Arizona Public Service
Four Corners Power Plant

Lined Ash Impoundment

Location Restrictions Demonstration Report

Prepared for :
Arizona Public Service

AECOM Job No. 60587725
October 8, 2018

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Certification Statement for Location Restrictions:

- **40 CFR § 257.60 – Placement above the uppermost aquifer**
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- **40 CFR § 257.62 – Fault areas**
- **40 CFR § 257.63 – Seismic impact zones**
- **40 CFR § 257.64 – Unstable Areas**

CCR Unit: Arizona Public Service Company; Four Corners Power Plant; Lined Ash Impoundment

I, Alexander Gourlay, being a Registered Professional Engineer in good standing in the State of New Mexico, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR unit, that the demonstration regarding the location of the CCR unit less than 1.52 meters (5 feet) above the upper limit of the uppermost aquifer, the demonstration regarding the location of the CCR unit in the wetlands, the demonstration regarding the location of the CCR unit within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time, the demonstration regarding the location of the CCR unit in a seismic impact zone, and the demonstration that the location of the CCR unit is not in an unstable area, as included in the Location Restrictions Demonstration Report dated October 8, 2018 meet the requirements of 40 CFR § 257.60(a), § 257.61(a), § 257.62(a), § 257.63(a), and § 257.64(a).

Alexander W. Gourlay, P.E.

Printed Name

October 8, 2018

Date

ALEXANDER W. GOURLAY
19846

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1 Introduction

Arizona Public Service Company (APS) contracted AECOM to assist in the location restrictions demonstrations of the existing coal combustion residual (CCR) surface impoundments at the Four Corners Power Plant (FCPP, the Plant) within the Navajo Nation, near Fruitland, New Mexico. Figure 1-1 shows the location of the CCR Impoundments at the FCPP. This Demonstration Report documents location-specific conditions relevant to the Lined Ash Impoundment (LAI).

1.1 Report Purpose and Description

The purpose of this report is to document the location restrictions demonstration for the LAI. The LAI is an existing CCR surface impoundment operated by APS. In 2015, the United States Environmental Protection Agency (EPA) finalized a rule (Rule) regulating CCRs under subtitle D of the Resource Conservation and Recovery Act (RCRA). As part of this Rule, owners and operators of existing CCR surface impoundments must obtain a certification from a qualified professional engineer stating that the demonstrations for the CCR unit meet the requirements relative to the uppermost aquifer, wetlands, fault areas, seismic impact zones, and unstable areas.

1.2 EPA Regulatory Requirements

On April 17, 2015 the United States Environmental Protection Agency issued 40 CFR Part 257 Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule (the Rule). Sections 257.60 through 257.64 define location restriction criteria for existing CCR surface impoundments and require the owner or operator of the CCR unit to demonstrate that the unit meets minimum requirements for:

a) Placement above the uppermost aquifer (§ 257.60);
b) Location outside wetlands (§ 257.61);
c) Location more than 60 meters (200 feet) from the outermost damage zone of a fault that has had displacement in Holocene time (§ 257.62);
d) Location outside seismic impact zones (§ 257.63);
e) Location away from unstable areas (§ 257.64).

Existing CCR surface impoundments, such as the LAI, are required to demonstrate compliance with the location restrictions no later than October 17, 2018. An owner or operator unable to demonstrate compliance is prohibited from placing CCR in the CCR unit under either 40 CFR § 257.60(c)(4), § 257.61(c)(4), § 257.62(c)(4), § 257.63(c)(4), or § 257.64(c)(4), as applicable.

1.3 Report Organization

This Demonstration Report is organized into the following sections:

Report Section	Applicable CFR 40 Part 257 Citation
• Section 1 – Introduction	
• Section 2 – Placement Above the Uppermost Aquifer	§ 257.60 Placement above the uppermost aquifer
• Section 3 – Location Relative to Wetlands	§ 257.61 Wetlands
• Section 4 – Location Relative to Fault Areas	§ 257.62 Fault areas

Section 5 – Location Relative to Seismic Impact Zones	§ 257.63 Seismic impact zones
Section 6 – Location Relative to Unstable Areas	§ 257.64 Unstable areas
Section 7 – Conclusions	
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Appendix A – Original Construction Plans and Boring Logs	
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Appendix C – Unified Hazard Tool Summary	

1.4 Facility Description

The FCPP is an electric generating station located within the Navajo Nation, near Fruitland, New Mexico. The FCPP is operated by APS and owned by a consortium of utility companies. The FCPP consists of two coal-fired electrical generating units, Units 4 and 5. Units 1, 2, and 3 ceased generation in 2013 and were then decommissioned. The two generating units are cooled by water from Morgan Lake, a man-made reservoir located immediately north of the Plant. Five existing CCR units are located at the FCPP: the Combined Waste Treatment Pond (CWTP) located immediately east of the Plant, the Lined Ash Impoundment (LAI) located approximately 1 mile west of the Plant, the Lined Decant Water Pond (LDWP) located approximately 1.5 miles west of the Plant and adjacent to the LAI, the Upper Retention Sump located immediately southeast of the Plant, and the Dry Fly Ash Disposal Area (DFADA), a landfill located approximately 2 miles southwest of the Plant and south of the LAI. Figure 1-1 shows the locations of these units.

The first phase of the LAI was constructed in 2003 over old Ash Pond 4 and the eastern portion of old Ash Pond 3; the LAI perimeter embankment was raised in several phases between 2003 and 2014, including an expansion over old Ash Pond 5. The LAI has a total surface area of approximately 129 acres. The LAI consists of a reservoir basin formed on all sides by a perimeter embankment that is founded either on native ground or the pre-existing perimeter embankments for the underlying old Ash Ponds 3, 4, and 5.

The LAI was constructed to receive hydraulically-transported fly ash from Units 1, 2, and 3 and flue gas desulfurization (FGD) sludge from Units 1, 2, 3, 4, and 5. With the closure of Units 1, 2, and 3, the LAI currently receives only FGD sludge from Units 4 and 5 and treated effluent from the Plant sewage treatment system.

2 Placement Above the Uppermost Aquifer

40 CFR § 257.60 requires that existing CCR surface impoundments must be constructed with a base that is located no less than 1.52 meters (5 feet) above the upper limit of the uppermost aquifer, unless the owner or operator demonstrates that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevation (including the seasonal high water table).

Uppermost aquifer is defined by the Rule to mean the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

2.1 Methodology

This Location Restrictions Demonstration Report includes an assessment of the separation between the base of the LAI and the uppermost aquifer based on available data. The following information was reviewed to assess the vertical location of the LAI relative to the uppermost aquifer:

- Preconstruction topographic conditions shown on construction plans (included in Appendix A)
- APS as-built drawings for 5228 Construction of the LAI (APS 2004)
- CCR Monitoring Well Network Report and Certification (AECOM 2017)
- Annual Groundwater Monitoring and Corrective Action Report for 2017 (Amec Foster Wheeler 2018)

2.2 Discussion and Conclusion

2.2.1 Base Elevation of the CCR Unit

The base of the LAI is defined by a 60-mil HDPE geomembrane liner installed on the top surface of old Ash Ponds 4 and 5 (URS 2012). The base of the LAI over old Ash Pond 4 slopes from east to southwest, from approximate EL 5228.0 feet (NGVD29, EL 5231.0 feet NAVD88) at the upstream toe of the East Embankment (over the old Ash Pond 4 footprint) to approximate EL 5206.0 feet (NGVD29, EL 5209.0 feet NAVD88) at the upstream toe of the southwest corner (over the divider dike between old Ash Ponds 3 and 4). The base of the LAI over old Ash Pond 5 slopes similarly, from approximate EL 5274.0 feet (NGVD29, EL 5277.0 feet NAVD88) to approximate EL 5256.0 feet (NGVD29, EL 5259.0 feet NAVD88). The base of the LAI over old Ash Pond 5 is approximately 50 feet higher in elevation than the base of the LAI over old Ash Pond 4.

2.2.2 Groundwater Elevations

Monitoring wells MW-7, MW-8, MW-12R, MW-12R1, MW-40R, MW-49A, MW-61, MW-75, and MW-76 were installed to monitor groundwater quality and elevation in the native soils (Lewis shale) underlying the ash disposal area west of the FCPP (Figure 2-1). MW-12R was abandoned in April 2018 and replaced with MW-12R1. MW-12R1 was dry at the time of installation and at the time of the most recent reading on June 22, 2018 (internal communication with APS, APS 2018b). Monitoring wells MW-54 and MW-60 do not meet criteria for inclusion in the CCR groundwater monitoring program, but provide useful groundwater elevation data and are shown on Figure 2-1; The wells are labeled as "supplementary" wells, consistent with terminology used in the Annual Groundwater Monitoring and Corrective Action Report for 2017 (Amec Foster Wheeler 2018).

Table 1 presents well data and the water level elevations in the wells monitored near the LAI (AECOM 2017, AECOM 2018, and Amec Foster Wheeler 2018).

Table 1 – Well Data and Groundwater Elevations (ft)[1]

	Well Name										
	MW-7	**MW-8**	**MW-12R**	**MW-12R1**	**MW-40R**	**MW-49A**	**MW-54**	**MW-60**	**MW-61**	**MW-75**	**MW-76**
Location Relative to the LAI	South	Southwest	East	East	Northwest	East	West	Northwest	West	West	West
Surface Elevation (ft)	5148.29	5120.85	5261.71	5268.23	5134.83	5281.38	5218.38	5141.50	5126.59	5124.80	5114.30
Bottom of Screen (ft)	5113.62	5072.81	5217.96	5236.23	5110.53	5216.38	5127.38	5117.16	5092.39	5085.78	5087.50
Screened In	Alluvium, Weathered Shale	Weathered, Unweathered Shale	Weathered Shale	Weathered Shale	Weathered Shale	Weathered Shale	Weathered Shale	Weathered Shale	Weathered Shale	Alluvium, Weathered Shale	Alluvium

