Sludge Sedimentation Basins
Location Restrictions Demonstrations

Clover Power Station
Clover, Virginia

August 2018

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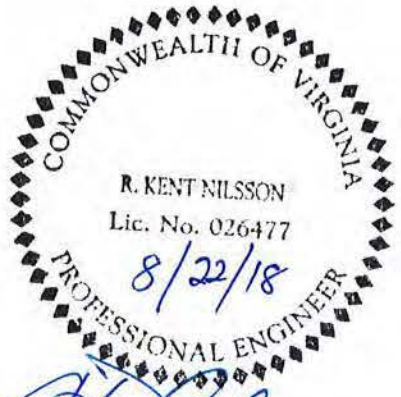
Prepared For
Virginia Electric and Power Company



Jonathan Hotstream
Civil Designer

R. Kent Nilsson, P.E.
Senior Engineer

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List of Appendices

Certification

I, the undersigned Virginia Professional Engineer, hereby certify that I am familiar with the technical requirements of 40 CFR 257 Subpart D. I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of paragraph (a) of in 40 CFR §257.60, 40 CFR §257.61, 40 CFR §257.62, 40 CFR §257.63, and 40 CFR §257.64.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Virginia Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.

COMMONWEALTH OF VIRGINIA
R. KENT NILSSON
Lic. No. 026477
PROFESSIONAL ENGINEER

R. Kent Nilsson, P.E.

026477
Commonwealth of Virginia License Number

Signature of Professional Engineer

8/22/18
Date

Section 1
Background

Virginia Electric and Power Company d/b/a Dominion Virginia Power (Dominion) owns and operates the Clover Power Station[1] (Station). The Station currently operates two Sludge Sedimentation Basins (North and South Basins; basins) that store and manage flue gas desulfurization (FGD) sludge. The basins are therefore considered Coal Combustion Residuals (CCR) surface impoundments as defined in the Environmental Protection Agency's (EPA) final CCR rule (Title 40 Code of Federal Regulations Parts 257 and 261) Subpart D-"Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments." Standards for the Disposal of CCR in Landfills and Surface Impoundments (federal CCR rule). The purpose of this report is to evaluate the compliance of basins at the Station with the location restrictions (Federal Register §257.60 through §257.64) as required by the federal CCR rule. This document includes information from a desktop study, site work, and engineering calculations to evaluate the basins concerning their locations with respect to the uppermost aquifer (§257.60), wetlands (§257.61), fault areas (§257.62), seismic impact zones (§257.63), and unstable areas (§257.64).

Supporting documents are provided in appendices to this report.

1.1 Site Setting

The Station is located on southwest side of the Staunton River in Halifax County, Virginia near the town of Clover. The basins are located on the northeast side of the Station, at approximately latitude 36°52'12.18"N, longitude 78°42'6.03"W.

The United States Geological Survey (USGS) Clover Quadrangle, Virginia 7.5 Minute Series topographic maps from 1982 and 2010, and aerial photo from 2010, were reviewed to evaluate the site setting and conditions (Figures 1 through 3 in Appendix A). Ground elevations near the basins in the topographic maps range from 355 feet to 375 feet North American Vertical Datum of 1988 (NAVD88 increased elevations in National Geodetic Vertical Datum of 1929 by approximately 1 ft to transform to NAVD88, based on a conversion from Vertcon (NGS 2003)).

The site falls within the Piedmont physiographic region composed of low rolling hills representing the coastal plain leading up to the Blue Ridge and Valley and Ridge physiographic units (Bailey 1999).

[1] The Clover Power Station and associated CCR units are jointly and equally owned by Dominion Virginia Power and Old Dominion Electric Cooperative (ODEC).

The interactive geologic map for the state (VDMME 2015; Figure 4 in Appendix B) indicates the area is underlain by Proterozoic and Paleozoic era metamorphic rocks. Specifically, the area is mapped as a mylonite, a highly deformed metamorphic rock. This description is consistent with the high strain zones mapped surrounding the mylonite unit which are representative of conditions during rock formation. The rock at the present time is not susceptible to continued strain under the current conditions. There are no karst features or faults mapped within 200 feet of the basins.

The National Soil Conservation Service Soil Survey for the site maps the area of the impoundments as loamy Udorthents. A Soil Map for Halifax County and the City of South Boston, Virginia (Soil Map) is attached to this document (Appendix C). The site is located in the Piedmont region where the underlying soil units are expected to be residual soils. These conditions were confirmed during the subsurface exploration performed by TRC (boring logs are provided in Sections D-1 and D-2 of Appendix D). Bedrock was not expected within the upper 5 feet based on adjacent soil units on the Soil Map and was not encountered during the subsurface exploration program (soil boring PW-13 was terminated at 50.2 feet below the ground surface due to auger refusal).

Site-specific subsurface information was available from a geotechnical exploration performed for the basin retrofit (TRC 2016; Appendix D-1), borings drilled with the installation of monitoring wells adjacent to the basins (TRC 2016; Appendix D-2), and historical soil borings drilled with the installation of monitoring wells adjacent to the Station (Golder Associates; Appendix D-3). The soil boring data indicates subsurface soils are soft to hard lean clay and fat clay overlying medium stiff to very stiff silt and medium dense to very dense silty sand. The borings were terminated at depths of 20 to 55 feet below the ground surface. Soil boring PW-13 was terminated at 50.2 feet below the ground surface where auger refusal was encountered (Appendix D-2). For the monitoring well borings surrounding the basins (PW-3 and PW-4 in Appendix D-2), standard penetration test refusal was encountered at depths of approximately 30 feet below the ground surface. Soil borings performed near the on-site landfill (Appendix D-3) were advanced into bedrock. This bedrock was described as fractured quartz hornblende gneiss, quartz feldspar gneiss, and mafic metavolcanic rocks ranging from highly to slightly weathered.

1.2 Existing Conditions

The two basins at the Station cover a total area of approximately 4 acres. The basins are located on the eastern side of the station. The existing basin (South Basin) consist of earthen impoundments lined with 30 mil thick Polyvinyl Chloride (PVC) geomembrane liner. The geomembrane liner is protected by a one-foot thick sand layer, and roller compacted concrete on the floor and riprap on the side slopes. The maximum depth of each basin is approximately nine feet with a bottom elevation of 365.4 feet NAVD88 based on the top of concrete. The

surrounding ground is approximately level with the basins on the west and south sides. The South Basin is incised. Earthen berms were constructed to provide containment on the north and east sides of the North Basin. The natural ground slopes down gently to the northeast. The North Basin has been retrofitted with a new liner system and the South Basin will be retrofitted in accordance with 40 CFR §257.102(k)(1) through the removal of CCR materials and the existing liner materials and subsoils, and installation of a composite liner system compliant with 40 CFR §257.72. Refer to Appendix E for the retrofit design.

Section 2
Location Restrictions

The location restrictions required by the federal CCR rule are presented below with a demonstration to show compliance with each restriction. The location restrictions address separation from the uppermost aquifer, wetlands, fault areas, seismic impact zones, and unstable areas. Supporting information for the demonstrations are attached as appendices to this report.

2.1 §257.60 - Separation from the Uppermost Aquifer

The federal CCR rule requires that basins must be constructed with a base that is located no less than 5 feet above the upper limit of the uppermost aquifer. To determine the proximity of the upper limit of the uppermost aquifer in relation to the base of the basins, groundwater elevation data for the monitoring wells surrounding the basins were reviewed for the period of March 1994 through November 2014.

Data from four groundwater monitoring wells installed in 1989, PW-2, PW-3, PW-4 and PW-5 indicate that the elevation of groundwater in the uppermost aquifer has fluctuated by as much as 12 feet over a 22-year period (1994 through 2016), most likely due to seasonal variations (Appendix F). Groundwater potentiometric surface maps were created for 3 different monitoring events (March 1994, September 2003, and April 2010) when the observed groundwater elevation at the upgradient well PW-2 initially suggested a separation distance less than five feet with the retrofit design liner subbase grade (elevation 363.5 feet NAVD88 at the low end of the basins; the bottom of liner for the existing basins is approximately 364 feet NAVD88) during the monitoring period from 1994 through 2016. However, these potentiometric surface maps show that the groundwater level gently slopes from the southwest to the northeast towards the Staunton River. The potentiometric maps also show that the groundwater levels below the basins are deeper with more separation than estimated using the upgradient PW-2 monitoring well elevations. Based on these maps, the April 2010 event presents the highest groundwater levels below the basins (Appendix F). The cross sections on Figure F-2 in Appendix F show the interpreted groundwater level based on the April 20, 2010 observations compared to the existing pond base elevations and the retrofit design subbase elevations. The minimum separation with groundwater is 10 feet from the bottom of the existing liner system at the South Basin (refer to cross section C-C′ on Figure F-2 in Appendix F). For the retrofitted basins, this will correspond to a groundwater separation of approximately 9.5 feet below the lowest point of the retrofitted basins (the pump station).

Based on this evaluation, the base of the existing and retrofitted basins and pump station is located greater than 5 feet above the upper limit of the uppermost aquifer. Therefore, the basins are in compliance with the requirements of §257.60.

2.2 §257.61 - Wetlands

The existing basins were approved and constructed at the same time as the initial construction of the plant. Each basin was lined with a 30-mil thick PVC geomembrane liner, a sand layer, with roller compacted concrete protective armoring on the floor and riprap on the side slopes. The retrofit will occupy the same footprint as the existing basins. The US Fish and Wildlife Service National Wetlands Inventory (2010) was consulted to determine potential impacts on wetlands. There are no wetlands mapped in the vicinity of the basins (Appendix G). Therefore, the basins are not located in wetlands and are in compliance with the requirements of §257.61.

2.3 §257.62 - Fault areas

The federal CCR rule requires that basins cannot be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time (11,700 years ago to present). To determine recent fault activity in the area, the subsurface exploration data and regional geologic history were reviewed.

The Virginia Department of Mines, Minerals, and Energy (VDMME) was contacted (Hatfield 2015) to determine if any geologic mapping showing structural features was available for Halifax County, VA. The VDMME reported that detailed geologic mapping and reporting for Halifax County was not available. However, a geologic report by the VDMME (Kriesa 1980) was provided that describes the bedrock and structural geology of 4 quadrangles (Omega, South Boston, Cluster Springs, and Virgilina) located southeast of the Clover Quadrangle (approximately 15 miles from the site). The information presented by Kriesa (1980) was compared to the VDMME Division of Geology and Mineral Resources Interactive Map (Figure 4 in Appendix B) to confirm that similar rock units and geologic structures are present near the Station basins, and that the areas underwent a similar geologic history.

The geologic maps accompanying the Kriesa VDMME report (1980) show two parallel normal faults and a reverse fault accompanying the north-northeastward-trending Virgilina synclinorium (Appendix B). The faulting observed in the Piedmont region is estimated to have occurred during the Triassic period (190 million to 230 million years ago) based on the age of the rock units deposited in the basins formed by the faulting documented to the south (Kriesa 1980). Figure 4 in Appendix B shows high strain zones of similar age (Triassic or older) over 2,000 feet from the Station basins. Considering the structural geology of this region, the

Allegheny orogeny is the most recent mountain building event and it occurred between 320 million years ago to 250 million years ago in the late Paleozoic Era (USGS 2015).

No evidence of active faulting during the Holocene within 200 feet of the Station basins has been identified; therefore, the basin locations are in compliance with the requirements of §257.62.

2.4 §257.63 - Seismic Impact Zones

The USGS Earthquake Hazards Program was consulted to determine the earthquake hazard for the site. The 2015 National Earthquake Hazards Reduction Program U.S. seismic design maps website (USGS 2015; Appendix H) indicates a mapped peak ground acceleration of 0.07g. Using the default site adjustment factor results in a design peak ground acceleration of 0.113g, refer to Appendix H. This design peak ground acceleration is above the 0.1g lower limit defined by the federal CCR rule for seismic impact zones; therefore, this site is located in a seismic impact zone as defined in §257.53. Because the site is located in a seismic impact zone, the design of the basin retrofit was developed by analyzing the design peak ground acceleration of 0.113g for the liner system and CCR removal system. The retrofit design uses the existing basin geometry and slightly increases the basin depth. Inasmuch as the retrofit design is seismically stable, it confirms the seismic design of the existing basins. The design computations result in satisfactory factors of safety for the peak ground acceleration loading conditions of 0.113g; therefore, the basins are in compliance with the requirements of §257.63.

2.5 §257.64 - Unstable Areas

Risks presented by unstable areas caused by soil conditions, geologic or geomorphologic features, and human made features must be evaluated to be in compliance with the federal CCR rule. This analysis was performed by evaluating the results of a geotechnical exploration at the basins (TRC 2016; Appendix D-1), reviewing the site geology and topography, and evaluating surrounding human impacts.

The geotechnical exploration performed at the site observed medium stiff to very stiff to hard lean clay, fat clay, and silt overlying medium dense to very dense silty sand to termination of soil borings at 20 to 50.2 feet below the ground surface. As discussed in Section 1.1, standard penetration test refusal was encountered at depths of approximately 30 feet below the ground surface in soil borings performed adjacent to the basins. These observations do not suggest unstable foundation conditions considering the existing and proposed loading conditions.

The basins were designed and constructed with engineered fill which was placed and compacted to project specifications. In addition, the geomembrane of the existing ponds and the liner system of the retrofitted ponds, will prevent the impounded water from weakening the

foundation soils. The constructed berms have been performing as originally designed for over 20 years with no indication of weakening, sloughing, poor performance, or differential settlement. Design of the basin retrofit included global stability analysis of the berms under the direction of a professional engineer. This analysis resulted in satisfactory factors of safety. Based on the subsurface conditions, unstable conditions due to foundation soils and bedrock are not present at the site. Excerpts from the geotechnical report are attached (Appendix D-1).

Geological and geomorphological information was also reviewed to determine potential unstable conditions at the site. The metamorphic bedrock mapped in the area is not susceptible to solution or formation of sinkholes. Differential settlement has not been observed at the site. From a geomorphological standpoint, the site is located outside of the alluvial valley of the Staunton River (John H. Kerr Reservoir); therefore, soft or loose alluvial soils are not anticipated below the basins. The subsurface exploration encountered residual soils and saprolite near the basins which confirms the stable foundation soil conditions. No unstable conditions are present due to the surrounding geological and geomorphological conditions.

Human impacts were considered for the unstable area evaluation. No significant change in elevation is observed between the two topographic maps (Appendix A) that would suggest uncontrolled filling of the area. In addition, the subsurface exploration did not document unstable soil conditions. There were no mining or gravel pits documented on the topographic map (Appendix A) or Soil Survey map (Appendix C).

Based on these analyses, the basins are not located in an unstable area. The basins are in compliance with the requirements of §257.64.

Section 3
Conclusions

Based upon the demonstrations provided in this report, the existing and retrofitted sludge sedimentation basins at the Station are in compliance with the location restrictions required by the EPA's final CCR rule. No additional action or justification is required after this document has been placed in the operating record, posted to the publicly accessible website, and government notifications have been provided.

Section 4
References

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Appendix A
Topographic Maps

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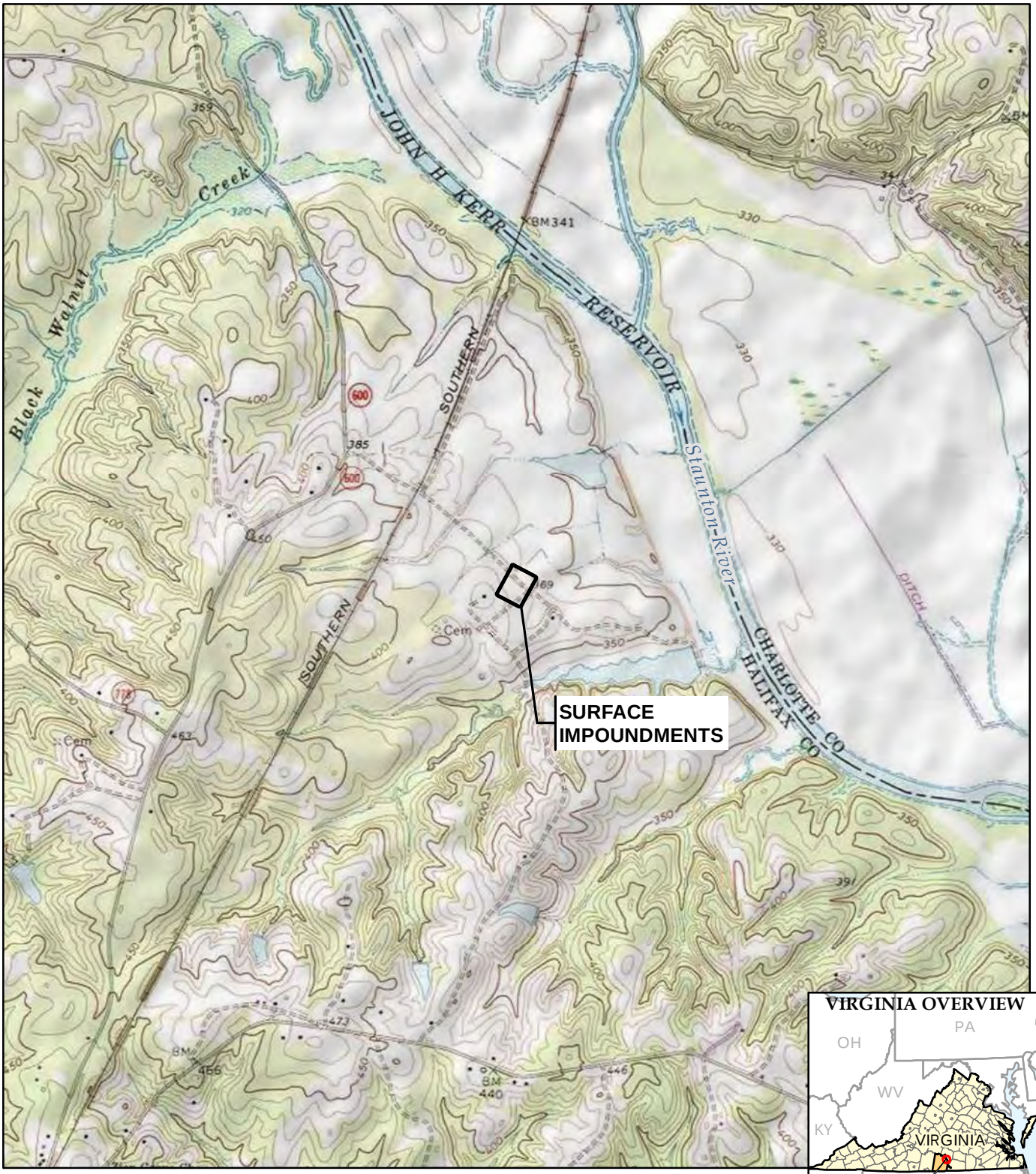

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES, 1982.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000
FEET

TRC

Patewood Plaza One, Suite 300
30 Patewood Drive
Greenville, SC 29615
Phone: 864.281.0030

DOMINION
CLOVER POWER STATION
CLOVER, HALIFAX COUNTY, VIRGINIA

SITE LOCATION MAP

DRAWN BY:	RHODE B
APPROVED BY:	RKN
PROJECT NO:	232002
FILE NO.	232002-001slm.mxd
DATE:	MAY 2016

E:\Dominion\Clover\VA\2015_232002\232002-001slm.mxd

FIGURE 1

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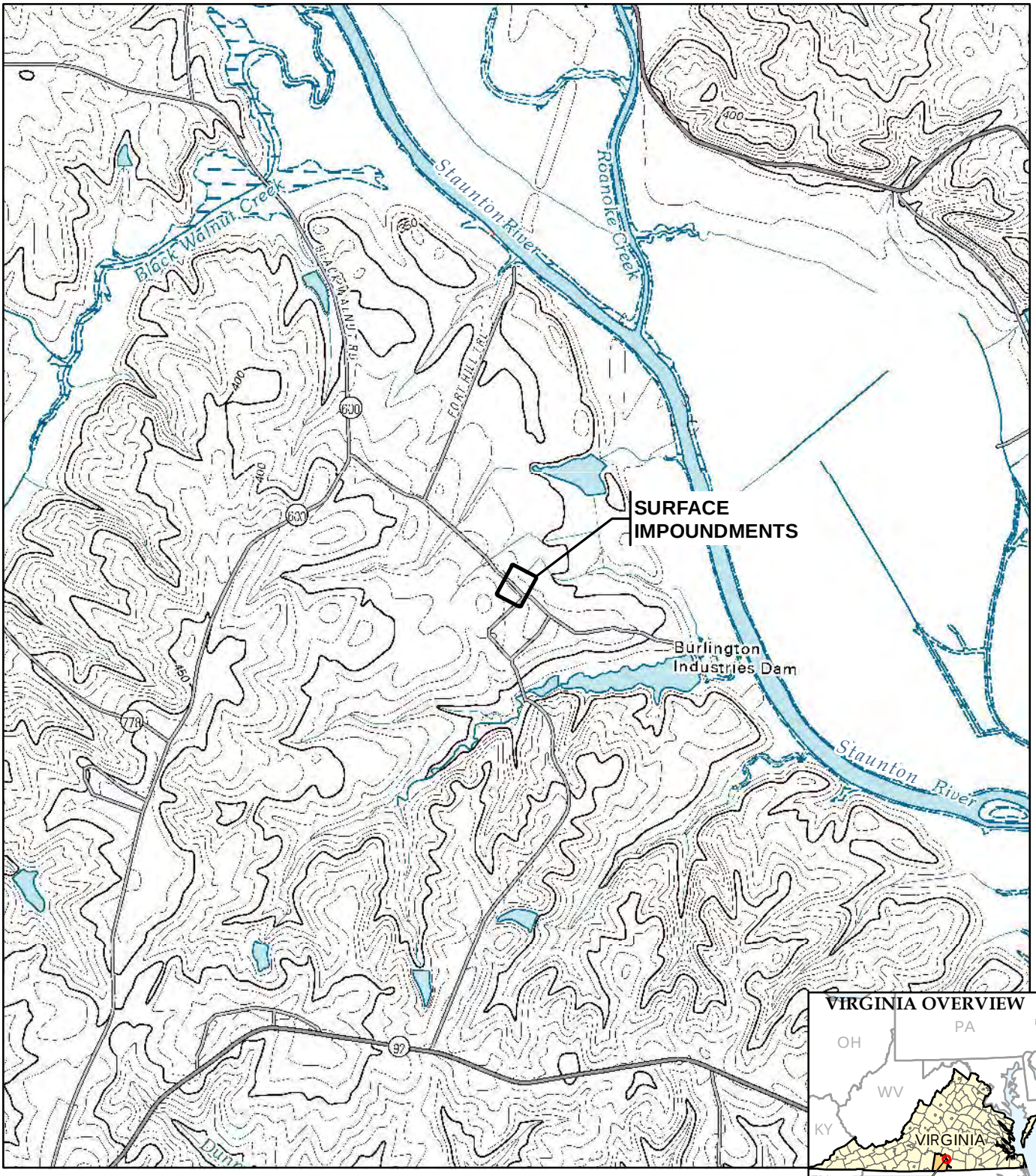

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES, 2010.

N

1 " = 2,000 '
1:24,000

0 2,000 4,000
FEET

TRC

Patewood Plaza One, Suite 300
30 Patewood Drive
Greenville, SC 29615
Phone: 864.281.0030

DOMINION
CLOVER POWER STATION
CLOVER, HALIFAX COUNTY, VIRGINIA

SITE LOCATION MAP

DRAWN BY:	RHODE B
APPROVED BY:	RKN
PROJECT NO:	232002
FILE NO.	232002-002slm.mxd
DATE:	MAY 2016

FIGURE 2

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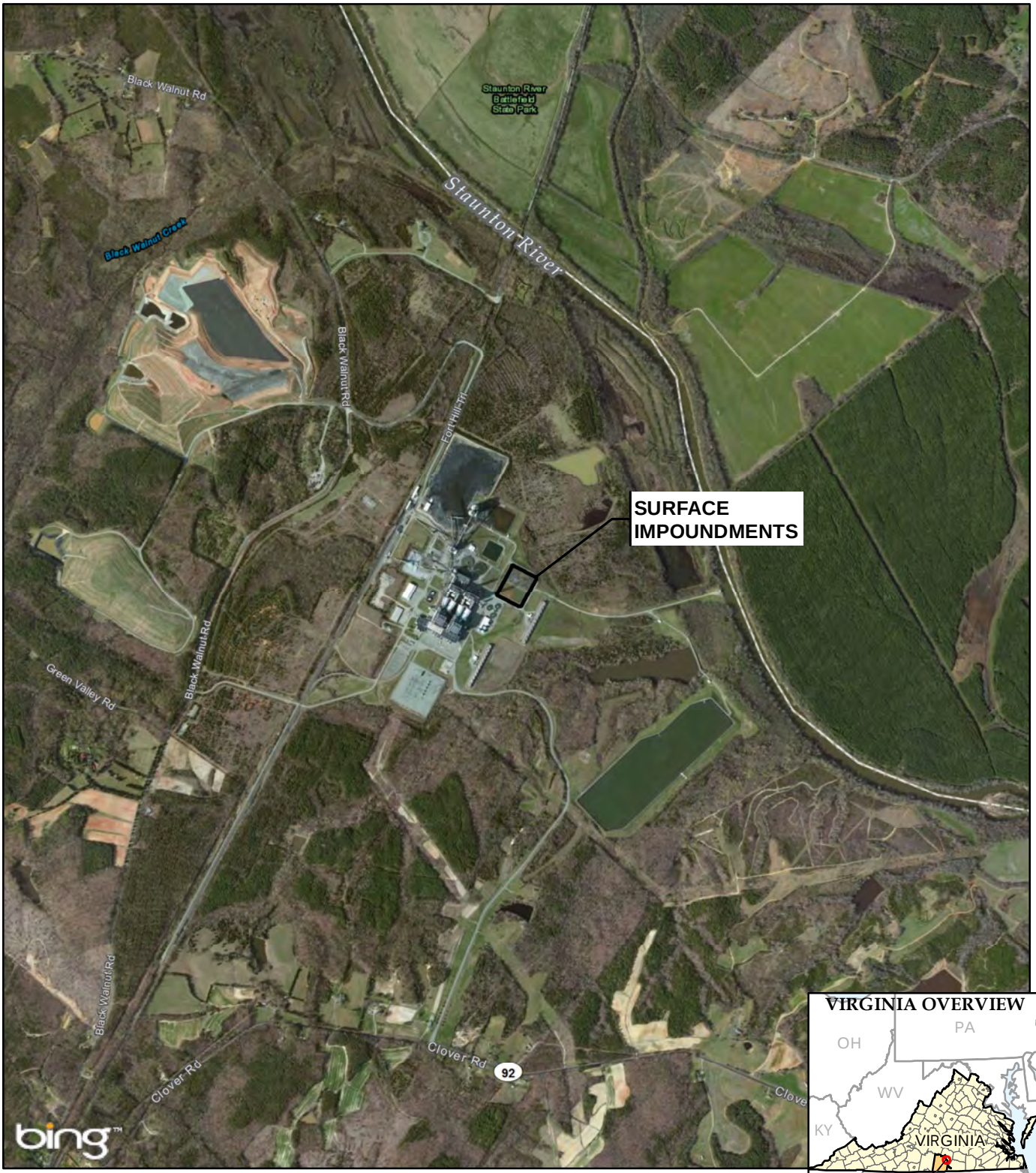

BASE MAP IMAGERY FROM ESRI/BING, 2010.

