January 15, 2016 390/265831

Mr. Benjamin Wilburn, P.E.
Senior Engineer
Fossil and Hydro Support
Talen Generation, LLC
835 Hamilton Street, Suite 150
Allentown, PA 18101

Subject: 2015 Annual (Initial) USEPA CCR Landfill Inspection Report
Brunner Island Ash Disposal Area No. 8

Dear Mr. Wilburn:

This letter report presents the findings of the 2015 annual inspection of the Brunner Island Ash Disposal Area No. 8 Landfill (Landfill). This inspection was performed on October 22, 2015, by HDR Engineering, Inc. (HDR) in accordance with Contract 619843-C, Release No. 5, dated May 27, 2015. This initial annual inspection was conducted in accordance with the requirements of the United States Environmental Protection Agency (USEPA) 40 CFR Parts 257 and 261 Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, April 17, 2015 (CCR Final Rule).

1.0 Summary

The Landfill is an operating Coal Combustion Residual (CCR) landfill, which is owned and operated by Brunner Island LLC, a division of Talen Energy (Talen). The Landfill is required to have an annual inspection, performed by a qualified engineer in accordance with the CCR Final Rule. The Landfill is also subject to regulation by the Pennsylvania Department of Environmental Protection (PADEP) and is classified as a Type II landfill (involving disposal of waste having an intermediate potential for adverse environmental and health effects). Although this is the initial inspection performed in accordance with the CCR Final Rule, Talen and its' predecessor, PPL, have inspected the Landfill in accordance with PADEP requirements since it began operation in 2009.

The CCR Final Rule requires that the annual inspection include the following elements:

- a review of available information to verify that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards;
- a visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit; and
- a summary of CCR volumes and an assessment of changes in geometry.

Design

A review of available information indicates that Ash Disposal Area No. 8 was generally designed and constructed in accordance with good engineering standards that were recognized and generally accepted at the time of design and construction between 2006 and 2009, though not all design information was available for review. Findings from the design review are summarized below.

The Landfill was constructed directly on top of a closed CCR surface impoundment, referred to as Ash Basin No. 5, which was filled to a depth of 35 feet with hydraulically placed bottom ash and fly ash, described as loose to very loose in test borings. These foundation conditions could potentially result in an unstable area, as defined by the CCR Final Rule. Talen is currently assessing the foundation of the Landfill as part of the unstable area demonstration required by the CCR Final Rule. There was no visual evidence of settlement or distress of the Landfill that could be attributed to foundation conditions during the initial inspection.

Site stormwater drainage measures were being modified at the time of the initial inspection, and the Run-on Run-off Control Plan, as required by the CCR Final Rule, had not yet been prepared, so that the adequacy of stormwater control measures could not be assessed.

Construction

A third-party construction summary report certified that construction was completed in accordance with the project design.

Operation and Maintenance

Talen provided documentation that the landfill is being operated and maintained in accordance with the permit requirements.

As noted above, stormwater drainage measures were being modified at the time of the inspection, and this work needs to be completed.

Talen observed what were considered to be excessive, unrealistic leakage rates as indicated by their liner leak detection system starting in 2011. Talen notified the PADEP and has been investigating the potential liner leakage, identifying and addressing potential issues with inflow from adjacent areas and controls issues. In August 2015, a sump level controller malfunction was observed which appeared to be falsely indicating that erroneous flows were occurring. Talen has not observed another occurrence of excessive leakage flow since the controller was replaced. Talen should continue monitoring of the leakage collection system to verify that the leakage monitoring system is functioning appropriately, that leakage is within accepted limits, and investigate significant leakage monitoring anomalies should they occur in the future.

2015 Visual Inspection

The landfill appeared to be well operated and well maintained during the 2015 annual inspection. No evidence of significant distress or malfunction was observed. The stormwater drainage measures were being modified at the time of the inspection and were, therefore, not complete. Talen reported that these modifications were completed subsequent to the USEPA inspection, were inspected by PADEP, and were found to be satisfactory.

Geometry

This is the initial inspection of the landfill conducted under the CCR Final Rule; therefore, there is no previous inspection with which to compare changes in geometry. Baseline conditions for use in future comparisons are provided in Section 2. As of the time of this inspection, approximately 110,000 tons of material had been landfilled in Cell 1; about 6 percent of the total landfill storage volume.

Recommendations

Continued attention to the items noted below is appropriate to satisfy the CCR Final Rule inspection requirements for existing CCR landfills:

- Continued monitoring of liner leakage and verification that replacement of the sump pump controls has alleviated leakage concerns;
- Maintenance of the facility, including completion of stormwater control modifications in accordance with the permit and drawings, re-shaping and cleaning and trimming excessive vegetation in the ditches and culverts as needed, removal of small trees, and treatment of an exposed section of liner at the cell edge;
- Documentation of run-on and run-off control measures; and
- Completion of the unstable areas demonstration, as well as implementation of remediation, monitoring, or other risk-reduction measures recommended as a result of the unstable area assessment.

2.0 Project Description and History

The Landfill is located between Black Gut Creek and the Susquehanna River at the southern end of Brunner Island in East Manchester Township, York County, Pennsylvania. Brunner Island is located along the western shore of the river and can be found on the York Haven USGS 7.5 Minute Quadrangle Map at 40º05′12″N, 76º41′18″W. The GPS address is 1281 Wago Rd, York Haven, PA 17370. The Landfill was originally owned by PPL. In June of 2015, the company changed their name to Brunner Island, LLC, which is a division of Talen Energy (Talen).

The Landfill is composed of three cells. Cell 1 was constructed in 2008; Cells 2 and 3 have not yet been constructed.

From the ground surface upwards, the landfill liner system consists of:

- Compacted grade, consisting of the earth cover to Ash Basin 5, that was cleared, grubbed, filled to grade if necessary, and proof-rolled;
- 6-inch-thick compacted sub-base consisting of silty clay, with a specified minimum compaction of 95 percent, a specified maximum permeability of 10^{-5} cm/sec., and a tested permeability of 10^{-8} cm/sec;
- Geocomposite secondary drainage layer with piping (leak detection zone). PADEP accepted this in lieu of a 12-inch-thick collection layer. Leakage collection piping consists of 4 inch SDR 11 HDPE pipe embedded in stone;
- Primary composite liner (Geosynthetic Clay Liner [GCL] and 60 mil textured high-density polyethylene geomembrane liner);
- Geocomposite primary drainage layer and piping (leachate drainage zone). PADEP accepted this in lieu of a 12-inch-thick collection layer. Leachate collection piping consists of 6 inch SDR 11 HDPE pipe bedded in stone; and
- 18-inch-thick sand protective cover layer.

All landfill material is shaped to promote run off, spread in loose layers approximately 1-foot thick and compacted. Permitted landfill material includes:

- Bottom ash;
- Fly ash;
- Sandblast waste;
- Industrial sludges;
- Resins and dessicants;
- Thermal insulation waste;
- Refractory waste;
- Coal mill rejects and soils containing pyrites;
- Intake sediment and debris;
- Construction/demolition waste; and
- Dewatered sludge from scrubber and balance of plant wastewater treatment facilities.

No portion of the landfill cap has been installed. From the fill surface upwards, the landfill cap will consist of:

- Geomembrane 40 mil FML textured HDPE;
- Geocomposite drainage layer HDPE geonet with a 6 ounce/square yard geotextile bonded to each side; and
- 24-inch-thick final cover soil, which can be a blend of top soil and fly ash.

