COAL COMBUSTION RESIDUALS
GROUNDWATER MONITORING SYSTEM DESIGN PLAN
ASH FILTER PONDS AND ASH DISPOSAL SITE

Prepared for:

Keystone-Conemaugh Projects, LLC
Keystone Generating Station
Shelocta, Pennsylvania

Prepared by:

Aptim Environmental & Infrastructure, LLC
Pittsburgh, Pennsylvania

October 2017
Rev. 01 August 2023

Table of Contents

List of Tables

List of Figures

List of Appendices

Plan Review/Assessment Log

Date of Review	Reviewer(s) Name(s)	If Amended: Rev. No., Section(s) Amended, and Reason(s)
October 2017	Mark Jacklin, GenOn Steve Frank, GenOn David Shott, APTIM Jim Kilburg, APTIM Richard Southorn, APTIM	Original Plan
August 2023	Nate Rozic, Keystone John Shimshock, Conemaugh David Shott, APTIM Robert Stolz, APTIM	Rev. 01: PE Certification (former PE no longer with APTIM); Sections 1.0 and 2.0 (administrative updates and added discussion of Ash Pond retrofits and Disposal Area closure); Section 3.0 (added additional justification for adequacy of monitoring well networks)

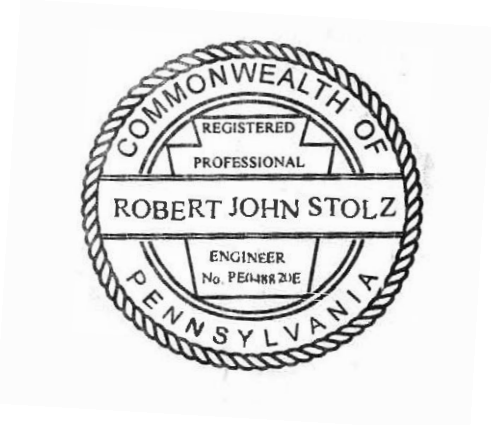
Professional Engineer's Certification

In accordance with §257.91(f) of the Rule, I hereby certify, based on a review of the information contained in the "Keystone CCR Groundwater Monitoring Network Design Report" (APTIM, October 2017) and other information made available to me, and my knowledge and understanding of accepted hydrogeological principles, that the groundwater monitoring systems associated with the Keystone CCR Units are adequate and appropriate. The construction and orientation of the respective groundwater monitoring systems are sufficient to satisfy the performance standards outlined in §257.91(a)(1-2) of the Rule. This certification further acknowledges the utilization of the required minimum number of monitoring wells as appropriate for the Keystone East Valley and West Valley Disposal Sites and the Ash Filter Ponds, and also the adoption of a multiunit monitoring system (per §257.91[d]) for the Ash Filter Ponds. Justification and basis for each respective monitoring network (including reliance on the minimum number of wells) is provided within the narratives of Sections 2.0 and 3.0 of this current document. These aspects address identification and characterization of the uppermost aquifer, well design and proximity to the CCR unit downgradient waste boundary, and groundwater flow directions.

Additionally, this certification recognizes confirmed operational upgrades (retrofit with composite liner systems per §257.72 and §257.70[c]) made to the Ash Filter Ponds from 2017 thru 2019, and the ongoing phased closure and final capping system installation (compliant with the performance standards of §257.102[d]) at the East Valley and West Valley Disposal Sites. The closure/capping of the disposal sites was initiated in early-2023, as a direct result of the Keystone Station's decision to permanently cease coal combustion no later than December 31, 2028, as a means to achieve compliance with the federal Effluent Limitation Guidelines Rule. Collectively, the pond upgrades and the ongoing closure/capping of the disposal sites represent measures to make each of these CCR units more robust and environmentally sound with respect to potential groundwater impacts during their remaining active life and into post-closure care (disposal sites only). The corresponding adequacy and effectiveness of the respective groundwater monitoring networks will be maintained by these actions.

Certified by: _____

Robert J. Stolz, P.E.
Professional Engineer Registration No. PE 048820E
Aptim Environmental & Infrastructure, LLC



Date: 8/25/2023

1.0 Introduction

Title 40 Code of Federal Regulations §257.91 requires owners or operators of Coal Combustion Residuals (CCR) landfills and surface impoundments, also known as CCR units, to implement a groundwater monitoring system. These requirements are part of the overall CCR Rule (or Rule) which was published in the Federal Register on April 17, 2015, and which became effective on October 19, 2015. The referenced groundwater monitoring system for each defined CCR unit must consist of a sufficient number of wells (minimum of one upgradient and three downgradient per §257.91[c][1]). Moreover, and per the performance standards outlined in §257.91(a)(1-2), these wells must be installed at appropriate locations to provide an accurate characterization of background groundwater quality and to be capable of accurately representing the quality of groundwater passing the downgradient boundary of the CCR unit. The overall groundwater monitoring system's ability to satisfy these elements of the Rule must be documented and certified by a registered professional engineer in accordance with §257.91(f).

The Keystone Generating Station (Keystone) is a coal-fired power plant located in Shelocta, Pennsylvania. The Rule applies to this facility due to the management/disposal of CCR materials that are generated from the combustion of coal. CCR units associated with Station operations include the Keystone Ash Disposal Site (represented by the East Valley and West Valley Disposal Sites), and three Ash Filter Ponds (Ponds "A," "B," and "C") used for the management of bottom ash. Each of these CCR units has a dedicated groundwater monitoring system that was originally installed to comply with Commonwealth of Pennsylvania Residual Waste Regulations, and was subsequently evaluated and modified (as needed) for use under the CCR program. Additionally, in accordance with the provisions of §257.91(d) of the Rule, the groundwater monitoring system for the Ash Filter Ponds has been designated to provide coverage in the context of a multiunit system encompassing all three ponds collectively.

The original Plan (APTIM, 2017) was placed in the Station's operating record per §257.105(h)(3), noticed to the State Director per §257.106(h)(2), and posted to the publicly accessible internet site per §257.107(h)(2). This revised Plan (Rev. 01, APTIM, 2023) has again been prepared to comply with the requirements of §257.91(f), addressing the adequacy and ability of the groundwater monitoring systems to satisfy the performance standards mandated by §257.91(a)(1-2) of the Rule. The revised Plan also acknowledges operational upgrades and future closure plans for each of Keystone's CCR units. As required, the same record-keeping requirements will be applied to this revised Plan, relative to placement in the facility operating record, notification and website posting.

2.0 CCR Unit Descriptions

2.1 General Descriptions

Ash Filter Ponds

As noted above, three ponds are utilized to manage bottom ash at the Station. These ponds are located within the Station proper, are situated immediately adjacent to one another and are designated from south to north as Ash Filter Pond "A," "B," and "C" (see attached Figure 1). Following completion of the retrofit activities in November 2019, each of the ponds retained their approximate dimensions of 410 feet long by 90 feet wide (at the crest), with depth and crest elevations adjusted appropriately to maintain adequate processing/settling capacities and to increase the separation distance between the bottom of the ponds and the observed upper limit of the uppermost aquifer. No changes were made to the existing CCR groundwater monitoring network (further discussed in Section 3.0) as a result of the retrofit.

Ash Disposal Site

The Keystone Ash Disposal Site is comprised of the contiguous East Valley and West Valley areas (see attached Figure 2). Stage I of East Valley was constructed first and became operational in 1985. Stage I was initially constructed in the northern part of East Valley, with Stage II being later constructed in the southern half of East Valley and piggy-backed over the Stage I area. The East Valley area is underlain by a single synthetic liner system. West Valley comprises Stages III and IV of the overall disposal area and both of these stages serve as the currently active portions. West Valley began operations in 2002 and this area has a double-liner system with one component being a geosynthetic clay liner. As designed, West Valley piggybacks over the western part of the East Valley Disposal Site, with Stage IV being a horizontal and vertical expansion of the Stage III area. Beginning in early-2023, closure and final capping activities were initiated and will be conducted in a phased manner (starting with East Valley) over the next six to seven years (targeted completion in 2029-2030). No changes to the existing CCR groundwater monitoring networks (further discussed in Section 3.0) will be undertaken as a result of the closure/capping of East Valley and West Valley.

