AECOM

FOUR CORNERS POWER PLANT LINED ASH IMPOUNDMENT - Periodic Structural Integrity Assessment

Periodic Hazard Potential Classification
Periodic Structural Stability Assessment
Periodic Safety Factor Assessment

October 2021
AECOM Project 60664563

Delivering a better world

Prepared for:

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Attachment

1. Introduction

This periodic update to the Structural Integrity Assessment for the Lined Ash Impoundment (LAI) at Four Corners Power Plant operated by Arizona Public Service (APS) has been prepared in accordance with the requirements of Title 40 of the Code of Federal Regulations Part 257 (40 CFR 257) ("the Coal Combustion Residuals [CCR] Rule" or "the Rule") and the specific requirements within 40 CFR § 257.73 for periodic (every 5 years) assessment regarding structural integrity.

2. Methodology

The methodology used to prepare this 2021 Periodic Assessment of Hazard Potential Classification, Structural Stability Assessment, and Periodic Safety Factor Assessment for the LAI at the Four Corners Power Plant is for the certifying Qualified Professional Engineer (QPE) to:

a. Perform a documented review of the 5 years of annual inspection reports since 2016, the most recent of which is:
    i. APS, 2020. Annual CCR Impoundment and Landfill Inspection Report: Four Corners Power Plant Lined Ash Impoundment, Lined Decant Water Pond, Combined Waste Treatment Pond, and Dry Fly Ash Disposal Area. Generation Engineering, Phoenix, AZ.
b. Perform a documented review of each major component of the contributing technical information from:
    i. AECOM, 2016. *Final Summary Report, Structural Integrity Assessment: Lined Ash Impoundment, Four Corners Power Plant, Fruitland, New Mexico*. Prepared for: Arizona Public Service, AECOM Job No. 60445844, August 2016 (hereafter referred to as the "2016 Report" and incorporated and referenced directly as Attachment A to this document); and
b. Consider and document whether the 2016 Report and its conclusions:
    i. Meet the current reporting requirements of the Rule;
    ii. Reflect the current condition of the structure, as known to the QPE and documented in the annual inspections;
    iii. Are compromised by any identified issues of concern; and
    iv. Are consistent with the standard of care of professionals performing similar evaluations in this region of the country; and
d. Identify any additional analyses, investigations, inspections, and/or repairs that should be completed in order to complete this 2021 Periodic Assessment.

This report documents the results of these considerations, incorporates the 2016 Report as an Appendix, identifies any additional technical investigation or evaluations (if needed), and presents an updated certification by the QPE.

3. 2017–2021 Annual Inspection Reports

Information relevant to the general site conditions and current adequacy and performance of the LAI embankment and outlet works have been considered. No issues were identified during the review that would affect the performance of the system and its compliance, as described in the 2016 Report, with the various requirements of the CCR Rule relative to (1) hazard potential classification, (2) structural stability, or (3) safety factor assessment.

The number of entries to the annual list of “Observed Conditions,” over the last 5 years of reports, has remained roughly consistent. The most consistently observed, or significant, conditions involve: (1) bulges of the exposed liner between the crest and the solids deposition level on the upstream slope of the LAI embankment; (2) settlement of the West Embankment; and (3) overfilling of the northern portion of the impoundment during the final year of operation.

The localized bulges of the exposed liner on the upstream face of the LAI embankment are caused by leaks in the upstream face HDPE liner that allow water to get between the liner and clay blanket of the embankment, thereby “floating” the HDPE liner and allowing a constrained “bulge”. The Plant has a procedure to identify bulges, identify the initiation leak, cut the liner to relieve the water pressure, and then patch the initiation and relief cuts. The design of the embankment to resist seepage relies on the combination of the 15-foot wide compacted clay blanket to minimize seepage loss and the large downstream wedge of fly and bottom ash to perform as a drain to relieve, drawdown, and prevent excessive seepage hydraulic gradients. With this embankment section, temporary ponding of water between the liner and clay low-permeability zone is not considered to have an adverse impact on the stability or structural integrity of the LAI embankments.

Settlement is measured by monuments SM-7 and SM-9 at the toe of the West Embankment of the LAI. There are no settlement monuments on the crest of the South, West, or North embankments. SM-7 and SM-9 indicate settlement of 10 and 8 inches, respectively, between 2015 and 2021. A 2021 topographic survey of the LAI embankments and reservoir indicates settlement of the central portion of the crest of the West Embankment of between 6 and 9 inches compared to the original design grade. Considering that the LAI is founded on old unlined Ash Ponds 3, 4, and 5, continued loading of the LAI will cause consolidation of the ash pond subgrade that will be expressed as broad settlement. No external bulges or other movements have been identified by the weekly or annual inspections to suggest a mechanism other than broad settlement. This form of settlement is not considered to have an adverse impact on the available storage capacity, stability, or structural integrity of the LAI embankments.

During the final years of operation of the LAI, before cessation of deposition in 2021, the properties of the flue gas desulfurization (FGD) slurry being discharged caused the material to drop out faster and at a steeper beach slope than the earlier mix of fly ash and FGD. As a result,

the northern portions of the pond (closer to the discharge locations) filled faster than the southern portions. Although the capacity of the impoundment to store the inflow design flood (IDF) was not diminished, the Plant took special measures to ensure that liquid flows were directed towards the center of the reservoir and away from portions of the embankment with diminished freeboard. Discharge ceased in April 2021. The topography of the final solids surface within the impoundment will direct runoff towards the flood pool in the southern end of the impoundment.

The 2017-2021 Annual Inspection Reports also provide information on minimum and maximum values for various types of geotechnical instrumentation installed within the embankments and foundations. Periodically, deviations or technical issues may be identified that limit or alter readings and these instances are reported in the Annual Inspection Reports. For the LAI, the instruments consist of vibrating wire and standpipe piezometers, inclinometers, buried settlement monuments, and surface settlement monuments. The records, including the SM-7 and SM-9 settlement records, were reviewed and no significant, adverse trends were identified that would cause structural instability or change in safety factor.

4. 2016 Certification – Review by Section

Other than as described in the remainder of this section, the details presented in this section of the 2016 Report adequately represent current conditions and satisfy the requirements of the Rule.

4.1 “1.4 Facility Description”

The LAI is no longer an operating CCR surface impoundment. APS provided notification, dated April 10, 2021, of its intent to close the LAI and APS ceased discharge of CCR to the LAI on or before April 10, 2021. In order to maintain adequate freeboard to contain the IDF, APS periodically pumps precipitation runoff and drain down water from the CCR solids from the free water pool at the southwest corner of the impoundment to the drop inlet tower, which discharges by gravity to the Lined Decant Water Pond (LDWP).

APS intends to close the LAI and its contents in place, similar to the closure approach used for old Pond 6. APS is currently undertaking a phased geotechnical investigation to identify safe and effective procedures to construct a soil cap over the soft contents of the impoundment.

APS is evaluating whether it wishes to restore the crest elevation of the West Embankment to its as-designed, pre-settlement elevation; this restoration would provide more flexibility for managing the normal operating pool and maintaining sufficient storage capacity for the IDF. The outcome of this evaluation will likely be reported in the 2021 (published in 2022) annual inspection report.

4.2 “2 Hazard Potential Classification”

The details presented in this section of the 2016 Report adequately represent current conditions and satisfy the requirements of the Rule.

Based on a review of the information presented in the 2016 Report, the LAI impoundment currently satisfies the criteria for Significant Hazard Potential classification.

4.3 "3 History of Construction"

The details presented in this section of the 2016 Report adequately represent current conditions and satisfy the requirements of the Rule.

The only construction actions that have occurred at the facility since the 2016 Report relate to maintenance activities, measures to control the deposition of solids around the discharge locations, and geotechnical investigations. In 2020 and 2021, APS advanced several pilot roads onto the solids surface to allow geotechnical testing and to assess the stability of different portions of the surface for eventual closure construction.

4.4 "4 Structural Stability Assessment"

The details presented in this section of the 2016 Report adequately represent current conditions and satisfy the requirements of the Rule.

AECOM assesses that the design, construction, operation, and maintenance of the LAI are consistent with recognized and generally accepted good engineering practice for the maximum volume of CCR and CCR wastewater that can be impounded therein.

4.5 "5 Safety Factor Assessment"

The details presented in this section of the 2016 Report adequately represent current conditions and satisfy the requirements of the Rule.

AECOM is not aware of any new information that would warrant reevaluation of any material properties, cross-section configurations, or piezometric conditions of the perimeter embankment.

The calculated factors of safety for the three critical cross sections along the LAI perimeter embankment exceeded the required minimum values for the long-term, maximum storage pool; the maximum surcharge pool; the seismic (pseudo-static); and liquefaction loading conditions.

4.6 "6 Conclusions"

The details presented in this section of the 2016 Report adequately represent current conditions and satisfy the requirements of the Rule.

5. Recommended Additional Technical Investigations or Evaluations

None identified and none recommended.

6. Conclusion

The 2016 Report and its conclusions meet the current reporting requirements of the Rule, reflect the current condition of the structure as known to the QPE and documented in the annual inspections, are not compromised by any identified issues of concern, and are consistent with the standard of care of professionals performing similar evaluations in this region of the country.

7. 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 presented in this report are made by others, such conclusions are the responsibility of others.

The Periodic Structural Integrity Assessment presented in this report is based on the 2016 Report and relies and incorporates any Limitations expressed in that report.

The Certification of Professional Opinion in this report is limited to the information available to AECOM at the time this Assessment was performed 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 have been assumed to be accurate, knowledge of the site, and partly on our general experience with dam safety evaluations performed on other dams.

No warranty or guarantee, either written or implied, is applicable to this work. The use of the word “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.

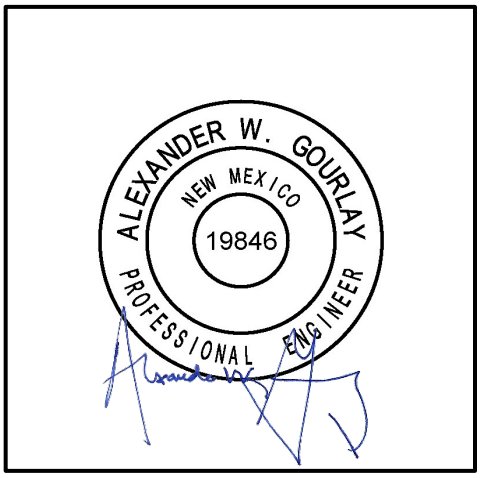
8. Certification Statement

Certification Statement for:

- 40 CFR § 257.73(a)(2)(ii) – Periodic Hazard Potential Classification for an Existing CCR Surface Impoundment
- 40 CFR § 257.73(d)(3) – Periodic Structural Stability Assessment for an Existing CCR Surface Impoundment
- 40 CFR § 257.73(e)(2) – Periodic Safety Factor Assessment for an Existing CCR Surface Impoundment

I, Alexander W. 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 periodic hazard potential classification, periodic structural stability assessment, and periodic safety factor assessment provided in this Periodic Structural Integrity Assessment Report, and referencing the 2016 Report, were conducted in accordance with the requirements of 40 CFR § 257.73.

Alexander W. Gourlay, P.E.
Printed Name



October 11, 2021
Date

Attachment A:

AECOM, 2016. *Final Summary Report, Structural Integrity Assessment: Lined Ash Impoundment, Four Corners Power Plant, Fruitland, New Mexico*. Prepared for: Arizona Public Service, AECOM Job No. 60445844, August 2016.

ATTACHMENT A

AECOM, 2016. *Final Summary Report, Structural Integrity Assessment: Lined Ash Impoundment Pond, Four Corners Power Plant, Fruitland, New Mexico*. Prepared for: Arizona Public Service, AECOM Job No. 60445844, August 2016.

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August 26, 2016

Final Summary Report
Structural Integrity Assessment

Lined Ash Impoundment
Four Corners Power Plant
Fruitland, New Mexico

Prepared for:
Arizona Public Service

AECOM Job No. 60445844
August 2016

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List of Acronyms

APS	Arizona Public Service
ASTM	American Society for Testing and Materials
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
CWTP	Combined Waste Treatment Pond
EAP	Emergency Action Plan
EL	Elevation
EPA	Environmental Protection Agency
FCPP	Four Corners Power Plant
FGD	Flue Gas Desulfurization
ft	feet
HDPE	High Density Polyethylene
HPC	Hazard Potential Classification
LAI	Lined Ash Impoundment
LDWP	Lined Decant Water Pond
NMOSE	New Mexico Office of the State Engineer
pcf	pounds per cubic foot
PMP	Propable Maximum Precipitation
PMF	Propable Maximum Flood
psf	pounds per square foot
RCRA	Resource Conservation and Recovery Act
USCS	Unified Soil Classification System
USGS	United States Geological Survey

Certification Statement

Certification Statement for:

- **40 CFR § 257.73(a)(2)(ii) – Initial Hazard Potential Classification for an Existing CCR Surface Impoundment**
- **40 CFR § 257.73(d)(3) – Initial Structural Stability Assessment for an Existing CCR Surface Impoundment**
- **40 CFR § 257.73(e)(2) – Initial Safety Factor Assessment for an Existing CCR Surface Impoundment**

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 initial hazard potential classification, initial structural stability assessment, and initial safety factor assessment as included in the Structural Integrity Assessment Report dated August 26, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73.

Alexander W. Gourlay, P.E.

Printed Name

August 26, 2016

Date

1 Introduction

Arizona Public Service Company (APS) contracted URS Corporation, a wholly owned subsidiary of AECOM, to assist in the initial structural integrity assessment of the existing coal combustion residual (CCR) surface impoundments at the Four Corners Power Plant (FCPP) on the Navajo Nation in Fruitland, New Mexico. Figure 1-1 shows the location of the CCR Impoundments at the FCPP. This Summary Report documents the AECOM structural integrity assessment for the Lined Ash Impoundment (LAI), NMOSE Dam No. D-634. Assessments of other CCR Impoundments at the FCPP are presented in separate reports.

1.1 Report Purpose and Description

The purpose of this report is to document the initial structural integrity assessment for the LAI located at the FCPP. The LAI is an existing CCR surface impoundment owned and operated by APS. The CCR impoundment is regulated by the New Mexico Office of the State Engineer (NMOSE). In 2015, the United States Environmental Protection Agency (EPA) finalized Federal Rule (Rule) 40 Code of Federal Regulations (CFR) *§* 257.73 (EPA, 2015) 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 complete initial and periodic structural integrity assessments to document whether the CCR unit poses a reasonable probability of adverse effects on health and the environment.

1.2 EPA Regulatory Requirements

Pursuant to Rule 40 CFR *§* 257.73 (EPA, 2015), each existing CCR surface impoundment must have initial and periodic structural integrity assessments to evaluate whether the CCR unit poses a reasonable probability of adverse effects on health and the environment. The assessment must address the following elements:

- *Periodic Hazard Potential Classification Assessment (40 CFR § 257.73(a)(2))* - Document the hazard potential classification of each CCR unit as either a high hazard, significant hazard, or low hazard potential CCR unit.

- *Emergency Action Plan (EAP) (40 CFR §257.73(a)(3))* - Prepare and maintain a written EAP for high and significant hazard CCR units. The EAP must be evaluated at least every five years, updated, and revised to ensure the information within is accurate.

In addition, the following elements must be addressed for CCR units, such as the LAI, that have a height of five feet (ft) or more and a storage volume of 20 acre-ft or more, or have a height of 20 ft or more:

- *History of Construction (40 CFR § 257.73(c)(1))* - Compile a history of construction of the CCR unit including elements of operation, location, design, monitoring instrumentation, maintenance and repair, and historic structural instabilities.

- *Periodic Structural Stability Assessment (40 CFR § 257.73(d))* - Document whether the design, construction, operation and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practice for the maximum volume of CCR and CCR wastewater which can be impounded therein.

- *Periodic Safety Factor Assessment (40 CFR § 257.73(e))* - Document whether the calculated factors of safety for each CCR unit achieve minimum safety factors for the critical cross section of the embankment under long-term, maximum storage pool loading conditions, maximum surcharge loading conditions, seismic loading conditions, and post-earthquake loading conditions for dikes constructed of soils susceptible to liquefaction.

Existing CCR surface impoundments, such as the LAI, are required to have an initial structural integrity assessment within 18 months of publication of the EPA Rule on April 17, 2015 and periodic assessments performed every five years thereafter.

1.3 Report Organization

This Summary Report has been organized into the following sections:

Report Section	Applicable CFR 40 Part 257 Citation
• Section 1 – Introduction	
• Section 2 – Hazard Potential Classification	§ 257.73(a)(2) Periodic hazard classification assessments
• Section 3 – Emergency Action Plan	§ 257.73(a)(3) Emergency Action Plan (EAP)
• Section 4 – History of Construction	§ 257.73(c)(1) History of construction
• Section 5 – Structural Stability Assessment	§ 257.73(d) Periodic structural stability assessment
• Section 6 – Safety Factor Assessment	§ 257.73(e) Periodic safety factor assessment
• Section 7 – Conclusions	
• Section 8 – Limitations	
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• Figures	
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• Appendix B – Safety Factor Calculation	

1.4 Facility Description

The FCPP is an electric generating station located on the Navajo Nation, in Fruitland, San Juan County, New Mexico. The station is operated by APS and owned by a consortium of five utility companies with APS possessing a majority stake. The FCPP consists of two coal-fired electrical generating units, Units 4 and 5. Units 1, 2, and 3 were decommissioned in 2013. The two generating units are cooled by water from Morgan Lake, a man-made reservoir located immediately north of the plant. Four existing CCR surface impoundments are located at the FCPP: the Combined Waste Treatment Pond (CWTP) located immediately east of the plant, the Lined Ash Impoundment (LAI) located about one mile west of the plant, the LDWP located about one and a half miles west of the plant and adjacent to the LAI, and the Upper Retention Sump (URS) located immediately southeast of the plant. CCR generated at the power plant are disposed of at a landfill, the Dry Fly Ash Disposal Area, and the LAI, while the CWTP and LDWP are used as water decant ponds. The URS is an incised surface impoundment receiving storm water from the flue gas desulfurization (FGD) thickener system. Figure 1-1 shows the location of the CWTP, LAI, and LDWP in relation to the power plant. This assessment evaluates the structural integrity of the LAI.

The LAI consists of a reservoir basin formed by a perimeter embankment. It receives fly ash and FGD sludge from the power plant. The LAI embankment was constructed in phases between 2003 and 2014. The impoundment was originally constructed on Ash Ponds 3 and 4 to EL 5228 ft and progressively raised in four lifts using the downstream method of construction to EL 5248, 5258, 5270 and 5280 ft. As the embankment was raised it expanded over Ash Pond 5. The LAI currently has a total surface area of about 129 acres and a total storage capacity of about 5,346 acre-ft when at the maximum storage pool water level of EL 5275.2 ft. The embankment ties into native weathered shale on the northeast and east sides of the impoundment. The LAI is licensed by NMOSE as a dam, NMOSE License No. D-634. Under NMOSE Regulations, the LAI perimeter embankment has been classified as an intermediate sized, significant hazard potential dam.

The LAI perimeter embankment is an earthen, zoned embankment dam consisting of compacted bottom ash and fly ash with a 15-foot wide compacted clay blanket along the upstream slope. The South Embankment was constructed using the existing Ash Pond 4 embankment as a starter dike and expanded downstream onto the adjacent native weathered shale. The West Embankment is founded on the Ash Pond 3 and 4 divider dike and on old hydraulically deposited fly ash within Ash Pond 3.

The Northwest Embankment is founded on the Ash Pond 5 and Ash Pond 6 embankments and hydraulically deposited fly ash within Ash Pond 6. The East Embankment lies on top of the native weathered shale. The embankment is approximately 6,600 ft in length with a maximum total height of about 107 ft near the southwest corner. The crest width ranges between about 20 and 30 ft over the length of the embankment. The upstream and downstream slope are inclination varies across the length of the perimeter embankment as specified in Section 3.2 with upstream slopes ranging between two horizontal to one vertical (2H:1V) and 4H:1V and downstream slopes ranging between 2H:1V and 3H:1V. The top of crest elevation (EL) is 5,280 ft, creating 4.8 ft of freeboard above the maximum storage pool water level and 2.8 ft of freeboard above the maximum surcharge pool water level (URS, 2012). The upstream slope of the perimeter embankment and the entire pond are lined with a geomembrane liner system that prevents erosion of the slopes; the downstream slope is composed of compacted granular material with high frictional strength.

The foundation of the LAI embankment varies along the perimeter length. On the western and northwestern sides of the LAI, the embankment is founded on about 45 to 50 ft of hydraulically placed existing fly ash and pre-existing embankment associated with the old ash ponds. On the northeastern and eastern sides, the embankment is tied into the weathered shale bedrock. On the southern side, the embankment lies on the pre-existing ash pond embankments and weathered shale bedrock. To limit seepage into the embankments and underlying fly ash deposits, the LAI was installed with a single High Density Polyethylene (HDPE) liner that covers the impoundment basin to the embankment crest. In addition, a compacted clay blanket on the upstream slope beneath the geomembrane provides additional seepage resistance. The clay blanket is supplemented by an approximately 1290-foot-long, 32-foot high cement-bentonite slurry wall along the Northwest Embankment of the LAI. The slurry wall was installed to seal possible gaps in the clay core that were discovered during field investigations of the existing Ash Pond 5 embankment. An internal toe drain allows dewatering of impounded ash in the vicinity of the West Embankment of the LAI.

The LAI was constructed without an overflow channel. Instead, the primary outlet spillway consists of a drop inlet tower located adjacent to the West Embankment. This drop inlet tower is a vertical, eight foot diameter, HDPE pipe with multiple drilled holes, to allow decant lateral inflow of water. The drop inlet is surrounded by a placed bottom ash filter zone that filters solids from the water seeping laterally into the drop inlet tower. The drop inlet tower drains to the west through an 8-inch or adjacent 16-inch HDPE pipe, through the West Embankment of the LAI, to the LDWP. The rim of the drop inlet is set at EL 5,277.84 ft; however, due to the lateral inflow to the inlet the maximum storage pool water level (operating water level) is EL 5,275.2 ft (URS, 2012). Analysis conducted as part of the 2012 Engineering Design for the 5280 Lift (URS, 2012) shows the outlet has capacity to adequately manage flow during and following the design level storm event, defined as the 72-hour probable maximum precipitation (PMP). In addition, the LAI pond was constructed with sufficient depth to fully contain the storm run-on on top of the operational maximum storage pool water level in the event the spillway was inoperable and could not pass flow to the LDWP. This water level, defined as the maximum surcharge pool water level (flood water level), is estimated at EL 5,277.2 ft based on an expected water level rise of 2.0 ft during the probable maximum flood (PMF) (URS, 2014). The surcharge pool water level leaves 2.8 ft of freeboard below the embankment crest

Standpipe piezometers, vibrating wire piezometers, inclinometers, and survey settlement/displacement monument devices are installed at the LAI to monitor the performance of the embankment and the North Toe Buttress. Measurements from the monitoring instruments are reviewed and documented annually as part of the annual inspection. Starting on October 19, 2015, the piezometers and survey monuments are read at intervals not exceeding 30 days per the requirements of *40 CFR* § 257.83(a)(1)(iii). The locations of the instruments are shown on Figure 1-2.

Inspections of the LAI are performed by a qualified person at intervals not exceeding seven days. The inspections examine the LAI for actual or potential conditions that could disrupt the operation or safety of the impoundment and documents the results of the inspection in the facility's operating record. In addition, a more detailed annual inspection is performed by a qualified professional engineer. The annual inspection includes a review of available information on the dam including the past year of monitoring data, a field inspection of the dam, abutment, and downstream toe, and documentation of findings and recommendations in a dam safety inspection report. The most recent annual inspection of the LAI was performed on October 14, 2015 (AECOM & APS, 2016).

2 Hazard Potential Classification

This section summarizes the initial Hazard Potential Classification (HPC) for the LAI. This initial HPC is intended to meet the requirement for periodic hazard potential classification assessment of existing CCR surface impoundments per Rule 40 CFR § 257.73(a)(2).

2.1 Methodology and Design Criteria

Per the Rule, the hazard potential classification provides an indication of the possible adverse incremental consequences that result from the release of water or stored contents due to failure or mis-operation of the CCR surface impoundment. The classification is based solely on the consequences of failure. As such, it is not dependent of the condition of the embankment or the likelihood of failure. Classifications per the Rule are separate from relevant and/or applicable federal, state or local dam safety regulatory standards, which may also include hazard classification definitions, and are not intended to substitute for other regulatory hazard potential classifications.

The Rule defines three hazard potential classifications as follows:

High hazard potential CCR surface impoundment – A diked surface impoundment where failure or mis-operation will probably cause loss of human life.

Significant hazard potential CCR surface impoundment – A diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

Low hazard potential CCR surface impoundment – A diked surface impoundment where failure or mis-operation results in no probable loss of life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment's owner's property.

The hazard potential of the LAI was assessed qualitatively, per the above definitions. The qualitative assessment process is generally performed in a step-wise manner by first determining whether the pond could be classified as low hazard potential, based on immediately obvious factors such as proximity to property lines and/or surface water bodies. After determining that a structure does not meet the criteria for Low Hazard Potential Classification, the structure is assessed to determine whether it meets the criteria for High Hazard Potential. The potential for loss of life differentiates between high and significant hazard potential in the Final CCR Rule; therefore, if the Dam does not meet the criteria for high hazard potential, it would be classified as Significant Hazard Potential structure.

The potential for downstream loss of life is assessed by reviewing land use in areas downstream (to the west) from the Dam, where inundation is likely in the event of a release. A dam break analysis and inundation mapping has been documented for the LAI (URS, 2009). The inundation was reportedly mapped downstream in the Chaco River to the San Juan River. No habitable structures were reported in the inundation area and the flood outflow passes beneath the Highway N36 Bridge (URS, 2009). United States Geological Survey (USGS) 7.5-Minute Quadrangle topographic map of The Hogback North, NM and associated digital orthoimage data (USGS, 2013) were also used to review downstream areas for existing permanent and temporary land use. Permanent land uses include permanently inhabited dwellings and worksite areas that would likely contain workers on a daily basis (public utilities, power plants, water and sewage treatment plants, private industrial plants, sand and gravel plants, farm operations, fish hatcheries). Temporary land uses include primary roads, established campgrounds, or other recreational areas.

2.2 Hazard Potential Classification Results

Inspection of the LAI Dam and its immediate surroundings relative to property lines, surface water bodies, and structures that could potentially be impacted by a release, as presented in the dam break analysis report (URS, 2009), indicated that the LAI Dam does not meet the criteria for a Low Hazard Potential classification based on the proximity to an off-site surface water body (Chaco River).

The Chaco River is approximately 4,000 ft downstream from the LAI Dam. The area between the LAI and the Chaco River is unoccupied and undeveloped. No permanent or temporary dwellings, worksites, roads, or other development that would indicate the routine presence of people downstream from the LAI (off-site) were identified. Therefore, the LAI Dam does not meet the criteria for a High Hazard Potential classification based on the absence of probable loss of life resulting from failure or mis-operation. Because the LAI Dam does not meet the criteria for classification as either Low Hazard Potential or High Hazard Potential, it is classified as a Significant Hazard Potential CCR surface impoundment.

3 History of Construction

This section summarizes the history of construction for the LAI. This information is intended to meet the requirement for compilation of the history of construction for each CCR surface impoundment per Rule 40 CFR § 257.73(c)(1).

3.1 Methodology

AECOM reviewed available documents obtained from APS or in-house resources for information regarding the history of construction for the LAI. Per the Rule, the compiled history of construction should include, to the extent feasible, the following information:

- Information identifying the CCR Unit, its purpose and the name and address of the owner/operator;
- The location of the CCR unit on the most recent USGS or other topographic map;
- Name and size of the watershed within which the CCR unit is located;
- A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit was constructed;
- A description of the type, size, and physical and engineering properties of each embankment zone;
- Provide detailed engineering drawings;
- A description of the type, purpose and location of existing instruments;
- Area-capacity curves for the CCR unit;
- A description of spillway and diversion design features;
- Construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit; and
- Any record of knowledge of structural instability.

3.2 LAI Construction Summary

The history of construction dating back to the original construction that began in 2003 is summarized in Table 3-1 below.

Table 3-1. History of Construction for the LAI

Item	As-Constructed/ Current	Comments	Reference Document
Name and Address of Owner	Arizona Public Service Company (APS): 400 North 5th Street, Phoenix, Arizona 85004	---	---
State ID No.	D-634	---	Annual CCR Impoundment and Landfill Inspection Report 2015 (AECOM & APS, 2016)
Size Classification	Intermediate	---	Annual CCR Impoundment and Landfill Inspection Report 2015 (AECOM & APS, 2016)
Hazard Classification	Significant	---	See Section 2.2
Construction Date	2004 – 5228 (original construction) 2007 – 5248 Lift 2010 – 5258 Lift 2012 – 5270 Lift 2014 – 5280 Lift	---	• LAI 5228 Lift Construction Completion Report (APS, 2004) • LAI 5248 Lift Construction Completion Report (APS, 2008) • LAI 5258 Lift Construction Completion Report (APS, 2011) • LAI 5270 Lift Construction Completion Report (URS, 2012) • LAI 5280 Lift Construction Completion Report (URS, 2014)
Location on USGS Quadrangle Map	The Hogback North Quadrangle: Sections 34 and 35, Township 29 North, Range 16 West	See Figure 3-1	The Hogback North Quadrangle (USGS, 2013)
Statement of Purpose	CCR Disposal	---	NMSOE Certificate of Construction (2015)
Name of Watershed	Chaco	---	NMSOE Certificate of Construction (2015)
Size of Watershed (ac)	135.9	---	LAI Engineering Design Report (URS, 2012))
Area Capacity Curve	Figure 3-2	---	LAI Engineering Design Report (URS, 2012)
Embankment Type	Zoned earth and ash fill dam	Compacted bottom ash and fly ash with an upstream clay blanket and geomembrane liner	LAI 5280 Lift Construction Completion Report (URS, 2014)
Embankment Maximum Height (ft)	107	---	NMSOE Certificate of Construction (2015)

Item	As-Constructed/ Current	Comments	Reference Document
Design Total Freeboard (ft)	4.8	Residual freeboard following PMF event is 2.8 ft	
Embankment Length (ft)	6,600	---	NMSOE Certificate of Construction (2015)
Embankment Crest Elevation (ft)	5,280	Crest elevation is along the West Embankment; crest is at higher elevation along other sections of the impoundment.	NMSOE Certificate of Construction (2015)
Embankment Crest Width (ft)	30 (West Embankment), 20 (South Embankment)	---	5280 Lift As-built Drawings (URS, 2014)
Embankment Slopes	West Embankment: 3H:1V (US and DS) East Embankment: 3H:1V (DS); 2H:1V (US) Northwest Embankment: 3H:1V (US); 4H:1V (DS) South Embankment 2H:1V (US and DS)	The Northwest Embankment was flattened to 4H:1V as part of the Ash Pond 6 closure project in November 2014.	• 5280 Lift As-Built Drawings (URS, 2014) • Ash Pond 6 Closure Construction Completion Report (URS, 2016)
Slope Protection	HDPE liner and clay on upstream slope	---	5280 Lift As-Built Drawings (URS, 2014)
Maximum Storage Level (ft)	5,275.2	---	LAI Engineering Design Report (URS, 2012)
Storage Capacity (ac-ft)	Normal – 5,346 Maximum – 5,986	---	• NMSOE Certificate of Construction (2015) • LAI and LDWP EAP
Surface Area (ac)	129.16	At EL 5,280 ft	LAI Engineering Design Report (URS, 2012)
Material Properties			
Clay Blanket			
Physical Properties	The clay blanket consists of compacted lean clay obtained from on-site borrow sources.	---	LAI 5280 Lift Construction Completion Report (URS, 2014)
Engineering Properties	• Unit Weight = 125 pounds per cubic foot (pcf) • Cohesion = 3,000 psf pounds per square foot (psf) • Friction Angle = 20^{o}	---	LAI Engineering Design Report (URS, 2012)

Item	As-Constructed/ Current	Comments	Reference Document
Physical Properties	Compacted bottom ash and fly ash.	---	LAI 5280 Lift Construction Completion Report (URS, 2014)
Engineering Properties	Bottom Ash • Unit Weight = 75.1 pcf • Cohesion = 0 psf • Friction Angle = 42° Fly Ash • Unit Weight = 90 psf • Cohesion = 0 psf • Friction Angle = 30° (dry), 28° (saturated)	---	LAI Engineering Design Report (URS, 2012)
Foundation			
Physical Properties	The LAI was constructed on top of Ash Ponds 3, 4, and 5. The perimeter embankment began as an extension of the Ash Pond 3 and 4 embankments. A series of downstream raises resulted in the LAI South and East Embankments being founded on native weathered shale, the LAI Northwest Embankment being founded on the Ash Pond 3 and 5 embankments, and the LAI West Embankment being founded on existing fly ash impounded within Ash Pond 3. The initial construction included addition of geogrid reinforcement below the West Embankment to limit potential settlement.	---	LAI Engineering Design Report (URS, 2012)
Engineering Properties	Native Weathered Shale: • Unit Weight = 130 pcf • Effective Cohesion = 500 psf • Effective Friction Angle = 30° Fly Ash • Unit Weight = 90 psf • Cohesion = 0 psf • Friction Angle = 28° (saturated)	---	
Abutments			

Item	As-Constructed/ Current	Comments	Reference Document
Physical Properties	Abutments consist of native weathered shale	---	LAI Engineering Design Report (URS, 2012)
Engineering Properties	<u>Native Weathered Shale:</u> • Unit Weight = 130 pcf • Effective Cohesion = 500 psf • Effective Friction Angle = 30°	---	
Spillway	A drop inlet structure consisting of an 8-foot diameter perforated HDPE pipe allows flows to pass into the adjacent LDWP.	The LAI maximum storage level was established to allow full containment of the PMF and maintain a residual freeboard to account for wave run-up.	LAI Engineering Design Report (URS, 2012)

Construction Specifications	<u>Bottom Ash:</u>
	• Fill lift thickness = 8 inches (5280 Lift)
	• Fill lift thickness = 8 inches (5258 and 5270 Lifts)
	• Minimum degree of compaction = 95% of the Standard Proctor (5280 Lift)
	• Minimum degree of compaction = method specification designed to meet 95% of the Standard Proctor (5258 and 5270 Lifts)
	• Field test frequency
	  ○ Method specification (5258, 5270, and 5280 Lifts)
	  ○ Random testing (5258 and 5270 Lifts
	  ○ One nuclear density test per 2,000 yds^3 placed (5280 Lift)
	  ○ One Sand Cone Field Density test per four nuclear density gauge tests (5280 Lift)
		• Specifications apply to the field testing portions of the 5258, 5270, and 5280 Lifts unless otherwise noted.
		• Bottom ash was exclusively used as embankment fill until the 5270 Lift.
		• Zoned layers of either bottom ash or fly ash material were used as embankment fill for the 5270 Lift.
		• The 5280 Lift utilized both bottom ash and fly ash, but did not blend the materials together.
			• LAI Method Specification Compacted Bottom Ash Test Fill Section (Western Technologies, 2003)
			• LAI 5258 Lift Specifications (APS, 2008)
			• LAI 5270 Lift (GEOMAT, 2010)
			• LAI 5270 Lift Specifications (URS, 2010)
			• LAI 5280 Lift Specifications (URS, 2011)

Item	As-Constructed/ Current	Comments	Reference Document

Construction Specifications (continued)	<u>Fly Ash (5280 Lift):</u>
	• Fill lift thickness = 8 inches
	• Initial minimum degree of compaction = 95% (Standard Proctor)
	• Field test frequency
	  ○ Method specification
	  ○ One nuclear density test per 2,000 yds^3 placed
	  ○ One Sand Cone Field Density test per four nuclear density gauge tests
	<u>Bottom Ash and Fly Ash Ballast (combined material – 5270 Lift):</u>
	• Fill lift thickness = 8 inches
	• Initial minimum degree of compaction = 95% (Standard Proctor)
	• Field test frequency
	  ○ Method specification
	  ○ One nuclear density test per 250 yds^3 placed
	<u>Compacted Clay:</u>
	• Fill was moisture-conditioned to be within -1 to +3 percent of the optimum moisture content
	• Initial minimum degree of compaction = 95% (Standard Proctor)
	• Field test frequency
	  ○ Method specification
	  ○ One nuclear density test per 250 yds^3 placed
	  ○ One Standard Proctor per 5,000 yds^3 placed
	One Sand Cone Field Density test per four nuclear density gauge tests
		• Specifications apply to the field testing portions of the 5258, 5270, and 5280 Lifts unless otherwise noted.
		• Bottom ash was exclusively used as embankment fill until the 5270 Lift.
		• A bottom ash-fly ash blended material was used as embankment fill for the 5270 Lift.
		The 5280 Lift utilized both bottom ash and fly ash, but did not blend the materials together.
			• LAI Method Specification Compacted Bottom Ash Test Fill Section (Western Technologies, 2003)
			• LAI 5258 Lift Specifications (APS, 2008)
			• LAI 5270 Lift (GEOMAT, 2010)
			• LAI 5270 Lift Specifications (URS, 2010)
			LAI 5280 Lift Specifications (URS, 2011)

Detailed Drawings	Appendix A	---	---

Item	As-Constructed/ Current	Comments	Reference Document
Existing Instrumentation			
Type and Purpose of Instrumentation	• Standpipe piezometers installed to monitor the phreatic levels in and below the embankment. • Vibrating wire piezometers installed to monitor the phreatic levels in and below the embankment. • Inclinometers to monitor horizontal deflections within the West Embankment and North Toe Buttress profiles. • Settlement rods to monitor vertical movement of the embankment and North Toe Buttress • Settlement monuments to monitor horizontal and vertical deflections within the West Embankment.	---	LAI and LDWP Comprehensive Instrumentation Plan (URS, 2014)
Location of Instrumentation	The West Embankment and North Toe Buttress.	See Figure 1-2	LAI and LDWP Comprehensive Instrumentation Plan (URS, 2014)
Provisions for Surveillance, Maintenance and Repair	• Visual inspections of the dam by a qualified person on a frequency not exceeding seven days. • Visual inspections of the dam conducted annually by a professional engineer. • Phreatic level behavior from piezometric measurements collected on a frequency not exceeding 30 days. • Embankment settlement using movement monuments survey data collected on a frequency not exceeding 30 days.	---	Annual CCR Impoundment and Landfill Inspection Report 2015 (AECOM & APS, 2016)
Record of Structural Instability	Reports of seepage along downstream toe of South Embankment during prior construction stages. Flows now believed to have been drainage from placed bottom ash embankment fill.	Drainage is now captured by French drain.	Annual CCR Impoundment and Landfill Inspection Report 2015 (AECOM & APS, 2016)

4 Structural Stability Assessment

This section summarizes the structural stability assessment for the LAI. This information is intended to satisfy the requirement of Rule 40 CFR § 257.73(d).

4.1 Foundation and Abutments

Per the requirements of40 CFR § 257.73(d)(1)(i), existing CCR impoundments must be assessed for "*Stable foundations and abutments*."

The LAI was constructed in phases starting in 2003. The impoundment was originally constructed on Ash Ponds 3 and 4 to EL 5228 ft and progressively raised in four lifts using the downstream method of construction to EL 5248, 5258, 5270 and 5280 ft. As the embankment was raised it expanded onto Ash Ponds 5 and 6. The foundation of the perimeter embankment varies around the LAI. The South Embankment was constructed using the existing Ash Pond 4 embankment as a starter dike and expanded downstream onto the adjacent native weathered shale. The West Embankment is founded on the Ash Pond 3 and 4 divider dike and on old hydraulically deposited fly ash within Ash Pond 3. The Northwest Embankment is founded on the Ash Pond 5 and Ash Pond 6 embankments and hydraulically deposited fly ash within Ash Pond 6. The East Embankment lies on top of the native weathered shale. The fly ash beneath the West Embankment is approximately is 45 ft thick. Prior to construction of the embankment along the West Embankment, the foundation surface was reinforced with geogrid and compacted bottom ash. The underlying weathered shale appears competent within the embankment footprint based on exploratory borings drilled to bedrock during the 2016 AECOM Geotechnical Investigation.

Along the northern portion of the West Embankment in an area bounded to the south by the LDWP embankment and to the north by the Ash Pond 6 embankment, an approximately 10 to 15 foot thick layer of wet fly ash was identified downstream at the toe of the LAI embankment prior to construction of the EL 5280 ft lift. This area, referred to as the North Toe area, is in the vicinity of a decant pond when Ash Pond 3 was active. In the decant pond, finer fly ash materials were deposited with relatively low densities. The area was also poorly drained, due to the underlying weathered shale that prevents downward flow. To stabilize the embankment slope, a North Toe Buttress was constructed in conjunction with the EL 5280 ft lift. The buttress was constructed by first installing wick drains on a nine foot triangular pattern to depths of up to 50 ft in order to allow pore pressure relief ("drainage") of the material as the buttress was installed. Next a wedge-shaped buttress of compacted bottom ash was installed from a 20-foot height at the toe of the LAI embankment, westward at a 20H:1V slope for a distance of 400 ft. The primary effect of the North Toe Buttress is to provide stability for the downstream toe of the West Embankment, but a secondary effect was also to drain, densify, and strengthen the wet fly ash as a result of the wick drainage and the surcharge load from the buttress fill. Water level readings from piezometers installed through the North Toe Buttress after construction indicate that the fly ash is draining.

To limit seepage through the LAI embankment and foundation, the bottom and the upstream slope of the impoundment is lined with an HDPE geomembrane liner to the crest. In addition, a 15-foot thick layer of compacted clay is installed on the upstream slope beneath the geomembrane effectively providing a composite liner system. The clay layer is supplemented by an approximately 1290-foot long by 32-foot high, cement-bentonite slurry wall along the Northwest Embankment of the LAI. The slurry wall was installed to seal possible gaps in the clay core that were discovered during field investigations of the existing Ash Pond 5 embankment. Piezometer readings from the most recent dam inspection report (AECOM & APS, 2016) show water levels below the foundation of the Western and Northwestern Embankments, an indication that the liner system is limiting seepage.

Review of the measured displacements of the survey rods and inclinometers at the LAI, as presented in the 2015 annual dam inspection report (AECOM & APS, 2016), indicates no significant settlements or horizontal displacement along the crest of the dam within the year. The relatively small settlement and horizontal movements measured at the LAI are an indication of stability in the dam foundation.

4.2 Slope Protection

Per the requirements 40 CFR § 257.73(d)(1)(ii), existing CCR impoundments must be assessed for "*Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown*."

The upstream slopes of the LAI are lined with an HDPE liner, which protects the slopes from erosion, wave action, and adverse effects of sudden drawdown. The downstream slopes consist of compacted bottom and fly ash and are not vegetated; however, the granular nature of bottom ash allows infiltration in preference to runoff and erosion. Additionally, APS has a program to regularly inspect, identify, and repair any erosion rills. The 2015 annual dam inspection report (AECOM & APS, 2016) reported that the downstream slopes of the embankments show evidence of minor erosion rilling, presumably caused by rainfall runoff. APS maintains the affected areas by regrading and recompacting eroded areas.

4.3 Dike Compaction

Per the requirements 40 CFR § 257.73(d)(1)(iii), existing CCR impoundments must be assessed for "*Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit*."

The LAI embankment is composed primarily of compacted bottom and fly ash and compacted clay, which has been demonstrated to compact readily with various ranges of compaction and hauling equipment. The embankment was constructed by placement of soils in mechanically compacted thin lifts of eight inches or less. Construction control of the compaction process was maintained using a method procedure where the soil preparation, placement, watering, discing (if necessary), and compaction are specified based on the results of testing during earthwork. Quality control testing was performed to check the bottom ash was reaching the minimum project requirements for compaction, defined as 95 percent of the Standard Proctor dry density (American Society for Testing and Materials [ASTM] D698).