The leachate collection and leakage detection piping are both sloped to drain to the northern end of the landfill where the leachate and leakage collection sumps are located. There are two inclined 15-foot-long, 18-inch SDR 11 perforated HDPE pipes forming the leachate sump

chambers, and one identical pipe forming the leakage collection sump chamber. The sump chambers are bedded in stone fill and separated as described above. Each sump has an individual submersible pump that discharges to a common header, located in a small concrete enclosure. Leachate and leakage flow is discharged to the plant Flue Gas Desulfurization (FGD) wastewater treatment plant. Discharge is estimated using recorded individual pump run times and the rated pump discharge provided by the vendor. While the individual pump run times allow separate, indirect measurement of leachate and leakage quantities, there are no sump volume or discharge flow monitoring devices that measure leachate or leakage volumes directly.

2.1 Changes in Geometry Since the Previous Inspection

This is the initial inspection conducted under the CCR Final Rule; therefore, this evaluation will establish a baseline for future annual inspections.

The Cell 1 liner system was constructed in 2008. The liner systems for Cells 2 and 3 have not yet been constructed. The location of Cell 3 is being used for temporary storage of cover soil. CCR material deposits to date are limited to the northern end of Cell 1. Ballast and cover protection at the southern end of Cell 1 are in place, but no CCR materials are present. Potentially contaminated stormwater run off from the active part of Cell 1 is routed to the treatment plant detention basin. The inactive part of Cell 1 is separated from the active part by a temporary dike. Clean water from the inactive part of Cell 1 is discharged to a swale and then to the Susquehanna River.

2.2 Approximate Volume of CCR Contained in the Unit

Table 1
Landfill Storage Areas and Volumes

Cell	Area Acres	Volume Cubic Yards	Volume Tons
1 Current Status	Active: 4, Inactive: 5	82,300	110,000
1 Total	9.2	378,000	505,000
2	5.7	460,000	615,000
3	6.1	525,000	702,000
Total	21.0	1,363,000	1,822,000

Areas and volumes were calculated from the design drawings. Total tonnage was taken from the PADEP permit application. Current tonnage was taken from the 2014 PADEP annual operation report, with tonnage for 2015 based on reported scale weights. Tonnages for each of the cells were estimated by pro-rating.

3.0 Review of Supporting Technical Information

As required by the USEPA CCR Final Rule, the annual inspection is to include verification that the design, construction, operation, and maintenance of the Landfill are consistent with recognized and generally accepted good engineering standards.

CCR Final Rule Compliance Documentation

Talen established their CCR website, posted their fugitive dust control plan, continued required record keeping, provided required notifications, and implemented weekly inspections by October 19, 2015, in accordance with the CCR Final Rule.

Talen is preparing the Run-on Run-off Control Plan, to be completed by October 17, 2016.

Talen will be preparing the unstable area location restriction demonstration in accordance with the requirements of the CCR Final Rule by October 17, 2018.

The summaries listed above were not completed at the time of the preparation of this inspection report and were not available for review. Available supporting technical information that was reviewed included the following:

- Drawings provided by Civil & Environmental Consultants, Inc. (CEC), dated 2008;
- PADEP Permit Application (dated 2008) and Permit;
- Construction Summary Report by Advanced Geosciences, dated 2009;
- Construction Test Results, dated 2008;
- Operational Compliance Verification Summaries;
- Drawing E376179, Sheet 1, Rev 5, 2015 Topographic Mapping; and
- Weekly Inspection Forms.

Design Review

Not all information necessary to complete the design review, including calculations and construction specifications, was available for the 2015 inspection, but a review of available information indicates that Ash Disposal Area No. 8 was designed and constructed in accordance with good engineering standards that were recognized and generally accepted at the time of design and construction between 2006 and 2008, with comments as noted below.

The permit application included requests for waivers to certain design elements required by PADEP. These requests were approved by PADEP as part of the permit, and include:

- The option to use a GCL in lieu of 6 inches of compacted clay sub-base was approved, although the construction documentation indicates that a 6-inch-thick compacted silty clay sub-base layer was placed;

- The use of a geo-composite drainage layer in lieu of a 12-inch-thick leachate detection zone layer;
- Waiver of the need for daily cover;
- Use of a blended mixture of 50% bottom ash and 50% top soil for a final cover material; and
- Exemption from the minimum slope requirement for drainage ditches.

Findings from the design review are summarized below.

The Landfill was constructed on top of a closed CCR surface impoundment, referred to as Ash Basin No. 5. Ash Basin No. 5 is filled with 35 to 40 feet of hydraulically placed bottom ash and fly ash, described as loose to very loose in a number of test borings, with the lower 15 feet of the deposited ash saturated. This deposit forms the foundation of the CCR landfill. The foundation conditions could potentially result in excessive settlement that could damage the liner system or drains, seismic or static liquefaction of the foundation, or low shear strength, resulting in an unstable area, as defined by the CCR Final Rule. Talen is currently assessing the foundation of the CCR landfill as part of the unstable area demonstration required by the CCR Final Rule. There was no evidence of settlement or distress observed during the visual inspection attributable to foundation conditions, though the maximum fill height at the time of the inspection of about 20 feet is considerably less than the final design fill height of about 90 feet.

The stormwater Run-on Run-off Control Plan is currently being developed.

Construction

A third-party construction summary report, by Advanced GeoServices and dated March 2009, certified that construction was completed in accordance with the project design and permit. This report included a summary of material testing results.

Operation

Talen is currently placing about 450 tons of material per week within the landfill. Talen provided documentation that they were maintaining the landfill in accordance with permit requirements and design drawings describing, among other things, the interim fill zones, temporary and permanent access measures, fill placement, and run-on and run-off control measures.

Talen noted that drawings showing site access and stormwater drainage measures for the transitional phases between the start and completion of filling had been prepared, though these were not available for review. These drawings should be made available for the next annual inspection. Material and cover placement practices appeared to be consistent with the project permit and fugitive dust control plan.

Talen observed what were considered to be excessive, unrealistic flow rates in their liner leakage detection system, starting in 2011. The cause of the excessive leakage estimates has been under investigation since that time, with a number of studies, investigations, and modifications conducted. Shortly before the October 2015 annual inspection, Talen determined that the sump pump level controller was not operating correctly and was causing the pump to continue to run after it had pumped the sump dry. Since flow rates were estimated using the recorded run time of the liner leakage sump pump and the rated pump capacity, the pump running with a dry sump appeared as excessive leakage. The sump level controller was replaced in the fall of 2015, and leakage flows returned to normal levels that are below regulatory limits.

An assessment of the groundwater monitoring program, sampling, analysis, and detection, as described by the CCR Final Rule, is not a required element of the visual inspection and was not included in this inspection report.

4.0 Visual Inspection Site Visit

The visual inspection site visit was conducted on October 22, 2015, by Adam Jones, P.E. and Nicholas Dempsey, E.I.T. of HDR. Benjamin Wilburn, P.E. and Wesley Michael of Talen accompanied HDR during part of the inspection. The weather during the inspection was clear with temperatures between 60 and 75 degrees. No rain occurred during the 48 hours prior to the inspection.

An aerial photograph of the site, relevant photographs from the inspection, and a key plan are provided in Appendix A.