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FEET

E:\Dominion\Clover\VA\2015_232002\232002-003slm.mxd

TRC

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30 Patewood Drive
Greenville, SC 29615
Phone: 864.281.0030

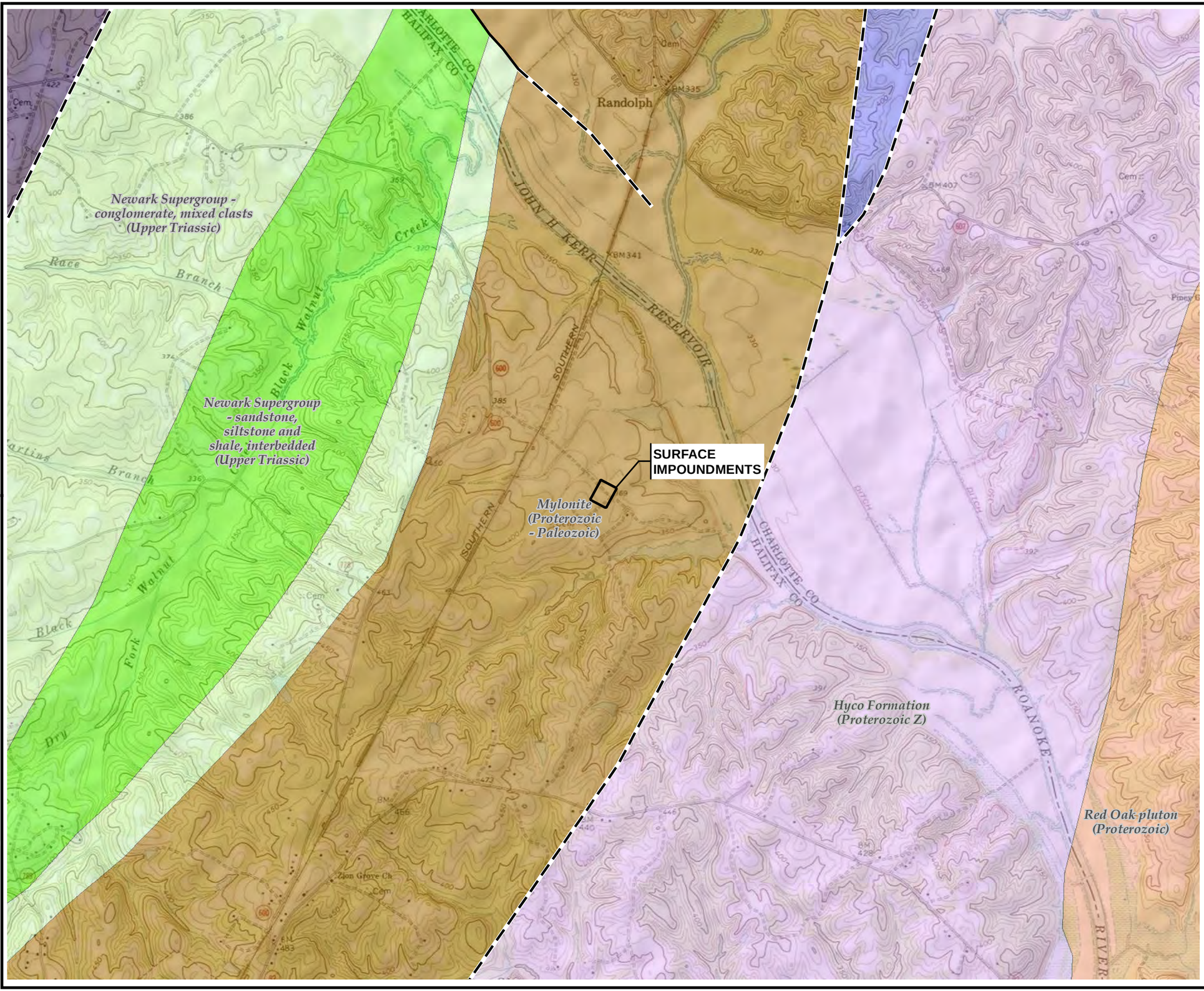
DOMINION
CLOVER POWER STATION
CLOVER, HALIFAX COUNTY, VIRGINIA

SITE LOCATION MAP

DRAWN BY:	RHODE B
APPROVED BY:	RKN
PROJECT NO:	232002
FILE NO.	232002-003slm.mxd
DATE:	MAY 2016

FIGURE 3

Appendix B
Bedrock Geology Maps



LEGEND

FAULTS

- DUCTILE HIGH-STRAIN ZONE
- GENERIC FAULT

BEDROCK UNIT DESCRIPTIONS

- HYCO FORMATION
- INTERLAYERED MAFIC AND FELSIC METAVOLCANIC ROCKS - QUARTZOFELDSPATHIC BIOTITE GNEISS
- MYLONITE
- NEWARK SUPERGROUP - CONGLOMERATE, MIXED CLASTS
- NEWARK SUPERGROUP - SANDSTONE, SILTSTONE AND SHALE, INTERBEDDED
- RED OAK PLUTON
- MIGMATITIC PARAGNEISS

NOTES

1. BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.
2. GEOLOGIC INFORMATION FROM VIRGINIA DEPARTMENT OF MINES MINERALS AND ENERGY, GEOLOGY AND MINERAL RESOURCES WEB MAPPING SERVICE.

1 " = 2,000 '
1:24,000

PROJECT:
DOMINION
CLOVER POWER STATION
CLOVER, HALIFAX COUNTY, VIRGINIA

TITLE:
GEOLOGIC MAP

DRAWN BY:	PAPEZ J	PROJ NO.:	232002
CHECKED BY:	JNH		
APPROVED BY:	RKN		**FIGURE 4**
DATE:	MAY 2016		

TRC
30 Patewood Drive
Patewood Plaza One, Suite 300
Greenville, SC 29615
Phone: 864.281.0030
www.trcsolutions.com

FILE NO.: 232002-005.mxd

TRC - GIS
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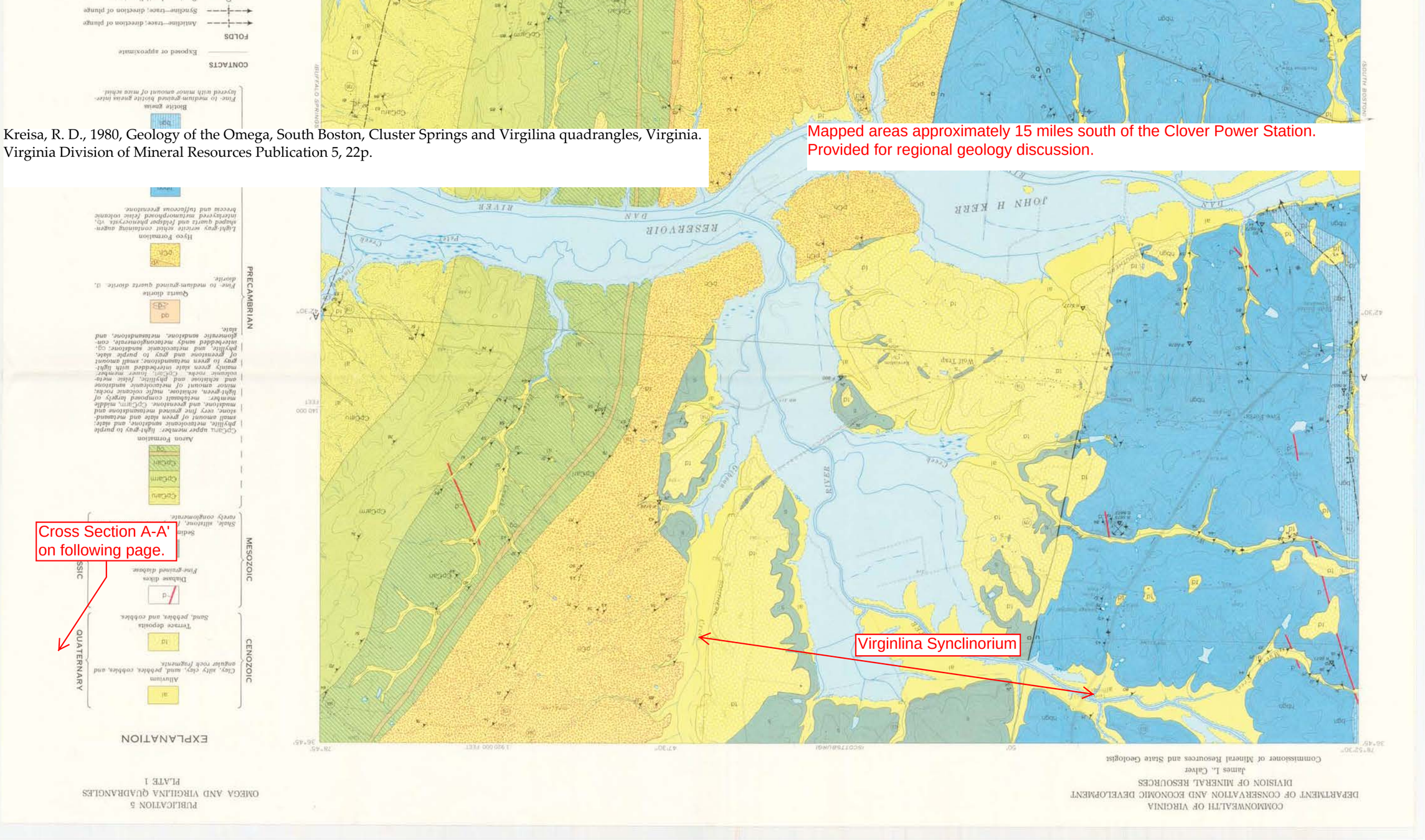
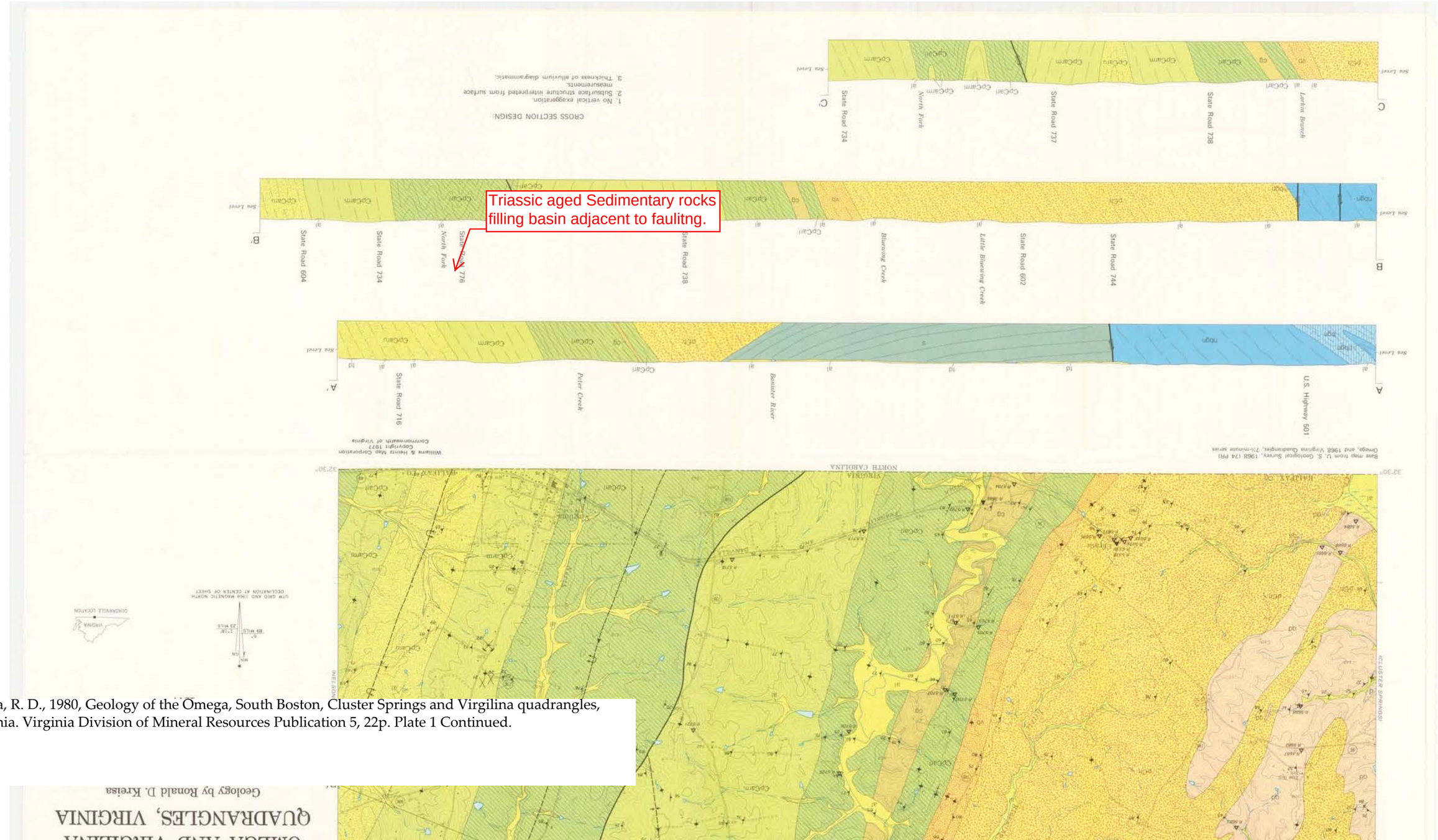


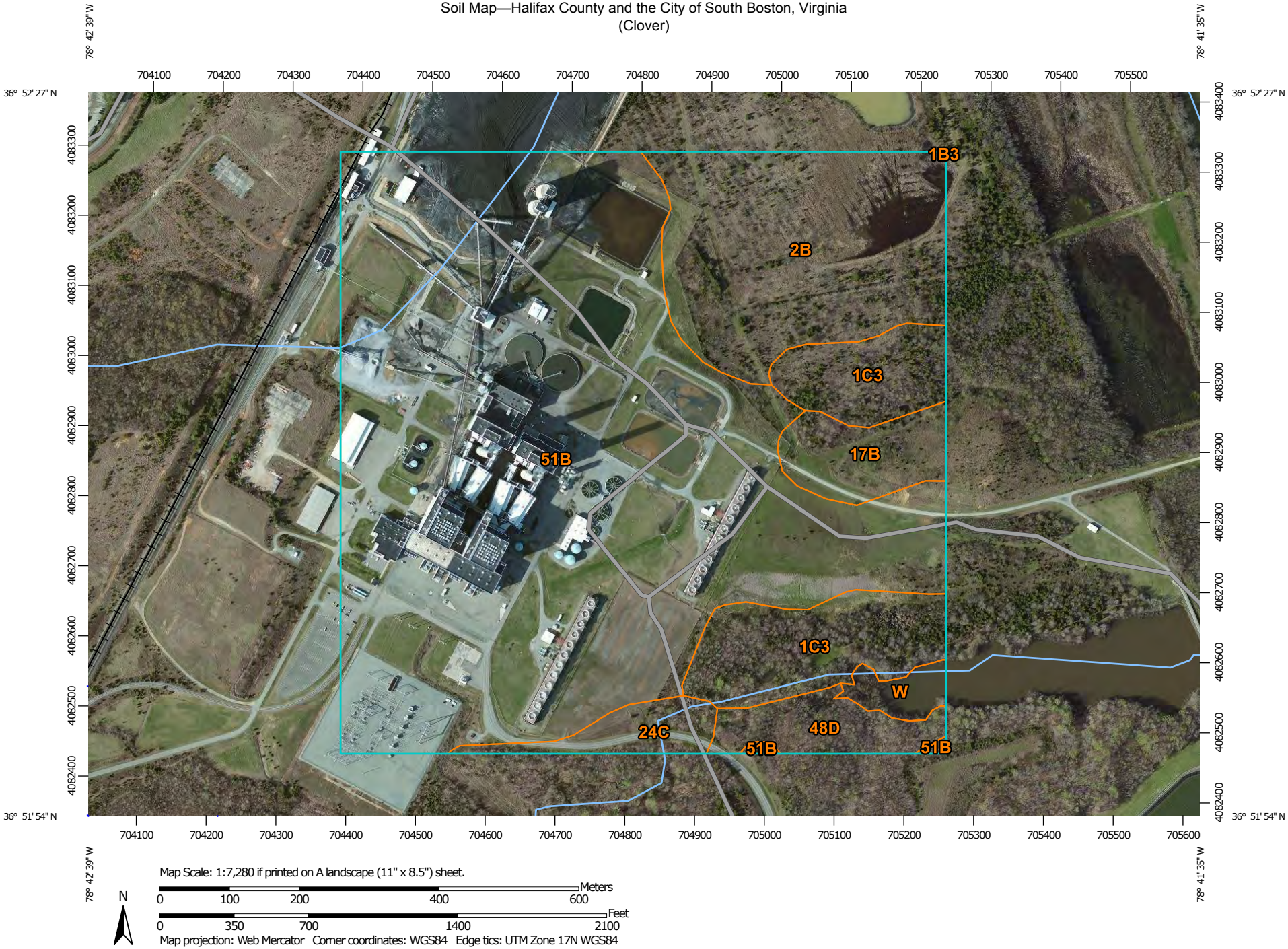
Kreisa, R. D., 1980, Geology of the Omega, South Boston, Cluster Springs and Virgilina quadrangles, Virginia. Virginia Division of Mineral Resources Publication 5, 22p.



Kreisa, R. D., 1980, Geology of the Omega, South Boston, Cluster Springs and Virgilina quadrangles, Virginia. Virginia Division of Mineral Resources Publication 5, 22p. Plate 1 Continued.

Appendix C
Soil Survey Map by Natural Resources Conservation Service

Soil Map—Halifax County and the City of South Boston, Virginia
(Clover)



Map Scale: 1:7,280 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Halifax County and the City of South Boston, Virginia
Survey Area Data: Version 13, Dec 13, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 10, 2010—Apr 4, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Halifax County and the City of South Boston, Virginia (VA083)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1B3	Appomattox clay loam, 2 to 8 percent slopes, severely eroded	0.0	0.0%
1C3	Appomattox clay loam, 8 to 15 percent slopes, severely eroded	17.9	9.7%
2B	Banister-Kinkora complex, 0 to 4 percent slopes, rarely flooded	28.1	15.2%
17B	Danripple sandy loam, 2 to 8 percent slopes, very rarely flooded	6.2	3.4%
24C	Halifax sandy loam, 8 to 15 percent slopes	4.0	2.1%
48D	Toast sandy loam, 15 to 25 percent slopes	5.4	2.9%
51B	Udorthents loamy, 2 to 8 percent slopes	121.1	65.5%
W	Water	2.1	1.2%
Totals for Area of Interest		**184.9**	**100.0%**

Table 15.—Engineering Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
1B3:											
Appomattox------	0-8	Clay loam	CL	A-6	0	85-100	80-100	75-100	55-80	35-52	18-28
	8-54	Clay, clay loam, sandy clay, sandy clay loam	CL, SC, CH	A-6, A-7	0-5	85-100	80-100	65-100	30-95	31-67	13-44
	54-79	Loam, sandy loam, clay	SC-SM, SC	A-2, A-4	0-5	85-100	80-100	50-100	25-95	16-57	2-36
1C3:											
Appomattox------	0-8	Clay loam	CL	A-6	0	85-100	80-100	75-100	55-80	35-52	18-28
	8-54	Clay, clay loam, sandy clay, sandy clay loam	CL, SC, CH	A-6, A-7	0-5	85-100	80-100	65-100	30-95	31-67	13-44
	54-79	Loam, sandy loam, clay	SC-SM, SC	A-2, A-4	0-5	85-100	80-100	50-100	25-95	16-57	2-36
2B:											
Banister--------	0-14	Loam	CL-ML, SM, SC-SM, ML, CL	A-4	0	85-100	80-100	65-95	45-75	20-40	3-18
	14-58	Clay, clay loam, sandy clay, silty clay loam, silty clay, sandy clay loam	SC, CL, CH	A-7, A-2-6	0	85-100	80-100	65-100	30-95	31-67	13-44
	58-65	Clay loam, sand, loamy sand, sandy loam, loam, sandy clay loam, gravelly sand	SC, CL	A-7, A-2-6	0	75-100	65-100	30-100	5-80	0-50	NP-29

Table 15.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
2B:											
Kinkora---------	0-4	Silt loam	CL, CL-ML, SC-SM	A-4, A-6	0	85-100	80-100	70-100	55-90	21-43	6-18
	4-45	Silty clay, clay, sandy clay, clay loam, silty clay loam, sandy clay loam	CH, CL	A-7	0	85-100	80-100	60-100	60-95	31-67	13-44
	45-62	Sandy loam, sandy clay loam, clay loam, silty clay loam, silt loam	CL, GC-GM, CL-ML, SM	A-1, A-6, A-4	0	85-100	80-100	50-100	25-95	18-50	2-29
3B:											
Bentley---------	0-17	Loamy sand	SC-SM, SM	A-2	0-2	85-100	80-100	40-75	10-30	17-30	2-9
	17-23	Sandy loam, loamy sand, fine sandy loam, loam, sandy clay loam, clay loam, gravelly sandy loam	SC, CL, CL-ML	A-2, A-4	0	65-100	50-100	25-100	8-80	16-32	2-13
	23-61	Clay, sandy clay, clay loam, sandy clay loam, gravelly sandy clay loam	CH, CL, SC	A-6, A-7	0	65-100	50-100	40-100	18-95	31-72	13-47
	61-80	Sandy clay, clay, sandy clay loam, gravelly sand	CH, CL, SC	A-6, A-7	0	65-100	50-100	25-100	2-95	0-67	NP-44

Table 15.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
15A:											
Comus	0-10	Fine sandy loam	SM, SC-SM	A-2, A-4	0	95-100	90-100	65-85	35-55	16-33	2-12
	10-35	Fine sandy loam, sandy loam, loam	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	95-100	90-100	55-95	25-75	16-30	2-12
	35-65	Loamy sand, loamy fine sand, sandy loam, fine sandy loam, sand	CL, CL-ML, ML, SC, SC-SM, SM	A-1, A-2-4, A-4	0	95-100	90-100	45-85	4-55	0-30	NP-12
16A:											
Dan River	0-9	Loam	CL, CL-ML	A-6	0	90-100	85-100	70-95	50-75	22-43	6-17
	9-30	Loam, fine sandy loam	CL-ML, ML, SC, CL	A-4, A-6	0	90-100	85-100	60-95	35-75	16-39	2-19
	30-56	Sandy clay loam, clay loam	CL, SC	A-6	0	90-100	85-100	65-100	30-80	29-44	13-25
	56-62	Sandy loam, fine sandy loam, loamy fine sand, loamy sand, sand	SM, SC	A-2, A-1, A-4	0	90-100	85-100	40-85	4-55	0-31	NP-13
17B:											
Danripple	0-10	Sandy loam	SC	A-6	0	90-100	80-100	50-70	25-40	22-37	6-13
	10-48	Clay, clay loam, sandy clay, sandy clay loam	CH, CL	A-6, A-7	0	90-100	85-100	70-100	30-95	37-63	19-40
	48-72	Sandy clay loam, clay loam, loam, sandy loam, gravelly sandy loam	CL	A-6, A-7	0	70-100	60-100	35-100	20-80	22-48	6-27
18B:											
Delila	0-8	Sandy loam	SC	A-2, A-4, A-6	0	90-100	80-100	50-70	25-40	17-35	2-12
	8-30	Clay, sandy clay, clay loam	CH, CL, SC	A-6, A-7	0	90-100	80-100	70-100	40-95	39-63	21-40
	30-65	Sandy loam, sandy clay loam, clay loam	CL, SC	A-2, A-4, A-6, A-7	0	90-100	80-100	50-100	25-80	18-41	2-21

Table 15.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
23E:											
Montonia--------	0-8	Channery silt loam	CL-ML, CL	A-6	0-12	70-85	60-75	50-75	35-70	22-43	7-18
	8-30	Channery clay loam, channery silty clay loam, very channery loam	CL, GC, SC	A-6	0-25	60-85	50-75	40-75	30-70	20-44	6-25
	30-41	Bedrock			---	---	---	---	---	---	---
	41-51	Bedrock			---	---	---	---	---	---	---
24B:											
Halifax---------	0-13	Sandy loam	SC, SC-SM, SM	A-2, A-4	0-3	85-100	80-100	50-70	25-40	17-35	2-13
	13-58	Clay, sandy clay, clay loam, sandy clay loam	CH	A-7	0	85-100	80-100	65-100	30-95	41-69	21-44
	58-65	Clay loam, sandy clay loam, loam, sandy loam, fine sandy loam, loamy sand	SC-SM, SC	A-6, A-4	0	85-100	80-100	40-100	10-80	0-44	NP-25
24C:											
Halifax---------	0-13	Sandy loam	SC, SC-SM, SM	A-2, A-4	0-3	85-100	80-100	50-70	25-40	17-35	2-13
	13-58	Clay, sandy clay, clay loam, sandy clay loam	CH	A-7	0	85-100	80-100	65-100	30-95	41-69	21-44
	58-65	Clay loam, sandy clay loam, loam, sandy loam, fine sandy loam, loamy sand	SC, SC-SM	A-6, A-4	0	85-100	80-100	40-100	10-80	0-44	NP-25
25B:											
Herndon---------	0-8	Silt loam	ML	A-4	0	90-100	85-100	75-100	60-90	9-25	NP-3
	8-57	Clay, silty clay, silty clay loam, clay loam	ML	A-5	0	95-100	85-100	75-100	60-95	25-52	3-13
	57-65	Silt loam, loam, silty clay loam	ML	A-4	0	95-100	85-100	70-100	50-95	13-25	NP-3

Table 15.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
47D:											
Badin----------	0-2	Silt loam	CL	A-4, A-6	0-2	85-95	80-92	70-90	55-80	24-43	7-18
	2-6	Silt loam, channery silt loam, channery loam	CL, ML	A-4, A-6	0-2	60-97	50-92	40-90	30-80	18-37	3-19
	6-25	Silty clay loam, clay, silty clay, clay loam, channery silty clay loam	CL	A-7	0-2	60-97	50-92	45-90	35-85	37-63	19-40
	25-38	Very channery silty clay loam, clay loam, silt loam, channery silty clay loam	CL, GC	A-2	0-2	40-75	25-70	20-70	18-65	24-50	7-29
	38-48	Bedrock			---	---	---	---	---	---	---
	48-58	Bedrock			---	---	---	---	---	---	---
48D:											
Toast----------	0-6	Sandy loam	SC-SM, SM	A-2, A-4	0-3	85-100	80-100	50-70	25-40	9-20	NP-2
	6-12	Sandy loam, coarse sandy loam, loam	SC-SM, SM	A-2, A-4	0-3	85-100	80-100	45-95	20-75	9-20	NP-2
	12-38	Clay, sandy clay loam, clay loam, sandy clay	ML	A-4, A-6	0	85-100	80-100	65-100	30-95	25-45	3-11
	38-65	Sandy loam, sandy clay loam, loam, loamy sand	SM	A-2, A-4	0	85-100	80-100	40-95	12-75	9-25	NP-3
49A:											
Toccoa----------	0-12	Fine sandy loam	SM, CL-ML	A-4	0	90-100	80-100	55-85	30-55	0-30	NP-10
	12-62	Fine sandy loam, loam, sandy loam, loamy sand, sand	ML, SC-SM	A-2, A-4	0	90-100	80-100	40-95	4-75	0-31	NP-13

Table 15.—Engineering Properties—Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
50B:											
Turbeville------	0-8	Loam, fine sandy loam	SM	A-4	0-2	85-100	80-100	70-95	30-50	8-19	NP-1
	8-60	Clay, sandy clay, clay loam, sandy clay loam	ML	A-4	0	90-100	85-100	70-100	30-95	30-49	5-12
50C:											
Turbeville------	0-8	Loam, fine sandy loam	SM	A-4	0-2	85-100	80-100	70-95	30-50	8-19	NP-1
	8-60	Clay, sandy clay, clay loam, sandy clay loam	ML	A-4	0	90-100	85-100	70-100	30-95	30-49	5-12
51B. Udorthents											
52B. Urban land											
53B:											
Virgilina-------	0-3	Gravelly silt loam	CL, CL-ML, ML, SM, SC	A-4	0-3	75-85	65-75	60-75	45-70	17-35	2-13
	3-11	Gravelly silt loam, gravelly loam	CL, CL-ML, ML, SM, SC	A-4	0-3	75-85	65-75	55-75	40-70	16-31	2-13
	11-32	Clay, silty clay, silty clay loam	CH	A-7	0	90-100	85-100	75-100	65-95	47-75	25-48
	32-42	Bedrock			---	---	---	---	---	---	---
54B:											
Virgilina-------	0-3	Gravelly silt loam	CL, CL-ML, ML, SM, SC	A-4	0-3	75-85	65-75	60-75	45-70	17-35	2-13
	3-11	Gravelly silt loam, gravelly loam	CL, CL-ML, ML, SM, SC	A-4	0-3	75-85	65-75	55-75	40-70	16-31	2-13
	11-32	Clay, silty clay, silty clay loam	CH	A-7	0	90-100	85-100	75-100	65-95	47-75	25-48
	32-42	Bedrock			---	---	---	---	---	---	---

