



**THE CITY OF NEW YORK**  
**Department of Sanitation**

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## **Fresh Kills Landfill**

# **Post-Closure Monitoring and Maintenance Operations Manual**

- A — Post-Closure Operations and Maintenance**
  - B — Fresh Kills Landfill Leachate Treatment Plant and Containment and Collection System Operations and Maintenance Plan
  - C — Environmental Monitoring Plan
  - D — Operation and Maintenance Plan for Landfill Gas Collection and Control System
- 

13 December 2002  
**Document No. 030-3208-09005-004**

**FRESH KILLS LANDFILL**  
**POST-CLOSURE MONITORING**  
**AND MAINTENANCE OPERATIONS MANUAL**

**VOLUME A**  
**POST-CLOSURE OPERATIONS AND MAINTENANCE**

**Prepared for:**

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**13 December 2002**

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- Attachment 2 – Final Cover and Drainage Systems Monitoring and Maintenance Manual
- Attachment 3 – Emergency/Contingency Contacts

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## SECTION 1

### INTRODUCTION

This Post-Closure Monitoring and Maintenance Operations Manual (the Manual) provides a description of overall management of the Fresh Kills Landfill (the Landfill) during the post-closure period. The Manual was prepared in accordance with the regulatory requirements of 6 NYCRR 360-2.15(k) and the Fresh Kills Order on Consent (Consent Order) for monitoring, maintenance, reporting, and resources requirements. This Manual sets the performance standards and requirements under which the actual monitoring, maintenance, and reporting practices are to be carried out for the entire Fresh Kills Landfill. The post-closure Fresh Kills Landfill Leachate Treatment Plant and Containment and Collection System Operations and Maintenance Plan, Environmental Monitoring Plan, and Operations and Maintenance Plan for the Landfill Gas Collection and Control System, as prepared by the facility consultants and contractors, are provided as separate volumes (Volumes B, C, and D, respectively). The Post-Closure Contingency Plan for the Fresh Kills Landfill, which is incorporated into Volume A and the other volumes, presents the course of actions to be taken in responding to a wide variety of contingency situations that may be encountered during the Landfill post-closure period.

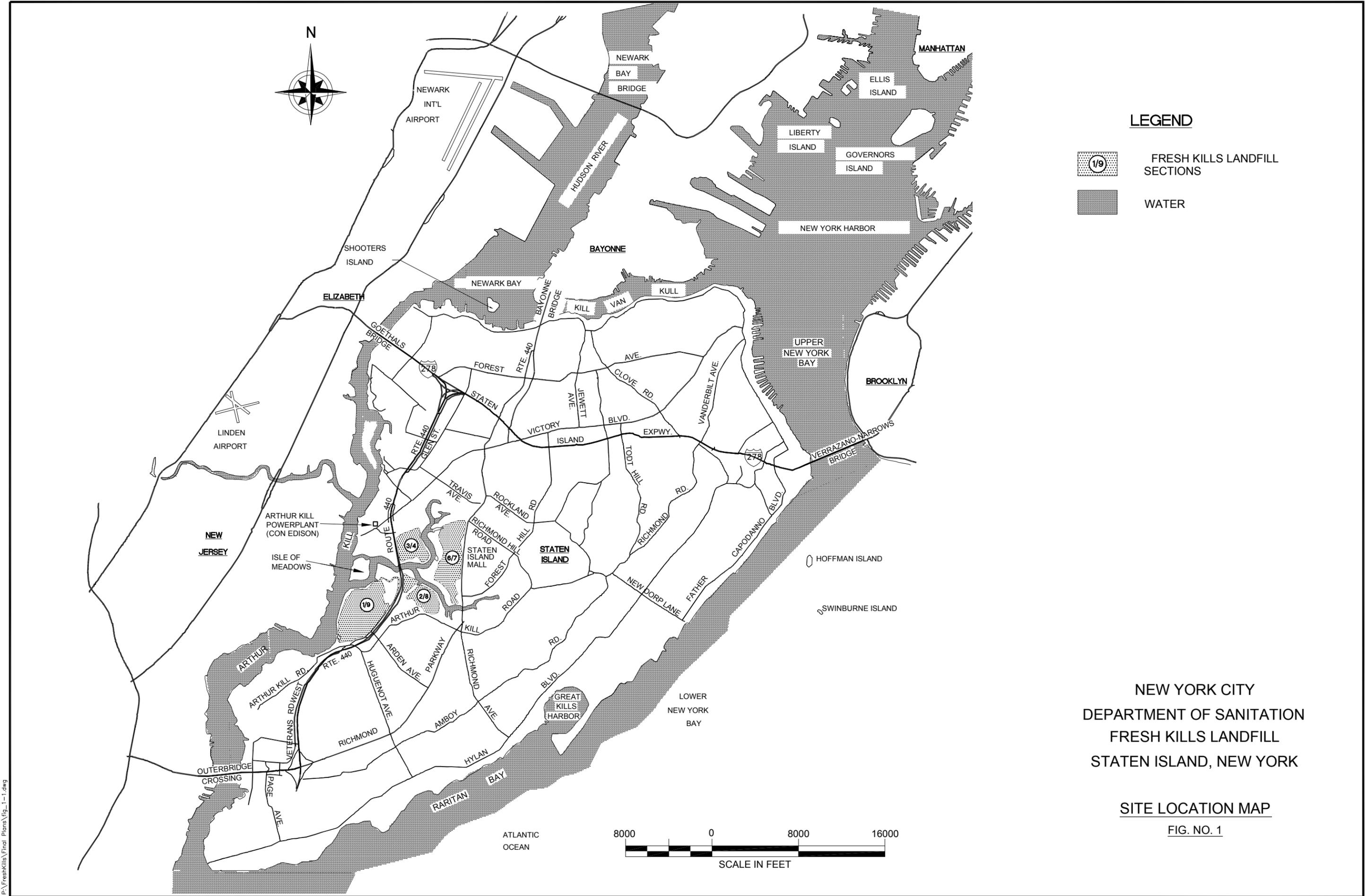
A current copy of this Manual, including Volumes A, B, C, and D, is maintained in the Landfill operating record.

#### 1.1 FACILITY OVERVIEW

The Fresh Kills Landfill is located in the borough of the City of New York known as Staten Island (See Figure 1-1). More specifically, the Fresh Kills Landfill is situated on an approximately 2,200-acre land area that is bounded by a residential neighborhood known as Travis and by Travis Ave. on the north, by Richmond Avenue on the east, by Arthur Kill Road and Rte. 440 (also known as the West Shore Expressway) on the south, and by a waterway known as the Arthur Kill on the west. See Figure 1-2 for a current site plan.

Rte. 440 and a network of waterways that consists of the Great Fresh Kills, the Fresh Kills, Richmond Creek, Main Creek, and Springville Creek divide the Fresh Kills Landfill into four distinct disposal areas, referred to as sections. The landfill sections are as follows:

- Section 1/9, which is approximately 401 acres in size and located generally between Rte. 440 and the Arthur Kill Road.
- Section 6/7, which is approximately 305 acres in size and located generally between Richmond Avenue and Main/Richmond creeks.
- Section 2/8, which is approximately 139 acres in size and located generally between Rte. 440 and Richmond Creek.
- Section 3/4, which is approximately 142 acres in size and located generally between Rte. 440 and Main Creek.



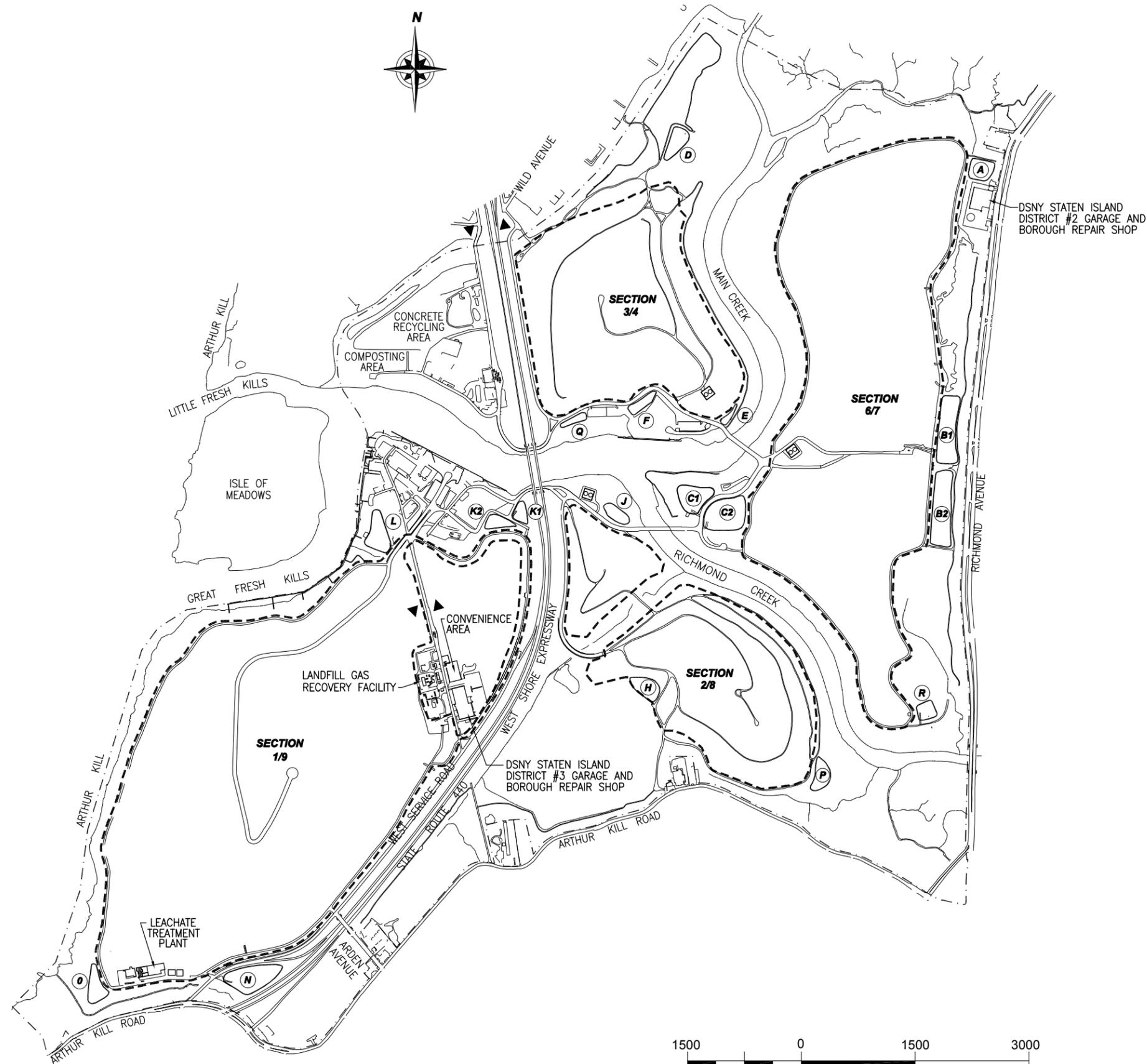
**LEGEND**

-  FRESH KILLS LANDFILL SECTIONS
-  WATER

NEW YORK CITY  
 DEPARTMENT OF SANITATION  
 FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK

**SITE LOCATION MAP**  
 FIG. NO. 1

P:\FreshKills\Final Plans\Fig. 1-1.dwg



LEGEND

- LIMIT OF LANDFILL SOLID WASTE MANAGEMENT UNIT 
- LANDFILL COMPLEX BOUNDARY 
- STORMWATER BASIN AND DESIGNATION 
- LFG FLARE STATION 
- ENTRANCE/EXIT 

NEW YORK CITY  
DEPARTMENT OF SANITATION  
FRESH KILLS LANDFILL  
STATEN ISLAND, NEW YORK

SITE PLAN

FIG. NO. 1-2



## **1.2 SUMMARY OF REPORT ORGANIZATION**

This Manual has been organized to cover all post-closure requirements with regard to facility management, environmental monitoring, reporting, resources, and contingency planning. Volume A serves as the main document; where applicable, Volume A references more detailed discussions in other volumes. Volumes B, C, and D provide more detailed information on leachate control facilities, environmental monitoring, and the landfill gas collection and control system.

Table 1-1 presents the regulatory matrix, which outlines specific regulatory requirements and the corresponding sections contained in the Manual. This Post-Closure Monitoring and Maintenance Operations Manual is prepared in compliance with and consistent to the applicable regulatory requirements, as discussed in detail in Section 1.3.

### **1.2.1 Volume A: Post-Closure Operations and Maintenance**

Volume A includes a discussion of management and personnel, including minimum resources requirements, and provides information on environmental monitoring processes and procedures, leachate collection and control, landfill gas control and monitoring, financial assurance requirements, end uses, post-closure facility controls, emergency services, and other issues related to landfill operations and maintenance during the post-closure period. Volume A also includes an overview of the maintenance procedures for final cover for the entire Landfill. Three attachments are included in Volume A for more detailed discussion of the following issues:

- Attachment 1 – Applicable Regulations (Excerpts from 6 NYCRR Part 360 and the Consent Order)
- Attachment 2 – Final Cover and Drainage Systems Monitoring and Maintenance Plan
- Attachment 3 – Emergency/Contingency Contacts

### **1.2.2 Volume B: Fresh Kills Landfill Leachate Treatment Plant and Containment and Collection System Operations and Maintenance Plan**

Volume B provides the O&M Plan for the Fresh Kills Landfill Leachate Treatment Plant (FKLLTP) and Containment and Collection System, and a discussion on reporting and record keeping. It addresses the regulatory requirements of 360-2.15(k)(7)(ii) and (iii) as they relate to the leachate control system.

### **1.2.3 Volume C: Environmental Monitoring Plan**

Volume C provides the description of the post-closure environmental monitoring program in accordance with regulatory requirements of 360. 2-15(k)(7)(i) and Appendix A-15 of the Consent Order. The description includes sampling type, location, and preservation. Reporting and record keeping for environmental monitoring are also addressed in Volume C.

**Table 1-1  
Regulatory Matrix  
Post-Closure Monitoring and Maintenance Operations Manual**

Regulatory Requirement (360-2.15(k))	Consent Order Requirements	Location in Manual
(7) A comprehensive post-closure monitoring and maintenance operations manual is required. This document shall provide all information needed to effectively monitor and maintain the facility for the entire post-closure period. Minimum components of this manual include:	A Post-Closure Monitoring and Maintenance Operations Manual for the landfill conforming to the requirements of 360-2.15(k)(7). The manual shall contain the components defined 360-2.15(k)(7)(i) to(viii):	
(i) description of type, location, sampling and sample preservation methodology, and recordkeeping and reporting requirements for all environmental monitoring activities. The monitoring plan shall conform to paragraph (4) of this subdivision;	A description of the sampling, record-keeping and reporting requirements for all environmental monitoring activities as defined in 360-2.15(k)(4); The Long-term Groundwater Monitoring Program developed pursuant to Compliance Schedule Appendix A-6, and the Long-Term Surface and Sediment Monitoring Program developed pursuant to Compliance Schedule Appendix A-7 shall be used as the basis for development of the post-closure environmental monitoring program. Information contained in the report submittals, revised to reflect current conditions, for Compliance Schedule Appendices A-1, A-2, A-4, A-8, and A-10, should be used as references for completion of this manual.	Volume C - Environmental Monitoring Plan Also summarized in Volume A - Section 4 (Environmental Monitoring Plan)
(ii) description of all environmental control systems including:	A description of Leachate containment/collection system; A description of all environmental control systems.	Volume B (for leachate control systems); Volume D (for landfill gas control system). Also summarized in Volume A - Sections 5 and 6
(a) process control monitoring types, locations, recordkeeping and reporting requirements. Leachate management activities shall include recording of the total volume of leachate stored and removed from the facility, sampling and analysis, and proper maintenance;		Volume B (for leachate control systems); Volume D (for landfill gas control system). Also summarized in Volume A - Sections 5 and 6
(b) environmental control maintenance requirements including description, type, frequency, and recordkeeping;		Volume B (for leachate control systems) Volume D (for landfill gas control system); Also summarized in Volume A - Sections 5 and 6
(iii) description of types, location and frequency of all other facility maintenance activities including:	A description of the nature, location and frequency of all facility maintenance activities including:	Volume B (for leachate control systems) Volume D (for landfill gas control system); Volume A - Attachment 2 (Final Cover and Drainage Systems Monitoring and Maintenance Manual) Also summarized in Volume A - Sections 3, 5 and 6
(a) maintaining the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, maintaining the appropriate vegetative cover, and preventing run-on and run-off from eroding or otherwise damaging the final cover;	Maintenance of the final cover system (to correct the effects of landfill settlement, subsidence, erosion);	Volume A - Attachment 2 (Final Cover and Drainage Systems Inspection and Maintenance Manual) Also summarized in Volume A - Section 3
(b) maintaining the leachate collection system in accordance with subdivision (i) of this section;	Leachate containment, collection and treatment systems; and	Volume B (for leachate control system) Volume A - Section 5 (Leachate Control)
(c) maintaining and operating the gas control and monitoring systems in accordance with the requirements of subdivision 360-2.17(f) of this Subpart; and	Landfill gas control and monitoring systems.	Volume D (for landfill gas control system) Volume A - Section 6 (Landfill Gas Control)
(d) recordkeeping and reporting requirements.		Volume B (for leachate control system) Volume D (for landfill gas control system) Volume A - Section 2; also in Sections 3, 5, and 6.
(iv) description of resource requirements including:	A description of the resource requirements, including:	Volume A - Section 2.2 (Resource Requirements)
(a) minimum personnel qualifications and numbers; and	Minimum personnel qualifications; and	Volume A - Section 2.2.1 Detailed in Volumes B, C, and D
(b) minimum equipment needs;	Equipment needs.	Volume A - Section 2.2.2 Detailed in Volumes B, C, and D
(v) a contingency plan which shall include:	A contingency plan containing	Volume A - Section 9 (Emergency Services)
(a) responses to problems that have a reasonable likelihood of occurrence including, but not limited to, major erosion problems, significant differential settlement, and fire;	Response actions to problems that may arise at the facility;	Volume A - Section 9 (Emergency Services), Section 3/ Attachment 2 (Final Cover and Drainage Systems Monitoring and Maintenance Manual) Also detailed in Volumes B and D
(b) action levels above which identified environmental monitoring, environmental control, or maintenance problems require prompt action by the owner and notification to the department; and	Action levels for the leachate containment/collection systems, action levels for environmental monitoring and control systems; and	Volume A - Sections 4, 5, 6 Also detailed in Volumes B, C, and D
(c) a summary of any corrective measures that must be done to be in accordance with section 360-2.20 of this Subpart;	A summary of corrective measures to be performed in conformance with section 360-2.20.	Volume A - Section 5 Also detailed in Volume B
(vi) name, address and telephone number of the person or office to contact on post-closure monitoring and maintenance, and corrective measure concerns during the post-closure period;		Volume A - Section 2 (Management and Organization) Volume A - Attachment 3
(vii) a summary of financial assurance criteria concerns that must be addressed to remain in compliance with the provisions of subdivisions 360-2.19(c) and (d) of this Subpart. This includes:		Volume A - Section 7
(a) submittal to the department of annual adjustments to cost estimates of post-closure care and corrective measures; and		Volume A - Section 7
(b) notification to the department of increases in post-closure care costs and corrective measure costs; and		Volume A - Section 7
(viii) a description of the planned uses of the property during the post-closure period. Planned uses shall be in compliance with paragraph (9) of this subdivision.	A description of the planned uses of the property during the post-closure period.	Volume A - Section 1.4 (End Use)

Regulatory requirements for post-closure reporting and record keeping are addressed in **Table 2-1, Post-Closure Reporting and Record Keeping**.

#### **1.2.4 Volume D: Operations and Maintenance Plan for Landfill Gas Collection and Control System**

Volume D provides the O&M Plan for the Landfill Gas Collection and Control System. Detailed descriptions of the landfill gas collection and control system, in accordance with 360-2.15(k)(iii)(c) and 360-2.17(f), are provided in Volume D. Descriptions of landfill gas emission monitoring and of reporting and record keeping for the landfill gas collection and control system are also included in Volume D.

### **1.3 REGULATORY REQUIREMENTS**

This Post-Closure Monitoring and Maintenance Operations Manual is prepared in accordance with 6 NYCRR Part 360 and the Order on Consent (Consent Order), Case No.: D2-90001-89-03. The Consent Order, between the New York State Department of Environmental Conservation (NYSDEC) and the City of New York Department of Sanitation (DSNY), was entered into in April 1990 and has been subsequently modified by mutual agreement. The Consent Order outlines the City's obligations for closure, post-closure monitoring and maintenance of the Landfill. Also included in the Consent Order are specific capital projects related to landfill closure and mitigative measures.

Under the requirements of the Modified Consent Order (Modification #7; see Attachment 1 for excerpt), the City shall carry out the measures specified in Appendix A-15 to ensure that closure and post-closure monitoring and maintenance of the landfill occur in compliance with 6 NYCRR Part 360.

- **Consent Order Modification (Appendix A-15)**

As stated in Compliance Schedule Appendix A-15 (Landfill Closure and Post Closure): *'The City must submit a Post-Closure Monitoring and Maintenance Operations Manual for the landfill conforming to the requirements of paragraph 360-2.15(k)(7) and shall provide all information necessary to monitor and maintain the landfill facility for the entire post-closure period. This manual shall contain the components defined in subparagraph 360-2.15(k)(7)(i) through (viii), including a description of the sampling, record keeping and reporting requirements for all environmental monitoring activities, as defined in paragraph 360-2.15(k)(4) and leachate containment and collection systems; a description of the nature, location and frequency of all facility maintenance activities, including maintenance of the final cover system (to correct the effects of the landfill settlement, subsidence, erosion), leachate containment, collection, and treatment system, and landfill gas control and monitoring systems; a description of the resource requirements, including equipment needs and minimum personnel qualifications; and a contingency plan containing response actions to problems that may arise at the facility, action levels for the leachate containment/collection systems, action levels for environmental monitoring and control systems, and a summary of corrective measures to be performed in conformance with section 360-2.20; and a description of the planned uses of the property during the post-closure period.'*

- **6 NYCRR Part 360**

Requirements for Post-Closure Monitoring and Maintenance Operations Manuals are provided in 6 NYCRR Part 360, specifically:

***360-2.15(k)(7)(i) through (viii)***

*A comprehensive post-closure monitoring and maintenance operations manual is required. This document shall provide all information needed to effectively monitor and maintain the facility for the entire post-closure period. Minimum components of this document include:*

- (i) description of types, location, sampling and sample preservation methodology, and recordkeeping and reporting requirements for all environmental monitoring activities. The monitoring plan shall conform to paragraph (4) of this subdivision;*
- (ii) description of all environmental control systems including:
  - (a) process control monitoring types, locations, recordkeeping and reporting requirements. Leachate management activities shall include recording of the total volume of leachate stored and removed from the facility, sampling and analysis, and proper maintenance;*
  - (b) environmental control maintenance requirements including description, type, frequency, and recordkeeping;**
- (iii) description of types, location and frequency of all other facility maintenance activities including:
  - (a) maintaining the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, maintaining the appropriate vegetative cover, and preventing run-on and run-off from eroding or otherwise damaging the final cover;*
  - (b) maintaining the leachate collection system in accordance with subdivision (i) of the section;*
  - (c) maintaining and operating the gas control and monitoring systems in accordance with the requirements of subdivision 360-2.17(f) of the Subpart; and*
  - (d) recordkeeping and reporting requirements.**
- (iv) description of resource requirements including
  - (a) minimum personnel qualifications and numbers; and*
  - (b) minimum equipment needs;**
- (v) a contingency plan which shall include:
  - (a) responses to problems that have a reasonable likelihood of occurrence, including, but not limited to, major erosion problems, significant differential settlement, and fire;*
  - (b) action levels above which identified environmental monitoring, environmental control, or maintenance problems require prompt action by the owner and notification to the department; and**

- (c) a summary of any corrective measures that must be done to be in accordance with section 360-2.20 of this Subpart;*
- (vi) name, address and telephone number of the person or office to contact on post-closure monitoring and maintenance, and corrective measure concerns during the post-closure period;*
- (vii) a summary of financial assurance criteria concerns that must be addressed to remain in compliance with the provisions of subdivisions 360-2.19(c) and (d) of this subpart. This includes:
  - (a) submittal to the department of annual adjustments to cost estimates of post-closure care and corrective measures; and*
  - (b) notification to the department of increases in post-closure care costs and corrective measure costs; and**
- (viii) a description of the planned uses of the property during the post-closure period. Planned uses shall be in compliance with paragraph (9) of this subdivision.*

### **360-2.15(k)(4)**

*Environmental and facility monitoring points including gas monitoring points must be maintained and sampled during the post-closure period for a minimum of 30 years. Post-closure explosive gas monitoring must be performed at least quarterly to determine if the facility meets the requirements of 360-2.17(f) of the subpart. If this monitoring shows explosive gas levels in excess of the lower explosive limit at the property boundary or in excess of the 25 percent of the lower explosive limit within any structure, appropriate actions must be taken and the department must be notified. Annual summary reports must be submitted to the department describing the results of the maintenance, monitoring, and/or sampling for the environmental and facility monitoring points. Annual baseline and quarterly routine monitoring must be performed on groundwater, surface water, and leachate samples for a minimum period of five years. After this five-year period, the permittee may request that the department modify the sampling and analysis requirements.*

### **1.4 END USE**

Landscaping and end use plans were developed in accordance with Part 360-2.6 in conjunction with final cover design reports for the various sections. The landscaping plans incorporate an initial stabilization plan, installation of permanent ground cover, and a long-term plan for the placement of herbaceous and woody plant communities.

End use of the Landfill property during the post-closure period will be in accordance with 360-2.15 (k)(9). This regulation stipulates that use of the property shall not disturb the integrity of the final cover, liners, or any other components of the containment system, or the function of the monitoring or environmental control systems, unless necessary to comply with the requirements of 360-2.20, which concerns corrective measures. Any change to end use of the Landfill will be a separate action under Part 360 and will be in accordance with 360-2.15(k)(9).

360-2.15(k)(9) states that “A description of the planned uses of the property during and after the post-closure period is required. Use of the property shall not disturb the integrity of the final

*cover, liners, or any other components of the containment system, or the function of the monitoring or environmental control systems, unless necessary to comply with the requirements of section 360-2.20 of this Subpart. The department will approve any other disturbance if the owner or operator demonstrates that disturbance of the final cover, liner or other component of the containment system, including any removal of waste, will not increase the potential threat to human health or the environment.”*

## SECTION 2

### MANAGEMENT AND RESOURCE REQUIREMENTS

This section provides the compliance organizational structure, responsibility and lines of authority for post-closure monitoring and maintenance operations at the Fresh Kills Landfill in compliance with the resource requirements under Part 360-2.15(k)(7)(iv) and the Consent Order. The organizational responsibilities are presented in the following areas:

- Facility Management and Organizational Structure
- Personnel Requirements and Equipment Needs
- Contact Information
- Reporting and Record keeping

#### 2.1 MANAGEMENT AND ORGANIZATION

During the post-closure period, DSNY will ensure monitoring and maintenance operations are managed in accordance with pertinent regulatory requirements, including clearly defined organization and personnel qualifications and responsibilities.

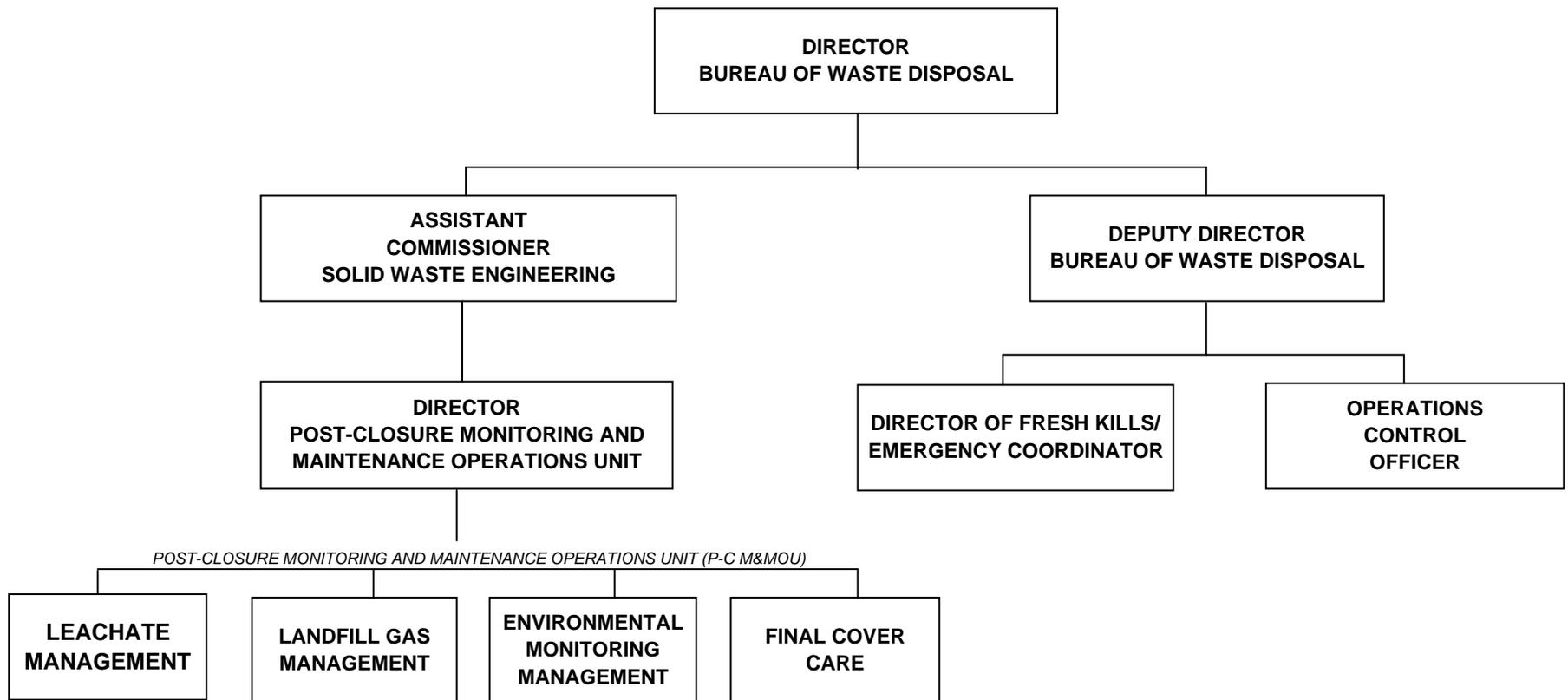
The DSNY organization for the post-closure period is summarized on Figure 2-1. Monitoring, operations, and maintenance of the environmental control systems, including gas collection and control systems, leachate collection and treatment systems, and final cover inspection and maintenance, will be performed by contractors. DSNY will oversee and monitor the activities, and will ensure that reporting and record keeping are maintained in compliance with all regulatory requirements.

The responsible DSNY organizational units and personnel for the post-closure period mainly include:

- Post-Closure Monitoring and Maintenance Operations Unit
- Director of Fresh Kills/Emergency Coordinator
- Operations Control Office (OCO)

DSNY will provide coordination during emergency situations. In case of emergency situations at the Landfill during the post-closure period, outside emergency services will be contacted to provide initial response. Local Emergency Medical Services (EMS), the New York City Fire Department (FDNY) and/or New York City Police Department (NYPD) will be contacted if necessary. Emergency response and notification procedures are detailed in Section 8 – Emergency Services.

**FIGURE 2-1  
 ORGANIZATION CHART  
 THE CITY OF NEW YORK DEPARTMENT OF SANITATION  
 FRESH KILLS LANDFILL  
 POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS**



## **2.2 RESOURCE REQUIREMENTS**

Resource requirements for maintenance and monitoring activities covered under Part 360 2.15(k)(7)(iv) include (a) minimum personnel qualifications and numbers, and (b) minimum equipment needs. The organizational structure is summarized in Figure 2-1, Organization Chart.

### **2.2.1 Personnel Responsibilities and Qualifications**

Most monitoring and maintenance operations activities at the landfill during the post-closure period will be performed by outside contractors. Personnel responsibilities and qualifications for the leachate control system are detailed in Volume B. For environmental monitoring activities, personnel responsibilities and qualifications are outlined in Volume C. For the landfill gas collection and control system, personnel responsibilities and qualifications are addressed in Volume D.

The following DSNY personnel will be responsible for activities and actions conducted during the post-closure period, oversee contractors, and address emergency situations. As discussed in Section 8, the Director of Fresh Kills/Emergency Coordinator will be responsible for on-site emergency coordination. When the Emergency Coordinator is absent from the site, all emergencies will be coordinated through the Operations Control Office.

#### ***Director, Post-Closure Monitoring and Maintenance Operations Unit (PCMMOU)***

- Acts as command center for all activities conducted at the Landfill.
- Takes overall responsibility for overseeing the monitoring and maintenance operations of the Landfill during the post-closure period.
- Ensures that all post-closure activities conducted at the Landfill are in compliance with all applicable regulations.
- Maintains all records, data, reports, and other pertinent information in the operating record to ensure that reporting and record keeping practices are in compliance with the applicable regulatory requirements.

#### ***Director of Fresh Kills/Emergency Coordinator***

- Acts as coordinator for emergencies, arranging for any and all resources.
- Serves as point of contact during emergency situations and initiates emergency notification procedures.
- Notifies PCMMOU and local authorities (EMS, Police Department, Fire Department, etc.) during emergency situations.
- Coordinates with responsible contractors and resources to initiate corrective measures.

#### ***Operations Control Officer***

- Provides 24-hour emergency hotline for reporting of emergencies.
- Provides emergency coordination when Emergency Coordinator is not available.
- Notifies Emergency Coordinator during after-work hours, weekends, and holidays to coordinate necessary responses.
- Transfers emergency information to appropriate local, state, or federal response agencies.

### **2.2.2 Equipment and Facility Requirements**

Maintenance of equipment and facilities, including the leachate control system and landfill gas control systems (including both emissions controls and migration controls), will be provided by DSNY's outside contractors. DSNY personnel will retain responsibility to oversee and monitor the maintenance activities performed by the contractors. In addition, DSNY personnel and the contractors, if responsible, will respond to contingency situations following the procedures as outlined in Section 8, and ensure all actions are conducted in a timely manner. Other repair and inspection work, such as landfill cover monitoring and maintenance, will be performed by outside contractors and overseen by DSNY personnel. The personnel requirements for maintenance operations are discussed below.

#### **Equipment**

Equipment associated with leachate and landfill gas control will be maintained on site and available for necessary operations. Routine service, preventive maintenance, and repair of this equipment will be performed by outside contractors under the direction of DSNY. Field equipment for final cover monitoring and maintenance, and for environmental monitoring, will be provided by the designated outside contractors. Equipment needs are detailed in Volume B for leachate control systems, Volume C for environmental monitoring, and Volume D for landfill gas control systems.

#### **Plant Facilities**

During the post-closure period, there will be no regular operational activities except for leachate collection and treatment, and landfill gas collection and control. Outside contractors will perform routine and corrective maintenance tasks at the leachate collection and landfill gas facilities under the direction of DSNY. Facility and systems repair and maintenance to be performed for specific tasks are detailed in Volume B (leachate control systems) and Volume D (landfill gas control systems). Contractors that operate the facilities will be responsible for providing necessary resources and equipment to ensure compliance with all applicable post-closure requirements.

### **2.3 CONTACT INFORMATION**

During the post-closure period, the contractors operating the leachate control system and landfill gas control system will designate on-site supervisors to manage and oversee operations. These supervisors will also serve as points of contact with DSNY in case of emergency situations. On-site supervisors will also be designated by the contractors for environmental monitoring activities and for final cover monitoring and maintenance. DSNY personnel will be on site as necessary to oversee the activities performed by the outside contractors.

In case of emergency, the Director of Fresh Kills/Emergency Coordinator will serve as the point of contact during the regular work hours. Emergency Services and Contact information will be available at the Landfill. Emergency response procedures and an emergency contact list are provided in Section 8 and Attachment 3, respectively.

## **2.4 REPORTING AND RECORD KEEPING**

Reporting and record keeping during the post-closure period will be in compliance with applicable regulatory requirements of Part 360 and the Consent Order. Regulatory requirements for reporting and record keeping are summarized in Table 2-1. Records, data, reports, associated monitoring, maintenance operations, and inspections for leachate and landfill gas control will be maintained by DSNY in the operating record at the landfill. Records of final cover monitoring, maintenance, and repair will be prepared in accordance with the applicable reporting and record keeping requirements. Maintenance and operation records for the landfill gas recovery facility and other activities that are under other permits will be the contractor's responsibility, as will ensuring compliance with the regulatory requirements.

Reporting and record keeping for all monitoring and maintenance activities, including type, frequency, and locations, are presented in the following sections and volumes:

- Final Cover Inspection and Maintenance - Section 3 of Volume A and Attachment 2
- Leachate Control System - Section 5 of Volume A and Volume B
- Environmental Monitoring, including landfill gas migration monitoring - Section 4 of Volume A and Volume C
- Landfill Gas Control System - Section 6 of Volume A and Volume D
- Financial Assurance Criteria and Requirements – Section 7

Table 2-2 summarizes all documents, records, and other information to be maintained as part of the operating records at the Landfill, in compliance with all applicable regulatory requirements.

**Table 2-1  
Post-Closure Reporting and Record Keeping Requirements  
Post-Closure Monitoring and Maintenance Operations Manual**

Regulations (Part 360)	Regulatory Requirements	Record Keeping Duration/ Reporting Frequency	Consent Order Requirements (Modification #7, Compliance Schedule Appendix A-15)
<b>Recordkeeping Requirements</b>			
360-1.14(i)(3)	Except as otherwise specified in this Part pertaining to a specific type of solid waste management facility, the facility owner or operator must keep records of <b>all data used to develop or support the permit applications and any supplemental information submitted to comply with the requirements of this Part and pertaining to construction of the facility throughout the active life of the facility and the post-closure period. Records pertaining to the operation of the solid waste facility must be kept for a period of no less than seven years</b> from the date they are made or are required to be made, whichever is later.	<i>Data used for support permit applications: Throughout the post-closure period.</i>  <i>Operation Records: at least 7 years.</i>	
360-1.14(i)(4)	The Facility owner or operator must retain records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation; and copies of all reports required by, or by a permit issued under, this Part) for a period of at least seven years from the date of the sample analysis, measurement, report or application.  Existing water quality records must be kept throughout the active life of the facility and the post-closure period. Records for monitoring information must include: the date, exact place, and time of sampling or measurements; the name of the individual who performed the sampling and measurement; the date analyses were performed; the name of the individual who performed the analyses; the analytical techniques or methods used; and the results of such analyses. Additional information relating to the analysis, including records of internal laboratory quality assurance and control, must be made available to the department at its request.	<i>All Monitoring Information: 7 years</i>  <i>Existing Water Quality Records: Throughout the active life and post-closure period</i>	
<b>Reporting Requirements</b>			
360-2.15(k)(4)	Environmental and facility monitoring points including gas monitoring points must be maintained and sampled <b>during the post-closure period for a minimum of 30 years. Post-closure explosive gas monitoring must be performed at least quarterly</b> to determine if the facility meets the requirements of 360-2.17(f) of this Subpart. If this monitoring shows explosive gas levels in excess of the lower explosive limit at the property boundary or in excess of the 25 percent of the lower explosive limit within any structures, appropriate actions must be taken and <b>the department must be notified.</b>  <b>Annual summary reports must be submitted to the department</b> describing the results of the maintenance, monitoring and/or sampling for the environmental and facility monitoring points. Annual baseline and quarterly routine monitoring must be performed on groundwater, surface water, and leachate samples <b>for a minimum period of five years.</b> After this five-year period, the permittee may request that the department modify the sampling and analysis requirements	<i>Quarterly monitoring for 30 years</i>  <i>The Department needs to be notified for exceedances.</i>  <i>Annual Summary Report for at least 5 years.</i>	<b>Post-Closure Monitoring and Maintenance Operations Manual (P.12 and 13)</b> <b>A description of the sampling, record-keeping and reporting requirements for all environmental monitoring activities as defined in 360-2.15(k)(4).</b>  The Long-term Groundwater Monitoring Program developed pursuant to Compliance Schedule Appendix A-6, and the Long-Term Surface and Sediment Monitoring Program developed pursuant to Compliance Schedule Appendix A-7 shall be used as the basis for development of the post-closure environmental monitoring program. Information contained in the report submittals, revised to reflect current conditions, for Compliance Schedule Appendices A-1, A-2, A-4, A-8, and A-10 should be used as references for completion of this manual.
360-2.15(k)(8)	<b>Quarterly inspections and inspections after major rainfall events (5-year storms) shall be performed on all facility components during the minimum 30-year post-closure period,</b> unless specific department approval is given to eliminate some or all of these requirements, to ensure that the facility is functioning as intended. <b>The results of those inspections shall be submitted to the department as part of a registration renewal report</b> as described in paragraph 360-2.15(l)(4) of this section, or more frequently, if deemed appropriate by the department.	<i>Quarterly monitoring for 30 years; submit as part of the Registration Renewal Report</i>  <i>Monitoring information will be kept for 7 years</i>	
360-2.15(l)	Closure and Post-Closure Registration Report  (2) <b>The registration must be renewed every five years</b> until the department determines that the post-closure monitoring and maintenance period for the facility has ended.  (4) Subsequent registration reports must be also include the following information: (i) a certification that the facility complies with all applicable closure and post-closure criteria contained in Section 360-2.15, financial assurance criteria contained in section 360-2.19, and corrective measures report criteria contained in section 360-2.20 of this Subpart. (ii) any other information which the department determines to be necessary to protect the public health and welfare and the environment or natural resources.	<i>Registration Renewal: every five years</i>	<b>Closure and Post-Closure Registration Report (P.13)</b> In accordance with the schedule specified below, the City must submit a Closure and Post-Closure Registration Report conforming with the requirements defined in subdivision 360-2.15(l). The Registration must be renewed every five years until the Department determines that the post-closure monitoring and maintenance period for the facility has ended (minimum 30 years). Registration renewals must include a certification that the facility compliance closure and post-closure criteria contained in section 360-2.15.
360-2.19(c)(1)(ii)	(ii) During the active life of the landfill and during the post-closure care period, the owner or operator must annually adjust the post-closure cost estimate for inflation; submit a copy of the adjusted estimate to the department	<i>Annual adjusted cost estimate for the post-closure care</i>	<b>Closure and Post-Closure Registration Report (P.13)</b> Registration renewal must include financial assurance criteria contained in section 360-2.19
208.9(e)	Except as provided in clause 3(b)(3)(l)(b) of this Part., each owner or operator subject to the provisions of this section shall keep for at least 7 years up-to-date, readily accessible records of all collection and control system exceedances of the operational standards in section 4 of this Part, the reading in the subsequent month whether or not the second reading is an exceedance, and the location of each exceedance.	<i>Monitoring data and exceedances: 7 years.</i>	

**Table 2-2  
Summary of Post-Closure Reporting and Record Keeping Information**

<b>Reporting</b>				
<b>Document Description</b>		<b>Performance<sup>1</sup> Frequency</b>	<b>Reporting Frequency</b>	<b>Applicable Regulations</b>
1	Final Cover Monitoring Reports	Quarterly	With Registration Renewal	360-2.15(k)(8)
2	Annual Summary Report for Environmental Monitoring	Quarterly	Annually	360-2.15(k)(4)
3	Annual Financial Estimate and Adjustment	Annually	Annually	360-2.19(c)(1)(ii)
4	Registration Renewal	Every 5 Years	Every 5 Years	360-2.15(l)
<b>Record Keeping<sup>2</sup></b>				
<b>Category</b>	<b>Document Description</b>	<b>Performance Frequency</b>	<b>Retention Time</b>	<b>Applicable Regulations</b>
General Information	Post-Closure Monitoring and Maintenance Operation Manual	N/A <sup>3</sup>	Throughout P-C period (30 years)	360-2.17(k)
	Data Used To Support Permit Application	N/A	Throughout P-C period (30 years)	360-1.14(i)(3)
	Annual Financial Assurance Update	Annual	7 years	360-1.14(i)(4)
	Final Cover Monitoring	Quarterly	7 years	360-1.14(i)(3)
	Registration Renewal	Every Five Years	7 years	360-1.14(i)(4)
Environmental Monitoring	Groundwater Monitoring Results	Quarterly	7 years	360-1.14(i)(4)
	Surface Water Monitoring Results	Quarterly	7 years	360-1.14(i)(4)
	Sediment Sampling Results	Quarterly	7 years	360-1.14(i)(4)
	Landfill Gas Migration Monitoring Data	Quarterly	7 years	360-1.14(i)(4)
	Existing Water Quality Data	N/A	Throughout P-C period (30 years)	360-1.14(i)(4)
Leachate Control	Inspection Records for Leachate Collection and Containment System	Quarterly	7 years	360-1.14(i)(4)
	Summary Report for Maintenance, Operation, and Monitoring Activities.	Quarterly	7 years	360-1.14(i)(4)
Landfill Gas Control	Stack Test Results	One-Time Test	7 years	208.9
	Landfill Cover Inspection	Quarterly	7 years	208.9(e)
	Surface Monitoring	Quarterly	7 years	208.9(e)
	Wellhead Monitoring	Quarterly	7 years	208.9(e)
	Flare Operation Monitoring Records	Monthly	7 years	208.9
	Facility Operation, Maintenance, and Repair Records.	As Needed	7 years	360-1.14(i)(4)

Note:

<sup>1</sup> Task will be performed throughout the post-closure period, except otherwise specified by NYSDEC

<sup>2</sup> Will be maintained in the Facility Operating Record at The Landfill

<sup>3</sup> N/A-Not Applicable

## SECTION 3

### FINAL COVER AND DRAINAGE SYSTEMS MONITORING AND MAINTENANCE PLAN

The final cover and drainage systems of the Fresh Kills Landfill will be monitored and maintained during the post-closure period as required by 360-2.15(k)(7) and (8) or otherwise approved by NYSDEC. These regulations specify that inspections every quarter and after major rainfall events (5-year storms) shall be performed of all facility components during the minimum 30-year post-closure period, unless specific department approval is given to eliminate some or all of these requirements. The regulations also require maintenance of the integrity and effectiveness of the final cover, including repairs to the landfill final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events; maintenance of vegetative cover; and prevention of run-on and run-off from eroding or otherwise damaging the final cover.

The general approach to be taken for post-closure monitoring and maintenance is described in this section. Specific action levels and maintenance activities for the various final cover and drainage systems are provided in Attachment 2.

#### **3.1 OVERVIEW OF MONITORING AND MAINTENANCE PROCESS**

In general, monitoring of the final cover and drainage systems at the Fresh Kills Landfill will be performed using the following three steps:

- **Inspection** by field technicians (“the inspectors”) of the final cover and drainage system on a quarterly basis and following major rainfall events. The inspectors will record information about each identified condition on an inspection form for use during assessment. Each landfill section will be inspected at least once each quarter; however, the inspections may be staggered.
- **Assessment** of findings from the field inspection by an engineer experienced with landfill maintenance issues (“the assessment engineer”). The assessment stage will be the basis of repair orders, recommendations of continued monitoring, and evaluations of need for additional investigations or design. It may involve additional field visits as necessary to clarify the nature and extent of conditions. In some cases, conditions observed during the inspection stage will be determined to be not significant during the assessment stage and will be removed from the list of conditions.
- **Tracking** of conditions observed during inspection. Tracking provides a record of all conditions identified during inspection. Once recorded, a condition will be tracked until it is removed from the list of conditions. The assessment engineer may close out a condition if it is determined not to be significant, has stabilized following continued monitoring to the extent that repair is not necessary, or has been acceptably repaired.

The flow chart in Figure 3-1 illustrates the process through which conditions are identified, assessed, tracked through follow-up action, and closed out. Both monitoring and maintenance activities will be performed on an ongoing basis throughout the year. Typically, maintenance teams will perform a number of repairs in one geographic area (i.e., one landfill section or portion of landfill section) before moving on to another area in order to minimize the number of mobilizations or deliveries of materials. However, if a condition is determined to be a priority for maintenance, it may be moved ahead of other pending maintenance activities deemed to be of lower priority. Certain types of activities, such as seeding, will be limited by seasonal constraints (i.e., it is expected that most seeding will be done in the spring). Maintenance actions may be assigned priority on the basis of similar types of repairs, geographic area, or urgency of repair.

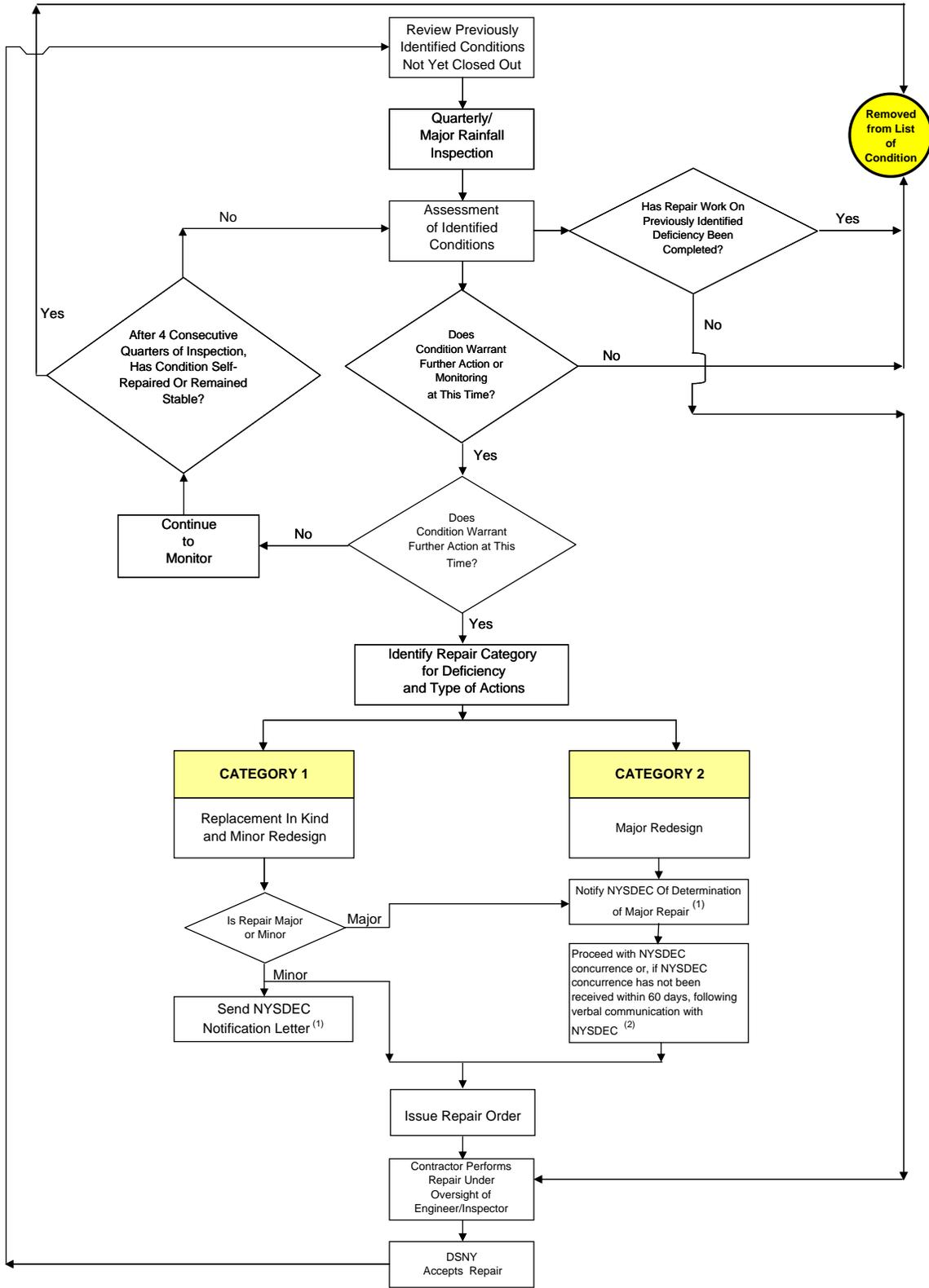
### **3.2 INSPECTION PROCEDURES**

Before a given landfill section is inspected, field inspectors and an assessment engineer will review previous inspection reports to determine what conditions are still outstanding and the status of each condition. In addition, the results of landfill cover inspection and surface monitoring conducted for the landfill gas collection and control system (see Volume A, Section 6.1.1.2, and Volume D) will help to identify potential problems and will be used to develop the final cover inspection paths for each landfill section. Those conditions will be highlighted for inspection during the upcoming round. The assessment engineer will lay out the inspection route for each section in advance of the field inspection. Final cover inspection routes may be varied from quarter to quarter in order to cover different elements of the final cover system and accommodate seasonal considerations; each actual inspection route will be noted on field drawings and shown in the quarterly inspection report. However, drainage inspection routes will conform to the path of stormwater flow through drainage structures.

Typically, each landfill section will be divided into inspection areas of approximately 20-40 acres to facilitate the inspection process. A drawing of the inspection areas will be provided with each quarterly inspection report; inspection areas may or may not correspond to watersheds. However, assessment will be performed on a watershed basis to analyze possible links among various conditions identified within a watershed.

As stated above, inspections will be performed on a quarterly basis and following major rainfall events (5-year storms or larger). The 5-year, 24-hour storm for Staten Island, New York, is 4.75 inches. Rainfall data for determining whether a 5-year storm has occurred will be obtained from the on-site weather station, the National Oceanic and Atmospheric Administration (NOAA) weather station at Newark Airport, or other accessible sources. Depending on when the major rainfall event occurs in relation to the projected inspection schedule, the major rainfall inspection may take the place of that quarter's regular quarterly inspection. In order to check for significant damage as a result of the major storm event, the format of a major rainfall inspection may differ from a regular quarterly inspection. A major rainfall inspection will target drainage-related deficiencies that are deemed by the assessment engineer following regular quarterly inspection to be particularly susceptible to storm damage. However, other incidental field observations will also be recorded during major storm inspections.

**Figure 3-1  
Flowchart of Post-Closure Final Cover Inspection Procedures**



Note:

(1) Notification may be included as part of the final cover inspection findings submitted to NYSDEC.

(2) DSNY may proceed with proposed repairs or actions without NYSDEC approval after 60 days of notification to NYSDEC. If NYSDEC approval has not been received within 60 days, DSNY will initiate verbal communications with NYSDEC prior to starting work on a major repair. NYSDEC may advise DSNY that additional time is needed for review and approval.

The inspection approach will vary seasonally to take advantage of applicable site conditions. During winter and early spring inspections, vegetation is sparse and ground conditions are more evident. During summer, changes in vegetation can be an indicator of certain field conditions, e.g., a stand of vegetation that is not uniform may reflect inadequate drainage conditions, and dead vegetation may be an indicator of landfill gas emissions. Mowing of grass will not be performed on a periodic, but on an as-needed basis, and will be determined by the assessment engineer as a result of the findings from each quarterly inspection. DSNY will ensure the site condition is maintained so that adequate inspection can be performed to meet the applicable regulatory requirements.

Visual inspection of the final cover and drainage systems will address conditions identified in Attachment 2 that may compromise the integrity of the final cover or interfere with a drainage structure's ability to convey and discharge stormwater flow. Performance criteria and action levels for these conditions are discussed in detail in Attachment 2.

### **3.3 FOLLOW-UP ACTION**

As illustrated in Figure 3-1, different types of conditions will require different follow-up actions, depending on their cause, scope, and severity. Conditions that are deemed significant by the assessment engineer can be divided into the following three general categories:

- 1. Replacement in kind or minor redesign.** When feasible, deficiencies will be repaired by replacement in kind to re-establish the original design conditions. Two examples are a significant erosion rill on the landfill sideslope and a breach in a drainage swale embankment. In other cases, a minor redesign to match the performance of the original design may be required due to changes in site conditions or original materials no longer being available. Replacement of an erosion matting-lined swale with a rip-rap-lined swale, and replacement of a 36-inch diameter culvert with two 24-inch diameter culverts are examples of minor redesigns.
- 2. Major redesign.** Repairs requiring major redesign involve additional investigations and extensive design efforts, as a result of latent defects in the original design, large-scale changes in site conditions, or modifications in site use. In certain cases, an additional contractor may need to be engaged in order to perform the investigation and/or design work. An example of a condition requiring major redesign is a modification in site use involving construction of a new road on the landfill surface.
- 3. Continued monitoring.** In some cases, the assessment engineer may find that additional observation is needed to determine the follow-up action. After several quarters of monitoring, a determination will be made whether repair is necessary. If, after four consecutive quarters of inspection, the condition has either self-repaired or remained stable, it will be removed from the list of conditions and will no longer be tracked.

