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POST CLOSURE MONITORING AND OPERATIONS MANUAL

PHILIPSTOWN LANDFILL

TOWN OF PHILIPSTOWN, PUTNAM COUNTY NEW YORK

Revised October, 1993
April, 1992

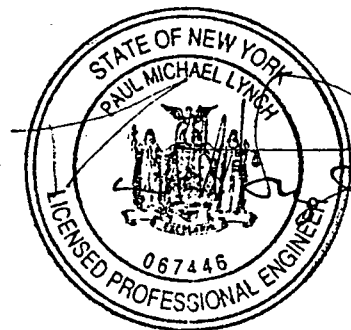


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Post Closure Monitoring and Operations Manual

Philipstown Landfill

Town of Philipstown, Putnam County New York

INTRODUCTION

This Post Closure Monitoring and Operations Manual is being prepared in accordance with 6 NYCRR Part 360, Solid Waste Management Facilities. This manual describes the procedures to be followed in order to implement the ground water, surface water and gas monitoring programs as a part of the Post Closure phase of the Town's landfill. This manual also outlines procedures for the proper maintenance of all facility components for a period of 30 years after landfill closure. The site is indicated on the location map labeled Exhibit #1 found at the rear of the manual.

MONITORING POINT LOCATIONS

GROUND WATER MONITORING POINTS:

There are thirteen (13) monitoring wells on the Landfill Site. These wells were installed in accordance with 6 NYCRR Part 360, as further described in the Subsurface Investigation Report (S.I.R.) prepared for this project. The monitoring well locations are shown on Exhibit #2. Site Plan. There is also a potable water well located on the site. This, too, is indicated on Exhibit #2.

It is noted that the revised Supplemental Subsurface Investigation Report (SSIR) will be recommending additional onsite monitoring

wells in the vicinity on the shed well and the burn area. Upon approval of the revised SSIR, the additional wells will be drilled and monitoring of the same will be incorporated in the monitoring program.

SURFACE WATER MONITORING POINTS

There are two surface water monitoring points located adjacent to the Landfill Site. The spring and pond located below the Landfill Site (see Exhibit #2) were sampled and analyzed as part of the S.I.R. These two locations will continue to be used as monitoring points.

GAS MONITORING POINTS

Gas monitoring points are located throughout the site, both around the perimeter of the landfill cap and also around the property boundary (see Exhibit #2).

SAMPLING AND MONITORING SCHEDULE

GROUND AND SURFACE WATER MONITORING

Ground and surface water sampling at and adjacent to the landfill site should be conducted quarterly. One quarterly sampling per year shall be tested for baseline parameters. The remaining quarterly samplings will be tested for routine parameters supplemented by additional parameters noted in Exhibit #3 for specific wells. Exhibit #4 outlines a four (4) year quarterly testing cycle, and Exhibit 5 tabulates the baseline and routine parameters. At the

end of the first cycle the sampling results should be analyzed. If the sampling results indicate that water quality standards are not being degraded by the landfill then a reduction of sampling frequency to semi-annually could be considered.

GAS MONITORING

Gas monitoring will be performed annually during the winter months. In addition to annual testing, quarterly testing will be performed in areas where houses or off site buildings are located within 500 feet of the property boundary. The need for quarterly testing will be re-evaluated on an annual basis.

GROUND WATER SAMPLING PROCEDURES

Before collecting each sample, the water table elevation in each monitoring well will be measured and recorded. In addition, a volume of water equal to three (3) times the calculated stored volume of water within the well will be removed prior to obtaining a sample. If the well is bailed dry prior to removing the required volume, it will be allowed to recharge and then a sample will be taken.

A ground water sample shall be taken from each monitoring well indicated on the schedule (see Exhibit #4). Care should be taken to use dedicated sampling equipment at each test well or to properly sanitize the sampling equipment between each sample. The purpose of these precautions is to avoid cross contamination of samples from different test well locations. Further detailed instructions or alternate methods of collection may be specified by

the lab chosen to analyze the samples. The testing lab will also provide instructions for the storage and handling of samples as well as a chain of custody record for each sample.