Measurement Date	**MW-7**	**MW-8**	**MW-12R**	**MW-12R1**	**MW-40R**	**MW-49A**	**MW-54[4]**	**MW-60**	**MW-61**	**MW-75**	**MW-76**
11/3-11/9, 11/14/2015	5121.97	5076.00	5219.95	NI[2]	Dry	5229.25	NM[5]	5129.69	5104.49	NI[2]	NI[2]
4/25/2016	5122.28	5077.80	5220.10	NI[2]	5111.73	5240.79	NM[5]	5128.65	5104.55	NI[2]	NI[2]
6/20/2016	NM[5]	NM[5]	NM[5]	NI[2]	NM[5]	NM[5]	5148.80	NM[5]	NM[5]	NI[2]	NI[2]
9/12/2016	5123.71	5075.45	Dry	NI[2]	5112.53	5240.56	NM[5]	5130.08	5103.64	NI[2]	NI[2]
9/16/2016	NM[5]	NM[5]	NM[5]	NI[2]	NM[5]	NM[5]	5148.38	NM[5]	NM[5]	NI[2]	NI[2]
10/19-10/20/2016	5122.96	5074.49	Dry	NI[2]	5112.71	5241.06	NM[5]	5129.82	5103.25	NI[2]	NI[2]
1/31-2/1/2017	5126.24	5075.62	Dry	NI[2]	5113.09	5241.73	NM[5]	5130.07	5103.09	NI[2]	NI[2]
5/1/2017	5128.49	5075.97	Dry	NI[2]	5112.96	5240.98	NM[5]	5129.67	5105.83	5102.32	Dry
9/9/2017	5129.35	5075.17	5220.02	NI[2]	5112.25	5240.64	NM[5]	5129.34	5102.38	5101.78	5088.47
10/11/2017	5129.60	5075.07	Dry	NI[2]	5113.29	5240.62	NM[5]	5129.63	5102.40	5101.85	Dry
8/9/2018	NM[5]	NM[5]	NM[5]	NI[2]	NM[5]	NM[5]	5147.25	NM[5]	NM[5]	NM[5]	NM[5]

Highest Recorded Groundwater Elevation (ft)	5129.60	5077.80	5220.10	<5236.23[3]	5113.29	5241.73	5148.80	5130.08	5105.83	5102.32	5088.47

1) Elevations are presented in NAVD88.
2) NI = Not installed. Monitoring wells MW-75 and MW-76 were installed in March 2017. Monitoring well MW-12R1 was installed in April 2018.
3) MW-12R1 was observed to be dry during drilling has been dry since installation. Last measured on June 22, 2018 (APS 2018b).
4) Groundwater elevation data for monitoring well MW-54 was provided by APS (internal communication, APS 2018c).
5) NM = The groundwater elevation was not measured on the date shown.

Table 2 presents data for piezometer P-23, installed in the northwest corner of the LDWP and screened in fly ash and native soil.

Table 2 – Open Standpipe Piezometer Groundwater Elevations (ft)[1]

	Piezometer Name
	P-23
Location Relative to the LDWP	Northeast
Collar Elevation (ft)	5216.98
Bottom of Screen (ft)	~5155
Screened In	Fly Ash and Native Soil

Measurement Date	P-23
1/28/2015	5157.56
4/28/2015	5157.22
7/6/2015	5157.43
1/15/2016	5157.34
4/18/2016	5157.18
7/13/2016	5157.16
10/10/2016	5157.18
1/18/2017	5157.19
4/17/2017	5157.16
7/17/2017	5157.03
10/16/2017	5157.07

Highest Recorded Groundwater Elevation (ft)	5157.56

1) Elevations are presented in NGVD29 (NAVD88 ≈ NGVD29 + 3 feet).

2.2.3 Draining of Old Ash Ponds 3, 4, and 5

APS undertook several measures to ensure and verify that the phreatic surface within ash contained in old Ash Ponds 3, 4, and 5 had lowered significantly prior to initial construction of the LAI. These measures were:

1. Gravity drain-down – Old Ash Ponds 3, 4, and 5 were allowed to dry and drain, without addition of CCR or process water, from the mid-1980s until 2003.

2. Toe drain – APS installed a gravity toe drain parallel to the downstream toe of the south embankment of the LAI 5258 Lift. The intent was to drain water pressure within the foundation of the dam. The toe drain produced water only when wet bottom ash fill was being placed on the downstream face of the embankment for raise construction; the drain is otherwise reported as dry (APS 2018a), indicating the absence of any established phreatic surface within the south embankment containing the old Ash Pond 4 ash deposits.

3. Tamarisk – Tamarisk were allowed to grow on the top surface of old Ash Ponds 3, 4, and 5 after cessation of discharge in the 1980s. The tamarisk has a long tap root that tends to seek and draw up saline groundwater. The tamarisk were removed prior to construction of the LAI in 2003.

4. Geotechnical investigation – Soil borings and cone penetration test soundings were advanced into old Ash Ponds 3 and 4 to verify their suitability as the foundation of the future LAI and LDWP in 2002.

2.2.4 Geotechnical Investigation of Old Ash Ponds 3 and 4

The primary purpose of the 2002 geotechnical investigation was to verify the suitability of the foundation for proposed construction of the west embankment of the LAI, which would overlie the divider dike between old Ash Ponds 3 and 4. One objective of the investigation was to identify the depth of the phreatic surface, if any, within the impounded ash of old Ash Ponds 3 and 4. The investigation consisted of a soil boring program and a separate cone penetration test (CPT) program:

> 2002 Soil Borings in Ash Ponds 3 and 4 – APS as-builts for the 2003 initial construction of the LAI (APS 2004) document boring logs for six hollow-stem auger soil borings drilled on either side of, and within, the divider dike between old Ash Ponds 3 and 4. The as-builts depicting the plan location of the borings and the boring logs are presented in Figures A-1 and A-2 (Appendix A).
>
> - Borings B-2 and B-4 – Drilled in old Ash Pond 3. Showed ash deposits to a depth of 36 feet in B-2 and 41 feet in B-4. Measured perched groundwater (impounded in Ash Pond 3) from 18 to 36 feet deep in B-2 and no groundwater in B-4.
> - Borings B-3 and B-5 – Drilled through the divider dike. Showed a minor thickness of ash. Measured groundwater in the native weathered shale at 46 feet deep in B-3 and no groundwater in B-5.
> - Borings B-1 and B-6 – Drilled in old Ash Pond 4, under the future impoundment of the LAI. Showed ash deposits to a depth of 36 feet in B-1 and 14 feet in B-6. 4. Measured perched groundwater (impounded in Ash Pond 4) from 31.5 to 37 feet depth in B-1 and no groundwater in B-6.
>
> The results of the soil boring program show that the phreatic surface within old Ash Pond 4, as evidenced by boring B-1 and B-6, was significantly deeper than 5 feet below the top of ash surface on which the LAI geomembrane liner was later installed.
>
> 2002 Cone Penetration Test (CPT) Program in Ash Ponds 3 and 4 – APS contracted ConeTec, Inc. to perform a series of CPT soundings with pore pressure measurements on either side of, and within, the divider dike between old Ash Ponds 3 and 4 in 2002. The as-builts depicting the plan location of the CPT soundings are presented in Figure A-1. The results of 15 CPT soundings confirm that the upper 10 feet did not appear to contain a stabilized phreatic surface.

2.2.5 Construction of the LAI

Construction of the LAI required extensive operation of heavy construction equipment across the top surface of Ash Ponds 3 and 4 for construction of perimeter embankments, site grading, and distribution of rolls of geomembrane. The equipment operated successfully, without hindrance from soft ground conditions. APS interprets the successful operation of heavy equipment as confirming the consistent absence of shallow saturation in old Ash Ponds 3 and 4 at the time of LAI construction. APS reports similar equivalent experience during the subsequent lateral extension of the LAI over old Ash Pond 5.

2.2.6 Separation from the Uppermost Aquifer

Soil borings B-1 and B-6 show that the phreatic surface within old Ash Pond 4 was significantly deeper than 5 feet below the top of ash surface at the time the LAI geomembrane liner was installed. The CPT soundings confirm the lack of an extensive, established phreatic surface in the upper 10 or more feet of ash in old Ash Pond 4. Successful operation of heavy equipment for construction of the LAI confirms the absence of significant moisture in the upper 5 feet of ash below the geomembrane liner at the time of construction of the LAI. The toe drain installed in the foundation of the south embankment remains dry since the end of embankment construction. The LAI geomembrane liner, undisturbed after initial burial, was intended and installed to prevent discharge from the LAI to the subgrade. There is no indication that the geomembrane liner is breached and therefore no indication of opportunity for sufficient leakage to re-saturate the subgrade of the LAI and to cause mounding of the phreatic surface within 5 feet of the base of the LAI.

There are three wells located upgradient (to the east) of the LAI: MW-12R (abandoned), MW-12R1, and MW-49A. Each of these three wells is dry or shows a highest recorded groundwater elevation significantly lower than the elevation of the adjacent LAI base liner (Table 3).

There is a well and a piezometer located downgradient (to the west) of the LAI: Well MW-54 and Piezometer P-23 (both installed in the LDWP embankment crest with screens in the upper part of the Lewis shale). Both of these instruments show a maximum recorded groundwater elevation significantly lower than the elevation of the adjacent LAI base liner (Table 3).

Table 3 – Maximum Recorded Groundwater Elevations and Adjacent LAI Base Elevation

Well/Piezometer	Maximum Recorded Groundwater Elevation (ft)[1]	Adjacent LAI Base Elevation (ft)[1,3]
MW-12R	5220.10	5234.0
MW-12R1	Dry[2]	5234.0
MW-49A	5241.73	5261.0
MW-54	5148.80	5209.0
P-23	5160.56	5211.0

1) Elevations are presented in NAVD88.
2) MW-12R1 was observed to be dry during drilling (to EL 5228.2 feet). The monitoring well was completed with a screened interval from EL 5246.23 feet to EL 5236.23 feet and has been dry at each measurement. Last measured on June 22, 2018 (APS 2018b).
3) The LAI base elevation (in NGVD29) is from APS drawing FC-C-17-ADS-150515, Sheet 2 (Appendix A). NAVD88 ≈ NGVD29 + 3 feet.

The five groundwater instruments that surround the LAI indicate groundwater is either not present or greater than 5 feet below the adjacent base elevation of the LAI.

Conclusion: The base of the LAI is located greater than 1.52 meters (5 feet) above the groundwater level in the uppermost aquifer.

3 Location Relative to Wetlands

40 CFR § 257.61 requires that existing surface impoundments not be located in wetlands. Wetlands are defined in 40 CFR § 232.2 as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

3.1 Methodology

A wetland delineation was performed in April 2012 and jurisdictional determinations of the wetlands identified have been reviewed and accepted by the U.S. Army Corps of Engineers and the Environmental Protection Agency (United States Department of the Interior, Office of Surface Mining Reclamation and Enforcement 2015). A map of wetlands identified at the FCPP in this study is presented in Appendix B.

3.2 Discussion and Conclusion

No wetlands were identified in the footprint of the LAI. One 0.07-acre wetland is located approximately 2,000 feet from the LAI. The wetland drains into a concrete-lined detention pond upstream of the Pond 3 Pumphouse.

Conclusion: The LAI is not located in wetlands.