### **3.4 MAINTENANCE AND TRACKING OF REPAIRS**

Repairs will be divided into two categories: major repair and minor repair. As illustrated in Figure 3-1, major repairs will include all major redesigns as well as replacements in kind or minor redesigns that involve penetration of geomembrane or other breach of final cover integrity, or are otherwise

deemed major by NYSDEC. All other repairs will be considered minor.

After identified conditions are assessed and categorized by the assessment engineer, DSNY will notify NYSDEC of all conditions that are determined to need repair. DSNY will proceed with minor repairs without NYSDEC approval, whereas DSNY will provide a 60-day NYSDEC response time for major repairs. If NYSDEC approval for a major repair has not been received within 60 days, DSNY will initiate verbal communications with NYSDEC prior to starting work. NYSDEC may advise DSNY that additional time is needed for review and approval.

Once the maintenance or repair work is completed, documentation will be submitted to DSNY for acceptance. The deficiency can be closed and therefore removed from the list of conditions being tracked once the repair is confirmed through a final round of inspection and assessment.

### **3.5 REPORTING AND RECORD KEEPING**

Quarterly inspection reports and documentation of maintenance work will be maintained in the facility operating record. Records will include inspection forms, tracking forms, and related material that will include, at minimum, the information below:

- The date of each inspection.
- The name of the inspector.
- A description of the landfill features inspected.
- A description of any conditions observed during the inspection, including the nature of the condition, approximate dimensions of the observation, location with respect to known reference points, etc.
- The date and nature of any remedial actions implemented or repairs made as a result of the inspection.

Monitoring and maintenance drawings may be modified to reflect changed site conditions, as a result of maintenance activities or findings during field inspections. Any changes to the monitoring and maintenance drawings will be entered into the facility operating record. The monitoring and maintenance drawings current as of submittal of this Manual are bound separately with this attachment.

DSNY will retain records of all monitoring information (e.g., copies of field inspection notes, photographs, repair records, and other documentation) for at least seven years, in accordance with 360-1.14(i)(4). As stipulated in 360-2.15(k)(8), results of quarterly inspections and inspections after major rainfall events (5-year storm or greater) will be submitted to NYSDEC as part of the Landfill's registration renewal report as described in 360-2.15(1)(4).

## SECTION 4

### ENVIRONMENTAL MONITORING PROGRAM

Environmental monitoring will be performed at Fresh Kills Landfill during the post-closure period. The post-closure Environmental Monitoring Plan (EMP) is consistent with the Consent Order Compliance Schedule Appendix A-15.

The specific procedures to be followed to comply with the Consent Order and 6 NYCRR Part 360 2.15(k)(7) environmental monitoring requirements are described in the EMP. These procedures are specific to groundwater quality, surface water and sediment quality, and landfill gas migration monitoring. Hydraulic monitoring and well maintenance activities related to groundwater and landfill gas migration monitoring are also described. Record keeping and reporting requirements and contingency action levels and procedures are also addressed in the EMP. Landfill gas emissions monitoring is discussed in Section 6 of this volume, as part of the Landfill Gas Emissions Control System.

Modifications to the environmental monitoring program will be implemented in accordance with 360-2.15(k)(4). Revisions to the EMP may be made through issuance of addenda, submittal of a partially (e.g., one section) or fully revised document, or submittal of revised supporting documents.

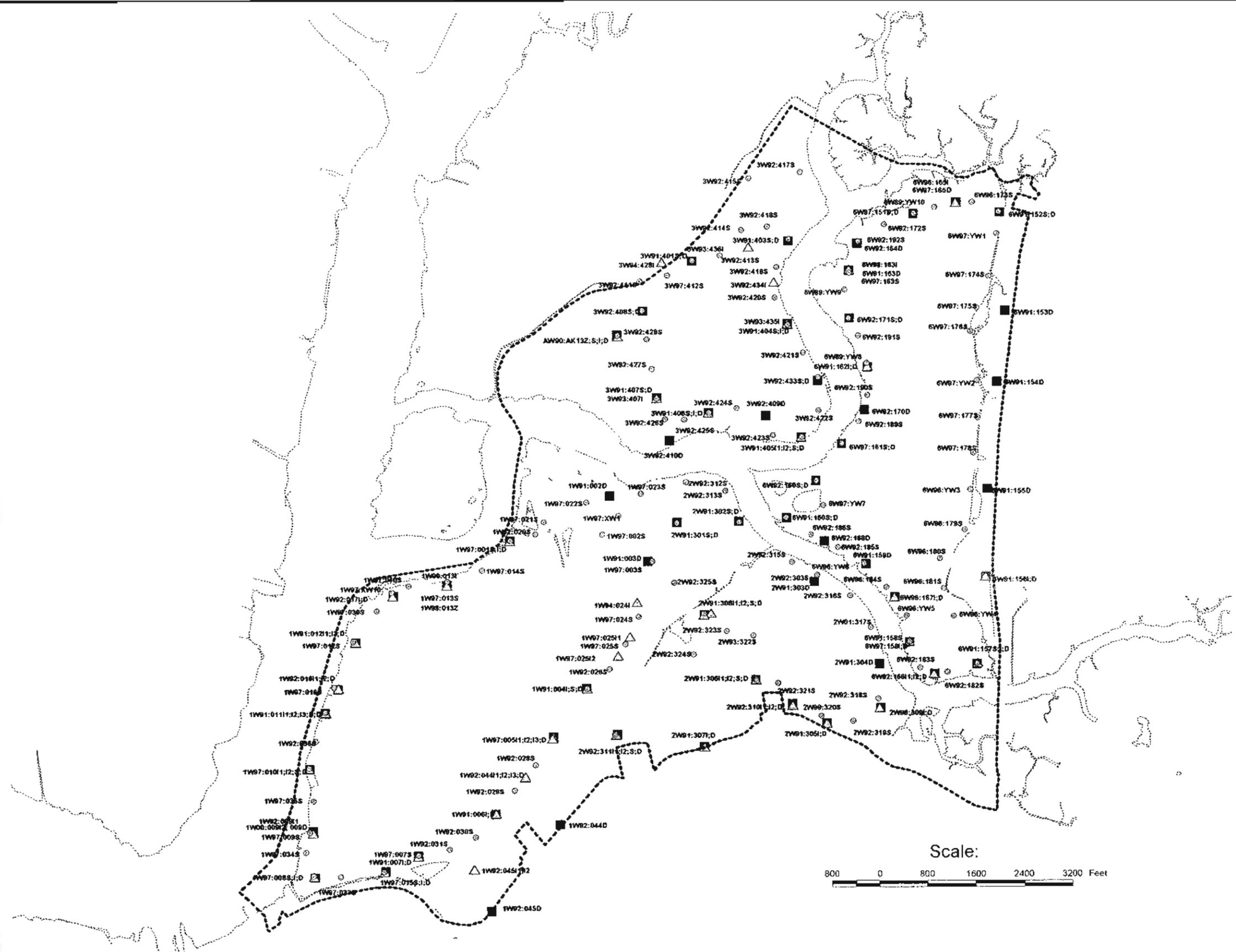
The details of the environmental monitoring program, including contingency procedures, are presented in the Environmental Monitoring Plan, Volume C of this Manual.

#### **4.1 GROUNDWATER QUALITY MONITORING PROGRAM**

Groundwater monitoring will be performed quarterly on a rotating landfill section basis during an annual monitoring period. The annual monitoring period will be based on a calendar year. Each groundwater sample will be analyzed for routine or baseline plus previously detected expanded (baseline +) parameters.

Monitoring of the shallow/refuse monitoring zone will be performed on a quarterly basis for baseline + parameters. The monitoring frequency of individual shallow/refuse monitoring wells will be biennial. Approximately half of the shallow/refuse monitoring wells will be sampled during each annual monitoring period. The locations of the shallow/refuse monitoring wells are shown on Figure 4-1.

Within the intermediate depth and deep (bedrock) monitoring zones, sample collection will also be performed quarterly. Sections 1/9 and 2/8 monitoring wells will be sampled during the January and July sampling quarters and Sections 3/4 and 6/7 monitoring wells during the April and October sampling quarters. During the January and April sampling quarters, groundwater samples will be analyzed for routine parameters. During the July and October sampling quarters, groundwater samples will be analyzed for baseline + parameters. The locations of the intermediate depth and deep (bedrock) groundwater monitoring wells are shown on Figure 4-1.



### Legend

- Shallow/Refuse monitoring well
- △ Intermediate depth monitoring well
- Deep (Bedrock) monitoring well
- - - Landfill Complex Boundary
- ⋯ Water Boundary

**FIGURE 4-1**  
**GROUNDWATER MONITORING WELL**  
**COMPOSITE ARRAY**

**ENVIRONMENTAL MONITORING PLAN**

**POST-CLOSURE MONITORING AND**  
**MAINTENANCE OPERATIONS MANUAL**

Under the direction of:  
NEW YORK CITY  
DEPARTMENT OF SANITATION  
FRESH KILLS LANDFILL, STATEN ISLAND, NY



PROJECT NO	FILE NO	DRAWN	DATE	CDT	DRAWING NO	REV NO
529363		ENGINEER	05/20/02	CDT	024-57-001	0
		APPROVED	05/20/02	EJW	J:\Projects\529363\Figures\4_1_2_3.dwg	

Groundwater samples will also be analyzed for geochemical solute and environmental isotope parameters. The intermediate depth and deep (bedrock) monitoring wells will be sampled annually and the shallow/refuse monitoring wells biennially for geochemical analysis. Groundwater samples for geochemical analysis will be collected during the January sampling quarter.

A sampling quarter will be initiated with the selection of the appropriate sampling schedule for that quarter. If wells were not sampled in their scheduled quarter because of sampling equipment problems or landfill activities, they will be added to a subsequent sampling quarter schedule. If necessary, the October sampling quarter will be extended to allow samples to be collected from repaired wells. The appropriate Quality Assurance/Quality Control (QA/QC) samples will also be added to the sampling schedule. The sampling schedule will be sent to the NYSDEC and will serve as notification of the upcoming sampling event.

The sampling schedule and requirements, either routine or baseline + analysis, will be reviewed with the laboratory so that the appropriate quantity and type of sample containers are prepared. Individual coolers will be used for each sampling location and each Quality Assurance/Quality Control (QA/QC) sample. Additional sampling equipment, such as field instruments, will also be prepared.

Groundwater samples and associated QA/QC samples will be collected according to the sampling schedule; adjustments may be made in the field if wells scheduled for a particular day are inaccessible because of landfill activities or other problems, such as inclement weather. Groundwater samples will be collected using dedicated pump systems installed in each monitoring well. Proper chain of custody documentation will be prepared for each sample. The samples will be shipped to the laboratory in sufficient time to meet the required holding times for sample analyses.

The laboratory will perform the requested analyses and provide the results in NYSDEC Analytical Services Protocol (ASP) data packages. The analytical results will be compiled in spreadsheet format on a quarterly basis. NYSDEC ASP Category B data packages will be compiled on an annual basis. Data validation and usability analysis will be performed on a subset of the data.

Following the completion of the four sampling quarters, an annual groundwater monitoring report will be prepared. This report will present the results of the annual groundwater quality monitoring activities and will include results of statistical analyses performed to determine changes in groundwater quality. Any contingency procedures performed during the annual monitoring period and proposed modifications to the monitoring program will also be presented.

## **4.2 SURFACE WATER AND SEDIMENT QUALITY MONITORING PROGRAM**

Surface water and sediment quality monitoring will be performed during the July sampling quarter. This program will consist of surface water, sediment and benthic ecology monitoring. Surface water quality will be monitored annually and sediment quality and benthic ecology will be monitored biennially. The surface water and sediment samples will be analyzed for baseline + parameters. The benthic ecology samples will be analyzed for grain size, total organic carbon and total petroleum hydrocarbons, as well as evaluated for the identification and enumeration of benthic organisms.

Up to fourteen (14) stations will be monitored during the post-closure monitoring period. These stations include one far field and one near field station within the Arthur Kill, three stations in Fresh Kills Creek, four stations in Main Creek, three stations in Richmond Creek and one station in each of the freshwater sections of Main and Richmond Creeks. The sampling station locations are shown on Figure 4-2.

The appropriate sampling program for the annual monitoring period will be determined. Surface water sample collection will be scheduled during a low tidal cycle. An alternate sampling date will be scheduled in the event the rainfall restriction is not met or because of inclement weather. These sample collection dates will be incorporated into the groundwater sampling schedule for the July sampling quarter.

The sampling schedule and requirements will be reviewed with the laboratory so that the appropriate type and quantity of sample containers are prepared. Individual coolers will be used for each sampling location and each Quality Assurance/Quality Control (QA/QC) sample. Sampling equipment and field instruments will be prepared.

A pre-sampling reconnaissance survey will be performed to determine accessibility to the surface water sampling stations prior to the sampling event. Surface water samples and associated QA/QC samples will be collected on the date scheduled if the rainfall restriction is met. Dedicated tubing and/or decontaminated sampling equipment will be used at each sampling station.

Proper chain of custody documentation will be prepared for each sample. The samples will be shipped to the laboratory in sufficient time to meet the required holding times for sample analyses. The laboratory will perform the requested analyses and provide the results in NYSDEC ASP data packages. The analytical results will be compiled in spreadsheet format on a quarterly basis. NYSDEC ASP Category B Data Packages will be compiled on an annual basis. Data validation and usability analysis will be performed on a subset of the data.

An annual surface water and sediment quality monitoring report will be prepared. This report will present the results of the surface water and sediment quality and benthic ecology monitoring activities. The results of statistical analyses performed to determine changes in surface water and sediment quality and benthic communities as well as proposed modifications to the monitoring program will be presented in this report.



Legend				
	Surface Water and Sediment Sampling Station			
	Surface Water, Sediment and Benthic Sampling Station			
	Landfill Complex Boundary			
	Water Boundary			

**FIGURE 4-2**  
**SURFACE WATER AND SEDIMENT QUALITY MONITORING SAMPLING STATIONS**

**ENVIRONMENTAL MONITORING PLAN**

**POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS MANUAL**

Under the direction of,  
 NEW YORK CITY  
 DEPARTMENT OF SANITATION  
 FRESH KILLS LANDFILL, STATEN ISLAND, NY



PROJECT NO	FILE NO	DRAWN	10/18/02 AY	DRAWING NO	REV. NO
529363		CHECKED	10/18/02 LYC	024-57-001	1
		APPROVED	10/18/02 LYC	J:\FreshKills\GIS\EM\Figures 4-1_2_3.apr	

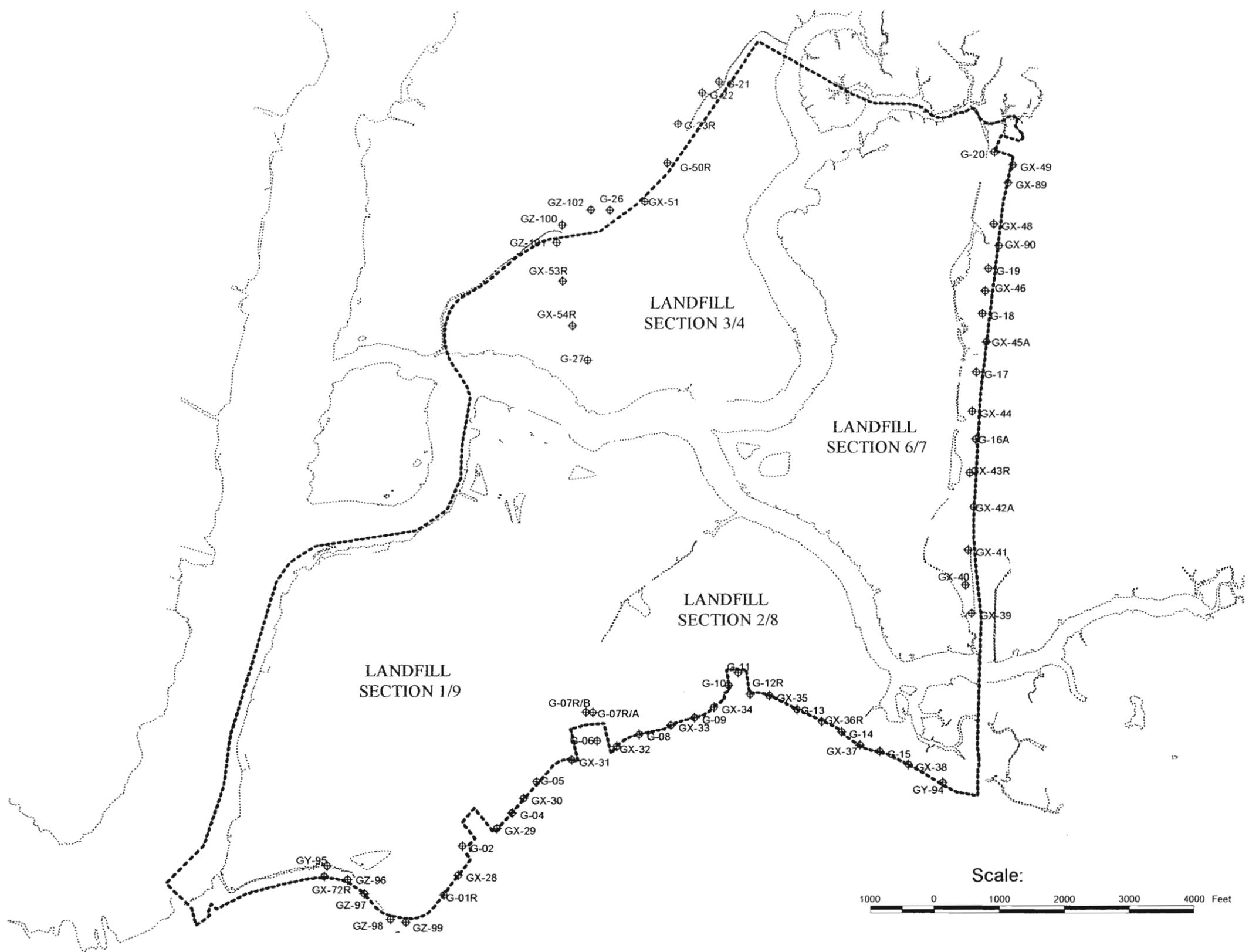
### **4.3 LANDFILL GAS MIGRATION MONITORING PROGRAM**

The landfill gas migration monitoring program will be performed quarterly. The landfill gas migration monitoring program will consist of the measurement of subsurface pressure and concentrations of methane, oxygen, carbon dioxide as percent gas at landfill gas migration monitoring wells located along the perimeter of the landfill complex. The locations of these wells are shown on Figure 4-3. Structures at the landfill will be equipped with methane sensors, which will be maintained and calibrated on a quarterly basis. NYSDEC will be notified in either case of exceedances or no exceedances based on results from the landfill gas migration monitoring program.

An annual summary report will be prepared which will include a description of the Landfill site, locations of landfill gas migration monitoring wells and methane sensors, maintenance activities, monitoring equipment, calibration procedures, a summary of results, and evaluation and conclusions.

### **4.4 RECORD KEEPING AND REPORTING**

In general, records will be maintained for seven years from the date generated. Reports will be submitted annually as described previously for groundwater, surface water and sediment, and landfill gas migration monitoring.



Legend					
	Landfill Gas Migration Monitoring Well				
	Landfill Complex Boundary				
	Water Boundary				
<b>FIGURE 4-3 LANDFILL GAS MIGRATION MONITORING WELL ARRAY</b>					
<b>ENVIRONMENTAL MONITORING PLAN</b>					
<b>POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS MANUAL</b>					
Under the direction of: NEW YORK CITY DEPARTMENT OF SANITATION FRESH KILLS LANDFILL, STATEN ISLAND, NY					
PROJECT NO.	FILE NO.	DRAWN	10/18/02 AY	DRAWING NO.	REV NO.
529363		CHECKED	10/18/02 LYC	024-57-001	1
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## SECTION 5

### LEACHATE CONTROL

Leachate is formed when water, generally from precipitation, comes in contact with refuse. Once leachate is generated, its migration is subject to refuse and cover soil conditions, localized hydrogeologic formations, and engineering controls at the Landfill.

The leachate containment, collection, and treatment systems (referred to collectively as the leachate control system) in place at Sections 1/9 and 6/7 of the Landfill will operate for the post-closure period as required by Part 360-2.15(k)(5) or otherwise approved by NYSDEC. Leachate controls at Sections 2/8 and 3/4 will be maintained in accordance with specific Consent Order requirements.

The operation and maintenance of the leachate control system are presented in detail in the Operations and Maintenance Plan for the Leachate Treatment Plant and Containment and Collection System, Volume B of this Manual. Contingency procedures for the leachate control system are also presented in Volume B.

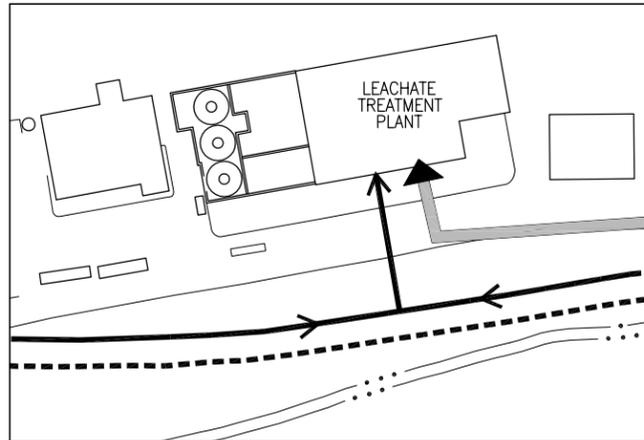
#### 5.1 LEACHATE CONTROL SYSTEM COMPONENTS

The components of the leachate control system vary between the Landfill sections. At Sections 1/9 and 6/7, the leachate management system consists of a cutoff wall and a leachate collection drain with associated leachate collection pump stations located along the perimeter of both landfill sections. In addition, a cutoff wall, leachate collection pump stations and a shallow drain are located along the northeastern perimeter of the main mound at Section 1/9 to the west of Muldoon Avenue. In addition, a leachate collection well is located within the landfill gas recovery facility to control leachate at the area of the facility. Hydraulic monitoring piezometers are installed on each side of the cutoff wall.

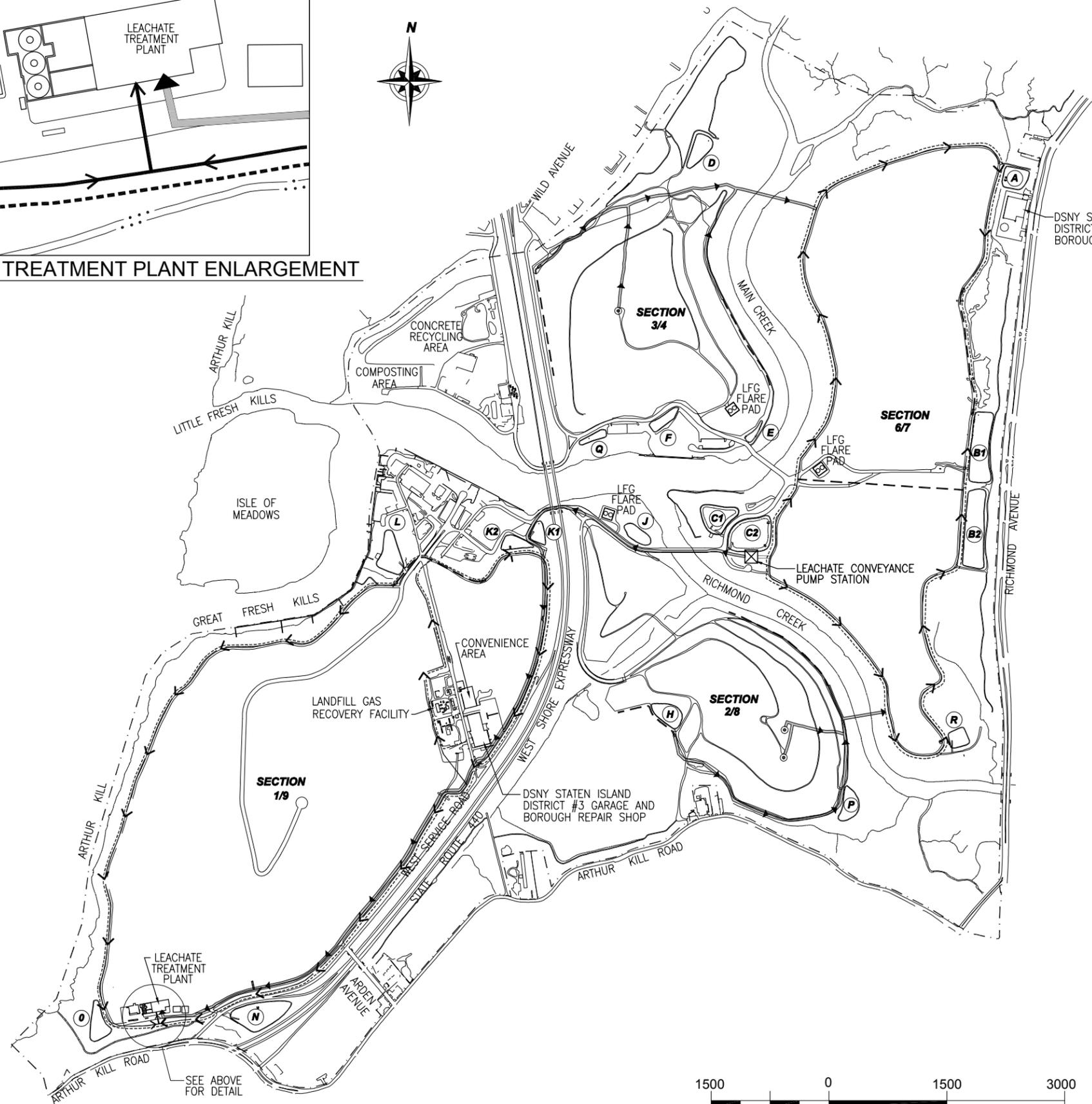
At Sections 2/8 and 3/4, the leachate management system includes leachate recovery wells located at the top of each section and partial perimeter drains. Leachate collection pump stations are located along the partial perimeter drains.

Collected leachate from all landfill sections is conveyed through leachate collection headers and force mains to the Fresh Kills Landfill Leachate Treatment Plant (FKLLTP). The FKLLTP, which is located in the southwestern end of Section 1/9, treats the collected leachate and discharges the effluent into the Arthur Kill through a subaqueous outfall.

An overall site plan of the leachate control system is presented on Figure 5-1. A schematic representation of the leachate control system components at Sections 1/9 and 6/7 is included on Figure 5-2. The leachate control system components at Sections 2/8 and 3/4 are depicted on Figure 5-3.



**LEACHATE TREATMENT PLANT ENLARGEMENT**



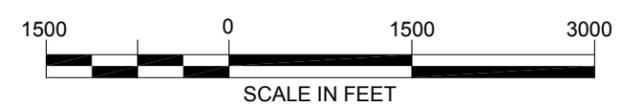
**LEGEND**

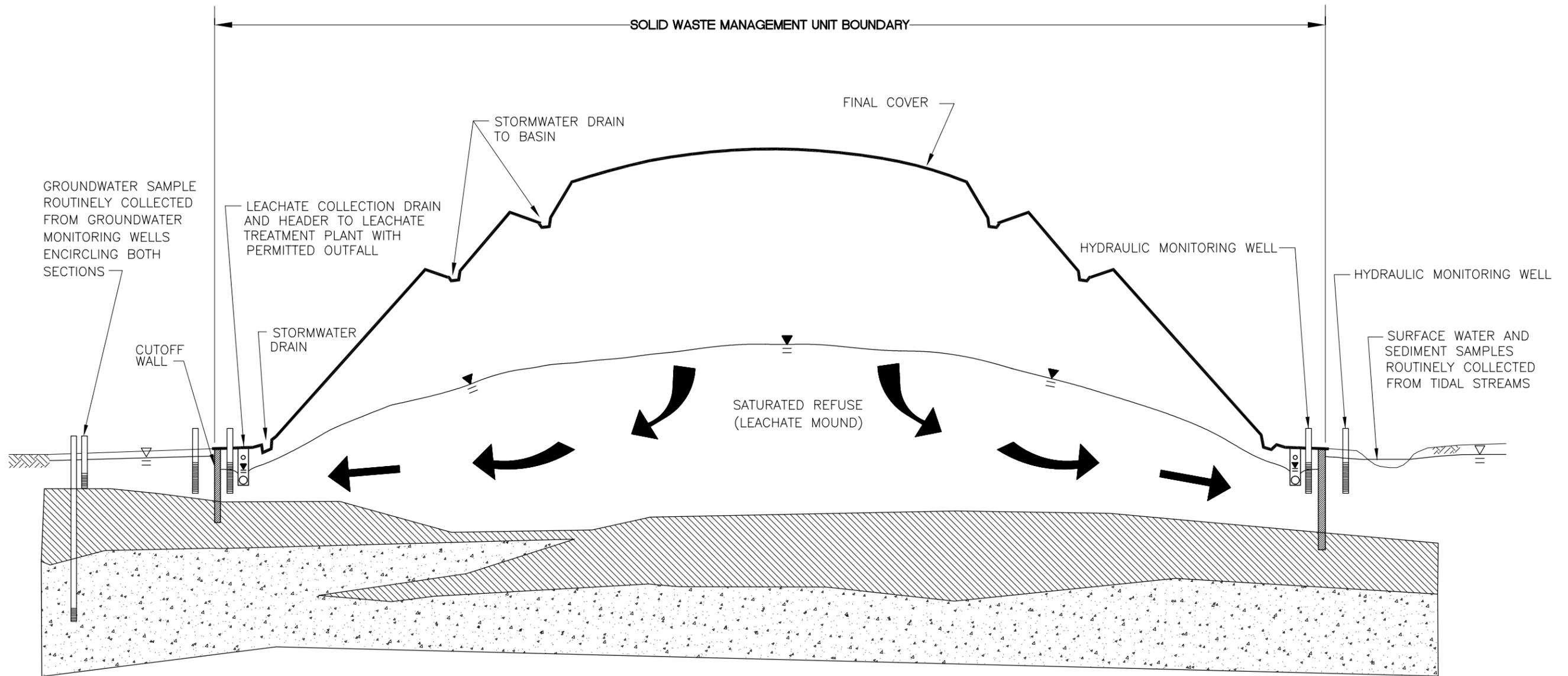
LANDFILL COMPLEX BOUNDARY	---
STORMWATER BASIN AND DESIGNATION	(E)
LFG FLARE STATION	⊠
CUTOFF WALL	----
LEACHATE COLLECTION DRAIN	----
LEACHATE FORCE MAIN	====>
LEACHATE COLLECTION HEADER AND DRAIN	====>
LEACHATE RECOVERY WELL	○
LEACHATE CONVEYANCE PUMP STATION	⊠

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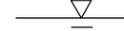
**LEACHATE CONTROL SYSTEM:  
 OVERALL SITE PLAN**

**FIG. NO. 5-1**





**LEGEND**

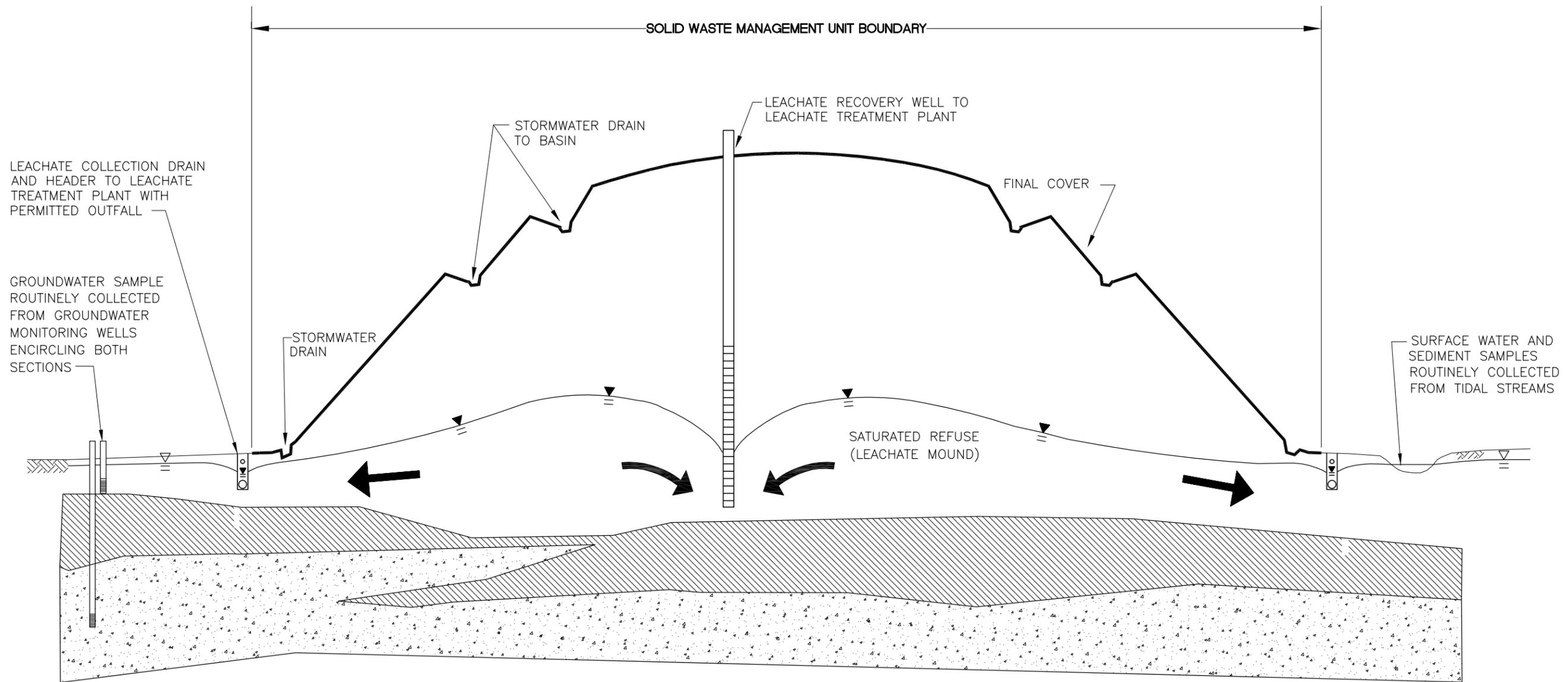
-  PREDOMINANT LEACHATE FLOW DIRECTION THROUGH REFUSE/FILL
-  FINAL COVER
-  LOW PERMEABILITY UNIT
-  HIGH PERMEABILITY UNIT
-  GROUNDWATER LEVEL
-  LEACHATE LEVEL

**NOTE:**

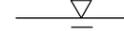
1. THIS IS A CONCEPTUAL SCHEMATIC REPRESENTATION WHICH IS NOT DRAWN TO SCALE.

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STATEN ISLAND, NEW YORK

**LEACHATE CONTROL SYSTEMS:**  
**SECTIONS 1/9 AND 6/7**  
**FIG. NO. 5-2**



**LEGEND**

-  PREDOMINANT LEACHATE FLOW DIRECTION THROUGH REFUSE/FILL
-  FINAL COVER
-  LOW PERMEABILITY UNIT
-  HIGH PERMEABILITY UNIT
-  GROUNDWATER LEVEL
-  LEACHATE LEVEL

**NOTE:**  
 1. THIS IS A CONCEPTUAL SCHEMATIC REPRESENTATION WHICH IS NOT DRAWN TO SCALE.

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**LEACHATE CONTROL SYSTEMS:**  
**SECTIONS 2/8 AND 3/4**  
**FIG. NO. 5-3**

## **5.2 CUTOFF WALL (SECTIONS 1/9 AND 6/7)**

Cutoff walls constructed of soil bentonite or cement bentonite extend around the entire perimeters of Sections 1/9 and 6/7. The bottoms of the cutoff walls are keyed into underlying fine-grained geologic units. The purpose of the cutoff wall is to restrict the horizontal flow of water from outside the Landfill boundary into the leachate collection drain and to restrict the flow of leachate into the surrounding environment. The cutoff wall also provides containment for leachate during periods of temporary shutdown of the leachate collection or treatment systems.

Routine inspections are performed to ensure that no visible structural damage to the wall exists. The cutoff wall has no moving or mechanical parts and requires no routine maintenance.

The effectiveness of the cutoff wall is monitored by measuring the water levels in hydraulic monitoring piezometers installed in pairs on each side of the cutoff wall.

## **5.3 LEACHATE COLLECTION DRAINS (SECTIONS 1/9 AND 6/7)**

At Sections 1/9 and 6/7, the leachate collection drain is located approximately 20 feet inside the cutoff wall. The drain consists of a stone-filled trench with a slotted corrugated high density polyethylene (HDPE) pipe. Leachate in the collection drain flows into a series of leachate collection pump stations, which pump the leachate to the FKLLTP. By pumping leachate from the leachate collection pump stations and the drain, the leachate level in the collection drain is lowered, resulting in an inward hydraulic gradient across the cutoff wall that precludes outward migration of leachate through the cutoff wall.

## **5.4 PARTIAL PERIMETER DRAINS (SECTIONS 2/8 AND 3/4)**

Partial perimeter drains, similar to those at Sections 1/9 and 6/7, are located at the toe of slope along selected perimeter segments of Sections 2/8 and 3/4. The effectiveness of the segment of leachate collection drain at Sections 2/8 and 3/4 located along Richmond and Main Creeks is monitored by measuring the water levels in monitoring piezometers installed in pairs on each side of the drain and by limited analytical testing of water samples taken at the monitoring piezometers and leachate collection pump stations.

## **5.5 LEACHATE RECOVERY WELLS (SECTIONS 2/8 AND 3/4)**

Leachate recovery wells are installed on the top of Landfill Sections 2/8 and 3/4, two at Section 2/8 and one at Section 3/4. These leachate recovery wells collect leachate from the central portion of the refuse mounds at these landfill sections.

## **5.6 LEACHATE CONVEYANCE SYSTEM**

The leachate conveyance system consists of leachate collection pump stations located along the leachate collection drains, and header pipes and force mains that convey the collected leachate to the FKLLTP. Each leachate collection pump station consists of a wet well with a submersible leachate well pump. Level sensors installed in each pump station control the activation of the pump. The

pumps are of stainless steel construction to provide reliable service in their potentially corrosive environments. At each leachate collection pump station, a sampling port, pressure gauge, check and ball valves and flow meter are located either in an aboveground enclosure or in an underground concrete vault, which extends to grade and is equipped with an access hatch for sampling and maintenance.

Leachate collected at the leachate collection pump stations is conveyed to the FKLLTP through leachate collection headers and force mains. The header at Section 1/9 flows directly to the FKLLTP. The force mains at Sections 2/8 and 3/4 cross beneath Richmond and Main Creeks, respectively, and connect into the header for Section 6/7, which empties into the Section 6/7 leachate conveyance pump station. The leachate conveyance pump station conveys leachate to the FKLLTP through a leachate force main. The locations of the leachate collection headers and force main are shown on Figure 5-1.

## **5.7 LEACHATE TREATMENT PLANT**

The FKLLTP is located in the southwestern end of Section 1/9 (see Figure 5-1). Collected leachate is conveyed to the plant and treated. Effluent from the plant is discharged into the Arthur Kill through a subaqueous outfall in accordance with the plant's State Pollution Discharge Elimination System (SPDES) Permit (SPDES No. NY-0200867). The plant has an average design capacity of 1,050,000 gallons per day (gpd) and a peak capacity of 1,325,000 gpd under NYSDEC Permit No. 2-6404-00275/00013-0. A process flow diagram for the FKLLTP is presented in Figure 5-4.

The treatment system at the FKLLTP consists of the following major unit processes:

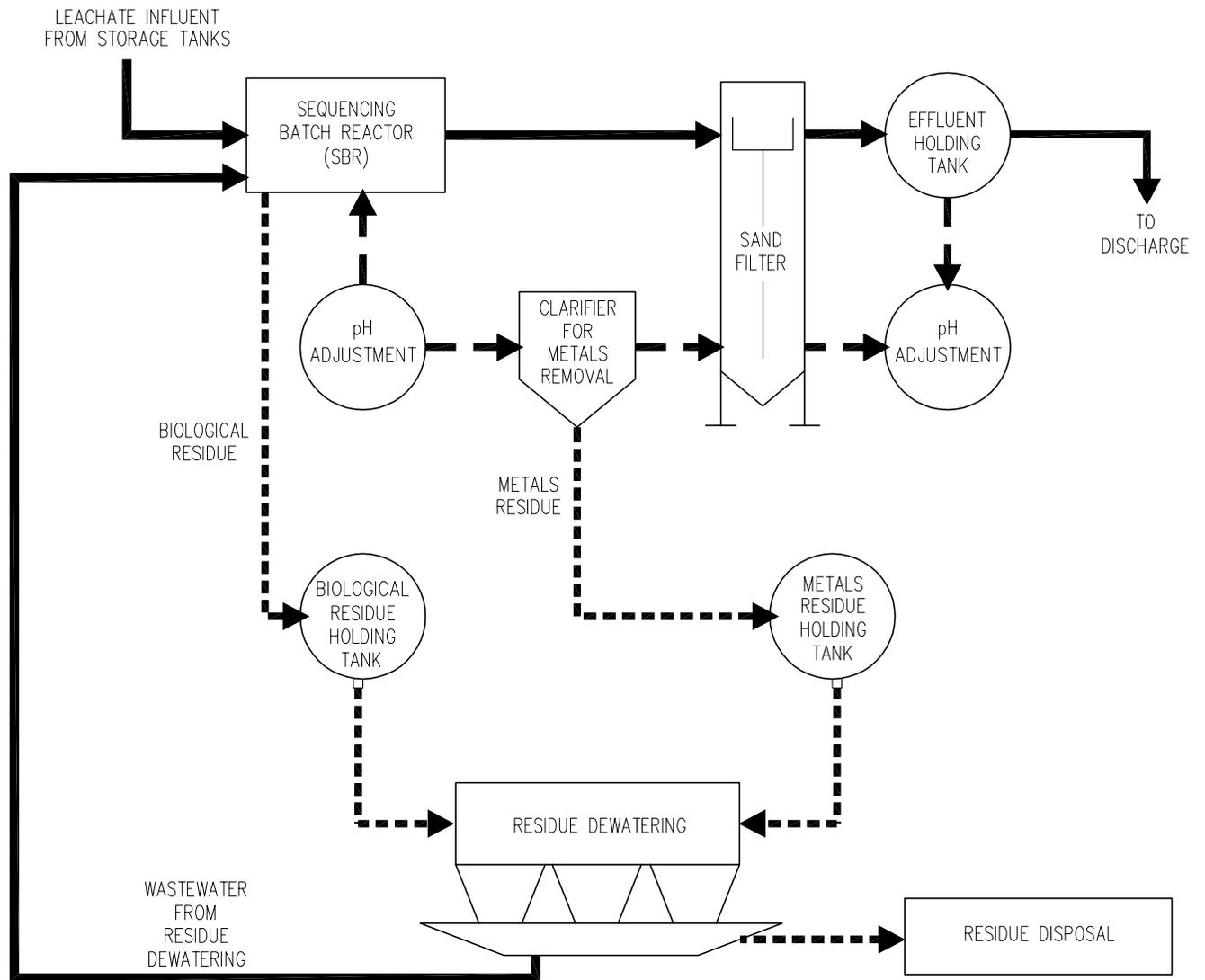
- Influent holding
- Sequencing batch reactors for biological treatment
- Metals precipitation
- Gravity clarification
- Sand filtration
- Effluent pH adjustment
- Discharge through diffuser outfall

Operations and monitoring of the FKLLTP, the leachate collection pump stations in Sections 1/9, 6/7, 2/8 and 3/4, and the recovery wells at Sections 2/8 and 3/4 are controlled by a supervisory control and data acquisition (SCADA) system.

The effectiveness of the FKLLTP is monitored by analytical testing of the influent and effluent performed in accordance with the requirements of the SPDES permit.

## **5.8 RECORD KEEPING AND REPORTING**

Maintenance, operation and monitoring activities for the leachate control system will be performed for the post-closure period or as otherwise approved by NYSDEC.



**LEGEND**

- BIOLOGICAL TREATMENT (SBR)
- - - - -** OPTIONAL METALS REMOVAL
- .....** RESIDUE

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 STATEN ISLAND, NEW YORK

**LEACHATE TREATMENT PLANT  
 PROCESS FLOW DIAGRAM**

FIG. NO. 5-4

An inspection checklist has been developed for use during routine quarterly inspections of the leachate collection and containment system. A copy of the inspection checklist is enclosed in Volume B.

Results of the monitoring of the FKLLTP required by the SPDES permit are submitted monthly to the NYSDEC as the Discharge Monitoring Report (DMR). In accordance with Item b) of the Recording, Reporting and Additional Monitoring Requirements of the SPDES permit (No. NY-0200867), monitoring data required by the SPDES permit will be maintained for three years after the date of sampling.

Information relative to maintenance, operation and monitoring activities at the leachate control facilities will be compiled on at least a quarterly basis and maintained in the facility operating record. Detailed information to be incorporated into the report is described in Volume B. Records will be maintained for seven years from the date generated.

## SECTION 6

### LANDFILL GAS CONTROL

The generation of landfill gas (LFG) is a natural process resulting from the decomposition of organic material in municipal solid waste. LFG is comprised mainly of methane, an explosive gas, and carbon dioxide, along with traces of other gases. Without controls, LFG will tend to migrate away from the Landfill within unsaturated soil layers, both vertically and horizontally. LFG also is a concern because of its odor and its effect on air quality—particularly the emission of methane, a “greenhouse gas” believed to contribute to global warming, and non-methane organic compounds (NMOC), which may be harmful to human health.

Landfill gas at the Fresh Kills Landfill is managed both to control emissions of methane and NMOC and to prevent off-site migration of LFG. Post-closure operations and maintenance of the landfill gas emissions control system are detailed in the Operations and Maintenance Plan for Landfill Gas Collection and Control System, which is included as Volume D of this Manual. The post-closure landfill gas migration monitoring program is detailed in Volume C.

#### **6.1 LANDFILL GAS EMISSIONS CONTROL SYSTEM**

Components of the landfill gas emissions control system are an active collection system, a flaring system, and a passive venting system. The active collection, flaring, and gas recovery systems will be in operation during the post-closure period. The active landfill gas collection and control systems will be operated in accordance with the requirements of 6 NYCRR Part 208. Passive vents will be closed while the active system is in operation; they will be opened only after the post-closure period or after methane generation has declined to the extent that the active gas collection system is no longer necessary or required.

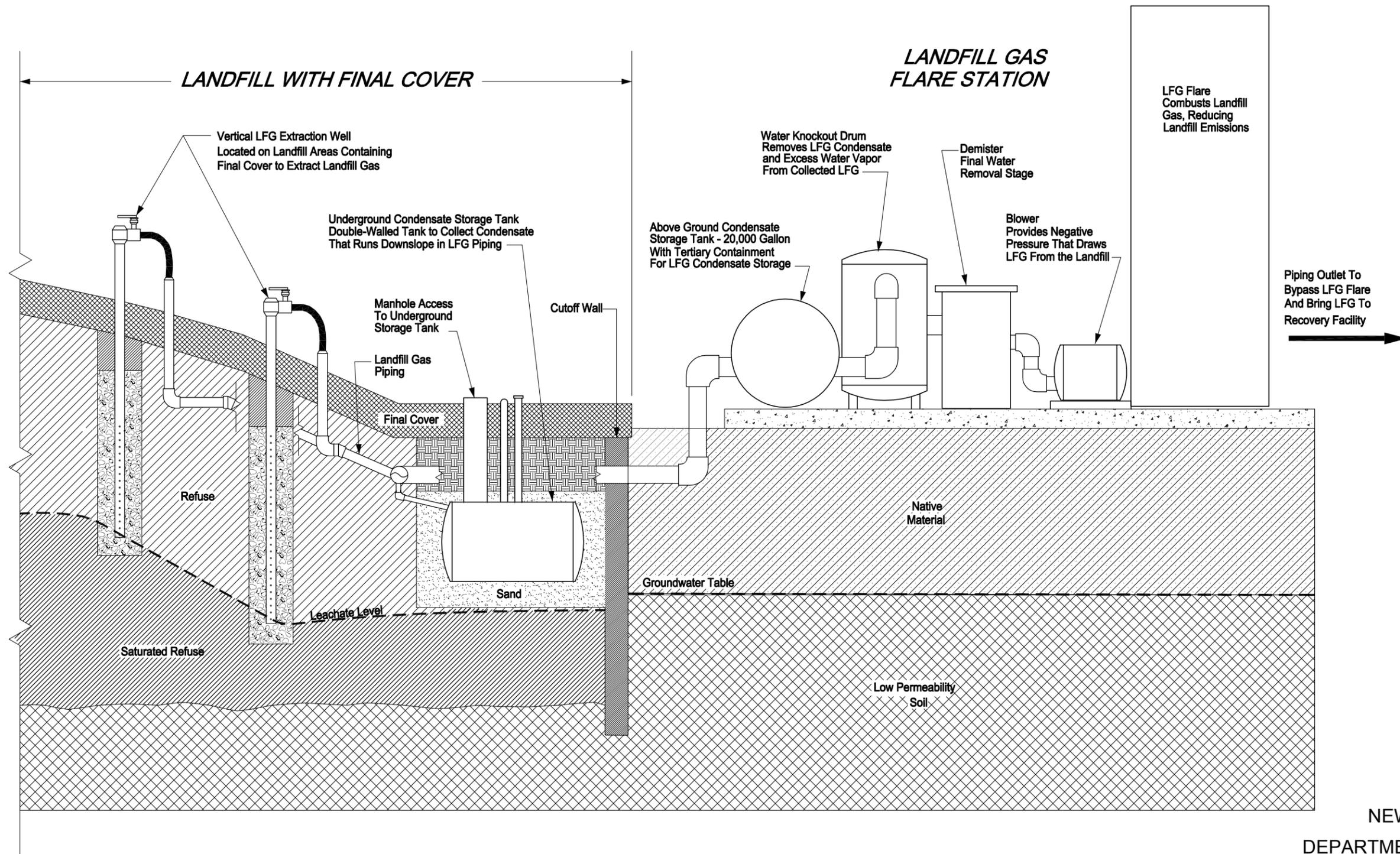
As established in 208.3(b)(2)(v), operation of the active collection system may be discontinued provided that the following conditions are met:

- The landfill shall be no longer accepting solid waste and shall be permanently closed;
- The collection and control system shall have been in operation for a minimum of 15 years;
- The calculated NMOC gas produced by the landfill shall be less than 50 megagrams per year on three successive test dates. The test dates shall be no less than 90 days apart, and no more than 180 days apart.

##### **6.1.1 Active Collection System**

###### **6.1.1.1 System Description**

The active LFG system is designed to collect and combust LFG from the Landfill, in accordance with Federal and state emissions regulations. The primary elements of the system, which are illustrated in Figure 6-1, are as follows:



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 STATEN ISLAND, NEW YORK

ACTIVE LANDFILL GAS  
(LFG) COLLECTION SYSTEM

FIG. NO. 6-1

NOTE:

1. THIS IS A CONCEPTUAL SCHEMATIC REPRESENTATION WHICH IS NOT DRAWN TO SCALE.

- Active LFG gas extraction wells installed at each Landfill section.
- Networks of interconnected piping at each Landfill section, which convey the collected LFG to the flare stations and/or the landfill gas transmission main.
- Condensate tanks, which collect condensate at low points along the header pipe runs at each section.
- LFG blowers at each flare station, which provide the necessary vacuum to draw LFG from the LFG wellfield and convey it to the flare stations and the LFG recovery facility.
- LFG flare stations located at Sections 2/8, 3/4, and 6/7, which combust the collected LFG.
- A separately permitted landfill gas recovery facility, which is used to recover and process the collected landfill gas for commercial purposes.

During the post-closure period, all gas extracted through these wells will be sent to the separately permitted landfill gas recovery facility. If the quantity of gas collected exceeds the capacity of the LFG recovery facility, or the facility is shut down, collected LFG will be sent to enclosed flares. LFG will be collected and processed in order to meet all applicable emissions standards. A detailed description of the active LFG system and procedures for operations and maintenance of the system are presented in Volume D.

#### **6.1.1.2 Compliance Monitoring**

During the post-closure phase, maintenance and monitoring will be conducted for the gas collection and control system in accordance with the regulatory requirements. Compliance monitoring activities include the following:

- **Landfill Cover Inspection**  
Inspection of the landfill cover will be conducted monthly to ensure final cover integrity.
- **Wellhead Monitoring**  
Monthly inspection and monitoring will be conducted at each landfill gas extraction well and the header riser for each Landfill Section. Parameters to be monitored include gauge pressure, temperature, oxygen or nitrogen levels, and flow rates. Detailed description of the wellhead monitoring is included in Volume D of this Manual.
- **Surface Monitoring**  
Quarterly surface methane monitoring will be performed at all sections using a portable analyzer to verify that methane levels at the surface of the landfill cover do not exceed 500 ppm above background levels. If no monitoring exceedances occur in three consecutive quarterly monitoring periods, the surface monitoring frequency will become annual. The Surface Monitoring Plan is provided as part of Volume D.

### **6.1.2 Flaring and Gas Recovery Systems**

LFG collected on site is processed through one of two methods in order to comply with regulatory requirements for emissions reduction. These methods are recovery and processing of the gas for use as fuel, and flaring, which is the combustion of LFG at high temperature resulting in the thermal destruction of NMOCs. The landfill gas recovery facility located adjacent to Section 1/9 is operated to recover and process the landfill gas collected from each section at the Fresh Kills Landfill. A landfill gas transmission force main conveys collected gas from Sections 2/8, 3/4, and 6/7 to the landfill gas recovery facility. At all sections except for Section 1/9, excess LFG that cannot be processed by the recovery facility will be combusted by the flare station at the section where the LFG is collected. Collected LFG from Section 1/9 can be directed to the flare stations via the landfill gas transmission main.

The modular flaring stations installed at Section 2/8, 3/4, and 6/7 combust the LFG and provide the necessary NMOC emissions reduction. As shown on Figure 6-1, these flaring stations (one each at Sections 2/8, 3/4, and 6/7) contain the same basic components and can each process up to 10,000 standard cubic feet per minute (scfm) of LFG. The basic components at each modular flaring station include two flares, three exhausters/blowers, three demisters, a knockout tank, and an aboveground 20,000-gallon condensate storage tank. Three blowers located at each flaring station act to provide the necessary negative pressure within the piping and wells to draw the LFG through the system. At each of these flaring stations, when operating at capacity, only two blowers will operate at any given time with one blower on standby as a backup during the post-closure period.

A Contingency Plan has been prepared and provided in Volume D, the Operations and Maintenance Plan for Landfill Gas Collection and Control System. The emergency situations, which may include power failure, malfunction of operation system, unusual field LFG emission, air/gas leaks from existing piping, and fire, and applicable responses are detailed in Volume D. Information on emergency services is provided in Section 8 of Volume A.

### **6.1.3 Passive Venting Systems**

Passive venting systems have been installed to vent LFG at all four Landfill sections. As discussed above, these systems will be closed while the active system is in operation; they will be opened only after the post-closure period or after methane generation has declined to the extent that the active gas collection system is no longer necessary or required.

At Sections 2/8 and 3/4, a network of LFG duct vents was constructed along with placement of final cover. These duct vents consist of trenches cut into the existing intermediate cover and refuse. Within each of the stone-filled ducts is a perforated pipe that runs along the entire length of the duct to facilitate gas movement. These ducts are fully enclosed within a geotextile to prevent the intrusion of cover soil and refuse. The ducts are oriented perpendicularly to the final grading contours of each landfill section. Along these ducts, vertical riser vents are connected that will convey the LFG from the ducts through the landfill cover layer and into ambient air. To preserve the integrity of the hydraulic barrier layer, the vertical riser vent is attached to the flexible geomembrane liner of the

final cover by means of a geomembrane boot. The LFG duct vents at Sections 2/8 and 3/4 are used

in lieu of a continuous gas venting layer. A cross-section of a typical LFG duct vent installed at Sections 2/8 and 3/4 is presented in Figure 6-2.