All samples shall be analyzed for the parameters listed in Exhibit #5 and supplemented with the parameters listed in Exhibit #3 for specific wells. The following detailed specific procedures shall be followed:

Ground Water Sampling

The following procedure will be used:

1. The volume of water in each well will be calculated using the following equation:

$$V = \pi (r^2) h (7.48 \text{ gal/ft}^3) \text{ where:}$$

V = casing volume (gallons)

$\pi = 3.14$

r = well casing radius (feet)

h = height of water column (feet)

2. A minimum of three casing volumes will be removed from the well using a redi-flow submersible pump. Non-deposable purging equipment will be decontaminated according to the procedures presented in Section 3.2. If a well evacuates to dryness and will be slow to recharge, only one casing volume will be removed. During well evacuation, excess agitation of the water in the well will be avoided to reduce the potential for chemical changes and for disturbance of sediment. Purged water will be collected and returned to the septic system.

3. Sampling will not be conducted until the well will be fully recovered from purging. Organic samples will be collected with dedicated PVC bailers and clean, new nylon bailing line. Inorganic samples will be collected from the pump dwell becharge which will be controlled to prevent turbulence.
4. VOC sample vials will be filled completely so that no head space remains in the container.
5. The sample containers will be placed in a cooler with ice packs to preserve the samples at 4°C and samples delivered to the laboratory for analysis.
6. A sample of the ground water will be collected for field measurements at the same time samples will be collected for laboratory analysis. Field measurements include temperature, pH, and specific conductance. Temperature will be measured with a thermometer that can be read to the nearest 0.1°C. A pH meter, used for pH measurement by placing the electrode in the pH 7 and pH 4 buffer solutions. Specific conductance will be measured with a combination meter that also will be calibrated between wells.

Procurement & Preparation of Sample Containers

Sample containers will be provided by the laboratory selected to perform the analyses, Camo Analytical Laboratories. Container

closures are screw-on type and made of inert materials. Sample containers are cleaned and prepared by the laboratory prior to being sent to the field.

Labeling of Samples

A unique sample number will be assigned to each sample location. A sample label bearing the well number, site location, client, sampler and date will be attached to each bottle prior to putting the sample into the bottle. The label will be protected by covering it with tape.

Decontamination of Sampling Equipment

Non-disposable ground water sampling devices will be decontaminated between sampling points using the following procedure:

1. Clean equipment of all foreign matter.
2. Cleaned with non-phosphate detergent and water solution.
3. Rinse with distilled water.
4. Rinse with 10% nitric acid (only for stainless steel equipment.)
5. Rinse with pesticide-grade methanol.
6. Rinse with HPLC grade hexane.
7. Air dry.
8. Rinse with distilled water.
9. Air dry.

Fluids generated from decontamination procedures will be collected and stored on-site for future disposal.

Quality Control Samples

Quality control procedures will be employed to check that sampling and analytical activities do not bias sample chemical quality. Trip and field rinsate blanks, duplicate samples, and matrix spike/matrix spike duplicate samples will be collected. The number of sampling days and samples collected. At least one set of Qa/Qcv samples will be collected per sampling day.

Trip blanks will be used each day of ground water sampling. The trip blank will be prepared by the laboratory by filling a 40-ml. vial with analyte-free water. The vial will be shipped to the site with the sample containers and accompanies the sample containers at all times. One trip blank will be returned to the laboratory with each day's shipment of samples scheduled for VOC analysis. The trip blank will be analyzed for VOCs to detect possible contamination during shipment.

The field rinsate blanks will be collected to check the decontamination procedures used at the site. At the field location, demonstrated analyte-free water provided by the laboratory will be passed through decontaminated sampling equipment and placed in an empty set of sampling containers. The field rinsate blanks will be then analyzed for VOCs using the same method as the sampled media.

One field blank will be collected for each type of equipment used
???? each day a decontamination event will be carried out.

For each sample matrix, a field duplicate sample will be collected at a rate of one sample per 20 environmental samples. The duplicate sample will be collected at the same location as the environmental sample to evaluate the laboratory accuracy.

A Matrix spike and matrix spike duplicate (MS/MSD) samples will also be collected. Extra sample volume from a selected location will be collected as the MS/MSD samples. These samples are used by the laboratory to provide supporting QA/QC that will be specific to the samples being analyzed.

