



DELAWARE SOLID WASTE AUTHORITY

Pasquale S. Canzano, P.E., BCEE
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January 8, 2007

Mr. Robert Hartman
Environmental Scientist
Solid and Hazardous Waste Management Branch
Department of Natural Resources and Environmental Control
Division of Air and Waste Management
89 Kings Highway
Dover, De 19901

RE: Pigeon Point Landfill Post Closure Permit Application

Dear Mr. Hartman:

We have received your letter dated July 25, 2006 which contains twelve (12) items that DNREC requested we address regarding the Pigeon Point Landfill Post Closure Permit Application submitted jointly by the Delaware Solid Waste Authority (DSWA) and the City of Wilmington (COW) on April 26, 2006. Our response to your numbered items is as follows:

ITEM 1 – Cap Maintenance and Performance

EXHIBIT 5 of the Permit Application is entitled “Maintenance and Protection for the Capping System.” It describes the activities and responsibilities of cap maintenance and protection. More specific procedures and controls proposed are as follows:

- 1) On a weekly basis DSWA personnel will inspect the capping system to ensure its integrity and effectiveness in accordance with Section 5.K. of the Delaware Regulations Governing Solid Waste. A weekly capping system inspection form similar to the one attached to this letter (see EXAMPLE 4) will be used to record the observations and actions taken.
- 2) Each operating day that the Cap Enhancement work is progressing, DSWA will conduct an inspection to ensure it meets the requirements of the 1999 plan prepared by Camp, Dresser & McKee (CDM) (see EXHIBIT 12 of the Permit Application). An operational inspection form similar to the one attached to this letter (see EXAMPLE 4) will be used to record the observations and actions taken.

1128 S. Bradford Street, P.O. Box 455, Dover, Delaware 19903-0455
Phone: (302) 739-5361 Fax: (302) 739-4287

CITIZENS' RESPONSE LINE: 1-800-404-7080 www.dswa.com

- 3) The contractor has been and will continue to be directed to only remove the existing topsoil, as described on the CDM drawings, during their cap enhancement work.

ITEM 2 – Stability Analysis

Enclosed with this letter are single copies of each stability analysis report prepared for the Pigeon Point Landfill. They are:

- 1) Geotechnical Study – Northern Solid Waste Management Center –1, Pigeon Point Disposal Area, Wilmington, Delaware dated December 10, 1999.
- 2) Slope Stability Evaluation for Pigeon Point Landfill, Wilmington, Delaware dated January 10, 2005.
- 3) Supplemental Slope Stability Analysis for Pigeon Point Landfill dated March 23, 2005.

ITEM 3 – Inspections

Attached to this letter is an Inspection Summary Table, which lists eight (8) categories of inspection, their frequency and methods. In addition, individual inspection forms are also attached which will be used as a guide format for the actual inspection forms to be used by DSWA personnel performing and recording the inspections. Once identified, corrections to problems will be made as soon as possible.

ITEM 4 – Leachate Collection System Alarms

An alarm from the leachate collection system is set up by autodialer to notify the contractor first and then DSWA operations personnel. Appropriate action will be taken in response to the alarm to rectify the problem and in the case of an environmental incident the procedures detailed in the Contingency Plan (see EXHIBIT 14 in APPENDIX 10 of the Permit Application) will be followed.

ITEM 5 – Inspections

See ITEM 3.

ITEM 6 – Odor Complaints

DSWA will maintain an Odor Complaint Log (similar to the Cherry Island Landfill log) documenting complaint information, investigative actions taken and response actions taken when required. In the event of a verified odor incident, the response taken will be as described for an environmental incident in the Contingency Plan (see EXHIBIT 14 in APPENDIX 10 of the Permit Application)

ITEM 7 – Use Agreement between COW and DSWA

The Use Agreement has gone through several drafts and is still in the negotiation and approval process.

ITEM 8 – Ownership of Pigeon Point Land

Approximately 22.13 acres of the property owned by the Delaware River and Bay Authority (DRBA), which consists of Pigeon Point Landfill, perimeter access road, and stormwater basin areas, are in the process of being conveyed to DSWA ownership. A survey has been completed Vandemark & Lynch, Inc. DRBA is taking this information to their Board of Directors for action. We will provide the Department of Natural Resources and Environmental Control (DNREC) with the information once we receive the final approved documents.

