CCR LOCATION RESTRICTION DEMONSTRATION

MITCHELL LANDFILL
MITCHELL POWER GENERATION PLANT
MARSHALL COUNTY, WEST VIRGINIA

Prepared For:
KENTUCKY POWER COMPANY
d/b/a AMERICAN ELECTRIC POWER, INC.
COLUMBUS, OHIO

Prepared By:
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CINCINNATI, OHIO

CEC Project 110-416

NOVEMBER 2015

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1.0 OBJECTIVE

This report has been prepared for Kentucky Power Company d/b/a American Electric Power, Inc. (AEP) to demonstrate that the Mitchell Landfill, a Coal Combustion Residuals (CCR) Unit by definition of the United States Environmental Protection Agency (EPA) CRR Rule which has been published in the Federal Register (FR) on April 17, 2015 and is an extension of the current Code of Federal Rules (CFR) Title 40, Part 257 (§257), meets or exceeds the requirements for Location Restrictions (LRs) as defined in §257.60 through §257.64. While it is recognized that Phases 1 and 2 of the Mitchell Landfill are considered to be part of an "Existing Landfill" by definition of the CCR Rule and require a demonstration of compliance for only LR Unstable Areas (§257.64), this report addressed all five of the LR's for purposes of the existing and future landfill phases (Phases 3 through 5). Because the future landfill phases have not begun construction prior to promulgation of the referenced Rule, they will be considered "Lateral Expansions" which must demonstrate compliance with all five LRs: Placement Above Uppermost Aquifer (§257.60), Wetlands (§257.61), Fault Areas (§257.62), Seismic Impact Zones (§257.63), and Unstable Areas (§257.64). A qualified professional engineer must certify compliance with the LRs.

2.0 BACKGROUND INFORMATION

Kentucky Power Company (KPC), a subsidiary of AEP, owns and operates the Mitchell Power Generation Plant. This facility is located along West Virginia Route 2 near the City of Cresap, West Virginia (WV) as shown on Figure 1 – Site Location Map. The mailing address of the Mitchell Power Generation Plant is P.O. Box K, Moundsville, WV 26041-0961.

The Mitchell Power Generation Plant uses bituminous coal as the primary fuel source for its two steam-turbine electric generating units. The total electric production capacity of this plant is 1,600 megawatts. Processes and equipment that control air emissions from the coal fired units generate CCRs comprised of fly ash, bottom ash and gypsum. CCRs that are not beneficially used, primarily fly ash, are disposed of at an off-site CCR Unit identified as the Mitchell Landfill, which is a Class F solid waste landfill that is owned and operated by KPC. Mitchell Landfill is classified as a Class F Industrial Landfill Facility by the WV Department of Environmental Protection (WVDEP) Division of Water and Waste Management (DWWM). The landfill was designed, permitted and operates in accordance with the WV Code of State Rules, Title 33, Series 1-Solid Waste Management Rule (33CSR1) and a NPDES Permit that was approved by the WVDEP on May 29, 2013 (Permit No. WV0116742). In addition, the WVDEP issued a State 401 Water Quality Certification (No. 12011) on January 10, 2013 and the U.S. Army Corps of Engineers (USACE) issued a Clean Water Act Section 404 permit (No. 2011-1499) on February 25, 2013. These permits provide the regulatory authority to impact aquatic resources including wetlands, streams and a pond. Additional detail is provided in Section 4.0 of this document.

The following subsections provide a summary of the Mitchell Landfill CCR Unit.

2.1 CCR UNIT LOCATION

Mitchell Landfill is located along Gatts Ridge Road (Marshall County Road 72), approximately 2 miles north of the intersection with County Road 74 (about 2 miles due east of the Mitchell Power Generation Plant). The approximate location of Mitchell Landfill is depicted on Figure 1 – Site Location Map and Figure 2 – Plant and CCR Unit Location Map. The center of Mitchell Landfill is located at the following coordinates:

- Latitude: 39 degrees 49 minutes 37 seconds North
- Longitude: 80 degrees 46 minutes 32 seconds West

2.2 DESCRIPTION OF CCR UNIT

Mitchell Landfill provides a maximum disposal capacity of about 10 million cubic yards of excess CCR produced from the Mitchell Power Generating Plant that is not beneficially reused.

The overall landfill boundary comprises about 169.6 acres with CCR being placed within a footprint of 57.6 acres (the CCR Unit disposal area is depicted on Figure 2 – Plant and CCR Unit Location Map). The landfill will be operated in 5 Phases with Phases 1 through 4 completing the maximum CCR Unit disposal footprint and Phase 5 comprising CCR placement atop the first four phases. Figure 3 – CCR Unit and Monitoring Wells, depicts the approximate boundary of the 5 phases. Each phase of the landfill has an estimated design life that varies from about 4 to 8 years. The expected life of the landfill is 24 years, based on the current estimated average yearly CCR production rates and beneficial use quantities.

In addition to the CCR disposal footprint, the CCR Unit includes several appurtenant structures that include: 1) a perimeter haul road; 2) a leachate storage pond; 3) three stormwater ponds (identified as South, West and North Ponds); and, 4) a Maintenance Building. Figure 3 – CCR Unit and Monitoring Wells, depicts the CCR Unit boundary, the landfill disposal footprint, and the associated appurtenant structures.

2.2.1 Engineering Systems

The landfill was designed and constructed to protect the environment in accordance with the WVDEP Class F Industrial Landfill requirements. To meet these requirements, Mitchell Landfill includes several engineering controls which include: 1) a groundwater interceptor drainage system; 2) a composite liner system; 3) a leachate collection system; and, 4) a surface water management system. These engineering systems are summarized below.

2.2.1.1 Groundwater Interceptor Drainage System

The groundwater interceptor drainage system for the landfill is a combination of pipes and aggregate drains that collect and direct groundwater from beneath the liner system to a discharge point beyond the landfill limits. This system is designed to accommodate natural groundwater volumes and the potential increased groundwater volume that may result from future hydrostatic conditions associated with future pool level increases for the Conner Run Impoundment that is positioned in the adjacent valley west of the landfill.

2.2.1.2 Composite Liner System

An impermeable barrier is constructed at the base of the Mitchell Landfill CCR Unit that is protective of groundwater and complies with the applicable WVDEP performance standards for a Class F Industrial Landfill Facility. The bottom elevations of the impermeable barrier/composite liner provide the required separation from bedrock, the seasonal high water table, and the uppermost significant aquifer. The composite liner system is comprised of the following (from top to bottom):

- 30-mil PVC geomembrane;

- Geosynthetic Clay Liner (GCL);
- A minimum 6-inch thick layer of compacted subbase soil; and,
- Structural fill or isolation soil as needed to provide the minimum separation from groundwater and bedrock.

2.2.1.3 Leachate Collection System

Mitchell Landfill has been constructed to include a leachate collection system that conveys leachate collected above the composite liner system via gravity flow to a lift station that pumps the leachate to a storage pond (denoted as the Leachate Storage Pond) via a force main. Stormwater runoff from within active landfill areas is directed to the leachate collection layer within the landfill via vertical aggregate drains (denoted as chimney drains). The leachate collection layer conveys both stormwater from the chimney drains and leachate that seeps through the CCR placed in the landfill and transports the combined flow to the lift station. The leachate collection system is designed to maintain a leachate head on the composite liner system of one-foot or less. The locations of the lift station and Leachate Storage Pond are identified on Figure 3 - CCR Unit and Monitoring Wells.

The leachate collection system within the waste placement limits (leachate collection layer) consists of the following:

- Geocomposite Drainage Net (GDN) – covers the entire bottom of the landfill and is constructed directly above the composite liner system;
- Granular Drainage Layer – constructed to a depth of 18-inches across the bottom of the landfill within the main valley axis; and,
- Leachate Collection Pipes – perforated HDPE pipes, surrounded by non-calcareous coarse aggregate and nonwoven, needle-punched geotextile, are constructed within the Granular Drainage Layer. These leachate collection pipes convey leachate collected at the base of the landfill to the lift station via gravity drainage, which is then pumped (via a force main) to the Leachate Storage Pond.

Leachate collected and transferred to the Leachate Storage Pond is beneficially reused for dust suppression within landfill waste limits, moisture conditioning of fly ash during compaction procedures or moisture conditioning at the fly ash silo storage facility. Any leachate that is not beneficially reused is transported to the Mitchell Plant Wastewater Treatment Bottom Ash Pond Complex for treatment prior to discharge into the Ohio River.

2.2.1.4 Surface Water Management System

Management of surface water that is not in contact with CCR placed in the landfill is accomplished by collection and conveyance of runoff to three stormwater detention basins: 1) South Pond; 2) West Pond; and, 3) North Pond. The South and West Ponds are utilized through all phases of the landfill life, and the North Pond is utilized in Phase 3 through Phase 5. The three ponds are depicted on Figure 3 - CCR Unit and Monitoring Wells.

Site runoff generated from both un-stabilized and stabilized constructed areas (i.e., construction areas, stockpiles, temporary landfill cover, and permanent landfill cover) is conveyed to the ponds via drainage channels and pipes. The collection, conveyance and ponds are designed to meet the required criteria in the referenced WVDEP regulations. The stormwater conveyed to the ponds is detained and released through a non-clogging dewatering skimmer device that allows settling of suspended solids and evacuation of the stored volume of water within a seven to eight day period.

2.2.2 Construction and Operational History

2.2.2.1 Landfill Construction

Construction of Mitchell Landfill was initiated in 2013 and Phases 1A, 1B, and 2A have been completed. Phase 2B construction is expected to be completed by October of 2015. The landfill construction was performed in accordance with the NPDES/Solid Waste Permit, the construction drawings, technical specifications, and the Quality Assurance And Quality Control Plan. Certification Reports were prepared and submitted to WVDEP in 2014 that provide confirmation and documentation that the construction of Phases 1A, 1B, and 2A was performed in accordance with the design and permit requirements.

Construction of Phase 3 is tentatively scheduled to begin in 2018.

2.2.2.2 Landfill Operations

Mitchell Landfill began operation in July 2014 and is currently receiving CCRs from Mitchell Power Generation Plant. Landfill operations, construction and monitoring are being performed in accordance with the NPDES/Solid Waste Permit.

2.2.2.3 Groundwater Monitoring

Background groundwater quality monitoring began in February 2012 and was completed in December 2014. Operational groundwater monitoring is conducted semi-annually in accordance with the Mitchell Landfill Operating Record and Groundwater Monitoring Plan. Groundwater quality results for key indicator parameters are statistical analyzed as part of each semi-annual groundwater monitoring event and included as part of the Annual Operation Report.

2.3 SUPPORTING INVESTIGATIONS AND DOCUMENTS

CEC has reviewed the following documents for evaluation of compliance with the CCR LRs:

1. Solid Waste/NPDES Permit Application, Mitchell Landfill, Mitchell Plant, Cresap, West Virginia, Prepared for American Electric Power, Prepared by Civil & Environmental Consultants, Inc., CEC Project No. 110-416, April 12, 2012.
2. Hydrogeologic and Geotechnical Subsurface Investigation Report, Mitchell Landfill, Marshall County, West Virginia, Prepared for American Electric Power, Prepared By Civil & Environmental Consultants, February 2012.
3. Background Groundwater Monitoring Report, Mitchell Landfill, Mitchell Electric Generating Plant, Marshall County, West Virginia, Prepared for American Electric Power, Prepared By Civil & Environmental Consultants, Inc., February 2014.
4. Mine Subsidence Analysis, Mitchell Landfill, Marshall County, West Virginia, Report to American Electric Power, 1 Riverside Plaza, Columbus, Ohio 43215, Prepared by Civil & Environmental Consultants, Inc., 4274 Glendale Milford Road, Cincinnati, Ohio 45242, CEC Project No. 110-416-2000, February 2012.
5. Jurisdictional Waters Delineation Report, American Electric Power Co, Inc., Proposed Mitchell Landfill Project, Cresap, Marshall County, West Virginia, Prepared for American Electric Power Co. Inc., Prepared by Civil & Environmental Consultants, Inc., Cincinnati, Ohio, CEC Project No. 110-416, September 9, 2011.
6. Phase 1A Subgrade And South Pond/Forebay Construction Certification Report (2014 Report #1); Mitchell Plant Class F Landfill, Moundsville, West Virginia; Prepared By: Hull & Associates, July 2014.
7. Phase 1A PVC Geomembrane And Geosynthetic Clay Liner Construction CertificationReport (2014 Report #2); Mitchell Plant Class F Landfill, Moundsville, West Virginia; Prepared By Hull & Associates, July 2014.
8. Phase 1A Leachate Collection System And Protective Cover Construction Certification Report (2014 Report #3); Mitchell Plant Class F Landfill, Moundsville, West Virginia; Prepared By Hull & Associates, August 2014.
9. Phase 1B/2A PVC Geomembrane And Geosynthetic Clay Liner Construction Certification Report (2014 Report #5); Mitchell Plant Class F Landfill, Moundsville, West Virginia; Prepared By Hull & Associates, October 2014.
10. Phase 1B/2A Leachate Collection System And Protective Cover Construction Certification Report (2014 Report #6); Mitchell Plant Class F Landfill, Moundsville, West Virginia; Prepared By Hull & Associates, December 2014.

2.4 HYDROGEOLOGIC SETTING

A site-specific subsurface investigation was conducted in the area of the Mitchell Landfill to support the Class F Industrial Landfill Facility Application submitted and approved by WVDEP, as well as to support the various engineering analyses and design of the landfill. The hydrogeologic and geotechnical subsurface investigation was completed to meet the requirements of 33CSR1, subsection 3.8 of Rule 33-1-3 Solid Waste Facility Permitting Requirements. The corresponding summary report is identified as the Hydrogeologic and Geotechnical Subsurface Investigation Report, Mitchell Landfill.

The purpose of the subsurface investigation was to characterize the in-situ soil and bedrock types and properties, as well as determine the hydrogeologic features and conditions within the planned landfill limits. The investigation was comprised of site reconnaissance, soil and rock borings, test pits, monitoring well installation and development, geophysical logging, pressure packer testing, in-situ hydraulic conductivity testing, and laboratory testing of selected soil and rock samples. The information developed from the field and laboratory programs associated with the subsurface investigation provided the basis for conclusions regarding the subsurface soil and bedrock profile characterizations, the hydrogeologic evaluation, and geotechnical engineering properties associated with the in-situ soils/bedrock, recompacted borrow soils, and CCR materials.

2.4.1 Climate

Climatic data for Mitchell Landfill is summarized as follows:

Average monthly temperature:

Jan./July (degrees F)	Feb./Aug. (degrees F)	March/Sep. (degrees F)	April/Oct. (degrees F)	May/Nov. (degrees F)	June/Dec. (degrees F)
26.70	28.80	38.50	50.10	59.70	68.1
72.00	70.60	64.10	52.50	41.60	31.4

Average monthly precipitation:

Jan./July (inches)	Feb./Aug. (inches)	March/Sep. (inches)	April/Oct. (inches)	May/Nov. (inches)	June/Dec. (inches)
2.86	2.40	3.58	3.28	3.54	3.30
3.83	3.31	2.80	2.49	2.34	2.57

Evapotranspiration:

Jan./July (inches)	Feb./Aug. (inches)	March/Sep. (inches)	April/Oct. (inches)	May/Nov. (inches)	June/Dec. (inches)
0.603	0.467	1.022	2.826	2.477	2.315
2.485	2.087	1.607	1.633	1.349	0.896

2.4.2 Regional and Local Geologic Setting

2.4.2.1 Regional Geology

The Mitchell Landfill site lies within the regional geologic area of West Virginia known as the Appalachian Plateau Province. This region comprises the western two-thirds of the state and is characterized by relatively flat-lying bedrock containing minable coal seams. While limestone is present within the region, the beds are generally thin and discontinuous. Most of the limestone is non-marine and there are no known karst features noted in the region. Based on the Geologic Map of West Virginia (WVGES Publication: Map 25A), the bedrock in Marshall County predominantly consists of Permian age sedimentary bedrock composed of a cyclic sequences of sandstone, siltstone, claystone, shale, limestone, and coal. The literature indicates that the bedrock was deposited in a wide fluvial-deltaic plain where sediment eroding from the Appalachian Mountains traveled west to be deposited in a large shallow sea in the interior of the continent (Martin, 1998). The bedrock units mapped within the vicinity of Mitchell Landfill are of Pennsylvanian/Permian age Dunkard, Monongahela and Conemaugh Groups.

The Mitchell Landfill site is located approximately 3.5 miles northwest of the Proctor Syncline which strikes to the northeast/southwest. No evidence of folding or faulting was observed during at the site during field investigations. Additional regional folds identified on the West Virginia GIS Technical Center website (http://wvgis.wvu.edu/index.php) are present southeast of the landfill site which include the New Martinsville Anticline, the Loudenville Syncline, the Washington Anticline and Nineveh Syncline all striking northeast/southwest.

According the Mine Subsidence Analysis Report (February 2012) included in the Mitchell Landfill Permit Application, The Pittsburgh coal formation rests in an elevation between approximately 420 to 460 feet above mean sea level (amsl). Ground surface elevations at Mitchell Landfill range from approximately 960 to 1,320 feet amsl; therefore, the Pittsburgh coal formation is approximately 500 to 800 feet below the ground surface.

2.4.2.2 Local Geology

The bedrock geology of the site consists of shale, claystone, siltstone, sandstone, and occasional limestone and coal deposits of the Permian Age, Dunkard Group, Greene and Washington Formations. The deposits are typical of cyclothemic sedimentation common throughout the region. The predominant lithologies are shale (which accounts for approximately 47 percent) and sandstone plus siltstone (which accounts for 44 percent of the deposits), based on the bedrock encountered in borings drilled to at least 300 feet below ground surface (bgs), or between approximate elevations of 1,228 to 930 amsl. Claystone, coal, limestone and soil make up less than 10 percent of the deposits. This is a much different lithology than that presented by Cross and Schemel (1956) and Barlow (1975) which suggests sandstone as the dominant lithology throughout the Greene Formation.

Site specific Hydrogeologic Cross Sections were developed as part of the Hydrogeologic and Geotechnical Subsurface Investigation Report for Mitchell Landfill. Of these cross sections, Geologic Cross Section D-D' and C-C' as identified on Figure 4 – Geologic Cross Section Location Map, represent the typical hydrogeologic strata. These two cross sections are depicted on Figure 5 – Geologic Cross Section D-D', which extends west to east in the southern site area, and Figure 6 – Geologic Cross Section C-C', which extends south to north along the central valley. These cross sections identify that facies changes occur across the landfill site making it difficult to correlate bedrock units. However, a relatively persistent black and dark gray limestone bed and a black shale bed were documented at numerous locations. Therefore, these units are considered to be "marker beds" and are sufficient to identify the bedrock structure and define specific bedrock units. Moreover, several thin coal seams are present which can be used to identify units. Based on the published bedrock lithology, several thin coal seams, and in some cases black shale, are identified at various elevations and between the different sandstone units. Overall, the position of the sandstone units with respect to each other, and the approximate elevation of the marker beds shown on Figure 5 – Geologic Cross Section D-D' have been used to identify the bedrock units at the Mitchell Landfill site. While several sandstone units occur across the site, they are not continuous due to the incised topography, as depicted in the referenced cross sections.

Sandstone was described as gray in color, fine to medium grained, and micaceous with occasional limestone inclusions. Most of the sandstone was well cemented with calcite cement and on occasion contained calcite filled fractures. The rock was hard and fresh at depth. Some zones contained interbedded sequences of sandstone and shale, or siltstone and shale.

The other predominant bedrock lithology at the site was shale. Shale unit thicknesses range from 1 to 23 feet. Small, less than ¼ inch, pyrite nodules were observed in 10 of the 22 rock cores, occurring 69 percent of the time in shale followed by siltstone and sandstone. Pyrite occurrence was generally below an elevation of 1,180 feet amsl. Plant fossils were also observed in about 15 of the 22 rock cores, occurring in shale units 81 percent of the time, the remainder being observed in siltstone.

The named sandstone units include (from bottom to top): the Hundred Sandstone; the Jollytown Sandstone; the Rush Run Sandstone; the Fish Creek Sandstone; and, the Burton Sandstone. The contacts between the sandstone units generally consist of sharp contacts to underlying dark gray and black shale with coals seams noted in the case of the Hundred and Jollytown Sandstone units. Note that the Hundred and Jollytown Sandstone units are not continuous beneath the Mitchell Landfill site. A black shale marker bed is present near the base of the Fish Creek Sandstone unit.

Based on the marker beds, bedrock appears to dip slightly to the south and southeast. Fracture and joint mapping was conducted on bedrock outcrops within and surrounding the Mitchell Landfill site. Overall, joints and fractures are oriented predominantly to the northeast between 10 and 90 degrees.

No faults were observed at or near the Mitchell Landfill site, nor are faults present according to available geologic information. As noted previously, a series of anticlines and synclines are located as near as 3.5 miles southeast of the site.

2.4.3 Surface Water and Surface Water-Groundwater Interactions

Groundwater at the site follows surface topography and bedrock bedding planes where there is a lower permeability rock type, such as a shale underlying a sandstone. Groundwater recharge is along the hilltop ridges and percolates through shallow fractured bedrock into the central valley. Groundwater discharges at meager springs and seeps along the incised channels and the valley walls where bedrock subcrops are typically covered with a veneer of residual soils. Groundwater discharging as seeps and springs flows downslope to the unnamed tributary to Fish Creek that is at the base of the incised valley.