At Sections 1/9 and 6/7, in general, the passive venting system consists of the following components:

- a geocomposite venting net layer installed beneath the geomembrane; and
- vents through the cap to provide for passive venting in the future.

The gas venting layer is constructed of geocomposite, consisting of a geotextile heat-bonded to both sides of HDPE geonet drainage material. The venting layer is installed in compliance with regulatory requirements of 360-2.15(e) and (f), which specify a 12-inch-thick layer of soil with a permeability of  $1 \times 10^{-3}$  cm/s or greater. The geocomposites used for this venting layer have a permeability on the order of  $1.0 \times 10^{-1}$  cm/s. The vents are installed at a density of one per acre. A cross-section of the passive LFG vents installed at Sections 1/9 and 6/7 is illustrated in Figure 6-2.

Inspection of the vents to identify any structural damage will be conducted during quarterly inspection of the final cover, as described in detail in Attachment 2. The landfill surface in the area of the vents will also be visually inspected to check for any signs of differential settlement, swelling, or other problems.

## **6.2 LANDFILL GAS MIGRATION CONTROL SYSTEM**

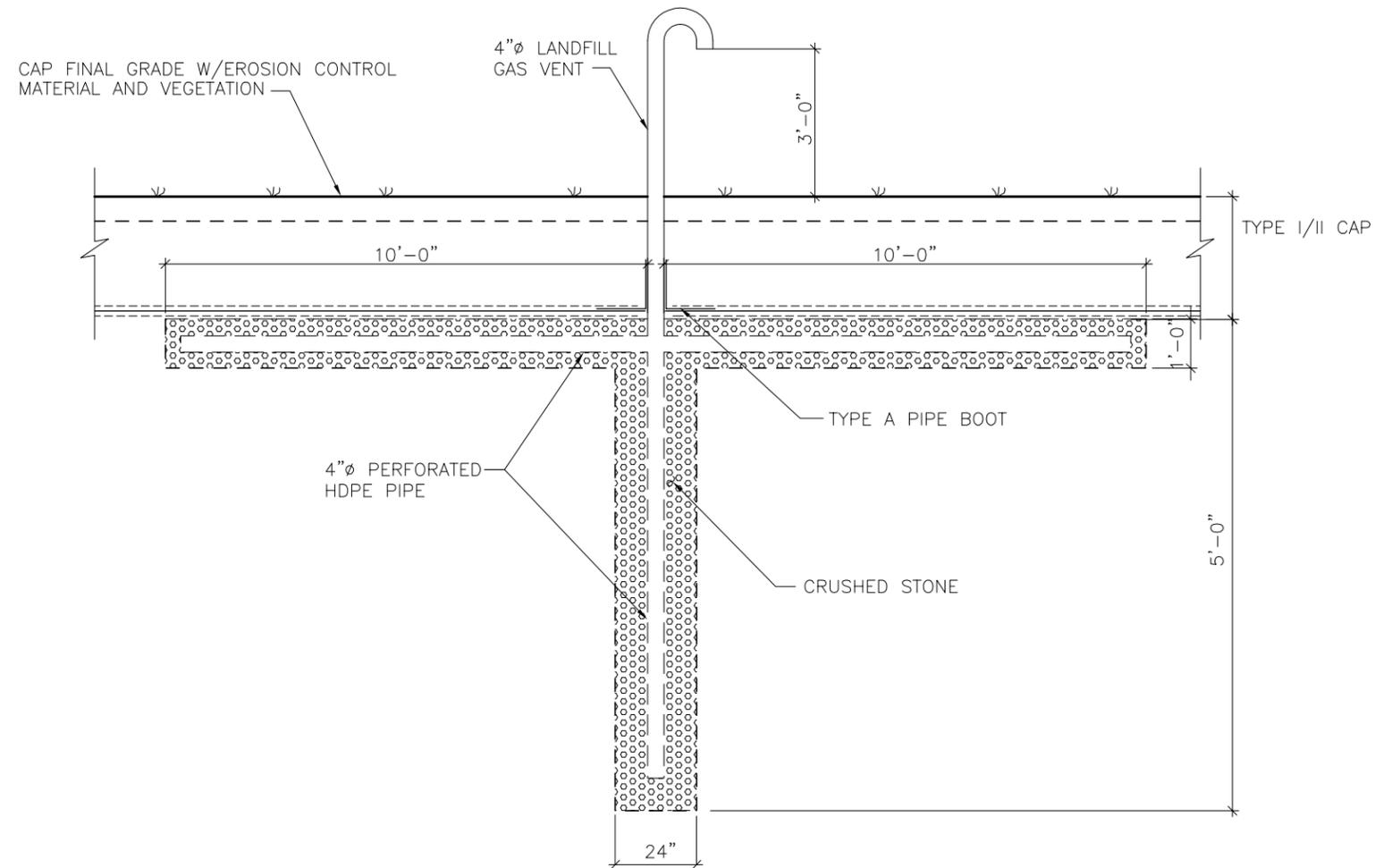
To prevent the off-site migration of LFG and to prevent the accumulation of LFG in both on-site and off-site structures, a LFG migration management system has been developed and implemented at the Landfill. In accordance with 360-2.17(f) and related regulations, the concentration of methane and other explosive gases generated by the Landfill shall not exceed:

- a) 25 percent of the lower explosive limit for gases in facility structures on or off site, excluding gas control or recovery system components; and
- b) the lower explosive limit for the gases at or beyond the property boundary.

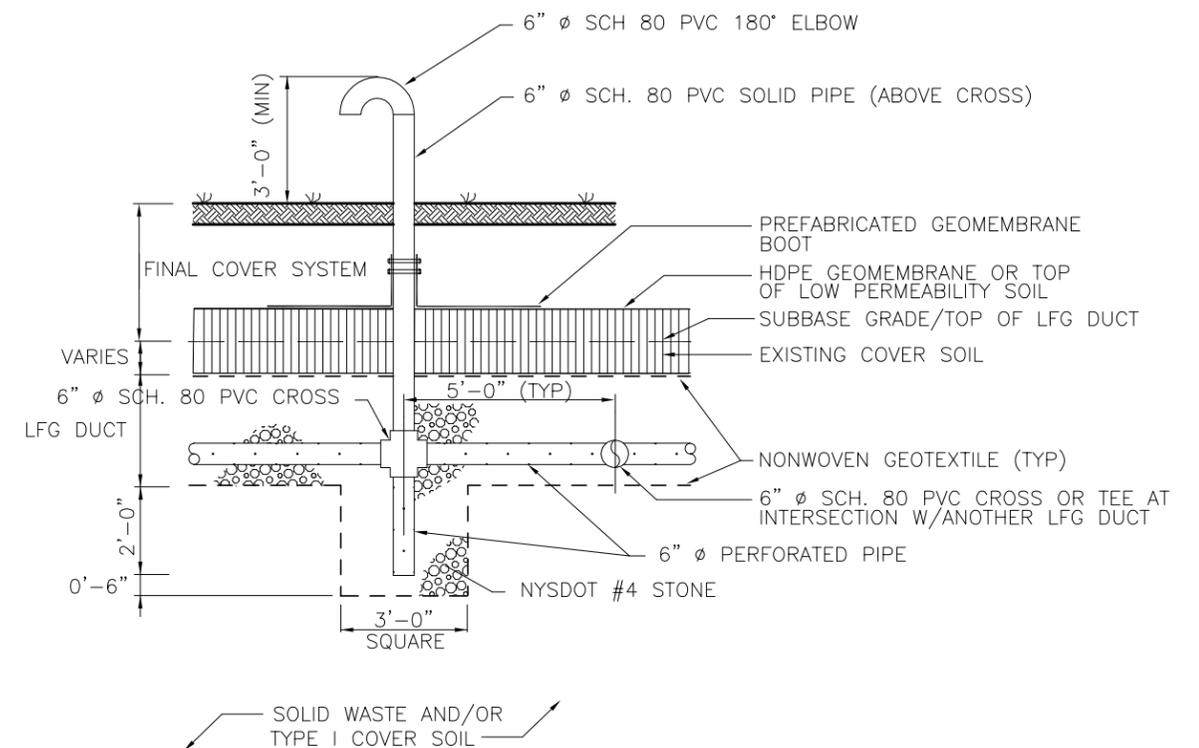
The LFG migration management system consists of two programs: engineered controls (including the perimeter LFG interceptor venting system, utility seals, and the perimeter leachate collection and containment systems, ), and migration monitoring along the property boundary of the Landfill. Both engineered controls and migration monitoring are illustrated in Figure 6-3 for Sections 2/8 and 3/4 and in Figure 6-4 for Sections 1/9 and 6/7.

### **6.2.1 Engineered Controls**

A perimeter LFG interceptor venting system (interceptor venting system) is installed around the Landfill. Location of the interceptor venting system is shown on Figure 6-5. The interceptor venting system is keyed into low-permeability soils or extended below the seasonal low groundwater table to form a barrier to off-site migration of LFG generated within the Landfill and to allow the LFG to vent passively. Where underground utilities may act as conduits for the LFG migration,



**TYPICAL PASSIVE GAS VENT DETAIL**  
**SECTIONS 1/9 AND 6/7**  
 NOT TO SCALE



**LFG DUCT VENT**  
**SECTIONS 2/8 AND 3/4**  
 NOT TO SCALE

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**LANDFILL GAS VENTS**  
**FIG. NO. 6-2**

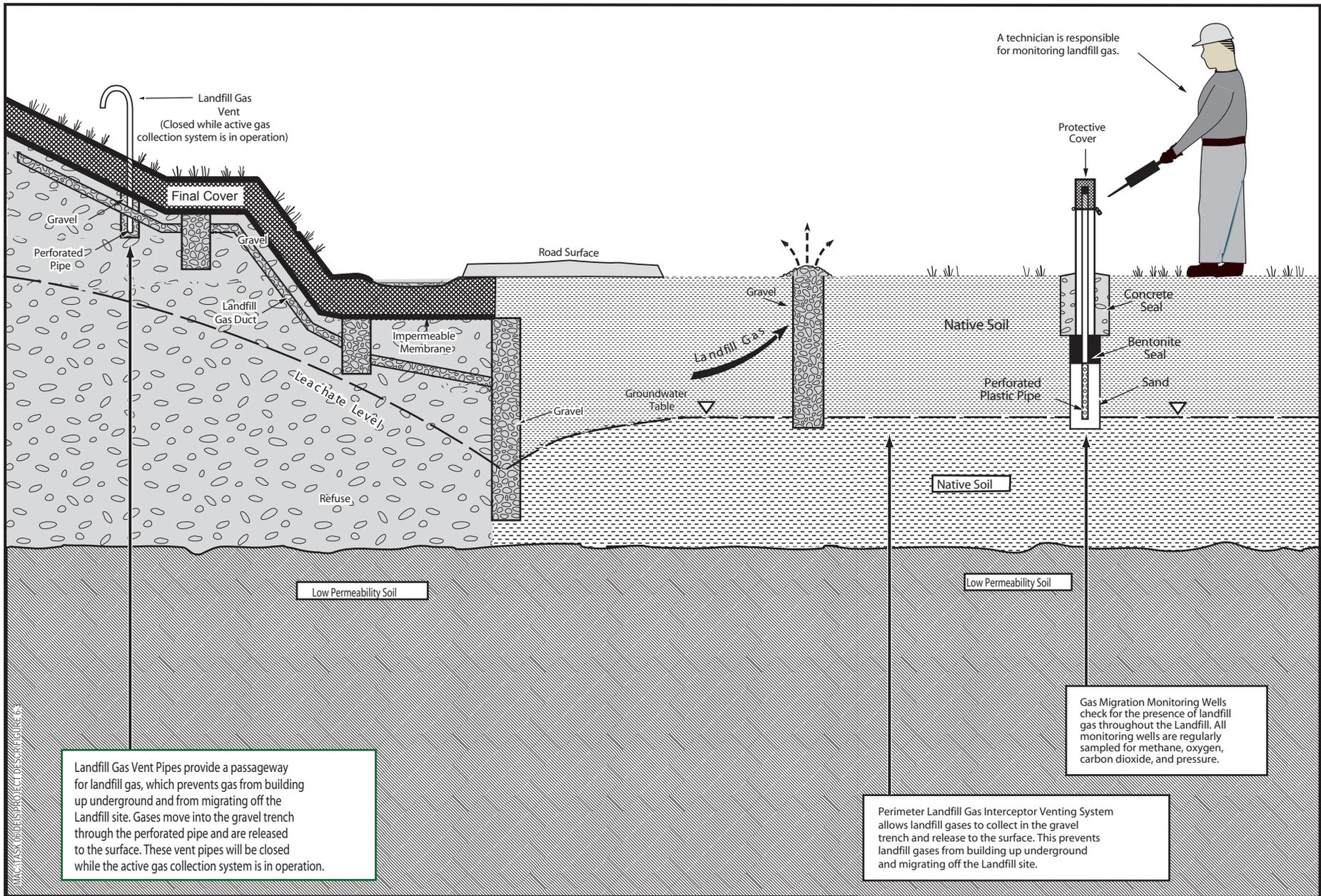
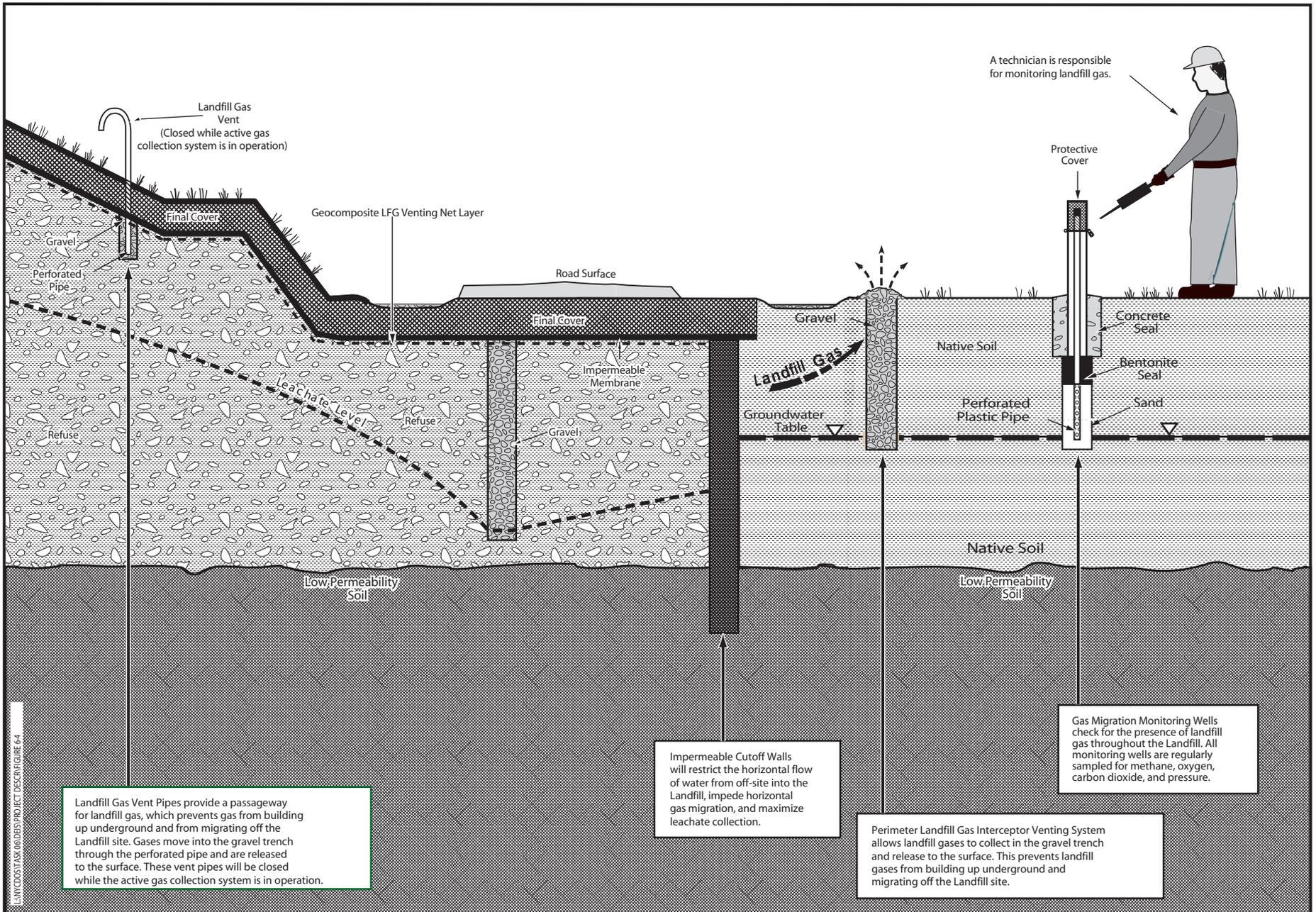


FIG. NO. 6-3  
CROSS SECTION OF THE LANDFILL  
GAS VENTING SYSTEM  
Sections 2/8 and 3/4



A technician is responsible for monitoring landfill gas.

Landfill Gas Vent Pipes provide a passageway for landfill gas, which prevents gas from building up underground and from migrating off the Landfill site. Gases move into the gravel trench through the perforated pipe and are released to the surface. These vent pipes will be closed while the active gas collection system is in operation.

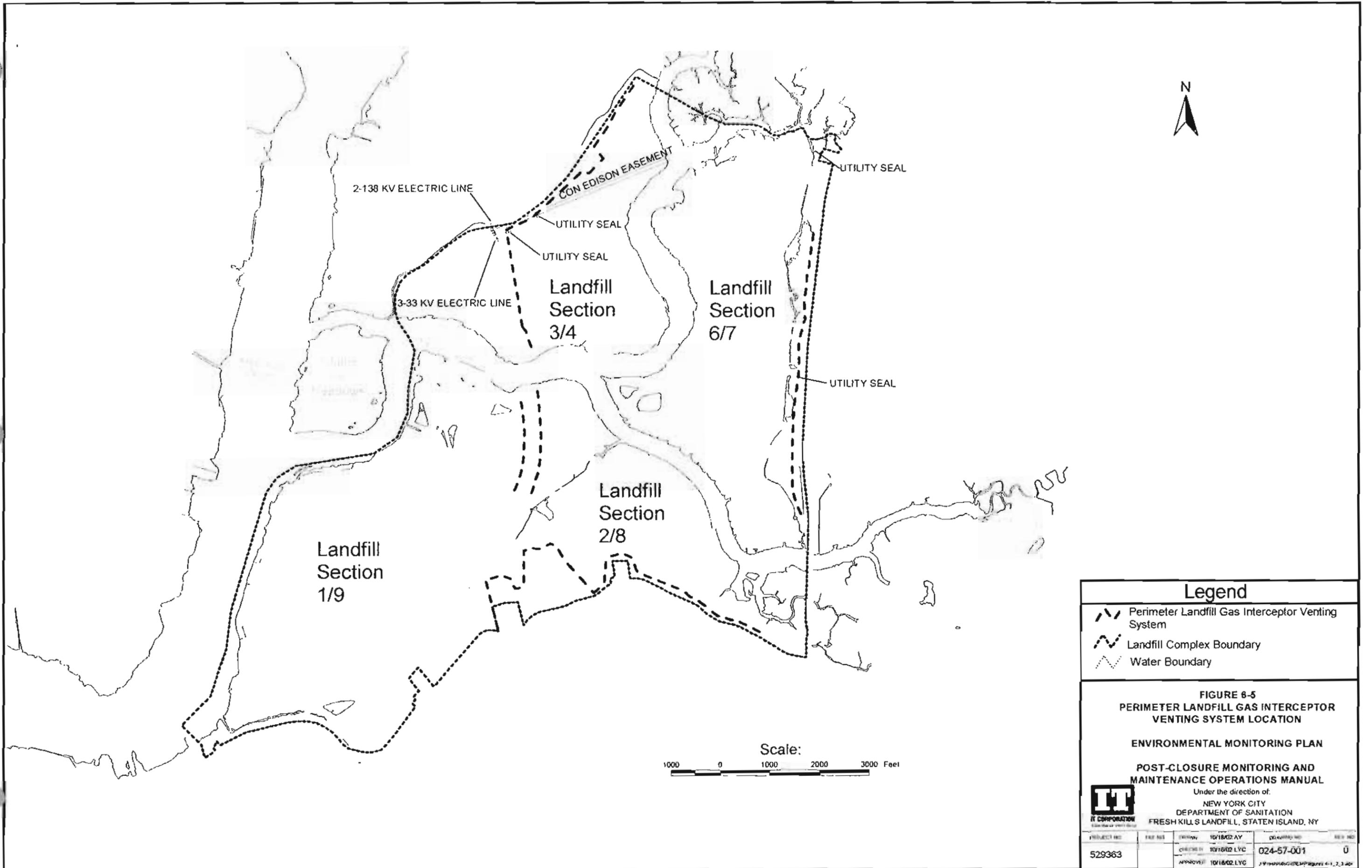
Impermeable Cutoff Walls will restrict the horizontal flow of water from off-site into the Landfill, impede horizontal gas migration, and maximize leachate collection.

Perimeter Landfill Gas Interceptor Venting System allows landfill gases to collect in the gravel trench and release to the surface. This prevents landfill gases from building up underground and migrating off the Landfill site.

Gas Migration Monitoring Wells check for the presence of landfill gas throughout the Landfill. All monitoring wells are regularly sampled for methane, oxygen, carbon dioxide, and pressure.

LNYCOSTASK 06/DES/PROJECT DESIGN FIGURE 6-4

FIG. NO. 6-4  
CROSS-SECTION OF THE LANDFILL  
GAS VENTING SYSTEM  
Sections 1/9 and 6/7



Legend	
	Perimeter Landfill Gas Interceptor Venting System
	Landfill Complex Boundary
	Water Boundary

**FIGURE 6-5**  
**PERIMETER LANDFILL GAS INTERCEPTOR VENTING SYSTEM LOCATION**  
  
**ENVIRONMENTAL MONITORING PLAN**  
  
**POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS MANUAL**  
  
 Under the direction of:  
 NEW YORK CITY  
 DEPARTMENT OF SANITATION  
 FRESH KILL'S LANDFILL, STATEN ISLAND, NY



PROJECT NO.	DATE	DESIGNER	DRAWING NO.	REV. NO.
529363		10/18/02 LYC	024-57-001	0
		10/18/02 LYC		
		10/18/02 LYC		

utility seals are used to cut off the LFG from migrating along the utility conduits. Locations of the utility seals are also shown on Figure 6-5.

The condition of the visible portion of the perimeter LFG interceptor venting system will be inspected quarterly. An inspection checklist has been developed for use during the quarterly inspections. A sample inspection checklist for the interceptor venting system is included in Attachment 2. Damage to the interceptor venting system will be noted, and repairs will be made as necessary, as determined by the assessment engineer. Results of the quarterly inspections will be maintained in the facility operating record.

An additional feature at the Landfill that contributes to LFG migration control is the leachate containment system. This system includes low permeability cutoff walls keyed into low permeability soils or bedrock around the perimeter of Sections 1/9 and 6/7. The primary function of this system is to contain leachate. However, the cutoff walls also act as barriers to horizontal LFG migration at Sections 1/9 and 6/7. The maintenance of the cutoff wall is discussed in Volume B of this Manual.

### **6.2.2 Migration Monitoring**

To evaluate the effectiveness of the engineered controls in deterring LFG migration and meeting the requirements of Part 360-2.15(k)(4) during the post-closure period, a post-closure landfill gas migration monitoring program has been developed. Details of the post-closure landfill gas migration monitoring program are presented in Volume C of this Manual and summarized in Section 4.3 of this volume.

Contingency procedures to be followed when methane concentrations measured during migration monitoring exceed regulatory limits are presented in Volume C of this Manual.

## **6.3 REPORTING AND RECORD KEEPING**

In general, records will be maintained for seven years from the date generated, in accordance with 360-1.14(i)(4).

Results of migration monitoring events will be submitted to NYSDEC in compliance with the approved LFG monitoring program detailed in Volume C. In addition, the following records, information, and documentation will be maintained in the facility operating record:

- Amount of Landfill Gas Burned in the Flare;
- Monitoring Records of Flare Inlet Flow Rate;
- Average Flare Combustion Temperature;
- Monthly Wellhead Monitoring Inspection Reports;
- Quarterly Surface Methane Monitoring Reports;
- Records of Flare Flame Monitoring Results, Including Visible Emission Reading, Heat Content, Flow Rates, and Exit Velocity;
- Operation, Maintenance and Repair Records; and

- Stack Test Results.

## SECTION 7

### FINANCIAL ASSURANCE CRITERIA AND REQUIREMENTS

#### **7.1 OVERVIEW AND REGULATORY BACKGROUND**

This section is prepared in compliance with regulatory requirements of 6 NYCRR Part 360, 2.15(k)(7)(vii) and Appendix A-15 of the Consent Order. These requirements address financial assurance criteria that must be satisfied to demonstrate that adequate funds will be readily available for the costs estimated for the closure, corrective measures, and post-closure care of the Landfill. The Financial Assurance Plan (FAP) will be submitted on an annual basis during the post-closure period.

According to 360 2.15(k)(7)(vii), the owner or operator must address the following issues in the post-closure monitoring and maintenance operations manual:

*A summary of financial assurance criteria concerns that must be addressed to remain in compliance with the provisions of subdivisions 360-2.19(c) and (d). This includes:*

- a) submittal to the department of annual adjustments to cost estimates of post-closure care and corrective measures; and*
- b) notification to the department of increases in post-closure care costs and corrective measure costs.*

Part 360-2.19 requires that the owner or operator of municipal solid waste landfills (MSWLFs) provide financial assurance for closure, corrective measures, and post-closure costs associated with MSWLFs that received solid waste on or after 9 October 1993. The initial date for providing financial assurance was 9 April 1997 as set forth in the revised Part 360-2.19, effective 26 November 1996. Financial assurance was to be based on written estimates of the cost of hiring a third party (neither a parent nor a subsidiary of the owner or operator) to perform the following activities:

- Close the largest active portion of the Landfill ever requiring a final cover at any time during the active life of the Landfill.
- Conduct post-closure care, including annual and periodic maintenance, over the entire post-closure care period.
- Perform corrective measures if required under Part 360-2.20.

Financial assurance requirements provide for annual adjustment in cost estimates both to adjust for inflation and to account for any changes in landfill conditions, closure, corrective measures, or post-closure requirements, technologies, or cost estimates. In addition, the financial assurance requirement will be adjusted as disbursements are made for closure, corrective measures, and post-closure activities. Therefore, each year there will be changes to the cost estimates from the prior year.

The criteria and requirements for providing a FAP are defined in state and federal rules and guidance documents. The primary source for such criteria and requirements is 6 NYCRR Part 360-2.19(c) and (d) for post-closure care and corrective measures.

Specific requirements are provided for the following types of activities in Part 360:

- Financial Assurance for Post-Closure Care. Part 360-2.19(c) requires the preparation of a detailed written estimate, in current dollars, to conduct post-closure care including annual and periodic maintenance throughout the entire post-closure period.
- Financial Assurance for Corrective Measures. Part 360-2.19(d) requires the preparation of a detailed written estimate, in current dollars, for the performance of all corrective measures required and planned.

### **7.1.1 Post-Closure Activities and Costs**

Post-closure activities consist of repair and maintenance of landfill final cover via inspection and monitoring activities, site-wide environmental monitoring (i.e., groundwater, surface water/sediment, landfill gas migration, and facility monitoring), and operation of a landfill gas emission control system. Post-closure activities are required for a minimum 30-year period following closure. Costs are estimated in current dollars for the entire post-closure period. The cost of ongoing environmental monitoring is estimated based on the cost of existing monitoring at the Landfill. The financial assurance cost estimates will be presented in the FAP. The disbursements, by fiscal year, for post-closure activities will be also included in the FAP.

### **7.1.2 Corrective Measures and Costs**

Corrective measures currently consist of the following activities:

- Operation and maintenance of a cutoff wall and leachate collection drains for Sections 1/9 and 6/7.
- Operation and maintenance of the leachate collection and conveyance system.
- Operation and maintenance of the FKLLTP.

Costs for corrective measures and activities will be provided in the annual FAP. Unless new conditions and corrective actions are identified, the costs of currently ongoing corrective activities at the Fresh Kills Landfill will be based on current contract costs or engineering estimates. All financial assurance cost estimates will be presented in tabular form. The disbursements, by fiscal year, for corrective measures will be also shown in the annual FAP. Notification will be provided to the NYSDEC if post-closure care costs and/or corrective measure costs increase.

## **7.2 MECHANISMS AVAILABLE**

Part 360-2.19 provides for the use of a series of allowable financial assurance mechanisms for municipal landfills to demonstrate the timely availability for adequate funds to meet closure, corrective measures, and post-closure needs. These mechanisms include a trust fund, security bond guaranteeing payment or performance, letter of credit, and insurance.

Part 360 also allows for other state-approved mechanisms to be used if approved in advance by NYSDEC in writing. In a letter dated 4 March 1997, NYSDEC authorized the use of the two additional mechanisms below as acceptable under Part 360-2.19. The mechanisms have not yet been added to the Part 360 solid waste regulations, but they have been adopted as under 40 CFR Part 258.

- Local Government Financial Test (LGFT). The test allows local governments to meet their financial assurance obligations by demonstrating their financial strength. Under this approach, a local government must demonstrate that it is capable of meeting its financial obligations at its MSWLF through “self-insurance.”
- Local Government Guarantee. A local government could guarantee the costs of closure, corrective action, and post-closure care associated with a MSWLF owned by another local government or by a private business. The local government guarantor would have to promise to take responsibility for the obligations of the owner or operator (if the owner or operator failed to do so) and to provide proof that it passes the financial test requirements.

The current FAP for post-closure care and corrective measures uses the LGFT. Sections 7.3, 7.4, and 7.5 will provide details on the specific criteria to be met in order to satisfy the LGFT.

## **7.3 FINANCIAL COMPONENT**

Consistent with applicable regulations, to be eligible to use the LFGT for financial assurance, the following financial criteria will be met:

- For landfill owners or operators with outstanding general obligation bonds, the current rating of the bonds must be at least BAA as rated by Moody's or BBB as rated by Standard and Poor's.
- The landfill owner or operator must prepare its annual financial statements in conformity with Generally Accepted Accounting Principles (GAAP) for governments.
- The landfill owner or operator must have its financial statements audited by an independent Certified Public Accountant (CPA) or appropriate state agency.
- Additionally, the local government is not eligible to assure its obligations with the LGFT if it:

- Has any outstanding general obligation bonds in default.
- Has any general obligation bonds rated lower than BAA (Moody's) or BBB (Standard and Poor's).
- Has operated at a deficit equal to 5% or more of annual revenue in either of the past two fiscal years.
- Has received an adverse audit opinion, disclaimer of audit opinion, or other qualified audit opinion from its independent CPAs during the most recent audit.

Upon satisfying the above-stated criteria, the owner or operator may use the LGFT to demonstrate financial assurance for the cost of its total environmental obligation up to a maximum amount that does not exceed 43% of its total annual revenues.

#### **7.4 PUBLIC NOTICE COMPONENT**

The City of New York will reference the costs assured through the LGFT in its most recent Comprehensive Annual Financial Report (CAFR) or its budget. Since the regulations (Part 360-2.19) became effective 9 April 1997, the City of New York will also include this information each year in its subsequent fiscal year's CAFR or budget.

The document will include the current cost estimate for corrective measures, and post-closure care as well as the years in which the costs are expected to be incurred. For activities that are expected to occur in the period covered by the budget, the costs will be included as a budgeted line item. Those costs that are to be incurred in future budget periods need only be disclosed in a supplemental section to the City's budget or financial report.

#### **7.5 RECORD KEEPING AND REPORTING**

The City of New York will review its financial situation every year to determine if it satisfies the requirements of the financial test and is still eligible to use the financial test. If the City determines that it no longer meets the financial test requirements, then it will obtain alternate financial assistance within 210 days of the close of its fiscal year.

If the City meets the test's financial requirements, it must also satisfy certain public notice and record keeping and reporting requirements to demonstrate financial assurance for municipal solid waste landfill corrective measures and post-closure costs. In addition to the annual adjustments to cost estimates of post-closure care and corrective measures, the City will also place in the landfill's operating record:

- A letter from the local government's Chief Financial Officer (CFO) that certifies that the local government satisfies the requirements of the financial test for those costs for which financial assurance is being demonstrated through the financial test.

- A local government's independently audited year-end CAFR prepared in accordance with GAAP.
- The opinion prepared by the auditor of the City's year-end CAFR.
- A report from the City's independent CPAs stating the following:
  - The City prepares its annual financial statements in conformity with GAAP.
  - The City has its annual financial statements audited.
  - The City has not operated at a deficit equal to 5% or more of the total annual revenue in each of the past two fiscal years.
  - The City has not received an adverse opinion, disclaimer of opinion, or other qualified opinion from the independent CPA auditing its annual financial statement.

The costs to be assured will be summarized and detailed in the annual FAP. The years in which the costs are to be incurred will be also summarized. The LGFT provides for assurance of costs up to 43% of the City's total annual revenues if the City does not assure other environmental obligations through a financial test.

Annual FAPs and supporting information will be maintained in the facility operating record throughout the post-closure period, as specified in 360-1.14(i)(3).

## **SECTION 8**

### **EMERGENCY SERVICES**

#### **8.1 INTRODUCTION**

This Section provides information on actions and resources to be taken in response to contingencies during the post-closure period at of the Fresh Kills Landfill. Section 8 is prepared as part of the post-closure contingency plan in compliance with the regulatory requirements of Part 360.2-15(k)(7)(v). In the event of a major accident or serious event, DSNY will closely coordinate responses with the City of New York's other emergency management agencies, including the Emergency Medical Services (EMS), New York City Police Department (NYPD) and the New York City Fire Department (FDNY).

Emergency and contingency contact information is included as Attachment 3 of Volume A. This format allows the specific contact to be periodically revised without revising the text unless a major change occurs in the overall performance criteria that would affect the approach to post-closure compliance. This section summarizes the procedures and contact information for emergency services. In case of emergency situations, the Emergency Coordinator will serve as the primary point of contact and will be responsible for coordination with emergency services agencies, responsible contractors, and other necessary resources. Additional discussions of contingency responses for specific facilities and activities during the post-closure period are detailed in Volume B (Fresh Kills Landfill Leachate Treatment Plant and Containment and Collection System O&M Plan), Volume C (Environmental Monitoring Plan) and Volume D (O&M Plan for Landfill Gas Collection and Control System).

#### **8.2 EMERGENCY NOTIFICATION**

In the event of an emergency at the Landfill during the post-closure period, emergency agencies will be notified as necessary and appropriate. These emergency agencies are listed in Attachment 3 of Volume A.

When an emergency situation occurs at the Fresh Kills Landfill, on-site personnel will contact the Director of Fresh Kills/Emergency Coordinator (see Section 2.2.1 for Responsibilities and Qualifications). The Emergency Coordinator will make any necessary internal (within DSNY) or external emergency notification. During the post-closure period, at least one Emergency Coordinator will be available during regular work hours. The Operations Control Office (OCO) will serve as point of contact during after-work hours, weekends, and/or holidays. If an emergency situation occurs at the FKLLTP or the landfill gas recovery facility, the on-site supervisor at the facility may contact emergency agencies directly, but he or she must also notify the Emergency Coordinator or, in the Emergency Coordinator's absence, the OCO.

In case of an environmental related emergency, NYSDEC on-site representatives and Regional Solid Waste Engineer will be notified. Environmental related emergencies will include any situation that may impair the function of the environmental control systems (including the landfill gas control

systems, the final cover system, the leachate control system, and the environmental monitoring system). Even if notification is made to a different division within NYSDEC, notification may also be made to NYSDEC's Division of Solid and Hazardous Materials.

The Director of Fresh Kills/Emergency Coordinator will coordinate with representative(s) from selected agencies for their participation in periodic on-site emergency response sessions, as necessary or as requested by the agencies. The purpose of these sessions is to ensure that the representatives from the selected agencies are familiar with the site, service roads, and evacuation routes, and understand their organization's role in contingency situations at the Landfill.

### **8.2.1 Emergency Medical Services (EMS)**

When an ill or injured person(s) is in need of immediate medical assistance, personnel on site or the Emergency Coordinator will call 911 and request medical assistance from the Emergency Medical Services (EMS). More detailed information regarding contacting EMS is detailed in Attachment 3.

### **8.2.2 Emergency Response Procedures**

It is the responsibility of the Emergency Coordinator to notify the appropriate emergency services agencies in case of an emergency situation. The Emergency Coordinator is responsible for coordination with agencies, contractors, or other resources to ensure that proper responses are made in a timely fashion.

The general steps to be taken in response to the emergency situations at the Landfill include identification, assessment, notification, and response.

Whenever there is an incident presenting an immediate or potential threat to the public health and safety or to the environment, on-site personnel who notice or discover the conditions will notify the Emergency Coordinator. The Emergency Coordinator will in turn identify the location, source, extent, and type of emergency. The Emergency Coordinator will then notify the appropriate emergency services agencies. The Emergency Coordinator will either arrange to meet emergency personnel him- or herself or identify the person who will meet emergency personnel and the location where they will be met. In the Emergency Coordinator's absence, the OCO will designate a person who will meet emergency personnel.

Immediate action by on-site personnel should concentrate on preventing any emergency situation that occurs from spreading to other areas. When required, immediate emergency medical attention should be given to injured personnel. When able to be accomplished without risk, any possible sources of ignition should be removed from the incident area, and vehicular traffic should be suspended and work stopped, as necessary, until the incident can be safely contained or controlled.

### **8.3 LANDFILL EVACUATION PLAN**

The Emergency Coordinator is responsible for making sure that a facility evacuation plan and appropriate notification procedures are posted in the active facilities, such as the FKLLTP and landfill gas recovery facility. The Emergency Coordinator also is responsible for ensuring that outside contractors are knowledgeable of these evacuation procedures. A site plan showing directions of traffic flow on site service roads for evacuation purposes is included as Figure 8-1.

In an emergency situation, the responsible Emergency Coordinator or the designated on-site supervisor of an outside contractor will be the individual responsible for determining when evacuation of the facility is required. Imminent or actual dangers that constitute a situation requiring evacuation include:

- A fire that is out of control or the threat of fire that cannot be controlled or avoided.
- An explosion or the threat of explosion that cannot be averted.
- A major spill or leak that cannot be contained and constitutes a threat to human health.

Once on-site personnel have been evacuated, the entrance road to the facility should be closed to prevent unauthorized site access, except for emergency personnel and equipment.

### **8.4 FIRE RESPONSE PROCEDURES**

In case of a fire at the site, the responsible Emergency Coordinator or the designated on-site supervisor of an outside contractor will notify the New York City Fire Department (FDNY). With the exception of facility-specific equipment located at the FKLLTP and landfill gas recovery facility (see Volumes B and D for specific descriptions), no fire-fighting equipment will be maintained on-site during the post-closure period.

The location of fire hydrants at the Landfill Complex is shown on Figure 8-1. As with other emergencies, the Emergency Coordinator or, in the Emergency Coordinator's absence, the OCO will identify the person who will meet emergency personnel and the location where they will be met.



**LEGEND**

- LIMIT OF LANDFILL SOLID WASTE MANAGEMENT UNIT —————
- LANDFILL COMPLEX BOUNDARY - - - - -
- STORMWATER BASIN AND DESIGNATION (E) ↗
- DIRECTION OF TRAFFIC ↔
- SITE ENTRANCE/EXIT ↓ ↑
- FIRE HYDRANT ⊙
- LFG FLARE STATION ⊠
- SERVICE ROADS - - - - -

**NEW YORK CITY  
DEPARTMENT OF SANITATION  
FRESH KILLS LANDFILL  
STATEN ISLAND, NEW YORK**

**ACCESS ROADS AND  
FIRE HYDRANT LOCATIONS**



FIG. NO. 8-1

**ATTACHMENT 1**

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**APPLICABLE POST-CLOSURE REGULATIONS**

**Part 360 – 1.14(i)(3)**  
**1.14(i)(4)**  
**2.15(k)**  
**2.15(l)**  
**2.19(c)(1)**

during all hours of operation to prevent curtailment of operations because of equipment failure except under extraordinary conditions beyond the control of the facility's owner or operator.

(3) Self inspection. The facility owner or operator must frequently monitor and inspect the facility for malfunctions, deteriorations, operator errors, and discharges that may cause a release to the environment or a threat to human health. The facility owner or operator must promptly remedy any deterioration or malfunction of equipment or structures or any other problems revealed by the inspections to ensure that no environmental or human health hazard develops. Where a hazard is imminent or has already occurred, remedial action must be taken immediately.

(g) Contingency plan. Contingency plans approved by the department for emergency situations must be implemented in accordance with the terms of the plan.

(h) Monitoring samples and results. Samples and measurements taken for the purpose of monitoring must be representative of the monitored activity and must be conducted in a manner approved by the department, including the use of a laboratory and data-reporting format acceptable to the department.

(i) Recordkeeping.

(1) The facility owner or operator must retain records of all unauthorized solid waste accepted identifying the waste and its final disposition. Such records must be summarized in the annual report. They must include the date solid waste was received, the type of solid waste received, the date of disposal, the disposal method and location.

(2) The facility owner or operator must record self inspections as required by paragraph 360-1.14(f)(3) of this Subpart in an inspection log. These records must be retained for at least seven years from the date of inspection. They must include the date and time of the inspection, the name of the inspector, a description of the inspection including the identity of specific equipment and structures inspected, the observations recorded, and the date and nature of any remedial actions implemented or repairs made as a result of the inspection.

(3) Except as otherwise specified in this Part pertaining to a specific type of solid waste management facility, the facility owner or operator must keep records of all data used to develop or support the permit applications and any supplemental information submitted to comply with the requirements of this Part and pertaining to construction of the facility throughout the active life of the facility and the post-closure period. Records pertaining to the operation of the solid

waste facility must be kept for a period of no less than seven years from the date they are made or are required to be made, whichever is later.

(4) The facility owner or operator must retain records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation; and copies of all reports required by, or by a permit issued under, this Part) for a period of at least seven years from the date of the sample analysis, measurement, report or application. Existing water quality records must be kept throughout the active life of the facility and the post-closure period. Records for monitoring information must include: the date, exact place, and time of sampling or measurements; the name of the individual who performed the sampling and measurement; the date analyses were performed; the name of the individual who performed the analyses; the analytical techniques or methods used; and the result of such analyses. Additional information relating to the analysis, including records of internal laboratory quality assurance and control, must be made available to the department at its request.

(j) Confinement of solid waste. Blowing litter must be confined to solid waste holding and operating areas by fencing or other suitable means. Solid waste must be confined to an area that can be effectively maintained, operated and controlled. Solid waste must not be accepted at a solid waste management facility unless the waste is adequately covered or confined in the vehicle transporting the waste to prevent dust, and blowing litter.

(k) Dust control. Dust must be effectively controlled so that it does not constitute a nuisance or hazard to health, safety, or property. The facility owner or operator must undertake any and all measures as required by the department to maintain and control dust at and emanating from the facility.

(l) Vector control. The facility must be maintained so as to prevent or control on-site populations of vectors using techniques appropriate for protection of human health and the environment and prevent the facility from being a vector breeding area.

(m) Odor control. Odors must be effectively controlled so that they do not constitute nuisances or hazards to health, safety or property.

(n) On-site roads. On-site roads and other thoroughways must be passable and safe at all times.

(o) Equipment shelter. Shelter for mobile equipment must be provided for routine maintenance and repair, as determined by the department.

appropriate remediation program must be implemented. The vector remediation program must be implemented to mitigate vector problems before cessation of waste disposal occurs at the landfill.

(k) Post-closure operation and maintenance. For a landfill subject to closure, a provision must be included in the property deed indicating the period of time during which the property has been used as a landfill, describing the wastes contained within and noting that records of the facility have been filed with the department. The deed must also reference a map which shall be filed with the county clerk and which will clearly indicate the limits of the landfilled areas within the property boundary. The deed must also indicate that the use of the site is restricted pursuant to the provisions of paragraph (9) of this subdivision.

(1) For landfills that are without a department approved plan for closure where the maximum slope of 33 percent was exceeded before December 31, 1988, the landfill may be closed with slopes exceeding 33 percent if supported by a slope stability analysis, which must be submitted to the department, and providing the following are met:

(i) final grades must not exceed 50 percent for more than a 20 feet vertical rise; and

(ii) for longer slopes, run-off diversion terraces must be constructed at vertical intervals not exceeding 20 feet. The terraces must be designed to intercept run-off for diversion to appropriately spaced drainage ways leading off the landfill slopes. All terrace and drainage way slopes must be at least four percent.

(2) Drainage control structures must be designed, graded, and maintained to prevent ponding and erosion to the cover. The surface drainage system must be designed and constructed to protect the cover from, at a minimum, the peak discharge of a 24-hour, 25-year frequency storm

(3) Soil cover integrity, slopes, cover vegetation, drainage structures, and gas venting structures must be maintained during the period of post-closure monitoring and maintenance, or as required by the department.

(4) Environmental and facility monitoring points including gas monitoring points must be maintained and sampled during the post-closure period for a minimum of 30 years. Post closure explosive gas monitoring must be performed at least quarterly to determine if the facility meets the requirements of 360-2.17(f) of this Subpart. If this monitoring shows explosive gas levels in excess of the lower explosive limit at the property boundary or in excess of the 25 percent of the lower explosive limit within any

structures, appropriate actions must be taken and the department must be notified. Annual summary reports must be submitted to the department describing the results of the maintenance, monitoring and/or sampling for the environmental and facility monitoring points. Annual baseline and quarterly routine monitoring must be performed on groundwater, surface water, and leachate samples for a minimum period of five years. After this five-year period, the permittee may request that the department modify the sampling and analysis requirements.

(5) Maintenance and operation of the leachate collection system are required during the post-closure period and the method of leachate treatment or disposal must be addressed for as long as leachate is capable of adversely impacting the environment. The department may waive this requirement when the owner demonstrates that leachate no longer poses a threat to human health or the environment.

(6) A vegetative cover must be established and maintained on all exposed final cover material within four months after placement. If this cannot be achieved due to seasonal constraints, measures must be taken to ensure the integrity of the final cover system before the establishment of vegetative cover.

(7) A comprehensive post-closure monitoring and maintenance operations manual is required. This document shall provide all information needed to effectively monitor and maintain the facility for the entire post-closure period. Minimum components of this manual include:

(i) description of type, location, sampling and sample preservation methodology, and recordkeeping and reporting requirements for all environmental monitoring activities. The monitoring plan shall conform to paragraph (4) of this subdivision;

(ii) description of all environmental control systems including:

(a) process control monitoring types, locations, recordkeeping and reporting requirements. Leachate management activities shall include recording of the total volume of leachate stored and removed from the facility, sampling and analysis, and proper maintenance;

(b) environmental control maintenance requirements including description, type, frequency, and recordkeeping;

(iii) description of types, location and frequency of all other facility maintenance activities including:

(a) maintaining the integrity and

effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, maintaining the appropriate vegetative cover, and preventing run-on and run-off from eroding or otherwise damaging the final cover;

(b) maintaining the leachate collection system in accordance with subdivision (i) of this section;

(c) maintaining and operating the gas control and monitoring systems in accordance with the requirements of subdivision 360-2.17(f) of this Subpart; and

(d) recordkeeping and reporting requirements.

(iv) description of resource requirements including:

(a) minimum personnel qualifications and numbers; and

(b) minimum equipment needs;

(v) a contingency plan which shall include:

(a) responses to problems that have a reasonable likelihood of occurrence including, but not limited to, major erosion problems, significant differential settlement, and fire;

(b) action levels above which identified environmental monitoring, environmental control, or maintenance problems require prompt action by the owner and notification to the department; and

(c) a summary of any corrective measures that must be done to be in accordance with section 360-2.20 of this Subpart;

(vi) name, address and telephone number of the person or office to contact on post-closure monitoring and maintenance, and corrective measure concerns during the post-closure period;

(vii) a summary of financial assurance criteria concerns that must be addressed to remain in compliance with the provisions of subdivisions 360-2.19(c) and (d) of this Subpart. This includes:

(a) submittal to the department of annual adjustments to cost estimates of post-closure care and corrective measures; and

(b) notification to the department of increases in post-closure care costs and corrective measure costs; and

(viii) a description of the planned uses of the property during the post-closure period. Planned uses shall be in compliance with paragraph (9) of this subdivision.

(8) Quarterly inspections and inspections after major rainfall events (5-year storms) shall be performed on all facility components during the minimum 30-year post-closure period, unless specific department approval is given to eliminate some or all of these requirements, to ensure that the facility is functioning as intended. The results of those inspections shall be submitted to the department as part of a registration renewal report as described in paragraph 360-2.15(l)(4) of this section, or more frequently, if deemed appropriate by the department.

(9) A description of the planned uses of the property during and after the post-closure period is required. Use of the property shall not disturb the integrity of the final cover, liners, or any other components of the containment system, or the function of the monitoring or environmental control systems, unless necessary to comply with the requirements of section 360-2.20 of this Subpart. The department will approve any other disturbance if the owner or operator demonstrates that disturbance of the final cover, liner or other component of the containment system, including any removal of waste, will not increase the potential threat to human health or the environment.

(l) Closure and post-closure registration report.

(1) The owner or operator of a closing facility must register with the department at least one year before the facility is scheduled to cease accepting waste. The owner or operator must register on a form prescribed by the department.

(2) The registration must be renewed every five years until the department determines that the post-closure monitoring and maintenance period for the facility has ended.

(3) The initial registration report must include: the facility's name, address and telephone number; the owner's name, address and telephone number, and the name, address and telephone number of the person who will be responsible for closure and post-closure care of the facility, and other information deemed necessary by the department.

(4) Subsequent registration reports must also include the following information:

(i) a certification that the facility complies with all applicable closure and post-closure criteria contained in section 360-2.15, financial assurance criteria contained in section 360-2.19, and corrective measures report criteria contained in section 360-2.20

of this Subpart; and

(ii) any other information which the department determines to be necessary to protect the public health and welfare and the environment or natural resources.

(5) A registration issued pursuant to this subdivision is transferable only upon prior written approval of the department and a demonstration that the prospective transferee will be able to comply with all applicable laws, regulations and requirements.

#### Section 360-2.16 Landfill gas recovery facilities.

(a) Purpose. This section regulates the construction and operation of all landfill gas recovery facilities (LGRF) that remove landfill gas from landfills subject to regulation under the provisions of this Part.

(b) Applicability. All LGRF's existing on the effective date of this Part must obtain a permit pursuant to this Part. All such LGRF's that are operating without such a permit must submit to the department within 180 days after the effective date of this Part a complete application prepared in accordance with the provisions of this subdivision and containing the following:

(1) An engineering plan detailing:

(i) a vicinity plan or map that must show the area within one mile of the boundaries of the landfill from which the gas is being recovered; the existing and proposed zoning and land uses within that area; and residences, access roads, and other existing and proposed man-made or natural features relating to the landfill gas recovery facility and associated landfill;

(ii) a site plan (certified by an individual licensed to practice land surveying in the State of New York) showing the landfill's property boundaries from which the landfill gas is to be removed; the location of the landfill gas recovery facility; off-site and on-site utilities, including electric, gas, water, storm, and sanitary sewer systems and right-of-way easements; the names and addresses of abutting property owners; the location of existing and proposed gas venting structures, wells, piezometers, environmental and landfill monitoring points and devices identified in accordance with a numbering system acceptable to the department and whose horizontal and vertical locations are accurate to the nearest 500th and 100th foot, respectively, as measured from the ground surface; and on-site buildings and appurtenances, fences, gates, roads, parking areas, drainage culverts, and signs; the delineation of the total landfill area from which landfill gas is to be recovered, including sequential or planned modular development of the landfill's operation; a wind rose; and the site topography with five feet minimum contour intervals of the landfill from which landfill gas is to be recovered; and

(iii) detailed plans of the landfill gas recovery facility must adequately delineate in plan views and in cross-sectional views, the location and grades of all landfill gas collection lines, locating and showing all critical elevations of the collection pipe inverts, cleanouts, and valves; layout of the facility structure including equipment locations, sampling locations; on-site drainage structures; and extraction well location, depth of placement, and construction materials.

(2) The engineering report must contain the following:

(i) a description of the operation of the facility and how the recovered landfill gas will be used;

(ii) an estimate of the quantities of condensate currently generated or expected to be generated and a description of how the condensate is being or will be disposed of;

(iii) an estimate of the cost to properly close the LGRF in accordance with the provision of subparagraph (viii) of this paragraph;

(iv) a description of all machinery, equipment, and materials used at the facility, including the equipment's make, model, manufacturer, design capacity, and performance data;

(v) a description of how the LGRF relates to the landfill's overall gas venting and control system;

(vi) a description of the procedures for taking, analyzing, and reporting data from condensate sampling;

(vii) a contingency plan that discusses an organized and planned method of responding to unexpected events during the construction and during the operation of a LGRF. The plan must address actions to be taken with respect to noise; personal injury; explosions; fires; detection of explosive landfill gases both on-site and off-site; and the equipment to be utilized to maintain proper landfill gas venting and control when normal operations cease; and

(viii) a closure plan that must include, at a minimum, methods to vent and control landfill gases after operation of the facility ceases, and any other requirements pertaining to landfill gas venting and control contained in section 360-2.15 of this Part.

(3) The operation and maintenance plan for the LGRF must include the following:

(i) a description of the project's personnel requirements including a discussion of their responsibilities and duties;

(ii) a description of the equipment

receive solid waste after October 9, 1993, the effective date of this section is April 9, 1997.

(3) A *third party*, for the purposes of this section, is a party who is neither a parent nor a subsidiary of the owner or operator. 108

(b) Financial assurance for closure.

(1) The owner or operator must have a detailed written estimate, in current dollars, of the cost of hiring a third party to close the largest active portion of the landfill requiring a final cover as required under section 360-2.15 of this Subpart at any time during the active life in accordance with the closure plan. This cost estimate must be approved by the department.

(i) At a minimum, the cost estimate must equal the cost of closing the largest active portion of the landfill requiring a final cover at any time during the active life when the extent and manner of its operation would make closure the most expensive, as indicated by its closure plan (see section 360-2.15 of this Subpart).

(ii) During the active life of the landfill, the owner or operator must annually adjust the closure cost estimate for inflation and submit a copy of the adjusted estimate to the department.

(iii) The owner or operator must notify the department and increase the closure cost estimate and the amount of financial assurance provided under paragraph (2) of this subdivision if changes in inflation, the closure plan, or landfill conditions increase the maximum cost of closure at any time during the remaining active life.

(iv) If approved by the department, the owner or operator may reduce the closure cost estimate and the amount of financial assurance provided under paragraph (2) of this subdivision if the cost estimate exceeds the maximum cost of closure at any time during the remaining active life of the landfill. The justification for the reduction of the closure cost estimate and a copy of the revised financial assurance documentation must be submitted to the department.

(2) The owner or operator of each landfill must establish financial assurance for closure of the landfill in compliance with subdivision (c) of this section. The owner or operator must provide continuous coverage for closure until released from financial assurance requirements by demonstrating compliance with section 360-2.15 of this Subpart.

(c) Financial assurance for post-closure care.

(1) The owner or operator must have a detailed

written estimate, in current dollars, of the cost of hiring a third party to conduct post-closure care for the landfill in compliance with the final closure plan developed under Section 360-2.15 of this Subpart. The post-closure cost estimate used to demonstrate financial assurance in paragraph (2) of this subdivision must account for the total costs of conducting post-closure care, including annual and periodic costs as described in the final closure plan over the entire post-closure care period. This post-closure care cost estimate must be approved by the department.

(i) At a minimum, the cost estimate for post-closure care must be based on the most expensive costs of post-closure care during the post-closure care period.

(ii) During the active life of the landfill and during the post-closure care period, the owner or operator must annually adjust the post-closure cost estimate for inflation submit a copy of the adjusted estimate to the department.

(iii) The owner or operator must notify the department and increase the post-closure care cost estimate and the amount of financial assurance provided under paragraph (2) of this subdivision if changes in inflation, the post-closure plan, or landfill conditions increase the maximum costs of post-closure care.

(iv) If approved in advance by the department in writing, the owner or operator may reduce the post-closure cost estimate and the amount of financial assurance provided under paragraph (2) of this subdivision if the cost estimate exceeds the maximum costs of post-closure care remaining over the post-closure care period. The justification for the reduction of the post-closure cost estimate and a copy of the revised financial assurance documentation must be submitted to the department.

