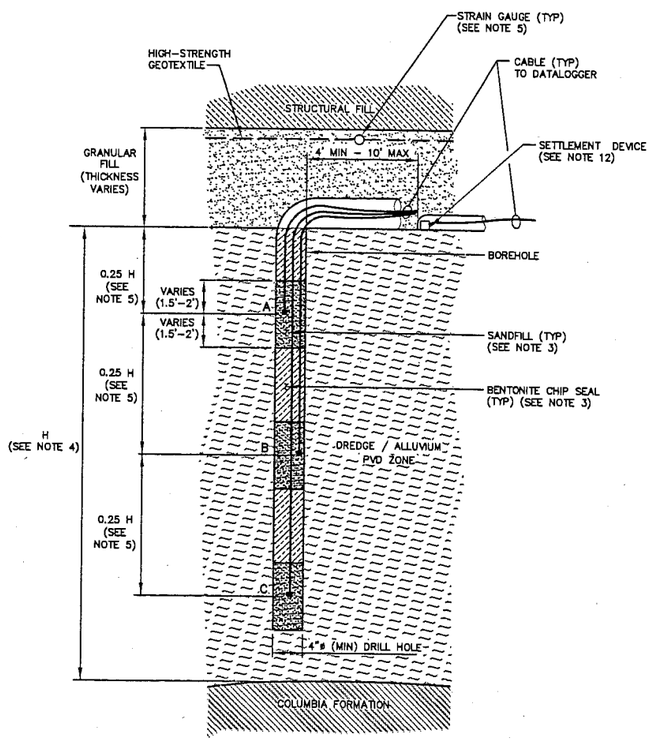
1 / – ELEVATION
MONITORING SECTION
NO SCALE



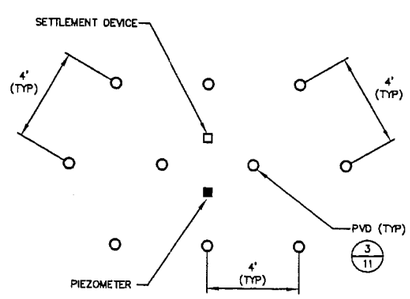
3 / – DETAIL
INSTRUMENTATION CLUSTER 2 OR 3 UNDER WASTE
NO SCALE
(SEE NOTES 9, 10, AND 12)



5 / – DETAIL
MSE BERM INSTRUMENTATION
NO SCALE



2 / – DETAIL
INSTRUMENT CLUSTER 1 UNDER MSE BERM
NO SCALE
(SEE NOTES 9, 10, AND 12)



4 / – PLAN
INSTRUMENT CLUSTER 1 UNDER MSE BERM
NO SCALE
(SEE NOTE 13)

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. MODIFICATIONS TO THE GEOTECHNICAL MONITORING PLAN MAY BE MADE AFTER COMPLETION OF THE PVD PILOT TEST.
3. BENTONITE SHALL CONFORM TO SPECIFICATIONS AND/OR MANUFACTURING RECOMMENDATIONS. SANDFILL SHALL CONFORM TO THE SPECIFICATIONS. MATERIAL SPECIFICATIONS ARE PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
4. DREDGE AND ALLUVIUM THICKNESS VARIES. FOR SPECIFIC INFORMATION ON TOP OF COLUMBIA FORMATION, REFER TO THE ALLUVIUM/GEOTECHNICAL CHARACTERIZATION REPORT, VOLUME 2, PART VIa (GEOSYNTEC 2003).
5. DEPTH INTERVALS ARE DEFINED BY THICKNESS OF THE DREDGE/ALLUVIUM.
6. STRAIN GAUGES SHALL BE INSTALLED ALONG MONITORING SECTIONS 5, 9, 12, AND 16.
7. INCLINOMETER SHALL BE INSTALLED 5 FEET FROM THE TOE OF THE BERM PRIOR TO BERM CONSTRUCTION. INCLINOMETER DETAILS ARE SHOWN IN DETAIL 1 OF SHEET 88. ADDITIONAL INFORMATION IS PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
8. INCLINOMETER SHALL BE INSTALLED PRIOR TO BERM CONSTRUCTION AND SHALL BE RAISED THROUGH BERM FOLLOWING MANUFACTURERS RECOMMENDATIONS. INCLINOMETER DETAILS ARE SHOWN IN DETAIL 1 OF SHEET 88. ADDITIONAL INFORMATION IS PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
9. ONE TO THREE PIEZOMETERS MAY BE INSTALLED IN A CLUSTER. IF ONLY ONE PIEZOMETER IS INSTALLED IT SHALL BE PLACED AT THE CENTER OF THE DREDGE/ALLUVIUM THICKNESS. SETTLEMENT DEVICE MAY BE A SETTLEMENT PLATE OR A SETTLEMENT SENSOR. PIEZOMETERS AND SETTLEMENT DEVICES TO BE INSTALLED AFTER PVD INSTALLATION HAS BEEN COMPLETED IN THE NEARBY AREA.
10. ALSO, THREE PIEZOMETERS SHALL BE INSTALLED IN CLUSTERS 1 AND 2 AT MONITORING LOCATIONS 1, 4, 7, 10, 13, AND 16. TWO PIEZOMETERS SHALL BE INSTALLED IN CLUSTERS 1 AND 2 AT THE REMAINING MONITORING SECTIONS EXCEPT FOR MONITORING SECTION 10, WHERE THREE PIEZOMETERS SHALL BE INSTALLED. ONLY ONE PIEZOMETER SHALL BE INSTALLED IN CLUSTER 3 FOR ALL MONITORING SECTIONS.
11. SETTLEMENT DEVICES MAY BE A SETTLEMENT PLATE (SEE DETAIL 4 ON DRAWING 89) OR A SETTLEMENT SENSOR (SEE DETAIL 5 ON DRAWING 89). SETTLEMENT PLATES SHALL BE MEASURED MANUALLY WHEREAS SENSORS SHALL BE HOOKED TO A DATALOGGER FOR AUTOMATIC READINGS.
12. EQUIVALENT INSTRUMENTS MAY BE USED AT ENGINEER'S DISCRETION.
13. BOTH SETTLEMENT DEVICE AND PIEZOMETER SHALL BE LOCATED AT THE "CENTER" OF THE PVD CELL.
14. SPACING BETWEEN INSTRUMENT CLUSTERS WILL BE FIELD DETERMINED BY ENGINEER

200 100 0 200 400
SCALE: 1" = 200'

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4333

REV.	DATE	DESCRIPTION	DR BY	APP BY
1	AUG 03	RESPONSE TO DNREC COMMENTS		MFH

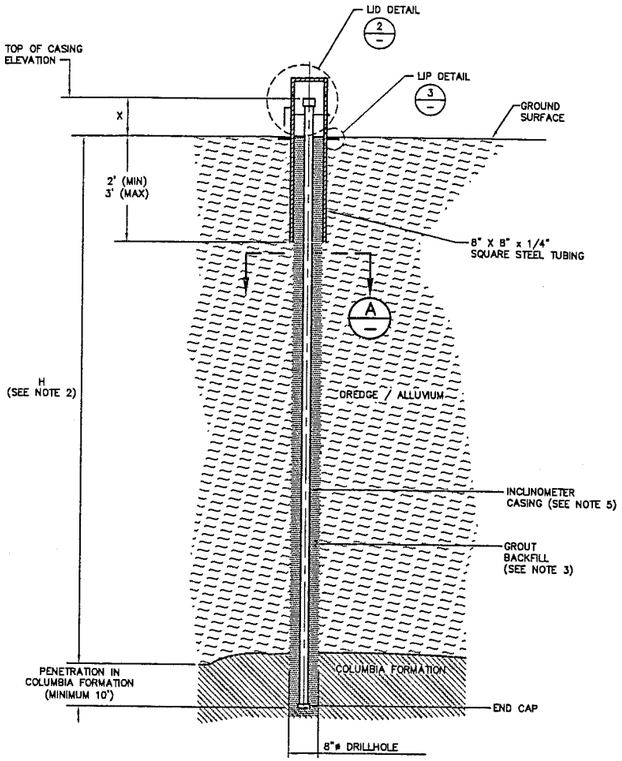
DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: NOT TO SCALE
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JOC	MAR 03		
CHK BY	RDE	APR 03	SHEET TITLE: GEOTECHNICAL MONITORING PLAN DETAILS I	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501088
DRAWING NO: 88 OF 89

P: 1d\0250\02501000\02501088.dwg, Model, 9/4/2003 10:16:03 A eosyntec consultants, inc. (joc)



1 DETAIL
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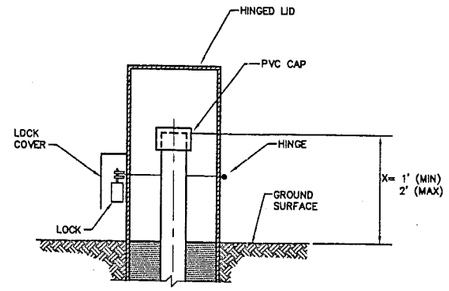
(SEE NOTES 3, 5, AND 6)



2 DETAIL
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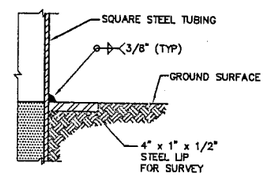
NO SCALE



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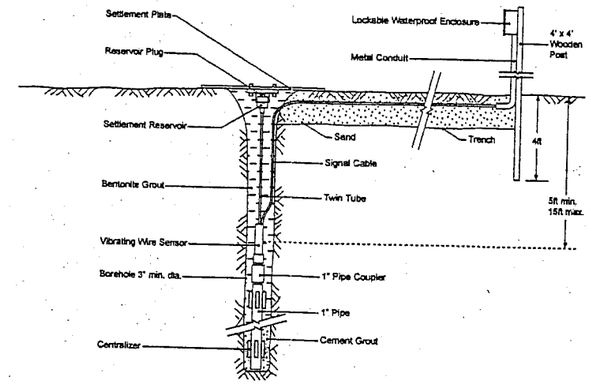

5 DETAIL (TYPICAL)
SETTLEMENT SENSOR
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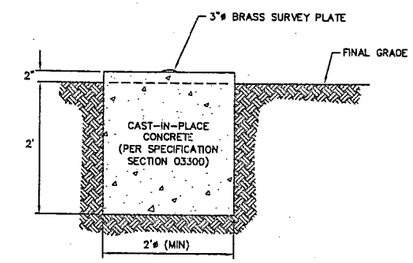
(SEE NOTES 4 AND 6)



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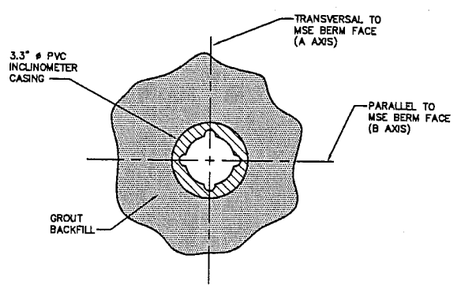

A SECTION
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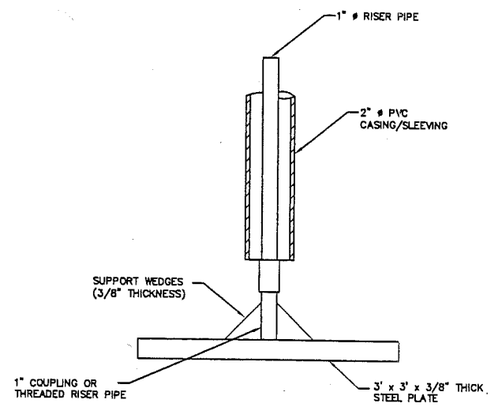

4 DETAIL (TYPICAL)
SETTLEMENT PLATE
NO SCALE

REDUCED COPY - NOT TO SCALE

NOTES:

1. SEE DRAWING 2 FOR GENERAL NOTES.
2. DREDGE AND ALLUVIUM THICKNESS VARIES. FOR SPECIFIC INFORMATION ON TOP OF COLUMBIA REFER TO THE GEOTECHNICAL CHARACTERIZATION REPORT, VOLUME 2, PART VIa (GEOSYNTEC CONSULTANTS, 2003).
3. ADDITIONAL INSTALLATION DETAILS AND MATERIAL SPECIFICATIONS ARE PROVIDED IN THE GEOTECHNICAL MONITORING PLAN.
4. INSTALLATION DETAILS MAY REQUIRE MODIFICATIONS IF INSTALLED UNDER EXISTING WASTE. ADEQUATE PROTECTION OF THE SIGNAL CABLE SHALL BE PROVIDED.
5. INCLINOMETER CASING DIAMETER AND SPECIFICATIONS PER MANUFACTURER'S RECOMMENDATIONS.
6. EQUIVALENT INSTRUMENT MAY BE USED AT ENGINEER'S DISCRETION.

PERMIT DOCUMENT

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10015 OLD COLUMBIA ROAD, SUITE A-200
COLUMBIA, MARYLAND 21046 USA
(410) 381-4332

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1	AUG 03	RESPONSE TO ONREC COMMENTS		MFH

DATE:	3 APRIL 2003		PROJECT NO. ME0250	SCALE: NOT TO SCALE
DES BY	RDE	MAR 03	PROJECT: CHERRY ISLAND LANDFILL EXPANSION NEW CASTLE COUNTY, DELAWARE	
DRN BY	JAB	MAR 04		
CHK BY	RDE	APR 03	SHEET TITLE: GEOTECHNICAL MONITORING PLAN DETAILS II	
REV BY	ESS	APR 03		
APP BY	MFH	APR 03		

SIGNATURE
DATE

DELAWARE SOLID WASTE AUTHORITY

FILE NO: 02501089
DRAWING NO: 89 OF 89

P: Id\0250\02501000\02501089.dwg, Model, 9/4/2003 10:18:10 AM geosyntec consultants, inc. (joc)

GEOTECHNICAL MONITORING PLAN

ATTACHMENT C
INSTRUMENT INSTALLATION PROCEDURES

ATTACHMENT C

C.1 Vibrating Wire Pressure Transducer

Vibrating Wire Pressure Transducers (VWPTs) are installed in multi-level clusters of two to three units per boring. Each of the borings containing VWPT clusters are referred to as "wireline piezometers". Nomenclature used in identifying each wireline piezometer in the field notebook and on drawings is the abbreviation "PZ", followed by the monitoring section identifier (1 through 18), followed by the piezometer ID (1, 2, or 3) and the depth ID (A, B, or C). For example, the wireline piezometer installed under the MSE berm in Phase V, Monitoring Section 8, is referred to as P5-PZ-08-1A.

Installation of the wireline piezometers involves: (i) drilling one borehole; (ii) installation of each VWPT; and (iii) appropriate backfilling and/or sand-packing in the borehole. In general, a borehole with a minimum diameter of six inches is advanced to a specified depth, as determined by the project geologist and/or design engineer.

Based on experience at the site, when drilling in an area that contains no waste material, results obtained when using the most satisfactory mud-rotary drilling with a 6-in. tri-cone, or roller, bit (other 6-in. rotary bits are acceptable). Drilling fluid used in the advancement of each borehole must be guar-based material. Bentonite drilling fluids are not acceptable for this application due to its designed tendency to coat the walls of the boring with a gel-like form of bentonite. Guar-based fluids (e.g., Johnson Screens' *Revert*®) will degrade more rapidly and easily flush out of the borehole when subjected to high pressure water flow. It is critical the borehole walls are free of bentonite or other coatings materials to prevent unwanted VWPT.

Drilling in an area overlying waste requires the advancement of 6¼-in. inside diameter hollow-stem augers (HSA) to a depth no less than 10 feet below the bottom of waste. The HSA then serves as a temporary casing to protect the borehole from caving of the loose waste material in the boring. After the HSA is set, mud-rotary drilling can begin inside the HSA. The drilling method is similar to un-cased drilling in technique, tools, and materials.

Following advancement of the boring to its maximum depth, a complete flushing of the borehole is performed. Flushing the borehole is performed by a constant flow of

clean water through the drill string and bit until cuttings and drilling fluids are no longer observed entering the drill tub. In general, up to 30 minutes is expected for the borehole to be adequately flushed. The driller shall observe the inflow of the drill tub and determine when the water is clean. The CQA geologist/engineer should confirm the observation before terminating the flush and retrieving drill pipe.

Immediately following drill pipe retrieval, the wireline piezometer installation should begin. It is critical that the borehole be filled with water to minimize the potential for collapse of the uncoated boring walls. First, drilling sand shall be placed at the bottom of the borehole. Lager diameter drilling sand is preferred to allow rapid sand deposition. A Number 3 drilling sand was found to provide favorable sand deposition rates. Smaller diameter sands, such as a Number 2 drilling sand, tended to pass through the water column too slowly, thus delaying the installation process. Drilling sand shall be poured into the boring at a steady and slow rate. The driller should monitor the thickness of the sand constantly and sand addition shall be stopped when the total thickness of sand at the base of the borehole is between one and one and one-half feet.

After achieving the correct thickness of sand at the base of the borehole, the first VWPT is lowered into the borehole. Each VWPT will be delivered to the boring location by the CQA geologist/engineer. Prior to installation, the CQA geologist/engineer will calibrate and pre-assemble each VWPT. When ready for installation, the CQA geologist/engineer will present a pressure transducer submerged in water and sealed with a latex membrane. A length of five-conductor cable is attached to the transducer. The borehole must be filled with water to overflowing at the time of installation. The installer shall lower the VWPT, still protected by the latex membrane, into the water. Once the VWPT is completely submerged, the latex membrane is removed and discarded outside of the borehole. The VWPT shall be lowered by cable to the base of the borehole, and rests lightly on top of the sand installed earlier. It is recommended to measure and mark on the VWPT wire the length needed to place the VWPT at the selected depth. The likelihood of installing a VWPT at the incorrect depth is minimized by taking this extra step because it is common for the VWPT to become lodged in the borehole above the base. By pre-marking the total length of wire needed, the installer can be assured that the VWPT is set at the correct depth. Additional cable is fixed to the drill head to prevent it from falling into the borehole.

Once installed, an additional one foot of drilling sand is poured into the borehole to seat the VWPT. The thickness of the overlying sand is critical and all efforts should be

made to keep overlying sand at a thickness of one to one and one-half feet. Bentonite chips are added to the borehole slowly to raise the bottom of the boring to one-foot below the elevation of the next clustered VWPT. Each clustered VWPT is installed in a manner similar to the method described above. When all clustered VWPT are installed, the borehole is filled to the ground surface with bentonite chips. There is no need to complete the borehole with sand or concrete, however it may be useful to cap the borehole with one to three feet of drilled cuttings.

C.2 Inclinometer Installation

Coupling Requirements

Care must always be taken to seal inclinometer couplings and bottom caps against intrusion of backfill. Couplings with O-Rings do not require additional sealing, but others usually require sealing mastic and tape. Where pop-rivets are intended to shear to allow telescoping movement, sealing mastic and tape should be used over the rivet heads. Even with rigid riveted couplings, the stem of the rivet occasionally pulls out during installation, and rivet heads should be filed smooth and sealed. Solvent cement is used on most rigid plastic couplings for sealing and tensile strength and usually one or more pop-rivets are installed on each side of the coupling to provide strength while the cement sets. When maximum tensile strength is required across cemented couplings in ABS or PVC casing, a primer should be used before the solvent cement is applied. Rivets should not be installed in casing grooves or any other location that would interfere with tracking of the probe.

When assembling couplings, one must be careful to avoid creating spiraled casing. Alternate couplings should be twisted left and right before fixing.

Borehole Requirements

At CIL, there is a risk of borehole collapse during installation, the borehole should be supported by drilling mud, drill casing, or hollow-stem augers. Drill casing or hollow-stem augers should be used if any doubt exists about the ability of drilling mud to support the borehole. Boreholes should be as near as possible to true vertical.

In general, the bottom of the inclinometer casing should be fixed from translation so that absolute deformation data can be calculated by assuming base fixity, and thus the borehole should be advanced to the Columbia Formation.

Installation in Boreholes

The annular space between the borehole wall and inclinometer casing should be backfilled with grout, sand, or pea gravel. Grout backfill is more likely than granular backfill to fill the annular space completely and is therefore recommended.

When a grout backfill is used, grout can be tremied via a pipe inserted outside the inclinometer casing. After the annual space between the borehole wall and inclinometer casing is filled with grout, a measured volume of water is pumped to displace grout from most of the grout pipe, the grout pipe s raised a short distance, and the check valve closes. The remaining grout in the grout pipe is removed by flushing thoroughly with water, under low flow to avoid reopening the check valve. Two methods are available for overcoming buoyancy until grout sets and for ensuring that the casing remains as straight as possible in the borehole. First, an adequate bottom weight can be attached to the bottom cap. Second, the weight of the grout pipe can be used, temporarily weighting the top of the inclinometer casing while the grout pipe is raised to slush with water. The second method is preferable for deep holes, for which the magnitude of the bottom weight would be used if the inclinometer casing has telescoping couplings.

MANUFACTURER'S INFORMATION

GEOKON

The World Leader in Vibrating Wire Technology

48 Spencer Street
Lebanon, NH 03766, USA
Tel: 603•448•1562
Fax: 603•448•3216
E-mail: geokon@geokon.com
http://www.geokon.com

Instruction Manual

Model 4600

VW Settlement Sensor

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(Doc Rev C, 4/01)

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4. Data Reduction 5

5. Maintenance and Trouble Shooting 5

Appendix A

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Appendix B

Model 4600M Multilevel Settlement Monitoring System 8

1. General Description

The 4600 Settlement System is designed to measure the settlement of a point relative to a point located immediately below it, in solid ground (bedrock). The usual method of installation is shown in Figure 1.

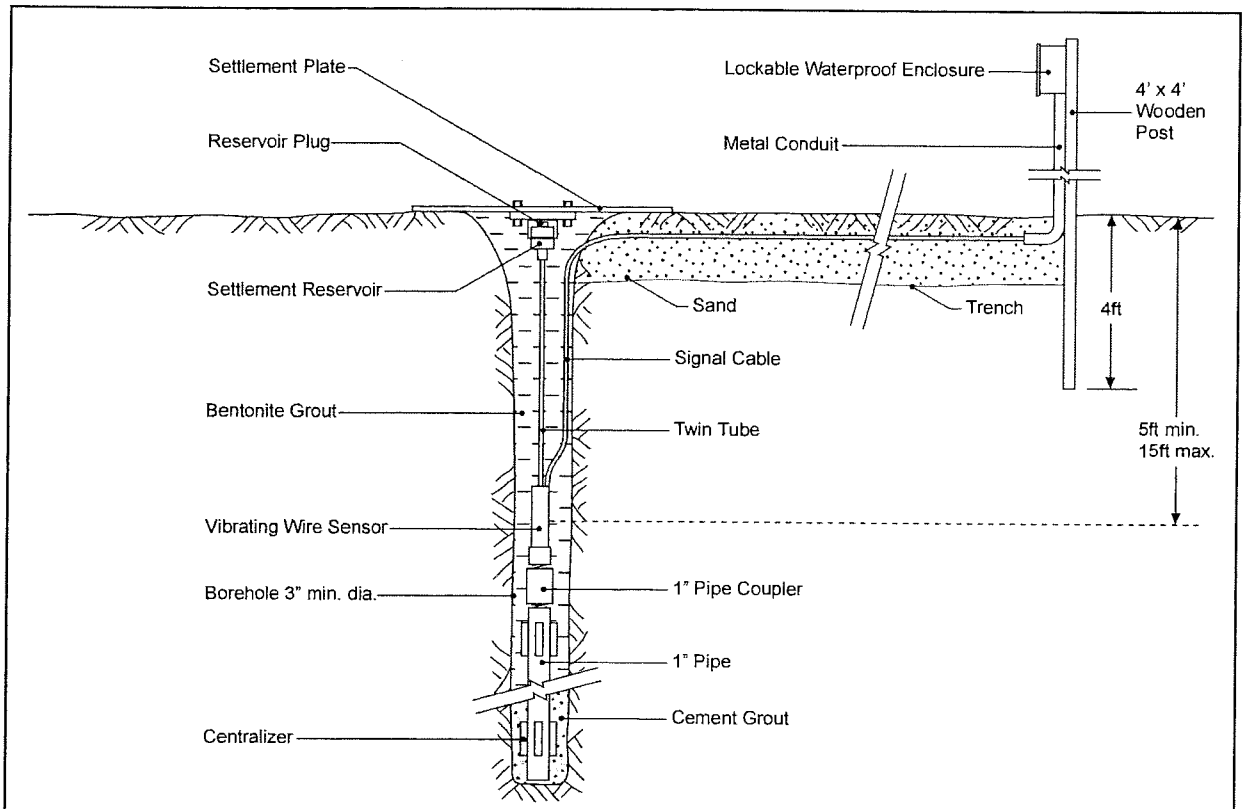


Figure 1. Model 4600 V.W. Settlement System.

The 4600 system has the disadvantage of requiring a borehole to reach solid ground but has the distinct advantage of avoiding the necessity for long horizontal runs of liquid-filled tubing to a remote readout location. The system is particularly suited to the measurement of settlements below sand islands constructed in marine environments.

A series of 4600 system, installed vertically above each other in a single borehole, can be used to monitor subsurface settlements at different elevations.

A pressure sensor is located in solid ground by attaching it to the upper end of a steel pipe, or rod, placed inside a borehole drilled to bedrock. The lower end of the pipe is grouted in place. A liquid-filled tube extends upwards from the sensor to the reservoir, which is attached to a settlement plate.

The settlement plate, usually located at the ground surface, (i.e. the elevation of the mouth of the borehole) settles with the ground, thus altering the height of the liquid column inside the liquid tube above the sensor. The sensor detects the change in liquid pressure and is read by means of an electrical cable running up the borehole and then horizontally to the readout location.

Standard systems are filled with either de-aired water or de-aired antifreeze solution, with chemicals added to prevent the growth of algae. The system is "closed" in that the inside of the sensor is connected, via a vent line,

between the sensor and the reservoir for the standard sensor range (7 meters) is 3 to 5 meters. The minimum spacing can be smaller so long as the spacing exceeds 3 times the anticipated maximum settlement. Thus if the anticipated maximum settlement is 0.5 meters, the sensor/reservoir spacing can be as close as 1.5 meters.

2.2

The Model 4600 Assembly is usually shipped with the liquid tube pre-filled with de-aired liquid. The liquid tube is of such a length to accommodate the spacing between sensor and reservoir specified at the time of ordering. Measure the depth of the borehole and prepare a length of pipe, (1" water-pipe is ideal), which will place the sensor at the desired elevation, (usually from 3 to 5 meters below the surface depending on the anticipated settlement, as previously discussed.)

2.3

Attach the sensor to the upper end of the pipe (the sensor normally has a matching thread built into it). Tie a long piece of rope to the upper end of the pipe and lightly tape a grout pipe to the lower end of the pipe. Lower the pipe into the borehole until it rests on the bottom.

2.4

Tremie full strength grout into the bottom 1.5 meters of the borehole. Pull the grout-pipe up 2 meters and tremie in a soft bentonite grout until the borehole is full.

2.5

If the hole is cased, the casing can now be removed. But first, tie the reservoir and signal cable to the rope and tie the rope to the top of the drill mast so that the casing can slide over and around the reservoir and signal cable as the casing is removed from the borehole.

2.6

4600 Settlement Systems are usually shipped with the reservoir completely filled with de-aired liquid so that there is no danger of air bubbles entering the liquid tube during shipment. To put the 4600 system into service it is necessary, now, to remove 10cc of liquid from the top of the reservoir and to connect the top of the reservoir to the desiccant chamber and vent line. Grip the Swagelock cap on top of the reservoir and pull the reservoir plug out of the top of the reservoir, (the larger of the two Delrin plugs). A syringe is provided for removal of the liquid and a short copper U-tube is supplied, with fittings, to be connected to the top of the reservoir after removal of the two Swagelock caps. Before replacing the reservoir plug and connecting the U-tube, add a few drops of light oil to the surface of the liquid to prevent evaporation.

2.7

Attach the settlement flange to the settlement plate using the bolts supplied.

2.8

While holding the reservoir in an upright position at all times, the settlement flange and plate can now be attached to the reservoir using the two machine screws provided or by using PVC cement obtained locally. (Federal Regulations prohibit the shipment of PVC cement). Apply PVC cement to the inside of the reservoir extension (see Figure 2) and to the outside of the top of the reservoir housing.

and **G** is the calibration factor supplied with the sensor.