2.4.4 Water Users

A private water well and an abandoned hand dug well were located at the 146 Gatts Ridge Road and located within about 300 feet of Mitchell Landfill waste limits. These two wells were sealed by a WV licensed well driller on December 27, 2011 in accordance with the guidelines provided by the Marshall County Health Department. Water Well Abandonment Reports (Well Abandonment Permit No. DW-25-2011-06) were subsequently submitted to the Marshall County Health Department. Therefore, the Mitchell Landfill disposal area is not located within 1,200 feet of any public or private water well supply.

3.0 §257.60 REQUIRED ISOLATION FROM UPPERMOST AQUIFER

3.1 §257.60 RULE DESCRIPTION

40 CFR 257.60(a) states:

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table).

3.2 INFORMATION SUPPORTING RULE COMPLIANCE

3.2.1 Groundwater Monitoring Network and Uppermost Aquifer Descriptions

The Mitchell Landfill groundwater monitoring network includes the Rush Run Sandstone and the overlying Fish Creek Sandstone unit. The Fish Creek Sandstone and the Burton Sandstone (positioned above the Fish Creek) are discontinuous, naturally incised sandstones which subcrop along the valley side slopes where they discharge as seeps and minor springs. There are no downgradient monitoring positions in the Burton Sandstone; therefore, the Burton is not included in the groundwater monitoring network. The Rush Run Sandstone is designated as the Uppermost Aquifer at the Mitchell Landfill site, as described in the referenced and approved NPDES Permit issued by WVDEP. The Rush Run is positioned below the base elevation of the Mitchell Landfill composite liner system and is the uppermost sandstone unit that can be monitored in upgradient and downgradient positions relative to the limits of waste at the landfill.

The Mitchell Landfill groundwater monitoring well locations are shown on Figure 3 – CCR Unit and Monitoring Wells. Monitoring wells were installed in accordance with WVDEP Title 47, Series 60, Monitoring Well Design Standards. Table 1 – Summary of Monitoring Well and Construction provides monitoring well construction details and the upgradient and downgradient hydraulic positions relative to the limits of waste.

The Rush Run Uppermost Aquifer is a fine to medium grained, gray sandstone ranging from approximately 9 feet to 32 feet thick as shown on Figure 7 – Rush Run Sandstone Isopach Map. The top elevation of the unit ranges from approximately 1,025 feet to the south and 1,048 feet amsl to the north as shown on Figure 8 – Top of Rush Run Sandstone Contours. The bottom elevation ranges from approximately 1,009 to the south and 1,039 feet amsl to the north and dips gently to the south as shown on Figure 9 – Base of Rush Run Sandstone Contours. The top and base of the Rush Run Sandstone is confined by low permeability shale which acts as an aquitard to groundwater flow.

The Rush Run is naturally incised in the down valley area near the limits of waste placement where the unit subcrops/outcrops in the central valley. Shale beds above the Rush Run provide confining aquitards that separate the Uppermost Aquifer from the landfill composite liner system. Where the upper confining aquitards have been naturally incised or removed during landfill construction in the southern portion of the central valley, structural fill and geologic isolation material have been constructed which provide the required 5-feet of separation between the Uppermost Aquifer and the landfill liner system. Figure 10 - Isolation from Uppermost Aquifer Isopach Map, demonstrates separation from the base of the composite liner system to the top of the Rush Run Sandstone.

3.2.1.1 Groundwater Flow in the Uppermost Aquifer

Groundwater flow in the Rush Run Sandstone Uppermost Aquifer is in the down-dip direction on the underlying shale unit aquitard. Figure 11 – Uppermost Aquifer Potentiometric Surface Map, Rush Run Sandstone, presents groundwater flow directions in the Rush Run. Discharge in the landfill area occurs at the subcrop position in the central valley to the south. As described in Section 2.2.1.1, Mitchell Landfill is constructed with a groundwater interceptor underdrain system designed to collect seepage along the inter-bedded sandstone subcrop positions located below structural fill and isolation fill materials constructed beneath the landfill composite liner system. The underdrain system provides an engineered, non-mechanical (gravity drained) hydraulic control that assures separation between groundwater and the composite liner system. In the central valley area near the southern limits of waste, the underdrain system collects groundwater discharge from the Rush Run Sandstone subcrop at approximate elevation 1,020 feet amsl to 1,010 feet amsl, as shown on Figure 11– Uppermost Aquifer Potentiometric Surface Map, Rush Run Sandstone.

3.2.1.2 Seasonal Water Levels

Water level monitoring in the Mitchell Landfill monitoring wells and piezometers began in February 2012 and is ongoing. Data collected to date are presented in Table 2 –Monitoring Well Static Water Levels. Hydrographs depicting water elevation fluctuations in the Rush Run Sandstone and Fish Creek Sandstone are provided in Appendix A. Water levels are below the top of the Rush Run Sandstone in six of the seven monitoring wells installed in the unit. One well, MW1102R constructed in the southeastern site area, has demonstrated fluctuating water levels since monitoring began in January 2013 which are periodically above the top of the sandstone unit. Thus, the Rush Run appears to exhibit seasonal artesian conditions.

3.3 COMPLIANCE WITH 40 CFR 257.60 REQUIREMENTS

The base of the Mitchell Landfill composite liner system ranges from 1,290 feet amsl in the northwestern limits to 1,038.5 feet amsl in the southern limits. Seasonal high water elevations in the Rush Run Sandstone correspondingly range from approximately 1,045 feet amsl in the northern and eastern areas to 1,010 feet amsl at the southern limits of waste placement. Separation between the landfill liner system and the top of the uppermost aquifer is provided by natural shale aquitards, or where the shales are incised, by the placement of structural fill and geologic isolation material. Furthermore, the underdrain collection system provides a non-mechanical (gravity) drain at the Rush Run subcrop position which serves as hydraulic discharge control in the southern central valley area. The landfill underdrain system provides effective control of the seasonal fluctuations in potentiometric head. Natural shale aquitards and construction of isolation materials and underdrains demonstrate that the base of the composite liner system is constructed greater than 1.52 meters (5-feet) above the Rush Run uppermost aquifer, a confined aquifer, at the Mitchell Landfill as shown on Figure 10 - Isolation from Uppermost Aquifer Isopach Map. Thus, the existing landfill and future expansion areas of Mitchell Landfill comply with 40 CFR 257.60 requirements.

4.0 §257.61 WETLANDS IMPACTS

4.1 §257.61 RULE DESCRIPTION

40 CFR 257.61 states:

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (a)(5) of this section.

(a)(1) Where applicable under section 404 of the Clean Water Act or applicable state wetlands laws, a clear and objective rebuttal of the presumption that an alternative to the CCR unit is reasonably available that does not involve wetlands.

(a)(2) The construction and operation of the CCR unit will not cause or contribute to any of the following:

> ***(a)(2)(i) A violation of any applicable state or federal water quality standard;***
>
> ***(a)(2)(ii) A violation of any applicable toxic effluent standard or prohibition under section 307 of the Clean Water Act;***
>
> ***(a)(2)(iii) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and***
>
> ***(a)(2)(iv) A violation of any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary.***

(a)(3) The CCR unit will not cause or contribute to significant degradation of wetlands by addressing all of the following factors:

> ***(a)(3)(i) Erosion, stability, and migration potential of native wetland soils, muds and deposits used to support the CCR unit;***
>
> ***(a)(3)(ii) Erosion, stability, and migration potential of dredged and fill materials used to support the CCR unit;***
>
> ***(a)(3)(iii) The volume and chemical nature of the CCR;***
>
> ***(a)(3)(iv) Impacts on fish, wildlife, and other aquatic resources and their habitat from release of CCR;***
>
> ***(a)(3)(v) The potential effects of catastrophic release of CCR to the wetland and the resulting impacts on the environment; and***
>
> ***(a)(3)(vi) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.***

(a)(4) To the extent required under section 404 of the Clean Water Act or applicable state wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent reasonable as required by paragraphs (a)(1) through (3) of this section, then minimizing unavoidable impacts to the maximum extent reasonable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and reasonable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands); and

(a)(5) Sufficient information is available to make a reasoned determination with respect to the demonstrations in paragraphs (a)(1) through (4) of this section.

4.2 INFORMATION SUPPORTING RULE COMPLIANCE

4.2.1 Wetland Delineation and Permitting

In August 2011 and February 2012, jurisdictional waters delineation studies were conducted within the disturbance limits associated with the construction of Mitchell Landfill, as well as an alternative site located in the adjacent hollow to the northeast, as described in the Jurisdictional Waters Delineation Report and the Supplemental Jurisdictional Waters Delineation Report for Mitchell Landfill. These studies resulted in the identification of two wetlands denoted as Wetland A and Wetland B. Wetland A, approximately 0.006-acre in size, was located approximately 175 feet outside the Mitchell Landfill boundary. Wetland B, approximately 0.014 acres in size, is located within the Mitchell Landfill facility boundary and construction disturbance limits. No perennial streams were identified within the Mitchell Landfill facility boundary and construction disturbance limits, only ephemeral and intermittent streams. A jurisdictional determination site visit was conducted on September 14, 2011 with the USACE and the WVDEP. These agencies concurred with the findings of the delineation reports and the USACE provided a Preliminary Jurisdictional Determination letter on November 15, 2011.

In January 2013, WVDEP issued State 401 Water Quality Certification (Permit No. 120011) to AEP to impact Wetland B, approximately one acre of open water (designated as Pond 1) and 10,226 linear feet of intermittent and ephemeral streams. In February 2013, the USACE issued a Clean Water Act Section 404 permit (No. 2011-1499) to AEP for the same construction impacts. The impacts, in accordance with the referenced permits, were mitigated via the WVDEP In Lieu Fee Fund program in 2013. Although Wetland A is located beyond the Mitchell Landfill facility boundary and is not impacted by the current landfill construction/operation, future construction of Phase 3 through 5 may require expansion of the landfill boundary into the adjacent valley to the east that includes Wetland A for the purpose of: 1) obtaining borrow soil for landfill cover; 2) stockpiling of excess bedrock material generated from planned landfill excavations; and, 3) relocation of the North Pond (not yet constructed). Should the expansion of the landfill be necessary in the future, AEP will obtain the required state and federal 401/404 permits prior to impacting Wetland A and applicable streams.

4.2.2 Landfill Design and Engineering Controls

Mitchell Landfill has been designed to protect the environment both within the facility and beyond the boundary limits. The landfill design included site specific investigations and engineering analyses to support development of engineering systems (described in Section 2.2) that maintain stability of the CCR unit and protect the environment by the following: 1) Dry placement and compaction of the CCR materials; 2) containment of CCR materials within the defined limits of waste through the use of soil berms and cover; 3) providing an impermeable barrier and drainage (underdrain) between the CCR materials and groundwater; 4) collection, conveyance, storage and treatment of water that comes in contact with the CCR materials via a leachate management system; and, 5) collection, conveyance, storage and treatment of stormwater contained within the facility through the use of interim and final soil cover over the CCR materials, stormwater channels; and 6) Best Management Practices (BMPs) for erosion and sediment control and detention basin structures. The engineering systems include design factors of safety that meet standard engineering practice and those outlined in the referenced CSR and WVDEP rules and regulations.

Figure 12 – Stormwater Discharge Map, depicts the flow paths from each the three stormwater ponds, the South Pond, the West Pond and the North Pond, that provide stormwater treatment and controlled discharge from Mitchell Landfill. Discharge flow paths from each of the landfill stormwater ponds are provided below.

<u>North Pond (Permit Outfall 001)</u>

The North Pond discharges into an intermittent stream that reaches Wetland A (identified in referenced Jurisdictional Waters Delineation Reports for Mitchell Landfill) approximately 450 linear feet below Outfall 001. Wetland A is a palustrine, emergent, seasonally flooded/saturated (PEM1E) wetland that is approximately 0.01 acre in size and located within an existing natural gas pipeline right-of-way. Based on information contained in the referenced Jurisdictional Waters Delineation Reports, Wetland A discharges into two intermittent channels (identified as Stream 10 and Stream 8) that lead to Little Tribble Creek, Fish Creek and the Ohio River.

<u>South Pond (Permit Outfall 002)</u>

The South Pond discharges into an intermittent stream (identified as Stream 1 in the referenced Jurisdictional Waters Delineation Reports for Mitchell Landfill) for about 1,400 linear feet prior to discharging into Fish Creek, which ultimately flows into the Ohio River.

<u>West Pond (Permit Outfall 003)</u>

The West Pond discharges to an intermittent stream (identified as Stream 19 in the referenced Jurisdictional Waters Delineation Reports for Mitchell Landfill) for about 1,300 linear feet prior to reaching Conner Run Impoundment. This impoundment is permitted under WVDEP NPDES Permit No. WV0005304.

The drainage area of these combined stormwater ponds is relatively unsubstantial in comparison to the drainage area of the three noted receiving streams: 1) Little Tribble Creek; 2) Fish Creek; and, 3) the Ohio River.

4.3 COMPLIANCE WITH 40 CFR 257.61 REQUIREMENTS

4.3.1 Compliance With Requirements In 40 CFR 257.61(a)(1)

As previously stated, a WVDEP Section 401 Water Quality Certification and USACE Section 404 Permit have been issued for the Mitchell Landfill project. As part of the Section 401/404 permit application, AEP provided an Alternatives Analysis which described alternative site designs. In general, the Alternatives Analysis analyzed two on-site alternatives and four off-site alternatives. Based on numerous criteria that were reviewed and analyzed, AEP concluded that the most viable alternative was the on-site, reduced impact alternative. The Section 401/404 Permits were ultimately granted based on acceptance of this Alternatives Analysis.

4.3.2 Compliance With Requirements In 40 CFR 257.61(a)(2)(i) through (a)(2)(iv)

Stormwater discharge from Mitchell Landfill occurs at one of the three referenced pond outlet structures. Each pond discharges through an outfall that is included as part of the Mitchell Landfill NPDES permit from WVDEP. The outfalls are subject to discharge monitoring and associated reporting in accordance with the Operating Record that provide confirmation that the discharge water does not violate state or federal water quality standards.

As part of the Mitchell Landfill Solid Waste/NPDES Permit Application, leach testing of the CCR materials was completed via ASTM preparation (ASTM D3987, Standard Test Method for Shake Extraction of Solid Waste with Water) and/or Toxicity Characteristic Leaching Procedure (TCLP), U.S. EPA Method 1311 preparation. Because the test data identified that the CCR material leachate meets the corrosivity and toxicity criteria listed in CSR 33-20-3 and the criteria outlined in 40 CFR 261 Subpart C, the Mitchell Landfill NPDES permit does not include discharge limitations from the facility outfalls. Therefore, based on the constructed engineering controls and systems to protect the environment (as described in Section 4.2.2) combined with the fact that the CCR material will not leach toxic concentrations of constituents, it is concluded that: 1) applicable state or federal water quality standards are not violated; and, 2) Section 307 of the Clean Water Act is not violated.

Through the issuance of the Section 401 permit, the WVDEP has determined that there are no known locations of rare/endangered/threatened species or sensitive habitats within the Mitchell Landfill facility boundary as confirmed by the referenced concurrence letters received from WVDNR.

Mitchell Landfill is not located in the vicinity of marine waters; therefore, this compliance requirement portion of the referenced subsection is not applicable.

4.3.3 Compliance With Requirements In 40 CFR 257.61(a)(3)(i) through (a)(3)(vi)

Native wetland soils, muds and wetland deposits, and dredged materials have not and will not be used for construction or support of the Mitchell Landfill. The Mitchell Landfill is supported by a prepared subbase, structural fill and geologic isolation material constructed in accordance with the construction drawings, technical specifications and the Quality Assurance and Quality Control Plan included in the Solid Waste/NPDES Permit Application.

Because Mitchell Landfill has been designed with engineering systems and controls to protect the environment (as described in Section 4.2.2), a release of CCR materials from the facility is unlikely. Flow over the emergency spillway or overtopping of stormwater ponds in conjunction with an extreme precipitation event presents the greatest potential for a release of untreated stormwater from the landfill facility. The drainage area of these combined stormwater ponds is relatively unsubstantial in comparison to the drainage area of the receiving streams (Little Tribble Creek, Fish Creek and the Ohio River). Thus, an extreme precipitation event and subsequent release of untreated stormwater from the landfill ponds will not cause or contribute to significant degradation or endangerment of fish, wildlife, aquatic resources and habitat, wetlands or the environment downstream of Mitchell Landfill.

4.3.4 Compliance With Requirements In 40 CFR 257.61(a)(4)

Mitigation requirements in the Section 401/404 Permits have been completed via payment into the West Virginia In-Lieu Fee program in 2013. These mitigation requirements achieved a no net loss of wetlands for the unavoidable minimum impacts of the Mitchell Landfill project, meeting compliance with this subsection of the rule.

As identified in Section 4.2.1, future expansion of the current landfill facility boundary may be necessary. Should landfill expansion become necessary in the future, AEP will achieve a no net loss for streams and wetlands that would be impacted by the expansion through appropriate mitigation as required by state and federal 401/404 permits.

4.3.5 Compliance With Requirements In 40 CFR 257.61(a)(5)

The information presented in Sections 4.2 and 4.3.1 through 4.3.4 is sufficient to make a reasoned determination that the Mitchell Landfill design and construction is in compliance with 40 CFR 257.61(a)(1) through (a)(4) requirements.

5.0 §257.62 FAULT AREAS

5.1 §257.62 RULE DESCRIPTION

40 CFR 257.62 states:

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

5.2 INFORMATION SUPPORTING RULE COMPLIANCE

5.2.1 Determination of Potential Faults

The regional and local geologic setting for the Mitchell Landfill site is discussed in Section 2.4.2. With respect to potential faults in the vicinity of Mitchell Landfill, the nearest Quaternary fault zones identified by the USGS Quaternary Fault and Fold Database (http://earthquake.usgs.gov/hazards/qfaults/) are: 1) the Pembroke faults; and, 2) the Central Virginia seismic zone. The closest being the Pembroke faults that are located over 200 miles to the south of Mitchell Landfill. Figure 13 – USGS National Fault Zone Map depicts location of the above referenced faults with respect to Mitchell Landfill. In addition, the site investigations and explorations performed in support of the Hydrogeologic and Geotechnical Subsurface Investigation Report did not indicate evidence of faulting at the landfill site.

5.3 COMPLIANCE WITH 40 CFR §257.62 REQUIREMENTS

The available USGS data demonstrates that Mitchell Landfill is not located within 60 meters (200 feet) of a fault that has displaced within Holocene time and complies with the requirement in 40 CFR 257.62 Fault Areas.

6.0 §257.63 SEISMIC IMPACT ZONES

6.1 §257.63 RULE DESCRIPTION

40 CFR 257.63 states:

(a) New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

6.2 INFORMATION SUPPORTING RULE COMPLIANCE

6.2.1 Seismic Impact Zone Determination

A seismic impact zone, as defined in the CCR Rule, is an area having 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g (10% of standard gravity) in 50 years. The peak ground (horizontal) acceleration for the Mitchell Landfill site is estimated to range between 4% and 6% of the earth's gravitational pull according to the USGS "National Seismic Hazard Map – 2014 Peak Ground Acceleration (%g) with 2% Probability of Exceedance in 50 years." Figure 14 - USGS National Seismic Hazard Map, depicts the Mitchell Landfill site with respect to the National Seismic Hazard Map.

6.3 COMPLIANCE WITH 40 CFR §257.63 REQUIREMENTS

Because the estimated peak horizontal acceleration from a potential seismic event is below 10% of standard gravity for the Mitchell Landfill site, it is concluded that the landfill site is not located within a seismic impact zone and satisfies the requirements of 40 CFR 257.63 Seismic Impact Zones.

7.0 §257.64 UNSTABLE AREAS

7.1 §257.64 RULE DESCRIPTION

40 CFR 257.64 states:

(a) An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

(b) The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;

(2) On-site or local geologic or geomorphologic features; and,

(3) On-site or local human-made features or events (both surface and subsurface).

(c) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.

7.2 INFORMATION SUPPORTING RULE COMPLIANCE

40 CFR 257.53 provides the following definition of Unstable Areas: "Unstable area means a location that is susceptible to natural or human induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains." The site investigations and explorations conducted for the permitting and design of Mitchell Landfill identified two local conditions that were considered potential unstable areas: 1) underground mine workings; and, 2) slope stability. Each potential unstable area was evaluated to determine whether the landfill engineering systems and appurtenant structures could be impacted and, if necessary, appropriate design was incorporated to maintain structural integrity, meet minimum engineering safety factors, and comply with the referenced rules and requirements associated with the WVDEP Solid Waste/NPDES Permit.

The following sections summarize the unstable area evaluations that were completed for Mitchell Landfill. Supporting calculations and reporting are contained in the Solid Waste/NPDES Permit Application, Section 3-C, which was submitted to and approved by WVDEP.

7.2.1 Underground Mine Workings

Site investigations identified that the two underground coal mines were present in the vicinity of Mitchell Landfill. The two mines are identified as the McElroy Mine and Ireland Mine. Based on available mine maps and records, the two mines are no longer in operation but the past underground mine works within these two mines extended under or adjacent to the Mitchell Landfill. Figure 15 – Underground Mine Map depicts the approximate location of the abandoned mine works that underlie the majority of the landfill footprint, based on the available historical mine maps. Records indicate that the Pittsburgh Coal seam was mined from these two mines at depths of approximately 500 to 800 feet below the base of the landfill.

Because abandoned mine works are present beneath a significant portion of Mitchell Landfill and future mining work could extend the existing mine works, analyses were performed to estimate the ground surface subsidence that could occur as a result of potential failure of mine works underlying the Mitchell Landfill. The evaluations, analyses and conclusions regarding the potential for subsidence and the impact on the stability of Mitchell Landfill is contained in the Mine Subsidence Analysis Report, prepared by CEC and dated February 2012. This report was submitted as part of the WVDEP Solid Waste/NPDES Permit Application for Mitchell Landfill.