The landfill appeared to be in good condition overall. There was no evidence of actual or potential structural weakness of the CCR landfill, or any conditions that were significantly disrupting or having the potential to significantly disrupt the safety of the Landfill. Overall views of the Landfill can be seen in Photos 2 through 5. Talen noted 3.2 inches of rain fell in 2 hours on August 20, 2015, and the stormwater system functioned well, though the temporary detention basin discussed below nearly overtopped.

The perimeter of the Landfill was surrounded by a stormwater run off collection swale, as seen in Photos 6 through 10. Talen installed markers showing the location of the edge of the liner, as required by PADEP, which were helpful in verifying that the site drainage features were located appropriately.

Talen noted that the lagoon at the east side of the active part of Landfill Cell 1 adjacent to the pump house, shown in Photo 6, is temporary and is scheduled to be filled in the near future. The perimeter swale around the active part of the Landfill currently directs contaminated run off to this basin, which is totally contained within the lined landfill. Before this lagoon is filled, Talen should verify that contaminated run off resulting from the design rainfall will be completely contained within the lined section of the Landfill, in accordance with the Run-on

Run-off Control Plan. The clean water channel draining the inactive part of Cell 1 is shown in Photo 7.

The perimeter stormwater run off collection swale around the active part of the Landfill was in the process of being reworked. At the time of the inspection, the swale did not provide a continuous, effective channel to convey and collect contaminated rainfall run off from the active part of the Landfill within the lined containment area. Areas where run off could potentially escape were observed along the south edge of the active part of Cell 1 where the separation berm between the active and inactive sections of Cell 1 was unlined and was either low, irregular, or had been infilled with debris at check dams, as seen in Photos 8 and 9, and at the northwest corner, where the swale and berms were under construction, seen in Photo 10. Talen reportedly completed modifications to the perimeter swale in October 2015, subsequent to the inspection. Since the run off from the inactive, lined section of Cell 1 is discharged directly to the Susquehanna River, the separation dike between the active and inactive sections of Cell 1 needs to be well constructed. Note that the design drawings call for a 4-foot minimum height, lined separation dike. The clean water swale on the west edge of Cell 1 was heavily vegetated, to the point where the vegetation may retard flow and adversely affect the hydraulic capacity. The swale along the east edge of the unlined section of Cell 1 was also heavily overgrown, as seen in Photo 11. The culverts passing under access roads at the north and south edges of Cell 1 were partially blocked with vegetation and debris. The grading of the access road at the entrance to Cell A did not appear to provide clear means to divert run off from the road and contain it.

Exposed liner was observed along the east edge of the landfill, under the separation berm, between the ditch draining contaminated run off from the active section of Cell 1 and the swale draining clean run off from the inactive section of Cell 1. The liner should be exposed, inspected for damage, and repaired or recovered as appropriate. Several small trees growing at the southeast corner of the landfill should be removed before the roots damage the liner. Talen noted that burrowing animals were observed in the area and are removed as necessary. Two foxes were seen on the unlined section of Cell 1 during the inspection. Talen reported that the dens for these foxes had been located and was safely off the landfill. The lower part of the west embankment of Cell 1 was heavily vegetated and could obscure burrowing animals. Talen reportedly mowed this area, simplifying management of burrowing animals.

The filled area of Cell 1 was well formed and maintained. Locally steep areas were observed along the north and south slopes of Cell 1, seen in Photos 12 and 13. Talen noted that the north edge had been temporarily filled and stabilized and would be built out shortly to the design limits and design slope of 3H:1V. Stabilizing the south slope would reduce erosion and the sediment load in the stormwater run off.

The active surface of the landfill can be seen in Photos 14 and 15. Run off and dust control measures were appropriate, except where grading was underway, as seen in Photo 15, to establish final grades and containment measures.

The leachate and leakage detection sumps are located at the north end of Cell 1. The mechanical building, seen in Photo 16, was in good condition. The pumps located in the two leachate collection sumps and one leakage detection sump all discharge into a common header, seen in Photo 17. The mechanical system and structures appeared to be in good condition. As noted previously, Talen encountered problems measuring and evaluating liner leakage. Talen replaced the level sensor and noted that significant liner leakage flow was no longer being observed. Talen records the overall pump run times and cycles daily. Calculating and plotting the run time and cycles on a regular basis would facilitate evaluation of leachate and leakage flows. Adding redundant sump level sensors, in-line flow measurement, separation of the headers into three separate lines, or a combination of these measures should be considered, particularly if abnormal flows are encountered. Talen calibrated the pump discharge at 33.5 gallons per minute shortly after the inspection. The pumps should be periodically checked to account for pump wear, and abnormal discharge readings should be checked.

5.0 Closure

This annual inspection was conducted in accordance with the requirements of the United States Environmental Protection Agency (USEPA) 40 CFR Parts 257 and 261 Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, April 17, 2015 (CCR Final Rule). HDR appreciates the opportunity to perform this work for Talen. If you have any questions or comments, please contact us.

Sincerely,

HDR ENGINEERING, INC.

1/15/2016

Adam N. Jones, P.E.
Senior Engineer

ANJ/cw

Appendix A: Inspection Photographs

APPENDIX A
INSPECTION PHOTOGRAPHS

LEGEND

CONTOUR (2 FT.)

0 100 200

Feet

MAP INFORMATION WAS COMPILED FROM THE BEST AVAILABLE PUBLIC SOURCES. NO WARRANTY IS MADE FOR ITS ACCURACY AND COMPLETENESS.

BRUNNER ISLAND

PATH: \\PWME-INFS01\ACTIVEPROJECTS\448766\0000000002584891\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\FINAL\BRUNNER_ISLAND_LANDFILL_ANSI_B_20151214_DWS.MXD - USER: DSOUCIE - DATE: 12/14/2015

DECEMBER 2015

Photo 1 - Aerial view of Brunner Island Ash Area No. 8. The active part of Cell 1 is seen to the left (north). The right (southern) part of Cell 1 has had the liner system installed, but has not been filled. Temporary plastic tarps can be seen covering the liner system over the inactive part of Cell 1. Construction of Cells 2 and 3 has not yet started.