Appendix D
Site Specific Subsurface Data

Table of Contents

Appendix D-1
Excerpts from Geotechnical Exploration (TRC 2016)

TEST BORING LOG

PROJECT: DOMINION CLOVER STATION
LOCATION: CLOVER, VA

BORING	**B-1**
G.S. ELEV.	373
FILE	232002
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	E. CARUSO
HELPER	C. SMART
INSPECTOR	C. HURT
DATE STARTED	06/29/2015
DATE COMPLETED	06/29/2015

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				0.4 ***BROWN SILTY TOPSOIL*** 372.6		
	S-1	3 5 9 9		***BROWN LEAN CLAY (CL), SOME BLACK INTERLAYERING, SM SILT, TR F/M SAND, VERY STIFF***		
	S-2	8 11 11 11				
5	S-3	9 9 12 16		6.0 367.0		
	S-4	5 8 12 12				
	S-5	11 12 13 12				
10				***BROWN TO GREENISH BROWN SILT WITH SAND (ML), SM MICA FLAKES, TR F/M SAND, STIFF TO VERY STIFF***		
15	S-6	5 5 5 7				
20	S-7	5 6 17 25		20.0 353.0		
				END OF BORING AT 20'		
25						
30						
35						

N: 3476286.6, E: 11423670.3

DRN.	CJH
CKD.	MLG

NEW PROJECTS TEST BORING LOG 232002_DOMINION CLOVER STATION.GPJ SITE BLAUVELT.GDT 6/9/16

TEST BORING LOG

PROJECT: DOMINION CLOVER STATION
LOCATION: CLOVER, VA

BORING	**B-2**
G.S. ELEV.	374
FILE	232002
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	E. CARUSO
HELPER	C. SMART
INSPECTOR	C. HURT
DATE STARTED	06/29/2015
DATE COMPLETED	06/29/2015

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				0.4 ***BROWN SILTY TOPSOIL*** 373.6		
				1.0 ***BROWN TO WHITE SILT, TR M/F SAND*** 373.0		
	S-1	8 9 10 12				
	S-2	10 15 20 22		***RED FAT CLAY (CH), MOTTLED YELLOWISH BROWN, TR M/C SAND, VERY STIFF TO HARD***		PP = 4.5 TSF
5	S-3	14 12 13 16		6.0 368.0		
	S-4	8 8 9 10				PP = 4.0 TSF
	S-5	9 10 11 14		***RED TO BROWN FAT CLAY (CH), SM SILT, TR F/M SAND, VERY STIFF***		PP = 3.0 TSF
10				13.0 361.0		
15	S-6	16 19 23 26		***BLACK TO BROWN MICACEOUS F/M SANDY SILT (ML), VERY STIFF TO HARD***		
	S-7	9 10 13 13		20.0 354.0		
				END OF BORING AT 20'		
20						
25						
30						
35						

N: 3476530.4, E: 11423799.8

DRN.	CJH
CKD.	MLG

NEW PROJECTS TEST BORING LOG 232002_DOMINION CLOVER STATION.GPJ SITE BLAUVELT.GDT 6/9/16

TEST BORING LOG

PROJECT: DOMINION CLOVER STATION
LOCATION: CLOVER, VA

BORING	**B-3**
G.S. ELEV.	373
FILE	232002
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	E. CARUSO
HELPER	C. SMART
INSPECTOR	C. HURT
DATE STARTED	06/29/2015
DATE COMPLETED	06/29/2015

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				0.7 ***BLACK SILTY TOPSOIL*** 372.3		
	S-1	6 9 13 16				ROCK FRAGMENT AT 2 FT
	S-2	10 10 12 15		***RED FAT CLAY (CH), BROWN TO WHITE MOTTLING, SM SILT, TR F/M SAND, VERY STIFF***		
5	S-3	14 14 15 18				PP = 2.5 TSF
	S-4	6 10 11 10				PP = 2.5 TSF
				8.0 365.0		
	S-5	9 14 15 16		***GRAY TO BROWN FAT CLAY (CH), STIFF TO VERY STIFF***		PP =4.25 TSF IN BROWN CLAY, 2.0 TSF IN GRAY CLAY
10				10.0 363.0		
						PP = 3.0 TSF
				RED TO BROWN CLAY, TR F/ GRAVEL, VERY STIFF		
15	S-6	11 10 11 13				
				18.0 355.0		PP = 2.5 TSF
				BROWN CLAY, VERY STIFF		
20	S-7	11 13 15 16		20.0 353.0		
				END OF BORING AT 20'		
25						
30						
35						

N: 3476506.9, E: 11424040.7

DRN.	CJH
CKD.	MLG

NEW PROJECTS TEST BORING LOG 232002_DOMINION CLOVER STATION.GPJ SITE BLAUVELT.GDT 6/9/16

TEST BORING LOG

PROJECT: DOMINION CLOVER STATION
LOCATION: CLOVER, VA

BORING	**B-4**
G.S. ELEV.	370
FILE	232002
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	E. CARUSO
HELPER	C. SMART
INSPECTOR	C. HURT
DATE STARTED	06/29/2015
DATE COMPLETED	06/29/2015

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				0.3 ***BLACK SILTY TOPSOIL*** 369.8		
				0.5 ***LIGHT BROWN SILTY M/C SAND (SM), MEDIUM DENSE*** 369.5		
	S-1	5 5 6 6				
	S-2	6 6 10 10		***RED TO BROWN ELASTIC SILT (MH), SM BLACK AND WHITE INTERLAYERING, SM CLAY, SM F/ GRAVEL, STIFF TO VERY STIFF***		PP = 3.75 TSF
5	S-3	10 10 12 16				PP = 2.75 TSF
	U-1			8.0 362.0		
						PP = 3.0 TSF
10	S-4	13 14 18 22				
				RED FAT CLAY (CH), MOTTLED BROWN TO WHITE, SM SEAMS OF GRAY SILT, VERY STIFF		
						PP = 2.5 TSF
15	S-5	5 7 9 13				
				18.0 352.0		
	S-6	13 15 32 24		***BLACK TO BROWN MICACEOUS SILT (ML), TR F/ GRAVEL, HARD***		
20				20.0 350.0		
				END OF BORING AT 20'		
25						
30						
35						

N: 3476356.1, E: 11424143.5

DRN. CJH
CKD. MLG

NEW PROJECTS TEST BORING LOG 232002_DOMINION CLOVER STATION.GPJ SITE BLAUVELT.GDT 6/9/16

TEST BORING LOG

PROJECT: DOMINION CLOVER STATION
LOCATION: CLOVER, VA

BORING	**B-5**
G.S. ELEV.	371
FILE	232002
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	E. CARUSO
HELPER	C. SMART
INSPECTOR	C. HURT
DATE STARTED	06/29/2015
DATE COMPLETED	06/29/2015

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	4 6 6 9		0.2 ***BLACK SILTY TOPSOIL*** 370.8		
	S-2	8 11 13 14		***REDDISH BROWN ELASTIC SILT (MH), SM CLAY, SM F/ GRAVEL, STIFF TO HARD***		
5	S-3	15 20 19 28		6.0 365.0		
	S-4	8 14 19 20		***RED TO GRAY FAT CLAY (CH), SMALL YELLOW MOTTLES, SM SILT, VERY STIFF*** 8.0 363.0		PP = 4.0 TSF
10	S-5	18 20 30 32		***GRAY FAT CLAY (CH), SM RED MOTTLES, SM SILT TR M/ SAND, HARD***		PP > 4.5 TSF
15	S-6	17 22 24 26		13.0 358.0		
	S-7	1 7 10 12		***LIGHT BROWN SILTY M/F SAND (SM), SM BLACK, WHITE, AND PINK MOTTLES, MEDIUM DENSE TO DENSE***		
20				20.0 351.0		
				END OF BORING AT 20'		
25						
30						
35						

N: 3476095.6, E: 11424012.7

DRN.	CJH
CKD.	MLG

NEW PROJECTS TEST BORING LOG 232002_DOMINION CLOVER STATION.GPJ SITE BLAUVELT.GDT 6/9/16

TEST BORING LOG

PROJECT: DOMINION CLOVER STATION
LOCATION: CLOVER, VA

BORING	**B-6**
G.S. ELEV.	373
FILE	232002
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	E. CARUSO
HELPER	C. SMART
INSPECTOR	C. HURT
DATE STARTED	06/29/2015
DATE COMPLETED	06/29/2015

DEPTH		A	B	C	DESCRIPTION	Wn	REMARKS
		S-1	4 4 7 8		0.3 ***BROWN SILTY TOPSOIL*** 372.7 1.0 ***REDDISH BROWN SILT (ML), SM M/C SAND, SM F/ GRAVEL*** 372.0		
		S-2	9 9 8 9		***BROWN TO WHITE FAT CLAY (CH), SM F/ SAND, STIFF***		
5		S-3	7 8 11 13		6.0 367.0		
		S-4	6 8 11 14				
10		S-5	12 14 24 22		***YELLOWISH BROWN TO WHITE AND PINK SILTY M/F/C SAND (SM), MEDIUM DENSE TO VERY DENSE***		
15		S-6	15 20 30 40				
20		S-7	40 50/0.4'		20.0 353.0		
					END OF BORING AT 20'		
25							
30							
35							

N: 3476117.5, E: 11423780.3

DRN.	CJH
CKD.	MLG

NEW PROJECTS TEST BORING LOG 232002_DOMINION CLOVER STATION.GPJ SITE BLAUVELT.GDT 6/9/16

KEY TO SYMBOLS

Symbol	Description	Symbol	Description

Strata symbols

Clay with High Plasticity

Clay with Low Plasticity

Silt with High Plasticity

Silt with Low Plasticity

Silty Sand

Topsoil

Misc. Symbols

▽	Water table first encountered
▼	Water table first reading after drilling
▼	Water table second reading after drilling
▼	Water table third reading after drilling
NR	Not Recorded
MH	Moh's Hardness

Sample Type

Split Barrel

Undisturbed Sample

Lab Symbols

FINES = Fines %

LL = Liquid Limit %

PI = Plasticity Index %

U_c = Unconfined Compressive Strength

W/V = Unit Weight

Notes:

COLUMN A) Soil sample number.

COLUMN B) FOR SOIL SAMPLE (ASTM D 1586): indicates number of blows obtained for each 6 ins. penetration of the standard split-barrel sampler. FOR ROCK CORING (ASTM D2113): indicates percent recovery (REC) per run and rock quality designation (RQD). RQD is the % of rock pieces that are 4 ins. or greater in length in a core run.

COLUMN C) Strata symbol as assigned by the geotechnical engineer.

DESCRIPTION) Description including color, texture and classification of subsurface material as applicable (see Descriptive Terms). Estimated depths to bottom of strata as interpolated from the borings are also shown.

DESCRIPTIVE TERMS: F = fine M = medium C = coarse

RELATIVE PROPORTIONS:

-Descriptive Term-	-Symbol-	-Est. Percentages-
Trace	TR	1-10
Trace to Some	TR to SM	10-15
Some	SM	15-30
Silty, Sandy, Clayey, Gravelly	-	30-40
And	and	40-50

REMARKS) Special conditions or test data as noted during investigation. Note that W.O.P. indicates water observation pipes.

* Free water level as noted may not be indicative of daily, seasonal, tidal, flood, and/or long term fluctuations.

SUMMARY OF LABORATORY TEST DATA

Project Name: Dominion Clover Power
Client Name: Dominion
TRC Project #: 232002

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Moisture Content (%)	COMPACTION CHARACTERISTICS			Unconfined Compressive Strength (TSF)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)		Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	
B-1 & B-6	BULK	-	CH	-	-	-		71	25	46	0.0	25.6	D698, A	103.8	21.2	-
B-1	S-2	2.0-4.0	CL	-	-	-		35	24	11	-0.1	22.8	-	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	33.2	-	-	-	-
	S-6	13.0-15.0	ML	0.0	17.6	82.4		41	29	12	1.0	41.4	-	-	-	-
B-2	S-4	6.0-8.0	CH	-	-	-		87	38	49	0.0	36.0	-	-	-	-
	S-7	18.0-20.0	ML	3.6	37.1	59.3		32	27	5	-0.1	26.4	-	-	-	-
B-3	S-1	0.0-2.0	-	-	-	-		-	-	-	-	10.7	-	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	30.9	-	-	-	-

DRAWN BY: TBT 07/22/15

CHECKED BY: JPB 07/22/15

SUMMARY OF LABORATORY TEST DATA

Project Name: Dominion Clover Power
Client Name: Dominion
TRC Project #: 232002

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Moisture Content (%)	COMPACTION CHARACTERISTICS			Unconfined Compressive Strength (TSF)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)		Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	
B-3	S-5	8.0-10.0	CH	-	-	-		66	25	41	-0.1	20.9	-	-	-	-
	S-6	13.0-15.0	-	-	-	-		-	-	-	-	33.3	-	-	-	-
	S-7	18.0-20.0	-	-	-	-		-	-	-	-	31.6	-	-	-	-
B-4	S-1	0.0-2.0	-	-	-	-		-	-	-	-	12.6	-	-	-	-
	U-1	6.0-8.0	MH	-	-	-		68	38	30	-0.1	35.0	-	-	-	1.41
	S-5	13.0-15.0	CH	-	-	-		67	26	41	0.1	29.2	-	-	-	-
B-5	S-2	2.0-4.0	MH	-	-	-		58	32	26	-0.2	27.8	-	-	-	-
	S-4	6.0-8.0	-	-	-	-		-	-	-	-	24.5	-	-	-	-
	S-7	18.0-20.0	SM	0.0	65.0	35.0		-	-	-	-	23.8	-	-	-	-

DRAWN BY: TBT 07/22/15

CHECKED BY: JPB 07/22/15

SUMMARY OF LABORATORY TEST DATA

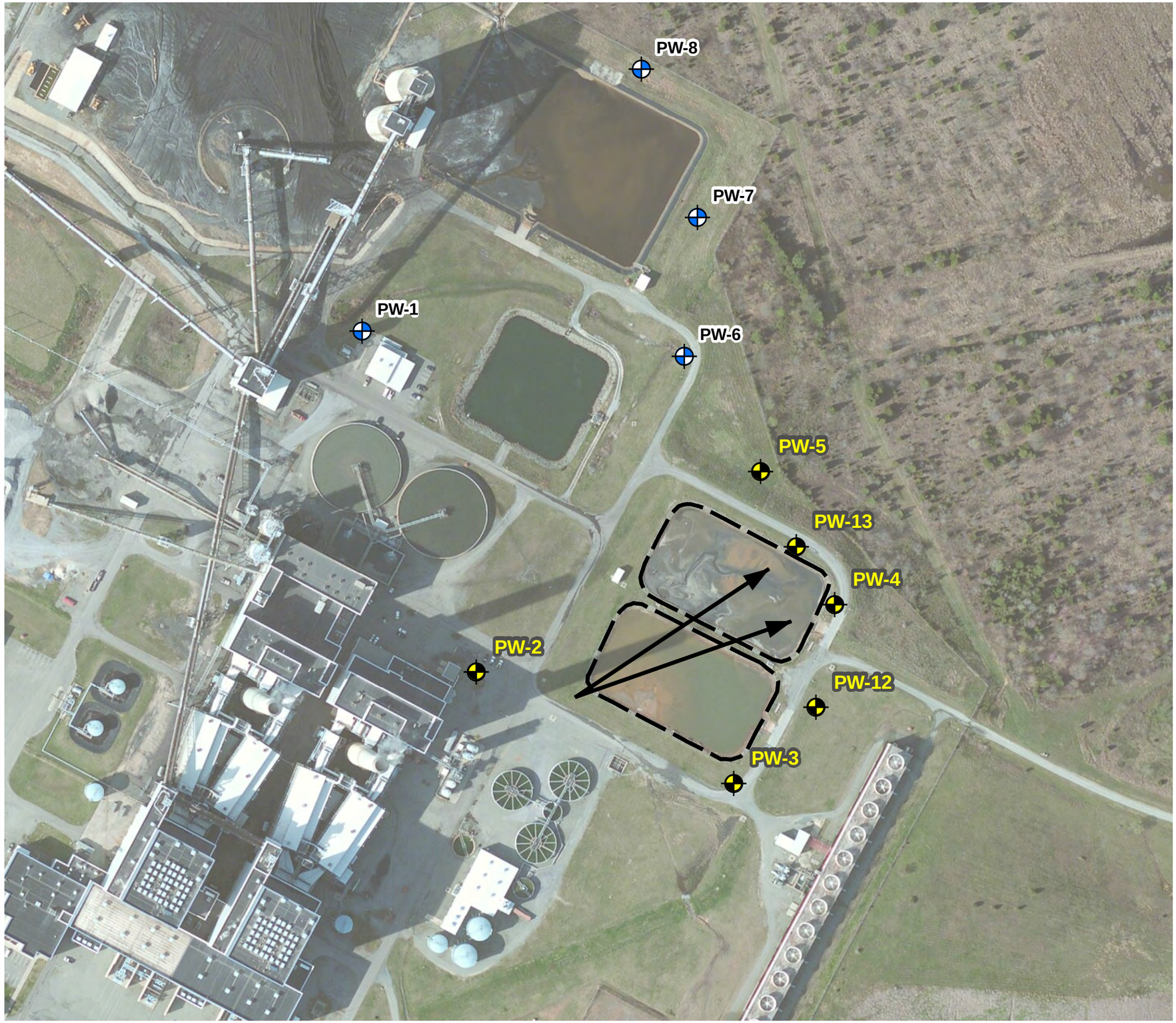
Project Name: Dominion Clover Power
Client Name: Dominion
TRC Project #: 232002

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Moisture Content (%)	COMPACTION CHARACTERISTICS			Unconfined Compressive Strength (TSF)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)		Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	
B-6	S-2	2.0-4.0	CH	-	-	-		66	24	42	0.0	25.5	-	-	-	-
	S-5	8.0-10.0	SM	1.0	71.5	27.5		-	-	-	-	12.5	-	-	-	-

DRAWN BY: TBT 07/22/15

CHECKED BY: JPB 07/22/15

Appendix D-2
Excerpts from Groundwater Monitoring Program (TRC 2016)



LEGEND

- MONITORING WELL TO BE SAMPLED
- MONITORING WELL
- SLUDGE SEDIMENTATION BASIN
- HISTORICAL DIRECTION OF GROUNDWATER FLOW

NOTES:

1) WELLS WERE SURVEYED BY TIMMONS GROUP.

2) AERIAL PHOTOGRAPH SOURCE: ESRI WORLD IMAGERY.

N

0 250 500 Feet

PROJECT:
DOMINION RESOURCES SERVICES, INC.
CLOVER POWER STATION, VIRGINIA

SHEET TITLE:
SLUDGE SEDIMENTATION BASINS
GROUNDWATER MONITORING NETWORK

DRAWN BY: RSW	SCALE: 1: 2,400	PROJ. NO. 232002.0.0	
CHECKED BY: LMC		FILE NO. Fig2-4_SludgeSedBasin.mxd	
APPROVED BY: GET	DATE PRINTED:	**FIGURE 2-4**	
DATE: FEBRUARY 2016			

TRC

30 Patewood Drive
Patewood Plaza One, Suite 300
Greenville, SC 29615
Phone: 864.281.0030
www.trcsolutions.com

Coordinate System: NAD 1983 CORS96 StatePlane Virginia South FIPS 4502 Ft US (Foot US)
Map Rotation: 0

Saved By: AFEIGL on 2/16/2016, 13:40:05 PM
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TRC - GIS

TEST BORING - WELL CONSTRUCTION LOG

PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-1
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 3
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Upgradient Well for Coal Pile/ Limestone Runoff Pond	**ELEV.** MP / GR

GROUND WATER					CASING	SAMPLE	CORE	WELL	
DATE	TIME	DEPTH	CASING	TYPE					**DATUM**
				DIAMETER					**STARTED** 10/29/93
				WEIGHT					**COMPLETED** 11/04/93
				FALL					**DRILLER** Dubesky/Cassell
									GEOLOGIST M.Armstrong (#710)

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTR-UCTION	IDENTIFICATION	REMARKS
0			Concrete; 6 7/8 inch protective steel casing; 8 inch borehole; 4 inch PVC Sch 80 casing; Cement grout		CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
	S-1	10, 9, 11		Tan to yellow brown silty clay (CL) dry	
5					
	S-2	17, 21, 30		Red brown clayey silt (ML) dry	
10					
	S-3	34, 30, 34		Red brown to tan clayey silt (ML) dry	
15					
	S-4	25, 50/5"		Red brown clayey silt (ML) dry	
20					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-1
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 2 OF** 3

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
			Cement grout		Hard drilling at 22 feet
	S-5	50/5"		Black silty sand (SM) dry (partially weathered rock)	
25					
	S-6	50/4"		Black silty sand (SM) dry, with pieces of rock (partially weathered rock)	
30					
	S-7	50/3"	Bentonite	No sample recovery	
35			Torpedo filter sand (4 bags)		
	S-8	50/4"	4 inch PVC Sch 80 10 slot well screen	Black silty sand (SM) moist (partially weathered rock)	
40				Terminated 6 1/4 inch borehole at 38.33 feet	
45					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		BORING NO. PW-1
CLIENT	H.B. Zachry Company and Black & Veatch	JOB NO. 931010	SHEET 3 OF 3

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
50			Torpedo filter sand (4 bags) 4 inch PVC Sch 80 10 slot well screen 1 foot PVC well cap Bentonite plug		Failing F-7 drilling rig reamed 8 inch hole to 55 feet to set well casing. Used mud rotary drilling method.
55					
60					
65					
70					

TEST BORING - WELL CONSTRUCTION LOG

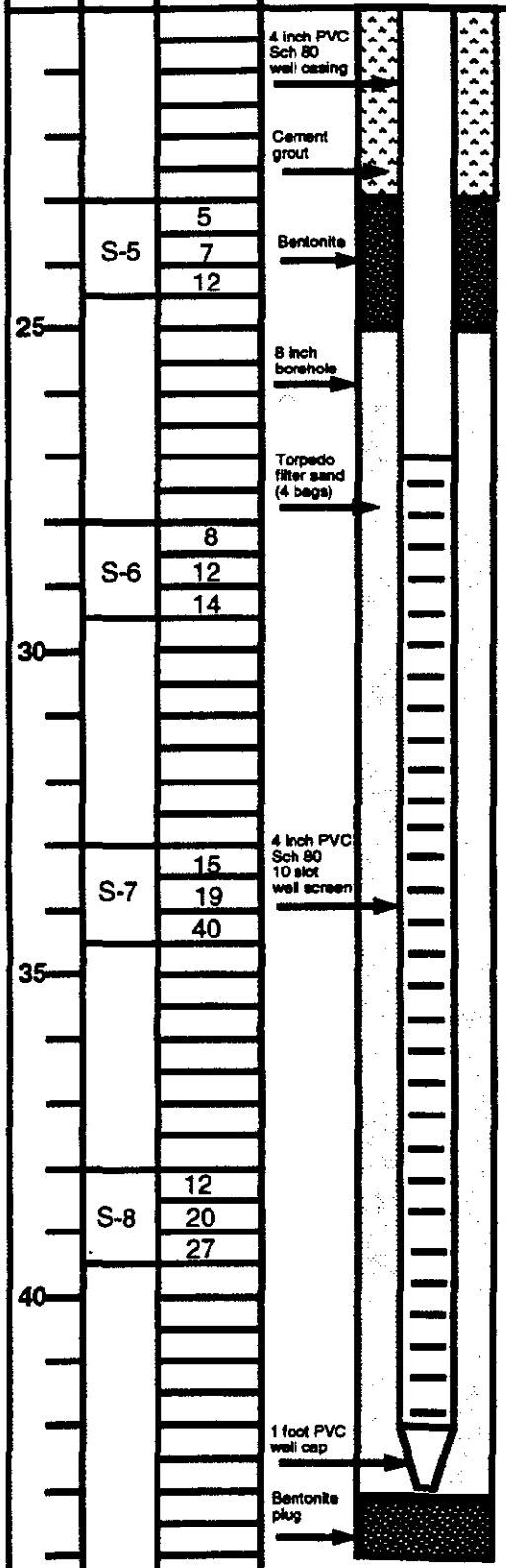
PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-2
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 2
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Upgradient Well for Holding Pond and Sludge Ponds	**ELEV.** MP / GR

GROUND WATER					CASING	SAMPLE	CORE	WELL	DATUM
DATE	TIME	DEPTH	CASING	TYPE					STARTED 10/29/93
				DIAMETER					COMPLETED 11/5/93
				WEIGHT				DRILLER	Dubesky/Cassell
				FALL				GEOLOGIST	M.Armstrong (#710)

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTR-UCTION	IDENTIFICATION	REMARKS
			Concrete; 6 7/8 inch protective steel casing; 8 inch borehole; 4 inch PVC Sch 80 casing; Cement grout		CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
	S-1	10, 14, 11		Black and orange silty sand (ML) dry	
5					
	S-2	4, 4, 5		Yellow brown to red brown silty clay (CL) slightly moist	
10					
	S-3	5, 7, 7		Orange to tan clayey silt (ML) moist	
15					
	S-4	4, 4, 5		Orange to yellow brown clayey silt with black streaks or layers (ML) wet	
20					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-2
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 2 OF 2**



IDENTIFICATION	REMARKS
Orange, yellow brown, pink clayey silt to silty clay (ML to CL) wet	
Brown and pink silty clay (CL) wet	
Gray, green, pink clayey silt (ML) wet	
Gray, green, black, orange clayey silt to silty clay (ML to CL) wet (partially weathered rock)	
Terminated 6 1/4" borehole at 39.5'	Failing F-7 drilling rig reamed 8 inch hole to 44 feet to set well casing. Used mud rotary drilling method.