As part of the referenced Mine Subsidence Analysis Report, a mine subsidence analysis was performed to assess the potential ground surface subsidence that could occur from a collapse of the current or future mine works located beneath the landfill, as well as the associated surface soil strains that may affect design of both the primary landfill area and ancillary landfill support facilities (e.g. detention ponds, containment berms, etc.). These analyses considered the potential "worst case" impacts resulting from mine failure, should this occur, and focused on developing an estimated maximum potential subsidence and the resulting ground surface strains that may impact critical landfill structures. The findings of the referenced Mine Subsidence Analysis Report determined that the maximum collapse thickness of the mine works, combined with the overall depth of underlying mine works, will result in a maximum potential settlement of less than 0.7 feet and maximum surface strains of 0.001 ft/ft. Further, the report concluded that in the event of future underground mine failure, the maximum ground surface subsidence and resulting soils strains are below typical design maximums and are accommodated by modern landfill construction methods and materials. Because the Mitchell Landfill engineering system designs and associated construction materials incorporated the above noted potential subsidence and commonly accepted maximums and safety factors, the potential unstable area resulting from a possible mine subsidence was mitigated.

7.2.2 Slope Stability

The steep natural topography combined with the presence of relatively weak overburden soils, as identified from the site investigations, contributed to the conclusion that there was a potential for unstable slopes throughout the Mitchell Landfill construction, placement of CCR, and final capping. For this reason, design of the landfill slopes, engineering systems and appurtenant structures required engineering analyses and engineering controls to mitigate the potential for unstable slopes. Specific slope stability analyses were performed as part of the landfill design and permitting to address the potential for slope instability and to confirm that the integrity of the structural components of the landfill would not be disrupted by slope instability. Specifically, slope stability analyses representing the design of the landfill engineering systems, CCR placement and final cap configuration were completed for: 1) the composite landfill liner system; 2) interim landfill slopes and berms; and, 3) the capped landfill slopes and berms. The evaluations, analyses and conclusions regarding slope stability calculations for the landfill are contained in the Design Calculation appendix to the WVDEP Solid Waste/NPDES Permit Application for Mitchell Landfill.

The above referenced slope stability analyses were performed using a critical cross section that was representative of the potential worst-case conditions given an evaluation of the following: 1) landfill geometry design; 2) liner system components and properties; 3) subsurface conditions (soil, bedrock, and groundwater); 4) CCR material properties and heights; 5) temporary and/or interim conditions; 6) technical specification for the construction materials; and, 7) seismic conditions. For the selected cross sections, a representative model was developed and input into a slope stability computer program to calculate the corresponding safety factors (ratio of the resisting forces to the driving forces). The results of the slope stability calculations yielded factors of safety of at least 1.5 for static conditions and 1.2 for seismic conditions. These safety factors meet standard engineering practice and those outlined in the referenced CSR and WVDEP rules and regulations.

While the slope stability calculations established that the appropriate safety factors were achieved for the landfill design, the analyses also identified the minimum properties required for the construction materials and/or products. These requirements were incorporated into the Technical Specification, the Construction Quality Assurance And Quality Control Plan, and the operating Record for Mitchell Landfill.

7.3 COMPLIANCE WITH 40 CFR §257.64 REQUIREMENTS

The information presented in Section 7.2 above is sufficient to make a reasoned determination that Mitchell Landfill has been designed to ensure that the integrity of the structural components of the landfill will not be disrupted by unstable areas in compliance with 40 CFR 257.64(a).

8.0 SUMMARY AND PE CERTIFICATION

This CCR Location Restriction Demonstration addresses compliance with all of the LR's for purposes of the both the existing and future landfill phases (Phases 3 through 5) that have not begun construction prior to promulgation of the referenced Rule and will be considered "Lateral Expansions". In summary, Mitchell Landfill has been designed and constructed to meet the CCR Rule LR requirements including: Placement Above Uppermost Aquifer (§257.60); Wetlands (§257.61); Fault Areas (§257.62); Seismic Impact Zones (§257.63); and, Unstable Areas (§257.64). Sections 3.0 through 7.0 of this report provide supporting information and conclusions demonstrating that each LR has been met.

The following certification statement provides confirmation that this report was prepared by a qualified professional engineer and that there is sufficient information to demonstrate that the existing Mitchell Landfill, and future expansion phases, meet the LR requirements stated in 40 CFR 257.60 through 257.64.

Professional Engineer's Certification

By means of this certification, I certify that I have reviewed this CCR Location Restriction Demonstration Report, Mitchell Landfill, Mitchell Power Generation Plant, and the design and construction of Mitchell Landfill meets the requirements of Section 40 CFR 257.60 through 257.64.

ANTHONY P. AMICON
REGISTERED
APA
19206
11-16-15
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER

Anthony P. Amicon
Printed Name of Professional Engineer

Signature

19206	West Virginia	6-23-11
Registration No.	Registration State	Date

9.0 BIBLIOGRAPHY

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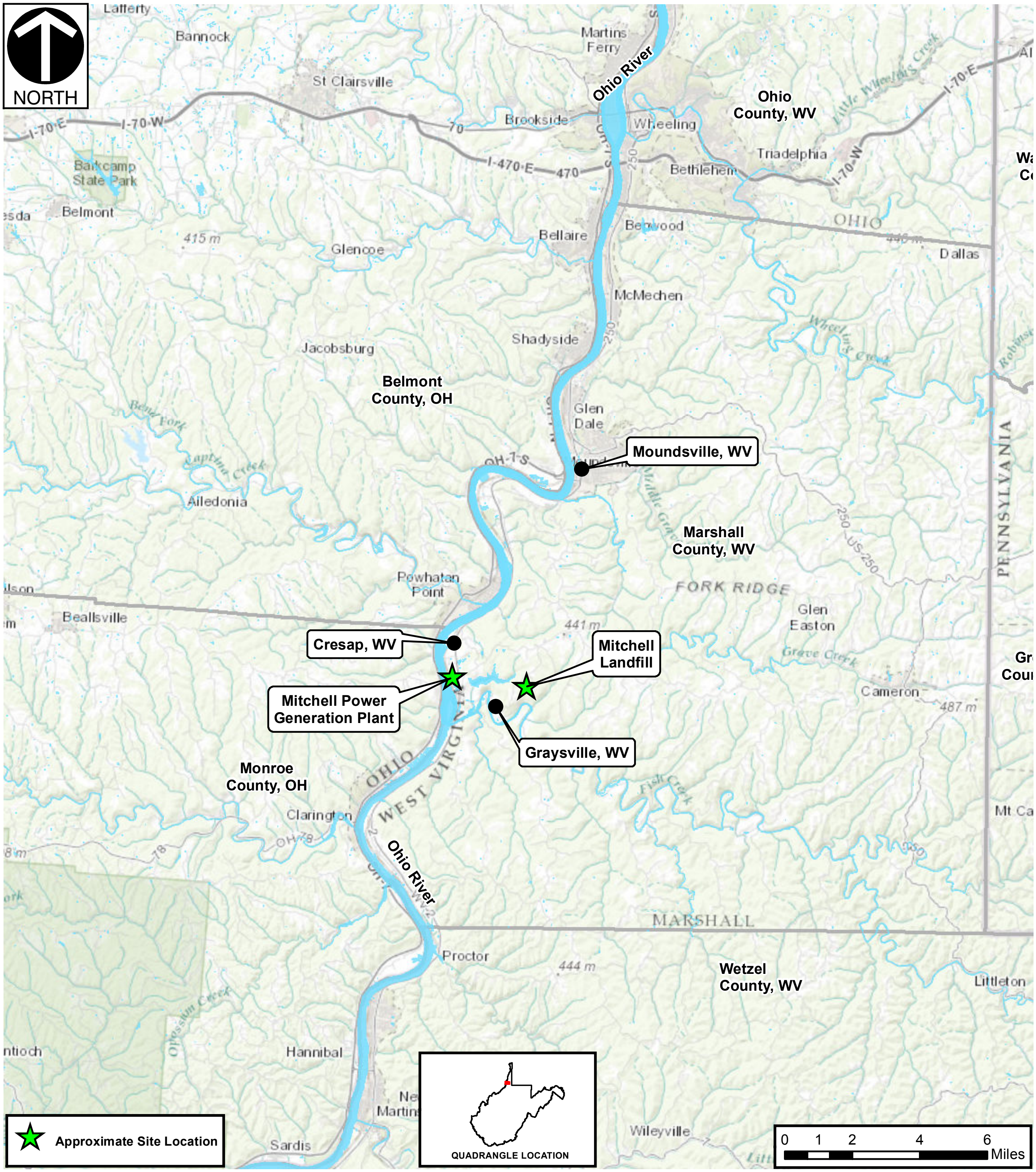
FIGURES



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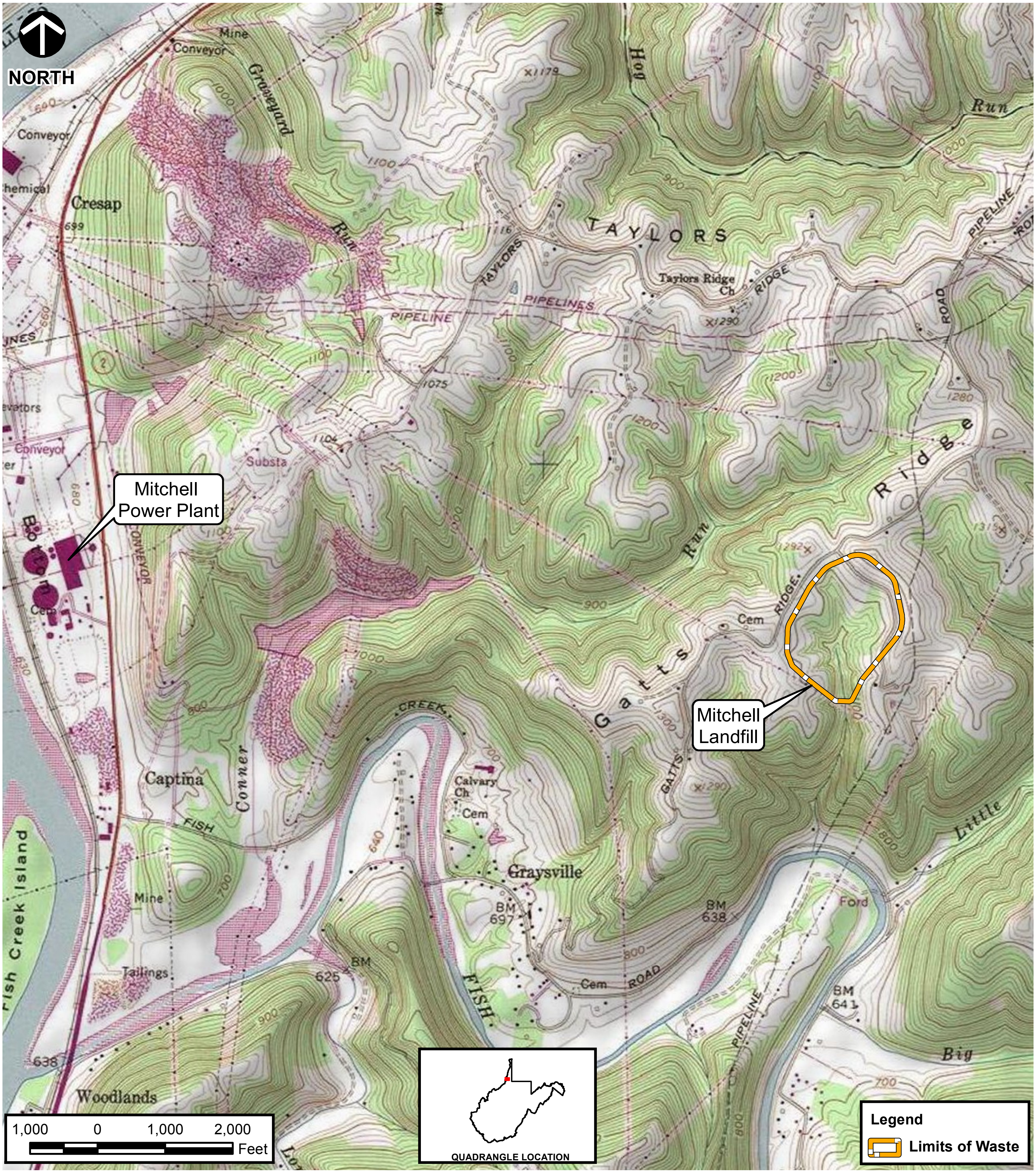
Civil & Environmental Consultants, Inc.
5899 Montclair Boulevard - Cincinnati, OH 45150
513-985-0226 - 800-759-5614
www.cecinc.com

AMERICAN ELECTRIC POWER
MITCHELL LANDFILL
MITCHELL POWER GENERATION PLANT
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
SITE LOCATION MAP

DRAWN BY: MAD	CHECKED BY: RAS	APPROVED BY: APA*	FIGURE NO: 1
DATE: NOVEMBER 16, 2015	DWG SCALE: 1 " = 4 miles	PROJECT NO: 110-416-7600	

Signature on File *



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP - GLEN EASTON, WV - 1978 AND POWHATAN POINT, WV - 1978.

Civil & Environmental Consultants, Inc.

5899 Montclair Boulevard - Cincinnati, OH 45150
513-985-0226 - 800-759-5614
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MITCHELL LANDFILL
MITCHELL POWER GENERATION PLANT
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
PLANT AND CCR UNIT LOCATION MAP

DRAWN BY:	MAD/DNB	CHECKED BY:	RAS	APPROVED BY:	APA*	FIGURE NO:	2
DATE:	OCTOBER 12, 2015	DWG SCALE:	1 " = 2,000 '	PROJECT NO:	110-416-7600		

Signature on File *

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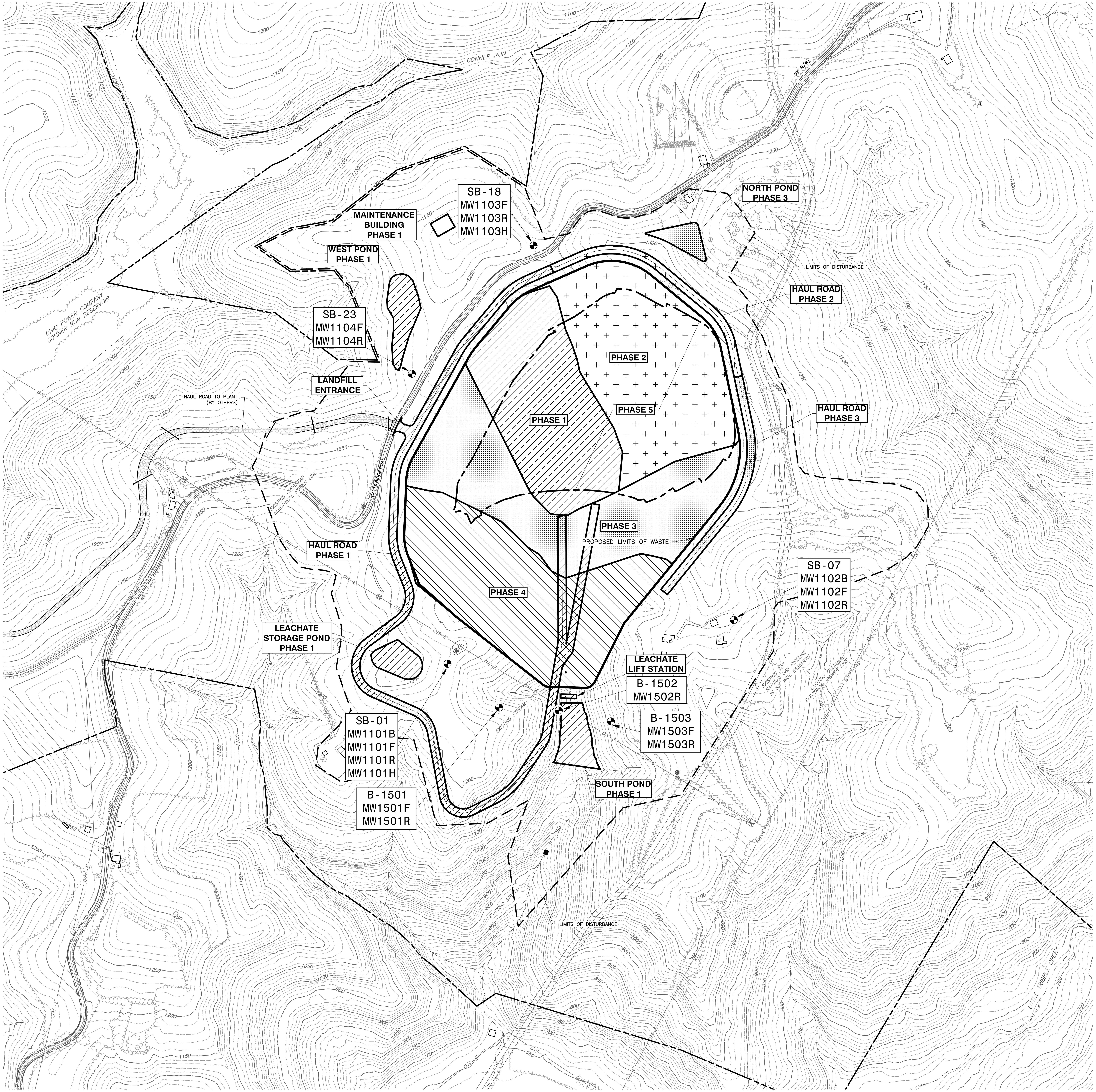


NORTH

SCALE IN FEET

0 200 400

CONTOUR INTERVAL = 10 FEET

LEGEND

- FACILITY BOUNDARY (AEP OWNED)
- EXISTING RIGHT–OF–WAY
- EXISTING EASEMENT
- 580 EXISTING CONTOURS
- EXISTING STREAM
- G EXISTING GAS PIPELINE
- OH–E EXISTING OVERHEAD ELECTRICAL POWER LINES
- EXISTING ELECTRICAL POLE AND TOWER
- EXISTING VEGETATION
- EXISTING ROADS
- EXISTING STRUCTURE
- LIMITS OF EARTHWORK
- LIMITS OF WASTE
- HAUL ROAD
- LIMITS OF PHASE 1 DEVELOPMENT
- LIMITS OF PHASE 2 DEVELOPMENT
- LIMITS OF PHASE 3 DEVELOPMENT
- LIMITS OF PHASE 4 DEVELOPMENT
- LIMITS OF PHASE 5 DEVELOPMENT (TO BE LOCATED ABOVE PHASES 1 THRU 4)
- SB-23 MW1104F MW1104R SOIL BORING/MONITORING WELL LOCATION

PHASE	WASTE CAPACITY (Cubic Yards)	ACRES
1	556,000	12.1
2	1,829,000	15.1
3	2,540,000	14.8
4	3,524,000	15.6
5	1,469,000	24.3
TOTAL	9,918,000	57.6

1. ACRES ARE PROJECTED ONTO HORIZONTAL PLANE
2. PHASE 5 IS ABOVE THE OTHER PHASES AND NOT INCLUDED IN THE TOTAL FOOTPRINT ACREAGE

REVISION RECORD

NO	DATE	DESCRIPTION

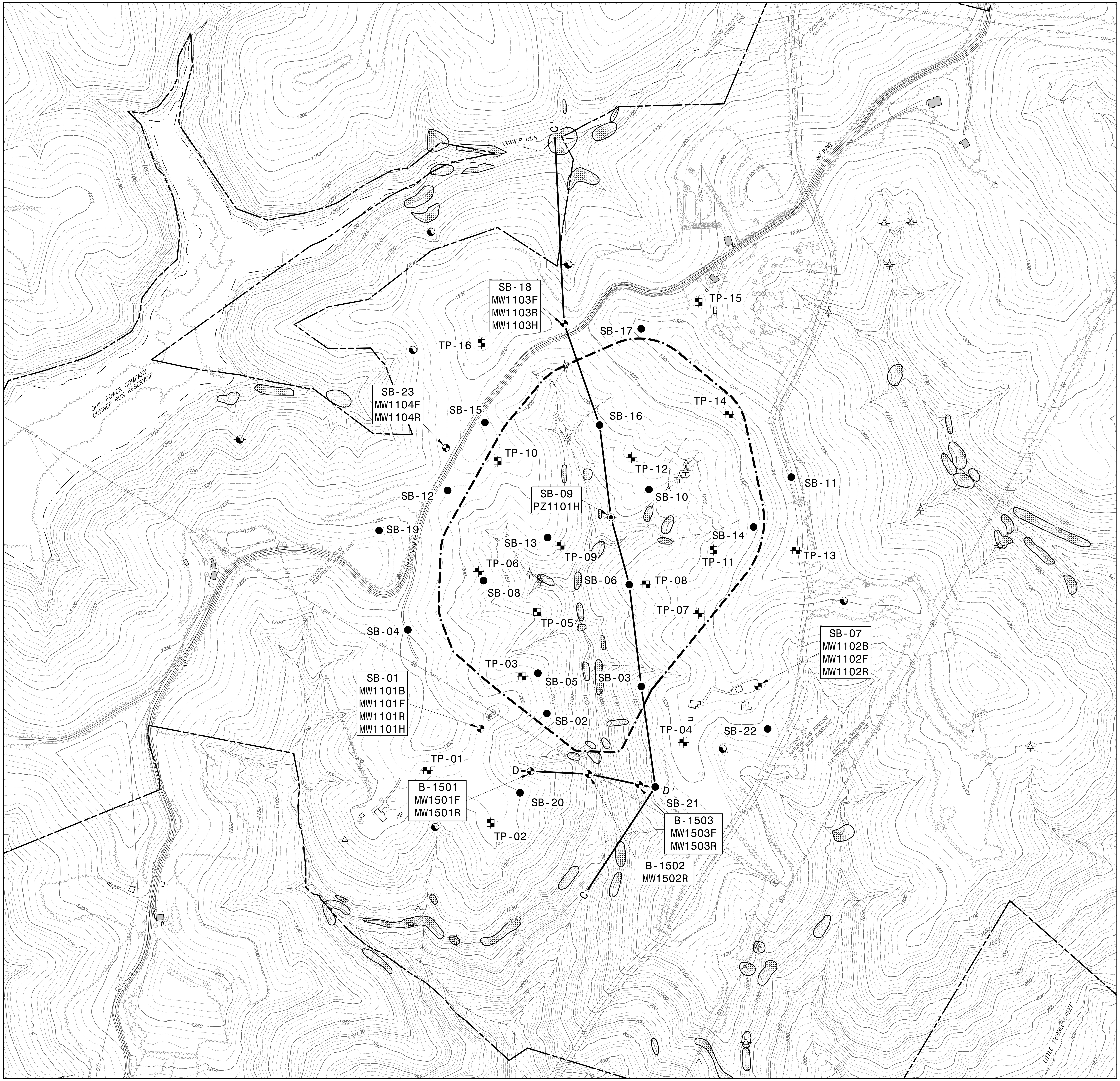
Civil & Environmental Consultants, Inc.
5899 Montclair Blvd. · Cincinnati, OH 45150
513-985-0226 · 800-759-5614
www.cecinc.com