4 Location Relative to Faults

40 CFR § 257.62 requires that existing surface impoundments not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time (beginning 11,700 years before present (BP)) unless the owner or operator demonstrates the an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

4.1 Methodology

AECOM reviewed the Quaternary Faults and Folds database maintained by the United States Geological Survey (USGS) as part of the Holocene fault search (USGS 2018). The Holocene epoch is the most recent subdivision of the Quaternary period and therefore any faults that have had displacement in the Holocene would also be included in the Quaternary period database. The Quaternary Faults and Folds database is the source for the faults used in the National Seismic Hazard Maps and contains information on faults and associated folds that are believed to be sources of M > 6 earthquakes during the Quaternary Period. AECOM searched the USGS Quaternary Fault and Fold Database for Category A and Category B faults in San Juan County, New Mexico. Fault categories are defined in Table 4. Fault categories A and B relate to the Rule; fault categories C and D describe less defined or non-tectonic features.

Table 4 – Fault Categories

Category	Definition
A	Geologic evidence demonstrates the existence of a Quaternary fault of tectonic origin, whether the fault is exposed by mapping or inferred from liquefaction or other deformational features.
B	Geologic evidence demonstrates the existence of Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes, or (2) the currently available geologic evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A.
C	Geologic evidence is insufficient to demonstrate (1) the existence of tectonic faulting, or (2) Quaternary slip or deformation associated with the feature.
D	Geologic evidence demonstrates that the feature is not a tectonic fault or feature; this category includes features such as joints, landslides, erosional or fluvial scarps, or other landforms resembling scarps but of demonstrable non-tectonic origin.

4.2 Discussion and Conclusion

The USGS Quaternary Faults and Folds Database of the United States does not contain any Class A or Class B faults in San Juan County.

Conclusion: No faults with Holocene displacement are present within 200 feet of the LAI.

5 Location Relative to Seismic Impact Zones

40 CFR § 257.63 requires existing surface impoundments not be located in seismic impact zones unless the owner or operator demonstrates that all structural components, including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site. *Seismic impact zone* is defined by the Rule as an area having a 2 percent or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years.

5.1 Methodology

The USGS maintains the Unified Hazard Tool website to provide access to the source and attenuation models for locations within the United States. AECOM utilized version 4.0.x of the 2014 Unified Hazard Tool to calculate the peak horizontal ground acceleration (PGA) with a 2 percent probability of exceedance in 50 years (USGS 2018a) for the LAI location. The Unified Hazard Tool result is presented in Appendix C.

5.2 Discussion and Conclusion

The PGA with a 2 percent probability of exceedance in 50 years for the LAI is 0.0746g. This value is less than the Rule-required maximum value of 0.10 g in 50 years.

Conclusion: The LAI is not located in a seismic impact zone.

6 Location Relative to Unstable Areas

40 CFR § 257.64 requires that existing surface impoundments not be located in an unstable area unless the owner or operator demonstrates that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted. The following factors must be considered when determining whether the area is unstable:

1) On-site or local soil conditions that may result in significant differential settling;
2) On-site or local geologic or geomorphologic features; and
3) On-site or local human-made features or events (both surface and subsurface).

Structural components include any component used in the construction and operation of the CCR landfill or CCR surface impoundment that is necessary to ensure the integrity of the unit and to ensure that the contents will not be released to the environment, including liners, leachate collection system, embankments, spillways, outlets, final covers, inflow design flood control systems.

Unstable area means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

6.1 Methodology

The location of the LAI relative to unstable areas was assessed by reviewing design and construction documentation, historic geological and geotechnical investigations, and engineering analyses (safety factor calculations). Information was reviewed to assess: 1) whether poor foundation conditions may exist which could result in inadequate foundation support for structural components of the LAI; and 2) whether areas susceptible to mass movement (such as subsidence, landslides, avalanches, debris slides and flows, block sliding, or rock falls) capable of impairing the integrity of the structural components of the LAI are present.

6.2 Discussion and Conclusion

6.2.1 Geologic Setting

The FCPP is located on the western flank of the San Juan Basin, in the Colorado Plateau physiographic province in northwestern New Mexico. The San Juan Basin is a structural basin approximately 100 miles from north to south and 90 miles from east to west underlain by laterally extensive, gently dipping to flat-lying sedimentary rocks of Late Cretaceous age. The northwestern boundary of the San Juan Basin is defined by the Hogback Monocline. The Hogback Monocline is a structural monocline where the generally horizontal to gently dipping Cretaceous sedimentary rock units in the area are uplifted into a one-sided fold which dips steeply (approximately 38 degrees) to the east. The resulting bedrock ridge approximately 3 miles west of the Plant is composed of younger rock units on the eastern flank and progressively older units exposed in the central and western portions of the Hogback.

Karst terrain is not known to be present beneath the FCPP or LAI footprint based on the predominance of shale and sandstone in the area.

6.2.2 Foundation Conditions

The LAI was created in 2003 by constructing a perimeter embankment and lining the interior with a geomembrane to form an impoundment on top of old Ash Pond 4 and a portion of old Ash Pond 3. The west embankment has the lowest crest elevation, now EL 5280 feet, and the longitudinal crest slope around the perimeter of the impoundment matches the historic and expected slope of hydraulic deposition from the northeast corner.

The first stage of the west embankment (the lowest section of the perimeter embankment) had a base elevation of 5208.0 feet and a crest elevation of 5228.0 feet. Between 2003 and 2014, the crest elevation of the west embankment was raised incrementally to a maximum elevation of 5280.0 feet, using downstream construction. At the completion of the LAI 5258 Lift, the ash level within the LAI matched the base elevation of adjacent old Ash Pond 5. For the subsequent LAI 5270 Lift, the LAI perimeter embankment and geomembrane liner were extended laterally to overlie old Ash Pond 5. A cement-bentonite slurry wall was installed along the crest of the west embankment of old Ash Pond 5 to improve the continuity of the seepage barrier provided by the clay core of the original starter embankment and the clay fill of subsequent centerline raises. All embankments except for the west embankment are founded on native soil or engineered fill.

Regulatory Review: The LAI and LDWP are regulated by the New Mexico Office of State Engineer (NMOSE), Dam Safety Bureau. NMOSE references the LAI as File No. D-634. For each raise of the LAI, APS has filed the results of geotechnical investigations, the design basis report, the construction documents, and the construction quality records with NMOSE. NMOSE has engaged actively in review and approved each stage of construction of the LAI.

Foundation Improvements: The foundation of the LAI has been investigated, improved, and protected through a series of measures implemented during initial construction and subsequent raises of the LAI. These measures include:

1. Old Ash Ponds 3, 4, and 5 were allowed to dry and drain by gravity, without addition of CCR or process water, from the mid-1980s until LAI construction.

2. Installation of a reinforced structural fill of bottom ash and two layers of bi-axial geogrid beneath the entire footprint of the west embankment.

3. Installation of a compacted clay zone (“liner”) on the upstream face of the LAI embankment and installation of a 60-mil HDPE geomembrane liner over the entire footprint, including side slopes, of the LAI to prevent impounded fluids from infiltrating into the subgrade of old Ash Ponds 4 and 5.

4. Provision of a decant tower and internal toe drain on the inside of the west embankment to allow gravity drainage of free fluids from the LAI to the LDWP.

5. Construction of a gravity toe drain parallel to the downstream toe of the south embankment of the LAI 5258 Lift to drain water pressure within the foundation of the dam.

6. Excavation and removal of fine-grained deposits within the former barge bay of old Ash Pond 6, located at the toe of the west embankment of old Ash Pond 5 prior to the downstream raise of the northwest embankment of the LAI.

7. Construction of a vertical cement-bentonite slurry wall along the crest of the west embankment of old Ash Pond 5 to assure vertical continuity of the seepage barrier prior to construction of the northwest embankment of the LAI.

8. Installation of wick drains and a pre-loading toe buttress in a localized zone at the toe of the west embankment of the LAI as part of construction of the final raise in 2013-2014. Additional details are described in the LAI Structural Integrity Assessment (AECOM 2016).

9. Multiple geotechnical investigations since 2002, comprising a total of 30 hollow-stem auger borings and 74 cone penetration test (CPT) soundings, to allow physical sample recovery (by hollow-stem auger) and

in situ property measurements (by CPT). The 2016 Structural Integrity Assessment (AECOM 2016) and 2012 Engineering Design Report (URS 2012) present additional details pertaining to these investigations.

10. Regular monitoring of embankment performance, throughout staged construction and continuing to the present time, using a geotechnical instrumentation set of standpipe and vibrating wire piezometers, buried vibrating wire and rod settlement monuments, inclinometers, and surface survey monuments.

11. Multiple geotechnical analyses of slope stability, seepage evaluation, drainage and consolidation, settlement, liquefaction (static and cyclic), and deformation under both static and earthquake loading. Additional details are presented in the 2012 URS Design Report (URS 2012) and the LAI Structural Integrity Assessment (AECOM 2016)

Conditions Associated with Unstable Areas: The Rule identifies three conditions that must be considered when determining whether the area is unstable:

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

   The presence of old Ash Ponds 3, 4, and 5 under the LAI is a foundation soil condition that will settle and could allow differential settlement. However, the engineered solutions (see “Foundation Improvement”) and minimal actual recorded differential deformations (APS 2018a) provide reasonable assurance that significant differential settling has not occurred during filling of the LAI and that the structural components of the LAI are intact. Additionally, since the rate of filling decreased drastically starting in 2014 after Units 1, 2, and 3 ceased generation, rates of total settlement should decrease over time.

2. On-site or local geologic or geomorphologic features:

   There are no identified geologic or geomorphologic features that could cause the area of the LAI to become unstable. In accordance with the NMOSE permit, the LAI is operated and maintained with a specified minimum freeboard to accommodate and store all runoff from the probable maximum flood (PMF).

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

   The perimeter embankment of the LAI, constructed on old Ash Ponds 3, 4, and 5, is a critical human-made feature, the failure of which would cause the LAI to become unstable. However, the good engineering practices (see “Foundation Improvement”) and monitored minimal actual deformations provide reasonable and continuing assurance that that the perimeter embankment of the LAI is, and will remain, intact. The physical condition of the perimeter embankment of the LAI is inspected and recorded weekly by trained Plant operations personnel and at least annually by a trained qualified professional engineer.

   The LAI is filled by gravity flow from the Plant. Over-filling of the impoundment is a human-caused event that could cause the LAI to become unstable. However, the LAI is operated and maintained with a specified minimum freeboard to accommodate and store all runoff from the probable maximum flood (PMF). The decant tower allows excess free fluid to flow by gravity to the LDWP. The impounded fluid level of the LAI is inspected and recorded weekly by trained Plant operations personnel and at least annually by a trained qualified professional engineer.

6.2.3 Areas Susceptible to Mass Movement

Topographic and geologic conditions in the area do not indicate the potential for landslides, avalanches, debris slides, debris flows, block sliding, rock falls, or other mass movements which could impact the structural components of the LAI.

Conclusion: The LAI is not located in an unstable area.