Vandemark & Lynch's deed search revealed that Diamond State Port Corporation is listed as the owner of Tax Parcel No. 10-011.00-014. Other New Castle County records indicate that the City of Wilmington is the owner. We have asked our attorneys to clarify this situation. When we receive the results of their review we will inform you at that time.

ITEM 9 – Topographic Map

We have enclosed our best available copy for your information.

ITEM 10 – Additional Groundwater Monitoring Parameters

We do not see the need to add Arsenic and Selenium to the annual groundwater monitoring (performed annually in March) for all the groundwater wells. Please see the attached memorandum from Dan Fluman explaining our position.

ITEM 11 – Additional Stormwater Monitoring Requirements

We believe our current stormwater monitoring program is appropriately thorough and does not need to be expanded as much as you request. Please see the attached memorandum from Dan Fluman explaining our position.

ITEM 12 – Discussion of Findings from Environmental Monitoring

We agree that a discussion of findings and conclusions from the environmental monitoring conducted at the site will be included as part of the Annual Report.

Both DSWA and COW hope that the above responses will satisfy your requirements and enable DNREC to issue a Post Closure Care Permit to us in the near future.

Sincerely,



Pasquale S. Canzano, P.E., BCEE
Chief Executive Officer
Delaware Solid Waste Authority



Kash Srinivasan, P.E.
Commissioner
City of Wilmington

Attachments

C: R. P. Watson, P.E., DEE
T. E. Houska II, P.E., BCEE
R. J. Peters, Sr.
R. M. Roddy, P.E., BCEE
D. A. Fluman
James Werner (DNREC)
Ali Mirzakhali, P.E. (DNREC)
Nancy Marker (DNREC)
Jeremy Homer, Esq. (PGS)
Bill Montgomery (COW)

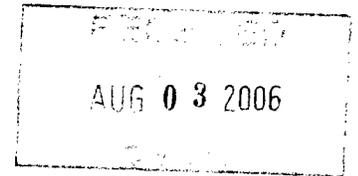
STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES
& ENVIRONMENTAL CONTROL
DIVISION OF AIR & WASTE MANAGEMENT
89 KINGS HIGHWAY
DOVER, DELAWARE 19901



SOLID & HAZARDOUS WASTE
MANAGEMENT BRANCH

TELEPHONE: (302) 739-9403
FAX NO.: (302) 739-5060

July 25, 2006



Mr. Richard P. Watson, P.E., DEE
Chief Engineer
Delaware Solid Waste Authority
1128 S. Bradford Street
P.O. Box 455
Dover, Delaware 19903-0455

Subject: Pigeon Point Landfill

Reference: *Pigeon Point Landfill Post-Closure Permit Application*, April 6, 2006

Dear Mr. Watson:

We have reviewed the Pigeon Point Landfill Post-Closure Permit Application submitted by the Delaware Solid Waste Authority in accordance with 7 Del. C. Chapter 60, and the Delaware Regulations Governing Solid Waste (DRGSW). In order to ensure that the permittees monitor and maintain the closed landfill in accordance with Section 5.K. of the DRGSW, we ask that you please address the following items.

1. In the post-closure care plan, please include specific procedures and controls to be used by the permittee to ensure proper cap maintenance and performance; particularly during the cap enhancement project (the interim agreement does not address cap performance). Tell us how the permittee will control the cap enhancement project to ensure the effectiveness of the capping system in accordance with Section 5.K. of the DRGSW and please specify what the capping system will consist of, recognizing that the contractor is removing the original landfill cap as they proceed from area to area. The contractor's cap removal/replacement process is not explained or controlled in the documents submitted as part of the application and, in fact, the CDM drawings call for the removal of just the top soil.
2. As part of the application, please provide a copy of the stability analysis done prior to the start of the cap enhancement project (as referenced in Appendix 10, Exhibit 11).

Delaware's good nature depends on you!