Construction records of the embankment indicate quality control testing of the bottom ash and compacted clay fills were performed for each raise of the LAI embankment. Quality control testing consisted of Standard Proctor moisture-density relationship determination (ASTM D698), sieve analysis testing (ASTM C136, C117), Atterberg Limit testing (ASTM D4318), in-place moisture content and density measurement using the nuclear method (ASTM D6938), and in-place density measurement using the sand cone method (ASTM D1556). Construction completion reports (GEOMAT, 2014) indicate that all locations tested met the project minimum density requirements.

Based on review of the construction records/completion report for the LAI raises, the embankments appear to be constructed with well compacted materials.

4.4 Slope Vegetation

Per the requirements 40 CFR § 257.73(d)(1)(iv), existing CCR impoundments must be assessed for "*Vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection*." Note that the United States Court of Appeals for the District of Columbia Circuit remanded with vacatur the phrase "*not to exceed a height of six inches above the slope of the dike*" from this subsection of the Rule.

As noted in Section 4.2, the downstream slope, which is comprised of compacted bottom and fly ash, are not vegetated. APS has a program to regularly inspection and repair erosion rills. The upstream slope consists of a dual HDPE liner and therefore is excluded from the vegetated slope requirements since it uses an alternate form of slope protection.

4.5 Spillways

Per the requirements 40 CFR § 257.73(d)(1)(v), existing CCR impoundments must be assessed for "*A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of this sections. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section*."

The spillway for the LAI consists of a drop inlet tower, located adjacent to the West Embankment. This drop inlet is a vertical, eight foot diameter, polyethylene pipe with multiple drilled holes to allow inflow of water. This drop inlet is surrounded by gravel

and sorted bottom ash that filters solids from the water flowing into the drop inlet. The drop inlet tower drains to the west through an 8-inch or adjacent 16-inch HDPE pipe, through the West Embankment of the LAI, to the LDWP. Analysis conducted as part of the 2012 Engineering Design for the EL 5280 ft Lift (URS, 2012), shows the spillway has capacity to adequately manage flow during and following the peak discharge from the full PMF, which exceeds the requirement for the significant hazard rating for this CCR Unit. In addition, the LAI pond was constructed with sufficient depth to fully contain the storm run-on on top of the operational maximum storage pool water level in the event the spillway was inoperable and could not pass flow to the LDWP. Recent inspections of the spillway (AECOM & APS, 2016), found it to be in good working order with no visible damage.

Based on the 2012 Engineering Design for the EL 5280 Lift and the most recent inspection report, the LAI has been designed, constructed, and maintained to adequately manage flow during and following the peak discharge of the 72-hour PMP event, as required for significant hazard potential impoundments. Furthermore, the spillway is of non-erodible construction and is designed to carry sustained flows.

4.6 Hydraulic Structures

Per the requirements 40 CFR § 257.73(d)(1)(vi), existing CCR impoundments must be assessed for "*Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structures*."

Three hydraulic structures penetrate the LAI embankment. The first structure consists of the two outlet pipes connected to the drop inlet tower as discussed in Section 4.5. The outlets penetrate the Western Embankment at about Sta 54+25 connecting the drop outlet to the LDWP. Water drains via gravity to the west through an 8-inch HDPE pipe. A 16-inch diameter HDPE pipe, located above the 8-inch drain, provides additional outflow capacity if the 8-inch pipe is blocked or in the case of large (e.g., storm) flows. A clean-out is located at the west end of the 8-inch pipe. The pipes were encased in flowable fill through the embankment. The most recent inspection report of the LAI (AECOM & APS, 2016) speculated the 8-inch pipe was partially blocked with sediment due to low flow volume observed at the outlet. The 16-inch pipe appeared to be flowing normally. The interconnection of the 8-inch pipe with the LDWP is not required for flood management purposes since the minimum freeboard of the LAI is sufficient to store the directly-incident PMP; however, continued monitoring of the flow from the 8-inch pipe and, if warranted, removal of the lodged material is recommended.

The second hydraulic structure is the solid wall outlet of a buried slotted drain pipe, known as the "dead pool drain", installed above the geomembrane liner at the inside toe of the West Embankment of the LAI. The pipe runs from a point approximately 200 ft south of the drop inlet spillway to the southwest corner of the LAI, where it transitions to a solid wall section, penetrates the embankment, and outfalls to a sump. This pipe is embedded in flowable fill within the starter embankment associated with the EL 5228 ft Lift. Accumulated water is pumped from the sump through a four inch pipe to the southeast corner of the LDWP. Operation of the dead pool drainpipe is not required for safe operation of the LAI but is encouraged because it assists with dewatering, consolidation, and strengthening of the impounded CCRs. During the most recent impoundment inspection (AECOM & APS, 2016), the drain system was pressurized but not operational; however, recent discussions with APS Personnel indicate the pump system is now operational.

The third hydraulic structure is a seepage intercept drain located within the downstream toe of the South Embankment. The drain was constructed beyond the embankment toe during the EL 5270 ft lift construction, was covered further by the downstream slope of the EL 5280 ft lift, and will be buried fully by Cell 3 of the Dry Fly Ash Disposal Area landfill that will eventually buttress the South Embankment of the LAI. The drain was originally intended to provide improved control of drainage from the embankment fill and prevent water from ponding between the South Embankment and the Dry Fly Ash Disposal Area landfill to the south. The toe drain consists of a buried channel with a 13-foot wide bottom and 1.5H:1V side slopes. The channel is about 3.5 ft deep and extends westward from the east end of the South Embankment, to an existing channel located along the outside toe of the south embankment of the LDWP. Two 10-inch inside diameter perforated drain pipes are installed in the channel and surrounded by a two-stage filter/drain. The pipes outfall into a channel adjacent to the LDWP where a headwall is located which facilitates monitoring flow rates from the two pipes. The flows from the drain are conveyed through the channel to a sump and then pumped to the LDWP. The most recent inspection report (AECOM & APS, 2016), observed no water flow from the toe drain pipes. The lack of flow is attributed to a lack of drainage from fresh embankment fill, a lack of seepage flow from the LAI itself, and an absence of shallow saturation in the foundation.

Other than the low flow volume observed in the 8-inch pipe connected to the drop inlet spillway, the hydraulic structures penetrating the LAI embankment appear to be working effectively with no evidence of subsidence or other indication of potential deterioration of the surrounding embankment.

4.7 Downstream Water Body

Per the requirements 40 CFR § 257.73(d)(1)(vii), existing CCR impoundments must be assessed as follows "*For CCR units with downstream slope which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body*."

The LDWP is located near the downstream toe of the Western Embankment of the LAI and contains water decanted from the LAI for reuse at the power plant. The LDWP is contained by an embankment with a double liner and leak detection system; therefore, making it unlikely under normal operating conditions to inundate the toe of the LAI. If the embankment or containment system were to breach in some manner, the water would follow the graded terrain that slopes away from the LAI and not inundate the LAI slopes.

Since it is unlikely that water from the LDWP would inundate the downstream slope of the LAI and no other bodies of water are present that could also reasonably inundate the slopes, no structural stability deficiencies are presently associated with inundation of the downstream slope of the LAI by an adjacent body of water.

4.8 Other Issues

No deficiencies were identified for the LAI that could affect the structural stability of the impoundment. The most recent dam inspection (AECOM & APS, 2016) reported observations of minor erosion rills on the downstream slopes. APS reportedly has been maintaining affected areas by regrading and recompacting eroded areas. It is recommended that the program be continued and that rills be repaired if the depth exceeds one foot.

4.9 Structural Stability Assessment Results

AECOM did not identify any structural stability deficiencies that would affect the structural condition of the LAI CCR surface impoundment based on the documents provided and reviewed as part of this assessment. AECOM assesses that the design, construction, operation and maintenance of the LAI are consistent with recognized and generally accepted good engineering practice for the maximum volume of CCR and CCR wastewater which can be impounded therein.

5 Safety Factor Assessment

This section summarizes the safety factor assessment for the LAI. This assessment is intended to satisfy the requirement of Rule 40 CFR § 257.73(e).

5.1 Methodology and Design Criteria

Slope stability analyses were performed to document minimum factors of safety for loading conditions identified by 40 CFR § 257.73(e) using the software program SLOPE/W (GEO-SLOPE International, 2012). The analyses were performed using Spencer's Method; a limit equilibrium method of slices that satisfies both force and moment equilibrium and incorporates the effects of interslice forces. The analyses incorporate strength and density properties and pore pressure distributions described in Sections 5.4 and 5.5. The slope stability models are presented in Appendix B.

5.2 Critical Cross Section

Safety factors were calculated for three cross sections of the LAI embankment selected to represent different embankment geometries, heights, and stratigraphic conditions to provide confidence that the critical cross section was identified. The critical cross section is the cross section that is anticipated to be most susceptible to structural failure for a given loading condition. The critical cross section thus represents a "most-severe" case. Section locations were selected based on variation in the embankment height, stratigraphic conditions, and presence of sensitive soils. Subsurface soil profiles were developed using information from the EL 5280 ft Lift (URS, 2012). The locations of the cross sections along the LAI embankment are shown in Figure 5-1. The three cross sections analyzed are:

Section A (West Embankment): This cross-section is located at Section A (Sta 43+76.99) as shown in Figure 5-1 and the as-built section in Appendix A. The section represents the maximum height along the West Embankment. The embankment is approximately 76 ft high from crest to downstream toe at this location with a crest width of 30 ft. The upstream slope is inclined at 2H:1V, while the downstream slope is inclined at 3H:1V. The embankment at this section consists of compacted bottom and fly ash with a 15-foot wide compacted clay blanket on the upstream slope. The embankment bears partially on the pre-existing Ash Pond 3 and 4 Divider Dike and partially on 46 ft of old hydraulically placed fly ash associated with Ash Pond 3.

Section M (South Embankment): This cross-section is located at Section M (Sta 36+47.02) as shown in Figure 5-1 and the as-built section in Appendix A. The section represents the maximum height along the South Embankment. The embankment is approximately 92 ft high from crest to downstream toe at this location with a crest width of 30 ft. Both the upstream and downstream slopes are inclined at 2H:1V. A pre-existing Ash Pond 4 Embankment was used as a starter dam for building the South Embankment using a downstream construction method. The pre-existing embankment consisted of compacted bottom and fly ash with a 40-foot wide layer of compacted clay on the upstream face. The subsequent raises of the LAI are constructed with compacted bottom and fly ash and a 15-foot wide blanket of compacted clay on the upstream slope. The clay blanket is keyed into the clay of the pre-existing (original) embankment. A toe drain that runs parallel with the embankment is located near the downstream toe of the embankment. The South Embankment is founded on native weathered shale.

Section X (North Toe Buttress): This cross-section is located at Section X (Sta 59+62.02) as shown in Figure 5-1 and the as-built section in Appendix A. The section crosses the North Toe Buttress at the northern end on the West Embankment. The North Toe Buttress was constructed against the base of the West Embankment to a height of 20 ft and is inclined downward toward the west at approximately 20H:1V to an approximate length of 400 ft. The buttress consists of a 1.5-foot thick bottom ash drain layer overlain by a combination of compacted bottom and fly ash to the approximate elevation of 5,227 ft at its highest point. The buttress overlies hydraulically placed wet fly ash (sensitive fines) associated with Ash Pond 3, improved by the installation of full-depth vertical wick drains at nine foot spacing.

The West Embankment at the Section X location is approximately 70 ft high from crest to downstream toe with a crest width of 30 ft. The upstream slope is inclined at 2H:1V and the downstream slope is inclined at 3H:1V. The embankment consists of

compacted bottom and fly ash with a 15-foot wide compacted clay blanket on the upstream slope. The embankment bears partially on the pre-existing Ash Pond 3 and 4 Divider Dike and partially on 25 ft of old hydraulically placed fly ash associated with Ash Pond 3.

5.3 Subsurface Stratigraphy

Idealized models of subsurface stratigraphic conditions for each cross section were developed based on as-built drawings (Appendix A). The stratigraphic units described as follows were used to develop SLOPE/W models for each cross section.

Compacted Bottom and Fly Ash: The LAI Embankment primarily consists of compacted bottom and fly ash. The bottom and fly ash provides stability to the embankment, but because of its relatively high hydraulic conductivity is not relied upon to control seepage from the pond which is managed by a HDPE geomembrane liner and compacted clay liner on the upstream slope. The compacted bottom classifies as a Silty Sand (SM) and the fly ash as a Silt (ML) based on the Unified Soil Classification System (USCS).

Compacted Clay: The LAI Embankment includes a less pervious layer of compacted clay along the upstream slope. The layer is about 15 ft wide and runs from the toe to the crest. The clay material was obtained from local weathered shale, broken down and mechanically compacted in lifts. The compacted clay consists predominately of Lean Clay (CL) based on the USCS.

Existing Fly Ash: Fly ash and FGD slurry waste product from the power generating process is associated with the decommissioned Ash Pond 3 and Ash Pond 4. The fly ash was pumped from the plant to the ash ponds and allowed to settle hydraulically. The LAI was constructed partially on top of the existing fly ash deposits. The existing fly ash classifies as a silt (ML) based on the USCS.

New Fly Ash: New fly ash and FGD slurry waste product from the power generating process is stored within the LAI impoundment.

Buttress Material: The North Toe Buttress consists of compacted bottom ash. The buttress material provides stability to the toe of the Western Embankment between the LDWP embankment to the south and the Ash Pond 6 embankment to the north. The buttress also has a secondary effect of increase the density and confinement pressure of the underlying wet existing fly ash.

Sensitive Fines: Sensitive soils consisting of wet fly ash material associated with hydraulic deposition of fly ash within Ash Pond 3. Sensitive fines were observed in the North Toe area and underlie portions of the North Toe buttress. The sensitive fines are potentially susceptible to liquefaction.

Weathered Shale: Bedrock beneath the embankment consists of weathered shale of the Cretaceous-age Lewis Shale Formation.

5.4 Material Properties

Material properties for soil, rock and embankment construction materials were developed based on an analysis and interpretation of historical geologic and geotechnical data presented in the URS Corporation, “Engineering Design Report Lined Ash Impoundment 5280 Lift” (URS, 2012). The material properties developed by the embankment designers and subsequent investigators were assessed for reliability and applicability to this safety factor assessment. The EL 5280 ft Lift Engineering Design Report (URS, 2012) presents soil strength parameters obtained from laboratory testing.

The material properties selected for use in the slope stability analyses of the LAI Embankment are presented in Table 5-1and and are the same as those used for the URS slope stability evaluation (2012). Additional properties for the residual strength of the sensitive fines material (liquefaction) were developed for this assessment. Details of the residual strength properties development are presented in the Appendix B calculation.

Table 5-1. Selected Material Parameters – LAI Safety Factor Assessment

Material	Material Properties						
	Moist Unit Weight, γ_m (pcf)	Saturated Unit Weight, γ_{sat} (pcf)	Drained Strength		Undrained Strength		Residual Strength
			Cohesion, c' (psf)	Friction Angle, ϕ' (degrees)	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Shear Strength Ratio (S_r/σ_v')
Compacted Bottom and Fly Ash	90	90	0	35	-	-	-
Existing Fly Ash (Top)	90	90	0	30	-	-	-
Existing Fly Ash (Bottom)	90	90	0	28	-	-	-
New Fly Ash (Impounded)	90	90	-	-	304	0	-
Compacted Bottom Ash	75.1	75.1	0	42	-	-	-
Compacted Clay	125	130	300	20	-	-	-
Weathered Shale (Native Ground)	120	125	-	-	500	30	-
Sensitive Fines (Drained)	80	-	0	18.5	-	-	-
Sensitive Fines (Liquefaction)	80	-	-	-	-	-	0.05
Buttress Fill	75	-	0	20	-	-	-
Drain Sand	110	-	0	30	-	-	-

5.5 Embankment Pore Pressure Distribution

Water levels within the embankment are anticipated to be low because of the geosynthetic liner that lines the pond basin and the compacted clay layer that extends along the upstream slope of the embankment. Standpipe and vibrating wire piezometers are installed along the West Embankment of the LAI, monitored on an interval not exceeding 30 days, and reported annually in an inspection report. These instruments were considered to be the most reliable indicators of pore pressure distribution within the LAI embankment. They indicate the water levels are beneath the embankment and within the underlying existing fly ash deposits that make up a majority of the foundation below the West Embankment (AECOM & APS, 2016). Consequently, the phreatic levels in the stability cross sections were modeled below the embankments within the existing fly ash foundation or weathered shale and the steady-state seepage condition within the embankment was modeled as a dry condition. The locations of the piezometers are shown on Figure 1-2.

5.6 Embankment Loading Conditions

Per 40 CFR § 257.73(e)(1)(i) through (iv), the following loading conditions were analyzed for each developed stability cross section:

- Long-term, maximum storage pool
- Maximum surcharge pool
- Seismic loading, and
- Liquefaction Loading

These loading conditions are described in the following sub-sections.

Long-Term, Maximum Storage Pool: The maximum storage pool loading is the maximum water level that will be maintained for a sufficient length of time for steady-state seepage or hydrostatic conditions to develop within the embankment. This loading condition is evaluated to document whether the CCR surface impoundment can withstand a maximum expected pool elevation with full development of the anticipated saturation in the embankment under long-term loading. The long-term, maximum storage pool loading condition considers a pool elevation in the CCR unit that is equivalent to the design operating level stated in the EL 5280 ft Lift Engineering Design Report (URS, 2012). The loading condition uses shear strengths expressed as effective stress and with pore water pressures that correspond to the long-term condition.

For the LAI embankment, the safety factor was calculated for the long-term, maximum storage pool at 5,275.2 ft (URS, 2012).

Maximum Surcharge Pool: The maximum surcharge pool loading is the temporary rise in pool elevation above the maximum storage pool elevation to which the CCR surface impoundment could be subject under inflow design flood state. This loading condition is evaluated to document whether the downstream slope of the CCR surface impoundment embankment can withstand the short-term impact of a raised pool level.

For the LAI embankment, the safety factor was calculated for the maximum surcharge pool at 5,277.2 ft (URS, 2012).

Seismic Loading: Seismic loading was evaluated to document whether the embankment is capable of withstanding a design earthquake without damage to the foundation or embankment that would cause a discharge of its contents. The seismic loading condition is assessed for a seismic loading event with a two percent probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years. A pseudostatic analysis was used to represent the seismic loading condition.

The seismic response of soil embankments is incorporated into the limit equilibrium analysis method by adding a horizontal force to simulate the seismic force acting on the embankment during an earthquake. The horizontal force is applied in the pseudo-static analyses through the addition of a seismic coefficient into the limit equilibrium calculations. The seismic coefficient was selected using the following procedure:

1. Determine the peak horizontal ground acceleration (PGA) generated in bedrock at the site by an earthquake having the 2 percent probability of exceedance in 50 years;
2. Select a Site Class, per International Building Code definitions, which incorporates the effects of seismic wave propagation through the top 100 ft in the soil profile above bedrock, and calculate the adjusted for Site Class effects, PGA_M;
3. Calculate the maximum transverse acceleration at the crest of the embankment, PGA_{crest}, using the PGA_M from step two; and
4. Adjust the PGA_{crest} using the method developed by Makdisi and Seed (1977) to account for the variation of induced average acceleration with embankment depth to calculate the seismic coefficient.

Each of these steps is discussed in more detail in Appendix B. The pseudostatic analyses incorporated a horizontal seismic coefficient of 0.083g for Section M which is founded on weathered shale and 0.104g for Sections A and X which are founded on existing fly ash.

The water level in the LAI for the seismic loading analysis was set to 5,275.2 ft to match the long-term, maximum storage pool. For the seismic loading condition, effective shear strength parameters summarized in Table 5-1 were used for free-draining soils (bottom ash) and total shear strength parameters summarized in Table 5-1 were used for low-permeability soils (existing fly ash and weathered shale) because it is anticipated that they would behave in an undrained manner due to the relatively rapid loading induced during the seismic event and low phreatic surfaces within the embankment.

Liquefaction Loading: The liquefaction factor of safety is evaluated for CCR embankments that show, through representative soil sampling, construction documentation, or anecdotal evidence from personnel with knowledge of construction of the CCR units, that soils of the embankment or foundation are susceptible to liquefaction.

Saturated, low-density sensitive fines were encountered in the North Toe Area adjacent to the downstream slope of the West Embankment. This material was assessed during the design of the EL 5280 ft Lift to be potentially susceptible to liquefaction (URS, 2012); therefore, a liquefaction loading analysis was performed for Section X.

The water level in the LAI for the liquefaction loading analysis was set to 5,275.2 ft to match the long-term, maximum storage pool. For the liquefaction loading condition, effective shear strength parameters were used for free-draining soils (bottom ash, fly ash, and compacted clay), total shear strength parameters were used for low-permeability soils (existing fly ash and weathered shale), and residual strength parameters were used for the potentially liquefiable soils (saturated sensitive fines). These material strength parameters are summarized in Table 5-1.

5.7 Safety Factor Assessment Results

Table 5-2 summarizes the results of the safety factor analysis for the LAI, for a more detailed discussion of the results see the safety factor calculation presented in Appendix B.

Table 5-2. Summary of Calculated Safety Factors

Loading Condition	Required Safety Factor[1]	Calculated Safety Factor		
		Section A (West Embankment)	Section M (South Embankment)	Section X (North Toe Buttress)
Long-term, maximum storage pool	1.50	2.17	1.55	2.47
Maximum surcharge pool	1.40	2.08	1.55	2.41
Seismic	1.00	1.35	1.27	1.71
Liquefaction	1.20	-	-	1.90

Note: (1) From 40 CFR § 257.73(e)(1)(i) through (iv) (EPA, 2015)

The calculated factors of safety for the three critical cross sections along the LAI Perimeter Embankment exceeded the required minimum values for the long-term, maximum storage pool; the maximum surcharge pool; the seismic (pseudo-static); and liquefaction loading conditions.

6 Conclusions

Based on the findings and results of the structural integrity assessment, AECOM provides the following conclusions for the LAI at the FCPP.

- The LAI is classified as a Significant Hazard Potential CCR surface impoundment.
- The LAI embankment is founded on stable foundations and abutments. Seepage is managed by a single HDPE liner across the impoundment, which is underlain by a clay blanket on the upstream slopes extending to the crest of the embankment.
- The embankment has a single HDPE liner with clay on the upstream slope to prevent erosion. The downstream slopes are constructed with bottom ash and are not vegetated. The granular nature of bottom ash generally allows infiltration in preference to runoff and erosion. APS has a regular program of inspection and repair of erosion rills.
- Based on the available information and quality control test results, the LAI embankment was mechanically compacted to a density sufficient to withstand the range of loading conditions anticipated at the site.
- The LAI is capable of adequately managing the flow during and following the peak discharge from the PMF event. Flows resulting from the PMF event are discharged via a riser that discharges into the adjacent LDWP, which has been designed, constructed, operated, and maintained with sufficient storage volume above the maximum storage pool water level to store the PMF, and maintain at least two ft of freeboard.
- Factors of safety greater than the minimum values required by the CCR Rule were calculated for three cross sections along the LAI embankment for loading conditions associated with the maximum storage pool water level, maximum surcharge pool water level, design level seismic event, and liquefaction of the saturated sensitive fines in the North Toe area.
- Based on review of available records concerning the LAI and the results of the stability analyses, no deficiencies were noted that would affect the structural condition of the dam.

7 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 Initial Structural Stability Assessment presented in this report was based on available information identified in Reference Section of the report that AECOM has relied on but not independently verified. Therefore, the Certification of Professional Opinion is limited to the information available to AECOM at the time the Assessment was performed 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, knowledge of the site, and partly on our general experience with dam safety evaluations performed on other dams. No warranty or guarantee, either written 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.

8 References

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Figures

Last saved by: KINGJ3(2016-07-11) Last Plotted: 2016-07-20
Filename: P:\ARIZONA PUBLIC SERVICE\60445844_APS_FCPP_STRUCTURAL_INTEGRITY\STRUCTURAL INTEGRITY REPORTS\CADD\FIGURE 1-1_SITE VICINITY MAP.DWG

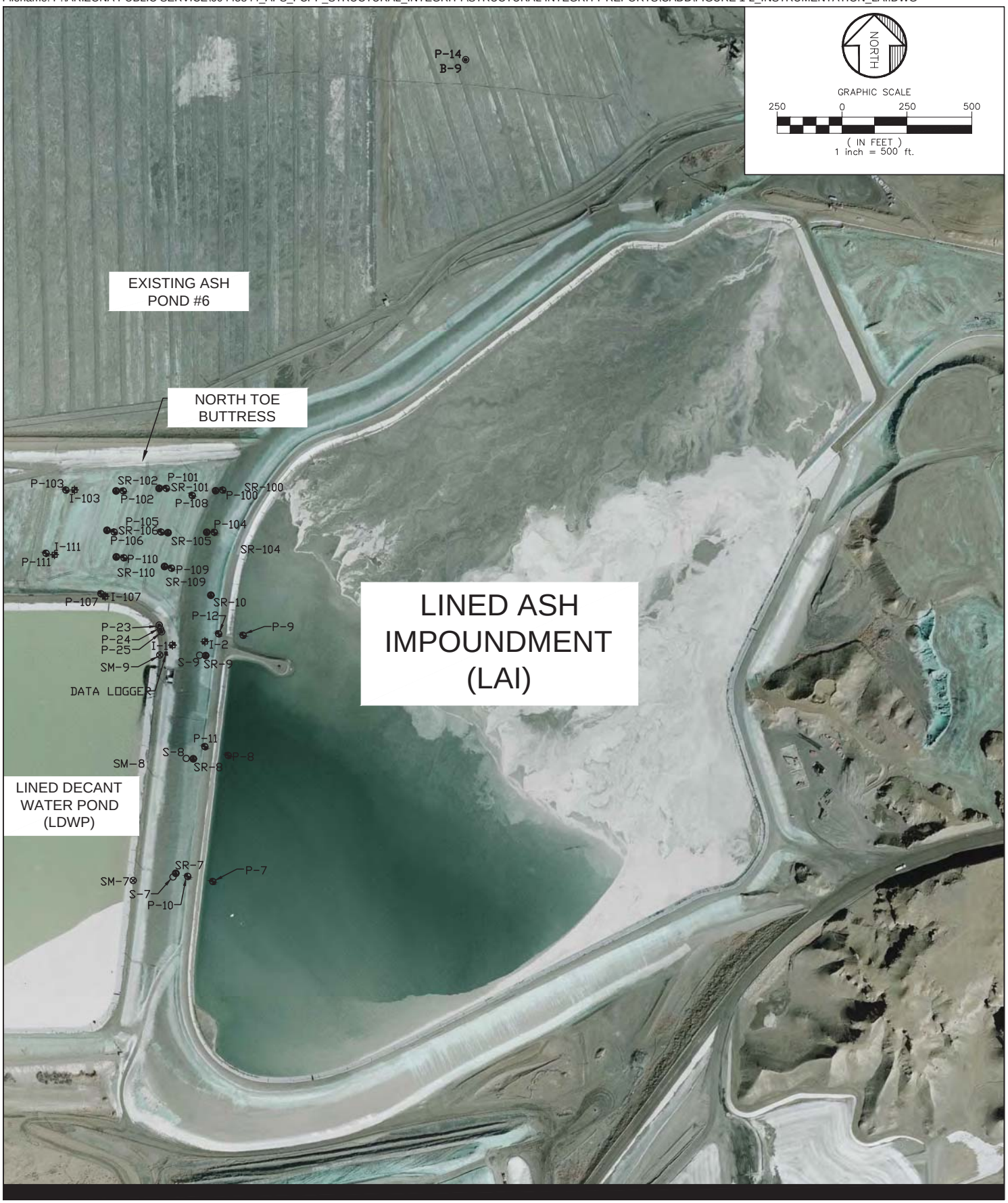
FOUR CORNERS POWER PLANT
STRUCTURAL INTEGRITY REPORT
ARIZONA PUBLIC SERVICE
Project No. 60445844

SITE VICINITY MAP

AECOM

FIGURE 1-1

Last saved by: KINGJ3(2016-07-06) Last Plotted: 2016-07-06 ANSI A 8.5" x 11"
Filename: P:\ARIZONA PUBLIC SERVICE\60445844_APS_FCPP_STRUCTURAL_INTEGRITY\STRUCTURAL INTEGRITY REPORTS\CADD\FIGURE 1-2_INSTRUMENTATION_LAI.DWG



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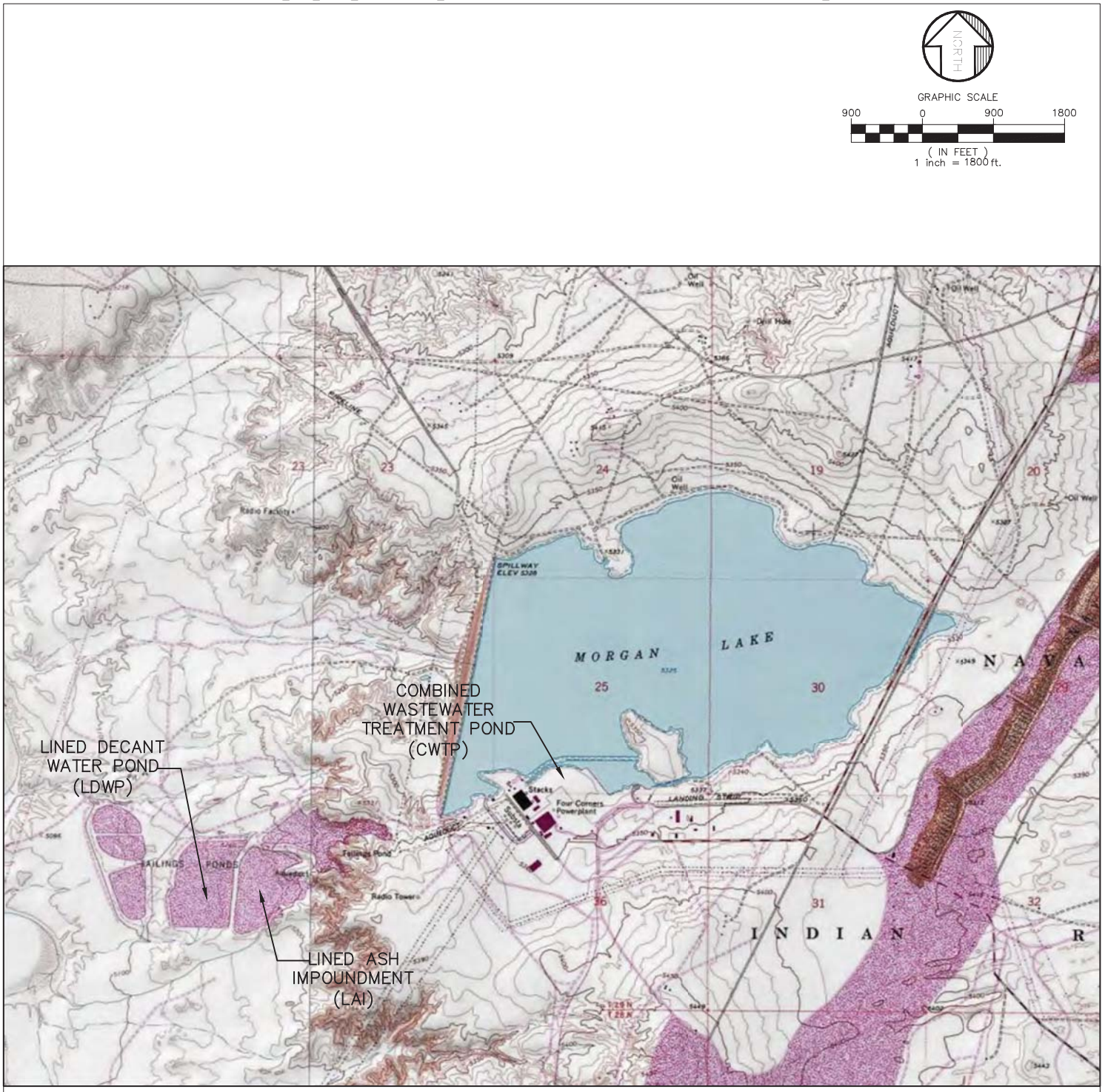
LINED ASH IMPOUNDMENT (LAI) INSTRUMENTATION MAP

AECOM

FIGURE 1-2

Last saved by: KINGJ3(2016-07-05) Last Plotted: 2016-08-05
Filename: P:\ARIZONA PUBLIC SERVICE\60445844_APS_FCPP_STRUCTURAL_INTEGRITY\STRUCTURAL INTEGRITY REPORTS\CADD\FIGURE 3-1_TOPOGRAPHY.DWG



FOUR CORNERS POWER PLANT
STRUCTURAL INTEGRITY REPORT
ARIZONA PUBLIC SERVICE
Project No. 60445844

SITE TOPOGRAPHIC MAP

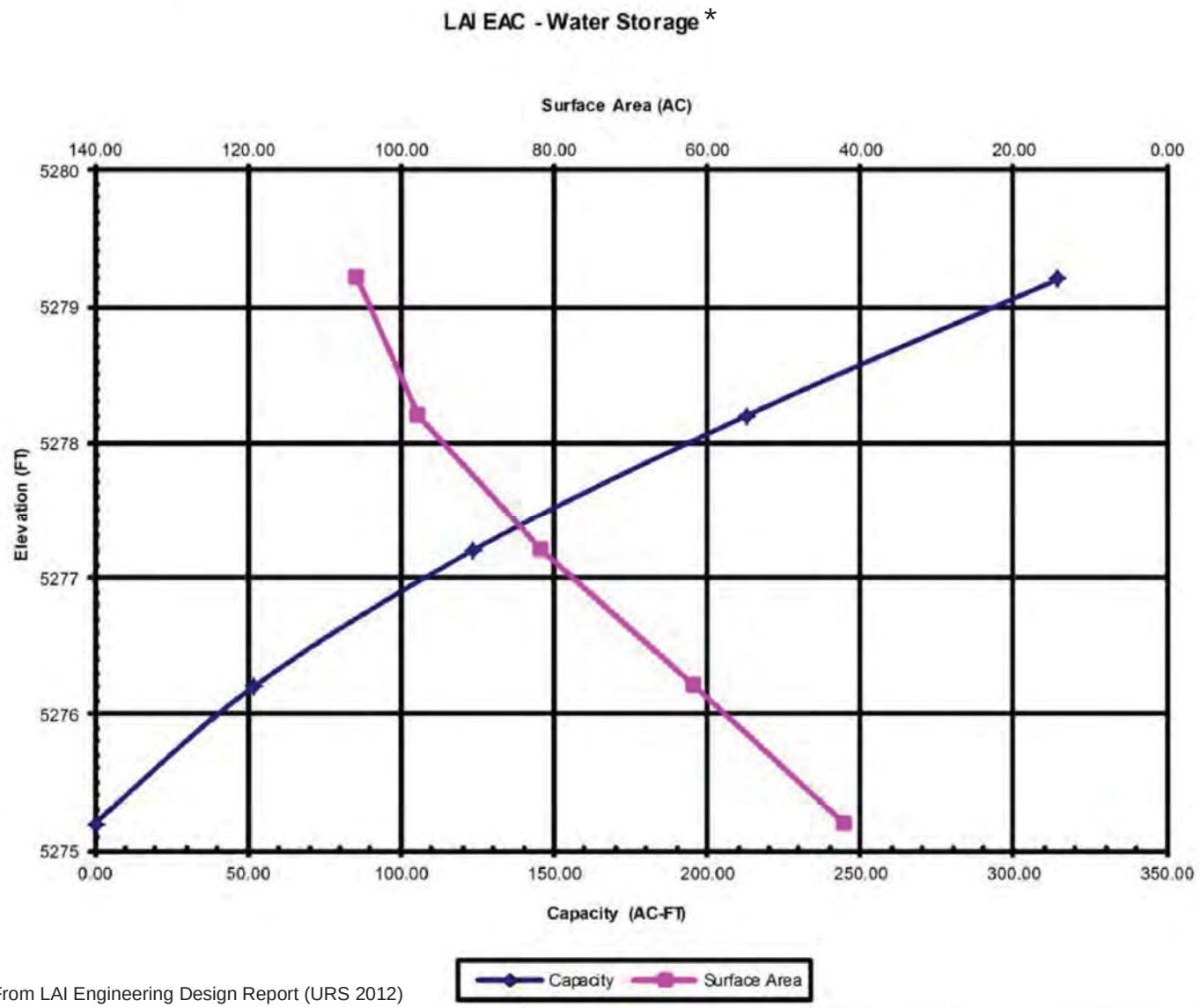
AECOM

FIGURE 3-1

Last saved by: KINGJ3(2016-07-07) Last Plotted: 2016-07-07
Filename: P:\ARIZONA PUBLIC SERVICE\60445844_APS_FCPP_STRUCTURAL_INTEGRITY\STRUCTURAL INTEGRITY REPORTS\CADD\FIGURE 4-2_AREACAPACITYCURVE_LDWP.DWG

LAI (Basin I) - Water Storage*

Reservoir Elevation	Surface Area	Total Surface Area	Average Surface Area	Elevation Difference	Reservoir Storage	Cumulative Storage
(ft)	(sf)	(acre)	(acre)	(ft)	(acre-ft)	(acre-ft)
5275.2	1,823,036	41.85	0.00	0.00	0.00	0.00
5276.2	2,683,394	61.60	51.73	1.00	51.73	51.73
5277.2	3,551,384	81.53	71.57	1.00	71.57	**123.29**
5278.2	4,250,569	97.58	89.55	1.00	89.55	212.85
5279.2	4,600,234	105.61	101.59	1.00	101.59	314.44
5280.0	4,862,684	111.63	108.62	0.80	86.90	401.33



*From LAI Engineering Design Report (URS 2012)

FOUR CORNERS POWER PLANT
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ARIZONA PUBLIC SERVICE
Project No. 60445844

AREA CAPACITY CURVE
WATER STORAGE

AECOM

FIGURE 3-2

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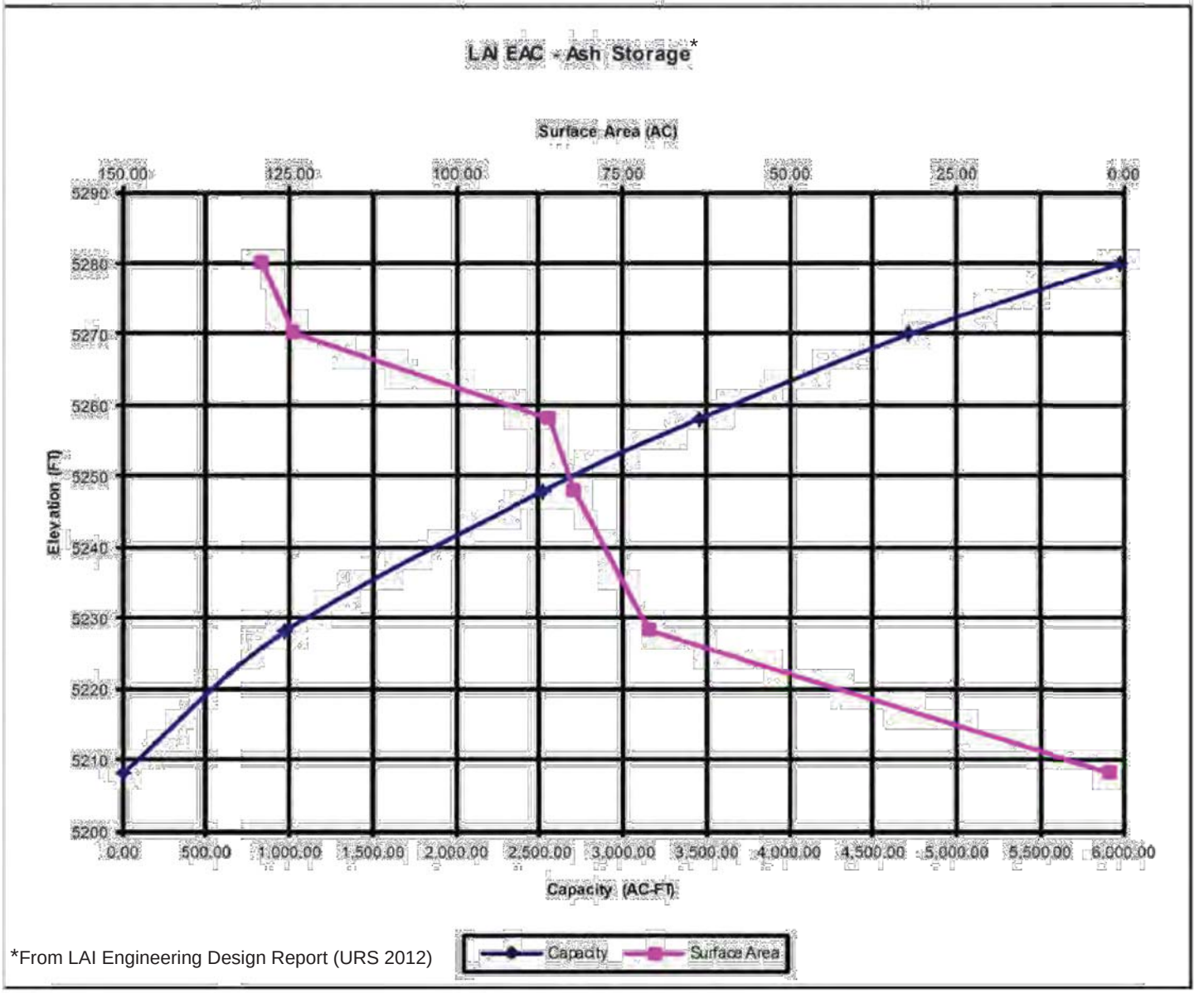
Filename: P:\ARIZONA PUBLIC SERVICE\60445844_APS_FCPP_STRUCTURAL_INTEGRITY\STRUCTURAL INTEGRITY REPORTS\CADD\FIGURE 3-2_AREACAPACITYCURVE_LDWP.DWG

LAI (Basin I) Ash Storage*

Reservoir Elevation	Surface Area	Total Surface Area	Elevation Difference	Cumulative Storage
(ft)	(sf)	(acre)	(ft)	(acre-ft)
5208	87,120	2.00	0.00	2.00
5228	3,092,760	71.00	20.00	969.00
5248	3,571,920	82.00	20.00	2,530.00
5258	3,746,160	86.00	10.00	3,456.00
5270	5,418,090	124.38	12.00	4,718.29
5280	5,626,367	129.16	10.00	5,986.02



*From LAI Engineering Design Report (URS 2012)

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AREA CAPACITY CURVE
ASH STORAGE

AECOM

FIGURE 3-3

Last saved by: ALEISA_KRUG(2016-07-21) Last Plotted: 2016-07-21
Filename: P:\ARIZONA PUBLIC SERVICE\60445844_APS_FCPP_STRUCTURAL_INTEGRITY\STRUCTURAL INTEGRITY REPORTS\CADD\FIGURE 6-1_CROSS SECTION LOCATIONS SAFETY FACTOR ASSESSMENT LAI.DWG