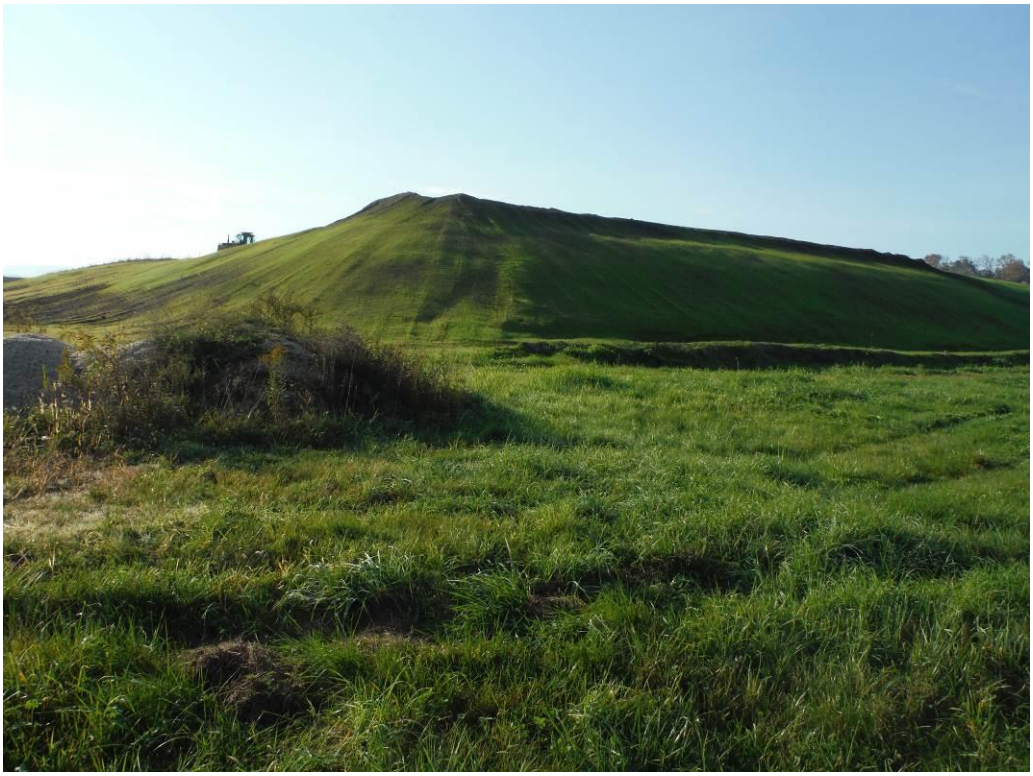

Photo 2 – North and east slopes of the active part of Cell 1. The final build out of the slopes has not taken place and the vegetative cover is temporary, providing erosion and dust control.

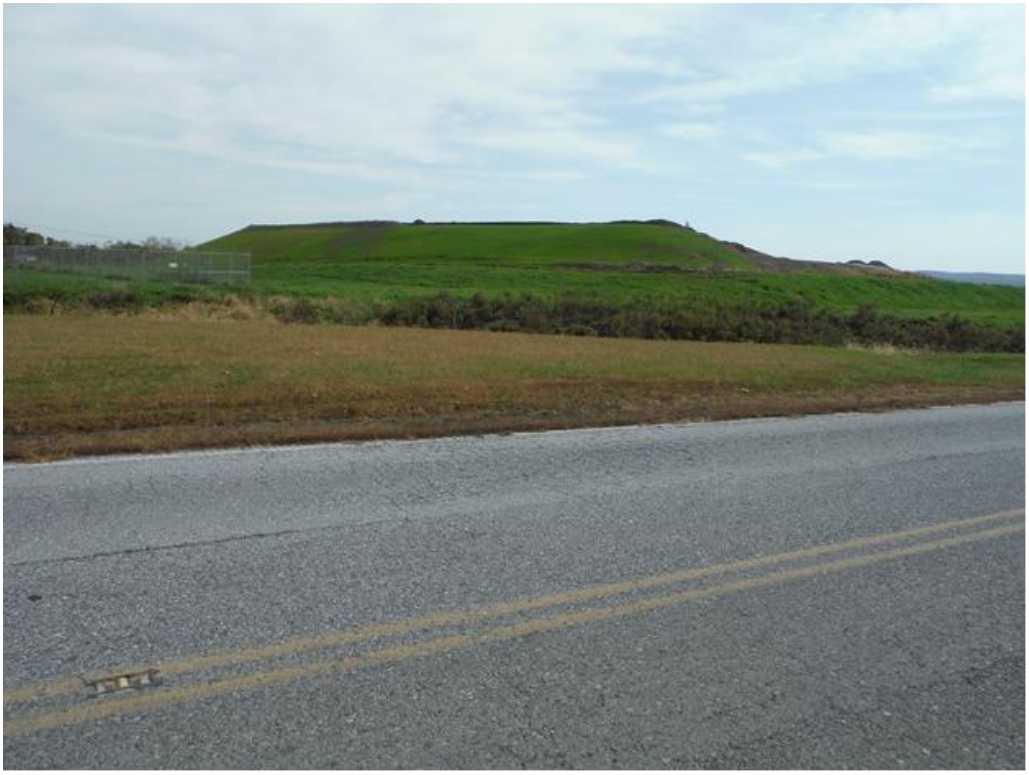

Photo 3 - North and west slopes of the active part of Cell 1.

Photo 4 – Unfilled (inactive) section of Cell 1. Note the temporary plastic tarps covering the liner system.

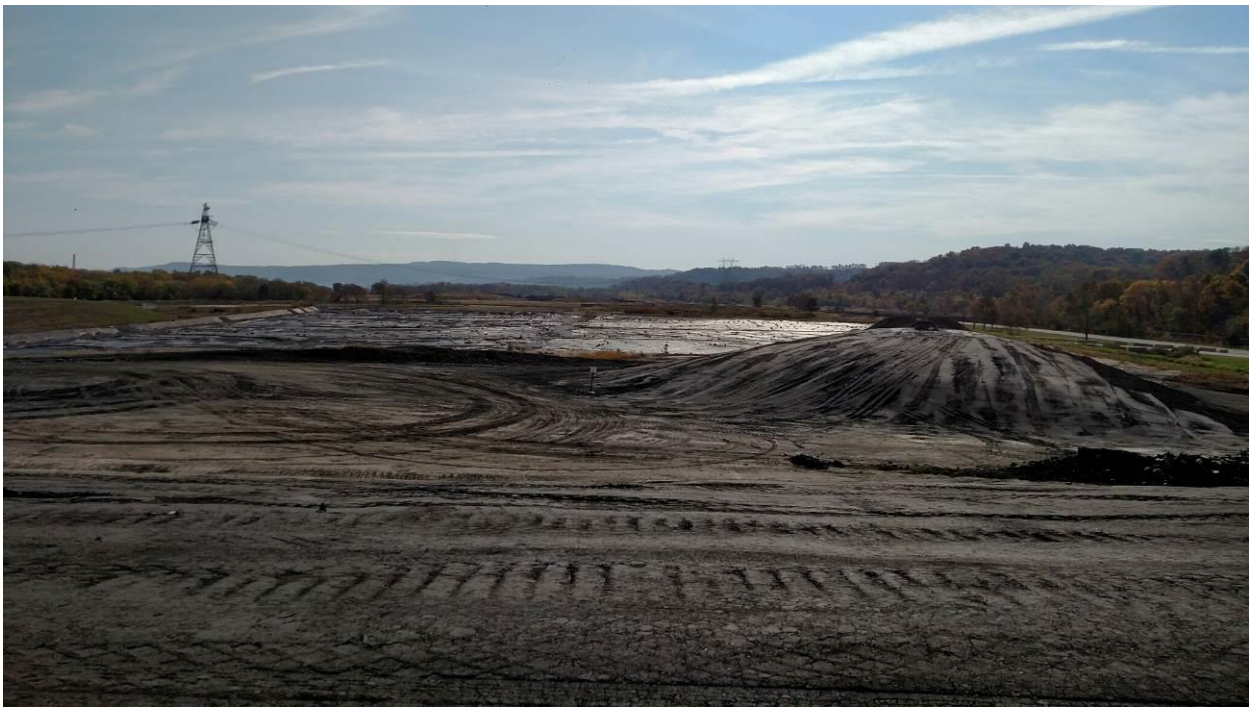

Photo 5 – Working surface of Cell 1, with the inactive part of Cell 1 in the background.