TEST BORING - WELL CONSTRUCTION LOG

PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-3
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 3
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Downgradient Well for Sludge Ponds	**ELEV.** MP / GR

GROUND WATER				CASING	SAMPLE	CORE	WELL	DATUM
DATE	TIME	DEPTH	CASING	TYPE				STARTED 10/29/93
				DIAMETER				COMPLETED 11/6/93
				WEIGHT				DRILLER Dubesky/Cassell
				FALL				GEOLOGIST M.Armstrong (#710)

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTR-UCTION	IDENTIFICATION	REMARKS
			Concrete; 6 7/8 inch protective steel casing; 8 inch borehole; 4 inch PVC Sch 80 casing; Cement grout		CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
	S-1	6, 8, 10		Red brown silty clay (CL) dry	
5					
	S-2	4, 4, 4		Orange slightly clayey silt (ML) dry	
10					
	S-3	6, 7, 9		Light orange slightly clayey silt (ML) slightly moist	
15					
	S-4	8, 9, 10		Red brown to tan clayey silt (ML) moist	
20					

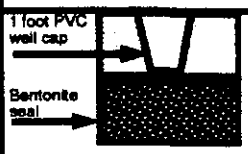
TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-3
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 2 OF** 3

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
			Cement grout		
			4 inch PVC Sch 80 casing		
		8			
	S-5	12	8 inch borehole	Tan silty slightly clayey sand (SM) wet	
		15			
25			Bentonite		
		17			
	S-6	28		Tan brown silty clayey sand (SM) wet	
		25			
30					
		33			
	S-7	50/6"		Orange silty sand (SM) wet (partially weathered rock)	
35					
	S-8	50/6"		Orange silty sand (SM) wet (partially weathered rock)	
				Terminated 6 1/4" borehole at 38.5'	Failing F-7 drilling rig reamed 8 inch hole to 47 feet to set well casing. Used mud rotary drilling method.
40			Torpedo filter sand 5 bags		
			4 inch PVC Sch 80 10 slot well screen		
45			1 foot PVC well cap		

TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-3
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 3 OF** 3

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
50					Failing F-7 drilling rig reamed 8 inch hole to 47 feet to set well casing. Used mud rotary drilling method.
55					
60					
65					
70					

TEST BORING - WELL CONSTRUCTION LOG

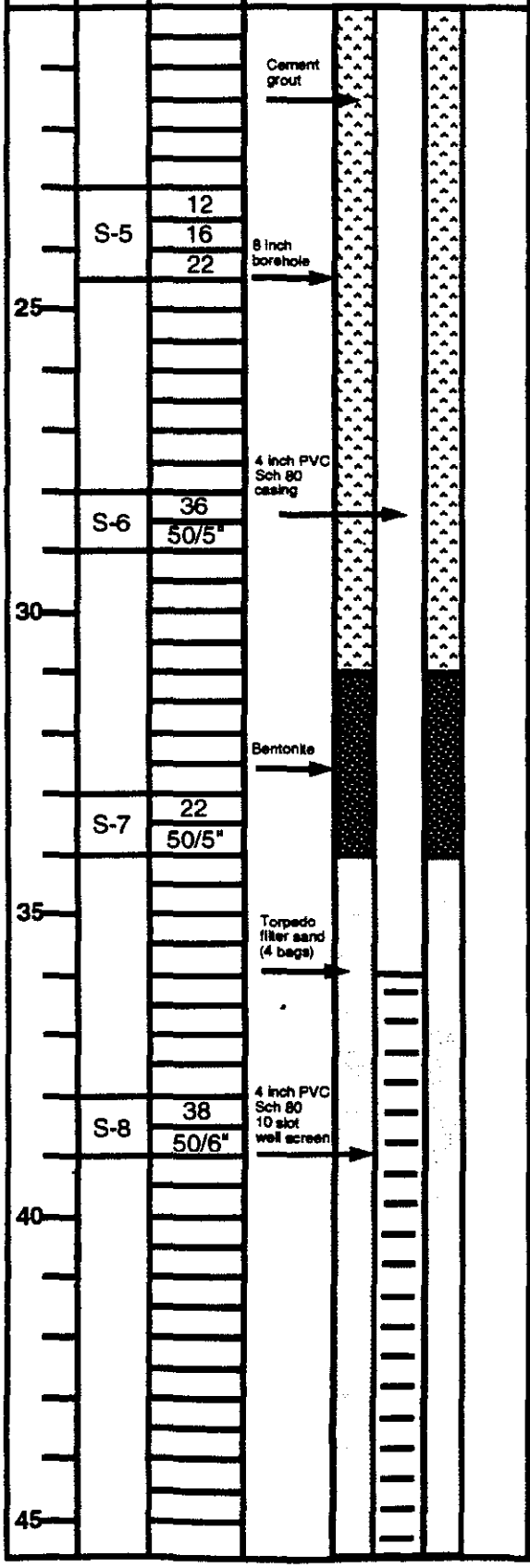
PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-4
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 3
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Down gradient Monitoring Well for Sludge Ponds	**ELEV.** MP / GR

GROUND WATER					CASING	SAMPLE	CORE	WELL	
DATE	TIME	DEPTH	CASING	TYPE					**DATUM**
				DIAMETER					**STARTED** 10/29/93
				WEIGHT					**COMPLETED** 11/8/93
				FALL					**DRILLER** Dubesky/Cassell
									GEOLOGIST M.Armstrong (#710)

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTR-UCTION	IDENTIFICATION	REMARKS
			Concrete		CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
			6 7/8 inch protective steel casing		
	S-1	5 6 7	8 inch borehole	Red brown silty clay (CL) dry	
5			4 inch PVC Sch 80 casing		
			Cement grout		
	S-2	6 12 13		Red brown silty clay (CL) dry	
10					
	S-3	6 8 8		Red brown to yellow brown silty clay (CL) slightly moist	
15					
	S-4	9 12 15		Gray, green slightly clayey micaceous silt (ML) slightly moist	
20					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-4
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 2 OF** 3



IDENTIFICATION	REMARKS
Gray green slightly clayey micaceous silt (ML) slightly moist	
Gray green slightly clayey micaceous silt (ML) slightly moist	
Gray green slightly clayey micaceous silt (ML) slightly moist	
Gray green slightly clayey micaceous silt (ML) slightly moist	
Terminated 6 1/4" borehole at 39.00'	

TEST BORING - WELL CONSTRUCTION LOG

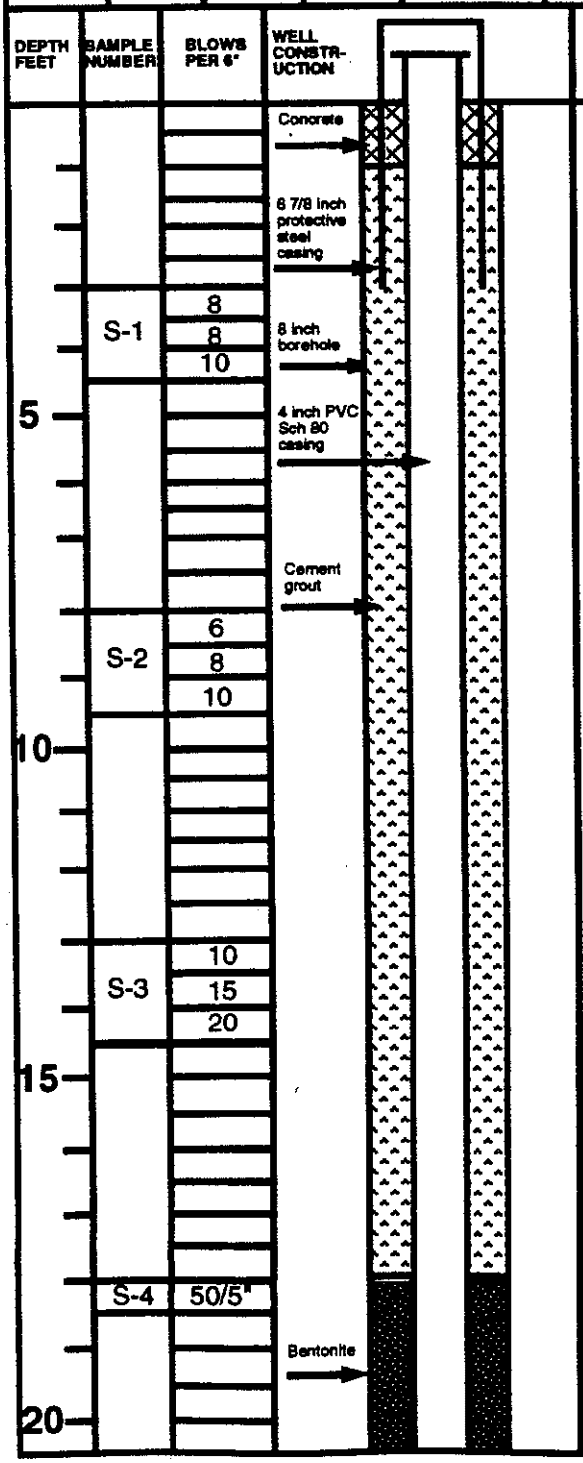
PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-4
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 3 OF** 3

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
50			Torpedo filter sand (4 bags) 4 inch PVC Sch 80 10 slot well screen 1 foot PVC well cap Bentonite plug		Failing F-7 drilling rig reamed 8 inch hole to 53 feet to set well casing. Used mud rotary drilling method.
55					
60					
65					
70					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-5
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 2
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Downgradient Monitoring Well for Sludge Ponds	**ELEV.** MP / GR

GROUND WATER					CASING	SAMPLE	CORE	WELL	DATUM
DATE	TIME	DEPTH	CASING	TYPE					STARTED 10/29/93
				DIAMETER					COMPLETED 11/9/93
				WEIGHT				DRILLER	Dubesky/Cassell
				FALL				GEOLOGIST	M.Armstrong (#710)



IDENTIFICATION	REMARKS
Yellow brown clayey silt (ML) slightly moist	CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
Yellow brown clayey silt to silty clay (ML to CL) slightly moist	
Light tan clayey sand to sandy clay (SC to CL) slightly moist	
No sample recovery	

TEST BORING - WELL CONSTRUCTION LOG

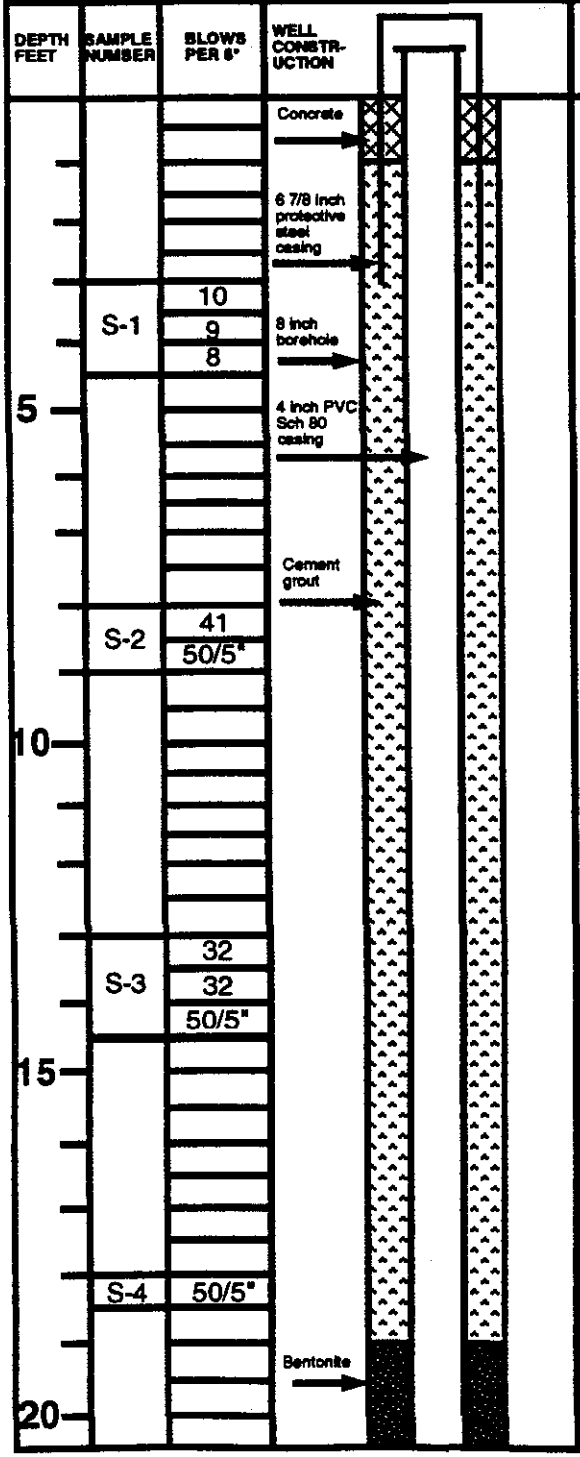
PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-5
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 2 OF 2**

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
			Bentonite		
	S-5	50/1"	8 inch borehole	No sample recovery	Split spoon wet
25					
	S-6	50/4"	Torpedo filter sand (4 bags)	Red brown silty sand (SM) wet (Partially weathered rock)	
30				Auger refusal for 6 1/4" auger at 32.00'	
			4 inch PVC Sch 80 10 slot well screen		
35					
			1 foot PVC well cap		Failing F-7 drilling rig reamed 8 inch hole to 41 feet to set well casing and screen. Used mud rotary drilling method.
40			Bentonite plug		
45					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-6
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 2
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Down gradient Monitoring Well for Holding Pond	**ELEV.** MP / GR

GROUND WATER				CASING	SAMPLE	CORE	WELL	DATUM
DATE	TIME	DEPTH	CASING	TYPE				STARTED 10/28/93
				DIAMETER				COMPLETED 11/10/93
				WEIGHT				DRILLER Dubesky/Cassell
				FALL				GEOLOGIST M.Armstrong (#710)



IDENTIFICATION	REMARKS
Fill material	CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
Yellow brown clayey silt to silty clay (ML to CL) dry	
Black to gray silty sand (SM) dry (partially weathered rock)	
Black, gray, tan, pink micaceous silty sand to sandy silt (SM to ML) dry (partially weathered rock)	
Same as above	

TEST RORING - WELL CONSTRUCTION LOG

PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-7
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 2
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Down gradient Monitoring Well for Coal Pile/ Limestone Runoff Pond	**ELEV.** MP / GR

GROUND WATER					CASING	SAMPLE	CORE	WELL	DATUM
DATE	TIME	DEPTH	CASING	TYPE					STARTED 10/28/93
				DIAMETER					COMPLETED 10/28/93
				WEIGHT					DRILLER Dubesky/Cassell
				FALL					GEOLOGIST M.Armstrong (#710)

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTR-UCTION	IDENTIFICATION	REMARKS
5	S-1	21 15 18	Concrete 6 7/8 inch protective steel casing 8 inch borehole 4 inch PVC Sch 80 casing Cement grout	Yellow brown/tan clayey silt to silty clay (ML) dry	CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
10	S-2	12 21 15		Black/tan/yellow silty clay to clayey silt (ML to CL) dry, (partially weathered rock)	
15	S-3	12 19 26		Tan, green silty clay (CL) dry	
20	S-4	50/5"	Bentonite Torpedo filter sand (4 bags)	Tan/light brown, pink silty sand (SM) dry (partially weathered rock)	

TEST BORING - WELL CONSTRUCTION LOG

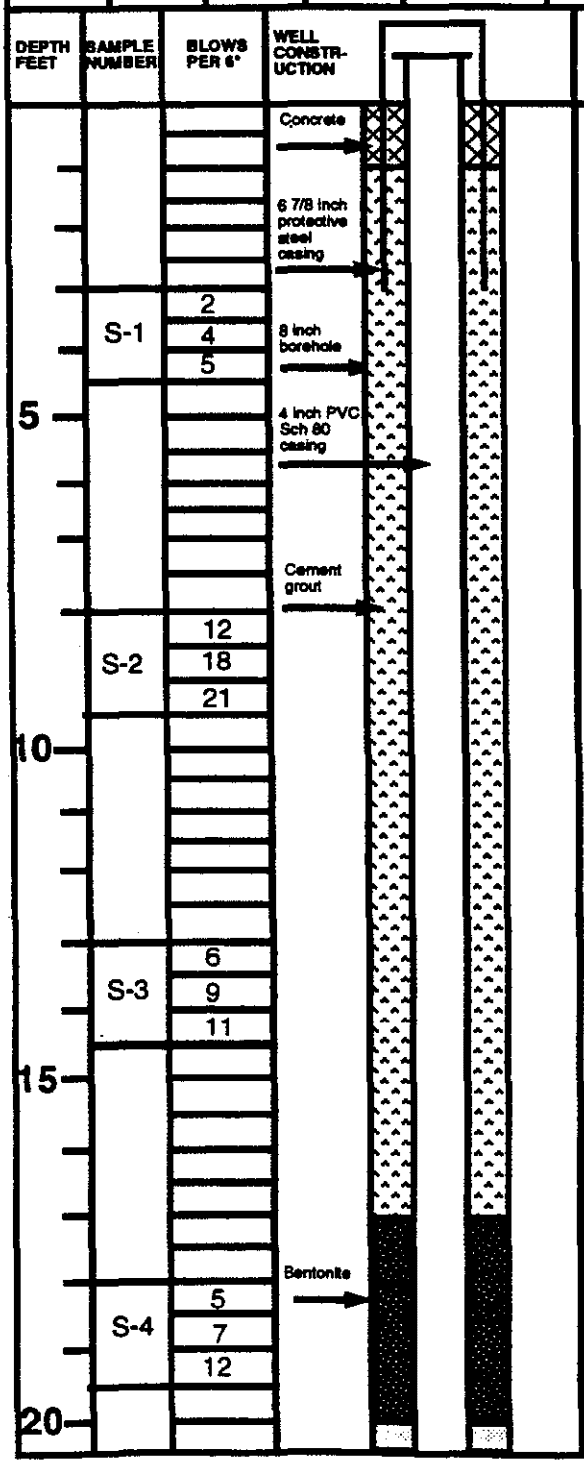
PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		**BORING NO.** PW-7
CLIENT	H.B. Zachry Company and Black & Veatch	**JOB NO.** 931010	**SHEET 2 OF 2**

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
	S-5	50/0"	8 inch borehole	No Sample Recovery	
25			Torpedo filter sand		
	S-6	50/1"	4 inch PVC Sch 80 10 slot well screen	No Sample Recovery	Split spoon wet
30					
	S-7	50/4"		Tan/orange Silty Sand (SM) (partially weathered rock) very little recovery	
35					
	S-8	50/2"	1 foot PVC well cap; Bentonite plug	Black silty sand (SM) (partially weathered rock)	Failing F-7 drilling rig reamed 8 inch hole to 40 feet to set well casing. Used mud rotary drilling method.
40				Terminated 6 1/4" borehole at 38.17'	
45					

TEST BORING - WELL CONSTRUCTION LOG

PROJECT Old Dominion Electric Cooperative - Clover, Virginia	**BORING NO.** PW-8
CLIENT H.B. Zachry Company and Black & Veatch	**SHEET 1 OF** 2
DRILLING CONTRACTOR Bore and Core	**JOB NO.** 931010
PURPOSE Down gradient Monitoring Well for Coal Pile/ Limestone Runoff Pond	**ELEV.** MP / GR

GROUND WATER					CASING	SAMPLE	CORE	WELL	
DATE	TIME	DEPTH	CASING	TYPE					**DATUM**
				DIAMETER					**STARTED** 10/28/93
				WEIGHT					**COMPLETED** 11/10/93
				FALL					**DRILLER** Dubesky/Cassell
									GEOLOGIST M.Armstrong (#710)



DEPTH FEET	IDENTIFICATION	REMARKS
		CME 75 rig drilled borehole using 6 1/4 inch O.D. 3 1/8 inch I.D. hollow stem augers
0 - 5	Red brown silty clay (CL) dry	
5 - 10	Tan to red brown silty clay (CL) dry	
10 - 15	Light gray to red brown silty clay (CL) slightly moist	
15 - 20	Tan, light brown silty sand (SP) wet, fine to coarse with large gravel	

TEST BORING - WELL CONSTRUCTION LOG

PROJECT	Old Dominion Electric Cooperative - Clover, Virginia		BORING NO. PW-8
CLIENT	H.B. Zachry Company and Black & Veatch	JOB NO. 931010	SHEET 2 OF 2

DEPTH FEET	SAMPLE NUMBER	BLOWS PER 6"	WELL CONSTRUCTION	IDENTIFICATION	REMARKS
25	S-5	50/0"	Torpedo filter sand 4 inch PVC Sch 80 10 slot well screen 1 foot PVC well cap Bentonite plug	No Sample Recovery Terminated 6 1/4" borehole at 23.00'	Hit Rock at 22 feet Failing F-7 drilling rig reamed 8 inch hole to 39 feet to set well casing. Used mud rotary drilling method.
30					
35					
40					
45					

SOIL BORING LOG

BORING NO. PW-12

Client:		Drilling Start Date:	Drilling End Date:	Page of
Dominion Resource Services		7-28-15	7-28-15	1 3
Site:		Drilling Method:		Project Number:
Clover Power Station		Hollow Stem Auger		232002.0.0
Geologist/Technician:	Driller (name/company):	Drill Rig Type:		Borehole Diameter (in.):
Rick Mayer	Joshua Ellingworth Parratt Wolff	CME-75 Mobile		8.25
Boring Coordinates:	Total Depth (ft.):	Measuring Point Elevation (ft.):	Lat: WGS84	Long: WGS84
N: 3476165.003 E: 11424121.60	42.00	Ground Surface = 369.12	36.869657	-78.700992
Datum Description:	Datum Elevation (ft.):	Checked by:		
NAD83, VA State Plane South	0.0 = Mean Sea Level	RAM		

Sample Interval	% Recovery	Sample Type	Blow Counts	PID (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
					1		TOPSOIL, silty, black.
					2		
					3		
					4		
					5		
	46	SS	5 8 12 13		6		LEAN CLAY (CL), 90% clay, 10% fine to medium-grained sand, mps = 2 mm, medium plasticity, red and yellowish- brown mottling, dry, very stiff, slightly foliated (Cohesive Fill).
					7		
					8		
					9		
					10		
	100	SS	3 3 3 5		11		SILT (ML), 30% clay, 10% fine-grained sand, mps = 2 mm, low plasticity, reddish-brown and light gray, moist, medium stiff, slightly foliated (Residual Soil).
					12		
					13		
					14		
					15		
	50	SS	2 3 2 3		16		SANDY SILT (ML), 40% fine to medium-grained sand, 10% clay, mps = 5 mm, nonplastic, yellowish-brown, moist, medium stiff, homogeneous (Residual Soil).
					17		
					18		
					19		

Continued Next Page

SOIL BORING LOG

BORING NO. PW-12

Client:		Drilling Start Date:	Drilling End Date:	Page of
Dominion Resource Services		7-28-15	7-28-15	2 3
Site:		Drilling Method:		Project Number:
Clover Power Station		Hollow Stem Auger		232002.0.0
Geologist/Technician:	Driller (name/company):	Drill Rig Type:		Borehole Diameter (in.):
Rick Mayer	Joshua Ellingworth Parratt Wolff	CME-75 Mobile		8.25
Boring Coordinates:	Total Depth (ft.):	Measuring Point Elevation (ft.):	Lat: WGS84	Long: WGS84
N: 3476165.003 E: 11424121.60	42.00	Ground Surface = 369.12	36.869657	-78.700992
Datum Description:	Datum Elevation (ft.):	Checked by:		
NAD83, VA State Plane South	0.0 = Mean Sea Level	RAM		

Sample Interval	% Recovery	Sample Type	Blow Counts	PID (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	54	SS	1 3 2 5		21		SILTY SAND (SM), 55% fine to coarse-grained sand, 45% silt, mps = 5 mm, nonplastic, yellowish-brown, micaceous, moist to wet at 21 feet, loose, homogeneous (Saprolite).
					22		
					23		
					24		
	83	SS	3 5 10 11		25		SILTY SAND (SM), 65% fine to coarse-grained sand, 35% silt, mps = 10 mm, nonplastic, yellowish-brown, wet, medium dense, 1 inch thick quartz vein at 26 feet, slight foliations (Saprolite).
					26		
					27		
					28		
					29		
	63	SS	15 23 19 35		30		SILTY SAND (SM), 75% fine to coarse-grained sand, 25% silt, mps = 5 mm, nonplastic, yellowish-brown and light pink, wet, very dense, foliated (Saprolite).
					31		
					32		
					33		
					34		
	54	SS	31 45 31 50/5		35		-as above; dry.
					36		
					37		
					38		
					39		

Continued Next Page

SOIL BORING LOG

BORING NO. PW-12

Client:		Drilling Start Date:	Drilling End Date:	Page of
Dominion Resource Services		7-28-15	7-28-15	3 3
Site:		Drilling Method:		Project Number:
Clover Power Station		Hollow Stem Auger		232002.0.0
Geologist/Technician:	Driller (name/company):	Drill Rig Type:		Borehole Diameter (in.):
Rick Mayer	Joshua Ellingworth Parratt Wolff	CME-75 Mobile		8.25
Boring Coordinates:	Total Depth (ft.):	Measuring Point Elevation (ft.):	Lat: WGS84	Long: WGS84
N: 3476165.003 E: 11424121.60	42.00	Ground Surface = 369.12	36.869657	-78.700992
Datum Description:	Datum Elevation (ft.):	Checked by:		
NAD83, VA State Plane South	0.0 = Mean Sea Level	RAM		

Sample Interval	% Recovery	Sample Type	Blow Counts	PID (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
	46	SS	11 15 27 38		41		SILT (ML), 55% silt, 30% clay, 15% fine to medium-grained sand, nonplastic, yellowish-brown, moist, very stiff, slight foliation (Saprolite).
					41		SILTY SAND (SM), 75% fine to coarse-grained sand, 25% silt, nonplastic, yellowish-brown and light pink, dry, very dense, foliated (Saprolite).
					42		**BORING TERMINATED AT 42 FEET**
					43		
					44		
					45		
					46		
					47		
					48		
					49		
					50		
					51		
					52		
					53		
					54		
					55		
					56		
					57		
					58		
					59		

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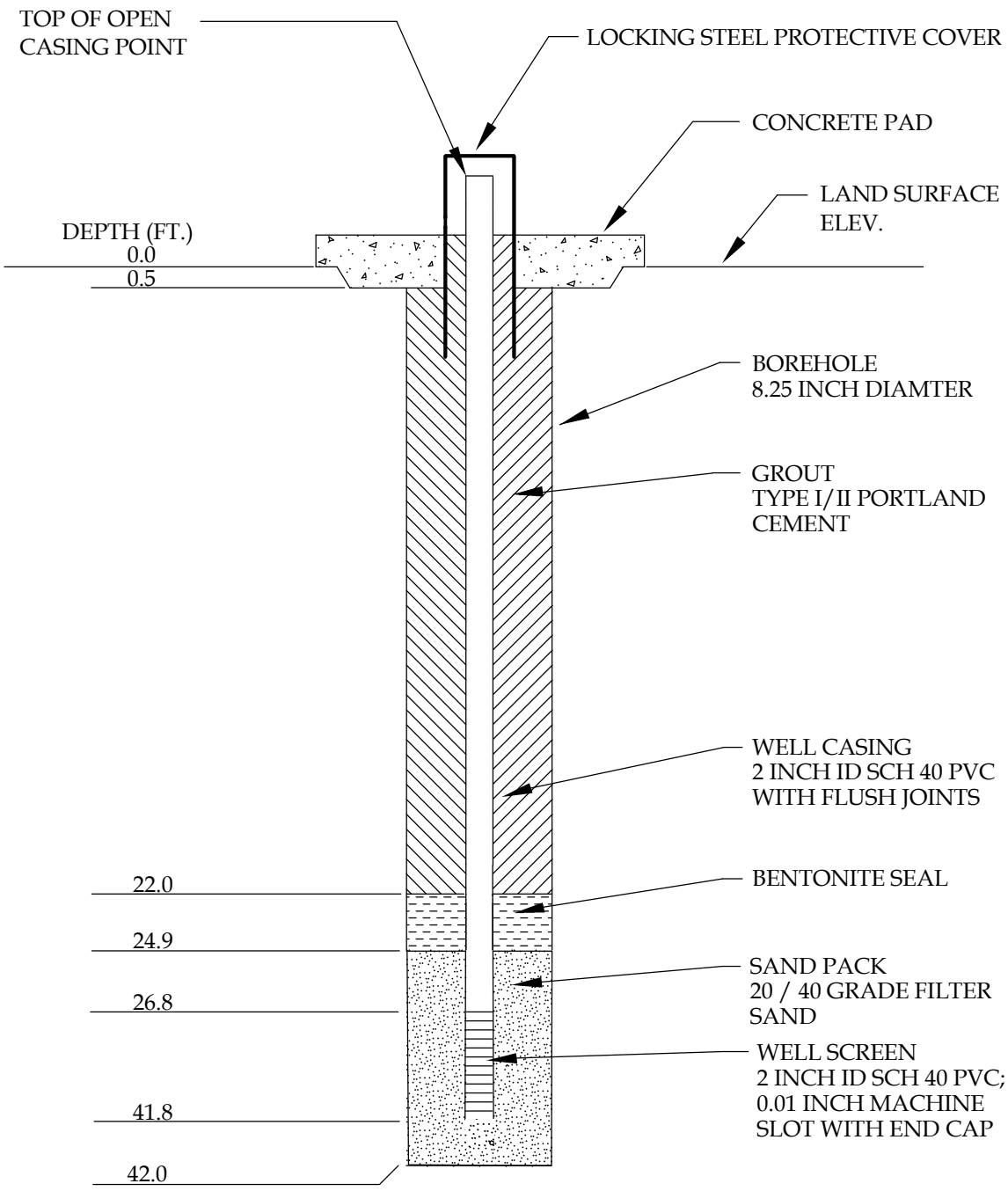

WELL CONSTRUCTION DIAGRAM

Not To Scale

PROJECT	Dominion Resource Services
PROJECT NO.	232002.0.0
WELL NO.	PW-12
DATE INSTALLED	7/28/2015
DRILLING CONTRACTOR	Joshua Ellingworth/ Parratt Wolff
TRC GEOLOGIST	Rick Mayer

SOIL BORING LOG

BORING NO. PW-13

Client:		Drilling Start Date:	Drilling End Date:	Page of
Dominion Resource Services		7-28-15	7-29-15	1 3
Site:		Drilling Method:		Project Number:
Clover Power Station		Hollow Stem Auger		232002.0.0
Geologist/Technician:	Driller (name/company):	Drill Rig Type:		Borehole Diameter (in.):
Rick Mayer	Joshua Ellingworth Parratt Wolff	CME-75 Mobile		8.25
Boring Coordinates:	Total Depth (ft.):	Measuring Point Elevation (ft.): Ground Surface = 373.66	Lat: WGS84 36.870531	Long: WGS84 -78.701126
N: 3476483.437 E: 11424082.873	50.20			
Datum Description:	Datum Elevation (ft.):	Checked by:		
NAD83, VA State Plane South	0.0 = Mean Sea Level	RAM		

Sample Interval	% Recovery	Sample Type	Blow Counts	PID (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
					1		TOPSOIL, silty, brown.
					2		
					3		
	79	SS	2 3 1 3		4		LEAN CLAY (CL), 70% clay, 20% silt, 10% fine-grained sand, mps = 2 mm, meidum plasticity, reddish-brown, dry, soft, slightly micaceous, homogeneous (Cohesive Fill).
					5		
					6		
					7		
					8		
	33	SS	4 7 8 10		9		as above; moist, very stiff.
					10		
					11		
					12		
					13		
	33	SS	4 8 9 13		14		LEAN CLAY with SAND (CL), 60% clay, 20% silt, 20% fine to medium-grained sand, mps = 10 mm, medium plasticity, reddish-brown and yellowish-brown, moist, very stiff, homogeneous (Cohesive Fill).
					15		
					16		
					17		
					18		
	46	SS	3 4		19		FAT CLAY (CH), 90% clay, 10% fine-grained sand, mps = 2 mm, trace roots, high plasticity, yellowish-brown, moist, stiff, homogeneous (Residual Soil).