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Project No. 60445844

CROSS SECTION LOCATIONS
SAFETY FACTOR ASSESSMENT

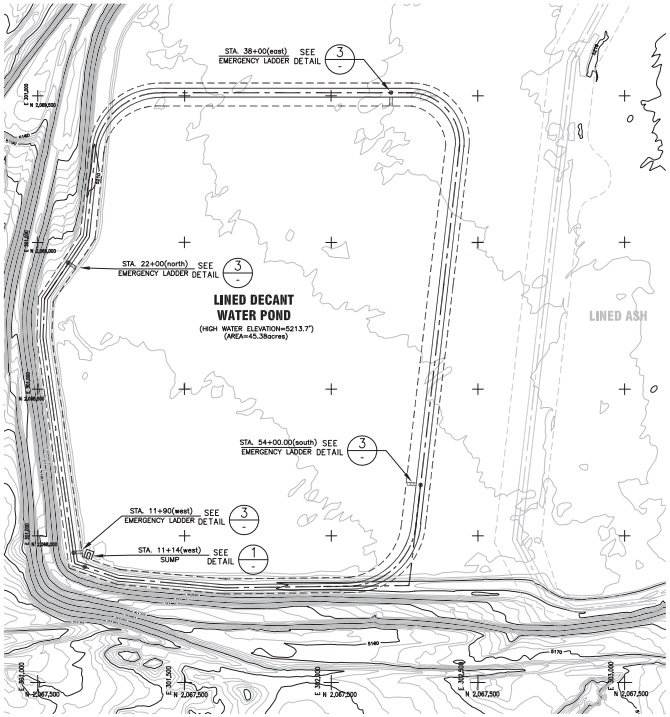
AECOM

FIGURE 5-1

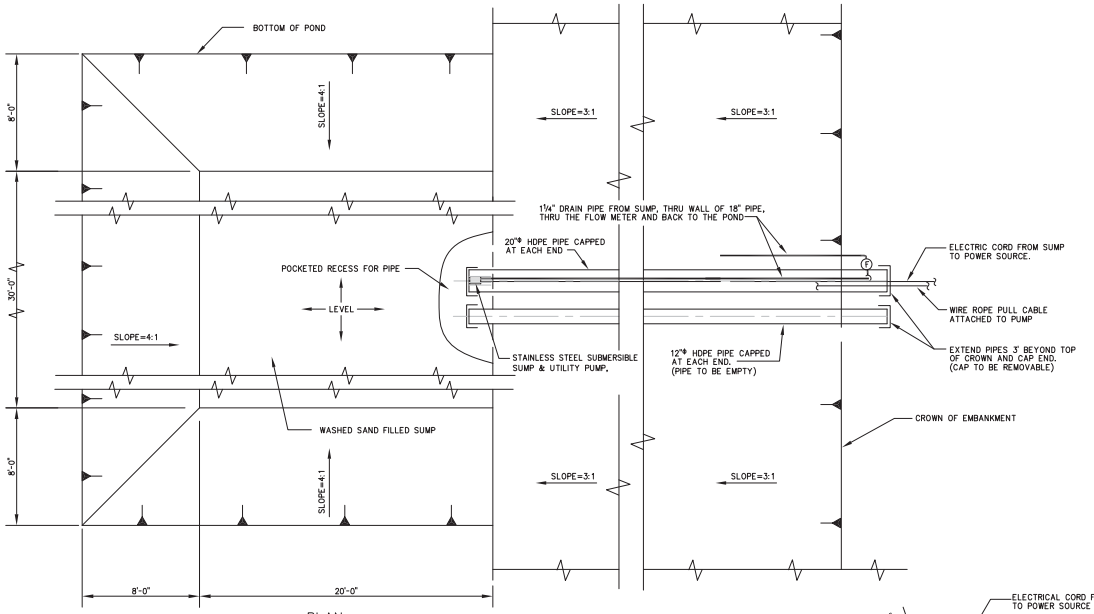
Appendix A.
Historic Drawings

5248 LIFT AS-BUILT DRAWINGS

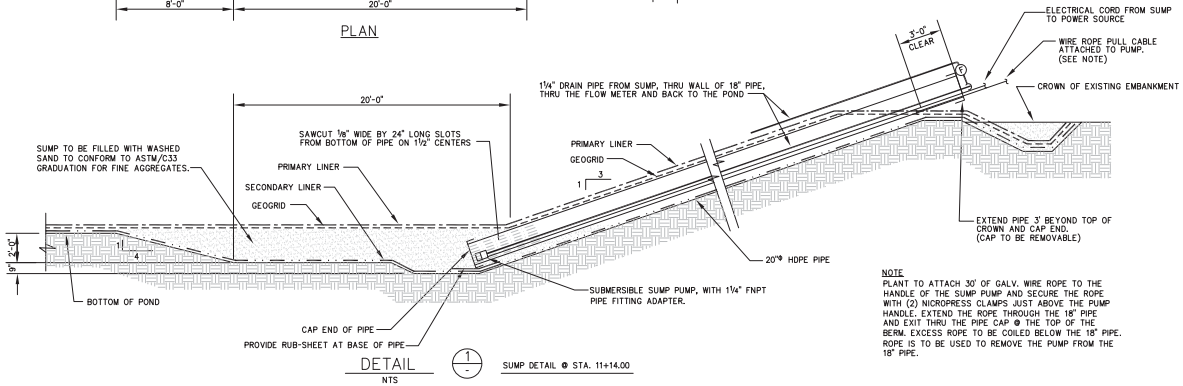
(APS, 2008)



SUMP PUMP & EMERGENCY LADDER LOCATIONS
1"=200'
CONTOUR INTERVAL=2'

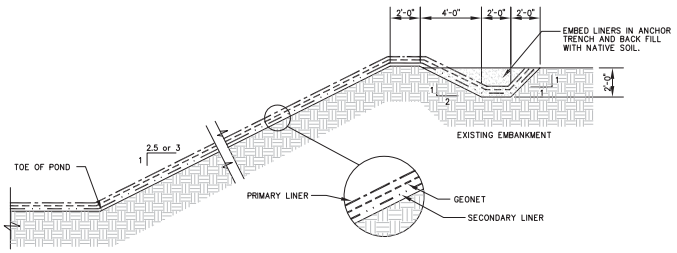


PLAN

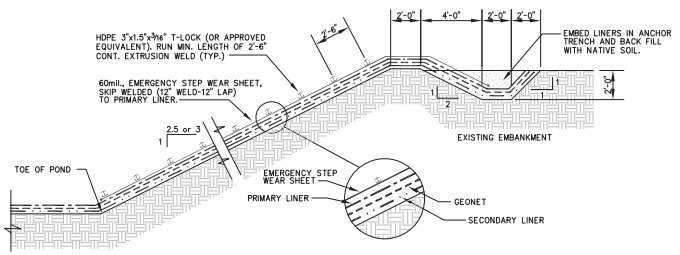


DETAIL 1 — SUMP DETAIL @ STA. 11+14.00
NTS

NOTE
PLANT TO ATTACH 30' OF GALV. WIRE ROPE TO THE HANDLE OF THE SUMP PUMP AND SECURE THE ROPE WITH (2) NICROPRESS CLAMPS JUST ABOVE THE PUMP HANDLE. EXTEND THE ROPE THROUGH THE 18" PIPE AND EXIT THRU THE PIPE CAP @ THE TOP OF THE BERM. EXCESS ROPE TO BE COILED BELOW THE 18" PIPE. ROPE IS TO BE USED TO REMOVE THE PUMP FROM THE 18" PIPE.



DETAIL 2 — DECANT POND LINER EMBEDMENT DETAIL
NTS



DETAIL 3 — DECANT POND EMERGENCY STEPS DETAIL
NTS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

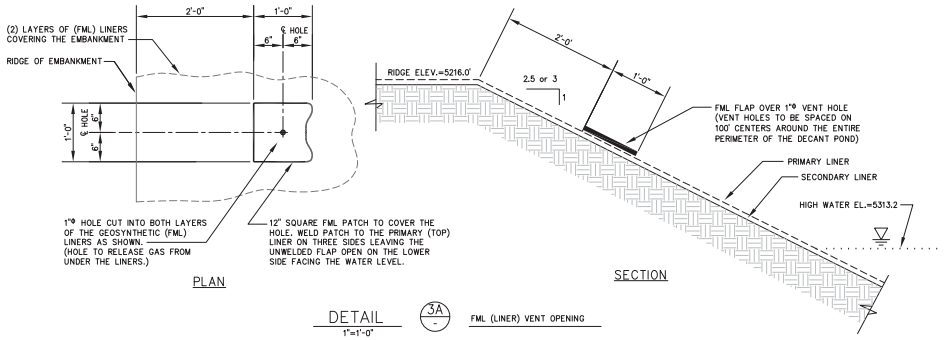
FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED DECANT WATER POND
LINER/EMERG. LADDER/SUMP PUMP PLAN & DETAILS

SCALE: NOTED DATE: 5-14-04

DWN	APPROVED	W A
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379
CHD: PSS		
EXD: BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	39	ADS	152408	1	0

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL PONDS LINER DETAILS\FC-C-39-ADS-152408-1.dwg



DETAIL 3A FML (LINER) VENT OPENING
1"=1'-0"

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

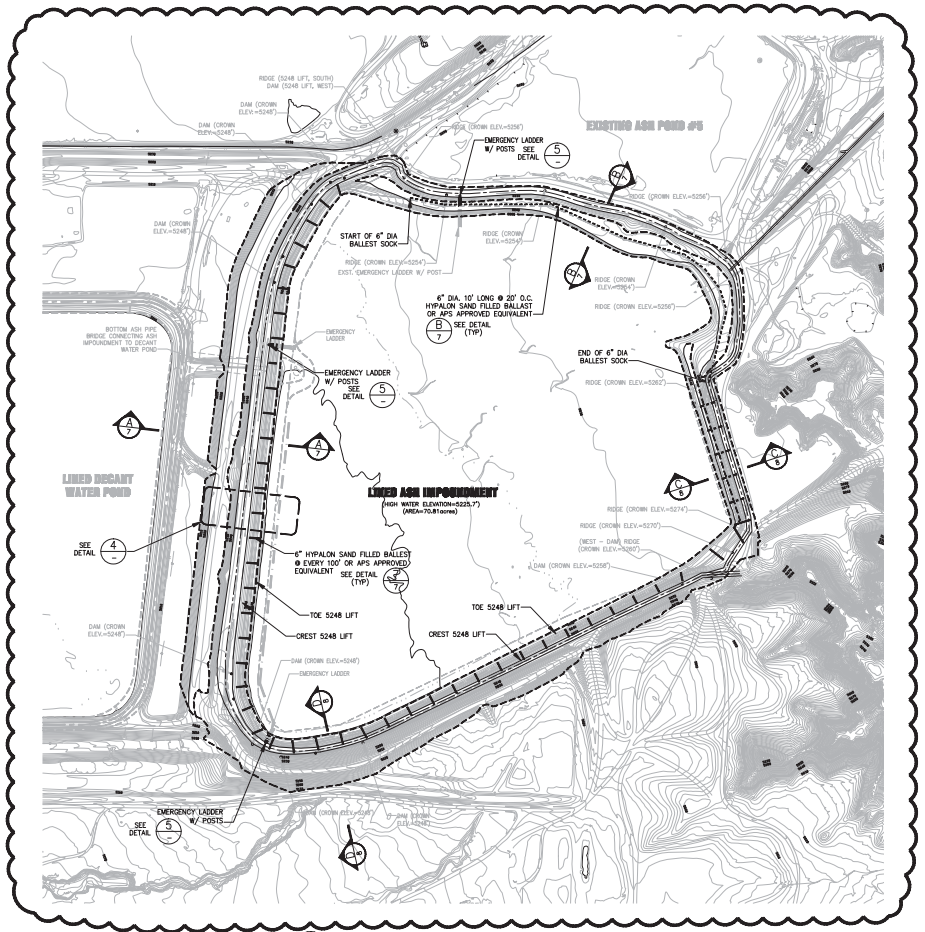
FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED DECANT WATER POND
LINER VENT OPENING DETAIL

SCALE: NOTED DATE: 5-14-04

DWN	APPROVED	W.A.
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379
CHD: PSS		
EXD: BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	39	ADS	152408	1A	0

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL PONDS LINER DETAILS\FC-C-39-ADS-152408-1A.dwg



NORTH

EMERGENCY LADDER LOCATIONS 2

1"=200'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. 4/2 SEE DETAIL
2. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4. THE LINER WELD FROM THE EXISTING LINER TO THE NEW LINER SHALL BE A WEDGE WELD WHEREVER POSSIBLE.

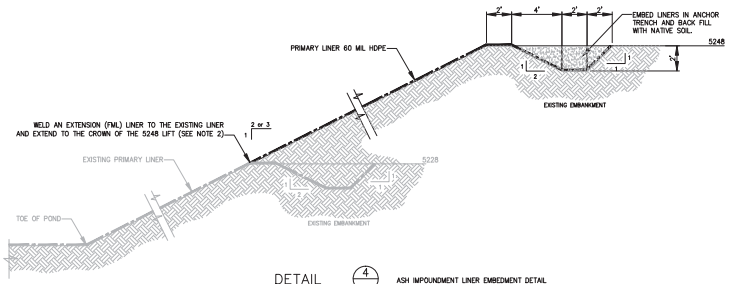
NOT USED FOR THIS DRAWING SET

3. ~~2 LAYERS OF GEOSYNTHETIC (FML) LINER WITH GEONET ON THE UPSTREAM FACE OF THE LINED DECANT WATER POND.~~

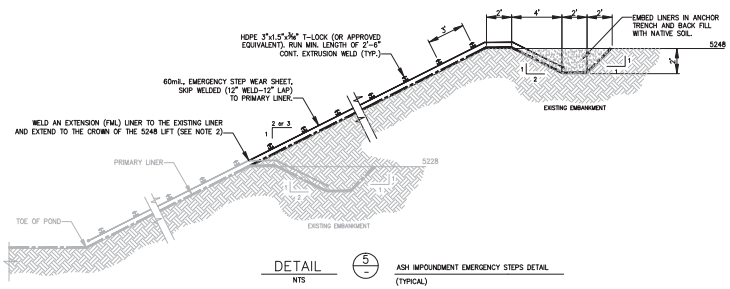
4. EXISTING BASE ELEVATIONS VARY. ELEVATIONS AT THE SECTIONS ARE TAKEN AT THE CUTS. IN THE CASE OF MULTIPLE CUTS OF THE SAME SECTION, THE SECTION INDICATED BY "SHOWN" ON THE SITE PLAN, IS THE ONE REPRESENTED ON THIS SHEET.

NOT USED FOR THIS DRAWING SET

5. ~~FOR PIPE PENETRATION THROUGH LINER~~ 6/2 SEE DETAIL



DETAIL 4/- ASH IMPOUNDMENT LINER EMBEDMENT DETAIL
NTS (TYPICAL)



DETAIL 5/- ASH IMPOUNDMENT EMERGENCY STEPS DETAIL
NTS (TYPICAL)

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	02-14-08	AS-BUILT	SMS	MLD	BRC		JDM	04-6606
1	5-23-06	ADDED WA NO., MODIFIED DETAIL 4 & 5, ADDED LADDER TO 5248 LIFT, MODIFIED SITE PLAN	GRK	MD	BC		JDM	04-6606
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
LINER/EMERG. LADDER/ PLAN AND DETAILS

APS

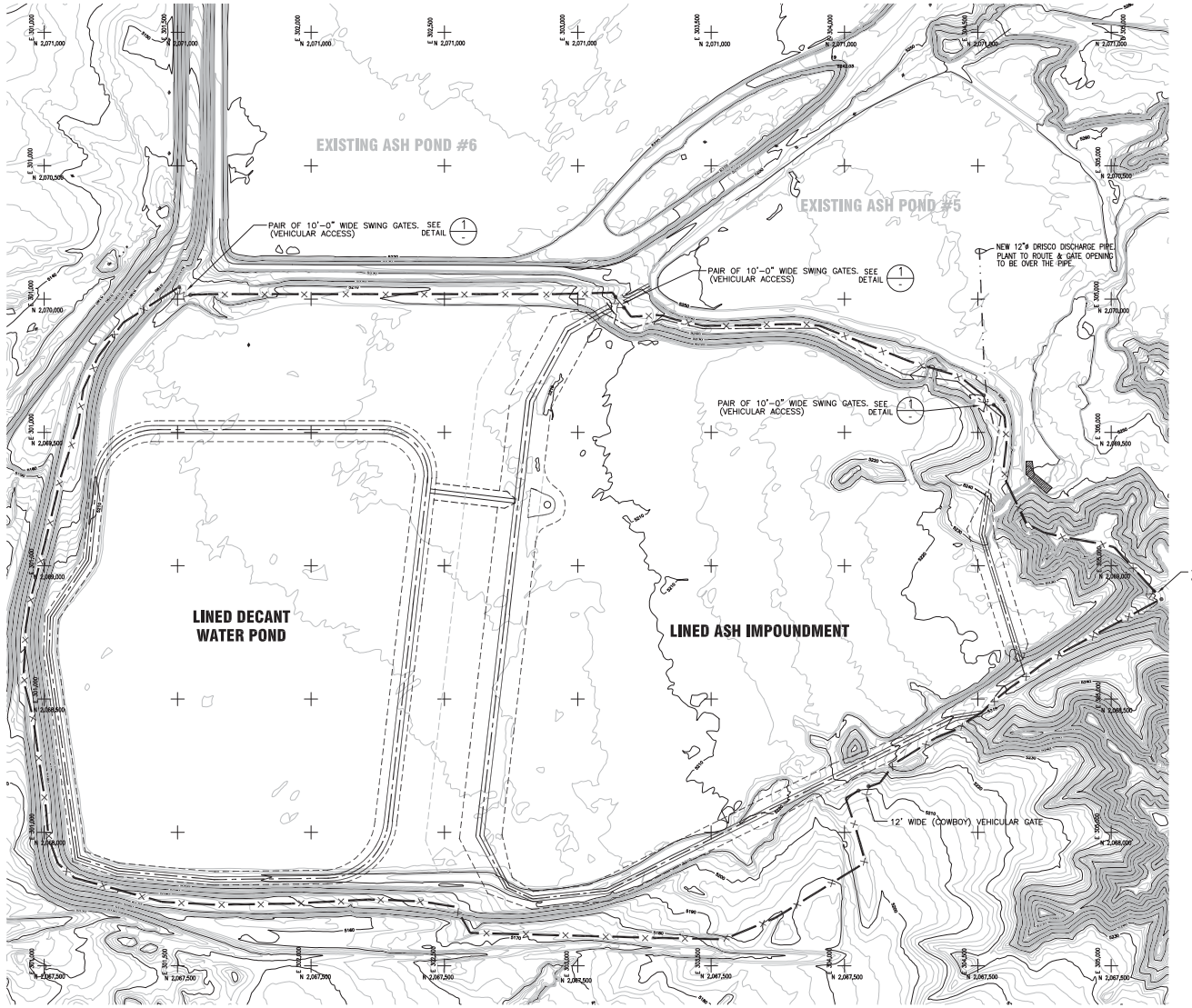
SCALE NOTED DATE 5-14-04

DWN PRATT | CHD PSS | APPROVED JOHN D. MITCHELL ENGINEERING SUPERVISOR | W.A. 04-6379/04-6606

EXD BRC | RVWD

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	152408	2

DRAWING: H:\common_active\FC\123\04-6606 u1-3 5248 ft. lft lined ash impoundment\310. dwgs\civil\land development

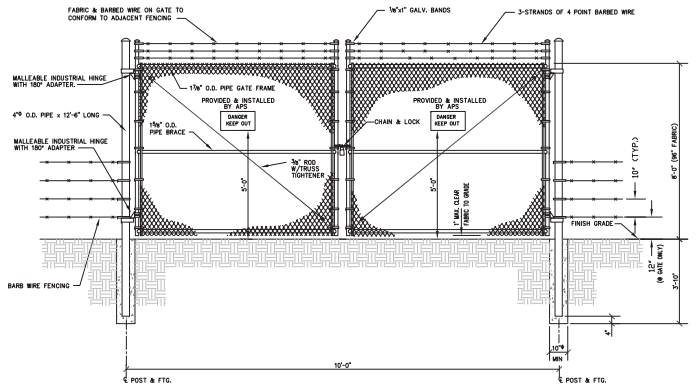


NOTES

1. FENCE TO BE 3'-8" HIGH WITH 4 STRANDS OF BARB WIRE SPACED 10" APART. CONTRACTOR TO DETERMINE MATERIAL AND METHOD OF INSTALLATION. CONSTRUCTION CRITERIA TO BE APPROVED BY APS.
2. "DANGER-KEEP OUT" SIGNS, WRITTEN IN 4" HIGH BOLD BLACK LETTERING, TO BE MOUNTED ON THE TOP STRAND OF WIRE AND SPACED EVERY 150'. SIGNS ARE ALSO TO BE PLACED ON EACH OF THE SWINGING GATES.

MATERIALS

1. 4-STRAND BARB WIRE, 4' HIGH FENCE=11,120lnft.±
2. 8' HIGH BY 10' WIDE CHAIN LINK FENCE=6ea. (3-pair)
3. 4' HIGH BY 12' WIDE COWBOY FENCE=1ea.



DETAIL 1/- 10'-0" CHAIN LINK FENCE-DOUBLE SWING GATE
3/8"=1'-0"

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

NORTH

PERIMETER FENCE PLAN
SCALE: 1"=200'

0 50 100 150 200 400 600 800

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
PERIMETER FENCE PLAN & DETAIL

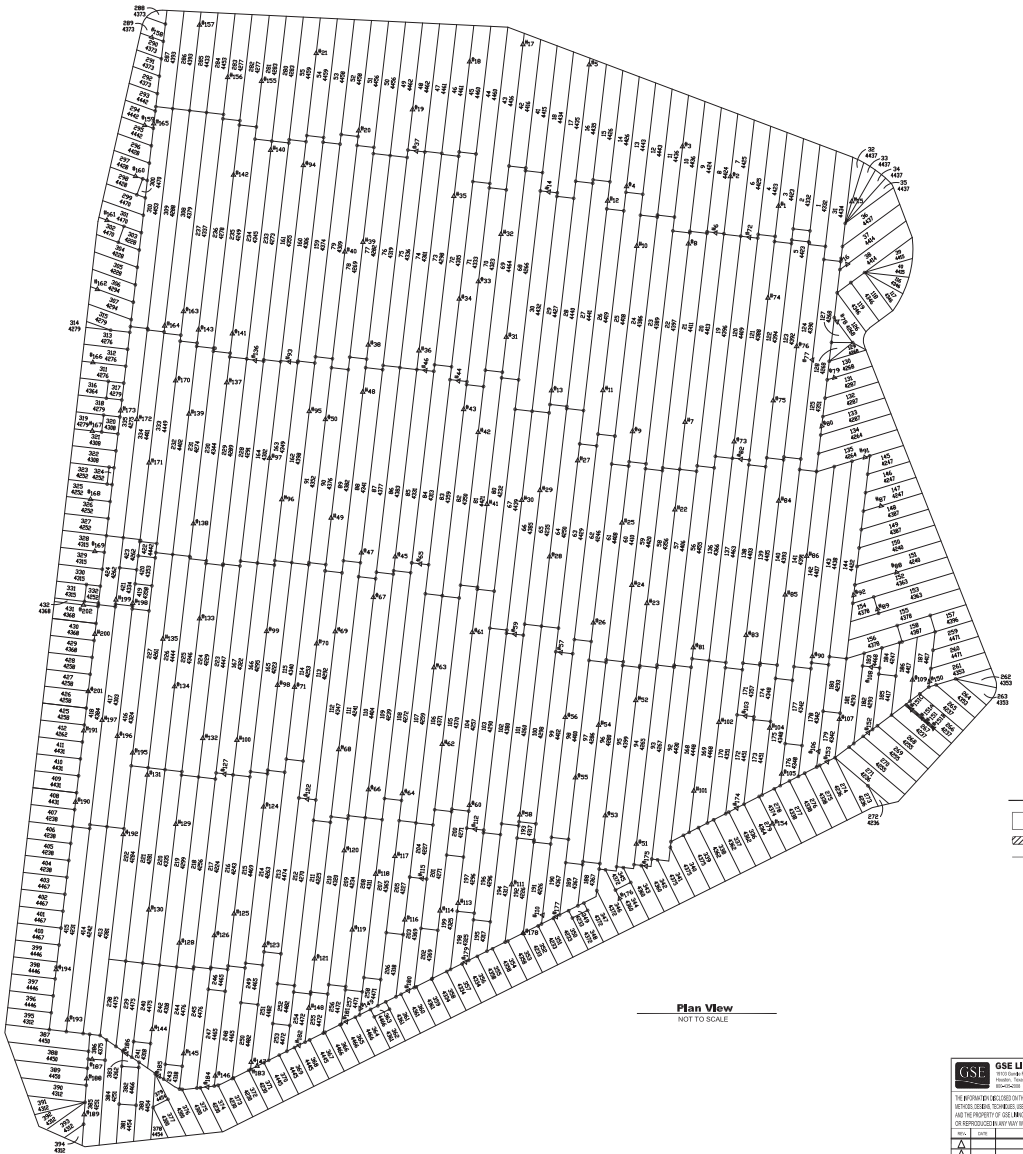
SCALE: NOTED DATE: 5-14-04

DWN	APPROVED	W A
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379
CHD PSS		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	39	ADS	152408	3	0

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL PONDS LINER DETAILS\FC-C-39-ADS-152408-3.dwg

513331A/Sht 1/Rev 0



LEGEND

- SHEET NO. (TYP.) / TYP. ROLL I.D. NO.
- TYP. CAP I.D.
- WELDED SEAMS
- TEST SAMPLE
- FAILED TEST SAMPLE
- PATCH

Plan View
NOT TO SCALE

GSE Lining Technology, Inc. 9330 Bunker Road Houston, Texas 77075 281-443-8564	APS Four Corners Power Plant		
	Farmington	New Mexico	
	As-Built Panel Layout Fly Ash Pond		
	SCALE: Noted	DATE: 01/05/04	REVISION NO.: 0
	DRAWN BY: Don	CHECKED BY: DG	SHT.: 1 of 3
			DRAWING NO.: 513331AA

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
(VENDOR DRAWING) AS-BUILT FML PANEL LAYOUT

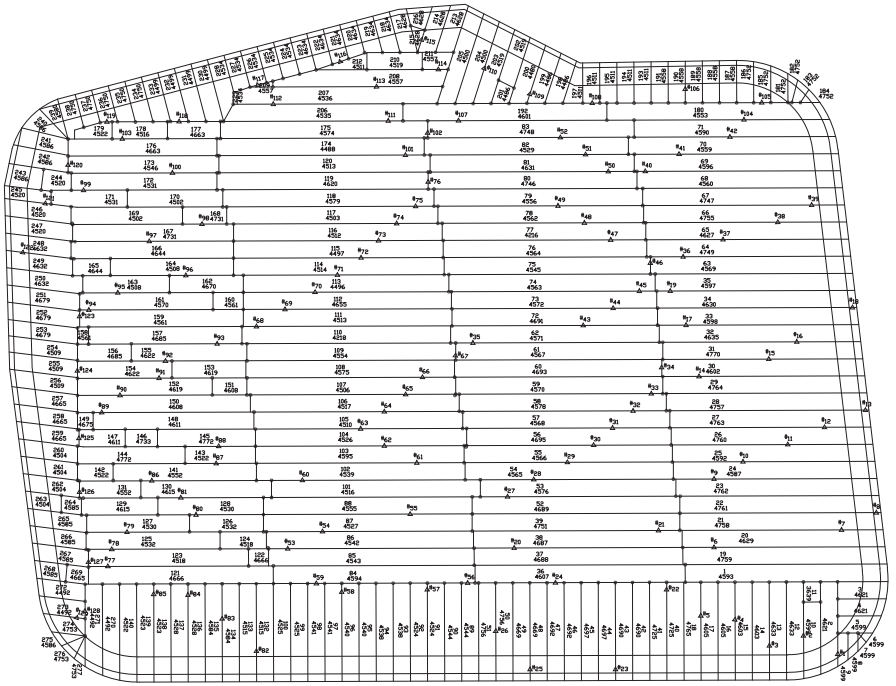
SCALE NOTED DATE 5-14-04

DWN	PRATT	APPROVED	W A
CHD	PSS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379
EXD	BRC		
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	39	ADS	152408	4	0

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL PONDS LINER DETAILS\FC-C-39-ADS-152408-4.dwg

513331B/Sht 2/Rev 0



Plan View
NOT TO SCALE

LEGEND

- 50 / 4593 – SHEET NO. (TYP.) / TYP. ROLL I.D. NO.
- WELDED SEAMS
- T2 – TEST SAMPLE
- PATCH
- LINER LIMIT
- GRADE BREAK

GSE Lining Technology, Inc.

APS
Four Corners Power Plant
Farmington New Mexico
Primary As-Built Panel Layout
Decant Water Pond

SCALE	DATE	DRAWING #	REV
1" = 80'-0"	01/05/04		0
DRAWN BY: MG	DESIGNED BY: DG	CHK'D: -E-	APP'D: -E-	513331A3

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED DECANT WATER POND
(VENDOR DRAWING) AS-BUILT FML PANEL LAYOUT/PRIMARY LAYER

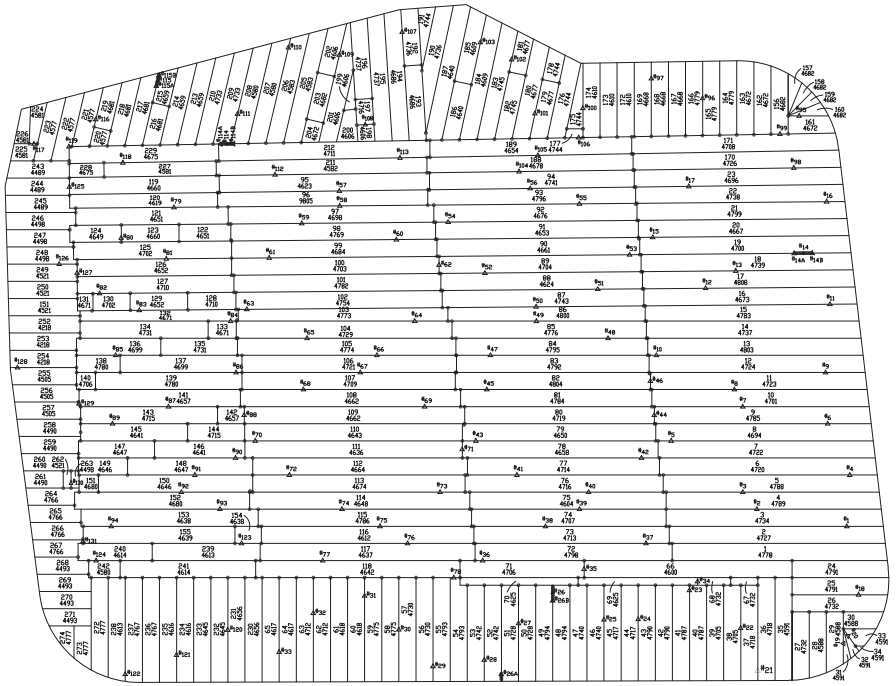
SCALE NOTED DATE 5-14-04

DWN	APPROVED	W A
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379
CHD PSS		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	39	ADS	152408	5	0

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL PONDS LINER DETAILS\FC-C-39-ADS-152408-5.dwg

513331A/Sht 3/Rev 0



Plan View
Approximate scale 1" = 80'

LEGEND

- SHEET NO. (TYP.) / TYP. ROLL I.D. NO.
- TYP. CAP I.D.
- WELDED SEAMS
- TEST SAMPLE
- FAILED TEST SAMPLE
- PATCH

GSE Lining Technology, Inc.	APS Four Corners Power Plant		
	Farmington	New Mexico	
	Secondary As-Built Panel Layout Decant Water Pond		
	Issued: Noted	01/05/04	Rev. Number: 0
	Drawn By: Don	Checked By: DG	Sheet No.: 3 of 3
	Drawing No.: 513331AC		

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
0	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

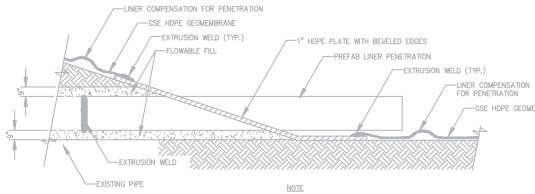
FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED DECANT WATER POND
(VENDOR DRAWING) AS-BLT FML PANEL LAYOUT/SECONDARY LAYER

SCALE: NOTED DATE: 5-14-04

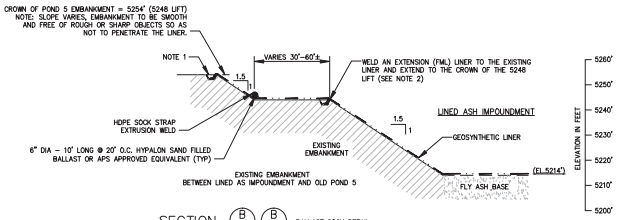
DWN: PRATT	APPROVED: JOHN D. MITCHELL, ENGINEERING SUPERVISOR	W A 04-6379
CHD: PSS		
EXD: BRC		
RVWD:		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET	REV
FC	C	39	ADS	152408	6	0

DRAWING: L:\Projects\4c\6379 New ash pond\civil\FINAL PONDS LINER DETAILS\FC-C-39-ADS-152408-6.dwg



DETAIL NONE 6/2 PREFAB PIPE PENETRATION



SECTION 1"=20' B/2 B/2 BALLAST SOCK DETAIL (SEE NOTE 4)

NOTES

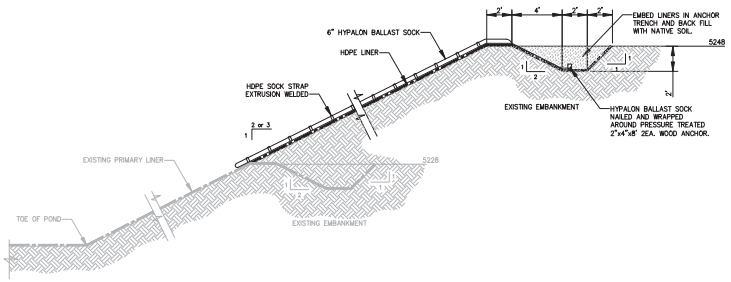
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. SEE 4/2 DETAIL
2. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT, REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4. THE LINER WELD FROM THE EXISTING LINER TO THE NEW LINER SHALL BE A WEDGE WELD WHEREVER POSSIBLE.
3. ~~2-LAYERS OF GEOSYNTHETIC (FML) LINER WITH GEONET ON THE UPSTREAM FACE OF THE LINED DECANT WATER POND.~~ NOT USED FOR THIS DRAWING SET
4. EXISTING BASE ELEVATIONS VARY. ELEVATIONS AT THE SECTIONS ARE TAKEN AT THE CUTS. IN THE CASE OF MULTIPLE CUTS OF THE SAME SECTION, THE SECTION INDICATED BY "SHOWN" ON THE SITE PLAN, IS THE ONE REPRESENTED ON THIS SHEET.
5. ~~FOR PIPE PENETRATION THROUGH LINER~~ NOT USED FOR THIS DRAWING SET SEE 6/2 DETAIL

NEW DAM EMBANKMENT MATERIALS

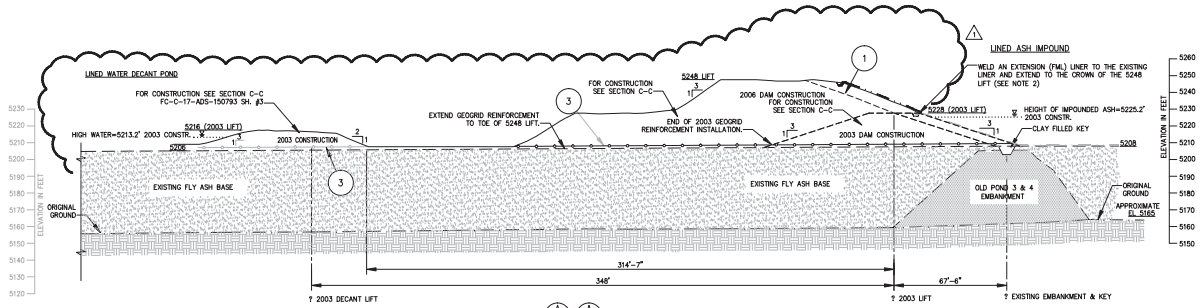
1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT–BOTTOM ASH OR CLAY AS SPECIFIED. SEE SECTION L/5

LEGEND

- EXISTING DAM EMBANKMENT
- EXISTING BOTTOM ASH & CONTINUOUS SHALE EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- BACK FILL (NATIVE SOIL)



DETAIL NTS 7/– BALLAST SOCK DETAIL ALONG RIDGE (TYPICAL)



SECTION 1"=30' A/2 A/2 SECTION LOOKING NORTH

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	01-29-08	AS-BUILTS FOR 5248 LIFT	SMS	MLD	BRC		JDM	04-6606

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
BALLAST SOCK, PREFAB PIPE & SECTION DETAILS

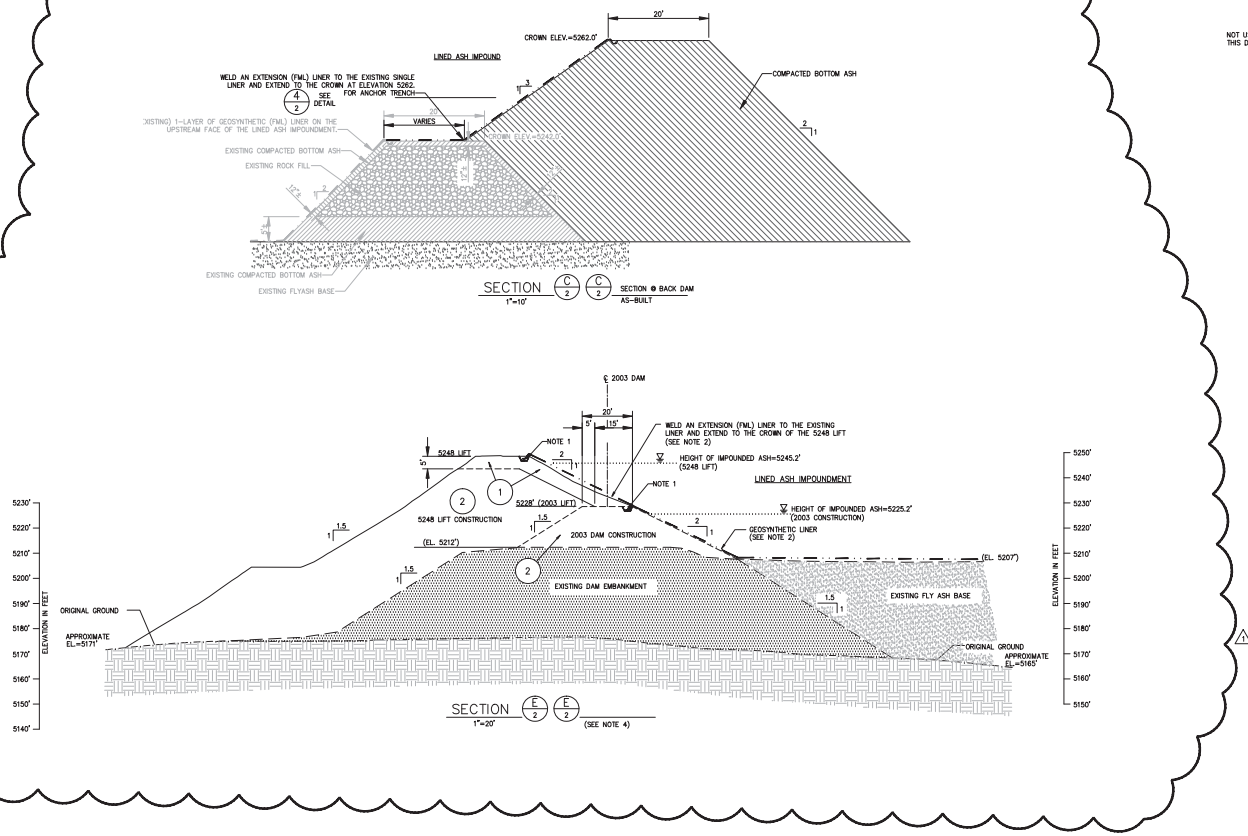
APS

SCALE NOTED DATE 5-23-06

DWN	APPROVED	W A
GRK	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379/04-6606
CHD MD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	152408	7

DRAWING: H:\common_active\fc\2123\04-6606 u1-3 5248 ft. lft lined ash impoundment\210_dwgs\civil\land development



NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. SEE DETAIL 4/2
2. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4. THE LINER WELD FROM THE EXISTING LINER TO THE NEW LINER SHALL BE A WEDGE WELD WHEREVER POSSIBLE.

NOT USED FOR THIS DRAWING SET

~~3. 1-LAYER OF GEOSYNTHETIC (FML) LINER WITH GEONET ON THE UPSTREAM FACE OF THE LINED DECANT WATER POND.~~

4. EXISTING BASE ELEVATIONS VARY. ELEVATIONS AT THE SECTIONS ARE TAKEN AT THE CUTS. IN THE CASE OF MULTIPLE CUTS OF THE SAME SECTION, THE SECTION INDICATED BY "SHOWN" ON THE SITE PLAN, IS THE ONE REPRESENTED ON THIS SHEET.

NOT USED FOR THIS DRAWING SET

~~5. FOR PIPE PENETRATION THROUGH LINER~~ SEE DETAIL 6/2

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED. SEE SECTION L/5

LEGEND

- EXISTING DAM EMBANKMENT
- EXISTING BOTTOM ASH & CONTINUOUS SHALE EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- EXISTING ROCK FILL

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	02-01-08	AS-BUILT FOR 5248 LIFT	SMS	MJD	BRC		JDM	04-6606

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
SECTION DETAILS

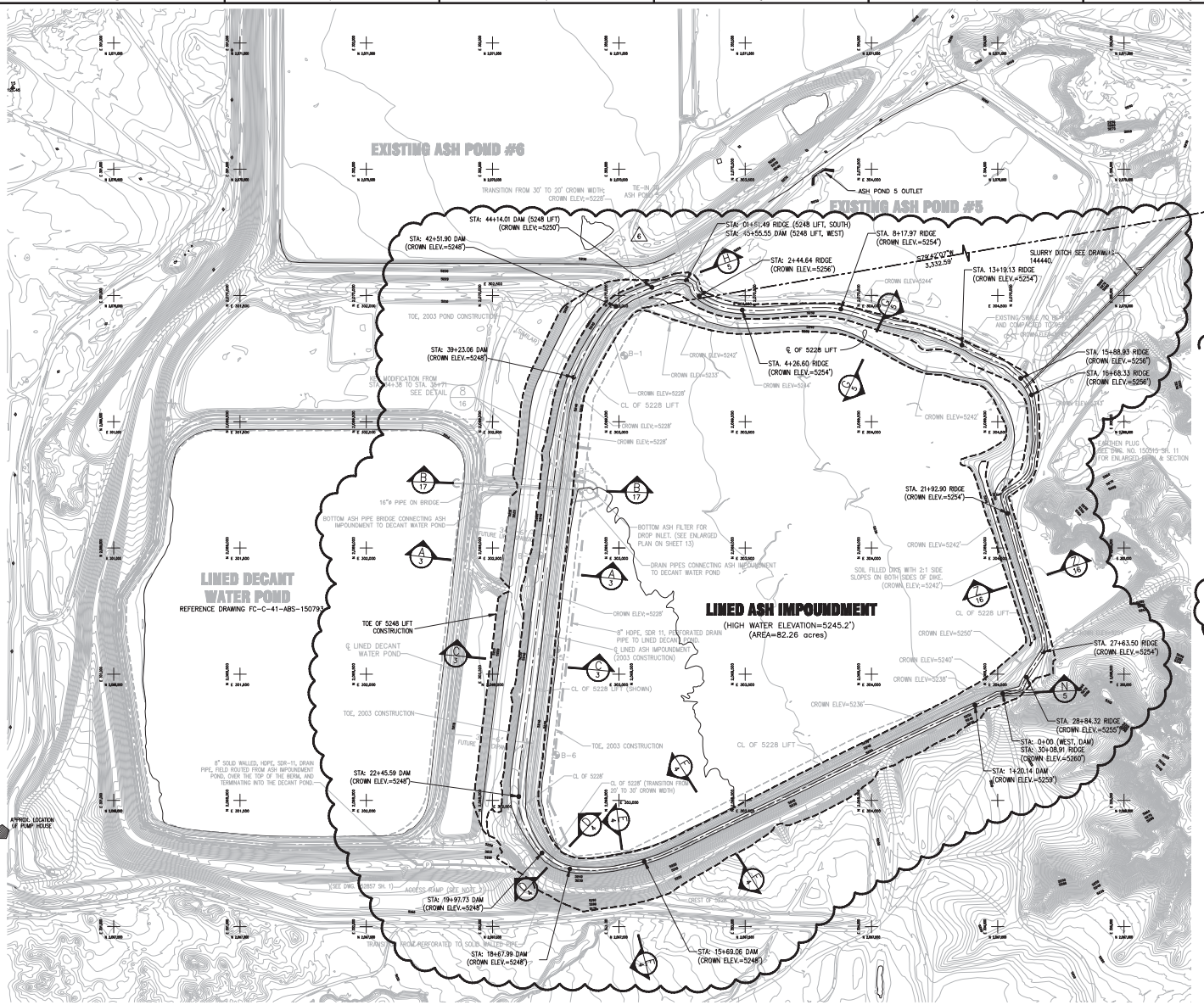
APS

SCALE NOTED DATE 5-23-06

DWN	APPROVED	W.A.
GRK	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379/04-6606
CHD MD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	152408	8

DRAWING: H:\common_active\FC\123\04-6606 ut-3 5248 ft. lift lined ash impoundment\310. dwgs\civil\land development :



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 10:1 FROM THE RAMP CROWN TO EXISTING 10:1 FROM THE RAMP CROWN TO EXISTING GROUND.
   (SEE ENLARGED PLAN ON SHEET 12)
3. FOR FLY ASH SLURRY DELIVERY PIPING SEE SHEET 15.
4.