2.2 Site Geology and Hydrogeology

Ash Filter Ponds

The Ash Filter Ponds are underlain by the Carmichaels Formation (Carmichaels) of the Pleistocene Epoch. The Carmichaels is comprised of unconsolidated sediments consisting of sandy clayey silt with interbedded sand and gravel, particularly near the bottom of the formation. Formation thickness typically varies from 30 to 50 feet; however, in the immediate area of the Ash Filter Ponds, the Carmichaels is approximately 18 to 22 feet thick. The Carmichaels directly overlies siltstone, claystone, and shale bedrock of the Mahoning Sandstone member of the Glenshaw

Formation (Conemaugh Group). The Mahoning Sandstone is a basal member of the Glenshaw Formation and is commonly comprised of silty to clayey sandstone with some shale, siltstone, and claystone interbeds.

The Carmichaels is generally devoid of a persistent and laterally continuous groundwater table and infiltrating stormwater passing through this formation recharges groundwater within the underlying Mahoning Sandstone. Although a persistent and laterally continuous groundwater table does not appear to exist in the Carmichaels, some groundwater may be present intermittently (following prolonged or intense precipitation) in the lower part of this formation near its interface with the Mahoning Sandstone.

A continuous groundwater table does reside within the fractured zones of the Mahoning Sandstone in the immediate area of the Ash Filter Ponds. Correspondingly, this water-bearing zone represents the uppermost aquifer in this area, existing in an unconfined condition since it is recharged, at least in part, directly from the overlying Carmichaels.

Ash Disposal Site

East Valley

East Valley is underlain by rocks of the Glenshaw Formation (Conemaugh Group) of the Pennsylvanian System. The Glenshaw Formation is typically about 300 feet thick and comprised of interbedded sandstone, siltstone, shale, and claystone. Four thin marine limestone beds are present in the Glenshaw Formation including the Ames, Woods Run, Pine Creek, and Brush Creek. Claystone beds occurring in the Glenshaw Formation are important units because they commonly act as aquitards and aquicludes[1] between groundwater bearing units in sandstone and siltstone beds. The importance of the marine limestone beds is that they are key marker beds that allow for determining stratigraphic position within the Glenshaw Formation. Economically unimportant coal beds typically only a few inches thick are also present within the Glenshaw Formation. Significant groundwater bearing units within the Glenshaw Formation commonly include the Saltsburg Sandstone, Buffalo Sandstone, and Mahoning Sandstone. The Mahoning Sandstone is the basal member of the Glenshaw Formation. These geologic formations affect the groundwater gradient in this area such that the gradient follows the slope of the ground surface (rather than the dip of individual rock units), and thus resulting in groundwater flow being topographically controlled, i.e., essentially indicating that downgradient is downhill and upgradient is uphill through the valley.

1 Aquitard - saturated, permeable geologic unit which cannot transmit significant quantities of water (but can transmit small quantities). Also called a semi-pervious formation or leaky formation. Aquiclude- geologic formation which may contain water, but is incapable of transmitting water.

Groundwater downgradient of East Valley resides within the fractured zones of the Mahoning Sandstone. The Mahoning Sandstone is the first geological unit and the uppermost groundwater bearing unit below ground surface in the area of the downgradient monitoring wells. Correspondingly, the Mahoning Sandstone represents the uppermost unconfined aquifer in the East Valley area.

West Valley

Considering the contiguous setting of the East Valley and West Valley areas, the geology and hydrogeology underlying both disposal sites are essentially the same. The Mahoning Sandstone is the first geological unit and the uppermost groundwater bearing unit below ground surface in the area of the downgradient monitoring wells. Correspondingly, the fractured zones of the Mahoning Sandstone represent the uppermost unconfined aquifer in the West Valley area. Groundwater flow in this valley is also topographically controlled, same as discussed above for the East Valley area.

3.0 Groundwater Monitoring Well Systems

The groundwater monitoring well systems for the Ash Filter Ponds and the Ash Disposal Site meet the requirements of §257.91 with respect to number and locations of wells and with respect to monitoring the same hydrostratigraphic interval. Provided below are tables showing details for the groundwater monitoring well systems for each of these CCR units. In support of development of the respective monitoring well systems, APTIM relied in part on information provided in the form of a third-party peer review conducted by GAI Consultants, Inc. (GAI, 2015).

3.1 Ash Filter Ponds

The groundwater monitoring system for the Ash Filter Ponds is comprised of four wells, including Well MW-5 (upgradient) and Wells MW-6, MP-29, and MP-30 (downgradient). This same grouping of wells also serves as the groundwater monitoring network for compliance with the Commonwealth of Pennsylvania Residual Waste regulations. The screened intervals of all four wells cross the interface between the Carmichaels Formation and the Mahoning Sandstone, previously noted as the horizon for the uppermost aquifer. The locations of the monitoring wells are shown on Figure 1 along with a depiction of the generalized and established groundwater flow direction, which is toward the southwest. As observed from Figure 1, each of the three downgradient wells is situated along the base of the dike adjacent to Pond "A," and in positions rendering them as close as practical to the downgradient CCR multi-unit waste boundary. With clear definition of groundwater flow direction in this area, three wells along this downgradient boundary are deemed to provide sufficient coverage over the approximate 400-foot lateral distance spanned by the ponds. Installation details and boring logs for the wells are contained in Appendix A of this document, with pertinent information summarized in Table 1. Screened intervals for the downgradient wells range from 25 to 30 feet, providing ample coverage of the uppermost aquifer (fractured zones of the Mahoning Sandstone), and effective monitoring for potential gross-level groundwater impacts.

Table 1: Ash Filter Ponds Groundwater Monitoring Well System

Monitoring Well No.	Hydrologic Position	Casing Diameter (inches/Material)	Ground Surface Elevation (feet msl)	Top of PVC Casing Elevation (feet msl)	Well Depth (feet bgs)	Top/Bottom Elevations of Screened Interval (feet msl)
MW-5	Upgradient	4-inch/PVC	1,022.91	1,025.66	40.0	1,007.91/982.91
MW-6	Downgradient	4-inch/PVC	1,021.76	1,024.86	40.0	1,006.76/981.76
MP-29	Downgradient	4-inch/PVC	1,021.28	1,023.03	45.2	1,006.08/976.08
MP-30	Downgradient	4-inch/PVC	1,021.34	1,023.35	45.1	1,006.24/976.24

Notes: feet bgs = feet below ground surface; PVC = polyvinyl chloride

3.2 Ash Disposal Site

East Valley and West Valley are designated as separate CCR units, and each has a dedicated groundwater monitoring well system. However, they share a common background monitoring well (identified as Well MP-21), which is situated upgradient/cross-gradient to the overall disposal site, and offers a location that mimics the geology and hydrogeology at the downgradient monitoring wells for both East Valley and West Valley. Further discussion of the individual monitoring well systems for East Valley and West Valley is provided below in Sections 3.2.1 and 3.2.2, respectively.

3.2.1 East Valley

The groundwater monitoring system for East Valley is comprised of four wells, including Well MP-21 (upgradient/cross-gradient) and Wells MP-4, MP-17B, and MP-18 (downgradient). This same grouping of downgradient wells is used for the Commonwealth of Pennsylvania Residual Waste monitoring, plus an upgradient well designated as MP-19. Comparison of groundwater quality between MP-21 and MP-19 (available from PADEP Form 14R documentation) shows high similarity, so the single utilization of well MP-21 for the CCR upgradient/cross-gradient monitoring well is deemed reasonable. Although groundwater quality between MP-21 and MP-19 is generally similar, the screened interval for well MP-19 also spans some additional rock units when compared to well MP-21. The screened intervals of all four CCR monitoring wells (MP-21, MP-4, MP-17B, and MP-18) are in bedrock units, including the Mahoning Sandstone which is represented as the uppermost aquifer in this area.