Continued Next Page

SOIL BORING LOG

BORING NO. PW-13

Client:		Drilling Start Date:	Drilling End Date:	Page of
Dominion Resource Services		7-28-15	7-29-15	2 3
Site:		Drilling Method:		Project Number:
Clover Power Station		Hollow Stem Auger		232002.0.0
Geologist/Technician:	Driller (name/company):	Drill Rig Type:		Borehole Diameter (in.):
Rick Mayer	Joshua Ellingworth Parratt Wolff	CME-75 Mobile		8.25
Boring Coordinates:	Total Depth (ft.):	Measuring Point Elevation (ft.):	Lat: WGS84	Long: WGS84
N: 3476483.437 E: 11424082.873	50.20	Ground Surface = 373.66	36.870531	-78.701126
Datum Description:	Datum Elevation (ft.):	Checked by:		
NAD83, VA State Plane South	0.0 = Mean Sea Level	RAM		

Sample Interval	% Recovery	Sample Type	Blow Counts	PID (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
			6 6		21 22 23		FAT CLAY (CH), 90% clay, 10% fine-grained sand, mps = 2 mm, trace roots, high plasticity, yellowish-brown, moist, stiff, homogeneous (Residual Soil).
	42	SS	5 5 7 14		24 25 26 27 28 29		SANDY SILT (ML), 60% silt, 30% fine to medium-grained sand, 10% clay, mps = 5 mm, nonplastic, yellowish-brown, moist, very stiff, foliated (Saprolite).
	42	SS	14 17 20 22		30 31 32 33 34		SANDY SILT (ML), 50% silt, 40% fine to medium-grained sand, 10% clay, mps = 5 mm, nonplastic, greenish-gray, moist to wet at approximently 31 feet, micaceous, hard, strong foliation (Saprolite).
	65	SS	8 8 18 50/5		35 36 37 38		-as above.
	100	SS	50/6		39		SILTY SAND (SM), 75% fine to coarse-grained sand, 25% silt, mps = 5 mm, nonplastic, reddish-yellow and yellowish-pink, dry, very dense, strong foliation (Saprolite).
							-as above.

Continued Next Page

SOIL BORING LOG

BORING NO. PW-13

Client:		Drilling Start Date:	Drilling End Date:	Page of
Dominion Resource Services		7-28-15	7-29-15	3 3
Site:		Drilling Method:		Project Number:
Clover Power Station		Hollow Stem Auger		232002.0.0
Geologist/Technician:	Driller (name/company):	Drill Rig Type:		Borehole Diameter (in.):
Rick Mayer	Joshua Ellingworth Parratt Wolff	CME-75 Mobile		8.25
Boring Coordinates:	Total Depth (ft.):	Measuring Point Elevation (ft.):	Lat: WGS84	Long: WGS84
N: 3476483.437 E: 11424082.873	50.20	Ground Surface = 373.66	36.870531	-78.701126
Datum Description:	Datum Elevation (ft.):	Checked by:		
NAD83, VA State Plane South	0.0 = Mean Sea Level	RAM		

Sample Interval	% Recovery	Sample Type	Blow Counts	PID (ppm)	Depth (feet)	Stratigraphy	LITHOLOGIC DESCRIPTION
					41		SILTY SAND (SM), 75% fine to coarse-grained sand, 25% silt, mps = 5 mm, nonplastic, reddish-yellow and yellowish-pink, dry, very dense, strong foliation (Saprolite).
					42		
					43		
	0	SS	50/0		44		No recovery.
					45		
					46		
					47		
					48		
	100	SS	50/1		49		SILTY SAND (SM), 80% fine to medium-grained sand, 20% silt, mps = 5 mm, nonplastic, reddish-yellow, wet, very dense, foliated (Saprolite).
					50		**BORING TERMINATED AT 50.20 FEET DUE TO AUGER REFUSAL**
					51		
					52		
					53		
					54		
					55		
					56		
					57		
					58		
					59		

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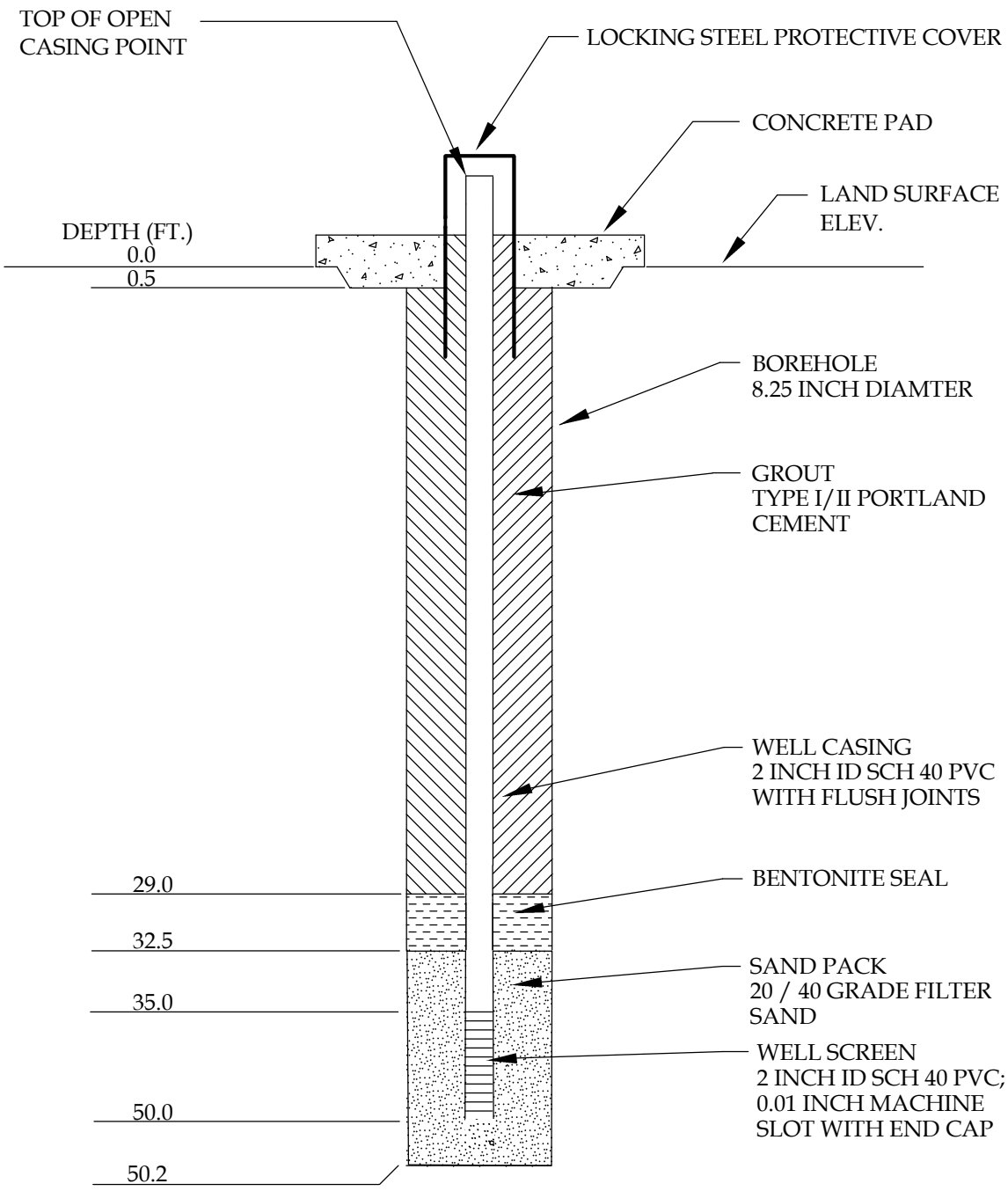


WELL CONSTRUCTION DIAGRAM

Not To Scale

PROJECT	Dominion Resource Services
PROJECT NO.	232002.0.0
WELL NO.	PW-13
DATE INSTALLED	7/29/2015
DRILLING CONTRACTOR	Joshua Ellingworth/ Parratt Wolff
TRC GEOLOGIST	Rick Mayer

Appendix D-3
Bedrock Boring Logs – Golder Associates, 1999

LEGEND

MONITORING WELL

NOTES:

1) WELLS ARE REFERENCED SPATIALLY FROM "FIGURE 2: POTENTIOMETRIC SURFACE MAP - FEBRUARY 2014" AND ARE APPROXIMATE.

2) AERIAL PHOTOGRAPH SOURCE: ESRI WORLD IMAGERY.

N

0 600 1,200
Feet

PROJECT:
DOMINION RESOURCES SERVICES, INC.
CLOVER POWER STATION, VIRGINIA

SHEET TITLE:
APPROXIMATE LANDFILL WELL LOCATIONS

DRAWN BY: AFEIGL	SCALE:	PROJ. NO.	232002.0.0
CHECKED BY: GSHEREDA	1: 7,200	FILE NO.	Fig01_S3LandfillWells.mxd
APPROVED BY: NADDISON	DATE PRINTED:	**FIGURE 1**	
DATE: MAY 2016			

TRC
30 Patewood Drive
Patewood Plaza One, Suite 300
Greenville, SC 29615
Phone: 864.281.0030
www.trcsolutions.com

TRC - GIS
Coordinate System: NAD 1927 StatePlane Virginia South FIPS 4502 (Foot US)
Map Rotation: 0
Saved By: AFEIGL on 5/26/2016, 11:21:05 AM
Path: P:_Vision\232002 - Dominion Clover\ArcGIS10\Fig01_S3LandfillWells.mxd

BOREHOLE LOG NO. MW - 6

Golder Associates
Richmond, Virginia

Project No.: 993-6640
Project Title: Virginia Power
roject Location: Stage 3 Clover Landfill
Reference Elev.: 342.32

Date: 11-15-99
Drilling Contractor: Ayers & Ayers
Driller: Jack Ayers Jr.
Drill Rig: ATV CME-45

Depth In feet (Elevation)	Boring Method	Description of Material	Graphic Log	USCS	Samples: Number	Samples: Blows/ 6 IN.	Samples: Recovery	Sample Description
0								
	2-3.5	mud brown (5yr. 4/4) silty sand, trace clay and micacious, moist			S1	3-4-4 (8)	6"	
5	4-5.5	mud, brown (5yr 3/4) saprolite layering present; iron rich, micacious layering. gneiss, clayey silt, particle size			S2	7-17-22 (39)	11"	
	7-8.5	same as above, more homogeneous lwss layering apparent (clayey silt size) moist			S3	22-23-6 (29)	11"	
10		mud brown (5yr 4/4) layered saprolite, biotite, feldspar-quartz (m-c sandy silt size) dry			S4	35-35-30 (+65) /.3	7"	
	12-13.5	grayish-brown (5yr 3/2) layered saprolite same content & size as above, dry			S5	25-100/.5 (+100)	8"	
15	14-15.5	dark yellowish brown (10yr 4/2) as above, trace gravel, dry			S6	55-45/.2 (+45)	6"	
	17-18.5	mud brown (5yr 4/4) same as above. coarser grains break down into silt when crushed, dry			S7	70-30/1" (+30)	8.5"	
20	19-20.5	dark yellowish brown (10yr 4/2) same as above, less quartz and feld, more biotite, moist			S8	100/0.5 (+100)	5"	
	22-23.5	same as above, moist			S9	40-60/.3 (+60)	6"	
25		Auger refusal at 23.5'						
30								

Logged by: MKD
Checked by: CMG

RECORD OF DRILLHOLE: MW-6

SHEET 1 OF 1

LOCATION: Clover Power Station
PROJECT NO.: 993-6640
INCLINATION: AZIMUTH:

ELEVATION: 342.32
DRILLING DATE: January 10, 2000

DATUM: MSL
DRILL RIG: IR A300

DEPTH (FE.	DESCRIPTION	GRAPHIC LOG	RUN NUMBER	RECOVERY	R.Q.D.	FRACTURE INDEX PER FOOT	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	INDEX	NOTES: WATER LEVEL INSTRUMENTATION
20										
	(23.5-25.5) Slightly weathered (sw), banded, greenish black (5GY2/1) and very light gray (N8) coarsely crystalline, strong, Quartz Hornblende Gneiss		1	83	12	10 8				
25	(25.5-27.5) Broken, moderately weathered section, weak-very weak rock, highly weathered along fractures. Lineation at 0° Iron-staining along fractures					9 7 2				
	(28-33.2) More finely crystalline, mafic, less quartz, fresh-slightly weathered (FR-SW), string-very strong rock, less factures.		2	100	87	1				
30						1 0 1 1 1				
	(33.2-34.3) Band of fresh (FR) very light gray (N8), moderate orange pink (10R 7/4) and minor greenish black (5GY 2/1), very coarsely crystalline, very strong Quartz Feldspar Gneiss (no fractures)									
35	(34.3-39.5) Fresh (FR), thinly lineated with slight banding, greenish black (5GY 2/1) and very light gray (N8) coarsely crystalline, very strong Quartz Hornblende Gneiss.					0 1 2 1				
	(42-47.3) Fresh-slightly weathered (sw) banded very light gray (ns) and greenish black (5GY2/1 fine-v. coarsely xline, v. strong QHG									
40	End of core at 39.5									
	Fractures 23.5-25.5', 27.5-39.5' Little-no staining, planar-curved, rough-v. rough surfaces, parallel to and across lineation direction. Quartz filled fractures at high angles to lineation.									
45										

DEPTH SCALE:
DRILLING CONTRACTOR: Bedford Well Drilling
DRILLER: P. Monaghan

LOGGED BY: Mary Dwyer
CHECKED: Chris Gee
DATE: December 5, 2000

Golder Associates

BOREHOLE LOG NO. MW - 8

Golder Associates

Project No.: 993-6640
Project Title: Virginia Power
Project Location: Stage 3 Clover Landfill
Reference Elev.: 353.75

Date: 11-15-99
Drilling Contractor: Ayers & Ayers
Jack Ayers Jr.
Drill Rig: CME-45

Depth in feet (Elevation)	Boring Method	Description of Material	Graphic Log	USCS	Samples: Number	Samples: Blows/6 IN.	Samples: Recovery	Sample Description
0								
5	4-4.6	firm light brown, (5yr 5/6) silty clay, moist			S1	4-4-3 (7)	7"	
10	9-9.7	loose sandy silty clay, mottled, dark brown red, saprolite gneiss, kspar quartz, biotite, muscovite, moist			S2	6-5-7 (12)	8"	
15	14-14.5	yellow brown saprolite gneiss kspar, quartz, large grains dry			S3	11-15-26 (41)	6"	
	17-17.7	yellow brown (darker) saprolite gneiss kspar and quartz, muscovite, layered large grain, biotite rich small grain,dry			S4	23-12-15 (27)	8"	
20	19-19.5	yellow brown saprolite gneiss, biotite rich layered, feldspar quartz, muscovite silt/clay sized, dry			S5	19-21-40 (61)	6"	
	22-22.8	light yellow brown sandy silty clay interfaced w/ mica feldspar quartz, layered saprolite gneiss, wet			S6	100/6" (+100)	10"	
25	24-24.7	light yellow brown sandy silty clay interfaced w/ mica feldspar quartz, layered saprolite gneiss, wet			S7	35-65-R (+65)	8"	
	27-27.3	light yellow brown sandy silty clay interfaced w/ mica feldspar quartz, layered saprolite gneiss, wet			S8	100/2 (+100)	3"	
30		Refusal at auger due to hardness of rock End of boring at 27'						

Logged by: MKD
Checked by: CMG

RECORD OF DRILLHOLE: MW-8

SHEET 1 OF 1

LOCATION: Clover Power Station
PROJECT NO.: 993-6640
INCLINATION: AZIMUTH:

ELEVATION: 353.75
DRILLING DATE: January 5, 2000

DATUM: MSL
DRILL RIG: IR A300

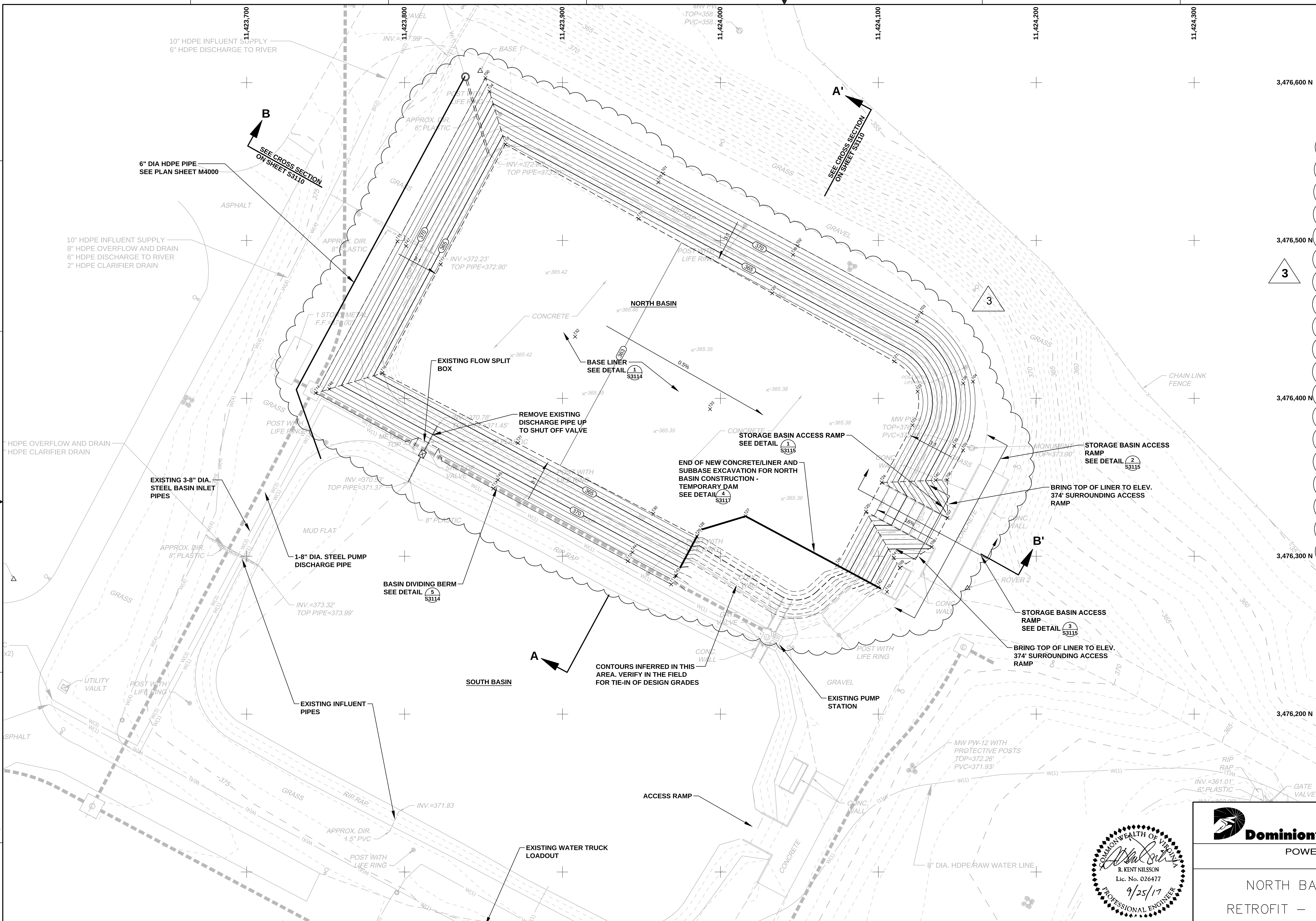
DEPTH (ft)	DESCRIPTION	GRAPHIC LOG	RUN NUMBER	RECOVERY	R.Q.D.	FRACTURE INDEX PER FOOT	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: GRAPHIC LOG	INDEX	NOTES: WATER LEVEL INSTRUMENTATION
25										
30	(29-31.8) Moderately weathered (MW), banded, pale yellowish brown (10 yr 6/2) to greenish black (5GY2/1) very coarsely crystalline, strong, banded quartz hornblende gneiss		1	100	70%	4				
	(31.8-36) Slightly weathered (sw) banded, pinkish gray (5 yr 8/1) to greenish black (5 6 y 2/1), medium to very coarsely crystalline very strong quartz (Feldspar) hornblende gneiss					6 6 0 0 2				
35	(36-38) Moderately weathered (mw) banded, moderate orange-pink (10 R 7/4)) to greenish black (5G4 4),) medium to very coarsely crystalline, stong, quartz		2	100	88%	2 2 3 2 1				
	(38-40.9) Fresh-slightly weathered (sw) banded pinkish gray 5YR8/1) to greenish black (5 GY2/1) fine-v. coarsely xline, v. strong QHG									
40	(40.9-42) Fresh-slightly weathered (sw) banded reddish-orange (10R6/6) to greenish black (5GY2/1) fine-v. coarsely xline, v. strong, QFHG					0 2 0 3 1				
	(42-47.3) Fresh-slightly weathered (sw) banded very light gray (ns) and greenish black (5GY2/1) fine-v. coarsely xline, v. strong QHG		3	100	90%					
45	End of core at 47.3					1 1				
50										

DEPTH SCALE:
DRILLING CONTRACTOR: Bedford Well Drilling
DRILLER: P. Monaghan

LOGGED BY: Mary Dwyer
CHECKED: Chris Gee
DATE: January 5, 2000

Golder Associates

Appendix E
Excerpts from Sedimentation Basin Retrofit Design Drawings



NOTES

1. REFER TO PLAN SHEET S3103 OF THIS PLAN SET FOR STANDARD LEGEND AND CONTROL POINT LOCATIONS.

POINT NO.	DESIGN LOCATIONS NORTH	DESIGN LOCATIONS EAST	SUBBASE GRADE DESIGN (ft)
100	3476602.95	11423851.20	374.00
101	3476542.40	11423963.65	374.00
102	3476496.48	11424048.94	374.00
103	3476454.27	11424127.32	374.00
104	3476410.66	11424159.97	374.00
105	3476367.13	11424153.70	374.00
106	3476348.45	11424143.68	374.00
107	3476324.32	11424143.77	369.65
108	3476305.83	11424133.82	369.65
109	3476292.64	11424113.65	374.00
110	3476277.42	11424105.51	374.00
111	3476282.17	11423968.83	374.00
112	3476296.95	11423941.38	374.00
113	3476342.81	11423856.19	374.00
114	3476403.35	11423743.74	374.00
115	3476499.49	11423795.49	374.00
116	3476415.99	11423785.86	363.63
117	3476484.78	11423822.88	363.63
118	3476560.85	11423863.83	363.63
119	3476513.76	11423948.22	363.16
120	3476466.56	11424032.81	362.67
121	3476423.45	11424110.07	362.23
122	3476404.23	11424124.91	362.12
123	3476382.92	11424121.62	362.08
124	3476346.74	11424102.15	362.08
125	3476328.25	11424092.19	362.08
126	3476294.30	11424073.94	362.08
127	3476325.35	11424015.97	362.41
128	3476316.68	11423987.32	362.51
129	3476312.55	11423985.11	362.51
130	3476326.88	11423957.51	362.67
131	3476371.75	11423871.77	363.15
132	3476439.07	11423908.01	363.15
133	3476393.18	11423993.47	362.67
134	3476594.39	11423853.77	371.89
135	3476536.84	11423960.65	371.89
136	3476490.91	11424045.94	371.89
137	3476448.70	11424124.32	371.89
138	3476409.51	11424153.75	371.89
139	3476369.92	11424148.03	371.89
140	3476348.15	11424136.34	371.89
141	3476298.95	11424109.85	371.89
142	3476280.38	11424099.93	371.89
143	3476287.74	11423971.83	371.89
144	3476302.52	11423944.38	371.89
145	3476348.38	11423859.19	371.89
146	3476405.92	11423752.31	371.89
147	3476496.49	11423801.07	371.89

COMMONWEALTH OF VIRGINIA
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Dominion — TRC

POWER GENERATION ENGINEERING
RICHMOND, VIRGINIA

NORTH BASIN LINER SUBBASE GRADES

RETROFIT – SLUDGE SEDIMENTATION BASINS CLOVER, VIRGINIA

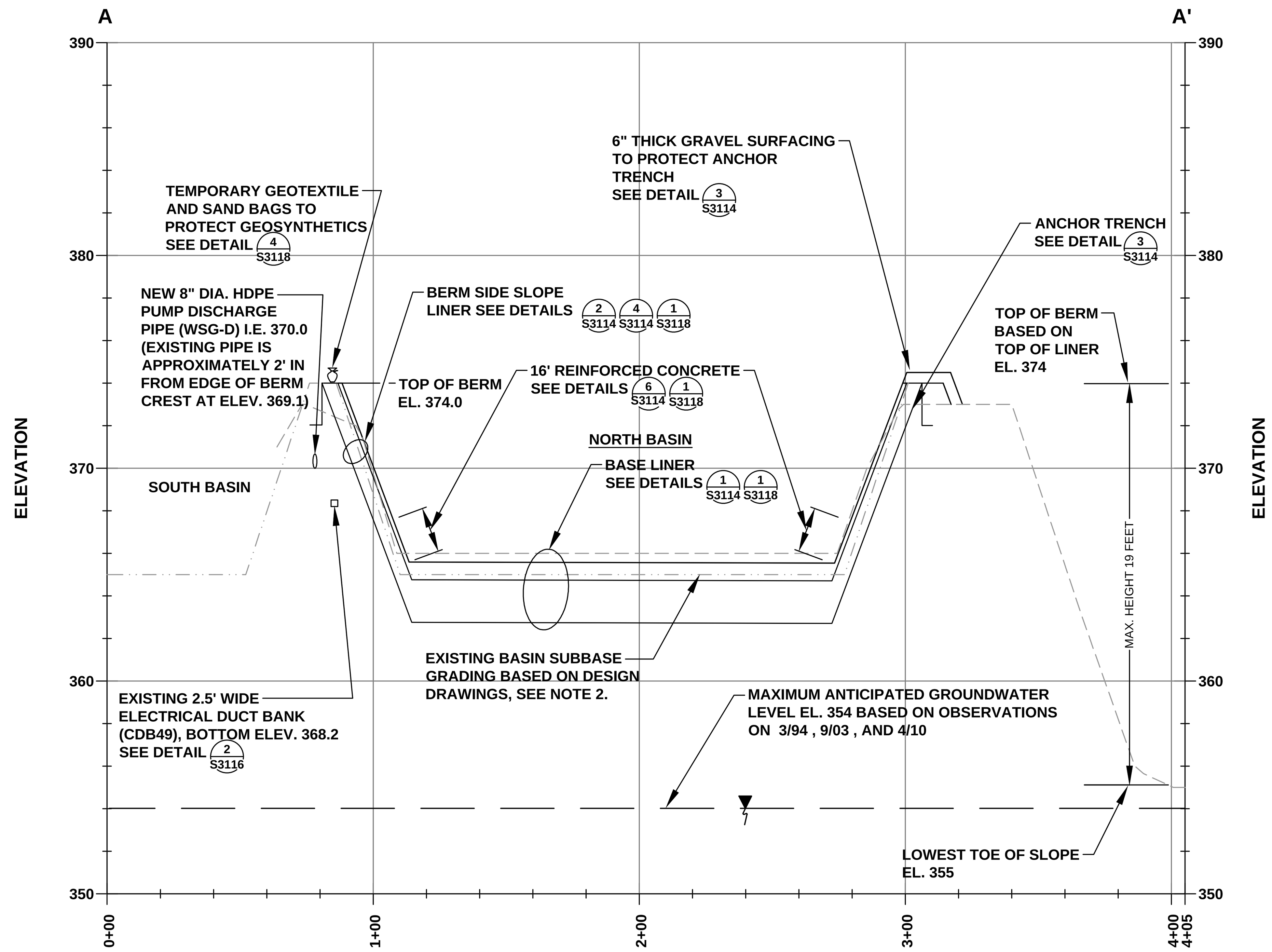
REV	DESCRIPTION	DATE	DSGN	DRWN	CHKD	DSGN SUPV	PROJ ENGR	CIVIL ENGR	ELEC ENGR	MECH ENGR	ARCH	E.M. ENGR	I&C ENGR
3	UPDATED SUBBASE GRADES AND PIPING REVISIONS	09 15 2017	DM	LLS	JNH		NA	RKN					
2	UPDATES TO EROSION AND SEDIMENT CONTROL SHEET AND EXISTING CONDITIONS	07 24 2017	DM	LLS	JNH		NA	RKN					
1	REVISED LINER SYSTEM	11 16 2016	DM	LLS	JNH		NA	RKN	CS	DS			
0	ISSUED FOR BID	04 08 2016	DM	LLS	JNH		NA	RKN	CS	DS			