3. In order to properly maintain access control, the capping system, the leachate control system (including the alarm system), the gas control system, the surface water management systems, and the environmental monitoring systems, the permittee will need to inspect these items at some established frequency. The permittee will need to document problems and initiate corrections quickly. Please include a detailed checklist(s) specifying inspection frequencies and inspection items for these systems and tell us how the permittee will insure that corrections are made.
4. In the post-closure care plan, please detail procedures for responding to alarms from the leachate collection system.
5. In order to reduce impacts to the local community, the permittee will need to inspect the landfill for dust, odors, litter, exposed solid waste and general housekeeping as well as establish procedures to correct problems identified. The permittee will also need to inspect roads leading to the landfill for dust and stabilized sludge. Please provide a checklist(s) specifying frequency of permittee inspections and inspection items. Tell us how the permittee will ensure that corrections are made in a timely manner.
6. Please establish a system for taking/addressing complaints, particularly for odors.
7. Please provide an update to the status of the use agreement cited in item I.D.2 of the PPLIA. Please recognize that any future use of the site must consider not only the waste disposal, but the stabilized sludge and fly ash placed on the landfill during the cap enhancement project. The Department anticipates placing use controls into an Environmental Covenant in the future.
8. Please provide an update to the ownership status of parcels 10-011.00-014 and 10-016.00-004.
9. If possible, please provide a clearer, "as-closed" topographical map. The one provided in Appendix 3 is not readable.
10. For groundwater monitoring please add arsenic and selenium to the March sampling event.
11. For stormwater monitoring, please begin sampling for the constituents required for the Cherry Island landfill (reference Table 5, of the CIL Environmental Monitoring Plan). In addition to the current sampling of the basins, please include semi-annual sampling for water discharges from the outfalls of the basins during a representative storm event (at least 0.1 inch of rain preceded by at least 72 hours of dry weather). The two sampling events must be separated by at least 3 months and the permittee must record estimated flow rates, amount of precipitation at the time of collection, and the time between the start of the storm event and sample collection.

12. Please recognize that the post-closure permit will require that the permittee discuss the findings and conclusions resulting from the environmental monitoring conducted at the site and the permit will require that discussion be provided in an annual report.

When you are ready to submit revisions, please call for an appointment to come in to revise the closure package (3 copies and the compact disk). The cover letter for the revisions should list all changes made. Please contact me at 302.739.9403 to arrange a meeting to discuss any questions you may have concerning our review. In closing, we would like to thank you for your efforts in providing the closure submittal.

Sincerely,



Robert Hartman
Environmental Scientist
Solid & Hazardous Waste Management Branch

RH: dtd
DSWA\Pigeon Point Transfer Station\General Correspondence\RH06030.doc

cc: Nancy Marker, Environmental Program Manager II, SHWMB
Bryan Ashby, Environmental Program Manager I, SHWMB
Frank Gavas, Hydrologist, SHWMB
Jae-Soo Chang, Engineer, SHWMB

MEMORANDUM

DELAWARE SOLID WASTE AUTHORITY



TO: Richard P. Watson, P.E., DEE
Chief Engineer

THROUGH: Anne M. Germain, P.E., BCEE *AG*
Manager of Engineering

FROM: Daniel A. Fluman *DAF*
Manager of Environmental Monitoring and Testing

DATE: October 18, 2006

SUBJECT: DNREC's Request for Additional Monitoring at the Pigeon Point Landfill

As per your request, I have reviewed Bob Hartman's letter of July 25, 2006 regarding the Pigeon Point Landfill (PPL) Permit Application. The information used in formulating my comments are based on personal knowledge, literature review (sources listed at the end of this document), discussions with personnel from the DGS, and data from our facilities. Regarding my review, I offer the following comments:

Conclusions and Recommendations

Item 10 - It is my recommendation that we not do any additional groundwater testing because:

1. Anthropogenic arsenic and selenium on the surface should not move into the groundwater;
2. The data provided would be ambiguous. As stated above, the presence of preexisting anthropogenic and natural sources for arsenic and selenium would provide little more than additional confirmation of what DNREC has concluded in past studies.
3. The varying morphology of the subsurface below Pigeon Point inhibits the vertical movement of most metals including selenium and arsenic.

Item 11 - It is my recommendation that DSWA do not perform NPDES monitoring as requested by Mr. Hartman in his letter dated July 25, 2006. The sedimentation and stormwater controls in place provide the necessary protection for local surfacewater bodies. The vegetated side slopes and large vegetated stormwater basins at PPL will provide additional polishing of stormwater (nutrient and metals uptake) before it can leave the site. The normal quarterly monitoring schedule and collection of grab samples from the basin is sufficient for post closure monitoring.