The locations of the monitoring wells are shown on Figure 2 along with a depiction of the generalized and established groundwater flow direction, which is toward the east. As observed from Figure 2, each of the three downgradient wells is situated along the eastern-most toe of the disposal area, and in positions rendering them essentially right at the downgradient CCR waste placement boundary. As previously noted, groundwater flow in this area is topographically controlled with flow in the downhill direction and ultimately being funneled through the valley to the toe of the disposal area where the downgradient monitoring wells are situated. This funneling effect further supports the utilization of only three downgradient wells as there is a confined and limited footprint represented at the toe of the disposal area.

Installation details and boring logs for the wells are contained in Appendix B of this document, with pertinent information summarized in Table 2. Screened intervals for the downgradient wells range from 10 to 20 feet, providing ample coverage of the uppermost aquifer (fractured zones of the Mahoning Sandstone), and effective monitoring for potential gross-level groundwater impacts.

Table 2: East Valley Ash Disposal Site Groundwater Monitoring Well System

Monitoring Well No.	Hydrologic Position	Casing Diameter (inches/Material)	Ground Surface Elevation (feet msl)	Top of PVC Casing Elevation (feet msl)	Well Depth (feet bgs)	Top/Bottom Elevations of Screened Interval (feet msl)
MP-21	Upgradient/ Cross-gradient	4-inch/PVC	1,123.39	1,125.70	152.0	1,106.39/971.39
MP-4	Downgradient	4-inch/PVC	1,037.30	1,039.28	27.0	1,020.30/1,010.30
MP-17B	Downgradient	4-inch/PVC	1,066.67	1,068.81	59.8	1,026.87/1,006.87
MP-18	Downgradient	4-inch/PVC	1,052.47	1,053.88	42.0	1,030.47/1,010.47

3.2.2 West Valley

The groundwater monitoring system for West Valley is comprised of four wells, including Well MP-21 (upgradient/cross-gradient), and Wells MP-16, MP-23, and MP-24 (downgradient). This same grouping of wells is used for the Commonwealth of Pennsylvania Residual Waste monitoring, plus an additional downgradient well designated as MP-22 on the northern downslope and in a location measurably distant from the West Valley waste boundary. Considering the commonality of the wells between the Residual Waste and CCR programs, the single utilization of well MP-21 for the CCR upgradient/cross-gradient monitoring well is deemed reasonable. The screened intervals of Wells MP-16, MP-21, and MP-24 are in bedrock units (including the Mahoning Sandstone and its upper fracture zones), while the screened interval for Well MP-23 extends across the soil/bedrock interface.

The locations of the monitoring wells are shown on Figure 2 along with a depiction of the generalized and established groundwater flow direction, which is toward the south. As observed from Figure 2, each of the three downgradient wells is situated near the southern-most toe of the disposal area, and in positions rendering them in very close proximity to the downgradient CCR waste placement boundary. The construction and presence of the West Valley Equalization Pond (shown on Figure 2 and used to manage contact stormwater runoff) and associated infrastructure necessitated locating the downgradient wells a slight distance from the actual waste placement boundary. Accordingly, their locations are deemed reasonable and responsive to the CCR Rule obligations. As previously noted, groundwater flow in this area is topographically controlled with flow in the downhill direction and ultimately being funneled through the valley to the toe of the disposal area where the downgradient monitoring wells are situated. This funneling effect further supports the utilization of only three downgradient wells as there is a confined and limited footprint represented at the toe of the disposal area. Installation details and boring logs for the wells are contained in Appendix C of this document, with pertinent information summarized in Table 3. Screened intervals for the downgradient wells range from 50 to 90 feet, providing ample coverage of the uppermost aquifer (the Mahoning Sandstone and its fracture zones), and effective monitoring for potential gross-level groundwater impacts.

Table 3: West Valley Ash Disposal Site Groundwater Monitoring Well System

Monitoring Well No.	Hydrologic Position	Casing Diameter (inches/Material)	Ground Surface Elevation (feet msl)	Top of PVC Casing Elevation (feet msl)	Well Depth (feet bgs)	Top/Bottom Elevations of Screened Interval (feet msl)
MP-21	Upgradient/ Cross-gradient	4-inch/PVC	1,123.39	1,125.70	152.0	1,106.39/971.39
MP-16	Downgradient	4-inch/PVC	1,064.27	1,066.25	70.0	1,054.27/994.27
MP-23	Downgradient	4-inch/PVC	1,071.19	1,073.34	85.0	1,056.19/986.19
MP-24	Downgradient	4-inch/PVC	1,099.48	1,100.26	111.0	1,083.48/988.48

4.0 Purging and Sampling Equipment

To support the collection of representative groundwater samples from the monitoring wells, the low-flow method has been adopted and utilized for sampling at each of the Keystone CCR units, and will remain in place for all subsequent CCR monitoring activities. The low-flow method is documented and accepted by the U.S. Environmental Protection Agency, and allows for purging/sampling of groundwater such that laminar flow (non-turbulent) conditions are maintained with corresponding minimal or no drawdown in the well. This, in turn, promotes continuous or near-continuous groundwater recharge of the well from the surrounding formation, and ensures that the subsequently collected samples are representative of fresh formation waters. Low-flow sampling can be performed using either dedicated or portable sampling equipment.

Dedicated air-operated bladder pumps manufactured by Geotech Environmental Equipment, Inc. (Geotech) have been installed in each of the groundwater monitoring wells at the Ash Filter Ponds and in each well at both the East Valley and West Valley Disposal Sites. Each of the dedicated pump intakes is set so that sediment from the bottom of the wells or stagnant water from the tops of the water columns is not drawn in during the groundwater purging/sampling. Table 4 provides a summary of the monitoring wells depths, the depth to the pump intakes, and the heights of the water column above the pump intakes (this information is based on actual field measurements).

Table 4: Well Depths and Sampling Pump Settings

Monitoring Well	Location	Measured Total Depth (feet below top of casing	Depth to Pump Intake (feet below top of casing)	Height of Water Column above Pump Intake (feet)
MW-5	Ash Filter Ponds	42.9	39.8	15.9
MW-6	Ash Filter Ponds	42.9	39.8	15.6
MP-29	Ash Filter Ponds	47.1	43.9	19.8
MP-30	Ash Filter Ponds	47.3	43.8	16.0
MP-21	East Valley/West Valley Disposal Sites	153.2	148.8	91.9
MP-4	East Valley Disposal Site	27.1	25.8	2.9
MP-17B	East Valley Disposal Site	62.1	56.8	12.3
MP-18	East Valley Disposal Site	44.6	38.8	2.1
MP-16	West Valley Disposal Site	72.2	64.8	48.6
MP-23	West Valley Disposal Site	86.8	80.8	66.9
MP-24	West Valley Disposal Site	112.9	105.8	72.8

Figures

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	11/30/22	--	E. Schlegel	D. Shott	--	631015097-B1

LEGEND:

MW-5 (1007.47) — CCR GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION MEASURED ON NOVEMBER 15, 2022

GROUNDWATER GENERALIZED FLOW DIRECTION

SCALE

0 100 200 FEET

REFERENCES:

1. GOOGLE AERIAL PHOTOGRAPH, DATED 9/26/2019.

APTIM
500 Penn Center Boulevard,
Suite 1000
Pittsburgh, Pennsylvania 15235

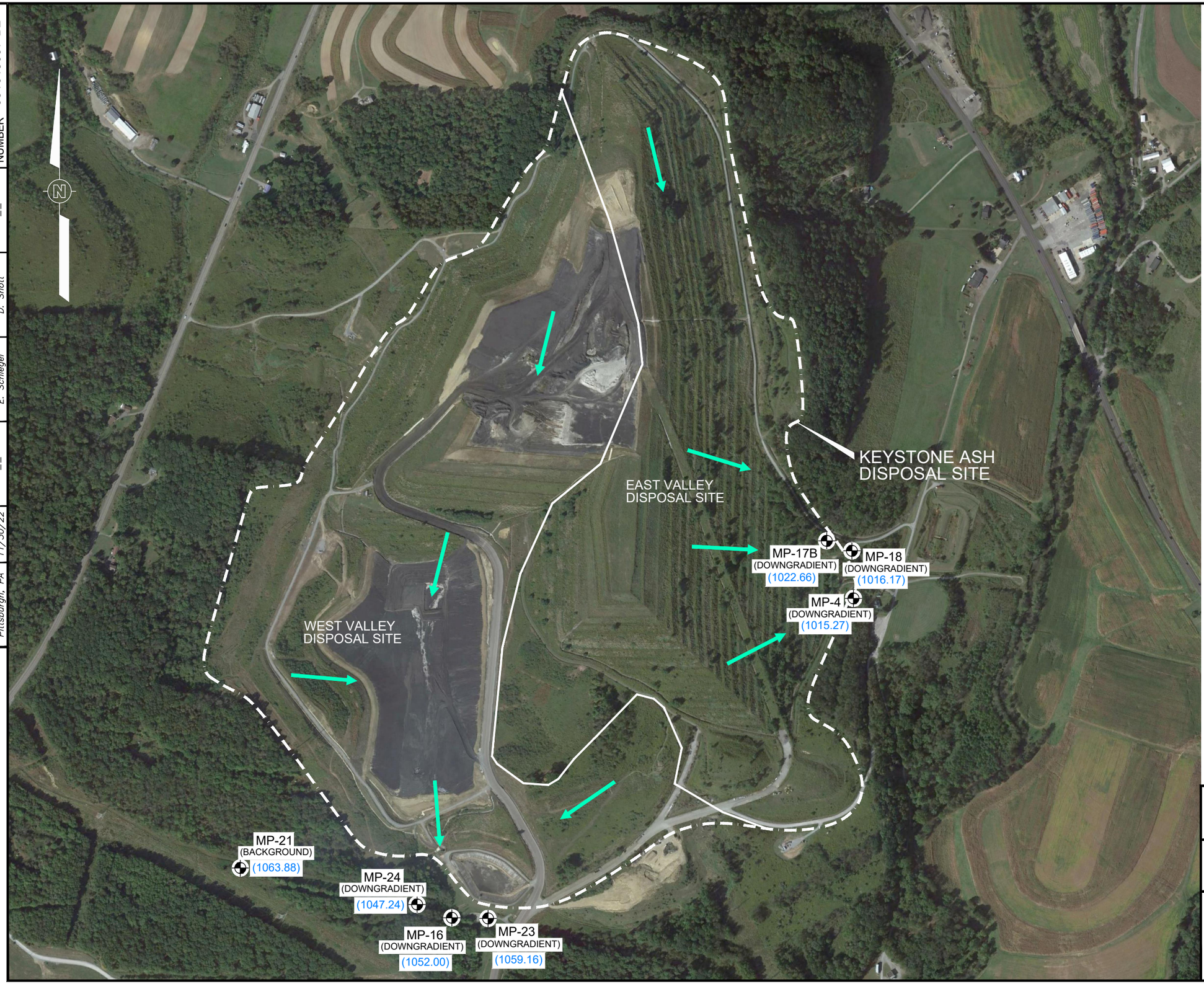
KEYSTONE STATION CAMS Consolidated Asset Management Services

FIGURE 1
CCR COMPLIANCE GROUNDWATER MONITORING WELL LOCATION MAP
ASH FILTER PONDS

KEYSTONE GENERATING STATION
PLUMCREEK TOWNSHIP, ARMSTRONG COUNTY, PA

File: O:\PROJECT\110870\631015097\631015097-B1.dwg
Plot Date/Time: Nov 30, 2022 - 12:25pm
Plotted By: Evan.Schlegel
Xref: Image

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	11/30/22	---	E. Schlegel	D. Shott	---	631015097-B2



LEGEND:

MP-18 (1016.17) CCR GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION MEASURED BETWEEN NOVEMBER 10 AND NOVEMBER 14, 2022

GROUNDWATER GENERALIZED FLOW DIRECTION

SCALE

0 600 1,200 FEET

REFERENCES:

1. GOOGLE AERIAL PHOTOGRAPH, DATED 9/26/2019.

APTIM
500 Penn Center Boulevard,
Suite 1000
Pittsburgh, Pennsylvania 15235

KEYSTONE STATION CAMS Consolidated Asset Management Services

FIGURE 2
CCR COMPLIANCE GROUNDWATER MONITORING WELL LOCATION MAP
EAST VALLEY AND WEST VALLEY ASH DISPOSAL SITES
KEYSTONE GENERATING STATION
PLUMCREEK TOWNSHIP, ARMSTRONG COUNTY, PA

File: O:\PROJECT_110870\Keystone\631015097\631015097-B2.dwg
Plot Date/Time: Nov 30, 2022 - 12:42pm
Plotted By: Evan.Schlegel
Xref:
Image

Appendix A

Boring Logs and Construction Details— Ash Filter Ponds Groundwater Monitoring Wells

GILBERT ASSOCIATES, INC.

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2

PROJECT: Ash Filter Ponds W.O. 04-4267-182 SITE AREA Keystone Station

DRILL HOLE NO. MW-5

CONTRACTOR: Penn Drilling Co. COORDINATES N-14, 704.04 E-59, 173.97

ELEVATION 1022.90

DRILLER: K. Baumgartner

GWL 0 HRS -

CLASSIFIED BY: Y. Shah DATE: 08-21-87

5 days 27.0' below G.S.

Depth Ft.	Sample No.	SPT Blows/6 In. (6 12 18)	Ft. Rec.	Profile	DESCRIPTION (Density (or Consistency), Color, Rock Or Soil Type - Accessories)	U.S.C.S.	R.Q.D.	Soil Or Rock: Range Size / Core Run	Soil Or Rock: Grain Shape / Rec. Core	REMARKS (Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.)
					SANDY CLAYEY SILT, little gravel, brown					1. Used compressed air to drill the hole.
10										2. Strong perched water inflow into the hole below 3'±.
				18'						Installed monitoring well, see page 2 of 2
20					GRAY CLAYSTONE OR SILTSTONE (Probably weathered to 22', fractured between 34' and 36'.)					
30										
40					Hole terminated at 45.0'.					

GILBERT ASSOCIATES, INC.

SOIL AND ROCK CLASSIFICATION SHEET

PROJECT: Ash Filter Ponds W.O. 04-4267-182 SITE AREA Keystone Station

CONTRACTOR: _____ COORDINATES _____

DRILLER: _____

CLASSIFIED BY: _____ DATE: 08-21-87

SHEET 2 OF 2

DRILL HOLE NO. MW-5

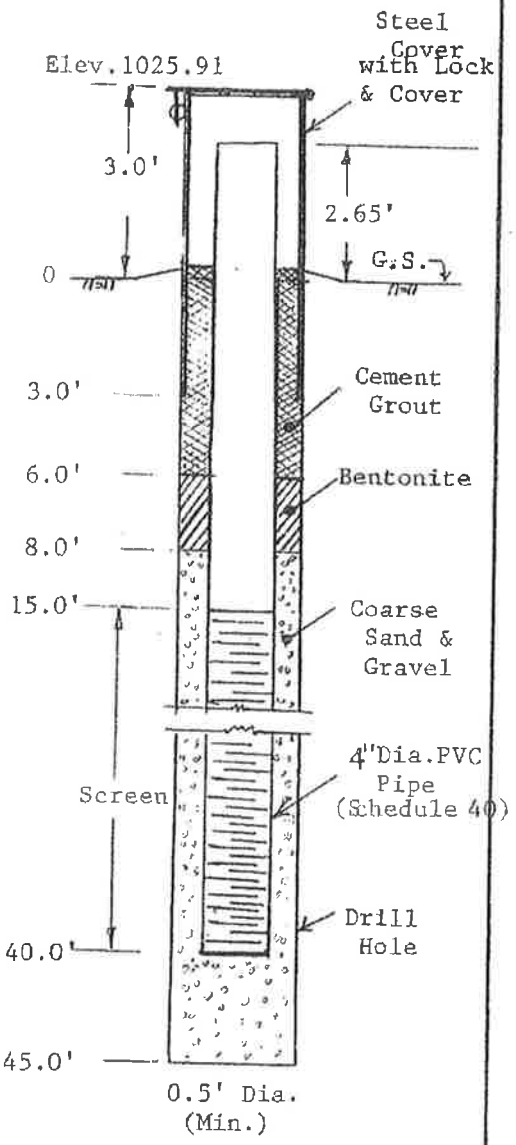
ELEVATION _____

GWL 0 HRS -

~~24 HRS~~ 5 days 27.0' below G.S.