A typical calibration sheet, as supplied by the factory, is shown in Figure 3 (page 6).

$\mathbf{E_0}$ = 541.623 meters

$\mathbf{R_0}$ = 6030

$\mathbf{R_1}$ = 6800

G = 1.78 mm/digit

E = 541.623 – (6800 – 6030) 1.78 x 10^{-3}

E = 540.252 meters

Or, in other words, there has been a settlement of 1.371 meters.

4.2 Corrections for temperature

Usually, since the 4600 system is completely buried, temperature effects are negligible.

The elevation, E_T, corrected for temperature is given by the equation.

$$\mathbf{E_T = E_0 - (R_1 - R_0)\, G + (T_1 - T_0)\, K}$$

where $\mathbf{T_0}$ is the initial temperature in °C,

$\mathbf{T_1}$ is the subsequent temperature in °C,

and **K** is the temperature correction factor given on the calibration sheet.

5. Maintenance and Trouble Shooting

Since all the 4600 Settlement System components are buried there is no maintenance to observe and little can be done in the event the readings become suspect. Unstable readings, especially with data loggers, may be caused by electrical noise form nearby power lines or electrical equipment. Make sure that the ground conductor is connected to the ground on the datalogger, or to the blue clip on the GK401 or GK403 patchcord.

Resistance between the black and red conductors should be 180 ohms ± 10 ohms plus 5 ohms for every 100 meters of lead wire.

Resistance between the green and white wires depends on the temperature as shown by the Thermistor Chart in Appendix A (page 7).

Appendix A:

Thermistor Linearization using Steinhart and Hart Log Equation

Tech Memo 91-03 Doc Rev 6-94, Geokon, Inc.

Thermistor Type: YSI 44005, Dale #1C3001-B3, Alpha #13A3001-B3

Basic Equation:

$$T = \frac{1}{A + B(LnR) + C(LnR)^3} - 273.2$$

where:

T = Temperature in °C.

LnR = Natural Log of Thermistor Resistance

A = 1.4051×10^{-3}

B = 2.369×10^{-4}

C = 1.019×10^{-7}

Note: Coefficients calculated over -50° to +150° C. span.

Resistance versus Temperature Table

Ohms	Temp	Ohms	Temp	Ohms	Temp	Ohms	Temp	Ohms	Temp
201.1K	-50	16.60K	-10	2417	+30	525.4	+70	153.2	+110
187.3K	-49	15.72K	-9	2317	31	507.8	71	149.0	111
174.5K	-48	14.90K	-8	2221	32	490.9	72	145.0	112
162.7K	-47	14.12K	-7	2130	33	474.7	73	141.1	113
151.7K	-46	13.39K	-6	2042	34	459.0	74	137.2	114
141.6K	-45	12.70K	-5	1959	35	444.0	75	133.6	115
132.2K	-44	12.05K	-4	1880	36	429.5	76	130.0	116
123.5K	-43	11.44K	-3	1805	37	415.6	77	126.5	117
115.4K	-42	10.86K	-2	1733	38	402.2	78	123.2	118
107.9K	-41	10.31K	-1	1664	39	389.3	79	119.9	119
101.0K	-40	9796	0	1598	40	376.9	80	116.8	120
94.48K	-39	9310	+1	1535	41	364.9	81	113.8	121
88.46K	-38	8851	2	1475	42	353.4	82	110.8	122
82.87K	-37	8417	3	1418	43	342.2	83	107.9	123
77.66K	-36	8006	4	1363	44	331.5	84	105.2	124
72.81K	-35	7618	5	1310	45	321.2	85	102.5	125
68.30K	-34	7252	6	1260	46	311.3	86	99.9	126
64.09K	-33	6905	7	1212	47	301.7	87	97.3	127
60.17K	-32	6576	8	1167	48	292.4	88	94.9	128
56.51K	-31	6265	9	1123	49	283.5	89	92.5	129
53.10K	-30	5971	10	1081	50	274.9	90	90.2	130
49.91K	-29	5692	11	1040	51	266.6	91	87.9	131
46.94K	-28	5427	12	1002	52	258.6	92	85.7	132
44.16K	-27	5177	13	965.0	53	250.9	93	83.6	133
41.56K	-26	4939	14	929.6	54	243.4	94	81.6	134
39.13K	-25	4714	15	895.8	55	236.2	95	79.6	135
36.86K	-24	4500	16	863.3	56	229.3	96	77.6	136
34.73K	-23	4297	17	832.2	57	222.6	97	75.8	137
32.74K	-22	4105	18	802.3	58	216.1	98	73.9	138
30.87K	-21	3922	19	773.7	59	209.8	99	72.2	139
29.13K	-20	3748	20	746.3	60	203.8	100	70.4	140
27.49K	-19	3583	21	719.9	61	197.9	101	68.8	141
25.95K	-18	3426	22	694.7	62	192.2	102	67.1	142
24.51K	-17	3277	23	670.4	63	186.8	103	65.5	143
23.16K	-16	3135	24	647.1	64	181.5	104	64.0	144
21.89K	-15	**3000**	**25**	624.7	65	176.4	105	62.5	145
20.70K	-14	2872	26	603.3	66	171.4	106	61.1	146
19.58K	-13	2750	27	582.6	67	166.7	107	59.6	147
18.52K	-12	2633	28	562.8	68	162.0	108	58.3	148
17.53K	-11	2523	29	543.7	69	157.6	109	56.8	149
								55.6	150

Appendix B:

a few drops of light oil to the liquid surface to prevent evaporation. Now replace the Bleed Screw and tighten. It would be better if the Reservoir were not laid on its side from this point on.

The spring-loaded anchors are tied and held in their closed position using the trip cords supplied. The hydraulically actuated cutter or the manually operated pull-pins are passed through the loops in the trip cords. A tremie pipe may be taped lightly to the lowermost sensor, or to the pipe on which it sits.

As the assembly is lowered into the borehole, each Connection Valve Screw is removed and replaced by the Seal Screw provided. Note: more than one person will be required to organize and control the various hydraulic leads/pull-cords, tubes and cables as they are lowered into the borehole. If pull-cords are used make sure that they are kept free at all times so that the anchors cannot be tripped prematurely.

The uppermost reservoir, if located at the surface, can be attached to a settlement plate, as described in Section 2.8

When all the sensors are in position, the casing can be pulled, (if the borehole is cased,) taking care not to damage or pull on the electrical cables coming from each sensor. As the casing is pulled, each spring-loaded anchor is tripped hydraulically as it clears the bottom of the casing. The borehole may be left open, or filled with a soft bentonite cement grout tremied into the borehole as the tremie pipe is retracted.

Multiple Level Settlement Systems

I- Introduction

Known as the "Missing Link," the Seminole Expressway Project 2 is the northern 5.7-mile portion of Toll Road 417/Central Florida GreeneWay. It will connect I-4 to Toll Road 417, which currently ends at US 17-92 in Sanford. Two new ramps will be constructed at both Lake Mary Boulevard and U.S. 17 (92), with new interchanges being included at County Road (C.R.) 46A, Rinehart Road and I-4. The $265 million project is expected to open to traffic in 2003.

The ramp construction at Lake Mary Boulevard involves the construction of a new embankment over soft muck deposits. Large settlements are anticipated due to the abundant presence of high organic content soils. The long-term settlements may include both primary consolidation and creep of the organic materials. Preloading construction technique was used to reduce the settlement of the future embankment. In order to verify the preliminary design and get a better understanding of the settlements of the organic soils, a site-monitoring program was undertaken. Due to the variable complex geology conditions as well as time of interest, settlement plates are augmented with settlement sensors. Multiple settlement sensors in a given hole and the use of vibrating wire instrumentation allowed for accurate assessment of settlement by layer as well as long-term response. Remote data acquisition system was used to send the field data to central computer at the University of Florida.

II- Equipment

Geokon, Inc. of Lebanon, NH, manufactured the settlement sensors. The equipment list included: settlement cells (vibrating wire pressure sensors) and data logger. In order to measure the settlement of each layer, a series of three settlement cells had been connected in each borehole.

Settlement cells consisting of vibrating wire pressure sensors located in a "closed" column of de-aired water or de-aired antifreeze connected to a reservoir, which is attached to another sensor or settlement plate. Each reservoir was equipped with a vent line, which is connected to a desiccant chamber to prevent moisture from entering the vent line from the reservoir. This arrangement ensures that the sensor readings are not influenced by temperature changes inside the reservoir, or by changes in barometric pressure. Three settlement cells are connected one on top of each other in each borehole to provide the settlement data for each of the soil layer. With the soil layer thickness information provided by the CPT soundings, the location of each cell had been determined to monitor settlement of each layer. The bottom VW sensor was fixed to the hard material layer at the bottom of borehole which is considered stationary. The top reservoir is attached to a steel plate and settles with the ground level. The two intermediate sensors and reservoirs are connected to each other and attached to the interface of the soil layers by two mechanical ground anchors.

Data logger using Geokon's Model 8020 MICRO-10 with a vibrating wire interface, data reduction software (Geokon's 8020-2) and a watertight metal enclosure. Also, the data logger will contain a cellular telephone package (Geokon's 8020-4) with modem and antenna compatible with the data logger. A 12-volt power supply with a solar panel (AP-75) and regulator for maintaining power was also included. Since the data will be collected over a long time frame (years), it is proposed that the cellular phone package was purchased too remotely download the data.

III- Installation

comparison. The graph also shows some rebound (from 1 to 2 inches) when the surcharge was removed in June 2001.

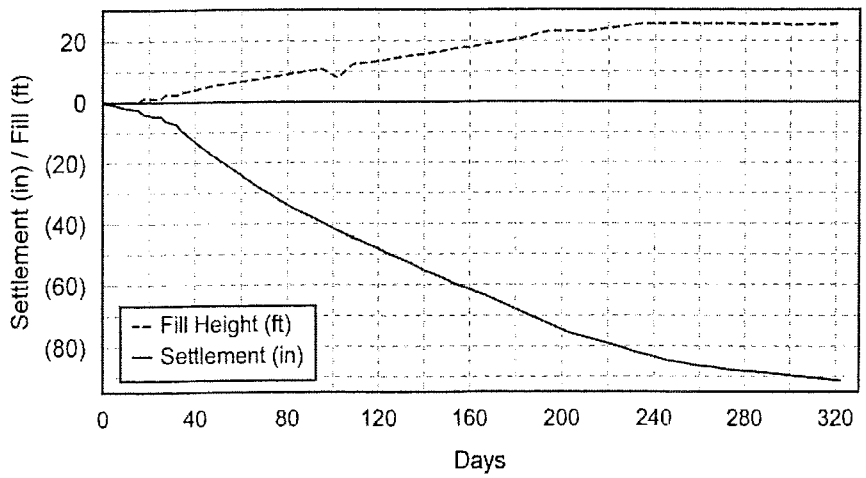


Figure 1: Settlement versus surcharge height

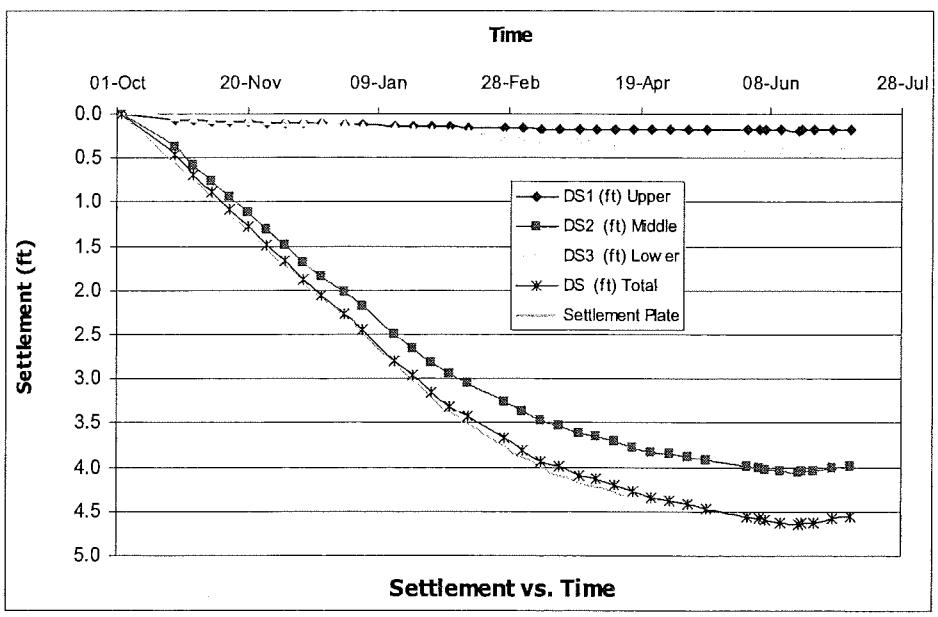


Figure 2: Settlement of different layers

V- Conclusions

The application of a multi level settlement system in this project has provided a unique set data which can be use to obtain detailed movement of each layer. Early stage data has showed a good agreement with other method of settlement acquisition. Long-term movement can be monitored with the automatic remote data acquisition system.

GEOCOMP Corporation
1145 Massachusetts Avenue
Boxborough, MA 01719

www.GEOCOMP.com
phone: 978-635-0012
fax: 978-635-0266

Instrument Installation Procedure

Vibrating Wire Piezometers (VWPZ)

bridging in the casing or auger, and the water level will be maintained. While withdrawing, effort will be made to minimize the length of unsupported hole but to avoid buildup of materials inside the casing or augers. The Bentonite shall be thoroughly tamped with a piece of tubing/casing or some other tamping device after each 2ft of Bentonite chips.

j. Readings will again be taken for the vibrating wire transducer and thermistor; the water level in the casing shall also be recorded.
k. The chips should be allowed to swell for 10-15min before the next piezometer is installed.
l. Repeat steps d through h for additional piezometers.
m. Top the hole off with Bentonite chips or pellets to grade
n. A protective elbow joint of PVC pipe or 6-12" thickness of sand shall be placed to protect the wires as they come out of the hole onto the ground surface. Pipe shall be covered with sand or similar backfill material.
o. Where cables run horizontally at the foundation/fill interface, clean sand shall be placed around the cable for 3 inches on either side, above and below. The cable shall be placed slack to minimize tubing stretching during subsequent straining of the foundation. Multiple cables running nearby shall be separated by at least 1ft. Covered cables will be tested prior to the placement of fill for continuity.
p. Cables will have a permanent numbering system with markings at the piezometer, at the end of cable, and every 25ft in between.
q. Placement and compaction of fill material within 1ft of the cables shall be done with hand tools only. Equipment that causes rutting of 2 inches shall not be permitted to drive over the wires until the height of fill is at least 5ft.

A post-installation acceptance test shall be performed after completion and cable placement by collecting three independent readings of the piezometric elevation; the reading shall differ by no more than 0.1ft of water pressure.

Note that the horizontal position shall be determined after installation to a ±1ft and the elevation of the piezometer diaphragm shall also be given to ±0.1ft

All materials used shall conform to the specifications given in the contract document. It is possible that field conditions dictate slight variations from the above procedures. Any variations shall be implemented with the prior approval of the Engineer

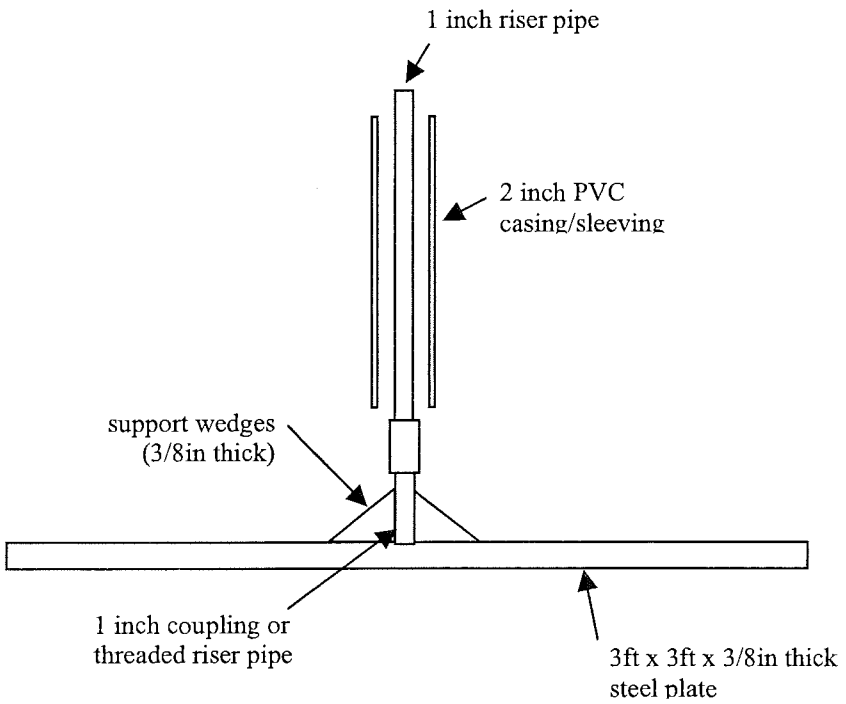
GEOCOMP Corporation
1145 Massachusetts Avenue
Boxborough, MA 01719

www.GEOCOMP.com
phone: 978-635-0012
fax: 978-635-0266

Instrument Installation Procedure

Settlement Plate (SP)

Figure 1 – Settlement Plate



GEOCOMP QA/QC Checklist

Vibrating Wire Piezometer Readout Unit

Project Name _____

Delivery Details

Rec'd		Date
Batch Identifier		
Quantities OK?		check against order details

Serial No	Charger, Leads, software	Calib.Cert?	Visual Inspection

Manufacturers QA/QC

QA/QC inspection?
Calibration certificates?
Checklists?

GEOCOMP QA/QC Checklist

Vibrating Wire Piezometer

Project Name _____

Delivery Details

	Rec'd	Date
	Batch Identifier	
	Quantities OK?	check against order details

			Visual Inspection		
Serial No	Match cable and on QA/QC	Calib.Cert?	Connector	Inst.	Cable

Manufacturers QA/QC

QA/QC inspection?	
Test Data?	
Calibration checklist and certificates?	

GEOCOMP pre-installation acceptance test record form

Vibrating Wire Piezometer

Project Name _____
Instrument Type Vibrating Wire Piezometer
Serial No. _____

Test Details

Date/Time _____ Temperature _____
Technician _____ BaroPressure _____

Testing Equipment

Readout Unit GK403 Standard Controls _____
Serial No. _____ _____

Applied Pressure (psi)	Reading	Temp	Comments
0			Matches Factory Readings?
10			
20			
30			
40			
50			

Calculated Linear Gauge Factor _____
Manufacturer's Gauge Factor _____
Match _____

Instrument Cable connection _____ OK? *read while bending*
Connector end _____ OK? *check for stability*

Cable Length _____
Coil Resistance (Ohms) _____
Therm Resistance (Ohms) _____
Shorts? _____

Pass/Fail? _____

General comments/notes _____

Instrument Installation Record

VIBRATING WIRE PIEZOMETER - ID _____

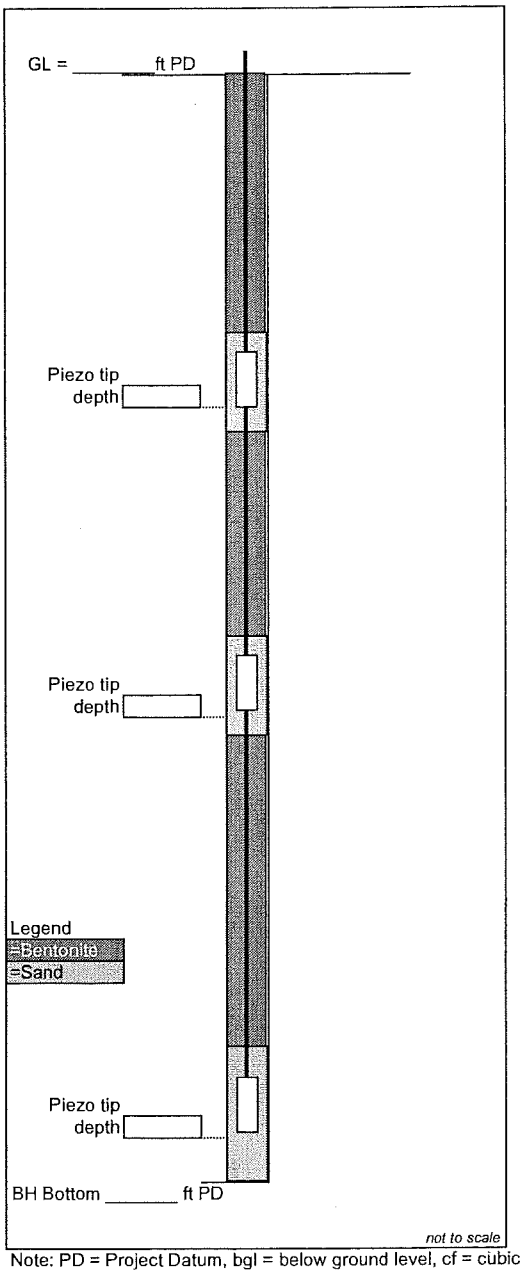
Installation Start Date _____
Installation Finish Date _____
Weather _____
_____
Installed by _____
Supervised by _____
Drillers _____
_____
Rig _____
Augers _____
Borehole Diameter _____ in

Chainage _____
Offset _____

Easting _____
Northing _____

Grnd Elev. _____ ft PD

Comments



Note: PD = Project Datum, bgl = below ground level, cf = cubic feet

Geology

Planned Installation

BH bottom (depth) _____ ft bgl
BH bottom (elev. PD) _____ ft PD

Piezometer Tip (depth) _____ ft
Top of Sand (depth) _____ ft
Top of Bentonite (depth) _____ ft

Grout _____ cf

Actual Installation

BH bottom (depth) _____ ft bgl
BH bottom (elev. PD) _____ ft PD

Piezometer Tip (depth) _____ ft
Top of Sand (depth) _____ ft
Top of Bentonite (depth) _____ ft

Grout _____ cf

Installation Details

	1	2	3
Tip Elevation	_____ ft PD	_____ ft PD	_____ ft PD
VWPZ Model	_____	_____	_____
Serial	_____	_____	_____
VWPZ wire length	_____ ft	_____ ft	_____ ft
VWPZ body length	_____ in	_____ in	_____ in
Calibration Factor	_____ /ft	_____ /ft	_____ /ft
Thermal Factor	_____ /deg F	_____ /deg F	_____ /deg F
Zero Reading	_____ Hz	_____ Hz	_____ Hz
Zero Temperature	_____ deg F	_____ deg F	_____ deg F

Samples

Sample No.	depth (ft bgl)	Pen/Rec	Description

Rosalie Island Grading Project - Instrument Installation Record

INSTRUMENT TYPE & ID _____

ıstallation Start Date _____
·tallation Finish Date _____
Weather _____

Installed by _____
Supervised by _____
Drillers _____

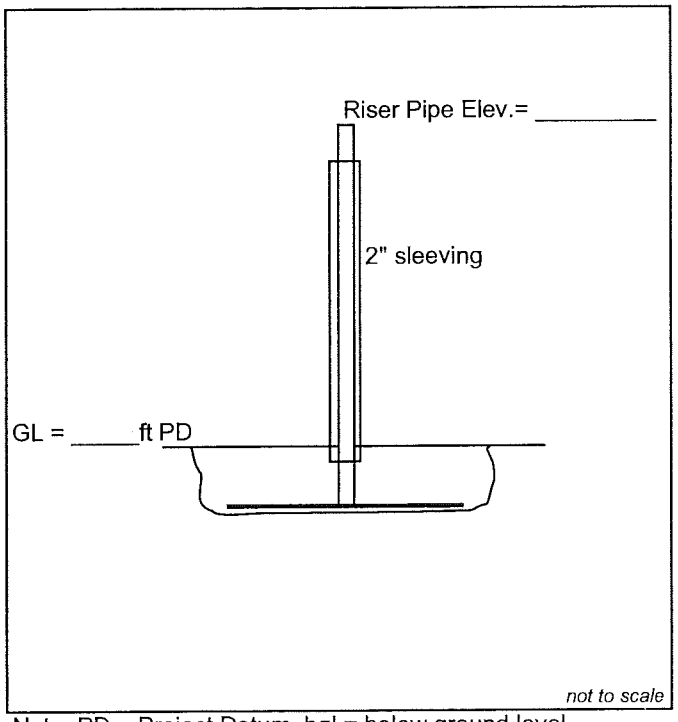
Rig _____
Augers _____
Borehole Diameter _____

Chainage _____
Offset _____

Easting _____
Northing _____

Grnd Elev. _____ ft PD

Comments



Note: PD = Project Datum, bgl = below ground level

Geology

Planned Installation

Base Material Existing Ground

Length of 1in pipe used 5 ft

Actual Installation

Base Material _____

Length of 1in pipe used _____ ft

Installation Details

Plate Level? _____ (yes/no)
Top of riser pipe elevation _____ ft PD
Interior riser pipe elevation check _____ ft from top of riser

GEOTECHNICAL MONITORING PLAN

ATTACHMENT D
INSTRUMENT REPAIR

APPENDIX D

STANDARD VERTICAL INCLINOMETER SPLINT REPAIR

1. Tie-off the aluminum or steel protective casing to 3 driven grade stakes utilizing a 2-lb. hammer and a 100-ft. nylon rope.

2. Open or remove locking lid on the protective casing and survey top of blue ABS cap (which is inserted within the ABS casing) in order to extend replacement to same elevation. A surveyor's level and rod is needed to accomplish this task.

3. Excavate and shovel (around inclinometer) to approximately 1.5 ft. below the ABS casing problem area utilizing an excavator and a hand shovel. The protective casings are approximately 7.5 ft. long and extend above the ground surface 2 to 5 ft.

4. Tie top of protective casing unit to the excavator bucket with a strap. While relieving downward pressure, saw the ABS casing with a carpenter's saw as square as possible and plug the hole with a towel when finished.

5. Using the blue ABS cap as a guide, file the end of the cut with a wood rasp until square. Clean around ABS casing approximately 1 ft. below cut with paper towels.

6. Saw a 1 ft. section from the male end of a new 10 ft. ABS casing and square the cut end. A measuring tape will be needed to perform this procedure. Generally, the coupling portion of the male piece is not counted as part of the one foot length.

7. Butt (squared ends to each other) the 1 ft. ABS section to the previously exposed ABS casing within the ground. Apply ABS cement to butt surface and tape outside area of both sections using electrician's tape.

8. Insert rodded T Tool into the grooves of ABS casing to the butted area of the two sections. Vice grip the rod at this location in order to achieve the necessary groove alignment between the casings once the splint has been placed.

9. Apply ABS cement on outside surface of both casing sections approximately 6-in. above and below the butt.

10. Place 3-in. Schedule 80 PVC splint with 3/8 gap along entire 10-in. length on the butt and tighten the two 3.5 in. hose clamps located near the ends with a screwdriver.

11. Apply ABS cement to the split along the PVC and duct tape entire splint.

12. Apply ABS cement to the outside surface of the eventual coupling placement location of the splinted 1 ft. ABS section. Insert the ABS coupling and apply ABS cement in the same fashion to the replacement section, which will extend to the previously surveyed elevation.

13. Apply Vaseline® with a putty knife around splint, 1 ft. ABS section, and ABS replacement section to help prevent heave of casing or wrap multiple layers of plastic around the ABS section(s) to achieve the same effect. Upon completion, place ABS cap on casing.

14. Backfill around ABS column with fine to course sand until top of aluminum anodized protective casing would be approximately 1 in. above the ABS casing upon replacement.

15. Center the aluminum protective casing over the ABS column and backfill around casing with fine to course sand. Tamper and compact sand by foot or butt of shovel while plumbing protective casing with a level until the original ground surface has been reached. The excavator will backfill the remaining area simultaneously and assure the inclinometer is accessible by vehicle.

16. Sand is then placed within the aluminum protective casing (around the ABS casing) until the top is encountered.

17. Place lower portion of lid with a 5/32-in. Alan wrench in order to secure upper locking cap.

NOTE: The underlined words denote materials needed to perform the procedure.