Item No. 10 - Detailed Comments

I find no basis for the addition of arsenic or selenium to be added to the groundwater monitoring program at Pigeon Point. It has been well documented by DNREC¹ that anthropogenic arsenic is present in surficial soils throughout Delaware, and is especially prevalent in New Castle County where arsenic was commonly used by various industries. Arsenic was also used as a pesticide by the agricultural industry. Natural deposits of rocks and sediments continuously release arsenic to groundwaters throughout the State. Although selenium is a rare metal with few natural sources, trace concentrations can be found in soils throughout Delaware as well.

Mobility of these metals will depend on pH, REDOX, the presence of cations, and hydraulic conductivity of the soils and aquifers. Because of pre-existing conditions, arsenic and/or selenium concentrations in samples will bias sample results. It should be noted that the drinking water standard for arsenic and selenium are 0.01 mg/L and 0.05 mg/L respectively. I present the following for your consideration:

Arsenic

- According to the DNREC's SIRB¹ Section, background levels of arsenic can be found at fairly high concentrations in soils throughout the state. Although some of the sources for arsenic can be traced to anthropogenic activities, background levels of fairly high concentrations (29.1 ppm) have been found in areas considered to not have been impacted by human activities. DNREC states that anthropogenic forms of arsenic seen in Delaware are normally considered to have low solubility properties, and do not travel significantly into surficial soils due to their pH, oxidizing potential, and the presence of common cations.
- DNREC¹, the DGS¹⁶ and USGS⁵ note that arsenic can be found in groundwater sources throughout the state including the Potomac Aquifer, which lies beneath Pigeon Point. This is due to groundwater contact with natural deposits of arsenic bearing rocks and soils. According to DNREC and the Delaware Department of Health, levels arsenic in groundwater can and do regularly exceed DNREC's proposed MCL drinking water standard of 0.01 mg/L (10 ppb).
- Pigeon Point lies within a large industrial sector of New Castle Delaware. Power plant and coal storage sites lie to the north of the Pigeon Point – both potential sources for selenium and arsenic. Railroad tracks run directly along the western and northern edges of the site also providing potential for historical contamination through regional coal shipment. Additionally, a coal gasification facility, tanneries (at least 53 identified in the Wilmington area alone by Tetra-tech, Inc.⁹) and many similarly unregulated polluters operated on the Delaware River and its tributaries until RCRA was promulgated. Common disposal practices for these industries included release of wastewaters, spent industrial fluids and tars to the ground and surfacewaters. Additionally, cinders and coal ash from homes and industries may have been disposed in the vicinity. All these activities would be sources of arsenic and selenium contamination in soils and groundwater.

In addition, tidal action, flooding, and proximity to natural and man-made guts would have moved anthropogenic contaminants from local sources to the marshes and rivers where they would be deposited on sediments in the riverbed. These contaminated sediments would have been deposited on the Pigeon Point marsh and potentially the upper Potomac and part of the Columbia formations as a result of channel deepening by the USACE.

Selenium

- Selenium in trace amounts is a required element for cell membranes. Studies have linked low doses of selenium (an antioxidant) with reduced cancer risk⁷.
- Little information is available regarding local groundwater studies involving selenium. However national studies^{7, 8} indicate selenium is normally a by-product of the copper extraction and power industries, and can be found in various shales. Locally, surfacewater contribution has been linked to poor application of chicken manure¹¹, and stockpiling of coal and power plant ash.
- Selenium has been found in sediments of the Delaware Bay in concentrations ranging from 0.05 mg/Kg – 1.32 mg/Kg.
- Selenium studies in the Delaware estuary indicate uptake by vertebrates and invertebrates transfer selenium to shorebirds and fish when ingested. This results in bioaccumulation of selenium in fish and shorebird tissues¹⁷.

- Studies by the DGS indicate that copper can be found in the crystalline basement (Wilmington complex and adjacent bedrock)⁶. Therefore, the potential exists for selenium to be in both the alluvium and associated groundwater.
- Selenium is mobile under oxidizing conditions and tends to concentrate in reducing estuarine/marsh sediments¹⁴. Discussions with personnel at the DGS indicate that subsurface migration of anthropogenic selenium is unlikely due to the presence of cations such as Ca, Fe, and Mn, and because selenium becomes immobile in reducing soils. This is why levels are fairly high in marsh and subaqueous sediments that are normally in a reducing state. Based on this, the dredge spoils and riverine sediments underlying the site coupled with the presence of common cations found in soils would prevent additional selenium from migrating into the Potomac.