Depth Ft.	Sample No.	SPT Blows/ 6 In. (6 12 18)	Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock: Range Size / Grain Shape / Core Run / Rec. Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.

Monitoring Well Data:



GILBERT ASSOCIATES, INC.

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2

PROJECT: Ash Filter Ponds W.O. 04-4267-182 SITE AREA Keystone Station

DRILL HOLE NO. MW-6

CONTRACTOR: Penn Drilling Co. COORDINATES N-14, 976.14

ELEVATION 1022.16

DRILLER: K. Baumgartner E-59, 448.01

GWL 0 HRS -

CLASSIFIED BY: Y. Shah DATE: 08-20-87

6 days 24.9' below G.S.

Depth Ft.	Sample No.	SPT Blows/6 In. (6 12 18)	Ft. Rec.	Profile	DESCRIPTION (Density (or Consistency), Color, Rock Or Soil Type - Accessories)	U.S.C.S.	R.Q.D.	Soil Or Rock: Range Size / Grain Shape	Core Run / Rec. Core	REMARKS (Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.)
					SANDY CLAYEY SILT, little gravel, brown					Used compressed air to drill the hole. Installed monitoring well, see page 2 of 2
10										
20				22'	GRAY CLAYSTONE OR SILTSTONE (Probably highly weathered to 27' depth, intermittently softer below)					
30										
40					Hole terminated at 45.0'.					

GILBERT ASSOCIATES, INC.

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2

PROJECT: Ash Filter Ponds W.O. 04-4267-182 SITE AREA Keystone Station

DRILL HOLE NO. MW-6

CONTRACTOR: Penn Drilling Co. COORDINATES

ELEVATION

DRILLER: K. Baumgartner

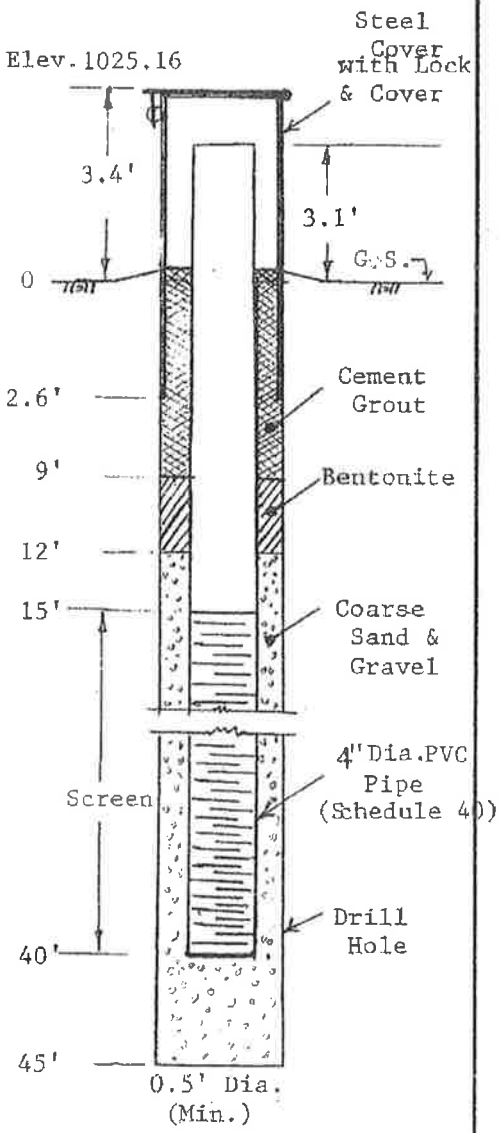
GWL 0 HRS –

CLASSIFIED BY: Y. Shah DATE: 08-21-87

~~24 HRS~~ 6 days 24.9' below G.S.

Depth Ft.	Sample No.	SPT Blows/ 6 In. 6 12 18	Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock: Range Size / Grain Shape; Core / Rec.; Run / Core	REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.

Monitoring Well Data:



Drilling Log

Monitoring Well **MP-29**

Project: NRG Keystone Generating Station | Owner: NRG
Location: Shelocta, Pennsylvania | Proj. No.: 1009174008
Surface Elev.: 1021.289 ft. | Total Hole Depth: 45.2 ft. | North: | East:
Top of Casing: 1023.03 ft. | Water Level Initial: ▽ 22.2 ft. | Static: ▼ 22.3 ft. | Diameter: 8 in.
Screen: Dia: 4 in. | Length: 30 ft. | Type/Size: Schedule 40 PVC/0.010 in.
Casing: Dia: 4 in. | Length: 17 ft. | Type: Schedule 40 PVC
Fill Material: Hole Plug | Rig/Core: Versa Drill
Drill Co.: Duncan Brothers Drilling, Inc. | Method: Air Rotary
Driller: Dave Powell | Log By: Dustin Moore | Date: 10/22/15 | Permit #: NA
Checked By: | License No.:

COMMENTS

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / % Recovery / Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic Descriptions are Based on the USCS.
0					SM	Topsoil and grass.
					SPG	Light brown FILL as POORLY GRADED SAND (medium to fine grained) WITH GRAVEL; gravel as sandstone cobbles; loose; dry; silty near base.
2					CLG	
					SPG	
						Brownish gray CLAY WITH GRAVEL; some silt; dry.
4					CL	Light brown FILL as POORLY GRADED SAND (medium to fine grained) WITH GRAVEL; gravel as sandstone cobbles; loose; dry; silty near base.
					SC	Gray CLAY; some silt and gravel; medium stiff; becoming sandy with depth beginning at 4 feet bgs; moist.
6						Brown SANDY CLAY; some silt and gravel; moist.
						Brown CLAYEY SILT WITH SAND; some clay; trace gravel; trace coal fragments; moist.
8						
10						
12					MH	
14						
16						
18						
20						
22 ▼						Dark gray SILTSTONE BEDROCK; weathered to 23 feet bgs; moist.
24						

Continued Next Page

Drilling Log

Monitoring Well **MP-29**

Project *NRG Keystone Generating Station* Owner *NRG*

Location *Shelocta, Pennsylvania* Proj. No. *1009174008*

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
26						*Continued* Sandy zone.
28						
30						
32						
34						Water encountered; dust dissipates.
36						
38						Hard zone.
40						
42						Gray SANDSTONE BEDROCK (fine grained); wet.
44						
46						
48						
50						
52						
54						
56						
58						

Drilling Log

Monitoring Well **MP-30**

Project: NRG Keystone Generating Station | Owner: NRG

Location: Shelocta, Pennsylvania | Proj. No.: 1009174008

Surface Elev.: 1021.341 ft. | Total Hole Depth: 45.1 ft. | North: | East:

Top of Casing: 1023.35 ft. | Water Level Initial: ▽ 27.3 ft. | Static: ▼ 27.3 ft. | Diameter: 8 in.

Screen: Dia: 4 in. | Length: 30 ft. | Type/Size: Schedule 40 PVC/0.010 in.