(2) The owner or operator of each landfill must establish, in a manner in accordance with subdivision (e) of this section, financial assurance for the costs of post-closure care as required under section 360-2.15 of this Subpart. The owner or operator must provide continuous coverage for post-closure care until released from financial assurance requirements for post-closure care by demonstrating compliance with subdivision 360-2.15 of this Subpart.

(3) Unless otherwise specifically approved in advance by the department in writing, a trust fund or a solid waste management facility reserve fund must be established for post-closure care. The trust fund must be established in a manner that allows the department to direct the trustee to hire a third party to conduct post-closure care if the owner fails to comply.

(d) Financial assurance for corrective measures.

## **Part 208**

**NEW YORK ENVIRONMENT CODIFIED REGULATIONS**

Title 6 - Department of Environmental Conservation

Chapter III - Air Resources

Subchapter A - Prevention and Control of Air Contamination and Air Pollution

Part 208 - Landfill Gas Collection and Control Systems for Certain Municipal Solid Waste Landfills

**Part 208 - Landfill Gas Collection and Control Systems for Certain Municipal Solid Waste Landfills****§208.1 Applicability.**

[N.Y. St. Reg. 10/10/2001]

This section applies to owners or operators of any municipal solid waste (MSW) landfill meeting the conditions in paragraphs (a), (b), and (c) of this subdivision. Owners and operators of an MSW landfill having a design capacity less than 2.5 million megagrams (or 2.5 million cubic meters) which meets the condition in paragraph (a) of this subdivision must initially comply with paragraph (3)(a) of this section. Physical or operational changes made to an existing landfill solely to comply with an emission guideline are not considered construction, reconstruction or modification for the purposes of this section. Activities required by or conducted pursuant to a CERCLA, RCRA, or State remedial action are not considered construction, reconstruction, or modification for purposes of this section.

(a) The landfill has commenced construction, reconstruction or modification or accepted waste at any time since November 8, 1987, or has additional design capacity available for future waste deposition;

(b) The landfill has a design capacity greater than or equal to 2.5 million megagrams and 2.5 million cubic meters. The landfill design capacity may be calculated in either megagrams or cubic meters for comparison with the exemption values. Any density conversions shall be documented and submitted with the report required under paragraph (3)(b) of this section; and

(c) The landfill has a nonmethane organic compound emission rate of 50 megagrams per year or more.

**§208.2 Definitions.**

[N.Y. St. Reg. 10/10/2001]

The following terms have the following meanings when used in this section:

- (a) Active collection system means a gas collection system that uses gas mover equipment.
- (b) Controlled landfill means any landfill at which collection and control systems are required under this section as a result of the nonmethane organic compounds emission rate.
- (c) Design capacity means the maximum amount of solid waste a landfill can accept, as specified in the construction and operating permit or permit application. It includes waste in all closed disposal cells, all areas actively receiving waste, and all areas that are approved to be constructed in subsequent stages and were previously addressed in accordance with SEQR.
- (d) Emission rate cutoff means the threshold annual emission rate to which a landfill compares its estimated emission rate to determine if control under the regulation is required.
- (e) Enclosed combustor means an enclosed firebox which maintains a relatively constant limited peak temperature generally using a limited supply of combustion air. An enclosed flare is considered an enclosed combustor.
- (f) Flare means an open combustor without enclosure or shroud.
- (g) Gas mover equipment means the equipment (i.e., fan, blower, compressor) used to transport landfill gas through the header system.
- (h) Interior Well means any well or similar collection component located inside the perimeter of the landfill footprint. A perimeter well located outside the landfilled waste is not an interior well.
- (i) Modification means an increase in the design capacity of the landfill by either lateral or vertical expansion based on design capacity as of May 31, 1991.
- (j) Municipal solid waste landfill emissions or MSW landfill emissions means gas generated by the decomposition of organic waste deposited in an MSW landfill or derived from the evolution of organic compounds in the waste.
- (k) NMOC means nonmethane organic compounds, as measured according to the provisions of subdivision (e) of this section.
- (l) Nondegradable waste means any waste that does not decompose through chemical breakdown or microbiological activity. Examples include, but are not limited to, concrete, municipal waste combustor ash, and metals.
- (m) Passive collection system means a gas collection system that solely uses positive pressure within the landfill to move the gas rather than using gas mover equipment.
- (n) Sufficient density means any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors,

necessary to maintain emission and migration control as determined by measures of performance set forth in this section.

(o) Sufficient extraction rate means a rate sufficient to maintain a negative pressure at all wellheads in the collection system without causing air infiltration, including any wellheads connected to the system as a result of expansion or excess surface emissions, for the life of the blower.

**§208.3 Standards for air emissions from municipal solid waste landfills.**

[N.Y. St. Reg. 10/10/2001]

(a) Each owner or operator of an MSW landfill having a design capacity less than 2.5 million megagrams by mass or 2.5 million cubic meters by volume shall submit an initial design capacity report to the Department as provided in paragraph 8(a) of this section. The owner or operator may calculate design capacity in either megagrams or cubic meters for comparison with the exemption values. Any density conversions shall be documented and submitted with the report. Submittal of the initial design capacity report shall fulfill the requirements of this section except as provided for in subparagraphs (1) and (2) of this paragraph. For landfills that already have obtained and have submitted this information to the Department through previous documentation (such as a closure plan, annual report, or permit application), the requirements of this paragraph may be waived upon approval of the Department.

(1) The owner or operator shall submit to the Department an amended design capacity report, as provided for in subparagraph 8(a)(3) of this section,

(2) When an increase in the maximum design capacity of a landfill exempted from the provisions of paragraph 3(b) through subdivision (10) of this section on the basis of the design capacity exemption in paragraph (a) of this subdivision results in a revised maximum design capacity equal to or greater than 2.5 million megagrams and 2.5 million cubic meters, the owner or operator shall comply with the provision of paragraph (b) of this subdivision.

(b) Each owner or operator of an MSW landfill having a design capacity equal to or greater than 2.5 million megagrams and 2.5 million cubic meters, shall submit an initial design capacity report to the Department as provided in paragraph 8(a) of this section and either comply with subparagraph (2) of this paragraph or calculate an NMOC emission rate for the landfill using the procedures specified in subdivision 5 of this section. The NMOC emission rate shall be recalculated annually, except as provided in clause 8(b)(1)(ii) of this section. The owner or operator of an MSW landfill subject to this section with a design capacity greater than or equal to 2.5 million megagrams and 2.5 million cubic meters is subject to Title V permitting requirements under Part 201 of this Title.

(1) If the calculated NMOC emission rate is less than 50 megagrams per year, the owner or operator shall:

(i) submit an annual emission report to the Department, except as provided for in clause 8(b)(1)(ii) of this section; and

(ii) recalculate the NMOC emission rate annually using the procedures specified in subparagraph 5(a)(1) of this section until such time as the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, or the landfill is closed pursuant to this Subpart.

(a) If the NMOC emission rate, upon recalculation required in clause (b)(1)(ii) of this subdivision, is equal to or greater than 50 megagrams per year, the owner or operator shall install a collection and control system in compliance with subparagraph (b)(2) of this paragraph.

(2) If the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, the owner or operator shall:

(i) Submit a collection and control system design plan and permit application prepared by a professional engineer to the Department within 1 year. The landfill gas collection system should be addressed in a Part 360 permit application or modification, while the landfill gas control system should be addressed in a Part 201 permit application or modification. In addition to meeting the requirements of subdivisions 360-2.16(a) through (e) of Part 360 and Parts 200 et. seq. of this Title, the owner and operator shall comply with the following:

(a) The collection and control system as described in the plan shall meet the design requirements of clause (b)(2)(ii) of this subdivision.

(b) The collection and control system design plan shall include any alternatives to the design and operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions of subdivisions 3 through 7 of this section proposed by the owner or operator.

(c) The collection and control system design plan shall either conform with specifications for active collection systems in subdivision 10 or include a demonstration to the USEPA's satisfaction of the sufficiency of the alternative provisions to subdivision 10.

(d) The USEPA shall review the information submitted under subclauses (a), (b), and (c) of this clause and either approve it, disapprove it, or request that additional information be submitted. Because of the many site-specific factors involved with landfill gas system design, alternative systems may be necessary. A wide variety of system designs are possible, such as vertical wells, combination horizontal and vertical collection systems, or horizontal trenches only, leachate collection components, and passive systems.

(e) The design plan for the collection and control system shall include a schedule for the construction and installation of this system. This schedule shall include the following increments of progress:

(1) Submittal of final control plan for the system

(2) Awarding of contracts for the system

- (3) Initiation of on-site construction or installation of the system
- (4) Completion of on-site construction or installation of the system
- (5) Final compliance with this regulation

This schedule will be included in the Title V and/or pre-construction permit required under Part 201-6 of this Title.

(ii) Install a collection and control system that captures the gas generated within the landfill as required under subclause (b)(2)(ii) (a) or (b) and clause (b)(2)(iii) of this subdivision within 30 months after the first annual report in which the emission rate equals or exceeds 50 megagrams per year, unless Tier 2 or Tier 3 sampling demonstrates that the emission rate is less than 50 megagrams per year, as specified in subparagraph 8(c) (1) or (2). The State Facility permit authorizing construction and operation of the collection and control system, required under Part 201-5.1(b) of this Title, shall contain the following increments of progress: the date upon which the final control plan for the system is to be submitted; the date upon which the awarding of contracts for the collection and control system is to occur; the date for initiation of construction or installation of the system and the date upon which completion of the on-site construction or installation of the collection and control system is to occur; and the date for final compliance with this regulation will occur.

(a) An active collection system shall:

- (1) Be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment;
- (2) Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade;
- (3) Collect gas at a sufficient extraction rate;
- (4) Be designed to minimize off-site migration of subsurface gas.

(b) A passive collection system shall:

- (1) Comply with the provisions specified in items (a)(1),(2) and (4) of clause (ii).
  - (2) Be installed with liners on the bottom and all sides in all areas in which gas is to be collected. The liners shall be installed as required under this Subpart.
- (iii) Route all the collected gas to a control system that complies with the requirements in either subclause (a), (b), or (c) of this clause.

(a) An open flare designed and operated in accordance with 40 CFR Part 60.18 (see section 200.9 of this Title);

(b) A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98

weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen. The reduction efficiency or parts per million by volume shall be established by an initial performance test to be completed no later than 180 days after the initial startup of the approved system using the test methods specified in paragraph 5(d).

(1) If a boiler or process heater is used as the control device, the landfill gas stream shall be introduced into the flame zone.

(2) The control device shall be operated within the parameter ranges established during the initial or most recent performance test. The operating parameters to be monitored are specified in subdivision 7 of this section;

(c) Route the collected gas to a treatment system that processes the collected gas for subsequent sale or use. All emissions from any atmospheric vent from the gas treatment system shall be subject to the requirements of subclause (1) and (2) of this clause.

(iv) Operate the collection and control device installed to comply with this section in accordance with the provisions of subdivisions 4, 6, and 7 of this section.

(v) The collection and control system may be capped or removed provided that all the following conditions are met:

(a) The landfill shall be no longer accepting solid waste and be permanently closed under the requirements of this Subpart;

(b) The collection and control system shall have been in operation a minimum of 15 years; and

(c) Following the procedures specified in paragraph 5(b) of this section, the calculated NMOC gas produced by the landfill shall be less than 50 megagrams per year on three successive test dates. The test dates shall be no less than 90 days apart, and no more than 180 days apart.

(c) For the purposes of obtaining a Title V Permit under Part 201 of this Title, the owner or operator of a MSW landfill subject to this section with a design capacity less than 2.5 million megagrams or 2.5 million cubic meters is not subject to the requirement to obtain a Title V permit under Part 201, unless the landfill is otherwise subject to permitting under Part 201.

(d) When a MSW landfill subject to this section is closed, the owner or operator is no longer subject to Title V permitting requirements under Part 201 and if the following conditions are met:

(1) The landfill was never subject to the requirement for a control system under subparagraph (b)(2) of this subdivision; or

(2) The owner or operator meets the condition for control system removal specified in clause (b)(2)(v) of this subdivision.

#### **§208.4 Operational standards for collection and control systems.**

[N.Y. St. Reg. 10/10/2001]

Each owner or operator of a MSW landfill gas collection and control system used to comply with the provisions of clause 3(b)(2)(ii) of this section shall:

(a) Operate the collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for:

- (1) 5 years or more if active; or
- (2) 2 years or more if closed or at final grade;

(b) Operate the collection system with negative pressure at each wellhead except under the following conditions:

- (1) a fire or increased well temperature. The owner or operator shall record instances when positive pressure occurs in efforts to avoid a fire. These records shall be submitted with the annual reports as provided in subparagraph (h)(6)(i) of this section;
- (2) use of a geomembrane or synthetic cover. The owner or operator shall develop acceptable pressure limits in the design plan;
- (3) a decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes shall be approved by the Department;

(c) Operate each interior wellhead in the collection system with a landfill gas temperature less than 55°C and with either a nitrogen level less than 20 percent or an oxygen level less than 5 percent. The owner or operator may establish a higher operating temperature, nitrogen, or oxygen value at a particular well. A higher operating value demonstration shall show supporting data that the elevated parameter does not cause fires or significantly inhibit anaerobic decomposition by killing methanogens.

(1) the nitrogen level shall be determined using Method 3C as described in 40 CFR Part 60 (see section 200.9 of this Title), unless an alternative test method is established as allowed by subclause 3(b)(2)(i) of this section.

(2) unless an alternative test method is established as allowed by subclause 3(b)(2)(i)(b) of this section, the oxygen shall be determined by an oxygen meter using Method 3A as described in 40 CFR Part 60 (see section 200.9 of this Title) except that:

- (i) the span shall be set so that the regulatory limit is between 20 and 50 percent of the span;
- (ii) a data recorder is not required;
- (iii) only two calibration gases are required, a zero and span, and ambient air may be used as the span;
- (iv) a calibration error check is not required;

- (v) the allowable sample bias, zero drift, and calibration drift are  $\pm 10$  percent.
- (d) Operate the collection system so that the methane concentration is less than 500 parts per million above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator shall conduct surface testing around the perimeter of the collection area along a pattern that traverses the landfill at 30 meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan shall be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30 meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing.
- (e) Operate the system such that all collected gases are vented to a control system designed and operated in compliance with clause 3(b)(2)(iii) of this section. In the event the collection or control system is inoperable, the gas mover system shall be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere shall be closed within 1 hour.
- (f) Operate the control or treatment system at all times when the collected gas is routed to the system.
- (g) If monitoring demonstrates that the operational requirement in paragraphs (b), (c), or (d) of this subdivision are not met, corrective action shall be taken as specified in subparagraph 6(a)(3) through (5) or paragraph 6(c) of this section. If corrective actions are taken as specified in subdivision 6, the monitored exceedance is not a violation of the operational requirements in this subdivision.

**§208.5 Test methods and procedures.**

[N.Y. St. Reg. 10/10/2001]

- (a)
- (1) The landfill owner or operator shall calculate the NMOC emission rate using either the equation provided in clause (i) or (ii) of this subparagraph. Both equations may be used if the actual year-to-year solid waste acceptance rate is known, as specified in (i), for part of the life of the landfill and the actual year-to-year solid waste acceptance rate is unknown, as specified in (ii), for part of the life of the landfill. The values to be used in both equations are 0.05 per year for  $k$ , 170 cubic meters per megagram for  $L_0$ , and 4,000 parts per million by volume as hexane for the  $C_{NMOC}$ .
- (i) The following equation shall be used if the actual year-to-year solid waste acceptance rate is known.

$$M_{\text{NMOC}} = \sum_{i=1}^n 2 k L_o M_i (e^{-kt_i} - e^{-k(t-t_i)})$$

where,

$M_{\text{NMOC}}$  = Total NMOC emission rate from the landfill, megagrams per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$L_o$  = methane generation potential, cubic meters per megagram solid waste

$M_i$  = mass of solid waste in the  $i^{\text{th}}$  section, megagrams

$t_i$  = age of the  $i^{\text{th}}$  section, years

$C_{\text{NMOC}}$  = concentration of NMOC, parts per million by volume as hexane

$3.6 \times 10^{-9}$  = conversion factor

The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for  $M_i$ , if the documentation of the nature and amount of such wastes is maintained.

(ii) The following equation shall be used if the actual year-to-year solid waste acceptance rate is unknown.

$$M_{\text{NMOC}} = 2L_o R (e^{-kc} - e^{-kt})$$

where,

$M_{\text{NMOC}}$  = mass emission rate of NMOC, megagrams per year

$L_o$  = methane generation potential, cubic meters per megagram solid waste

$R$  = average annual acceptance rate, megagrams per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$t$  = age of landfill, years

$C_{\text{NMOC}}$  = concentration of NMOC, parts per million by volume as hexane

$c$  = time since closure, years. For active landfill  $c = 0$  and  $e^{-kc} = 1$

$3.6 \times 10^{-9}$  = conversion factor

The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating the value for R, if the documentation of the nature and amount of such wastes is maintained.

(2) Tier 1. The owner or operator shall compare the calculated NMOC mass emission rate to the standard of 50 megagrams per year.

(i) If the NMOC emission rate calculated in subparagraph (a)(1) of this paragraph is less than 50 megagrams per year, then the landfill owner shall submit an emission rate report as provided in subparagraph 8(b)(1) of this section, and shall recalculate the NMOC mass emission rate annually as required under subparagraph (3)(b)(1).

(ii) If the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, then the landfill owner shall either comply with subparagraph (3)(b)(2), or determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the procedures provided in subparagraph (a)(3) of this paragraph.

(3) Tier 2. The landfill owner or operator shall determine the NMOC concentration using the following sampling procedure. The landfill owner or operator shall install at least two sample probes per hectare of landfill surface that has retained waste for at least 2 years. If the landfill is larger than 25 hectares in area, only 50 samples are required. The sample probes should be located to avoid known areas of nondegradable solid waste. The owner or operator shall collect and analyze one sample of landfill gas from each probe to determine the NMOC concentration using Method 25C of appendix A of 40 CFR Part 60 or Method 18 of appendix A (see section 200.9 of this Title). If using Method 18 of appendix A, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). If composite sampling is used, equal volumes shall be taken from each sample probe. If more than the required number of samples are taken, all samples shall be used in the analysis. The landfill owner or operator shall divide the NMOC concentration from Method 25C of appendix A by six to convert from  $C_{\text{NMOC}}$  as carbon to  $C_{\text{NMOC}}$  as hexane.

(i) The landfill owner or operator shall recalculate the NMOC mass emission rate using the equations provided in clauses (a)(1)(i) or (ii) of this subdivision and using the average NMOC concentration from the collected samples instead of the default value in the equation provided in subparagraph (a)(1) of this subdivision.

(ii) If the resulting mass emission rate calculated using the site-specific NMOC concentration is equal to or greater than 50 megagrams per year, then the landfill owner or operator shall either comply with subparagraph 3(b)(2) of this section, or determine the site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the procedure specified in subparagraph (4) of this paragraph.

(iii) If the resulting NMOC mass emission rate is less than 50 megagrams per year, the owner or operator shall submit a periodic estimate of the emission rate report as provided in subparagraph 8(b)(1) of this section and retest the site-specific NMOC concentration

every 5 years using the methods specified in this subdivision.

(4) Tier 3. The site-specific methane generation rate constant shall be determined using the procedures provided in Method 2E of appendix A of 40 CFR Part 60 (see section 200.9 of this Title). The landfill owner or operator shall estimate the NMOC mass emission rate using equations in clauses (a)(1)(i) or (ii) of this subdivision and using a site-specific methane generation rate constant *k*, and the site-specific NMOC concentration as determined in subparagraph (a)(3) of this paragraph instead of the default values provided in subparagraph (a)(1) of this paragraph. The landfill owner or operator shall compare the resulting NMOC mass emission rate to the standard of 50 megagrams per year.

(i) If the NMOC mass emission rate as calculated using the site-specific methane generation rate and concentration of NMOC is equal to or greater than 50 megagrams per year, the owner or operator shall comply with subparagraph 3(b)(2) of this section.

(ii) If the NMOC mass emission rate is less than 50 megagrams per year, then the owner or operator shall submit a periodic emission rate report as provided in subparagraph 8(b)(1) of this section and shall recalculate the NMOC mass emission rate annually, as provided in subparagraph 8(b)(1) of this section using the equations in subparagraph (a)(1) of this paragraph and using the site-specific methane generation rate constant and NMOC concentration obtained in subparagraph (a)(3) of this paragraph. The calculation of the methane generation rate constant is performed only once, and the value obtained from this test shall be used in all subsequent annual NMOC emission rate calculations.

(5) The owner or operator may use other methods to determine the NMOC concentration or a site-specific *k* as an alternative to the methods required in subparagraphs (a)(3) and (a)(4) of this subdivision if the method has been approved by the USEPA.

(b) After the installation of a collection and control system in compliance with subdivision 6 of this section, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in clause 3(b)(2)(v) of this section, using the following equation:

$$M_{\text{NMOC}} = 1.89 \times 10^{-3} Q_{\text{LFG}} C_{\text{NMOC}}$$

where,

$M_{\text{NMOC}}$  = mass emission rate of NMOC, megagrams per year

$Q_{\text{LFG}}$  = flow rate of landfill gas, cubic meters per minute

$C_{\text{NMOC}}$  = NMOC concentration, parts per million by volume as hexane

(1) The flow rate of landfill gas,  $Q_{\text{LFG}}$ , shall be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control device using a gas flow measuring device calibrated according to the provisions of section 4 of Method

2E of appendix A of 40 CFR Part 60 (see section 200.9 of this Title).

(2) The average NMOC concentration,  $C_{\text{NMOC}}$ , shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18 of appendix A of 40 CFR Part 60 (see section 200.9 of this Title). If using Method 18 of appendix A, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The sample location on the common header pipe shall be before any condensate removal or other gas refining units. The landfill owner or operator shall divide the NMOC concentration from Method 25C of appendix A by six to convert from  $C_{\text{NMOC}}$  as carbon to  $C_{\text{NMOC}}$  as hexane.

(3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the USEPA.

(c) When calculating emissions for PSD purposes, the owner or operator of each MSW landfill subject to the provisions of this section shall estimate the NMOC emission rate for comparison to the PSD major source and significance levels in 40 CFR section 51.166 or 52.21 (see section 200.9 of this Title) using AP-42 or other approved measurement procedures.

(d) For the performance test required in subclause 3(b)(2)(iii)(b) of this section, Method 25C or Method 18 of appendix A of 40 CFR Part 60 (see section 200.9 of this Title) shall be used to determine compliance with 98 weight-percent efficiency or the 20 ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Department as provided by subclause 3(b)(2)(i)(b). If using Method 18 of appendix A of 40 CFR Part 60, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42).

The following equation shall be used to calculate efficiency:

$$\text{Control Efficiency} = \left( \frac{\text{NMOC}_{\text{in}} - \text{NMOC}_{\text{out}}}{\text{NMOC}_{\text{in}}} \right) \times 100$$

where,

$\text{NMOC}_{\text{in}}$  = mass of NMOC entering control device

$\text{NMOC}_{\text{out}}$  = mass of NMOC exiting control device

#### §208.6 Compliance provisions.

[N.Y. St. Reg. 10/10/2001]

(a) Except as provided in subclause 3(b)(2)(i)(b) of this section, the specified methods in subparagraphs (1) through (6) of this paragraph shall be used to determine whether the gas collection system is in compliance with clause 3(b)(2)(i) of this section.

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with item 3(b)(2)(ii)(a)(1) of this section, one of the following equations shall be used. The  $k$  and  $L_0$  kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Department. If  $k$  has been determined as specified in subparagraph 5(a)(4) of this section, the value of  $k$  determined from the test shall be used. A value of no more than 15 years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

$$Q_m = 2 L_0 R (e^{-kc} - e^{-kt})$$

where,

$Q_m$  = maximum expected gas generation flow rate, cubic meters per year

$L_0$  = methane generation potential, cubic meters per megagram solid waste

$R$  = average annual acceptance rate, megagrams per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$t$  = age of the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure,  $t$  is the age of the landfill at installation, years

$c$  = time since closure, years (for an active landfill  $c = 0$  and  $e^{-kc} = 1$ )

(ii) For sites with known year-to-year solid waste acceptance rate:

$$Q_M = \sum_{i=1}^n 2 k L_0 M_i (e^{-kt_i})$$

where,

$Q_M$  = expected gas generation flow rate, cubic meters per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$L_0$  = methane generation potential, cubic meters per megagram solid waste

$M_i$  = mass of solid waste in the  $i^{\text{th}}$  section, megagrams

$t_i$  = age of the  $i^{\text{th}}$  section, years

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, the equations in clauses (a)(1)(i) and (ii) of this subdivision. If the landfill is still accepting waste, the actual measured flow data will not equal the maximum expected gas generation rate, so calculations using the equations in clauses (a)(1)(i) or (ii) or other methods shall be used to predict the maximum expected gas generation rate over the intended period of use of the gas control system equipment.

(2) For the purposes of determining sufficient density of gas collectors for compliance with item 3(b)(2)(ii)(a)(2) of this section, the owner or operator shall design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the Department, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards.

(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with item 3(b)(2)(ii)(a)(3) of this section, the owner or operator shall measure gauge pressure in the gas collection header at each individual well, monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under paragraph (4)(b) of this section. If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial measurement of positive pressure. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Department for approval.

(4) Owners or operators are not required to expand the system as required in subparagraph (3) of this paragraph during the first 180 days after gas collection system startup.

(5) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator shall monitor each well monthly for temperature and nitrogen or oxygen as provided in paragraph (4)(c) of this section. If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Department for approval.

(6) An owner or operator seeking to demonstrate compliance with item 3(b)(2)(ii)(a)(4) of this section through the use of a collection system not conforming to the specifications provided in subdivision 10 shall provide information satisfactory to the USEPA as specified in subclause 3(b)(2)(i)(c) demonstrating that off-site migration is being controlled.

(b) For purposes of compliance with paragraph (4)(a) of this section, each owner or operator of a controlled landfill shall place each well or design component as specified in the approved design plan as provided in clause 3(b)(2)(i) of this section. Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

- (1) 5 years or more if active; or
- (2) 2 years or more if closed or at final grade;.

(c) The following procedures shall be used for compliance with the surface methane operational standard as provided in paragraph (4)(d) of this section.

(1) After installation of the collection system, the owner or operator shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter-intervals (or a site-specific established spacing) for each collection area on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in paragraph (d) of this subdivision.

(2) The background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells.

(3) Surface emission monitoring shall be performed in accordance with section 4.3.1 of Method 21 of appendix A of 40 CFR Part 60 (see section 200.9 of this Title), except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions.

(4) Any reading of 500 parts per million or more above background at any location shall be recorded as a monitored exceedance and the actions specified in clauses (c)(4)(i) through (v) of this subdivision shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of paragraph 4(d) of this section.

(i) The location of each monitored exceedance shall be marked and the location recorded.

(ii) Cover maintenance or adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of each exceedance shall be made and the location shall be re-monitored within 10 calendar days of detecting the exceedance.

(iii) If the re-monitoring of the location shows a second exceedance, additional corrective action shall be taken and the location shall be monitored again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the same location, the action specified in clause (c)(4)(v) of this subdivision shall be taken, and no further monitoring of that location is required until the action specified in clause (c)(4)(v) has been taken.

(iv) Any location that initially showed an exceedance but has a methane concentration less than 500 ppm methane above background at the 10-day re-monitoring specified in

clause (c)(4)(ii) or (iii) of this subdivision shall be re-monitored 1 month from the initial exceedance. If the 1-month remonitoring shows a concentration less than 500 parts per million above background, no further monitoring of that location is required until the next quarterly monitoring period. If the 1-month remonitoring shows an exceedance, the actions specified in clause (c)(4)(iii) or (v) shall be taken.

(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Department for approval.

(5) The owner or operator shall implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis.

(d) Each owner or operator seeking to comply with the provisions in paragraph (c) of this subdivision shall comply with the following instrumentation specifications and procedures for surface emission monitoring devices:

(1) The portable analyzer shall meet the instrument specifications provided in section 3 of Method 21 of appendix A of 40 CFR Part 60 (see section 200.9 of this Title), except that "methane" shall replace all references to VOC.

(2) The calibration gas shall be methane, diluted to a nominal concentration of 500 parts per million in air.

(3) To meet the performance evaluation requirements in section 3.1.3 of Method 21 of appendix A of 40 CFR Part 60, the instrument evaluation procedures of section 4.4 of Method 21 of appendix A shall be used (see section 200.9 of this Title).

(4) The calibration procedures provided in section 4.2 of Method 21 of appendix A of 40 CFR Part 60 (see section 200.9 of this Title) shall be followed immediately before commencing a surface monitoring survey.

(5) The provisions of this section apply at all times, except during periods of start-up, shutdown, or malfunction, provided that the duration of start-up, shutdown, or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices.

#### **§208.7 Monitoring of operations.**

[N.Y. St. Reg. 10/10/2001]

Except as provided in subclause 3(b)(2)(i)(b) of this part,

(a) Each owner or operator seeking to comply with subclause 3(b)(2)(ii)(a) of this part for an active gas collection system shall install a sampling port and a thermometer, other temperature measuring device, or an access port for temperature measurements at each

wellhead and:

- (1) Measure the gauge pressure in the gas collection header on a monthly basis as provided in subparagraph 6(a)(3) of this part; and
  - (2) Monitor nitrogen or oxygen concentration in the landfill gas on a monthly basis as provided in subparagraph 6(a)(5) of this part; and
  - (3) Monitor temperature of the landfill gas on a monthly basis as provided in subparagraph 6(a)(5) of this part.
- (b) Each owner or operator seeking to comply with clause 3(b)(2)(iii) of this part using an enclosed combustor shall calibrate, maintain, and operate according to the manufacturer's specifications, the following equipment:
- (1) A temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of  $\pm 1$  percent of the temperature being measured expressed in degrees Celsius or  $\pm 0.5$  °C, whichever is greater. A temperature monitoring device is not required for boilers or process heaters with design heat input capacity greater than 44 megawatts.
  - (2) A device that records flow to or bypass of the control device. The owner or operator shall either:
    - (i) Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or
    - (ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.
  - (c) Each owner or operator seeking to comply with clause 3(b)(2)(iii) of this part using an open flare shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:
    - (1) A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame.
    - (2) A device that records flow to or bypass of the flare. The owner or operator shall either:
      - (i) Install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or
      - (ii) Secure the bypass line valve in the closed position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.
  - (d) Each owner or operator seeking to demonstrate compliance with clause 3(b)(2)(iii) of this part using a device other than an open flare or an enclosed combustor shall provide

information satisfactory to the USEPA as provided in subclause 3(b)(2)(i)(a) of this section describing the operation of the control device, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The USEPA shall review the information and either approve it, or request that additional information be submitted. The USEPA may specify additional appropriate monitoring procedures.

(e) Each owner or operator seeking to install a collection system that does not meet the specifications in subdivision 10 of this part or seeking to monitor alternative parameters to those required by subdivisions 4 through 7 shall provide information satisfactory to the USEPA as provided in clauses 3(b)(2)(i)(b) and (c) of this part describing the design and operation of the collection system, the operating parameters that would indicate proper performance, and appropriate monitoring procedures. The USEPA may specify additional appropriate monitoring procedures.

(f) Each owner or operator seeking to demonstrate compliance with paragraph 6(c) of this part, shall monitor surface concentrations of methane according to the instrument specifications and procedures provided in paragraph 6(d). Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the monitoring frequency for that landfill to quarterly monitoring.

#### **§208.8 Reporting requirements**

[N.Y. St. Reg. 10/10/2001]

Except as provided in subclause 3(b)(2)(i)(b) of this part,

(a) Each owner or operator subject to the requirements of this section shall submit an initial design capacity report to the Department.

(1) The initial design capacity report shall be submitted no later than 90 days after the effective date of this section or 90 days after construction or reconstruction commences, whichever is later.

(2) The initial design capacity report shall contain the following information:

(i) A drawing of the landfill, providing the size and location of the landfill, and identifying all areas where solid waste is authorized to be landfilled;

(ii) The maximum design capacity of the landfill. Where the maximum design capacity is specified in the permit to construct and operate, a copy of the permit specifying the maximum design capacity may be submitted as part of the report. If the maximum design capacity of the landfill is not specified in the permit, the maximum design capacity shall be calculated using good engineering practices. The calculations shall be provided, along with the relevant parameters as part of the report. The Department may request other reasonable information as may be necessary to verify the maximum design capacity of the landfill.

(3) An amended design capacity report shall be submitted to the Department providing notification of an increase in the design capacity of the landfill, within 90 days of an increase in the maximum design capacity of the landfill to or above 2.5 million megagrams and 2.5 million cubic meters. This increase in design capacity may result from an increase in the permitted volume of the landfill or an increase in the density as documented in the annual recalculation required in paragraph 9(f).

(b) Each owner or operator subject to the requirements of this section shall submit an NMOC emission rate report to the Department initially and annually thereafter, except as provided for in clause (1)(ii) or subparagraph (3) of this paragraph. The Department may request such additional information as may be necessary to verify the reported NMOC emission rate.

(1) The NMOC emission rate report shall contain an annual or 5-year estimate of the NMOC emission rate calculated using the formula and procedures provided in paragraph 5(a) or (b) of this section, as applicable.

(i) The initial NMOC emission rate report may be combined with the initial design capacity report required in paragraph (a) of this subdivision and shall be submitted no later than indicated in subparagraph 8(a)(1). Subsequent NMOC emission rate reports shall be submitted annually thereafter, except as provided for in clause (1)(ii) and subparagraph (3) of this paragraph.

(ii) If the estimated NMOC emission rate as reported in the annual report to the Department is less than 50 megagrams per year in each of the next 5 consecutive years, the owner or operator may elect to submit an estimate of the NMOC emission rate for the next 5-year period in lieu of the annual report. This estimate shall include the current amount of solid waste-in-place and the estimated waste acceptance rate for each year of the 5 years for which an NMOC emission rate is estimated. All data and calculations upon which this estimate is based shall be provided to the Department. This estimate shall be revised at least once every 5 years. If the actual waste acceptance rate exceeds the estimated waste acceptance rate in any year reported in the 5-year estimate, a revised 5-year estimate shall be submitted to the Department. The revised estimate shall cover the 5-year period beginning with the year in which the actual waste acceptance rate exceeded the estimated waste acceptance rate.

(2) The NMOC emission rate report shall include all the data, calculations, sample reports and measurements used to estimate the annual or 5-year emissions.

(3) Each owner or operator subject to the requirements of this section is exempted from the requirements of subparagraphs (1) and (2) of this paragraph, after the installation of a collection and control system in compliance with subparagraph 3(b)(2) of this section, during such time as the collection and control system is in operation and in compliance with subdivisions 4 and 6 of this section.

(c) Each owner or operator subject to the provisions of clause 3(b)(2)(i) of this section shall submit a collection and control system design plan to the Department within 1 year of the first report, required under paragraph (b) of this subdivision, in which the emission rate exceeds 50 megagrams per year, except as follows:

(1) If the owner or operator elects to recalculate the NMOC emission rate after Tier 2 NMOC sampling and analysis as provided in subparagraph 5(a)(3) of this section and the resulting rate is less than 50 megagrams per year, annual periodic reporting shall be resumed, using the Tier 2 determined site-specific NMOC concentration, until the calculated emission rate is equal to or greater than 50 megagrams per year or the landfill is closed. The revised NMOC emission rate report, with the recalculated emission rate based on NMOC sampling and analysis, shall be submitted within 180 days of the first calculated exceedance of 50 megagrams per year.

(2) If the owner or operator elects to recalculate the NMOC emission rate after determining a site-specific methane generation rate constant (k), as provided in Tier 3 in subparagraph 5(a)(4) of this section, and the resulting NMOC emission rate is less than 50 megagrams per year, annual periodic reporting shall be resumed. The resulting site-specific methane generation rate constant k shall be used in the emission rate calculation until such time as the emissions rate calculation results in an exceedance. The revised NMOC emission rate report based on the provisions of subparagraph 5(a)(4) and the resulting site-specific methane generation rate constant k shall be submitted to the Department within 1 year of the first calculated emission rate exceeding 50 megagrams per year.

(d) Each owner or operator of a controlled landfill shall submit a final closure plan to the Department pursuant to the requirements of subdivision 360-2.15(c) of Part 360 of this Title. No additional wastes may be placed into the landfill without filing a notification of modification as described under 40 CFR section 60.7(a)(4) (see section 200.9 of this Title) and obtaining Department approval pursuant to this Part.

(e) Each owner or operator of a controlled landfill shall submit an equipment removal report to the Department 30 days prior to removal or cessation of operation of the control equipment.

(1) The equipment removal report shall contain all of the following items:

(i) A copy of the final closure plan submitted in accordance with paragraph (d) of this subdivision;

(ii) A copy of the initial performance test report demonstrating that the 15 year minimum control period has expired; and

(iii) Dated copies of three successive NMOC emission rate reports demonstrating that the landfill is no longer producing 50 megagrams or greater of NMOC per year.

(2) The Department may request such additional information as may be necessary to verify that all of the conditions for removal in clause 3(b)(2)(v) of this section have been met.

(f) Each owner or operator of a landfill seeking to comply with subparagraph 3(b)(2) of this section using an active collection system designed in accordance with clause 3(b)(2)(ii) shall submit to the Department annual reports of the recorded information in subparagraphs (1) through (6) of this paragraph. The initial annual report shall be submitted within 180 days of installation and start-up of the collection and control

system, and shall include the initial performance test report required under 40 CFR 60.8 (see section 200.9 of this Title). For enclosed combustion devices and flares, reportable exceedances are defined under paragraph 9(c) of this section.

(1) Value and length of time for exceedance of applicable parameters monitored under paragraphs 7(a),(b),(c), and (d) of this section.

(2) Description and duration of all periods when the gas stream is diverted from the control device through a bypass line or the indication of bypass flow as specified under subdivision 7 of this section.

(3) Description and duration of all periods when the control device was not operating for a period exceeding 1 hour and length of time the control device was not operating.

(4) All periods when the collection system was not operating in excess of 5 days.

(5) The location of each exceedance of the 500 parts per million methane concentration as provided in paragraph 4(c) of this section and the concentration recorded at each location for which an exceedance was recorded in the previous month.

(6) The date of installation and the location of each well or collection system expansion added pursuant to subparagraph 6(a)(3), paragraph 6(b), and subparagraph 6(c)(4) of this section.

(g) Each owner or operator seeking to comply with clause 3(b)(2)(iii) of this section shall include the following information with the initial performance test report required under 40 CFR 60.8 (see section 200.9 of this Title):

(1) A diagram of the collection system showing collection system positioning including all wells, horizontal collectors, surface collectors, or other gas extraction devices, including the locations of any areas excluded from collection and the proposed sites for the future collection system expansion;

(2) The data upon which the sufficient density of wells, horizontal collectors, surface collectors, or other gas extraction devices and the gas mover equipment sizing are based;

(3) The documentation of the presence of asbestos or nondegradable material for each area from which collection wells have been excluded based on the presence of asbestos or nondegradable material;

(4) The sum of the gas generation flow rates for all areas from which collection wells have been excluded based on nonproductivity and the calculations of gas generation flow rate for each excluded area; and

(5) The provisions for increasing gas mover equipment capacity with increased gas generation flow rate, if the present gas mover equipment is inadequate to move the maximum flow rate expected over the life of the landfill; and

(6) The provisions for the control of off-site migration.

#### **§208.9 Recordkeeping requirements.**

[N.Y. St. Reg. 10/10/2001]

Except as provided in subclause 3(b)(3)(i)(a) of this section,

(a) Each owner or operator of an MSW landfill subject to the provisions of paragraph 3(b) of this section shall keep for at least 7 years up-to-date, readily accessible, on-site records of the design capacity report which triggered paragraph 3(b), the current amount of solid waste in-place, and the year-by-year waste acceptance rate.

(b) Except as provided in subclause 3(b)(2)(i)(b), each owner or operator of a controlled landfill shall keep up-to-date, readily accessible records for the life of the control equipment of the data listed in subparagraphs (1) through (4) of this paragraph as measured during the initial performance test or compliance determination. Records of subsequent tests or monitoring shall be maintained for a minimum of 7 years. Records of the control device vendor specifications shall be maintained until removal.

(1) Where an owner or operator subject to the provisions of this section seeks to demonstrate compliance with clause 3(b)(2)(ii) of this section:

(i) The maximum expected gas generation flow rate as calculated in subparagraph 6(a)(1) of this section. The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the Department.

(ii) The density of wells, horizontal collectors, surface collectors, or other gas extraction devices determined using the procedures specified in subparagraph 10(a)(1) of this section.

(2) Where an owner or operator subject to the provisions of this section seeks to demonstrate compliance with clause 3(b)(2)(iii) of this section through use of an enclosed combustion device other than a boiler or process heater with a design heat input capacity greater than 44 megawatts:

(i) The average combustion temperature measured at least every 15 minutes and averaged over the same time period of the performance test.

(ii) The percent reduction of NMOC determined as specified in subclause 3(b)(2)(iii)(b) achieved by the control device.

(3) Where an owner or operator subject to the provisions of this section seeks to demonstrate compliance with item 3(b)(2)(iii)(b)(1) through use of a boiler or process heater of any size: a description of the location at which the collected gas vent stream is introduced into the boiler or process heater over the same time period of the performance testing.

(4) Where an owner or operator subject to the provisions of this section seeks to demonstrate compliance with subclause 3(b)(2)(iii)(a) through use of an open flare, the flare type (i.e., steam-assisted, air-assisted, or nonassisted), all visible emission readings, heat content determination, flow rate or bypass flow rate measurements, and exit velocity determinations made during the performance test as specified in 40 CFR 60.18 (see

section 200.9 of this Title); continuous records of the flare pilot flame or flare flame monitoring; and records of all periods of operations during which the pilot flame of the flare flame is absent.

(c) Except as provided in subclause 3(b)(2)(i)(b), each owner or operator of a controlled landfill subject to the provisions of this section shall keep for 7 years up-to-date, readily accessible continuous records of the equipment operating parameters specified to be monitored in subdivision 7 of this section as well as up-to-date, readily accessible records for periods of operation during which the parameter boundaries established during the most recent performance test are exceeded.

(1) The following constitute exceedances that shall be recorded and reported under paragraph 8(f) of this section:

(i) For enclosed combustors except for boilers and process heaters with design heat input capacity of 44 megawatts (150 million British thermal unit per hour) or greater, all 3-hour periods of operation during which the average combustion temperature was more than 28 °C below the average combustion temperature during the most recent performance test at which compliance with clause 3(b)(2)(iii) was determined.

(ii) For boilers or process heaters, whenever there is a change in the location at which the vent stream is introduced into the flame zone as required under subparagraph (b)(3) of this subdivision.

(2) Each owner or operator subject to the provisions of this section shall keep up-to-date, readily accessible continuous records of the indication of flow to the control device or the indication of bypass flow or records of monthly inspections of car-seals or lock-and-key configurations used to seal bypass lines, specified under subdivision 7.

(3) Each owner or operator subject to the provisions of this section who uses a boiler or process heater with a design heat input capacity of 44 megawatts or greater to comply with clause 3(b)(2)(iii) shall keep an up-to-date, readily accessible record of all periods of operation of the boiler or process heater.

(4) Each owner or operator seeking to comply with the provisions of this section by use of an open flare shall keep up-to-date, readily accessible continuous records of the flame or flare pilot flame monitoring specified under paragraph 7(c) of this section, and up-to-date, readily accessible records of all periods of operation in which the flame or flare pilot flame is absent.

(d) Except as provided in subclause 3(b)(2)(i)(b), each owner or operator subject to the provisions of this section shall keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.

(1) Each owner or operator subject to the provisions of this section shall keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors as specified under paragraph 6(b) of this section.

(2) Each owner or operator subject to the provisions of this section shall keep readily

accessible documentation of the nature, date of deposition, amount, and location of asbestos-containing or nondegradable waste excluded from collection as provided in clause 10(a)(3)(i) as well as any nonproductive areas excluded from collection as provided in clause 10(a)(3)(ii).

(e) Except as provided in subclause 3(b)(2)(i)(b), each owner or operator subject to the provisions of this section shall keep for at least 7 years up-to-date, readily accessible records of all collection and control system exceedances of the operational standards in subdivision 4 of this section, the reading in the subsequent month whether or not the second reading is an exceedance, and the location of each exceedance.

(f) Landfill owners or operators who convert design capacity from volume to mass or mass to volume to demonstrate that landfill design capacity is less than 2.5 million megagrams or 2.5 million cubic meters, as provided in the definition of "design capacity", shall keep readily accessible, on-site records of the annual recalculation of site-specific density, design capacity, and the supporting documentation. Off-site records may be maintained if they are retrievable within 4 hours. Either paper copy or electronic formats are acceptable.

#### **§208.10 Specifications for active collection systems.**

[N.Y. St. Reg. 10/10/2001]

(a) Each owner or operator seeking to comply with clause 3(b)(2)(i) of this section shall site active collection wells, horizontal collectors, surface collectors, or other extraction devices at a sufficient density throughout all gas producing areas using the following procedures unless alternative procedures have been approved by the USEPA as provided in subclauses 3(b)(2)(i)(c) and (d):

(1) The collection devices within the interior and along the perimeter areas shall be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues shall be addressed in the design: depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expendability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat.

(2) The sufficient density of gas collection devices determined in subparagraph 9 of this paragraph shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

(3) The placement of gas collection devices determined in subparagraph 9 of this paragraph shall control all gas producing areas, except as provided by clauses (i) and (ii) of this subparagraph.

(i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under paragraph 9(d). The documentation shall provide the nature, date of deposition, location and amount of asbestos or nondegradable

material deposited in the area, and shall be provided to the Department upon request.

(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material shall be documented and provided to the Department upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections shall be compared to the NMOC emissions estimate for the entire landfill. Emissions from each section shall be computed using the following equation:

$$Q_i = 2 k L_o M_i (e^{-kt_i}) C_{NM}$$

where,

$Q_i$  = NMOC emission rate from the  $i^{\text{th}}$  section, megagrams per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$L_o$  = methane generation potential, cubic meters per megagram solid waste

$M_i$  = mass of the degradable solid waste in the  $i^{\text{th}}$  section, megagram

$t_i$  = age of the solid waste in the  $i^{\text{th}}$  section, years

$C_{NMOC}$  = concentration of nonmethane organic compounds, parts per million by volume

$3.6 \times 10^{-9}$  = conversion factor

(iii) The values for  $k$  and  $C_{NMOC}$ , determined in field testing shall be used, if field testing has been performed in determining the NMOC emission rate or the radii of influence (the distance from the well center to a point in the landfill where the pressure gradient applied by the blower or compressor approaches zero). If field testing has not been performed, the default values for  $k$ ,  $L_o$  and  $C_{NMOC}$  provided in subparagraph (e)(1)(i) of this section or the alternative values from subparagraph (e)(1)(v) shall be used. The mass of nondegradable solid waste contained within the given section may be subtracted from the total mass of the section when estimating emissions provided the nature, location, age, and amount of the nondegradable material is documented as provided in clause (a) of this subparagraph.

(b) Each owner or operator seeking to comply with subclause 3(b)(2)(i)(a) of this section shall construct the gas collection devices using the following equipment or procedures:

(1) The landfill gas extraction components shall be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other nonporous corrosion resistant material of suitable dimensions to: convey projected

amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system shall extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors shall be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations shall be situated with regard to the need to prevent excessive air infiltration.

(2) Vertical wells shall be placed so as not to endanger underlying liners and shall address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors shall be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices shall be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.

(3) Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly shall include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.

(c) Each owner or operator seeking to comply with subclause 3(b)(2)(i)(a) of this section shall convey the landfill gas to a control system in compliance with clause 3(b)(2)(iii) through the collection header pipe(s). The gas mover equipment shall be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:

(1) For existing collection systems, the flow data shall be used to project the maximum flow rate. If no flow data exists, the procedures in subparagraph (2) of this paragraph shall be used.

(2) For new collection systems, the maximum flow rate shall be in accordance with subparagraph 6(a)(1) of this section.

**FRESH KILLS ORDER ON CONSENT  
MODIFICATION #7**

STATE OF NEW YORK  
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

-----X  
In the Matter of the Alleged Violations of Article 17 of the  
Environmental Conservation Law ("ECL") Articles 17, 25  
and 27 and Title 6 of the Official Compilation of Codes,  
Rules and Regulations of the State of New York ("6 NYCRR")  
Parts 360, 661 and 751 by

**FRESH KILLS ORDER  
ON CONSENT  
MODIFICATION #7**

THE CITY OF NEW YORK  
Department of Sanitation  
125 Worth Street  
New York, New York 10013

CASE # D2-90001-89-03

Respondent.

-----X  
**WHEREAS:**

1. Respondent, the City of New York ("Respondent," or the "City"), operates the Fresh Kills Landfill (the "Landfill") on Staten Island, N.Y. The City and the New York State Department of Environmental Conservation ("DEC" or the "Department") executed the original version of this order on April 24, 1990 (the "1990 Order"). The 1990 Order was later modified to reflect new and relevant information about the Landfill (much of it produced by the City through investigations required under the 1990 Order), on September 21, 1990, April 22, 1992, November 18, 1993, July 15, 1994, July 26, 1995 and October 20, 1998.
2. Pursuant to the 1990 Order, as modified on July 26, 1995, the City was obligated to deliver a Part 360 landfill operation permit application pertaining to the Landfill, based on investigations mandated under the Order, by March 15, 1996. The City did so and DEC, which had reviewed and commented upon the various investigations incorporated into the application, determined the application to be complete on May 14, 1996.
3. By 1996, the landfill was the sole in-City facility for the disposal of the City's residential and institutional waste. On May 28, 1996, Mayor Rudolph P. Giuliani and Governor George E. Pataki announced their agreement to close the landfill to further receipt of solid waste by December 31, 2001. At the same time, the Mayor and the Governor formed a Task Force to examine alternatives to manage the City's solid waste.

4. On June 2, 1996, Governor Pataki signed Chapter 107 of the Laws of 1996 (Environmental Conservation Law Section 27-0706) barring disposal of waste at the Landfill after January 1, 2002.

5. On September 15, 1996, the New York City Department of Sanitation ("DOS") wrote to DEC to request that it suspend review of the March 15, 1996 Part 360 permit application, in view of the agreement to close the landfill to the further receipt of solid waste by December 31, 2001. The September 15, 1996 letter also stated the City's intention to withdraw the application as soon as this Order was modified to establish, among other necessary provisions, the new date for closure.

6. On November 29, 1996 the Fresh Kills Task Force issued its report: "A Plan to Phase Out the Fresh Kills Landfill." Among other matters, the Report notes that the Task Force had recommended and the City had agreed 1) to make regular reductions in the amount of waste shipped to the landfill in the years prior to its closure; 2) that the annual tonnage goal reductions would be achieved, to the extent practicable, with measures including waste reduction and recycling initiatives, based on studies and pilot projects undertaken as a result of the Task Force report, and 3) to modify the City's solid waste management plan to reflect an overall waste management strategy for the diminution of waste sent to the Fresh Kills Landfill.

7. DEC and the City agree that the City's decision to cease solid waste disposal operations at the Landfill after December 31, 2001, subsequently codified in state law, requires that the 1990 Order be modified once again to establish appropriate measures for the accelerated closure of the Fresh Kills Landfill.

8. The 1990 Order, as modified between 1990 and 1998 (the "Modified Order") contains over 130 "milestones" requiring investigation and remediation of conditions at the landfill. The City had completed most of these milestones, contained in the A-Series Appendices, by the time the City submitted its permit application. The work that continues under the terms of the Modified Order consists primarily of ongoing landfill monitoring and annual (or other periodic) reporting of monitoring results.

9. This seventh modification to the 1990 Order (the "Seventh Consent Order Modification," or "this Order") formalizes the City's withdrawal of the Part 360 application for

the Landfill and memorializes the City's commitment to close the Landfill in accordance with all laws and regulations.

NOW, having considered this matter and being duly advised, **IT IS ORDERED THAT:**

A. **Cessation of Disposal Activities and Performance of Necessary Landfill Closure and Post-Closure Measures:** Paragraph I of the Modified Order ("Compliance Schedules and Remedial Actions") is modified as follows: The City shall cease disposing of waste at the Fresh Kills Landfill in accordance with Compliance Schedule Appendix A-15. Moreover, the City shall carry out the measures specified in Appendix A-15, attached to and incorporated as part of this Order, to ensure that closure and post-closure monitoring and maintenance of the Landfill occur in compliance with 6 NYCRR Part 360. Finally, the City's March 15, 1996 Permit Application is hereby withdrawn with prejudice to its reintroduction.

Paragraph V of the Modified Order, relating to variances from Part 360 standards for landfill permit issuance, is no longer relevant to this matter and is deleted.

B. **State Funding of Closure Under the Clean Water/Clean Air Bond Act of 1996:** Pursuant to the New York State Clean Water/Clean Air Bond Act of 1996, Section 56-0407 of the Environmental Conservation Law (ECL) provides authority to the Commissioner of DEC to enter into a contract with the City to provide state assistance payments for the closure of the Landfill. Following execution of this Order and submission of a complete Bond Act funding application by the City, the DEC will prepare and send to the City a contract for the disbursement of state assistance payments for closure of the Landfill. DEC and the City agree to expedite completion of this process.

C. **Consent Order Termination:** Paragraph IV of the Modified Order is modified as follows:

Consistent with Part 360 and other landfill closure orders entered into by DEC, the City's obligations under this Order shall terminate when the City has successfully completed all obligations pertaining to closure, post closure monitoring and landfill maintenance, according to the terms of Appendix A-15 and 6 NYCRR Part 360.

In the interim, once DEC has approved the City's Final Closure Plan and the City has ceased waste disposal operations as required by law and under this Order, some of the provisions

contained herein will require further modification (or deletion) to reflect the fact that the City is no longer performing disposal operations at the Landfill and DEC no longer need monitor such operations. DEC and the City agree to conclude such a modification expeditiously.

D. **Solid Waste Management Planning** Paragraph VI of the Modified Order, which specifies the City's obligations relative to Solid Waste Management Planning, is modified as follows: The City is in the midst of modifying its Local Solid Waste Management Plan, in response to the fact that the Landfill must cease to accept solid waste after December 31, 2001. The City shall comply with all obligations to submit its Plan Modification for approval to DEC pursuant 6 NYCRR Part 360-15.

E. **Public Participation** Paragraph XXVI of the Modified Order, pertaining to public participation, is modified as follows:

The City and DEC shall jointly maintain at least one public access document repository within the Borough of Staten Island until three months after the completion of the following:

- i) all closure construction activities required under Appendix A-15 and
- ii) approval of a final end-use plan for the Landfill.

The City shall conduct, during the month of February, every year, a public meeting within the Borough of Staten Island until the February following the completion of all closure construction activities contained in Compliance Schedule Appendix A-15. In recognition of the City's commitment to public participation on activities associated with the landfill and the evolving end-use planning efforts for this facility, the City will utilize a public participation component for all end-use planning development activities.

F. **Incorporation by Reference**: The terms and conditions of this Seventh Consent Order Modification are hereby incorporated by reference into the 1990 Order, as previously modified. All terms or conditions of the 1990 Order, as previously modified, that are not inconsistent with this Seventh Consent Order Modification shall remain in full force and effect.

G. **Receipt of Waste/O&M Plan**: This Modification # 7 to the 1990 Consent Order requires the cessation of the disposal of waste by January 1, 2002 (regardless of any statutory requirements otherwise for a later date) at the Fresh Kills Landfill in accordance with law and the subsequent closure of the landfill. It adds Appendix A-15 to the 1990 Consent Order. Milestone

Subject 11 of Appendix A-15 requires submittal of a draft post-closure monitoring and maintenance operations manual by April 1, 2002. Milestone Subject 12 requires submittal of a final acceptable post-closure monitoring and maintenance operations manual 90 days after receipt of Departmental comments on Subject 11. The post-closure monitoring and maintenance operations manual will sufficiently address the landfill's requirements for an operations and maintenance plan and a landfill contingency plan. Accordingly, therefore, Milestone Subject 2 under Appendix A-1, the requirement to submit revisions of the Landfill Operations and Maintenance Plan by January 31 of each year is discontinued after the submittal required by January 31, 2001. Additionally, the annual updating requirement under Milestone Subject 3 under Appendix A-2, the final acceptable landfill contingency plan, is discontinued after the submittal required by July 15, 2001.