AMERICAN ELECTRIC POWER
MITCHELL LANDFILL
MITCHELL POWER GENERATION PLANT
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
CCR UNIT AND MONITORING WELLS

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:			110-416
APPROVED BY:			APA

FIGURE NO.: 3



NORTH

SCALE IN FEET

0 200 400

LEGEND

- FACILITY BOUNDARY (AEP OWNED)
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- 580 EXISTING CONTOURS
- EXISTING STREAM
- G EXISTING GAS PIPELINE
- OH-E EXISTING OVERHEAD ELECTRICAL POWER LINES
- EXISTING ELECTRICAL POLE AND TOWER
- EXISTING VEGETATION
- EXISTING ROADS
- EXISTING STRUCTURE
- EXISTING OCCUPIED DWELLING
- LIMITS OF WASTE (OVERALL)
- SB-11 SOIL BORING LOCATION
- SB-23 MW1104F MW1104R SOIL BORING/MONITORING WELL LOCATION
- SB-09 PZ1101H SOIL BORING/PIEZOMETER LOCATION
- TP-13 TEST PIT LOCATION
- B BURTON SANDSTONE
- F FISH CREEK SANDSTONE
- R RUSH RUN SANDSTONE
- H HUNDRED SANDSTONE
- A—A' CROSS SECTION LOCATION
- SPRING
- SEEP
- BEDROCK OUTCROP

NOTES:

1. THE EXISTING CONDITION, TOPOGRAPHIC AND SURVEY INFORMATION SHOWN ON THESE DRAWINGS WAS FURNISHED BY AEP AND/OR ITS OTHER CONSULTANTS AND CONTRACTORS, OR OBTAINED FROM DATA UTILIZED ON PREVIOUS AEP PROJECTS. THE EXISTING CONDITIONS SHOWN ON THESE DRAWINGS ARE BELIEVED TO REPRESENT THE BEST KNOWN DATA AVAILABLE. ALTHOUGH THIS INFORMATION HAS BEEN INCLUDED IN THE CONSTRUCTION PLANS BY CIVIL AND ENVIRONMENTAL CONSULTANTS, INC. (CEC), IT IS NOT NECESSARILY THE WORK PRODUCT OF CEC AND HAS BEEN INCORPORATED IN RESPONSE TO CERTAIN ASSIGNED CONDITIONS. CEC HAS NOT SURVEYED OR FIELD VERIFIED ANY OF THE EXISTING CONDITION INFORMATION AND CANNOT BE HELD RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THESE DATA.
2. TOPOGRAPHIC MAPPING WAS PROVIDED BY AEP AND IS BASED UPON AN AERIAL SURVEY DATED NOVEMBER 11, 2010. MAPPING IS BASED UPON THE FOLLOWING DATUM AND PROJECTION:

   HORIZONTAL DATUM: STATE PLANE COORDINATES, NAD 83 WEST VIRGINIA NORTH, U.S. FEET
   VERTICAL DATUM: NAVD 88
3. NATURAL GAS PIPELINE LOCATION AND ALIGNMENT PROVIDED BY DOMINION GAS (PROVIDED BY ROBERT C. ORNDORFF, DATED JUNE 15, 2011). LIMITED SURVEY OF GAS LINE LOCATION, AS MARKED IN THE FIELD BY DOMINION GAS, WAS PERFORMED BY EXLINE SURVEYING ON NOVEMBER 10, 2011.
4. OUTCROP, SPRING AND SEEP LOCATIONS WERE IDENTIFIED DURING CEC'S SITE RECONNAISANCE. THE SITE AND THE LOCATIONS OF BOUNDARIES ARE APPROXIMATE.

REVISION RECORD

NO	DATE	DESCRIPTION

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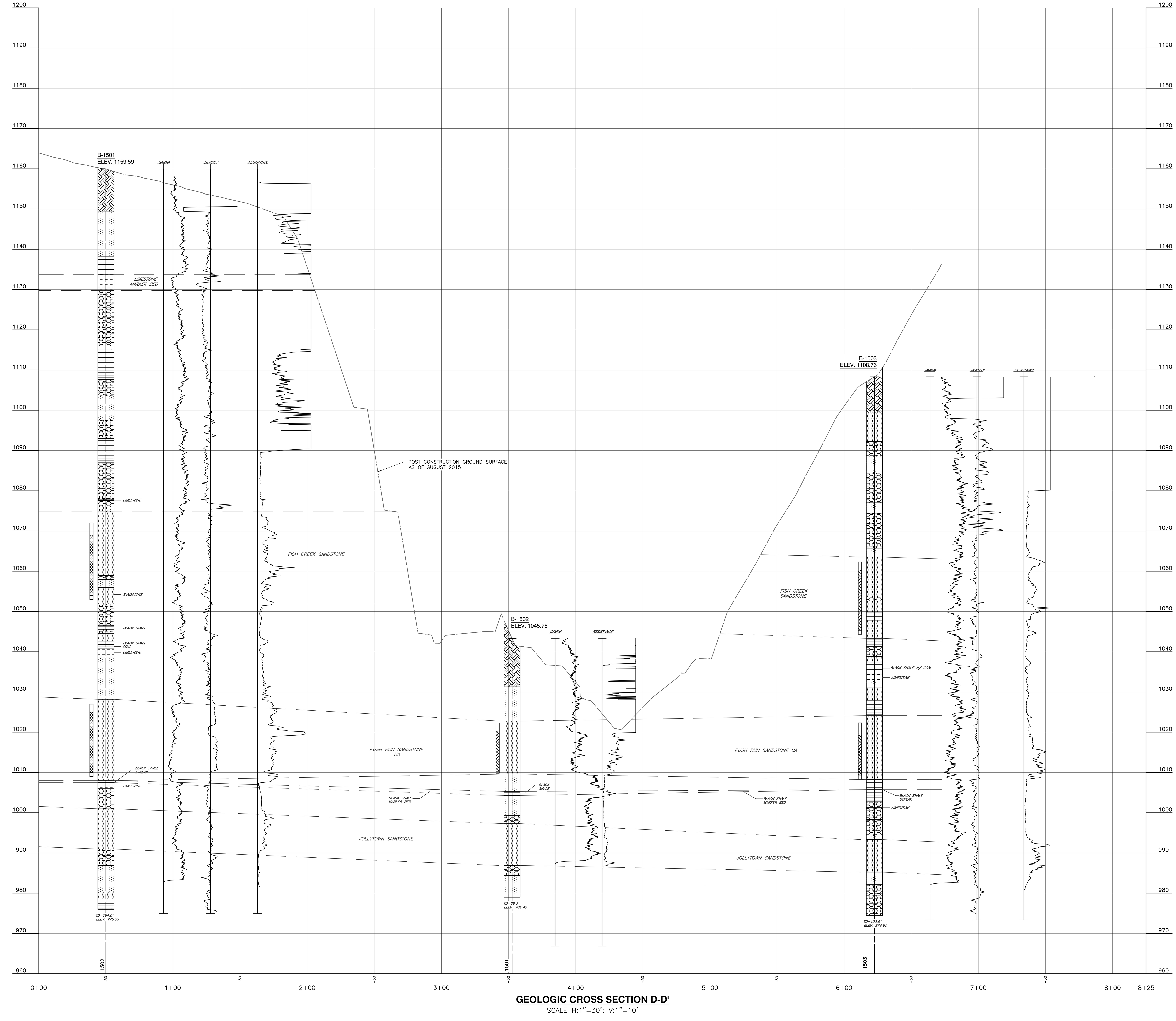
AMERICAN ELECTRIC POWER
MITCHELL LANDFILL
MITCHELL POWER GENERATION PLANT
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
GEOLOGIC CROSS SECTION LOCATION MAP

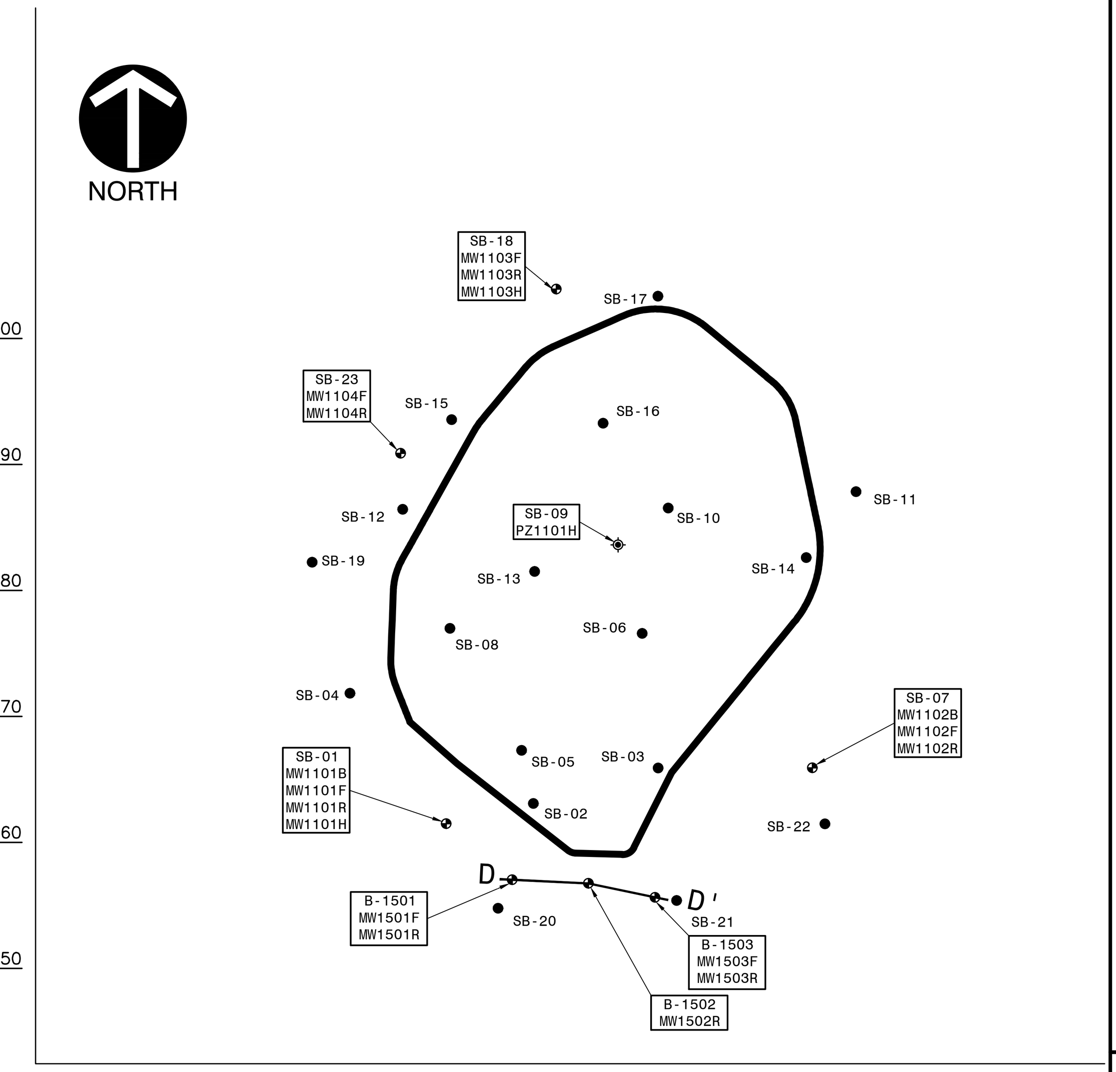
DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416		
APPROVED BY:	APA		

FIGURE NO.: 4



GEOLOGIC CROSS SECTION D-D'

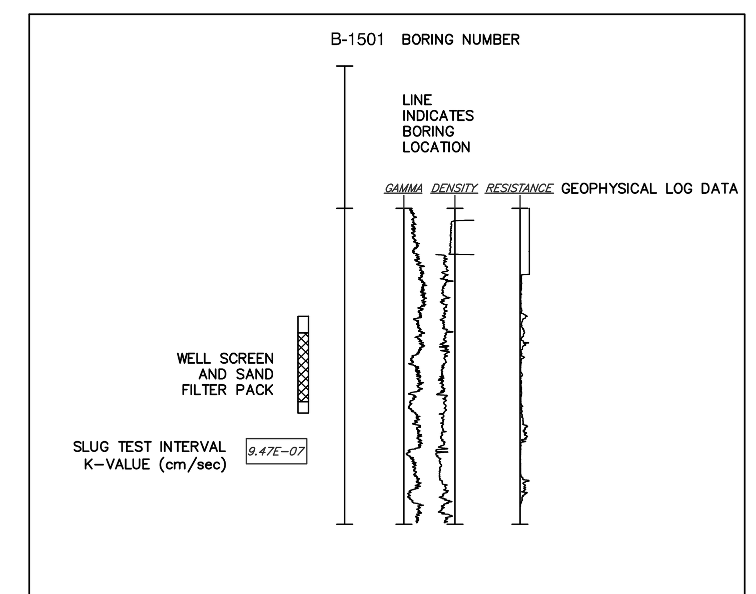
SCALE H:1"=30'; V:1"=10'



KEY PLAN

- SOIL
- CLAYSTONE
- LIMESTONE
- SANDSTONE
- SHALE
- SILTSTONE

UA – UPPERMOST AQUIFER



MONITORING WELL DIAGRAM

NOTE:

1. THE BORING LOGS AND RELATED INFORMATION PRESENTED HEREIN DEPICT SUBSURFACE CONDITIONS AT THE TEST BORING LOCATIONS AND AT THE TIME OF DRILLING. SOIL CONDITIONS AT OTHER LOCATIONS MAY DIFFER.
2. GEOLOGIC CORRELATIONS SHOWN BETWEEN TEST BORINGS GENERALLY ARE BASED ON A STRAIGHT–LINE INTERPOLATION. ACTUAL CONDITIONS BETWEEN TEST BORINGS MAY DIFFER.

SCALE IN FEET 0 50 100

SCALE IN FEET 0 10 20

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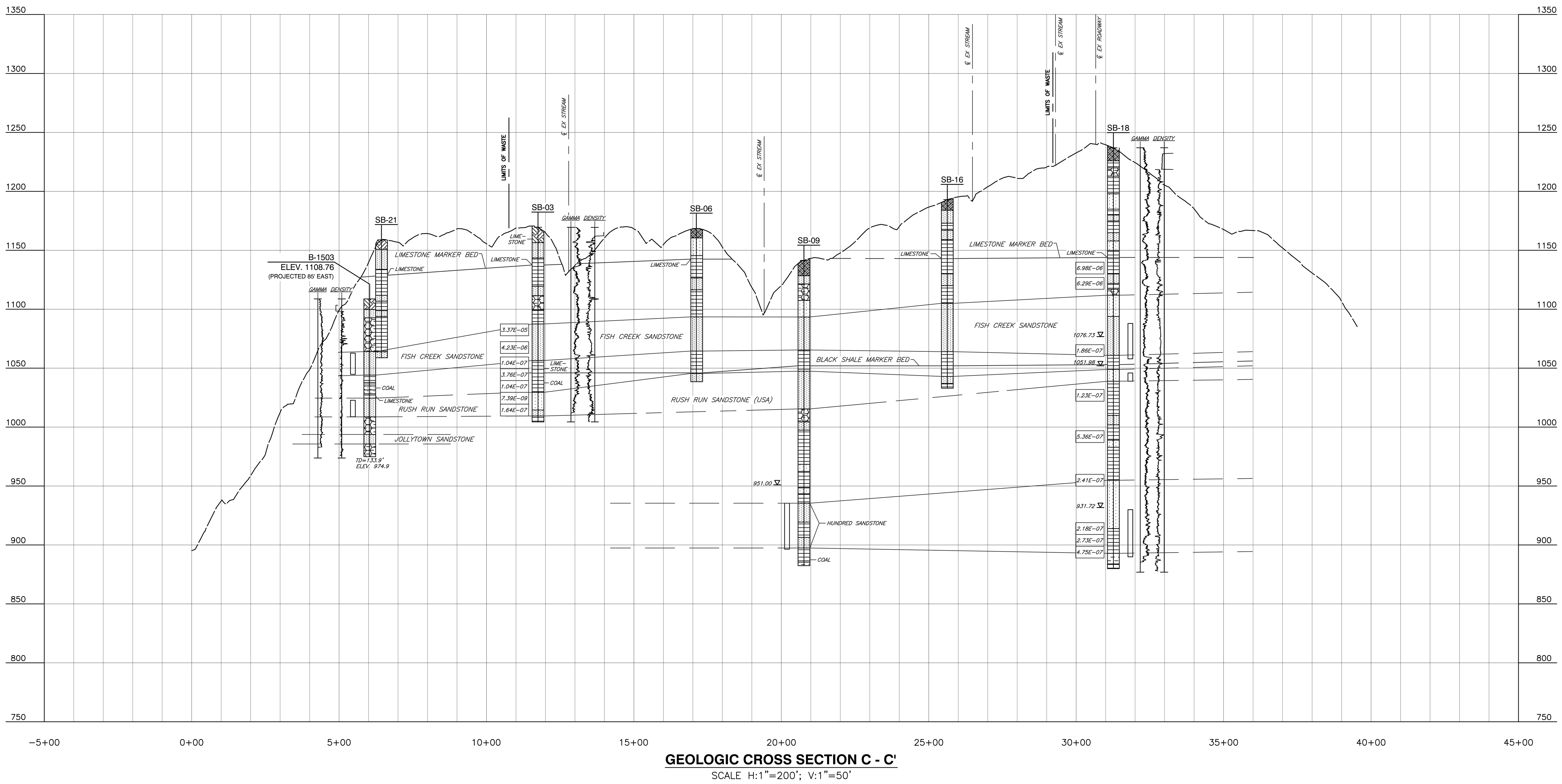
CCR LOCATION RESTRICTION DEMONSTRATION
GEOLOGIC CROSS SECTION D-D'

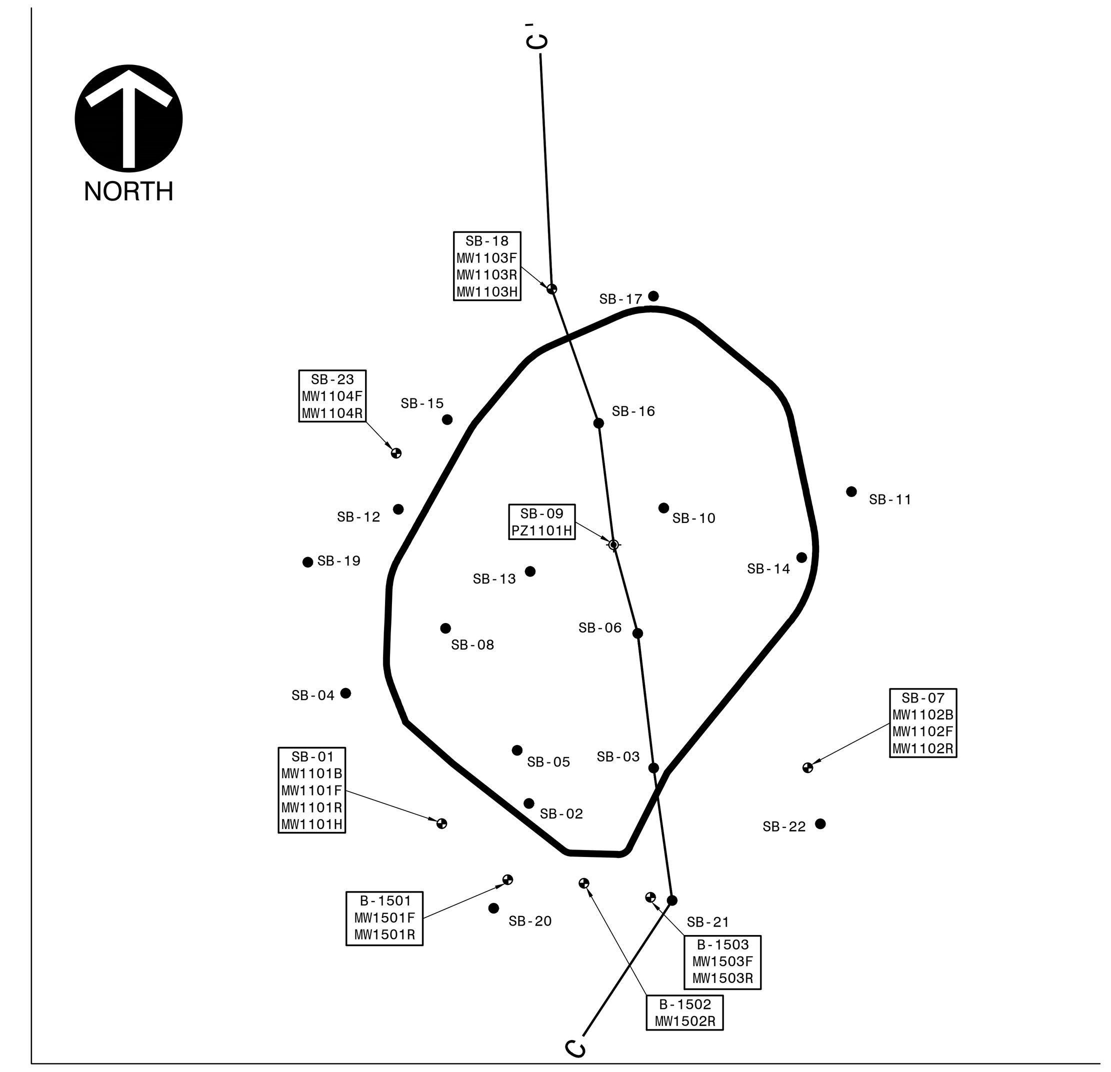
DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416		
APPROVED BY:	APA		