7 Conclusions

Based on the findings and results of the location restrictions demonstrations, AECOM provides the following conclusions for the LAI:

- The base of the LAI is located greater than 1.52 meters (5 feet) above the groundwater level in the uppermost aquifer.
- The LAI is not located in wetlands.
- No faults with Holocene displacement are present within 200 feet of the LAI.
- The LAI is not located in a seismic impact zone.
- The LAI is not located in an unstable area.

8 Limitations

This report is for the sole use of APS on this project only and is not to be used for other projects. In the event that conclusions based upon the data obtained in this report are made by others, such conclusions are the responsibility of others. The Certification of Professional Opinion is limited to the information available to AECOM at the time this report was written. This report was written in accordance with current practice and the standard of care. Standard of care is defined as the ordinary diligence exercised by fellow practitioners in this area performing the same services under similar circumstances during the same period. Professional judgments presented herein are primarily based on information from previous reports that were assumed to be accurate partly based on knowledge of the site and partly based on our general experience with similar evaluations performed for similar structures. No warranty or guarantee, express or implied, is applicable to this work.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

9 References

AECOM, 2016. “Final Summary Report Structural Integrity Assessment, Lined Ash Impoundment, Four Corners Power Plant, Fruitland, New Mexico.” August.

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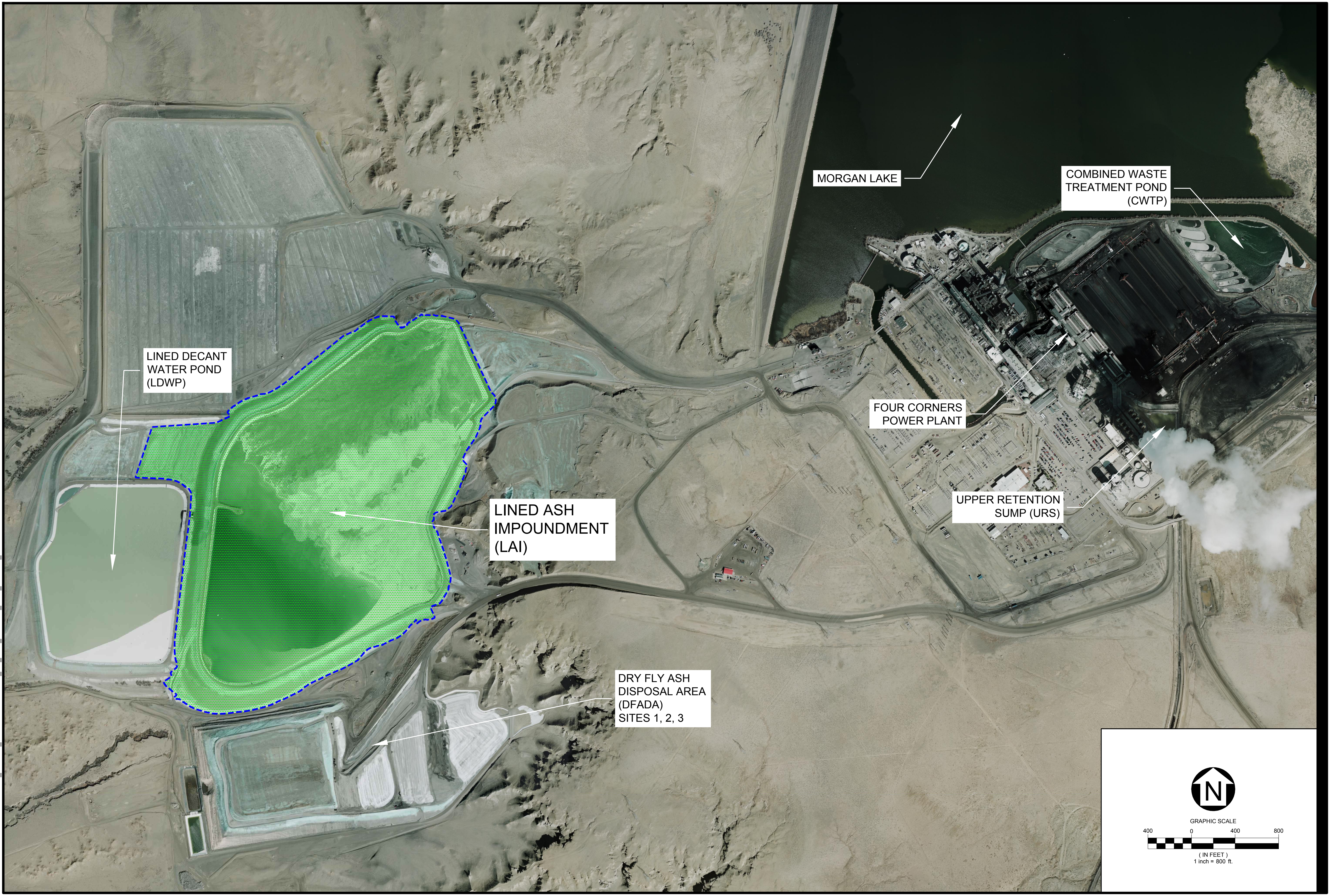
URS, 2011. “Specifications for the 5280 Lift of Lined Ash Impoundment at the Four Corners Power Plant Units 1-3 – San Juan County, New Mexico.” October.

URS, 2012. “Engineering Design Report – Lined Ash Impoundment – 5280 Lift – Four Corners Power Plant –San Juan County, New Mexico, NMOSE File No. D-634.” Prepared for Arizona Public Service. March.

Figures



Last saved by: LEE.WRIGHT(2018-09-14) Last Plotted: 2018-09-14
Filename: P:\PROJECTS\ARIZONA_PUBLIC_SERVICE\60587725_FC_LOC_RES\900_CAD_GIS\910_CAD\25-SKETCHES\60587725-SKE-20-0000-C-FIGURE1.1LAI.DWG

Project Management Initials: Designer: LMW Checked:_____ Approved:_____ ANSI B 11" x 17"

FOUR CORNERS POWER PLANT
LAI LOCATION RESTRICTIONS
ARIZONA PUBLIC SERVICE
Project No.: 60587725

SITE VICINITY MAP

AECOM

Figure 1-1

Last saved by: LEE.WRIGHT(2018-09-25) Last Plotted: 2018-09-25
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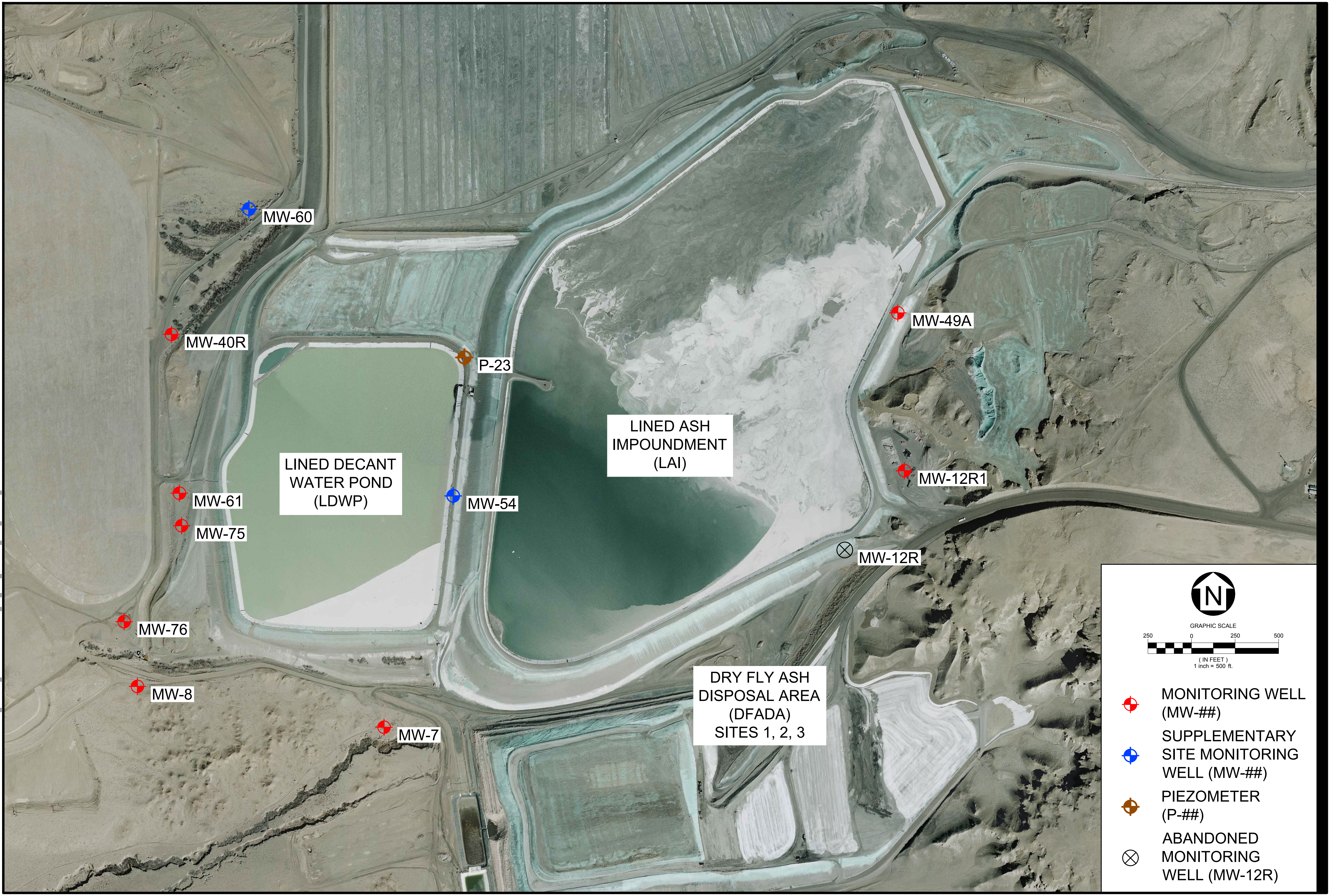
Project Management Initials: Designer: LMW Checked:___ Approved:___ ANSI B 11" x 17"