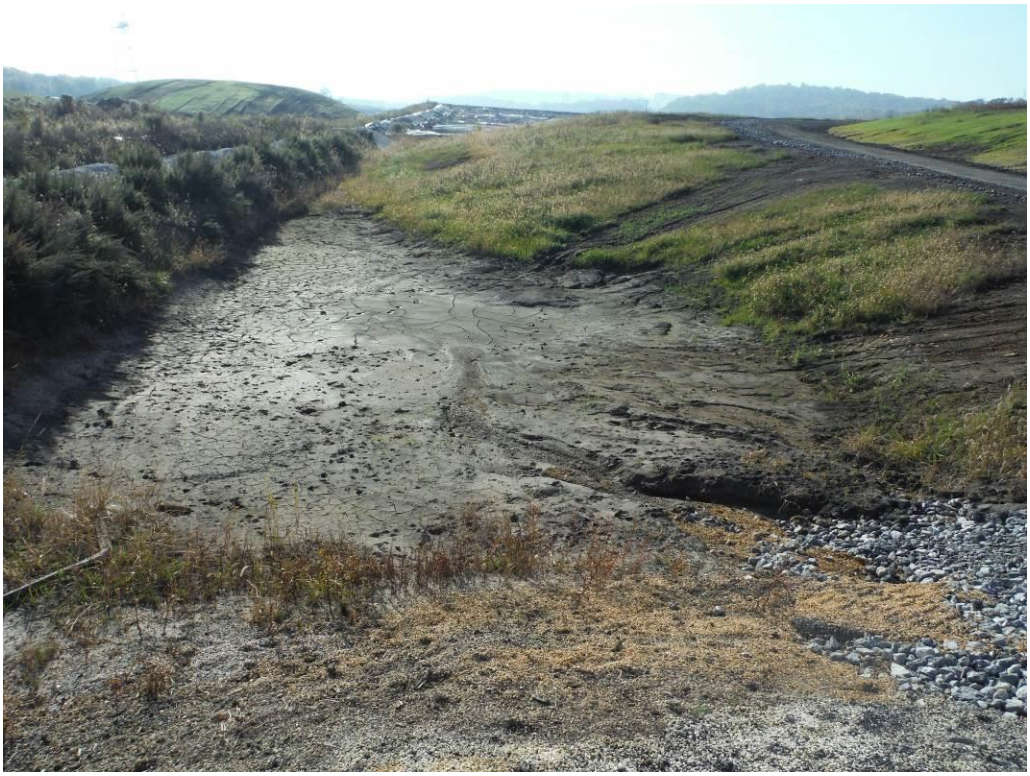

Photo 6 – Ditch separating Cell 1 from future Cell 2. The swale surrounding the active part of Cell 1 drains to the temporary stormwater detention basin shown in the foreground. Captured stormwater percolates to the sump and is pumped to the Plant Flue Gas Desulfurization (FGD) waste water treatment plant. The clean water channel shown in Photo 7 is to the left.

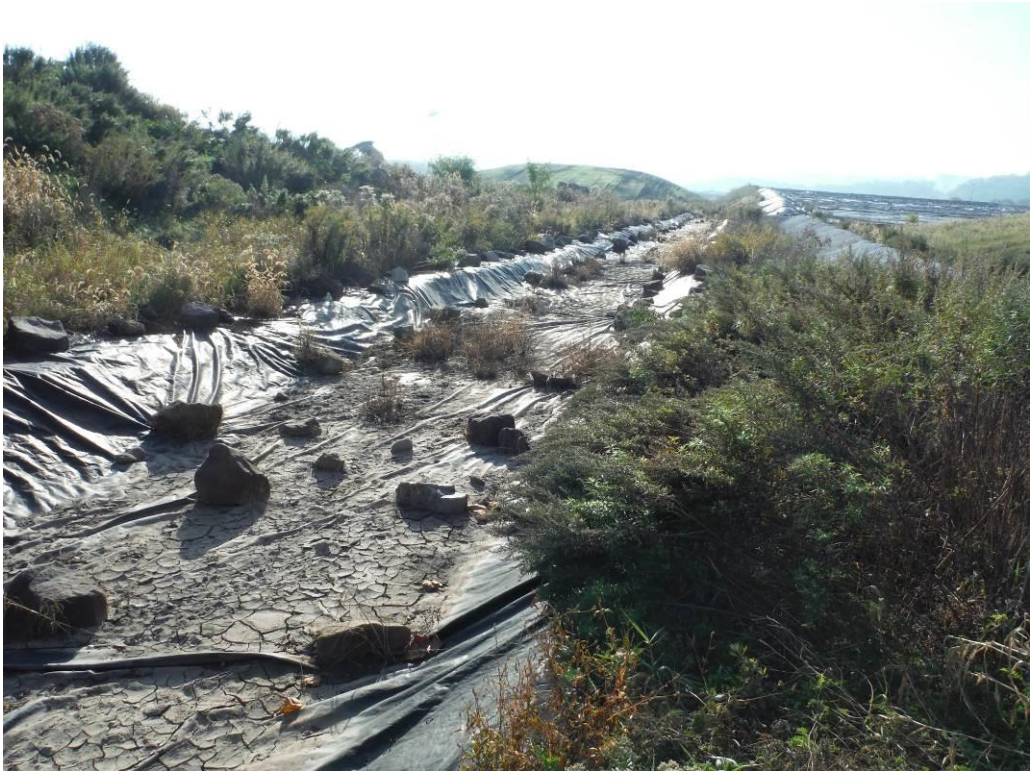

Photo 7 – Clean water discharge channel draining the unfilled part of Cell 1. This discharges to a ditch leading to the Susquehanna River.

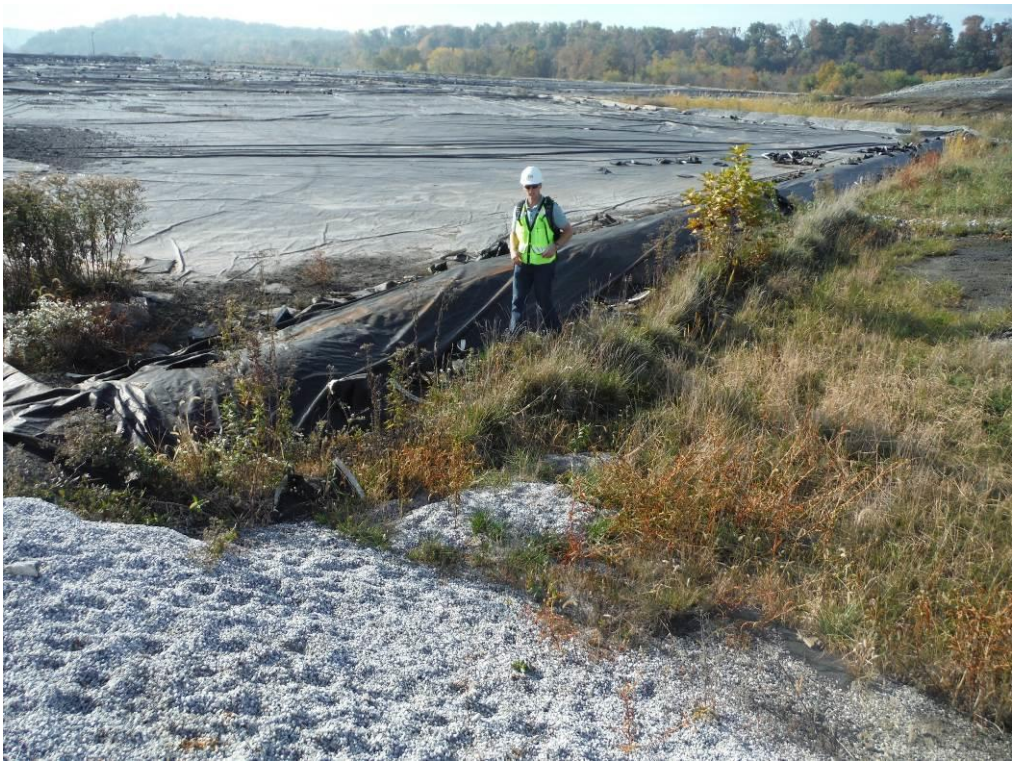

Photo 8 – Separation dike between the active and inactive parts of Cell 1, looking southwest. This section, at the southeast corner of the active part of Cell 1, is well formed, though it appeared to be less than the 4 foot height shown on the project drawings.