FIGURE NO.: 5



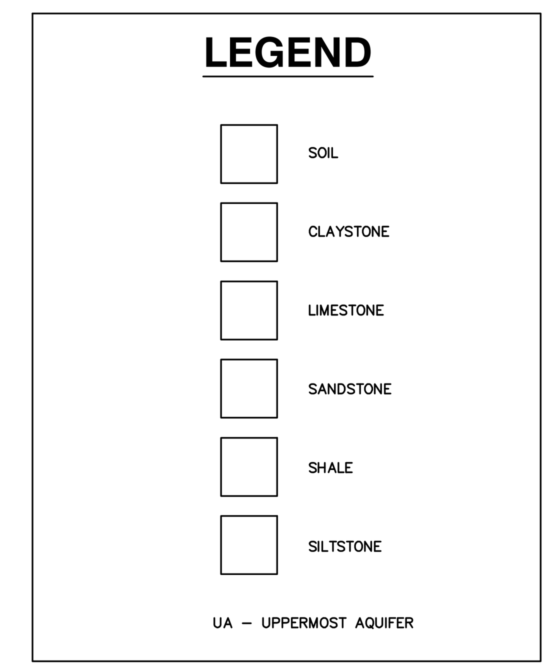
GEOLOGIC CROSS SECTION C - C'

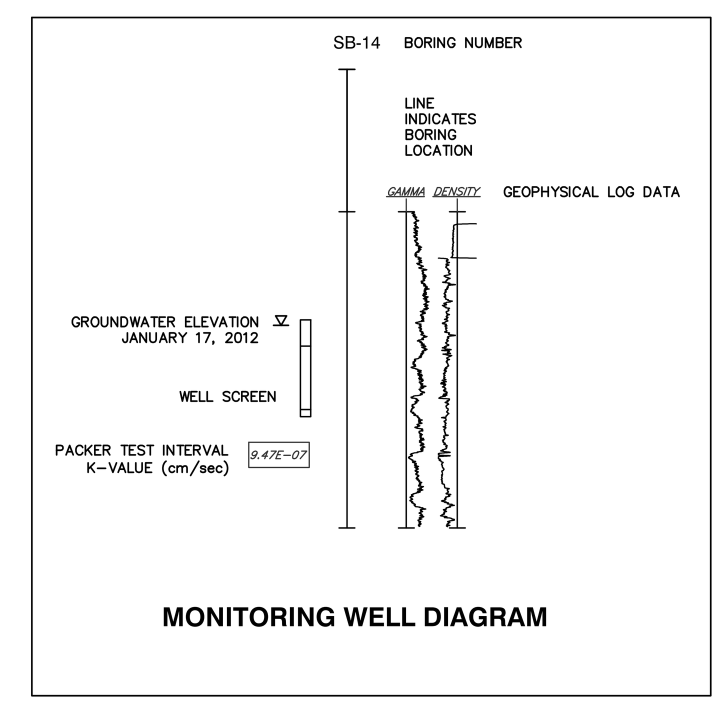
SCALE H:1"=200'; V:1"=50'



KEY PLAN

N.T.S.





MONITORING WELL DIAGRAM

NOTE:

1. THE BORING LOGS AND RELATED INFORMATION PRESENTED HEREIN DEPICT SUBSURFACE CONDITIONS AT THE TEST BORING LOCATIONS AND AT THE TIME OF DRILLING. SOIL CONDITIONS AT OTHER LOCATIONS MAY DIFFER.
2. GEOLOGIC CORRELATIONS SHOWN BETWEEN TEST BORINGS GENERALLY ARE BASED ON A STRAIGHT-LINE INTERPOLATION. ACTUAL CONDITIONS BETWEEN TEST BORINGS MAY DIFFER.

HORZ. SCALE: 1"=200'

VERT. SCALE: 1"=50'

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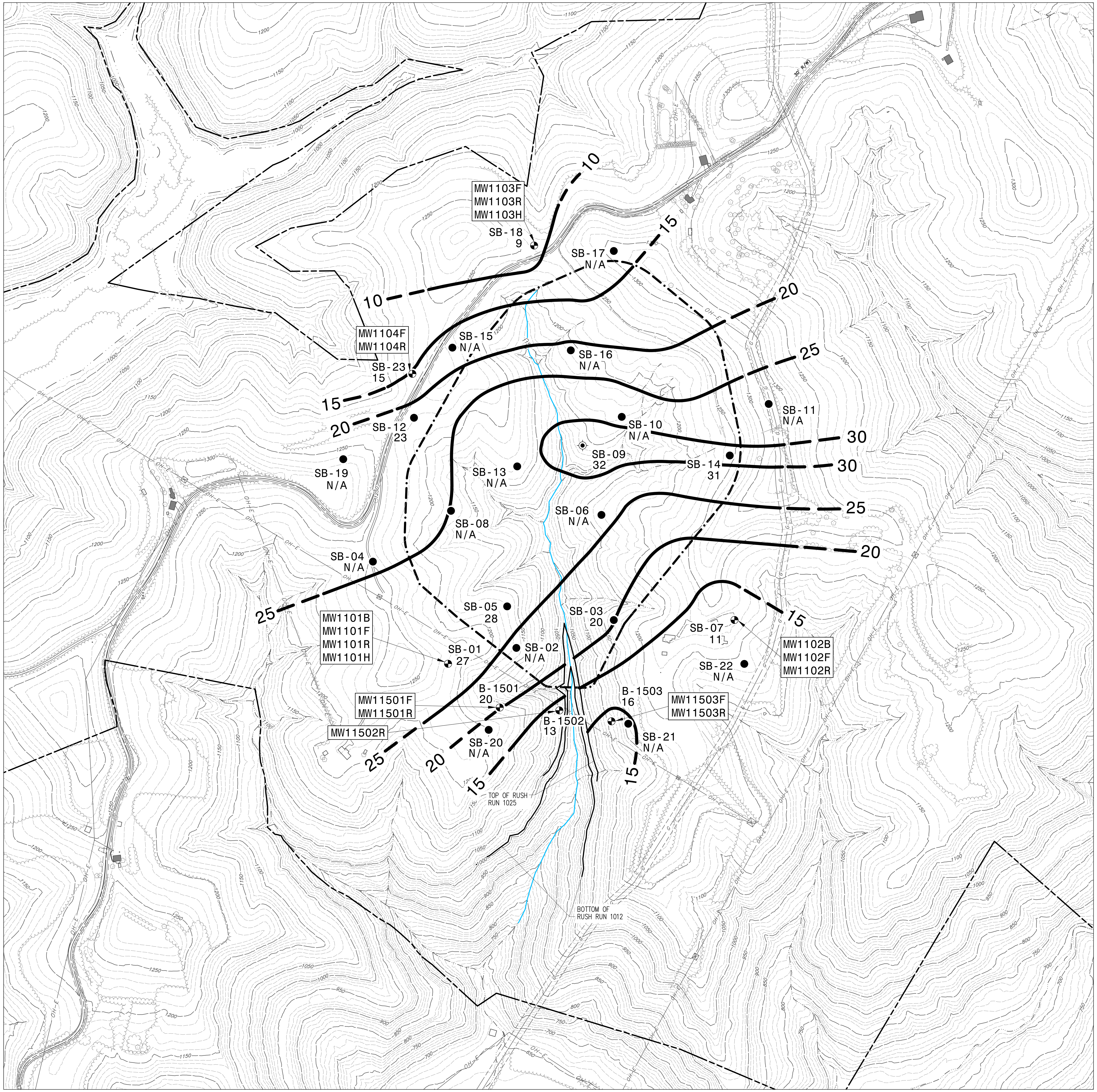
CCR LOCATION RESTRICTION DEMONSTRATION
GEOLOGIC CROSS SECTION C-C'

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:			110-416
APPROVED BY:			APA

FIGURE NO.: 6



LEGEND

- FACILITY BOUNDARY (AEP OWNED)
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- EXISTING CONTOURS
- EXISTING STREAM
- EXISTING GAS PIPELINE
- EXISTING OVERHEAD ELECTRICAL POWER LINES
- EXISTING ELECTRICAL POLE AND TOWER
- EXISTING VEGETATION
- EXISTING ROADS
- EXISTING STRUCTURE
- EXISTING OCCUPIED DWELLING
- LIMITS OF WASTE (OVERALL)
- SB-01 SOIL BORING LOCATION
- 30 THICKNESS OF RUSH RUN SANDSTONE (FT)
- MONITORING WELL
- PIEZOMETER/SOIL BORING LOCATION
- ISOPACH CONTOUR OF RUSH RUN SANDSTONE (DASHED WHERE INFERRED)

NOTES:

BEDROCK CONTOURS AND ISOPACHS ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOW ELEVATIONS AND USING KNOWLEDGE OF GEOLOGY AND SITE-SPECIFIC CONDITIONS. ACTUAL ELEVATIONS MAY DIFFER AT LOCATIONS BETWEEN DATA POINTS FROM THOSE DEPICTED.

NORTH

SCALE IN FEET
0 200 400

REVISION RECORD

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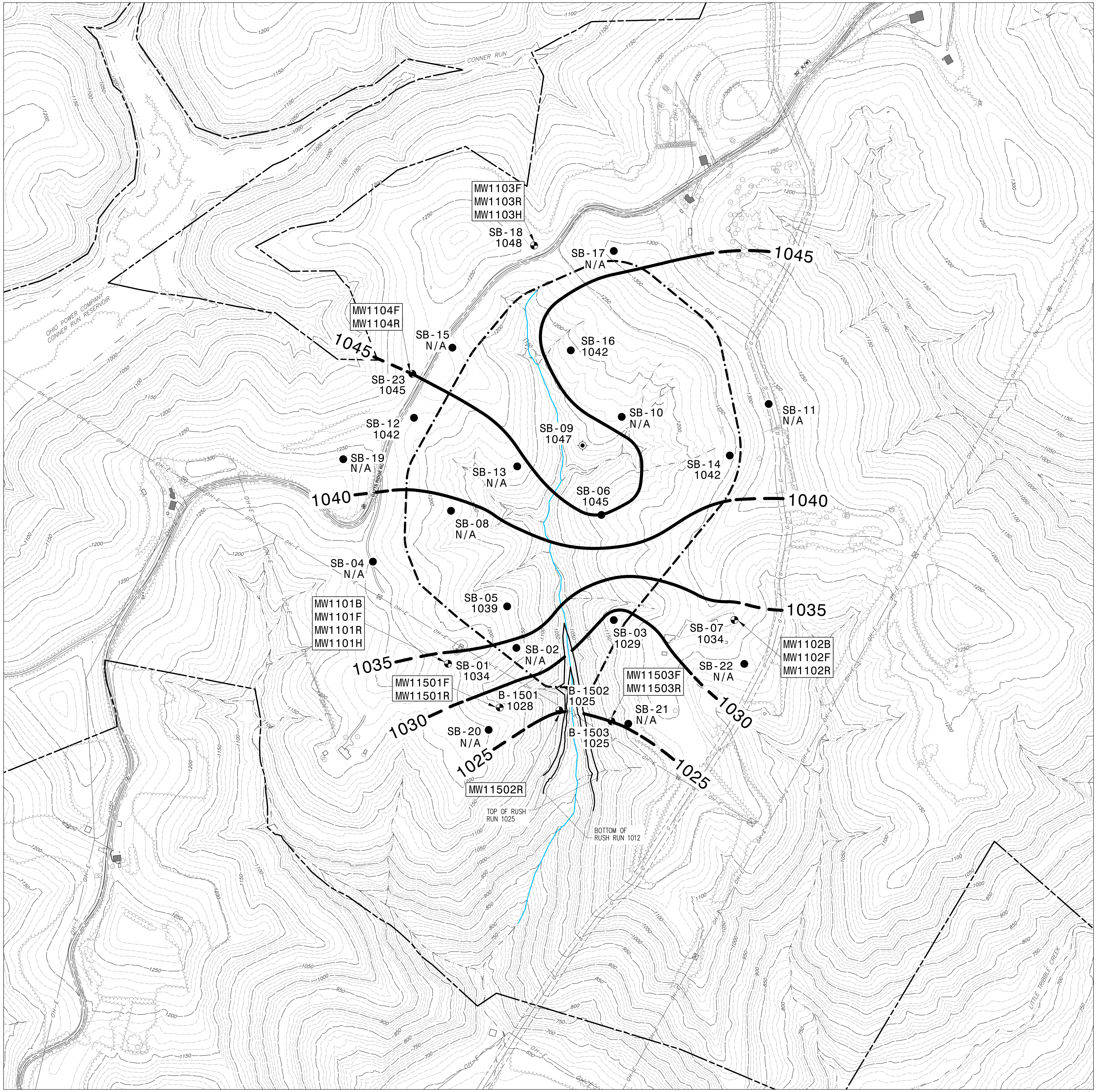
CCR LOCATION RESTRICTION DEMONSTRATION
RUSH RUN SANDSTONE ISOPACH MAP

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416		
APPROVED BY:	APA		

FIGURE NO.: 7



LEGEND

- FACILITY BOUNDARY (AEP OWNED)
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- EXISTING CONTOURS
- EXISTING STREAM
- EXISTING GAS PIPELINE
- EXISTING OVERHEAD ELECTRICAL POWER LINES
- EXISTING ELECTRICAL POLE AND TOWER
- EXISTING VEGETATION
- EXISTING ROADS
- EXISTING STRUCTURE
- EXISTING OCCUPIED DWELLING
- LIMITS OF WASTE (OVERALL)
- SB-01 SOIL BORING LOCATION
- 1134 TOP OF RUSH RUN SANDSTONE ELEVATION
- MONITORING WELL
- PIEZOMETER/SOIL BORING LOCATION
- BASE OF RUSH RUN SANDSTONE CONTOURS (DASHED WHERE INFERRED)

NOTES:

BEDROCK CONTOURS AND ISOPACHS ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOW ELEVATIONS AND USING KNOWLEDGE OF GEOLOGY AND SITE-SPECIFIC CONDITIONS. ACTUAL ELEVATIONS MAY DIFFER AT LOCATIONS BETWEEN DATA POINTS FROM THOSE DEPICTED.

NORTH

SCALE IN FEET

0 200 400

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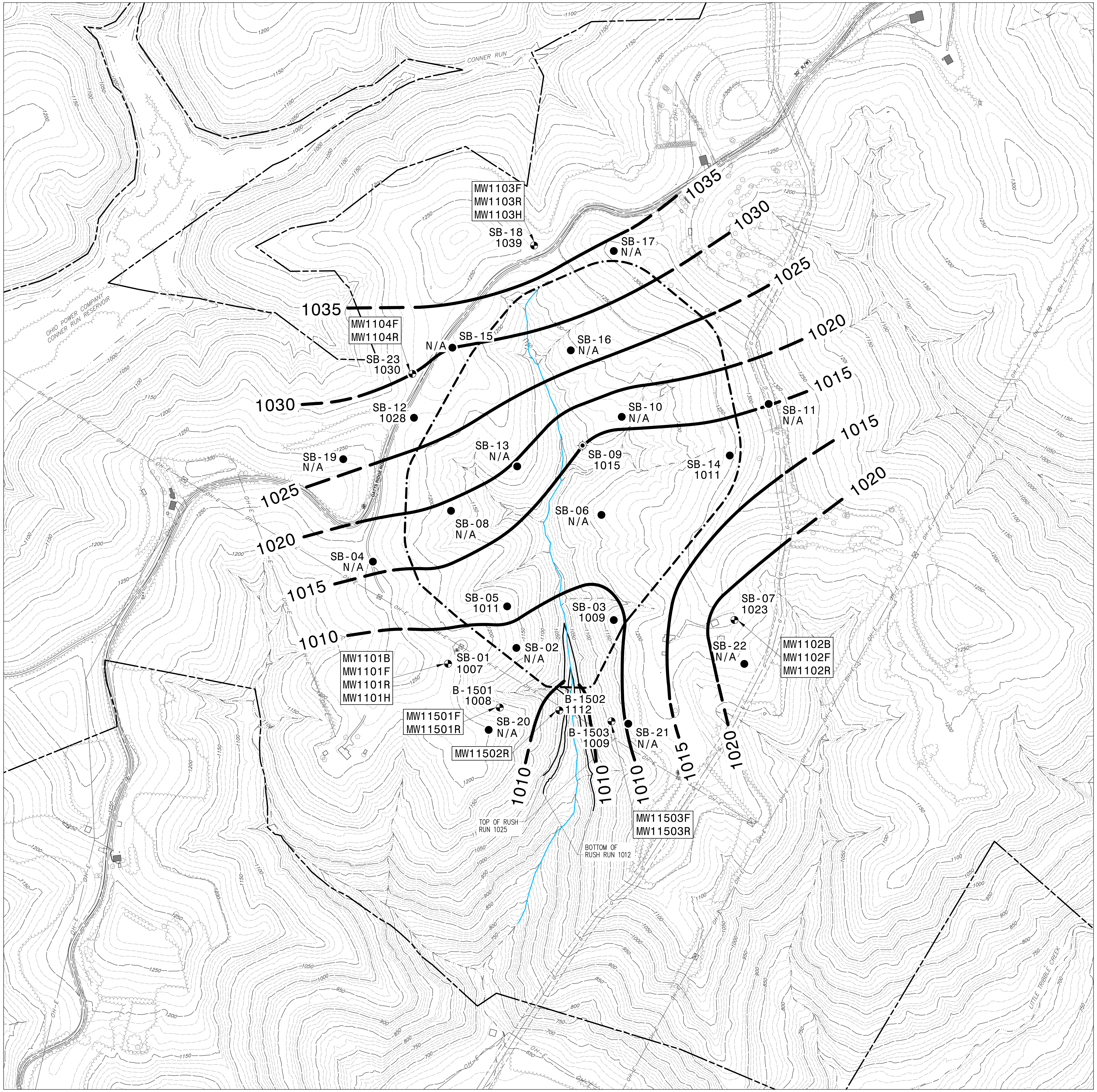
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
TOP OF RUSH RUN SANDSTONE CONTOURS

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416		
APPROVED BY:	APA		

FIGURE NO.: 8



LEGEND

- FACILITY BOUNDARY (AEP OWNED)
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- 580 EXISTING CONTOURS
- EXISTING STREAM
- G EXISTING GAS PIPELINE
- OH-E EXISTING OVERHEAD ELECTRICAL POWER LINES
- EXISTING ELECTRICAL POLE AND TOWER
- EXISTING VEGETATION
- EXISTING ROADS
- EXISTING STRUCTURE
- EXISTING OCCUPIED DWELLING
- LIMITS OF WASTE (OVERALL)
- SB-01 SOIL BORING LOCATION
- 1130 TOP OF RUSH RUN SANDSTONE ELEVATION
- MONITORING WELL
- PIEZOMETER/SOIL BORING LOCATION
- BASE OF RUSH RUN SANDSTONE CONTOURS (DASHED WHERE INFERRED)

NOTES:

BEDROCK CONTOURS AND ISOPACHS ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOW ELEVATIONS AND USING KNOWLEDGE OF GEOLOGY AND SITE-SPECIFIC CONDITIONS. ACTUAL ELEVATIONS MAY DIFFER AT LOCATIONS BETWEEN DATA POINTS FROM THOSE DEPICTED.