GEOTECHNICAL MONITORING PLAN

ATTACHMENT E
OUTLINE OF MONITORING REPORT

ATTACHMENT E

QUARTERLY GEOTECHNICAL MONITORING REPORT

Cherry Island Landfill
Wilmington, Delaware

1. INTRODUCTION

2. LANDFILL ACTIVITIES

3. INSTRUMENTATION REPAIR/REPLACEMENT

4. MONITORING SECTIONS

4.1 Monitoring Section 1
4.2 Monitoring Section 2
4.3 Monitoring Section 3
4.4 Monitoring Section 4
4.5 Monitoring Section 5
4.6 Monitoring Section 6
4.8 Monitoring Section 7
4.9 Monitoring Section 8
4.10 Monitoring Section 9
4.11 Monitoring Section 10
4.12 Monitoring Section 11
4.13 Monitoring Section 12
4.14 Monitoring Section 13
4.15 Monitoring Section 14
4.16 Monitoring Section 15
4.17 Monitoring Section 16
4.18 Monitoring Section 17

5. SUMMARY

APPENDICES

APPENDIX H
APPLICABLE APPROVALS

INCLUDING:
SWA-99/10, Yard Waste Recycling approval letter
SWA-98-14, Asbestos Disposal approval letter
Clean Earth, Slag and Barrier approval letter dated May 9, 2000
Tarp approval letter dated February 28, 1996

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

WASTE MANAGEMENT
SECTION

HAZARDOUS WASTE: (302) 739-3689
SOLID WASTE: (302) 739-3820
FAX.: (302) 739-5060

Approval SWA-99/10

CHERRY ISLAND LANDFILL
RECEIVED
SEP 23 1999

Effective Date: September 20, 1999
Expiration Date: September 20, 2004

Contact Person: Mr. Pasquale S. Canzano, Chief Operating Officer

Mailing Address: Delaware Solid Waste Authority
1128 S. Bradford Street
P.O. Box 455
Dover, Delaware 19903-0455

Location of Approved Activity: Delaware Recycling Center (Pigeon Point)
Northern Solid Waste Management Center - 2
Central Solid Waste Management Center
Southern Solid Waste Management Center
Pine Tree Corners Transfer Station (collect/stockpile only)
Cheswold Transfer Station (collect/stockpile only)
Sussex County Transfer Stations (collect/stockpile only)

In accordance with the Delaware Regulations Governing Solid Waste, Section 2.C.6, approval is hereby granted to DSWA to collect and stockpile yard waste comprising of grass, leaves, and branches at the above locations. Additionally, in accordance with the Delaware Regulations Governing Solid Waste, Section 2.C.2, approval is hereby granted to compost grass, leaves. and branches at the Delaware Recycling Center, NSWMC-2, CSWMC, and SSWMC.

This approval is based upon the following documents:

1. DSWA letter, *DSWA Yard Waste Recycling Program,* dated May 17, 1999.
2. DSWA letter, *Expansion of Yard Waste Collection Program, Cheswold Transfer Station*, dated June 4, 1999).
3. DSWA plan, *Plan of Operation for a Statewide Yard Waste Recycling Program*, revised July 23, 1999.

This approval is subject to the following conditions.

1. Operation of the yard waste program shall be conducted in accordance with the DNREC approved *Plan of Operation for a Statewide Yard Waste Recycling Program.*

2. Stockpiles shall be inspected at least once each operating day to ensure that unwanted material (such as municipal solid waste) has not been deposited in the yard waste. Unwanted materials shall be removed and disposed of properly. A record of inspections shall be maintained by the DSWA and shall be available for inspection by the DNREC.

3. Stockpiled yard waste shall be shredded at least twice per year. DSWA shall maintain records which demonstrate compliance with this approval condition.

4. Stockpiling and composting of yard waste shall not result in odors associated with solid waste being detected off site.

5. Stockpiling and processing of yard waste shall be conducted in a manner that eliminates, to the extent possible, insect and rodent breeding.

6. Appropriate mechanisms shall be used to prevent fires. Yard waste and its products shall be staged in a manner that provides access to fire fighting equipment and protects the landfill and its control systems.

7. The DSWA shall notify the DNREC immediately anytime there is a fire involving the stockpile, the shredded material, or the compost. Immediate notification shall be supplemented by written notification within 5 business days. Written notification shall include the cause of the fire, actions taken, and preventive measures to be implemented (if applicable).

8. Shredded yard waste or compost used at the landfills shall comply with the applicable requirements specified by the solid waste facility permit.

9. A copy of this approval and the approved *Plan of Operation for a Statewide Yard Waste Recycling Program* shall be maintained at any site where yard waste is collected, stockpiled, or composted.

10. This approval does not relieve the Delaware Solid Waste Authority from complying with other applicable federal, state, or local statutes, regulations, or ordinances.

Any violation of the conditions of this approval, regulations promulgated by DNREC, Secretary's Orders, or provisions of 7 Del. C. Chapter 60 shall be grounds for termination of the approval.

If you have any questions concerning the approval, you may contact Bob Hartman at (302) 739-3820.

Sincerely,

Nancy C. Marker

Nancy C. Marker
Program Manager II
Solid and Hazardous Waste Management Branch

RH/A9910c

cc: Richard VonStetten, Manager of Recycling, DSWA
Ann Marie Dykes, Northern Facility Manager, DSWA
Logan Miller, Central Division Manager, DSWA
Mark Mallamo, Southern Division Manager, DSWA
Jamie Rutherford, Program Manager, Solid Waste Management Branch
James Short, Environmental Scientist, Solid Waste Management Branch
Indra Batra, Environmental Engineer, Solid Waste Management Branch

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

SECTION
HAZARDOUS WASTE: (302) 739-3689
SOLID WASTE: (302) 739-3820
FAX.: (302) 739-5060

R1
SC
G+1

CHERRY ISLAND LANDFILL
RECEIVED
DEC 14 1998

APROVAL SWA-98/14

Effective Date: December 14, 1998
Expiration Date: December 14, 2003

Ann Marie Dykes
Delaware Solid Waste Authority
1128 S. Bradford Street
P. O. Box 455
Dover, DE 19903-455

Location of the Approved Activity: Cherry Island, Phase IA, Wilmington, DE

Original Approval: SWA-93/012 dated December 14,1993

In accordance with the Delaware Regulations Governing Solid Waste approval is hereby granted to Delaware Solid Waste Authority (DSWA) to continue use of the remaining capacity of Phase1A at Cherry Island Landfill for asbestos disposal. Per your request, DSWA is also permitted to fill the outer perimeter of Phase 1A with asbestos instead of solid waste; therefore, approval SWA-94/77 of December 1, 1994 issued for filling solid waste in the outer perimeter of the Phase is canceled

This approval is subject to the following conditions:

1. DSWA shall not dispose of any asbestos in Phases III, IV and V.
2. During asbestos disposal operations, cover materials approved by DNREC shall be used.
3. Compliance with the provisions of NESHAPS as they are adopted by the Air Resources Branch of DNREC.

If any further extension for continuation of this activity is required, DSWA shall notify DNREC no later than 90 days prior to expiration date.

DSWA shall notify DNREC in writing of changes in operations or procedures which were described in the original submission dated November 12,1993 to DNREC, ten (10) working days prior to putting those changes into effect.

This approval does not relieve DSWA of complying with other applicable Federal, State and local regulations and ordinances.

In the event that regulations governing the activity authorized in this approval are revised, this approval may be modified. At that time, additional limitations, requirements, and/or special conditions may be included in the approval.

Any violation of the conditions of this approval, regulations promulgated by DNREC, Secretary's orders, or provision of 7 Delaware Code, Chapter 60 will be grounds for termination of this approval.

Delaware's good nature depends on you!

If you have any questions, please feel free to contact Indra Batra at (302) 739-3820.

Sincerely,

for Nancy C. Marker
Program Manager II
Solid & Hazardous Waste Management Branch

C: cil_dcc.doc

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

WASTE MANAGEMENT
SECTION

HAZARDOUS WASTE: (302) 739-3689
SOLID WASTE: (302) 739-3820
(302) 739-5060
Via Facsimile
& U.S. Mail

CHERRY ISLAND LANDFILL
RECEIVED
MAY 11 2000

May 9, 2000

Ann Marie Andrzejewski
Delaware Solid Waste Authority (DSWA)
1128 Bradford Street
P. O. Box 455
Dover, DE 19901

Re: Alternate Landfill Cover Materials and Recovered Resources
Permit #s SW-93/02 (Revised) and SW-95/04

Dear Ms. Andrzejewski:

In accordance with Section 5.I.2.c.(4) of the Delaware Regulations Governing Solid Waste (DRGSW), the Department of Natural Resources and Environmental Control (Department) approves the use of the following materials as alternate cover materials at DSWA's Cherry Island Landfill (CIL), as requested in your February 29, 2000, letter:

1. Clean Earth (thermally treated soil)
2. Barrier (recycled construction & demolition material produced by Burns & Co. of Philadelphia)
3. Slag (produced at CitiSteel in Claymont, Delaware and from Lukens Steel in Coatsville, PA)

This approval is based on the following analytical reports:

1. Analytical report dated April 26, 2000, for PCBs and TCLP on a representative sample of thermally treated soil from Clean Earth of New Castle.

2. Analytical report dated September 16, 1999, for PCBs, BTEX and TCLP metals on a representative sample of Barrier material produced by Burns and Co., Philadelphia, PA.

3. Analytical report dated August 3, 1999, for TCLP metals on a representative sample of slag from Citisteel, Claymont, DE.

4. Analytical report dated November 20, 1997, for TCLP metals on a representative sample of slag from Lukens Steel, Coatsville, PA.

Approval for use of Bottom Ash/Reagent M Mixture (supplied by VFL from Conectiv) as cover material, also requested by DSWA in the letter dated February 29, 2000, shall be issued separately.

If you have any questions, please do not hesitate to contact Indra Batra at (302) 739-3689.

Sincerely,

Jamie H. Rutherford

Jamie H. Rutherford
Program Manager
Solid & Hazardous Waste Management Branch

JHR/ipb/tmp
IPB00006.doc

cc: Nancy C. Marker, Program Manger II, Solid & Hazardous Waste Management Branch
Indra P. Batra, Environmental Engineer, Solid & Hazardous Waste Management Branch

Delaware's good nature depends on you!

DELAWARE SOLID WASTE AUTHORITY

N.C. Vasuki, P.E., DEE
Chief Executive Officer

Pasquale S. Canzano, P.E., DEE
Chief Operating Officer

Board of Directors
Richard V. Pryor
Chairman
Ronald G. McCabe
Vice Chairman
J. Donald Isaacs
Theodore W. Ryan
Phyllis M. McKinley
William G. Turner, Jr.
John P. Healy

February 28, 1996

Ref: NSWMC-96-070

Mr. Indra Batra
Dept. of Natural Resources
and Environmental Control
89 Kings Highway
P.O. Box 1401
Dover, DE 19903

RE: TRIAL USE OF TARPS AT
THE CHERRY ISLAND LANDFILL

Dear Mr. Batra:

As we discussed on Friday, February 23, 1996, DNREC has given DSWA permission to begin a trial use of tarps for intermediate cover at the Cherry Island Landfill in accordance with my February 8, 1996 letter to Mr. Richard Folmsbee. As you stated, an approval letter from DNREC for the trial use is not required.

DSWA will purchase the tarps within the next few weeks. DSWA will inform you of the date when the tarps will be placed so DNREC may witness the placement.

If you have any questions, I can be contacted at 764-5385.

Sincerely,

Ann Marie Dykes

Ann Marie Dykes
Facility Engineer

AMD:ljh

c: N. C. Vasuki, P.E., DEE
Pasquale S. Canzano, P.E., DEE
David M. Wilhelm, P.E.
Joseph LaDana, P.E.
Nicholas J. Ferrara, III (Cherry Island, Inc.)
Anthony Casarino (Cherry Island, Inc.)
30.036.000.A

1128 S. BRADFORD STREET • P.O. BOX 455 • DOVER, DELAWARE 19903-0455
PHONE (302) 739-5361 • FAX (302) 739-4287
CITIZENS' RESPONSE LINE (800) 404-7080

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APPENDIX I
DEFINITIONS

SECTION 3: DEFINITIONS

The following words, phrases, and terms as used in these regulations have the meanings given below:

"100-YEAR FLOOD" means a flood that has a one percent or greater chance of recurring in any given year or a flood of a magnitude equaled or exceeded once in 100 years on the average over a significantly long period.

"ACTION LEAKAGE RATE" means the quantity of liquid collected from a leak detection system of a double liner system over a specified period of time which, when exceeded, requires certain actions to be taken as described in the Action Leakage Rate response plan approved by the Department.

"ACTIVE LIFE" means the period of operation beginning with the initial receipt of solid waste and ending at the completion of closure activities.

"ACTIVE PORTION" means that portion of a facility that presently has an operating permit issued by the Department of Natural Resources and Environmental Control.

"AGRICULTURAL WASTE" means carcasses of poultry or livestock, crop residue, or animal excrement which is returned to the land for use as a soil amendment.

"AQUIFER" means a geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells, springs or surface water.

"ASTM" means the American Society for Testing and Materials.

"AUTHORIZED REPRESENTATIVE" means the person responsible for the overall operation of a facility or an operational unit (i.e., part of a facility), e.g., the plant manager, landfill manager, superintendent, or person of equivalent responsibility.

"BOTTOM ASH" means the residue remaining in the combustion chamber of an incinerator after the combustion of fossil fuels.

"BUFFER ZONE" means those on-site areas adjacent to the facility property line which shall be left undeveloped during the active life as well as the inactive life of the facility.

"BULKY WASTE" means items whose large size or weight precludes or complicates their handling by normal collection, processing, or disposal methods.

"CAP" or "CAPPING SYSTEM" means the material used to cover the top and sides of a sanitary or industrial landfill when fill operations cease.

"CELL" means a discrete engineered area that is designed for the disposal of solid waste and that is a subpart of a landfill.

"CERTIFICATION" means a statement of professional opinion based upon knowledge and belief.

"CFR" means the Code of Federal Regulations.

"CLAY", as a soil separate, means the mineral soil particles less than 0.002 mm in diameter. As a soil textured class, "CLAY" means soil material that is 40% or more clay, less than 45% sand, and less than 40% silt. Clay used as a liner or cap should be classifiable as a CL or CH (Unified Soil Classification System) with a liquid limit between 30 and 60, should place above the A-line on the plasticity chart, and should have a minimum plastic index of 15. A clay liner should have a cation exchange capacity greater than 15 meq/100 grams and be in the neutral pH range.

"CLEAN FILL" means a nonwater-soluble, nondecomposable, environmentally inert solid such as rock, soil, gravel, concrete, broken glass, and/or clay or ceramic products.

"CLOSED PORTION" means that portion of a facility which an owner or operator has closed in accordance with the approved facility closure plan and all other applicable closure requirements.

"CLOSURE" means the cessation of operation of a facility or a portion thereof and the act of securing such a facility so that it will pose no significant threat to human health or the environment.

"CLOSURE PLAN" means written reports and engineering plans detailing those actions that will be taken by the owner or operator of a facility to effect proper closure of that facility or a portion thereof.

"COMMERCIAL WASTE" means solid waste generated by stores, offices, restaurants, warehouses, and other non-manufacturing, non-processing activities.

"CONFINED AQUIFER" means an aquifer containing ground water which is everywhere at a pressure greater than atmospheric pressure and from which water in a well will rise to a level above the top of the aquifer. A confined aquifer is overlain by material of distinctly lower permeability ("confining bed") than the aquifer.

"CONTAMINANT" means any substance that enters the environment at a concentration that has the potential to endanger human health or degrade the environment.

"CONTROLLING SLOPES" means slopes on those areas of a liner that have a direct influence on the maximum leachate head, or slopes that are perpendicular to the collection laterals.

"DAILY COVER" means a layer of compacted earth, or other suitable material as approved by the Department, used to enclose a volume of solid waste each working day.

"DEPARTMENT" means The Department of Natural Resources and Environmental Control.

"DIKE" means an embankment or ridge of either natural or man-made materials used to prevent or to control the movement of solids, liquids, or other materials.

"DISCHARGE" means the accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of a substance into or onto any land, water, or air.

"DISPOSAL" means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste into or upon any land or water.

"DISPOSAL FACILITY" means any facility or portion of a facility at which solid waste is intended to be and/or is intentionally placed into or onto any land and at which solid waste will remain after closure has taken place.

"DOUBLE LINER SYSTEM" means a liner system consisting of two liners with a leachate detection and collection system in between.

"DRY WASTE" (formerly called "INERT SOLID WASTE") means wastes including, but not limited to, plastics, rubber, lumber, trees, stumps, vegetative matter, asphalt pavement, asphaltic products incidental to construction/demolition debris, or other materials which have reduced potential for environmental degradation and leachate production.

"ENVIRONMENTAL ASSESSMENT" means a detailed and comprehensive description of the condition of all environmental parameters as they exist at and around the site of a proposed action prior to implementation of the proposed action. This description is used as a baseline for assessing the environmental impacts of a proposed action.

"ENVIRONMENTALLY UNSOUND" means characterized by any condition, resulting from the methods of operation or design of a facility, which impairs the quality of the environment when compared to the surrounding background environment or any appropriate promulgated federal, state, county or municipal standard.

"EXISTING FACILITY" means a facility which was in operation or for which construction had commenced on or before the date of enactment of these regulations, provided that the facility was being constructed or operated pursuant to all permits and/or approvals required by the Department at the time of enactment. A facility has commenced construction if either:

(i) an on-site physical construction program has begun and is moving toward completion within a reasonable time; or

(ii) the owner or operator has entered into contractual obligations – which cannot be cancelled or modified without substantial loss – for physical construction to be completed within a reasonable time.

"EXPANSION" means the process of increasing the areal dimensions, vertical elevations, or slopes beyond the original approved limits of the facility.

"FACILITY" means all contiguous land, and structures, other appurtenances, and improvements on the land, used in resource recovery and/or the treatment, handling, composting, storage, or disposal of solid waste. A facility may consist of several operational units (e.g., one or more landfills, cells, incinerators, compactors, or combinations thereof).

"FINAL COVER" means the material used to cover the top and sides of a dry waste disposal facility when fill operations cease.

"FLOOD PLAIN" means the lowland and relatively flat areas adjoining inland and coastal waters, that are inundated by the 100-YEAR FLOOD.

"FLY ASH" means a powdery residue resulting from the combustion of fossil fuels and captured by air pollution control equipment prior to exiting the smokestack.

"FREE LIQUIDS" means liquids which readily separate from the solid portion of a waste under ambient temperature and pressure, using any or all of the following tests: EPA Paint Filter Test; EPA Plate Test; EPA Gravity Test.

"GARBAGE" means any putrescible solid and semi-solid animal and/or vegetable wastes resulting from the production, handling, preparation, cooking, serving or consumption of food or food materials.

"GENERATION" means the act or process of producing solid waste.

"GENERATOR" means the producer or the source of the solid waste.

"GEOMEMBRANE" means a prefabricated continuous sheet of flexible polymeric or geosynthetic material.

"GROUND WATER" means any water naturally found under the surface of the earth.

"HAZARDOUS WASTE" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating irreversible, illness, or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Without limitation, included within this definition are those hazardous wastes described in Sections 261.31, 261.32, and 261.33 of the Delaware Regulations Governing Hazardous Waste.

"HOUSEHOLD WASTE" means any solid waste derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).

"HYDRAULIC CONDUCTIVITY" means the capacity to transmit water. It is expressed as the volume of water that will move in a unit of time under a unit hydraulic gradient through a unit area.

"IMPERMEABLE" means having a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec as determined by field and laboratory permeability tests made according to standard test methods which may be correlated with soil densification as determined by compaction test.

"INDUSTRIAL LANDFILL" means a land site at which industrial waste is deposited on or into the land as fill for the purpose of permanent disposal, except that it will not include any facility that has been approved for the disposal of hazardous waste under the Delaware Regulations Governing Hazardous Waste.

"INDUSTRIAL WASTE" means any water-borne liquid, gaseous, solid, or other waste substance or a combination thereof resulting from any process of industry, manufacturing, trade or business, or from the development of any agricultural or natural resource.

"INFECTIOUS WASTE": see section 11, Part 1.B for definitions pertaining to infectious waste.

"INSTITUTIONAL WASTE" means solid waste that is generated by institutional enterprises such as social, charitable, educational, and government services and that is similar in nature to household waste.

"INTERMEDIATE COVER" means a layer of compacted earth, or other suitable material as approved by the Department, applied to a partially completed landfill.

"LANDFILL" means a natural topographic depression and/or man-made excavation and/or diked area, formed primarily of earthen materials, which has been lined with man-made and/or natural materials or remains unlined and which is designed to hold an accumulation of solid wastes.

"LEACHATE" means liquid that has passed through, contacted, or emerged from solid waste and contains dissolved, suspended, or miscible materials, chemicals, and microbial waste products removed from the solid waste.

"LIFT" means a completed series of compacted layers within a cell.

"LIMITED TRANSPORTER" means a person who uses five (5) or fewer vehicles to transport solid waste (excluding infectious waste and asbestos), which vehicles have a manufacturers Gross Vehicle Weight Rating of 26,000 pounds or more.

"LINER" means a continuous layer of impermeable material beneath and on the sides of a landfill or landfill cell.

"LIQUID WASTE" means a waste that contains less than 20 percent solids or releases free liquids.

"LOCAL AGENCY" means any special district, authority, municipality, county, or any other political subdivision.

"MATERIALS RECOVERY FACILITY" means a facility at which materials, other than source separated materials, are recovered from solid waste for recycling or for use as an energy source.

"MUNICIPAL SOLID WASTE" means household waste and solid waste that is generated by commercial, institutional, and industrial sources and is similar in nature to household waste.

"MUNICIPAL SOLID WASTE ASH" means the ash resulting from the combustion of municipal solid waste in a thermal recovery facility.

"MUNICIPALITY" means a city or town of the State of Delaware.

"NEW SANITARY LANDFILL CELL" means any municipal solid waste landfill unit which has not received waste prior to the effective date of these regulations. "SANITARY LANDFILL CELL" has the same meaning as "MUNICIPAL SOLID WASTE LANDFILL UNIT" in the RCRA Subtitle D (40 CFR Part 258) Regulations.

"NEW SOLID WASTE FACILITY" means a facility which was not in operation or for which construction had not commenced on or before the date of enactment of these regulations.

"ON-SITE" means on the same or geographically contiguous property which may be divided by public or private right-of-way. Non-contiguous properties owned by the same person but connected by a right-of-way which the owner controls and to which the public does not have access are also considered on-site property.

"OPEN BURNING" means the combustion of solid waste without:

(1) Control of combustion air to maintain adequate temperature for efficient combustion,
(2) Containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion, and
(3) Control of the emission of the combustion products.

"OPERATOR" means the person responsible for the overall operation of a solid waste facility.

"OWNER" means the person who owns a facility or any part of a facility.

"PERMITTEE" means a person holding a permit issued by the Department pursuant to this regulation.

"PERSON" means any individual, trust, firm, joint stock company, federal agency, partnership, corporation (including a government corporation), association, state, municipality, commission, political subdivision of a state, any interstate body, company, society, or any organization of any form.

"PERSONNEL" or "FACILITY PERSONNEL" means all persons who work at, or oversee the operations of, a solid waste facility, and whose actions or failure to act may result in noncompliance with the requirements of the Delaware Solid Waste Regulations or other regulations under the jurisdiction of the State of Delaware.

"POST-CLOSURE CARE" means maintenance and long-term monitoring of, and financial responsibility for, a closed facility.

"RECHARGE AREA" means that portion of a drainage basin in which the net saturated flow of ground water is directed away from the water table.

"RECYCLABLE MATERIAL" means a solid waste that exhibits the potential to be used repeatedly in place of a virgin material.

"RECYCLING" means the process by which recyclable materials, which would otherwise be disposed of as solid waste, are returned to the economic mainstream in the form of raw materials or products.

"REFUSE" means any putrescible or nonputrescible solid waste, except human excreta, but including garbage, rubbish, ashes, street cleanings, dead animals, offal and solid agricultural, commercial, industrial, hazardous and institutional wastes, and construction wastes.

"REGULATED MEDICAL WASTE": see Section 11, Part 1.B. for definitions pertaining to REGULATED MEDICAL / INFECTIOUS WASTE.

"RESOURCE RECOVERY" means the process by which materials, excluding those under control of the Nuclear Regulatory Commission, which still have useful physical or chemical properties after serving a specific purpose are reused or recycled for the same or another purpose, including use as an energy source.

"RESOURCE RECOVERY FACILITY" means a facility that is either a MATERIALS RECOVERY FACILITY or a THERMAL RECOVERY FACILITY.

"RUBBISH" means any nonputrescible solid waste, excluding ashes, such as cardboard, paper, plastic, metal or glass food containers, rags, waste metal, yard clippings, small pieces of wood, excelsior, rubber, leather, crockery, and other waste materials.

"RUN-OFF" means any precipitation that drains over land from any part of a facility.

"RUN-ON" means any precipitation that drains over land onto any part of a facility.

"SALVAGING" means the controlled removal of solid waste from any facility for reuse of the waste material.

"SANITARY LANDFILL" means a land site at which solid waste is deposited on or into the land as fill for the purpose of permanent disposal, except that it will not include any facility that has been approved for the disposal of hazardous waste under the Delaware Regulations Governing Hazardous Waste.

"TRANSFER STATION" means any facility where quantities of solid waste delivered by vehicle are consolidated or aggregated for subsequent transfer by vehicle for processing, recycling, or disposal.

"TRANSPORTATION" means the movement of solid waste by air, rail, water, over the roadway, or on the ground.

"TRANSPORTER" means any person engaged in the transportation of solid waste.

"TREATMENT" means the process of altering the physical, chemical, or biological condition of the waste to prevent pollution of water, air, or soil or to render the waste safe for transport, disposal, or reuse.

"UNCONFINED AQUIFER" means an aquifer in which the upper surface of the zone of saturation is at atmospheric pressure.

"UPPERMOST AQUIFER" means the geologic formation nearest the natural ground surface that is an aquifer, as well as, lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

"VARIANCE" means a permitted deviation from an established rule or regulation, or plan, or standard or procedure, as provided in 7 Del. Code, Chapter 60.

"VECTOR" means a carrier organism that is capable of transmitting a pathogen from one organism to another.

"VEHICLE" means a motorized means of transporting something. "Vehicle" includes both the motorized unit and all containerized units of a conveyance attached thereto. For purposes of determining whether a transporter qualifies as a "LIMITED TRANSPORTER", motorized units will be counted.

"WATER TABLE" means that surface in a ground water body at which the water pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water.

"WELL" means any excavation that is drilled, cored, bored, washed, driven, dug, jetted or otherwise constructed when the intended use of such excavation is for the location, testing, acquisition or artificial recharge of underground water, and where the depth is greater than the diameter or width.

"WORKING FACE" means that portion of a landfill where waste is discharged, spread and compacted prior to placement of daily cover.

"SANITARY LANDFILL CELL BOUNDARY" means a vertical surface located at the hydraulically downgradient limit of the cell. This vertical surface extends down into the uppermost aquifer. "Sanitary Landfill Cell Boundary" has the same meaning as "Waste Management Unit Boundary" in the RCRA Subtitle D (40 CFR Part 258) Regulations. "Sanitary Landfill" has the same meaning as "MSWLF" in the RCRA Subtitle D (40 CFR Part 258) Regulations.

"SATURATED ZONE" means that part of the earth's crust in which all the voids are filled with water.

"SCAVENGING" means the uncontrolled and/or unauthorized removal of solid waste from any facility.

"SECRETARY" means the Secretary of the Department of Natural Resources and Environmental Control or his duly authorized designee.

"SETBACK" means the area between the actual disposal area and the property line which can be used for construction of environmental control systems such as run-off diversion ditches, monitoring wells, or scales.

"SITE" means the area of land or water within the property boundaries of a facility where one or more solid waste treatment, resource recovery, recycling, storage or disposal areas are located.

"SLUDGE" means any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a wastewater treatment plant.

"SOLID WASTE" means any garbage, refuse, rubbish, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility and other discarded material, including solid, liquid, semi-solid or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under 7 Del. Code, Chapter 60, as amended, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended.

"SOURCE SEPARATED" means divided into its separate recyclable components at the point of generation.