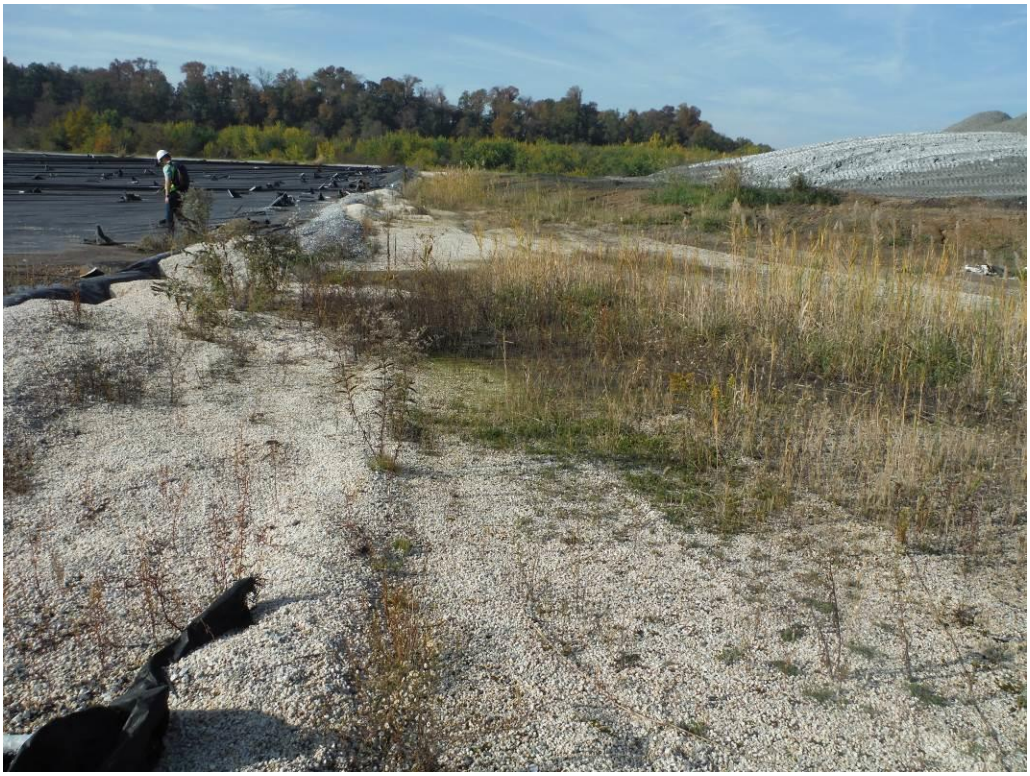

Photo 9 – Irregularly formed section of the separation dike between the active and inactive parts of Cell 1. This section of the dike should be reformed with a minimum height of 4 feet, as shown on the Project drawings.

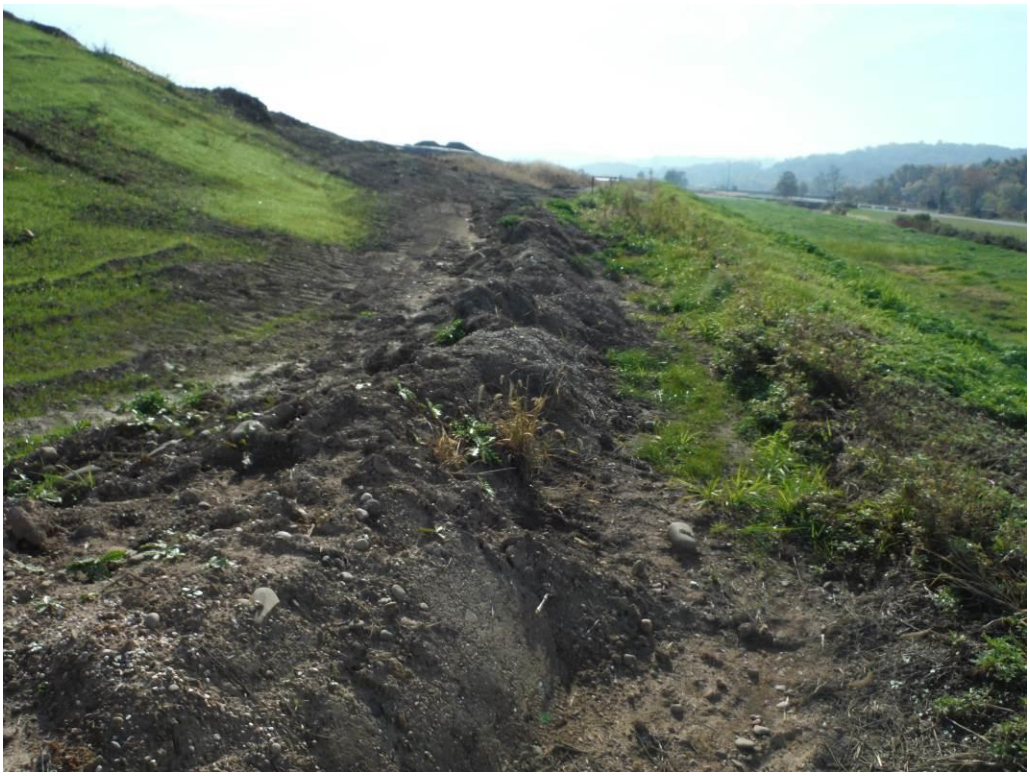

Photo 10 – Ditch at the northwest corner of Cell 1, under construction. The section to the left will convey contaminated stormwater run off to the south, and the ditch to the right conveys clean stormwater run off to the north.

