Subject: 2017 Annual USEPA CCR Landfill Inspection Report
Brunner Island Ash Disposal Area No. 8

This report presents the findings of the 2017 annual inspection of the Brunner Island Ash Disposal Area No. 8 Landfill (Landfill). This inspection was performed on August 25, 2017, by Talen Energy. 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).

1.0 Executive 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).

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 inspection.

The Run-on Run-off Control Plan, as required by the CCR Final Rule, was completed and is available on the Talen website. Permanent drainage measures were designed to accommodate run-off from the 25-year storm, in accordance with the requirements of the CCR Final Rule. There is no storm water drainage entering the site (run-on). Talen is planning to construct containment berms around the active portions of the basin to contain ash contact run-off water within the active work area.

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.

In 2011 Talen observed what were considered to be excessive, unrealistic flow rates from the Detection Zone. Talen notified the PADEP and began investigating potential issues of inflow from adjacent areas and controls issues. Run time meters were installed as primary form of flow measurement to duplicate the existing flow meters which are capricious and prone to malfunction due to frequent fouling. In August 2015, a sump level controller malfunction was observed. The level controller is responsible for starting and stopping the pump based on water levels. It is believed that the level controller malfunction was causing the pumps to run even when no water was present. The level controller was replaced in the fall of 2015. Excessive flows were observed in the winter of 2015/2016, indicating that the defective sump level controller was not the sole cause of the previous excessive flow measurements. The ongoing investigation also determined that the rock fill surrounding the leachate collection sumps was plugged with fine sediment, causing elevated water levels in the leachate collection basin. Talen removed and replaced the clogged stone around the sumps and installed filters around the leachate collection sumps in an attempt to prevent further clogging. In 2017 Talen identified that two of the check valves on the pump system had malfunctioned potentially allowing flow from the leachate collection sump into the detection zone. The check valves were repaired and a 3rd check valve was installed for added protection. Talen should continue to monitor and maintain all aspects of the landfill including the leachate capture and conveyance system.

Talen is currently placing about 500 tons of material per week within the Landfill. Talen provided documentation of landfill maintenance 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. Material and cover placement practices appeared to be consistent with the project permit and fugitive dust control plan.

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.

2017 Visual Inspection

The Landfill appeared to be well operated and well maintained during the 2017 annual inspection. No evidence of significant distress or malfunction was observed. The stormwater drainage measures that were being installed in the prior year's inspection were complete at the time of this inspection.

Geometry

This is the third inspection of the Landfill conducted under the CCR Final Rule. Approximately 24,130 tons of material has been landfilled since the previous inspection, which has a negligible effect on the geometry of the Landfill. Conditions for use in future comparisons are provided in Section 2. As of the time of this inspection, approximately 141,830 tons of material had been landfilled in Cell 1; about 6 percent of the total Landfill storage volume. In late 2016 and early 2017 the active area of the landfill was expanded into the inactive area and areas were stabilized to be considered clean runoff.

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 integrity, followed by identification of the cause and repair if necessary;
- 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
- 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 (detection zone). PADEP accepted this in lieu of a 12-inch-thick collection layer. Detection zone piping consists of 4-inch Standard Dimension Ratio (SDR)11 High Density Polyethylene (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 Flexible Membrane Liner (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 detection zone piping are both sloped to drain to the northern end of the Landfill where the leachate and detection zone collection sumps are located. There are two inclined 15-foot-long, 18-inch-diameter SDR 11 perforated HDPE pipes forming the leachate sump chambers, and one identical pipe forming the detection zone 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 detection zone flow is discharged to the plant Flue Gas Desulfurization (FGD) wastewater treatment plant. Discharge is measured with run times and the rated pump discharge provided by the vendor, as a check, flow is also measured by flow meters in the header for each discharge line but due to ongoing fouling the flow meters are used as a secondary method of flow measurement.

2.1 Changes in Geometry since the Previous Inspection

The CCR Final Rule requires that changes in geometry since the previous inspection be documented. This is the second inspection conducted under the CCR Final Rule. Approximately 24,130 tons of material has been landfilled since the previous inspection, which has a negligible effect on the geometry of the Landfill. The active portion has been expanded to be 7.19 acres and inactive area is now 1.81 acres. An intermittent lift area to the north, which is to grade, has had soil added in late 2016 and stabilized with vegetation in 2017 to allow the area to be considered clean runoff and it currently does not require the stormwater to be collected and treated.

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: 7.19, Inactive: 1.81	105,920	141,830
1 Total	9.0	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 2016 PADEP annual operation report, with tonnage for 2016 based on reported scale weights. Tonnages for each of the cells were estimated by pro-rating, based on the volumes.