DSGN D.MARSHALL — DSGN SUPV ———
DRWN L. STORMER — ENGR SUPV ———
CHKD JH — PROJ ENGR ———
DISPL ENGR ——— — SCALE: AS NOTED

DATE NOVEMBER 2016
DGNSPEC FOR FILE VERIFICATION
DRAWING NO. 66706-15348-CWSG-S3108 — REV. 3
UNLESS OTHERWISE NOTED — SH 10 OF 41

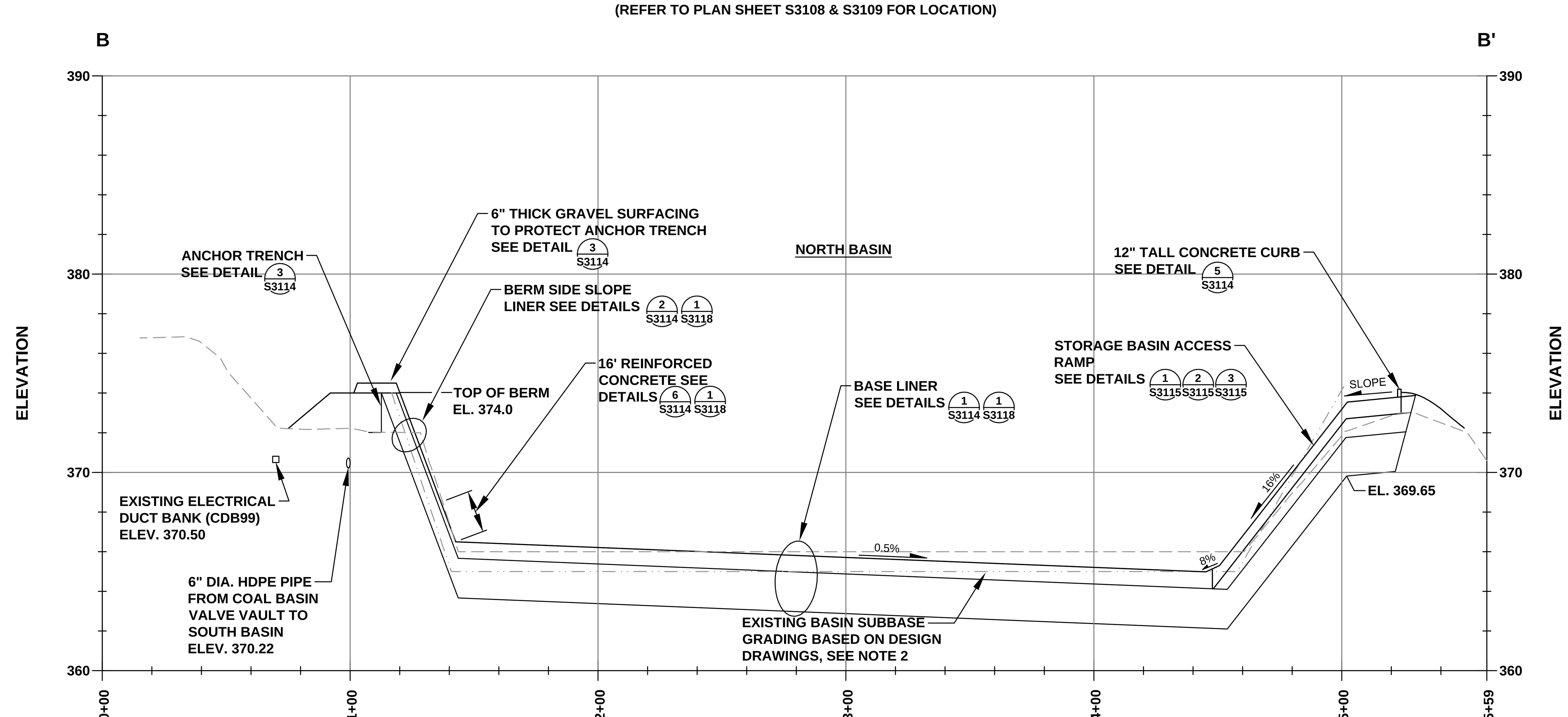
NOTES

1. REFER TO PLAN SHEET S3103 OF THIS PLAN SET FOR STANDARD LEGEND AND CONTROL POINT LOCATIONS.
2. EXISTING DESIGN GRADES BASED ON DRAWING 15348-1STF-S3001 REV12.



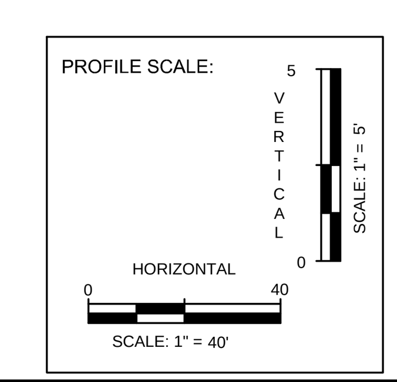
CROSS SECTION A-A'

(REFER TO PLAN SHEET S3108 & S3109 FOR LOCATION)



CROSS SECTION B-B'

(REFER TO PLAN SHEET S3108 & S3109 FOR LOCATION)



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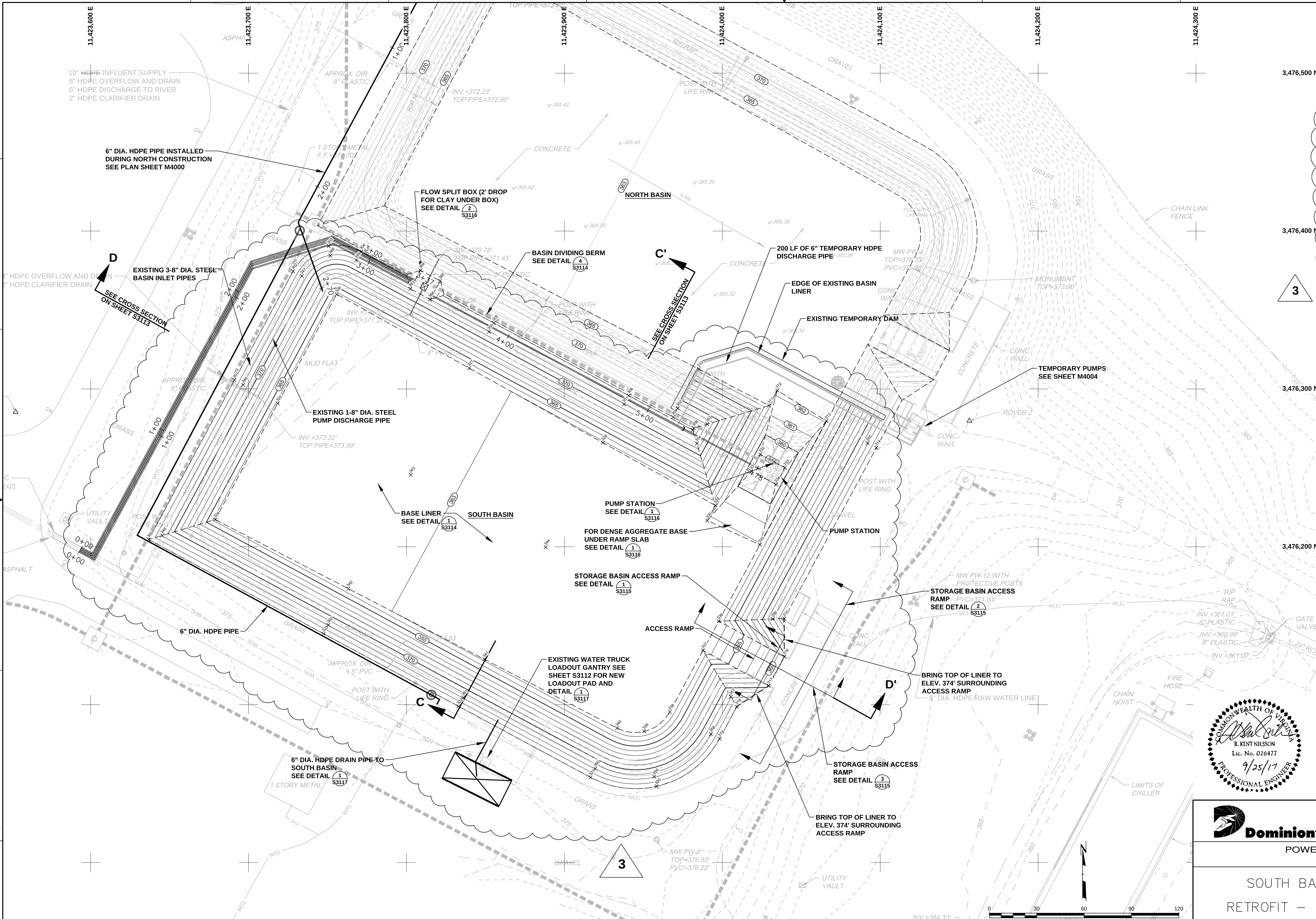
POWER GENERATION ENGINEERING
RICHMOND, VIRGINIA

NORTH BASIN CROSS SECTIONS

RETROFIT – SLUDGE SEDIMENTATION BASINS
CLOVER, VIRGINIA

REV	DESCRIPTION	DATE	DSGN	DRWN	CHKD	DSGN SUPV	PROJ ENGR	CIVIL ENGR	ELEC ENGR	MECH ENGR	ARCH	E.M. ENGR	I&C ENGR
1	REVISED LINER SYSTEM	11 16 2016	DM	LLS	JNH		NA	RKN	CS	DS			
0	ISSUED FOR BID	04 08 2016	DM	LLS	JNH		NA	RKN	CS	DS			

DSGN D.MARSHALL	DSGN SUPV	DATE NOVEMBER 2016 DGNSPEC FOR FILE VERIFICATION
DRWN L. STORMER	ENGR SUPV	DRAWING NO. 66706–15348–CWSG–S3110 REV. 1
CHKD JH	PROJ ENGR	
DISPL ENGR ---	SCALE: AS NOTED	UNLESS OTHERWISE NOTED SH 12 OF 40



10" HDPE INFLUENT SUPPLY
8" HDPE OVERFLOW AND DRAIN
6" HDPE DISCHARGE TO RIVER
2" HDPE CLARIFIER DRAIN
6" DIA. HDPE PIPE INSTALLED DURING NORTH CONSTRUCTION SEE PLAN SHEET M4000
FLOW SPLIT BOX (2' DROP FOR CLAY UNDER BOX) SEE DETAIL 2 S3116
NORTH BASIN
BASIN DIVIDING BERM SEE DETAIL 4 S3114
200 LF OF 6" TEMPORARY HDPE DISCHARGE PIPE
EDGE OF EXISTING BASIN LINER
EXISTING TEMPORARY DAM
EXISTING 3-8" DIA. STEEL BASIN INLET PIPES
SEE CROSS SECTION ON SHEET S3113
EXISTING 1-8" DIA. STEEL PUMP DISCHARGE PIPE
TEMPORARY PUMPS SEE SHEET M4004
BASE LINER SEE DETAIL 1 S3114
SOUTH BASIN
PUMP STATION SEE DETAIL 1 S3116
FOR DENSE AGGREGATE BASE UNDER RAMP SLAB SEE DETAIL 1 S3116
PUMP STATION
STORAGE BASIN ACCESS RAMP SEE DETAIL 1 S3115
STORAGE BASIN ACCESS RAMP SEE DETAIL 2 S3115
ACCESS RAMP
6" DIA. HDPE PIPE
EXISTING WATER TRUCK LOADOUT GANTRY SEE SHEET S3112 FOR NEW LOADOUT PAD AND DETAIL 1 S3117
BRING TOP OF LINER TO ELEV. 374' SURROUNDING ACCESS RAMP
6" DIA. HDPE DRAIN PIPE TO SOUTH BASIN SEE DETAIL 1 S3117
STORAGE BASIN ACCESS RAMP SEE DETAIL 3 S3115
BRING TOP OF LINER TO ELEV. 374' SURROUNDING ACCESS RAMP
11,423,600 E
11,423,700 E
11,423,800 E
11,423,900 E
11,424,000 E
11,424,100 E
11,424,200 E
11,424,300 E
3,476,500 N
3,476,400 N
3,476,300 N
3,476,200 N
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COMMONWEALTH OF VIRGINIA
SCALE IN FEET
0 30 60 90 120

NOTES

1. REFER TO PLAN SHEET S3103 OF THIS PLAN SET FOR STANDARD LEGEND AND CONTROL POINT LOCATIONS.

2. EXISTING PUMP STATION STRUCTURE, PIPING AND ELECTRICAL SHALL BE DEMOLISHED AND DISPOSED OFF-SITE.

POINT NO.	DESIGN LOCATION NORTH	DESIGN LOCATION EAST	SUBBASE GRADES DESIGN (ft)
300	3476204.59	11423636.73	374.00
301	3476305.56	11423691.09	374.00
302	3476374.49	11423728.20	374.00
303	3476390.55	11423750.72	374.00
304	3476386.98	11423771.29	374.00
305	3476341.75	11423855.32	374.00
306	3476295.77	11423940.73	374.00
307	3476273.93	11423981.29	374.00
308	3476275.12	11423981.93	374.00
309	3476282.17	11423968.83	374.00
310	3476312.52	11423985.17	362.51
311	3476289.43	11424029.63	362.26
312	3476299.03	11424034.80	362.26
313	3476279.65	11424065.96	362.08
314	3476262.68	11424097.56	374.00
315	3476154.54	11424039.27	374.00
316	3476130.40	11424039.37	369.65
317	3476111.91	11424029.41	369.65
318	3476098.71	11424009.20	374.00
319	3476078.45	11423998.29	374.00
320	3476048.26	11423958.29	374.00
321	3476053.93	11423916.58	374.00
322	3476098.94	11423832.98	374.00
323	3476144.92	11423747.56	374.00
324	3476217.24	11423678.87	363.63
325	3476290.85	11423718.50	363.63
326	3476359.86	11423755.82	363.63
327	3476313.20	11423839.69	363.15
328	3476265.95	11423924.40	362.67
329	3476226.22	11423995.60	362.26
330	3476216.65	11423990.45	362.26
331	3476247.89	11424018.38	359.00
332	3476258.49	11424024.08	359.00
333	3476250.11	11424039.66	359.00
334	3476239.51	11424033.95	359.00
335	3476201.32	11424023.76	362.08
336	3476152.83	11423997.72	362.08
337	3476134.34	11423987.76	362.08
338	3476095.42	11423966.78	362.07
339	3476083.06	11423950.50	362.12
340	3476085.17	11423933.40	362.20
341	3476128.76	11423849.30	362.67
342	3476173.46	11423763.19	363.16
343	3476245.64	11423802.69	363.15
344	3476199.75	11423888.15	362.67
345	3476207.16	11423645.30	371.89
346	3476302.57	11423696.66	371.89
347	3476371.49	11423733.77	371.89
348	3476384.36	11423751.75	371.89
349	3476381.45	11423768.22	371.89
350	3476336.20	11423852.28	371.89
351	3476290.22	11423937.69	371.89
352	3476287.74	11423971.83	371.89
353	3476277.69	11423990.50	371.89
354	3476265.36	11423983.86	371.89
355	3476265.71	11424091.94	371.87
356	3476154.24	11424031.92	371.89
357	3476105.01	11424005.41	371.89
358	3476081.45	11423992.72	371.89
359	3476054.43	11423956.91	371.89
360	3476059.50	11423919.58	371.89
361	3476104.49	11423836.01	371.89
362	3476150.47	11423750.60	371.89
363	3476363.39	11423802.46	372.00
364	3476375.08	11423808.91	372.00
365	3476368.35	11423821.41	372.00
366	3476356.66	11423814.96	372.00

Dominion

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POWER GENERATION ENGINEERING
RICHMOND, VIRGINIA

SOUTH BASIN LINER SUBBASE GRADES

RETROFIT – SLUDGE SEDIMENTATION BASINS
CLOVER, VIRGINIA

REV	DESCRIPTION	DATE	DSGN	DRWN	CHKD	DSGN SUPV	PROJ ENGR	CIVIL ENGR	ELEC ENGR	MECH ENGR	ARCH	E.M. ENGR	I&C ENGR
3	UPDATED SUBBASE GRADES AND PIPING REVISIONS	09 15 2017	DM	LLS	JNH		NA	RKN					
2	UPDATES TO EROSION AND SEDIMENT CONTROL SHEET AND EXISTING CONDITIONS	07 24 2017	DM	LLS	JNH		NA	RKN					
1	REVISED LINER SYSTEM	11 16 2016	DM	LLS	JNH		NA	RKN	CS	DS			
0	ISSUED FOR BID	04 08 2016	DM	LLS	JNH		NA	RKN	CS	DS			

DSGN D.MARSHALL | DSGN SUPV
DRWN L. STORMER | ENGR SUPV
CHKD JH | PROJ ENGR
DISPL ENGR --- | SCALE: AS NOTED

DATE NOVEMBER 2016
DGNSPEC FOR FILE VERIFICATION
DRAWING NO. 66706-15348-CWSG-S3111 REV. 3
UNLESS OTHERWISE NOTED
SH 13 OF 41

Appendix F
Groundwater Elevation Data

Dominion Clover Power Station

Historical Depths to Groundwater Data (1994 through 2016)

Date	Groundwater Elevations						Depths to Groundwater[(1)]					
	Upgradient	Downgradient					Upgradient	Downgradient				
	PW-2	PW-3	PW-4	PW-5	PW-12	PW-13	PW-2	PW-3	PW-4	PW-5	PW-12	PW-13
	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)
3/23/1994	359.52	353.23	347.32	345.54	NA	NA	**3.98**	10.27	16.18	17.96	NA	NA
6/13/1994	347.18	351.76	345.52	343.84	NA	NA	16.32	11.74	17.98	19.66	NA	NA
9/12/1994	354.99	349.06	342.72	342.02	NA	NA	8.51	14.44	20.78	21.48	NA	NA
12/13/1994	353.44	349.56	342.60	342.34	NA	NA	10.06	13.94	20.90	21.16	NA	NA
3/14/1995	353.18	346.25	344.92	344.43	NA	NA	10.32	17.25	18.58	19.07	NA	NA
7/5/1995	353.56	346.28	344.06	345.19	NA	NA	9.94	17.22	19.44	18.31	NA	NA
9/11/1995	352.69	N/S	342.63	342.18	NA	NA	10.81	N/S	20.87	21.32	NA	NA
12/12/1995	352.91	351.22	342.75	343.54	NA	NA	10.59	12.28	20.75	19.96	NA	NA
3/13/1996	354.81	349.54	344.57	345.71	NA	NA	8.69	13.96	18.93	17.79	NA	NA
6/4/1996	355.33	349.71	343.44	344.21	NA	NA	8.17	13.79	20.06	19.29	NA	NA
9/24/1996	355.05	349.26	343.74	344.54	NA	NA	8.45	14.24	19.76	18.96	NA	NA
12/10/1996	355.55	349.48	344.49	345.84	NA	NA	7.95	14.02	19.01	17.66	NA	NA
3/25/1997	357.15	350.63	345.33	346.45	NA	NA	6.35	12.87	18.17	17.05	NA	NA
6/10/1997	355.13	354.06	344.19	345.06	NA	NA	8.37	9.44	19.31	18.44	NA	NA
9/15/1997	356.85	350.10	343.92	344.69	NA	NA	6.65	13.40	19.58	18.81	NA	NA
12/9/1997	356.44	350.31	344.48	345.43	NA	NA	7.06	13.19	19.02	18.07	NA	NA
12/29/1997	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	NA	NA
1/14/1998	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	NA	NA
3/10/1998	357.43	351.52	346.59	ND	NA	NA	6.07	11.98	16.91	ND	NA	NA
6/30/1998	358.15	351.34	344.66	345.74	NA	NA	5.35	12.16	18.84	17.76	NA	NA
9/21/1998	357.25	349.84	342.62	343.58	NA	NA	6.25	13.66	20.88	19.92	NA	NA
12/8/1998	355.23	348.44	341.24	342.22	NA	NA	8.27	15.06	22.26	21.28	NA	NA
3/31/1999	356.28	349.79	344.48	345.78	NA	NA	7.22	13.71	19.02	17.72	NA	NA
6/2/1999	356.95	350.18	344.57	345.54	NA	NA	6.55	13.32	18.93	17.96	NA	NA
9/20/1999	356.59	349.80	346.92	345.34	NA	NA	6.91	13.70	16.58	18.16	NA	NA
12/8/1999	356.74	350.31	344.78	345.89	NA	NA	6.76	13.19	18.72	17.61	NA	NA
3/15/2000	357.37	351.12	345.42	346.65	NA	NA	6.13	12.38	18.08	16.85	NA	NA
6/6/2000	357.42	351.22	345.50	346.82	NA	NA	6.08	12.28	18.00	16.68	NA	NA
9/5/2000	356.90	350.66	344.91	346.82	NA	NA	6.60	12.84	18.59	16.68	NA	NA
12/5/2000	355.93	349.85	343.73	344.77	NA	NA	7.57	13.65	19.77	18.73	NA	NA

Dominion Clover Power Station

Historical Depths to Groundwater Data (1994 through 2016)

Date	Groundwater Elevations						Depths to Groundwater[(1)]					
	Upgradient	Downgradient					Upgradient	Downgradient				
	PW-2	PW-3	PW-4	PW-5	PW-12	PW-13	PW-2	PW-3	PW-4	PW-5	PW-12	PW-13
	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)
3/19/2001	355.35	350.22	345.01	346.16	NA	NA	8.15	13.28	18.49	17.34	NA	NA
6/18/2001	356.63	351.16	345.76	346.95	NA	NA	6.87	12.34	17.74	16.55	NA	NA
9/19/2001	355.43	349.85	343.61	344.78	NA	NA	8.07	13.65	19.89	18.72	NA	NA
12/12/2001	354.20	348.74	342.69	343.61	NA	NA	9.30	14.76	20.81	19.89	NA	NA
3/12/2002	353.95	349.06	343.71	344.96	NA	NA	9.55	14.44	19.79	18.54	NA	NA
6/4/2002	355.15	349.88	344.04	345.18	NA	NA	8.35	13.62	19.46	18.32	NA	NA
9/4/2002	353.63	348.26	342.64	343.82	NA	NA	9.87	15.24	20.86	19.68	NA	NA
12/9/2002	355.09	350.28	345.23	346.58	NA	NA	8.41	13.22	18.27	16.92	NA	NA
3/11/2003	356.63	351.78	346.94	348.05	NA	NA	6.87	11.72	16.56	15.45	NA	NA
6/4/2003	358.03	352.66	347.60	349.39	NA	NA	5.47	10.84	15.90	14.11	NA	NA
9/16/2003	358.68	352.60	346.32	347.68	NA	NA	**4.82**	10.90	17.18	15.82	NA	NA
12/18/2003	357.78	352.80	347.39	348.96	NA	NA	5.72	10.70	16.11	14.54	NA	NA
3/3/2004	357.31	352.55	346.32	347.58	NA	NA	6.19	10.95	17.18	15.92	NA	NA
6/8/2004	356.58	351.51	345.33	346.76	NA	NA	6.92	11.99	18.17	16.74	NA	NA
9/27/2004	356.83	351.34	345.84	347.36	NA	NA	6.67	12.16	17.66	16.14	NA	NA
12/1/2004	356.75	351.50	346.80	348.41	NA	NA	6.75	12.00	16.70	15.09	NA	NA
4/13/2005	357.33	352.16	346.74	348.26	NA	NA	6.17	11.34	16.76	15.24	NA	NA
10/5/2005	356.25	349.86	343.24	344.36	NA	NA	7.25	13.64	20.26	19.14	NA	NA
4/4/2006	356.75	350.76	344.93	346.34	NA	NA	6.75	12.74	18.57	17.16	NA	NA
10/12/2006	355.33	349.56	345.04	346.61	NA	NA	8.17	13.94	18.46	16.89	NA	NA
4/17/2007	356.12	351.18	346.15	347.82	NA	NA	7.38	12.32	17.35	15.68	NA	NA
10/2/2007	354.38	348.34	341.62	342.81	NA	NA	9.12	15.16	21.88	20.69	NA	NA
4/21/2008	354.55	349.53	344.73	346.35	NA	NA	8.95	13.97	18.77	17.15	NA	NA
10/28/2008	354.62	348.45	342.14	343.66	NA	NA	8.88	15.05	21.36	19.84	NA	NA
4/22/2009	355.31	349.96	345.04	346.48	NA	NA	8.19	13.54	18.46	17.02	NA	NA
10/27/2009	355.33	349.16	342.49	343.91	NA	NA	8.17	14.34	21.01	19.59	NA	NA
4/20/2010	358.53	353.15	346.71	348.01	NA	NA	**4.97**	10.35	16.79	15.49	NA	NA

Dominion Clover Power Station

Historical Depths to Groundwater Data (1994 through 2016)

Date	Groundwater Elevations						Depths to Groundwater[1]					
	Upgradient	Downgradient					Upgradient	Downgradient				
	PW-2	PW-3	PW-4	PW-5	PW-12	PW-13	PW-2	PW-3	PW-4	PW-5	PW-12	PW-13
	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)	(foot)
10/6/2010	355.88	350.34	344.19	345.16	NA	NA	7.62	13.16	19.31	18.34	NA	NA
4/19/2011	356.76	351.26	345.89	347.31	NA	NA	6.74	12.24	17.61	16.19	NA	NA
12/5/2011	355.83	350.51	344.89	346.36	NA	NA	7.67	12.99	18.61	17.14	NA	NA
4/17/2012	358.13	352.16	346.54	347.36	NA	NA	5.37	11.34	16.96	16.14	NA	NA
8/2/2012	357.53	350.81	344.16	345.25	NA	NA	5.97	12.69	19.34	18.25	NA	NA
4/9/2013	357.43	351.93	346.94	348.13	NA	NA	6.07	11.57	16.56	15.37	NA	NA
11/14/2013	356.24	350.88	344.22	345.25	NA	NA	7.26	12.62	19.28	18.25	NA	NA
5/12/2014	358.48	353.21	347.84	348.66	NA	NA	5.02	10.29	15.66	14.84	NA	NA
11/13/2014	357.28	352.16	346.14	345.98	NA	NA	6.22	11.34	17.36	17.52	NA	NA
11/3/2015	355.72	350.44	346.19	345.73	348.78	345.39	7.78	13.06	17.31	17.77	14.72	18.11
2/8/2016	357.17	352.04	349.01	348.27	351.05	348.11	6.33	11.46	14.49	15.23	12.45	15.39
5/5/2016	357.48	352.98	348.54	347.58	351.12	347.47	6.02	10.52	14.96	15.92	12.38	16.03

Footnotes:

1. Estimated depth to groundwater based on a bottom of basin liner elevation of 363.5 feet NAVD 88.

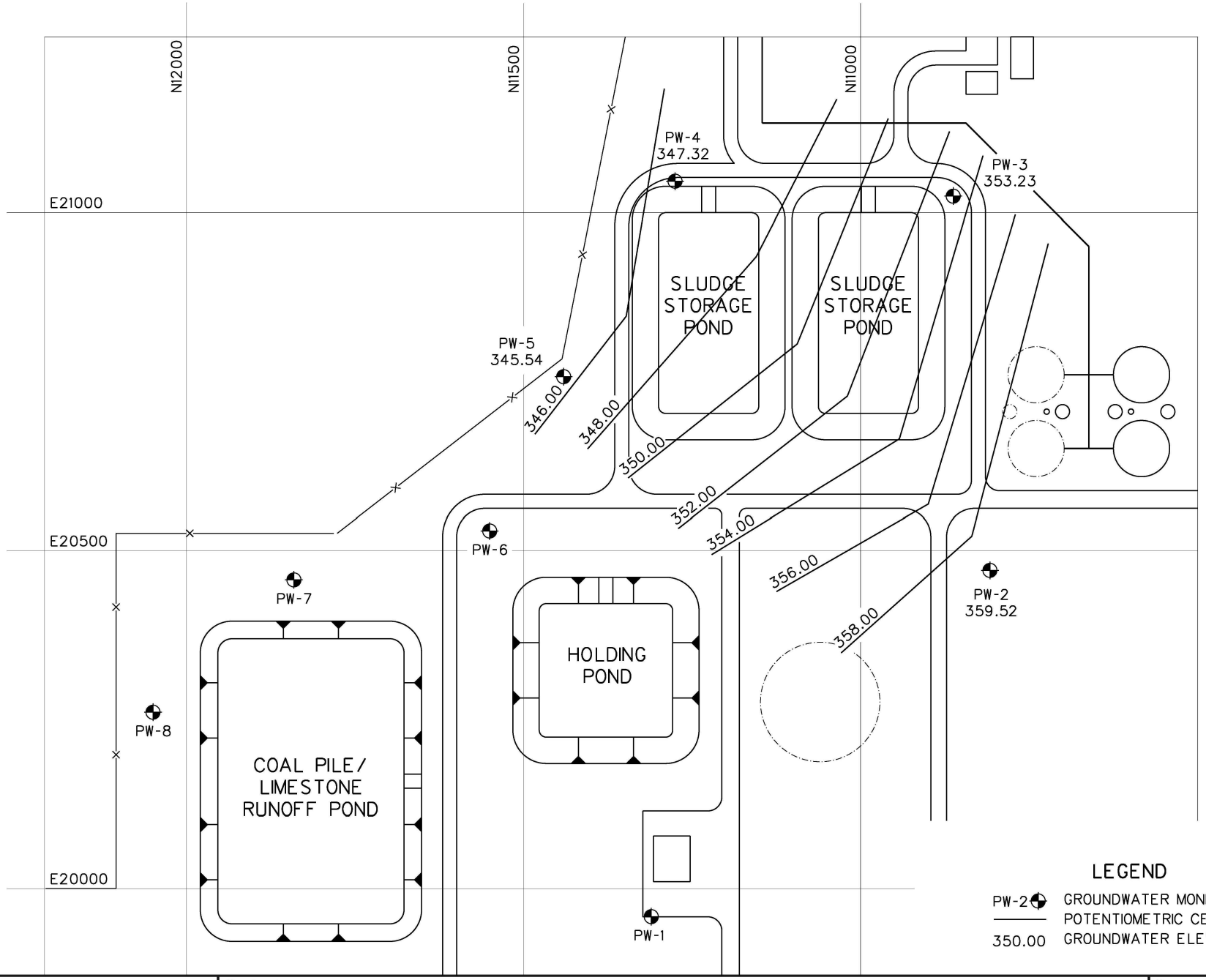
ND - No data collected

NA - Not applicable

3.98 - Potentially less than five feet of separation based on groundwater level at upgradient well and low point of basins.