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MARSHALL COUNTY, WEST VIRGINIA

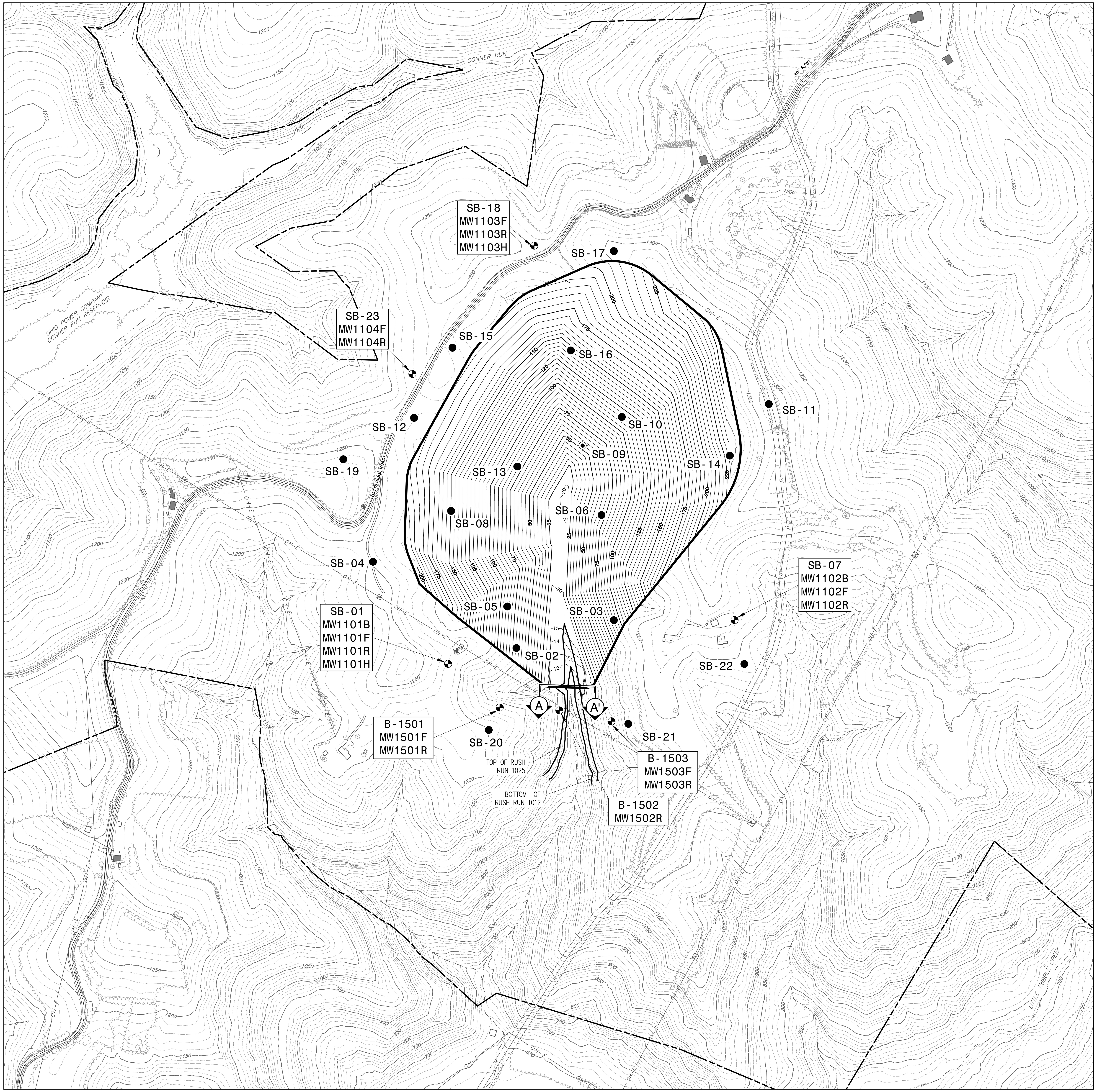
CCR LOCATION RESTRICTION DEMONSTRATION
BASE OF RUSH RUN SANDSTONE CONTOURS

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416	APPROVED BY:	APA

FIGURE NO.: 9

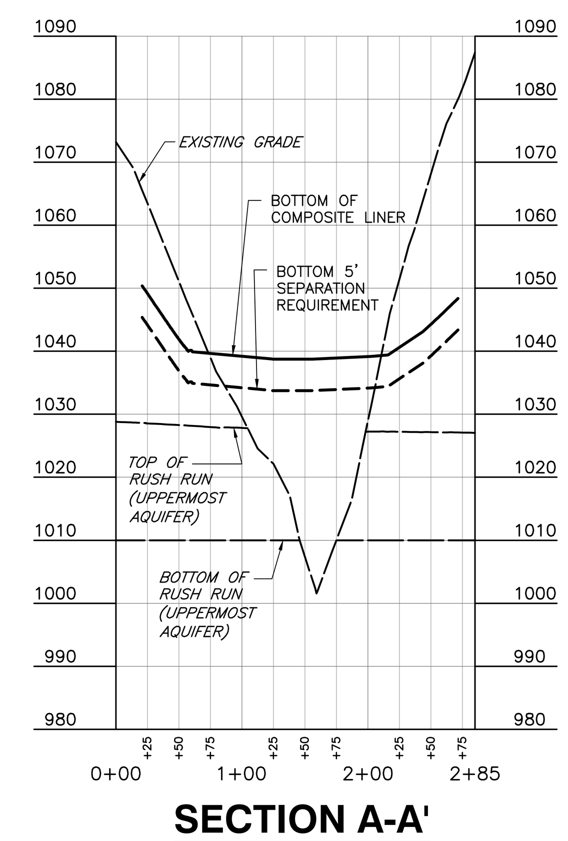
LEGEND

- PROPERTY BOUNDARY
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- EXISTING CONTOURS (580)
- EXISTING STREAM
- EXISTING GAS PIPELINE (G)
- EXISTING OVERHEAD ELECTRICAL POWER LINES (OH-E)
- EXISTING ELECTRICAL POLE AND TOWER
- EXISTING VEGETATION
- EXISTING ROADS
- EXISTING STRUCTURE
- EXISTING OCCUPIED DWELLING
- LIMITS OF WASTE (OVERALL)
- ISOPACH CONTOUR (100)
- SB-01 — SOIL BORING LOCATION
- SB-23 MW1104F MW1104R — SOIL BORING/MONITORING WELL LOCATION



NOTES:

ISOPACH CONTOURS SHOWN ARE THE SEPARATION DISTANCES BETWEEN THE LANDFILL LINER SYSTEM AND THE TOP OF RUSH RUN SANDSTONE.



SECTION A-A'

SCALE: H:1"=100'; V:1"=20'

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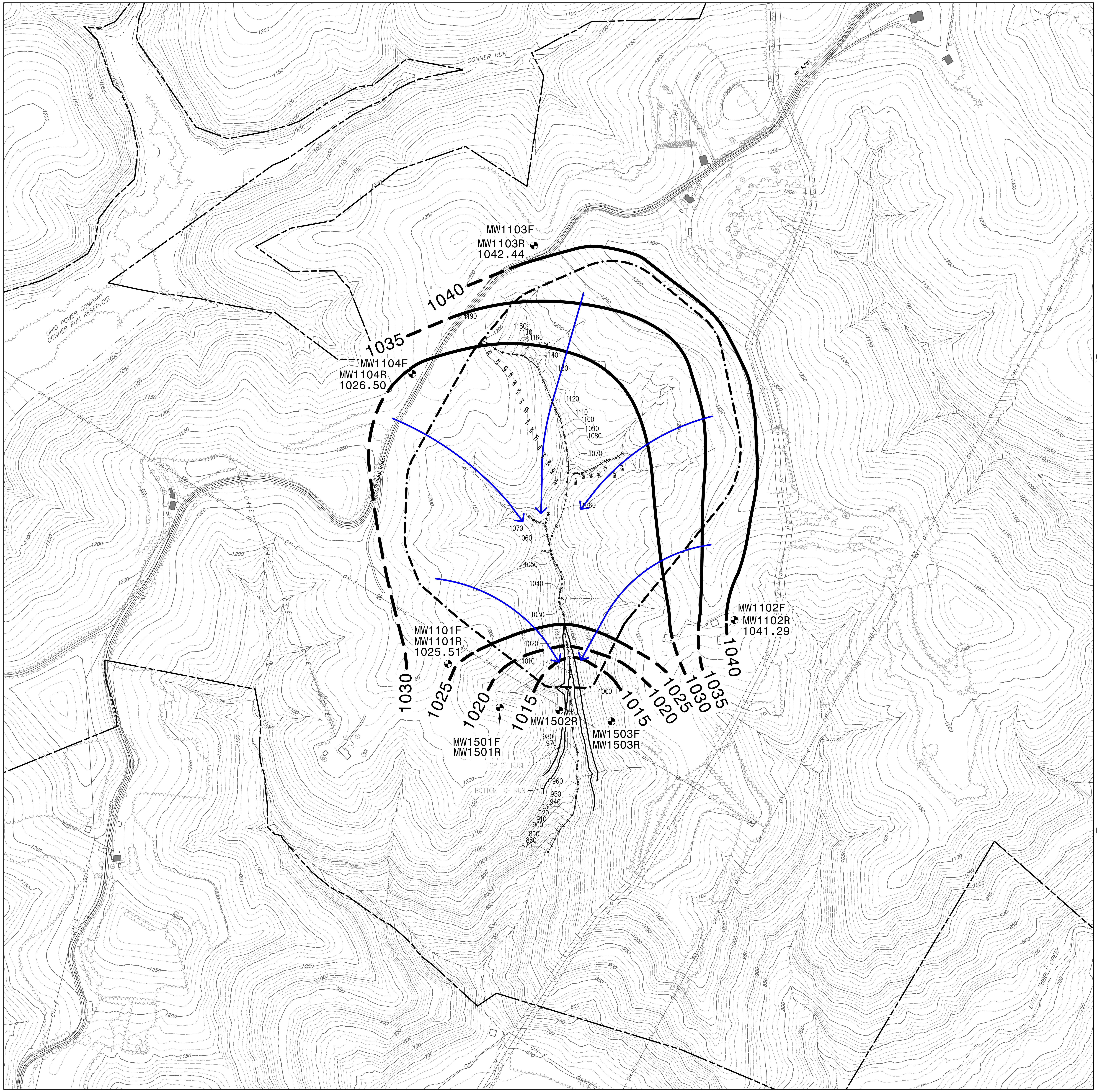
CCR LOCATION RESTRICTION DEMONSTRATION
ISOLATION FROM UPPERMOST AQUIFER ISOPACH

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416	APPROVED BY:	APA

FIGURE NO.: **10**

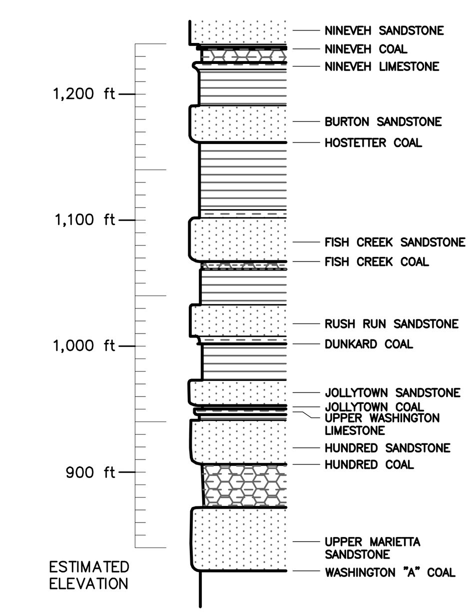


LEGEND

FACILITY BOUNDARY (AEP OWNED)
EXISTING RIGHT-OF-WAY
EXISTING EASEMENT
580 EXISTING CONTOURS
EXISTING STREAM
G EXISTING GAS PIPELINE
OH-E EXISTING OVERHEAD ELECTRICAL POWER LINES
EXISTING ELECTRICAL POLE AND TOWER
EXISTING VEGETATION
EXISTING ROADS
EXISTING STRUCTURE
EXISTING OCCUPIED DWELLING
LIMITS OF WASTE (OVERALL)
880 UNDERDRAIN POSITION AND ELEVATION
MW1103R 1042.44 MONITORING WELL AND STATIC WATER ELEVATION MAY 20, 2015.
POTENTIOMETRIC CONTOUR LINES (DASHED WHERE INFERRED)
GROUNDWATER FLOW DIRECTION

UNDERDRAIN REFERENCE DRAWINGS:

1. PHASE 1A BOTTOM OF ISOLATION LAYER/GROUNDWATER INTERCEPTOR PLAN, DWG. NO. AP0050.100.0014. HULL AND ASSOCIATES, INC., TOLEDO, OHIO, SUBMITTAL DATE JULY 2014
2. GROUNDWATER INTERCEPTOR/STORM PIPE PLAN–FROM PHASE 1A TO ENERGY DISSAPATER (SOUTH END). DWG. NO. AP0050.100.0008. HULL AND ASSOCIATES, INC., TOLEDO, OHIO. SUBMITTAL DATE JULY 2014.



BEDROCK STRATIGRAPHIC COLUMN

NOTES:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
2. POTENTIOMETRIC CONTOURS ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF KNOWN STATIC WATER LEVEL ELEVATIONS AND USING KNOWLEDGE OF SPECIFIC–SITE CONDITIONS. ACTUAL STATIC WATER LEVELS AT LOCATIONS BETWEEN THE MONITORING POINTS MAY DIFFER FROM THOSE DEPICTED.

NORTH

SCALE IN FEET
0 200 400

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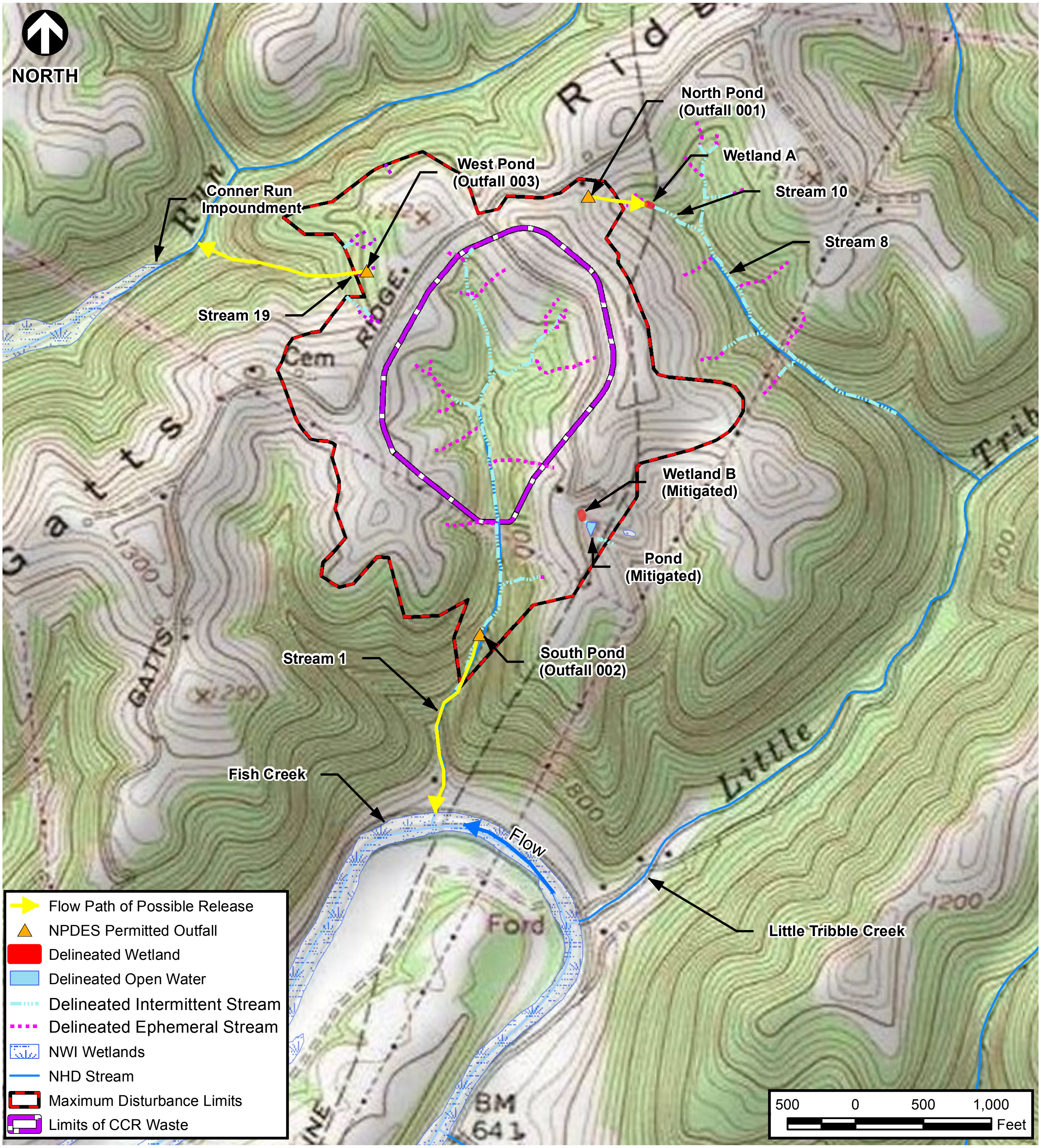
CCR LOCATION RESTRICTION DEMONSTRATION
UPPERMOST AQUIFER POTENTIOMENTRIC SURFACE MAP
RUSH RUN SANDSTONE

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:			110-416
APPROVED BY:			APA

FIGURE NO.: 11



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP - POWHATAN POINT, WEST VIRGINIA - 1978.
WETLANDS DATA OBTAINED FROM THE USFWS WEBSITE (http://wetlandsfws.er.usgs.gov/imf/imf.jsp?site=extract_tool), 2015.
STREAMS DATA OBTAINED FROM USDA GEOSPATIAL GATEWAY WEBSITE (https://gdg.sc.egov.usda.gov/), 2015

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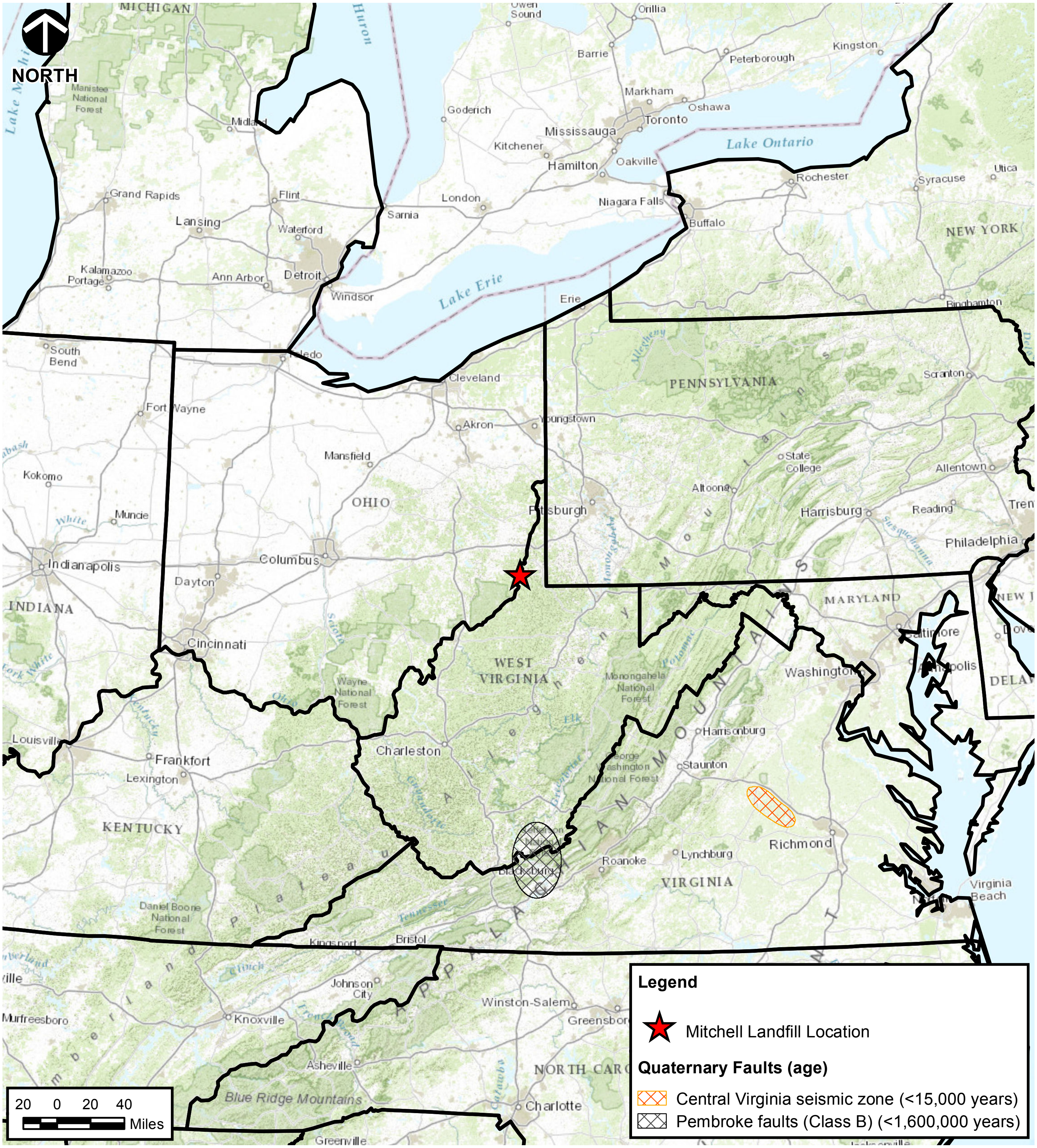
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
STORMWATER DISCHARGE MAP

DRAWN BY: ACL	CHECKED BY: DAM	APPROVED BY: APA*	FIGURE NO: 12
DATE: SEPTEMBER 14, 2015	DWG SCALE: 1 " = 1,000 '	PROJECT NO: 110-416.7603	

Signature on File *



SOURCE: USGS NATIONAL FAULT AND FOLD DATABASE
ACCESSED AT: http://earthquake.usgs.gov/hazards/qfaults/