"SPECIAL SOLID WASTES" means those wastes that require extraordinary management. They include but are not limited to abandoned automobiles, white goods, used tires, waste oil, sludges, dead animals, agricultural and industrial wastes, infectious waste, municipal ash, septic tank pumpings, and sewage residues.

"STORAGE" means the holding of solid waste for a temporary period, at the end of which time the solid waste is treated, disposed of, or stored elsewhere.

"SUBBASE" means the supporting soil layers beneath a liner.

"SURFACE WATER" means water occurring generally on the surface of the earth.

"THERMAL RECOVERY FACILITY" means a facility designed to thermally break down solid waste and to recover energy from the solid waste.

"TOPSOIL" means the friable dark upper portion of a soil profile that contains mineral substances and organic material in varying degrees of decomposition and is capable of supporting vegetation.

APPENDIX J
HEALTH AND SAFETY PLAN FOR CHERRY ISLAND LLC DATED OCTOBER 25 2000

Cherry Island L.L.C.

Cherry Island Landfill

Health and Safety Plan

Safety Policies and Procedures

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Introduction

The Cherry Island Landfill is an approximately 342-acre landfill site. Operations began in October 1985. The landfill accepts commercial and industrial wastes and a minor amount of municipal solid waste. The average amount of waste accepted daily is 1800 Tons. The Landfill also accepts and recycles white goods, tires, and yard wastes. There are 6 phases currently at the Landfill, Phases I – V and IA. Phases III, IV and V are currently active and are used for solid waste disposal and Phase IA is currently utilized for Asbestos disposal.

The scope and purpose of the Site Health and Safety Plan (SHASP) is to define the necessary precautions and procedures to be followed during all land filling operations at this site, including but not limited to confined space entry, hearing conservation, hazard communication, trenching/excavation, lock-out/tag-out, respiratory protection, medical monitoring, accident/incident reporting and emergency procedures. Also included in the plan are basic company safety policies that include but are not limited to disciplinary action plan, procedure for rule violation, E.E.O. policy, substance abuse policy and equipment policy.

This SHASP applies to all employees of Cherry Island L.L.C., Government agencies, contractors, subcontractors, owner's representatives, landfill customers, and visitors.

Cherry Island L.L.C. personnel assignments as follows:

Site Superintendent:	**Tony Casarino**
Site Supervisor:	**James Johnson**
Health and Safety Officer:	**Karen Reynolds**
Site Safety Officers:	**Tony Casarino/James Johnson**

The work covered by this Health and Safety Plan includes but is not limited to Trenching/Excavation, Confined Space Entry, Hazard Identification, and Asbestos Disposal.

Policies

Safety Policy Statement

It is the policy of *Cherry Island L.L.C.* that accident prevention shall be considered of primary importance in all phases of operation and administration. It is the intention of *Cherry Island L.L.C.* management to provide safe and healthy working conditions, to establish and insist upon safe practices at all times by all employees. The prevention of accidents is an objective affecting all levels of our company and its operations. It is a basic requirement that each supervisor make the safety of all employees an integral part of his or her regular management function.

The foremen are the keys in our safety effort because they are in constant touch with all employees and are aware of changing conditions. They are charged with conducting a safe efficient operation at all times for all employees. Every individual who supervises, directs or controls the work or actions of others is responsible for the safety of each person under their supervision, direction, or control. In addition, all such individuals are responsible for the safety of equipment and property within their area of responsibility.

It is equally the duty of each employee to accept and follow established safety regulations and procedures. Every effort will be made to provide adequate training to employees. However, if an employee is ever in doubt about how to do a job or task safely, it is his or her duty to ask a qualified person for assistance. Employees are expected to assist management in accident prevention activities. Unsafe conditions must be reported immediately. Everyone is responsible for the housekeeping duties that pertain to their jobs. Every injury that occurs on the job must be reported to management as soon as possible. Under no circumstances, except emergency trips to the hospital, should an employee leave the worksite without reporting an injury. When you have an accident, everyone is hurt. Please work safely. Safety is everyone's business.

Disciplinary Action Policy

It is the policy of *Cherry Island L.L.C.* that certain rules and regulations regarding employee behavior are necessary for the efficient operation of the company and for the benefit and safety of all employees. Conduct that interferes with operations, discredits the company, or is offensive to customers or fellow employees will not be tolerated.

Guidelines for Supervisory Judgement

Each Supervisor is expected to exhibit good judgement in exercising disciplinary authority and use punishment only as a last resort. It is better to use more positive tools of fairness and effective leadership.

All Supervisors are expected to be well versed in the company's policies and procedures. Supervisors must temper their disciplinary action so the offenders are punished but not humiliated. The Supervisor's goal should be to halt the offending behavior and to motivate the employee to perform properly in the future.

Safety Rules

Employees are expected at all times to conduct themselves in a positive manner so as to promote the best interest of the company. Such conduct includes:

- Reporting to work as scheduled and being ready for work at the assigned starting time.
- Giving proper advance notice whenever unable to work or report on time. Three consecutive days of absenteeism without notice or excessive absence or tardiness will be sufficient cause for termination.
- Complying with all company safety and security regulations.
- Smoking only at times and in places not prohibited by company rules or site specific restrictions.
- Wearing clothing appropriate for the work being performed. All employees are required to wear a shirt, work boots, hard hat, and a safety vest on all jobs at all times. This site requires specific personal protective equipment as designated in specific areas. Protective tyvek suits, safety glasses, gloves and dusk respirators are required and provided where specified.
- Maintaining work place and surrounding areas for the work being performed and in accordance with rules and regulations of the Delaware Solid Waste Authority.
- Treating all customers, visitors, and fellow employees in a courteous manner,
- Performing assigned tasks efficiently and in accordance with established quality and OSHA standards.
- Reporting to management suspicious, unethical, or illegal conduct by fellow employees, customers, or suppliers.
- Good Housekeeping is essential to safe and efficient management of the landfill and is the responsibility of each foreman and his crew. Work areas, stairways, walkways, and other areas shall be kept clean and free of obstructions, paper, scrap, pipe, lumber, welding rods, rags and other debris at all times.

Prohibited Conduct

The following is prohibited and will subject the individual involved to disciplinary action up to and including termination.

- The reporting to work under the influence of alcohol and/or illegal drugs and narcotics, or the use, sale, dispensing or possession of alcoholic beverages and/or illegal drugs and narcotics on company or customer's premises.
- The use of profanity or abusive language.
- Insubordination or the refusal by an employee to follow management's instructions concerning a job related matter.
- The possession of a firearm or other weapons on company property or customer's premises.
- Fighting or assault on a fellow employee or customer.
- Theft, destruction, defacement, or misuse of company property or of another employee's property.
- Gambling or playing cards on company property or jobsites.
- Falsifying or altering any company record or report, to include an application for employment, a medical report, a production record, a time record, an expense report, an absentee report, or shipping and receiving records,
- Threatening or intimidating management, supervisors, or fellow employees.
- Horseplay, pranks, or practical jokes.
- Unauthorized sleeping on the job.
- Failure to wear assigned safety equipment or failure to abide by safety rules and policies.
- Improper attire or inappropriate personal appearance.
- Engaging in any form of sexual harassment.
- Improper disclosure of trade secrets or confidential information.
- Parking in restricted areas or areas where parking in prohibited.
- Littering, use designated trash receptacles.

The above are illustrative of the type of behavior/conduct that will not be permitted but is not intended to be an all-inclusive listing. Any questions in connection with this policy should be directed to your Supervisor, Site Supervisor or to the Safety Director.

Procedure for Rule Violations

Compliance with company rules and safety procedures are a condition of employment when working for *Cherry Island L.L.C.* All employees working for this company must familiarize themselves with company rules and safety procedures. If you have not been informed of the company work rules and safety procedures, ask your foreman.

Management personnel at all levels are responsible for taking action when a violation is observed. Foremen are responsible for their crews.

The following procedures shall be utilized when a rule or safety violation is observed.

First Warning The first warning will be a verbal warning given to the employee. A memo identifying the violation will be given to the Safety Director.

Second Warning The second warning will be written and a copy given to the Safety Director. The employee may be required to meet with the Safety Director or Manager for counseling. Repeat violation may result in termination.

Third Warning A written warning similar to the second warning will given to the employee and the Safety Director. A meeting with the Employee, Foreman, Safety Director, and Manager will be held to determine why the employee is unwilling to comply with the rules and regulations for the company and the Facility.

Fourth Warning A written warning will be prepared and a copy will be given to the employee and the Vice President of the Company. A determination for disciplinary action will be made and taken at this time, which may include termination of employment. Four warnings within a 12-month period may result in suspension or termination of employment.

Written warnings must include details, such as the date, time, place and the incident that occurred. The date of issuance must be recorded, and the written warning given to the employee as soon as possible after the incident occurs.

Equal Employment Opportunity Officer

Cherry Island L.L.C. is bound to live up to the provisions of the Civil Rights Act of 1964 and the current Executive Orders relating to Equal Employment Opportunity. Anyone who believes he or she has been discriminated against because of race, creed, color, national origin, or sex, should report this fact promptly to the assigned Equal Employment Opportunity Officer.

The Equal Employment Opportunity Officer can be reached by telephone at 302-658-5241 or at 4048 New Castle Avenue, New Castle, Delaware 19720.

Substance Abuse Policy

Cherry Island L.L.C. is dedicated to maintaining a competitive, safe and drug-free work environment for its employees. The Company knows the abuse of legal drugs, including alcohol and prescription medication, and the use of illegal drugs threatens the health and safety of its employees and the public. Employees who use illegal drugs or abuse controlled substances on or off duty tend to be less productive, less reliable and prone to greater absenteeism than employees who do not use such substances. Ultimately such use could threaten the Company's competitiveness and result in increase to cost, delay, and risk in our construction industry. Therefore, *Cherry Island L.L.C.* has established and organized a program to control substance abuse problems in the workplace.

This substance abuse policy will specify the circumstances under which drug testing will be required and the procedures for conducting such testing. This policy applies to all current employees and all final candidates for employment. This policy also complies with the United States Department of Transportation Anti-Drug Regulations that prohibits the use of Marijuana, Cocaine, Opiates, Amphetamines, Phencyclidine and Alcohol.

TESTING

In order to assure compliance, *Cherry Island L.L.C.,* reserves the right to administer substance abuse testing under the following conditions:

PRE-EMPLOYMENT

All final candidates for employment will undergo a drug screen prior to assignment of a job. Each applicant will be notified verbally of the policy and given a checklist describing their role in the collection process. No applicant is to start work until after the results of the drug screen have been received. Applicants will rejected for employment for failing to pass a drug/alcohol screen.

POST ACCIDENT TESTING

Driving or operating company owned vehicles and equipment is a privilege that must be earned. Any accident where the employee's performance contributed to the accident, is cause for a drug test.

REASONABLE CAUSE TESTING

Employees who are reasonably suspected of being unfit for duty by reason of acting in an impaired or unsafe manner will be removed from the job site and promptly transported by a *Cherry Island L.L.C.,* employee to a medical facility where the suspected employee's condition will be evaluated to determine whether or not drugs or alcohol have been used. Any employee refusing to cooperate with the medical evaluation (including tampering with or falsifying a specimen) will result in termination of employment. The supervisor will fill out a Reasonable Cause Report of Observed Behavior on such employee. Another supervisor should witness the employee's behavior, if possible. The medical facility will determine if the employee is capable of working, should be sent home, or needs further medical treatment.

TESTING COSTS

Pre-employment testing, Post accident testing, Reasonable Cause testing, and Random testing will be paid by *Cherry Island L.L.C.*

Re-testing after initial positive result, The employee will be required to be re-tested on his/her own time, and will be responsible for paying all fees associated with the re-test at the time the service is rendered directly to the facility/laboratory.
Any and all cost associated with rehabilitation will be the employee's responsibility.
Follow up testing will be the employee's responsibility.

PRIVACY AND CONFIDENTIALITY

The company will apply its drug testing policy in a reasonable and non-discriminatory manner. Tests will be administered discretely and test results will be maintained in strict confidence. Every effort will be made to preserve the employee's right to dignity; and privacy. Knowledge of test results and disciplinary actions taken will be limited to those who have a direct need to know. Any employee, upon written request, shall have access to any records relating to his/her drug or alcohol test result.

CONDITION OF EMPLOYMENT

Compliance with this Substance Abuse Policy is a condition of employment. The failure or refusal by an applicant or employee to cooperate fully by not signing the consent form or other required documents or not submitting to any test or any procedure under this policy will be grounds for refusal to hire or for termination of employment.

As with all policies, *Cherry Island L.L.C.,* reserves the right to revise, supplement, or rescind any policy from time to time as it deems appropriate. Employees will be notified of such changes as they occur. If you have any questions regarding this policy, please contact Karen Reynolds, Safety Director.

SUBSTANCE ABUSE CHECKLIST

- Present a **photo identification** of yourself and sign in at the medical facility
- Complete the information on the custody and control form (supplied by the Medical Facility)
- Remove any unnecessary garments (i.e. coat, jackets, hats) Personal belongings (i.e. purse, briefcase), you may retain your wallet.
- You will be asked to wash and dry your hands before taking the test
- The collector will give you a specimen bottle
- You may provide the specimen in the privacy of a stall. However, *Cherry Island L.L.C.*, reserves the right to have any and all substance abuse tests observed by a member of the medical facility.
- You should observe the entire collection procedure. (The collector will check the specimen for volume, temperature, and color and than seal the bottle.
- You should initial the identification label to be placed on the specimen bottle to certify that it is your specimen
- The results of the laboratory analysis will be forwarded to *Cherry Island L.L.C.*, Medical Review Officer (MRO). The MRO will review the laboratory results and will then notify *Cherry Island L.L.C., if* a Positive result was due to the use of legitimate prescription medicine, then the MRO will report the test as negative to *Cherry Island L.L.C.*

EMPLOYEE'S ACKNOWLEDGEMENT RECEIPT

I acknowledge receipt of a copy of *Cherry Island L.L.C.*, **Substance Abuse Policy**.

My signature below signifies my agreement to cooperate and participate in the program, as it is a condition of my employment with *Cherry Island L.L.C.*

Print Name: Signature:

First Name MI Last Name

Date of Receipt

Company Equipment Policy

Equipment is indispensable to *Cherry Island L.L.C.*. Effective equipment loss control requires that equipment will be maintained and safely operated.

- No individual will be authorized to operate a piece of equipment unless deemed qualified by management.
- All employees operating equipment must follow all OSHA standards.
- Management has the right to remove any operator from any piece of equipment that they are operating in an unsafe manner.
- All equipment should be inspected before use to assure it's in proper operating condition.
- Any piece of equipment in need of repair is not to be used until repaired and inspected by the shop.
- All equipment operators are responsible for performing daily equipment maintenance on the site as needed.
- Any operator with three or more preventable accidents will have operating privileges revoked.

Procedures

Safety Training

All employees are required to complete site specific Landfill safety training such as Waste Screening as provided by the Delaware Solid Waste Authority. The Safety Director will review the Site Safety and Health Plan will all employees within the first six months of startup. *Cherry Island L.L.C.* will provide annual CPR and First Aid Training for all employees.

The Site Superintendent and Site Supervisor have completed 40-Hour Hazmat training and Manager of Landfill Operations (MOLO) certification. The 40-Hour Hazmat training will be given to all operators within 6 months of start. The Site Superintendent and Site Supervisor, operators, (at least three individuals) will complete Asbestos Worker's Training Class A, in order to be qualified to operate the asbestos disposal area. Records of those trained will be maintained at 4048 New Castle Avenue, New Castle, Delaware 19720.

In addition, ongoing periodic safety training in the form of "Tool Box Talks" will be completed. Tool Box talks will be given by the Supervisor and signed off by all employees in attendance. The sign off sheets are to be turned in with the Supervisor's time sheets.

Confined Space Entry Procedures

A confined space provides the potential for usually high concentrations of contaminants, explosive atmospheres, limited visibility, and restricted movement. These procedures will establish requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910 and NIOSH 80-106.

Definitions

Confined Space: A space or work area not designed or intended for normal human occupancy, having limited means of egress and poor natural ventilation; and/or any structure, including buildings or rooms, which have limited means of egress.

Confined Space Observer: An individual assigned to monitor the activities of personnel working within a confined space. The confined space observer summons rescue personnel in the event of an emergency and assists the rescue team.

General Provisions

When possible, confined spaces should be identified with a posted sign, which reads: Caution – Confined Space.

Only personnel trained and knowledgeable of the requirements of these Confined Space Entry Procedures (CSEP) will be authorized to enter a confined space or be a confined space observer.

Natural ventilation shall be provided for the confined space prior to the initial entry and for the duration of the CSEP. Positive /forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area.

If flammable liquids may be contained within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded,

The contents of any confined space shall, where necessary, be removed prior to entry. All sources of ignition must be removed prior to entry.

Hand tools used in confined spaces shall be in good repair, explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used.

Hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb and must be explosion proof.

Compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space.

If a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space.

A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the space.

When air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent introduction into the confined space.

Vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation.

Smoking in confined spaces will be prohibited at all times.

Any deviation from these Confined Space Entry Procedures requires the prior permission of the on-scene Coordinator.

Procedure for Confined Space Entry

The Site Supervisor, or Safety Director shall:

Evaluate the job to be done and identify the potential hazards before a job in a confined space is scheduled.

Ensure that all process piping, mechanical, and electrical equipment, etc., have been disconnected, purged, blanked-off or locked and tagged as necessary.

If possible, ensure removal of any standing fluids that may produce toxic or air displacing gasses, vapors, or dusts.

Ensure that any hot work (welding, burning, open flames, or spark producing operation) that is to be performed in the confined space has been approved by the Facilities Management and is indicated on the CSEP.

Ensure that the space is ventilated before starting work in the confined space and for the duration of the time that the work is to be performed in the space.

Ensure that personnel who enter the confined space and the confined space observer are familiar with the contents and requirements of this instruction.

Ensure remote atmospheric testing of the confined space prior to employee entry and before ventilation/revalidation of a CSEP to ensure the following:

1. Oxygen content between 19.5% - 23.0%
2. No concentration of combustible gas in the space.
   Sampling will be done throughout the confined space and specifically at the lowest point in the space.
3. The absence of other atmospheric contaminants, if the space has contained toxic, corrosive, or irritant material.
4. If remote testing is not possible, Level B PPE is required.

Designate whether hot or cold work will be allowed. If all tests are satisfactory, complete the CSEP listing and safety precautions, protective equipment, or other requirements.

The CSEP shall be considered void if work in the confined space does not start within one hour after the tests are performed or if significant changes within the confined space atmosphere or job scope occur.

The CSEP posted at the work site shall be removed at the completion of the job or end of the shift, whichever is first.

The Confined Space Observer:

While personnel are inside the confined space, a confined space observer will monitor the activities and provide external assistance to those in the space. The observer will have no other duties that may take his attention away from the work or require him to leave the vicinity of the confined space.

The confined space observer shall maintain at least contact with all personnel in the confined space. Visual contact is preferred, if possible.

The observer shall be instructed by his supervisor in the method for contacting rescue personnel in the event of an emergency.

If the observer detects irregularities within the space, personnel within the space will be ordered to exit.

In the event of an emergency, the **observer must never enter the confined space prior to contacting and receiving assistance** from a helper. Prior to this time, he should attempt to remove personnel with the lifeline and to perform all other rescue functions from outside the space.

A helper shall be designated to provide assistance to the confined space observer in case the observer must enter the confined space to retrieve personnel.

☐ CONFINED SPACE ☐ HAZARDOUS AREA

MIT VALID FOR 8 HOURS ONLY. ALL COPIES OF PERMIT WILL REMAIN AT WORK SITE UNTIL JOB IS COMPLETED.

LOCATION AND DESCRIPTION	DATE
RPOSE OF ENTRY	TIME
PERSON AUTHORIZING ENTRY	DURATION

AUTHORIZED ENTRANT(S)—ATTACH LIST (IF NECESSARY)

ATTENDANT(S)

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lock Out/De-Energize/Tag-Out			**Lifelines**		
Line(s) Broken—Capped—Blanked			Fire Extinguishers		
Purge—Flush and Vent			Lighting (Explosive Proof)		
Ventilation			Protective Clothing		
Secure Area (Post and Flag)			Respirator(s) (Air Purifying)		
Breathing Apparatus			Burning and Welding Permit		
Resuscitator-Inhaler					
Standby Safety Personnel					
Full Body Harness with "D" Ring					
Emergency Escape Retrieval Equipment					

MMUNICATION PROCEDURES

: BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY.
ENTER N/A OR CROSS OUT ITEMS THAT DO NOT APPLY.

TEST(S) TO BE TAKEN*	PERMISSIBLE ENTRY LEVEL	DATE								
		TIME								
Percent of Oxygen	19.5% to 23.5%									
Lower Explosive Limit	Under [illegible]									
Carbon Monoxide	†35 PPM									
Hydrogen Sulfide	†10PPM *15PPM									

GAS TESTER(S) NAME	CHECK #	INSTRUMENT MODEL/TYPE	SERIAL/UNIT #

REMARKS

*Short-term exposure limit: Employee can work in area up to 15 minutes.
†8 hour Time Weighted Average (TWA): Employee can work in area up to 8 hours (longer with appropriate respiratory protection).
*CONTINUOUS MONITORING REQUIRES RESULTS TO BE MONITORED EVERY 2 HOURS.

SAFETY STANDBY PERSON(S)	CHECK #	SAFETY STANDBY PERSON(S)	CHECK #

ENTRY SUPERVISOR, ALL ABOVE CONDITIONS SATISFIED		FIRE	AMBULANCE
DEPARTMENT	PHONE	Safety	Gas Coordinator

☐ CONFINED SPACE ☐ HAZARDOUS AREA

MIT VALID FOR 8 HOURS ONLY. ALL COPIES OF PERMIT WILL REMAIN AT WORK SITE UNTIL JOB IS COMPLETED.

LOCATION AND DESCRIPTION	DATE
PURPOSE OF ENTRY	TIME
PERSON AUTHORIZING ENTRY	DURATION

AUTHORIZED ENTRANT(S)—ATTACH LIST (IF NECESSARY)

ATTENDANT(S)

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lock Out/De-Energize/Tag-Out			**Lifelines**		
Line(s) Broken—Capped—Blanked			Fire Extinguishers		
Purge—Flush and Vent			Lighting (Explosive Proof)		
Ventilation			Protective Clothing		
Secure Area (Post and Flag)			Respirator(s) (Air Purifying)		
Breathing Apparatus			Burning and Welding Permit		
Resuscitator-Inhaler					
Standby Safety Personnel					
Full Body Harness with "D" Ring					
Emergency Escape Retrieval Equipment					

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BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY.
ENTER N/A OR CROSS OUT ITEMS THAT DO NOT APPLY.

TEST(S) TO BE TAKEN	PERMISSIBLE ENTRY LEVEL	DATE								
		TIME								
Percent of Oxygen	19.5% to 23.5%									
Lower Explosive Limit	Under 10%									
Carbon Monoxide	†35 PPM									
Hydrogen Sulfide	†10PPM *15PPM									

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†8 hour Time Weighted Average (TWA): Employee can work in area up to 8 hours (longer with appropriate respiratory protection).
*CONTINUOUS MONITORING REQUIRES RESULTS TO BE MONITORED EVERY 2 HOURS.

SAFETY STANDBY PERSON(S)	CHECK #	SAFETY STANDBY PERSON(S)	CHECK #

ENTRY SUPERVISOR, ALL ABOVE CONDITIONS SATISFIED		FIRE	AMBULANCE
DEPARTMENT	PHONE	Safety	Gas Coordinator

Confined Space Training

Date of Training:

Training Given by:

I have been trained in Confined Space Entry Procedures found in 29 CFR 1926.21, 29 CFR 1910 and understand the regulations. I understand the hazards associated with confined spaces and how to identify a confined space. I have been trained and understand how to operated the Air Monitoring Equipment owned by Cherry Island L.L.C.

Employee Name: _____

Employee Signature: _____

Date: _____

Hearing Conservation Program

Every reasonable effort shall be made to eliminate or reduce the hazardous noise levels at the source through engineering controls. This is considered the key element in any hearing program. If such engineering controls are considered to be technically unavailable or cost prohibitive, or while controls are being planned, or programmed, or implemented, employees shall be required to wear hearing protective devices.

The program includes all work areas, equipment, and procedures associated with excessive noise. These include:

Measurement and evaluation of potentially noise hazardous area.

Audiometric tests for employees exposed.

Fit, issue and use of protective devices.

Engineering noise control feasibility studies.

Selection or design and installation of equipment with lower noise levels.

All work areas or equipment which produce sound pressure levels of 85 dba or greater, 140 dba peak sound levels will be appropriately labeled/signed. All employees shall wear hearing protective devices when they enter or work in an area where generated noise levels are:

1. 85-dba sound level or greater, or
2. 140-dba peak sound pressure level or greater.

A combination of insert type and circumaural type protective devices (double protection) shall be worn in areas where levels exceed 115-dba sound level.

All employees who have been identified for inclusion in the hearing conservation program shall receive monitoring testing annually. The monitoring audiogram shall be compared with the reference audiogram to determine if a significant threshold shift (15 dba in any frequency 500 – 6000 Hz in either ear) has occurred relative to the reference test. Employees experiencing a threshold shift of 15 dba or greater shall be considered outside normal limits and therefore subject to further investigation.

Hearing Conservation Training

Date of Training:

Training Given by:

I have been trained and understand the O.S.H.A. regulations 29 CFR 1926.52 and 1926.101. I understand how to protect my hearing and when to use hearing protection.

Employee Name: _____

Employee Signature: _____

Date: _____

Hazard Communication Program

Company Policy

To ensure that all affected employees know information about the dangers of all hazardous chemicals and materials used by Cherry Island L.L.C., the following hazardous information program has been established:

All work units of the company will participate in the hazard communication program. This written program will be available in the Main Office and Location Office for review by any interested employee. A copy of this program is to be maintained at each jobsite.

Container Labeling

The office personnel (for items delivered to the office), site superintendent/supervisor (for items delivered to the field or work location) will verify that all containers received for use will be clearly labeled as to the contents, note the appropriate hazard warning and list the name and address of the manufacturer.

The office personnel and field supervisors in each section will ensure that all secondary containers are labeled with either an extra copy of the original manufacturer's label or with labels that have the identity and the appropriate hazard warning. For help with labeling, see purchasing agent or Safety Director.

The purchasing agent, office personnel or Safety Director will review the company labeling procedures and update periodically.

Material Safety Data Sheets (MSDS)

The office personnel, manager and Safety Director are responsible for establishing and monitoring the company MSDS program. He/she will make sure procedures are developed to obtain the necessary MSDS and will review all incoming MSDS for new or significant health and safety information. He/she will see that any new information is passed on to affected employees. The following procedure will be followed when an MSDS is not received at the time of initial shipment: contact the vendor to request a Material Safety Data Sheet.

Copies of MSDS for all hazardous chemicals/materials in use will be kept in the office.

MSDS will be readily available to all employees during each work shift. If an MSDS is not available, immediately contact the office personnel or Safety Director. To ensure MSDS are readily available in each work area, the following format will be used: If necessary, copies will be delivered to the project site. Original MSDS will be on file in the office.

When revised MSDS's are received, they will replace existing sheets. The office personnel or Safety Director will periodically review and update.

Employee Training and Information

The company will provide initial training to all new employees and annual review for all employees. The site supervisors will be responsible for the company's employee training in Hazard identification and recognition. The Safety Director will provide training materials and assistance.

Prior to starting work, each new employee of *Cherry Island L.L.C.* will be trained in matters of health and safety in accordance with the training program. The appropriate training includes the following:

- An overview of the requirements contained in the Hazard Communication Standard.
- Hazardous chemicals present at the workplace.
- Physical and health risks of the hazardous chemicals.
- The symptoms of overexposure.
- How to determine the presence or release of hazardous chemicals in the work area.
- How to reduce or prevent the exposure to hazardous chemicals and materials through use of control procedures, work practices and personal protective equipment.
- Steps the company has taken to reduce or prevent exposure to hazardous chemicals and materials.
- Procedures to follow if employees are overexposed to hazardous chemicals and materials.
- How to read labels and review MSDSs to obtain hazard information.
- Location of the MSDS file and written hazard communication program.