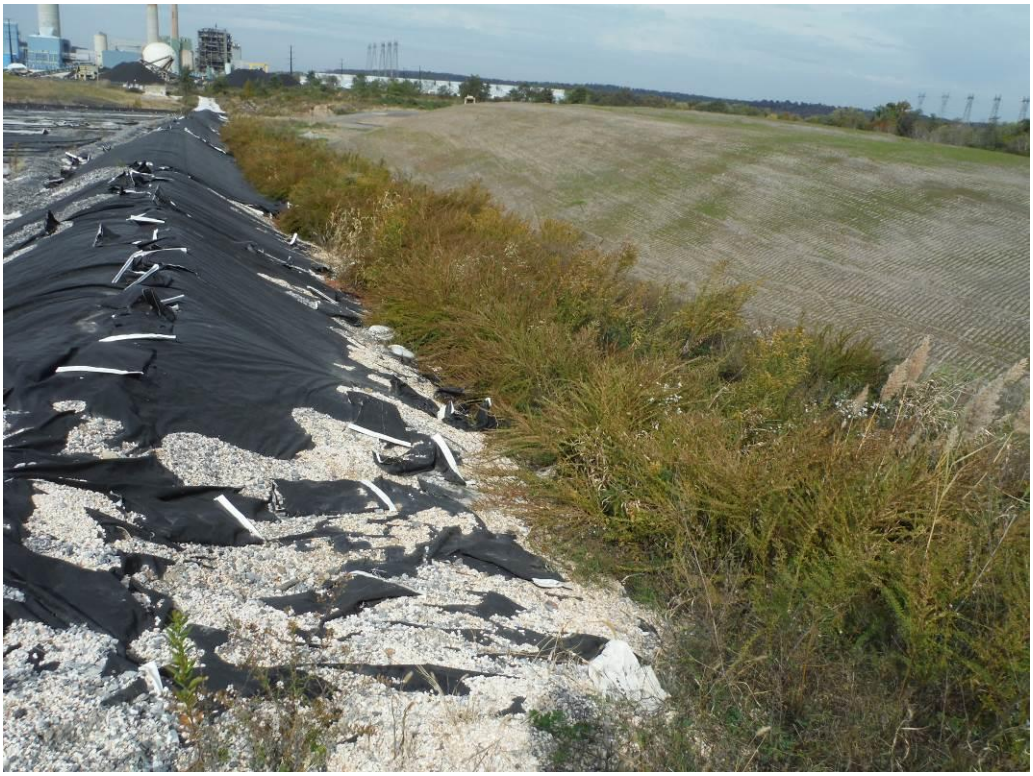

Photo 11 – Overgrown ditch along the east edge of the inactive section of Cell 1.

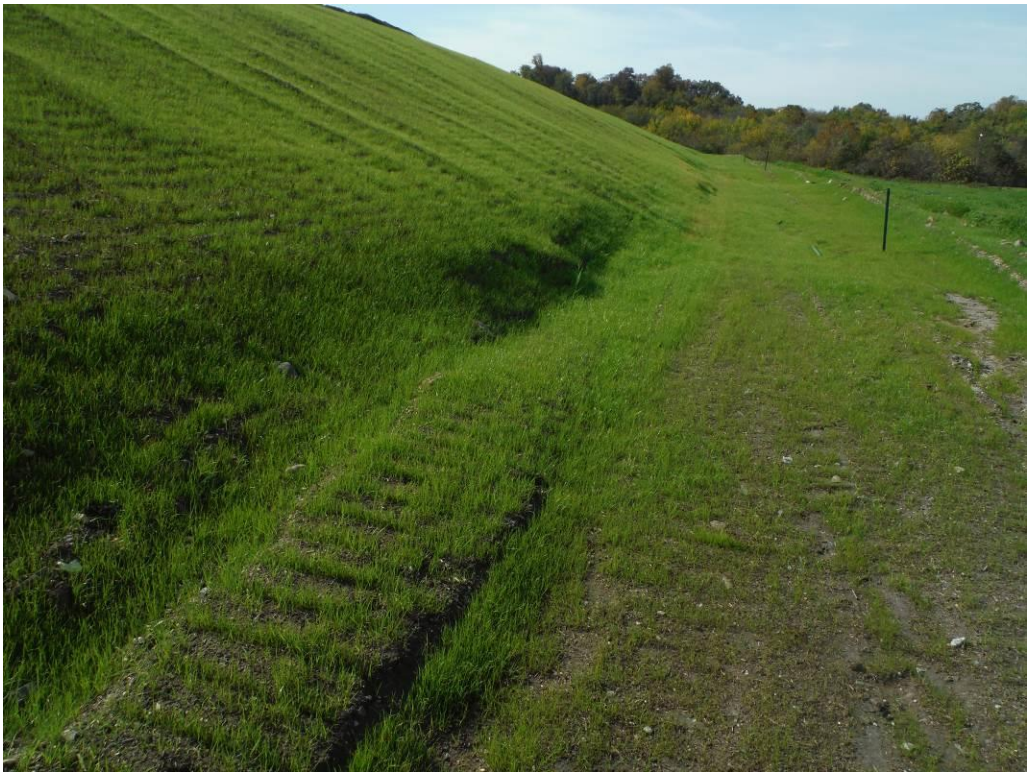

Photo 12 – Locally steep, irregular slope along the north edge of the Cell 1. Talen noted that this fill was temporary and final filling and grading would take place in the near future.

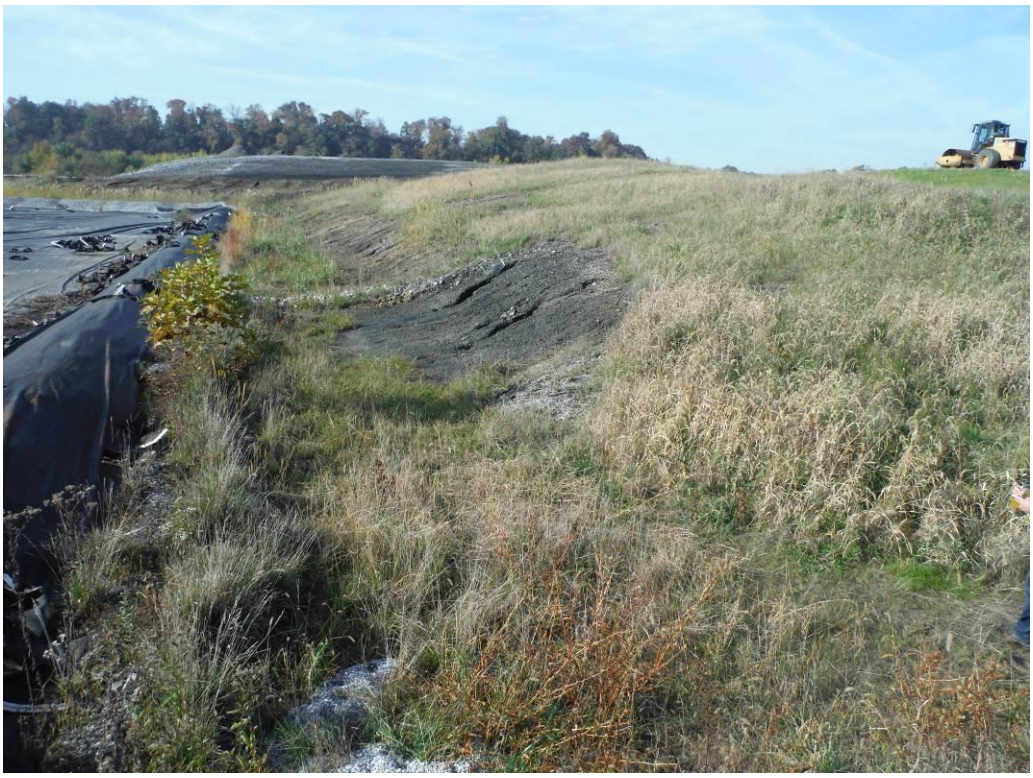

Photo 13 – South edge of the active part of Cell 1, showing temporary vegetation used for erosion control and a locally steep area subject to erosion.