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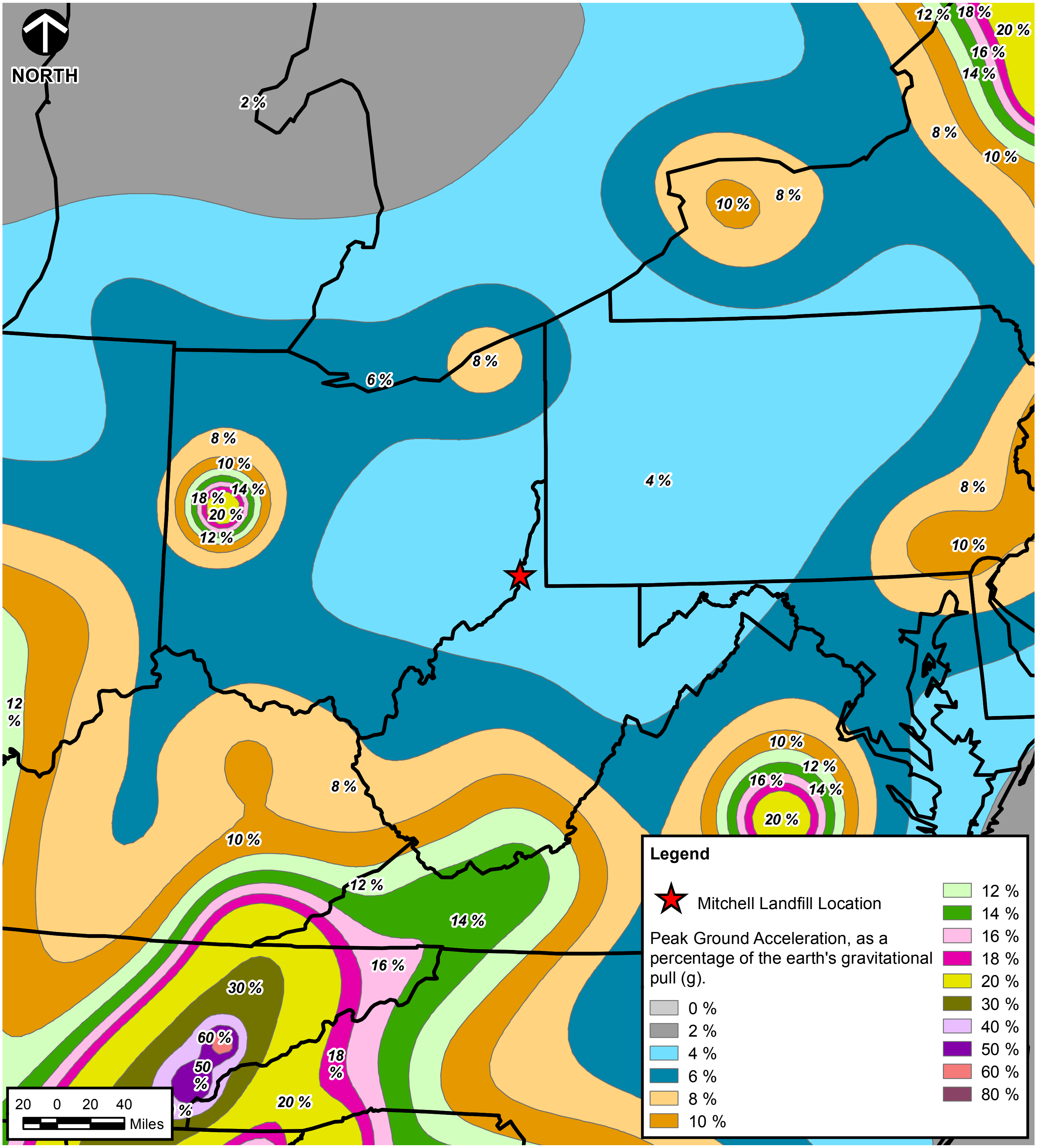
MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
USGS NATIONAL FAULT ZONE MAP

DRAWN BY: JBF	CHECKED BY: BPA	APPROVED BY: APA*	FIGURE NO:
DATE: AUGUST 14, 2015	DWG SCALE: 1 " = 80 miles	PROJECT NO: 110-416-7600	13

Signature on File *

P:\2011\110-416\-GIS\Maps\Task 7601\110416 FaultMap.mxd - 8/14/2015 - 3:32:25 PM (jfrodge)



SOURCE: USGS NATIONAL SEISMIC HAZARD MAP - 2014 PEAK GROUND ACCELERATION (%g) WITH 2% PROBABILITY OF EXCEEDENCE IN 50 YEARS.
ACCESSED AT: http://earthquake.usgs.gov/hazards/products/conterminous/

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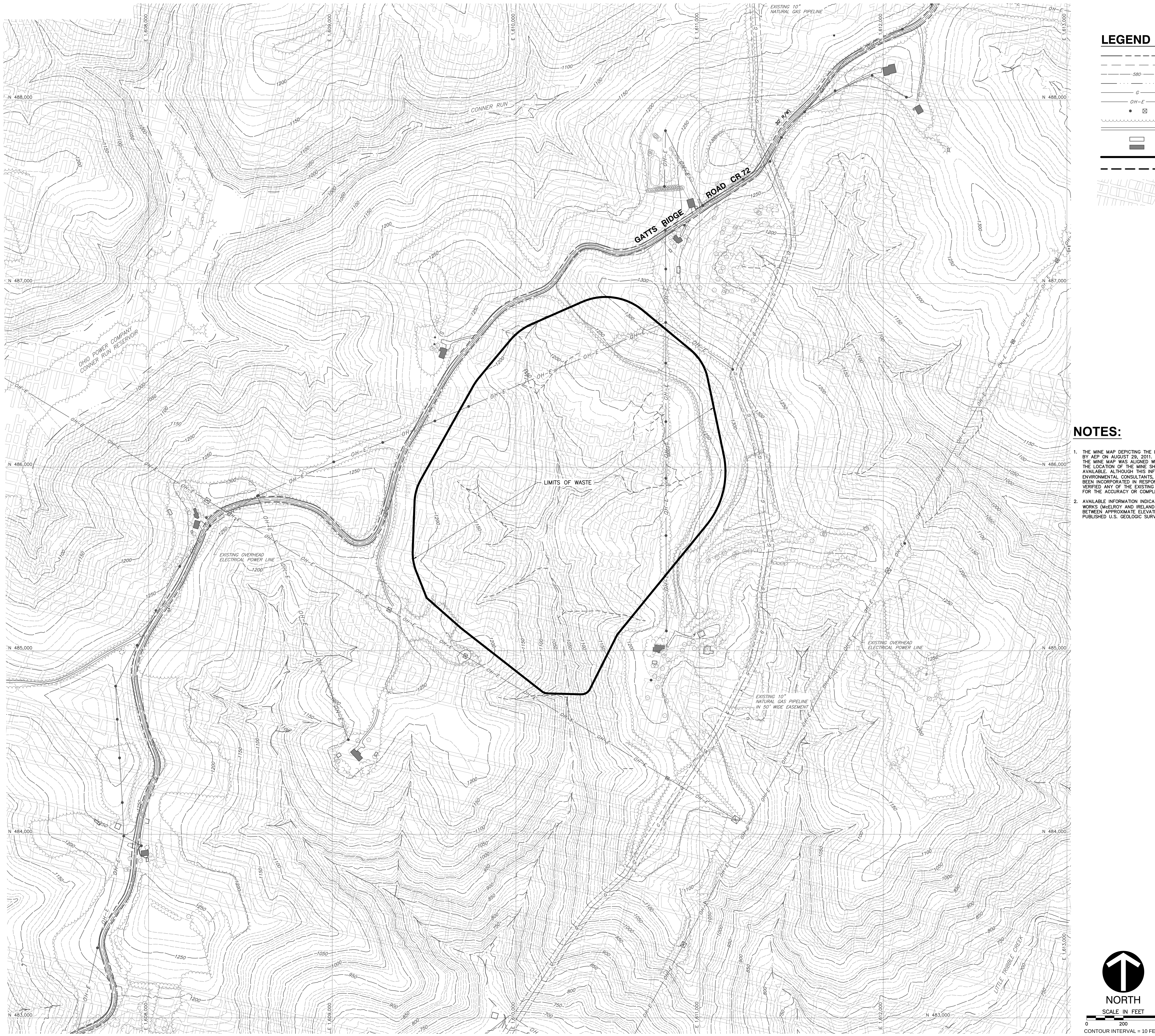
CCR LOCATION RESTRICTION DEMONSTRATION
USGS NATIONAL SEISMIC HAZARD MAP

DRAWN BY: JBF	CHECKED BY: BPA	APPROVED BY: APA*	FIGURE NO:	14
DATE: AUGUST 14, 2015	DWG SCALE: 1 " = 80 miles	PROJECT NO: 110-416-7600		

Signature on File *

P:\2011\110-416\-GIS\Maps\Task 7601\SeismicHazardMap.mxd - 8/14/2015 - 3:30:31 PM (ifrodge)



LEGEND

	EXISTING RIGHT-OF-WAY
	EXISTING EASEMENT
580	EXISTING CONTOURS
	EXISTING STREAM
G	EXISTING GAS PIPELINE
OH-E	EXISTING OVERHEAD ELECTRICAL POWER LINES
	EXISTING ELECTRICAL POLE AND TOWER
	EXISTING VEGETATION
	EXISTING ROADS
	EXISTING STRUCTURE
	EXISTING OCCUPIED DWELLING
	LIMITS OF WASTE
	1,500 FT. OFFSET FROM LIMITS OF WASTE
	ABANDONED UNDERGROUND MINE WORKS– McELROY/IRELAND WORKS IN THE PITTSBURGH COAL (SEE NOTES 1 AND 2) (APPROXIMATE LOCATION)

NOTES:

1. THE MINE MAP DEPICTING THE LOCATION OF THE UNDERLYING McELROY/IRELAND MINE WORKS WAS PROVIDED BY AEP ON AUGUST 29, 2011. THE MAP WAS NOT DEVELOPED ON THE STATE PLANE COORDINATE SYSTEM. THE MINE MAP WAS ALIGNED WITH THE EXISTING TOPOGRAPHY USING EASILY IDENTIFIABLE SURFACE FEATURES. THE LOCATION OF THE MINE SHOWN ON THESE DRAWINGS IS BELIEVED TO REPRESENT THE BEST KNOWN DATA AVAILABLE. ALTHOUGH THIS INFORMATION HAS BEEN INCLUDED IN THE CONSTRUCTION PLANS BY CIVIL AND ENVIRONMENTAL CONSULTANTS, INC. (CEC), IT IS NOT NECESSARILY THE WORK PRODUCT OF CEC AND HAS BEEN INCORPORATED IN RESPONSE TO CERTAIN ASSIGNED CONDITIONS. CEC HAS NOT SURVEYED OR FIELD VERIFIED ANY OF THE EXISTING CONDITION INFORMATION OR THE MINE AND CANNOT BE HELD RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THESE DATA.

2. AVAILABLE INFORMATION INDICATES THAT THE PITTSBURGH COAL SEAM WAS MINED FROM THE DEPICTED MINE WORKS (McELROY AND IRELAND MINE). THE PITTSBURGH COAL SEAM IS APPROXIMATELY 6 FEET THICK AND BETWEEN APPROXIMATE ELEVATIONS OF 420 AND 460 FEET ASML IN THE VICINITY OF THE SITE PER PUBLISHED U.S. GEOLOGIC SURVEY INFORMATION.

REVISION RECORD

NO	DATE	DESCRIPTION

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MARSHALL COUNTY, WEST VIRGINIA

CCR LOCATION RESTRICTION DEMONSTRATION
UNDERGROUND MINE MAP

DATE:	AUGUST 2015	DRAWN BY:	DAR
DWG SCALE:	AS NOTED	CHECKED BY:	RAS
PROJECT NO:	110-416		
APPROVED BY:	APA		

FIGURE NO.: **15**

TABLES

Table 1 - Summary of Monitoring Well and Piezometer Construction
CCR Location Restriction Demonstration
Mitchell Landfill
American Electric Power - Mitchell Generating Plant

Soil Boring ID	Monitoring Well ID	Monitoring Well Tag Number	Date Well Installed	Coordinates[1]		Ground Surface Elevation (ft amsl)[2]	Top of Riser Elevation (ft amsl)	Elevation Top of Bentonite Seal (ft amsl)	Elevation Top of Sand (ft amsl)	Depth to Top of Screen (ft amsl)	Top of Screen Elevation (ft bgs)	Screen Length (ft amsl)	Depth to Base of Screen (ft bgs)	Measured Total Depth[4] (feet)	Bottom of Screen Elevation (ft amsl)	Elevation Bottom of Sand/Top of Bentonite Back Fill (ft amsl)	Depth to Top of Dedicated Pump[5] (ft bgs)	Borehole Diameter Soil/Rock (inches)	Casing Type	Casing Diameter (inches)	Monitored Geologic Material	Monitored Stratigraphic Unit
				Northing	Easting																	
SB-01	MW1101H	0491-0003-2011	10/7/2011	484883.9	1609657.8	1218.7	1220.71	935.7	930.7	290.0	928.7	50.0	340.0	342.9	878.7	877.7	--	8.0/6.0	SCH 40 PVC	2.0	Very Fine to Fine, Micaceous SS w/ LS Inclusions & Interbedded ST Seams 287'-297'; Very Fine to Med., Micaceous SS w/ LS Inclusions 297'-310'; SH w/ Interbedded Slightly Micaceous ST Seams 310'-321'; ST w/ Interbedded, Slightly Micaceous SS Seams 321'-324'; SH w/ Interbedded ST 324'-327'; Very Fine to Med., Micaceous SS 327'-330'; Slightly Micaceous ST 330'-333'; SH w/ Few LS Inclusions 333'-338'; COAL Streak 338'-338.5'; Calcareous SH w/ LS Inclusions 338.5'-347'.	H and Interval Below
	MW1101R	0491-0006-2011	10/28/2011	484877.8	1609656.4	1218.7	1221.23	1038.7	1033.7	187.0	1031.7	25.0	212.0	214.5	1006.7	1004.7	206.5	8.0/6.0	SCH 40 PVC	2.0	Very Fine to Medium Micaceous SS w/ few limestone inclusions; few ST seams 184.3' - 186.9'; Very fine to medium micaceous SS, very hard 186.9' - 211.0'; CT w/ few shale seams and limestone inclusions 211' - 214'.	R and Interval Below
	MW1101F	0402-0006-2011	12/20/2011	484864.5	1609651.4	1219.0	1220.86	1066.0	1059.0	162.0	1057.0	7.0	169.0	171.1	1050.0	1049.0	167.5	8.0/6.0	SCH 40 PVC	2.0	SH thinly laminated to laminated 160' - 160.5'; ST w/ few LS inclusions, broken 160.5' - 161.3' Very Fine to Med SS w/ limestone inclusions, interbedded ST and SH 161.3' - 168.5'; Slightly Micaceous ST, few interbedded SH 168.5' - 169'; SH w/ few CT seams 168.5' - 170';	F and Interval Above
	MW1101B	0402-0005-2011	12/19/2011	484870.8	1609653.8	1218.8	1220.73	1136.8	1131.8	89.0	1129.8	18.0	107.0	109.2	1111.8	1110.8	101.5	8.0/6.0	SCH 40 PVC	2.0	Iron Stained LS 86' - 89'; Calcareous SH w/ few blocky CT seams 89' - 94.3'; CT w/ few shale seams, iron stained 94.3' - 103.3'; Calcareous SS, few ST seams 103.3' - 106.4'; Calcareous SH w/ few ST seams 106.4' - 108';	Unnamed Unit Above F
SB-07	MW1102R	0402-0002-2011	12/14/2011	485101.7	1611103.3	1226.7	1228.36	1037.7	1032.7	196.0	1030.7	8.0	204.0	205.8	1022.7	1021.7	--	8.0/6.0	SCH 40 PVC	2.0	ST w/ LS and calcite veins 194' - 197'; ST w/ LS interbeds and calcite veins 197' - 204.1'; Calcareous SH w/ few CT seams, some iron staining 204.1' - 205';	R
	MW1102F	0491-0004-2011	10/25/2011	485106.1	1611110.1	1226.8	1228.67	1086.8	1081.8	147.0	1079.8	30.0	177.0	180.0	1049.8	1048.8	170.0	8.0/6.0	SCH 40 PVC	2.0	Micaceous Fine to Medium SS 145' - 147'; Micaceous Fine to Medium SS, few Calcite filled fractures 147' - 174.2'; SH 174.2' - 178';	F and Interval Below
	MW1102B	0402-0003-2011	12/15/2011	485097.4	1611096.9	1226.9	1228.84	1159.9	1156.9	72.0	1154.9	17.0	89.0	90.9	1137.9	1136.9	83.0	8.0/6.0	SCH 40 PVC	2.0	SH few CT seams 70' 70.2'; ST w/ LS inclusions 70.2' - 73.3' Micaceous Fine to Med SS 73.3' - 76.1' Micaceous Fine to Medium SS 76.1' - 89.1'; SH 89.1' - 90'	Unnamed Unit Above F / Above Limestone
SB-18	MW1103H	0491-0002-2011	9/27/2011	487005.3	1610094.0	1237.4	1239.82	937.4	932.4	307.0	930.4	40.0	347.0	349.4	890.4	889.4	--	8.0/6.0	SCH 40 PVC	2.0	ST 305'-308'; Very Fine to Med. SS 308'-312'; ST 312'-317'; Very Fine to Med., Slightly Micaceous SS 317'-319'; Slightly Micaceous ST 319'-323'; SS 323'-327'; SH & Interbedded ST w/ LS Inclusions 327'-337'; SH & Interbedded ST/SS 337'-341'; SH w/Carbonaceous Streak 341'-345'; Interbedded LS and Calcareous SH 345'-347'.	H and Interval Below
	MW1103R	0402-0004-2011	12/16/2011	486998.5	1610097.2	1238.1	1240.01	1053.1	1049.1	191.0	1047.1	7.0	198.0	200.3	1040.1	1039.1	--	8.0/6.0	SCH 40 PVC	2.0	ST slightly micaceous w/ few limestone inclusions 189' - 193'; Micaceous Very Fine to Medium SS w / few ST seams. 193' - 195.5'; ST w/ few LS inclusions, few SS seams 195.5' - 198' SH 198' - 199';	R
	MW1103F	0491-0005-2011	10/26/2011	487011.2	1610102.2	1236.4	1239.19	1094.4	1089.4	149.0	1087.4	30.0	179.0	181.6	1057.4	1056.4	173.5	8.0/6.0	SCH 40 PVC	2.0	Micaceous Very Fine to Med. SS w/ interbedded ST 147' - 176.2' SH w/ COAL seam 0.042' thick 176.2' - 177'; SH w/ few CT seams 177' - 180'	F and Interval Below
SB-23	MW1104R	0402-0008-2011	12/22/2011	486345.1	1609471.2	1228.7	1230.66	1046.7	1043.7	187.0	1041.7	25.0	212.0	213.8	1016.7	1015.7	--	8.0/6.0	SCH 40 PVC	2.0	Micaceous Very Fine to Med. SS, Calcareous 185' - 189'; Micaceous Very Fine to Med. SS w/ few LS inclusions 189' - 195.8'; ST few interbedded SH and few LS inclusions 195.8' 199'; SH w/ few LS inclusions 199' - 203.2'	R and Interval Below
	MW1104F	0402-0007-2011	12/21/2011	486352.3	1609469.3	1228.5	1230.30	1083.5	1078.5	152.0	1076.5	20.0	172.0	174.1	1056.5	1055.5	--	8.0/6.0	SCH 40 PVC	2.0	ST w/ few interbedded SS and SH seams 150' - 150.8'; Micaceous Very Fine to Med. SS 150.8' - 154.4'; ST w interbedded SS seams 154.4' -159'; ST, calcareous few interbedded SH and SS seams 159' - 169.5'; Micaceous Very Fine to Med. w/ interbedded LS 169.5 ' - 171.4'; ST w /few SH and LS seams 171.4' - 172.5'; SH, calcareous w/ interbedded SS and LS 172.5' - 173'	F and Interval Below
SB-09	PZ1101H[3]	0402-0001-2011	9/19/2011	485990.9	1610339.5	1141.3	1143.59	934.3	931.3	212.0	929.3	35.0	247.0	247.5	894.3	893.3	--	5.0	SCH 40 PVC	1.0	Micaceous Interbedded SS and SH trace Calcite inclusions 206' - 211.4'; Fine to Medium Micaceous SS some SH interbeds 211.4' - 222.8'; SH w/ some LS inclusions 222.8' - 229.8'; SH w/ trace calcite inclusions 229.8' - 235.8' Micaceous SS and SH interbeds, trace limestone inclusions 235.8' - 239.8'; Micaceous Fine to Medium SS 239.8' - 244.8'; SH w / some SS interbeds 244.8' - 247.2'; Micaceous Fine to Medium SS 247.2' - 247.8'; SH w/ some plant fossils 247.2' - 248'	H
B-1501	MW1501R		12/22/2011			1159.6		1033.9	1026.9	135.4	1024.2	15.0	150.6		1009.0	1008.6	--	8.0/6.0	SCH 40 PVC	4.0	Micaceous SS, well sorted, well cemented, slightly fractured to unfractured.	R
	MW1501F		12/21/2011			1159.6		1079.4	1072.0	91.4	1068.2	15.0	106.6		1053.0	1052.6	--	8.0/6.0	SCH 40 PVC	4.0	Micaceous SS, very fine grained, thinly bedded, competent, well cemented, slightly to moderately fractured. CT near bottom of monitored interval, approximately 8 inches, underlain by approximately 14 inches of siltstone.	F
B-1502	MW1502R		9/19/2011			1045.8		1028.1	1024.8	23.4	1022.4	10.0	33.6		1012.2	1012.2	--	5.0	SCH 40 PVC	4.0	Micaceous SS, well sorted, moderately fractured, iron-stained vertical fracture, sub-vertical fractures and horizontal fractures noted, interbedded ST zone noted, color change from gray to light brown.	R
B-1503	MW1503R		12/22/2011			1108.8		1030.8	1023.2	89.4	1019.4	10.0	99.6		1009.2	1007.8	--	8.0/6.0	SCH 40 PVC	4.0	Micaceous SS, medium to thick bedded near top, very hard and finer grained in lower portion of monitored interval, trace pyrite noted, calcareous cement, slightly to moderately fractured, some brecciated siltstones and mudstone interbeds over 18 inch interval, iron-stained vertical and sub-vertical fractures noted.	R
	MW1503F		12/21/2011			1108.8		1070.6	1062.8	48.4	1060.4	15.0	63.6		1045.2	1044.8	--	8.0/6.0	SCH 40 PVC	4.0	Micaceous SS, very fine grained, thin to thick beds, competent, well cemented; trace calcareous nodules, slightly fractured to unfractured. Interbedded SH, CT and SS in lower portion of monitored interval.	F

Notes:
(1) Survey coordinates are US State Plane 1983 West Virginia North.
(2) amsl = average mean sea level. Vertical Datum is NAVD 1988, GEOID 03.
(3) Piezometer Abandoned in June 2013 due to encroaching landfill construction. One inch diameter piezometer.
(4) Measured from the top of riser.
(5) Dedicated bladder pumps installed December 2013.