HIGH WATER ELEV.	NOMINAL LIFT ELEV.
5245.2	5248
5225.2	5228

STATION NO.	NORTHING	EASTING
STA: 01+61.49 RIDGE STA: 46+51.91 DAM	N 2070059.51	E 303267.67
STA. 2+44.64	N 2069998.19	E 303318.17
STA. 4+26.60	N 2069942.51	E 303488.42
STA. 8+17.97	N 2069945.95	E 303878.92
STA. 13+19.13	N 2069803.75	E 304358.05
STA. 15+88.93	N 2069671.82	E 304591.14
STA. 16+68.33	N 2069606.44	E 304633.74
STA. 21+92.90	N 2069136.84	E 304539.52
STA. 27+63.50	N 2068588.97	E 304679.48
STA. 28+84.32	N 2068487.61	E 304613.72
STA. 0+00 (Dam) STA. 30+08.91 (Ridge)	N 2068422.90	E 304519.54

STATION POINTS – RIDGE
(TIED TO STATE COORDINATES)

STATION NO.	NORTHING	EASTING
STA. 0+00 (Dam) STA. 30+15.66 (Ridge)	N 2068422.90	E 304519.54
STA. 1+20.14	N 2068377.46	E 304409.72
STA. 15+69.06	N 2067758.05	E 303100.58
STA. 18+67.99	N 2067791.82	E 302695.38
STA. 19+97.73	N 2067728.37	E 302805.69
STA. 22+45.59	N 2068015.44	E 302603.37
STA. 39+23.06	N 2069682.38	E 302823.49
STA. 42+51.90	N 2069961.56	E 302993.79
STA. 44+14.01 (Dam)	N 2070034.28	E 303137.63
STA: 01+61.49 (Ridge) STA. 45+55.55 (Dam)	N 2070059.51	E 303267.67

STATION POINTS – DAM
(TIED TO STATE COORDINATES)

REFERENCE:
FLOWN BY "AERO GRAPHICS, INC." ON NOVEMBER 23, 2006
40 W. OAKLAND AVE.
SALT LAKE CITY, UT 84115

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

RYNON R. CORRAO
NEW MEXICO
13248
REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
6	02-13-08	AS-BUILTS FOR 5248 LIFT	SMS	MD	BRC		JDM	04-6606
5	4-26-06	REVISED TITLE BORDER AND 5248 DAM AND RIDGE	GRK	MD	BRC		JDM	04-6606
4	4-6-06	REVISED W.A. NO. & ADDED 5248 LIFT	GRK	MD	BRC		JDM	04-6606
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

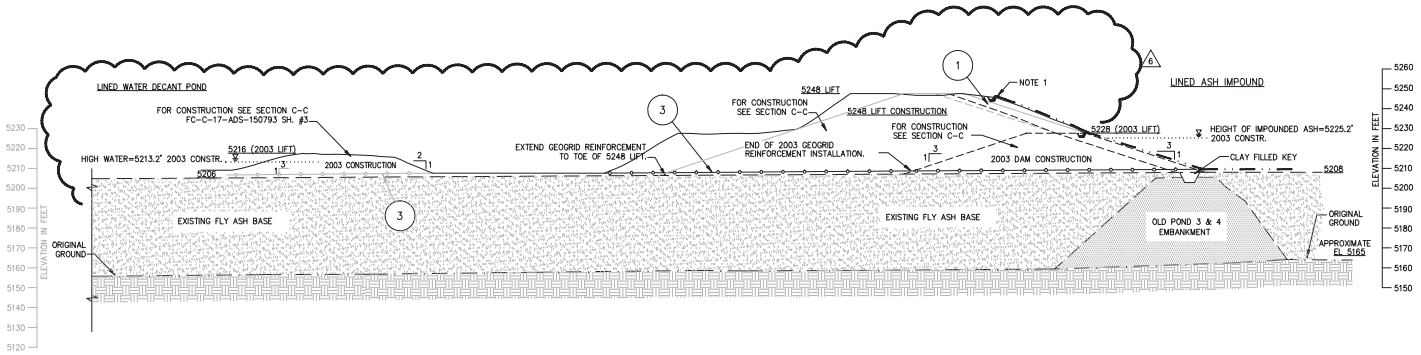
APS

SCALE: NOTED
DATE 6-28-02

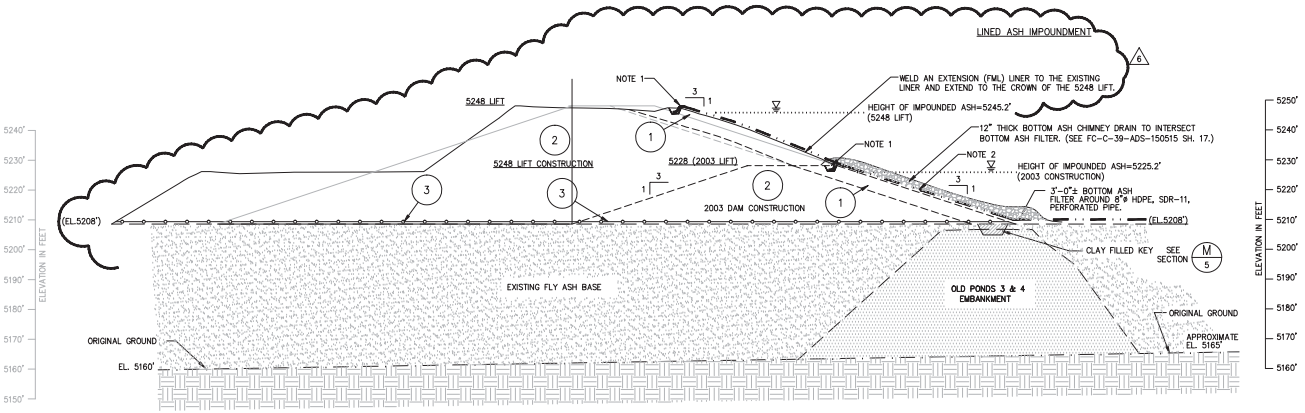
DWN	APPROVED	W.A.
PRATT/GRK	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379/04-6606
CHD		
EXD BRC		
RVWD		

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

DRAWING: H:\Documents_active\Fc\f123\04-6606 ut-3 5248 ft. lift lined ash impoundment\dd10. dwgs\Civil\[and development



SECTION A/2 A/2 — SECTION LOOKING NORTH
1"=30'



SECTION C/2 C/2 — EMBANKMENT CROSS-SECTION (SEE NOTE 4)
1"=20'

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. SEE 4/152408 SH. 2 DETAIL
2. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4.
3. 2-LAYERS OF GEOSYNTHETIC (FML) LINER WITH GEONET ON THE UPSTREAM FACE OF THE LINED DECANT WATER POND.
4. EXISTING BASE ELEVATIONS VARY. ELEVATIONS AT THE SECTIONS ARE TAKEN AT THE CUTS. IN THE CASE OF MULTIPLE CUTS OF THE SAME SECTION, THE SECTION INDICATED BY "SHOWN" ON THE SITE PLAN, IS THE ONE REPRESENTED ON THIS SHEET.
5. FOR PIPE PENETRATION THROUGH LINER 6/152408 SH. 2 SEE DETAIL

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED. SEE SECTION L/5

LEGEND

- EXISTING DAM EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
6	02-04-08	AS-BUILTS FOR 5248 LIFT	SMS	MD	BRC		JDM	04-6606
5	4-26-06	MOVED SEC. B-B TO SHT. 17	GRK	MD	BRC		JDM	04-6606
4	4-6-06	REVISED W.A. NO. & ADDED 5248 LIFT	GRK	MD	BRC		JDM	04-6606
3	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379
2	6-5-03	add det. to note 1/add note 5	PRATT		BRC		JDM	04-6379
1	1-14-03	REVISE PER STATES' 1st REVIEW	PRATT		BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
SECTIONS

APS

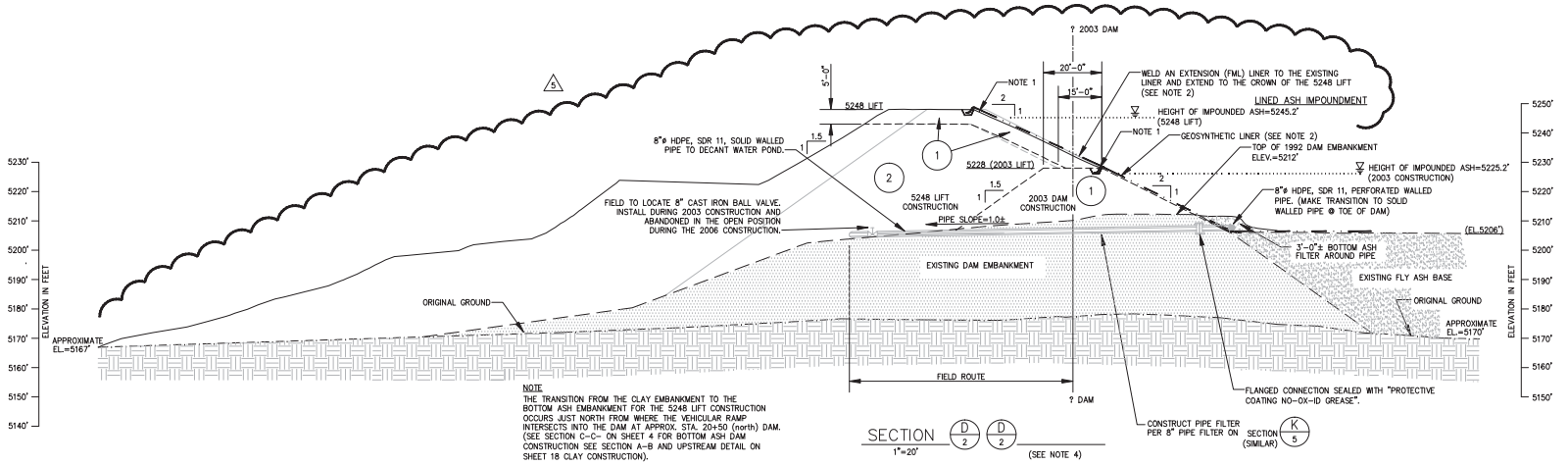
SCALE NOTED — DATE 6-28-02

DWN	APPROVED	W.A.
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379/04-6606
CHD		
EXD BRC		
RVWD		

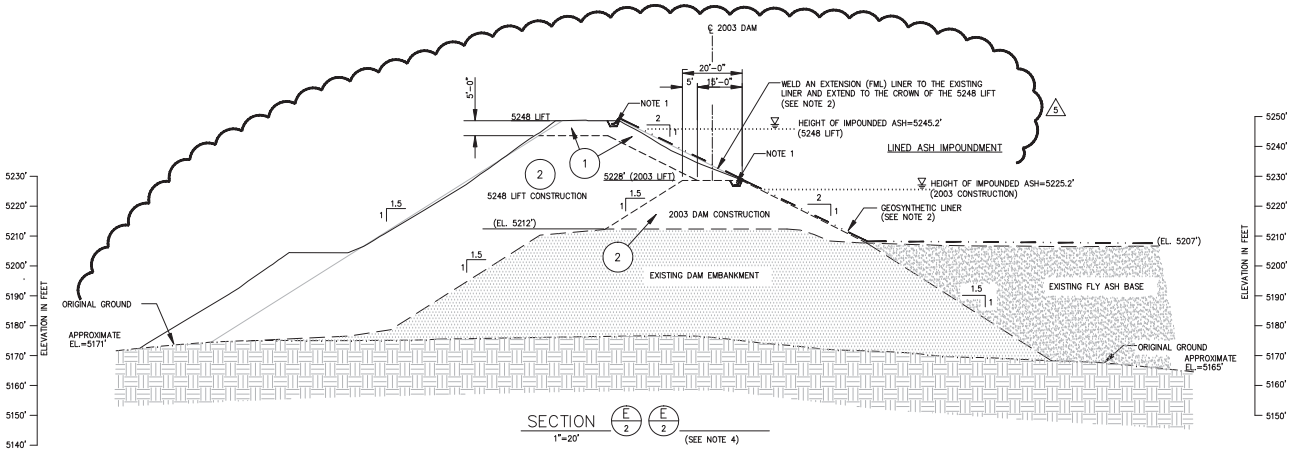
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	150515	3

BYRON R. CONNER NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER

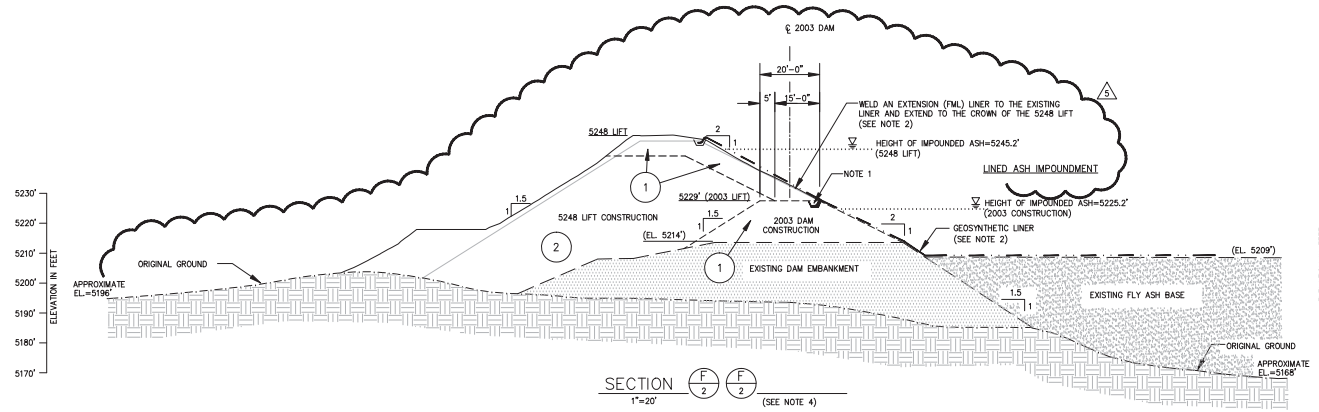
DRAWING: H:\common_active\fc\123\04-6606 u1-3 5248 ft. lift lined ash impoundment\d10. dwgs\Civil\land development



SECTION D/2 D/2 (SEE NOTE 4)
1"=20'



SECTION E/2 E/2 (SEE NOTE 4)
1"=20'



SECTION F/2 F/2 (SEE NOTE 4)
1"=20'

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE 152408 SH. 2 DETAIL
2. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4.
3. 2-LAYERS OF GEOSYNTHETIC (FML) LINER WITH GEONET ON THE UPSTREAM FACE OF THE LINED DECANT WATER POND.
4. EXISTING BASE ELEVATIONS VARY. ELEVATIONS AT THE SECTIONS ARE TAKEN AT THE CUTS. IN THE CASE OF MULTIPLE CUTS OF THE SAME SECTION, THE SECTION INDICATED BY "SHOWN" ON THE SITE PLAN, IS THE ONE REPRESENTED ON THIS SHEET.
5. FOR PIPE PENETRATION THROUGH LINER (6) SEE 152408 SH. 2 DETAIL

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED. SEE SECTION (L/5)

LEGEND

- EXISTING DAM EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
5	02-14-08	AS-BUILT FOR 5248 LIFT	SMS	MD	BRC		JDM	04-6606
4	4-6-06	REVISED W.A. NO. & ADDED 5248 LIFT	GRK	MD	BRC		JDM	04-6606
3	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379
2	6-5-03	change 2003 flt to clay on sec. d add det. to note 1/add note 5	PRATT		BRC		JDM	04-6379
1	1-14-03	REVISE PER STATES' 1st REVIEW	PRATT		BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
SECTIONS

APS

SCALE NOTED DATE 6-28-02

DWN PRATT | CHD | EXD BRC | RVWD

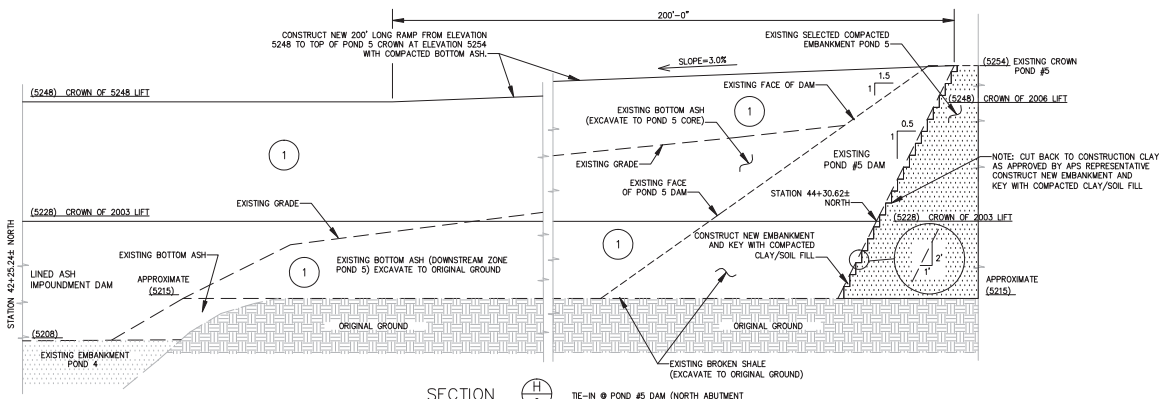
APPROVED JOHN D. MITCHELL ENGINEERING SUPERVISOR

W.A. 04-6379/04-6606

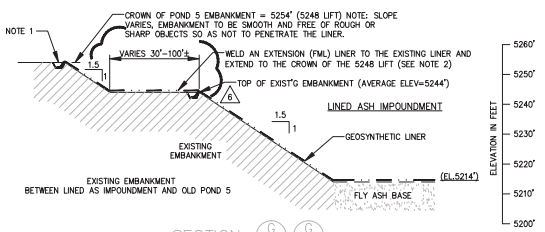
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	150515	4

RYRON R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER

DRAWING: H:\common_active\Fc\0123\04-6606 u1-3 5248 ft. lift lined ash impoundment\d10. dwg\civil\land development



SECTION H/2 — TIE-IN @ POND #5 DAM (NORTH ABUTMENT)
1"=10' HORIZONTAL
1"=10' – VERTICAL



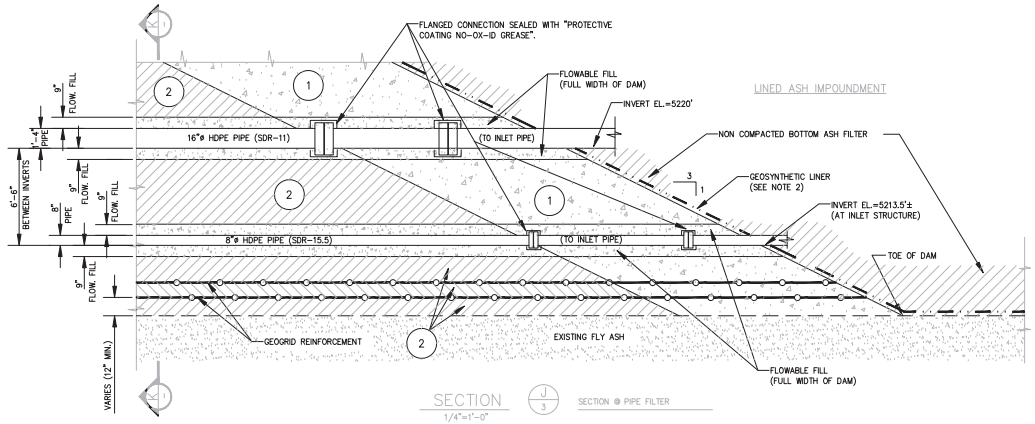
SECTION G/2 — (SEE NOTE 4)
1"=20'

NOTES

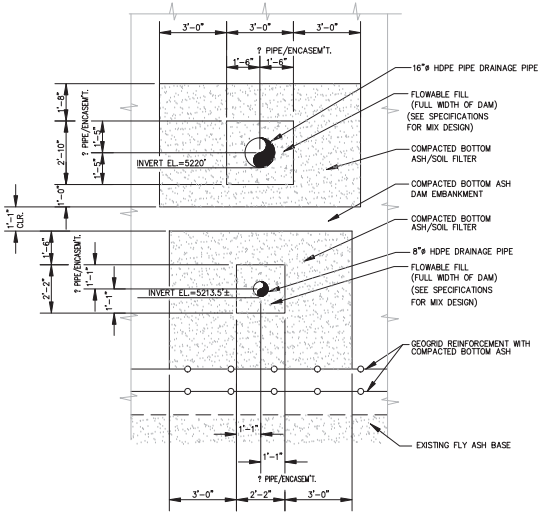
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 152408 SH. 2
2. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4.
3. 2-LAYERS OF GEOSYNTHETIC (FML) LINER WITH GEONET ON THE UPSTREAM FACE OF THE LINED DECANT WATER POND.
4. EXISTING BASE ELEVATIONS VARY. ELEVATIONS AT THE SECTIONS ARE TAKEN AT THE CUTS. IN THE CASE OF MULTIPLE CUTS OF THE SAME SECTION, THE SECTION INDICATED BY "SHOWN" ON THE SITE PLAN, IS THE ONE REPRESENTED ON THIS SHEET.
5. FOR PIPE PENETRATION THROUGH LINER (6) SEE DETAIL 152408 SH. 2

LEGEND

- EXISTING DAM EMBANKMENT
- EXISTING BOTTOM ASH & CONTINUOUS SHALE EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE



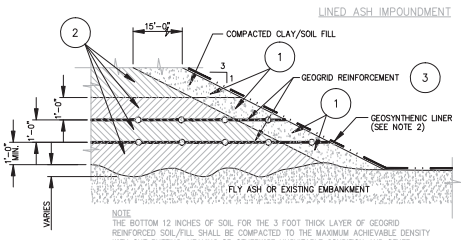
SECTION J/3 — SECTION @ PIPE FILTER
1/4"=1'-0"



SECTION K/– — 3/8"=1'-0"

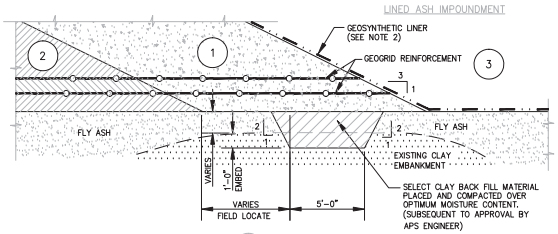
NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT–BOTTOM ASH OR CLAY AS SPECIFIED.

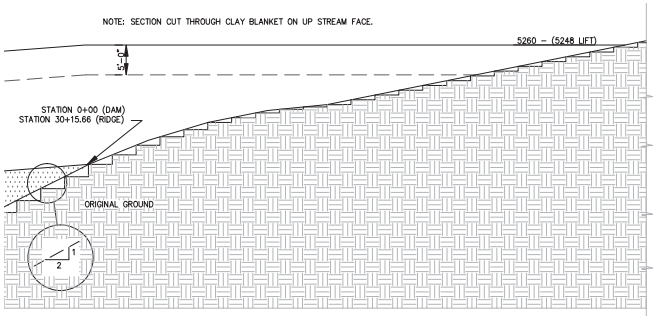


NOTE
THE BOTTOM 12 INCHES OF SOIL FOR THE 3 FOOT THICK LAYER OF GEOGRID REINFORCED SOIL/FILL SHALL BE COMPACTED TO THE MAXIMUM ACHIEVABLE DENSITY WITH OUT RUTTING, HEAVING OR OTHERWISE UNSUITABLE CONDITION AND OTHER UNEVEN FEATURES OR TO 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D698, SUBSEQUENT TO APPROVAL BY APS ENGINEER. THE REMAINING SOIL/FILL FOR THE GEOGRID REINFORCED SOIL/FILL SHALL BE COMPACTED TO A MINIMUM OF 95% OF MAXIMUM DENSITY AS DETERMINED BY ASTM D698. GEOGRID TO BE (TENSAR BX-1200).

SECTION L/– — GEOGRID REINFORCEMENT
3/8"=1'-0"



SECTION M/3 — SECTION @ KEY
1/4"=1'-0"



SECTION N/– — TIE-IN @ SOUTH ABUTMENT
1"=10' HORIZONTAL
1"=10' – VERTICAL

RYAN R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
6	01-22-08	AS-BUILTS G-G VERIES 30'-100'±	SMS	MD	BRC		JDM	04-6606
5	4-26-06	REVISE DETAIL G-G	GRK	MD	BRC		JDM	04-6606
4	4-6-06	REVISED W.A. NO. & ADDED 5248 LIFT	GRK	MD	BRC		JDM	04-6606
3	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379
2	6-5-03	add detail to note 1/add note 5 change bott. ash to clay on sec. n	PRATT		BRC		JDM	04-6379
1	1-14-03	REVISE PER STATES' 1st REVIEW	PRATT		BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
SECTIONS

APS

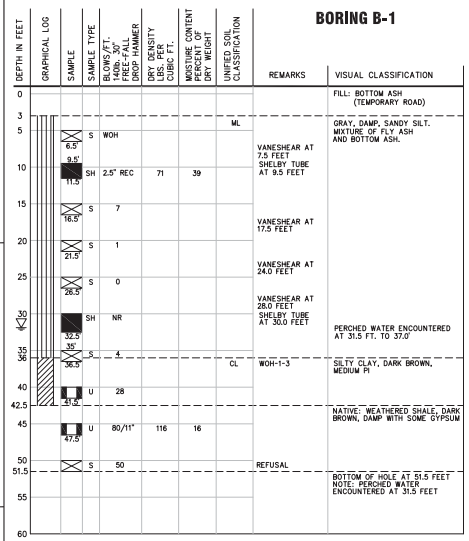
SCALE NOTED — DATE 6-26-02

DWN	APPROVED	W.A.
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379/04-6606
CHD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	150515	5

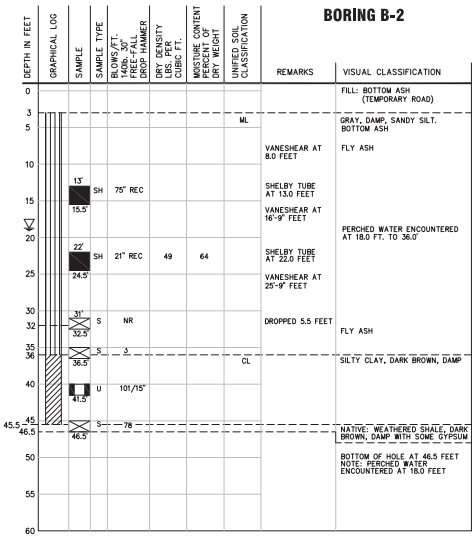
DRAWING: H:\common_active\fc\123\04-6606 u1-3 5248 ft. lift lined ash impoundment\fc110. dwg\LAYOUT(land development

BORING B-1



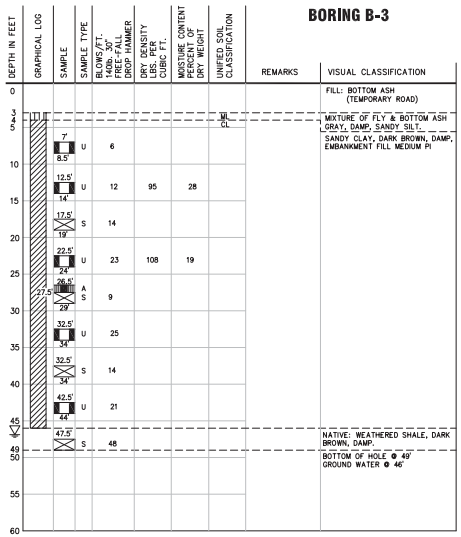
SAMPLE TYPE
A=AUGER CUTTINGS; NR=NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-2



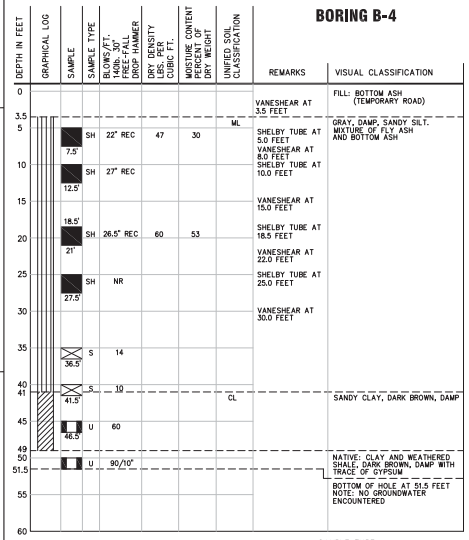
SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-3



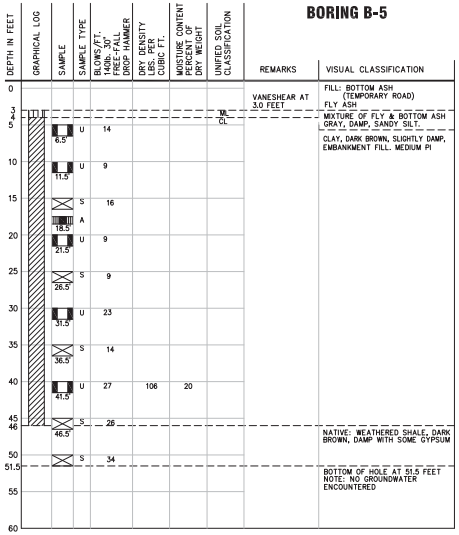
SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-4



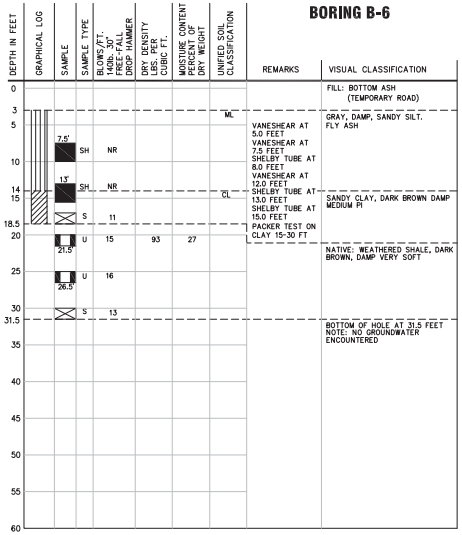
SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

BORING B-5



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

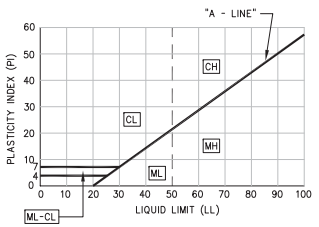
BORING B-6



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. GRAVELLY 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



PLASTICITY CHART

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

RYAN R. CONRAD — NEW MEXICO — 13248 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	4-6-06	REVISED W.A. NO.	GRK	MD	BRC		JDM	04-6606
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

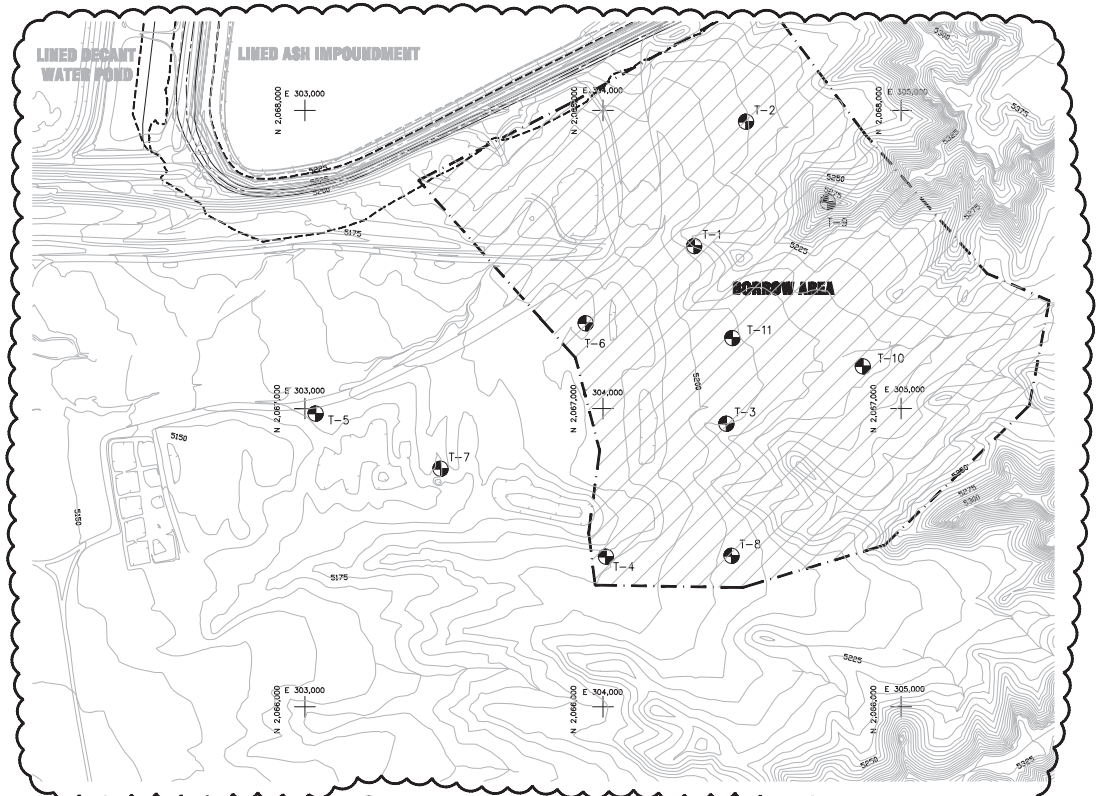
APS

SCALE: NONE — DATE: 6-28-02

DWN	APPROVED	W.A.
PRATT	JOHN D. MITCHELL, ENGINEERING SUPERVISOR	3 04-6379/04-6606
CHD		
EXD BRC		
RVWD		

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

DRAWING: T:\gen\GeorgiaKieyoomia\CheckOut\FC-C-39-ADS-150515-7.dwg



NORTH

PLAN VIEW
1"=200'
CONTOUR INTERVAL=10'
0 50 100 150 200 400 600 800

LEGEND
- T-1 TEST PIT LOCATIONS
- TOPO BEFORE EXCAVATION
- OUTLINE OF BORROW AREA (2006)

BORROW AREA TEST PIT COORDINATES

BORING NO.	LONGITUDE LATITUDE	(NORTHING)	(EASTING)
T-1	N36°40'48.90" W108°30'04.80"	N 2,067,544.80	E 304,306.00
T-2	N36°40'53.04" W108°30'02.70"	N 2,067,962.00	E 304,480.00
T-3	N36°40'43.02" W108°30'03.42"	N 2,066,949.00	E 304,414.00
T-4	N36°40'38.58" W108°30'34.00"	N 2,066,503.00	E 304,010.00
T-5	N36°40'43.26" W108°30'20.34"	N 2,066,983.00	E 303,036.00
T-6	N36°40'46.32" W108°30'09.24"	N 2,067,286.00	E 303,942.00
T-7	N36°40'41.46" W108°30'15.18"	N 2,066,798.00	E 303,455.00
T-8	N36°40'38.64" W108°30'03.18"	N 2,066,506.00	E 304,430.00
T-9	N36°40'50" W108°29'57"	N 2,067,692.25	E 304,754.237
T-10	N36°40'45" W108°29'56"	N 2,067,141.50	E 304,871.897
T-11	N36°40'46" W108°30'01"	N 2,067,236.36	E 304,434.051

TEST PIT T-1
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–0.5				CL	GRAY, SLIGHTLY DAMP CLAY
0.5–8			A		GRAY, SLIGHTLY DAMP WEATHERED SHALE, BLOCKY ROCK WEATHERING TO CLAY. (TEST PIT ON A RIDGE) DEPTH (ft) 0–3.5, LL=41, PI=27 HARDER @ 3.5' BLOCKEY ROCK

STOP EXCAVATION @ 8'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-2
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–4			A	CL	GRAY BROWN, SLIGHTLY DAMP, SANDY CLAY DEPTH (ft) 0–4, LL=34, PI=19
4–10			A		HIGHLY WEATHERED SHALE GRAY SLIGHTLY DAMP WEATHERED SHALE

STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-3
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–1				CL	GRAY, SLIGHTLY DAMP CLAY
1–8			A		GRAY, SLIGHTLY DAMP WEATHERED SHALE HIGHLY WEATHERED DEPTH (ft) 0–8, LL=48, PI=29 HARDER HARD

STOP EXCAVATION @ 8'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-4
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–8			A	CL	GRAY BROWN, SLIGHTLY DAMP, SANDY CLAY DEPTH (ft) 0–8, LL=34, PI=18 THIN SANDY LENS GRANULAR, TAN SLIGHTLY DAMP
8–10					BROWN, SLIGHTLY DAMP, SANDY CLAY

STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-5
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–8			A	CL	BROWN, SLIGHTLY DAMP, SANDY CLAY DEPTH (ft) 0–8, LL=34, PI=18
8–9					WEATHERED SHALE @ 8'

STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-6
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–8			A	CL	BROWN, SLIGHTLY DAMP, SANDY CLAY DEPTH (ft) 0–8, LL=30, PI=14
8–9					THIN SANDSTONE LENS

STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-7
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–9			A	CL	BROWN, SLIGHTLY DAMP, SANDY CLAY DEPTH (ft) 0–9, LL=30, PI=15
9–10					THIN SANDSTONE LENS

STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-8
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–10			A	CL	BROWN, SLIGHTLY DAMP, SANDY CLAY DEPTH (ft) 0–10, LL=32, PI=13

STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-9
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–5.5			G	SM	SILTY SAND; GRAY, LOOSE, SLIGHTLY DAMP
5.5					SILTSTONE/CLAYSTONE; GRAY, SOFT TO MODERATELY HARD, SLIGHTLY DAMP, SOME WATER SOLUBLE SALTS.

BACK HOE REFUSAL @ 5.5'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
G=GRAB

TEST PIT T-10
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–3			G	CL	LEAN CLAY; GRAY TO BROWN, SOFT TO STIFF, SLIGHTLY DAMP DEPTH (ft) 0.5–1, LL=35, PI=19
3–4			G		STIFF TO VERY STIFF
4–7			G		DEPTH (ft) 4–4.5, LL=42, PI=24
7–10			G		CLAYSTONE; GRAY TO BROWN, SOFT, SLIGHTLY DAMP, SOME COAL AND SANDSTONE FRAGMENTS.

STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
G=GRAB

TEST PIT T-11
VISUAL CLASSIFICATION

DEPTH IN FEET	GRAPHICAL LOG	SAMPLE	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	
0–3			G	CL	LEAN CLAY; GRAY TO BROWN, SOFT TO STIFF, SLIGHTLY DAMP DEPTH (ft) 0.5–1, LL=31, PI=15
3–9			G		CLAYSTONE; GRAY TO BROWN, SOFT, SLIGHTLY DAMP

STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.
SAMPLE TYPE
G=GRAB

BYRON R. CONRAD
NEW MEXICO
13248
REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
5	01-22-08	AS-BUILTS FOR 5248 LIFT	SMS	MD	BRC		JDM	04-6606
4	4-26-06	ADDED 9,10 & 11 TEST PITS	GRK	MD	BRC		JDM	04-6606
3	4-6-06	REVISED W.A. NO. & BORROW AREA	GRK	MD	BRC		JDM	04-6606
2	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379
1	1-14-03	WAS SHEET #6	PRATT		BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
BORROW AREA SOIL TEST PIT LOGS

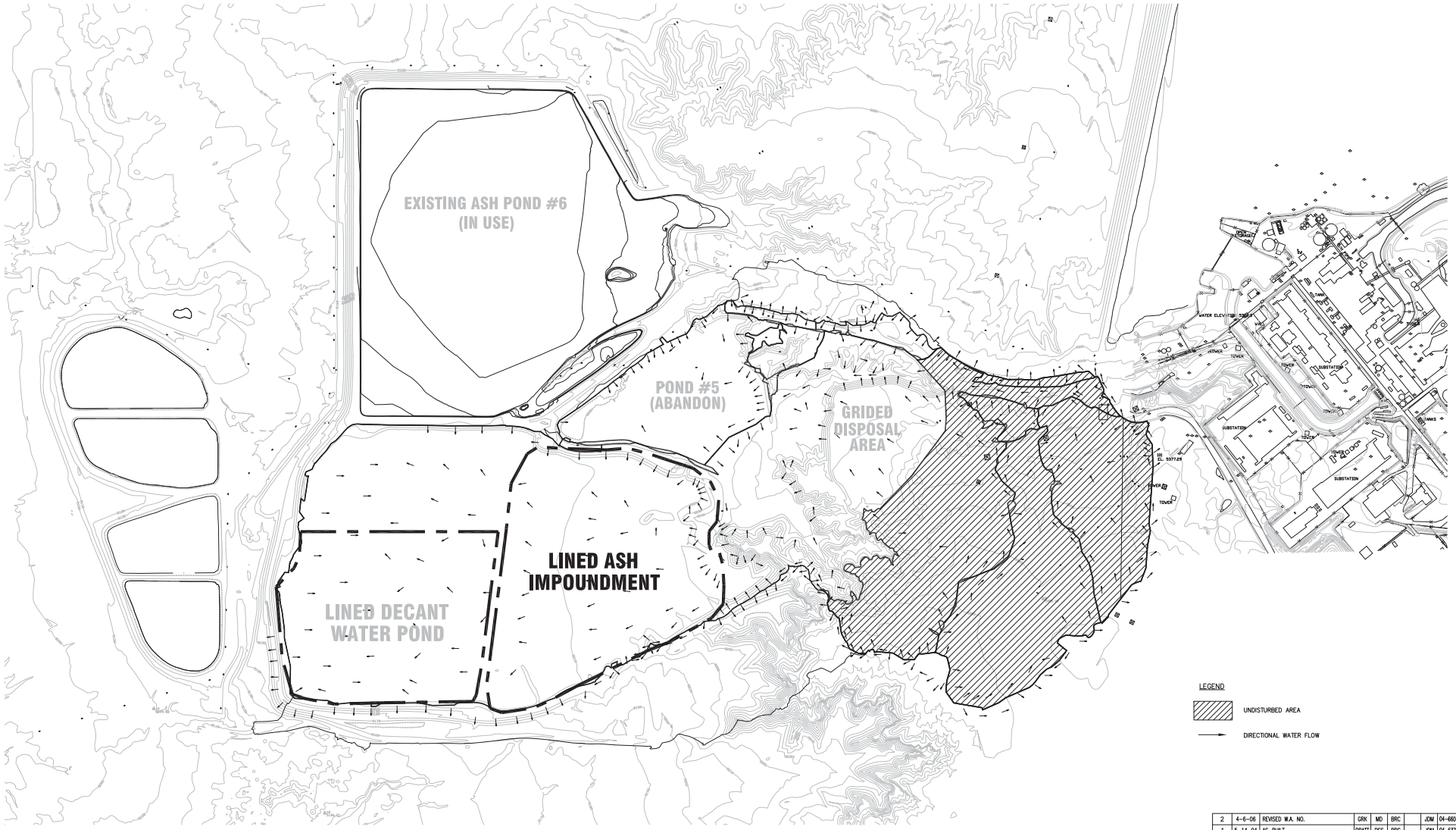
APS

SCALE NOTED
DATE 6-28-02

DWN	APPROVED	W.A.
GRK	JOHN D. MITCHELL ENGINEERING SUPERVISOR	04-6379/04-6606
CHD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
4C	C	16	ADS	150515	8

DRAWING: H:\common_active\brc\123\04-6606 u1-3 5248 ft. lift lined ash impoundment\dt10. dwgs\civil\land development



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

NORTH

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

BYRON R. CONRAD
NEW MEXICO
13248
REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	4-6-06	REVISED W.A. NO.	GRK	MD	BRC		JDM	04-6606
1	5-14-04	AS-BUILT	PRATT	PSS	BRC		JDM	04-6379

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT
DRAINAGE MAP

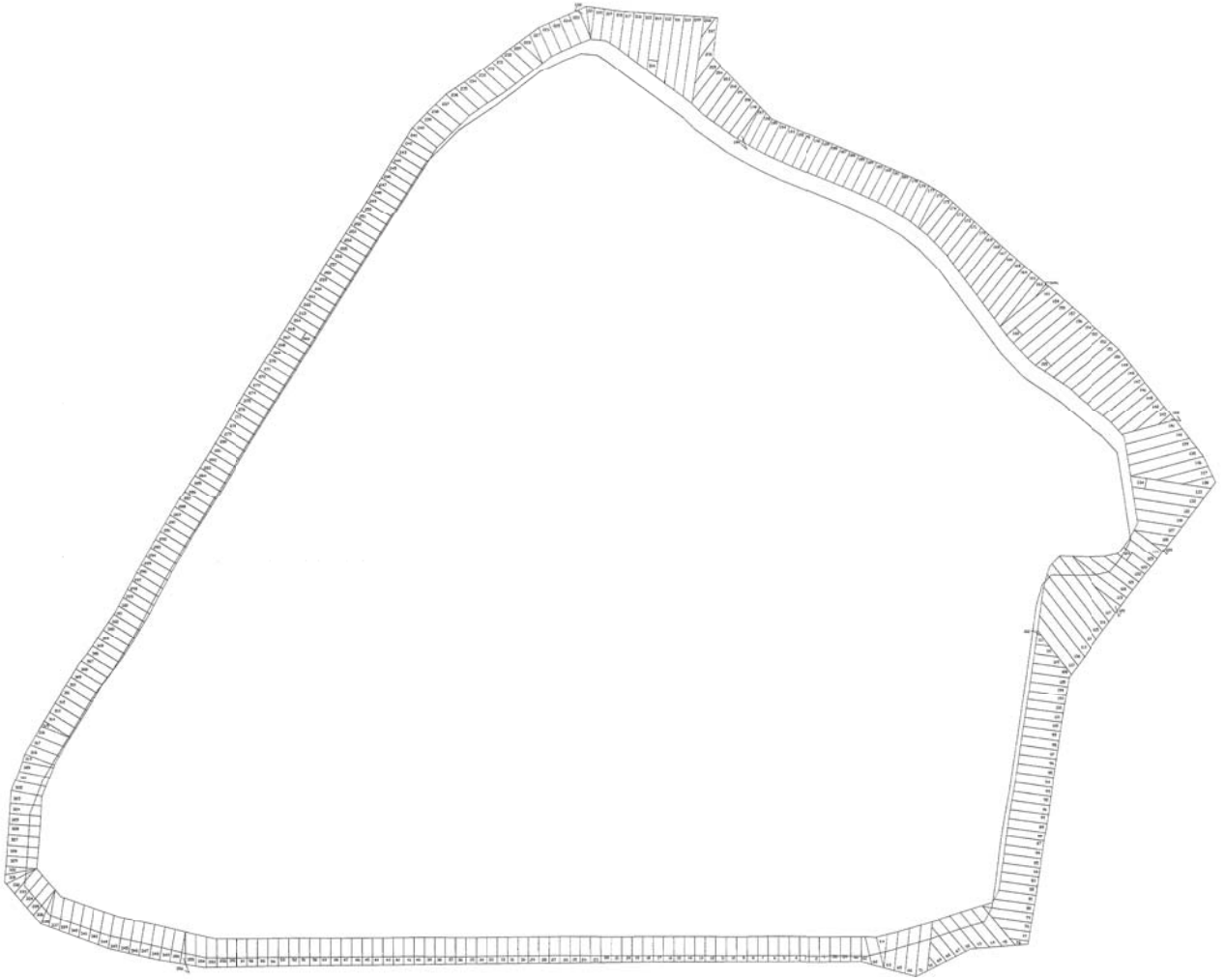
APS

SCALE 1"=300' DATE 1-14-03

DWN	APPROVED	W A
PRATT	JOHN D. MITCHELL ENGINEERING SUPERVISOR	2 04-6379/04-6606
CHD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	150515	9

DRAWING: T:\gen\GeorgiaKleyoomla\CheckOut\FC-C-16-ADS-150515-9.dwg



Notes :
1) Red lines represent approximate location of panel limits.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5248 LIFT LINED ASH IMPOUNDMENT
LINER PLAN

APS

SCALE NOT TO SCALE DATE 2/1/08

Submitted By:
COLORADO LINING INTERNATIONAL

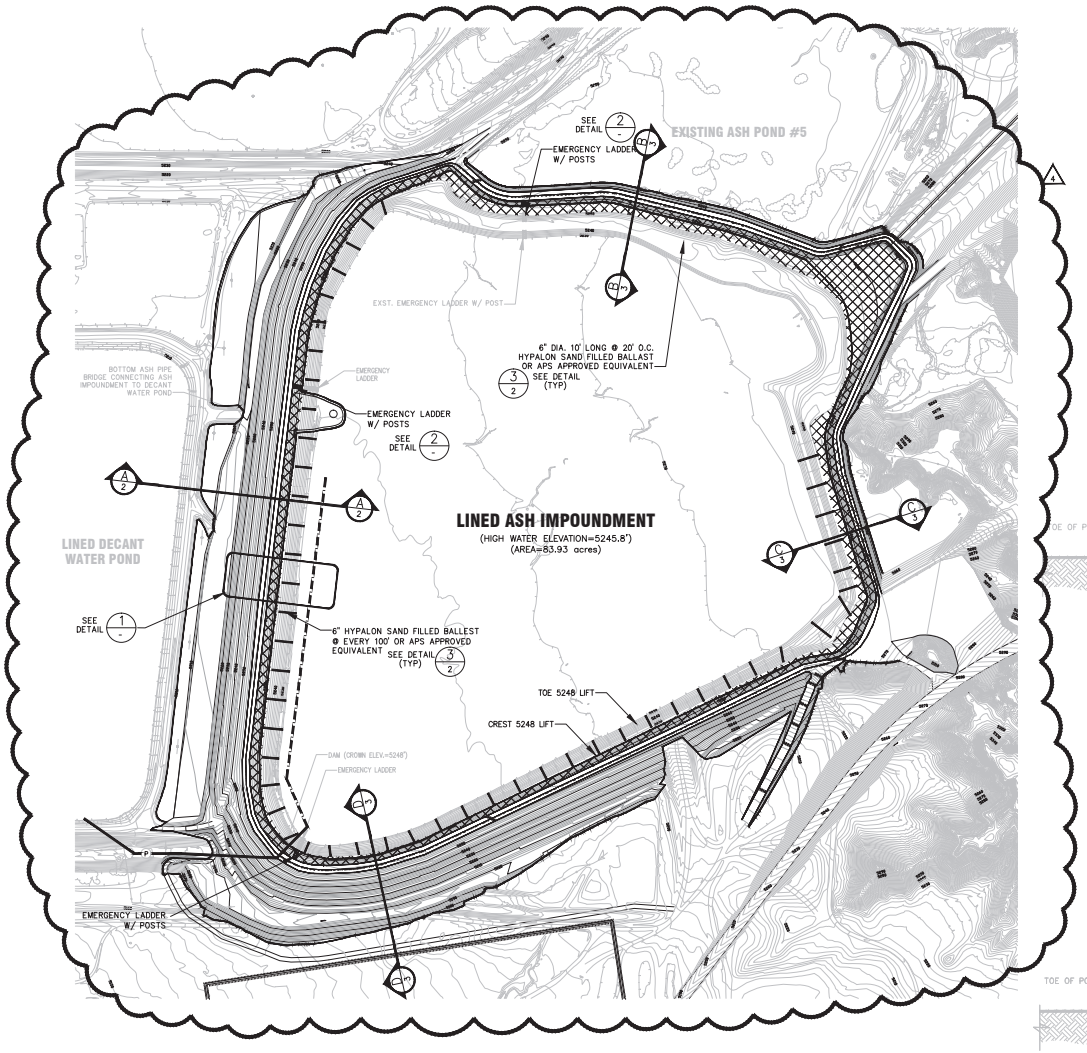
DWN SMS	APPROVED JOHN D. MITHELL ENGINEERING SUPERVISOR	W A 04-6606
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	150515	19

DRAWING: H:\common_active\fc\123\04-6606 u1-3 5248 ft. lift lined ash impoundment\dd10. dwgs\civil\(land development structure)\150515\dwg\FC-0

5258 LIFT AS-BUILT DRAWINGS

(APS, 2010)



NORTH

EMERGENCY LADDER LOCATIONS

1"=200'
CONTOUR INTERVAL=2'

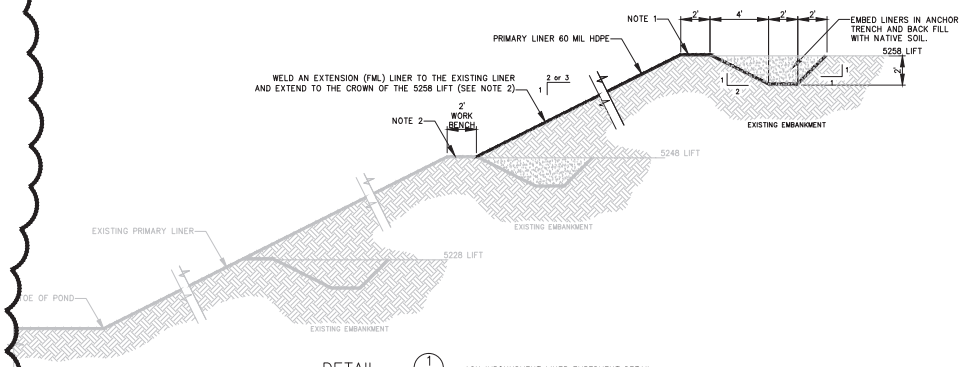
GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

NOTES

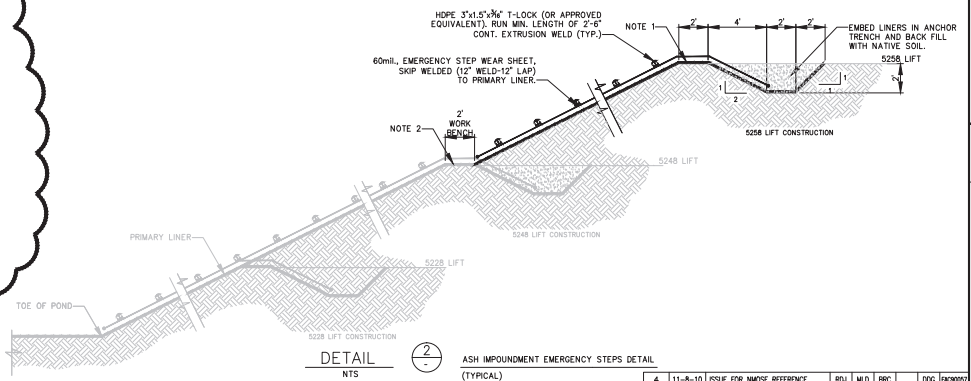
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. SEE DETAIL 4/2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. SEE DETAIL 5/2

LEGEND

NEW LINER AREA



DETAIL 1/- NTS — ASH IMPOUNDMENT LINER EMBEDMENT DETAIL (TYPICAL)



DETAIL 2/- NTS — ASH IMPOUNDMENT EMERGENCY STEPS DETAIL (TYPICAL)

FOR INFORMATION ONLY

DRAWING REFERENCE LIST

SEE APS DRAWING 150515 SHEETS 1-18 FOR THE LAI 5258 LIFT CONSTRUCTION PLANS

SEE APS DRAWING 161545 SHEETS 1-24 FOR THE LAI 5258 LIFT ASBUILT PLANS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
4	11-8-10	ISSUE FOR NMOSE REFERENCE	RDJ	MLD	BRC		DDG	FAC90057
3	04-05-10	AS-BUILTS FOR LAI 5258 LIFT	SMS	MLD	BRC		JDM	FAC90057
2	07-22-09	REMOVAL OF BALLAST SOCKS	SMS	MLD	BRC		JDM	FAC90057
1	03/25/08	FIXED EAST EMBANKMENT	SMS	MLD	BRC		JDM	FAC90057

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT 5258 LIFT
LINER/EMERG. LADDER/ PLAN AND DETAILS

APS

SCALE NOTED DATE 03-11-08

DWN	APPROVED	W.A.
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90057
CHD MD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	156868	1

DRAWING: P:\Active\FC-F123\1279\10. Dwgs\Civil\LDS\5258 Lift AB\dwg\FC-C-39-ADS-156868-1.dwg

NOTES

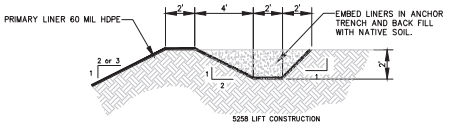
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4/-) SEE DETAIL
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5/-) SEE DETAIL
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4. THE LINER WELD FROM THE EXISTING LINER TO THE NEW LINER SHALL BE A WEDGE WELD WHEREVER POSSIBLE.

NEW DAM EMBANKMENT MATERIALS

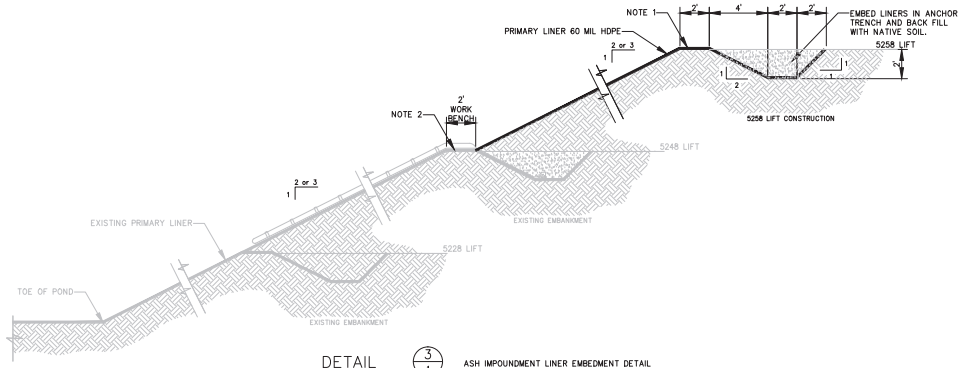
1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.

LEGEND

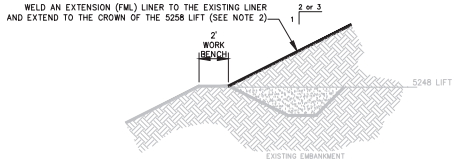
- EXISTING DAM EMBANKMENT
- EXISTING BOTTOM ASH & CONTINUOUS SHALE EMBANKMENT
- EXISTING FLY ASH BASE
- EXISTING GROUND SURFACE
- BACK FILL (NATIVE SOIL)



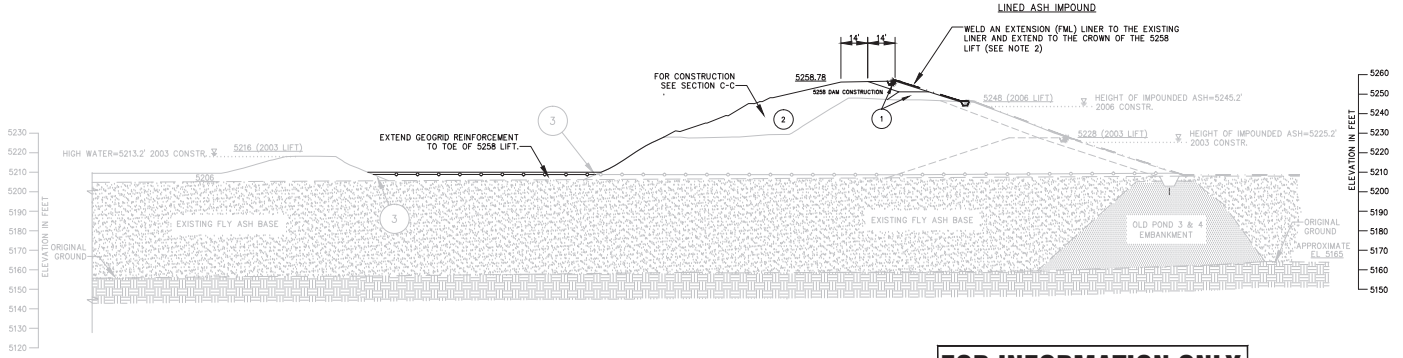
DETAIL (4/1) NTS — ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER (TYPICAL)



DETAIL (3/1) NTS — ASH IMPOUNDMENT LINER EMBEDMENT DETAIL (TYPICAL)



DETAIL (5/1) NTS — WORK BENCH (TYPICAL)



SECTION (A/1) (A/1) 1"=30' — SECTION LOOKING NORTH

FOR INFORMATION ONLY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	11-8-10	ISSUE FOR NMOSE REFERENCE	RDJ	MLD	BRC		DDC	FAC90057
2	04-05-10	AS-BUILTS FOR 5258 LIFT LAI	SMS	MLD	BRC		JDM	FAC90057
1	07-22-09	REMOVAL OF BALLAST SOCK	SMS	MLD	BRC		JDM	FAC90057

FOUR CORNERS COMMON ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT 5258 LIFT
BALLAST SOCK, PREFAB PIPE & SECTION DETAILS

APS

SCALE NOTED — DATE 03-11-08

DWN SMS	APPROVED		W A
CHD MD	JOHN D. MITCHELL ENGINEERING SUPERVISOR		FAC90057
EXD BRC	UNIT	DISC	TYPE	SYS	NUMBER	SHEET
RVWD	FC	C	65	ADS	156868	2

DRAWING: P:\Active\FC-F123\1279\10. Dwgs\Civil\LDS\5258 Lift AB\dwg\FC-C-65-ADS-156868-2.dwg

NOTES

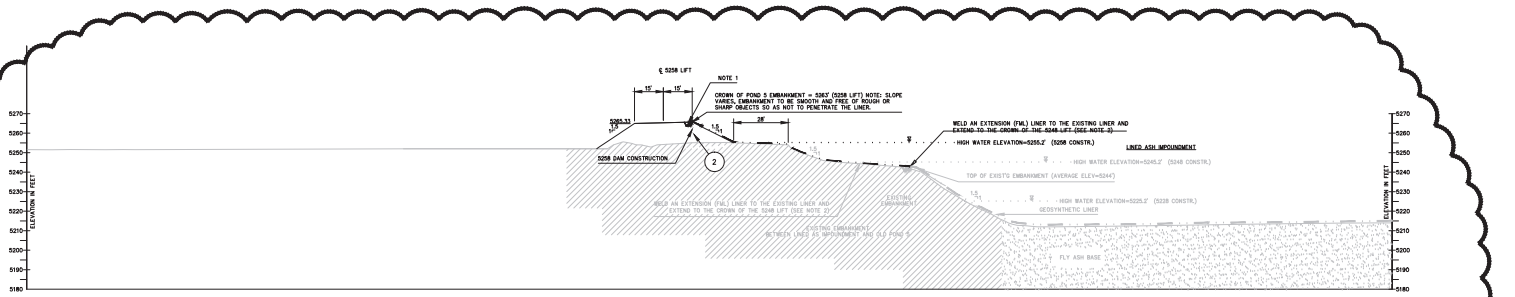
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4/2) SEE DETAIL
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5/2) SEE DETAIL
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408, SH. 4. THE LINER WELD FROM THE EXISTING LINER TO THE NEW LINER SHALL BE A WEDGE WELD WHEREVER POSSIBLE.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.

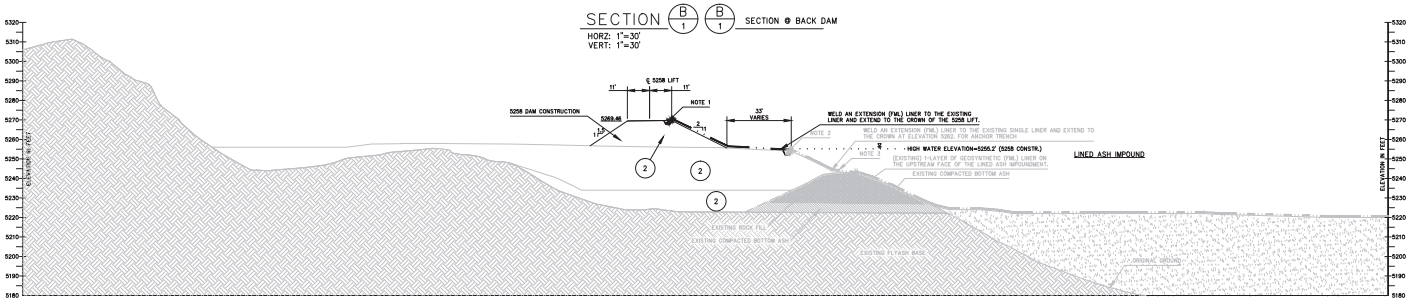
LEGEND

- ORIGINAL DAM EMBANKMENT
- EXISTING BOTTOM ASH & CONTINUOUS SHALE EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- BACK LINER TIE AREA COMPACTED BOTTOM ASH
- ROCK FILL 5228 CONSTRUCTION
- 5258 LIFT
- PREVIOUS LIFTS



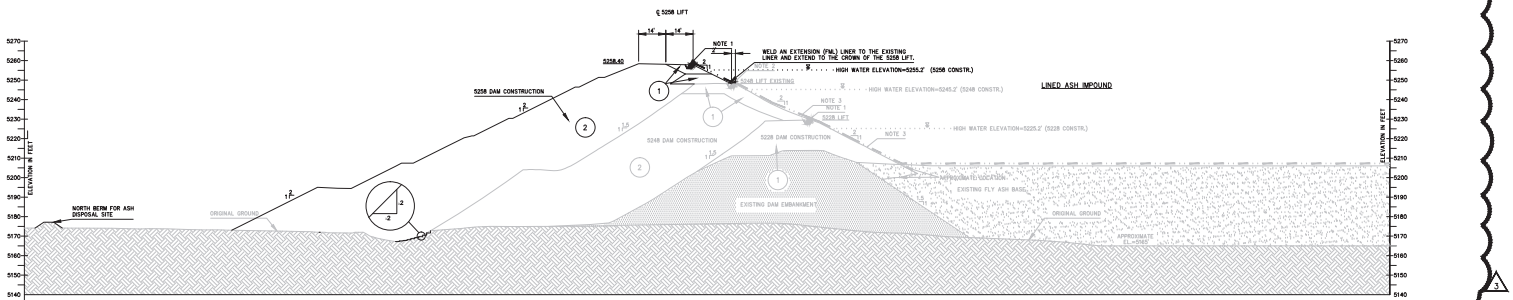
SECTION (B/1) (B/1) SECTION @ BACK DAM

HORZ: 1"=30'
VERT: 1"=30'



SECTION (C/1) (C/1)

HORZ: 1"=30'
VERT: 1"=30'



SECTION (D/1) (D/1)

HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 Inch = 30 ft.

FOR INFORMATION ONLY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	11-8-10	ISSUE FOR NMOSE REFERENCE	RDJ	MLD	BRC		DDC	FAC90057
2	04-01-10	AS-BUILTS FOR 5258 LIFT LAI	SMS	MLD	BRC		JDM	FAC90057
1	03/25/08	FIXED EAST EMBANKMENT	SMS	MLD	BRC		JDM	FAC90057

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
LINED ASH IMPOUNDMENT 5258 LIFT
SECTION DETAILS

APS

SCALE NOTED DATE 03-11-08

DWN	APPROVED	W A
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90057
CHD MD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	156868	3

DRAWING: P:\Active\FC-F123\1279\10. Dwgs\Civil\LDS\5258 Lift AB\dwg\FC-C-65-ADS-156868-3.dwg

5270 LIFT AS-BUILT DRAWINGS

(APS, 2012)

DAM OWNER'S CERTIFICATE

I, MARK A. SCHIAVONI, BEING FIRST DULY SWORN, UPON MY OATH, STATE THAT I AM THE SENIOR VICE-PRESIDENT OF FOSSIL GENERATION AT ARIZONA PUBLIC SERVICE COMPANY, A CORPORATION DULY ORGANIZED UNDER THE LAWS OF THE STATE OF ARIZONA, THAT THE ACCOMPANYING CONSTRUCTION DRAWINGS (CONSISTING OF 31 SHEETS), FOR THE LINED ASH IMPOUNDMENT 5270 LIFT WERE MADE UNDER AUTHORITY OF THE BOARD OF DIRECTORS OF SAID CORPORATION AND THAT, IN THEIR BEHALF, I HAVE READ AND EXAMINED THE STATEMENTS AND REPRESENTATIONS AND ALL THAT IS SHOWN HEREIN IS DONE WITH THEIR FREE CONSENT AND IN ACCORDANCE WITH THEIR WISHES AND STATE THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

ARIZONA PUBLIC SERVICE COMPANY
CLAIMANT

BY: MARK A. SCHIAVONI, SENIOR VICE-PRESIDENT
FOSSIL GENERATION

SUBSCRIBED AND SWORN TO BEFORE ME THIS 20th DAY OF April, 2012.

NOTARY PUBLIC

MY COMMISSION EXPIRES [redacted] (SEAL)

ENGINEER'S CERTIFICATE

I, BYRON R. CONRAD, STATE THAT I AM A QUALIFIED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW MEXICO, THAT I HAVE SUPERVISED THE ALTERATIONS OF LINED ASH IMPOUNDMENT 5270 LIFT AND APPURTENANT STRUCTURES AND FIND THEM TO BE COMPLETED IN ACCORDANCE WITH THE RECORD CONSTRUCTION DRAWINGS AND SPECIFICATIONS AND ARE NOW IN SATISFACTORY CONDITIONS FOR ACCEPTANCE.

REGISTERED PROFESSIONAL ENGINEER
LICENSE NUMBER: 13248

04/20/2012
DATE SUBMITTED

BYRON R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER

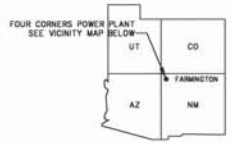
STATE ENGINEER'S CERTIFICATE

I HEREBY CERTIFY THAT THE ACCOMPANYING DRAWINGS OF THE LINED ASH IMPOUNDMENT 5270 LIFT AND RELATED APPURTENANCES AT THE FOUR CORNERS POWER PLANT HAVE BEEN DULY EXAMINED BY ME AND ACCEPTED FOR FILING ON THE _____ DAY OF _____, 20____.

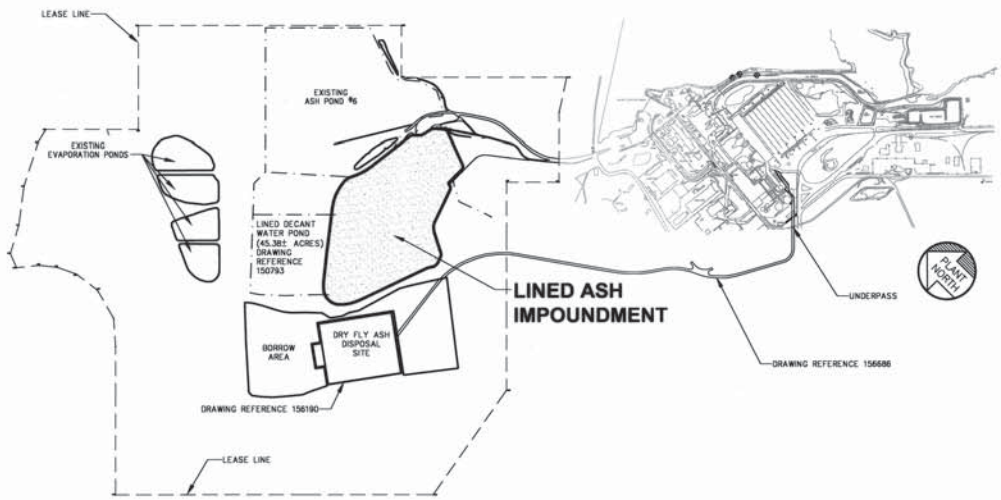
NEW MEXICO STATE ENGINEER

aps

LINED ASH IMPOUNDMENT 5270 LIFT
FOR THE
FOUR CORNERS POWER PLANT, UNITS 1-3
ARIZONA PUBLIC SERVICE COMPANY
LOCATED IN
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 34, T29N, R16W
OF SAN JUAN COUNTY, STATE OF NEW MEXICO



VICINITY MAP
N.T.S.



PROJECT SITE
N.T.S.

LIST OF DRAWINGS

DRAWING NUMBER	TITLE
FC-C-41-ADS-158134-1	FILING SHEET
FC-C-16-ADS-158134-2	SITE PLAN
FC-C-39-ADS-158134-3	PLAN AND SECTION
FC-C-39-ADS-158134-4	PLAN AND SECTION
FC-C-39-ADS-158134-5	PLAN AND SECTION
FC-C-39-ADS-158134-6	PLAN AND SECTION
FC-C-65-ADS-158134-7	SECTIONS
FC-C-65-ADS-158134-8	SECTIONS
FC-C-65-ADS-158134-9	SECTIONS
FC-C-65-ADS-158134-10	SECTIONS
FC-C-65-ADS-158134-11	SLURRY WALL AND NOTCH CUT DETAILS
FC-C-65-ADS-158134-12	LAI INTERCEPT TRENCH PLAN AND PROFILE
FC-C-65-ADS-158134-13	DROP INLET PIPE DETAIL
FC-C-39-ADS-158134-14	DROP INLET PIPE VENDER (5228 LIFT)
FC-C-39-ADS-158134-15	DROP INLET PIPE VENDER (5248 LIFT)
FC-C-39-ADS-158134-16	DROP INLET PIPE VENDER (5258 LIFT)
FC-C-39-ADS-158134-17	LONGITUDINAL CROSS SECTION
FC-C-39-ADS-158134-18	LONGITUDINAL CROSS SECTION
FC-C-39-ADS-158134-19	LONGITUDINAL CROSS SECTION
FC-C-65-ADS-158134-20	CLAY CORE TIE IN
FC-C-16-ADS-158134-21	BORING AND CPT LOCATIONS
FC-C-16-ADS-158134-22	BORROW AREA TEST PIT LOCATIONS
FC-C-39-ADS-158134-23	SOIL BORING LOGS
FC-C-39-ADS-158134-24	SOIL BORING LOGS
FC-C-39-ADS-158134-25	SOIL BORING LOGS
FC-C-39-ADS-158134-26	SOIL BORING LOGS
FC-C-39-ADS-158134-27	BORROW AREA TEST PIT LOGS
FC-C-39-ADS-158134-28	PIEZOMETER AND SETTLING PLAT LOCATIONS
FC-C-65-ADS-158134-29	SECTIONS AND DETAILS
FC-C-65-ADS-158134-30	HEADWALL DETAILS
FC-C-39-ADS-158134-31	DROP INLET PIPE VENDOR DRAWING

LINED ASH IMPOUNDMENT 5270 LIFT
FOR THE
FOUR CORNERS POWER PLANT, UNITS 1-3
ARIZONA PUBLIC SERVICE COMPANY
LOCATED IN SAN JUAN COUNTY, STATE OF NEW MEXICO

THE UNDERSIGNED APS COMPANY, CLAIMANT, WHOSE ADDRESS IS POST OFFICE BOX 53933, MAIL STATION 3190, CITY OF PHOENIX, COUNTY OF MARICOPA, STATE OF ARIZONA, CONSTRUCTED ASH DISPOSAL DAMS 3 & 4 AT THE FOUR CORNERS POWER PLANT. WE PROPOSE TO CONSTRUCT A LINED ASH IMPOUNDMENT ON THE EMBANKMENT BETWEEN PONDS 3 & 4 AND RELATED APPURTENANCES AS DESCRIBED AND INDICATED, HEREBY THIS MAKES THESE SEVERAL STATEMENTS RELATIVE AND OFFERS THOSE DRAWINGS AND STATEMENTS FOR ACCEPTANCE AND FILING IN COMPLIANCE WITH THE LAWS OF THE STATE OF NEW MEXICO.

5270 LIFT LINED ASH IMPOUNDMENT CHARACTERISTICS STATED BELOW PER SECTION 19.25.12.11.D(6) NMAC

(A) NAME OF DAM; LINED ASH IMPOUNDMENT (LAI)
(B) TYPE OF DAM (MATERIAL); EARTHEN/ TAILINGS TYPE
(C) HAZARD POTENTIAL CLASSIFICATION; SIGNIFICANT HAZARD POTENTIAL
(D) MAXIMUM HEIGHT ABOVE THE DOWNSTREAM TOE; APPROXIMATELY 97 FEET FOR THIS LIFT
(E) MAXIMUM LENGTH IN FEET; APPROXIMATELY 6050 FEET IN LENGTH, STA 18+50 TO STA 79+00
(F) CREST WIDTH IN FEET; 30 FEET
(G) SLOPE OF THE UPSTREAM FACE; SOUTH EMBANKMENT 2 HORIZONTAL TO 1 VERTICAL, WEST EMBANKMENT 3 HORIZONTAL TO 1 VERTICAL
(H) SLOPE OF THE DOWNSTREAM FACE; SOUTH EMBANKMENT 2 HORIZONTAL TO 1 VERTICAL, WEST EMBANKMENT 3 HORIZONTAL TO 1 VERTICAL
(I) ELEVATION OF THE DAM CREST; ELEVATION OF THE DAM CREST IS 5270
(K) ELEVATION OF OUTLET CONDUIT FLOW LINE; FLOW LINE ELEVATION 5220
(L) FREEBOARD IN FEET; 4.8 FEET AT WEST EMBANKMENT STA 37+00 TO 62+00
(N) TYPE OF OUTLET CONDUIT; 16 INCH DR11 HDPE PIPE
(O) MAXIMUM OUTLET CONDUIT DISCHARGE CAPACITY IN CUBIC FEET PER SECOND; 28.6 CFS.
(P) LOCATION OF THE OUTLET WORKS INTAKE STRUCTURE (NEW MEXICO STATE PLANE COORDINATE SYSTEM); NORTHING IS 2,069,229 AND EASTING IS 302,886

THE DAM WILL BE ROLLED EARTH FILL AND PLACED ON TOP OF THE EXISTING DAMS, AND IMPOUNDED FLY ASH.

DRAWING REFERENCE LIST

SEE APS DRAWING 156687 SHEETS 1-25 FOR 5258 LIFT AS-BUILTS

SEE APS DRAWING SET 150515 SHEETS 1-18 FOR 5248 LIFT AND 5228 LIFT AS-BUILTS

SEE APS DRAWING SET 144440 SHEETS 1-8 FOR THE ASH DEPOSIT CHANNEL SYSTEM

SEE APS DRAWING SET 152857 SHEETS 1&2 FOR THE DRAIN PIPE TO LINED DECANT POND.

SEE APS DRAWING SET 150793 SHEETS 1-7 FOR THE LINED DECANT WATER POND

SEE APS DRAWING SET 156868 SHEET 2 FOR THE FML LINER CONNECTION DETAILS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	RGJ	MLD	BRC		AK	FAC90173
1	06-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RGJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT POND
FILING SHEET

aps

SCALE: NONE DATE: 12-09-09

DWN: SMS CHD: MLD EXD: BRC RVWD:

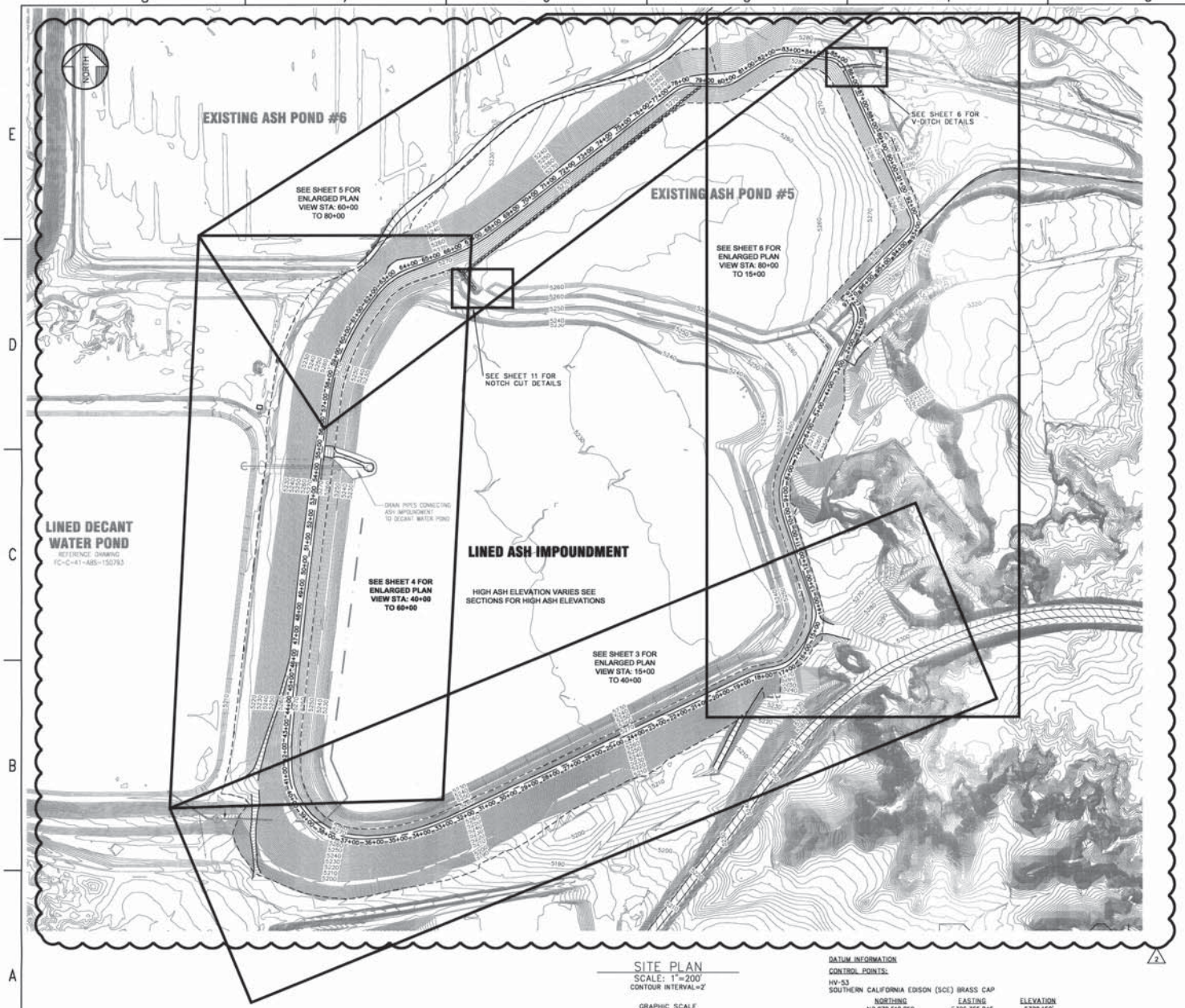
APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W.A. FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	41	ADS	158134	1

WORK SAFELY TODAY

DRAWING: C:\Users\David_Ramirez\appdata\local\temp\AcPublish_4664\FC-C-41-ADS-158134-1.dwg



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

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

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
N.G.V.D. 1929

2 REFERENCE:
FLOWN BY AERIAL MAPPING CO. ON MAY 7, 2010 IN NAD 83, NAVD 88.
CONVERTED BY AERIAL MAPPING ON JULY 25, 2011 TO NAD 27, NGVD 29.