H. **Force Majeure**: Subparagraph A. of Paragraph XX. of the 1990 Fresh Kills Order is modified as follows: Respondent shall not suffer any penalty under this Order, or be subject to any proceeding or action, if it cannot comply with any requirement hereof because of circumstances beyond Respondent's control, an act of God, war, insurrection, riot, strikes, floods, fire, judicial injunctions and orders, state or Federal legislation or contractor default (per the terms of Subparagraph B). Respondent shall immediately notify the Department in writing when it obtains knowledge of any such condition and request an appropriate extension or modification of the 1990 Fresh Kills Order as modified.

I. **Effective Date**: This Order shall be effective upon the return of the executed consent form by the City and subsequent execution on behalf of DEC.

DATED: Albany, New York  
April 3<sup>rd</sup>, 2000

  
John P. Cahill, Commissioner  
New York State Department of  
Environmental Conservation

CONSENT BY RESPONDENT CITY OF NEW YORK DEPARTMENT OF SANITATION

Respondent hereby consents to the issuing and entering of the foregoing Modification #7 to the Fresh Kills Landfill Consent Order (DEC File No. D2-9001-89-03).

Dated: New York, New York  
April 18, 2000



Kevin P. Farrell, Commissioner  
City of New York Department of Sanitation

Compliance Schedule Appendix A-5  
Waste Transport and Unloading Facilities

<u>Subject</u>	<u>Milestone Date</u>
1. Respondent shall submit to the Department for review and comment, a report containing the proposed actions which have been and/or will be taken to achieve the following:  a. Containment of solid waste which is deposited in the surface waters during barge unloading operations from escaping to the Arthur Kill and removal of waste so contained;  b. Cleaning of all shorelines adjacent to the Fresh Kills Landfill, including Isle of Meadows, of solid waste of the type allowed to be disposed of at the Landfill;  c. Transition to rubber tired vehicles for the transport of solid waste from the barge unloading areas to the working face;  d. Reduction, to the greatest extent practicable, of windblown litter at the barge unloading areas and working faces;  e. Passable roadways for use of rubber tired vehicles from the barge unloading facilities to the appropriate landfill sections;  f. Removal of solid waste released into the Arthur Kill as a result of a contingent failure of the Respondent's solid waste control system; and  g. Installation of fencing or establishment of other means around the perimeter of the Landfill to limit unauthorized access to the Landfill.  The submitted report shall contain, by reference to	12-31-90

maps or other documents, a physical description of the areas Respondent has cleaned, or intends to clean, pursuant to Subject 1.b above. The submission shall recommend additional Subjects and Milestone Dates that will be incorporated into this Compliance Schedule, once accepted by the Department. The Subjects shall include: issuance of bid proposals, contract award, and activity completion dates where appropriate. The additional Subjects and Milestone Dates shall not be repetitive of, nor deemed to be, operational requirements as set forth in Appendices B-1 and B-2.

- |     |  |  |
|-----|--|--|
| 2.  | Respondent shall submit to the Department the acceptable report incorporating Department comments. Upon acceptance by the Department, the Subjects shall be considered incorporated into this Compliance Schedule. | 90 days after the Department submits its comments to the Respondent. |
| 3.  | Purchase and delivery of two skimmer boats.  | 8-15-91  |
| 4.  | Issuance of bid proposals for thirteen additional refuse haulers.  | 10-15-91   |
| 5.  | Contract award for purchase of thirteen additional refuse haulers.   | 10-15-91   |
| 6.  | Contract award for purchase of two hydraulic cranes.   | 11-15-91   |
| 7.  | Initiation of construction of 4,000 linear feet of road across Section 1/9.  | 12-15-91   |
| 8.  | Completion of Stages I and III of paving of Plant 1.   | 2-1-92   |
| 9.  | Completion of Stages I and III of construction of Plant 1 concrete retaining walls.  | 2-1-92   |
| 10. | Initiation of construction of new bridge across Main Creek.  | 2-1-92   |
| 11. | Completion of construction of 4,000 linear feet of road  |  |

	across Section 1/9.	2-15-92
12.	Completion of construction of additional fencing.	3-1-92
13.	Completion of construction of Plant 1 access road.	3-30-92
14.	Delivery of thirteen additional refuse vehicles.	5-15-92
15.	Delivery of two hydraulic cranes.	5-15-92
16.	Institution of refuse hauler loading at Plant 1, First Unloading Pad.	5-30-92
17.	Completion of Stage II of Plant 1 paving.	10-31-92
18.	Completion of Stage II of construction of Plant 1 concrete retaining walls.	10-31-92
19.	Institution of refuse hauler loading at Plant 1, Second Unloading Pad.	11-30-92
20.	Complete final design for the unloading facility.	12-30-94
21.	Complete construction of the unloading facility.	3-31-98
22.	Establish a satisfactory protocol for the operation and maintenance of the unloading facility.	9-30-98

On July 15, 1994, Modification #4 was added to the 1990 Consent Order. Among other things, it added Milestone Subjects 20, 21 and 22. These Milestone Subjects were added to reflect terms of the 1993 Consent Decree of the U.S. District Court for the District of New Jersey in Township of Woodbridge, et. al. vs. City of New York, Civil Action No. 79-1060.

In an Order dated September 16, 1997, New Jersey District Court Judge Barry eliminated the requirements to build an enclosed unloader at the Fresh Kills Landfill from the Consent Decree in the Woodbridge litigation for as long as the City ensures that the amount of debris emanating from the landfill is restricted satisfactorily.

Accordingly, therefore, Milestone Subjects 20, 21, and 22 are deleted.

NOTE: With respect to Subject 1 of this Appendix, the Respondent may request an extension of a Milestone Date according to the terms of this note by:

1. Requesting, in writing, the extension at least two (2) weeks before the applicable Milestone Date;
2. Communicating the request to the Regional Solid and Hazardous Waste Engineer, and
3. Stating the reason and basis for the extension.

The Regional Solid and Hazardous Waste Engineer may extend the Milestone Date for the noted Subject up to two months upon his/her discretion based upon a reasonable showing by the Respondent, and such extension shall not be unreasonably withheld. The extended date shall become the new Milestone Date for the specific Subject. Modifications beyond two months of the noted Subject are governed by the provisions of paragraph XXIV of the Order.

Compliance Schedule Appendix A-15  
Landfill Closure and Post Closure

The Respondent shall conform to the requirements for landfill closure and post-closure care set forth in 6 NYCRR Part 360 Section 360-2.15 (c)-(l), revised effective November 26, 1996 (hereafter, all such citations are denoted as "Section 360-") and this Compliance Schedule. A series of major information and reporting requirements set forth in Section 360-2.15 are included as Subject Milestones in this Appendix.

As part of the process to ensure proper closure of the Fresh Kills Landfill, the Department and Respondent agree to meet, at a minimum, on a bi-monthly basis to discuss the status of closure field activities by the Respondent and to provide the Department with the opportunity to provide technical/regulatory assistance to the Respondent during the development of all document submittals for this Compliance Schedule Appendix.

**Cessation of Waste Disposal Operations**

The Respondent shall cease disposal of solid waste at Fresh Kills Landfill, in accordance with the schedule specified below.

**Final Cover Design and Construction Reports**

The Respondent shall prepare **Final Cover Design Reports** for Sections 1/9 and 6/7 of the landfill which shall provide the detail of the remaining construction work for the closure of each landfill unit in accordance with the specified schedule. The **Final Cover Design Reports** shall include:

- a description of the material and construction methods (i.e., material and execution specifications) used for the placement of all gas venting and final cover systems to demonstrate conformance with the requirements set forth in section 360-2.13;
- an analysis of the structural integrity and overall stability of the landfill and each component of the final cover;
- an erosion and sediment control plan to mitigate erosion and facilitate stormwater control over the immediate cover during post operation and closure construction;
- a stormwater control plan to control erosion and convey drainage over the final cover;
- a presentation of the closure and post-closure maintenance requirements for final cover and drainage systems;

- a landscape plan in accordance with 360-2.6;
- a presentation of the future use of the site, that conforms to the landscape plans and does not adversely affect the final cover system;
- any variance applications in accordance with 360-1.7(c);
- engineering drawings that set forth the operating unit and adjacent lands to the property boundaries; construction detailed drawings depicting the final grades and proposed elevations of the landfill cover system, including the final cover sub-base grading plan, gas venting layer, low permeability barrier; topsoil layers; typical roadway sections and details; diversion berms, swales, drainage channels, culverts and other devices needed to collect and survey surface water run-off; and a landscape plan in accordance with 360-2.6;
- plans depicting phases of construction of the final cover system which will be used for development of individual Closure Certification Reports for submittal to the Department;
- construction quality assurance/construction quality control plan in accordance with 360-2.8;
- an estimate of the inventory of wastes in the landfill;
- a closure construction schedule; and
- a recapitulation of the most recent Financial Assurance costs for the closure, post-closure and corrective measures costs for the landfill.

No final cover construction shall be performed until acceptance by the Department of the Final Cover Design Report and associated construction plans and technical specifications for the applicable section. However, the Respondent may submit for review and acceptance an interim report including final grading plans, plans for the placement of grading material for drainage and achievement of final sub-grades, and associated grading material technical specifications prior to submittal of any Final Cover Design Reports. No placement of grading material for achievement of final sub-grade shall occur until Department acceptance of the interim report.

**Post-Closure Monitoring and Maintenance Operations Manual**

In accordance with the schedule specified below, the City must submit a Post-Closure Monitoring and Maintenance Operations Manual for the landfill conforming to the requirements of paragraph 360-2.15(k)(7) and shall provide all information necessary to monitor and maintain the landfill facility for the entire post-closure period. This manual shall contain the components

defined in subparagraphs 360-2.15(k)(7)(i) through (viii), including a description of the sampling, record-keeping and reporting requirements for all environmental monitoring activities, as defined in paragraph 360-2.15(k)(4) and leachate containment/collection systems; a description of all environmental control systems; a description of the nature, location and frequency of all facility maintenance activities, including maintenance of the final cover system (to correct the effects of landfill settlement, subsidence, erosion), leachate containment, collection and treatment systems, and landfill gas control and monitoring systems; a description of the resource requirements, including equipment needs and minimum personnel qualifications; and a contingency plan containing response actions to problems that may arise at the facility, action levels for the leachate containment/collection systems action levels for environmental monitoring and control systems, and a summary of corrective measures to be performed in conformance with section 360-2.20; and a description of the planned uses of the property during the post-closure period.

The Long-Term Groundwater Monitoring Program developed pursuant to Compliance Schedule Appendix A-6, and the Long-Term Surface Water and Sediment Monitoring Program developed pursuant to Compliance Schedule Appendix A-7 shall be used as the basis for development of the post-closure environmental monitoring program. Information contained in the report submittals, revised to reflect current conditions, for Compliance Schedule Appendices A-1, A-2, A-4, A-8 and A-10 should be used as references for completion of this manual.

#### **Annual Landfill Closure Progress Report**

In accordance with the schedule specified below, the City shall submit a Landfill Closure Progress Report on an annual basis and shall describe in each such Report the progress that year toward closure of the landfill as well as closure activities for the coming year. The report must identify where final cover is complete, denoting new final cover placed during the previous calendar year. For the next calendar year, the report must describe the new final cover construction work anticipated.

#### **Closure and Post-Closure Registration Report**

In accordance with the schedule specified below, the City must submit a Closure and Post-Closure Registration Report conforming with the requirements defined in subdivision 360-2.15(l). The Respondent must register with the Department at least one year before the facility is scheduled to cease accepting waste. At a minimum, the report must include the facility name, address, phone number, and the name, address and phone number of the person who will be responsible for closure and post-closure care of the facility. The registration must be renewed every five years until the Department determines that the post-closure monitoring and maintenance period for the facility has ended (minimum thirty years). Registration renewals must include a certification that the facility complies with all applicable closure and post-closure criteria contained in section 360-2.15, financial assurance criteria contained in section 360-2.19; corrective measures report criteria contained in section 360-2.20; and any other information that

the Department determines to be necessary to protect the public health and welfare and the environment or natural resources.

**Closure Construction Certification Report(s)**

In accordance with the schedule specified below, the City must submit Closure Construction Certification Report(s) conforming to the requirements defined in paragraph 360-2.15(d)(7). The report(s) must be submitted by the Respondent to the Department for approval within 180 days after completion of landfill closure construction for each area as defined in the Acceptable Final Cover Design Reports. The report(s) must include the results of all construction quality assurance and quality control testing required in paragraphs 360-2.13(p)-(t). The report(s) must document any failed test results, describe procedures used to correct failures, and state the results of retesting. The report(s) must also include as-built drawings, with notations to identify any deviation from the approved final cover design plans. The Department shall undertake to comment on the Closure Construction Certification Reports within 90 days of receipt and comments shall include whether the reports conform to the certification requirements or which specific deficiencies require correction for satisfactory completion of the reports.

**Final Landfill Closure Plan and Landfill Closure**

The Respondent must submit a Final Landfill Closure Plan for the landfill and close the Landfill, in accordance with applicable regulations and with the schedule specified below. The plan must include a site plan and a description of facility structures; the final cover system; the landfill gas control system; leachate containment, collection and treatment systems; a final end use plan including use of native vegetation for landscaping; and, as necessary, plans for vector control, gas control, including by reference those aspects of landfill gas control related to the on-site landfill gas recovery facility and landfill gas flares. The plan must address potential environmental impacts associated with the Landfill, and provide the following: estimates of the landfill area to be covered and an inventory of wastes in the landfill; a closure construction schedule that conforms with subdivision 360-2.15(d); and amended closure and post-closure monitoring and maintenance cost estimates, in accordance with section 360-2.19. The Final Landfill Closure Plan must meet the requirements for post-closure operation and maintenance defined in subdivision 360-2.15(k). The Final Cover Design Reports and Post-closure Monitoring and Maintenance Operations Manual developed in accordance with this Appendix A-15 shall be deemed a part of the Final Landfill Closure Plan as accepted.

<u>Subject</u>	<u>Milestone Date</u>
1. Initiation of final cover construction of Section 6/7 for Compliance Schedule Appendix A-15 activities	July 1, 2000

- |   |   |
|---|---|
| 2. Draft Section 6/7 Final Cover Design Report  | September 1, 2000   |
| 3. Closure and Post-Closure Registration Report: The Respondent shall submit the Closure and Post-closure Registration Report in accordance with subdivision 360-2.15(l).   | December 31, 2000   |
| 4. Final acceptable Section 6/7 Final Cover Design Report   | *90 days after receipt of Department comments   |
| 5. Draft Section 1/9 Final Cover Design Report  | May 1, 2001   |
| 6. Final acceptable Section 1/9 Final Cover Design Report   | *90 days after receipt of Department comments   |
| 7. Annual Landfill Closure Progress Report  | March 1 of each year beginning March 1, 2001  |
| 8. Cessation of disposal of solid-waste at Fresh Kills Landfill   | January 1, 2002   |
| 9. Closure Construction Certification Report(s): The Respondent shall submit to the Department the Closure Construction Certification Report(s), on a basis defined in the acceptable Final Cover Design Report(s), according to the requirements defined in paragraph 360-2.15(c)(7). The final Closure Construction Certification Report shall include a summary of the preceding reports and portions of the landfill to which they pertain. | 180 days after construction completion of each area as defined on the accepted Final Cover Design Reports |
| 10. Initiation of final cover construction of Section 1/9 for Compliance Schedule Appendix A-15 activities  | February 1, 2002  |
| 11. Draft Post-Closure Monitoring and Maintenance Operations Manual: The Respondent shall submit to the Department for review the draft Post-Closure Monitoring and Maintenance Operations Manual.  | April 1, 2002   |
| 12. Final acceptable Post-Closure Monitoring and Maintenance Operations Manual  | *90** days after receipt of Department comments on Subject 11   |

13. Draft Final Closure Plan for the Landfill

September 1, 2002

14. Final acceptable Landfill Closure Plan for the Landfill

\*90 days after receipt of  
Department comments on  
Subject 12

NOTE\*: With respect to these specified Milestone Date, DOS may request an extension of this indicated Milestone Date according to the terms of this note by:

1. Requesting, in writing, the extension at least two (2) weeks before the applicable Milestone Date;
2. Communicating the request to the Regional Solid and Hazardous Waste Engineer, and
3. Stating the reason and basis for the extension.

The Regional Solid and Hazardous Waste Engineer may extend the Milestone Date for the noted Subject up to two months upon his/her discretion based upon a reasonable showing by the Respondent, and such extension shall not be unreasonably withheld. The extended date shall become the new Milestone Date for the specific Subject. Modifications beyond two months of the noted Subject are governed by the provisions of paragraph XXIV of the Order.

NOTE\*\*: Upon acceptance of the Post-Closure Monitoring and Maintenance Operations Manual, the requirements for Milestones Subject 2 of Compliance Schedule Appendix A-1 and Milestone Subject 3 of Compliance Schedule Appendix A-2 shall become null and void.

## **ATTACHMENT 2**

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# **FINAL COVER AND DRAINAGE SYSTEMS MONITORING AND MAINTENANCE MANUAL**

## ATTACHMENT 2

### FINAL COVER AND DRAINAGE SYSTEMS MONITORING AND MAINTENANCE MANUAL

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**ATTACHMENT 2**  
**FINAL COVER AND DRAINAGE SYSTEMS**  
**MONITORING AND MAINTENANCE MANUAL**

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## ATTACHMENT 2

### FINAL COVER AND DRAINAGE SYSTEMS INSPECTION AND MAINTENANCE MANUAL

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### FINAL COVER AND DRAINAGE SYSTEMS MONITORING AND MAINTENANCE MANUAL

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## ATTACHMENT 2

### FINAL COVER AND DRAINAGE SYSTEMS MONITORING AND MAINTENANCE MANUAL

#### **A2.1 INTRODUCTION**

This manual for the post-closure monitoring and maintenance of the final cover and drainage systems at the Fresh Kills Landfill has been prepared in accordance with 360-2.15(k)(7) and (8), as well as Consent Order Modification # 7. Sections A2.2 and A2.3 detail monitoring and maintenance procedures for the final cover system and drainage structures, respectively. Section A2.4 provides the contingency plan for the final cover and drainage systems. Section A2.5 addresses reporting and record keeping requirements. Monitoring and maintenance drawings of the final cover and drainage systems for all four landfill sections are included with this Manual.

The final cover and drainage systems of the Fresh Kills Landfill will be monitored and maintained during the post-closure period as required by 360-2.15(k)(7) and (8) or otherwise approved by NYSDEC. These regulations specify that inspections every quarter and after major rainfall events (5-year storms) shall be performed of all facility components during the minimum 30-year post-closure period, unless specific department approval is given to eliminate some or all of these requirements. The regulations also require maintenance of the integrity and effectiveness of the final cover, including repairs to the landfill final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events; maintenance of vegetative cover; and prevention of run-on and run-off from eroding or otherwise damaging the final cover.

In general, monitoring of the final cover and drainage systems at the Fresh Kills Landfill will be performed using the following three steps:

- **Inspection** by field technicians (“the inspectors”) of the final cover and drainage system on a quarterly basis and following major rainfall events. The inspectors will record information about each identified condition on an inspection form for use during assessment. Each landfill section will be inspected at least once each quarter; however, the inspections may be staggered.
- **Assessment** of findings from the field inspection by an engineer experienced with landfill maintenance issues (“the assessment engineer”). The assessment stage will be the basis of repair orders, recommendations of continued monitoring, and evaluations of need for additional investigations or design. It may involve additional field visits as necessary to clarify the nature and extent of conditions. In some cases, conditions observed during the inspection stage will be determined to be not significant during the assessment stage and will be removed from the list of conditions.
- **Tracking** of conditions observed during inspection. Tracking provides a record of all conditions identified during inspection. Once recorded, a condition will be tracked until it is removed from the list of conditions. The assessment engineer may close out a condition if it is determined not to be significant, has stabilized following continued monitoring to the

extent that repair is not necessary, or has been acceptably repaired.

The flow chart in Figure A2-1 illustrates the process through which conditions are identified, assessed, tracked through follow-up action, and closed out. Both monitoring and maintenance activities will be performed on an ongoing basis throughout the year. Typically, maintenance teams will perform a number of repairs in one geographic area (i.e., one landfill section or portion of landfill section) before moving on to another area in order to minimize the number of mobilizations or deliveries of materials. However, if a condition is determined to be a priority for maintenance, it may be moved ahead of other pending maintenance activities deemed to be of lower priority. Certain types of activities, such as seeding, will be limited by seasonal constraints (i.e., it is expected that most seeding will be done in the spring). Maintenance actions may be assigned priority on the basis of similar types of repairs, geographic area, or urgency of repair.

### **A2.1.1 Inspection Procedures**

Before a given landfill section is inspected, field inspectors and an assessment engineer will review previous inspection reports to determine what conditions are still outstanding and the status of each condition. In addition, the results of landfill cover inspection and surface monitoring conducted for the landfill gas collection and control system (see Volume A, Section 6.1.1.2, and Volume D) will help to identify potential problems and will be used to develop the final cover inspection paths for each landfill section. Those conditions will be highlighted for inspection during the upcoming round. The assessment engineer will lay out the inspection route for each section in advance of the field inspection. Final cover inspection routes may be varied from quarter to quarter in order to cover different elements of the final cover system and accommodate seasonal considerations; each actual inspection route will be noted on field drawings and shown in the quarterly inspection report. However, drainage inspection routes will conform to the path of stormwater flow through drainage structures.

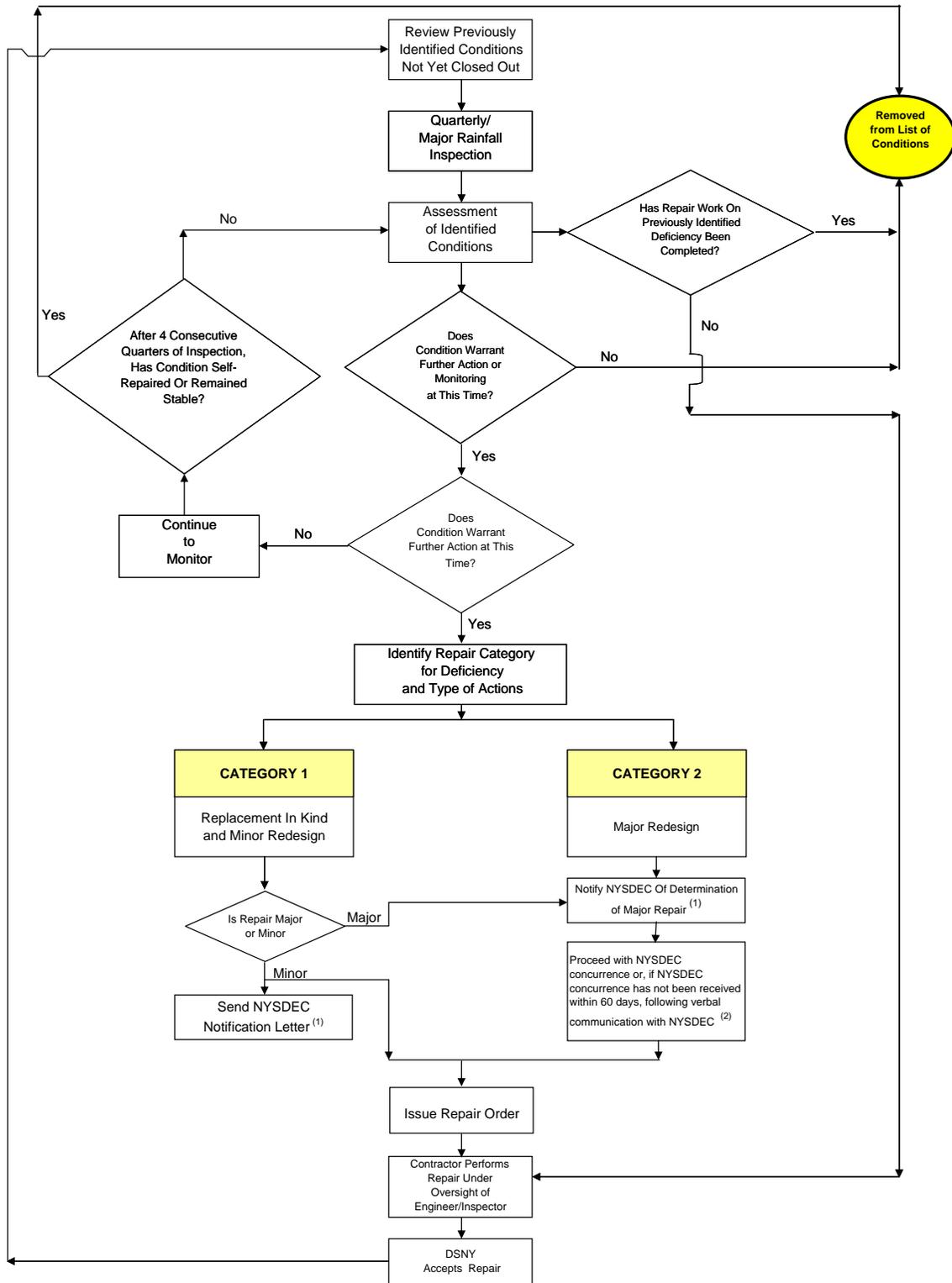
Typically, each landfill section will be divided into inspection areas of approximately 20-40 acres to facilitate the inspection process. A drawing of the inspection areas will be provided with each quarterly inspection report; inspection areas may or may not correspond to watersheds. However, assessment will be performed on a watershed basis to analyze possible links among various conditions identified within a watershed.

Inspection forms will be used to manage information collected during field inspections. Typical forms are included in this manual; future inspection forms may vary in format, but will contain similar information. In addition, the list of inspection items presented in Figure A2-2 provides a guideline for systematic inspection. Conditions identified during the inspection will be recorded on the forms using the item identification codes on the list. Elements for inspection include functionality as well as structural integrity. The elements on the list are divided into the following three aspects:

#### **Final Cover**

1. Final Cover Integrity
  
2. Final Cover Penetrations (LFG vents, LFG extraction wells, leachate recovery wells)

**Figure A2-1**  
**Flowchart of Post-Closure Final Cover Monitoring Procedures**



Note:

- (1) Notification may be included as part of the final cover inspection findings submitted to NYSDEC.
- (2) DSNY may proceed with proposed repairs or actions without NYSDEC approval after 60 days of notification to NYSDEC. If NYSDEC approval has not been received within 60 days, DSNY will initiate verbal communications with NYSDEC prior to starting work on a major repair. NYSDEC may advise DSNY that additional time is needed for review and approval.

**Figure A2-2  
FRESH KILLS LANDFILL POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS  
INSPECTION ITEM LIST**

Fresh Kills Landfill POST-CLOSURE O&M: - ITEM LIST -	
<b>1. FINAL COVER INTEGRITY</b>	
1A	Limited Accessibility and Visibility
1B	Bare Spots
1C	Exposed Liner
1D	Seeps
1E	Erosion Rills, Washouts
1F	Sloughing/ Subsidence
1G	Ponding, Local Settlement
1H	Other:
<b>2. FINAL COVER PENETRATIONS (LFG Vents, LFG Extraction Wells, Leachate Recovery Wells)</b>	
2A	Visible Gap
2B	Seeps
2C	Odor
2D	Damage to Well/Vent Structure
<b>3. FINAL COVER/FLARE PAD CONNECTION</b>	
3A	Settlement
3B	Damage to Geomembrane
3C	Other:
<b>4. BUILT STRUCTURES (Swales, Swale Embankments, Gabion Downchutes, Service Spillways, Emergency Spillways)</b>	
4A	Discontinuation / Erosion/ Breakage of Structure
4B-i	Damage Due to Vandalism
4B-ii	Damage Due to Overgrown Vegetation
4B-iii	Damage Due to Other:
4C	Settlement
4D	Vertical/ Horizontal Misalignment
4E	Reverse Pitch/ Ponding
4F-i	Washouts into Swale
4F-ii	Washouts out of Swale
4G	Other:
<b>5. PREFABRICATED PARTS (Downchute Pipes, Slotted Inlets, Culverts)</b>	
5A-i	Blockage/Clogging by Vegetation
5A-ii	Blockage/Clogging by Sedimentation
5A-iii	Blockage/ Clogging by Debris
5B	Vertical or Horizontal Misalignment
5C-i	Breakage/Damage Due to Wear
5C-ii	Breakage/Damage Due to Vandalism
5D	Other:
<b>6. WATER FLOW OBSTRUCTIONS</b>	
6A-i	Disturbance by Vegetation
6A-ii	Disturbance by Sedimentation
6A-iii	Disturbance by Debris
6A-iv	Disturbance by Other:
<b>7. OTHER OBSERVATIONS</b>	
7A	Drawing-Field Discrepancies
7B	Vectors
7C	Burrowing Animals
7D	Odor
7E	Post Closure Activities
7F	Other:

<u>LEGEND</u>	
Boundary of Solid Waste Management Unit	
Limit of Final Cover Type	
LFG Extraction Well/ Monitoring Well	 EX
LFG Vent	 V
Boundary of Watershed Areas	
Drainage Swale	
<b><u>ABBREVIATIONS AND CODES</u></b>	
IN	= INLET
SW	= SWALE
DC	= DOWNCHUTE
CL	= CULVERT
FC	= FINAL COVER
FCS	= FINAL COVER SOUTH

### 3. Final Cover/Flare Pad Connection

#### Drainage

4. Built Structures (swales, swale embankments, gabion downchutes, service spillways, emergency spillways)
5. Water Flow Obstructions
6. Prefabricated Parts (downchute pipes, slotted inlets, culverts)

#### Other

7. Other Observations

As stated above, inspections will be performed on a quarterly basis and following major rainfall events (5-year storms or larger). The 5-year, 24-hour storm for Staten Island, New York, is 4.75 inches. Rainfall data for determining whether a 5-year storm has occurred will be obtained from the on-site weather station, the National Oceanic and Atmospheric Administration (NOAA) weather station at Newark Airport, or other accessible sources. Depending on when the major rainfall event occurs in relation to the projected inspection schedule, the major rainfall inspection may take the place of that quarter's regular quarterly inspection. In order to check for significant damage as a result of the major storm event, the format of a major rainfall inspection may differ from a regular quarterly inspection. A major rainfall inspection will target drainage-related deficiencies that are deemed by the assessment engineer following regular quarterly inspection to be particularly susceptible to storm damage. However, other incidental field observations will also be recorded during major storm inspections.

The inspection approach will vary seasonally to take advantage of applicable site conditions. During winter and early spring inspections, vegetation is sparse and ground conditions are more evident. During summer, changes in vegetation can be an indicator of certain field conditions, e.g., a stand of vegetation that is not uniform may reflect inadequate drainage conditions, and dead vegetation may be an indicator of landfill gas emissions. Mowing of grass will not be performed on a periodic, but on an as-needed basis, and will be determined by the assessment engineer as a result of the findings from each quarterly inspection. DSNY will ensure the site condition is maintained so that adequate inspection can be performed to meet the applicable regulatory requirements.

#### **A2.1.2 Follow-up Action**

As illustrated in Figure A2-1, different types of conditions will require different follow-up actions, depending on their cause, scope, and severity. Conditions that are deemed significant by the assessment engineer can be divided into the following three general categories:

1. **Replacement in kind or minor redesign.** When feasible, deficiencies will be repaired by replacement in kind to re-establish the original design conditions. Two examples are a significant erosion rill on the landfill sideslope and a breach in a drainage swale embankment. In other cases, a minor redesign to match the performance of the original design may be required due to changes in site conditions or original materials no longer being available. Replacement of an erosion matting-lined swale with a rip-rap-lined swale, and replacement of a 36-inch diameter culvert with two 24-

inch diameter culverts are examples of minor redesigns.

2. **Major redesign.** Repairs requiring major redesign involve additional investigations and extensive design efforts, as a result of latent defects in the original design, large-scale changes in site conditions, or modifications in site use. In certain cases, an additional contractor may need to be engaged in order to perform the investigation and/or design work. An example of a condition requiring major redesign is a modification in site use involving construction of a new road on the landfill surface.

3. **Continued monitoring.** In some cases, the assessment engineer may find that additional observation is needed to determine the follow-up action. After several quarters of monitoring, a determination will be made whether repair is necessary. If, after four consecutive quarters of inspection, the condition has either self-repaired or remained stable, it will be removed from the list of conditions and will no longer be tracked.

### **A2.1.3 Maintenance and Tracking of Repairs**

Repairs will be divided into two categories: major repair and minor repair. As illustrated in Figure A2-1, major repairs will include all major redesigns as well as replacements in kind or minor redesigns that involve penetration of geomembrane or other breach of final cover integrity, or are otherwise deemed major by NYSDEC. All other repairs will be considered minor.

After identified conditions are assessed and categorized by the assessment engineer, DSNY will notify NYSDEC of all conditions that are determined to need repair. DSNY will proceed with minor repairs without NYSDEC approval, whereas DSNY will provide a 60-day NYSDEC response time for major repairs. If NYSDEC approval for a major repair has not been received within 60 days, DSNY will initiate verbal communications with NYSDEC prior to starting work. NYSDEC may advise DSNY that additional time is needed for review and approval.

All identified field conditions will be summarized on a tracking form; a typical tracking form is included as Figure A2-3. The follow-up actions and repair category for each identified condition will be determined and included on the tracking form. Identified conditions may be grouped together as one action item for follow-up actions or repairs, if appropriate. Also included on the tracking form will be the notification date, design submission date, NYSDEC approval date, and field work date for the major repairs. The form will be included in the quarterly inspection report.

Once the maintenance or repair work is completed, documentation will be submitted to DSNY for acceptance. The deficiency can be closed and therefore removed from the list of conditions being tracked once the repair is confirmed through a final round of inspection and assessment.

Figure A2-3  
 FRESH KILLS LANDFILL POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS  
 INSPECTION TRACKING FORM

ASSESSMENT ENGINEER \_\_\_\_\_ ASSESSMENT DATE \_\_\_\_\_ INSPECTION DATE \_\_\_\_\_ YEAR - QUARTER - LF SECTION \_\_\_\_\_ 'A': \_\_\_\_\_ 'B': \_\_\_\_\_  
 INSPECTORS' NAMES

CONDITION #	ITEM NO. (from list)	CONDITION DESCRIPTION	No Further Action (NFA)	Target in Storm Event (SE)	FOLLOW UP ACTION LEVEL				REPAIR CATEGORY		NYSDEC Notification Date	Condition Closure Date	COMMENTS
					Continue Monitor (CM)	Replacement in Kind (RIK)	Minor Redesign (MNRD)	Major Redesign (MJRD)	Minor Repair	Major Repair			
										Design Submission Date:			
										NYSDEC Approval Date:			
										Verbal Communication to NYSDEC (If Applicable):			
										Field Work Date:			
										Design Submission Date:			
										NYSDEC Approval Date:			
										Verbal Communication to NYSDEC (If Applicable):			
										Field Work Date:			
										Design Submission Date:			
										NYSDEC Approval Date:			
										Verbal Communication to NYSDEC (If Applicable):			
										Field Work Date:			
										Design Submission Date:			
										NYSDEC Approval Date:			
										Verbal Communication to NYSDEC (If Applicable):			
										Field Work Date:			
										Design Submission Date:			
										NYSDEC Approval Date:			
										Verbal Communication to NYSDEC (If Applicable):			
										Field Work Date:			

DSNY REVIEW AUTHORIZATION \_\_\_\_\_ NAME, TITLE \_\_\_\_\_ DATE \_\_\_\_\_

## **A2.2 FINAL COVER SYSTEM MONITORING AND MAINTENANCE**

### **A2.2.1 Final Cover Monitoring**

As listed on the inspection item list (Figure A2-2), visual inspection of the final cover will address the following conditions that may compromise the integrity of the final cover at specific penetration points, elsewhere on the landfill surface, or at the connection of the final cover and landfill gas flare pad. In addition, a general observation category is provided for other miscellaneous conditions.

#### **Final Cover Integrity**

- Limited Accessibility and Visibility
- Bare Spots
- Exposed Liner
- Seeps
- Erosion Rills, Washouts
- Sloughing/Subsidence
- Ponding, Local Settlement
- Other

#### **Final Cover Penetrations (LFG vents, LFG extraction wells, leachate recovery wells)**

- Visible Gap
- Seeps
- Odor
- Damage to Well/Vent Structure

#### **Final Cover/Flare Pad Connection**

- Settlement
- Damage to Geomembrane
- Other

#### **Other Observations**

- Drawing-Field Discrepancies
- Vectors
- Burrowing Animals
- Odor
- Post-Closure Activities
- Other

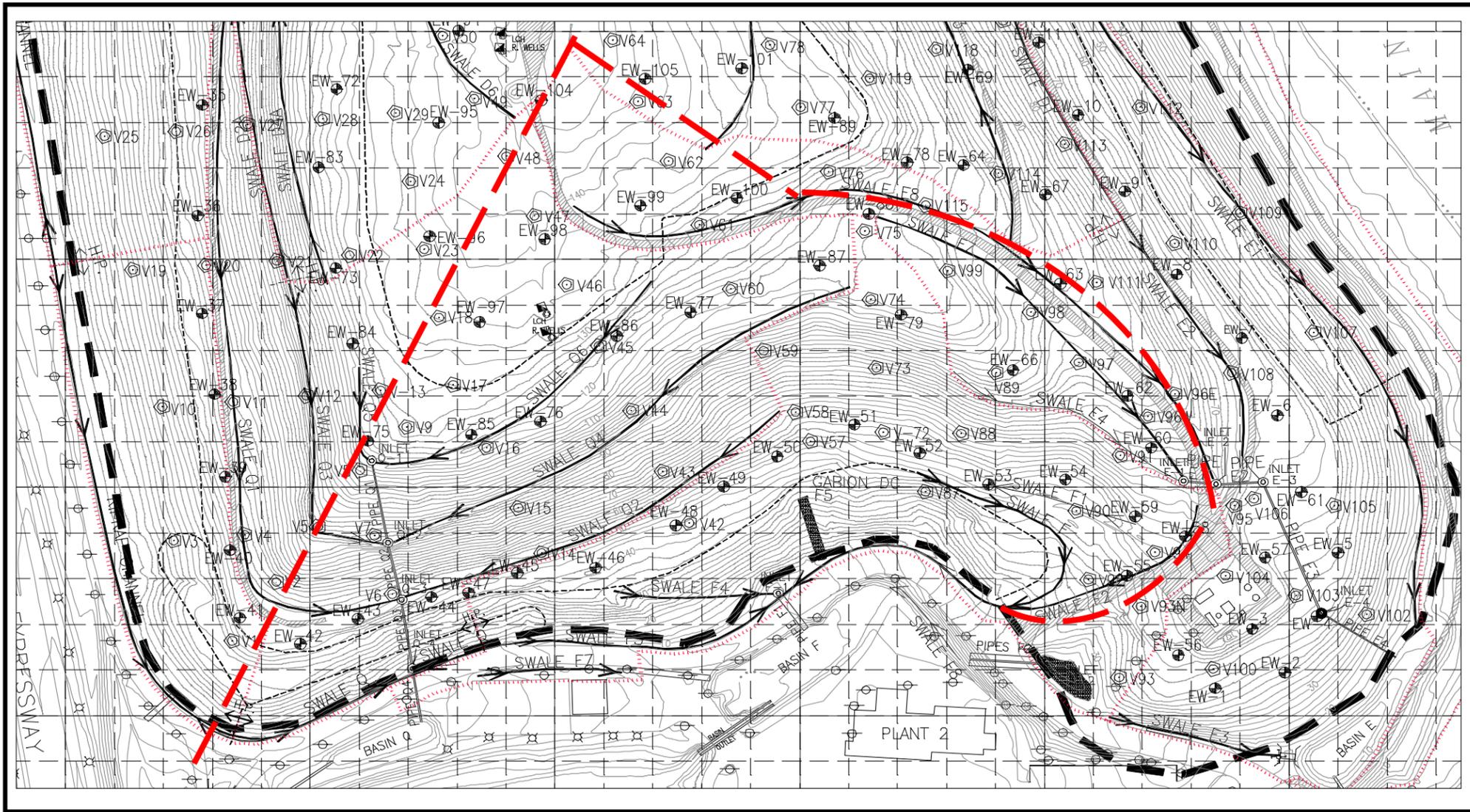
As discussed above, the assessment engineer will lay out the inspection route for each inspection area in advance. During the inspection round, the actual route will be noted on field drawings. Figure A2-4 is a typical final cover inspection form, incorporating a drawing of the inspection area. General information to be recorded on the final cover inspection form will include the following:

- Inspectors' Names
- Inspection Date
- Inspection Start Time

**Figure A2-4**  
**FRESH KILLS LANDFILL POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS**  
**FINAL COVER INSPECTION FORM**

Inspector Name- 'A' \_\_\_\_\_ Date \_\_\_\_\_  
 \_\_\_\_\_ YEAR / QUARTER  Quarterly Inspection  Storm Event Inspection  Other Inspection \_\_\_\_\_

Section 3/4 \_\_\_\_\_ Final Cover: Area 34-S  
 Landfill Section \_\_\_\_\_ (Watersheds 'Q', 'F')  
 Inspection Area \_\_\_\_\_ 2001-A-34-FCS-A  
 Designation \_\_\_\_\_ Inspection Form # \_\_\_\_\_  
 Temperature \_\_\_\_\_ Last Rain Event \_\_\_\_\_ Extreme Weather Cond. \_\_\_\_\_  
 Time Start \_\_\_\_\_ Time Finish \_\_\_\_\_



GRID SCALE: 100'x100'

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

This form shall be approved by the assessment engineer after completion by inspector \_\_\_\_\_ ASSESSMENT ENGINEER INITIALS \_\_\_\_\_

CONDITION NO. : 2001-A-34-FCS-A ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FCS-A ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FCS-A ITEM NO. (from list): Descrip. / measurement/photos/attach.:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FCS-A ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:
CONDITION NO. : 2002-D-34-FCS-A ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:

- Inspection Finish Time
- Quarterly Inspection/Storm Event Inspection/Other (e.g., Emergency)
- Inspection Year/Quarter
- Landfill Section
- Inspection Area Designation
- Inspection Form No.
- Temperature
- Last Rain Event Date
- Extreme Weather Condition

Each form will include a description of any conditions observed during the inspection, such as the nature of the condition and approximate dimensions. The location of each condition will be marked on the accompanying drawing of the inspection area. When photographs are taken, ID numbers of photographs taken of each observed condition will be included in the inspection form.

Findings from final cover inspection forms will be transferred to tracking forms during the assessment phase. As shown on the typical tracking form included as Figure A2-3, the follow-up action level for each identified condition will be determined by the assessment engineer and included on the tracking form.

#### **A2.2.2 Final Cover Maintenance**

The overall objective of any maintenance of the final cover system will be to maintain the integrity and effectiveness of the final cover system. Any repairs to the final cover system will be made based on recommendations issued during the assessment stage. Repairs to final cover will be made in accordance with design specifications or as otherwise determined by the assessment engineer. In general, the materials used for final cover repair will match the materials used during original construction. If the material originally specified is no longer available, the material used for repairs will match the performance of the original.

The critical maintenance items for the final cover system can be generally separated into the following conditions, which may be identified during inspection:

- Bare Spots and Stressed Vegetation (see Section A2.2.2.1)
- Repairs to Geomembrane Liner (see Section A2.2.2.2)
- Seeps (see Section A2.2.2.3)
- Erosion (see Section A2.2.2.4)
- Sloughing (see Section A2.2.2.5)
- Settlement and Surface Water Ponding (see Section A2.2.2.6)
- Animal Burrowing (see Section A2.2.2.7)
- Vandalism and Unauthorized Dumping (see Section A2.2.2.8)

### **A2.2.2.1 Bare Spots and Stressed Vegetation**

Sparsely vegetated areas will be revegetated during the current or next planting season, as appropriate. If seeding is not possible due to seasonal constraints, erosion control measures, such as hay bales, silt fences, jute mesh, mulch or other appropriate materials, may be installed above the sparsely vegetated area to help control erosion until such time as vegetation can be established.

When vegetative stress is observed, visually check for cause (e.g., gas odors, leachate seepage, insect infestation or extreme dry periods). If vegetation is stressed due to lack of water (e.g., during drought conditions) and the stand does not reestablish itself within two months, reseed the affected area during the next planting season. Refer to the final cover specifications for topsoil, seed mix, planting criteria, and planting seasons. If vegetation is stressed due to leachate seepage, refer to Section A2.2.2.3 of this attachment for repair requirements. If vegetation is stressed due to leakage of landfill gas, the leakage will be repaired in accordance with operation and maintenance procedures for the landfill gas collection and control system. Vegetative stress resulting from other causes will be dealt with in consultation with a qualified horticulturist.

Trees or brush found growing on the final cover generally will not be removed unless they cause other problems such as blockage of a swale or other drainage structure, interference with access, or erosion. In case of such conditions, cut the trees or brush above the roots. Replace topsoil if necessary and compact. Reseed in accordance with specifications.

### **A2.2.2.2 Repairs to Geomembrane Liner**

Repairs to geomembrane liner will be made in accordance with final cover specifications or as otherwise determined by the assessment engineer. As shown on Sheets 19-3, 19-4, 28-2, 34-2, 67-3, and 67-4 of the attached monitoring and maintenance operations drawings, several different final cover types have been used at each landfill section. In general, the materials used for liner repair (e.g., geomembrane, geotextiles or geocomposites used for drainage layers or gas venting layers, barrier protection material, or low-permeability soil hydraulic barrier layers) will match the materials used during final cover construction in that area. If the material originally specified is no longer available, the material used for repairs will match the performance of the original.

If a section of geomembrane liner is determined to need repair or replacement, repairs will be made such that the new geomembrane liner overlaps the existing geomembrane liner and seams are welded. All welding of geomembrane must be performed in accordance with final cover specifications.

Erosion control measures, such as hay bales, silt fences, jute mesh, mulch or other appropriate materials, may be installed above the area to be repaired to help control erosion until the repair is completed and vegetation can be established. Barrier protection layer soil and topsoil will be placed in accordance with specifications to match the surrounding grade. Reseeding will be performed in accordance with final cover specifications.

### **A2.2.2.3 Seeps**

The locations of all seeps will be recorded during inspection and marked on the inspection drawing. It should be noted that many seeps are not leachate; they may be groundwater discharge from the subsurface drainage layer. However, in certain cases, groundwater seeps may indicate inadequate subsurface drainage. Liquid from seeps will be field-screened for conductivity. If the conductivity reading is similar to that of leachate currently being collected from the landfill, a sample of the liquid will be collected and analyzed for leachate indicator parameters (including ammonia, biochemical oxygen demand (BOD), total Kjeldahl nitrogen (TKN) and alkalinity). The analytical results will be compared by the assessment engineer to existing leachate and surface water test results from the area of the seep to evaluate presence of leachate. If the results from the seep are similar to those of leachate, the source of the leachate must be identified. If the analytical results do not indicate that the liquid is leachate, the assessment engineer will determine whether other follow-up action is necessary.

The sources of leachate seeps are usually near penetrations through the geomembrane (e.g., a landfill gas extraction well or leachate recovery well). Since breaks in the geomembrane are generally accompanied by leakage of landfill gas, detection of landfill gas may indicate the source of a leachate seep. Various gas monitoring instruments can be utilized to detect landfill gas escaping through such breaches or in adjacent soil gas. Landfill gas (LFG) in any significant concentration, as indicated by a methane concentration above the permit limit of 500 ppm (as per NYSDEC Air Permit for surface monitoring) in the soil above a geomembrane suggests a breach in the geomembrane. **Once the source of leakage has been located, hand-excavate materials to the level of the geosynthetics following the seepage path, and check the integrity of the membrane liner at the point of seepage origin.** Care should be exercised in order not to damage geosynthetics during uncovering operations.

If the membrane liner is damaged, follow steps for repair damage to the geomembrane liner in Section A2.2.2.2 of this attachment.

### **A2.2.2.4 Erosion Damage**

Erosion rills that are less than 6 inches deep and vegetated will require no maintenance, whereas erosion rills that are less than 6 inches deep and devegetated will be reseeded. Other erosion rills will be repaired in accordance with final cover specifications (i.e., replacement in kind) or as otherwise determined by the assessment engineer. Erosion control measures, such as hay bales, silt fences, jute mesh, mulch, or other appropriate materials, may be installed as necessary above the area to be repaired to help control erosion until the repair is completed and vegetation can be established.

Erosion may indicate that some portion of the drainage system is not functioning correctly. Examples of this condition could be sediment impeding water flow through swales or downchutes, blockage of water inflow through the openings of downchutes or inlets or differential settlement along swales contributing to stormwater overtopping the drainage systems. Any such malfunctioning of the drainage system will be identified and corrected as detailed in Section A2.3 of this attachment.

In areas of intense or repeated erosion, further investigation may indicate changes to the plant mixture or use of stone or rip-rap in place of vegetative cover.

### **A2.2.2.5 Sloughing**

Sloughing is generally caused by insufficient drainage, either at the surface or in the subsurface

drainage layer. Any instances of sloughing will be monitored for at least three consecutive quarterly monitoring rounds to determine if the sloughed area stabilizes or continues to progress. If the sloughed area is stable, repairs will involve regrading with clean fill and/or topsoil, compacting, and reseeding.

If the sloughing continues to progress, additional steps must be taken to stabilize the cover soil. These steps may include the following:

- Modifying the grading in and around the sloughed area to improve surface drainage.
- Improving subsurface drainage by adding a subsurface drain pipe that discharges to the surface drainage system.
- Changing the plant mixture to reinforce the soil.

#### **A2.2.2.6 Settlement and Surface Water Ponding**

If settlement is uniform (i.e., over a large areal extent and not noticeable except by survey), no repair will be required. Ponding of water on the landfill surface indicates non-uniform or differential settlement. Repair of minor and major settlement will not be required unless the settlement results in sustained ponding of water, impeded surface water runoff or health and safety hazards to personnel. If runoff is affected, with ponded water over an area of more than 500 square feet (e.g., a rectangular area larger than 25 feet by 20 feet) and a depth of 12 inches or more, repair will be made in accordance with final cover specifications or as otherwise determined by the assessment engineer.

Repairs generally will include clearing of vegetation, if any, filling with replacement soils to match final cover specifications, and reseeding. Erosion control measures, such as hay bales, silt fences, jute mesh, mulch, or other appropriate materials, may be installed as necessary above the area to be repaired to help control erosion until the repair is completed and vegetation can be established.

Any instances of severe and abrupt differential settlement that could impact the integrity of the geomembrane liner will be investigated. Visual observation of the final cover ground surface will be used to locate areas of major differential settlement. In general, liner repair will be initiated when the calculated liner strain exceeds 10%, though the threshold may differ depending on the type of geomembrane used in the area in question. Depths required to mobilize 10% liner strain for various diameter depressions are shown in Table A2-1. These depths and diameters can be used as a guideline to assess the need for liner repair. Repairs to the geomembrane liner are discussed in Section A2.2.2.2 of this attachment. Ponded water will be transferred to nearby swales and downchutes by pumping or other appropriate means as necessary before making repairs.

**TABLE A2-1**  
**Depression Diameter vs. Depression Depth Required to**  
**Mobilize 10% Strain in Cover System Geosynthetics**

Diameter (feet)	Depth (feet)
5	0.98
10	1.97
15	2.95
20	3.94
25	4.94
30	5.90
35	6.88
40	7.87
45	8.85
50	9.84

**A2.2.2.7 Animal Burrowing**

Animal burrow holes will be monitored for at least three quarterly rounds to determine if the conditions worsen. In general, animal burrow holes do not compromise the integrity of the geomembrane liner and will not require repair. Excessive animal burrow holes that lead to significant erosion will be repaired in the same manner as erosion rills (see Section A2.2.2.4, above). If significant damage is observed, an exterminator may also be contracted to evict burrowing animals.

**A2.2.2.8 Vandalism and Unauthorized Dumping**

On-site security personnel will be informed of the location and date of detection of any occurrences of vandalism or unauthorized dumping. Any waste resulting from unauthorized dumping must be disposed of off-site in accordance with all applicable regulations. Damage resulting from vandals will be repaired to original condition.

**A2.2.3 Monitoring and Maintenance of Final Cover at Flare Pad**

Visual field inspection of the flare pad and surrounding service road will be performed on a quarterly basis, as part of the final cover inspection. The purpose of the inspection is to evaluate the impact of settlement on flare pad access and, where applicable, the integrity of the flare pad/final cover system connection. If significant settlement interfering with either access or the flare pad/cap system connection is observed, the assessment engineer will review and may re-inspect the condition. If deemed necessary by the assessment engineer, appropriate maintenance activities will be initiated. These activities may include backfilling the service road to meet the top of the flare pad slab elevation and repairing any damage to the underlying geomembrane final cover system.

Flare pads are located at Sections 2/8, 3/4, and 6/7. At Section 2/8, the flare pad is located outside the limit of final cover. At Section 6/7, the final cover system is connected to the flare pad by a batten strip connection; a typical detail of this connection is provided in Figure A2-5. Inspection of the batten strip connection will focus on whether or not settlement has damaged the geomembrane/flare pad connection, and whether or not stress is being imposed onto the geomembrane. Should it be determined that damage has occurred to the geomembrane liner and/or the connection, the area adjacent to the damage will be excavated and repaired to meet the performance requirements of original construction and material specifications. In addition, the road will be backfilled with like material to meet the top of the flare pad slab elevation.

A typical flare pad inspection form, including an area-specific map showing the flare pad area to be inspected, is presented in Figure A2-6. Applicable items from the inspection item checklist (Figure A2-2) will be noted on the form.

#### **A2.2.4 Monitoring and Maintenance of Perimeter Landfill Gas Interceptor Venting System**

The condition of the visible portion of the perimeter landfill gas interceptor venting system will be inspected quarterly, in conjunction with quarterly landfill gas migration monitoring. The venting system will be inspected for conditions that interfere with its capacity to allow landfill gas to vent. Specific items to be inspected include:

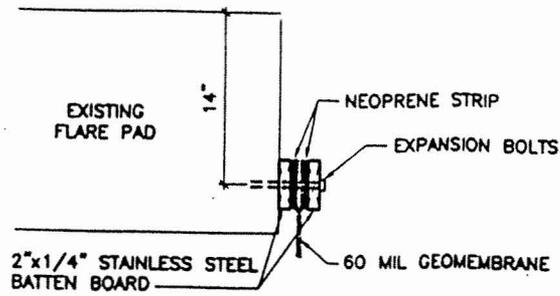
- Silting
- Excessive vegetative growth

A typical inspection form to be used for inspection of the perimeter interceptor venting system, including an area-specific map of the segment to be inspected, is presented in Figure A2-7. Any damage to the interceptor venting system will be noted by the field inspectors and reviewed by the assessment engineer to determine if repairs are necessary. Repairs may include removal of silt or vegetation, and replacement of stone.

### **A2.3 DRAINAGE SYSTEM MONITORING AND MAINTENANCE**

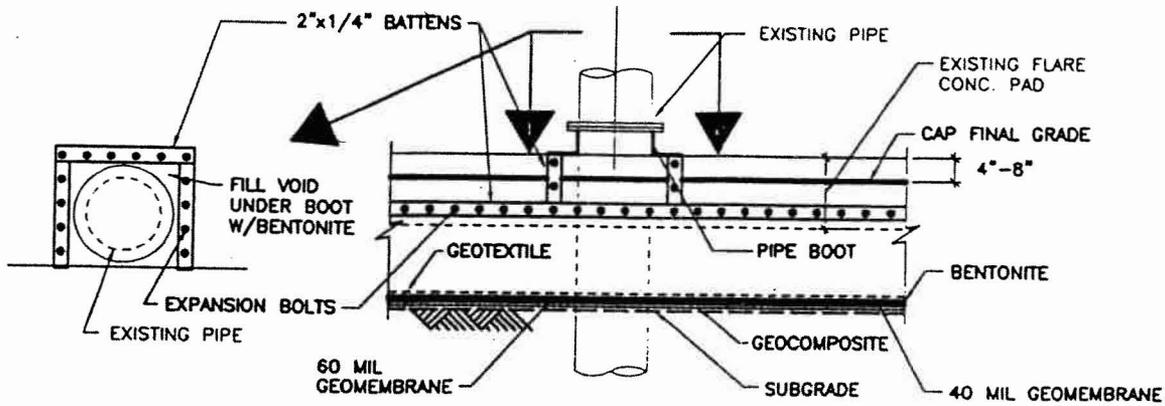
#### **A2.3.1 Drainage System Monitoring**

Inspection of the drainage structures will be conducted in conjunction with inspection of the final cover system, i.e., quarterly and after major rainfall events (5-year storms or larger). As stated in Section A2.1.1, the major rainfall inspection may take the place of that quarter's regular quarterly inspection, depending on when the major rainfall event occurs in relation to the projected inspection schedule. In order to check for significant damage as a result of the major storm event, the format of a major rainfall inspection may differ from a regular quarterly inspection. A major rainfall inspection will target drainage-related deficiencies that are deemed by the assessment engineer following regular quarterly inspection to be particularly susceptible to storm damage. However, other incidental field observations will also be recorded during major storm inspections.