Prior to introducing a new material and chemical hazard into any section of the company, each employee will be given information and training as outlined above for the new materials or chemical hazard. The training format will be handouts and/or audiovisual instruction where applicable.

Hazardous Non-routine tasks

Periodically, employees are required to perform hazardous non-routine tasks. Some examples of non-routine tasks are confined space entry, tank cleaning, loading of trucks and trucking of hazardous materials. Prior to the start of work on such projects, site specific training will be provided that details specific hazards involved, control measures in place and the steps the company has taken to reduce exposure and personal protection requirements (such as ventilation, respirators, presence of another employee, and emergency procedures). The individual site superintendent and site supervisor will provide this site-specific training in conjunction with the Safety Director (where applicable).

Informing other Employers

It is the responsibility of the manager or supervisor (inform sub-contractors, etc.) and office personnel to provide other employers with information about hazardous chemicals and materials their employees may be exposed to on a site and suggested precautions for the employees. It is the responsibility of the manager or supervisor to obtain information about hazardous chemicals used by other employers to which an employee of this company may be exposed.

Other employers will be provided with material safety data sheets for hazardous chemicals and materials generated by their company's operations. The Site superintendent or supervisor will give out material Safety Data Sheets if applicable. In addition to providing MSDS to other employers, other employers will be informed of precautionary measures needed to be taken to protect their employees who are exposed to operations performed by this company.

Also, other employers will be informed of the hazard labels used by the company.

File of Hazardous Chemicals/ Materials

A file of hazardous chemicals/ materials (MSDS) will be maintained at the site office. Chemicals/materials not already on file are added to the file within 30 days of introduction into the workplace. To ensure that the chemical/material is added in a timely manner, the following procedures apply: add to the file as they are received or request MSDS as soon as possible.

The Safety Director supervises our Hazard Communication program. A copy of this program is made available to any employees and their representatives upon request.

Hazard Communication Checklist

- ☐ 1. Has a list been prepared of all-hazardous chemicals / materials in the Workplace?
- ☐ 2. Is the company prepared to update the hazardous chemicals / materials list?
- ☐ 3. Has the company obtained or developed a material safety data sheet for each chemical / material we use?
- ☐ 4. Has a system been developed to ensure that all-incoming hazardous chemicals/ materials are checked for proper labels and data sheets?
- ☐ 5. Are procedures in place to ensure labeling and warning signs for containers that hold hazardous chemicals / materials?
- ☐ 6. Are employees aware of the specific information and training requirements of the Hazard Communication Standard?
- ☐ 7. Are employees familiar with the different types of chemicals / materials and hazards associated with them?
- ☐ 8. Have employees been informed of the hazards associated with performing non-routine tasks?
- ☐ 9. Do employees understand how to detect the presence of hazardous chemicals / materials in their work area?
- ☐ 10. Are employees trained about proper work practices and PPE for their work area?
- ☐ 11. Does the training program provide information on appropriate first aid, emergency procedures and symptoms of overexposure?
- ☐ 12. Does the training program include an explanation of labels and warnings that are used.
- ☐ 13. Does the training include where to obtain Material Safety Data Sheets and how to use them?
- ☐ 14. Is a system in place to ensure that new employees are trained before beginning work?
- ☐ 15. Is a system in place to identify new hazardous chemicals / materials before they are introduced into the work area?
- ☐ 16. Is a system in place to inform employees of new hazards associated with a chemical / material?

Hazard Communication
And
Material Safety Data Sheets

Date of Training:

Training given by:

I understand the safe work procedures and precautions to be taken when working with hazardous products, including the use of Protective Equipment and/or apparel. I am aware that I may review the companies Material Safety Data Sheets and Written Program. I know where the Material Safety Data Sheets, written program, emergency supplies, and emergency phone numbers are and I understand how to get them.

Employee Name: _____

Employee Signature: _____

Date: _____

Trenching / Excavation Standard

Before you excavate:

- ☐ Contact Miss Utility at least 48 hours before you dig at 1-800-282-8555 to find the exact locations of the underground installations in the area.
- ☐ Remove or adequately support objects in the excavation area that could create a hazard to employees. These may include trees, rocks, sidewalks, and other objects.
- ☐ Classify the type of soil and rock deposits at the site as either stable rock, Type A, Type B, or Type C Soil. The soil classification must be made based on the results of at least one visual and one manual analysis conducted by a competent person.

Soil Classification

Stable rock refers to natural solid mineral matter which can be excavated with vertical sides and remain intact while exposed.

Type A soil is cohesive with an unconfined compressive strength of 1.5 tons per square foot (tsf). Type A soils include clay, silty clay, sandy clay, caliche, hardpan and sometimes silty clay loam and sandy clay loam. No soil should be classified as Type A if it is fissured; subject to vibration from traffic, pile driving or similar effects; previously disturbed or part of a sloped, layered system where the slope is 4.1 or greater.

Type B soil is cohesive soil with an unconfined compressive strength greater than .5 tsf but less than 1.5 tsf. Type B soils include granular cohesionless soils like angular gravel, silt, silt loam, sandy loam, and sometimes silty clay loam, and sandy clay loam; previously disturbed soils that are not type C; fissured soils and soils subject to vibration that would otherwise be classified as type A; dry rock that is not stable, and material that is part of a sloped, layered system where the layers dip on a slope less steep than 4.1.

Type C soil is cohesive soil with an unconfined compressive strength of .5 tsf or less. Type C soils such as gravel, sand, and loamy sand; submerged soil; soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered system where the layers dip into the excavation at a slope of 4.1 or steeper.

Protective Support Systems

Protective system options include proper sloping or benching of the sides of the excavation; supporting the sides of the excavation with timber shoring or aluminum hydraulic shoring; or placing a shield between the sides of the excavation and the work area. A registered professional engineer must design protective systems for use in excavations more than 20 feet in depth.

If the excavation is less than 5 feet in depth and there is no indication of a potential cave-in, then no protection system is necessary.

Sloping and Benching

If sloping or benching is used to protect against cave ins, there are four basic options that can be chosen. See table 1 below.

Table 1
Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes for Excavations less than 20 Ft. Deep
Stable Rock	Vertical (90 deg.)
Type A	3/ 4:1 (53 deg.)
Type B	1:1 (45 deg.)
Type C	1- 1/ 2:1(34 deg.)

Aluminum Hydraulic Shoring

Designs for aluminum hydraulic shoring should be based upon manufacturers tabulated data. If the data cannot be utilized, the aluminum shoring can be designed using OSHA specifications.

Trench Boxes or Shielded Systems

Designs for shield systems should be based upon manufacturers tabulated data and must be kept at the jobsite. The shield system must extend at least 18" above the top of the vertical side.

General Requirements for Excavations

1. Sufficient means of exiting excavations 4 Feet deep or more must be provided and must be within 25 feet of lateral travel for employees.

2. Employees exposed to public vehicular traffic must wear warning vests made of reflectorized or high visibility material.

3. A competent person must inspect the excavation and the adjacent areas on a daily basis for possible cave-ins, failure of protective systems and equipment, hazardous atmospheres, or other hazardous conditions. Cherry Island's daily excavating checklist must be filled out daily during period of excavation. Inspections are also required after the occurrence of any natural (such as rain) or man-made events (such as blasting) that could increase the potential for hazards.

4. A warning system should be used to alert operators of the edge of an excavation.

5. Adequate protection must be provided to protect employees from falling rock, soil or other materials and equipment.

6. Employees should not be permitted under loads that are handled by lifting or digging equipment. Employees should not be permitted to work in the excavation above other employees unless the lower level employees are adequately protected.

7. While the excavation is open, underground installations must be protected, supported, or removed as necessary to safeguard employees. Adjacent structures must be supported to prevent possible collapse.

8. Employees should not be permitted to work in excavations where water has accumulated or is accumulating unless adequate precautions have been taken. Diversion ditches, dikes,. or other means must be used to prevent surface water from entering an excavation and to provide drainage to the adjacent area.

9. Before an employee enters an excavation greater than 4 feet in depth, a competent person must test the atmosphere where oxygen deficiency or a hazardous atmosphere exists or could reasonably exist. Emergency rescue equipment must be readily available and must be attended when hazardous atmospheric conditions exist or may develop.

10. Guardrails must be provided is there are walkways or bridges crossing over an excavation.

Emergency Action Plan for Trenching/Excavation

Basic Trench – Rescue Procedures

1. Get everyone out of the trench and account for all workers

2. Call 911 or the local rescue squad. Every jobsite should know the phone number and have means for calling for help. The following information should be reported during the call: How many workers are trapped, the trench depth, and any hazardous conditions.

3. Keep everyone more than 50 feet away from the trench is possible. Approaching the area of the cave-in could cause a secondary cave-in, which could completely bury a partially buried victim.

4. Except for pumps removing water from the danger zone, shut down equipment that could create vibrations and cause a secondary cave-in. Stop traffic in the vacinity.

5. Do not attempt to dig victim(s) out with a backhoe/excavator or other equipment.

6. Do not move the victim's tools or equipment until rescuers arrive. The location of tools and equipment can help to locate the victim(s).

Valuable time can be saved if the following additional information is collected while waiting for the rescue team:

Where the victim(s) were last seen.
The time the cave-in occurred
Soil type and condition
How much soil has collapsed on the victim(s)
Location of underground utilities and their conditions

Most importantly, REMAIN CALM, USE YOUR HEAD, AND STAY OUT OF THE TRENCH UNTIL IT HAS BEEN STABILIZED. Write down the important information, and give it to the rescuers as soon as they arrive. Only trained rescue personnel should be permitted to attempt a trench rescue.

Trenching and Shoring Training

Date of Training:

Training given by:

I have been trained in Trenching and Excavation, Shoring and Soil Classification from the O.S.H.A. 1926.650 – 652 Regulations. I understand the regulations and how to classify soil.

Employee Name: _____

Employee Signature: _____

Date: _____

Lock Out / Tag Out Procedures

Re: 29 CFR Part 1910

Employees shall be instructed in the safety significance of this procedure. Persons authorized to install Lock Out/Tag Out are the Superintendent or Site Supervisor, or the Operator. Only those mentioned or their designated representatives in an emergency may initialize this procedure.

Preparation

Make a survey to locate and identify devices to be certain which switch(s), valve(s), or other energy devices apply.

Sequence of Procedure

1. Notify employees what system is to be serviced, including all hazards associated.
2. If the machine is operating, snug it down by normal stopping procedure (depress stop button, open toggle switch, etc.)
3. De-energize the switch. Any stored energy must be dissipated or restrained by repositioning, blocking, bleeding down system, etc.
4. Lockout and/or tag out isolating devices with assigned individual lock(s) or tag(s).
5. After checking to ensure no employees are exposed, operate the push button or other operating controls to make certain the equipment will not operate.

CAUTION:
Return operating controls to NEUTRAL or OFF position after the test. The Equipment is now locked/tagged out.

Restoring to Normal Operation:

1. Check area around equipment to ensure that no one is exposed.
2. After all tools have been removed from the equipment, guards have been re-installed, and employees are in the clear, remove Locks/Tags. Operate and restore power to equipment.

Lock-Out / Tag-Out Training

Date of Training:

Training Given By:

I have been trained and understand the O.S.H.A. Lock-Out / Tag-Out Regulations 29 CFR 1910. I have been given a copy of Cherry Island L.L.C.'s Lock-out/ Tag-out Procedures and understand how and when to use this program.

Employee Name: _____

Employee Signature: _____

Date: _____

Respiratory Protection Program

Purpose:

The elements described in this program are designed to ensure the safe and effective usage of respiratory protection at Cherry Island Landfill.

Program Administration:

Administration of the respiratory protection program is assigned to Karen Reynolds, Safety Director. Site Administrator is Tony Casarino, Site Superintendent

The administrator is responsible for the overall implementation and maintenance duties that include:

- Determining which tasks require respiratory protection
- Selecting the proper respirator for the special application
- Conducting employee training and conducting fit testing.
- Ensuring that employees clean, maintain and properly store respirators.
- Conducting periodic evaluation of the respiratory protection program to ensure that it is achieving its desired goal.

Supervisors are responsible for:

- Ensuring that appropriate, approved type respirators are available for use.
- Ensuring that employees wear the required respirators.
- Conducting periodic inspections to ensure employees are maintaining their respirators, which would include cleaning, sanitizing, and proper storage.

Employees are responsible for:

- Using the respiratory protection in accordance with the training received.
- Inspecting, cleaning, sanitizing, and proper storage of their respirator.

Respiratory Selection

The Safety Director and Site Superintendent will conduct the selection of appropriate respiratory protection.

The selection of appropriate respirators will be based upon the following elements:

- The type(s) and concentrations of airborne contaminant(s).
- The characteristics and location of the hazardous area
- The workers' activities in the hazardous area
- The capabilities and limitations of the respirators.
- Duration of respirator use.

Selection will be made according to "practices for Respiratory Protection" American National Standards Institute (ANSI) Z88.2-1980. Only respirators having NIOSH approval will be used.

Respirators currently approved for use are as follows:

Respirator Manufacturer	Model	Work Task
MSA – Maintenance Free	#8165 –(25) N95	Sorting, covering – ordinary dusts
MSA Half Mask	Advantage 200 – P100 Filter	Asbestos Area
SCBA – Comb. Airline w/ Air Purifying, half mask, chemical filtration cartridges as needed		Confined Space – Oxygen Deficiency, Gas & Vapor Contaminants

Note: A copy of the hazard determination for each task is maintained and is contained in the respiratory selection section.

Maintenance, Cleaning, Inspection, and storage will ensure that employees properly clean and maintain their respirators.

The following items will be included in the maintenance program:

Cleaning and sanitizing

- **Disassemble components from the respirator and inspect for any defects.**
- **Immerse the respirator and components in warm soapy water (120-130 F).** Air-purifying filters and cartridges must never be washed. The respirator facepiece and components should be gently scrubbed to remove all dirt. Care must be taken not to damage any of the components.
- **Rinse the respirator and components.**
- **Sanitize the respirators and components by immersing them in chlorine bleach solution** (approx. 1 ounce of household bleach to one quart of water.)
- **Rinse components and allow to air dry.**
- **Inspect, test, and repair if necessary.**
- Storage should separate the respirator from sunlight, caustic and toxic chemicals that may cause deterioration of the respirator (mask and other parts).

Inspect before and after each use for the following:

- **Deterioration of any rubber or silicone parts**
- **Conditions of components** (filters, cartridges, valves, etc.).
- **Tightness of all connections**
- **Check any end-of-service life indicators. SCBA alarms, regulators, gauges, etc. SCBA cylinder pressure**

RESPIRATOR INSPECTION RECORD I
SELF- CONTAINED BREATHING APPARATUS

Monthly Checklist

Respirator Type:	
Serial No. and Model No.	
Year:	
Location:	
Inspected by	
User:	
Rubber Facepiece	
Rubber Head Harness	
Rubber Hose	
"O" Ring Connector	
Exhalation Valve	
Inhalation Valve	
Facepiece Lens	
Harness	
Backpack	
Cleanliness	
Instruction Sheet	
Fogproof	
Air Cylinder Pressure	
Cylinder Valve	
Bypass Valve	
Mainline Valve	
PAK Alarm	
Regulator Diaphragm	
Regulator Function	
Demand	
Pressure Demand	
Storage Box	
Comments:	
Storage:	

RESPIRATOR INSPECTION RECORD II

CARTRIDGE & RESPIRATOR

Monthly Checklist

Respirator Type	
Serial No. & Model No.	
Year	
Inspected by:	
Location:	
User:	
Rubber Facepiece	
Rubber Head	
Harness	
Rubber Hose Papr	
"O" Ring Connector	
Exhalation Valve	
Inhalation Valve	
Facepiece Lens	
Cartridge Holder	
Cartridge Gaskets	
Cleanliness	
Fogproof	
Blower Motor Papr	
Battery Pack/Papa	
Storage Box	
Comments:	
Storage:	

Storage

All Respirators must be properly stored to protect them from damage due to environmental factors (sunlight, temperature extremes, etc.) and chemicals. When respirators are not use, they must be placed in a plastic bag and stored in a clean area. Respirators should be stored with the facepiece and exhalation valve in a normal position to prevent it from taking a permanent distorted shape. Respirators should not be stored in workbenches, toolboxes, or lockers unless they are protected against airborne contaminants, distortions, and any damage.

Training

All employees who are required to use respiratory protection will be instructed on the proper selection, use, and limitations of this equipment. This training will be provided prior to any assignment requiring the use of such equipment. The training, conducted by the Safety Director and/or site supervisor, will also include information on:

- Nature of the respiratory hazard and what may happen if the respirator is not used properly.
- Engineering and administrative controls being used and the need for the respirator as added protection
- Reason(s) for selection of a particular type of respirator. Limitations of the selected respirator. Methods of donning the respirator and checking the fit (negative and positive checks) and operation.
- Proper wear of the respirator. Respirator maintenance and storage.
- Proper method for handling emergency situations, and
- A record of employee names, dates, type of initial training and subsequent refresher training will be recorded.

Training Record

Name	Type of Respirator	Date

Employee has received training in the Use, Care, Cleaning, Inspection and Storage of respirator.

Trainer's Name:
Date:

Respirator Fit Test Record

Employee Name:

Employee Job Description/ Location:

Respirator Selected:
Manufacturer: NIOSH Approval No.: Date
Purchased:

Conditions that could affect Respirator Fit: (Check all that apply):

Clean Shaven ☐ Yes ☐ No
Beard Growth ☐ Yes ☐ No (If beard growth is below sealing area, fit testing is not permitted)
Moustache ☐ Yes ☐ No
Dentures ☐ Yes ☐ No
Wt. Loss/Gain ☐ Yes ☐ No
Facial Scar ☐ Yes ☐ No
Dentures Absent ☐ Yes ☐ No
Glasses ☐ Yes ☐ No

If any of the above interfere with the function or seal of the respirator, fit testing is not permitted unless the condition is corrected.

Comments:

Qualitative Fit Testing (Check all methods that used)

Isoamyl Acetate	☐ Pass	☐ Fail
Irritant Smoke:	☐ Pass	☐ Fail
Bitrex Solution:	☐ Pass	☐ Fail
Saccharin Test	☐ Pass	☐ Fail

Fail
Qualitative Fit Testing: ☐ Pass ☐ Fail
☐ Yes ☐No

Quantitative Fit Testing

Instrument Used:
Make:
Model:
Serial Number:
Fit Factor: ☐ Pass ☐

Instrument Printout:

Note: If box is checked Yes, attach printout to back of page

Comments:

Test Conducted by: Date:

Worksheet for Selection of Respirator

Location:

Reason for requesting respirator evaluation: Known hazards as reported in Material Safety Data Sheets from Suppliers (copies attached)

Requested By: _____ Date: _____

I. Employee Exposure Evaluation:

Contaminant(s) or other Respiratory hazard(s):

Estimated concentration(s):
(Reference sampling reports or show calculations as appropriate)

Chemical state of contaminant(s):

Physical Form (including particle size distribution) of contaminants(s):

Appropriate exposure limits(s):

II. Respirator Determination:

☐ Exposure is documented to be below the exposure limits and use by employees is voluntary. Respirator use is "not required" under the standard. Respirator may be used if desired. (Go to section III a)

☐ Exposure is documented to be below the exposure limits and a job rule or procedure requires use by employees. Respirator use is required under the standard. (Go to section III b)

Exposure may exceed exposure limit maximum concentration is known. Respirator use is required under the standard. (Go to section III b)

☐ Exposure is not characterized ("cannot identify or reasonably estimate the employee exposure"). Exposure is considered IDLH. (Go to Section III c)

III. a – Selection of Respirator

A. Voluntary use of respirator. Indicate make, model, and approval number of respirator selected and indicate any limitations on its use. If respirator is a chemical cartridge or filter type respirator, indicate the frequency required for cartridge or filter replacement:

Type of Respirator: Manufacturer: Model No:

Approval No:

Limitations:

Cartridge/filter replacement schedule (if applicable):

Prepared by: Signature: Date:

III.b. – Selection of Respirator

B. Respirator use is required by the standard. Indicate make, model, and approval number of respirator selected and indicate any limitations on its use. If respirator is a chemical cartridge or filter type respirator, indicate the frequency required for cartridge or filter replacement.

Type of Respirator: Manufacturer: Model No:

Approval No:

Limitations: See Attached Instructions

Cartridge/filter replacement schedules (if applicable): User determines as conditions vary

Basis for determining cartridge change schedule: (include all calculations and assumptions. Indicate basis for assumptions and references to published literature where appropriate.

Prepared by: Karen Reynolds Signature: Date: October , 2000

III .c. - Respirator Selection

C. Atmosphere is considered to be Immediately Dangerous to Life or Health (IDLH). Respirators for IDLH atmospheres are limited to: Indicate make, model, and approval number of respirator selected and indicate any limitations on its use. NOTE: Only self-contained breathing apparatus (SCBA) with a 30-minute air supply is acceptable.

Type of Respirator: Manufacturer: Model No:

Approval No: _TC13F

Limitations:

Procedures to be used for accountability (reference Company Confined Space Entry Program)

Prepared by: Signature: Date:

Medical Evaluation

Individuals assigned to tasks that require the use of respiratory protection will have a medical evaluation to determination if they are able to perform the work while wearing a respirator.

The medical evaluations will be conducted and reviewed by the licensed health care professional (PLHCP) at Omega Medical Center – Building K, 15 Omega Drive, Newark, Delaware (302) 368-5100.

The evaluation will be given prior to an employee being allowed to wear a respirator. Periodic examinations will be conducted as necessary based on based on the PLHCP professional opinion(s) and any other contributing factors (i.e., changes in physical status, anatomy, vision, hearing, etc.).

Program Evaluation:

The Safety Director shall conduct evaluations of the workplace to ensure that the provisions of the current written program is being properly implemented and that it continues to be effective. The Safety Director will regularly consult employees required to use respirators to assess the employees' views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected.

Factors to be assessed include, but are not limited to:

- Respirator Fit (including ability to use the respirator without interfering with effective workplace performance)
- Appropriate respirator selection for the hazards to which the employee is exposed
- Proper respirator use under the workplace conditions the employee encounters
- Proper respirator maintenance

Recordkeeping:

The written records regarding medical evaluations, fit testing, maintenance and inspection, respirator selection will be the responsibility of the Safety Director, and maintained at 4048 New Castle Avenue, New Castle, Delaware. Forms for completion are contained in this program.

Medical Questionnaire Routing

Employee Name:

Social Security No:

Job/Location:

Date Questionnaire Given:

Date Evaluated by PLHCP:

Date Referred for Physical:

Results of Physical and/or Questionnaire:

☐ Pass (can wear respirator)

☐ Fail (restricted duty)

Program Administrator:

Date:

Medical Monitoring

The Medical Monitoring Program is designed to track the physical condition of employees on a regular basis as well as survey, pre-employment, or baseline conditions prior to potential exposures. It is part of this Health and Safety Program.

Baseline or Pre-assignment Monitoring

Prior to being assigned to a hazardous or potentially hazardous activity involving exposure to toxic materials, each employee must receive a pre-assignment or baseline physical. The contents of this physical are to be determined by our Medical Consultant. Per the NIOSH/OSHA and EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, medical monitoring requirements for each work site should include:

- Complete medical and work histories
- Physical examination
- Pulmonary Function Tests
- Chest X-ray every two years
- EKG
- Eye examination and visual acuity
- Audiometry
- Urinalysis
- Blood Chemistry, including hematology, serum analysis and heavy metals toxicology

The pre-assignment physical should categorize employees as fit-for-duty and able to wear respiratory protection.

Periodic Monitoring

In addition to baseline physical, all employees require a periodic physical within the last twelve months unless the advising physician recommends a shorter interval. The Medical Consultant should be familiar with the requirements of 29 CFR 1910.120. Proof of the required medical examinations for employees working on site must be current and available for review.

Site Specific Medical Monitoring:

For activities at *Cherry Island Landfill* the employees exposed to hazardous dusts such as asbestos, required to wear personal protective equipment such as hearing protection or respirators, are subject to these medical monitoring procedures as well as any others specified in the applicable sections of this Health and Safety Program.

Exposure/Injury/Medical Support

As a follow up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending on the type of exposure, it may be critical to perform follow-up testing within 24 – 48 hours. It will be up to *Cherry Island* Medical Consultant to advise the type of test required to accurately monitor for exposure effects.

Exit Physical

At termination of employment or re-assignment to an activity or location, which does not represent a risk of exposure to hazardous materials, an employee shall be required to take an exit physical. This can only be waiver by the *Cherry Island* Medical Consultant.

Accident/Incident Reporting

All accidents and incidents must be reported to site superintendent and/or site supervisor. They will notify emergency services as may be required for initial response. Subsequent to the initial response, the site superintendent and/or site supervisor will notify project manager and Safety Director of the nature of the incident as soon as possible.

Accidents/Incidents should be reported on the Delaware Solid Waste Authority's Accident/Incident Report Form. Site superintendent will be responsible for obtaining information and completion of the report. The Safety Director will follow up with an accident investigation where required. A Polaroid camera is provided to the site superintendent for accident/incident reporting purposes.

Emergency Contacts

Service	Telephone Number
Ambulance	**911**
Fire	**911**
Explosion	**911**
Site Office of Cherry Island Landfill	**302-764-8929**
Site Superintendent - Tony Casarino	**302-420-2266 (Cell)** **302-998-0229 (Home)**
Site Supervisor - James Johnson	**302-420-0577 (Cell)** **302-322-4349 (Home)**
Safety Director – Karen Reynolds	**302-981-9508 (Cell)** **302-658-6041 (Shop)**

Delaware Solid Waste Authority
Accident/Incident Report

Time : _____ Date : _____ Location of accident/incident: _____

Task being performed when accident/incident occurred: _____

Describe what happened: _____

_____

_____

_____

_____

If a DSWA employee was injured complete a-d; a. Name: _____

b. Position/Title: _____

c. Reason for being on premises: _____

d. Extent of injuries: _____

If other people are injured; Name: _____ Phone No. _____

Address: _____

Extent of injuries: _____

_____

(If more room is needed, list names, addresses, phone numbers, and extent of injuries on back of this form.) _____ ▶

roperty Damaged: (if vehicle, list yr, make, lic no.) _____

Name of Owner: _____ Phone No. _____

Address: _____

Extent of damage: _____

_____

_____

Police called: No / Yes, By _____ Time: _____

Police action: _____

_____

Name of Witness 1: _____ Phone No. _____

Address: _____

Name of Witness 2: _____ Phone No. _____

Address: _____

List DSWA Personnel Notified: _____

_____

Date and Time notified: _____

This form completed by: _____ Date and Time: _____

Send original completed form to the Safety Coordinator within 24 hours of accident/incident.

Revised 9-18-00

ON THE JOB INJURIES

All employees injured on the job should be sent or taken to the Omega Medical Center for treatment. The have longer hours and after hour on-call services for night time operations. In the event of an on the job accident or injury continue to notify either Doug Polen or Lynn Mowers before sending employee for treatment so that authorization can be given.

Then proceed to **Omega Center** located at **15 Omega Drive-Building K, Newark, Delaware 19713**. The Phone number is **(302) 368-5100 and their hours are Monday through Friday 7:00am to 6:00pm**.

To obtain **after-hour services: from a touch-tone telephone, dial 575-3450 - You will hear 3 beeps - Immediately dial your own number - then hang up.** The Medical Assistant from Omega will call you to assess the situation. He/she will either instruct you to take the employee to Omega, or will offer other instructions that will best meet the needs of the employee. Do not proceed to Omega Medical Center until the "On Call" technician returns your call.