Created By: G. Tieman, 3/22/2015; G. Shereda, 6/15/2016

Checked By: J. Hotstream, 7/17/2015, 6/23/2016



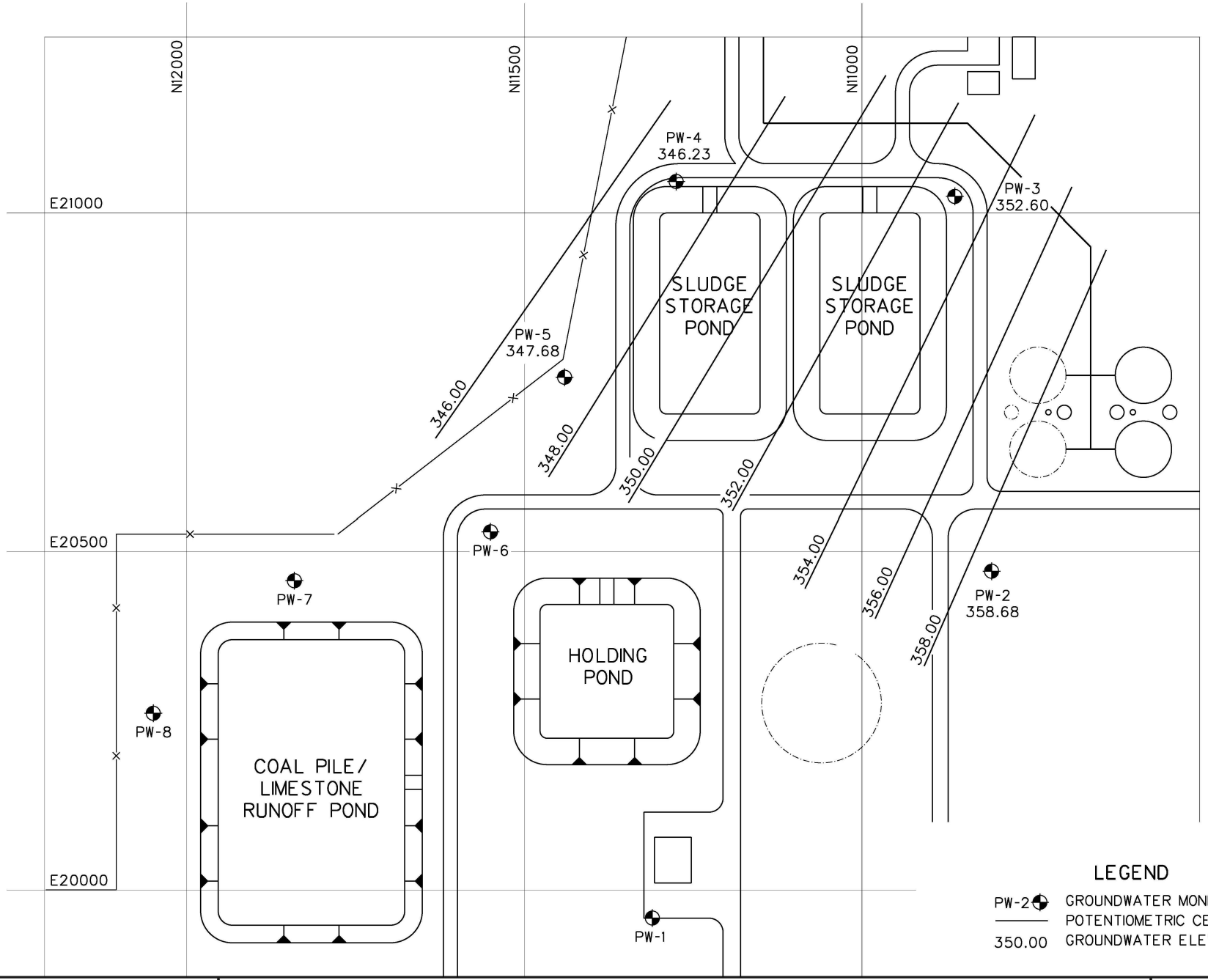
TRC
One Kenton Dr.
Suite 200
Charleston, West Virginia

Project:
DOMINION
CLOVER POWER STATION

Title:
POTENTIOMETRIC SURFACE MAP
03/23/94

Drawn by:	TLP
Approved by:	GT
Project No.	232002
Date:	03/2015

F:\RMD\Projects\Dominion Ash Ponds\Clover, VA\CADD Drawings\Clover Potentiometric Surface.dgn 03\30\15 01:27:45 PM

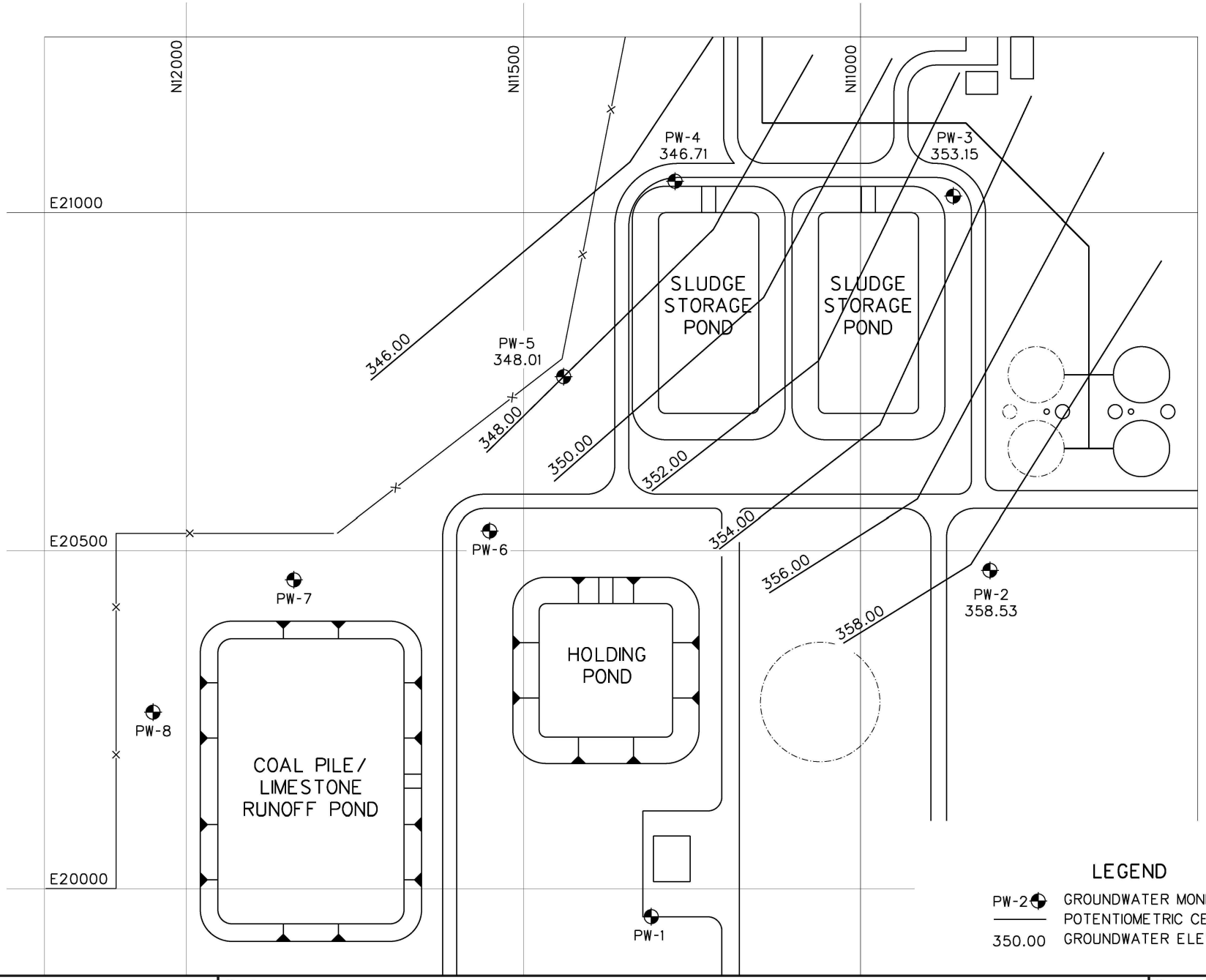


TRC
One Kenton Dr.
Suite 200
Charleston, West Virginia

Project:
DOMINION
CLOVER POWER STATION

Title:
POTENTIOMETRIC SURFACE MAP
09/16/03

Drawn by:	TLP
Approved by:	GT
Project No.	232002
Date:	03/2015

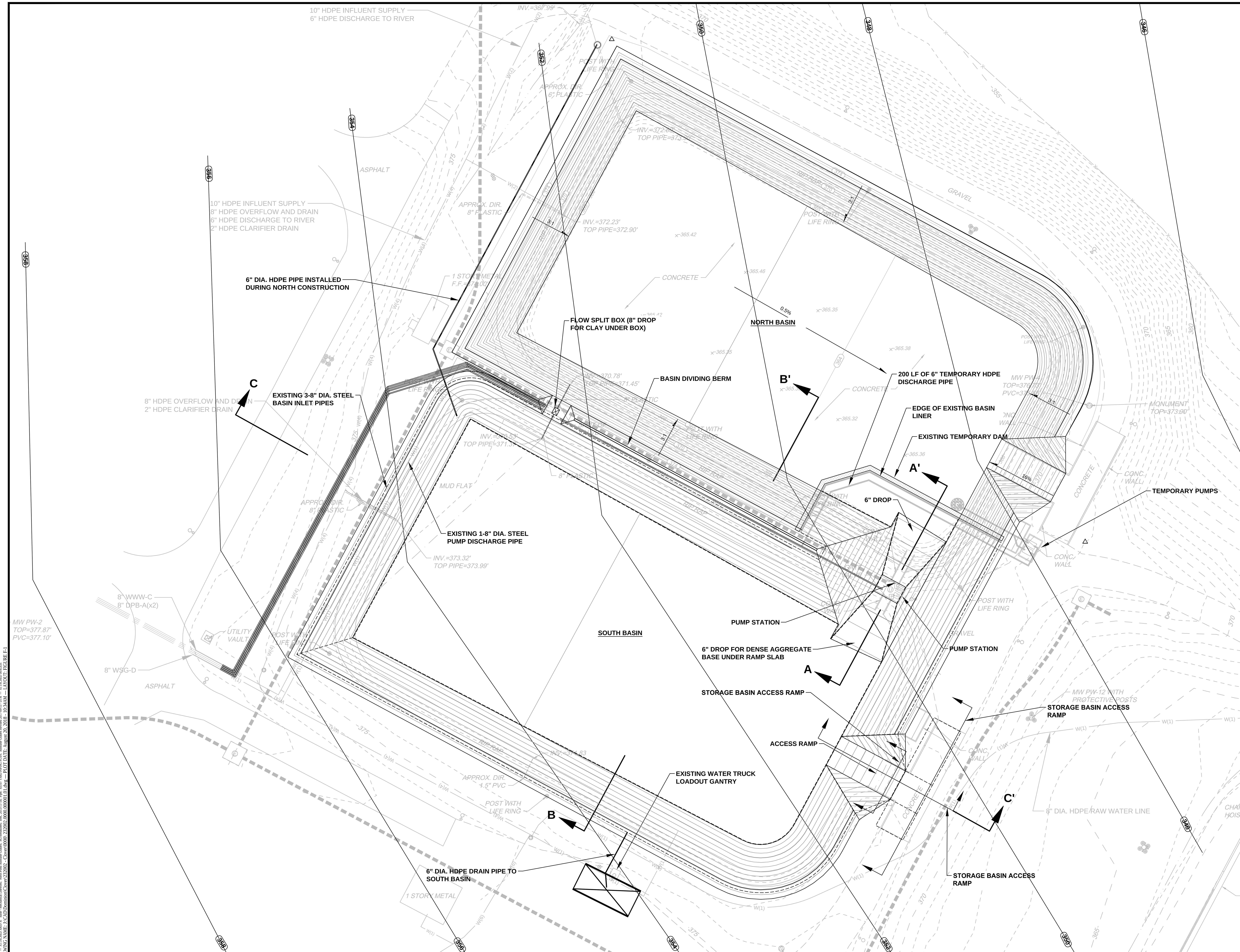


TRC
One Kenton Dr.
Suite 200
Charleston, West Virginia

Project:
DOMINION
CLOVER POWER STATION

Title:
POTENTIOMETRIC SURFACE MAP
04/20/10

Drawn by:	TLP
Approved by:	GT
Project No.	232002
Date:	03/2015


6" DIA. HDPE PIPE INSTALLED DURING NORTH CONSTRUCTION
FLOW SPLIT BOX (8" DROP FOR CLAY UNDER BOX)
NORTH BASIN
BASIN DIVIDING BERM
200 LF OF 6" TEMPORARY HDPE DISCHARGE PIPE
EDGE OF EXISTING BASIN LINER
EXISTING TEMPORARY DAM
EXISTING 3-8" DIA. STEEL BASIN INLET PIPES
EXISTING 1-8" DIA. STEEL PUMP DISCHARGE PIPE
6" DROP
TEMPORARY PUMPS
SOUTH BASIN
PUMP STATION
6" DROP FOR DENSE AGGREGATE BASE UNDER RAMP SLAB
PUMP STATION
STORAGE BASIN ACCESS RAMP
STORAGE BASIN ACCESS RAMP
ACCESS RAMP
EXISTING WATER TRUCK LOADOUT GANTRY
6" DIA. HDPE DRAIN PIPE TO SOUTH BASIN
STORAGE BASIN ACCESS RAMP
A
A'
B
B'
C
C'
10" HDPE INFLUENT SUPPLY
6" HDPE DISCHARGE TO RIVER
10" HDPE INFLUENT SUPPLY
8" HDPE OVERFLOW AND DRAIN
6" HDPE DISCHARGE TO RIVER
2" HDPE CLARIFIER DRAIN
8" HDPE OVERFLOW AND DRAIN
2" HDPE CLARIFIER DRAIN
MW PW-2
TOP=377.87'
PVC=377.10'
8" WWW-C
8" DPB-A(x2)
8" WSG-D
ASPHALT
GRAVEL
CHAIN LINK FENCE
8" DIA. HDPE RAW WATER LINE
0
30
60
90
120
SCALE IN FEET

NOTES

1. DESIGN BASED ON THE ISSUED FOR BID DRAWINGS TITLED CLOVER POWER STATION RETROFIT - SLUDGE SEDIMENTATION BASINS DATED APRIL 8, 2016.
2. GROUNDWATER POTENTIOMETRIC SURFACE BASED ON 4/20/2010 MEASUREMENTS.

(350) GROUNDWATER POTENTIOMETRIC ELEVATION

PROJECT: DOMINION POWER GENERATION ENGINEERING
CLOVER POWER STATION
SLUDGE SEDIMENTATION BASINS RETROFIT
CLOVER, VA

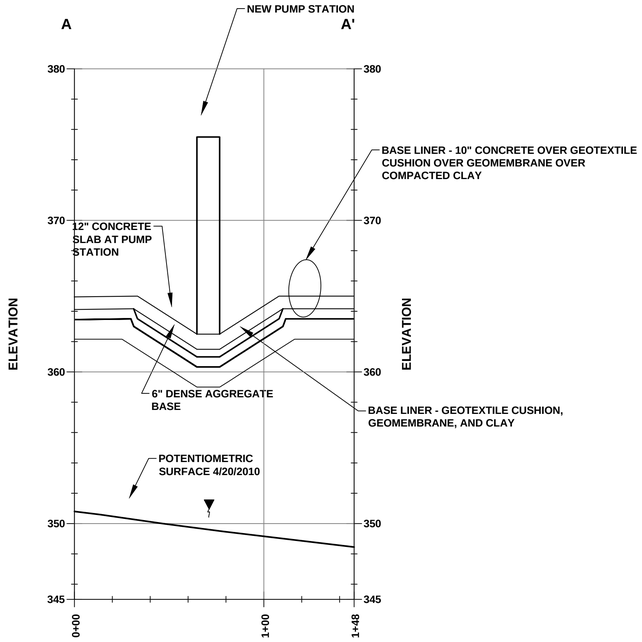
TITLE: SOUTH BASIN RETROFIT SUBBASE GRADES AND GROUNDWATER LEVELS

DRAWN BY:	L. STORMER	PROJ. NO.:	232002.0000.000001
CHECKED BY:	JH	FIGURE F-1	
APPROVED BY:	---		
DATE:	AUGUST 2018		

TRC

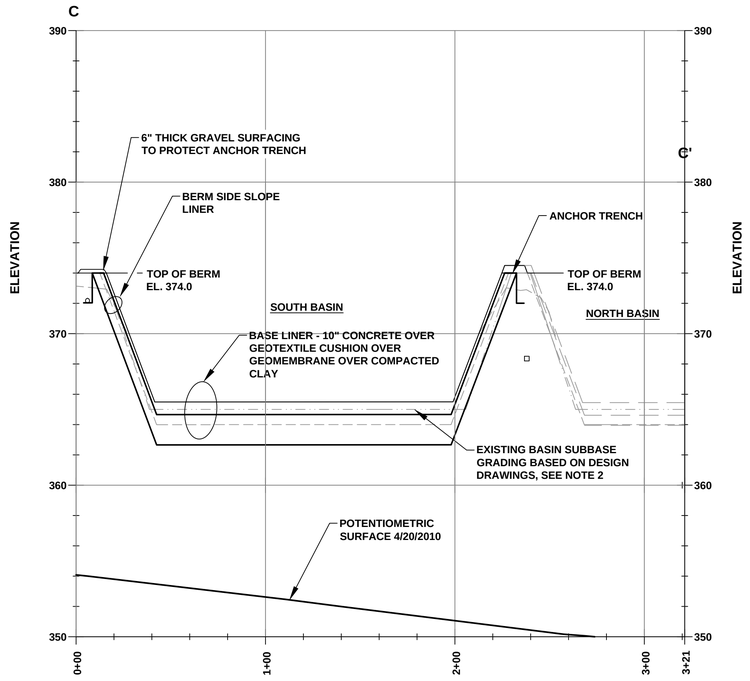
30 Patewood Drive
Patewood Plaza One, Suite 300
Greenville, SC 29615
Phone: 864.281.0030

FILE NO.: 232002.0000.000001.01.dwg



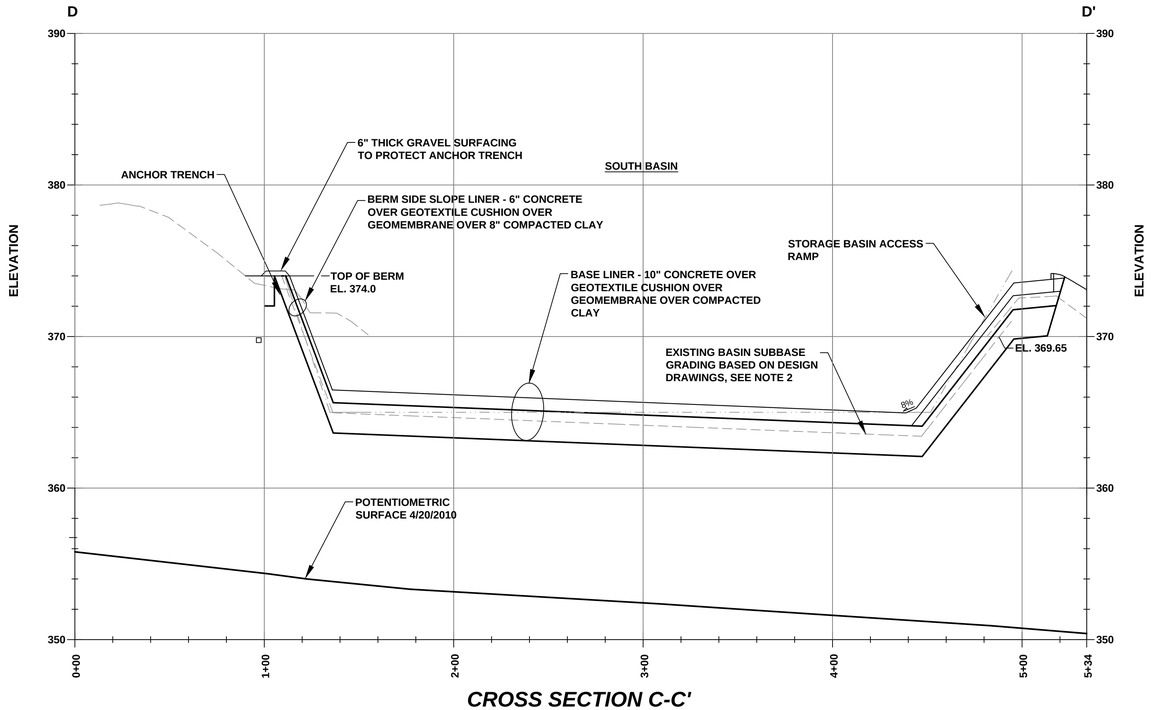
CROSS SECTION A-A'

(REFER TO FIGURE F-1 FOR LOCATION)



CROSS SECTION B-B'

(REFER TO FIGURE F-1 FOR LOCATION)



CROSS SECTION C-C'

(REFER TO FIGURE F-1 FOR LOCATION)

NOTES

1. DESIGN BASED ON THE ISSUED FOR BID DRAWINGS TITLED CLOVER POWER STATION RETROFIT - SLUDGE SEDIMENTATION BASINS DATED 4/8/2016.
2. EXISTING DESIGN GRADES BASED ON DRAWING 15348-1STF-S3001 REV12.
3. GROUNDWATER ELEVATIONS SHOWN ARE BASED ON THE 4/20/2010 MEASUREMENTS.

PROFILE SCALE:
VERTICAL 5 0 SCALE 1" = 5'
HORIZONTAL 0 40 SCALE: 1" = 40'

PROJECT: DOMINION POWER GENERATION ENGINEERING
CLOVER POWER STATION
SLUDGE SEDIMENTATION BASINS RETROFIT
CLOVER, VA

TITLE: SOUTH BASIN CROSS SECTIONS WITH HIGHEST OBSERVED GROUNDWATER LEVELS

DRAWN BY:	L. STORMER	PROJ. NO.:	232002.0000.000001
CHECKED BY:	JH		
APPROVED BY:	---		FIGURE F-2
DATE:	AUGUST 2018		

TRC
30 Patewood Drive
Patewood Plaza One, Suite 300
Greenville, SC 29615
Phone: 864.281.0030

FILE NO.: 232002.0000.000001.02.dwg

Appendix G
Wetlands

U.S. Fish and Wildlife Service

National Wetlands Inventory

Clover

Mar 24, 2015

Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deepwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

Riparian

- Herbaceous
- Forested/Shrub

Riparian Status

- Digital Data

User Remarks:

U.S. Fish & Wildlife Service

National Wetlands Inventory

Ecological Services

Enter Classification code: (Example: L1UB1Hx)

For geographically specific information* (optional), please enter a State code: (Example: TX for Texas)

DECODE

Description for code PUBHh :

P System PALUSTRINE: The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics: 1. are less than 8 hectares (20 acres); 2. do not have an active wave-formed or bedrock shoreline feature; 3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin; 4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

Subsystem :

UB Class UNCONSOLIDATED BOTTOM: Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%.

Subclass :

Modifier(s):

H WATER REGIME Permanently Flooded: Water covers the land surface throughout the year in all years.

h SPECIAL MODIFIER Diked/Impounded: These wetlands have been created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The descriptors ‘diked’ and ‘impounded’ have been combined into a single modifier since the observed effect on wetlands is similar. They have been combined here due to image interpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits.

WV Plant Specie(s):

Scientific Name	Common Name	Indicator	Reference Info.

WV Soil(s):

Series	Subgroup	Soils Fields Ind.	Drainage Class	Flood Frequency	Flood Duration	Flood Latest	HWT Depth	HWT Latest	LRR	Soil-5 Code

U.S. Fish & Wildlife Service

National Wetlands Inventory

Ecological Services

Enter Classification code: (Example: L1UB1Hx)

For geographically specific information* (optional), please enter a State code: (Example: TX for Texas)

DECODE

Description for code PFO1A :

P System PALUSTRINE: The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics: 1. are less than 8 hectares (20 acres); 2. do not have an active wave-formed or bedrock shoreline feature; 3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin; 4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

Subsystem :

FO Class FORESTED: Characterized by woody vegetation that is 6 m tall or taller.