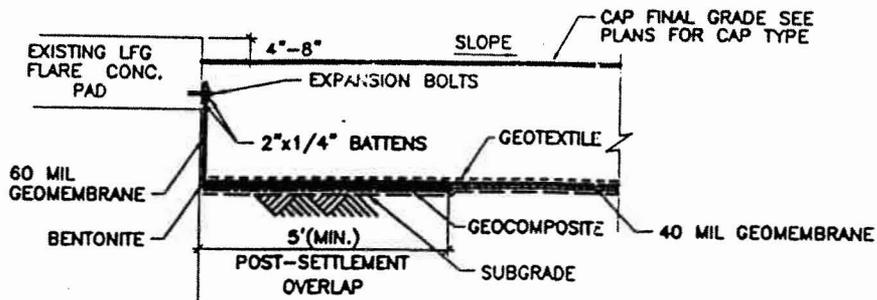
**TYPICAL BATTEN STRIP CONNECTION DETAIL**

SCALE: 1 1/2"=1'-0"



**FLARE PAD EXISTING PIPE CONNECTION DETAIL**

SCALE: 1/2"=1'-0"



**FLARE PAD/FINAL COVER CONNECTION DETAIL**

SCALE: 1/2"=1'-0"

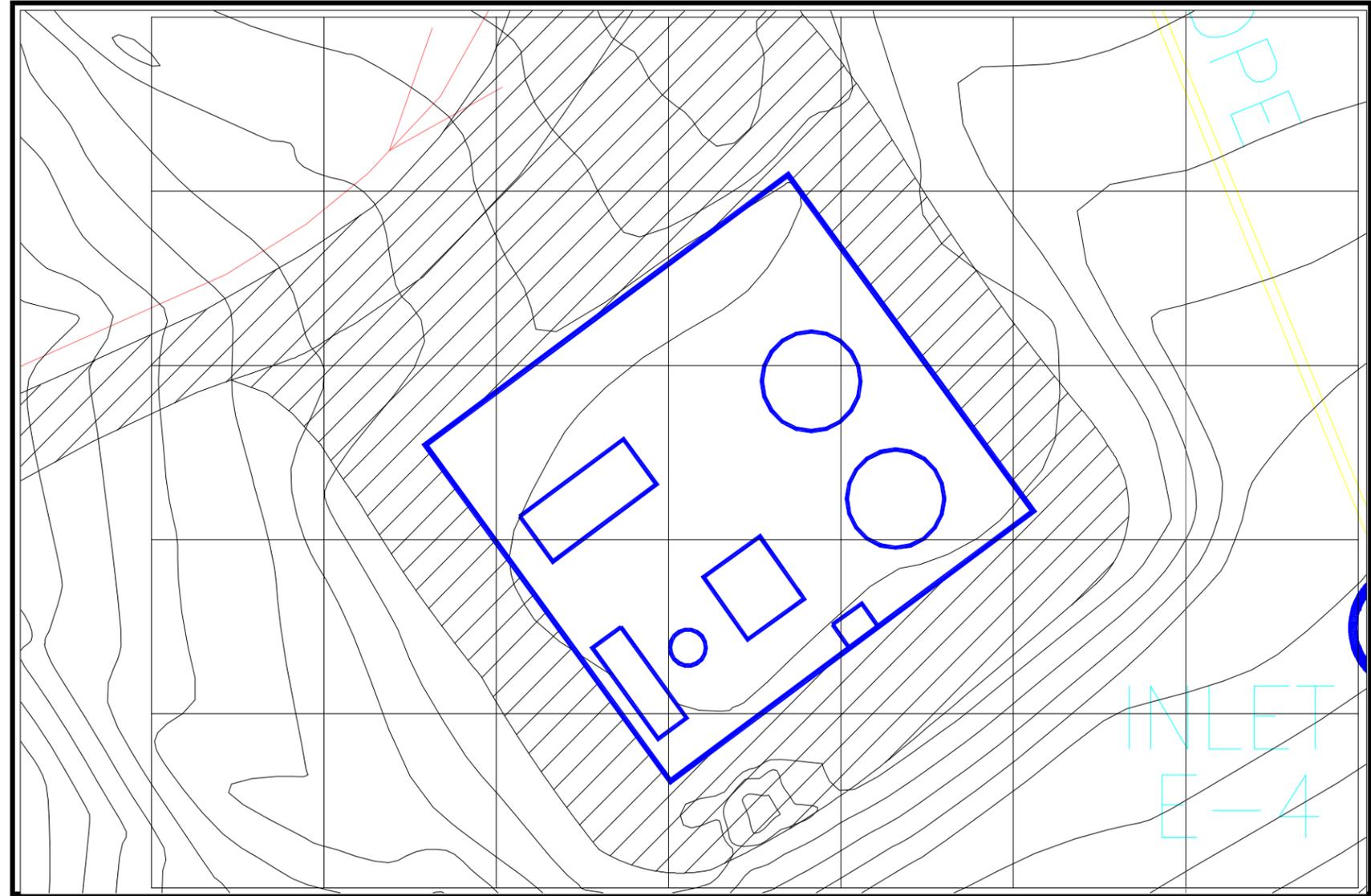
NEW YORK CITY  
 DEPARTMENT OF SANITATION  
 FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 DETAILS OF FINAL COVER CONNECTION  
 AT FLARE PAD, SECTION 6/7

FIG. NO. A2-5

**Figure A2-6  
FRESH KILLS LANDFILL POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS  
FLARE PAD INSPECTION**

Inspector Name \_\_\_\_\_ Date \_\_\_\_\_  Quarterly Inspection  Storm Event Inspection  Other Inspection \_\_\_\_\_  
YEAR / QUARTER

Section 3/4 \_\_\_\_\_ Flare Pad - Section 3/4 \_\_\_\_\_ 2001-A-34-FP \_\_\_\_\_  
 Landfill Section \_\_\_\_\_ Inspection Area \_\_\_\_\_ Inspection Form # \_\_\_\_\_ Temperature \_\_\_\_\_ Last Rain Event \_\_\_\_\_ Extreme Weather Cond. \_\_\_\_\_  
 Designation \_\_\_\_\_ Time Start \_\_\_\_\_ Time Finish \_\_\_\_\_



GRID SCALE: 50'x50'

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

This form shall be approved by the assessment engineer after completion by inspector

ASSESSMENT ENGINEER INITIALS \_\_\_\_\_

CONDITION NO. : 2001-A-34-FP ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FP ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FP ITEM NO. (from list): Descrip. / measurement/photos/attach.:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FP ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:
CONDITION NO. : 2001-A-34-FP ITEM NO. (from list): Location/ Description / Dimensions:  Photo/attach. #:

**Figure A2-7  
FRESH KILLS LANDFILL POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS  
PERIMETER LANDFILL GAS INTERCEPTOR VENTING SYSTEM**

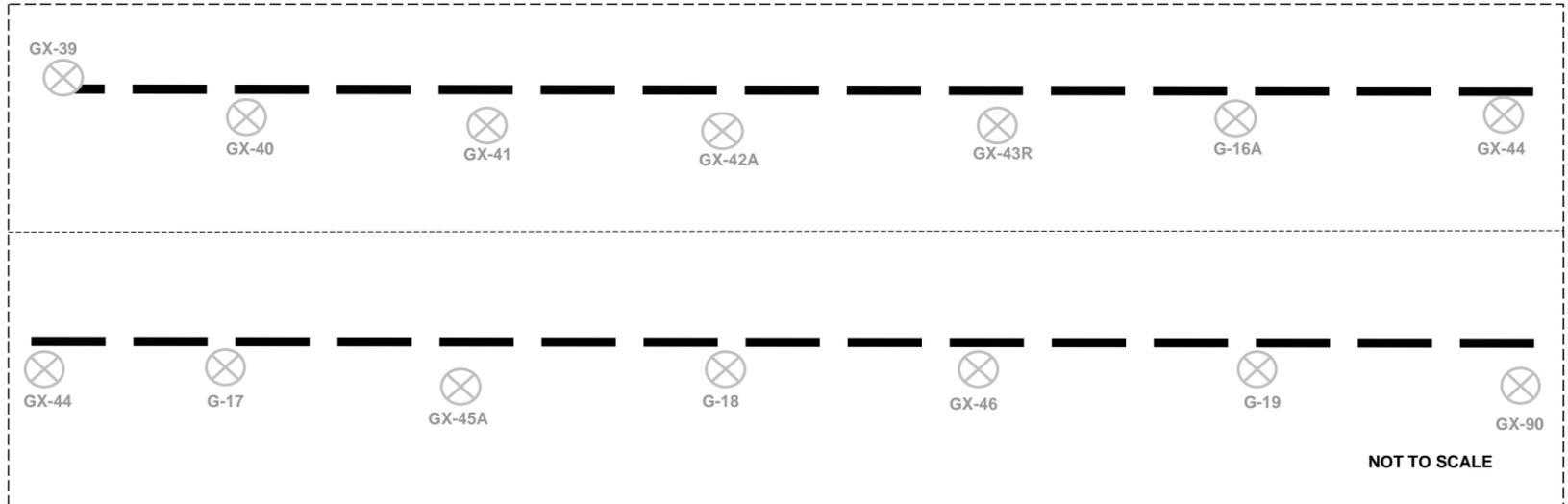
Inspector Name \_\_\_\_\_ Date \_\_\_\_\_  Quarterly Inspection  Storm Event Inspection  Other Inspection  
YEAR / QUARTER

Section 6/7 Landfill Section 67-PISV Inspection Area Designation 2001-D-67-PIVS- Inspection Form # Temperature Last Rain Event Extreme Weather Cond. Time Start Time Finish

*\* CHECK BOX IF NO CONDITIONS WERE DETECTED*

<b>RECORD CONDITIONS</b>	
COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	Photo/attach. #:
COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	Photo/attach. #:
COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	Photo/attach. #:

<b>RECORD CONDITIONS OF LANDFILL GAS PERIMETER INTERCEPTOR VENTING SYSTEM</b>		
COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:
Photo/attach. #:	Photo/attach. #:	Photo/attach. #:



<b>RECORD CONDITIONS OF LANDFILL GAS PERIMETER INTERCEPTOR VENTING SYSTEM</b>		
COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:	COND.NO. : 2001-D-67-PIVS- ITEM NO. (from list): Location/ Description / Dimensions:
Photo/attach. #:	Photo/attach. #:	Photo/attach. #:

This form shall be approved by the assessment engineer after completion by inspector

ASSESSMENT ENGINEER INITIALS \_\_\_\_\_

The list of inspection items presented in Figure A2-2 provides a guideline for systematic inspection. Conditions identified during the inspection will be recorded on inspection forms using the item identification codes on the list. A typical drainage inspection form, which includes a diagram showing drainage structures to be inspected, is presented as Figure A2-8. As with inspections of the final cover system, detailed description of any conditions observed during the inspection, including the nature of the condition, approximate dimensions of the observation, location with respect to known reference points, etc., will also be included on the form and noted on the drawing of the inspection area. When photographs are taken, ID numbers of photographs taken of each observed condition will be included in the inspection form.

Drainage structures at the Landfill include swales, culverts, gabion downchutes, downchute pipes, slotted inlets, drop-inlet boxes, and stormwater basins. Any conditions that interfere with a drainage structure's ability to convey and discharge stormwater flow will be noted during inspection on the inspection form and marked on the accompanying inspection drawing. A tracking form (see typical tracking form in Figure A2-3) will be used to summarize the identified conditions and the follow-up actions.

As listed on the inspection item list (Figure A2-2), visual inspection of the drainage system will address the following conditions that may interfere with a drainage structure's ability to convey and discharge stormwater flow:

Built Structures (swales, swale embankments, gabion downchutes, service spillways, emergency spillways)

- Discontinuation/Erosion/Breakage of Structure
- Damage Due to Vandalism
- Damage Due to Overgrown Vegetation
- Damage Due to Other
- Settlement
- Vertical/Horizontal Misalignment
- Reverse Pitch/Ponding
- Washouts into Swale
- Washouts out of Swale
- Others

Prefabricated Parts (downchute pipes, slotted inlets, culverts)

- Blockage /Clogging by Vegetation
- Blockage/Clogging by Sedimentation
- Blockage/Clogging by Debris
- Vertical or Horizontal Misalignment
- Breakage/Damage Due to Wear
- Breakage/Damage Due to Vandalism
- Other



## Water Flow Obstructions

- Disturbance by Vegetation
- Disturbance by Sedimentation
- Disturbance by Debris
- Disturbance by Other

Information to be recorded on the drainage inspection form will be similar to that recorded during final cover inspections, as detailed in Section A2.2.1. The location of each condition will be marked on the accompanying drawing of the inspection area. When photographs are taken, ID numbers of photographs taken of each observed condition will be included in the inspection form.

Findings from drainage inspection forms will be transferred to tracking forms during the assessment phase. As shown on the typical tracking form included as Figure A2-3, the follow-up action level for each identified condition will be determined by the assessment engineer and included on the tracking form.

### **A2.3.2 Drainage System Maintenance**

The overall objective of any maintenance of the drainage system will be to maintain the integrity of drainage structures to ensure positive drainage. Any repairs to the drainage system will be made based on recommendations issued during the assessment stage. Repairs to drainage structures will be made in accordance with design specifications or as otherwise determined by the assessment engineer. For instance, in the case of a severe washout of a grass or geosynthetic-lined swale, the appropriate remedy may be to line the swale with rip-rap. In general, the materials used for repair of a drainage structure will match the materials used during original construction of the structure. If the material originally specified is no longer available, the material used for repairs will match the performance of the original.

The critical maintenance items for the drainage system can be separated according to structure into the following components:

- Swales (see Section A2.3.2.1)
- Gabion Downchutes and Drop-Inlet Boxes (see Section A2.3.2.2)
- Prefabricated Parts (Downchute Pipes, Slotted Inlets, and Culverts) (see Section A2.3.2.3)
- Stormwater Basins (see Section A2.3.2.4)

#### **A2.3.2.1 Swales**

The overall objective of swale repairs will be to restore the functioning of the swale to ensure positive drainage. Guidelines for repair of typical conditions associated with swales are discussed below; however, the assessment engineer may determine that other repair methods are more appropriate based on specific field conditions.

### Settlement of Swale Structure

If the swale embankment has settled such that its ability to convey drainage is compromised, the swale embankment will be rebuilt according to original design specifications, unless otherwise determined by the assessment engineer.

### Erosion

For erosion rills that are less than 6 inches in depth and vegetated, no action will be required. Other erosion washouts will be repaired in accordance with final cover specifications or as otherwise determined by the assessment engineer. Erosion control measures, such as hay bales, silt fences, jute mesh, mulch, or other appropriate materials, may be installed as necessary above the area to be repaired to help control erosion until the repair is completed and the swale surface is restored to original design conditions (i.e., vegetation is re-established or rip-rap is replaced).

If a section of the swale embankment has been eroded such that the swale's ability to convey stormwater flow is compromised, the swale embankment will be restored to design conditions or as otherwise determined by the assessment engineer.

### Standing Water

If ponding is caused by accumulated material or other blockage, the obstruction will be removed and the swale surface will be restored to original design conditions as necessary. If standing water is observed and no obstruction is present, it may indicate differential settlement. In cases when ponding is greater than 6 inches deep and extends for more than 25 feet, the swale will be regraded to drain in conformance with minimum and maximum design grades.

### Overgrown Vegetation

Trees or brush growing in a swale that block the flow of drainage or compromise the integrity of the swale structure will be cut. After the vegetation is cut, the swale surface will be restored to original design conditions as necessary.

### Vandalism

Vandalism that impedes flow or otherwise interferes with proper functioning of the swale will be restored to original design conditions or as otherwise determined by the assessment engineer.

#### **A2.3.2.2 Gabion Downchutes and Drop-Inlet Boxes (Sections 1/9 and 6/7)**

The major objective of repairs to gabion downchutes and drop-inlet boxes will be to restore the structure's integrity so that stormwater flow is effectively conveyed from the swale to the stormwater basin. Maintenance guidelines for typical conditions observed at gabion downchutes and drop-inlet boxes are discussed below; however, the assessment engineer may determine that other repair methods are more appropriate based on specific field conditions.

### Discontinuation or Breakage of Structure

Any discontinuations or breakage of downchutes or drop-inlet boxes will be repaired to match design conditions. For example, if gaps or voids are observed within gabion structures, additional stone will be placed in gabion baskets to restore the profile of the structure. Broken gabion baskets will be repaired or replaced as necessary, unless otherwise determined by the assessment engineer.

### Deformation/Undermining of Structure

If the gabion structure is deformed or if a gap is observed underneath the structure, as a result of either settlement or erosion, the structure will be repaired as necessary to restore its integrity.

### Blockage

If accumulated material is observed restricting flow in the downchute or drop-inlet structure, the material will be removed. After the material is removed, the surface of the structure will be restored to original design conditions as necessary, unless otherwise determined by the assessment engineer.

### Overgrown Vegetation

Trees, brush, or other overgrown vegetation that impedes flow of stormwater through the downchute or drop-inlet structure will be removed as necessary. If necessary, additional stone will be placed in gabion baskets to restore the profile of the structure.

### **A2.3.2.3 Prefabricated Parts (Downchute Pipes, Slotted Inlets, and Culverts)**

The overall objective of repairs to downchute pipes, slotted inlets, and culverts will be to restore the integrity and functioning of the structure to ensure positive drainage. Maintenance guidelines for typical conditions associated with downchute pipes, slotted inlets, and culverts are discussed below; however, the assessment engineer may determine that other repair methods are more appropriate based on specific field conditions.

### Blockage or Clogging

Blockage or clogging of pipes and inlets may be caused by vegetation, sedimentation, or accumulated material. In each of these cases, if the blockage restricts flow of stormwater through the pipe or inlet, the material causing the blockage will be removed and disposed of appropriately. After the blockage is removed, soil or other material may be placed as necessary around the inlet or outlet of the pipe or slotted inlet.

### Vertical or Horizontal Misalignment

If misalignment of the pipe or inlet restricts the flow of stormwater, the pipe will be re-aligned as necessary to restore proper flow. Repair may involve excavation and repair of the downchute pipe, slotted inlet, or culvert, and shortening or lengthening of the downchute pipe or culvert if necessary.

### Breakage or Other Damage to Structure

Breakage or other damage to downchute pipes, inlets, or culverts may result from wear, vandalism, or other factors. In case of such breakage or other damage, the structure will be repaired or replaced as necessary to restore proper functioning.

#### **A2.3.2.4 Stormwater Basins**

The overall objective of maintenance of stormwater basins is to preserve the basins' capacity to receive and discharge stormwater flow from a 25-year storm. Maintenance guidelines for typical conditions associated with stormwater basins are discussed below; however, the assessment engineer may determine that other repair methods are more appropriate based on specific field conditions.

#### Basin Intake

Excessive build-up of silt or other material at the basin intake that significantly impairs the basin's capacity to receive stormwater flow will be removed.

#### Service Spillway/Emergency Spillway

Damage to the service spillway (i.e., riser pipe) or emergency spillway that significantly impairs the basin's capacity to discharge stormwater flow will be repaired. The nature of repair will be determined by the assessment engineer.

#### Accumulations in Basin

Accumulations of material (e.g., silt) inside basin that significantly impair the basin's capacity to convey stormwater flow will be removed as necessary to restore flow. Material removed will be properly disposed of away from the basin.

#### Outlet Structure

If blockage or damage is observed in the outlet structure, the blockage will be removed or damage repaired as necessary to restore the basin's ability to discharge flow.

### **A2.4 CONTINGENCY PLAN FOR FINAL COVER AND DRAINAGE SYSTEMS**

Contingencies associated with the final cover system may include major erosion problems, significant differential settlement, and fire. Responses to erosion and settlement problems are addressed in Sections A2.2.2.4 and A2.2.2.6, respectively. Contingencies involving major erosion problems or significant differential settlement generally will require major repairs. As discussed in Section A2.1.3, DSNY will notify NYSDEC of all conditions that are determined to need repair. DSNY will provide a 60-day NYSDEC response time for major repairs.

In cases of fires at the landfill, including ground fire, the New York City Fire Department will be notified. Once the Fire Department has fully extinguished the fire, the final cover will be inspected for the extent of damage. Areas where vegetation has been destroyed will be reseeded during the

current or next planting season, as discussed in Section A2.2.2.1, above. If seeding is not possible due to seasonal constraints, erosion control measures, such as hay bales, silt fences, jute mesh, mulch, or other appropriate materials, may be installed above the sparsely vegetated area to help control erosion until such time as vegetation can be established.

## **A2.5 REPORTING AND RECORD KEEPING**

Quarterly inspection reports and documentation of maintenance work will be maintained in the facility operating record. Records will include inspection forms, tracking forms, and related material that will include, at minimum, the information below:

- The date of each inspection.
- The name of the inspector.
- A description of the landfill features inspected.
- A description of any conditions observed during the inspection, including the nature of the condition, approximate dimensions of the observation, location with respect to known reference points, etc.
- The date and nature of any remedial actions implemented or repairs made as a result of the inspection.

Monitoring and maintenance drawings may be modified to reflect changed site conditions, as a result of maintenance activities or findings during field inspections. Any changes to the monitoring and maintenance drawings will be entered into the facility operating record. The monitoring and maintenance drawings current as of submittal of this Manual are bound separately with this attachment.

DSNY will retain records of all monitoring information (e.g., copies of field inspection notes, photographs, repair records, and other documentation) for at least seven years, in accordance with 360-1.14(i)(4). As stipulated in 360-2.15(k)(8), results of quarterly inspections and inspections after major rainfall events (5-year storm or greater) will be submitted to NYSDEC as part of the Landfill's registration renewal report as described in 360-2.15(1)(4).

FRESH KILLS LANDFILL  
STATEN ISLAND, NEW YORK

POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS MANUAL  
VOLUME A, ATTACHMENT 2  
FINAL COVER AND DRAINAGE SYSTEM DRAWINGS

DECEMBER 13, 2002

LIST OF DRAWINGS

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19-8	SECTION 1/9 - DRAINAGE DETAILS (SHEET 3 OF 3)				

PREPARED BY:  
ROY F. WESTON OF NEW YORK, INC.  
205 CAMPUS DRIVE  
EDISON, NJ 08837

WO NO. 02147-005-030-3209-02

UNDER THE SUPERVISION OF:  
THE CITY OF NEW YORK DEPARTMENT OF SANITATION  
44 BEAVER STREET  
NEW YORK, NEW YORK 10004

## REFERENCES

**NOTE:**

THIS DRAWING SET HAS BEEN COMPILED FOR THE PURPOSES OF POST-CLOSURE MONITORING AND MAINTENANCE. THE REFERENCES LISTED BELOW COMPRISE THE SOURCE DOCUMENTS FOR THE DRAWINGS IN THIS SET. IF ADDITIONAL DETAIL IS NEEDED, REFER TO THE SOURCE DOCUMENTS.

- A-2** AIR SURVEY CORP. DECEMBER 10, 2001 AERIAL PHOTOGRAPHY AND TOPOGRAPHIC SURVEY.
- F-21** FREDERIC R. HARRIS, INC. MARCH 1990. FINAL COVER CONSTRUCTION AND CERTIFICATION RESULTS – SECTION 2/8, 1989 CONSTRUCTION SEASON, REPORT VOLUME I
- F-22** FREDERIC R. HARRIS, INC. JULY 1990. FINAL COVER CONSTRUCTION AND CERTIFICATION RESULTS – SECTION 3/4, 1988, 1989, 1990 CONSTRUCTION SEASONS, REPORT VOLUME I
- I-35** INTERSTATE INDUSTRIAL CORP. JUNE 18, 1997. AS-BUILT OF FINAL COVER AND LANDFILL GAS EXTRACTION SYSTEM – SECTION 2/8. CAPITAL PROJ S197-242 – CONTRACT NO. 9458165
- M-11** MALCOLM PIRNIE. JANUARY 2001 FRESH KILLS LANDFILL – SECTION 6/7 FINAL COVER DESIGN REPORT APPENDIX D: ENGINEERING PLANS.
- P-39** PETOSA BROS. INC. JUNE 30, 1997. AS-BUILT OF FINAL COVER AND GAS EXTRACTION SYSTEM – SECTION 3/4. CAPITAL PROJ S197-242, CONTRACT NO. 9327735.
- S-32** SCS ENGINEERS, P.C. MARCH 15, 1994. FRESH KILLS LANDFILL FINAL COVER AND LANDFILL GAS EXTRACTION SYSTEM FOR SECTION 2/8.
- S-33** SCS ENGINEERS, P.C. MARCH 12, 1993. FRESH KILLS LANDFILL FINAL COVER AND LANDFILL GAS EXTRACTION SYSTEM FOR SECTION 3/4.
- T-1** TULLY CONSTRUCTION/MUNOZ ENGINEERING DECEMBER 20, 1999 CONSTRUCTION AS-BUILT DRAWINGS FRESH KILLS LANDFILL LEACHATE CONTROL SITEWORK AND APPURTENANCES CAPITAL PROJECT S111 AND S197, CONTRACT NO. 9699566.
- U-14** URS CORP. JANUARY 4, 2002 FRESH KILLS LANDFILL SECTION 1/9 FINAL COVER DESIGN REPORT APPENDIX D: ENGINEERING PLANS, OVERALL CONCEPTUAL DESIGN, URS CORP., JANUARY 4, 2002 APPENDIX D-2: ENGINEERING PLANS, RECLAMATION WORK PLAN, IT CORP., DECEMBER 20, 2001

## LEGEND AND SYMBOLS

-  60 GRADE CONTOUR AS SPECIFIED
-  SOLID WASTE MANAGEMENT UNIT UNIT BOUNDARY
-  FINAL COVER TYPE LIMIT
-  FENCE
-  SERVICE ROAD
-  RETAINING WALL
-  DRAINAGE SWALE
-  CULVERT
-  DOWNCHUTE (GABION)
-  DOWNCHUTE PIPE
-  GRAVEL TRANSITION FROM SWALE TO DOWNCHUTE
-  INLET STRUCTURE
-  EMERGENCY SPILLWAY
-  HIGH POINT
-  MANHOLE
-  STORM SEWER
-  BASIN INTAKE
-  RIPRAP PAD

F:\FreshKills\Closure Plan Dwg\LF-1.dwg

NO.	DATE	APPD	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

# FRESH KILLS LANDFILL STATEN ISLAND, NEW YORK POST-CLOSURE MONITORING AND MAINTENANCE OPERATIONS DRAWINGS

PREPARED BY:  
ROY F. WESTON OF NEW YORK, INC.  
205 CAMPUS DRIVE  
EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
CITY OF NEW YORK DEPARTMENT OF SANITATION  
NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL

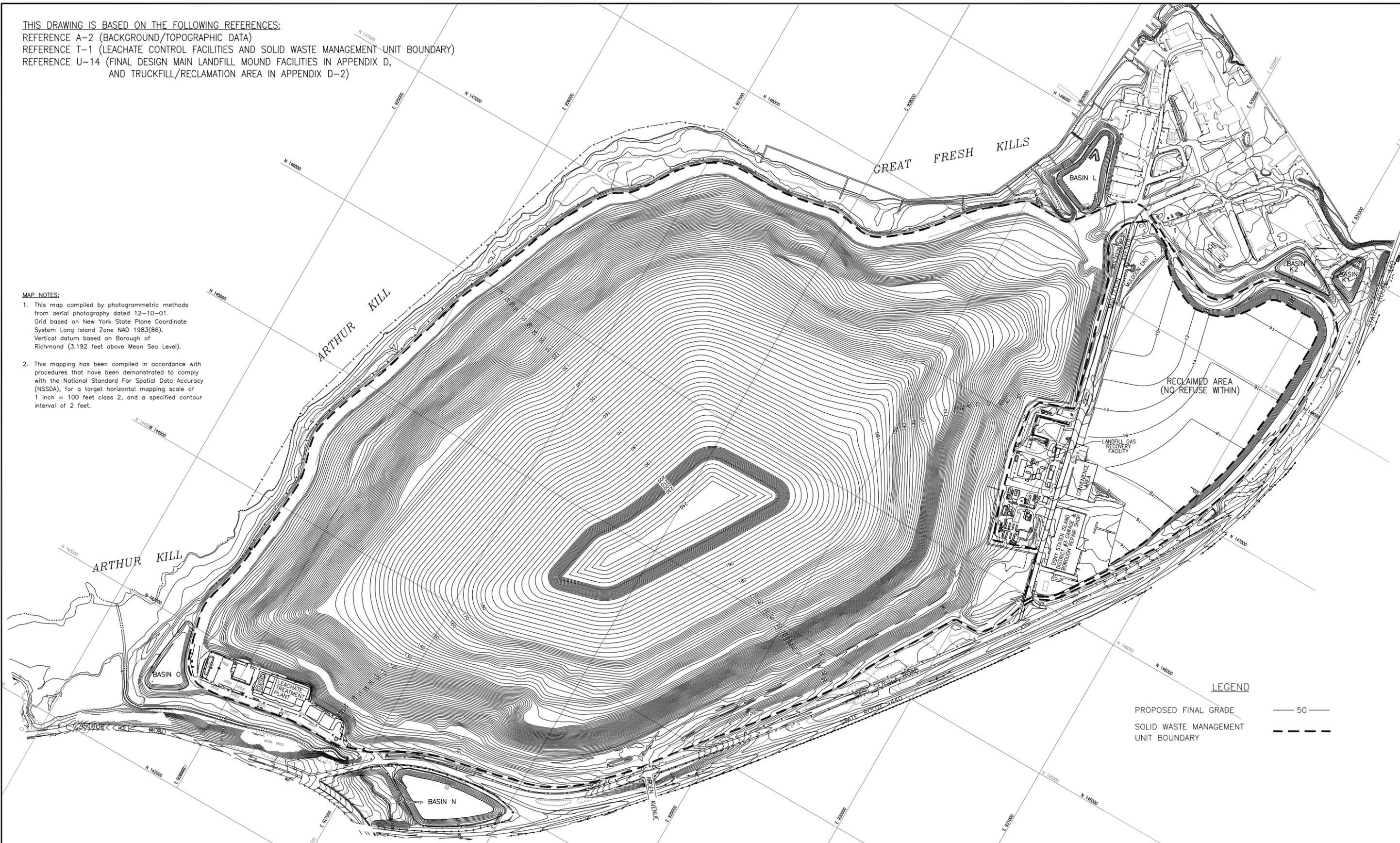
## REFERENCES, LEGEND AND SYMBOLS

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	LF-1	REV. NO.	0
W.O. NO.	02147.005.030.3209.02		SHT	OF			

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE T-1 (LEACHATE CONTROL FACILITIES AND SOLID WASTE MANAGEMENT UNIT BOUNDARY)  
 REFERENCE U-14 (FINAL DESIGN MAIN LANDFILL MOUND FACILITIES IN APPENDIX D,  
 AND TRUCKFILL/RECLAMATION AREA IN APPENDIX D-2)

**MAP NOTES:**

1. This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.



**LEGEND**

- PROPOSED FINAL GRADE — 50 —
- SOLID WASTE MANAGEMENT UNIT BOUNDARY - - - -

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0	12/13/02	JH	SUBMITTED TO NYSDEC

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

600 0 600 1200  
 SCALE IN FEET

FRESH KILLS LANDFILL

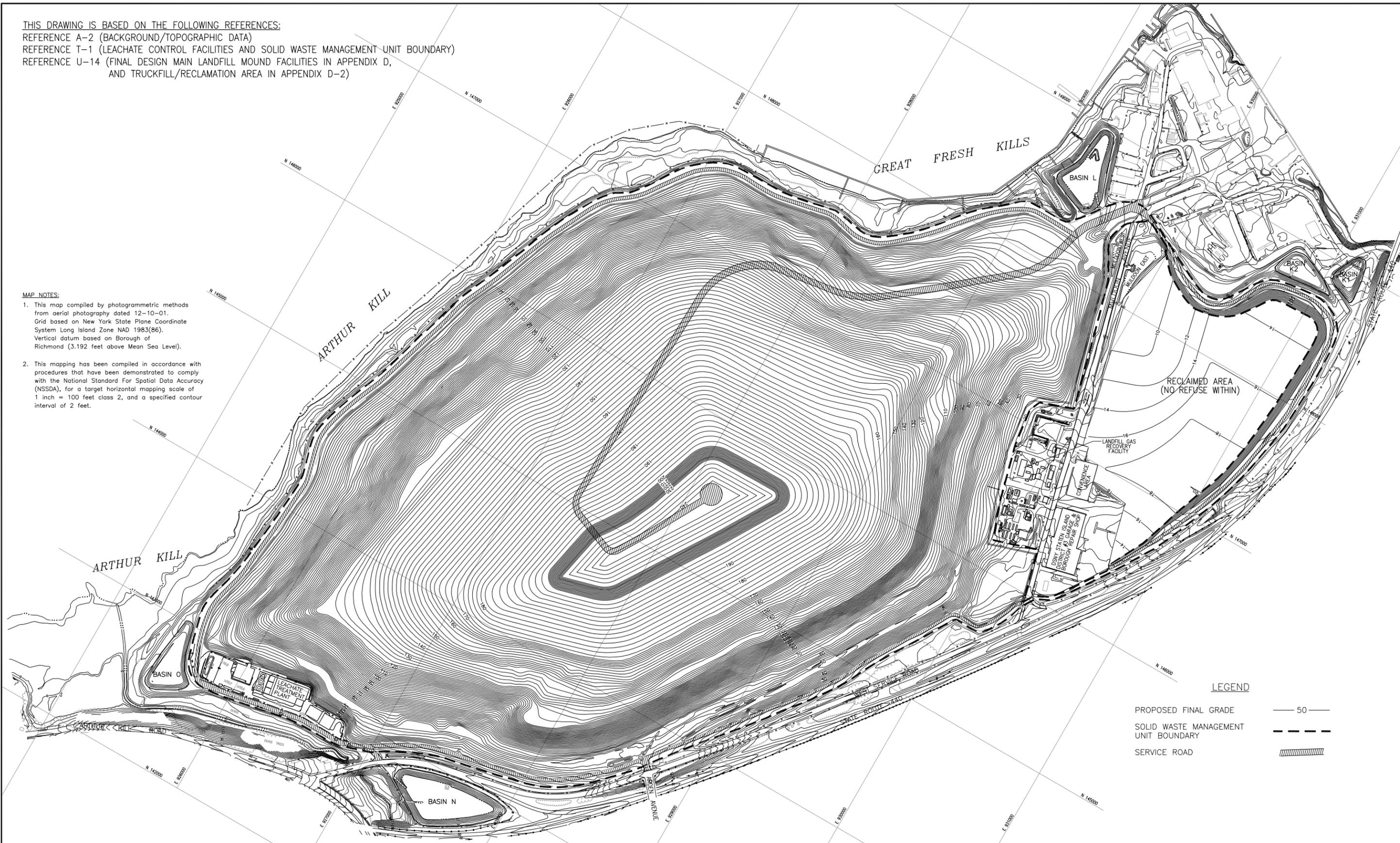
**SECTION 1/9  
 FINAL GRADING PLAN**

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	19-1	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE T-1 (LEACHATE CONTROL FACILITIES AND SOLID WASTE MANAGEMENT UNIT BOUNDARY)  
 REFERENCE U-14 (FINAL DESIGN MAIN LANDFILL MOUND FACILITIES IN APPENDIX D,  
 AND TRUCKFILL/RECLAMATION AREA IN APPENDIX D-2)

**MAP NOTES:**

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2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.



**LEGEND**

- PROPOSED FINAL GRADE ——— 50 ———
- SOLID WASTE MANAGEMENT UNIT BOUNDARY - - - - -
- SERVICE ROAD [Hatched Pattern]

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NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

600 0 600 1200  
 SCALE IN FEET

FRESH KILLS LANDFILL

**SECTION 1/9  
 SITE PLAN**

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	19-2	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

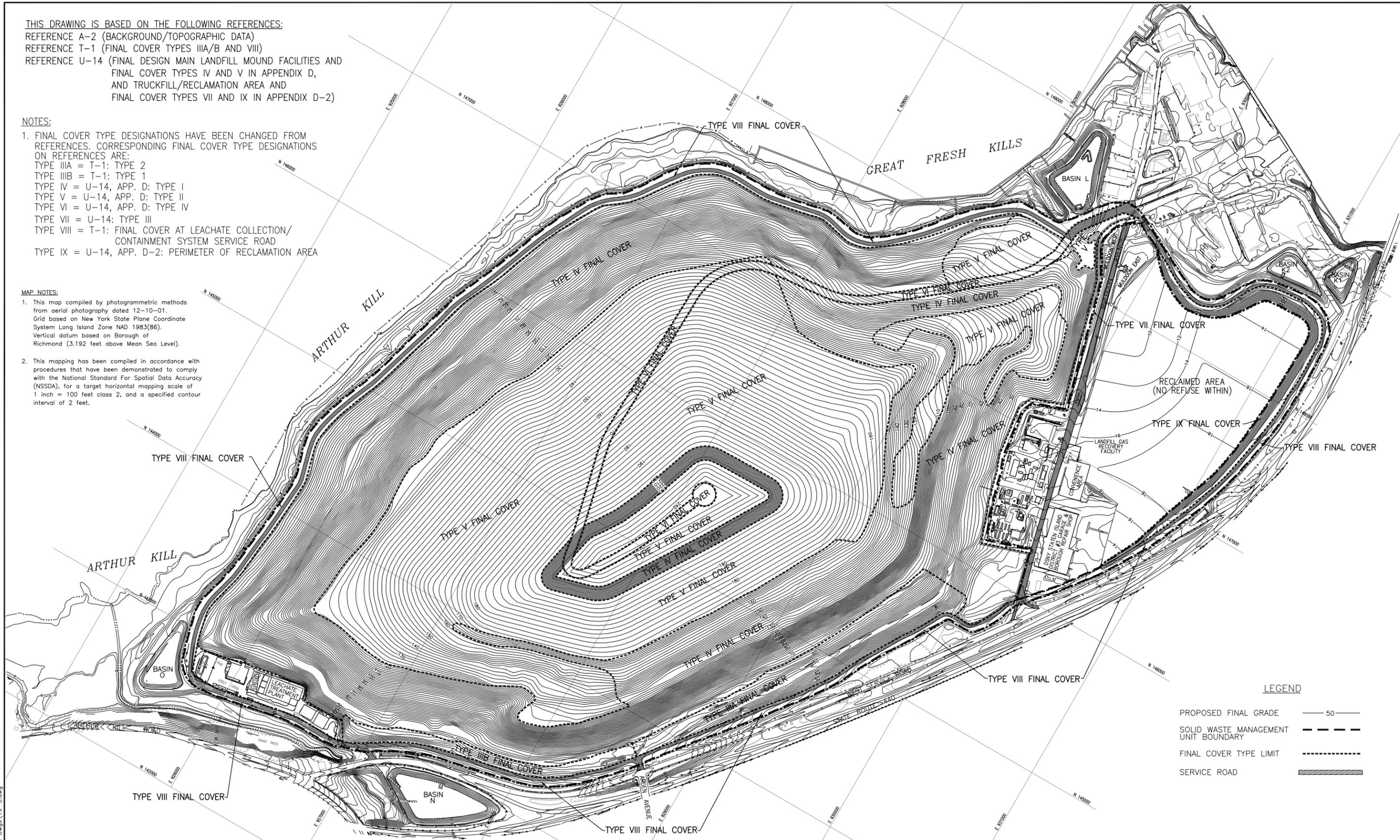
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE T-1 (FINAL COVER TYPES IIIA/B AND VIII)  
 REFERENCE U-14 (FINAL DESIGN MAIN LANDFILL MOUND FACILITIES AND  
 FINAL COVER TYPES IV AND V IN APPENDIX D,  
 AND TRUCKFILL/RECLAMATION AREA AND  
 FINAL COVER TYPES VII AND IX IN APPENDIX D-2)

**NOTES:**

- FINAL COVER TYPE DESIGNATIONS HAVE BEEN CHANGED FROM REFERENCES. CORRESPONDING FINAL COVER TYPE DESIGNATIONS ON REFERENCES ARE:  
 TYPE IIIA = T-1: TYPE 2  
 TYPE IIIB = T-1: TYPE 1  
 TYPE IV = U-14, APP. D: TYPE I  
 TYPE V = U-14, APP. D: TYPE II  
 TYPE VI = U-14, APP. D: TYPE IV  
 TYPE VII = U-14: TYPE III  
 TYPE VIII = T-1: FINAL COVER AT LEACHATE COLLECTION/CONTAINMENT SYSTEM SERVICE ROAD  
 TYPE IX = U-14, APP. D-2: PERIMETER OF RECLAMATION AREA

**MAP NOTES:**

- This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
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**LEGEND**

- PROPOSED FINAL GRADE ——— 50 ———
- SOLID WASTE MANAGEMENT UNIT BOUNDARY - - - - -
- FINAL COVER TYPE LIMIT - · - · - ·
- SERVICE ROAD // // //

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NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

600 0 600 1200  
 SCALE IN FEET

FRESH KILLS LANDFILL

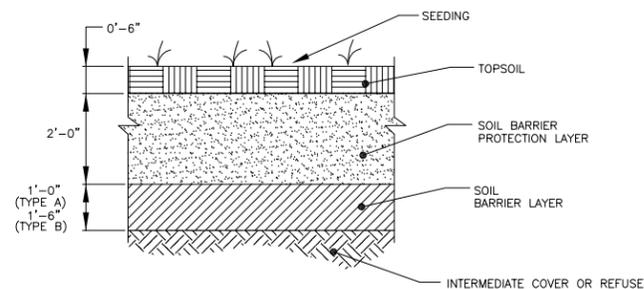
**SECTION 1/9  
 FINAL COVER PLAN**

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	19-3	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

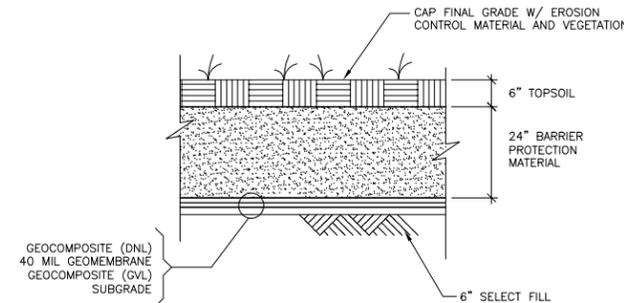
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE T-1 (FINAL DESIGN COVER TYPES IIIA/B AND VIII)  
 REFERENCE U-14 (FINAL DESIGN COVER TYPES IV, V, VI, VII, AND IX)

**NOTES:**

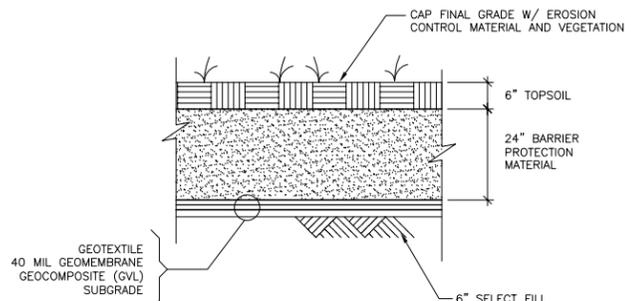
- FINAL COVER TYPE DESIGNATIONS HAVE BEEN CHANGED FROM REFERENCES. CORRESPONDING FINAL COVER TYPE DESIGNATIONS ON REFERENCES ARE:  
 TYPE IIIA = T-1: TYPE 2  
 TYPE IIIB = T-1: TYPE 1  
 TYPE IV = U-14, APP. D: TYPE I  
 TYPE V = U-14, APP. D: TYPE II  
 TYPE VI = U-14, APP. D: TYPE IV  
 TYPE VII = U-14: TYPE III  
 TYPE VIII = T-1: FINAL COVER AT LEACHATE COLLECTION/CONTAINMENT SYSTEM SERVICE ROAD  
 TYPE IX = U-14, APP. D-2: PERIMETER OF RECLAMATION AREA



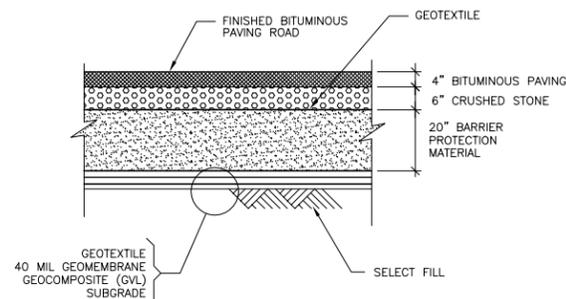
**FINAL COVER SECTION - TYPE IIIA/B**  
 (LIMITED PERIMETER SLOPES)  
 SCALE: 1/2"=1'-0"



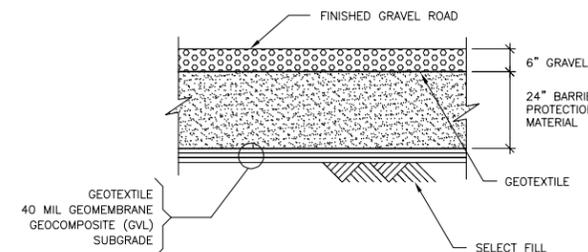
**FINAL COVER SECTION - TYPE IV**  
 (SLOPES GREATER THAN 15%)  
 SCALE: 1/2"=1'-0"



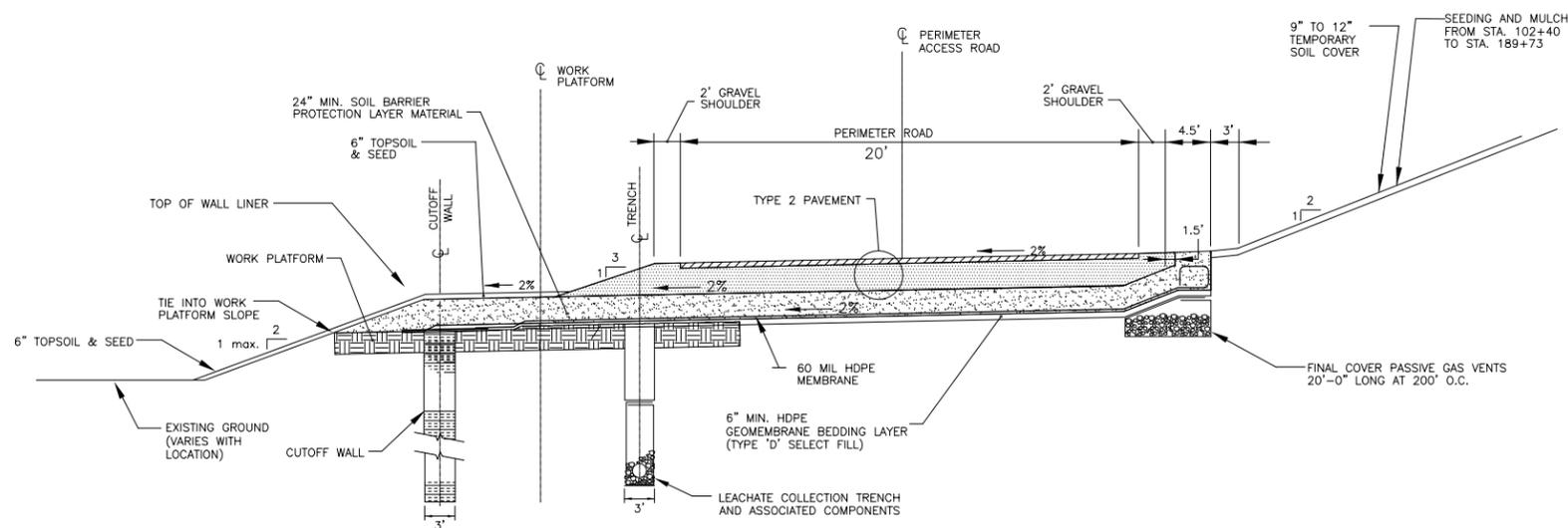
**FINAL COVER SECTION - TYPE V**  
 (SLOPES LESS THAN OR EQUAL TO 15%)  
 SCALE: 1/2"=1'-0"



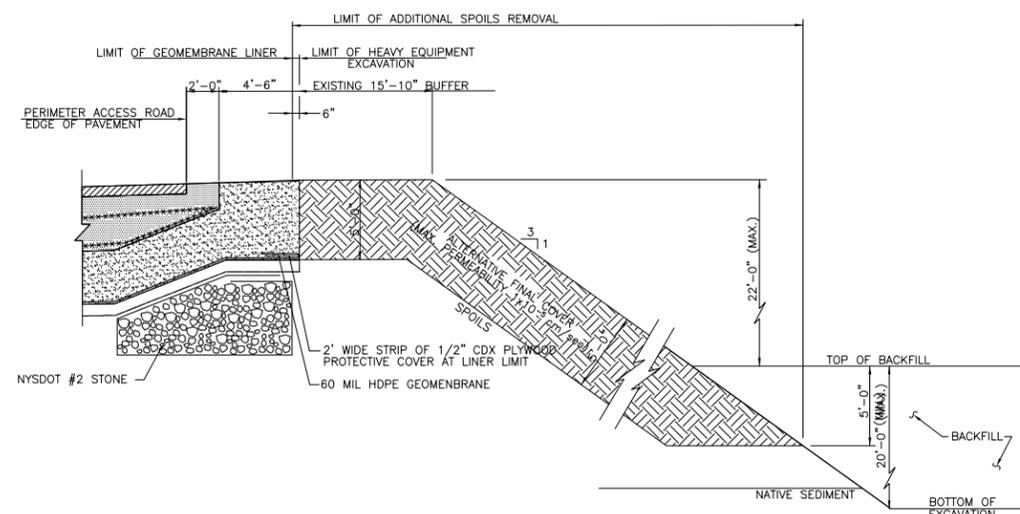
**FINAL COVER SECTION - TYPE VI**  
 (ASPHALT ROAD)  
 NO SCALE



**FINAL COVER SECTION - TYPE VII**  
 (GRAVEL ROAD)  
 NO SCALE



**FINAL COVER SECTION - TYPE VIII**  
 (AT LEACHATE COLLECTION/CONTAINMENT SYSTEM SERVICE ROAD)  
 NO SCALE



**FINAL COVER SECTION - TYPE IX**  
 (PERIMETER OF RECLAMATION AREA)  
 NO SCALE

F:\FreshKills\Closure Plan Dwg\19-4.dwg

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**

PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
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 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL

**SECTION 1/9  
 FINAL COVER SECTIONS**

NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	19-4	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE T-1 (LEACHATE CONTROL FACILITIES AND SOLID WASTE MANAGEMENT UNIT BOUNDARY)  
 REFERENCE U-14 (FINAL DESIGN MAIN LANDFILL MOUND FACILITIES IN APPENDIX D,  
 AND TRUCKFILL/RECLAMATION AREA IN APPENDIX D-2)

- NOTES:
- FOR SWALE DETAILS AND SCHEDULE SEE SHEET 19-6.
  - SWALE DESIGNATIONS CORRESPOND TO RECEIVING BASIN DESIGNATIONS.

- MAP NOTES:
- This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
  - This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.



LEGEND

PROPOSED FINAL GRADE	— 50 —
SOLID WASTE MANAGEMENT UNIT BOUNDARY	— — — —
SERVICE ROAD	▬▬▬▬▬▬
DRAINAGE SWALE	← L13
DOWNCHUTE	▬▬▬▬▬▬
CULVERT	▭
DROP-INLET BOX	○
MANHOLE	○
GRAVEL TRANSITION FROM SWALE TO DOWNCHUTE	◁
STORM SEWER	— ST —
EMERGENCY SPILLWAY	▭
BASIN INTAKE	▭

FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

600 0 600 1200  
 SCALE IN FEET

DRAWN BY		K.S.		DATE		12/13/02		DWG. NO.		19-5		REV. NO.		0	
W.O. NO.		02147.005.030.3209.02		SHT		OF									

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NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

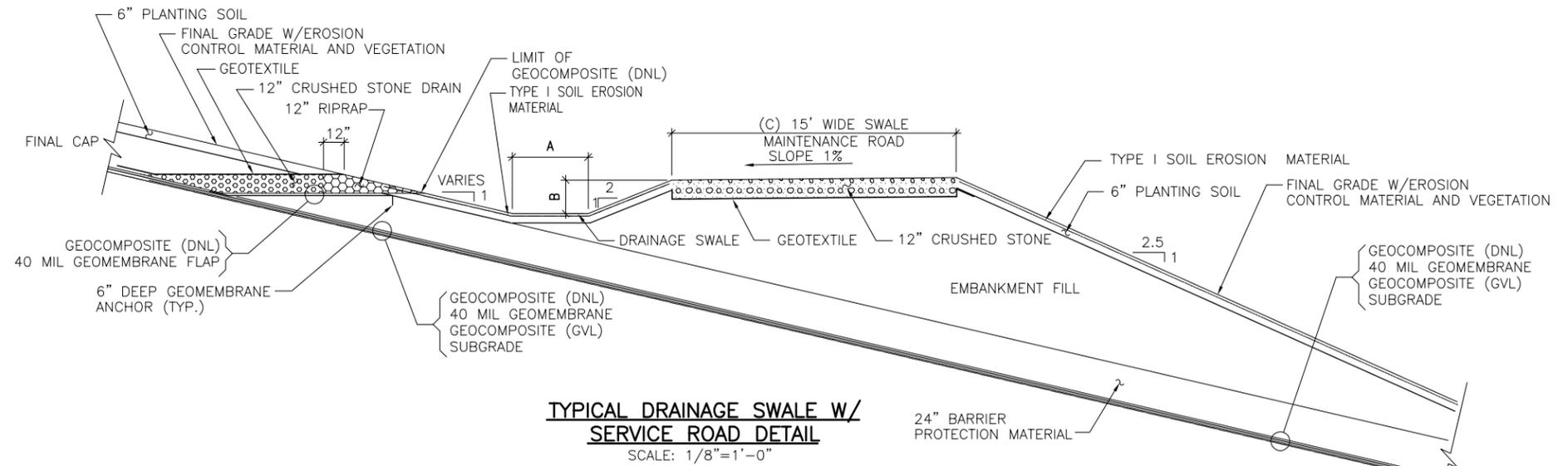
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
REFERENCE U-14 (FINAL DESIGN DRAINAGE DETAILS)

**NOTES:**

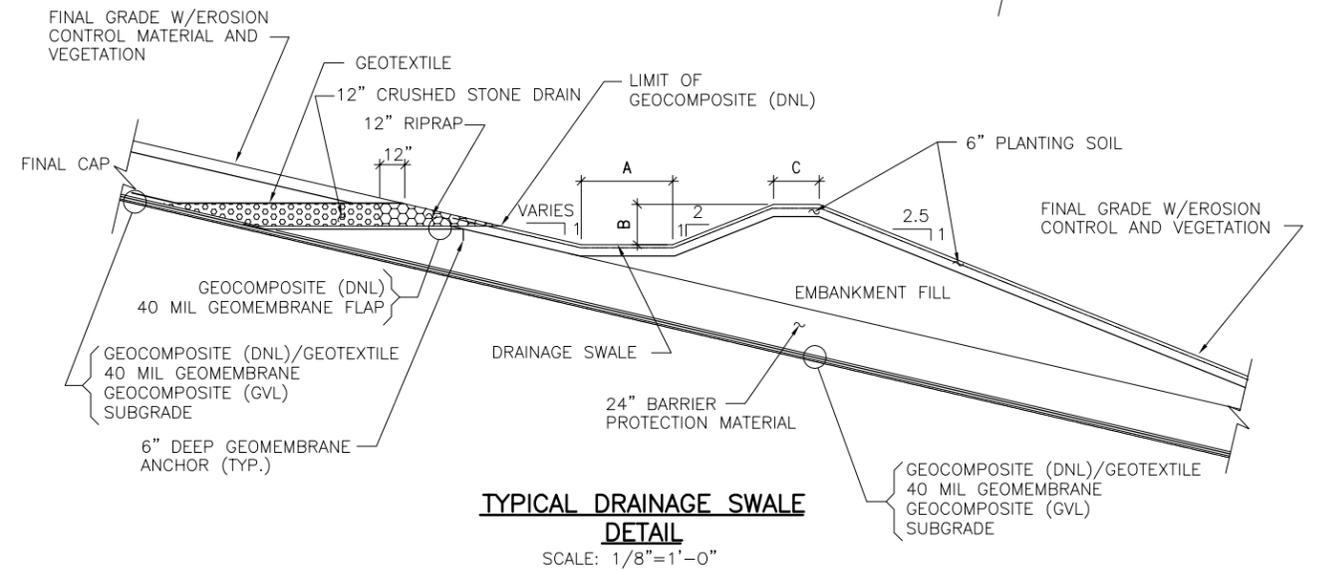
- SWALE DESIGNATIONS CORRESPOND TO RECEIVING BASIN DESIGNATIONS.
- SWALE ID CODES MODIFIED FROM ORIGINAL SOURCE DOCUMENTS FOR FACILITIES MANAGEMENT PURPOSES.