As a final note, Pigeon Point lies within a groundwater management zone where DNREC has determined the water quality to be degraded to such an extent as to be non-potable for the foreseeable future. The closest extraction well to Pigeon Point is the Atlas Point well (Deep Potomac Aquifer) 1/3 of a mile to the South of the site. The water from this well has been determined by DNREC as being contaminated by solvents from the Hercules chemical pits immediately to the South of the Delaware Memorial Bridge.

Monitoring of Groundwaters at Pigeon Point

DSWA and DNREC have data in their Pigeon Point historical groundwater quality files spanning a period of over 20 years. The data is as variable as the makeup of materials forming each geologic unit below the site (channel sands, dredge spoils, marsh soils, and variable alluvium of silts and sands). The data set for arsenic and selenium spans 21 years, and indicates that low levels of these elements have been detected in discontinuous sand lenses within the dredge materials, in the marsh soils, and in even in the deepest aquifer monitored (Potomac).

Arsenic Testing in Groundwaters

Between July 1985 and March 2001, 21 wells were sampled for arsenic 223 times. Of the 223 analyses, 19 (15%) tested positive for arsenic (range = 0.002 mg/L - 0.051 mg/L). The maximum concentration of arsenic (0.051 mg/L) was detected in Well 52A, which is screened vicinity of the original channel of Magazine Ditch. Arsenic was detected at low levels in all but one (1) of the water bearing units (Columbia) below Pigeon Point.

The data indicates the presence of arsenic in water from the dredge spoils, riverine sediments, and Potomac Aquifer. Water from the phreatic aquifer (Columbia) shows no detections of arsenic. Based on arsenic's low mobility, and the low permeability of the dredge spoils, and the distribution of arsenic throughout all but the uppermost aquifer, demonstrates that arsenic is already present throughout the site, and that the sources of the arsenic are likely natural and not anthropogenic in nature.

Selenium Testing in Groundwaters

- Of the 212 samples tested for selenium between July 1985 and March 2001, two (2) samples (0.9%) tested positive for Selenium (range = 0.0021 mg/L to @mdl of 0.01 mg/L).

Both detections of Selenium came from the same monitoring well – Well 40. This well is screened in dredge materials and marsh soils, is very shallow, and the water tends to fluctuate

between oxidizing and reducing states. The presence of selenium is not be surprising since dredge materials were deposited beneath the site. Ample sources of anthropogenic selenium in the Wilmington and New Castle area contributed to the selenium in subsoils beneath Pigeon Point.

Impacts of PPL Cap Enhancement project on Groundwater

When considering the cap enhancement project with regards to impacts on groundwater, neither arsenic nor selenium should be of great concern.

- The VFL fill material is capped with topsoil and seeded as slopes are completed during construction of each phase. The vegetated soil cap placed on top of the VFL material will keep arsenic and selenium within the footprint of the landfill.
- Erosion of sediments is controlled by silt fencing, berms and swales designed to deliver runoff to sediment traps which should allow most of the sediments to settle out. The sediment traps discharge to rock-lined channels to further trap and filter water before it can reach the toe of the slope. These channels direct the clean stormwater to large vegetated stormwater basins. The vegetation acts as a biofilter to remove any remaining contaminants. As a result, the PPL cap enhancement project will not impact the poor groundwater quality beneath the site.
- Loading of VFL fill material on top of the landfill cell should result in an upward vertical gradient as the dredge materials below the landfill continue to dewater and discharge to the leachate collection system. This will result in further consolidation of the dredge materials, and strengthening the natural liner below the landfill.
- Enhancement of the cap restricts infiltration of precipitation into the landfill by promoting runoff. This will reduce leachate generation and the migration of contaminants. Leachate will be collected in the leachate collection system.

Impacts on Leachate Quality

Historically, leachates from the five (5) PPL pump stations have been tested for arsenic and selenium at various times. Four (4) pump stations discharge to the DRP Pump Station (DRP-PS) to the northwest of the site. Leachate from the DRP-PS transfers leachate and wastewater generated at Pigeon Point to the New Castle County (NCC) force main to the west of the site. The NCC sewer line eventually discharges to the City of Wilmington's wastewater treatment plant at Cherry Island.