1 Subclass Broad-Leaved Deciduous: Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season; e.g., black ash (Fraxinus nigra).

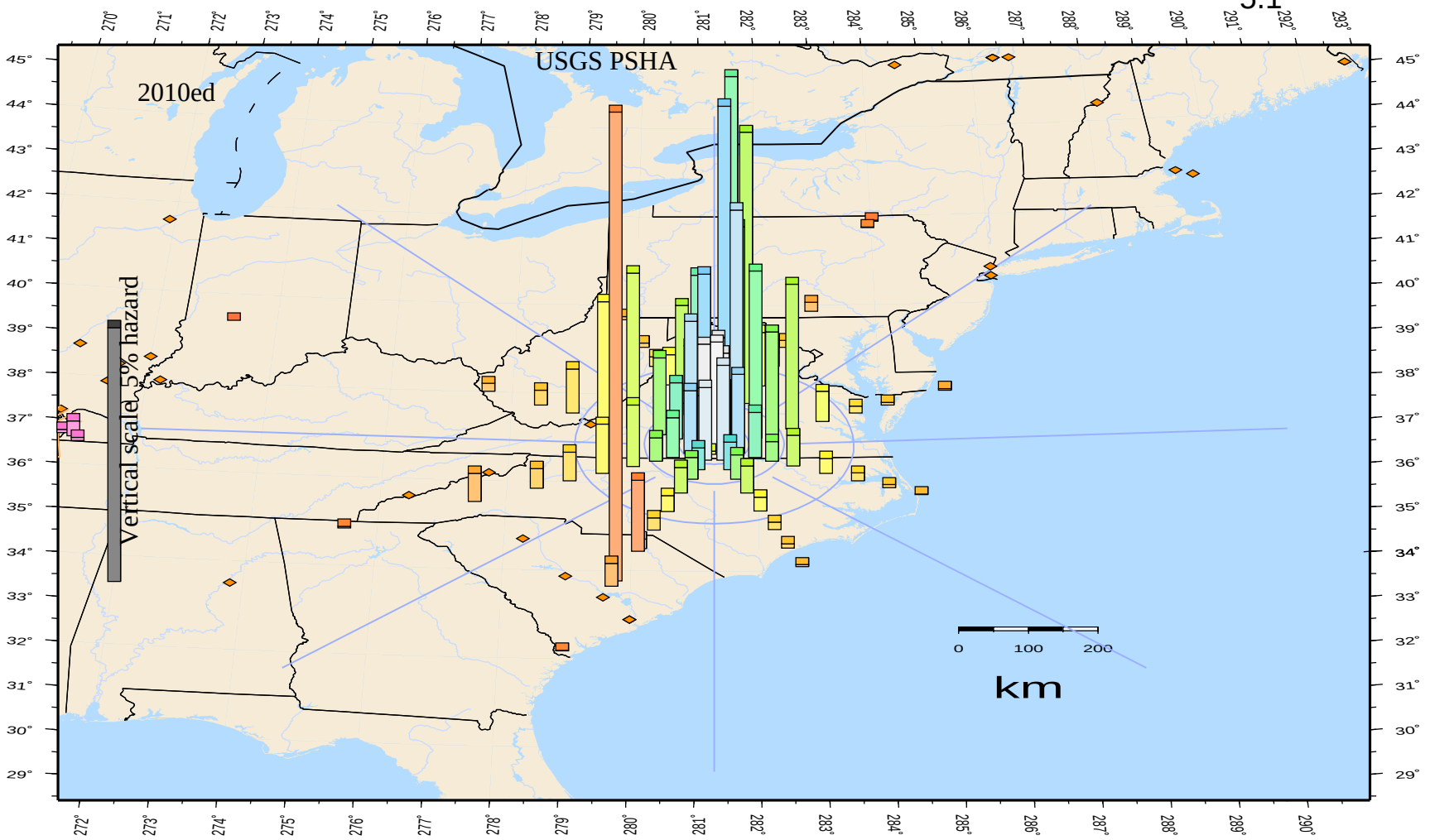
Modifier(s):

A WATER REGIME Temporary Flooded: Surface water is present for brief periods during growing season, but the water table usually lies well below the soil surface for most of the growing season. Plants that grow both in uplands and wetlands may be characteristic of this water regime.

Appendix H
Seismic Hazard

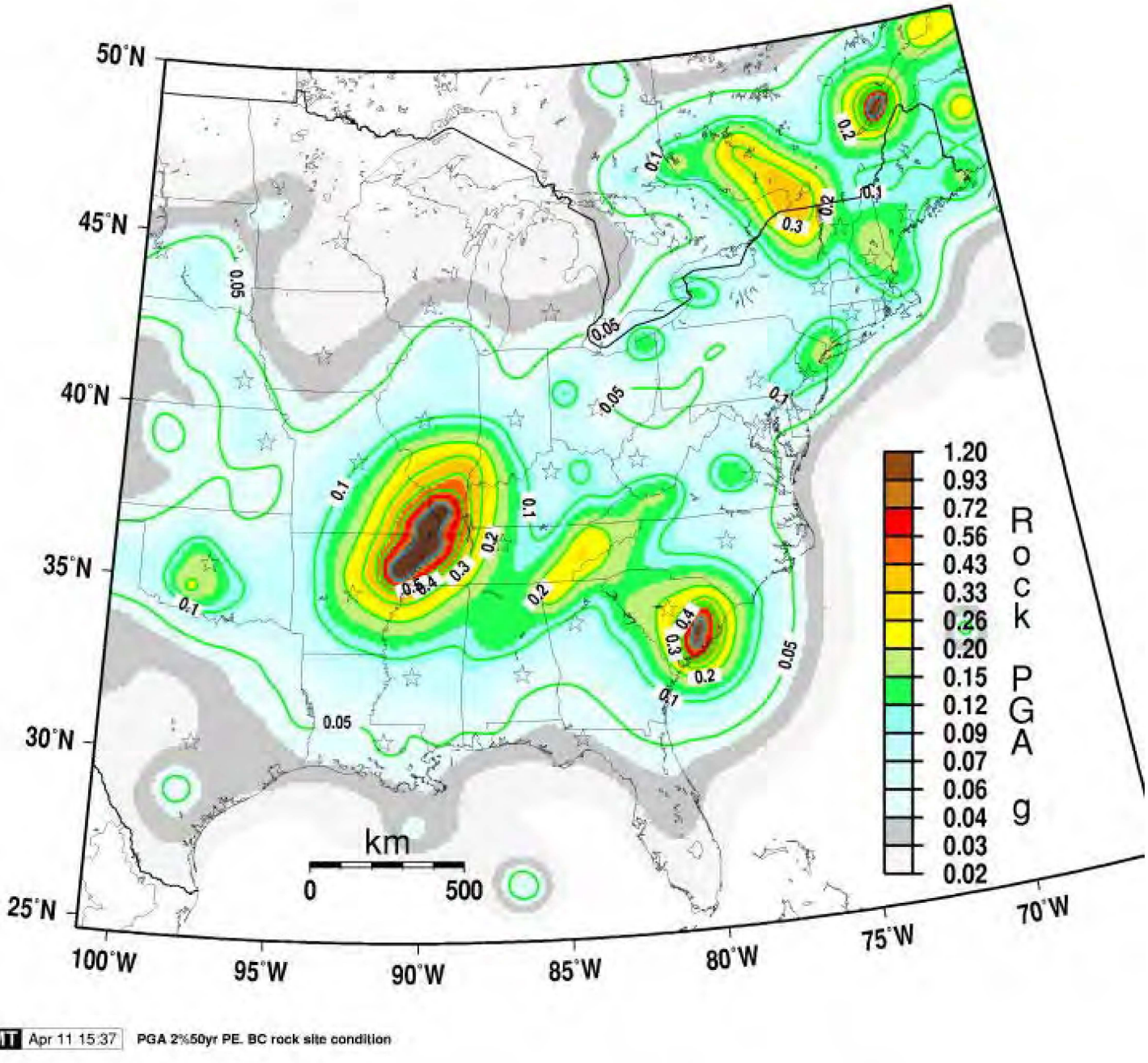
Clover Geographic Deagg. Seismic Hazard for 0.00-s Spectral Accel, 0.07338 g

PGA Exceedance Return Time: 2475 year
Max. significant source distance 935. km.
View angle is 35 degrees above horizon
Gridded-source hazard accum. in 45° intervals
Rock site. Vs30(m/s) = 760.0



GMT 2015 Mar 24 03:46:56 **Site Coords:-78.7016 36.8700 (yellow disk) Vs30= 760.0. Max annual ExcdRate .3731E-04 (column height prop. to ExRate). Diamonds: historical earthquakes. Red M>6,WUS. Orange M>5,CEUS**

PGA with 2%/50 yr PE, 2008

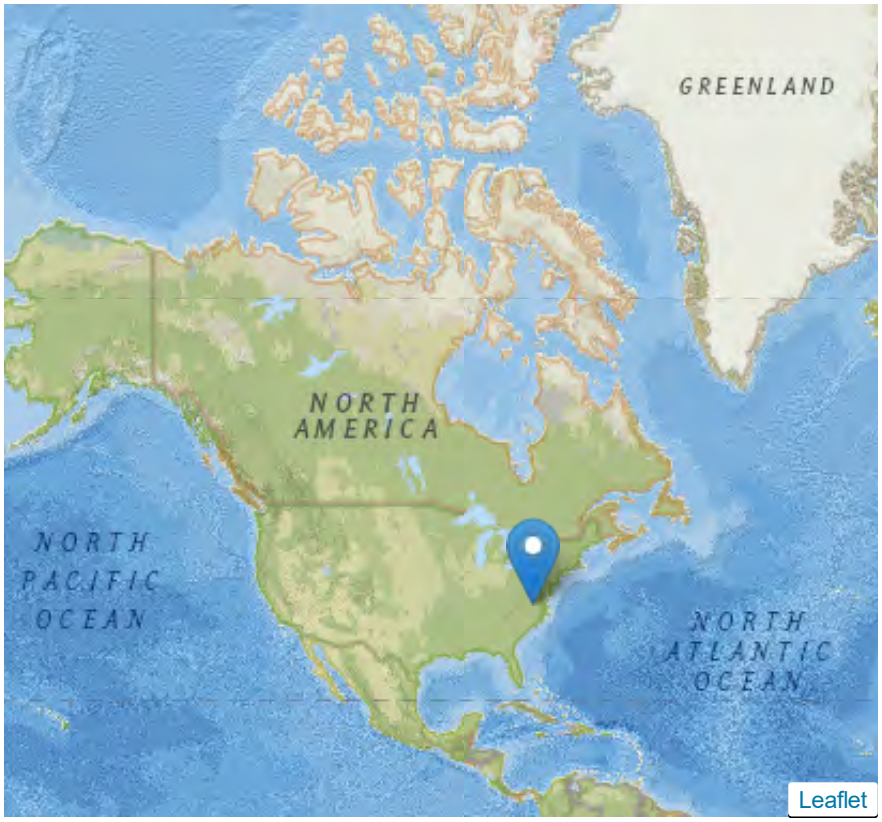


U.S. Geological Survey - Earthquake Hazards Program

Basins

Latitude = 36.870°N, Longitude = 78.702°W

Location



Reference Document

2015 NEHRP Provisions

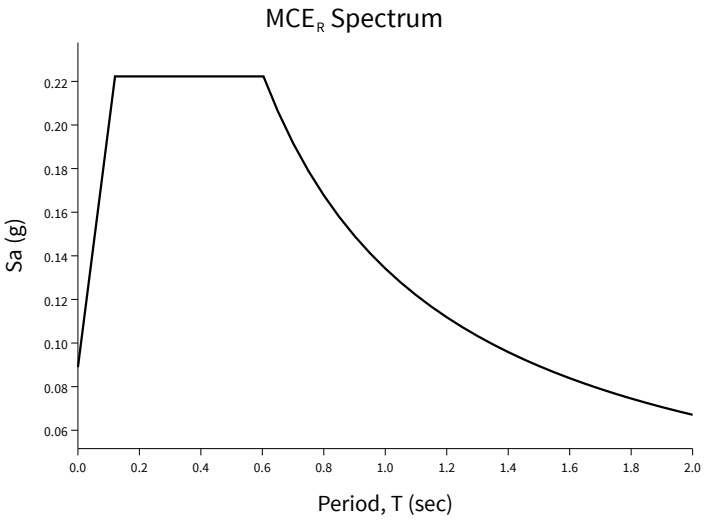
Site Class

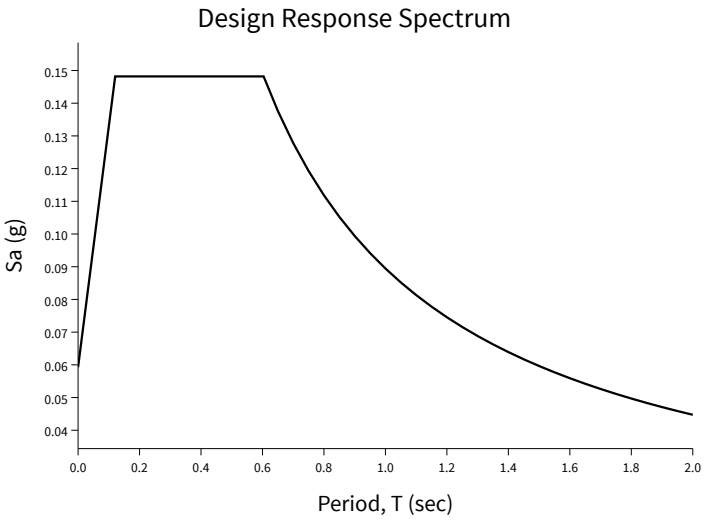
D (default): Stiff Soil

Risk Category

IV e.g. (Essential Facilities)

S_S =	0.139 g	S_{MS} =	0.222 g	S_{DS} =	0.148 g
S_1 =	0.056 g	S_{M1} =	0.134 g	S_{D1} =	0.089 g


MCE$_R$ Spectrum
Sa (g)
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Period, T (sec)


Design Response Spectrum
Sa (g)
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Period, T (sec)

Mapped Acceleration Parameters, Long-Period Transition Periods, and Risk Coefficients

Note: The S_S and S_1 ground motion maps provided below are for the direction of maximmum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) 1.3 (to obtain S_1).

- FIGURE 22-1 S_S Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Parameter for the Conterminous United States for 0.2 s Spectral Response Acceleration (5% of Critical Damping), Site Class B
- FIGURE 22-2 S_1 Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Parameter for the Conterminous United States for 1.0 s Spectral Response Acceleration (5% of Critical Damping), Site Class B
- FIGURE 22-9 Maximum Considered Earthquake Geometric Mean (MCE_G) PGA, %g, Site Class B for the Conterminous United States
- FIGURE 22-14 Mapped Long-Period Transition Period, T_L (s), for the Conterminous United States
- FIGURE 22-18 Mapped Risk Coefficient at 0.2 s Spectral Response Period, C_{RS}
- FIGURE 22-19 Mapped Risk Coefficient at 1.0 s Spectral Response Period, C_{R1}

Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site class as Site Class , based on the site soil properties in accordance with Chapter 20.

Table 20.3-1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20 • Moisture content w ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		
For SI: 1ft/s = 0.3048 m/s 1lb/ft^2 = 0.0479 kN/m^2			

Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Risk-targeted Ground Motion (0.2 s)

$C_{RS}S_{SUH} = 0.934 \times 0.149 = 0.139$ g

Deterministic Ground Motion (0.2 s)

$S_{SD} = 1.500$ g

$S_S \equiv$ "Lesser of $C_{RS}S_{SUH}$ and S_{SD}" = 0.139 g

Risk-targeted Ground Motion (1.0 s)

$C_{R1}S_{1UH} = 0.913 \times 0.061 = 0.056$ g

Deterministic Ground Motion (1.0 s)

$S_{1D} = 0.600$ g

$S_1 \equiv$ "Lesser of $C_{R1}S_{1UH}$ and S_{1D}" = 0.056 g

Table 11.4-1: Site Coefficient F_a

Site Class	Spectral Reponse Acceleration Parameter at Short Period					
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S = 1.25$	$S_S \geq 1.50$
A	0.8	0.8	0.8	0.8	0.8	0.8
B (measured)	0.9	0.9	0.9	0.9	0.9	0.9
B (unmeasured)	1.0	1.0	1.0	1.0	1.0	1.0
C	1.3	1.3	1.2	1.2	1.2	1.2
D (determined)	1.6	1.4	1.2	1.1	1.0	1.0
D (default)	1.6	1.4	1.2	1.2	1.2	1.2
E	2.4	1.7	1.3	1.2 *	1.2 *	1.2 *
F	See Section 11.4.7					

* For Site Class E and $S_S \geq 1.0$ g, see the requirements for site-specific ground motions in Section 11.4.7 of the 2015 NEHRP Provisions. Here the exception to those requirements allowing F_a to be taken as equal to that of Site Class C

has been invoked.

Note: Use straight-line interpolation for intermediate values of S_S.

Note: Where Site Class B is selected, but site-specific velocity measurements are not made, the value of F_a shall be taken as 1.0 per Section 11.4.2.

Note: Where Site Class D is selected as the default site class per Section 11.4.2, the value of F_a shall not be less than 1.2 per Section 11.4.3.

For Site Class = D (default) and S_S = 0.139 g, F_a = 1.600

Table 11.4-2: Site Coefficient F_v

Site Class	Spectral Response Acceleration Parameter at 1-Second Period					
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 = 0.50$	$S_1 \geq 0.60$
A	0.8	0.8	0.8	0.8	0.8	0.8
B (measured)	0.8	0.8	0.8	0.8	0.8	0.8
B (unmeasured)	1.0	1.0	1.0	1.0	1.0	1.0
C	1.5	1.5	1.5	1.5	1.5	1.4
D (determined)	2.4	2.2 [1]	2.0 [1]	1.9 [1]	1.8 [1]	1.7 [1]
D (default)	2.4	2.2 [1]	2.0 [1]	1.9 [1]	1.8 [1]	1.7 [1]
E	4.2	3.3 [1]	2.8 [1]	2.4 [1]	2.2 [1]	2.0 [1]
F	See Section 11.4.7					

[1] For Site Class D or E and $S_1 \geq 0.2$ g, site-specific ground motions might be required. See Section 11.4.7 of the 2015 NEHRP Provisions.

Note: Use straight-line interpolation for intermediate values of S_1.

Note: Where Site Class B is selected, but site-specific velocity measurements are not made, the value of F_v shall be taken as 1.0 per Section 11.4.2.

For Site Class = D (default) and $S_1 = 0.056$ g, $F_v = 2.400$

Site-adjusted MCE_R (0.2 s)

$$S_{MS} = F_a S_S = 1.600 \times 0.139 = 0.222 \text{ g}$$

Site-adjusted MCE_R (1.0 s)

$$S_{M1} = F_v S_1 = 2.400 \times 0.056 = 0.134 \text{ g}$$

Design Spectral Acceleration Parameters

Design Ground Motion (0.2 s)

$S_{DS} = ⅔ S_{MS} = ⅔ \times 0.222 = 0.148$ g

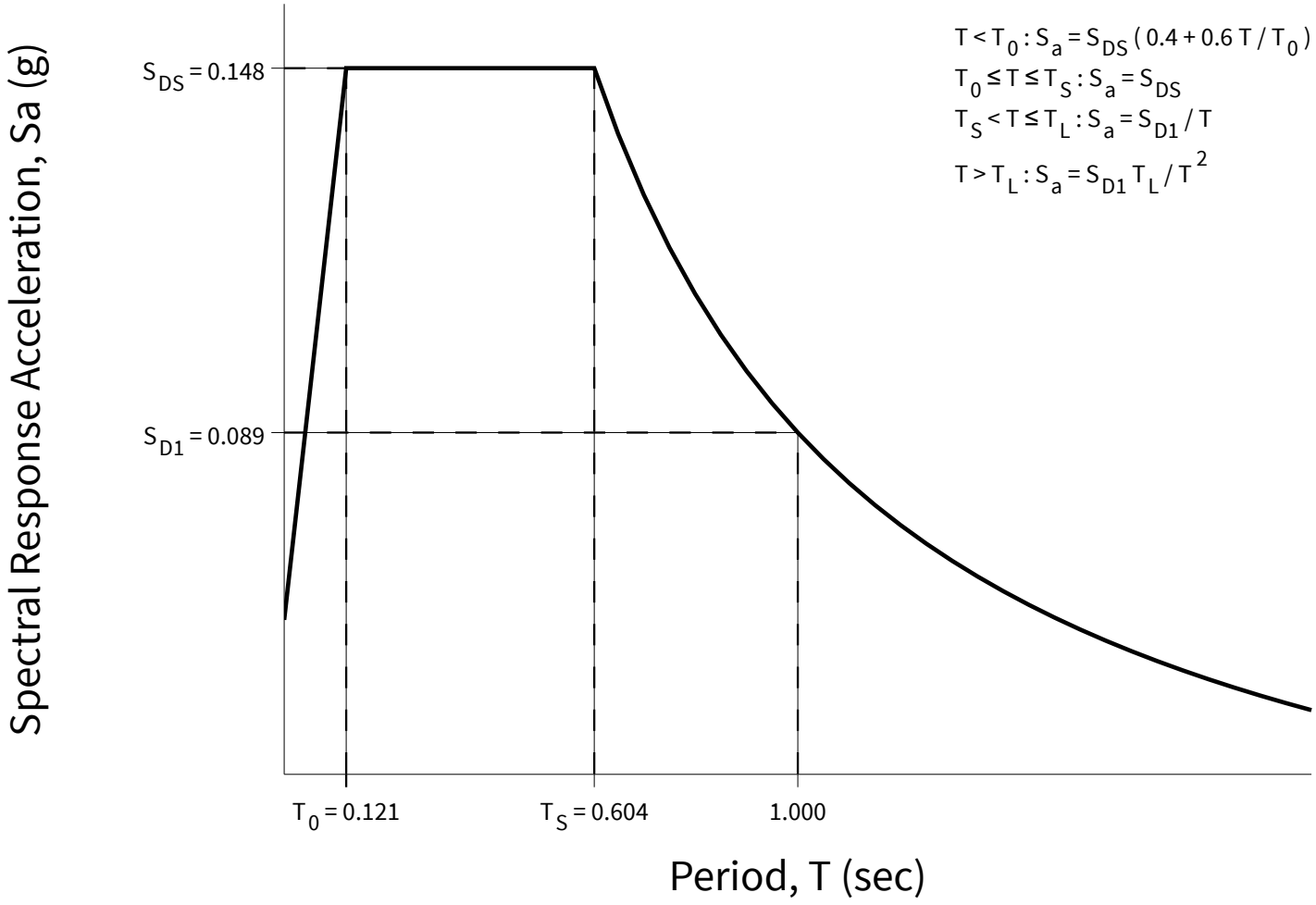
Design Ground Motion (1.0 s)

$S_{D1} = ⅔ S_{M1} = ⅔ \times 0.134 = 0.089$ g

Design Response Spectrum

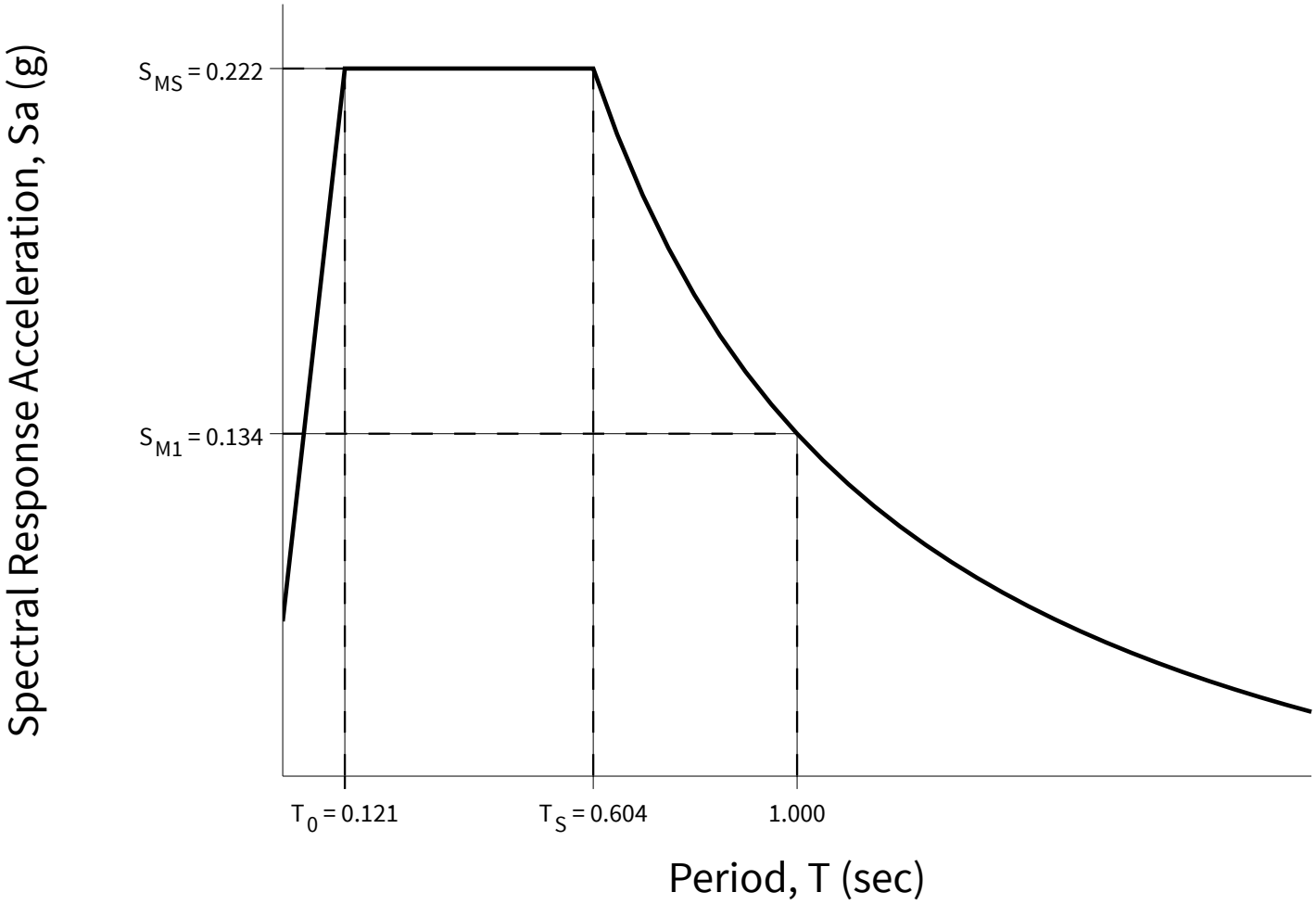
Long-Period Transition Period = T_L = 8 s

Figure 11.4-1: Design Response Spectrum



MCE_R Response Spectrum

The MCE_R response spectrum is determined by multiplying the design response spectrum above by 1.5.



Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

Table 11.8-1: Site Coefficient for F_{PGA}

Site Class	Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration					
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA = 0.50	PGA ≥ 0.60
A	0.8	0.8	0.8	0.8	0.8	0.8
B (measured)	0.9	0.9	0.9	0.9	0.9	0.9
B (unmeasured)	1.0	1.0	1.0	1.0	1.0	1.0
C	1.3	1.2	1.2	1.2	1.2	1.2
D (determined)	1.6	1.4	1.3	1.2	1.1	1.1
D (default)	1.6	1.4	1.3	1.2	1.2	1.2
E	2.4	1.9	1.6	1.4	1.2	1.1
F	See Section 11.4.7					

Note: Use straight-line interpolation for intermediate values of PGA

Note: Where Site Class D is selected as the default site class per Section 11.4.2, the value of F_{pga} shall not be less than 1.2.

For Site Class = D (default) and PGA = 0.071 g, F_{PGA} = 1.600

Mapped MCE_G

PGA = 0.071 g

Site-adjusted MCE_G

$PGA_M = F_{PGA}PGA = 1.600 \times 0.071 = 0.113$ g