Sample Custody

SSEC will follow an established program of sample chain-of-custody during both field and laboratory operations. A chain-of custody form will be sent by the laboratory and will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first "received" blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form, including: sampler names and signatures, sampling station identification, date, time, type of sample, and the required analysis.

After sampling has been completed, the sample containers will be placed in coolers for shipping. The sampler will sign and date the

next "relinquished" blank space on the chain-of-custody form. The samples will be transported to the laboratory under custody of SSEC or laboratory personnel. The chain-of-custody form will be placed in the cooler.

All samples will be received by the laboratory within 24 hours of collection. Samples will be received by laboratory personnel, who will assume custody of the samples, and sign and date the next "received" blank on the chain-of-custody form.

Sample Analysis

All sample analysis will be conducted by Camo Laboratories or another New York State certified laboratory using approved analytical methods. The established laboratory QA/QC program will be followed which defines procedures for the evaluation and documentation of analytical methodologies and reporting of data. Additionally, quality control procedures will be performed during sample analysis, which include method blank analysis to analyze levels of laboratory contaminants, duplicate analysis to establish analytical accuracy. The laboratory report will contain all information necessary to evaluate the quality of the contained data, including:

1. Case narrative
2. QA/QC summaries with supporting documentation.
3. Relevant calibration data with supporting documentation.
4. Instrument and method performance data.
5. Data report forms with calculations used in determining concentrations.

GAS MONITORING PROCEDURE

Post closure gas monitoring will be performed to insure that decomposition gases generated within the landfill will be controlled to avoid hazards to health, safety and property. The monitoring is to insure that the concentration of methane and other explosive gases generated by the facility do not exceed 25% of the lower explosive limit for gases in facility structures on or off-site, or the lower explosive limit for the gases at or beyond the property boundary.

Detection of methane or other explosive gas levels above the limit specified above should be immediately reported to the appropriate Town Official(s) and the New York State Department of Environmental Conservation. The appropriate steps should be taken immediately to ensure for the safety and protection of the health of the general public.

The explosive gas investigation will be conducted during the winter months when a frost layer exists, a potential for snow cover, and when wind conditions are at a minimum. These three conditions maximize the potential for gas migration from the landfill area and help to insure its detection. The actual testing should be conducted when the temperature is above freezing and within the operating range of the gas detection equipment.

The investigation shall utilize a portable gas detection instrument designed to detect the presence of methane or other combustible decomposition gases in the air. The gas readings around the

perimeter of the landfill shall be taken by advancing a probe hole into the ground to a depth below frost level. After removing the probe hole bit from the hole, a probe attached to the gas meter aspirator adaptor shall be inserted into the ground. The gas reading will be taken from the gas detector after aspiration.

For readings exceeding 25% of the lower explosive limit for gases, additional readings will be taken at twenty five (25) foot intervals in both directions along the perimeter as well as perpendicular to the landfill edge. This will be done to define the area of high concentration.

Probe hole gas readings shall also be taken around the corners of any buildings located on site. In addition, gas readings shall be taken inside the buildings on site. The readings shall be taken at floor level, head level and at the highest extended arm level. A portable hand-held gas detection meter shall be utilized which responds with an audible signal when readings in excess of 25% of lowest explosive limit is encountered.

SITE MAINTENANCE PROGRAM

MONTHLY INSPECTION

Monthly inspection of the landfill site should be performed to identify and document any problems that may have developed after final closure of the landfill. The inspection will include looking at the landfill cover sections, gas venting systems, and site drainage control system. The visual inspection should also identify the presence of any vectors on the site. The following

sections describe in more detail the specifics of the site inspection.

COVER SYSTEM

The landfill has been designed for a synthetic cover system. Problems that may be encountered and need repair over the course of time include but are not limited to the following:

1. tearing of synthetic membrane
2. settlement of the landfill (total and differential)
3. erosion of surface soils on top of the landfill or along side slopes.
4. loss of vegetative cover

In areas where cracks and depressions are discovered in the cover system. The synthetic barrier layer should be exposed to determine its integrity. If the synthetic liner is damaged it will be repaired prior to replacing the cover soil and reseeding. All work associated with repairing the synthetic liner will be in accordance with present day technologies available to the Town Consultant.