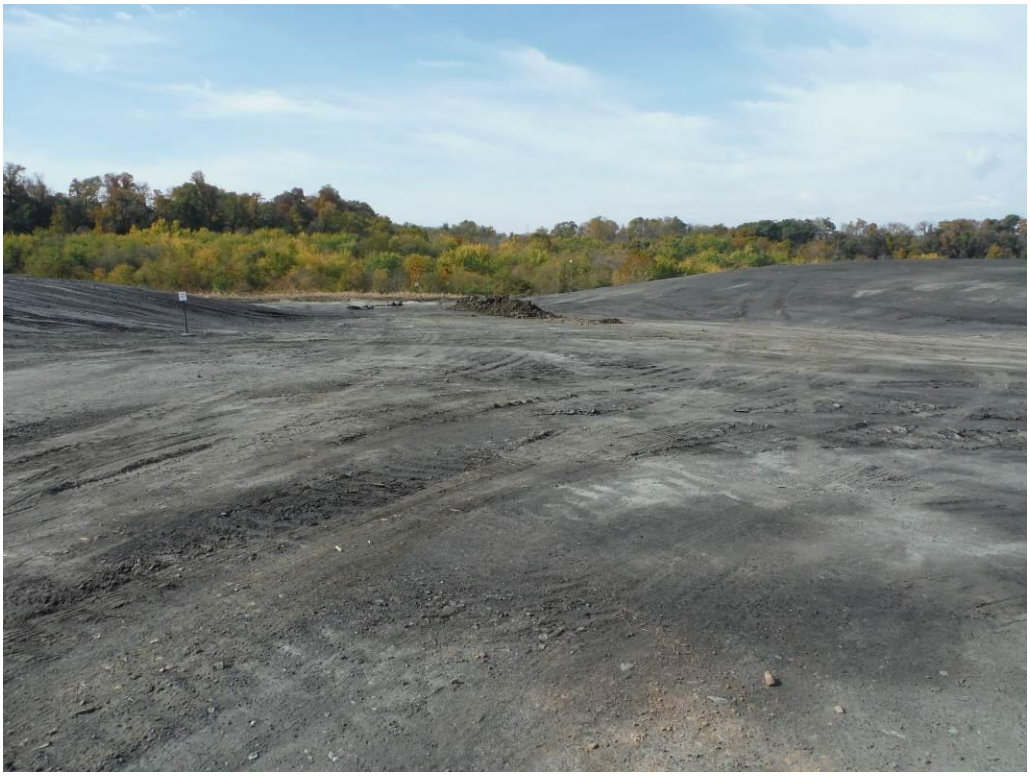

Photo 14 – Landfill surface, showing grading and finishing of the working surface. A recently dumped load can be seen in the photo center.

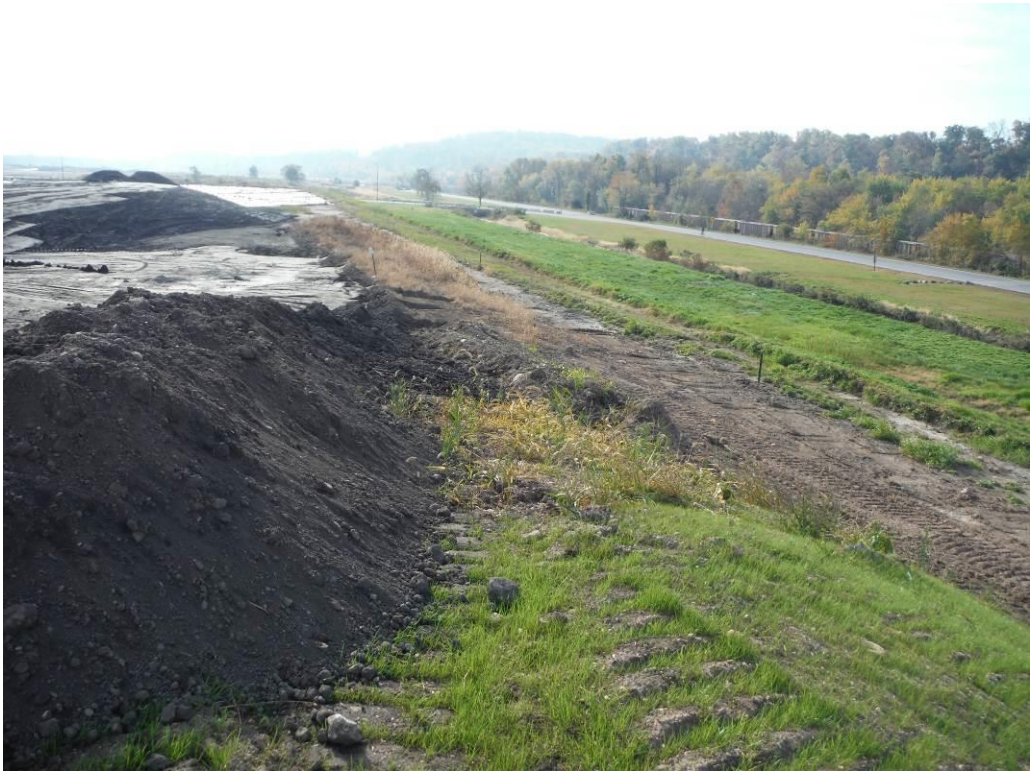

Photo 15 – West edge of Cell 1 showing containment measures under construction. .

Photo 16 – Mechanical building housing the leachate collection and leakage detection sump pumps.

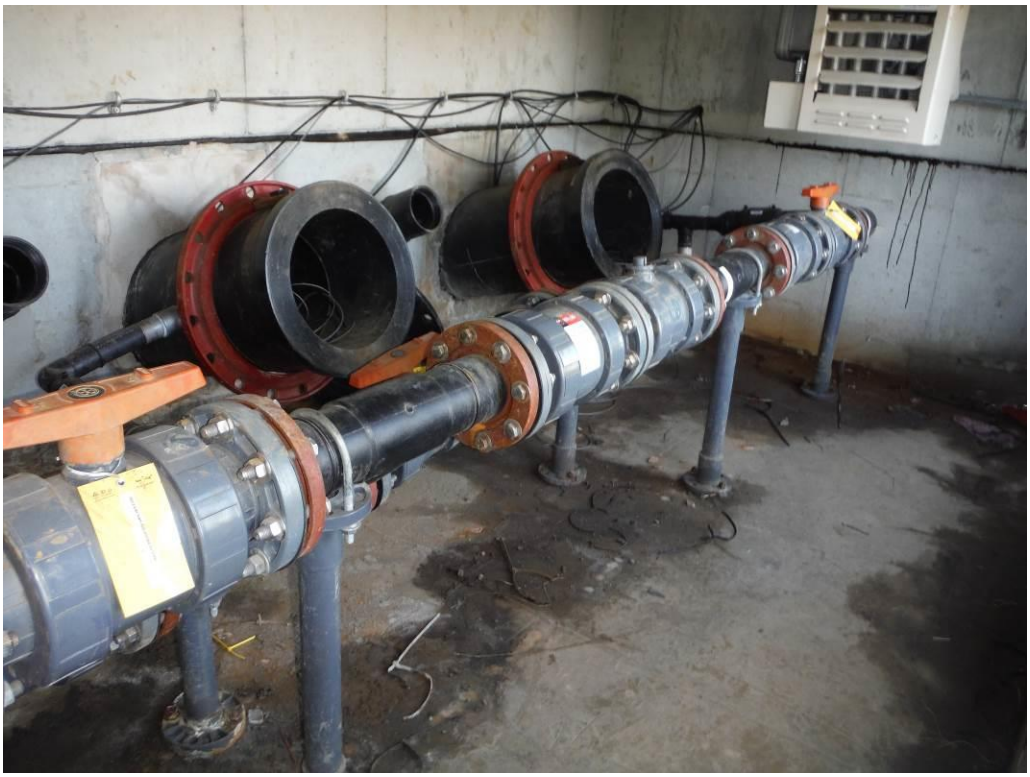

Photo 17 – Sump pumping system.