Listed below are indications that your employee should proceed immediately to Emergency Room (or you should call 911) and not call Omega:

- Difficulty breathing, shortness of breath
- Chest or upper abdominal pain or pressure
- Bleeding that will not stop after 10 or 15 minutes
- Severe or persistent vomiting
- Coughing up or vomiting blood
- Severe spinal injuries
- Severe or major burns
- Drug overdose
- Suicidal or Homicidal feelings
- Poisoning
- Severe head injuries

HEALTH AND SAFETY PLAN

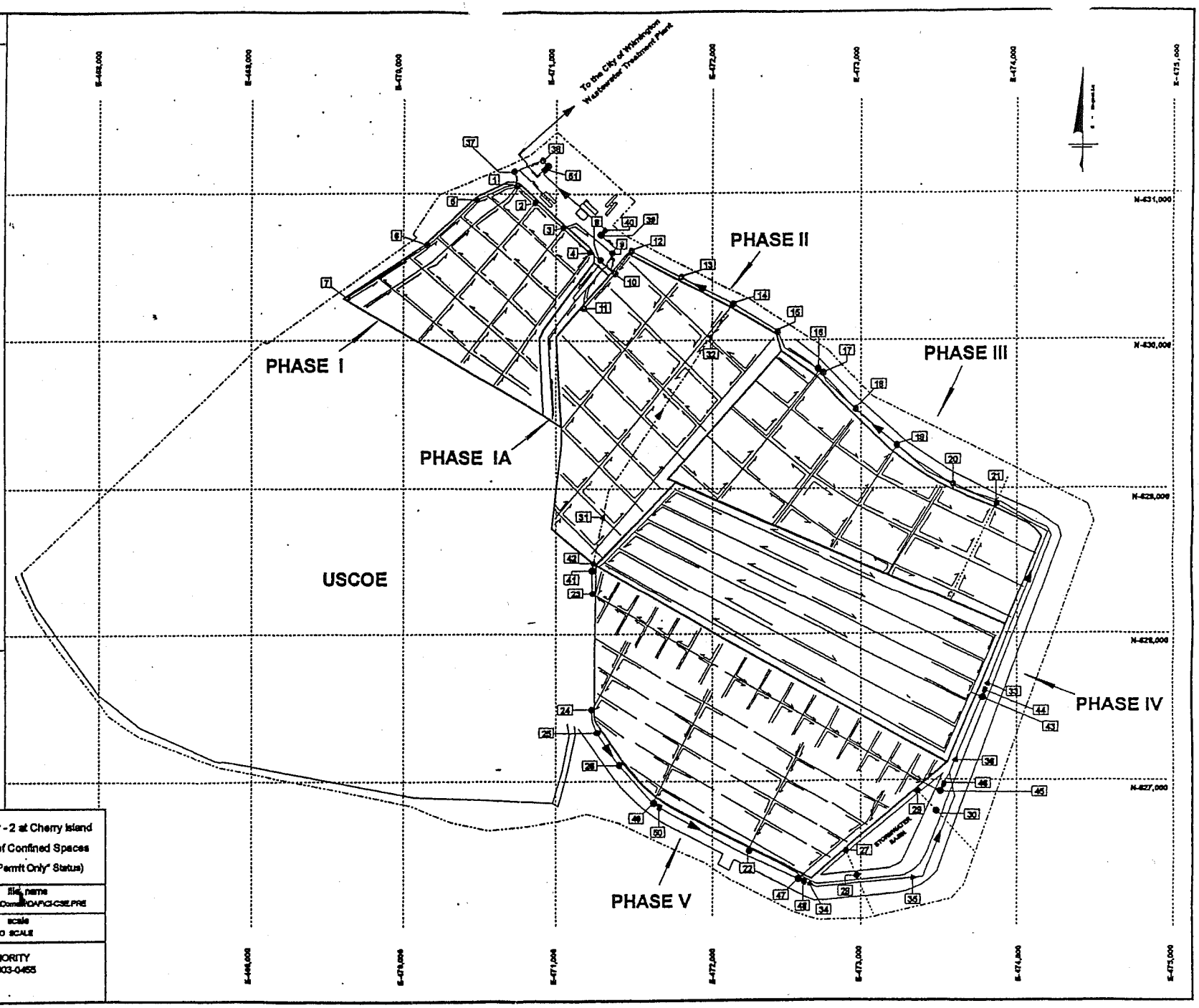
APPENDIX A
SITE MAP/SITE PLAN

LEGEND

1. Phase I - Manhole #1 ●
2. Phase I - Manhole #2 ●
3. Phase I - Manhole #3 ●
4. Phase I - Manhole #4 ●
5. Phase I - Manhole #5 ●
6. Phase I - Manhole #6 ●
7. Phase I - Manhole #7 ●
8. Phase II - Manhole #8 ●
9. Phase IA - Manhole #8A ●
10. Phase II - Manhole #9 ●
11. Phase II - Manhole #10 ●
12. Phase II - Manhole #11 ●
13. Phase II - Manhole #12 ●
14. Phase II - Manhole #13 ●
15. Phase II - Manhole #14 ●
16. Phase III - Manhole #15 ●
17. Phase III - Manhole #16 ●
18. Phase III - Manhole #17 ●
19. Phase III - Manhole #18 ●
20. Phase III - Manhole #19 ●
21. Phase III - Manhole #20 ●
22. Phase V - Manhole V-2 ●
23. Phase V - Manhole V-4 ●
24. Phase V - Manhole V-5 ●
25. Phase V - Manhole V-5A ●
26. Phase V - Manhole V-5B ●
27. Phase V - Upper SE Wick Drain Manhole ●
28. Phase V - Lower SE Wick Drain Manhole ●
29. Phase V - Upper NE Wick Drain Manhole ●
30. Phase V - Lower NE Wick Drain Manhole ●
31. Phase IV - Air Release Valve Manhole #1 △
32. Phase IV - Air Release Valve Manhole #2 △
33. Phase IV - Air Release Valve Manhole #3 △
34. Phase V Air Release Valve Manhole #1 △
35. Phase V Air Release Valve Manhole #2 △
36. Phase V Air Release Valve Manhole #3 △
37. Manhole #1A ●
38. Manhole #1B ●
39. North Central Pump Station ●
40. North Central Pump Station Valve Vault ■
41. Central Pump Station ●
42. Central Pump Station Valve Vault ■
43. East Pump Station ●
44. East Pump Station Valve Vault ■
45. South East Pump Station ●
46. South East Pump Station Valve Vault ■
47. South Pump Station ●
48. South Pump Station Valve Vault ■
49. South Central Pump Station ●
50. South Central Pump Station Valve Vault ■
51. Master Pump Station/Truck Unloading Station/Wet Well ▬

KEY TO SYMBOLS

- ● Leachate Collection Manhole
- △ Air Release Valve Manhole
- ■ Pump Station Valve Vault
- ● Pump Station
- ▬ Master Pump Station/Wet Well



Northern Solid Waste Management Center - 2 at Cherry Island

Leachate Flow Directions and Locations of Confined Spaces

(See Landfill Manager for "Entry by Permit Permit Only" Status)

drawn	approved	file name
DAF		H:\Public\Domain\DAF\CI-CSE.PRE
checked	date	scale
	Rev #1: 02/26/99	NO SCALE

DELAWARE SOLID WASTE AUTHORITY
P. O. BOX 455, DOVER, DE 19903-0455
Phone: (302) 739-5361
FAX: (302) 739-4287

HEALTH AND SAFETY PLAN

APPENDIX B
EMISSIONS STANDARD FOR ASBESTOS

10.1 The provisions of 40 CFR, Part 61, Subpart M (1992) are hereby incorporated into this Regulation by reference. Whenever the word "Administrator" is used in 40 CFR, Part 61, Subpart M (1992) it shall be replaced by the word "Secretary". The provisions of this Regulation, with the exception of Section 10.9, are applicable to all ***NESHAP*** projects.

DEFINITIONS

"CRITICAL SEALS": ***"Critical seals"*** are defined as a minimum of two (2) separate layers of 6-mil *plastic sheeting* over all openings, sealed appropriately.

"DECONTAMINATION UNIT": A ***"decontamination unit"*** is a room attached to the work area that is intended to be used for the removal of contaminated items and tools, with a "clean room" adjacent to it wherein workers may obtain protective clothing and respirators prior to entering the work area.

"ENCLOSURE": An ***"enclosure"*** for an asbestos abatement work area consists of barriers on all sides of the work area. These barriers will be a minimum of 6-mils thick, and completely separate the work area from the surrounding area. The ***"enclosure"*** will be of sufficient size as to provide a safe working environment, with ease of both entry and exit. The ***"enclosure"*** will be equipped with a portable negative air machine, as described in this Regulation.

"NESHAP": ***"NESHAP"*** means the ***"National Emission Standards for Hazardous Air Pollutants"***.

"PLASTIC SHEETING": ***"Plastic sheeting"*** is a sheet of material 6-mils thick that is impermeable when sealed.

"VIEWING PORT": A ***"viewing port"*** is a section of clear, transparent, shatterproof material, greater than or equal to ⅛" in thickness and 18" square.

10.2 Portable negative air-handling equipment equipped with a High Efficiency Particulate Air *("HEPA")* filter that will supply a minimum of four (4) air changes per hour and maintain a minimum of 0.02 inch of water (static pressure) between the work area and the area outside of the work area must be utilized. A *manometer* or similar monitoring device shall be used to

monitor the pressure differential between the work area and the area outside of the work area. Wet removal will be used in conjunction with negative air. Roofing and siding materials located on the exterior of a structure are excluded from this requirement. Alternative asbestos control methods must receive prior approval by the Secretary, pursuant to Section 10.10, before being implemented.

10.3 Demolition: prior to the initiation of asbestos removal subject to this Regulation, the following are required:

(a) Before beginning any demolition project, cover all windows, doors, and other openings with *critical seals*.

(b) If a structure or building is to be partially demolished, construct a barrier of *plastic sheeting* sealed with tape to prevent asbestos from entering any portion of the structure or building not to be demolished, and seal ducts, including air conditioning and heat ducts, before wetting and removal.

10.4 Renovation: prior to the initiation of asbestos removal subject to this Regulation, the following are required:

(a) Before beginning any renovation project, remove all movable objects from the work area and cover all non-movable objects with *plastic sheeting* taped securely in place. Cover floors, other large areas such as walls, and all windows in the work area with *plastic sheeting* sealed with tape. Shut down all forced-air ventilation in the work area and seal exhaust and intake ducts with *critical seals*.

(b) Construct double barriers of *plastic sheeting* at all entrances and exits to work area. Construct a *decontamination unit* connected to the work area to be used for removal of contaminated items and tools. Provide a clean room where workers obtain protective clothing and respirators before entering the work area.

(c) The containment area shall have clear *viewing ports* of adequate size installed on all accessible walls to permit optimum viewing of the work area. Windows shall be maintained in a clean and unobscured manner at all times.

(d) The integrity of the containment seals and portable negative air machine(s) shall be maintained throughout the project.

10.5 Cleaning and Monitoring:

(a) Buildings or structures which are to be completely demolished shall have no residue of asbestos material visible in the work area after all asbestos materials are removed in accordance with *NESHAP*.

(b) For *NESHAP* asbestos projects other than demolition:

1. Precleaning is required prior to installing the *plastic sheeting* in areas where dust, debris or asbestos is visibly present. The *decontamination unit* and *critical seals* shall be in place with the negative air

machine(s) installed and operating before precleaning commences.

2. After removal of asbestos materials and cleaning of the work area, a visual inspection shall be accomplished to ensure that all asbestos-containing or contaminated material has been removed. The work area shall be dry and ready for clearance air monitoring at the time of this inspection. The final visual inspection and clearance air monitoring shall be conducted by a Certified Field Technician employed by a Certified Professional Service Firm.

3. Aggressive air sampling procedures shall be used within the work area during clearance air monitoring. After the visual inspection, forced-air equipment (such as a 1-horsepower leaf blower) shall be used to direct exhaust air against all walls, ceilings, floors, ledges and other surfaces in the work area. This should take at least 5 minutes per 1,000 square feet of floor area. Place a 20-inch fan in the center of the room. (Use one fan per 10,000 cubic feet of room space). Place the fan on slow speed and point it toward the ceiling. Sampling will be accomplished immediately after this procedure. The aggressive air sampling procedure shall not be required for an asbestos project conducted outside of an enclosed structure when such project has been approved in accordance with Section 10.10 of this Regulation. The sampling shall ensure that the airborne concentration of asbestos fibers equal to or longer than 5 microns is less than 0.01 fiber per cubic centimeter *(f/cc)*. This sampling may be analyzed using *Phased Contrast Optical Microscopy ("PCM")* or *Transmission Electron Microscopy ("TEM")*. When using *PCM*, samples shall be analyzed in accordance with the ***"NIOSH" 7400 Method*** specified by the National Institute for Occupational Safety and Health ***"NIOSH"***. The Department may require analysis by *TEM*. Samples analyzed using *PCM* will consider all fibers counted to be asbestos. Crawlspaces with soil floors are to be tested non-aggressively to avoid overloading sample collection cassettes.

4. If the airborne concentration of asbestos fibers is not less than 0.01 *f/cc*, then clean-up procedures shall be repeated until compliance is achieved. Recleaning shall include the use of HEPA vacuums and/or wet-wiping of all surfaces with the portable negative air-handling equipment operating. After recleaning is complete, the sequence of visual inspection and aggressive air sampling shall be repeated.

10.6 Signs and Labels:

Warning signs: Display DANGER signs whenever airborne asbestos fibers may be present, in accordance with applicable OSHA Regulations and the ***National Emission Standards for Hazardous Air Pollutants*** *("NESHAP")*.

10.7 Work Practices:

(a) Wet asbestos materials to be stripped or removed with a water solution containing a surfactant that will adequately wet the material.

(b) Dispose of all asbestos-containing waste, sealing tape, *plastic sheeting*, mopheads, sponges, filters, and disposable clothing in clearly labeled, sealed containers. The containers shall be labeled in accordance with Section 10.6;

10.8 Storage and Transportation:

(a) The storage of clearly-labelled asbestos waste containers awaiting transport to an authorized disposal facility shall be in a secured location to prevent access by unauthorized personnel. The asbestos material shall be kept wet until disposed-of at an approved landfill.

(b) All vehicles or transportation containers (e.g., dumpsters) will be lined on the sides and floor with one (1) layer of 6-mil *plastic sheeting* to be removed and properly disposed-of with the load of asbestos waste.

(c) Transportation and disposal of asbestos waste shall occur within forty-five (45) days of removal, in a manner that will not permit the release of asbestos fibers into the ambient air.

(d) Vehicles that transport asbestos waste must be properly licensed in accordance with Section 7 of the Solid Waste Regulations.

10.9 Control of asbestos from any non-*NESHAP* asbestos project. A person engaged in any asbestos project not subject to NESHAP shall take precautions to prevent asbestos from becoming airborne, including, but not limited to:

(a) Wetting the asbestos material (except asbestos to be encapsulated);

(b) Taking measures such as sealing the work area and using appropriate work practices to minimize the dispersal of particulate asbestos;

(c) Leaving no visible residue of asbestos after completing the project;

(d) Sealing asbestos waste in an appropriate container;

(e) Disposing of the asbestos at a site or landfill approved by the Department in a manner that prevents asbestos from becoming airborne; and

(f) Receipts and records of proper disposal shall be made available to the Department upon request.

10.10 The Department may, on a case-by-case basis, approve an alternative

procedure for control of emissions from an asbestos project provided that the person submits the alternative procedure to the Department in writing, and demonstrates to the satisfaction of the Department that the alternative procedure provides an equivalent or greater control of asbestos emissions into the air.

Additional documents applicable for asbestos in the State of Delaware:

- The State of Delaware Contractor/Supervisor/Worker Certification Program;
- The State of Delaware Solid Waste Regulations, Section 7, governing solid waste; and
- The U.S. Department of Labor, Occupational Safety and Health Administration *("OSHA")*:
  - Title 29 CFR, Part 1926.1101; and
  - Title 29 CFR, Part 1910.1001.

INFORMATION FOR *PRIVATE HOMEOWNERS*

REGARDING ASBESTOS SIDING SHINGLES

PROCEDURE

1. Wet (mist) the material with a water-and-surfactant solution (low-sudsing soap) while on side of house.

2. Remove as carefully as possible to avoid breaking (excessive breaking causes fiber releases).

3. Proper Packaging of wet shingles:

   a. Use clear, pre-labeled asbestos bags...one bag inside of the other;

   ...OR...

   b. Wrap material in clear, double layer, 6-mil polyethylene, similar to wrapping a package. Tape and label, using CAUTION ASBESTOS labels (this is probably the least expensive method).

4. Call the Delaware Solid Waste Authority (DSWA) landfill, in the county in which you live, and tell them that you are bringing asbestos shingles in for disposal:

New Castle County	764-2732
Kent County	284-3933
Sussex County	875-2004

5. PREPARE A "GENERATOR'S LABEL" AS FOLLOWS; PLACE THIS LABEL ON ALL PACKAGES:

> "GENERATOR'S LABEL"
>
> Your Name
> Your Address [number/street/(development/suburb)/city/state/zipcode]
> Date material disposed-of

6. Transport to the landfill and dispose of material where directed by landfill manager. Obtain a receipt for your records.

NOTE: The individual homeowner DOES NOT have to wear protective clothing or respiratory protection IF he or she elects not to. This is optional both while removing and while unloading asbestos siding shingles at the landfill.

From: DNREC - Air Quality Management Section

New Castle	323-4542
Dover	739-4791
Complaints	1-800-662-8802

ATTENTION

If you wish to export asbestos from Delaware, you must first have the out-of-state destination added to your permit application. To do this, merely send or FAX (302-739-5060) or a letter to the following address requesting to add one or more out-of-state asbestos disposal facilities to your existing permit:

State of Delaware
DNREC
Division of Air & Waste Management
89 Kings Highway
P.O. Box 1401
Dover, DE 19903
Attn: Ms. Margaret "Peg" Murphy

The names, addresses and phone number of the out-of-state facilities must be contained in the letter and a copy of this letter must be carried in each vehicle along with your existing permit for transporting asbestos. No confirmation of receipt will be sent to you, but you may call 302-739-3820 to confirm receipt of your request if you so desire. All information concerning out-of-state transport of asbestos must be included in your annual report with each destination listed separately.

Should you have any questions concerning this feel free to call Ms. Murphy or Mr. Dave Johnson at 302-739-3820.

RECEIVED
APR 2 2 2002
DSWA

DEPARTMENT OF NATURAL RESOURCES
AND ENVIRONMENTAL CONTROL

DELAWARE SOLID WASTE AUTHORITY

ASBESTOS POLICY AND PROCEDURES

Effective Date: April 1, 1995
Revised: April 15, 2002

The Department of Natural Resources and Environmental Control *("DNREC")* and the Delaware Solid Waste Authority *("DSWA")* have established the following Policy concerning the handling and disposal of Asbestos-Containing Material *("ACM")*.

ANY TYPE OF ASBESTOS-CONTAINING MATERIAL MAY BE TRANSPORTED TO AN AUTHORIZED ASBESTOS LANDFILL OUT-OF-STATE, OR DISPOSED OF AT AN APPROVED DSWA FACILITY.

Asbestos-Containing Material to be landfilled out of state:

- The asbestos material must be packaged in accordance with State of Delaware regulations or the regulations of other affected states, whichever are the more stringent. Furthermore, the out-of-state destination must be approved by *DNREC*[1] as part of the permitting procedure for a transporter Permit.

Asbestos-Containing Material to be landfilled in Delaware:

- ***Friable***[1] asbestos material must be wetted, packaged in leak-proof containers and labeled in accordance with *DNREC* regulations. This material may be landfilled at the Northern Solid Waste Management Center, ***only***. The *DSWA* charges a special disposal fee for this material.

- Category I ***non-friable*** Asbestos-Containing Material *ACM* and Category II ***non-friable*** Asbestos-Containing Material *ACM* may be landfilled at any of the Delaware Solid Waste Authority Facilities at DSWA's standard disposal fee with the following packaging requirements:

  - Northern Solid Waste Management Center: Category I ***non-friable*** *ACM*[2] must be wetted and may be removed and transported in covered dumpsters or trucks and landfilled unpackaged in the designated asbestos disposal area. Category II ***non-friable*** *ACM*[3] must be wetted and packaged in sealed, leakproof clear plastic wrap and labeled as asbestos. At the landfill it must be placed in the designated asbestos disposal area. Disposal of ***bulk*** shipments of Category I & II ***non-friable*** asbestos will be accepted at the Northern Solid Waste Management Center ***only***.

  - Central and Southern Solid Waste Management Centers: Category II ***non-friable*** *ACM*[3] destined for these Facilities must be wetted and packaged in sealed, leak-proof clear plastic wrap; and labeled as asbestos. At the landfill, it must be placed in a roll-off container specifically dedicated for this purpose. Category I ***non-friable*** *ACM*[2] may be transported to these Facilities *unpackaged* in a covered vehicle, and off-loaded into a roll-off container specifically dedicated for this purpose.

Packaging of Category I, ***non-friable*** *ACM*[2] in the same manner as Category II non-friable *ACM*[3] is preferred but is not required.

In order to be exempt from the packaging requirements, any *ACM* classified and handled as Category I ***non-friable*** *ACM*[2] must be certified as such by a licensed Delaware Certified Professional Service Firm. This certification shall include a description of the material, where the sample originated and the date the material was sampled. This certification must be sent along with the **NOTIFICATION OF DEMOLITION/RENOVATION** to the Department of Natural Resources and Environmental Control. A copy of the Category I, ***non-friable*** *ACM*[2] certification must accompany the material to the landfill. All *ACM* must be removed by a licensed Delaware Asbestos Abatement Contractor[4], unless a written waiver has been issued by the Department of Natural Resources and Environmental Control, Air Quality Management Section, Engineering and Compliance Branch. A copy of this waiver must accompany the material to the landfill.

In addition to the above requirements, disposal of all asbestos material at *DSWA* Facilities is subject to the *DSWA* Asbestos Disposal Procedures, which require at least 24-hour prior notice to the landfill of any deliveries of asbestos.

Nicholas A. DiPasquale, Secretary
Department of Natural Resources and
Environmental Control

N.C. Vasuki
Delaware Solid Waste Authority

[1]***Friable*** asbestos material means any material containing more than one (1) percent asbestos, as determined using the method specified in Appendix A, Subpart F, 40 CFR, Part 763, Section 1, *Polarized Light Microscopy*, that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. If the asbestos content is less than ten (10) percent, as determined by a Method other than point-counting by *Polarized Light Microscopy* ("PLM"), verify the asbestos content by point-counting using "PLM."

[2]Category I ***non-friable*** Asbestos-Containing Material ("ACM") means asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than one (1) percent asbestos, as determined using the method specified in Appendix A, Subpart F, 40 CFR, Part 763, Section I, *Polarized Light Microscopy*.

[3]Category II ***non-friable*** Asbestos-Containing Material ("ACM") means any material, excluding Category I, ***non-friable*** ACM, containing more than one (1) percent asbestos as determined using the methods specified in Appendix A, Subpart F, 40 CFR, Part 763, Section I, *Polarized Light Microscopy* ("PLM") that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

NOTE: asphalt/vinyl floor tiles, mastic/adhesive, transite materials and house siding are considered Category II materials.

[4]Homeowners are exempt from this requirement.

JHR: jmr
IPB01037.doc

Modification Synopsis

March 18, 2002: The Asbestos Policy was modified to allow for the removal of category I non-friable ACM by a general contractor, provided a licensed Delaware certified Professional Service Firm has certified that the material is Category I non-friable ACM. A written waiver would be issued by the Department of Natural Resources and Environmental Control, Air Quality Management Section, Engineering and Compliance Branch to allow for this.

HEALTH AND SAFETY PLAN

APPENDIX C
REPORTING AND RECORD KEEPING REQUIREMENTS FOR WASTE DISPOSAL

United States
Environmental Protection
Agency

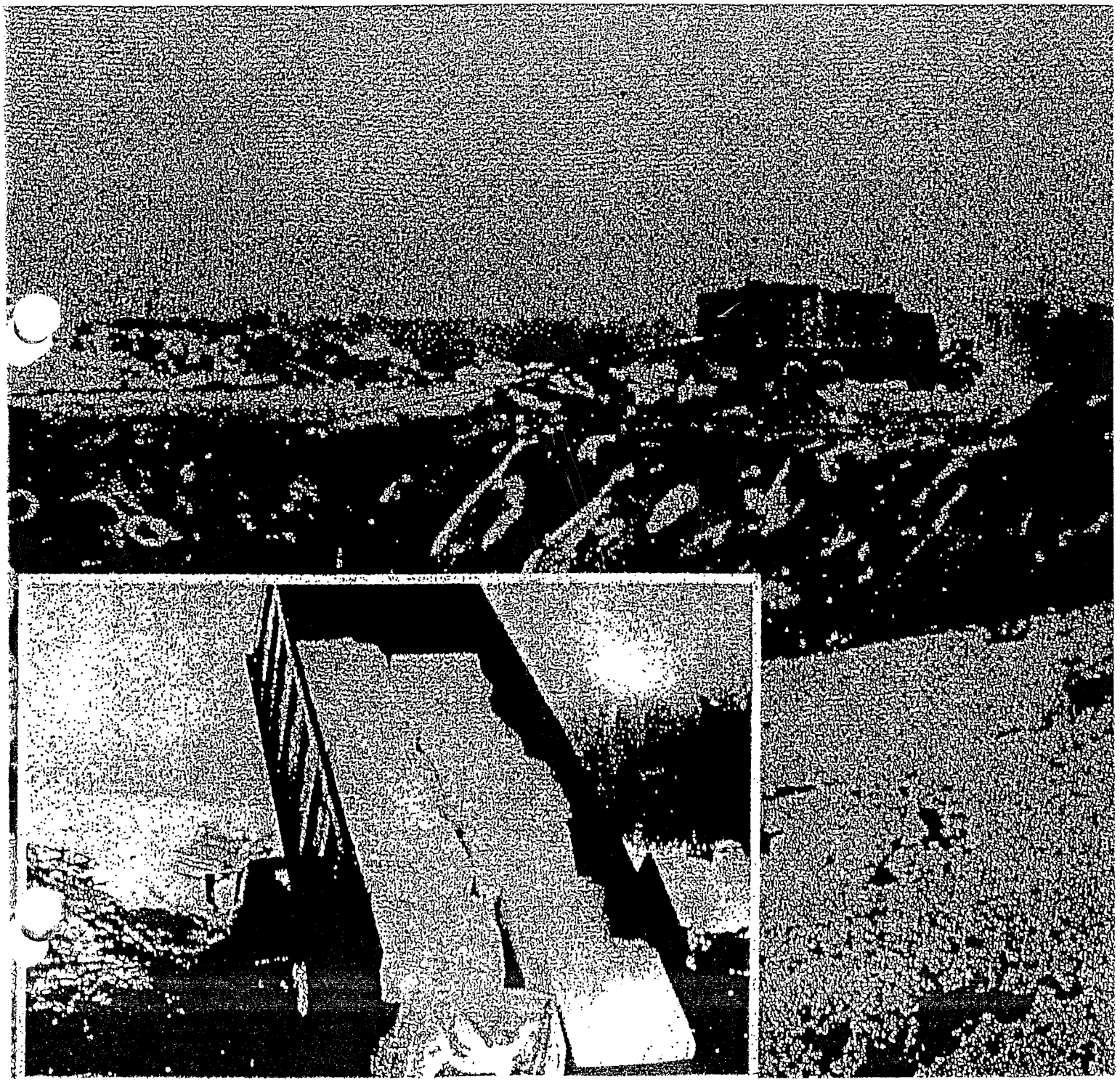
Air And Radiation
(EN-341)

EPA 340/1-90-016
November 1990

EPA

Reporting And Recordkeeping Requirements For Waste Disposal

A Field Guide



I. WASTE SHIPMENT RECORD

After (the effective date of this rule), all shipments of asbestos containing waste material must be accompanied by a Waste Shipment Record (WSR) similar to the sample shown in Figure 1. When it is signed by the generator, the transporter and the waste disposal site operator, the WSR documents the movement and ultimate disposition of asbestos waste. The WSR consists of three parts and requires three signatures, those of the generator, the transporter and the disposal site operator.

A. Waste Generator

Waste generator means any owner or operator of a source covered by this rule whose activities produce asbestos-containing waste materials. Included are asbestos mills, manufacturers, fabricators, demolitions, renovations and spraying operations [40 CFR 61.149 and 150]. Generators are responsible for filling out Items 1-9 of the WSR. The original should be turned over to the transporter along with the waste shipment, although the generator should retain a copy of the WSR signed by the transporter acknowledging receipt of the waste shipment (Item 10) for his records.

Directions for filling out the WSR form are found in Figure 1. Items 1-4 and 6 provide important reference information. In Item 5, Category I nonfriable materials (asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products) should be considered nonfriable if they have not been sanded, ground, burned, or abraded; and Category II materials such as asbestos-cement products taken out before demolition may be reported as nonfriable also.