In those areas where erosion is visible, cover soil will be repaired by replacing the eroded soil and compacting prior to the re-establishing of vegetative cover. Temporary erosion control will be provided by using hay bales for siltation control.

Bare spots on the landfill cover should be repaired by re-working the cover soil, re-seeding, fertilizing and mulching. In addition, it is necessary to mow the vegetative cover a minimum of 6 times a year to help maintain the integrity of the cover system. Hand held or light-weight equipment should be used to avoid the creation of ruts.

GAS VENTING SYSTEM

The inspection of the gas venting system shall include the checking of the vents for physical damage, blockage and the surrounding area for total and differential settlement. In addition, the inspection shall pay special attention to the land and vegetation surrounding the landfill. Signs of stressed vegetation, bubbling of surface water could be indicative of a malfunction of the gas venting system.

Physically damaged vents should be repaired or replaced. Blockages in the vent should be removed using a non-metallic device such as a snake tool.

Settlement of the cover system around the gas vent will be treated as described under the preceding discussion for cover system.

Smoking or use of open flame will be strictly prohibited. Signs shall be posted along the perimeter of the landfill that state "CAUTION: EXPLOSIVE GAS VENTING. NO SMOKING OR USE OF OPEN FLAME."

DRAINAGE SYSTEM

Site drainage patterns, will be inspected to verify that drainage is leaving the site as prescribed. The inspection will identify any erosion, siltation, settlement, blockage, restriction or re-routing of storm water runoff. The necessary repairs to re-establish the integrity of the system will be undertake at once.

VECTORS

Upon closure of the landfill, the Town shall retain a Professional Pest Control Specialist who will develop and implement a Vector Remediation Program. The program shall insure that any pests that

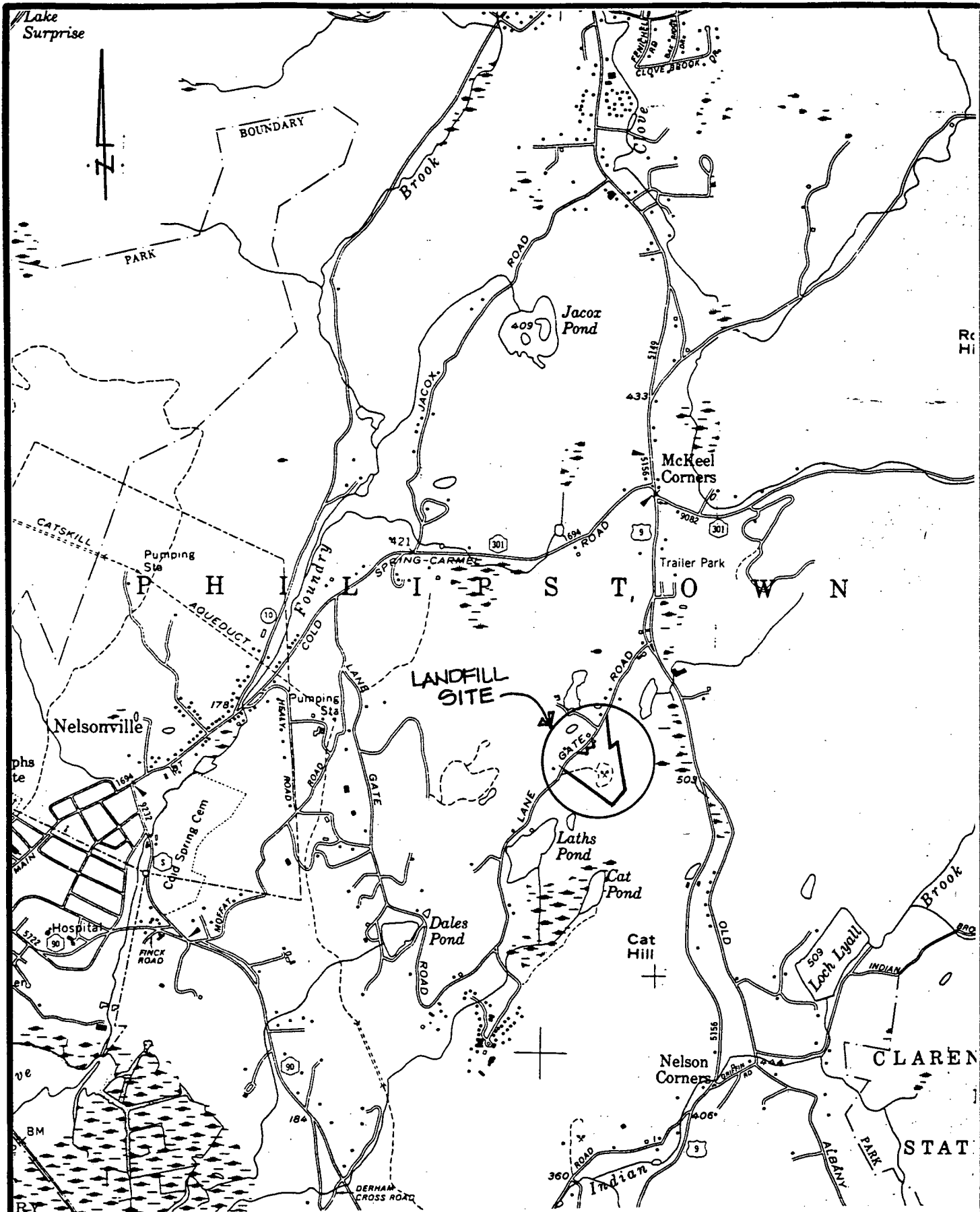
may exist in the landfill will not be driven to surrounding homes and areas after closure. The program shall consist of specific procedures for treating the landfill for rodents. The program shall continue until determined to not be necessary by the governing Public Health Officials. The program may be modified as determined appropriate on an annual basis.