SWALE SCHEDULE	
SWALE DESIGNATION	LINING
O1	GRASS & TRM <sup>1</sup>
O2	GRASS & TRM <sup>1</sup>
O3	GRASS & TRM <sup>1</sup>
O4	ASPHALT
N1	GRASS & TRM <sup>1</sup>
N2	GRASS & TRM <sup>1</sup>
N3	GRASS & TRM <sup>1</sup>
N4	GRASS & TRM <sup>1</sup>
N5	GRASS & TRM <sup>1</sup>
N6	GRASS & TRM <sup>1</sup>
N7	GRASS & TRM <sup>1</sup>
N8	RIP-RAP <sup>2</sup>
N9	GRASS & TRM <sup>1</sup>
N10	RIP-RAP <sup>2</sup>
N11	GRASS & TRM <sup>1</sup>
N12	GRASS & TRM <sup>1</sup>
N13	GRASS & TRM <sup>1</sup>
N14	GRASS & TRM <sup>1</sup>
M1	GRASS & TRM <sup>1</sup>
M2	GRASS & TRM <sup>1</sup>
M3	STONE
L1	RIP-RAP <sup>2</sup>
L2	RIP-RAP <sup>2</sup>
L3	RIP-RAP <sup>2</sup>
L4	RIP-RAP <sup>2</sup>
L5	GRASS & TRM <sup>1</sup>
L6	RIP-RAP <sup>2</sup>
L7	GRASS & TRM <sup>1</sup>
L8	RIP-RAP <sup>2</sup>
L9	GRASS & TRM <sup>1</sup>
L10	GRASS & TRM <sup>1</sup>
L11	GRASS & TRM <sup>1</sup>
L12	GRASS & TRM <sup>1</sup>
L13	GRASS & TRM <sup>1</sup>
L14	RIP-RAP <sup>2</sup>
L15	GRASS & TRM <sup>1</sup>
L16	GRASS & TRM <sup>1</sup>
L17	GRASS & TRM <sup>1</sup>
L18	GRASS & TRM <sup>1</sup>
MW1	GRASS & TRM <sup>1</sup>
MW2	GRASS & TRM <sup>1</sup>
AK1	GRASS & TRM <sup>1</sup>
AK2	GRASS & TRM <sup>1</sup>
AK3	GRASS & TRM <sup>1</sup>
AK4	GRASS & TRM <sup>1</sup>
AK5	GRASS & TRM <sup>1</sup>
AK6	GRASS & TRM <sup>1</sup>

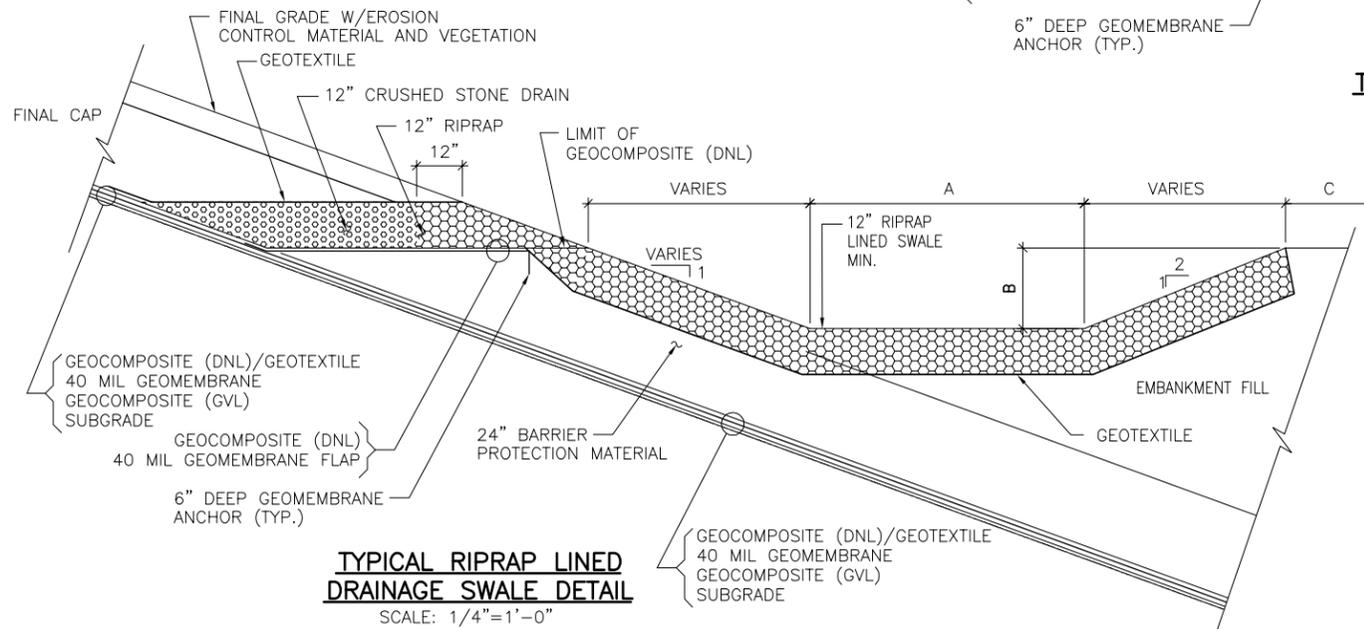
<sup>1</sup>TRM CONSISTS OF TYPE 1 EROSION CONTROL MATERIAL  
<sup>2</sup>RIP-RAP D<sub>50</sub> = 4 INCHES



**TYPICAL DRAINAGE SWALE W/  
SERVICE ROAD DETAIL**  
SCALE: 1/8"=1'-0"



**TYPICAL DRAINAGE SWALE  
DETAIL**  
SCALE: 1/8"=1'-0"



**TYPICAL RIPRAP LINED  
DRAINAGE SWALE DETAIL**  
SCALE: 1/4"=1'-0"

FRESH KILLS LANDFILL  
STATEN ISLAND, NEW YORK  
POST-CLOSURE MONITORING AND  
MAINTENANCE OPERATIONS DRAWINGS

PREPARED BY:  
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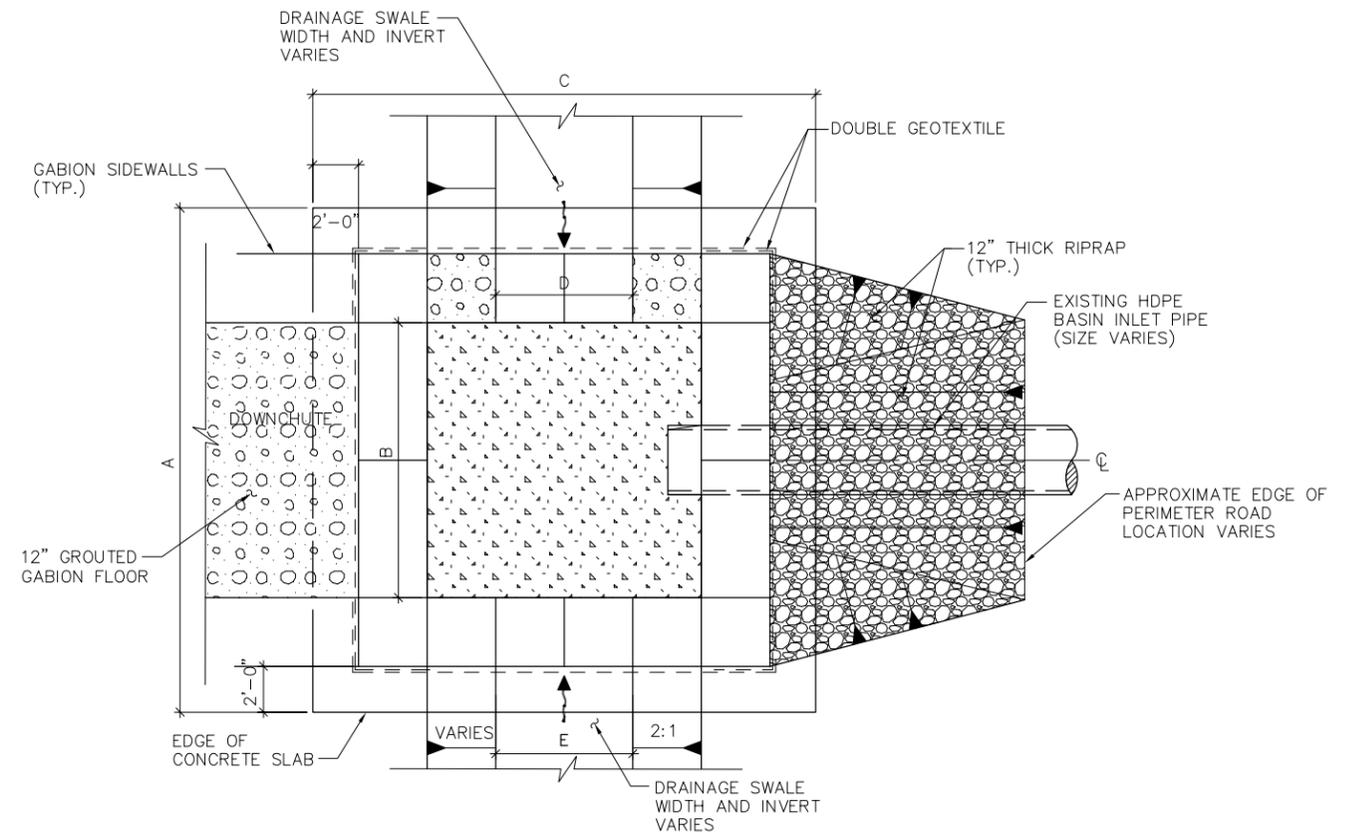
FRESH KILLS LANDFILL  
SECTION 1/9  
DRAINAGE DETAILS  
(SHEET 1 OF 3)

F:\FreshKills\Closure Plan Dwg\19-6.dwg

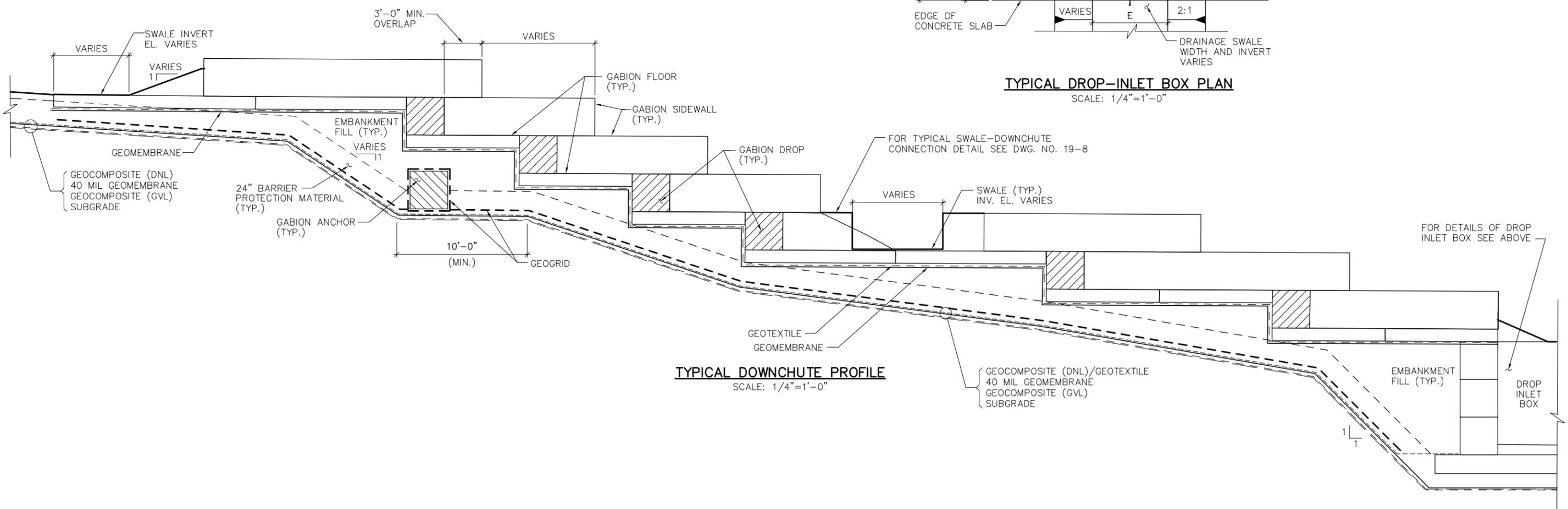
NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

DRAWN BY	DATE	DWG. NO.	REV. NO.
K.S.	12/13/02	19-6	0

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE U-14 (FINAL DESIGN DRAINAGE DETAILS)



**TYPICAL DROP-INLET BOX PLAN**  
 SCALE: 1/4"=1'-0"



**TYPICAL DOWNCHUTE PROFILE**  
 SCALE: 1/4"=1'-0"

F:\FreshKills\Closure Plan Dwg\19-7.dwg

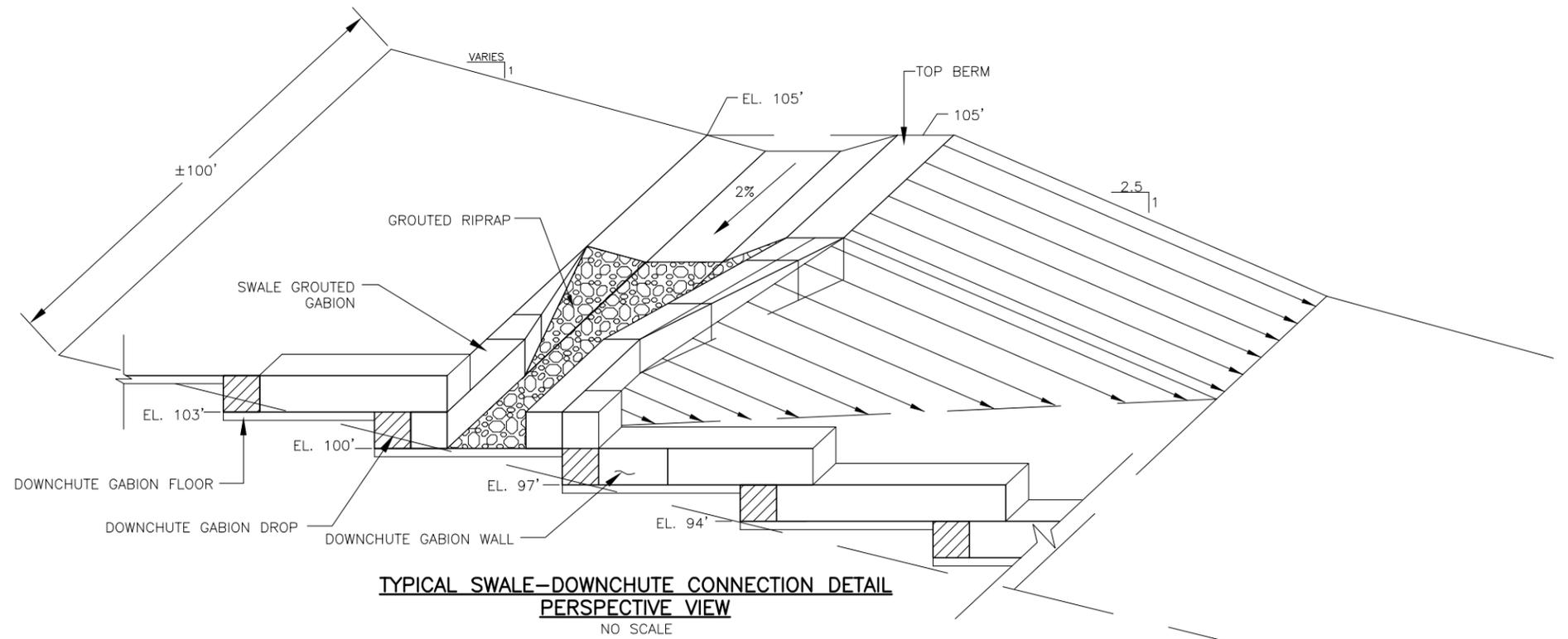
NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**

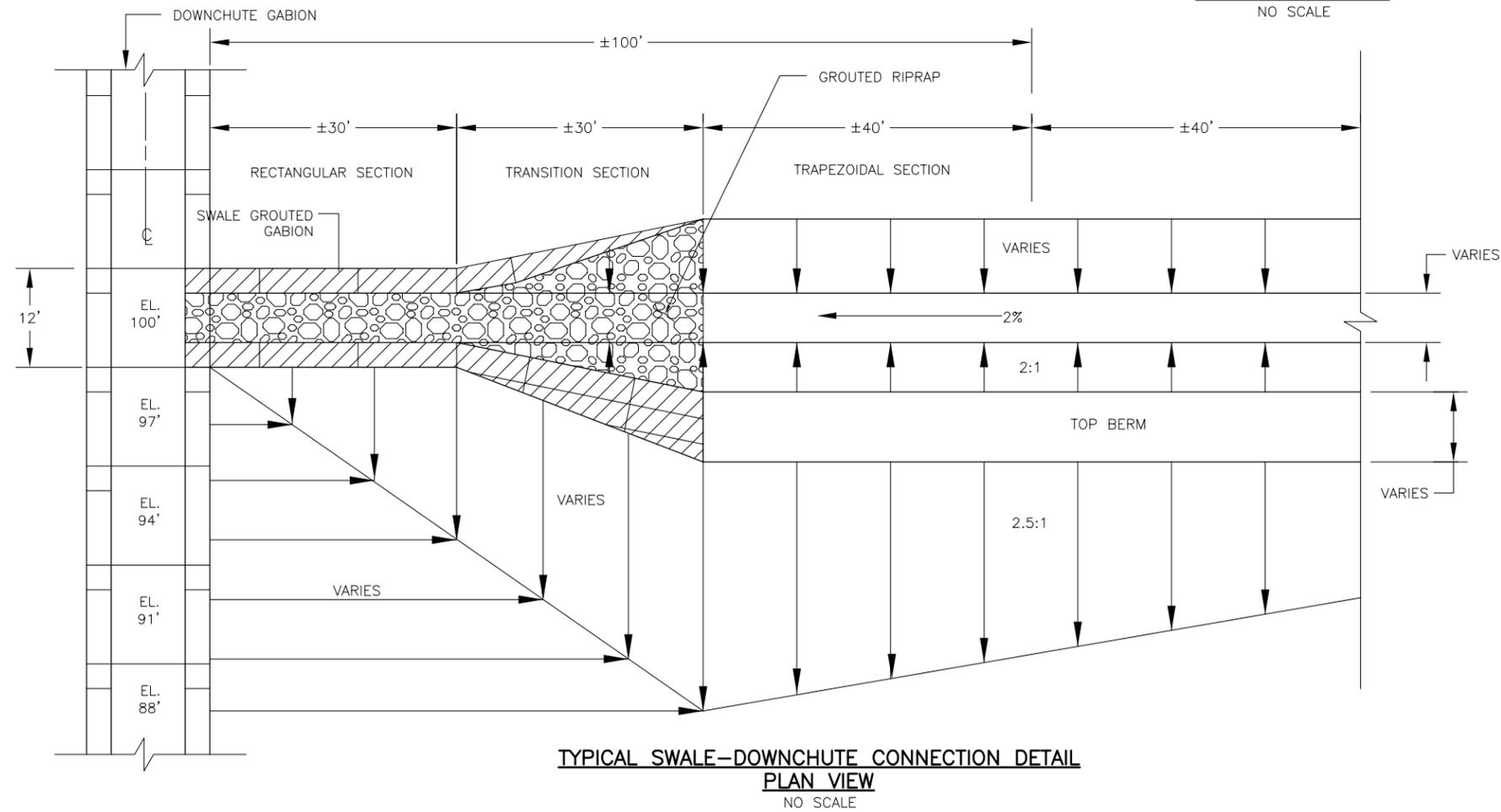
PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL			
SECTION 1/9			
DRAINAGE DETAILS			
(SHEET 2 OF 3)			
DRAWN BY	DATE	DWG. NO.	REV. NO.
K.S.	12/13/02	19-7	0
W.O. NO.	02147.005.030.3209.02		SHT. ____ OF ____

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE U-14 (FINAL DESIGN DRAINAGE DETAILS)



**TYPICAL SWALE-DOWNCHUTE CONNECTION DETAIL**  
**PERSPECTIVE VIEW**  
 NO SCALE



**TYPICAL SWALE-DOWNCHUTE CONNECTION DETAIL**  
**PLAN VIEW**  
 NO SCALE

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NO.	DATE	APPD.	REVISION DESCRIPTION
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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**

PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

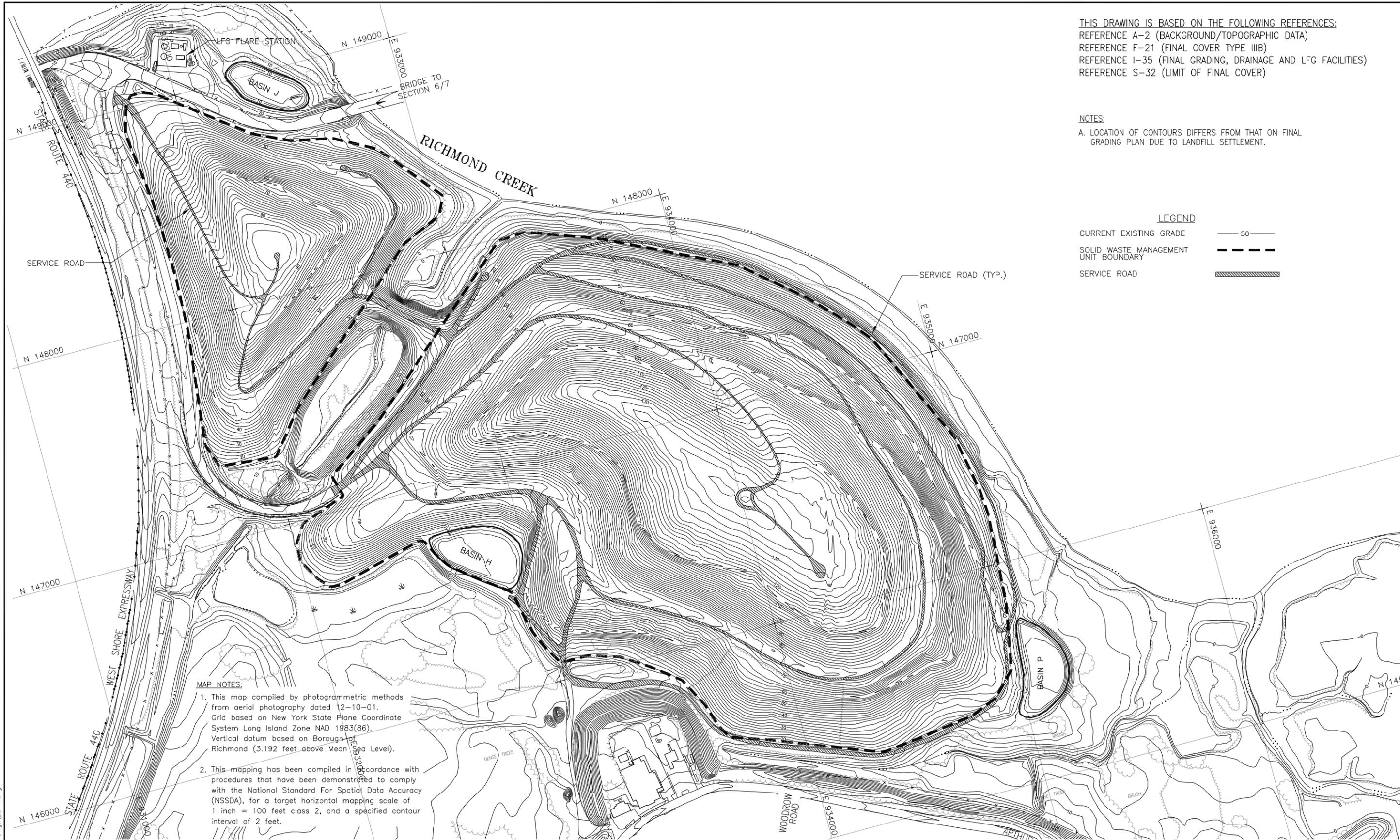
FRESH KILLS LANDFILL  
**SECTION 1/9  
 DRAINAGE DETAILS  
 (SHEET 3 OF 3)**

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	19-8	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE F-21 (FINAL COVER TYPE III B)  
 REFERENCE I-35 (FINAL GRADING, DRAINAGE AND LFG FACILITIES)  
 REFERENCE S-32 (LIMIT OF FINAL COVER)

NOTES:  
 A. LOCATION OF CONTOURS DIFFERS FROM THAT ON FINAL GRADING PLAN DUE TO LANDFILL SETTLEMENT.

**LEGEND**  
 CURRENT EXISTING GRADE — 50 —  
 SOLID WASTE MANAGEMENT UNIT BOUNDARY - - - - -  
 SERVICE ROAD 



**MAP NOTES:**  
 1. This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).  
 2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



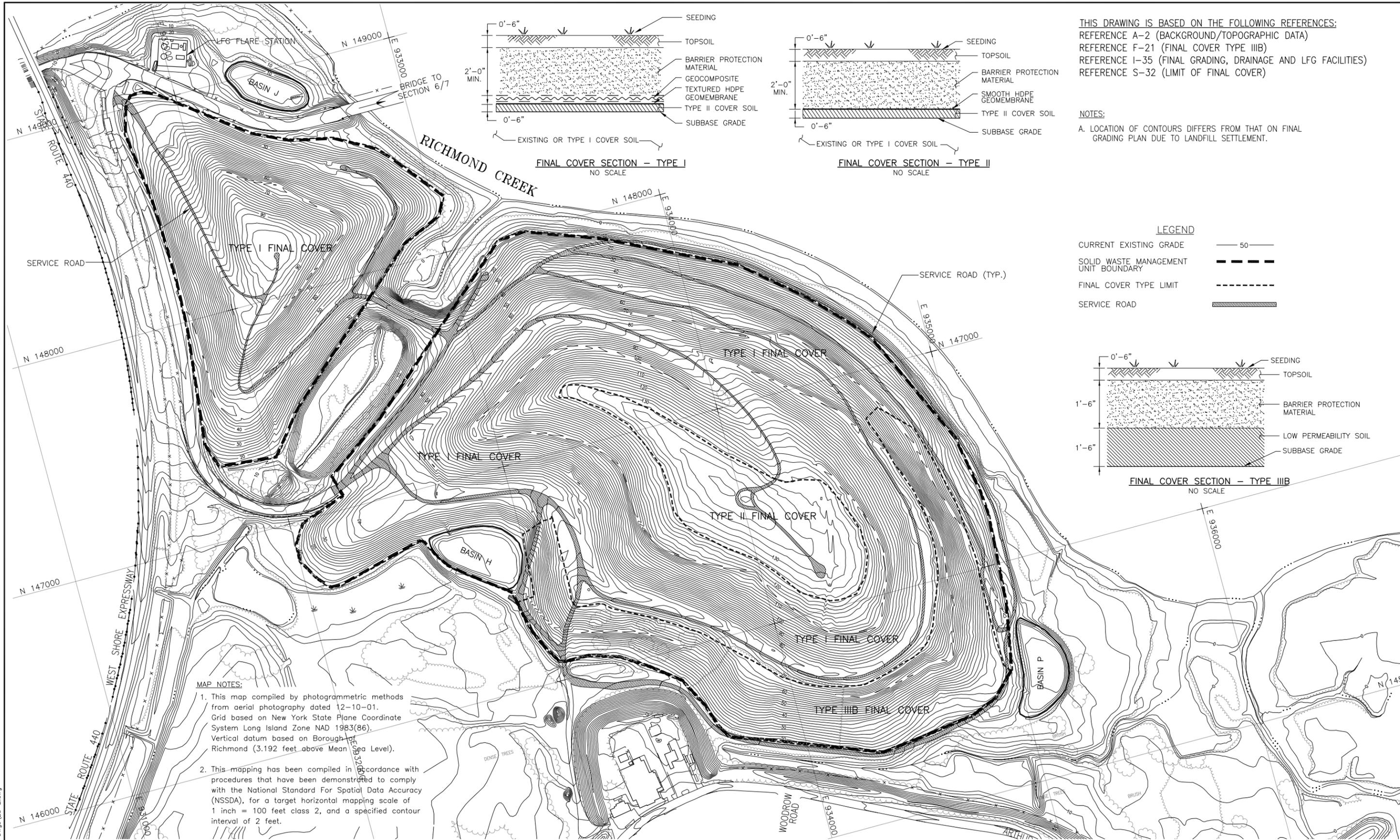
PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

400 0 400 800  
 SCALE IN FEET

DRAWN BY		K.S.		DATE		12/13/02		DWG. NO.		28-1		REV. NO.		0	
W.O. NO.		02147.005.030.3209.02		SHT		OF									

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THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE F-21 (FINAL COVER TYPE III B)  
 REFERENCE I-35 (FINAL GRADING, DRAINAGE AND LFG FACILITIES)  
 REFERENCE S-32 (LIMIT OF FINAL COVER)

NOTES:  
 A. LOCATION OF CONTOURS DIFFERS FROM THAT ON FINAL GRADING PLAN DUE TO LANDFILL SETTLEMENT.

**LEGEND**

CURRENT EXISTING GRADE	— 50 —
SOLID WASTE MANAGEMENT UNIT BOUNDARY	— — — — —
FINAL COVER TYPE LIMIT	- - - - -
SERVICE ROAD	▨▨▨▨▨

**MAP NOTES:**

1. This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

400 0 400 800  
 SCALE IN FEET

DRAWN BY		K.S.	DATE	12/13/02	DWG. NO.	28-2	REV. NO.	0
W.O. NO.		02147.005.030.3209.02			SHT	OF		

F:\FreshKills\Closure Plan Dwg\28-2.dwg

NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

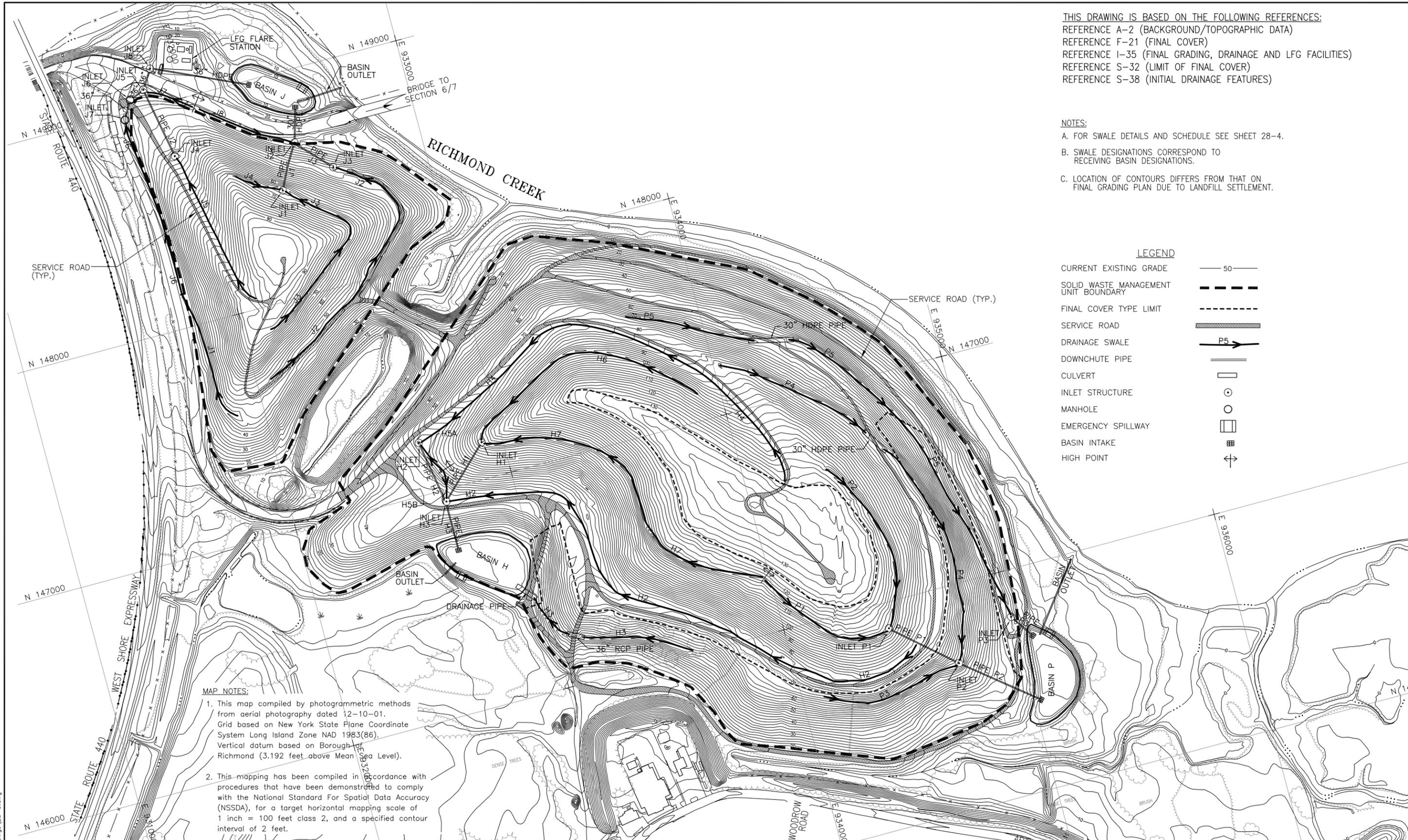
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE F-21 (FINAL COVER)  
 REFERENCE I-35 (FINAL GRADING, DRAINAGE AND LFG FACILITIES)  
 REFERENCE S-32 (LIMIT OF FINAL COVER)  
 REFERENCE S-38 (INITIAL DRAINAGE FEATURES)

**NOTES:**

- A. FOR SWALE DETAILS AND SCHEDULE SEE SHEET 28-4.
- B. SWALE DESIGNATIONS CORRESPOND TO RECEIVING BASIN DESIGNATIONS.
- C. LOCATION OF CONTOURS DIFFERS FROM THAT ON FINAL GRADING PLAN DUE TO LANDFILL SETTLEMENT.

**LEGEND**

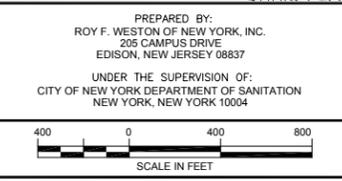
- CURRENT EXISTING GRADE ——— 50 ———
- SOLID WASTE MANAGEMENT UNIT BOUNDARY - - - - -
- FINAL COVER TYPE LIMIT - - - - -
- SERVICE ROAD ——— P5 ———
- DRAINAGE SWALE ——— P5 ———
- DOWNCHUTE PIPE ———
- CULVERT ———
- INLET STRUCTURE ———
- MANHOLE ———
- EMERGENCY SPILLWAY ———
- BASIN INTAKE ———
- HIGH POINT ———



**MAP NOTES:**

1. This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.

**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**

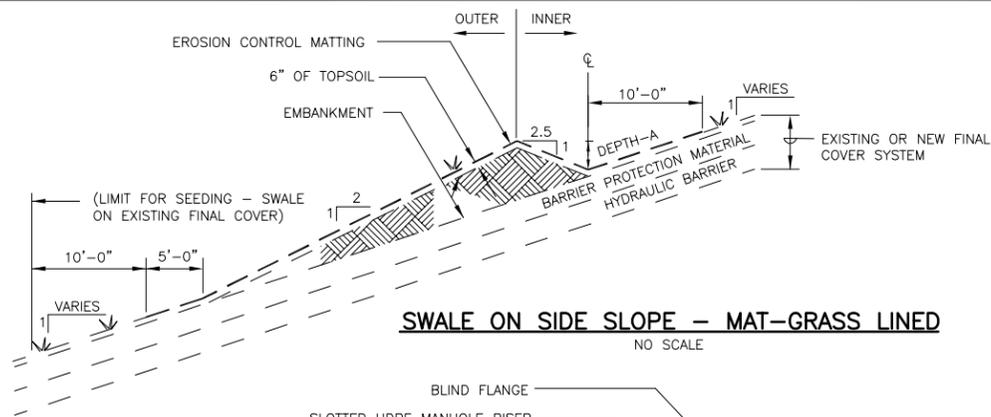


FRESH KILLS LANDFILL		SECTION 2/8		DRAINAGE PLAN	
DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	28-3
W.O. NO.	02147.005.030.3209.02	SHT	OF		
				REV. NO.	0

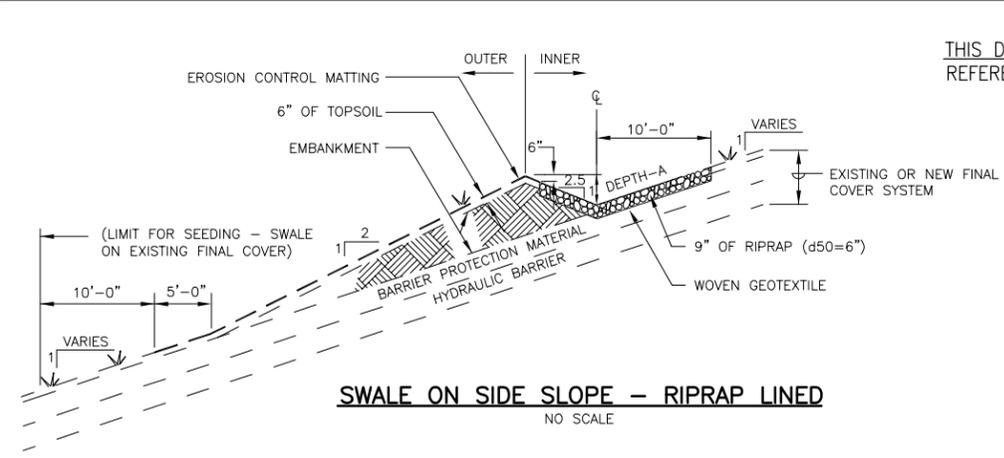
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NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

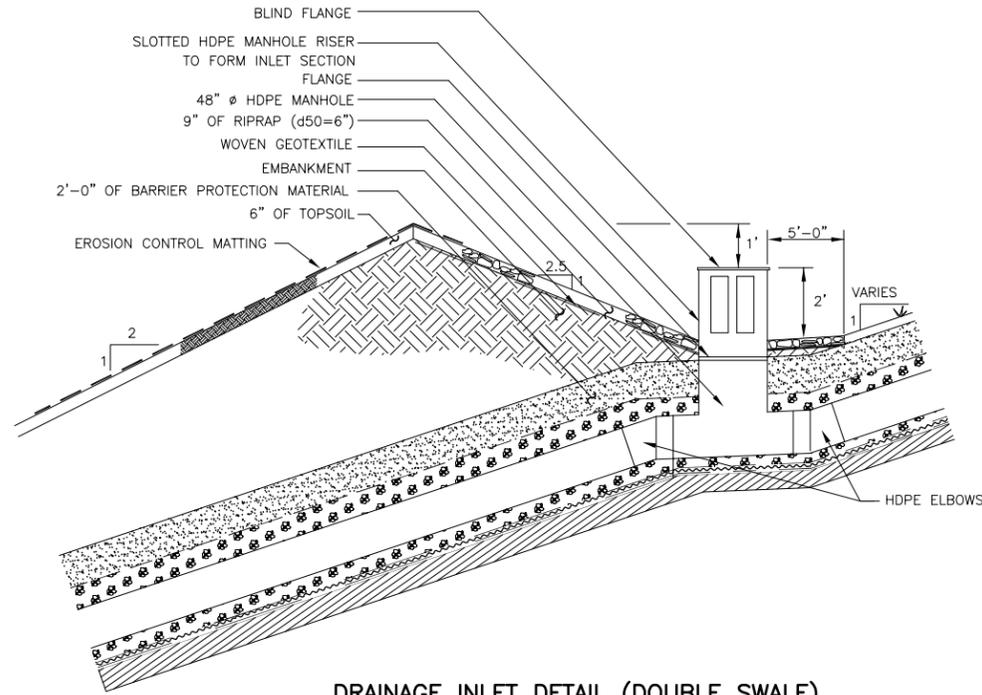
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
REFERENCE 1-35 (FINAL GRADING, DRAINAGE AND LFG FACILITIES)



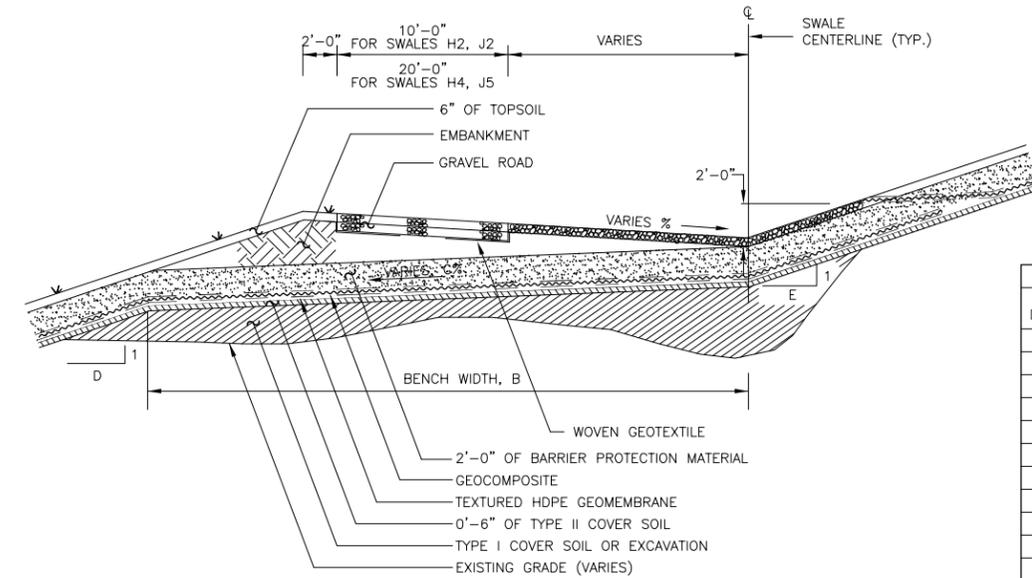
**SWALE ON SIDE SLOPE - MAT-GRASS LINED**  
NO SCALE



**SWALE ON SIDE SLOPE - RIPRAP LINED**  
NO SCALE

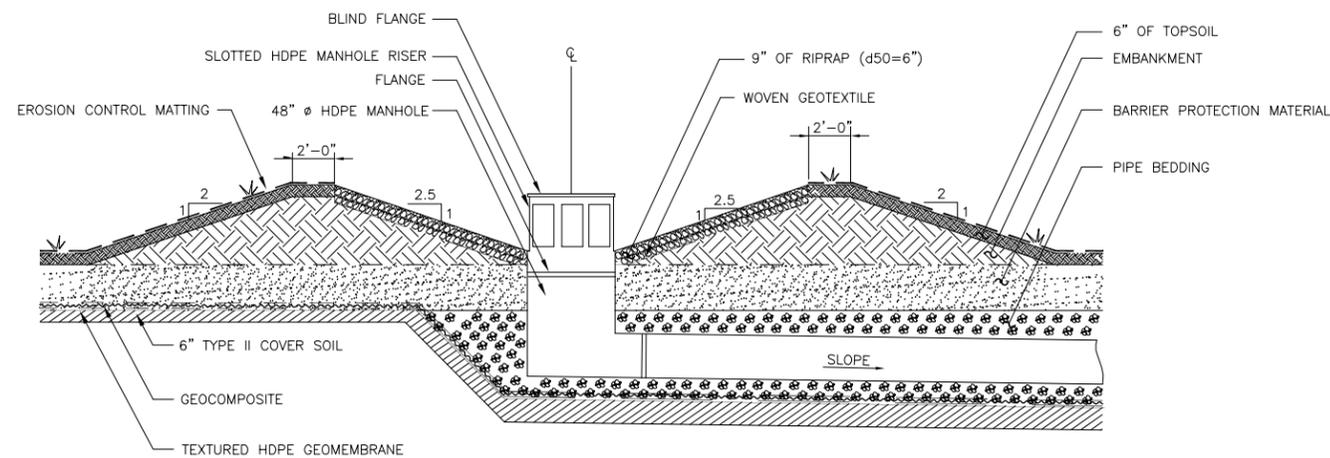


**DRAINAGE INLET DETAIL (DOUBLE SWALE)**  
NO SCALE

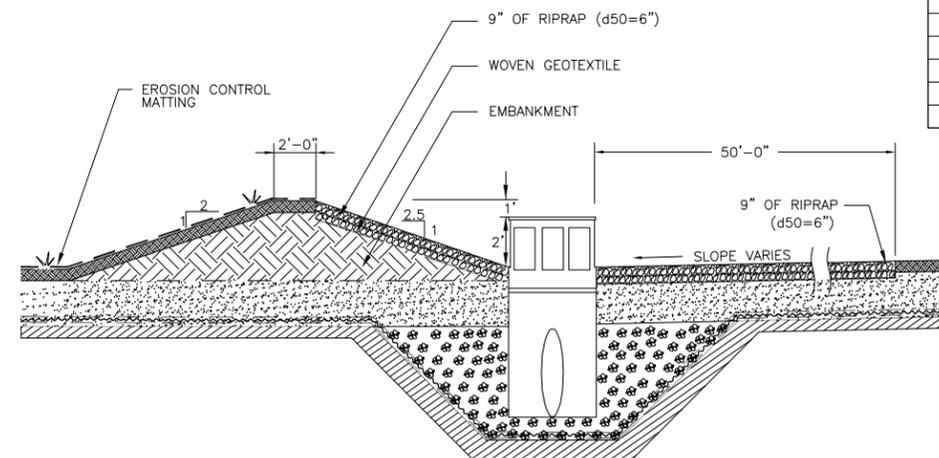


**ROAD/SWALE DETAIL**  
NO SCALE

SWALE SCHEDULE				
SWALE DESIGNATION	TYPE	LINING	DEPTH A	CHANNEL SLOPE
H2	ROAD	MATTING	2.0	2%
H3	SIDE SLOPE	MAT & RIPRAP	2.0	2%
H4	ROAD	RIPRAP	1.5	VARIES
H5A	SIDE SLOPE	MATTING	1.0	2.2%
H5B	SIDE SLOPE	MATTING	1.0	10.1%
H6	SIDE SLOPE	MATTING	2.0	2%
H7	SIDE SLOPE	MAT & RIPRAP	2.0	2%
J1	SIDE SLOPE	MATTING	2.0	2%
J2	ROAD	MATTING	1.4	2%
J3	SIDE SLOPE	MATTING	2.0	2%
J4	SIDE SLOPE	MATTING	2.0	2%
J5	ROAD	RIPRAP	2.4	VARIES
J6	EX. ROAD	RIPRAP	VARIES	2%
J7	EX. ROAD	RIPRAP	VARIES	3%
J8	EX. ROAD	RIPRAP	VARIES	1.3%
P1	SIDE SLOPE	MATTING	1.5	2%
P2	SIDE SLOPE	MATTING	1.5	2%
P3	SIDE SLOPE	MATTING	1.5	2%
P4	SIDE SLOPE	MAT & RIPRAP	2.0 & 2.5	2%
P5	SIDE SLOPE	MAT & RIPRAP	2.0 & 2.5	2%



SECTION PERPENDICULAR TO SWALE CENTERLINE



SECTION ALONG SWALE CENTERLINE

**DRAINAGE INLET DETAIL (SINGLE SWALE)**  
NO SCALE

FRESH KILLS LANDFILL  
STATEN ISLAND, NEW YORK  
POST-CLOSURE MONITORING AND  
MAINTENANCE OPERATIONS DRAWINGS

PREPARED BY:  
ROY F. WESTON OF NEW YORK, INC.  
205 CAMPUS DRIVE  
EDISON, NEW JERSEY 08837  
UNDER THE SUPERVISION OF:  
CITY OF NEW YORK DEPARTMENT OF SANITATION  
NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL

SECTION 2/8  
DRAINAGE DETAILS

F:\FreshKills\Closure Plan Dwg\28-4.dwg

NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	28-4	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE F-22 (FINAL COVER TYPES IIIA/B)  
 REFERENCE P-39 (STORMWATER BASINS, ROADS AND  
 FINAL COVER TYPES I AND II)  
 REFERENCE S-33 (FINAL COVER TYPE LIMIT)

NOTES:  
 1. LOCATION OF CONTOURS DIFFERS FROM FINAL  
 GRADING PLAN DUE TO LANDFILL SETTLEMENT.

LEGEND

CURRENT EXISTING GRADE ——— 50 ———  
 SOLID WASTE MANAGEMENT  
 UNIT BOUNDARY - - - - -  
 SERVICE ROAD 



MAP NOTES:

1. This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.

F:\FreshKills\Closure Plan Dwg\34-1.dwg

NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

400 0 400 800  
 SCALE IN FEET

FRESH KILLS LANDFILL  
 SECTION 3/4  
 SITE PLAN

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	34-1	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

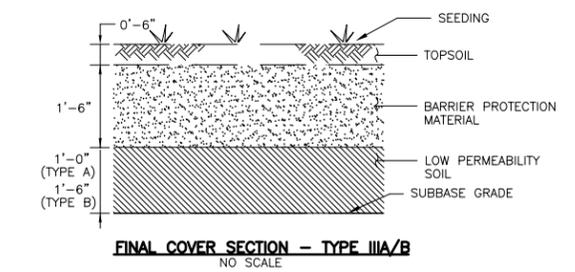
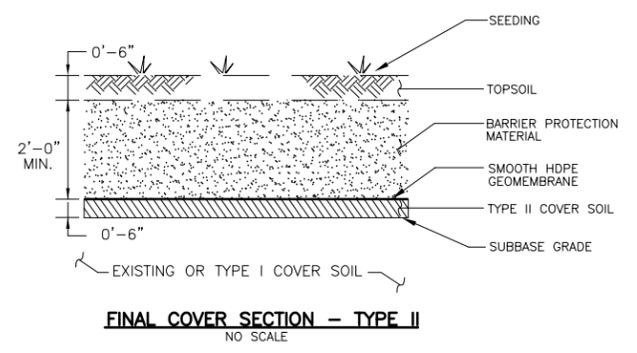
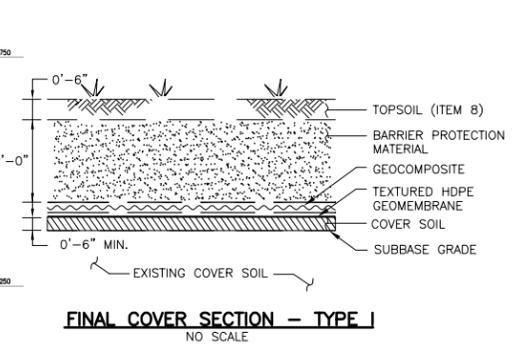


**THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:**  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE F-22 (FINAL COVER TYPES IIIA/B)  
 REFERENCE P-39 (STORMWATER BASINS, ROADS AND FINAL COVER TYPES I AND II)  
 REFERENCE S-33 (FINAL COVER TYPE LIMIT)

**NOTES:**  
 1. TYPE II FINAL COVER ON THIS PLAN CORRESPONDS TO FINAL COVER ALT. V IN REFERENCE S-33.  
 2. LOCATION OF CONTOURS DIFFERS FROM FINAL GRADING PLAN DUE TO LANDFILL SETTLEMENT.