Item 7 asks for the quantity of waste in cubic meters or cubic yards. You may report in the units that you are most comfortable using, but you are expected to make a good faith effort to report correctly. Some helpful conversion factors are provided below:

- Drums and barrels used as asbestos-waste containers are typically of 35 gallons capacity. Gallons can be converted to cubic yards by multiplying gallons by 0.00379. In our example, 35 gallons x 0.00379 = 0.133 cubic yards for the volume of a drum or barrel.

- Plastic bags have a nominal volume of 0.1 cubic yards, but when they contain asbestos waste their volume is assumed to be about 0.075 cubic yards.

- Cubic yards can be changed to cubic meters by multiplying cubic yards by 0.765. The drum for which we calculated a volume of 0.133 cubic yards would have a volume of 0.133 x 0.765 = 0.102 cubic meters.

Follow the instructions given in Figure 1 to complete Items 8 and 9. When you turn the waste over to the transporter, require the transporter to acknowledge receipt of the asbestos waste by signing the WSR at Item 10: retain a copy of the WSR signed by the transporter for your files.

B. Transporter

At the time that you take possession of the load of waste, ask the generator for a WSR. Acknowledge receipt of the asbestos waste by signing the WSR at Item 10; return a copy of it to the generator. If you turn the shipment over to a second transporter require him to

acknowledge receipt of the shipment by signing the WSR at Item 11. It is recommended that you retain a copy of the signed document for your files when you surrender the WSR to a second transporter. The transporter who delivers the waste shipment to the waste disposal site should surrender the WSR to the disposal site operator. It is recommended that you keep a copy of the WSR signed by the disposal site operator for your files as a matter of good business practice.

C. Waste Disposal Site Operator

Waste disposal site operators are not expected to open bags or other containers to verify that the material is asbestos: if a WSR accompanies the shipment, that is sufficient verification. You must complete Items 12 and 13 of the WSR according to the instructions in Figure 1 and send a copy of the WSR according to the name and address listed in Item 2 of the WSR. The disposal site operator should check to see that the numbers of containers reported in WSR Item 6 and the quantities reported in WSR Item 7 appear to be correct. Any discrepancy should be noted in Item 12.

If the WSR indicates a truckload of asbestos waste, ask the driver if he knows the truck's cargo capacity. If he cannot tell you the capacity, estimate it by multiplying the length by the width by the height of the cargo compartment (all in feet) and divide by 27 cubic feet to obtain cubic yards. If you know the capacity of a truck—say 20 cubic yards—and you judge it to be half-full, estimate the load as 10 cubic yards.

Item 12 is also used to note improperly enclosed or uncovered waste.

II. REPORTING REQUIREMENTS

The revised NESHAP now includes reporting requirements for generators and waste disposal site operators. Generators are required to submit exception reports if they do not receive a copy of the WSR signed by the disposal site owner or operator within 45 days of the date the shipment was accepted by the first transporter. Disposal site operators must file reports of discrepancies between the quantities of waste indicated on the WSR and the quantities actually received, as well as reports of improperly enclosed or uncovered waste.

A. Exception Report

If you as a generator of a shipment of asbestos waste do not receive a copy of the WSR signed by the disposal site operator within 35 days after you turned the waste over to the first transporter, you must take steps to locate the waste shipment.

First, contact the transporter and verify the fact that the waste was delivered to the waste disposal site specified in Item 3 of the WSR. If the transporter has not delivered the shipment, determine the reason for the delay, and when it will be delivered. If the transporter has delivered the waste to the specified waste disposal site, inquire if a copy of the WSR signed by the disposal site operator can be made available to you. (The transporter is not required to obtain or keep a copy signed by the disposal site operator: however, some may do so as a matter of good business practice.) Next contact the disposal site operator and determine why you have not received a copy of the WSR signed by him. Request that the disposal site operator send a signed copy of the WSR to you immediately.

If you have not received a signed WSR from the disposal site operator within 45 days after you turned the waste over to the initial transporter, you must submit a written exception

report to the responsible NESHAP program agency (see Appendix A for a list of agencies and their jurisdictions). The report should include a copy of the WSR in question as well as a cover letter that explains what you have done to locate the shipment, and the results of your search.

B. Discrepancy Report

As a waste disposal site operator, you will be checking the WSR that accompanies each asbestos waste shipment that arrives at your site to make sure that the information on the WSR accurately describes the waste shipment. If you see that there is a discrepancy between the number of containers shown on the WSR and the number that you count in the truck you should note this in Item 12 of the WSR and contact the generator to determine if there is a reasonable explanation for the discrepancy. If you are able to reconcile the apparent discrepancy, make a note of it on the WSR and forward it to the generator as you would normally do.

If you are unable to resolve the discrepancy within 15 days of accepting the waste, you must send a written discrepancy report immediately to the responsible agency in whose jurisdiction the generator of the waste is located. The discrepancy report should describe the discrepancy in question and the steps you have taken to obtain an explanation for it, such as how and when you attempted to reach the generator. A copy of the shipment's WSR must accompany the discrepancy report.

C. Report of Improperly Enclosed or Uncovered Waste

Disposal site operators will check asbestos waste shipments arriving at their sites and are expected to look for significant amounts of improperly enclosed or uncovered waste before the material is disposed of. If significant amounts of improperly enclosed or uncovered waste are discovered in a shipment (see discussion under WSR), note it in Item 12 of the WSR and send, by the following working day, a written report of the problem to the specific agency responsible for administering the NESHAP program for the jurisdiction where the job site is located (identified on the WSR). If the disposal site is located in a different jurisdiction than the job site, you should also send a copy of the WSR to the agency responsible for the disposal site. The written report should describe the improperly enclosed or uncovered waste in sufficient detail that the responsible agency can determine the urgency of the situation and what action to take. A copy of the WSR must be submitted along with the written report.

III. RECORDKEEPING REQUIREMENTS

New requirements for recordkeeping are set for waste generators and waste disposal sites. Generators must keep copies of all WSR's for at least 2 years. In addition to keeping WSR's for at least 2 years, active waste disposal sites must also keep records of the asbestos-containing waste material located within the site.

A. Waste Generator

As a waste generator, you must retain copies of all WSR's, including WSR's signed by the owner or operator of the waste disposal site where the waste was deposited for at least 2 years. The WSR's should be kept in chronological order in a secure, water-tight file. You are expected to provide copies of WSR's upon request of the responsible agency and to make the WSR file available for inspection during normal business hours.

B. Active Waste Disposal Site Operator

You, the waste disposal site operator, are required to keep copies of WSR's that you have received for at least 2 years. The WSR's should be kept in chronological order in a secure, water-tight file. You are expected, further, to provide copies of WSR's upon request of the responsible agency and to make the WSR file available for inspection during normal business hours.

Another new requirement is that you now must maintain up-to-date records that indicate the location, depth and area, and quantity of asbestos containing waste material within the disposal site on a map or diagram of the disposal area.

You have the option of either restricting the asbestos waste to specified areas within the disposal site or depositing it throughout the site. In making this decision you should consider the future use of the property after the disposal site has been closed. By restricting the area where asbestos waste is deposited you will be able to preserve more of the property for future use. However, if you choose to deposit asbestos waste throughout the site, the responsible agency would consider that the entire disposal area contains asbestos.

When you open a new trench (or area) for asbestos waste disposal, place stakes in the ground at the corners of the trench. Take precautions to see that the stakes are kept where they are originally positioned and are not broken during the time that the trench is being filled. When you have filled the trench, call in a land surveyor. The surveyor will use the stakes to determine the location of the asbestos deposit within the disposal site. Ask the surveyor to prepare a map or diagram of the disposal site that shows the location(s) and surface dimensions of the asbestos deposit.

Before beginning to fill a new trench with asbestos waste, measure the maximum depth of the trench, record it, and save it to put on the map provided by the surveyor. Use the data provided in Item 7 of the WSR's to obtain the quantity of asbestos-containing waste material. Add up the cubic yards (cubic meters) of waste indicated on the WSR's for all of the asbestos waste shipments that are deposited in the trench up until the time that it is full and is closed. Also, put the total quantity of asbestos-waste deposited at the site on the map provided by the surveyor.

The map should be kept current until the time that the waste disposal site is closed. At closure you must submit a copy of records of asbestos waste disposal locations and quantities to the agency responsible for administering the NESHAP program in your area. The surveyor's map or diagram of the disposal site with the location and surface dimensions of the asbestos deposit(s), maximum depth of the deposit(s) and asbestos waste quantities fulfills this requirement and should be submitted to the Administrator. See Figure 2 for an example of a map.

Within 60 days of closing your waste disposal site you must record on the deed to the waste disposal site the following information:

- The land has been used for the disposal of asbestos-containing waste material,

- The survey plot and record of the location and quantity of asbestos containing waste disposed of within the disposal site have been filed with (name of responsible agency), and

- The site is subject to 40 CFR 61 Subpart M.

In some states, a Notation of Deed form can be used to add this information to a deed, while in others it may be easier to prepare a new deed than it is to annotate an existing deed. You should contact the Register of Deeds at the county seat of the county in which your disposal site is located to learn the rules that cover deeds and for instructions on how to proceed.

IV. SOURCE REPORTING REQUIREMENTS FOR DISPOSAL SITE OPERATORS

Another new requirement is that, within 90 days of the effective date of this rule, you are required to report certain information about your asbestos waste disposal operations to the responsible asbestos NESHAP program agency (see Appendix A for a list of agencies). Section 61.153 of the asbestos NESHAP requires that you report the following information:

- A brief description of the waste disposal site, which would include such information as the location and size of the disposal facility.

- A description of the method or methods that will be used to comply with the asbestos NESHAP, or a description of alternative methods that will be used. Methods to be used, such as covering asbestos waste daily with 6 inches of nonasbestos cover or the use of dust suppressants should be reported. Other information that might be reported includes procedures to prevent public access to the asbestos waste disposal area, such as the use of warning signs and fencing. You must report this information using the format in Appendix A of Part 61 of Title 40 of the Code of Federal Regulations (40 CFR).

In addition to the information listed above, you as the waste disposal site operator, must also report the following information required by the source reporting requirements of Section 61.10 of Subpart, Part 61 of 40 CFR.

- Name and address of the owner or operator.
- The location of the source.
- The type of hazardous pollutants emitted by the stationary source.

- A brief description of the nature, size, design, and method of operation of the stationary source including the operating design capacity of the source. Identify each point of emission for asbestos.

- The average weight per month of asbestos being processed by the source over the last 12 months preceding the date of the report.

If there is a change in any of the information listed above, you must report the changes to the appropriate agency within 30 days after they occur.

Generator	1. Work site name and mailing address	Owner's name	Owner's telephone no.
	2. Operator's name and address		Operator's telephone no.
	3. Waste disposal site (WDS) name, mailing address, and physical site location		WDS phone no.
	4. Name, and address of responsible agency		
	5. Description of materials	6. Containers No. Type	7. Total quantity m^3 (yd^3)
	8. Special handling instructions and additional information		
	9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.		
	Printed/typed name & title	Signature	Month Day Year
Transporter	10. Transporter 1 (Acknowledgment of receipt of materials)		
	Printed/typed name & title Address and telephone no.	Signature	Month Day Year
	11. Transporter 2 (Acknowledgment of receipt of materials)		
	Printed/typed name & title Address and telephone no.	Signature	Month Day Year
Disposal Site	12. Discrepancy indication space		
	13. Waste disposal site owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.		
	Printed/typed name & title	Signature	Month Day Year

(Continued)

Figure 1. Waste Shipment Record

INSTRUCTIONS

Waste Generator Section (Items 1-9)

1. Enter the name of the facility at which asbestos waste is generated and the address where the facility is located. In the appropriate spaces, also enter the name of the owner of the facility and the owner's phone number.

2. If a demolition or renovation, enter the name and address of the company and authorized agent responsible for performing the asbestos removal. In the appropriate spaces, also enter the phone number of the operator.

3. Enter the name, address, and physical site location of the waste disposal site (WDS) that will be receiving the asbestos materials. In the appropriate spaces, also enter the phone number of the WDS. Enter "on-site" if the waste will be disposed of on the generator's property.

4. Provide the name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.

5. Indicate the types of asbestos waste materials generated. If from a demolition or renovation, indicate the amount of asbestos that is

   - Friable asbestos material
   - Nonfriable asbestos material

6. Enter the number of containers used to transport the asbestos materials listed in item 5. Also enter one of the following container codes used in transporting each type of asbestos material (specify any other type of container used if not listed below):

   DM - Metal drums, barrels
   DP - Plastic drums, barrels
   BA - 6 mil plastic bags or wrapping

7. Enter the quantities of each type of asbestos material removed in units of cubic meters (cubic yards).

8. Use this space to indicate special transportation, treatment, storage or disposal or Bill of Lading information. If an alternate waste disposal site is designated, note it here. Emergency response telephone numbers or similar information may be included here.

NOTE: The waste generator must retain a copy of this form.

(continued)

Figure 1. Waste Shipment Record

9. The authorized agent of the waste generator must read and then sign and date this certification. The date is the date of receipt by transporter.

Transporter Section (Items 10 & 11)

10. & 11. Enter name, address, and telephone number of each transporter used, if applicable. Print or type the full name and title of person accepting responsibility and acknowledging receipt of materials as listed on this waste shipment record for transport. Enter date of receipt and signature.

NOTE: The transporter must retain a copy of this form.

Disposal Site Section (Items 12 & 13)

12. The authorized representative of the WDS must note in this space any discrepancy between waste described on this manifest and waste actually received as well as any improperly enclosed or contained waste. Any rejected materials should be listed and destination of those materials provided. A site that converts asbestos-containing waste material to nonasbestos material is considered a WDS.

13. The signature (by hand) of the authorized WDS agent indicates acceptance and agreement with statements on this manifest except as noted in item 12. The date is the date of signature and receipt of shipment.

NOTE: The WDS must retain a completed copy of this form. The WDS must also send a completed copy to the operator listed in item 2.

Figure 1. Waste Shipment Record

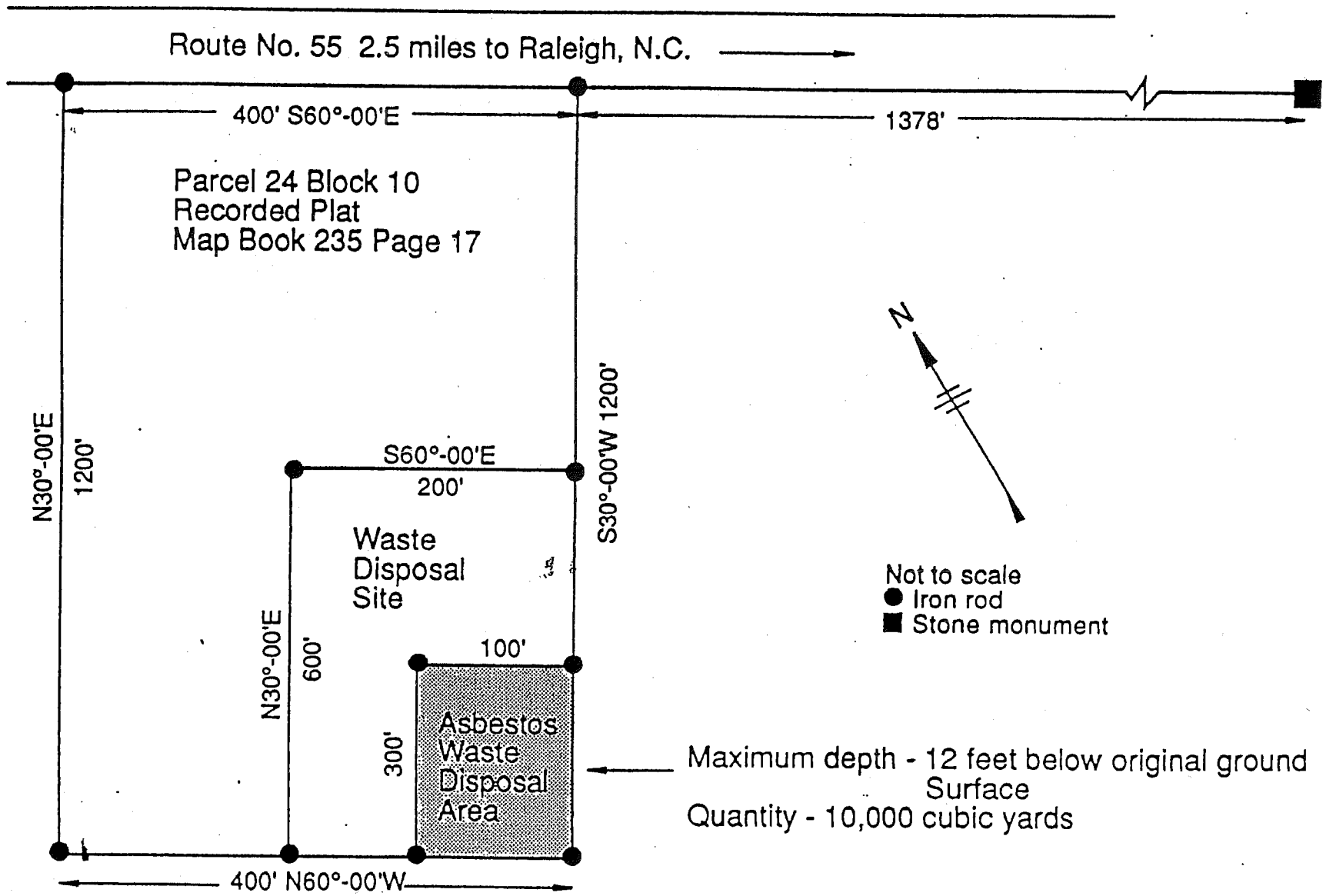


Figure 2. Example plat of waste disposal site showing asbestos waste disposal area.

HEALTH AND SAFETY PLAN

APPENDIX D
DSWA POLICY ON SPECIAL SOLID WASTE

RMC

Policy Adopted 12/07/95
Revised 1/22/03

DELAWARE SOLID WASTE AUTHORITY JAN 23 2003

POLICY ON

SPECIAL SOLID WASTES

All Generators of Special Solid Wastes* in Delaware who wish to dispose their Special Solid Waste at a Delaware Solid Waste Authority (DSWA) facility shall meet the requirements of this policy.

1. Generators shall not deliver and DSWA will not approve disposal of any waste from a Federal Superfund site.

2. Generators shall not deliver and DSWA will not approve disposal of any Special Solid Waste that is hazardous excepting household hazardous waste.

3. Generators shall not deliver and DSWA will not approve disposal of any Special Solid Waste, which is strictly prohibited by any applicable law, regulation, or permit.

4. Generators may deliver and DSWA will approve disposal of NON-HAZARDOUS solid waste from State of Delaware Hazardous Substance Cleanup Act (HSCA) sites in accordance with the Memorandum of Agreement between DSWA and DNREC dated November 15, 2002.

5. Generators may deliver and DSWA will approve disposal of Asbestos-Containing Material in accordance with the most current revision of the Asbestos Policy and Procedures adopted and signed by the Delaware Solid Waste Authority and the Department Natural Resources and Environmental Control.

6. Generators shall request, in writing, approval for disposal of the Special Solid Waste and shall provide, at a minimum, the following information in this order:

   a. The location of the Special Solid Waste generation site
   b. A description of the Special Solid Waste
   c. A statement that the waste is not from a Federal Superfund Site
   d. A statement that the waste is also not hazardous as provided herein
   e. A description of how and where a representative sample(s) of the Special Solid Waste was taken
   f. A copy of all required test results as further described in this policy below

**Special Solid Wastes are defined by the Department of Natural Resources and Environmental Control's Regulations Governing Solid Waste as "...those wastes that require extraordinary management. They include, but are not limited to, abandoned automobiles, white goods, used tires, waste oil, sludges, dead animals, agricultural and industrial wastes, infectious waste, municipal ash, septic tank pumpings, and sewage residues."*

g. Documentation that the laboratory is duly certified to perform the required environmental analysis
h. An estimate of the total quantity of Special Solid Waste to be disposed of (in tons)
i. A proposed delivery schedule for the Special Solid Waste disposal (tons per day) and frequency (days per week, month, and year)

7. At his own expense, the Generator shall arrange to have the sampling, testing, and reporting completed in accordance with the conditions and requirements of this Special Solid Waste Policy and as directed by DSWA.

8. All sampling and testing shall be done in accordance with the most recent version of U.S. EPA Test Methods for Evaluating Solid Waste, SW-846 or other method, which shall be approved by DSWA. Testing must be performed by a duly certified laboratory.

9. A representative sample of the Special Solid Waste shall be subjected to the following testing:

   a. The Toxicity Characteristic Leaching Procedure (TCLP). The resulting leachate must be tested for the TCLP constituents listed in SW-846 or others required by DSWA. No constituent can exceed its respective regulatory level to obtain approval for disposal.
   b. Ignitibility – The Special Solid Waste must be determined to be non-ignitable.
   c. Corrosivity – The Special Solid Waste must be determined to be non-corrosive.
   d. Reactivity – The Special Solid Waste must be determined to be non-reactive.
   e. Benzene, Toluene, Ethylbenzene, Xylene (BTEX) – The Special Solid Waste must not have a concentration greater than any of the following:
      Benzene 0.5 ppm
      Toluene 10 ppm
      Ethylbenzene 5 ppm
      Xylene 5 ppm
   f. Polychlorinated biphenyls (PCBs) - The Special Solid Waste must have a concentration of PCBs less than 50.0 mg/kg.
   g. Solids Content - The Special Solid Waste must be a minimum of 20% solids by weight and not contain free liquids (as determined by the Paint Filter Liquids Test (SW-846)).

10. At DSWA's request the Generator shall provide DSWA with split samples of the Special Solid Wastes. DSWA or its designated representative shall be allowed to be present when such split samples are taken.

11. DSWA, at its sole discretion, reserves the right to require additional testing of the Special Solid Waste at the Generator's expense or may, at its sole discretion, waive certain testing or other requirements.

12. DSWA reserves the right to accept or reject the Special Solid Waste regardless of whether the above requirements are met. Consideration and approval will be made on a case-by-case basis. Approval/denials shall be issued by DSWA in letter form.

13. For all approved Special Solid Wastes that will be disposed of on a continuous basis, the Generator shall follow the sampling, analysis, and reporting requirements established by the DSWA for their Special Solid Waste.

14. DSWA, at its sole discretion, for any reason whatsoever, reserves the right to withdraw approval given to a Generator of Special Solid Waste.

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APPENDIX K
ALTERNATIVE COVER APPROVALS

RECEIVED
AUG 1 5 2003
CHERRY ISLAND LANDFILL

RECEIVED
AUG 1 4 2003
DSWA

RECEIVED JUN 1 0 2005

State Permit Number: DM 0009/95B
Effective Date: July 1, 2000
Expiration Date: June 30, 2005

AUTHORIZATION TO CONDUCT
A DISTRIBUTION AND MARKETING PROGRAM
FOR THE UTILIZATION OF SLUDGE OR SLUDGE PRODUCTS

1. Pursuant to the provisions of 7 Del. C., $_s$6003

   VFL Technology Corporation
   16 Hagerty Boulevard
   West Chester, Pennsylvania 19382-7594

   is hereby granted authorization to conduct a limited distribution and marketing program for the utilization of alkaline stabilized sludge products generated at the VFL preparation site at the City of Wilmington Wastewater Treatment Facility, 12 Street and Hay Road, Wilmington, Delaware.

2. The general requirements, monitoring requirements and other permit conditions are set forth in Parts I, II and III hereof.

R. Peder Hansen, PE, P.G.
Surface Water Discharges Section
Division of Water Resources
Department of Natural Resources and
Environmental Control

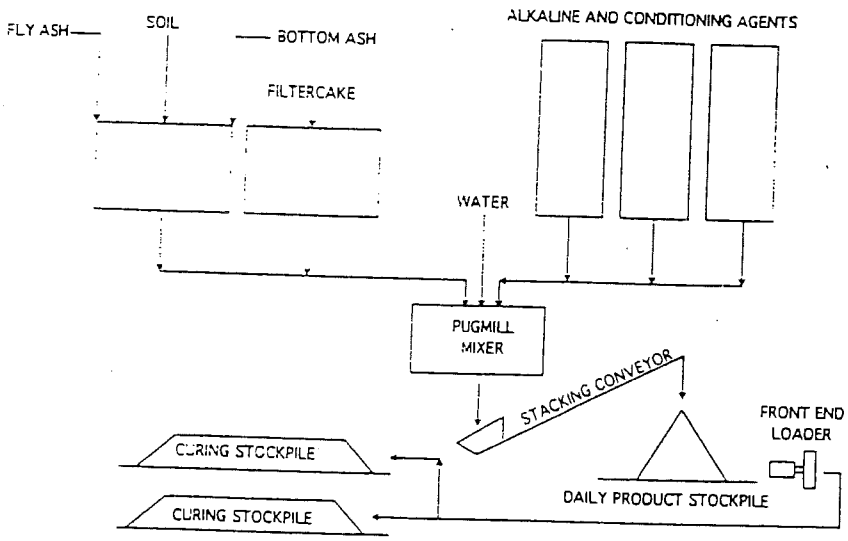
6/30/00
Date Signed

General Description

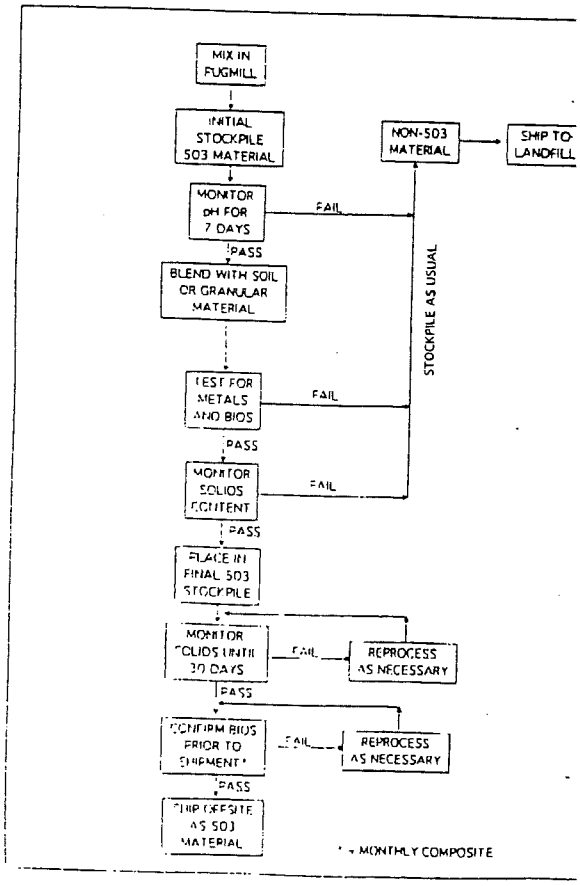
The operation involves the alkaline stabilization of sewage sludge generated by the Wilmington Wastewater Treatment Facility by VFL Technology Corporation, the sludge product preparer. The stabilization process employed, the N-Viro process, conforms to the criteria set forth in Delaware's **Regulations Governing the Use and Disposal of Wastewater Sludge** for the production of Class A (PFRP) and table 402.4 sludge (also known as Exceptional Quality (EQ) sludge). Typically sludge is dewatered at the treatment facility to a solid content of approximately 17%, or greater, prior to the alkaline stabilization process. The sludge cake is blended with approved coal fly ash, alkaline material, and other blending agents by the preparer to produce a synthetic soil like material. The resultant product "Synsoil" may be distributed to customers for approved end-uses, as identified and set forth in the permit application.

Material may also be blended at the site that does not meet the Class A, but does at minimum meet the criteria for Class B table 402.2 sludge product, as set forth in Delaware's **Regulations Governing the Use and Disposal of Wastewater Sludge.** The latter material may be used as a soil in landfill projects exclusive of the requirements of this permit.

SCHEMATIC OF VFL'S PROCESS FOR STABILIZATION OF CITY OF WILMINGTON FILTERCAKE



DECISION SCHEMATIC FOR MONITORING OF STABILIZED SLUDGE



The limited distribution and marketing program shall be conducted in accordance with the following documents:

1. The Department's **Regulations Governing the Use and Disposal of Wastewater Sludge** (October, 1999);

2. The permit application submitted January 4, 1995, revised March 10, 1995 and revised April 5, 1995;

3. Chapter I, Subchapter 0, **Title 40 of the Code of Federal Regulations, Part 503,** effective March 22, 1993, and:

4. Addendum (dated May 23, 2000) to the April 5, 1995 permit application designating additional uses of Class B Sludge Product and a listing of additional blending additives.