Landfill closure in itself is a primary method of vector control. Covering the refuse removes the attractant for vectors and often causes vectors to migrate to other active portions of the landfill in search of available food sources. The vector remediation program, if necessary will generally consist of periodic placement of rodent bait boxes strategically located within the landfill controlled property. During the final capping phase, this bait program will be implemented through a Licensed Contractor and shall continue as necessary after installation of the final cover.

Avian predators will continue to provide additional natural vector control after capping is complete.

EXISTING BUILDINGS/STRUCTURES/FACILITIES

All structures located at the landfill site including but not limited to: fences, gates, buildings, monitoring well covers, and gas vents shall be checked to insure that they are undamaged and secure. Any damaged structure should be repaired as previously outlined or required. The entrances to the landfill shall have proper signage to indicate that it is a closed landfill and to prohibit unauthorized entering.



CASHIN ASSOCIATES, P.C.
ENGINEERS - ARCHITECTS - PLANNERS
 RD#6, RTE. 22, BREWSTER, NEW YORK

PHILIPSTOWN LANDFILL
LOCATION MAP
EXHIBIT # 1

160491
 255 EXECUTIVE DRIVE
 PLAINVIEW
 NEW YORK 11803

4616 ROUTE 347
 PORT JEFFERSON STATION
 NEW YORK 11778

RD 6, RTE 22
 BREWSTER
 NEW YORK 10509

POST CLOSURE MONITORING AND OPERATIONS MANUAL

EXHIBIT #2

TOWN OF PHILIPSTOWN LANDFILL SITE PLAN

(LOCATED IN POCKET AT REAR OF REPORT)

EXHIBIT #3
TOWN OF PHILIPSTOWN LANDFILL
ADDITIONAL ANALYTICAL PARAMETERS

ADDITIONAL ANALYTICAL PARAMETERS

PARAMETER	WELL DESIGNATION														
	R	AS	BR	BS	CR	DR	ER	FR	GR	GS	IR	KR	POND	SPRING	SHED
GENERAL															
BOD	X					X	X								
INORGANICS															
Boron		X												X	
Aluminum										X	X	X			
Barium				X											
VOCs-601 (ppb)															
Chloromethane	X														X
Bromomethane	X											X			X
Vinyl Chloride	X											X			X
1,1 Dichloroethane	X											X			X
Dichlorodifluoromethane	X											X			X
Trichlorofluoromethane												X			X
Chloroethane												X			X
cis-1,2, dichloroethylene												X			
1,2, Dichloroethane												X			
Chlorobenzene												X			
VOCs - 602 (ppb)															
Benezene												X			X
p-xylene															X
m-xylene															X
chlorobenzene												X			
1,4 - Dichlorobenzene												X			
VOCs - 625 (ppb)															
Di-nbutylphthalate	X				X		X			X	X	X			
bis (2-ethylhexyl) phthalaate	X				X		X			X	X	X			