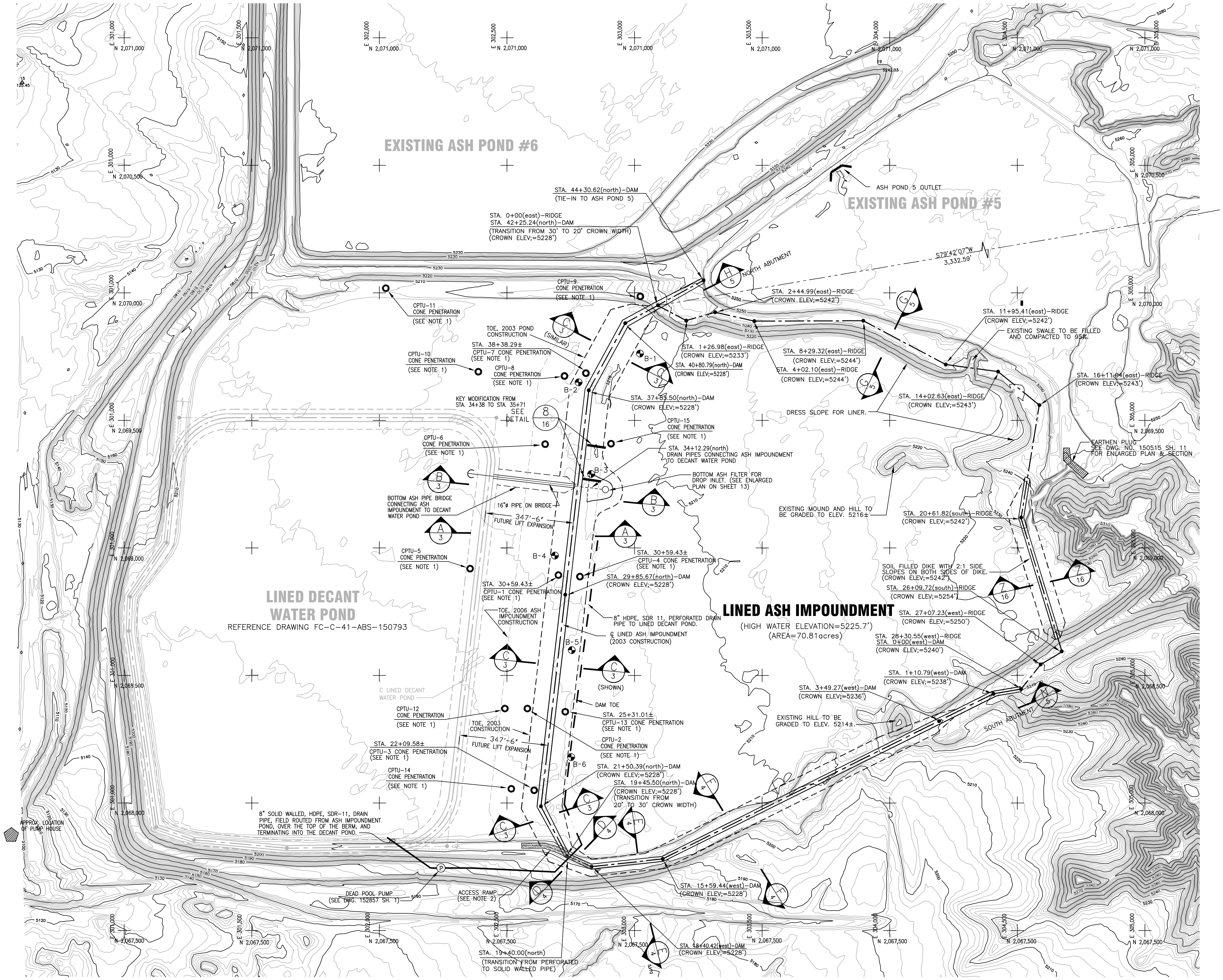
AECOM

Figure 2-1

WELL LOCATION MAP

FOUR CORNERS POWER PLANT
LAI LOCATION RESTRICTIONS
ARIZONA PUBLIC SERVICE
Project No.: 60587725

Appendix A.
Original Construction Plans and Boring Logs



NOTES:

1. FOR CONE PENETRATION TESTING RESULTS, SEE REPORT PREPARED BY "CONETEC INC." DATED OCT. 14, 2002.
2. CONSTRUCT A 20' WIDE CLAY ACCESS RAMP FROM CROWN OF EMBANKMENT (ELEV. 5228) DOWN TO EXISTING GRADE (ELEV. 5212). SLOPE TO BE 10:1 AND A TOTAL LENGTH OF 160'±. EXCAVATE OUT BOTTOM ASH CONSTRUCTION ACCESS RAMP DOWN TO THE PRE-CONSTRUCTION EMBANKMENT, (APPROXIMATE ELEVATION OF 5212'). REMOVE TOP 6 INCHES OF THE EXISTING CLAY CREST OF THE SOUTH EMBANKMENT, SCARIFY THE SURFACE, MOISTURE CONDITIONED TO OPTIMUM MOISTURE CONTENT (-1% TO +2%) AND COMPACT PER THE SPECIFICATIONS.
BACK FILL WITH CLAY AND COMPACT TO 95% AS DETERMINED BY ASTM D698. SIDE SLOPES TO BE 1½:1 FROM THE RAMP CROWN TO EXISTING GROUND. (SEE ENLARGED PLAN ON SHEET 12)
3. FOR FLY ASH SLURRY DELIVERY PIPING SEE SHEET 15.

DATUM CONTROL
HV-53
(ACTUAL LOCATION OFF DRAWING)

STATION NO.	NORTHING	EASTING
STA. 0+00 (ridge) STA. 42+25.24 (dam)	N2,069,951.02	E303,092.78
STA. 1+26+98	N2,069,891.18	E303,203.19
STA. 2+44.99	N2,069,924.03	E303,316.54
STA. 4+02.10	N2,069,889.06	E303,469.71
STA. 8+29.32	N2,069,890.43	E303,896.41
STA. 11+95.41	N2,069,718.82	E304,219.79
STA. 14+02.63	N2,069,690.93	E304,424.85
STA. 16+11.04	N2,069,559.63	E304,587.14
STA. 20+61.82	N2,069,119.08	E304,515.16
STA. 26+09.72	N2,068,594.41	E304,673.94
STA. 27+07.23	N2,068,542.55	E304,591.50
STA. 28+30.55 (ridge) STA. 0+00 (dam)	N2,068,446.45	E304,514.73

STATION POINTS - RIDGE

(TIED TO STATE COORDINATES)

STATION NO.	NORTHING	EASTING
STA. 0+00 (dam) STA. 28+30.55 (ridge)	N2,068,446.45	E304,514.73
STA. 1+10.79	N2,068,428.07	E304,406.53
STA. 3+49.27	N2,068,320.86	E304,193.50
STA. 15+59.44	N2,067,780.86	E303,110.49
STA. 18+40.42	N2,067,750.49	E302,831.16
STA. 19+40.00	N2,067,788.32	E302,745.87
STA. 19+45.50	N2,067,793.10	E302,735.10
STA. 21+50.39	N2,067,983.85	E302,660.31
STA. 29+85.67	N2,068,813.66	E302,755.69
STA. 34+12.29	N2,069,236.05	E302,804.44
STA. 37+85.50	N2,069,608.26	E302,847.01
STA.40+80.79	N2,069,867.69	E302,988.04
STA. 42+25.24 (dam) STA. 0+00 (ridge)	N2,069,951.02	E303,092.78
STA. 44+30.62	N2,070,048.93	E303,271.25

STATION POINTS - DAM

(TIED TO STATE COORDINATES)

Figure A-1

REFERENCE;

FLOWN BY "AERIAL MAPPING COMPANY, INC." ON JULY 19, 2001
3141 WEST CLARENDON AVENUE
PHOENIX, ARIZONA 85017

LEGEND

B-1	SOIL BORING LOCATIONS (SEE BORING LOGS ON SHEET #7)
○	CPTU TEST LOCATION (SEE NOTE #1)
A/3	TYPICAL CROSS SECTIONS (SEE SHEETS 3-5)

NORTH

SITE PLAN
SCALE: 1"=200'
CONTOUR INTERVAL=2'

0 50 100 150 200 400 600 800

DRAINAGE AREA DRAWING, SEE E-150515 SHEET #9

DATUM INFORMATION

CONTROL POINTS;

HV-53
SOUTHERN CALIFORNIA EDISON (SCE) BRASS CAP

NORTHING	EASTING	ELEVATION
N2,070,519.859	E306,365.846	5328.150'

NEW MEXICO STATE PLANE
TRANSVERSE MERCATOR-WEST ZONE
N.A.D. 1927

BYRON R. CONRAD
NEW MEXICO
13248
REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379
2	6-5-03	Add ramp/note 2 & earth plug	PRATT		BRC		JDM	04-6379
1	1-14-03	REVISE PER STATES' FIRST REVIEW	PRATT		BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
SITE PLAN