1. PROGRAM LIMITATIONS

During the period beginning on the effective date and lasting through the expiration date the permittee is authorized to conduct a Distribution and Marketing Program for the sludge product, "Synsoil" prepared by the permittee at the City of Wilmington Wastewater Treatment Facility. The program limitations are specified below:

Only sludge product which satisfies Class A (PFRP) requirements, with regard to pathogen indicators, and the Pollution Concentrations limits from Table 402.3 of the Department's Regulations **Governing the Use and Disposal of Wastewater Sludge** (see below) may be distributed under this permit. In order to satisfy the minimum requirements for Class A conditions, the material must be processed employing one of the Class A stabilization alternatives as found in section 600 of the Department's Regulations **Governing the Use and Disposal of Wastewater Sludge** (or any additional methods approved by the U.S. EPA Pathogen Equivalency Committee for achieving Class A standards).

Pollutant Concentrations:

Cadmium	39.0 mg/kg	Nickel	420.0 mg/kg	Copper	1500.0 mg/kg
Zinc	2800.0 mg/kg	Lead	300.0 mg/kg	Selenium	36.0 mg/kg
Arsenic	41.0 mg/kg	Chromium	1200.0 mg/kg	Mercury	17.0 mg/kg
Molybdenum	18.0 mg/kg	PCB's	5.0 mg/kg		

Sludge products failing to meet Class A, table 3 standards shall not be distributed under this permit. Utilization of non-Class A sludge products that achieve Class B standards, as defined by the Department's **Regulations Governing the Use and Disposal of Wastewater Sludge** must receive separate authorization from the Department prior to distribution or disposal. This would include use as dike material by the Army Corp of Engineers.

Sludge meeting the Class B standard and, at minimum the Ceiling Concentrations as defined by Table 402.1 of the Department's **Regulations Governing the Use and Disposal of Wastewater Sludge,** may be utilized at landfills owned and operated by the Delaware Solid Waste Authority (DSWA) with DSWA approval. Such product is exempt form the limitations and requirements of this permit.

No sludge shall be utilized if sample analysis yields pollutant concentrations in excess of the following values:

Arsenic	75 mg/kg	Cadmium	85 mg/kg	Chromium	3000 mg/kg
Copper	4300 mg/kg	Lead	840 mg/kg	Mercury	57 mg/kg
Molybdenum	75 mg/kg	Nickel	420 mg/kg	Selenium	100 mg/kg
Zinc	7500 mg/kg	PCB	5 mg/kg		

1. PROGRAM LIMITATIONS (continued)

The permittee shall resample the sludge products and submit to the Department additional analysis if there has been a significant increase (greater than 25%) from the baseline established in the permit application. Based upon a review of the data submitted, the Department may require the permittee to make changes in the product literature, may limit the allowable end uses, or may otherwise modify or revoke this permit.

All sludge products must be dried to the minimum percent solids specified for compliance with the Vector Attraction Reduction required in the in Section 600 of the Department's **Regulations Governing the Use and Disposal of Wastewater Sludge** prior to distribution or marketing as "Synsoil".

"Synsoil" shall not be applied to lands where root vegetables or vegetables which are eaten raw are grown or will be grown within twenty-four (24) months. Sludge products shall not be sold or distributed to the general public under the conditions of this permit.

Sludge products may be distributed to customers who intend to utilize the material for the following end-uses only:

1. Construction of dikes and berms.
2. Construction of structural bases for roads and buildings.
3. Base structure for turf establishment.

The Department following departmental approval of use-specific product literature may approve additional end uses.

The permittee shall not knowingly allow any customer to use the sludge product in any manner, which is inconsistent with the product literature.

No sludge products may be stored or applied so as to cause surface or groundwater pollution, run-on/runoff, cause odor, adversely affect the food chain, attract vectors, or adversely affect private or public water supplies.

NOTE: See Part III, A, Special Condition No. 3 for additional requirements.

2. MONITORING REQUIREMENTS:

During the period beginning on the effective date and lasting through the expiration date the permittee is authorized to conduct a Distribution and Marketing program for the sludge product. "Synsoil", prepared at the City of Wilmington Wastewater Treatment Facility. Sludge product for distribution and marketing shall be monitored by the permittee as specified below:

B.1 DIGESTED SLUDGE

Parameter	Unit Measurement	Minimum Frequency	Sample Type
Moisture Content	Percent	Monthly	Composite *
Total Nitrogen as N (dry weight basis)	Percent	Monthly	Composite *
Organic Nitrogen as N (dry weight basis)	Percent	Monthly	Composite *
Ammonium and Nitrate Nitrogen as N (Dry weight basis)	Percent	Monthly	Composite *
pH	S.U.	Monthly	Composite *
Volatile solids	Percent	Monthly	Composite *
PCB's (dry weight basis)	Mg/kg	Monthly	Composite *
Phosphorus (dry weight basis)	Mg/kg	Monthly	Composite *
Potassium (dry weight basis)	Percent	Monthly	Composite *
Cadmium (dry weight basis)	Mg/kg	Monthly	Composite *
Zinc (dry weight basis)	Mg/kg	Monthly	Composite *
Copper (dry weight basis)	Mg/kg	Monthly	Composite *
Nickel (dry weight basis)	Mg/kg	Monthly	Composite *
Lead (dry weight basis)	Mg/kg	Monthly	Composite *
Chromium (dry weight basis)	Mg/kg	Monthly	Composite *
Mercury (dry weight basis)	Mg/kg	Monthly	Composite *
Molybdenum (dry weight basis)	Mg/kg	Monthly	Composite *
Selenium (dry weight basis)	Mg/kg	Monthly	Composite *
Arsenic (dry weight basis)	Mg/kg	Monthly	Composite *
Priority pollutant scan (see NOTE)	-	Annually	Composite *

All sludge product samples shall be collected and analyzed in accordance with Exhibit E of the Permit Application dated April 5, 1995. See Part I F.1. for reporting requirements.

NOTE: A list of the 126 priority pollutants can be found in 40 CFR, Part 423, Appendix A, 1987.

B.2. SYNSOIL

Parameter	Unit Measurement	Minimum Frequency	Sample Type
Moisture Content	Percent	Monthly	Composite *
Total Nitrogen as N (dry weight basis)	Percent	Monthly	Composite *
Organic Nitrogen as N (dry weight basis)	Percent	Monthly	Composite *
Ammonium and Nitrate Nitrogen as N (Dry weight basis)	Percent	Monthly	Composite *
pH	S.U.	Monthly	Composite *
Volatile solids	Percent	Monthly	Composite *
PCB's (dry weight basis)	Mg/kg	Monthly	Composite *
Phosphorus (dry weight basis)	Mg/kg	Monthly	Composite *
Potassium (dry weight basis)	Percent	Monthly	Composite *
Cadmium (dry weight basis)	Mg/kg	Monthly	Composite *
Zinc (dry weight basis)	Mg/kg	Monthly	Composite *
Copper (dry weight basis)	Mg/kg	Monthly	Composite *
Nickel (dry weight basis)	Mg/kg	Monthly	Composite *
Lead (dry weight basis)	Mg/kg	Monthly	Composite *
Chromium (dry weight basis)	Mg/kg	Monthly	Composite *
Mercury (dry weight basis)	Mg/kg	Monthly	Composite *
Molybdenum (dry weight basis)	Mg/kg	Monthly	Composite *
Selenium (dry weight basis)	Mg/kg	Monthly	Composite *
Arsenic (dry weight basis)	Mg/kg	Monthly	Composite *
Priority pollutant scan (see NOTE)	–	Annually	Composite *

All Synsoil samples are to be collected at the following locations: Synsoil batch stockpiles.
All sludge samples shall be collected at the following location(s): sludge filter press
All sludge product samples shall be collected and analyzed in accordance with Exhibit E of the Permit Application dated April 5, 1995. See Part I F.1. for reporting requirements.

NOTE: A list of the 126 priority pollutants can be found in 40 CFR, Part 423, Appendix A, 1987.

B.3. VFL "SYNSOIL" BATCH PROCESS MONITORING (See Note)

*Parameter	Unit Measurement	Minimum Sampling Frequency	Sample Type
Temperature (Ambient Mean)	Degrees Centigrade	Daily	In-Situ
pH	Standard Units	Daily	In-Situ
Detention Time	Days	Daily	In-Situ

Process monitoring requirements may be changed to conform with the Class A process alternative used. The Department shall be notified when such changes are needed.

NOTE: Temperature and pH monitoring results and detention time monitoring for each "Synsoil" batch shall be recorded on the Process Material Data Tracking Record, Exhibit G of the April 5, 1995 permit Application. See Part I, F.1 for reporting requirements.

C. Schedule of Compliance

None

D. Bonding

1. As a requirement for maintaining this permit, the permittee shall file with the Department a bond or other security on a form approved by the Department. The bond shall be payable to the Department and the obligation of the bond shall be conditioned upon the fulfillment of all requirements related to this permit. Liability of the bond shall remain in effect until the expiration date of this permit. Within sixty (60) days of the effective date of this permit, a bond in the amount specified in the current fee scheduled established by the Department, shall be executed by the applicant and by a corporate surety licensed to do business in this State. Instead of having a bond executed by a corporated surety, the applicant may elect to deposit in a escrow account set up by permittee, filing copies of the escrow agreement with the Department, cash or negotiable bonds of the federal government or of this State or any other securities acceptable to the Department. The amount of the cash deposit or the market value of any securities shall be at least equal to the required sum of the bond. The Department shall receive and hold the cash or securities in trust, for the purpose for which the deposit is posted. The obligation of the applicant and of any corporate surety under the bond shall become due and payable, and all or any part of a cash or securities shall be applied to payment of the costs of properly fulfilling any requirement of the Permit if the Department has:

   a.) Notified the applicant or any corporate surety that the conditions of the permit have not been fulfilled, and specified in the notice the particular deficiencies in the fulfillment of the permit conditions; and

   b.) Given the applicant and any corporate surety a reasonable opportunity to correct the deficiencies and to fulfill all of the conditions of the permit; and

   c.) Determined that, at the end of a reasonable length of time some or all of the deficiencies specified in Part I, D.1(a), above, remain uncorrected.

E. Monitoring

1. Representative Sampling:

   a.) Samples and measurements taken as required herein shall be representative of the volume and nature of the sludge product to be distributed and marketed.

   b.) All sludge products must be analyzed for the parameters identified in Part I, B.1 of this permit prior to distribution.

2. Recording of Results:

   For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the information:

   a.) The exact place, date and time of sampling and/or measurement;
   b.) The person(s) who performed the sampling and/or measurement;
   c.) The dates and analyses that were performed and the time that the analysis was begun;
   d.) The person(s) who performed the analyses;
   e.) The results of each analysis, along with the original laboratory report; and,
   f.) The analytical methods employed.

Records Retention:

All records and information resulting from the monitoring activities required by this permit, including all records of analyses performed and calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation, shall be retained for five (5) years. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the permittee, or as requested by the Department.

F. Reporting:

1. Monthly Report

A monthly report shall be submitted for any period, up to one month, whenever "Synsoil" is produced for distribution and marketing under the guidelines of this permit.

a) Sludge product analytical and stabilization process monitoring data obtained during the previous one (1) month shall be summarized for each month and postmarked no later than the 28th day of the month following the completed reporting period. The first report shall be due one (1) month after the effective date of this permit. Signed copies of these, and all other reports required herein, shall be submitted to the Department at the following address:

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, DIVISION OF WATER RESOURCES, SURFACE WATER DISCHARGES SECTION, 89 KINGS HIGHWAY, DOVER, DELAWARE 19901. TELEPHONE: 302-739-5731

When submitting monitoring results, copies of the original laboratory sheets should be included. If more than one sample is analyzed during any month, a table showing the range of constituent concentration values shall be prepared and included with the submittal.

b.) Temperature, pH and detention time monitoring of the material within the batch piles, as required in Part I, B.2 of this permit, shall be summarized in the monthly report. However, if any stabilization parameter cannot be met in any batch of Synsoil, the permittee shall indicate the exact time and duration of the period(s) that pH, desired operating temperatures or detention time were not achieved.

2. Annual Report

The permittee shall submit to the Department an annual report to include the date, customer, shipping destination, quantity and proposed end-use of all sludge products distributed during the previous year. The annual report shall be due on February 1 of each year, and the information contained in the report shall cover the previous calendar year.

3. Test Procedures

Test procedures for laboratory analyses shall conform to the applicable test procedures identified in Section 1000 of **Regulations Governing the Use and Disposal of Wastewater Sludge and** the Quality Assurance Program of the Permit Application.

G. Definitions

1. "Composite" means a series of grab samples which have been collected in a manner such that the final sample is representative of the volume and characteristics of the sludge to be distributed.

2 "Distribute" means to barter, sell, offer for sale, consign, furnish, provide, or otherwise supply a material as part of a commercial enterprise or giveaway program

3. "Food chain crops" means tobacco, crops grown for human consumption, and crops grown to feed animals whose products are consumed by humans.

4. "Handling" means any way in which sludge, treated sludge, or any other product containing these materials is dealt with other than collection, burning, storage, treatment, land application, disposal, or transportation. It includes distribution of treated sludge.

5. "Label" means the display of all written, printed or graphic material on the immediate container, or information accompanying the material.

6. "Landfill" means a natural topographic depression, man-made excavation or diked area formed primarily of earthen materials, which has been lined with man-made materials or remains unlined and which is designed to hold an accumulation of solid wastes.

7. "Person" means an individual, trust, firm, joint stock company, federal agency, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, or any interstate body.

8. "PFRP" means process to further reduce pathogens.

9. "Sewage" means water-carried human or animal wastes from septic tanks, water closets, residences, buildings, industrial establishments, or other places, together with such groundwater infiltration, subsurface water, admixture of industrial wastes or other wastes as may be present.

10. "Sewage sludge" means sludge which derives in whole or in part from sewage.

11. "Sludge" means the accumulated semi-liquid suspension, settled solids, or dried residue of these solids that is deposited from (a) liquid waste in a municipal of industrial wastewater treatment plant, (b) surface or groundwaters treated in a water treatment plant, whether or not these solids have undergone treatment. Septage is included herein as sludge.

12. "Storage" means the interim containment of sludge, treated sludge, or any other product containing these materials after removal from the wastewater and before disposal or utilization.

13. "Synsoil" is the product derived from the blending of alkaline agents, coal fly ash and other approved conditioning agents with biosolids in a process that meets a PFRP equivalence and contains monitored metals below regulated pollutant limits.

14. "Treatment' means a process which alters, modifies or changes the biological, physical, or chemical characteristics of sludge or liquid wastes.

H Management Requirements

1. Noncompliance Notification

The permittee shall report to the Department:

a.) In writing, thirty (30) days before any planned change to the sludge product treatment process or the distribution and marketing program, if that change would result in any alterations to the program as represented in the permit application.

b.) In writing thirty (30) days before any anticipated change which would result in noncompliance with any permit condition or the **Regulations Governing the Use and Disposal of Wastewater Sludge.**

c.) Orally, as soon as possible but no later than, twenty-four (24) hours from the time the permittee became aware of any noncompliance which may endanger the public health or the environment, at (302) 739-5731 during normal working hours, or (800) 662-8802 after normal working hours.

d.) In writing as soon as possible but within five (5) days of the date the permittee knows or should know of any noncompliance unless extended by the Department. This report shall contain:

i. A description of the noncompliance and its cause.

ii. The period of noncompliance including to the extent possible, times and dates and, if the noncompliance has not been corrected, the anticipated time it is expected to continue.

iii. Steps taken or planned to reduce or eliminate reoccurrence of the noncompliance.

e.) In writing as soon as possible after the permittee becomes aware of relevant facts not submitted or incorrect information submitted, in a permit application or any report to the Department. Those facts or the correct information shall be included as a part of this report.

2. Minimize Impacts

The permittee shall take all necessary actions to eliminate and correct any adverse impact on the public health or the environment resulting from permit noncompliance.

I Responsibilities

1. Renewal Responsibilities

At least 180 days before the expiration date of this permit, the permittee shall submit a new application for a permit or notify the Department of the intent to cease operation of the distribution and marketing program by the expiration date. In the event that a timely and sufficient reapplication has been submitted and the Department is unable, through no fault of the permittee, to issue a new permit before the expiration date of this permit, the terms and conditions of this permit are automatically continued and remain fully effective and enforceable.

2. Entry and Access

The permittee shall allow the Department, consistent with 7 Del. C., Chapter 60, to:

a) Enter the permitted facility.

b) Inspect any records that must be kept under this permit.

c) Inspect any facility, equipment, practice, or operation permitted or required by this permit.

d) Sample of monitor for the purpose of assuring permit compliance, any substance or any parameter at the facility or land application site.

3. Provide Information

The permittee shall furnish to the Department within a reasonable time, any information requested, including copies of records, which may be used by the Department to determine whether cause exists for modifying, revoking, re-issuing, or terminating the permit, or to determine compliance with the permit or the **Regulations Governing the Use and Disposal of Wastewater Sludge.**

4. Transfer of Ownership or Control

This permit shall be transferrable to a new owner or operator provided that the permittee notifies the Department by requesting a minor modification of the permit before the date of transfer and provided that the transferee shows evidence of a legal right to use the site and is otherwise in compliance with all applicable provisions of the Department's **Regulations Governing the Use and Disposal of Wastewater Sludge.**

5. Operation of Facility

The permittee shall at all times properly maintain and operate all structures, systems, and equipment for treatment, control and monitoring, which are installed or used by the permittee to achieve compliance with 7 Del. C., Chapter 60, this permit, or the **Regulations Governing the Use and Disposal of Wastewater Sludge.**

6. Permit Revocation and Modification

a) After notice and opportunity for a hearing, this permit may be revoked if the permittee violates any permit condition, any provisions of the **Regulations Governing the Use and Disposal of Wastewater Sludge,** or fails to pay applicable Department fees.

b) If the Department finds that the public health, safety or welfare requires emergency action, the Department shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the permittee. Thereafter, if requested by the permittee in writing, the Department shall provide the permittee a revocation hearing and prior notice thereof. Such hearings shall be conducted in accordance with 7 Del. C., Chapter 60.

c) This permit may be modified to reflect authorization by the Department of additional sludge product end-uses, based upon the review and approval of additional product literature specific to the proposed end-use.

7. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation.

8. Property Rights

The issuance of this permit does not convey any property rights in either real of personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

9. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application or any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

A Special Conditions

1. The Department must be notified within seventy-two (72) hours of initial use if the permittee chooses to use any alternative source of materials for the preparation of Synsoil other than those described in the addendum to the Permit Application dated May 23, 2000.

2. At a minimum, 2 copies of the following product literature sheets as submitted to the Department in the permit application shall be distributed to each end-user, along with any additional product literature specific to the intended end-sues(s).

   - General Guidelines for Using VFL's Synsoil Product (Stabilized Municipal Sludge Filter Cake) in Construction Applications.

3. Sludge product that has not met the conditions for Class A (PFRP) and/or pollutant concentration limits shall be transported only in accordance with a valid Delaware Waste Transporter's Permit.

4. The Permittee shall require the use of tarps or otherwise assure that all vehicles transporting sludge products from the facility are properly sealed to retain the sludge product in the vehicle during transportation.

5. For end-users who may utilize more than 100 tons of sludge product/year, a plan shall be submitted to the Department which addressees the following:

   a) The end use(s) of the sludge product
   b) Maximum application rates
   c) Total amount of sludge product to be utilized
   d) Storage practices
   e) Transportation method

6. The permittee shall maintain a log of all persons that receive more than ten (10) cubic yards of Synsoil on an annual basis. At a minimum, this log shall include the name of the purchaser, the amount purchased, and the proposed end-use. These logs shall be maintained in accordance with Part I, E.3 of this permit

7. Synsoil for distribution and marketing may be stockpiled by the permittee at the following locations:

   a) Within the processing building, and

   b) The designated stockpile areas adjacent to the VFL processing building at the City of Wilmington Wastewater Treatment Facility.

8. The permittee must comply with **Title 40 Code of Federal Regulations Parts 258 and 503.**

9. In the event that the **Regulations Governing the Use and Disposal of Wastewater Sludge** or applicable Federal Regulations are revised, this permit may be reopened and modified accordingly after notice and opportunity for a public hearing.

RPW

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

RECEIVED
MAY 0 4 2005
DSWA

SOLID & HAZARDOUS WASTE
MANAGEMENT BRANCH

TELEPHONE: (302) 739 - 3689
FAX NO.: (302) 739 - 5060

April 28, 2005

Ms. Robin M. Roddy, P.E.
Facility Manager, SSWMC
Delaware Solid Waste Authority
1128 S. Bradford Street
P.O. Box 455
Dover, Delaware 19903-0455

Subject: Alternate Daily Cover Approval, Kaofin®
Reference: Permit SW-01/01

Dear Ms. Roddy:

This letter shall serve as our approval for the Delaware Solid Waste Authority, Northern Solid Waste Management Center 2 to use an alternate daily landfill cover as described by Beneficial Use Determination (BUD) #15, issued by the Solid & Hazardous Waste Management Branch on February 17, 2004. Branch approval for the use of the Kaofin® material is provided as requested by your February 1, 2005, letter and is contingent upon DSWA complying with the following conditions:

1. DSWA shall comply with conditions C.4, C.5, C.6, and C.7 of BUD #15, and those conditions are hereby incorporated into this approval and attached.

2. This approval shall be valid only as long as BUD #15 remains in effect and valid. Upon termination or expiration of BUD #15, the DSWA shall cease using the material as alternate cover. If the DSWA desires to apply for subsequent approval for this material, that request shall be submitted in accordance with Section 5.I.2.c.(4)a. of the DRGSW.

3. DSWA shall review the results of the analysis required by BUD #15, Condition C.8 and shall notify the SHWMB immediately (no later than the next business day) if the material is found to present an increased threat to human health or the environment or is otherwise determined to be unsuitable for use as an alternative daily landfill cover.

4. Upon discovery that the Kaofin® alternate daily cover does not meet the performance requirements specified in Section 5.I.2.c.(1)a. of the DRGSW or discovery that the material presents an increased threat to human health or the environment, the DSWA shall cease using the material immediately.

5. So long as this approval is valid, it shall be maintained in Appendix K of the facility's Plan of Operations.

If you have any questions concerning this letter, please contact Robert Hartman at 302-739-3689.

Sincerely,

Nancy C. Marker
Environmental Program Manager II
Solid & Hazardous Waste Management Branch

NCM: RH: mjd
DSWA/Cherry Island Landfill/Approvals/RH05016

Enclosure: BUD #15

cc: Avery Dalton, Environmental Scientist, SHWMB
Katie Bennett, Environmental Scientist, SHWMB
Richard Watson, Chief Engineer, DSWA

RHW

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

OCT 2 6 2004

SOLID & HAZARDOUS WASTE
MANAGEMENT BRANCH
TELEPHONE: (302) 739 - 3689
FAX NO.: (302) 739 - 5060

October 21, 2004

Via Facsimile & U.S. Mail

RECEIVED
NOV 0 1 2004
DSWA

Ms. Robin Roddy, P.E.
Facility Manager
DSWA Cherry Island Landfill
1128 S. Bradford Street
P.O. Box 455
Dover, Delaware 19903-0455

Subject: Conditional One-Time Approval of Alternate Daily Cover
Reference: Permit SW-01/01

Dear Ms. Roddy:

This letter shall serve as the Solid and Hazardous Waste Management Branch's (SHWMB) approval for the Delaware Solid Waste Authority, Northern Solid Waste Management Center 2 to use, as alternate daily cover, the degraded wood mulch from the site known as the Potts Property and as described in the Site Investigation and Restoration Branch letter dated October 12, 2004. In accordance with Section 5.I.2.c.(4) of the *Delaware Regulations Governing Solid Waste*, SHWMB approval for the use of the degraded wood mulch is provided as requested by your October 13, 2004 letter and is contingent upon DSWA complying with the following conditions:

1. The material shall be stockpiled and used within the lined area of the landfill.

2. The material shall not be used or stored on outside slopes of the landfill or in areas where it could be carried off of the lined area by way of stormwater.

3. This approval shall expire on December 31, 2005.

4. DSWA shall notify the SHWMB immediately (no later than the next business day) if the material is found to be unsuitable for use as alternate daily cover, or if the material has been found to present an increased threat to human health or the environment.

5. Any violation of the conditions of this approval, regulations promulgated by DNREC, Secretary's Orders or provisions of 7 Del. C. Chapter 60 shall be grounds for immediate termination of the approval.

If you have any questions concerning the approval, you may contact Robert Hartman at (302) 739-3689.

Sincerely,

Nancy C. Marker

Nancy C. Marker
Environmental Program Manager II
Solid & Hazardous Waste Management Branch

NCM: RH: jmr
DSWA\Cherry Island Landfill\Approvals\RH04087.doc

Attachment: BUD #22 Approval

cc: Jamie H. Rutherford, Environmental Program Manager I, SHWMB
James Short, Environmental Program Manager I, SHWMB
Stephen Johnson, Environmental Engineer, SIRB
James Thomas, Jr., Keogh Contracting Co., Inc.

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

SOLID & HAZARDOUS WASTE
MANAGEMENT BRANCH

TELEPHONE: (302) 739 - 3689
FAX NO.: (302) 739 - 5060

BENEFICIAL USE DETERMINATION #22

Issuance Date:	October 21, 2004
Expiration Date:	December 31, 2004
Contact Person:	James Thomas, Jr.
Facility Name:	Keogh Contracting Co., Inc.
Mailing Address:	P.O. Box 690, New Castle DE 19720
Location of Approved Activity:	601 Christiana Ave., Wilmington DE

A. SUPPORTING DOCUMENTATION

1. Letter dated October 20, 2004, from James Thomas, Jr., to James Short requesting permission to remove degraded wood mulch stockpiled on the Potts Property for the purpose of beneficially using the material.

2. Letter dated October 13, 2004, from Marian R. Young (Brightfields, Inc.) to Bob Hartman (DNREC), Janet Manchester (DNREC) and Robin Roddy (DSWA) requesting approval to transport the degraded wood mulch from the Potts Property on Chrsitiana Avenue in Wilmington, Delaware, to the Delaware Solid Waste Authority's Cherry Island Landfill (CIL) in Wilmington, Delaware, for use as alternate daily cover.

3. Letter dated October 12, 2004, from Alex Rittberg (DNREC) to Robin Roddy (DSWA) certifying that the degraded wood mulch on the Potts Property is not a hazardous waste and is suitable for use in a permitted landfill setting as "Soil Class B."

B. APPROVED ACTIVITIES

In accordance with the *Delaware Regulations Governing Solid Waste* (DRGSW), Section 2.E.2, the Department of Natural Resources and Environmental Control (DNREC) grants a BUD to Keogh Contracting, Inc., to ship the degraded wood mulch on the Potts Property for use as alternate daily landfill cover.

C. CONDITIONS

This approval for beneficial use is subject to the following conditions:

1. The landfill facility intending to use this material must obtain separate approval from the Department as required by Section 5.I.c.4 of the Delaware Regulations Governing Solid Waste.

2. A copy of this approval must be presented upon request to any law enforcement officer or representative of the Department.

3. The Department must be notified immediately of any changes in the waste characteristics or changes that will alter the characteristics or the beneficial use of these materials.

4. Only that material that has been sampled, analyzed, and certified by SIRB as non-hazardous and suitable for use at the landfill shall be transported for use as alternate daily cover.

5. All of the degraded wood mulch shall be removed from the Potts Property by the expiration date of this BUD.

This Determination does not relieve Keogh Contracting, Inc., from complying with any other applicable Federal, State, or Local regulations or ordinances.

Any violation of the conditions of this Determination, regulations promulgated by the Department, Secretary's Orders, or provisions of 7 Del. C., Chapter 60, will be grounds for termination of this BUD, and implementation of appropriate enforcement action.

Nancy C. Marker

Nancy C. Marker
Environmental Program Manager II
Solid and Hazardous Waste Management Branch

10-22-04
Date

NCM:JM:krc
Keogh BUD 102004