- To date there appears to be a reduction in arsenic and selenium levels since the cap enhancement began.
- To date there has been no exceedances of limits imposed by DSWA's NCC wastewater discharge permit with regards to arsenic or selenium. Arsenic has not been detected in leachates being discharged from the DRP-PS to the NCC force main since October 2000. Selenium has not been detected in leachates being discharged to the NCC force main since September 2004.

Historical Leachate Testing

Currently, leachates from PPL are tested for Arsenic and Selenium on a semi-annual basis as part of DSWA's ongoing leachate monitoring program. There have been no positive detects for arsenic or selenium in any PPL leachates since September 2004.

- Between July 1985 and September 2006, 324 samples were collected from leachate monitoring points at Pigeon Point and tested for arsenic. Of the 324 samples, 110 (34%) tested positive for Arsenic (Range = 0.0026 mg/L to 0.216 mg/L with an average of 0.019 mg/L).
- Between July 1985 and September 2006, 168 samples were collected from leachate monitoring points at Pigeon Point and tested for selenium. Of the 168 samples, 11 (7%) tested positive for selenium (Range = 0.004 mg/L to 0.05 mg/L with an average of 0.013 mg/L).

Item No. 11 – Detailed Comments

In addition, there is no basis for performing additional, more complex NPDES monitoring of stormwater as requested by DNREC. PPL is no longer accepting MSW and is a closed MSW facility. DSWA and VFL are making considerable efforts to meet the requirements of the existing DNREC stormwater control permit for the cap enhancement project. In addition to multiple layers of sediment controls on the surface of the landfill, DSWA maintains two large vegetated stormwater management basins to allow additional capture of sediments and further polishing of runoff from the landfill. Areas below the limits of construction are fully vegetated with grass, opportunistic flora and trees that help remove nutrients and contaminants that might move beyond the limits of construction due to sheetwater flow. The cap is inspected on a monthly basis by a third-party (ALSI), and more frequently by DSWA personnel. These sediment and erosional controls along with the cap will provide adequate protection for local surfacewater bodies. Therefore, current indicator analysis will be adequate to check natural background levels. The following supports this contention:

- PPL is a closed waste disposal site. DNREC has made a beneficial use determination (BUD) of the VFL material for berm construction as well for cap enhancement. Therefore, this material is considered safe for use.
- DNREC has required more extensive stormwater monitoring at Cherry Island because the Cherry Island stormwater management & sediment control basins were being eliminated as part of the Cherry Island expansion. PPL has two large stormwater management basins to control and polish stormwater and eliminate sediment.
- The Sediment and Stormwater Control Branch of DNREC approves each individual phase of the stormwater management and control system prior to placement of materials. Detailed plans include locations of silt fencing, drainage swales, sedimentation traps (each phase has its own sedimentation trap designed specifically for that area) and rock-lined down-chutes. All stormwater from the project goes through these structures to prevent sediments from leaving the landfill footprint. Additionally, all stormwater is directed to one of the two large vegetated stormwater management basins on site that act as biofilters for additional polishing.
- DSWA tests for indicator analytes on surfacewaters collected at PPL similar to surfacewaters and groundwaters at our other facilities. As indicator analytes, these can be used to give an overall assessment of the quality of the matrix being studied as well as be used for comparative analysis between matrices. The proposed listing of analytes required by DNREC is excessive and goes beyond indicator testing. For example:
 - 8082 aroclor analyses are run on our leachates on a semi-annual basis. To date, only one (1) leachate sample has ever had detectable levels of PCBs at method detection limits (0.94 ug/L for samples run). Even recent congener analysis of PPL leachates did not exceed 0.2 ug/L.

- 8082 arochlor analyses was run on random samples of fly ash, sewage sludge, and various mixtures of both. The results of analysis showed no arochlors present in any of the samples.
- COD is a better, more reliable indicator of oxygen demand. In general, BOD + TOC should not exceed COD. Therefore, COD provides an adequate gauge for evaluating the oxygen demand of the samples.
- Ortho phosphate is the form of phosphorus used in fertilizer (ammonium phosphate), and is the only form used by plants. Orthophosphate rapidly converts to insoluble forms of phosphorus. Once converted, phosphorous tends to remain in the upper stratum of the soil. Phosphorus travels on soil particles eroded from the land surface. That is why buffer strips along waterways reduce phosphorus loading. With the in-place sediment and erosion control, there is no concern of excess phosphorus.
- TKN is a method used to separate the inorganic fraction of nitrogen compounds from the organic fraction. It is not generally used as an indicator because the primary component of TKN is Ammonia-N, and is therefore not necessary to measure.
- Mercury has rarely been seen in ANY groundwater or leachate sampled by DSWA statewide. DSWA tested multiple samples of sewage sludge, fly ash and VFL mixtures, and noted that trace amounts of mercury were detected in all samples. However, because mercury is not mobile and will either remain in place or volatilize, its presence in the solid waste mass does not mean it will be present in leachates or other waters.
- Because oil and grease are hydrophobic, they tend to stick to soil particles. As long as sediments are managed, there should be no problems. Additionally, most oils and greases are energy sources that would be prone to microbial degradation if made available.