APS

SCALE NOTED
DATE 6-28-02

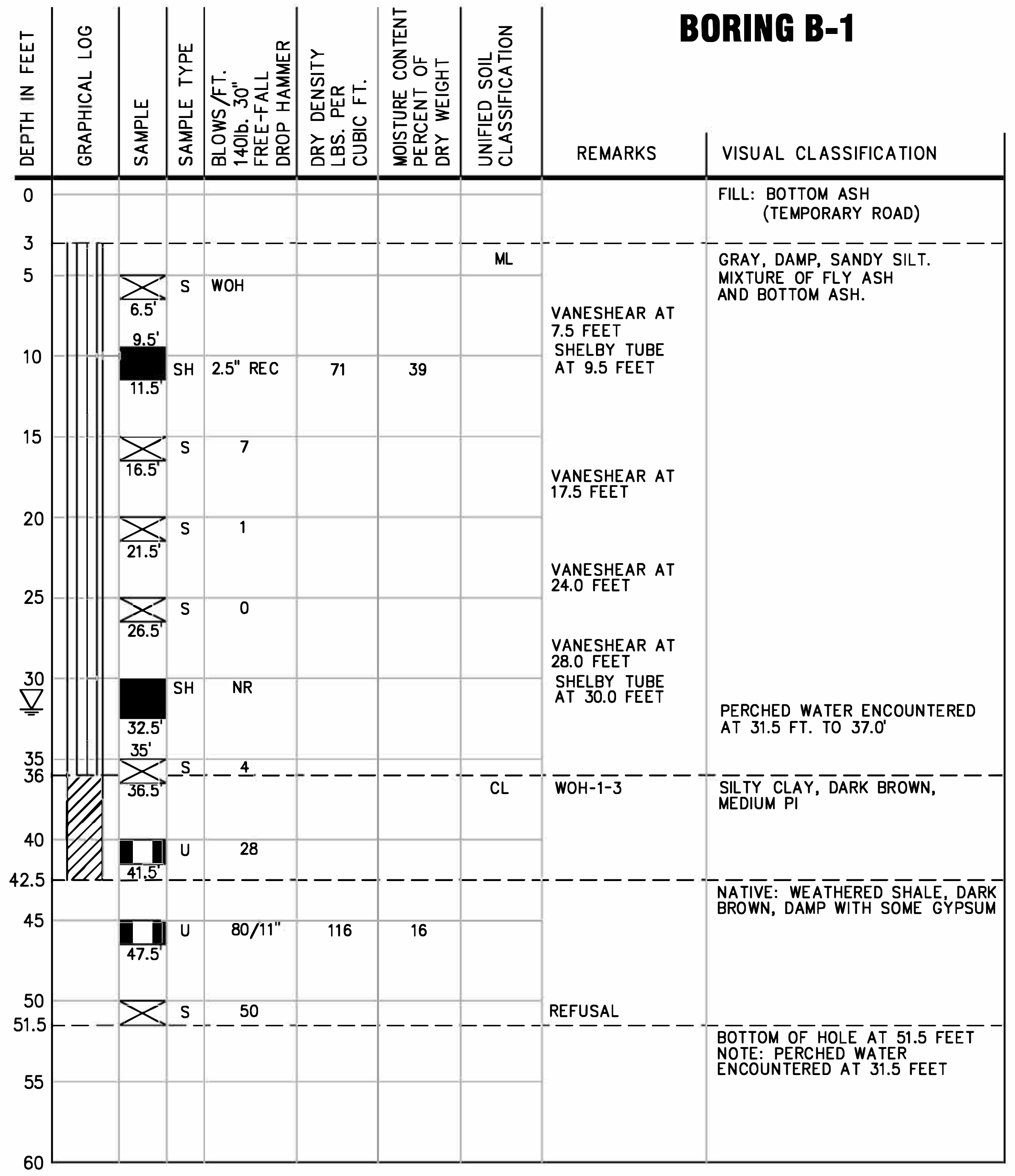
DWN PRATT
CHD
EXD BRC
RVWD

APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W A
04-6379

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	17	ADS	150515	2	3

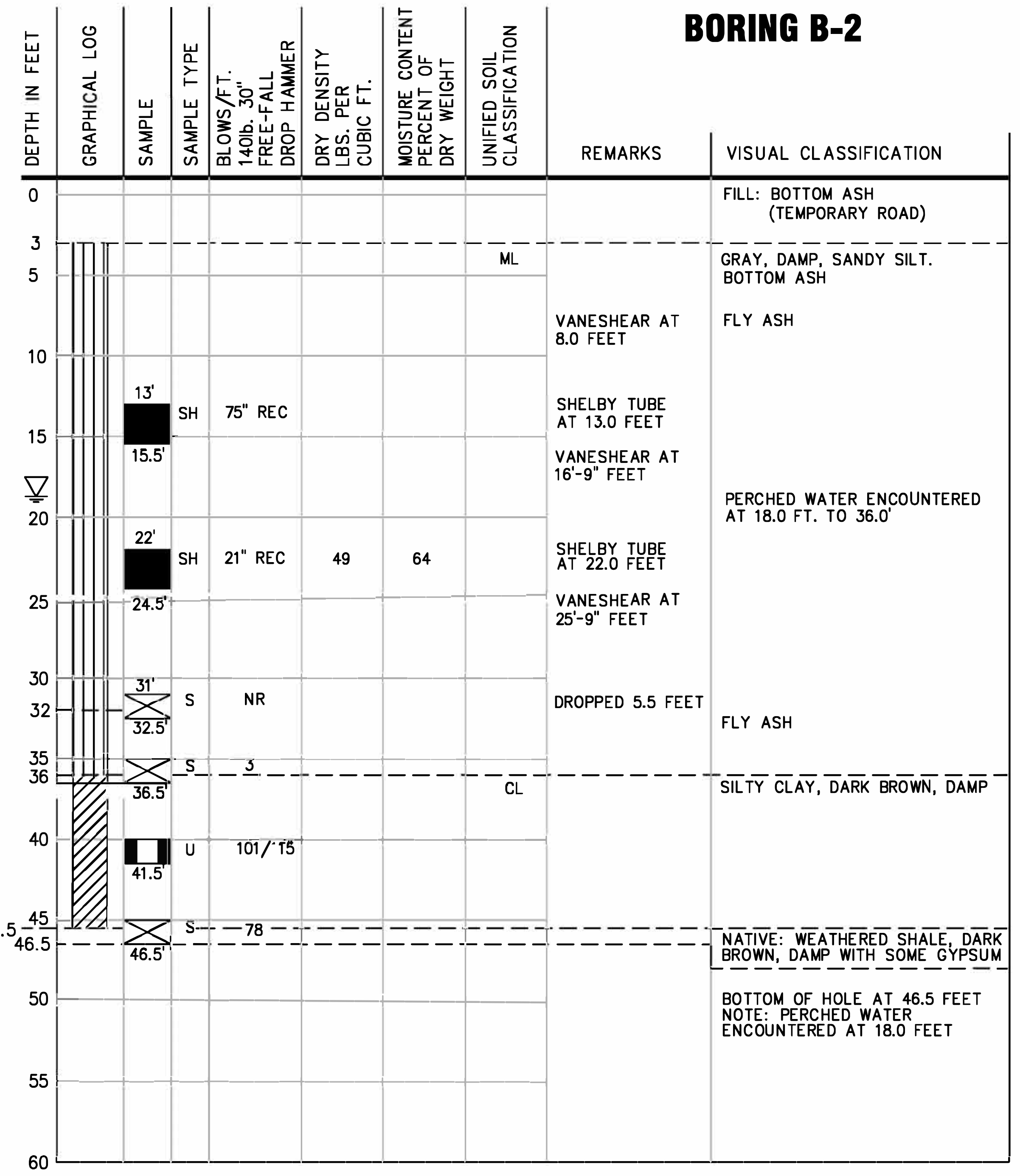
BORING B-1



▽ GROUNDWATER DEPTH = 31.5'

SAMPLE TYPE
A=AUGER CUTTINGS; NR=NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

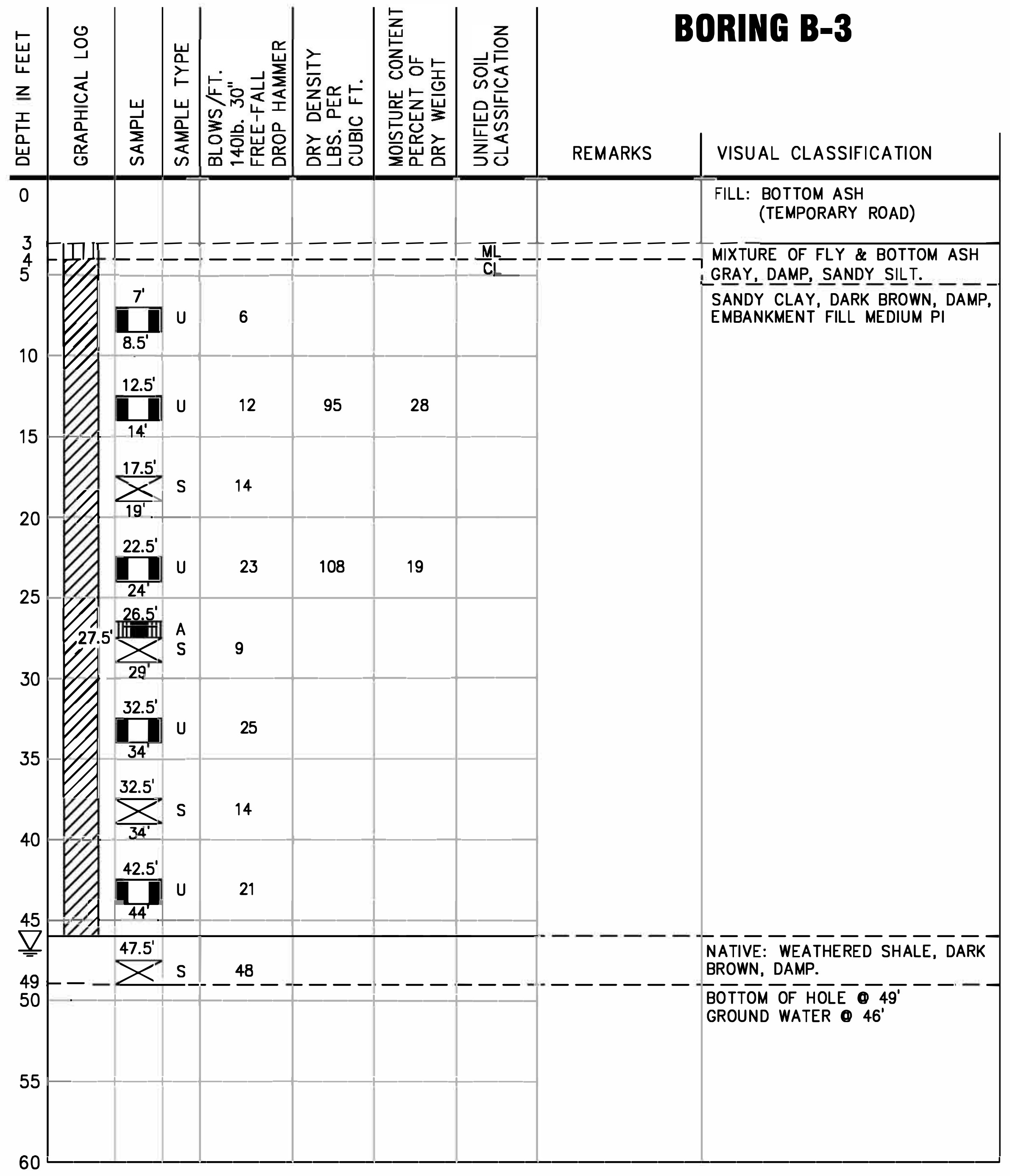
BORING B-2



▽ GROUNDWATER DEPTH = 18.0'

SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-3



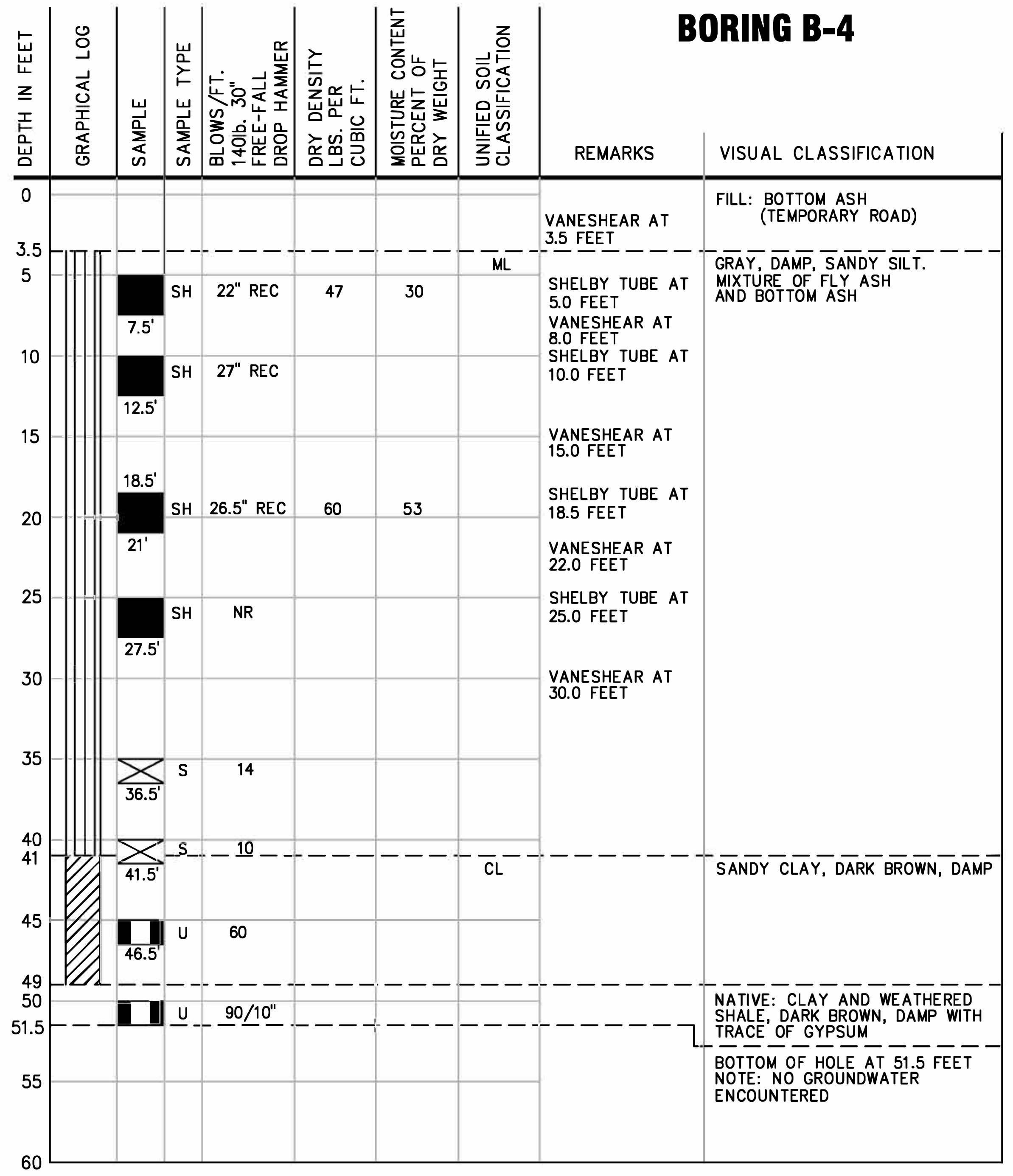
▽ GROUNDWATER DEPTH = 46.0'

SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS, (LITTLE OR NO FINES)	░	GW	WELL GRADED GRAVELS. GRAVEL-SAND MIXTURE. LITTLE OR NO FINES.
			░	GP	POORLY GRADED GRAVELS. GRAVEL-SAND MIXTURE. LITTLE OR NO FINES.
		GRAVELS WITH FINES. (APPRECIABLE AMOUNT OF FINES.)	▥	GM	SILTY GRAVELS. GRAVEL-SAND-SILT MIXTURES.
			▨	GC	CLAYEY GRAVELS. GRAVEL-CLAY-SAND MIXTURE.
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	░	SW	WELL GRADED SANDS, GRAVELY-SANDS, LITTLE OR NO FINES.
			░	SP	POORLY GRADED SANDS. GRAVELY-SANDS, LITTLE OR NO FINES.
		SANDS WITH FINES. (APPRECIABLE AMOUNT OF FINES.)	▥	SM	SILTY SANDS. SAND-SILT MIXTURE.
			▨	SC	CLAYEY SANDS. SAND-CLAY MIXTURES.
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▥	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY. GRAVELY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.
			▥	OL	ORGANIC SILTS AND ORGANIC SILTY-CLAYS OF LOW PLASTICITY.
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS.
			▨	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS, ORGANIC SILTS.
HIGHLY ORGANIC SOILS			▤	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS.