Casing: Dia: 4 in. | Length: 17 ft. | Type: Schedule 40 PVC

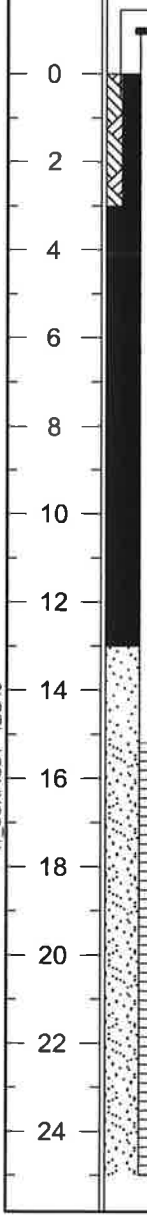
Fill Material: Hole Plug | Rig/Core: Versa Drill

Drill Co.: Duncan Brothers Drilling, Inc. | Method: Air Rotary

Driller: Dave Powell | Log By: Dustin Moore | Date: 10/23/15 | Permit #: NA

Checked By: | License No.:

COMMENTS



Depth (ft.)	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
0	SM	Topsoil and grass.
	MH	Light brown FILL as CLAYEY SILT WITH SAND; some gravel; medium stiff; moist.
2	SC	Light brown SANDY CLAY; some gravel; medium stiff; moist; hard zone of gravel at 4.5 feet bgs.
4		
6	MH	Medium brown CLAYEY SILT WITH SAND; occasional gravel; medium stiff; moist.
8		
10		
12		
14		
16		
18		
20		Dark gray SILTSTONE BEDROCK; weathered to 22 feet bgs; moist.
22		
24		

Continued Next Page

Drilling Log

Monitoring Well **MP-30**

Project *NRG Keystone Generating Station* Owner *NRG*

Location *Shelocta, Pennsylvania* Proj. No. *1009174008*

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic Descriptions are Based on the USCS.
26						*Continued*
28						
30						
32						
34						
36						
38						Water encountered; dust dissipates; slightly shaly.
40						
42						
44						Gray SANDSTONE BEDROCK (fine grained); wet.
46						
48						
50						
52						
54						
56						
58						

Appendix B

Boring Logs and Construction Details— East Valley Ash Disposal Site Groundwater Monitoring Wells

Borehole Number: KEYSTONE STATION WEST VALLEY MP-21
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 153
al Depth: 153 Feet (ft)
epth to Static Ground Water Level (SWL): 25.79 (ft)
Date SWL Measured: JUNE 28, 2000 (mm/dd/yy)

Drilling Method: HOLLOW STEM AUGERS/DOWN HOLE AIR HAMMER
Date Drilled: JUNE 26, 2000 (mm/dd/yy)
Drilled By: PA. Drilling – Chris Colter/Earl Dye
Drillers License Number: 0406
Logged By: S.C. WIGTON – GAI Consultants, Inc.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments
0						
	BROWN/RED SILT SOME CLAY TRACE ROCK FRAGS AND ORGANICS					
5						
	BROWN M. SOFT SILTSTONE					
10						
15						
	GRAY M. SOFT SILTSTONE					
20						
	BROWN M. SOFT SILTSTONE					
25			▽			
	GRAY SOFT CLAYSTONE					
30						
	GRAY M. SOFT SHALE					
35						
	DK. GRAY M. SOFT SILTY CLAYSTONE					
40						
	GRAY M. SOFT SILTSTONE					
45						
	GRAY M. SOFT SILTSTONE SOME CALCAREOUS STREAKS					
50						
55						
60						

Well/Piezometer Construction:
- Locking Steel Protective Cover
- Concrete Pad
- CONCRETE
- 3.0
- 4" Ø Sch. 40 PVC Riser
- VOLCLAY CHIPS
- 10.0
- Bentonite Pellets
- 13.5
- 17.0
- 4" Ø Sch. 40 PVC Screen
- SAND

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Borehole Number: KEYSTONE STATION WEST VALLEY MP-21
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 153
Total Depth: 153 Feet (ft)
Depth to Static Ground Water Level (SWL): 25.79 (ft)
Date SWL Measured: JUNE 28, 2000 (mm/dd/yy)

Drilling Method: HOLLOW STEM AUGER/DOWN HOLE AIR HAMMER
Date Drilled: JUNE 26, 2000 (mm/dd/yy)
Drilled By: PA. DRILLING – CHRIS COLTER / EARL DYE
Drillers License Number: 0406
Logged By: S.C. (WIGTON) – GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec**/Att	Comments	Well/Piezometer Construction	Depth (Ft)
60	GRAY M. SOFT SILTSTONE SOME CALCAREOUS STREAKS							60
65								65
70							SAND	70
75	GRAY SOFT CLAYSTONE							75
80								80
85								85
90							4" Ø Sch. 40 PVC Screen	90
95								95
100								100
105								105
110	GRAY M. HARD SANDSTONE						SAND	110
115								115
120								120

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Recycled Paper

Borehole Number: KEYSTONE STATION WEST VALLEY MP-21
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 153
al Depth: 153 Feet (ft)
Depth to Static Ground Water Level (SWL): 25.79 (ft)
Date SWL Measured: June 28, 2000 (mm/dd/yy)

Drilling Method: Hollow Stem Auger / Down Hole Air Hammer
Date Drilled: June 26, 2000 (mm/dd/yy)
Drilled By: PA Drilling - Chris Colter / Earl Dye
Drillers License Number: 0406
Logged By: S. C. WIGTON – GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments	Well/Piezometer Construction	Depth (Ft)
120	GRAY M. HARD SANDSTONE		▽					120
125								125
130	GRAY INTERBEDDED SHALE, SILTSTONE, SANDSTONE SOME CARBONACEOUS STREAKS						4"Ø Sch 40 PVC SCREEN	130
135							SAND	135
140								140
145								145
150							152.0 XXX CAVE IN XXXXXXX CAVE IN XXXXXX	150
155	BOTTOM OF BORING 153'						BOTTOM OF BORING 153 FT.	155

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Recycled Paper

FORM 6R

Sheet 1 of 1

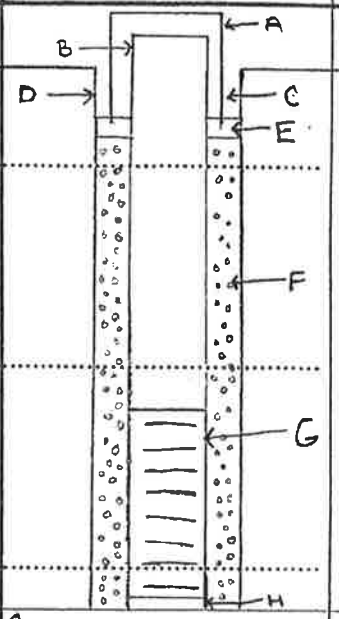
I.D. Number 300837

Borehole Number: MP-4
Surface Elevation (Ft/MSL): 1037.3 (ft)
Borehole Diameter: 8 inches, From 0 To 27
inches, From ____ To ____
Total Depth: 27 (ft)
Depth to Static Ground Water Level (SWL): 18.5 (ft)
Date SWL Measured: 7/24/83 (mm/dd/yy)

Drilling Method: 8" Air Rotary
Date Drilled: 11/21/78 (mm/dd/yy)
Drilled By: ____
Drillers License Number: ____
Logged By: SRM
County: Armstrong
Township or Municipality: Plum Creek

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments
0						
	Sandstone, Brown					medium Hard
10	Sandstone, gray					
	Sandstone, Brown					
	Sandstone, gray					
	Sandstone, Brown					medium Soft
	Sandstone, Tan		18.5 ▼			medium Hard
20	Sandstone, Light Gray					
	Sandstone, gray Brown					
	Sandstone, Tan					
30						Bottom of Boring at 27 Ft.

Well/Piezometer Construction



Depth (Ft): 0, 10, 20, 30

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Sheet 1 of 1

FORM 6R

I.D. Number: 300837

Borehole Number: MP-17B
Surface Elevation (Ft/MSL): 1066.67 (ft)
Borehole Diameter: 7 7/8 inches, From 0 To 59.8
inches, From ____ To ____
Total Depth: 59.8 (ft)
Depth to Static Ground Water Level (SWL): 58 (ft)
Date SWL Measured: 10/7/93 (mm/dd/yy)

Drilling Method: 7 7/8" Air Rotary (Truck Mounted)
Date Drilled: 10/5-7/93 (mm/dd/yy)
Drilled By: L.G. Hetager
Drillers License Number: 1728
Logged By: S.E. Gould
County: Armstrong
Township or Municipality: Plum Creek

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments
0	Silty Clay, Brown					
	Decomposed, sandy Shale, Brown					
10						
20	Silty Shale, Gray					
30	Limestone, Tan and Gray					
	Limey Sandstone, Gray					
	Sandstone, Gray					
40						
	Sandy Shale, Gray					
50	Sandstone, Gray					
	Silty Shale, Gray		58 ▼			
60	Silty Shale, Dark Gray					Bottom of Boring at 59.8 Ft.