Literature and Sources Consulted

1. <http://www.dnrec.state.de.us/dnrec2000/Divisions/AWM/SIRB/Arsenic>
2. <http://www.epa.gov/safewater/arsenic/index.html>
3. <http://www.who.int/mediacentre/factsheets/fs210/en/>
4. [http://www.foodconsumer.org/777/8/Arsenic and Old Laced Water Sources .shtml](http://www.foodconsumer.org/777/8/Arsenic%20and%20Old%20Laced%20Water%20Sources.shtml)
5. <http://water.usgs.gov/nawqa/trace/pubs/fs-063-00/>
6. <http://www.udel.edu/dgs/Publications/pubsonline/RI60.pdf>
7. <http://www.scescape.net/~woods/elements/selenium.html>
8. <http://en.wikipedia.org/wiki/Selenium>
9. <http://tetrattech-de.com/tanneries/bysite.asp>
10. <http://www.pca.state.mn.us/water/groundwater/gwmap/seleniu7.pdf>
11. <http://www.washingtonpost.com/wp-srv/local/daily/aug99/chicken1.htm>
12. <http://pubs.usgs.gov/wri/wri99-4269/pdf/AppPlateausReport.pdf>
13. <http://ag.udel.edu/extension/fnutri/pdf/Nutrition/fnf-21.pdf>
14. <http://www.state.nj.us/drbc/regs/MONb.pdf>
15. <http://www.water-research.net/standards.htm>
16. A.S. Andres of the Delaware Geologic Survey
17. [http://www.kennecott.com/pdf/water qua.pdf](http://www.kennecott.com/pdf/water_qua.pdf)

Inspection Summary

	Inspections	Frequency	Method
1	Access Control	Each Operation Day	PPLF Cap Enhancement Project Daily Activity Report prepared by gatekeeper
2	Operational Inspection	Each Operation Day	Inspection performed by operations personnel (see attached form)
3	Litter Inspection	Weekly	Inspection performed by operations personnel (see attached form)
4	Capping System	Weekly	Visual inspection prepared by operations personnel (see attached form)
5	Leachate Control System	Weekly	Visual inspection prepared by operations personnel (see attached form)
6	Gas Control System	Monthly	Inspection, maintenance and repairs performed by LFG contractor; monthly report submitted to DSWA
7	Surface Water Management System	Monthly	Visual inspection prepared by operations personnel (see attached form)
8	Groundwater System	Quarterly	Sampling, inspection, maintenance and repairs performed by ground water monitoring contractor; quarterly report submitted to DSWA

Figure - Joint Landfill
Cap Enhancement Project
Daily Activity Report
PRINT ALL INFO. LEGIBLY