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 posted the Run-on Run-off Control Plan to the website prior to 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.

Other 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;
- Run-on Run-off Control Plan; and
- Fugitive Dust Control Plan

Design Review

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 percent bottom ash and 50 percent top soil for a final cover material;
- The use of 2-foot-high intermediate dikes, instead of 4 foot, 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 run-off calculations address post-closure discharge to the perimeter swale, but do not address handling of ash contact run-off water while the Landfill is being filled. Talen is planning to construct containment dikes to keep run-off within the work area, away from the perimeter swale.

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.

4.0 Visual Inspection Site Visit

The visual inspection of the site was conducted on August 25, 2017, by Benjamin Wilburn, P.E. and Andrey Lernerman of Talen. The weather during the inspection was sunny with temperatures around 75 degrees Fahrenheit. No rain occurred during the 48 hours prior to the inspection.

This visual inspection consisted of observations of features and conditions readily discernible by external visual inspection through reasonable efforts. 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.

The perimeter of the Landfill was surrounded by a stormwater run-off collection swale. Talen installed markers showing and grid numbers 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.

The leachate collection sump is located at the north east side of the active part of Landfill Cell 1 adjacent to the pump house. The internal swales around the active part of the Landfill currently directs contaminated run-off to this sump as well as the leachate which infiltrated through the waste, is totally contained within the lined Landfill. Talen was considering filling this sump, but has since determined that the volume is needed to contain contaminated run-off resulting from the design rainfall within the lined section of the Landfill, in accordance with the Run-on Run-off Control Plan.

The perimeter stormwater run-off collection swale around the active part of the Landfill was reworked in 2017 to ensure no intermingling between contaminated contact water and clean stormwater runoff. The separation dike between the inactive and active portions of the landfill has been relocated in late 2016 and early 2017 and the inactive side discharges directly to the Susquehanna River. These revisions addressed stormwater concerns from the 2016 inspection report.

The clean water swale on the west edge of Cell 1 was recently mowed, which is an improvement from the 2016 inspection. A review of the stormwater run-off analysis indicated that the channel was designed to allow for heavy vegetation characteristic of high grass and dense brush so a mowed swale would be a more efficient channel and is acceptable. The grading of the access road at the entrance to Cell 1 was re-worked in 2016 and 2017 to pitch the runoff into the drainage basin / leachate collection sump.

Exposed rain flap 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 exposed sections of liner should be covered.

The filled area of Cell 1 was well formed and maintained. The locally steep area observed along the north slope of Cell 1 in 2015 had been regraded. Locally steep, unvegetated areas with erosion rills were observed within the landfill upslope of the entrance road and should be filled in and stabilized. This slope was recently regraded with soil and attempted to be vegetated. The receiving channel upslope of the entrance road was also regraded with soil and stabilized; however, the vegetation died and exposed the temporary geotextile matting. The channel should have the proper seed re-applied to achieve stabilization. A small dike separating the active area from the clean water runoff area, where equipment is staged, was less than the design height and should be raised.

Run-off and dust control measures were generally appropriate in the active area.

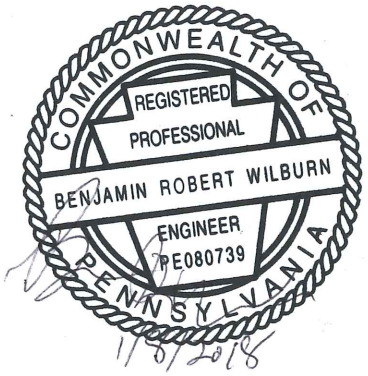
The leachate and detection zone sumps are located at the north end of Cell 1. The mechanical building was in good condition. The pumps are located in the two leachate collection sump pipes and one detection sump pipe all discharge into a common header. The mechanical system and structures appeared to be in good condition. Earlier in the year the check valves preventing flow from the leachate collection sumps to the detection zone were reportedly malfunctioning and were serviced. A additional check valve was also added for redundancy.

5.0 Closure

Based on the available information and visual observations, 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), to the best of my knowledge, information, and belief, and was conducted in accordance with professional standards of care for similar work.

Benjamin R. Wilburn, P.E.
Senior Engineer

Appendix A: Inspection Photographs
Appendix B: Topographical Mapping



APPENDIX A
INSPECTION PHOTOGRAPHS

TALEN ENERGY

2017 Annual Inspection - Brunner Island
Ash Area 8

BRUNNER ISLAND

Picture 1 – New sand and rock filter around the sump area to reduce the sediment in the sump area.

Picture 2 – Recently regraded entrance road, looking north. Note the clean water runoff swale was fertilized and seeded, but the vegetation died and should be reseeded.