Bedrock Unit Legend:
H = Hundred Sandstone
R = Rush Run Sandstone
F = Fish Creek Sandstone
B = Burton Sandstone/Shallow Bedrock

Rock Type Symbol Legend:
CL = Clay
CLSH = Clay shale
CT = Claystone
SS = Sandstone
ST = Siltstone
SH = Shale
LS = Limestone

Table 2 - Monitoring Well Static Water Levels
CCR Location Restriction Demonstration
Mitchell Landfill
American Electric Power Company – Mitchell Generating Plant

Well Identification	Top of Casing Elevation (ft asml)	Total Well Depth (ft)	Bottom of Screen Elevation (ft amsl)	January 17, 2012			February 1, 2012			April 1, 2012			June 18, 2012		
				Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)
MW1101B	1220.70	109.32	1111.80	86.29	22.61	1134.41	89.31	19.59	1131.39	89.40	19.50	1131.30	89.56	19.34	1131.14
MW1101F	1220.90	171.15	1050.00	163.62	7.28	1057.28	165.84	5.06	1055.06	114.90	56.00	1106.00	125.18	45.72	1095.72
MW1101R	1221.20	214.51	1006.70	191.83	22.67	1029.37	194.88	19.62	1026.32	193.41	21.09	1027.79	194.06	20.44	1027.14
MW1101H	1220.70	337.81	878.70	299.51	42.49	921.19	327.84	14.16	892.86	328.91	13.09	891.79	332.55	9.45	888.15
MW1102B	1228.80	91.07	1137.90	68.39	22.51	1160.41	74.26	16.64	1154.54	66.01	24.89	1162.79	64.86	26.04	1163.94
MW1102F	1228.70	177.86	1049.80	155.91	22.99	1072.79	157.51	21.39	1071.19	155.93	22.97	1072.77	156.39	22.51	1072.31
MW1102R	1228.40	205.98	1022.70	201.01	4.69	1027.39	204.14	1.56	1024.26	200.12	5.58	1028.28	200.94	4.76	1027.46
MW1103F	1239.20	181.62	1057.40	162.46	19.34	1076.74	161.32	20.48	1077.88	157.16	24.64	1082.04	157.51	24.29	1081.69
MW1103R	1240.00	200.25	1040.10	188.03	11.87	1051.97	198.52	1.38	1041.48	199.63	0.27	1040.37	199.39	0.51	1040.61
MW1103H	1239.80	340.62	890.40	308.10	41.30	931.70	336.87	12.53	902.93	336.73	12.67	903.07	338.90	10.50	900.90
MW1104F	1230.30	174.12	1056.50	162.46	11.34	1067.84	173.60	0.20	1056.70	173.81	-0.01	1056.49	173.71	0.09	1056.59
MW1104R	1230.70	213.49	1016.70	191.24	22.76	1039.46	204.01	9.99	1026.69	207.07	6.93	1023.63	210.53	3.47	1020.17
PZ1101H	1143.60	247.51	894.30	192.59	56.71	951.01	187.94	61.36	955.66	N/A	N/A	N/A	N/A	N/A	N/A

Well Identification	Top of Casing Elevation (ft asml)	Total Well Depth (ft)	Bottom of Screen Elevation (ft amsl)	August 20, 2012			October 22, 2012			December 17, 2012			February 18, 2013		
				Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)
MW1101B	1220.70	109.32	1111.80	89.58	19.32	1131.12	89.69	19.63	1131.01	88.20	21.12	1132.50	88.38	20.52	1132.32
MW1101F	1220.90	171.15	1050.00	148.50	22.40	1072.40	162.43	8.72	1058.47	164.99	6.16	1055.91	128.27	42.63	1092.63
MW1101R	1221.20	214.51	1006.70	194.57	19.93	1026.63	194.94	19.57	1026.26	195.54	18.97	1025.66	195.73	18.77	1025.47
MW1101H	1220.70	337.81	878.70	333.35	8.65	887.35	334.21	3.60	886.49	333.19	4.62	887.51	333.24	8.76	887.46
MW1102B	1228.80	91.07	1137.90	63.00	27.90	1165.80	63.71	27.36	1165.09	57.17	33.90	1171.63	58.09	32.81	1170.71
MW1102F	1228.70	177.86	1049.80	156.45	22.45	1072.25	156.59	21.27	1072.11	156.54	21.32	1072.16	156.52	22.38	1072.18
MW1102R	1228.40	205.98	1022.70	199.91	5.79	1028.49	198.74	7.24	1029.66	197.50	8.48	1030.90	194.31	11.39	1034.09
MW1103F	1239.20	181.62	1057.40	157.65	24.15	1081.55	157.76	23.86	1081.44	157.79	23.83	1081.41	157.88	23.92	1081.32
MW1103R	1240.00	200.25	1040.10	199.29	0.61	1040.71	199.24	1.01	1040.76	199.20	1.05	1040.80	199.16	0.74	1040.84
MW1103H	1239.80	340.62	890.40	338.43	10.97	901.37	339.31	1.31	900.49	339.36	1.26	900.44	338.80	10.60	901.00
MW1104F	1230.30	174.12	1056.50	173.67	0.13	1056.63	173.81	0.31	1056.49	173.75	0.37	1056.55	173.71	0.09	1056.59
MW1104R	1230.70	213.49	1016.70	211.82	2.18	1018.88	211.53	1.96	1019.17	211.76	1.73	1018.94	211.64	2.36	1019.06
PZ1101H	1143.60	247.51	894.30	170.79	78.51	972.81	167.91	79.60	975.69	166.19	81.32	977.41	164.54	N/A	N/A

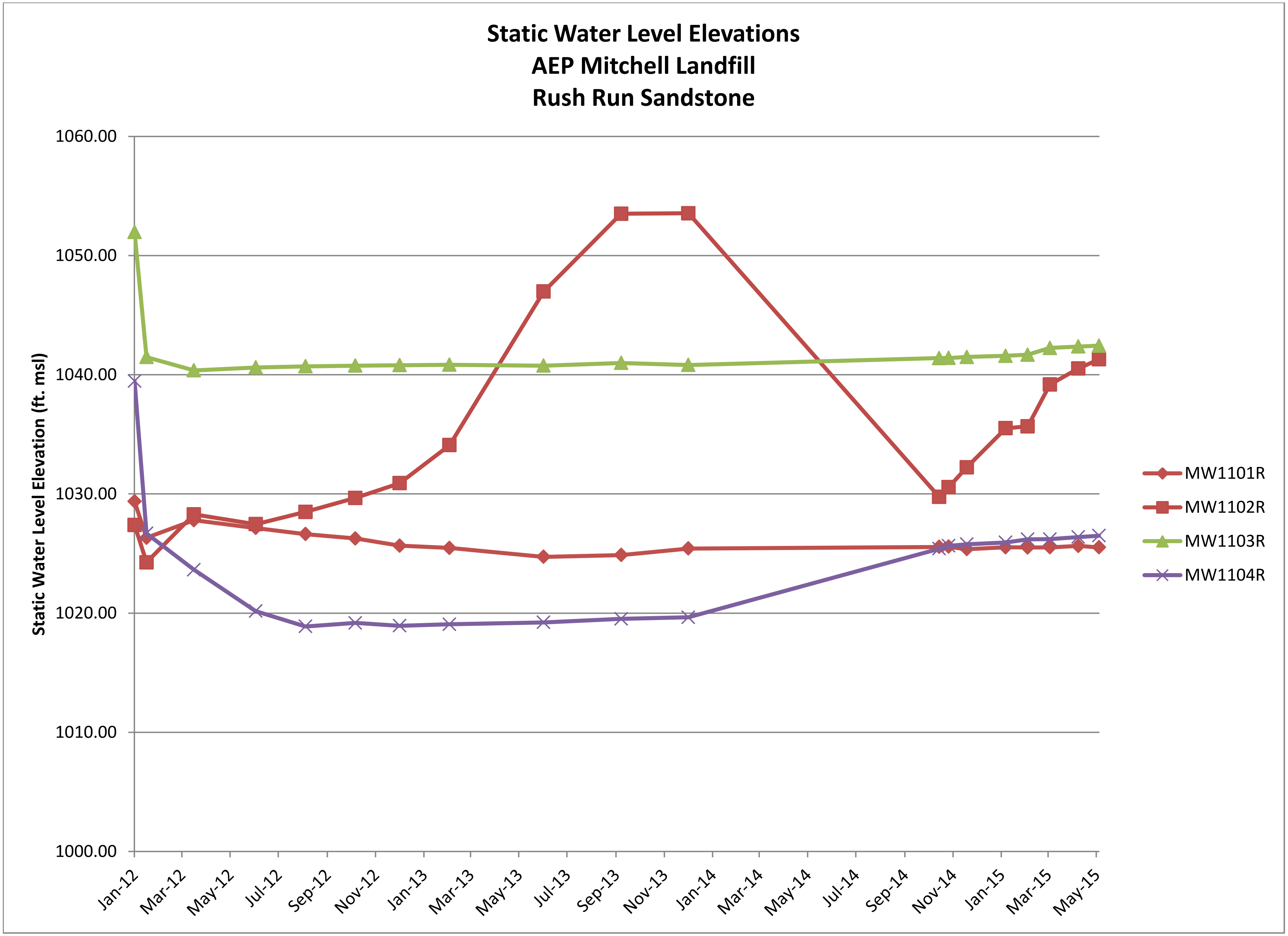
Well Identification	Top of Casing Elevation (ft asml)	Total Well Depth (ft)	Bottom of Screen Elevation (ft amsl)	June 17, 2013			September 23, 2013			December 17, 2013			October 30, 2014		
				Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)
MW1101B	1220.70	109.32	1111.80	88.38	20.94	1132.32	89.44	19.88	1131.26	88.02	21.30	1132.68	89.83	19.49	1130.87
MW1101F	1220.90	171.15	1050.00	128.27	42.88	1092.63	126.44	44.71	1094.46	138.34	32.81	1082.56	139.86	31.29	1081.04
MW1101R	1221.20	214.51	1006.70	195.73	18.78	1025.47	196.33	18.18	1024.87	195.78	18.73	1025.42	195.65	18.86	1025.55
MW1101H	1220.70	337.81	878.70	333.24	4.57	887.46	332.80	5.01	887.90	328.33	9.48	892.37	331.64	6.17	889.06
MW1102B	1228.80	91.07	1137.90	58.09	32.98	1170.71	62.93	28.14	1165.87	57.16	33.91	1171.64	64.36	26.71	1164.44
MW1102F	1228.70	177.86	1049.80	156.52	21.34	1072.18	156.54	21.32	1072.16	156.57	21.29	1072.13	156.68	21.18	1072.02
MW1102R	1228.40	205.98	1022.70	194.31	11.67	1034.09	174.89	31.09	1053.51	174.85	31.13	1053.55	198.64	7.34	1029.76
MW1103F	1239.20	181.62	1057.40	157.88	23.74	1081.32	157.12	24.50	1082.08	156.99	24.63	1082.21	159.21	22.41	1079.99
MW1103R	1240.00	200.25	1040.10	199.16	1.09	1040.84	199.01	1.24	1040.99	199.18	1.07	1040.82	198.60	1.65	1041.40
MW1103H	1239.80	340.62	890.40	338.80	1.82	901.00	337.91	2.71	901.89	337.62	3.00	902.18	333.05	7.57	906.75
MW1104F	1230.30	174.12	1056.50	173.71	0.41	1056.59	173.75	0.37	1056.55	173.74	0.38	1056.56	173.73	0.39	1056.57
MW1104R	1230.70	213.49	1016.70	211.64	1.85	1019.06	211.19	2.30	1019.51	211.05	2.44	1019.65	205.30	8.19	1025.40
PZ1101H	1143.60	247.51	894.30	164.54	82.97	979.06	Piezometer removed			Piezometer removed			Piezometer removed		

Well Identification	Top of Casing Elevation (ft asml)	Total Well Depth (ft)	Bottom of Screen Elevation (ft amsl)	November 11, 2014			December 4, 2014			January 22, 2015			February 19, 2015		
				Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)
MW1101B	1220.70	109.32	1111.80	89.91	19.41	1130.79	89.94	19.38	1130.76	88.65	20.67	1132.05	88.44	20.88	1132.26
MW1101F	1220.90	171.15	1050.00	139.96	31.19	1080.94	140.31	30.84	1080.59	140.60	30.55	1080.30	140.55	30.60	1080.35
MW1101R	1221.20	214.51	1006.70	195.63	18.88	1025.57	195.84	18.67	1025.36	195.68	18.83	1025.52	195.70	18.81	1025.50
MW1101H	1220.70	337.81	878.70	331.24	6.57	889.46	330.61	7.20	890.09	329.13	8.68	891.57	329.10	8.71	891.60
MW1102B	1228.80	91.07	1137.90	64.83	26.24	1163.97	65.32	25.75	1163.48	61.55	29.52	1167.25	61.43	29.64	1167.37
MW1102F	1228.70	177.86	1049.80	156.61	21.25	1072.09	156.92	20.94	1071.78	156.67	21.19	1072.03	156.13	21.73	1072.57
MW1102R	1228.40	205.98	1022.70	197.83	8.15	1030.57	196.17	9.81	1032.23	192.89	13.09	1035.51	192.73	13.25	1035.67
MW1103F	1239.20	181.62	1057.40	158.60	23.02	1080.60	158.37	23.25	1080.83	158.03	23.59	1081.17	158.00	23.62	1081.20
MW1103R	1240.00	200.25	1040.10	198.59	1.66	1041.41	198.51	1.74	1041.49	198.41	1.84	1041.59	198.32	1.93	1041.68
MW1103H	1239.80	340.62	890.40	332.10	8.52	907.70	331.15	9.47	908.65						
MW1104F	1230.30	174.12	1056.50	173.75	0.37	1056.55	173.73	0.39	1056.57	173.74	0.38	1056.56	173.73	0.39	1056.57
MW1104R	1230.70	213.49	1016.70	205.05	8.44	1025.65	204.92	8.57	1025.78	204.77	8.72	1025.93	204.51	8.98	1026.19
PZ1101H	1143.60	247.51	894.30	Piezometer removed			Piezometer removed			Piezometer removed			Piezometer removed		

Well Identification	Top of Casing Elevation (ft asml)	Total Well Depth (ft)	Bottom of Screen Elevation (ft amsl)	March 19, 2015			April 24, 2015			May 20, 2015		
				Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)	Depth to Water (ft)	Water Height (ft)	SWL Elevation (ft amsl)
MW1101B	1220.70	109.32	1111.80	87.49	21.83	1133.21	88.20	21.12	1132.50	89.10	20.22	1131.60
MW1101F	1220.90	171.15	1050.00	111.57	59.58	1109.33	98.32	72.83	1122.58	99.11	72.04	1121.79
MW1101R	1221.20	214.51	1006.70	195.69	18.82	1025.51	195.56	18.95	1025.64	195.69	18.82	1025.51
MW1101H	1220.70	337.81	878.70	327.56	10.25	893.14	326.52	11.29	894.18	325.80	12.01	894.90
MW1102B	1228.80	91.07	1137.90	58.25	32.82	1170.55	59.54	31.53	1169.26	61.96	29.11	1166.84
MW1102F	1228.70	177.86	1049.80	156.64	21.22	1072.06	156.20	21.66	1072.50	156.44	21.42	1072.26
MW1102R	1228.40	205.98	1022.70	189.22	16.76	1039.18	187.87	18.11	1040.53	187.11	18.87	1041.29
MW1103F	1239.20	181.62	1057.40	157.95	23.67	1081.25	157.69	23.93	1081.51	157.22	24.40	1081.98
MW1103R	1240.00	200.25	1040.10	197.75	2.50	1042.25	197.63	2.62	1042.37	197.56	2.69	1042.44
MW1103H	1239.80	340.62	890.40	323.75	16.87	916.05	323.28	17.34	916.52	323.04	17.58	916.76
MW1104F	1230.30	174.12	1056.50	173.72	0.40	1056.58	173.73	0.39	1056.57	173.68	0.44	1056.62
MW1104R	1230.70	213.49	1016.70	204.50	8.99	1026.20	204.32	9.17	1026.38	204.20	9.29	1026.50
PZ1101H	1143.60	247.51	894.30	Piezometer removed			Piezometer removed			Piezometer removed		

Notes:
SWL = Static Water Level
N/A= Unable to obtain reading
amsl = above mean sea level

APPENDIX A



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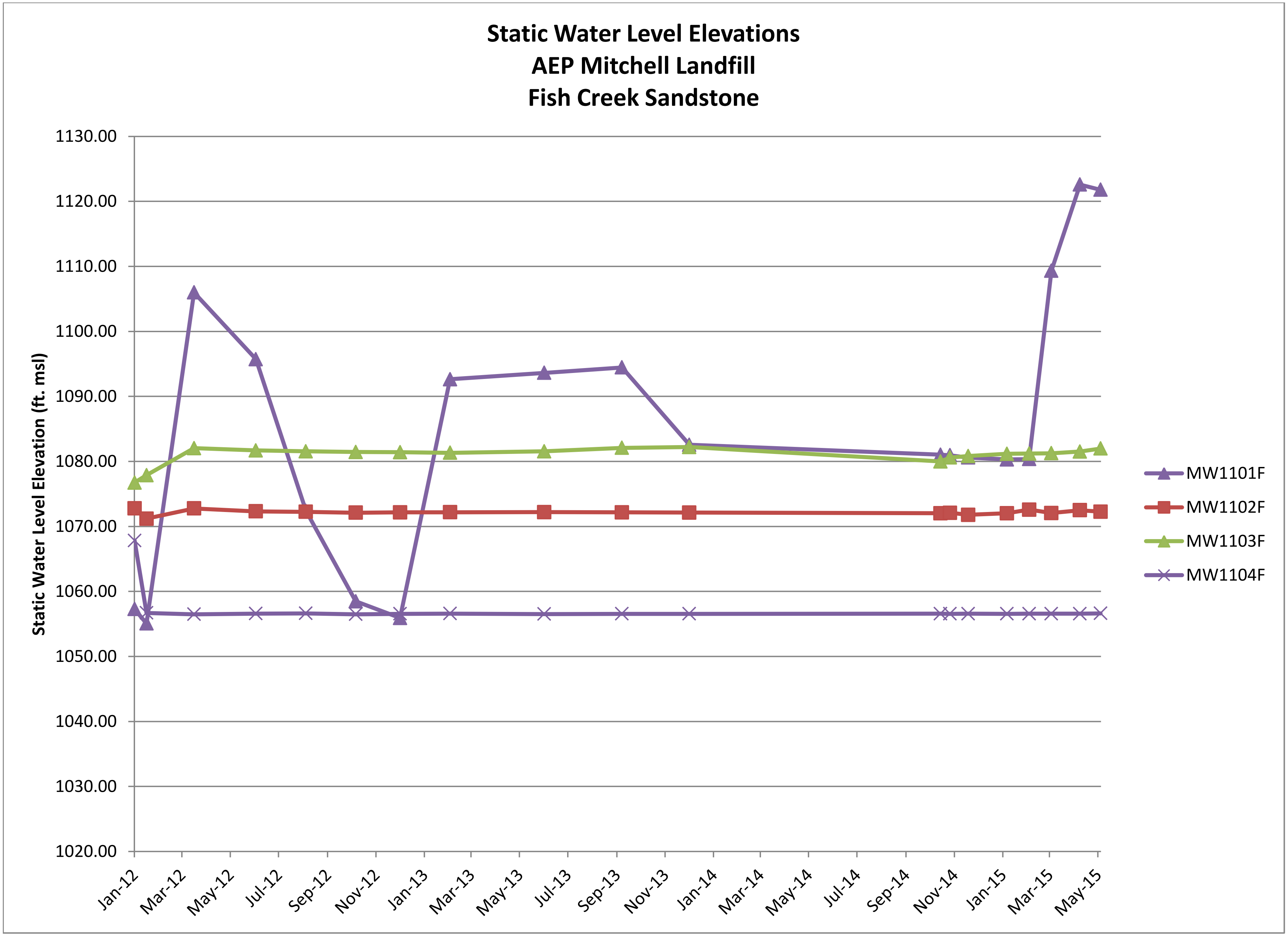

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