5270 LIFT ASBUILT TOPO BY SOUDER, MILLER AND ASSOCIATES ON DECEMBER 29, 2011

LEGEND
5270 LIFT TOE
5270 LIFT ℄
5270 LIFT CREST
INDICATES ENLARGED PLAN VIEW

REVISION 1 CHANGES.
1 UPDATED EXISTING TOPO TO SHOW 5258 ASBUILT TOPO.
2 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

2 REVISION 2 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

DENNIS R. GROSSO NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SITE PLAN

aps

SCALE AS-NOTED DATE 01-04-10

DWN	SMS	APPROVED	W.A.
CHD	MLD	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
EXD	BRC		
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	158134	2

WORK SAFELY TODAY

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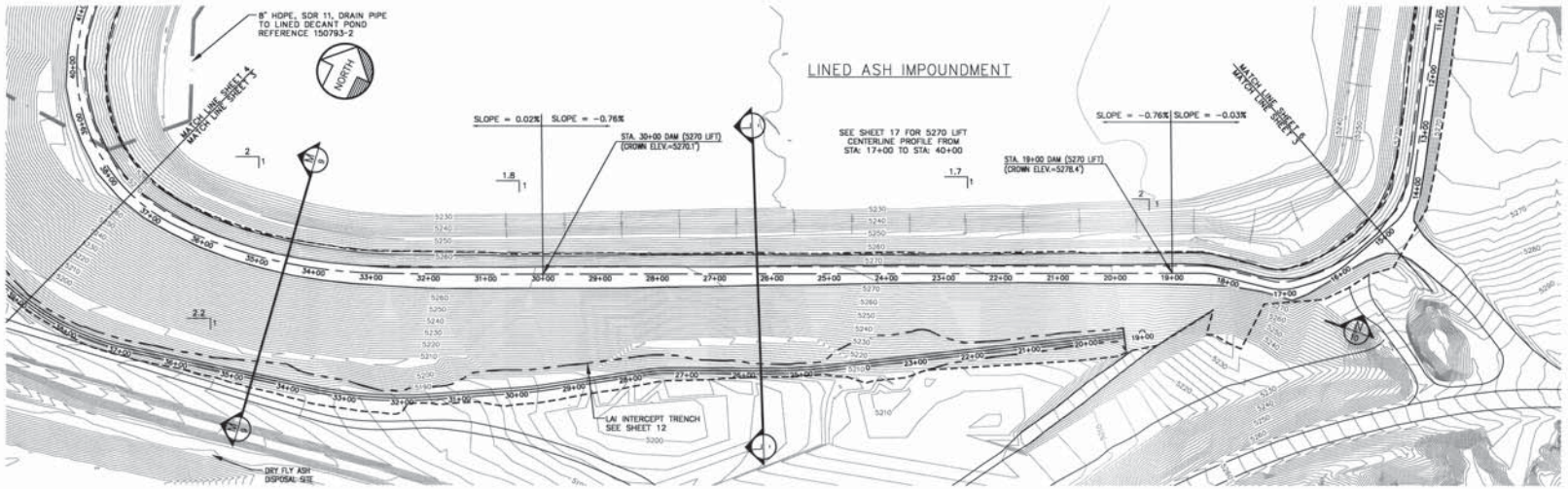
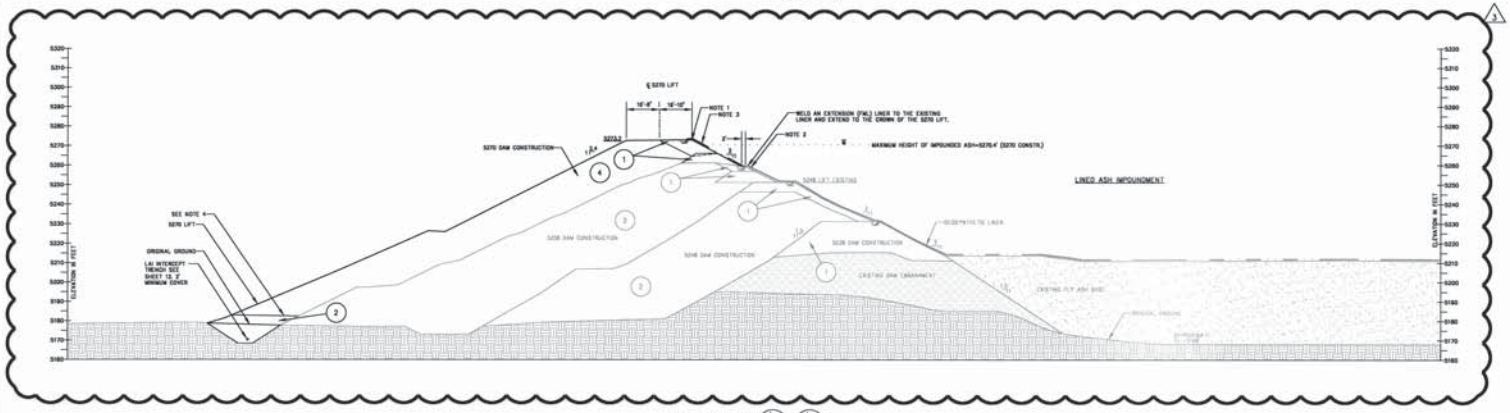


5270 LIFT CENTER LINE PLAN VIEW STA: 15+00 TO STA: 37+50
SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION ℄ ℄ SOUTH SIDE OF POND
HORZ: 1"=30' STA: 26+25

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SH.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SH.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408
4. FIRST 5 FEET OF FILL OVER THE LAI INTERCEPT TRENCH TO BE COMPACTED BOTTOM ASH. TOP ELEVATION VARIES.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- ORIGINAL POND 4 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- FML LINER
- LAI INTERCEPT TRENCH

REVISION 1 CHANGES.
1 UPDATED EXISTING TOPO TO SHOW 5258 ASBUILT TOPO.
2 SIMPLIFIED SECTION LINE TYPES FOR LEGIBILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES.
1 UPDATE FOR CHANGE IN THE INTERIM RAISE IN THE CLAY BLANKET

REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

DYSON R. CONGRESS NEW MEXICO 13240 REGISTERED PROFESSIONAL ENGINEER
04/29/2010

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-10	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
2	11-19-10	INTERIM CLAY BLANKET	JED	JH	BRC		DDG	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT POND
PLAN AND SECTION (STA: 15+00 TO STA: 40+00)

aps

SCALE AS-NOTED DATE 01-04-10

DWN	APPROVED	W.A.
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	3

WORK SAFELY TODAY

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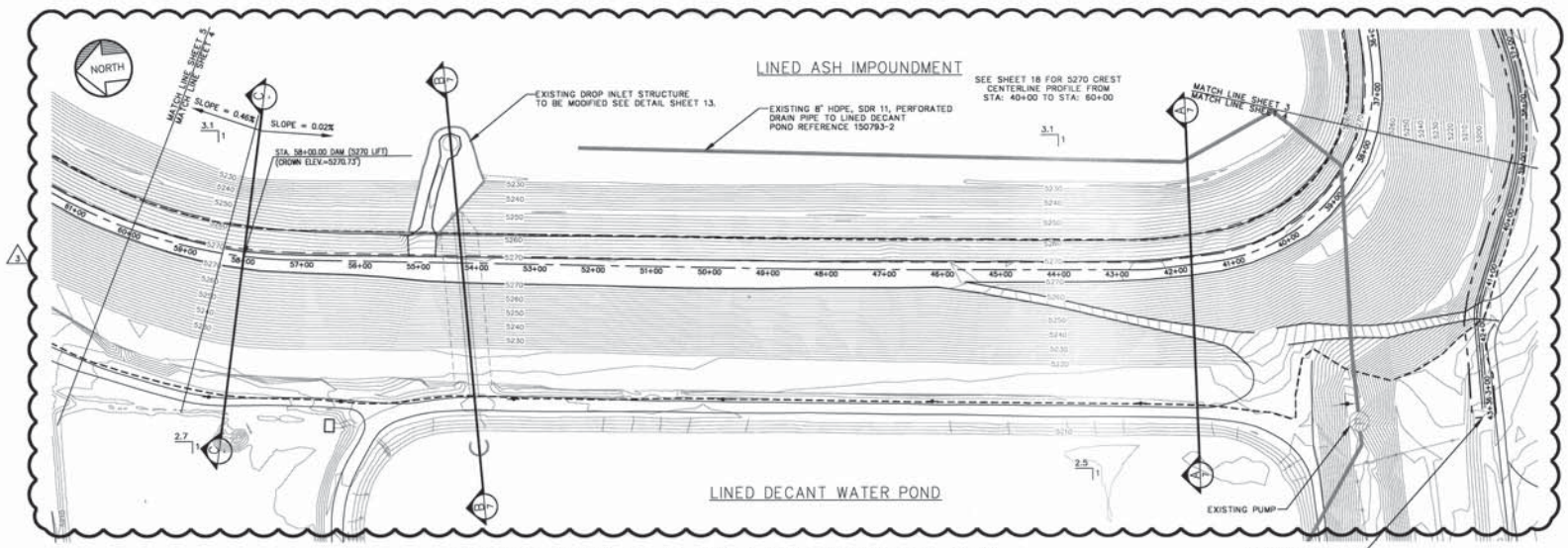
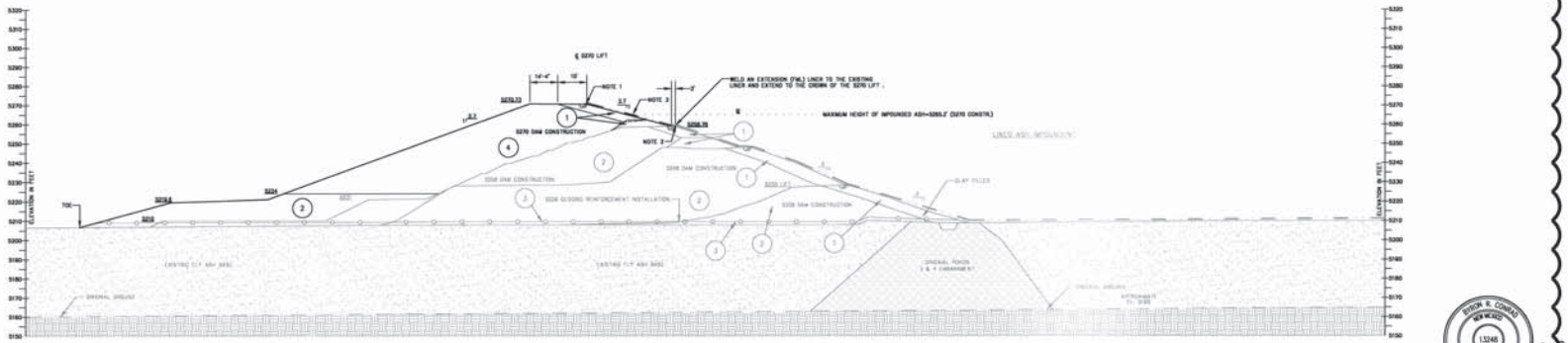


5270 LIFT CENTER LINE PLAN VIEW STA: 37+50 TO STA: 60+00
SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION C - C NORTHWEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SR.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SR.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT, REFERENCE DRAWING FC-C-39-ADS-152408

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- ORIGINAL POND 3 & 4 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- GEOGRID REINFORCEMENT
- FML LINER
- LAI INTERCEPT TRENCH

REVISION 1 CHANGES.
1 UPDATED EXISTING TOPO TO SHOW 5258 ASBUILT TOPO.
2 SIMPLIFIED SECTION LINE TYPES FOR LEGIBILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES.
1 UPDATE FOR CHANGE IN THE INTERIM RAISE IN THE CLAY BLANKET

REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

STATE OF NEW MEXICO DENNIS R. GROSSO 13248 REGISTERED PROFESSIONAL ENGINEER 04/22/2014

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
2	11-19-10	INTERIM CLAY BLANKET	JED	JH	BRC		DDG	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
PLAN AND SECTION (STA: 40+00 TO STA: 60+00)

aps

SCALE AS-NOTED DATE 01-04-10

DWN	CHD	EXD	RVWD	APPROVED	W A
SMS	MLD	BRC		DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	4

WORK SAFELY TODAY

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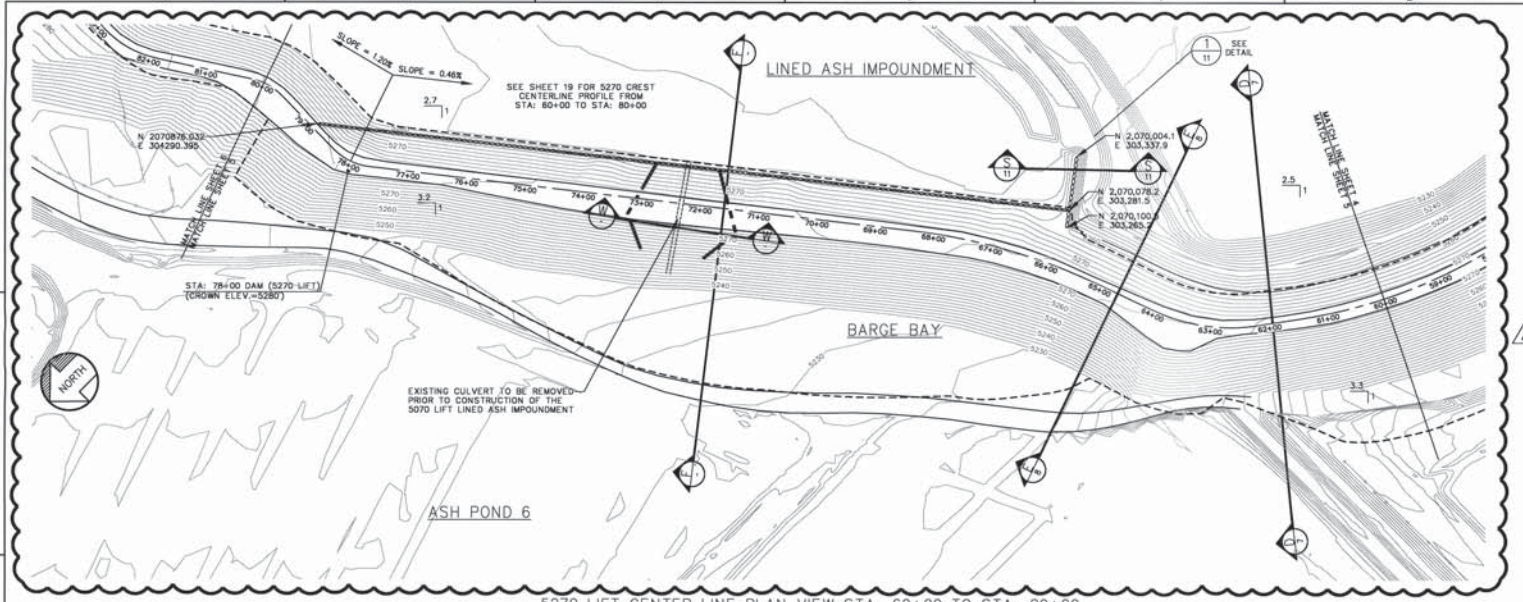
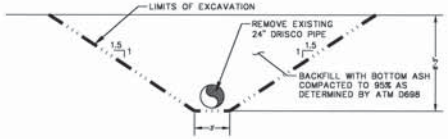


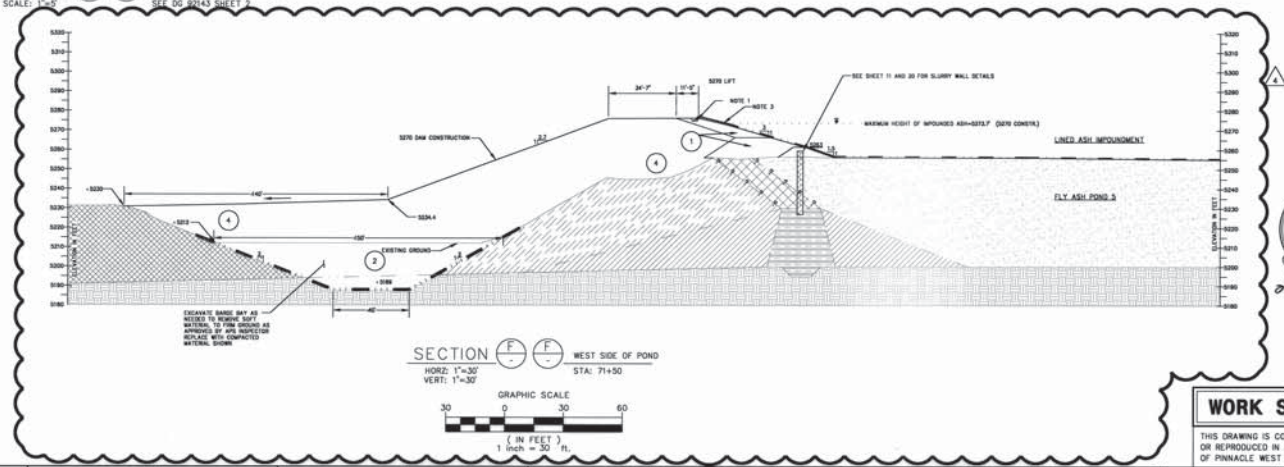
5270 LIFT CENTER LINE PLAN VIEW STA: 60+00 TO STA: 80+00

HORIZONTAL SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION W - W EXISTING CULVERT EXCAVATION
SCALE: 1"=5'
SEE DG 80143 SHEET 2



SECTION F - F WEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'
STA: 71+50

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SH.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SH.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408
4. SEE DRAWING 161707 PIPE AND PUMP REMOVAL AND PLACEMENT.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- EXISTING POND 5 EMBANKMENT BROKEN SHALE
- EXISTING POND 5 EMBANKMENT BROKEN SHALE AND BOTTOM ASH
- CLAY CORE POND 5 ABOVE 5230
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- CLAY CORE POND 5
- SLURRY WALL
- COMPACTED BOTTOM ASH
- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- FML LINER
- LIMITS OF EXCAVATION
- CEMENT-BENTONITE CUTOFF WALL

REFERENCE DRAWINGS

161707 SHEETS 1 & 2 PUMP AND PIPE RELOCATION PLANS

REVISION 4 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
4	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
3	11-1-10	REFERENCE MECHANICAL EQUIPMENT RELOCATION DRAWINGS	DJ	MLD	BRC		DG	FAC90173
2	10-18-10	MODIFICATION TO MATCH LINES AND GRADING LIMITS	DJ	MLD	BRC		DG	FAC90173
1	06-18-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	DJ	MLD	BRC		DG	FAC90173

DENNIS R. GROSSO NEW MEXICO 13240 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
PLAN AND SECTION (STA: 60+00 TO STA: 80+00)

aps

SCALE AS-NOTED DATE 01-04-10

DWN	APPROVED	W A
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	5

WORK SAFELY TODAY

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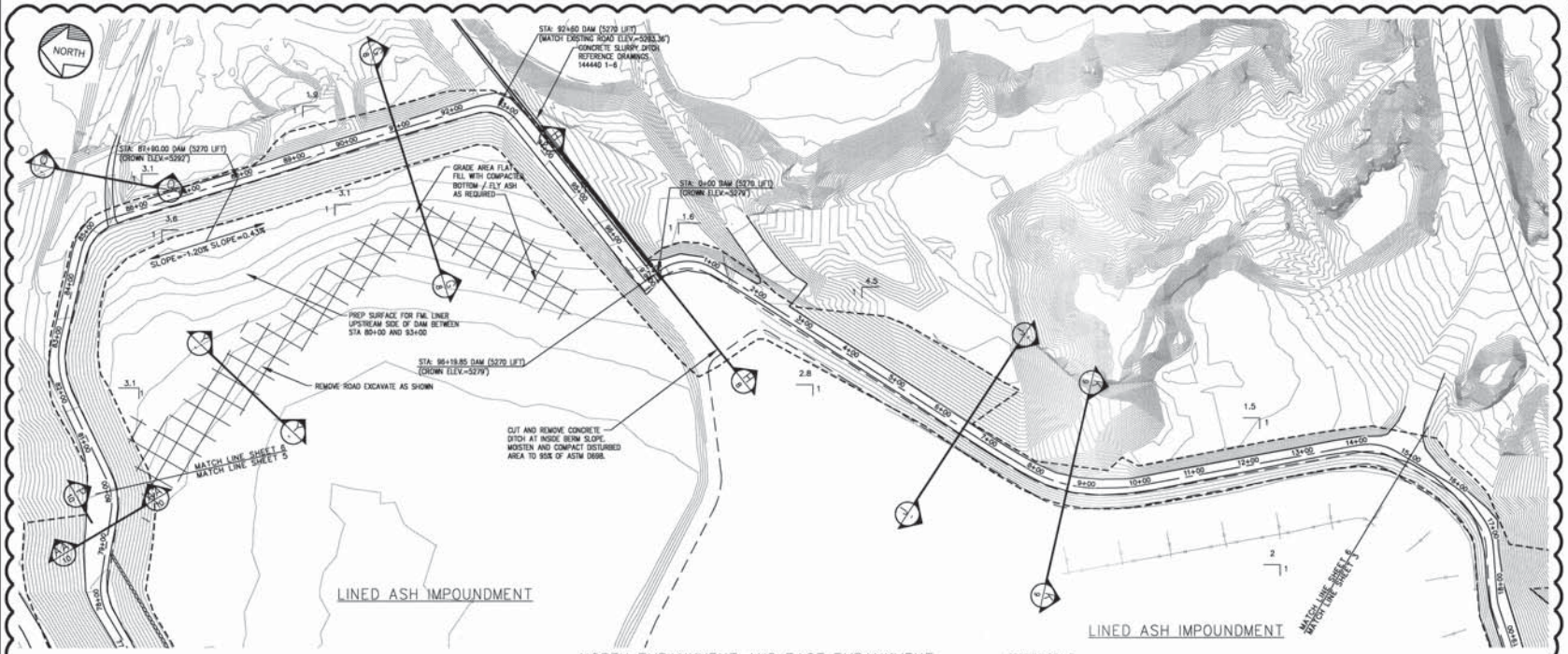
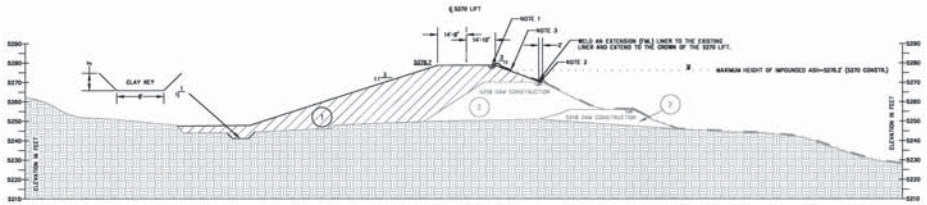


NORTH EMBANKMENT AND EAST EMBANKMENT

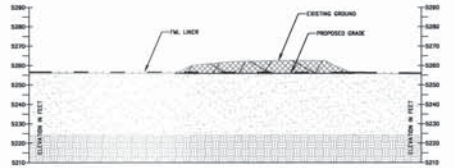
SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



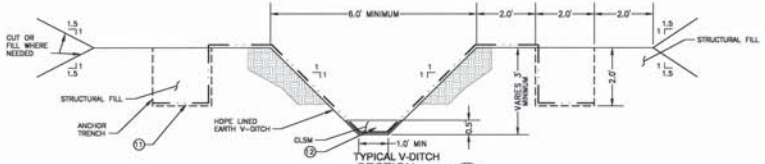
SECTION J J TYPICAL NORTH AND EAST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.



SECTION Y Y REMOVE ROAD AND EXCAVATE AS SHOWN
HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.



TYPICAL V-DITCH SECTION Q

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SH.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SH.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- COMPACTED SHALE BLANKET
- ORIGINAL GROUND SURFACE
- EXCAVATION AREAS
- EXISTING FLY ASH BASE
- COMPACTED BOTTOM ASH
- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- FML LINER
- ADDITIONAL GRADING AREA
- CLAY KEY CENTERLINE

REVISION 1 CHANGES.
1 UPDATED EXISTING TOPO TO SHOW 5258 ASBUILT TOPO.
2 SIMPLIFIED SECTION LINE TYPES FOR LEGIBILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES.
1 UPDATED EXISTING CLAY KEY CENTERLINE TO SHOW THE NEW LOCATION OF THE CLAY KEY CENTERLINE.

REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

GENERAL NOTES:
1. EXCAVATE CHANNEL FOR V-DITCH ALONG THE CENTERLINE AS SHOWN. MAINTAIN A 1-FOOT MINIMUM BOTTOM WIDTH.
2. NORTHING AND EASTING ARE APPROXIMATE.
3. FIELD VERIFY AND EXCAVATE 6 INCHES BELOW EXISTING CHANNEL BOTTOM FLOW LINE ELEVATION.
4. REMOVE BROKEN SECTION OF EXISTING CONCRETE V-DITCH TO CLEAN EDGE AND OVER EXCAVATE 1 FOOT TO THE EAST OF CLEAN EDGE.
5. MAINTAIN A 300 FOOT MINIMUM CURVE RADIUS.
6. MAINTAIN A MINIMUM CHANNEL SLOPE OF 2.0%
7. CHANNEL SIDE SLOPES SHALL NOT BE CONSTRUCTED STEEPER THAN 1:1.
8. V-DITCH TO INTERSECT THE LAI AT APPROXIMATELY STATION 85+35.50.
9. EXCAVATE ANCHOR TRENCH ALONG THE ENTIRE LENGTH OF THE NEW V-DITCH EXTENSION.
10. HDPE LINER TO BE INSTALLED BY OTHERS. ANCHOR TRENCH BACKFILL TO BE COMPLETED BY OTHERS.
11. 60 MIL HDPE LINER TO BE INSTALLED BY OTHERS. TIE INTO LINEAR EXTENSION.
12. CLSM TO BE INSTALLED ONCE LINER IS IN PLACE AND IS TO MATCH EXISTING CHANNEL BOTTOM FLOW LINE ELEVATION WHERE NEW V-DITCH EXTENSION MEETS OLD V-DITCH.
13. V-DITCH SHALL DAYLIGHT ON THE UPSTREAM SLOPE OF THE LAI EMBANKMENT.
14. COMPACT STRUCTURAL FILL TO MINIMUM COMPACTION OF 95% OF MAXIMUM DRY DENSITY PER ASTM D698. CONSULT CURRENT SPECIFICATIONS OF THE 5270 LIFT CONSTRUCTION FOR ADDITIONAL DETAILS.

BYRON R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/29/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
2	5-13-11	CHANGE ORDER PER NEW MEXICO STATE ENGINEERS OFFICE	SEB					FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

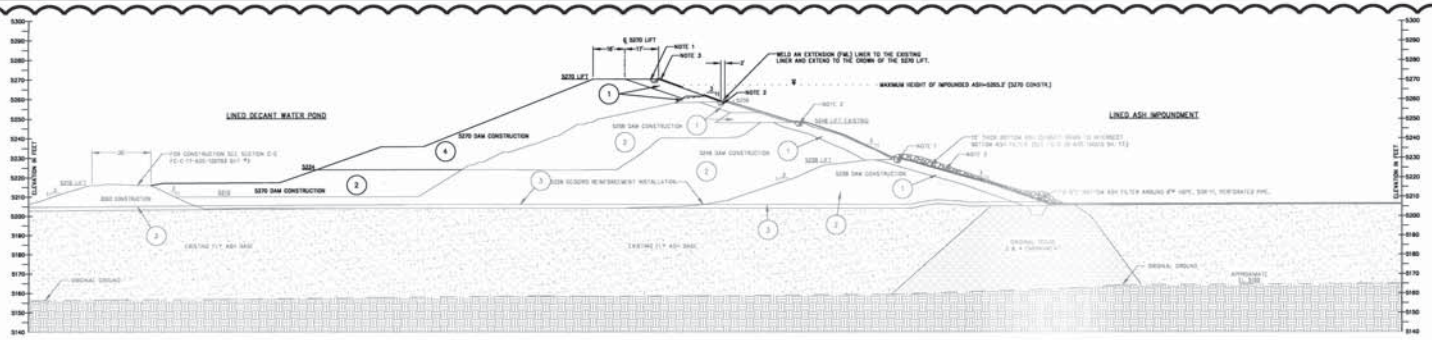
FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
PLAN AND SECTION (STA: 80+00 TO STA: 15+00)

aps

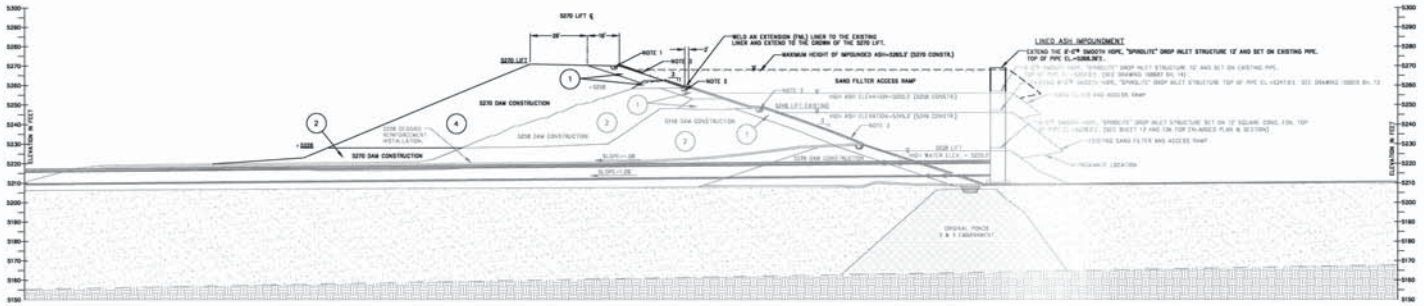
SCALE AS-NOTED DATE 01-04-10
DWN SMS
CHD MLD
EXD BRC
RVWD
APPROVED
DENNIS DEL GROSSO
ENGINEERING SUPERVISOR
W A FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	6

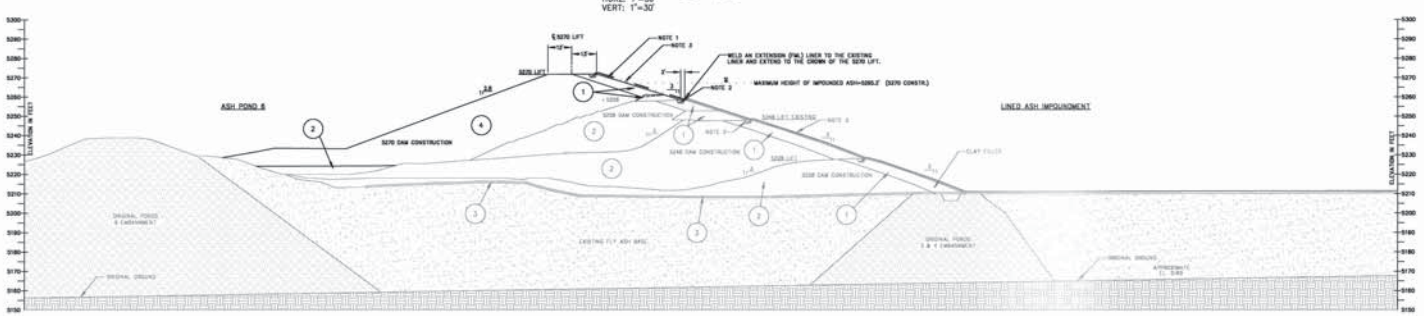
DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CA



SECTION (A/4) (A/4) SOUTHWEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'



SECTION (B/4) (B/4) WEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'



SECTION (D/5) (D/5) WEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SR.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SR.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- ORIGINAL PONDS 3, 4 & 5 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- 5270 LIFT EMBANKMENT
- COMPACTED CLAY
- EXISTING LIFTS
- GEOGRID
- FML LINER

REVISION 1 CHANGES.
1 UPDATED EXISTING SECTIONS TO SHOW 5258 ASBUILT.
2 SIMPLIFIED SECTION LINE TYPES FOR LEDGABILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES.
1 UPDATE FOR CHANGE IN THE INTERIM RAISE IN THE CLAY BLANKET

REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

STEVEN R. CONGDO NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
2	11-19-10	INTERIM CLAY BLANKET	JEO	JH	BRC		DDG	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SECTIONS

aps

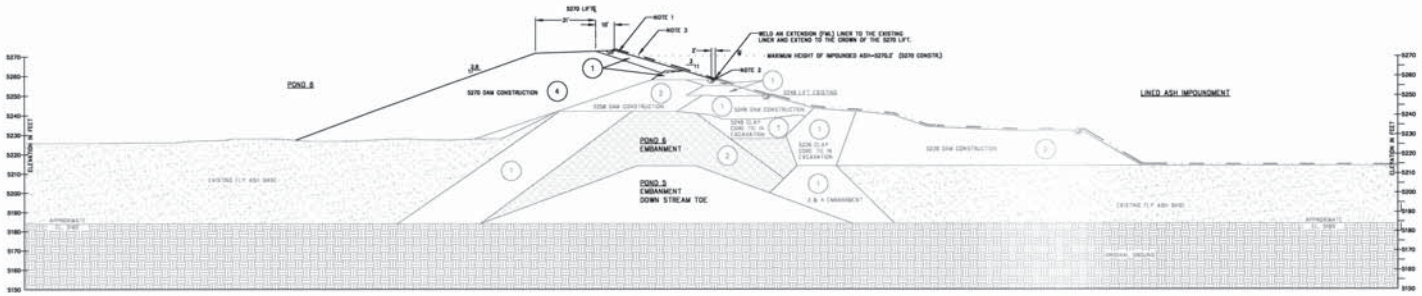
SCALE AS-NOTED DATE 01-04-10

DWN	APPROVED	W.A.
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

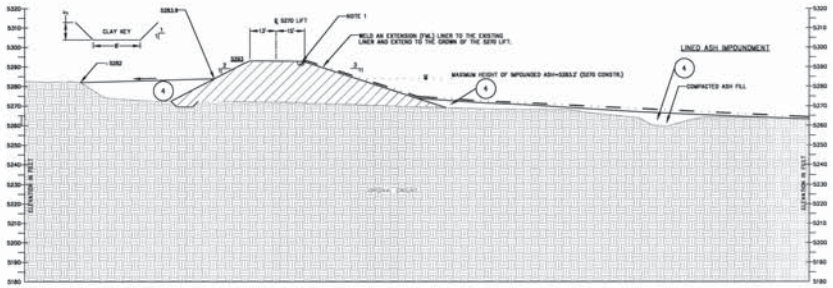
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	7

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CA

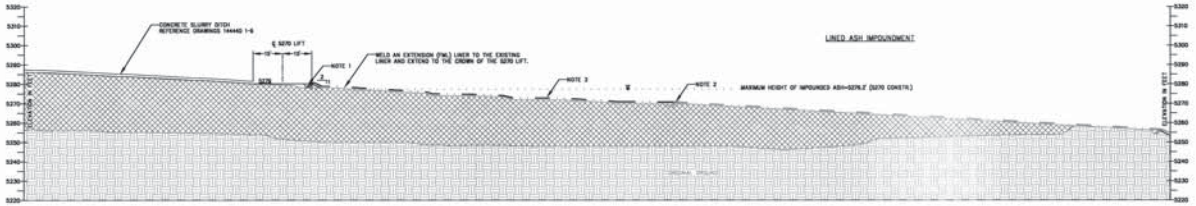


SECTION E/5 E/5 WEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'



NOTE
CONSTRUCT 5270 LIFT FROM STA 88+00 TO STA 91+00 WITH COMPACTED SHALE BLANCKET AND COMPACTED BOTTOM ASH AS SHOWN IN SECTION G

SECTION G/6 G/6 NORTH SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'



SECTION H/6 H/6 NORTH SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SH.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SH.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- ORIGINAL PONDS 3, 4 AND 6 EMBANKMENT
- COMPACTED SHALE BLANKET
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- COMPACTED BOTTOM ASH
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- COMPACTED CLAY
- FML LINER

REVISION 1 CHANGES.
1 UPDATED EXISTING SECTIONS TO SHOW 5258 ASBUILT.
2 SIMPLIFIED SECTION LINE TYPES FOR LEGGABILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES.
1 UPDATE FOR CHANGE IN THE INTERIM RAISE IN THE CLAY BLANKET

REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

3

BYRON R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/29/2014

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
2	11-19-10	INTERIM CLAY BLANKET	JEO	JH	BRC		DDG	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SECTIONS

aps

SCALE AS-NOTED DATE 01-04-10

DWN	APPROVED	W A
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC	UNIT FC / DISC C / TYPE 65 / SYS ADS / NUMBER 158134	SHEET 8
RVWD		

WORK SAFELY TODAY

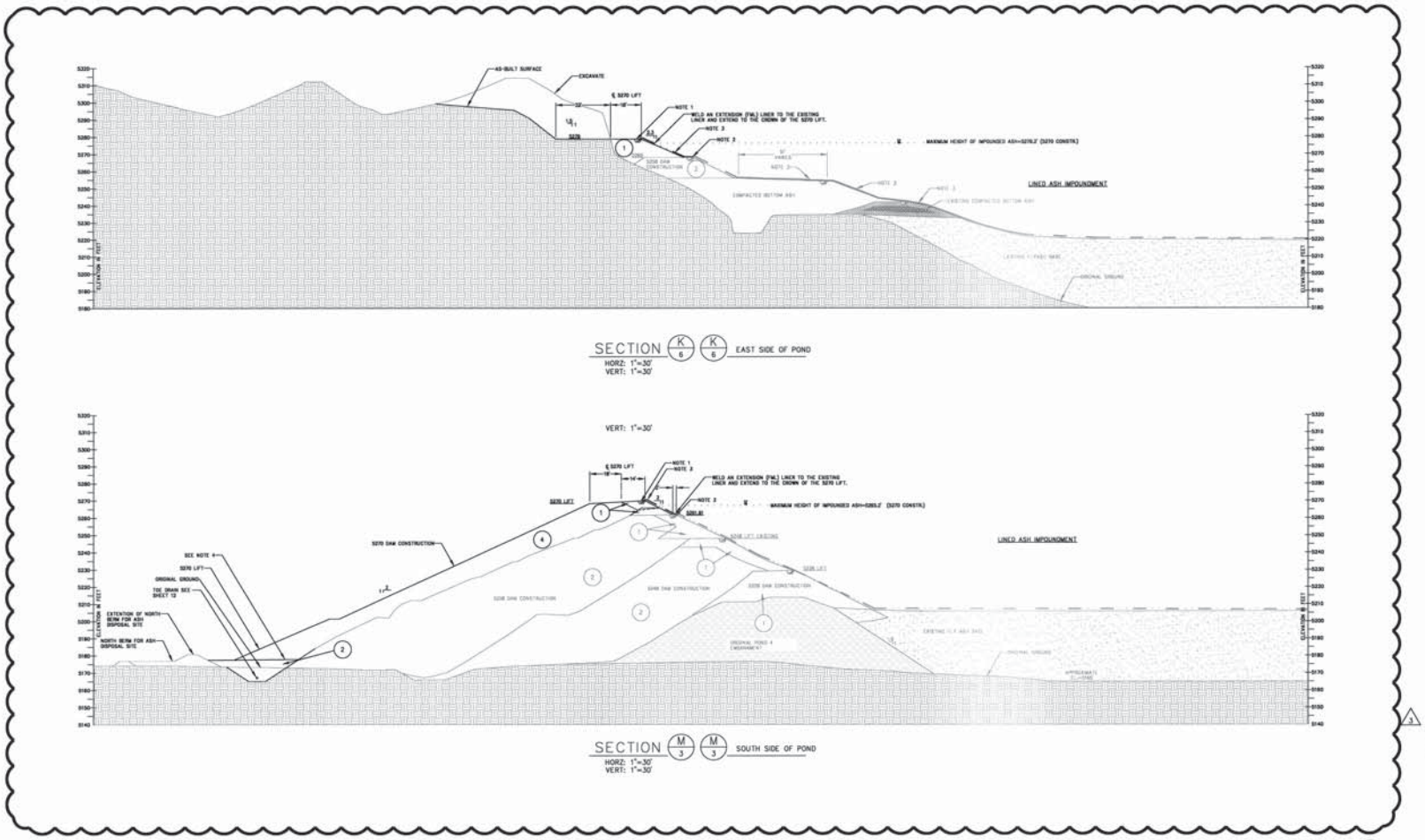
DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5.0_Technical\5.6_CA

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SR.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SR.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408
4. FIRST 5 FEET OF FILL OVER THE LAI INTERCEPT TRENCH TO BE COMPACTED BOTTOM ASH. TOP ELEVATION VARIES.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH



SECTION (K) (6) (K) (6) EAST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'

SECTION (M) (3) (M) (3) SOUTH SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'

LEGEND

- ORIGINAL DAM EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- BACK LINER TIE AREA COMPACTED BOTTOM ASH
- ROCK FILL 5228 CONSTRUCTION
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- COMPACTED CLAY
- FML LINER

REVISION 1 CHANGES.
1 UPDATED EXISTING TOPO TO SHOW 5258 ASBUILT TOPO.
2 SIMPLIFIED SECTION LINE TYPES FOR LEGIBILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES.
1 UPDATE FOR CHANGE IN THE INTERIM RAISE IN THE CLAY BLANKET

△3 REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS △3

BYRON R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 inch = 30 ft.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
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1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SECTIONS

aps

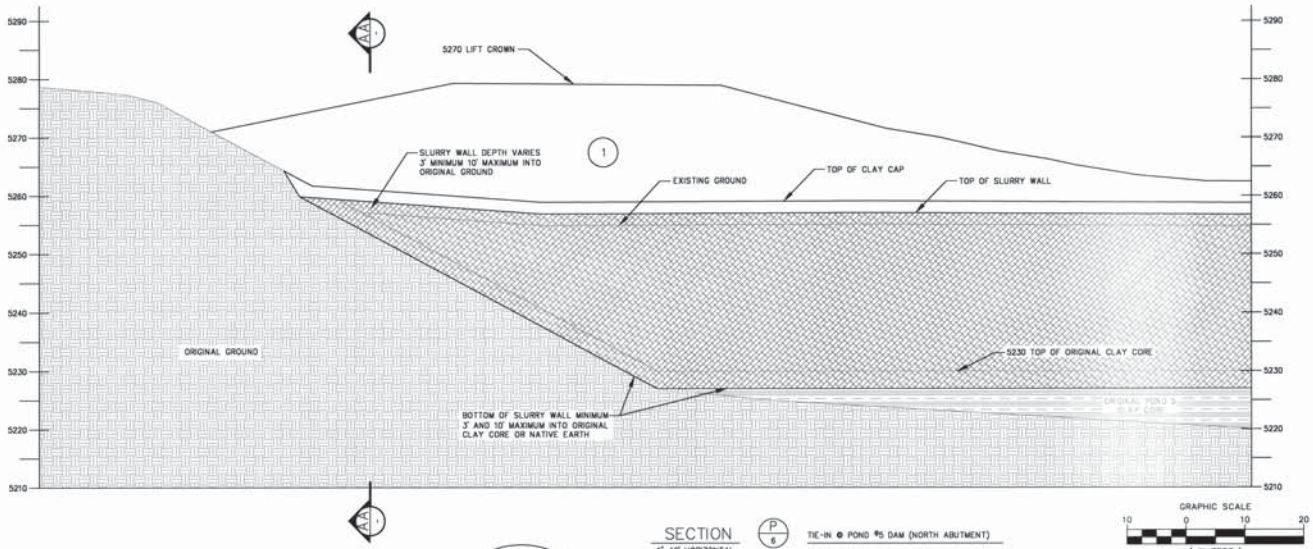
SCALE AS-NOTED DATE 01-04-10

DWN	APPROVED	W A
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

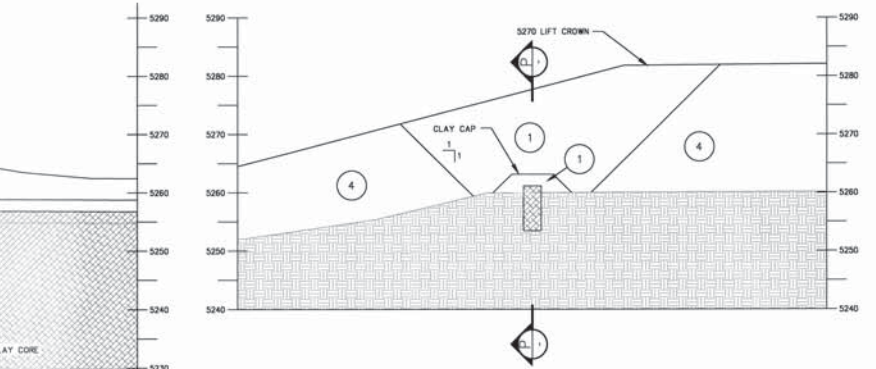
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	9

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5.0_Technical\5.6_CA

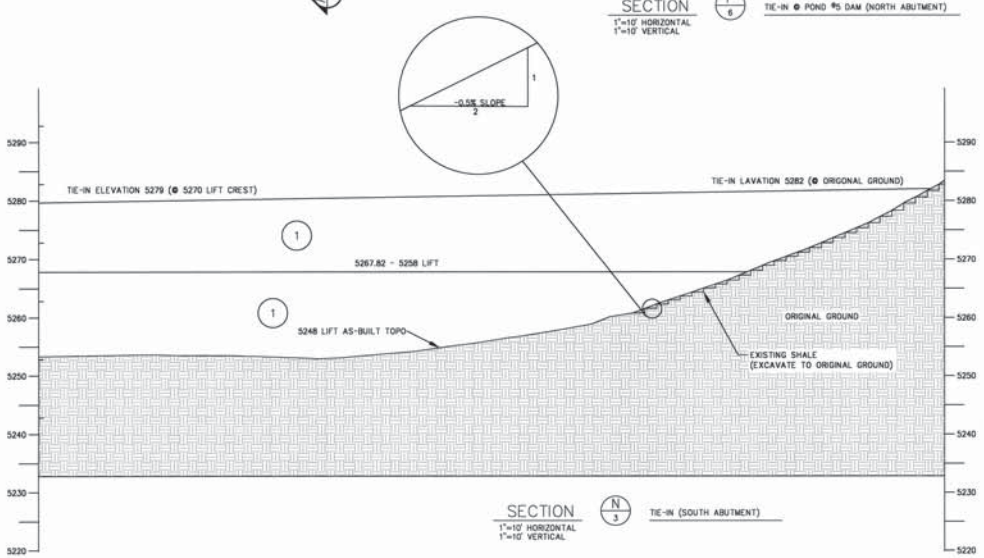


SECTION AA — TIE-IN @ POND #5 DAM (NORTH ABUTMENT)
1"=10' HORIZONTAL
1"=10' VERTICAL



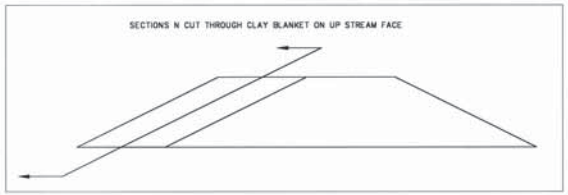
SECTION AA — TIE-IN @ POND #5 DAM (NORTH ABUTMENT)
1"=10' HORIZONTAL
1"=10' VERTICAL

GRAPHIC SCALE
10 0 10 20
(IN FEET)
1 inch = 10 ft.