Well/Piezometer Construction: B, A, I, J, K, L, M, N, O, H

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Sheet 1 of 1

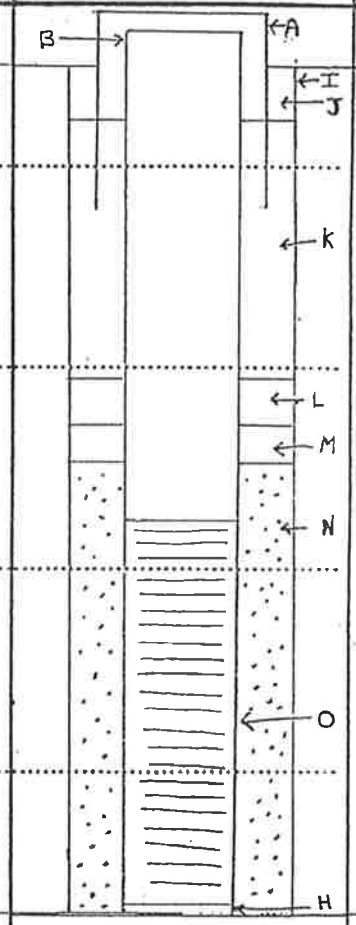
FORM 6R

I.D. Number: 300837

Borehole Number: MP-18
Surface Elevation (Ft/MSL): 1052.47 (ft)
Borehole Diameter: 7 7/8 inches, From 0 To 42
inches, From ____ To ____
Total Depth: 42 (ft)
Depth to Static Ground Water Level (SWL): 33.23 (ft)
Date SWL Measured: 2/3/94 (mm/dd/yy)

Drilling Method: 7 7/8" Air Rotary (Truck Mounted)
Date Drilled: 9/24/93 (mm/dd/yy)
Drilled By: L.G. Hetager
Drillers License Number: 1728
Logged By: S.E. Gould
County: Armstrong
Township or Municipality: Plum Creek

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments
0	Sandstone, Tan					
10						
20	Carboneous Sandstone, Gray					
	Sandstone, Tan					
	Calcareous sandstone, Gray					
30	Sandstone, Gray		33.23 (2/3/94)			
	Sandstone, Tan					
40	Interbedded Sandstone, Tan and Gray					Bottom of Boring at 42 Ft.



* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Appendix C

Boring Logs and Construction Details— West Valley Ash Disposal Site Groundwater Monitoring Wells

Borehole Number: KEYSTONE STATION WEST VALLEY MP-21
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 153
al Depth: 153 Feet (ft)
epth to Static Ground Water Level (SWL): 25.79 (ft)
Date SWL Measured: JUNE 28, 2000 (mm/dd/yy)

Drilling Method: HOLLOW STEM AUGERS/DOWN HOLE AIR HAMMER
Date Drilled: JUNE 26, 2000 (mm/dd/yy)
Drilled By: PA. Drilling – Chris Colter/Earl Dye
Drillers License Number: 0406
Logged By: S.C. WIGTON – GAI Consultants, Inc.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments	Well/Piezometer Construction	Depth (Ft)
0							Locking Steel Protective Cover; Concrete Pad; Concrete; 3.0; 4" Ø Sch 40 PVC Riser; Vol Clay Chips; 10.0; Bentonite Pellets; 13.5; 17.0; 4" Ø Sch. 40 PVC Screen; Sand	0
5	BROWN/RED SILT SOME CLAY TRACE ROCK FRAGS AND ORGANICS							5
10	BROWN M. SOFT SILTSTONE							10
15								15
20	GRAY M. SOFT SILTSTONE							20
25	BROWN M. SOFT SILTSTONE		▽					25
30	GRAY SOFT CLAYSTONE							30
35	GRAY M. SOFT SHALE							35
40	DK. GRAY M. SOFT SILTY CLAYSTONE							40
45	GRAY M. SOFT SILTSTONE							45
50	GRAY M. SOFT SILTSTONE SOME CALCARIOUS STREAKS							50
55								55
60								60

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Recycled Paper

Borehole Number: KEYSTONE STATION WEST VALLEY MP-21
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 153
Total Depth: 153 Feet (ft)
Depth to Static Ground Water Level (SWL): 25.79 (ft)
Date SWL Measured: June 28, 2000 (mm/dd/yy)

Drilling Method: Hollow Stem Auger/Down Hole Air Hammer
Date Drilled: June 26, 2000 (mm/dd/yy)
Drilled By: PA. Drilling – Chris Colter/Earl Dye
Drillers License Number: 0406
Logged By: S.C. WIGTON – GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec**/Att	Comments	Well/Piezometer Construction	Depth (Ft)
60	GRAY M. SOFT SILTSTONE SOME CALCAREOUS STREAKS							60
65								65
70							SAND	70
75	GRAY SOFT CLAYSTONE							75
80								80
85								85
90							4" Ø Sch. 40 PVC Screen	90
95								95
100								100
105								105
110	GRAY M. HARD SANDSTONE						SAND	110
115								115
120								120

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Recycled Paper

Borehole Number: KEYSTONE STATION WEST VALLEY MP-21
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 153
Total Depth: 153 Feet (ft)
Depth to Static Ground Water Level (SWL): 25.79 (ft)
Date SWL Measured: June 28, 2000 (mm/dd/yy)

Drilling Method: Hollow Stem Auger / Down Hole Air Hammer
Date Drilled: JUNE 26, 2000 (mm/dd/yy)
Drilled By: PA. Drilling - Chris Colter / Earl Dyce
Drillers License Number: 0406
Logged By: S. C. WIGTON - GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments	Well/Piezometer Construction	Depth (Ft)
120	GRAY M. HARD SANDSTONE		▽					120
125								125
130	GRAY INTERBEDDED SHALE, SILTSTONE, SANDSTONE SOME CARBONACEOUS STREAKS						4" Ø Sch 40 PVC SCREEN	130
135								135
140							SAND	140
145								145
150							152.0 XXX CAVE IN XXXXXXX CAVE IN XXXXXX	150
155	BOTTOM OF BORING 153'						BOTTOM OF BORING 153 FT.	155

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Recycled Paper

Sheet 1 of 2

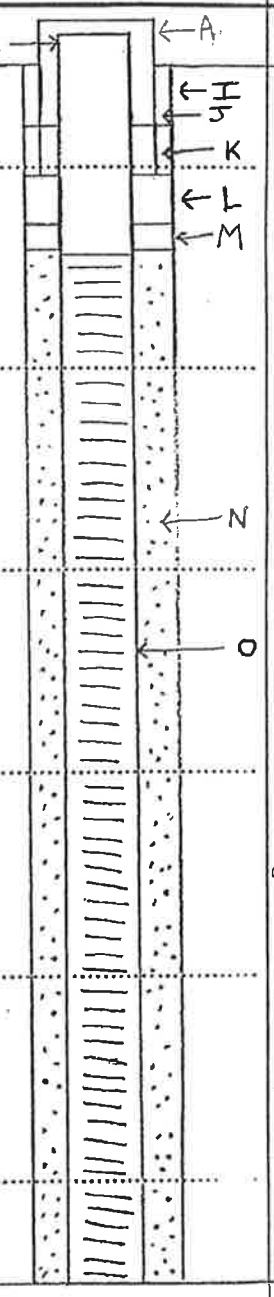
FORM 6R

I.D. Number: 300837

Borehole Number: MP - 16
Surface Elevation (Ft/MSL): 1064.27 (ft)
Borehole Diameter: 7 7/8" inches, From 0 To 70
inches, From To
Total Depth: 70 (ft)
Depth to Static Ground Water Level (SWL): 57.3 (ft)
Date SWL Measured: 9/22/93 (mm/dd/yy)

Drilling Method: 7 7/8" Air Rotary (Truck Mounted)
Date Drilled: 9/22/93 (mm/dd/yy)
Drilled By: L.G. Hetager
Drillers License Number: 1728
Logged By: S.E. Gould
County: Armstrong
Township or Municipality: PLUM CREEK

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments
0						
	Silty - Clay, Tan					
	Sandstone, Tan					
	Clayey Sandstone and Shale, Tan/Gray					Highly Weathered
10						
	Shale, gray					
	Shale, gray					
	Coal, Black					
20						medium Soft To medium Hard
	Clayey Sandstone, Gray					
30						
	Clayey Shale, Gray					medium Hard
40						
	Sandstone, Gray					Hard
	Shale, Black					
	Clayey Sandstone, gray					
50	Clayey Siltstone, gray					
	Clayey Sandstone, gray					
			57.3 ▼			
	Sandstone, gray					
60						