Picture 3 – Erosion scar in the recently regraded slope above the entrance road.

Picture 4 – BMP in the roadway used to assist in the separation of the active area and the entrance roadway.

Picture 5 – Berm behind the equipment is less than 2’ high.

Picture 6 – Low separation berm as located in picture 5.

Picture 7 – Active landfill area with internal channel.

Picture 8 – Outside northern embankment is well vegetated and stabilized.

Picture 9 – Recently relocated separation berm between inactive and active portions of the landfill.

Picture 10 – Perimeter stormwater channel was recently mowed.

Picture 11 – Berm between Cell 1 and future Cell 2. A geo-membrane rain flap liner has been installed separating the two cells. The liner was exposed in a few areas.

Picture 12 – Edge of liner marker with grid location.

Picture 13 – Clean water runoff channel around the northern end of the landfill.

Picture 14 – Valve house with pipes leading to the sump where the pumps are located. The horizontal pipe is a common header for the leachate pumps 1 & 2 and the leak detection pump #3.

Picture 15 – Control board showing the pumps with runtime, flow meters, and depth of water in the leachate collection zone and the leak detections zone.

Picture 16 – Area to the north that is to grade on an intermediate lift. This area received soil and had seed applied.

APPENDIX B
TOPOGRAPHICAL MAPPING

PLANT GRID

N 7,500 | N 7,000 | N 6,500 | N 6,000 | N 5,500 | N 5,000 | N 4,500

E 0 | E −,500 | E −1,000 | E −1,500 | E −2,000

DISPOSAL AREA 8
FUTURE CELLS 2 AND 3

BOUNDARY LIMIT OF CELL 1
FOR DISPOSAL AREA 8

CLEAN RUNOFF
DIVERSION/BERM

DISPOSAL AREA 8
CELL 1 ACTIVE

PZ 809-2
PZ 809-1
PZ 6-7
PZ 6-8
PZ 6-5A
PZ 6-5B
PZ 6-1A
PZ 6-1B
PZ 6-3B

LEGEND OF SYMBOLS AND ABBREVIATIONS

⊕	CONTROL POINT	265	CONTOURS 2016
⊕ w ⊕	PIEZOMETER	265	INDEX CONTOURS 2017
⊕	MONITORING WELL	264	INTERMEDIATE CONTOURS 2017
⊕MH	MANHOLE		TREELINE
✧	LIGHT POLE		BRUSHLINE
♗	FIRE HYDRANT		GUIDERAIL
⊹	UTILITY POLE		EDGE OF ROAD/TRAIL
▫	POST		EDGE OF WATER
	SWAMP		
◇	BUSH		

NOTES:

1. From ground control surveys dated May 2, 2017 by CDI L.R. Kimball, aerial photography dated April 9, 2017 by Air Photographics, Inc.
2. Horizontal control is based on Plant Datum provided by Talen Energy Services.
3. Vertical control is based on Plant Datum provided by Talen Energy Services.
4. 2016 Contours are depicted as light grey. The 2017 contours are darker.
5. The spot elevations shown on plan were established from the aerial photography.

0 200 400 Feet

CDI L.R. Kimball

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL STEPHEN MICHAEL LANDGREBE LAND SURVEYOR No. SU075199

REVISION							
NO.	DATE	ACCT.			BY	REVIEWED	APPROVED
7	5/17	-	ADDED 2017 ASH CONTOURS & CHANGED TITLE TO REFLECT 2016 RESULTS		JAW	AL	BRW
6	6/16	-	ADDED 2016 ASH CONTOURS & CHANGED TITLE TO REFLECT 2015 RESULTS		JAW	AL	BRW
5	6/15	-	ADDED 2015 ASH CONTOURS & CHANGED TITLE TO REFLECT 2014 RESULTS		JAW	AL	BRW
4	6/14	750189	ADDED 2014 ASH CONTOURS & CHANGED TITLE TO REFLECT 2013 RESULTS		JTE	AL	BRW

LOCATION CODES | SORTS

REFERENCE TITLE	NUMBER	REFERENCE TITLE	NUMBER

FRACTIONAL | DECIMAL

ACCT: -
SCALE: 1"=100'
BY: JAW
REVIEWED

BRUNNER ISLAND S.E.S.
ASH AREA NO. 8
2017 TOPOGRAPHICAL MAPPING FOR 2016 OPERATIONAL REPORT

EAST MANCHESTER TOWNSHIP YORK CO., PA.

APPROVED A. D. Spear DATE 5/23/04

Talen Energy Corp

PPL DRAWING NO. E376179 | SHEET NO. 1 | REV. 7

Brunner_Ash_Basin_Plant_Datum_20170509.dwg

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