**LEGEND**

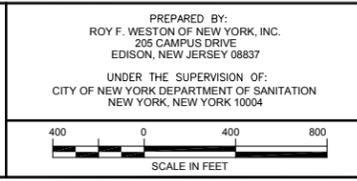
CURRENT EXISTING GRADE	— 50 —
SOLID WASTE MANAGEMENT UNIT BOUNDARY	— — — —
FINAL COVER TYPE LIMIT	- - - - -
SERVICE ROAD	▨ ▨ ▨ ▨



**MAP NOTES:**  
 1. This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).  
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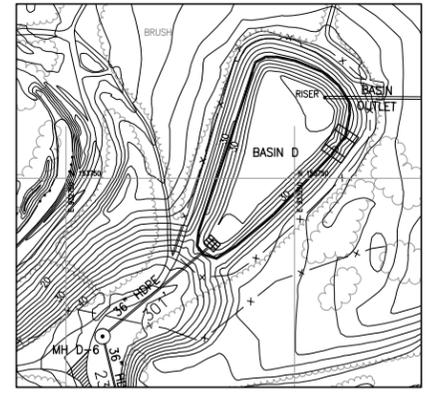
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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY: ROY F. WESTON OF NEW YORK, INC. 205 CAMPUS DRIVE EDISON, NEW JERSEY 08837		FRESH KILLS LANDFILL	
UNDER THE SUPERVISION OF: CITY OF NEW YORK DEPARTMENT OF SANITATION NEW YORK, NEW YORK 10004		SECTION 3/4 FINAL COVER PLAN AND SECTIONS	
DRAWN BY	K.S.	DATE	12/13/02
W.O. NO.	02147.005.030.3209.02	DWG. NO.	34-2
		SHT	OF
		REV. NO.	0

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BASIN D INSET

**LEGEND**

- CURRENT EXISTING GRADE — 50 —
- SOLID WASTE MANAGEMENT UNIT BOUNDARY ———
- FINAL COVER TYPE LIMIT - - - - -
- SERVICE ROAD [Hatched pattern]
- DRAINAGE SWALE [Arrow with 'E8']
- DOWNCHUTE PIPE [Dashed line]
- CULVERT [Double line]
- INLET STRUCTURE [Circle with dot]
- MANHOLE [Circle]
- EMERGENCY SPILLWAY [Rectangular box]
- BASIN INTAKE [Grid pattern]
- HIGH POINT [Arrow with 'H']

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE F-22 (FINAL COVER TYPE LIMIT)  
 REFERENCE P-39 (FINAL DRAINAGE AND LFG FACILITIES)  
 REFERENCE S-33 (FINAL COVER LIMIT)  
 REFERENCE S-38 (INITIAL DRAINAGE FEATURES)

**NOTES:**  
 1. FOR SWALE DETAILS, SEE SHEET 34-4  
 2. SWALE DESIGNATIONS CORRESPOND TO RECEIVING BASIN DESIGNATIONS

SWALE SCHEDULE				
SWALE DESIGNATION	TYPE	LINING	DEPTH A	CHANNEL SLOPE
D 1	ROAD	MATTING	1.5	2%
D 2A	SIDE SLOPE	MATTING	1.5	2.5%
D 2B	ROAD	MATTING	1.5	2%
D 3	ROAD	MATTING	1.5	2%
D 4A	SIDE SLOPE	RIPRAP	2.0	2%
D 4B	SIDE SLOPE	MATTING	2.0	2%
D 5	SIDE SLOPE	MATTING	2.0	2%
D 6	SIDE SLOPE	MATTING	2.0	2%
E 1	SIDE SLOPE	RIPRAP	2.0	2%
E 2	ROAD	GRASS	1.5	2%
E 3	ROAD	RIPRAP	1.0	4%
E 4	SIDE SLOPE	*	2.0	2%
E 7	ROAD	RIPRAP	1.0	VARIES
E 8	ROAD	RIPRAP	1.0	VARIES
F 1	SIDE SLOPE	GEOSYN.		
F 2	SIDE SLOPE	GEOSYN.		
F 3	ROAD	RIPRAP		
F 4	SIDE SLOPE	GABION BASKETS		
F 5	ROAD	RIPRAP		
F 6	ROAD	*		
F 7	CHANNEL	RIPRAP		
Q 1	ROAD	*	1.5	2.7%
Q 2	SIDE SLOPE	MATTING	2.0	2%
Q 3	SIDE SLOPE	GEOSYN.	1.5	2%
Q 4	SIDE SLOPE	RIPRAP	2.0	3%
Q 5	SIDE SLOPE	GRASS	--	2%
Q 6	SIDE SLOPE	GEOSYN.	1.5	2%

\* NEED TO BE FIELD VERIFIED

**MAP NOTES:**

- This map compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
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F:\FreshKills\Closure Plan Dwg\34-3.dwg

NO.	DATE	APPD.	REVISION DESCRIPTION
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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

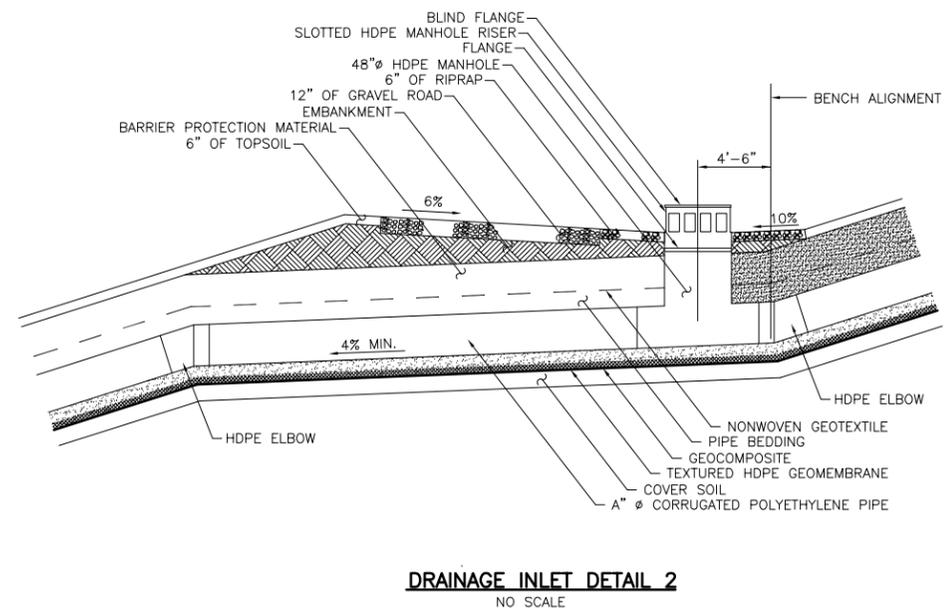
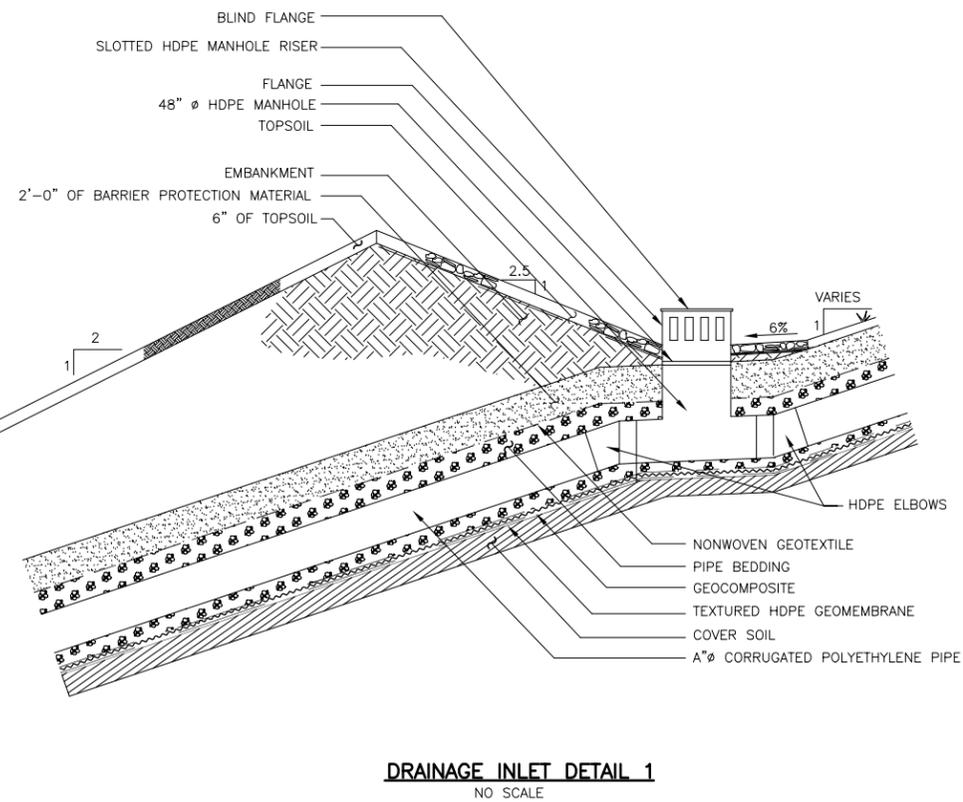
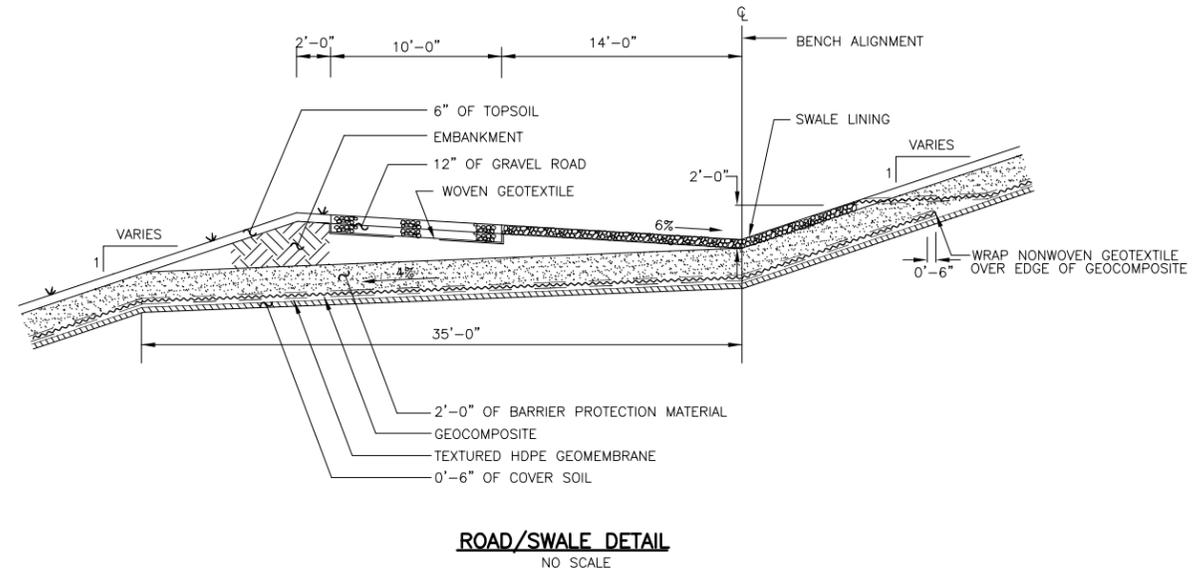
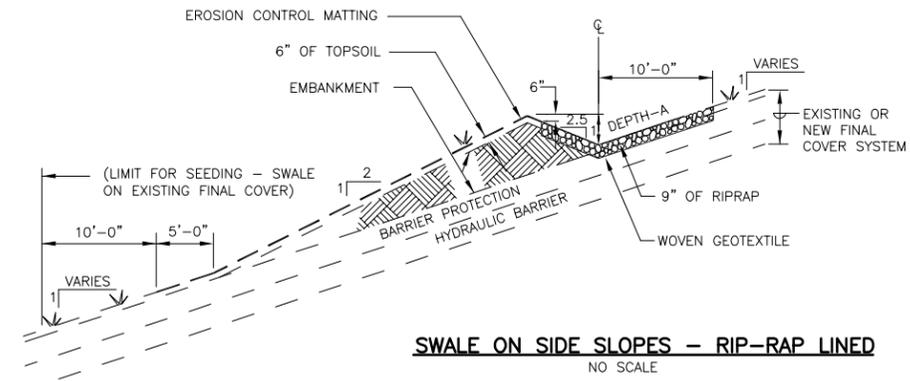
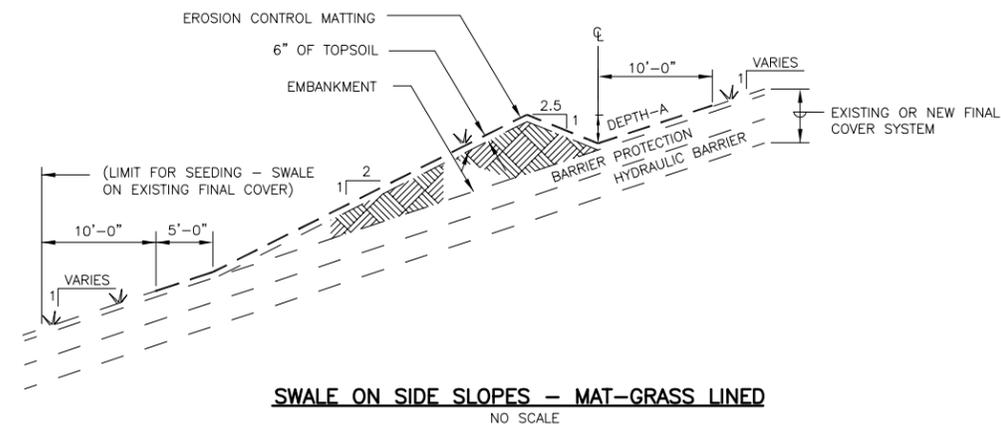
UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

400 0 400 800  
 SCALE IN FEET

FRESH KILLS LANDFILL  
**SECTION 3/4  
 DRAINAGE PLAN**

DRAWN BY: K.S. DATE: 12/13/02 DWG. NO. 34-3 REV. NO. 0  
 W.O. NO. 02147.005.030.3209.02 SHT. OF

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE P-39 (AS-BUILT CONDITIONS, FINAL GRADING  
 AND DRAINAGE DETAILS)



FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS

PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL  
 SECTION 3/4  
 DRAINAGE DETAILS

P:\FreshKills\Closure Plan Dwg\34-4.dwg

NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

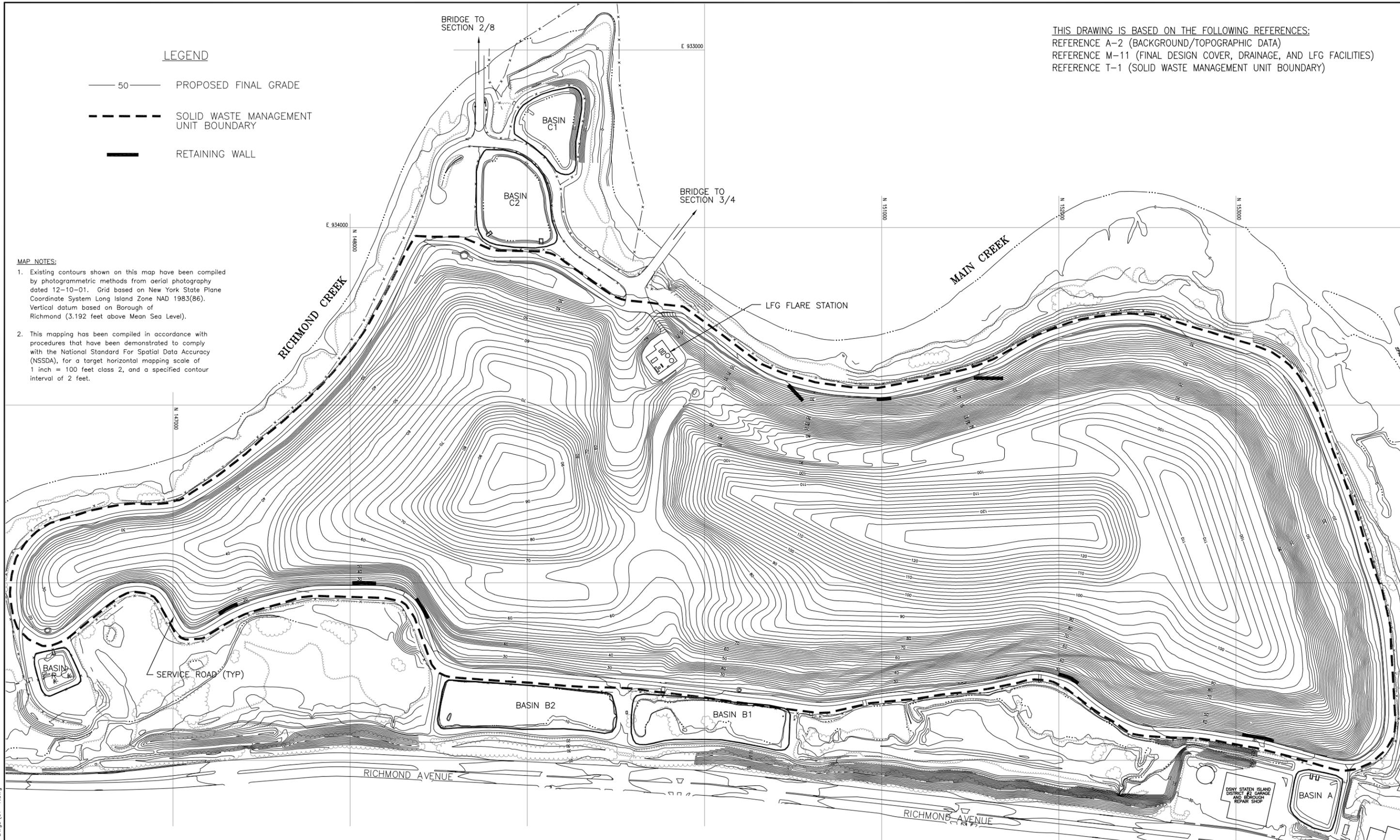
DRAWN BY	DATE	DWG. NO.	REV. NO.
K.S.	12/13/02	34-4	0

**LEGEND**

- 50 — PROPOSED FINAL GRADE
- - - - - SOLID WASTE MANAGEMENT UNIT BOUNDARY
- RETAINING WALL

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE M-11 (FINAL DESIGN COVER, DRAINAGE, AND LFG FACILITIES)  
 REFERENCE T-1 (SOLID WASTE MANAGEMENT UNIT BOUNDARY)

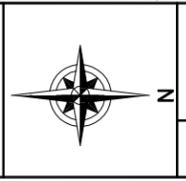
- MAP NOTES:**
- Existing contours shown on this map have been compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
  - This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard for Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.



P:\FreshKills\Closure Plan Dwg\67-1.dwg

NO.	DATE	APPD.	REVISION DESCRIPTION
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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

500 0 500 1000  
 SCALE IN FEET

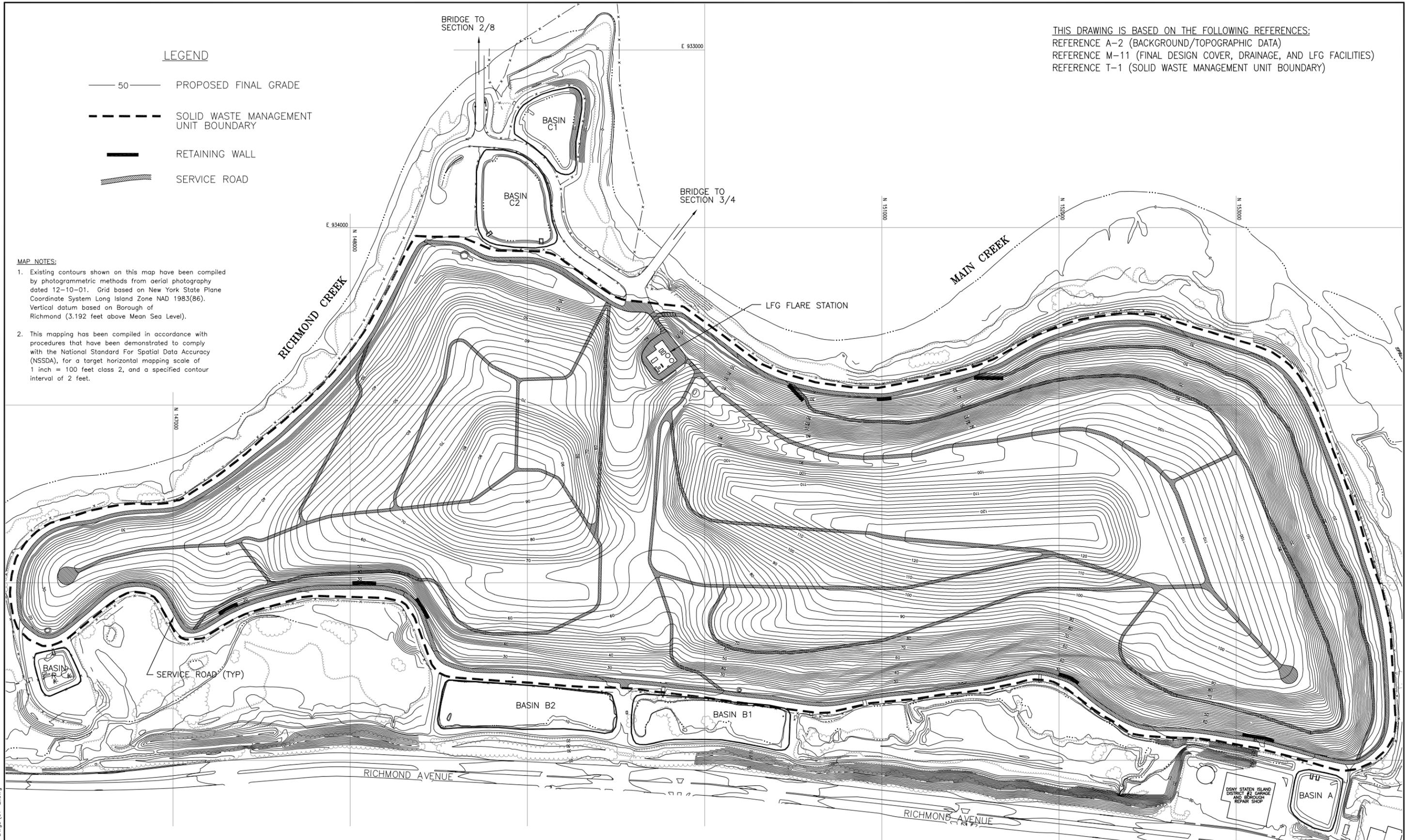
FRESH KILLS LANDFILL			
SECTION 6/7 FINAL GRADING PLAN			
DRAWN BY	K.S.	DATE	12/13/02
W.O. NO.	02147.005.030.3209.02	DWG. NO.	67-1
		SHT	OF
			REV. NO. 0

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE M-11 (FINAL DESIGN COVER, DRAINAGE, AND LFG FACILITIES)  
 REFERENCE T-1 (SOLID WASTE MANAGEMENT UNIT BOUNDARY)

**LEGEND**

- 50 — PROPOSED FINAL GRADE
- - - - - SOLID WASTE MANAGEMENT UNIT BOUNDARY
- RETAINING WALL
- ▨ SERVICE ROAD

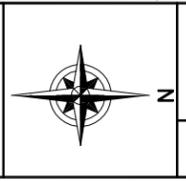
- MAP NOTES:**
- Existing contours shown on this map have been compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
  - This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard for Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.



F:\FreshKills\Closure Plan Dwg\67-2.dwg

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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

500 0 500 1000  
 SCALE IN FEET

FRESH KILLS LANDFILL			
SECTION 6/7 SITE PLAN			
DRAWN BY	K.S.	DATE	12/13/02
W.O. NO.	02147.005.030.3209.02		
DWG. NO.	67-2	SHT	OF
REV. NO.	0		

**LEGEND**

- 50 — PROPOSED FINAL GRADE
- — — SOLID WASTE MANAGEMENT UNIT BOUNDARY
- - - - - FINAL COVER TYPE LIMIT
- ▨ SERVICE ROAD

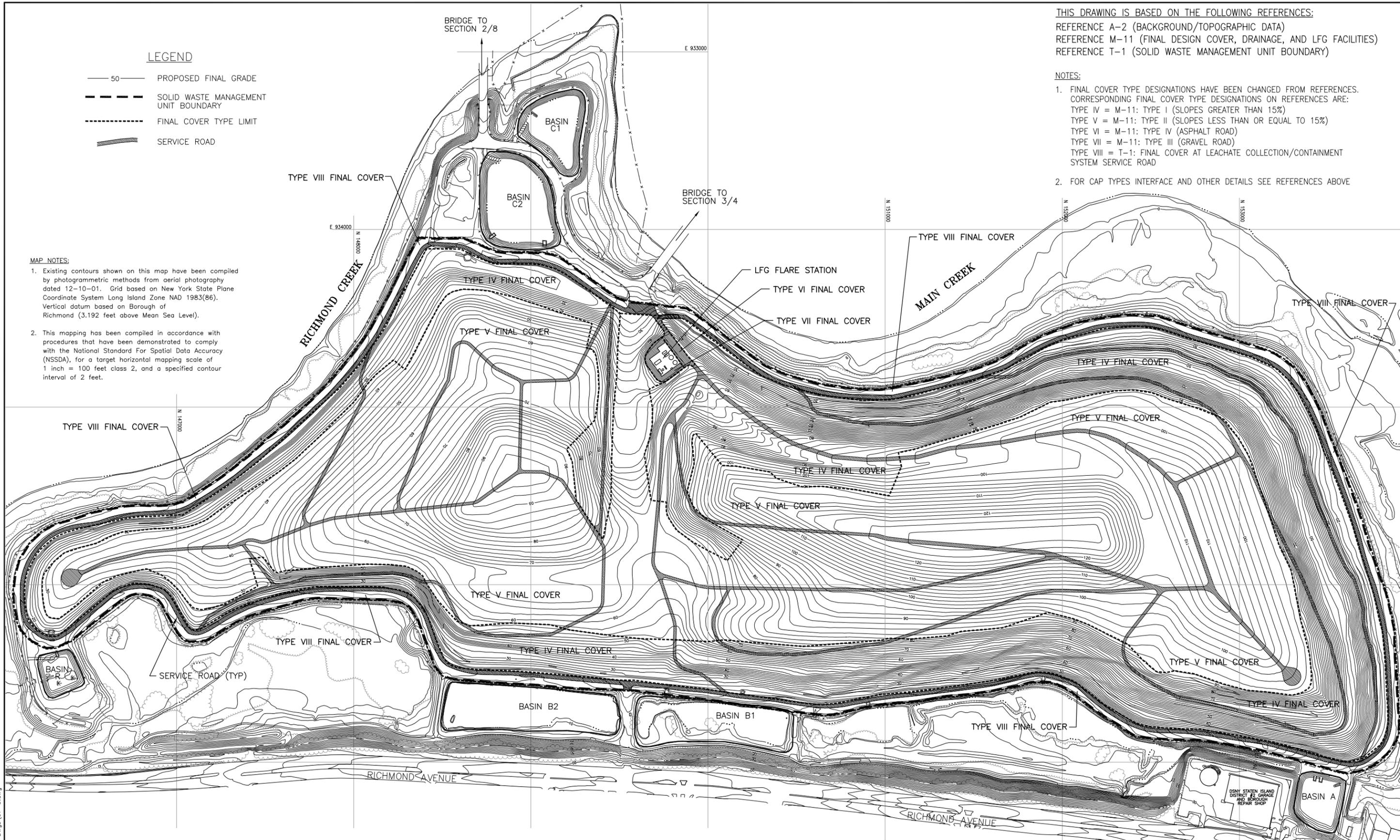
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE M-11 (FINAL DESIGN COVER, DRAINAGE, AND LFG FACILITIES)  
 REFERENCE T-1 (SOLID WASTE MANAGEMENT UNIT BOUNDARY)

**NOTES:**

1. FINAL COVER TYPE DESIGNATIONS HAVE BEEN CHANGED FROM REFERENCES. CORRESPONDING FINAL COVER TYPE DESIGNATIONS ON REFERENCES ARE:  
 TYPE IV = M-11: TYPE I (SLOPES GREATER THAN 15%)  
 TYPE V = M-11: TYPE II (SLOPES LESS THAN OR EQUAL TO 15%)  
 TYPE VI = M-11: TYPE IV (ASPHALT ROAD)  
 TYPE VII = M-11: TYPE III (GRAVEL ROAD)  
 TYPE VIII = T-1: FINAL COVER AT LEACHATE COLLECTION/CONTAINMENT SYSTEM SERVICE ROAD
2. FOR CAP TYPES INTERFACE AND OTHER DETAILS SEE REFERENCES ABOVE

**MAP NOTES:**

1. Existing contours shown on this map have been compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.



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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

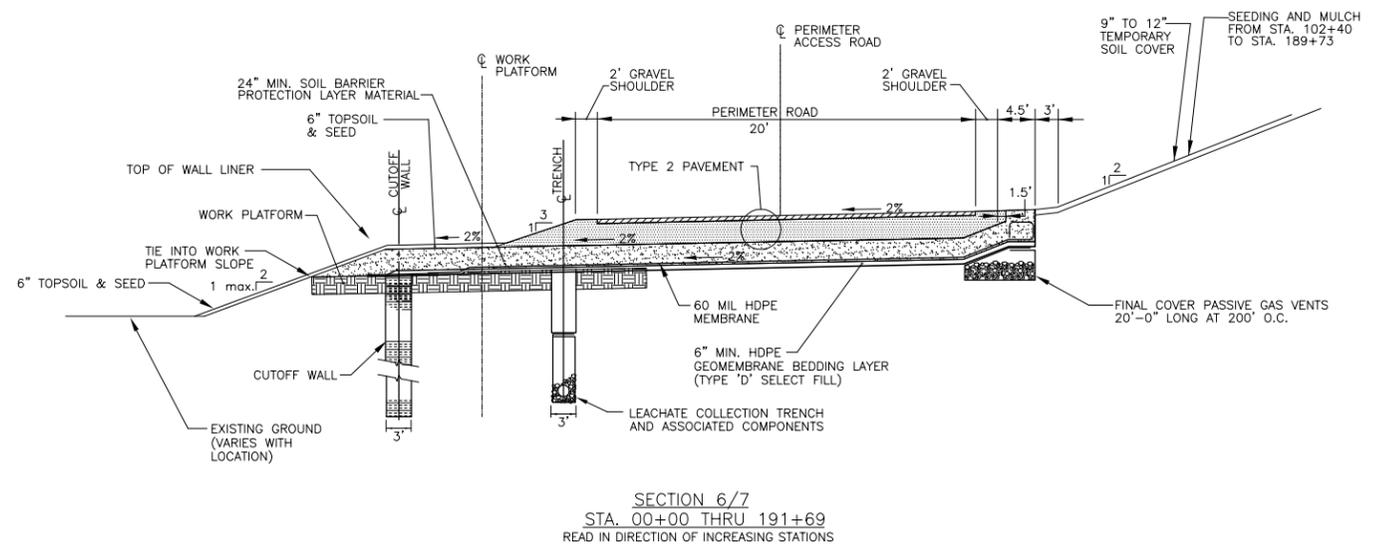
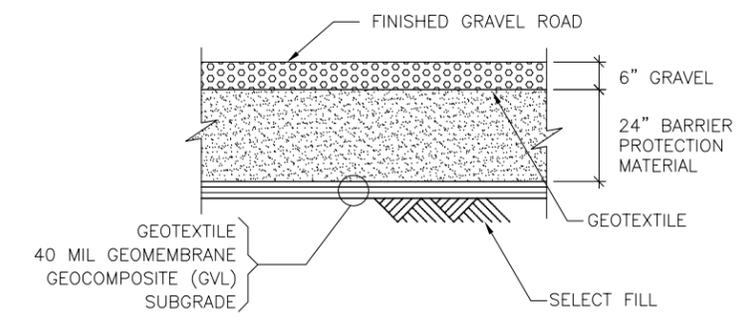
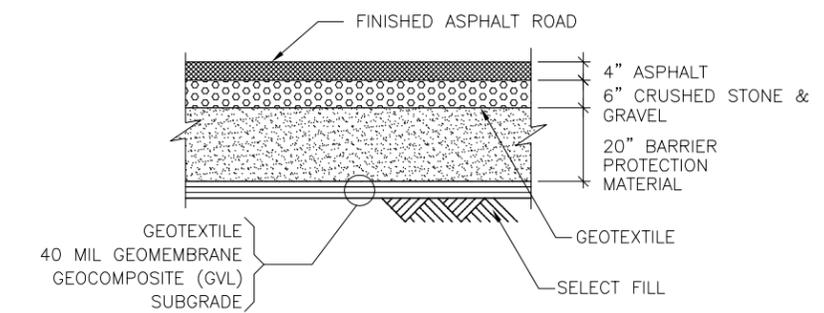
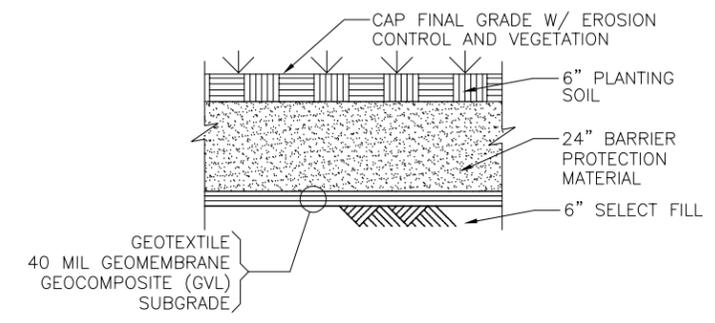
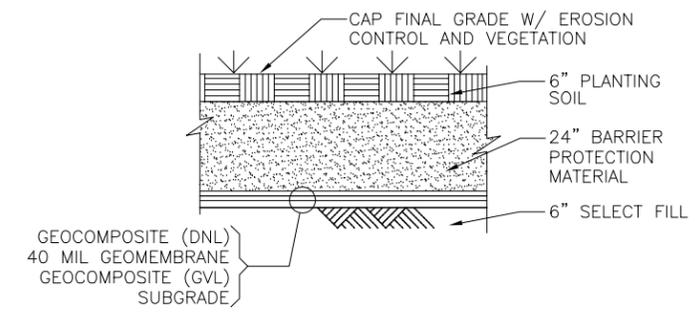
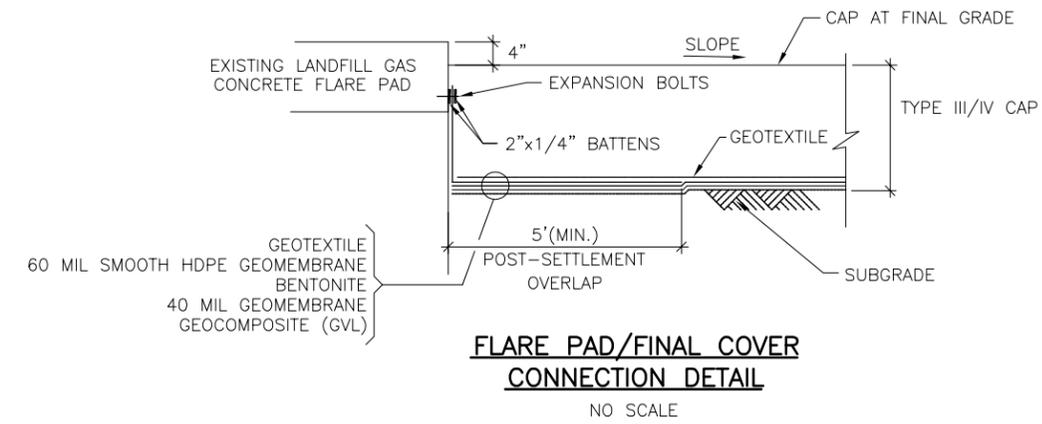
UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

500 0 500 1000  
 SCALE IN FEET

FRESH KILLS LANDFILL			
<b>SECTION 6/7 FINAL COVER PLAN</b>			
DRAWN BY	K.S.	DATE	12/13/02
W.O. NO.	02147.005.030.3209.02	DWG. NO.	67-3
		SHT	OF
			0

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE M-11 (FINAL DESIGN COVER TYPES IV, V, VI, AND VII)  
 REFERENCE T-1 (FINAL DESIGN COVER TYPE VIII)

- NOTES:
- FINAL COVER TYPE DESIGNATIONS HAVE BEEN CHANGED FROM REFERENCES. CORRESPONDING FINAL COVER TYPE DESIGNATIONS ON REFERENCES ARE:  
 TYPE IV = M-11: TYPE I (SLOPES GREATER THAN 15%)  
 TYPE V = M-11: TYPE II (SLOPES LESS THAN OR EQUAL TO 15%)  
 TYPE VI = M-11: TYPE IV (ASPHALT ROAD)  
 TYPE VII = M-11: TYPE III (GRAVEL ROAD)  
 TYPE VIII = T-1: FINAL COVER AT LEACHATE COLLECTION/CONTAINMENT SYSTEM SERVICE ROAD
  - FOR CAP TYPES INTERFACE AND OTHER DETAILS SEE REFERENCES ABOVE



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NO.	DATE	APPD.	REVISION DESCRIPTION
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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**

PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837

UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL				
SECTION 6/7 FINAL COVER SECTIONS				
DRAWN BY	DATE	DWG. NO.	REV. NO.	
K.S.	12/13/02	67-4	0	
W.O. NO.	02147.005.030.3209.02		SHT. OF	

**LEGEND**

- 50 — EXISTING AND PROPOSED FINAL GRADE
- SOLID WASTE MANAGEMENT UNIT BOUNDARY
- ▬ SERVICE ROAD
- C7 → DRAINAGE SWALE
- ▬▬ DOWNCHUTE
- CULVERT
- DROP-INLET BOX
- ▭ EMERGENCY SPILLWAY
- ▣ BASIN INTAKE
- ↔ HIGH POINT

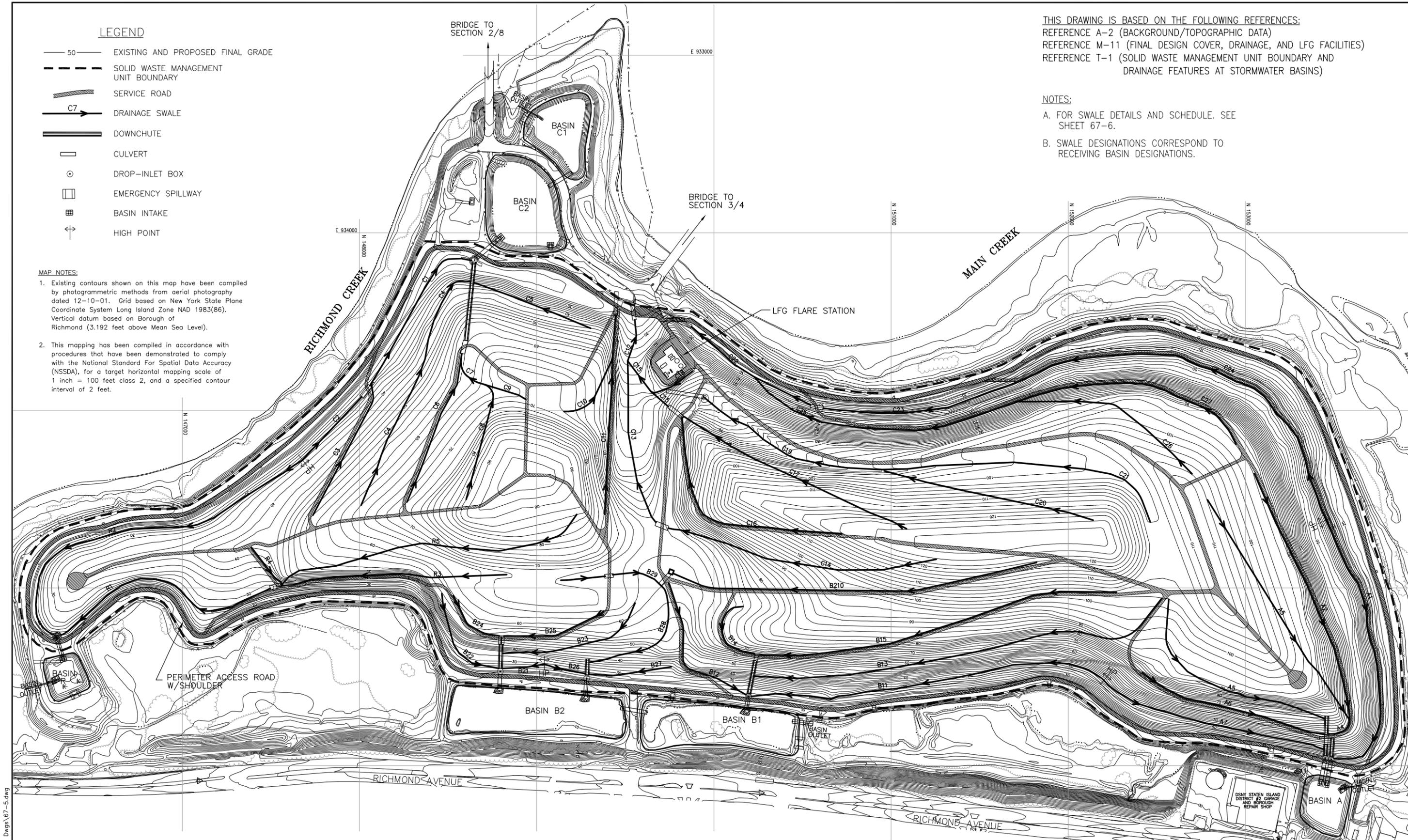
**MAP NOTES:**

1. Existing contours shown on this map have been compiled by photogrammetric methods from aerial photography dated 12-10-01. Grid based on New York State Plane Coordinate System Long Island Zone NAD 1983(86). Vertical datum based on Borough of Richmond (3.192 feet above Mean Sea Level).
2. This mapping has been compiled in accordance with procedures that have been demonstrated to comply with the National Standard For Spatial Data Accuracy (NSSDA), for a target horizontal mapping scale of 1 inch = 100 feet class 2, and a specified contour interval of 2 feet.

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE A-2 (BACKGROUND/TOPOGRAPHIC DATA)  
 REFERENCE M-11 (FINAL DESIGN COVER, DRAINAGE, AND LFG FACILITIES)  
 REFERENCE T-1 (SOLID WASTE MANAGEMENT UNIT BOUNDARY AND DRAINAGE FEATURES AT STORMWATER BASINS)

**NOTES:**

- A. FOR SWALE DETAILS AND SCHEDULE. SEE SHEET 67-6.
- B. SWALE DESIGNATIONS CORRESPOND TO RECEIVING BASIN DESIGNATIONS.



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**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**



PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

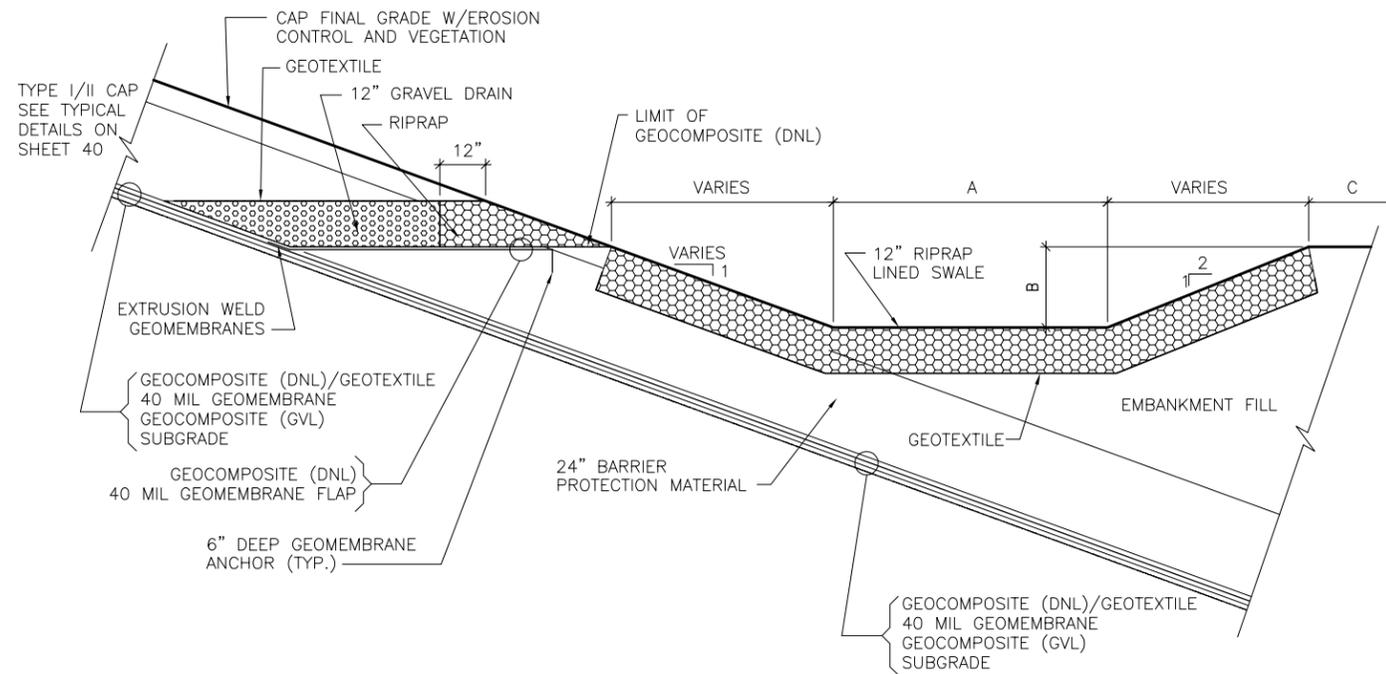


FRESH KILLS LANDFILL			
<b>SECTION 6/7 DRAINAGE PLAN</b>			
DRAWN BY	K.S.	DATE	12/13/02
W.O. NO.	02147.005.030.3209.02	DWG. NO.	67-5
		SHT	OF
			REV. NO. 0

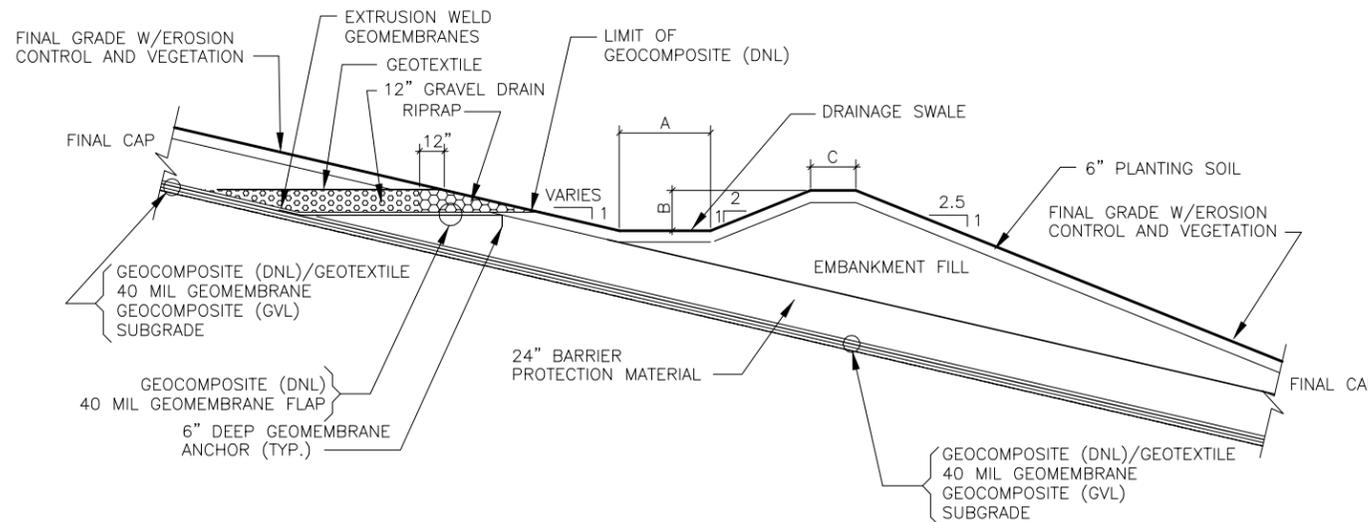
THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
 REFERENCE M-11 (FINAL DESIGN COVER, DRAINAGE, AND LFG FACILITIES)

NOTES:

- A. SWALE DESIGNATIONS CORRESPOND TO RECEIVING BASIN DESIGNATIONS.
- B. SWALE ID CODES MODIFIED FROM ORIGINAL DESIGN DOCUMENTS FOR FACILITIES MANAGEMENT PURPOSES.



**TYPICAL RIP-RAP LINED DRAINAGE SWALE DETAIL**  
 SCALE: 1/4"=1'-0"



**TYPICAL DRAINAGE SWALE DETAIL**  
 NO SCALE

SWALE SCHEDULE	
SWALE DESIGNATION	LINING
A1	GRASS
A2	GRASS
A3	GRASS
A4	GRASS
A5	GRASS
A6	GRASS
A7	GRASS
B11	GRASS
B12	GRASS
B13	GRASS
B14	GRASS
B15	GRASS
B21	GRASS
B22	GRASS
B23	GRASS
B24	GRASS
B25	GRASS
B26	GRASS
B27	GRASS
B28	GRASS
B29	GRASS
B210	RIP-RAP
R1	GRASS
R2	GRASS
R3	GRASS
R4	GRASS
R5	GRASS
C1	GRASS
C2	GRASS
C3	GRASS
C4	GRASS
C5	GRASS
C6	GRASS
C7	GRASS
C8	GRASS
C9	GRASS
C10	GRASS
C11	GRASS
C12	RIP-RAP
C13	GRASS
C14	GRASS
C15	RIP-RAP
C16	GRASS
C17	GRASS
C18	GRASS
C19	GRASS
C20	GRASS
C21	GRASS
C22	RIP-RAP
C23	GRASS
C24	GRASS
C25	RIP-RAP
C26	GRASS
C27	GRASS

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NO.	DATE	APPD.	REVISION DESCRIPTION
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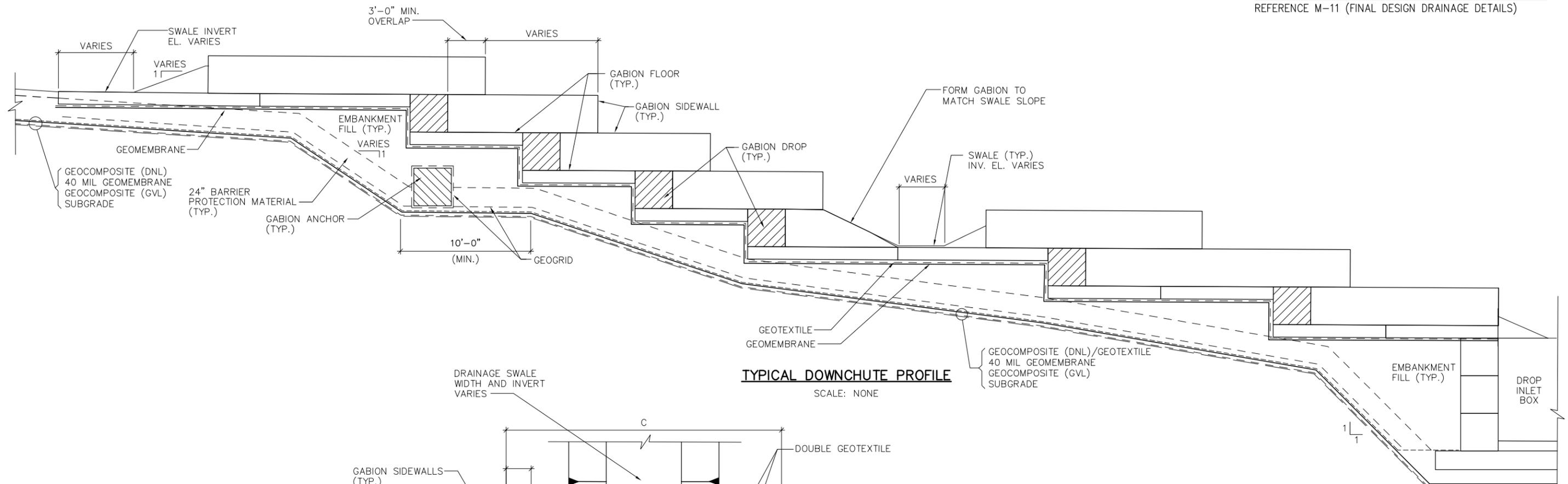
**FRESH KILLS LANDFILL  
 STATEN ISLAND, NEW YORK  
 POST-CLOSURE MONITORING AND  
 MAINTENANCE OPERATIONS DRAWINGS**

PREPARED BY:  
 ROY F. WESTON OF NEW YORK, INC.  
 205 CAMPUS DRIVE  
 EDISON, NEW JERSEY 08837  
 UNDER THE SUPERVISION OF:  
 CITY OF NEW YORK DEPARTMENT OF SANITATION  
 NEW YORK, NEW YORK 10004

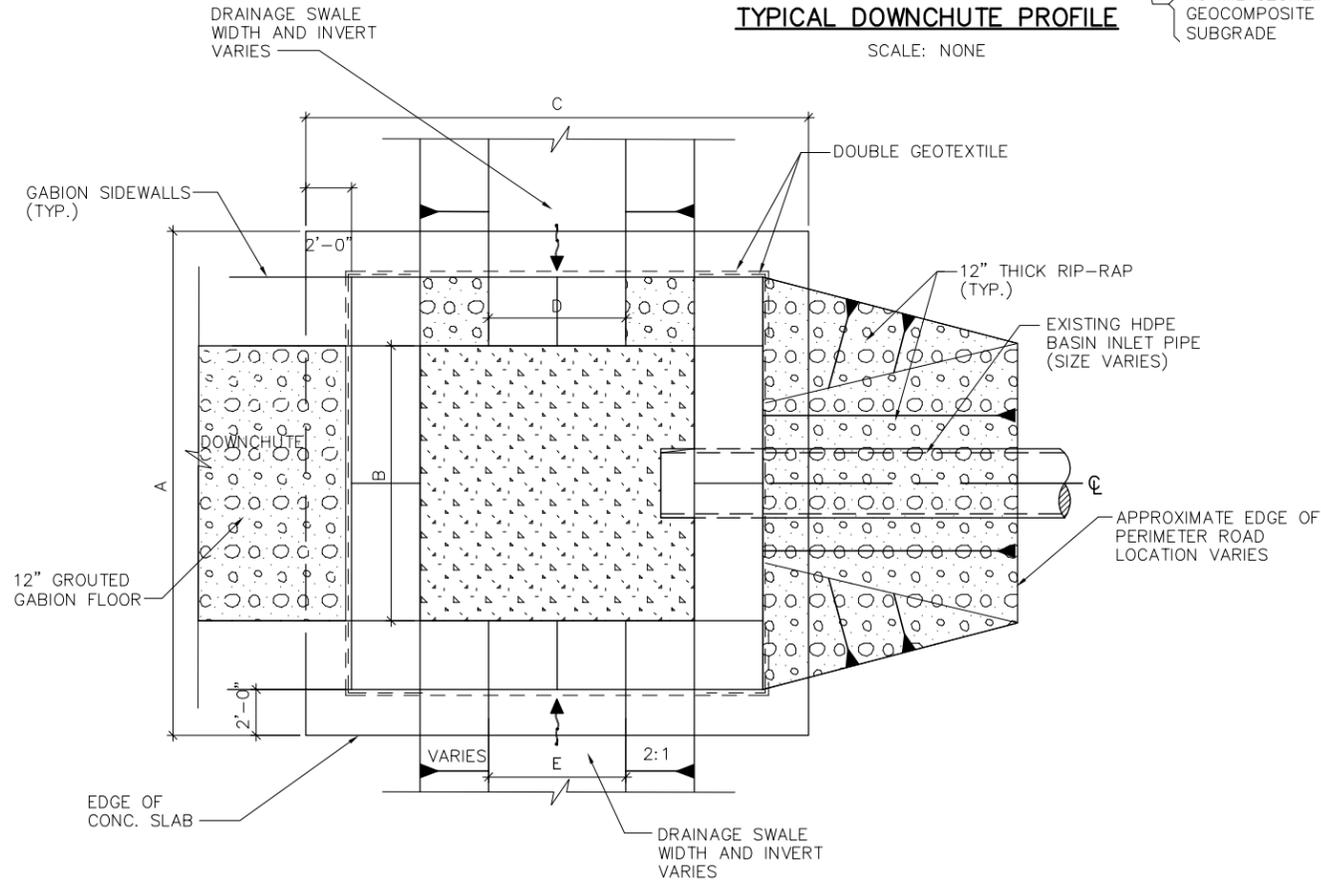
FRESH KILLS LANDFILL  
**SECTION 6/7  
 DRAINAGE DETAILS  
 (SHEET 1 OF 2)**

DRAWN BY	K.S.	DATE	12/13/02	DWG. NO.	67-6	REV. NO.	0
W.O. NO.	02147.005.030.3209.02			SHT	OF		

THIS DRAWING IS BASED ON THE FOLLOWING REFERENCES:  
REFERENCE M-11 (FINAL DESIGN DRAINAGE DETAILS)



**TYPICAL DOWNCHUTE PROFILE**  
SCALE: NONE



**TYPICAL DROP-INLET BOX PLAN**  
SCALE: NONE

**DOWNCHUTE SCHEDULE**

DOWNCHUTE NUMBER	LOCATION	DEPTH (ft)	WIDTH (ft)	SLOPE (ft)
2	BASIN B1	3	9	3.5H:1V,6H:1V,10H:1V
3	BASIN B2	3	6	7H:1V
4	BASIN B2	3	3	6H:1V,14H:1V
5	BASIN C	3	9	5H:1V,8H:1V
6	BASIN A	3	6	3H:1V,6H:1V
7	BASIN A	3	6	3H:1V,6H:1V

**DROP-INLET BOX SCHEDULE**

BASIN	DROP-INLET BOX NUMBER	A (ft)	B (ft)	C (ft)	D (ft)	E (ft)	INLET-PIPE SIZE (in.)
B1	2	19	9	20	4	N/A	36
B2	3	16	6	20	4	4	36
	4	16	6	20	4	4	48
C	5	19	9	22	6	N/A	42
A	6	16	6	22	6	N/A	48
	7	16	6	20	4	N/A	36
R	8	16	N/A	24	6	8	36

F:\FreshKills\Closure Plan Dwg\67-7.dwg

**FRESH KILLS LANDFILL  
STATEN ISLAND, NEW YORK  
POST-CLOSURE MONITORING AND  
MAINTENANCE OPERATIONS DRAWINGS**

PREPARED BY:  
ROY F. WESTON OF NEW YORK, INC.  
205 CAMPUS DRIVE  
EDISON, NEW JERSEY 08837  
UNDER THE SUPERVISION OF:  
CITY OF NEW YORK DEPARTMENT OF SANITATION  
NEW YORK, NEW YORK 10004

FRESH KILLS LANDFILL  
**SECTION 6/7  
DRAINAGE DETAILS  
(SHEET 2 OF 2)**

NO.	DATE	APPD.	REVISION DESCRIPTION
0	12/13/02	JH	SUBMITTED TO NYSDEC

DRAWN BY	DATE	DWG. NO.	REV. NO.
K.S.	12/13/02	67-7	0

W.O. NO. 02147.005.030.3209.02 SHT \_\_\_\_ OF \_\_\_\_

**ATTACHMENT 3**

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**EMERGENCY AND CONTINGENCY CONTACTS**

**ATTACHMENT 3**  
**EMERGENCY/CONTINGENCY CONTACTS**

Current phone numbers and contact names will be updated and maintained on-site by the Director of Fresh Kills/Emergency Coordinator. A copy of the list of emergency and contingency contacts will be maintained in the operating record and provided to the Operations Control Office. The following contact information will be included on the list:

**Director of Fresh Kills/Emergency Coordinator**

**Post-Closure Monitoring and Maintenance Operations Unit**

**Operations Control Office**

**On-Site Supervisors:**

FKLLTP

Landfill Gas Recovery Facility

Environmental Monitoring Contractor

Final Cover Inspection Contractor

Final Cover Maintenance Contractor

Other Field Offices

**Emergency Services:**

**New York City Police Department**

**New York City Fire Department**

**Other New York City Agencies**

Department of Health

Department of Environmental Protection

### **New York State Agencies**

Department of Environmental Conservation

Department of Health

### **Federal Agencies**

United States Coast Guard

United States Environmental Protection Agency (Region 2)

Federal Emergency Management Agency

### **Hospitals**

Bayley Seaton Hospital

Sea View Hospital

Staten Island University Hospital (North)

Staten Island University Hospital (South)

St. Vincents Hospital

### **Utilities**

Con Edison – Emergency Hot Line

KeySpan