Depth (Ft): 0, 10, 20, 30, 40, 50, 60

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Sheet 2 of 2

FORM 6R

I.D. Number: 300 837

Borehole Number: MP-16
Surface Elevation (Ft/MSL): 1064.27 (ft)
Borehole Diameter: 7 7/8 inches, From 0 To 70
inches, From ____ To ____
Total Depth: 70 (ft)
Depth to Static Ground Water Level (SWL): 57.3 (ft)
Date SWL Measured: 9/22/93 (mm/dd/yy)

Drilling Method: 7 7/8" Air Rotary (Truck Mounted)
Date Drilled: 9/22/93 (mm/dd/yy)
Drilled By: L.G. Hetager
Drillers License Number: 1728
Logged By: S.E. Gould
County: ARMSTRONG
Township or Municipality: PLUM CREEK

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments	Well/Piezometer Construction	Depth (Ft)
60								60
	Sandstone, gray						N, O, H	
70						Bottom of Boring at 70Ft.		70

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Borehole Number: KEYSTONE STATION WEST VALLEY MP-23
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 86
Total Depth: 86 Feet (ft)
Depth to Static Ground Water Level (SWL): 18.11 (ft)
Date SWL Measured: July 14, 2000 (mm/dd/yy)

Drilling Method: HOLLOW STEM AUGER/DOWN HOLE AIR HAMMER
Date Drilled: JUNE 28, 2000 (mm/dd/yy)
Drilled By: PA. DRILLING - Chris Colter / Earl Dye
Drillers License Number: 0406
Logged By: S.C. WIGTON - GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments	Well/Piezometer Construction	Depth (Ft)
0	YELLOW/BROWN SILT SOME CLAY, ORGANICS TOP TWO FEET.						Locking Steel Protective Cover; Concrete Pad; Concrete 0–3.0; Volclay Chips 3.0–9.5; 4" Ø Sch. 40 PVC Riser 0–13.0; Bentonite Pellets 9.5–13.0; 15.0	0
5								5
10								10
15			▽					15
20	GRAY SOFT CLAYSTONE (WEATHERED)							20
25	GRAY SILTY CLAYSTONE							25
30							4" Ø Sch. 40 PVC Screen 13.0–15.0	30
35			▽					35
40								40
45								45
50								50
55	(CARBONACEOUS 54-55)							55
60								60

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

Recycled Paper

Borehole Number: KEYSTONE STATION WEST VALLEY MP-23
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 86
Depth: 86 Feet (ft)
Depth to Static Ground Water Level (SWL): 18.11 (ft)
Date SWL Measured: July 14, 2000 (mm/dd/yy)

Drilling Method: Hollow Stem Augers / Down Hole Air Hammer
Date Drilled: June 28, 2000 (mm/dd/yy)
Drilled By: PA. Drilling - Chris Cotter / Earl Dye
Drillers License Number: 0406
Logged By: S.C. WIGTON - GAI Consultants, Inc.
County: ARMSTRONG
Township or Municipality: Plum Creek Twp.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** / Att	Comments	Well/Piezometer Construction	Depth (Ft)
60	GRAY SILTY CLAYSTONE							60
65								65
70							4" Ø Sch. 40 PVC Screen	70
75								75
80	GRAY M. HARD SANDY SHALE						SAND	80
85							GRAY CLAY-SILTY CLAYSTONE	85
90	BOTTOM OF BORING 86.0 Feet						BOTTOM OF BORING 86.0 Feet	90

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

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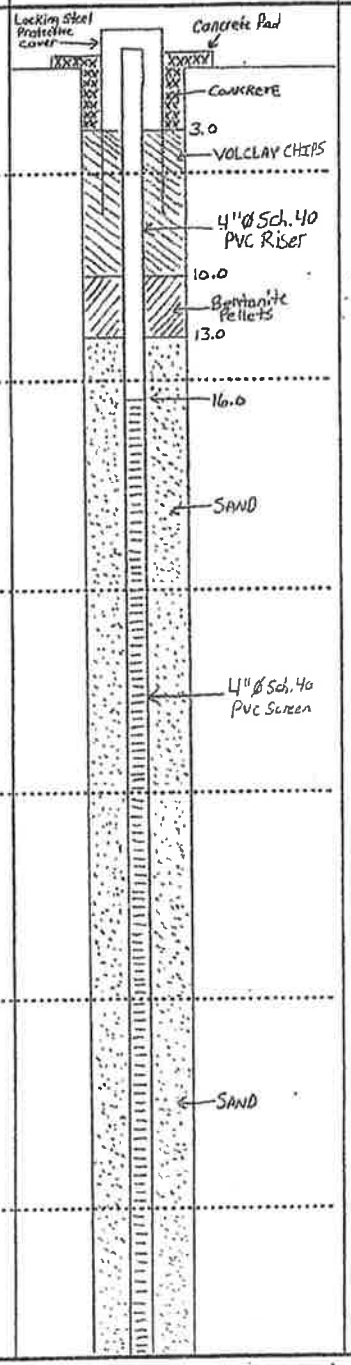
Borehole Number: KEYSTONE STATION WEST VALLEY MP-24
Surface Elevation (Ft/MSL): _____ (ft)
Borehole Diameter: 12 inches, From 0 To 5
8 inches, From 5 To 112
Depth: 112 Feet (ft)
Depth to Static Ground Water Level (SWL): 36.39 (ft)
Date SWL Measured: June 28, 2000 (mm/dd/yy)

Drilling Method: HOLLOW STEM AUGER / DOWN HOLE AIR HAMMER
Date Drilled: JUNE 22, 2000 (mm/dd/yy)
Drilled By: PA. DRILLING – Chris Colter / Earl Dye
Drillers License Number: 0406
Logged By: S.C. WIGTON – GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments
0	BROWN SILT TRACE ORGANICS					
	YELLOW/BROWN SILT SOME CLAY TRACE ROCK FRAGS					
5	BROWN M. SOFT SILTSTONE					
10						
15						
20	GRAY/BROWN M. HARD SILTSTONE					
25						
30						
35	GRAY M. HARD CLAYSTONE					
40						
45						
50						
55						
60	DK. GRAY M. HARD SILTY SHALE SLIGHTLY CARBONACEOUS					

Well/Piezometer Construction



Depth (Ft)

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Recycled Paper

Borehole Number: KEYSTONE STATION WEST VALLEY MP-24
Surface Elevation (Ft/MSL): _____ (ft)
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Drilling Method: HOLLOW STEM AUGERS / DOWN HOLE AIR HAMMER
Date Drilled: JUNE 22, 2000 (mm/dd/yy)
Drilled By: PA. DRILLING - CHRIS COLLER / EARL DYE
Drillers License Number: 0406
Logged By: S.C. WIGTON - GAI CONSULTANTS, INC.
County: ARMSTRONG
Township or Municipality: PLUM CREEK TWP.

Depth (Ft)	Lithologic Description	Plot	Ground Water* Observations	Samples No.	Samples Rec** Att	Comments	Well/Piezometer Construction	Depth (Ft)
60	DK. GRAY M. HARD SILTY SHALE SLIGHTLY CARBONACEOUS							60
	GRAY M. SOFT CLAYSTONE							
65								65
	GRAY M. HARD CALCAREOUS CLAYSTONE							
	GRAY M. HARD SILTSTONE						SAND	
70	SOME CALCAREOUS ZONES							70
75								75
80			▽					80
	SOME SHALY ZONES							
85								85
							4" Ø Sch. 40 PVC Screen	
90								90
95								95
							SAND	
100								100
	GRAY HARD LIMESTONE							
105								105
110							111.0 XXXX CAVE-IN XXXXXX CAVE-IN XXXX	110
	BOTTOM OF BORING 112 FT.						BOTTOM OF BORING 112 FT.	
115								115

* ▽ Encountered Ground Water ▼ Composite Static Water Level ** Recovered/Attempted

Use additional sheets with this format as necessary

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