Date: 02/06/06		Gatekeeper: TOM MOSLEY		Gate 1 CK Time(s): 7:07 (L)	2:36 AM (L)	
Time Gate "2" Unlocked: 7:27		Time Gate "2" Locked: 3:30 PM		Gate 3 CK Time(s): 7:13 (L)	3:39 PM (L)	
Material (DNREC Approval Required) (Sludge, Bottom/Fly Ash, Clean Earth, Etc.)				Gate 4 CK Time(s): 7:15 (M)	3:43 PM (M)	
Load #	Truck No.	In Time	Out Time	Origin	Ticket No.	Tons
		7:15		CALLED ROBIN - GATE 4 UNLOCKED - TOLD TO LEAVE AS HE		
				AND NOTE IT IN LOG.		
		7:30 AM		VFL OPERATOR - W. MURRAY		
1	2000	7:53 AM	7:50 AM	STABILIZED SLUDGE	VFL 136408	20.68
2	2001	7:45 AM	7:53 AM	STABILIZED SLUDGE	VFL 136409	21.98
3	2011	8:11 AM	8:21 AM	STABILIZED SLUDGE	VFL 136411	16.83
4	2007	8:18 AM	8:27 AM	STABILIZED SLUDGE	VFL 136412	19.53
5	2000	8:21 AM	8:27 AM	STABILIZED SLUDGE	VFL 136413	17.13
6	2001	8:25 AM	8:31 AM	STABILIZED SLUDGE	VFL 136415	18.82
7	2011	8:47 AM	9:11 AM	STABILIZED SLUDGE	VFL 136417	14.95
8	2000	8:57 AM	9:03 AM	STABILIZED SLUDGE	VFL 136418	17.53
9	2001	9:02 AM	9:07 AM	STABILIZED SLUDGE	VFL 136420	18.28
10	2007	9:18 AM	9:26 AM	STABILIZED SLUDGE	VFL 136419	22.73
11	2000	9:30 AM	9:37 AM	STABILIZED SLUDGE	VFL 136422	19.68
12	2001	9:33 AM	9:41 AM	STABILIZED SLUDGE	VFL 136423	21.28
13	2011	9:36 AM	9:48 AM	STABILIZED SLUDGE	VFL 136424	18.02
		9:37 AM	12:57 PM	ALEX ENGINEERS		
				M. PETERMAN + M. PERSON		
14	2007	10:00 AM	10:11 AM	STABILIZED SLUDGE	VFL 136426	22.20
15	2000	10:06 AM	10:16 AM	STABILIZED SLUDGE	VFL 136427	19.75

(1) Also include other construction materials for final cover, roads and berms such as topsoil, stone, common borrow, etc.

EXAMPLE 2

PPLF Daily Operational Inspection
(Each Operating Day)

Date: _____

Inspection:	Inspected By:	Actions Required	Actions Taken	Date
Dust				
Odors				
Dust/ Stabilized Sludge on Roads				
Cap Construction is progressing in compliance with CDM Plan dated 1999				
Exposed Waste (Only applicable when stripping topsoil)				

General Procedures for correcting identified problems:
 Dust: Utilize water truck and/or sweeper truck or stop deliveries
 Odors: Cover Stabilized sludge or stop deliveries
 Dust/Stabilized Sludge on Roads: Sweeper truck or stop deliveries
 Exposed Solid Waste: stop stripping activity - cover solid waste

EXAMPLE 3

PPLF Weekly Operational Inspection Litter

Date: _____
Initials: _____

	Litter (Y/N)	Actions Taken	Date
Perimeter Road			
Haul Road			
Landfill Areas			

Are there any actions necessary to maintain/restore good housekeeping? Yes / No

If yes, describe
actions taken:

EXAMPLE 4

Pigeon Point Weekly Inspection Form Capping System

	Detailed Location & Description	Repairs Needed	Date	Initials	Actions Taken	Date	Initials
Erosion							
Seeps							
Vegetation							
Other							

Comments:

Weekly Leachate Control System Inspection Form

Date: _____

Initials: _____

Main Pump Station	Alarm condition present?	Yes	No	Comments:
	Pump run test:			
	Does pump run in hand?			
East Pump Station	Pump 1	Yes	No	Comments:
	Pump 2	Yes	No	
	Alarm condition present?	Yes	No	
West Pump Station	Pump run test:			Comments:
	Does pump run in hand?			
	Pump 1	Yes	No	
North Lift Station	Pump 2	Yes	No	Comments:
	Alarm condition present?	Yes	No	
	Does station have power?	Yes	No	
South Lift Station	Alarm condition present?	Yes	No	Comments:
	Does station have power?	Yes	No	
	Does station have power?	Yes	No	

EXAMPLE 7

Monthly Surface Water Management System Inspection

1 - Is the appropriate silt fence installed and functioning properly? Yes / No

If No, describe locations needing repair/clean out and actions taken.

2 - Are sediment traps functioning properly? Yes / No

If No, describe necessary repairs and actions taken.

3 - Sediment Basin No.1 Outfall

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

Have repairs taken place? Yes: ___ No: ___

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

Sediment Basin No.2 Outfall

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

Have repairs taken place? Yes: ___ No: ___

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

4 - Are stormwater channels functioning and free from debris? Yes / No

If No, describe necessary repairs and actions taken.

5 - Is silt removal from stormwater channels required? Yes / No

If Yes, describe necessary repairs and actions taken.