SECTION N — TIE-IN (SOUTH ABUTMENT)
1"=10' HORIZONTAL
1"=10' VERTICAL

GRAPHIC SCALE
10 0 10 20
(IN FEET)
1 inch = 10 ft.



LEGEND

- EXISTING POND 5 EMBANKMENT BROKEN SHALE
- CLAY CORE POND 5 ABOVE 5230
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- CLAY CORE POND 5
- SLURRY WALL

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT- BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

REVISION 1 CHANGES:
1 UPDATED EXISTING TOPO TO SHOW 5258 ASBUILT TOPO.
2 SIMPLIFIED SECTION LINE TYPES FOR LEGIBILITY
3 IDENTIFIED MAXIMUM ASH HEIGHT
4 ADJUSTED 5270 LIFT CENTERLINE ALIGNMENT

REVISION 2 CHANGES:
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

BYRON R. CONGER NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	06-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SECTIONS

aps

SCALE NOTED DATE 01-04-10

DWN	APPROVED	W.A.
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

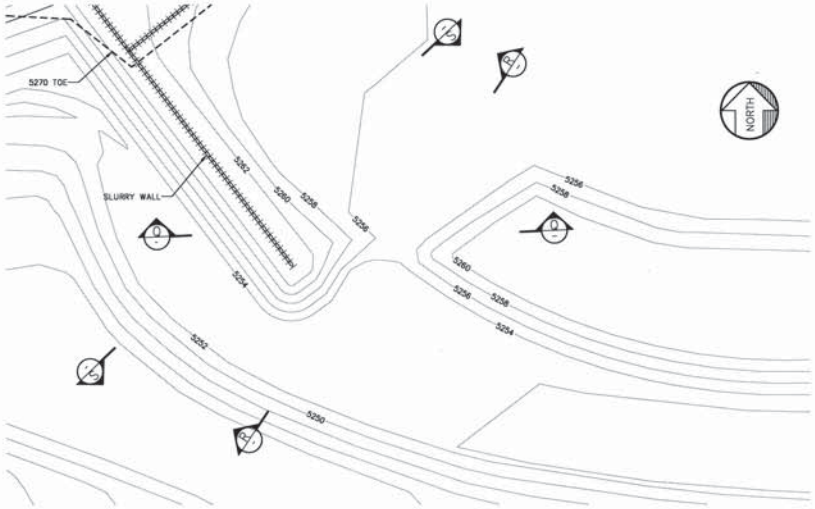
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	10

WORK SAFELY TODAY

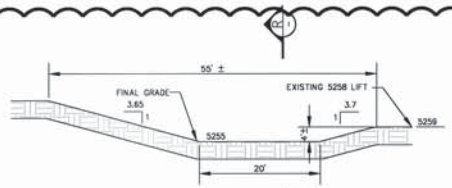
DRAWING: P:\WRES\Arizona_Public_Service\23448038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

NOTES

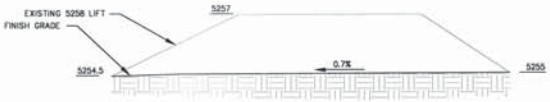
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. SEE DETAIL 4 158144 SH.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. SEE DETAIL 5 158144 SH.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152408 SH. 3



DETAIL 1/5 ENLARGED PLAN OF NOTCH CUT
SCALE: 1"=20'



SECTION Q Q NOTCH CUT
SCALE: 1"=10'



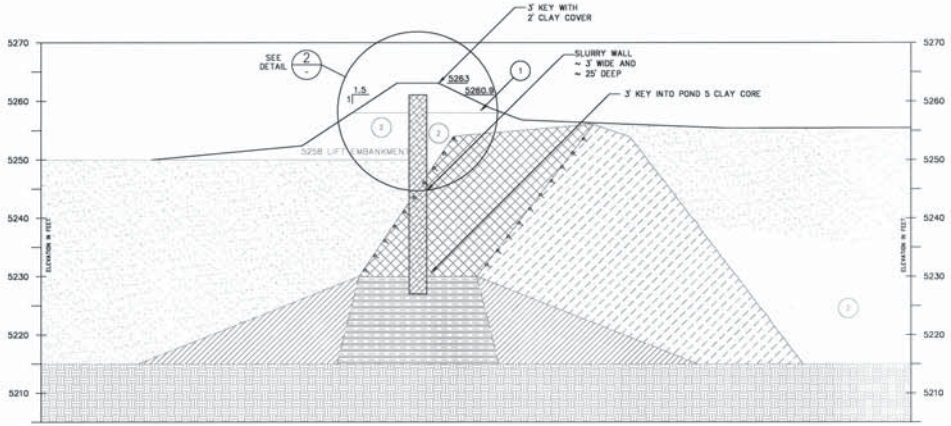
SECTION R R NOTCH CUT
NOT TO SCALE

NEW DAM EMBANKMENT MATERIALS

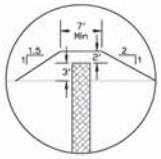
1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

LEGEND

- EXISTING POND 5 EMBANKMENT BROKEN SHALE
- EXISTING POND 5 EMBANKMENT BROKEN SHALE AND BOTTOM ASH
- CLAY CORE POND 5 ABOVE 5230
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- CLAY CORE POND 5
- SLURRY WALL
- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- 5270 LIFT EMBANKMENT
- EXISTING LIFTS
- FML LINER
- LIMITS OF EXCAVATION
- CEMENT-BENTONITE CUTOFF WALL



SECTION S 5.20 S 5.20 EXISTING NORTH EMBANKMENT
HORZ: 1"=10'
VERT: 1"=10'
STA: 65+50.00, 150' RT



DETAIL 2 CLAY CAP DIMENSIONS
SCALE: 1"=10'

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.

BYRON R. CONRAD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	10-18-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SECTIONS

aps

SCALE: NOTED DATE: 01-04-10

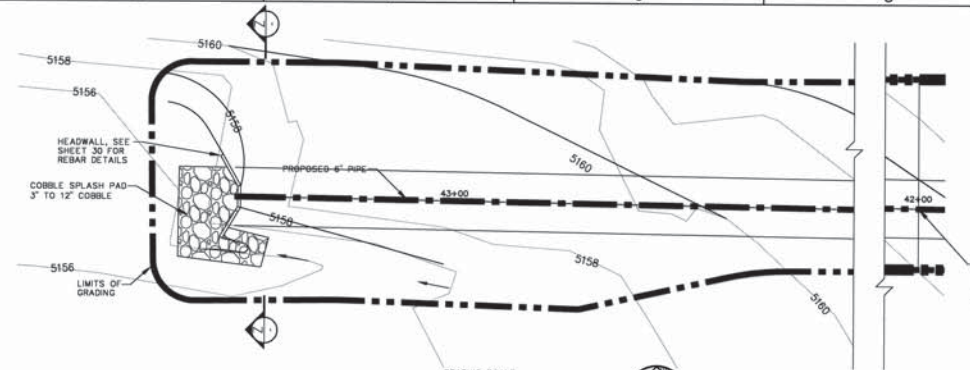
DWN	SMS	APPROVED	W.A.
CHD	MLD	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
EXD	BRC		
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	11

REVISION 2 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC



HEADWALL GRADING PLAN
SCALE: 1"=10'

GRAPHIC SCALE
10 0 10 20
(IN FEET)
1 inch = 10 ft.

NORTH

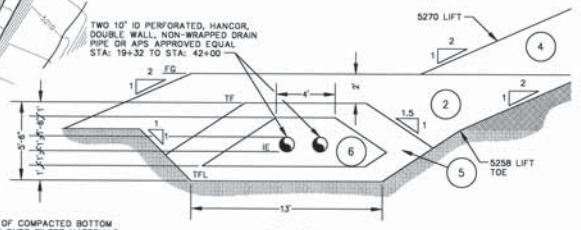
LEGEND

GB	GRADE BREAK		EXISTING EMBANKMENT
STA	STATION		ORIGINAL GROUND SURFACE
ID	INTERCEPT DITCH		DRAIN MATERIAL 2
IE	INVERT ELEVATION		DRAIN MATERIAL 1
FG	FINISH GRADE		COMPACTED CLAY FILL
TW	TOP OF HEADWALL		5270 LIFT TOE
CSP	COBBLE SPLASH PAD		5280 LIFT TOE
T	TRENCH		TOE DRAIN LIMITS OF GRADING
P	PIPE		ORIGINAL GROUND SURFACE
TF	TOP OF FILTER MATERIAL		TOE DRAIN
TFL	TRENCH FLOW LINE		TOE DRAIN CENTER LINE

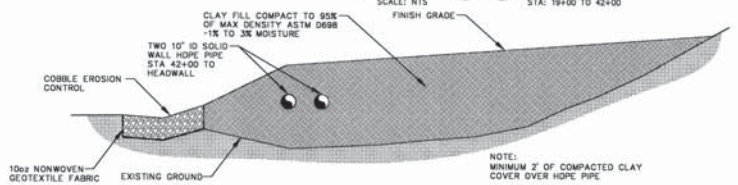
TOE DRAIN PLAN VIEW
SCALE: 1"=100'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

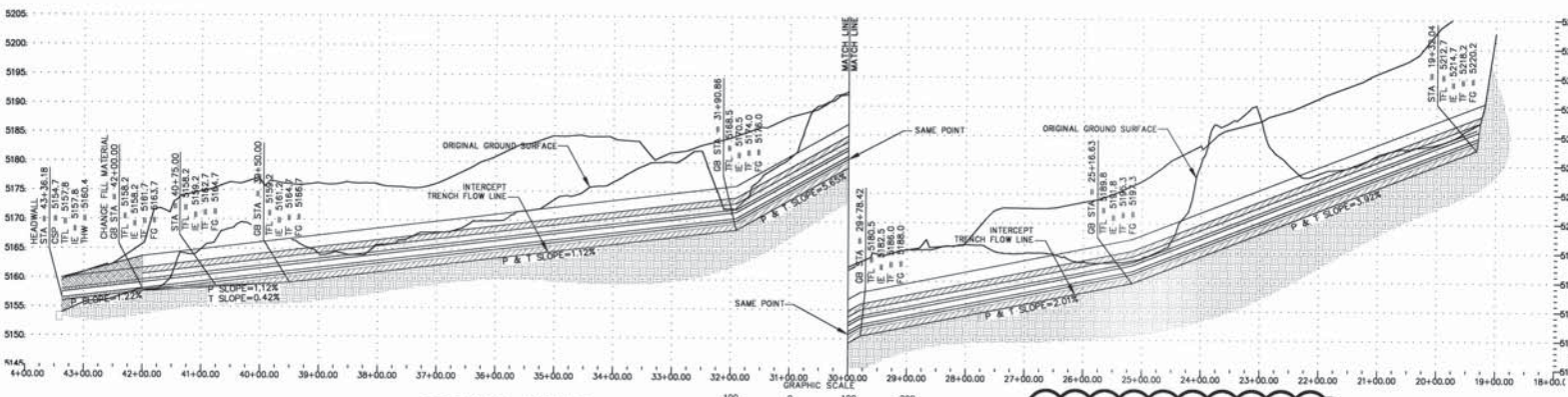
NORTH



SECTION X-X
SCALE: NTS
TYPICAL INTERCEPT DITCH
STA: 19+00 TO 42+00



SECTION Z-Z
SCALE: 1/2" = 1'
TYPICAL INTERCEPT DITCH
STA: 42+00 TO HEADWALL



TOE DRAIN PROFILE
HORZ: 1"=100'
VERT: 1"=10'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

REVISION 2 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITION

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH
5. DRAIN MATERIAL 1 - SEE SPECIFICATIONS
6. DRAIN MATERIAL 2 - SEE SPECIFICATIONS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	10-14-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	KDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT POND
LAI INTERCEPT TRENCH PLAN AND PROFILE

aps

SCALE AS-NOTED DATE 01-04-10

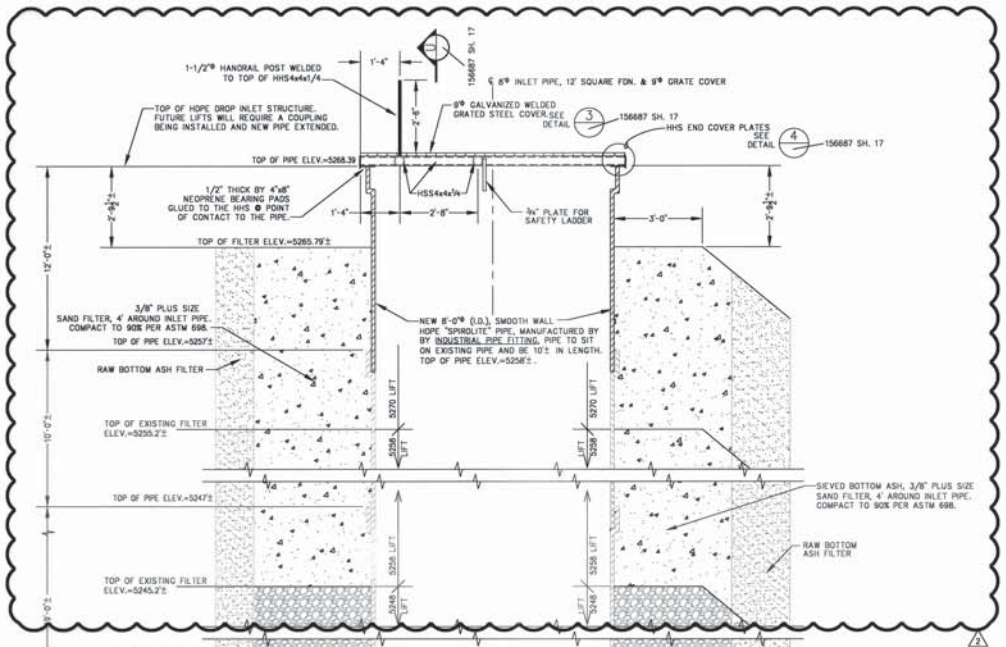
DWN	APPROVED	W A
SMS	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	12

WORK SAFELY TODAY

BYRON R. CONRAD NEW MEXICO 13248 04/12/12

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CA



NOTES

1. 8'ø PIPE TO HAVE PERCOLATION SLOTS DRILLED INTO THE THE PIPE WALLS PER SPECIFICATIONS.
2. 8'-0" IS THE INSIDE DIA. OF THE PIPE. (BELL FITTING I.D. IS SLIGHTLY LARGER)
3. ACCESS DOOR IN GRATE AND GRATING REINFORCING NOT SHOWN FOR CLARITY. SEE DETAIL 3 — 156687 SH. 17
4. 3/8"+ BOTTOM ASH FILTERS TO BE COMPACTED TO 90% PER ASTM 698, AROUND BOTH PIPES AND FULL LENGTH BACK TO THE DAM.

DETAIL 6
SCALE: NOT TO SCALE

NEW 10 DROP INLET PIPE

REVISION 2 CHANGES.
1 UPDATED TOP OF PIPE
2 UPDATED EXTENSION LENGTH
3 UPDATED TOP OF FILTER
2

BYRON R. CONRAD — NEW MEXICO — 13248 — REGISTERED PROFESSIONAL ENGINEER
04/27/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT POND
DROP INLET PIPE DETAIL

aps

SCALE: NOTED — DATE: 12-15-09

DWN	CHD	EXD	RVWD	APPROVED	W A
SMS	MLD	BRC		JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	13

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

REQUIRED SIGNATURE FOR CONFINED SPACE

SAFETY REPRESENTATIVE DATE

NOTES:

1. EMBEDMENT SHOULD BE PLACED AROUND THE MANHOLE RISER FOR THE FULL HEIGHT OF THE MANHOLE.
2. EMBEDMENT SHALL EXTEND A MINIMUM OF THREE AND A HALF (3.5) FEET FROM THE RISER OR TO THE TRENCH WALL; WHICHEVER IS THE GREATER DISTANCE.
3. EMBEDMENT AROUND MANHOLE RISER IS REQUIRED TO BE CLASS I OR II MATERIAL PER ASTM D2321, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.
4. MANHOLES SHALL BE INSTALLED IN A DRY TRENCH WITH A STABLE FOUNDATION. THE FOUNDATION SHOULD CONSIST OF A MINIMUM OF 8" OF CLASS I MATERIAL COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
5. WHEN VEHICLE LOADS ARE PRESENT, A CONCRETE CAP OR OTHER SUCH STRUCTURE DESIGNED TO WITHSTAND THESE LOADS SHOULD BE PLACED OVER THE MANHOLE SO THAT THE LOADS ARE TRANSMITTED INTO THE SURROUNDING SOIL AND NOT DIRECTLY INTO THE RISER.
6. THE FOLLOWING PARAMETERS WERE ASSUMED:
   A) MAXIMUM SOIL DENSITY OF 120 LBS/FT^3.
   B) GROUND WATER NOT TO EXCEED TOP OF THE MANHOLE. FLOTATION OF MANHOLE MAY NEED TO BE ADDRESSED. WHEN A POLYETHYLENE ANCHOR CONNECTION RING IS INCLUDED, IT MUST BE USED IN CONJUNCTION WITH A CONCRETE ANCHOR BY OTHERS. THE PE ANCHOR CONNECTION RING IS NOT DESIGNED TO RESTRAIN THE STRUCTURE BY ITSELF.
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 70B664. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. 1,080 1/2"ø PERFORATIONS WILL BE DRILLED INTO THE RISER. THE HOLES WILL BE ON 11-INCH CENTERS WITH 27 HOLES PER ROW. THE ROWS WILL BE 6" APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2".

SAFETY NOTE TO OWNER/PURCHASER

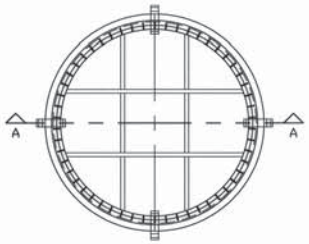
MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

QUOTE NUMBER: S-6930
CUSTOMER: BYRON CONRAD
PROJECT: ARIZONA PUBLIC SERVICE COMMISSION
SHEET 1 OF 1
PLOT DATE: 10/2/03

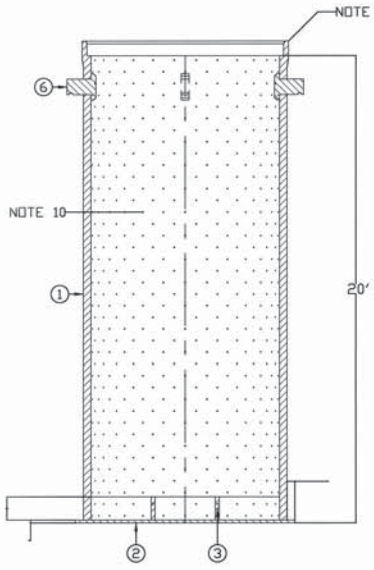
SUBMITTAL AND APPROVAL STAMP	
CUSTOMER:	HUGHES
ORDER/QUOTE #:	S-6943
APPROVED FOR FABRICATION	
SIGNATURE:	
DATE:	

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	20	FT.	-	-	96" I.D.	CLASS 315	HDPE - SW RISER STOCK (PE X B)
2	86.7	SQFT.	-	-	1-1/2" THICK	-	HDPE - PLATE STOCK (BOTTOM)
3	30.4	SQFT.	-	-	2" THICK	-	HDPE - PLATE STOCK (GUSSETS)
DELETED ~~4~~	~~1~~	~~EA.~~			~~16" IPS~~	~~DR 11~~	~~HDPE - STUB-OUT 2' LONG (SHIP LOOSE)~~
DELETED ~~5~~	~~1~~	~~EA.~~			~~8" IPS~~	~~DR 11/15.5~~	~~HDPE - STUB-OUT 2' LONG (SHIP LOOSE)~~
6	4	EA.	-	-	-	-	LIFTING LUGS



PLAN VIEW



SECTION VIEW A - A

REV.	DESCRIPTION	DWN. DATE
1	DELETED THE 8" (ITEM 5) & 16" (ITEM 4) STUB-OUTS FROM THE BILL OF MATERIAL	PTC 10/03

DEPT.	APPROVAL	DATE
MFG.		
MKT.		
TECH.		

Performance Pipe
a division of
Chevron Phillips Chemical Company LP

TITLE: 96" I.D. CLASS 315 HDPE PERFORATED MANHOLE - 20' TALL

DRAWING NUMBER: CU91B619 REVISION: 1

DRAWN BY: PTC
DATE: 9/12/03
CHECKED BY:
SCALE: NONE
TOLERANCES:
DECIMAL: ±2"
FRACTIONAL: ±2"
ANGULAR: ±2°

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
DROP INLET PIPE VENDOR DRAWING (5228)

aps

SCALE: NONE DATE: 12-15-09

DWN	APPROVED	W.A.
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173
CHD: MLD		
EXD: BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	14

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

NOTES:

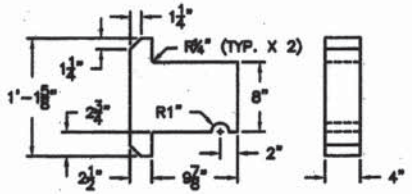
1. EMBEDMENT SHOULD BE PLACED AROUND THE MANHOLE RISER FOR THE FULL HEIGHT OF THE MANHOLE.
2. EMBEDMENT SHALL EXTEND A MINIMUM OF THREE AND A HALF (3.5) FEET FROM THE RISER OR TO THE TRENCH WALL; WHICHEVER IS THE GREATER DISTANCE.
3. EMBEDMENT AROUND MANHOLE RISER IS REQUIRED TO BE CLASS I OR II MATERIAL PER ASTM D2321, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.
4. MANHOLES SHALL BE INSTALLED IN A DRY TRENCH WITH A STABLE FOUNDATION. THE FOUNDATION SHOULD CONSIST OF A MINIMUM OF 8" OF CLASS I MATERIAL COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
5. WHEN VEHICLE LOADS ARE PRESENT, A CONCRETE CAP OR OTHER SUCH STRUCTURE DESIGNED TO WITHSTAND THESE LOADS SHOULD BE PLACED OVER THE MANHOLE SO THAT THE LOADS ARE TRANSMITTED INTO THE SURROUNDING SOIL AND NOT DIRECTLY INTO THE RISER.
6. THE FOLLOWING PARAMETERS WERE ASSUMED:
   A) MAXIMUM SOIL DENSITY OF 120 LBS/FT.^{3}
   B) GROUND WATER NOT TO EXCEED TOP OF THE MANHOLE. FLOTATION OF MANHOLE MAY NEED TO BE ADDRESSED. WHEN A POLYETHYLENE ANCHOR CONNECTION RING IS INCLUDED, IT MUST BE USED IN CONJUNCTION WITH A CONCRETE ANCHOR BY OTHERS. THE PE ANCHOR CONNECTION RING IS NOT DESIGNED TO RESTRAIN THE STRUCTURE BY ITSELF.
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 70B664. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. 999 1/2"ø PERFORATIONS WILL BE DRILLED INTO THE RISER. THE HOLES WILL BE ON 11-INCH CENTERS WITH 27 HOLES PER ROW. THE ROWS WILL BE 6" APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2".
11. TWO SETS OF WOOD SUPPORTS WILL BE INCLUDED TO HOLD THE PIPE AS ROUND AS POSSIBLE FOR SHIPPING.

SAFETY NOTE TO OWNER/PURCHASER

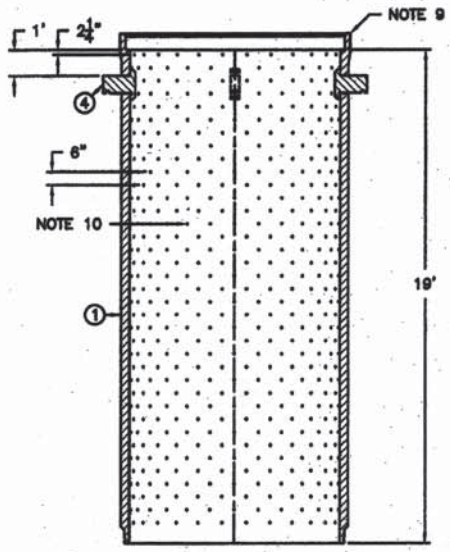
MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	19	FT.	–	–	96" I.D.	CLASS 315	HDPE – SW RISER STOCK (B X S)
2	4	EA.	–	–	4" THK	–	LIFTING LUGS (SEE LIFTING LUG DETAIL)



ITEM 4 – LIFTING LUG DETAIL
EXTRUDER WELD INSIDE & OUT



SECTION VIEW A – A

SUBMITTAL AND APPROVAL STAMP
APPROVED FOR FABRICATION
SIGNATURE:
DATE:

NOTES:

1.) ALL DIMENSIONS ARE IN INCHES.
2.) FRACTIONAL TOLERANCE ± 2"
3.) ANGULAR TOLERANCE ± 2°

REFERENCE DRAWINGS
DO NOT SCALE DRAWING
N.T.S.
1 CHANGED FLAT SECTION TO SPIRIT END MF 4/30/09
REV DESCRIPTION BY CHK APP DATE

INDUSTRIAL PIPE FITTINGS
6030 OSBORN ST Phone: 713-645-2555
HOUSTON, TEXAS 77033 Fax: 713-645-1766

96" CLASS 315
HDPE PERFORATED MANHOLE
20' TALL
ARIZONA PUBLIC SERVICE CO.
DWG. NO. MH 91B110 SHEET 1 OF 1 REV 1

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
DROP INLET PIPE VENDOR DRAWING (5248)

aps

SCALE NONE DATE 12-15-09

DWN	APPROVED	W.A.
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	15

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_8_CADD\APS_EDC

NOTES:

1. EMBEDMENT SHOULD BE PLACED AROUND THE MANHOLE RISER FOR THE FULL HEIGHT OF THE MANHOLE.
2. EMBEDMENT SHALL EXTEND A MINIMUM OF THREE AND A HALF (3.5) FEET FROM THE RISER OR TO THE TRENCH WALL; WHICHEVER IS THE GREATER DISTANCE.
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6. THE FOLLOWING PARAMETERS WERE ASSUMED:
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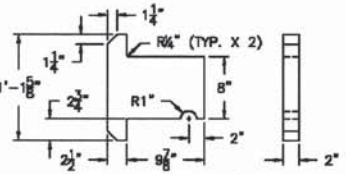
   B) GROUND WATER NOT TO EXCEED TOP OF THE MANHOLE. FLOTATION OF MANHOLE MAY NEED TO BE ADDRESSED. WHEN A POLYETHYLENE ANCHOR CONNECTION RING IS INCLUDED, IT MUST BE USED IN CONJUNCTION WITH A CONCRETE ANCHOR BY OTHERS. THE PE ANCHOR CONNECTION RING IS NOT DESIGNED TO RESTRAIN THE STRUCTURE BY ITSELF.
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 708664. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. (405) 1/2"ø PERFORATIONS WILL BE DRILLED INTO THE RISER. THE HOLES WILL BE ON 11-INCH CENTERS (OF ID) WITH 27 HOLES PER ROW. THE ROWS WILL BE 6" APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2".
11. TWO SETS OF WOOD SUPPORTS WILL BE INCLUDED TO HOLD THE PIPE AS ROUND AS POSSIBLE FOR SHIPPING.

SAFETY NOTE TO OWNER/PURCHASER

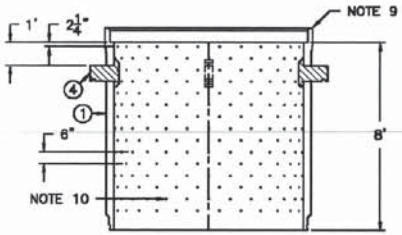
MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	8	FT.	–	–	96" I.D.	CLASS 315	HDPE – SW RISER STOCK (B X S)
2	4	EA.	–	–	2" THK	–	LIFTING LUGS (SEE LIFTING LUG DETAIL)



ITEM 4 – LIFTING LUG DETAIL
EXTRUDER WELD INSIDE & OUT



SUBMITTAL AND APPROVAL STAMP
CUSTOMER: ARIZONA PUBLIC SERVICE COM.
ORDER/QUOTE #: 91B7-1062
APPROVED FOR FABRICATION
SIGNATURE:
DATE:

NOTES:

1.) ALL DIMENSIONS ARE IN INCHES.
2.) FRACTIONAL TOLERANCE ± 2"
3.) ANGULAR TOLERANCE ± 2°

REFERENCE DRAWINGS

DO NOT SCALE DRAWING

REV.	DESCRIPTION	BY	CHK.	APP.	DATE
0	-	-	-	-	-

DRAWN BY: RGP 3-10-09
CHECKED BY:
ENGR. APP. BY:
SCALE: N.T.S
DATE:
MFG JOB. NO.

INDUSTRIAL PIPE FITTINGS
6030 OSBORN ST
HOUSTON, TEXAS 77033
Phone: 713-645-3358
Fax: 713-645-1758

96" CLASS 315
HDPE PERFORATED MANHOLE
8' TALL (B X S)
ARIZONA PUBLIC SERVICE CO.

DWG. NO. MH 91B110 SHEET 1 OF 1 REV. 0

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
DROP INLET PIPE VENDOR DRAWING (5258)

aps

SCALE: NONE DATE: 12-15-09

DWN: SMS
CHD: MLD
EXD: BRC
RVWD:

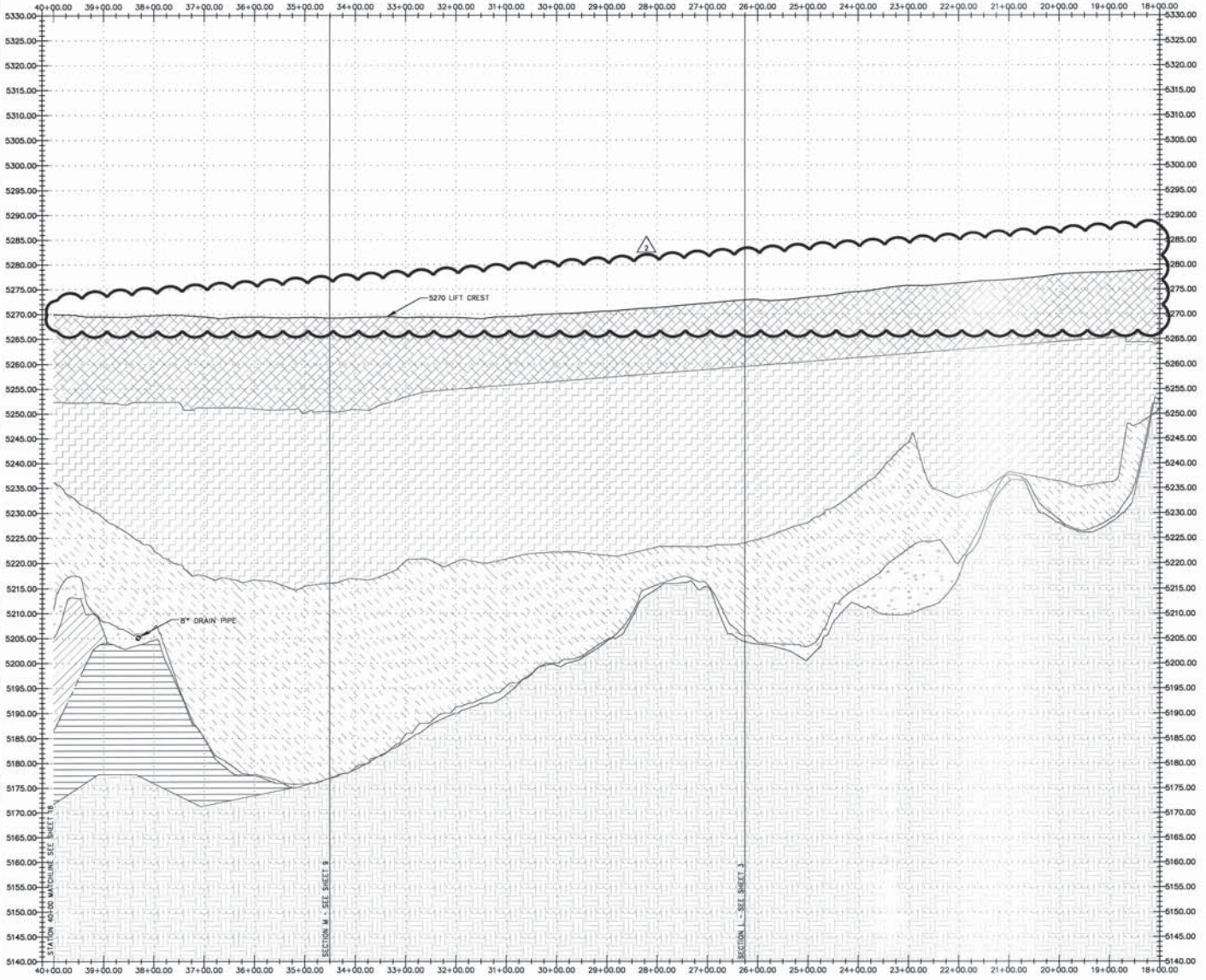
APPROVED: JOHN D. MITCHELL, ENGINEERING SUPERVISOR

W.A. FAC90173

UNIT	DISC.	TYPE	SYS.	NUMBER	SHEET
FC	C	39	ADS	158134	16

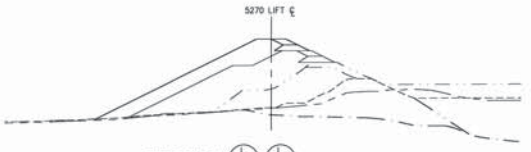
WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

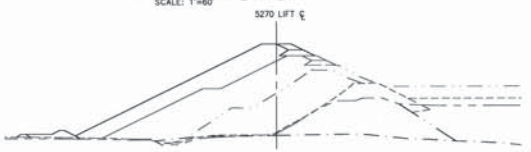


5270 LIFT LONG SECTION STA: 18+00.00 TO STA: 39+00.00
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION L 2,3 L 2,3 STA: 26+00.89
SCALE: 1"=60'



SECTION M 2,3 M 2,3 STA: 34+65.02
SCALE: 1"=60'

LEGEND

- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO

5270 LIFT EMBANKMENT
CONSTRUCTION BOTTOM ASH

5258 LIFT EMBANKMENT
CONSTRUCTION BOTTOM ASH
DWG: 156687 CONSTRUCTION SET

5248 LIFT EMBANKMENT
CONSTRUCTION BOTTOM ASH
DWG: 100003 SHEET 80

5228 LIFT EMBANKMENT
CONSTRUCTION BOTTOM ASH
DWG: 100003 SHEETS 71-76

POND 3 BOTTOM ASH EMBANKMENT
DWG: 110559 SHEETS 1-5

EXISTING GROUND SURFACE BEFORE
POND CONSTRUCTION
DWG: 144875 SHEET 1&2

POND 3 FLY ASH
DWG: 100003 SHEET 64

REVISION 2 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	10-18-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
LONGITUDINAL CROSS SECTION

aps

SCALE AS-NOTED DATE 12-15-09

DWN SMS
CHD MLD
EXD BRC
RVWD

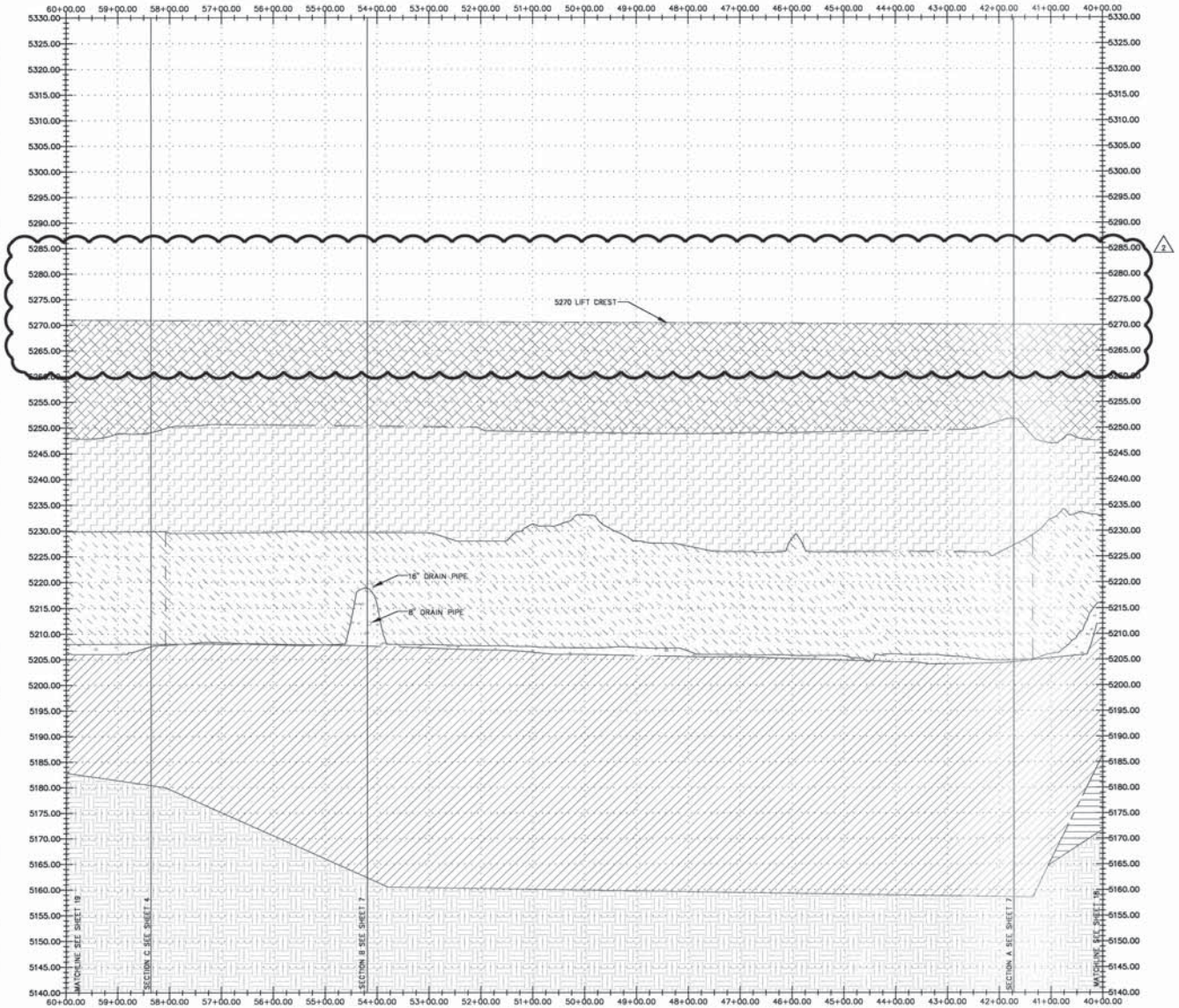
APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W A FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	17

WORK SAFELY TODAY

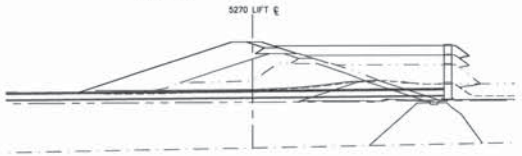
DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CA



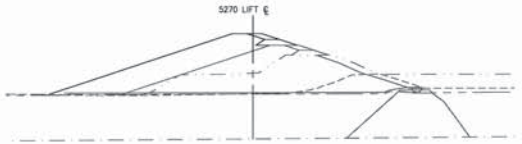
5270 LIFT LONG SECTION STA: 60+00.00 TO STA: 79+00.00
VERTICAL SCALE: 1"=10'
HORIZONTAL SCALE: 1"=100'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

SECTION A/2,4 A/2,4 STA: 41+35.04
SCALE: 1"=60'



SECTION B/2,4 B/2,4 STA: 53+79.15
SCALE: 1"=60'



SECTION C/2,4 C/2,4 STA:58+08.00
SCALE: 1"=60'

LEGEND

- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO
- PROPOSED 5270 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH
- 5258 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 156687 CONSTRUCTION SET
- 5248 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 DHEET 80
- 5228 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEETS 71-76
- POND 3 FLY ASH DWG: 100003 SHEET 64
- POND 3 BOTTOM ASH EMBANKMENT DWG: 110559 SHEETS 1-5
- EXISTING GROUND SURFACE BEFORE POND CONSTRUCTION DWG: 144876 SHEET 1&2

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	RDJ	MLD	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

BYRON R. CONRAD — NEW MEXICO — 13248 — REGISTERED PROFESSIONAL ENGINEER
04/20/2012

FOUR COURNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPONDMENT
LONGITUDINAL CROSS SECTION

aps

SCALE AS-NOTED DATE 12-15-09

WORK SAFELY TODAY

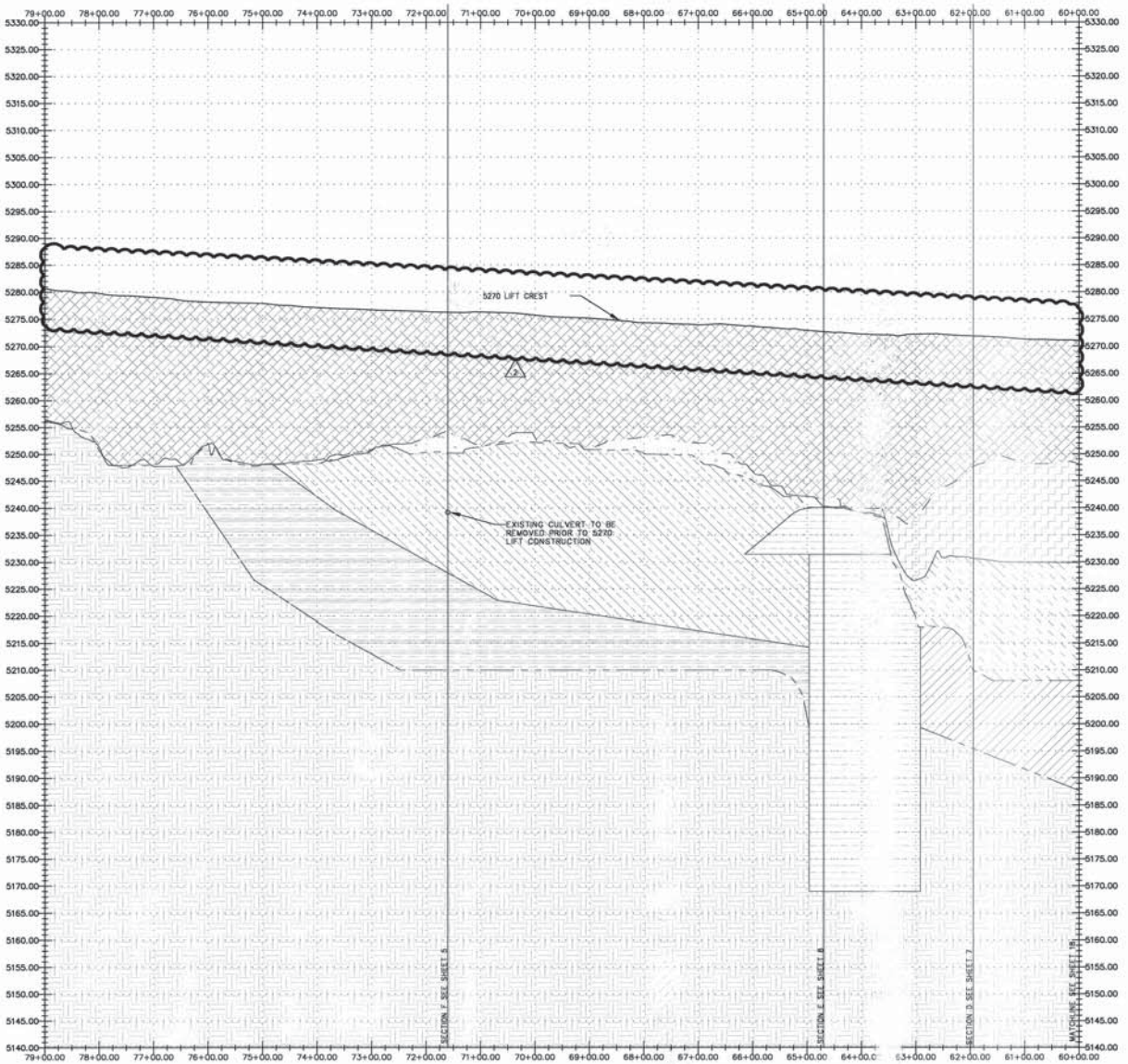
DWN SMS | CHD MLD | EXD BRC | RVWD

APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W A FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	18

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC



5270 LIFT LONG SECTION STA: 60+00.00 TO STA: 79+00.00

VERTICAL SCALE: 1"=10'

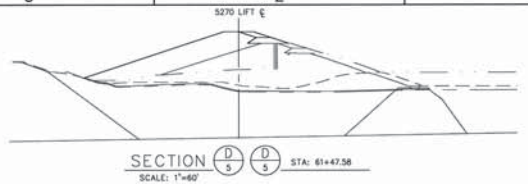
HORIZONTAL SCALE: 1"=100'

GRAPHIC SCALE

100 0 100 200

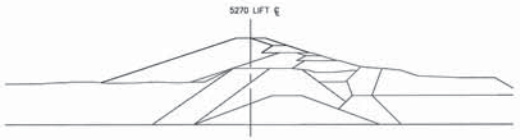
(IN FEET)

1 inch = 100 ft.