EXHIBIT #4
TOWN OF PHILIPSTOWN LANDFILL
SURFACE & SUBSURFACE SAMPLING SCHEDULE
FOUR (4) YEAR CYCLE

QUARTERLY				
<u>ON SITE</u>	1 (Jan-Mar)	2 (Apr-Jun)	3 (July-Sept)	4 (Oct-Dec)
Well/Surface Test Site	A _r , A _r	B _s , B _r	B _r , A _s	A _r , B _s
	C _r , E _r	E _r , D _r	F _s , C _r	F _r , E _r
	G _r , G _s	G _s , K _r	I _r , G _r	K _r , G _s
	Shed	Spring	Pond	D _r
TEST TYPE				
Year 1	Baseline	R	R	R
Year 2	Routine	BL	R	R
Year 3	Routine	R	BL	R
Year 4	Routine	R	R	BL

REPEAT CYCLE EVERY FOUR (4) YEARS

EXHIBIT #5

PHILIPSTOWN LANDFILL
POST CLOSUREWATER QUALITY ANALYSIS TABLE

GROUND AND SURFACE WATER

	Baseline Parameters	Routine Parameters	Expanded Parameters
FIELD PARAMETERS			
Static water level (in wells and sumps)	x	x	x
Specific Conductance	x	x	x
Temperature	x	x	x
Floaters or Sinkers ¹	x	x	
			pH
EH	x	x	x
Dissolved Oxygen ²	x	x	x
Field Observations ³	x	x	x
LEACHATE INDICATORS			
Total Kjeldahl Nitrogen (TKN)	x		x
Ammonia	x	x	x
Nitrate	x	x	x
Chemical Oxygen Demand (COD)	x	x	x
Biochemical Oxygen Demand (BOD ₅)	x		x
Total Organic Carbon (TOC)	x	x	x
Total Dissolved Solids (TDS)	x	x	x
Sulfate	x	x	x
Alkalinity	x	x	x
Phenols	x	x	x
Chloride	x	x	x
Total hardness as CaCO ₃	x	x	x
Turbidity	x	x	x
Color	x		x
Boron	x		x
METALS			
Potassium	x	x	x
Sodium	x	x	x
Iron	x	x	x
Manganese	x	x	x
Magnesium	x	x	x

PHILIPSTOWN LANDFILL
POST CLOSURE
WATER QUALITY ANALYSIS TABLE

GROUND AND SURFACE WATER			
	Baseline Parameters	Routine Parameters	Expanded Parameters
Lead	x	x	x
Cadmium	x	x	x
Aluminum	x		x
Calcium	x	x	x
Toxic metals ⁴ and cyanide	x		x
Volatile organics ⁵	x		x
All constituents listed in 6 NYCRR Part 373-2, Appendix 33 ⁶			x

The department may modify this list as needed.

All samples must be whole and unfiltered except as otherwise specified by the department.

¹Any floaters or sinkers found must be analyzed separately from baseline parameters.

²Surface Water only.

³Any unusual conditions (color, odors, surface sheens, etc.) noticed during well development, purging, or sampling must be reported.

⁴Toxic metals include: Antimony, Arsenic, Beryllium, Barium, Cadmium, Chromium (total and hexavalent)*, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium and Zinc.

⁵Volatile organics are to be analyzed using EPA methods 601 and 602 as described in 40 CFR Part 136 (see section 360-1.3 of the Part).

⁶Upon request of the applicant, the department may waive the requirement to analyze for dioxins and furans (suggested method 8380), where appropriate.

*The department may waive the requirements to analyze Hexavalent Chromium provided that Total and Hexavalent and Trivalent Chromium values do not exceed 0.05 mg/l.