UNIFIED SOIL CLASSIFICATION SYSTEM

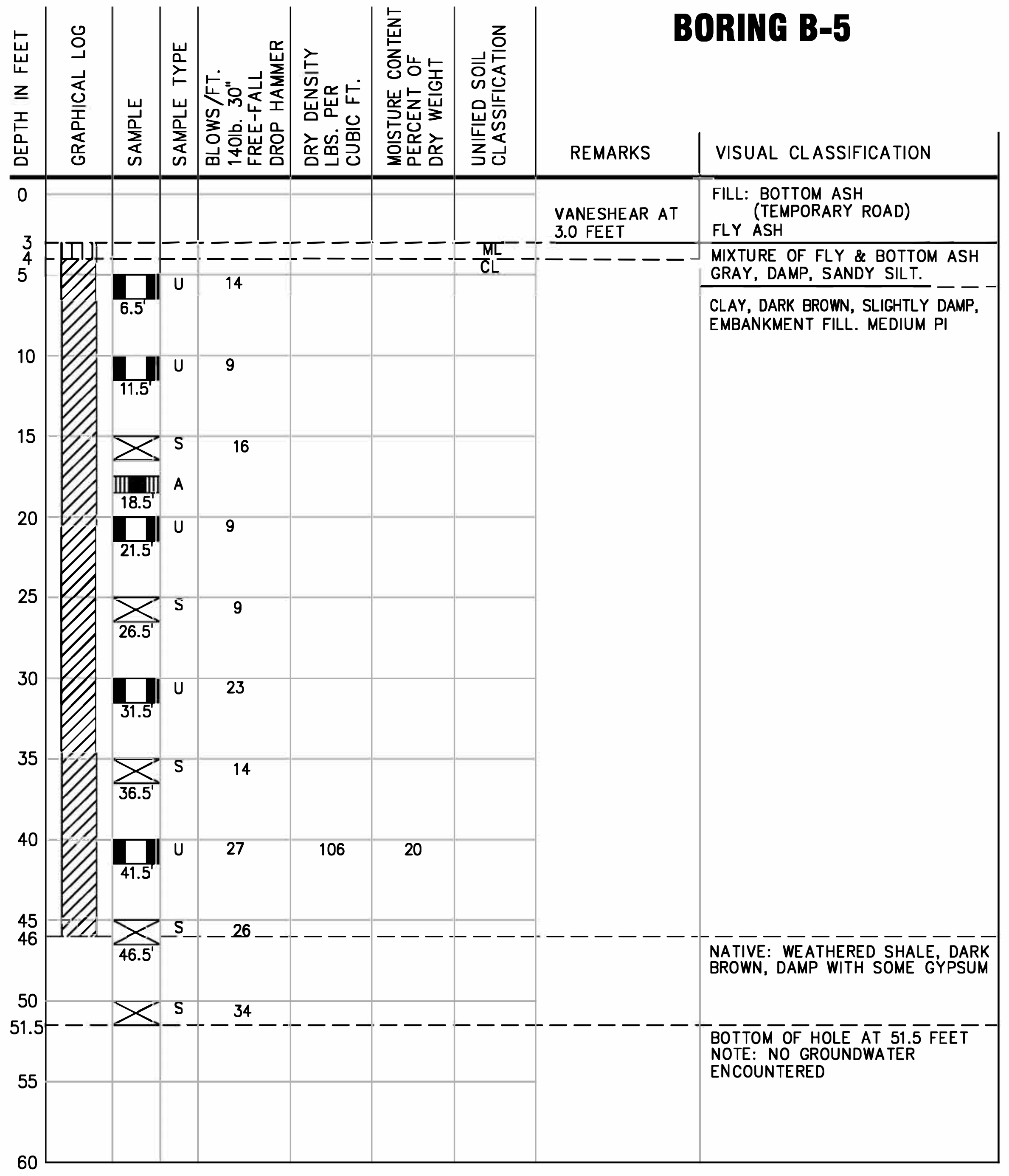
BORING B-4



▽ GROUNDWATER DEPTH = N/A

SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-5



▽ GROUNDWATER DEPTH = N/A

SAMPLE TYPE
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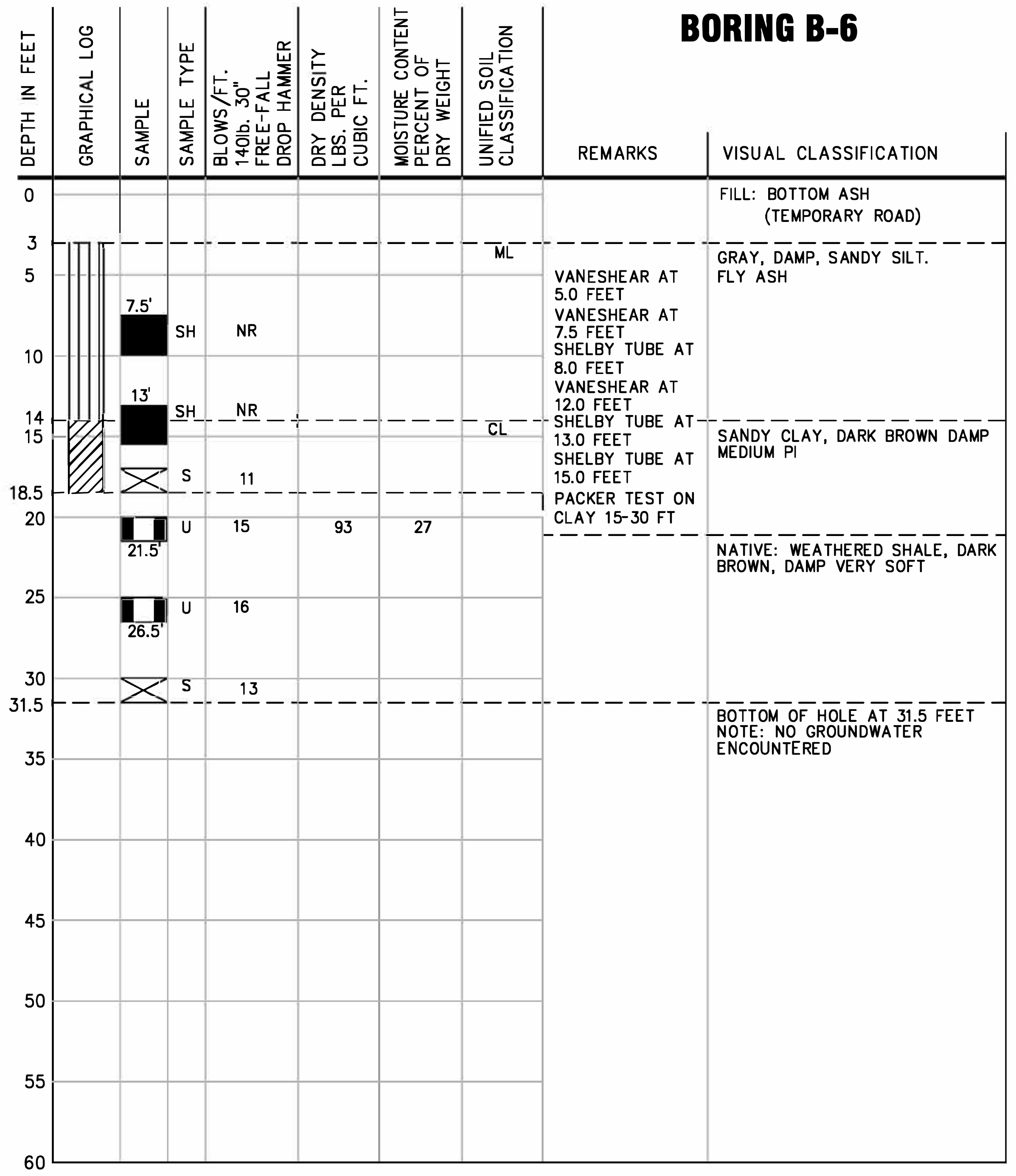
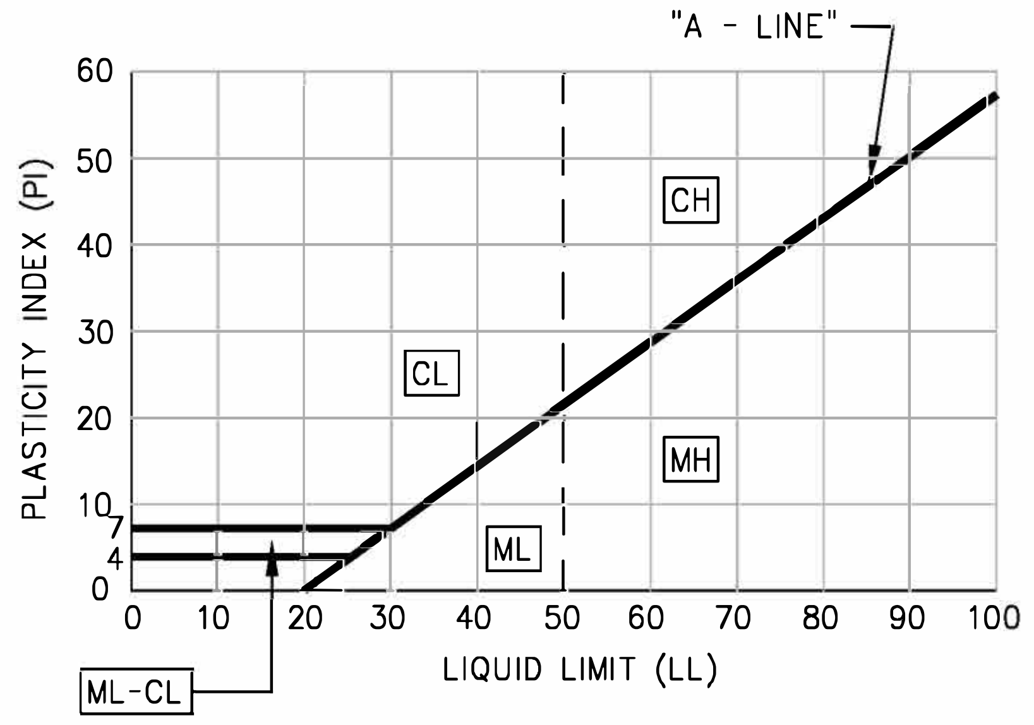
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-6



▽ GROUNDWATER DEPTH = N/A

SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE



PLASTICITY CHART

Figure A-2

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. E-150515 SHEET #2

BYRON R. CONRAD
13248

THIS DRAWING IS CONFIDENTIAL AND SHALL NOT BE USED OR REPRODUCED IN ANY PART WITHOUT WRITTEN CONSENT OF PINNACLE WEST CAPITAL CORPORATION.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379
1	1-14-03	WAS SHEET #5	PRATT		BRC		JDM	04-6379

FOUR CORNER COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
SOIL BORING LOGS

APS

SCALE NONE
DATE 6-28-02

DWN PRATT
CHD
EXD BRC
RVWD

APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W A 04-6379

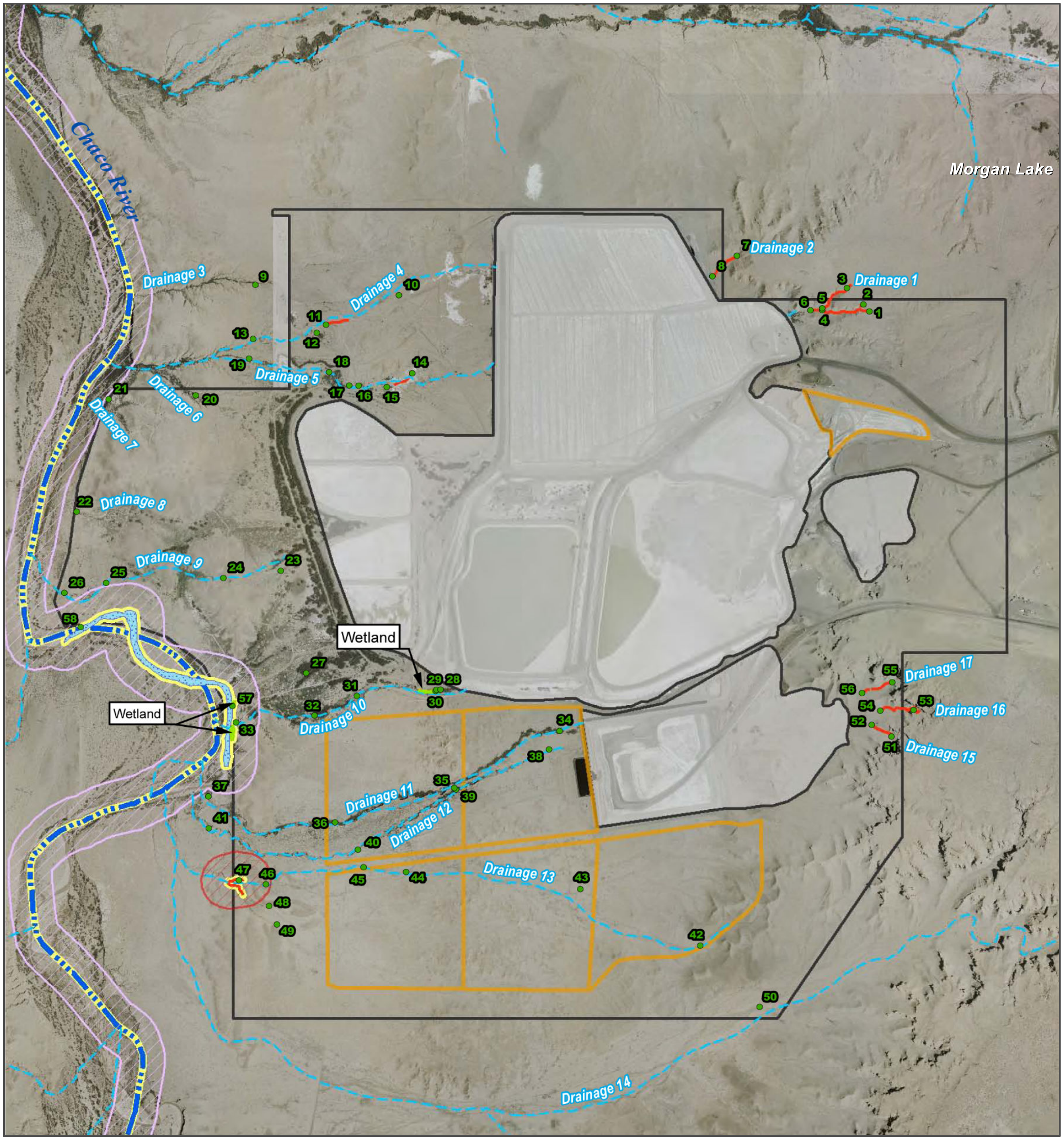
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	150515	7

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL ASH PONDS\FC-C-39-ADS-150515-7.dwg

Appendix B.
Wetlands Map

Figure 4.5-7

Jurisdictional Waters of the US
in the Vicinity of the FCPP
Proposed Ash Disposal Facility



GPS Survey Point (#)	● 01
Wetland	🟩
Chaco River OHWM	▨
Ephemeral	– – –
Intermittent	–··–
Ordinary High Water Mark Observed*	—
Jurisdictional (highlighted)	—
Waters of the U.S. Delineation Boundary	☐
Existing Fly Ash Disposal Facilities	■
Proposed Fly Ash Facility	☐
Chaco River Avoidance Area	▨
Avoidance Area	▨

*Observed Ordinary High Water Mark without jurisdiction is considered isolated.

Appendix C.
Unified Hazard Tool Summary

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

^ Input

Edition

Conterminous U.S. 2014 (v4.0.x)

Spectral Period

Peak ground acceleration

Latitude

Decimal degrees

36.684

Time Horizon

Return period in years

2475

Longitude

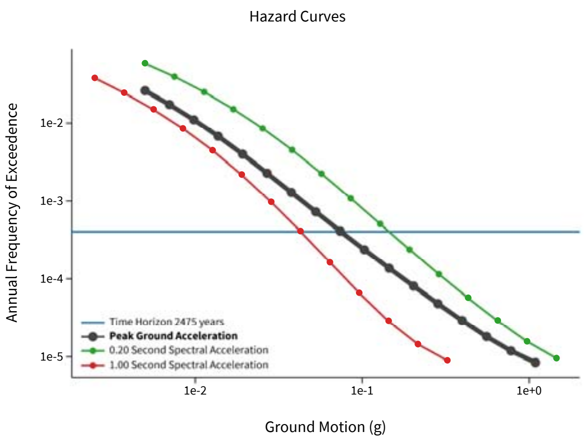
Decimal degrees, negative values for western long…

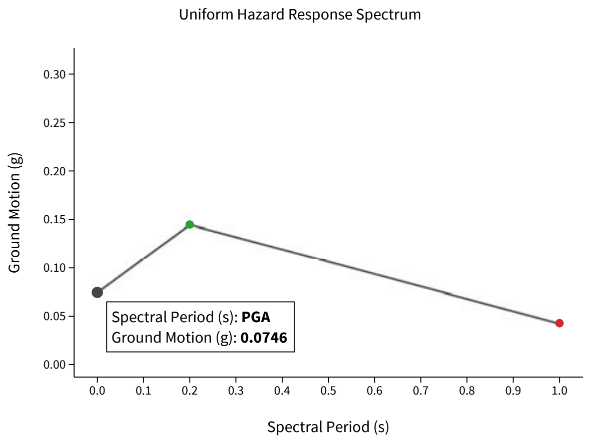
-108.504

Site Class

760 m/s (B/C boundary)

Hazard Curve


Hazard Curves


Uniform Hazard Response Spectrum

View Raw Data