SECTION D/5 D/5 STA: 61+47.58

SCALE: 1"=60'



SECTION E/5 E/5 STA: 64+10.03

SCALE: 1"=60'

SECTION F/5 F/5 STA: 70+69.21

SCALE: 1"=60'

LEGEND

- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO
- 5270 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH-FLY ASH
- 5258 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 156687 CONSTRUCTION SET
- 5248 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEET 80
- 5228 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEETS 71-76
- POND 3 FLY ASH DWG: 110559 SHEET 1-5
- CLAY POND 6 EMBANKMENT DWG: 110560 SHEET 3
- BROKEN SHALE AND BOTTOM ASH MIX POND 5 EMBANKMENT DOWN STREAM DWG: 43604 SHEET 1
- CLAY SHALE POND 5 EMBANKMENT CONSTRUCTION DWG: 43604 SHEET 1
- EXISTING GROUND SURFACE BEFORE POND CONSTRUCTION DWG: 144876 SHEETS 1&2

VISION 2 CHANGES.
REMOVED AS-LET DESIGN INFORMATION FOR CLARITY.
UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

BYRON R. CONRAD 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

FOUR COURNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPONDMENT
LONGITUDINAL CROSS SECTION

aps

SCALE AS-NOTED DATE 12-15-09

DWN SMS CHD MLD EXD BRC RVWD

APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W A FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	19

WORK SAFELY TODAY

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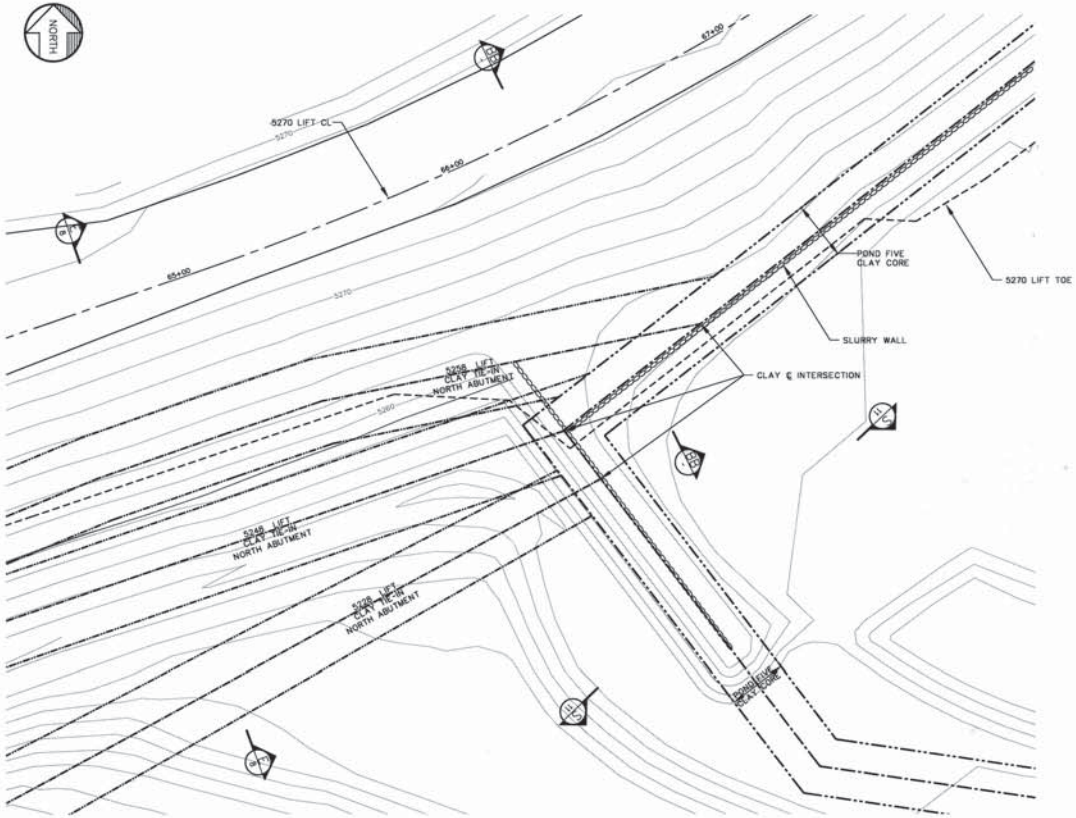
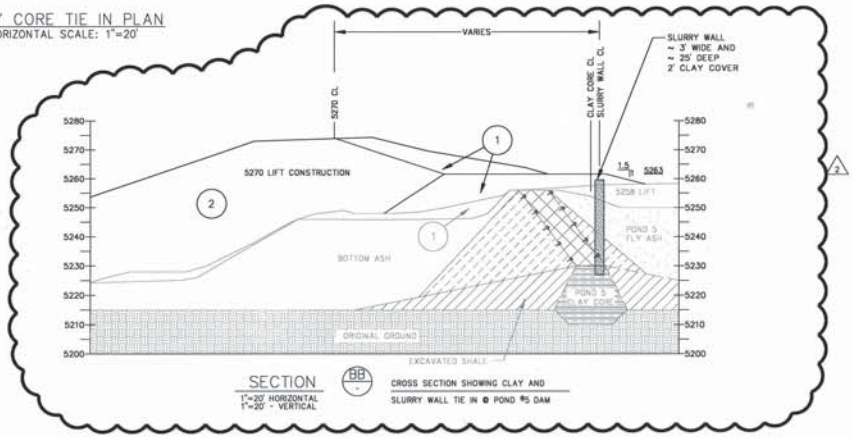


CLAY CORE TIE IN PLAN
HORIZONTAL SCALE: 1"=20'



SECTION BB
1"=20' HORIZONTAL
1"=20' VERTICAL

CROSS SECTION SHOWING CLAY AND SLURRY WALL TIE IN @ POND #5 DAM

LEGEND

- EXISTING POND 5 EMBANKMENT BROKEN SHALE
- EXISTING POND 5 EMBANKMENT BROKEN SHALE AND BOTTOM ASH
- CLAY CORE POND 5 ABOVE 5230
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- CLAY CORE POND 5
- SLURRY WALL
- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- EMBANKMENT
- EXISTING LIFTS
- FML LINER
- LIMITS OF EXCAVATION
- CEMENT-BENTONITE CUTOFF WALL
- CLAY TOE TIE-IN
- CLAY ℄ TIE-IN
- POND 5 CLAY CORE
- POND 5 CLAY ℄

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158144 SH.5
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158144 SH.5
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT, REFERENCE DRAWING FC-C-39-ADS-152408

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH

REVISION 2 CHANGES:
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

GRAPHIC SCALE
20 0 20 40
(IN FEET)
1 inch = 20 ft.

EDSON R. CONRAD 13248 REGISTERED PROFESSIONAL ENGINEER
04/12/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	ROJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
CLAY CORE TIE IN PLAN AND SECTIONS

aps

SCALE AS-NOTED DATE 01-04-10

DWN ROJ	APPROVED					W A
CHD MLD	DENNIS DEL GROSSO ENGINEERING SUPERVISOR					FAC90173
EXD BRC	UNIT	DISC	TYPE	SYS	NUMBER	SHEET
RVWD	FC	C	39	ADS	158134	20

WORK SAFELY TODAY

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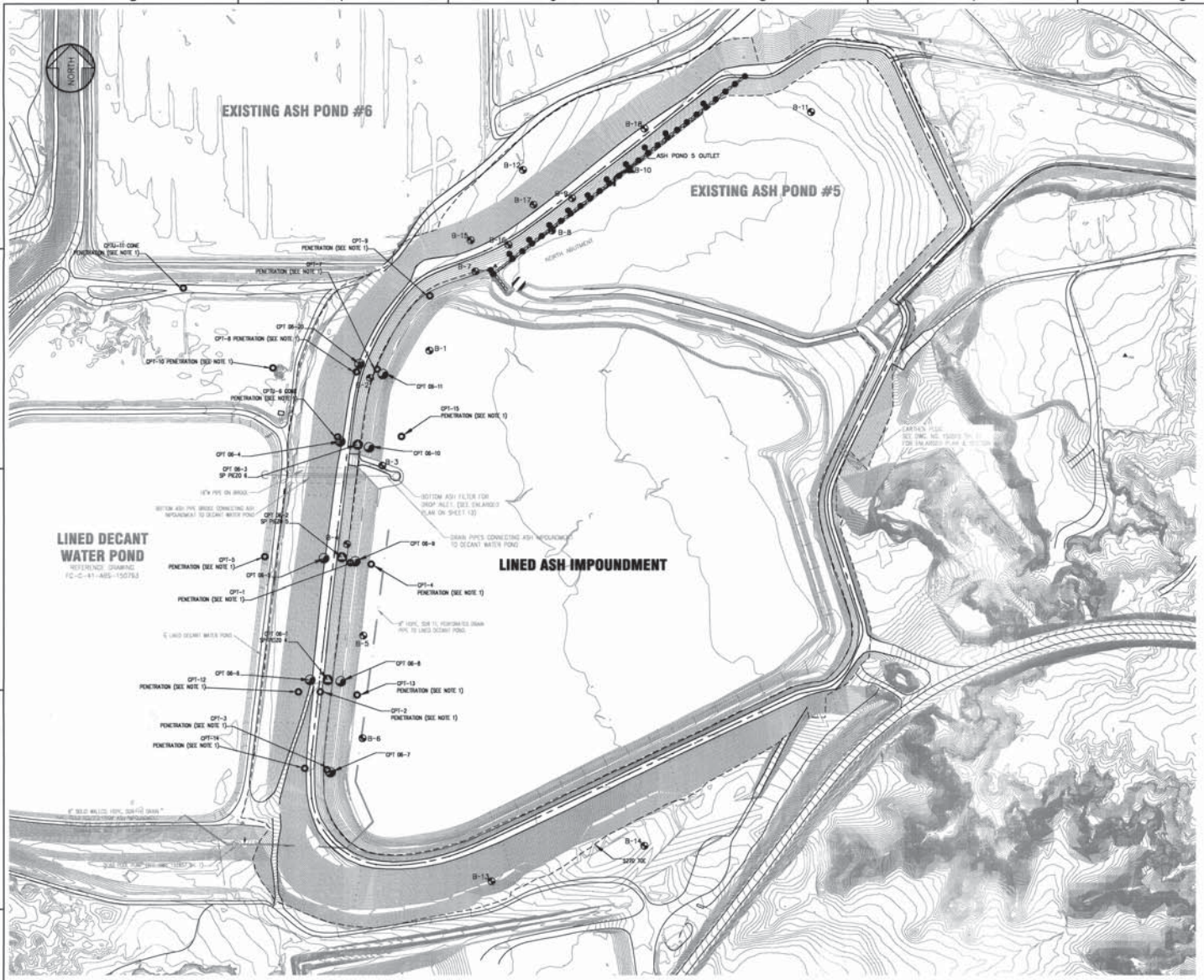

NOTES:

1. FOR THE 2002 CONE PENETRATION TESTING RESULT (CPT), SEE REPORT PREPARED BY "CONETEC INC." DATED OCT. 14, 2002. FOR THE 2006 CONE PENETRATION TESTING RESULT (CPT), SEE REPORT PREPARED BY "CONETEC INC." DATED OCT. 14, 2006.
2. FOR FLY ASH SLURRY DELIVERY SEE SHEET 17.

REVISION 1 CHANGES.
1 UPDATED SHEET TO SHOW 5270 LIFT ALIGNMENT

REVISION 2 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

2

LEGEND

- 5270 LIFT TOE
- 5270 LIFT ℄
- 5270 LIFT CREST
- B-1 SOIL BORING LOCATIONS (SEE BORING LOGS ON SHEET #10)
- 2002 CPT LOCATION
- 2006 CPT LOCATION
- 2006 CPT LOCATION AND SP PIEZO LOCATION
- 2009 CPT LOCATION

NORTH

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

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

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

EDISON R. CONFER NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
BORINGS AND CPT LOCATIONS

aps

SCALE NOTED DATE 12-15-09

DWN	APPROVED	W A
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	158134	21

WORK SAFELY TODAY

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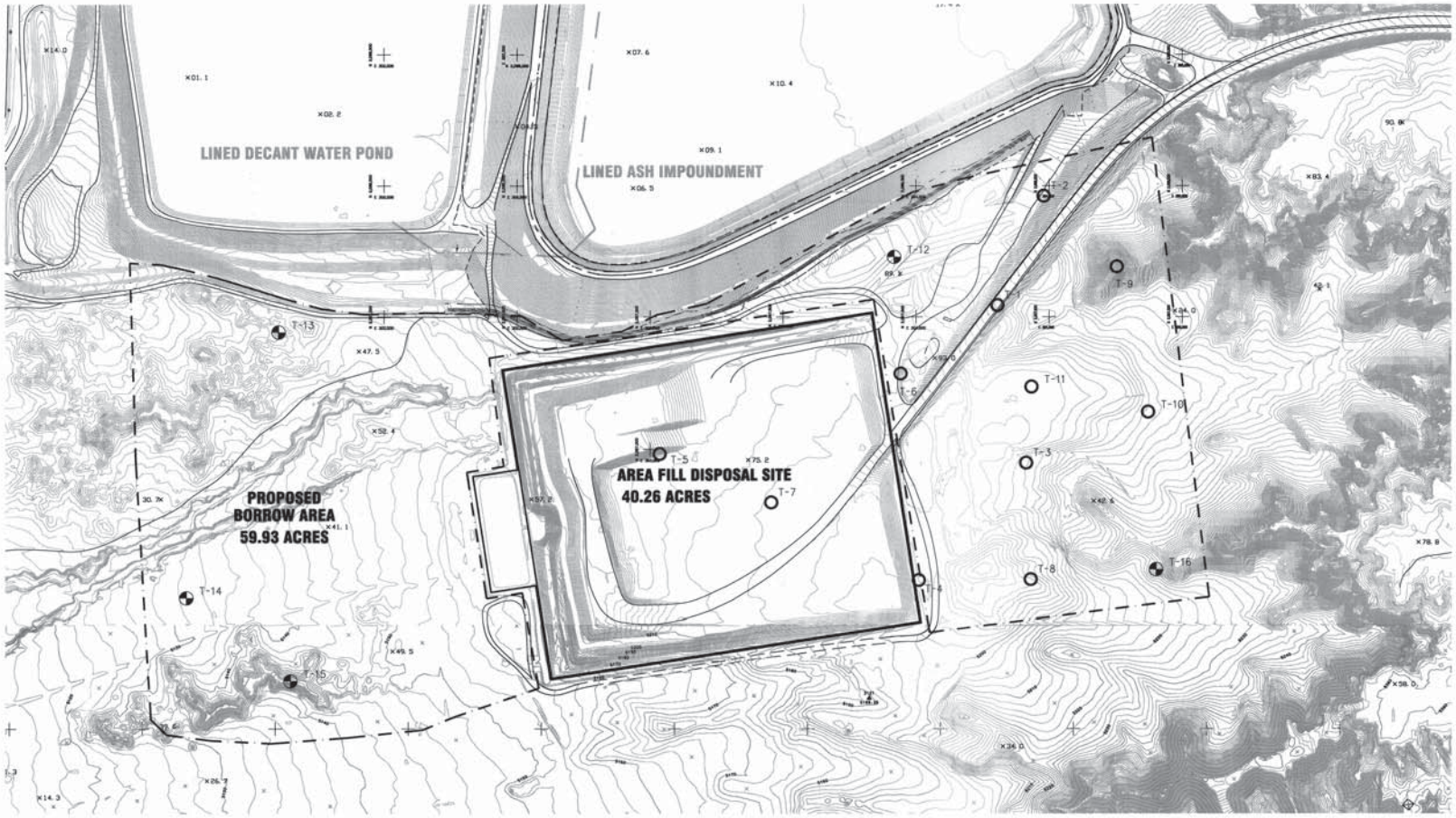


PLAN VIEW
1"=200'
CONTOUR INTERVAL=2'

LEGEND

- NEW TEST PIT LOCATIONS
- EARLIER TEST PIT LOCATIONS
- 5270 TOE
- 5270 CREST
- 5270 ℄
- TOPO BEFORE EXCAVATION
- OUTLINE OF PROPOSED BORROW AREA (2010-2011)

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

BORROW AREA TEST PIT COORDINATES

BORING NO.	(NORTHING)	(EASTING)
EXISTING T-1	N 2,067,545	E 304,306
EXISTING T-2	N 2,067,962	E 304,480
EXISTING T-3	N 2,066,949	E 304,414
EXISTING T-4	N 2,066,503	E 304,010
EXISTING T-5	N 2,066,983	E 303,036
EXISTING T-6	N 2,067,286	E 303,942
EXISTING T-7	N 2,066,798	E 303,455
EXISTING T-8	N 2,066,506	E 304,430
EXISTING T-9	N 2,067,692	E 304,754
EXISTING T-10	N 2,067,141	E 304,872
EXISTING T-11	N 2,067,236	E 304,434
NEW T-12	N 2,067,730	E 303,920
NEW T-13	N 2,067,440	E 301,610
NEW T-14	N 2,066,430	E 301,260
NEW T-15	N 2,066,120	E 301,650
NEW T-16	N 2,066,540	E 304,910

SEE SHEET 11A THIS SET FOR TEST PIT LOG DATA

REVISION 1 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS
1

BYRON R. CONDAS NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/29/2014

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
BORROW AREA TEST PIT LOCATIONS

aps

SCALE: NOTED DATE: 12-15-09

DWN: SMS
CHD: MLD
EXD: BRC
RVWD:

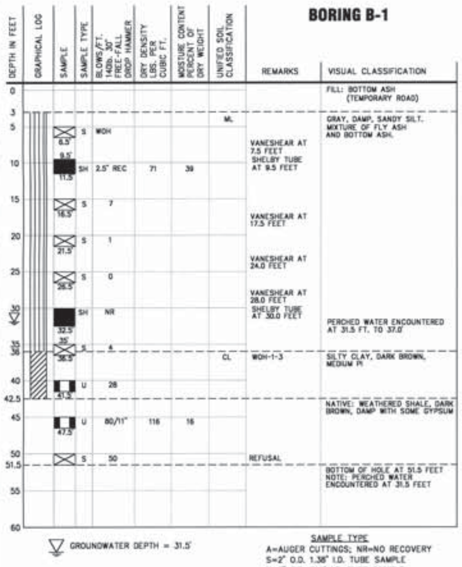
APPROVED
JOHN D. MITCHELL
ENGINEERING SUPERVISOR

W A FAC90173

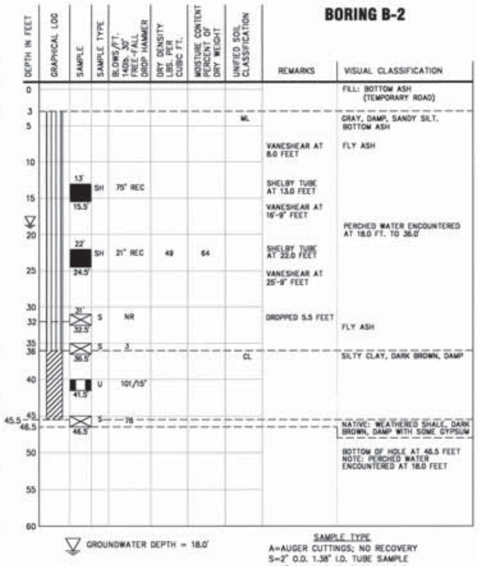
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	158134	22

WORK SAFELY TODAY

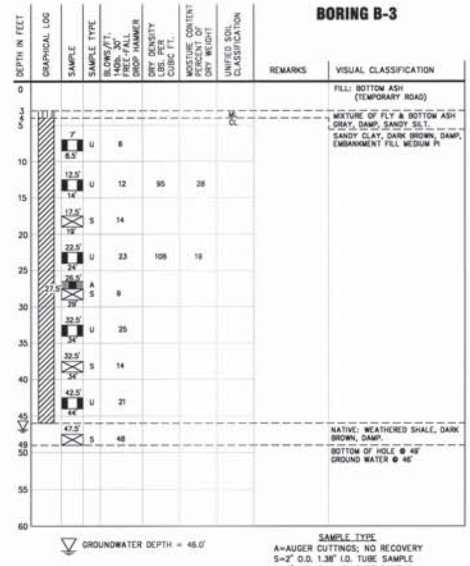
DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC


BORING B-1
DEPTH IN FEET
GRAPHICAL LOG
SAMPLE
SAMPLE TYPE
BLOWS/FT. 140lb. 30" FREE-FALL DROP HAMMER
DRY DENSITY LBS. PER CUBIC FT.
MOISTURE CONTENT PERCENT OF DRY WEIGHT
UNIFIED SOIL CLASSIFICATION
REMARKS
VISUAL CLASSIFICATION
FILL: BOTTOM ASH (TEMPORARY ROAD)
ML
GRAY, DAMP, SANDY SILT. MIXTURE OF FLY ASH AND BOTTOM ASH.
S WOH 6.5'
9.5' SH 2.5" REC 71 39 11.5'
VANESHEAR AT 7.5 FEET SHELBY TUBE AT 9.5 FEET
S 7 16.5'
VANESHEAR AT 17.5 FEET
S 1 21.5'
VANESHEAR AT 24.0 FEET
S 0 26.5'
VANESHEAR AT 28.0 FEET SHELBY TUBE AT 30.0 FEET
SH NR 32.5'
PERCHED WATER ENCOUNTERED AT 31.5 FT. TO 37.0'
35' S 4 36.5'
CL WOH-1-3
SILTY CLAY, DARK BROWN, MEDIUM PI
U 28 41.5'
NATIVE: WEATHERED SHALE, DARK BROWN, DAMP WITH SOME GYPSUM
U 80/11" 116 16 47.5'
S 50 REFUSAL
BOTTOM OF HOLE AT 51.5 FEET NOTE: PERCHED WATER ENCOUNTERED AT 31.5 FEET
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
DEPTH IN FEET
GRAPHICAL LOG
SAMPLE
SAMPLE TYPE
BLOWS/FT. 140lb. 30" FREE-FALL DROP HAMMER
DRY DENSITY LBS. PER CUBIC FT.
MOISTURE CONTENT PERCENT OF DRY WEIGHT
UNIFIED SOIL CLASSIFICATION
REMARKS
VISUAL CLASSIFICATION
FILL: BOTTOM ASH (TEMPORARY ROAD)
ML
GRAY, DAMP, SANDY SILT. BOTTOM ASH
VANESHEAR AT 8.0 FEET
FLY ASH
13' SH 75" REC 15.5'
SHELBY TUBE AT 13.0 FEET
VANESHEAR AT 16'-9" FEET
PERCHED WATER ENCOUNTERED AT 18.0 FT. TO 36.0'
22' SH 21" REC 49 64 24.5'
SHELBY TUBE AT 22.0 FEET
VANESHEAR AT 25'-9" FEET
31' S NR 32.5'
DROPPED 5.5 FEET
FLY ASH
S 3 36.5'
CL
SILTY CLAY, DARK BROWN, DAMP
U 101/15" 41.5'
S 78 46.5'
NATIVE: WEATHERED SHALE, DARK BROWN, DAMP WITH SOME GYPSUM
BOTTOM OF HOLE AT 46.5 FEET NOTE: PERCHED WATER ENCOUNTERED AT 18.0 FEET
GROUNDWATER DEPTH = 18.0'

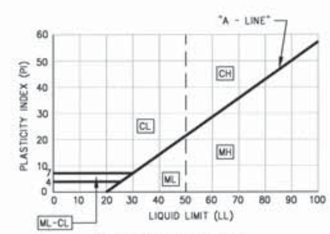
SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE


BORING B-3
DEPTH IN FEET
GRAPHICAL LOG
SAMPLE
SAMPLE TYPE
BLOWS/FT. 140lb. 30" FREE-FALL DROP HAMMER
DRY DENSITY LBS. PER CUBIC FT.
MOISTURE CONTENT PERCENT OF DRY WEIGHT
UNIFIED SOIL CLASSIFICATION
REMARKS
VISUAL CLASSIFICATION
FILL: BOTTOM ASH (TEMPORARY ROAD)
ML CL
MIXTURE OF FLY & BOTTOM ASH
GRAY, DAMP, SANDY SILT.
SANDY CLAY, DARK BROWN, DAMP, EMBANKMENT FILL MEDIUM PI
7' U 6 8.5'
12.5' U 12 95 28 14'
17.5' S 14 19'
22.5' U 23 108 19 24'
26.5' 27.5' A S 9 29'
32.5' U 25 34'
32.5' S 14 34'
42.5' U 21 44'
47.5' S 48
NATIVE: WEATHERED SHALE, DARK BROWN, DAMP.
BOTTOM OF HOLE @ 49' GROUND WATER @ 46'
GROUNDWATER DEPTH = 46.0'

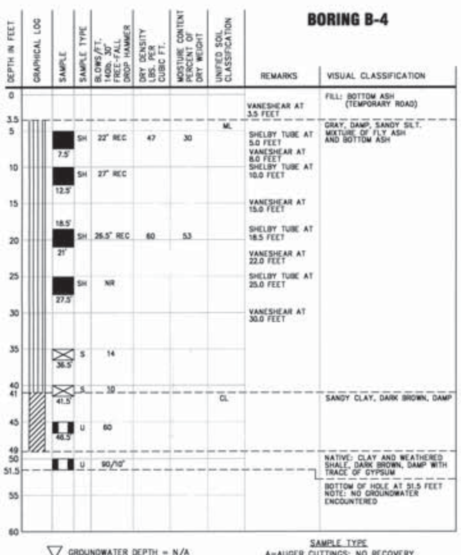
SAMPLE TYPE
A=AUGER CUTTINGS; NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELY SOILS	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.
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES. (APPRECIABLE AMOUNT OF FINES.)		GM	SILTY GRAVELS. GRAVEL-SAND-SILT MIXTURES.
				GC	CLAYEY GRAVELS. GRAVEL-CLAY-SAND MIXTURE.
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	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.
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	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.

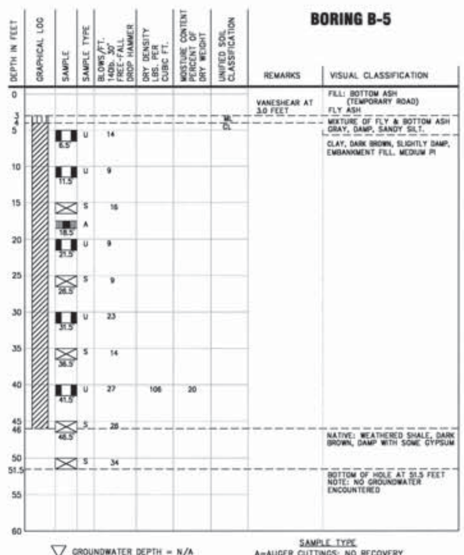
UNIFIED SOIL CLASSIFICATION SYSTEM



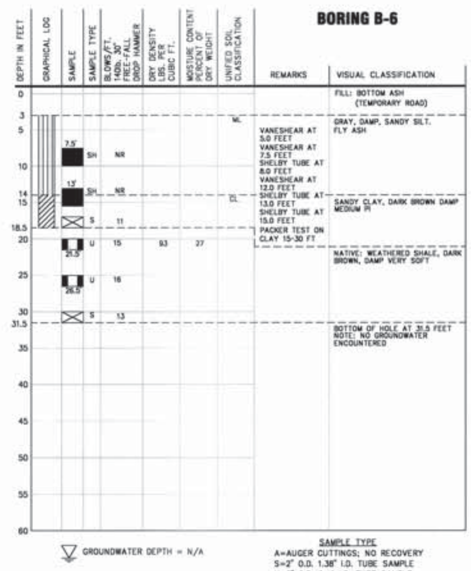
PLASTICITY CHART


BORING B-4
DEPTH IN FEET
GRAPHICAL LOG
SAMPLE
SAMPLE TYPE
BLOWS/FT. 140lb. 30" FREE-FALL DROP HAMMER
DRY DENSITY LBS. PER CUBIC FT.
MOISTURE CONTENT PERCENT OF DRY WEIGHT
UNIFIED SOIL CLASSIFICATION
REMARKS
VISUAL CLASSIFICATION
VANESHEAR AT 3.5 FEET
FILL: BOTTOM ASH (TEMPORARY ROAD)
ML
GRAY, DAMP, SANDY SILT. MIXTURE OF FLY ASH AND BOTTOM ASH
SH 22" REC 47 30 7.5'
SHELBY TUBE AT 5.0 FEET
VANESHEAR AT 8.0 FEET
SHELBY TUBE AT 10.0 FEET
SH 27" REC 12.5'
VANESHEAR AT 15.0 FEET
18.5' SH 26.5" REC 60 53 21'
SHELBY TUBE AT 18.5 FEET
VANESHEAR AT 22.0 FEET
SHELBY TUBE AT 25.0 FEET
SH NR 27.5'
VANESHEAR AT 30.0 FEET
S 14 36.5'
S 10 41.5'
CL
SANDY CLAY, DARK BROWN, DAMP
U 60 46.5'
U 90/10"
NATIVE: CLAY AND WEATHERED SHALE, DARK BROWN, DAMP WITH TRACE OF GYPSUM
BOTTOM OF HOLE AT 51.5 FEET NOTE: NO GROUNDWATER ENCOUNTERED
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
DEPTH IN FEET
GRAPHICAL LOG
SAMPLE
SAMPLE TYPE
BLOWS/FT. 140lb. 30" FREE-FALL DROP HAMMER
DRY DENSITY LBS. PER CUBIC FT.
MOISTURE CONTENT PERCENT OF DRY WEIGHT
UNIFIED SOIL CLASSIFICATION
REMARKS
VISUAL CLASSIFICATION
VANESHEAR AT 3.0 FEET
FILL: BOTTOM ASH (TEMPORARY ROAD)
FLY ASH
ML CL
MIXTURE OF FLY & BOTTOM ASH GRAY, DAMP, SANDY SILT.
CLAY, DARK BROWN, SLIGHTLY DAMP, EMBANKMENT FILL, MEDIUM PI
U 14 6.5'
U 9 11.5'
S 16
A 18.5'
U 9 21.5'
S 9 26.5'
U 23 31.5'
S 14 36.5'
U 27 106 20 41.5'
S 28 46.5'
NATIVE: WEATHERED SHALE, DARK BROWN, DAMP WITH SOME GYPSUM
S 34
BOTTOM OF HOLE AT 51.5 FEET NOTE: NO GROUNDWATER ENCOUNTERED
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-6
DEPTH IN FEET
GRAPHICAL LOG
SAMPLE
SAMPLE TYPE
BLOWS/FT. 140lb. 30" FREE-FALL DROP HAMMER
DRY DENSITY LBS. PER CUBIC FT.
MOISTURE CONTENT PERCENT OF DRY WEIGHT
UNIFIED SOIL CLASSIFICATION
REMARKS
VISUAL CLASSIFICATION
FILL: BOTTOM ASH (TEMPORARY ROAD)
ML
GRAY, DAMP, SANDY SILT. FLY ASH
VANESHEAR AT 5.0 FEET
VANESHEAR AT 7.5 FEET
SHELBY TUBE AT 8.0 FEET
VANESHEAR AT 12.0 FEET
SHELBY TUBE AT 13.0 FEET
SHELBY TUBE AT 15.0 FEET
PACKER TEST ON CLAY 15-30 FT
7.5' SH NR
13' SH NR
CL
SANDY CLAY, DARK BROWN DAMP MEDIUM PI
S 11
U 15 93 27 21.5'
NATIVE: WEATHERED SHALE, DARK BROWN, DAMP VERY SOFT
U 16 26.5'
S 13
BOTTOM OF HOLE AT 31.5 FEET NOTE: NO GROUNDWATER ENCOUNTERED
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

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 156687 SHEET #3

04/20/2012

BYRON R. CONRAD NEW MEXICO 13248 PROFESSIONAL ENGINEER

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

aps

SCALE NONE   DATE 12-15-09

DWN	SMS	APPROVED	W A
CHD	MLD	JOHN D. MITCHELL, ENGINEERING SUPERVISOR	FAC90173
EXD	BRC		
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	23

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

B-7

SURFACE ELEV.: 5249
TOTAL DEPTH: 60.5

	Coring	Ring Sampler	Split Spoon	SMM Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.		140 lbs.		Drill Rod Size		
Hammer Fall		30 in.		I.D. (O.D.)		

GROUNDWATER DATA: Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol

SAMPLE: DEPTH (Ft) | USCS | GRAPHIC | TYPE | NUMBER | SYMBOL | FROM | TO | MOISTURE, % | DRY DENSITY (PCF) | N | REC. (In.) | Blows/Foot

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- BOTTOM ASH: Grey, sandy, non-plastic, dry to moist, medium dense to dense
- -with some sand and gravel
- -Becomes dry
- CLAY (CL) (FILL): Brown, low to medium plasticity, moist, soft
- -Becomes mixture of bottom ash and clay fill
- BOTTOM ASH
- SHALE: Brown to grey, highly weathered, hard
- -Becomes moist, highly to completely weathered, hard to very hard, high plasticity
- -Becomes dark brown, moist, highly weathered, medium plasticity
- -Moderately weathered
- -Becomes grey, dry to moist, slightly weathered, very hard, iron oxide stained, blocky structure

Bottom of test hole at 60.5 feet

B-8

SURFACE ELEV.: 5256.65
TOTAL DEPTH: 74

	Coring	Ring Sampler	Split Spoon	SMM Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.		140 lbs.		Drill Rod Size		
Hammer Fall		30 in.		I.D. (O.D.)		

GROUNDWATER DATA: Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol

SAMPLE: DEPTH (Ft) | USCS | GRAPHIC | TYPE | NUMBER | SYMBOL | FROM | TO | MOISTURE, % | DRY DENSITY (PCF) | N | REC. (In.) | Blows/Foot

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- BOTTOM ASH: Light grey, sandy, dry, medium dense
- -Becomes damp
- FLY ASH: Light grey, clayey, moist, medium stiff
- -Clay and flyash mix
- CLAY (CL) (FILL): Brown, with grey fly ash
- -Becomes moist, very stiff, low plasticity, with some gravel
- -Some coarse sand
- -Becomes brown and white
- -Becomes brown, with some claystone gravel
- -Becomes silty clay, moist, stiff, low to medium plasticity
- -Becomes stiff to very stiff
- -Becomes very stiff
- -Becomes low plasticity
- SHALE: Highly to completely weathered, very soft rock/very hard soil
- -Becomes less weathered, blocky
- -Becomes completely weathered
- -Becomes highly to moderately weathered
- -Becomes slightly weathered, very hard, calcite/gypsum and iron oxide infilling, blocky structure

Bottom of test hole of 74 feet (Due to Auger refusal)

B-9

SURFACE ELEV.: 5255.29
TOTAL DEPTH: 72

	Coring	Ring Sampler	Split Spoon	SMM Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.		140 lbs.		Drill Rod Size		
Hammer Fall		30 in.		I.D. (O.D.)		

GROUNDWATER DATA: Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol
06/03/09 | 13:00 AM | 78.0
06/04/09 | 13:00 AM | 53.0

SAMPLE: DEPTH (Ft) | USCS | GRAPHIC | TYPE | NUMBER | SYMBOL | FROM | TO | MOISTURE, % | DRY DENSITY (PCF) | N | REC. (In.) | Blows/Foot

VISUAL MATERIAL CLASSIFICATION AND REMARKS

PIEZOMETER #14: Bentonite / Cement; 2" Dia. SCH 40 PVC; Bentonite; Sand; Top of Screen

- BOTTOM ASH: Grey, sandy
- -Becomes grey mottled with black
- -Becomes grey
- -Some gravel
- CLAY (CL) (FILL): brown, medium plasticity
- BOTTOM ASH: Some gravel
- CLAY (CL) (FILL): Brown to grey, moist, low plasticity, some reworked claystone
- -Some bottom ash in sample, wet, reworked shale
- -Becomes brown, reworked highly weathered shale, stiff to very stiff
- BOTTOM ASH
- CLAY (CL) (FILL): Dark brown, wet, low to medium plasticity, intermixed with bottom ash
- -Becomes brown highly weathered shale, moist, medium plasticity
- SANDY CLAY (CL): Brown, wet non-plastic to high plasticity, very stiff
- -Becomes coarse sand, some clay, medium dense
- SHALE: Slightly weathered, very hard, iron oxide stains and calcite or gypsum infilling

Bottom of test hole of 72.0 feet (Due to Auger refusal)

B-10

SURFACE ELEV.: 5255.27
TOTAL DEPTH: 58.25

	Coring	Ring Sampler	Split Spoon	SMM Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.		140 lbs.		Drill Rod Size		
Hammer Fall		30 in.		I.D. (O.D.)		

GROUNDWATER DATA: Date | Time | Water Depth (ft) | Casing Depth (ft) | Hole Depth (ft) | Symbol

SAMPLE: DEPTH (Ft) | USCS | GRAPHIC | TYPE | NUMBER | SYMBOL | FROM | TO | MOISTURE, % | DRY DENSITY (PCF) | N | REC. (In.) | Blows/Foot

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- BOTTOM ASH
- FLY ASH: Moist, stiff; Light grey to brown fine-grained fly ash
- -With some brown sandy clay
- -Becomes moist, with brown clay in top half of sample
- SANDY CLAY (CL) (FILL): Brown mottled with white, moist, medium stiff, low plasticity
- FLY ASH: Fine-grained
- -Becomes light grey and brown, with clay fill in sample
- -Becomes brown and light grey, with timber in sample, low plasticity, stiff, some fly ash
- SILTY CLAY (CL/ML) (FILL): Brown, moist, stiff, low plasticity
- -Becomes dark brown to dark grey, moist, very stiff, low plasticity
- -Becomes brown, low to medium plasticity
- -Becomes brown to grey, low plasticity, possibly weathered shale
- SANDY CLAY (CL): Brown mottled with white, moist, very stiff, low plasticity
- -With some gravel
- SHALE: Dark grey, iron oxide stains, slightly to moderately weathered, weak rock/very hard soil

Bottom of test hole of 58.25 feet

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 158134 SHEET 21

4/20/2012 — BYRON R. CONRAD, 13248, REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SOIL BORING LOGS

aps

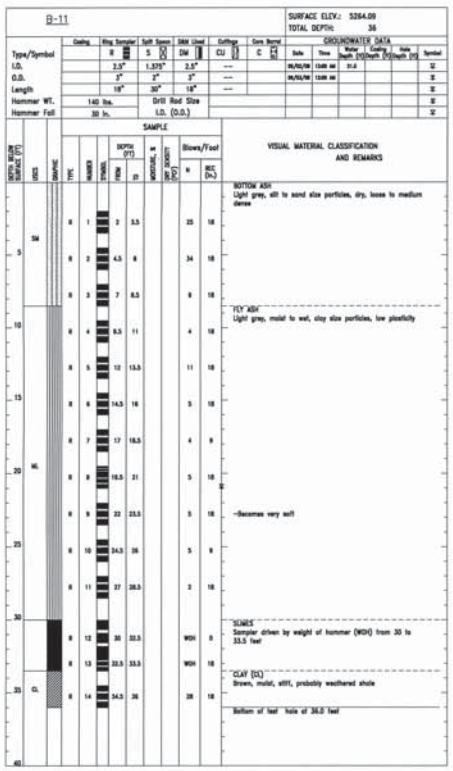
SCALE: NONE DATE: 12-15-09

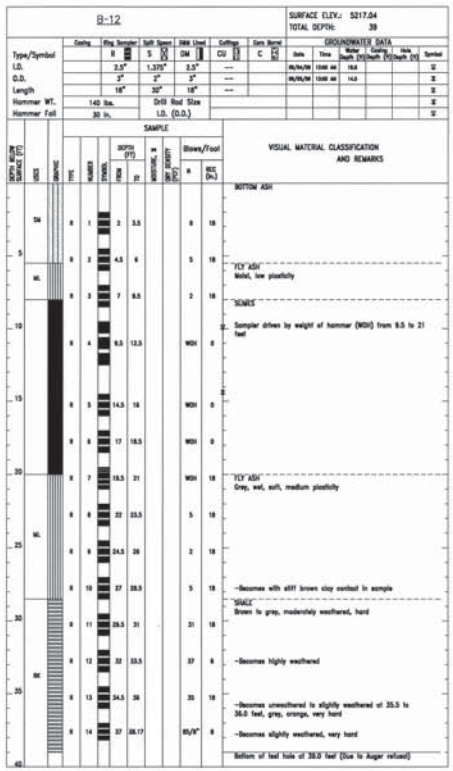
WORK SAFELY TODAY

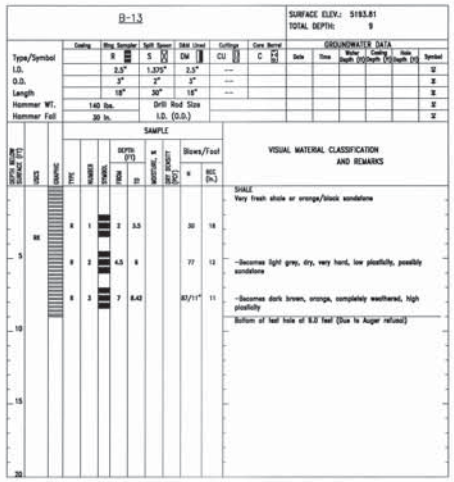
DWN: SMS | CHD: MLD | EXD: BRC | RVWD:
APPROVED: JOHN D. MITCHELL, ENGINEERING SUPERVISOR | W.A. FAC90173

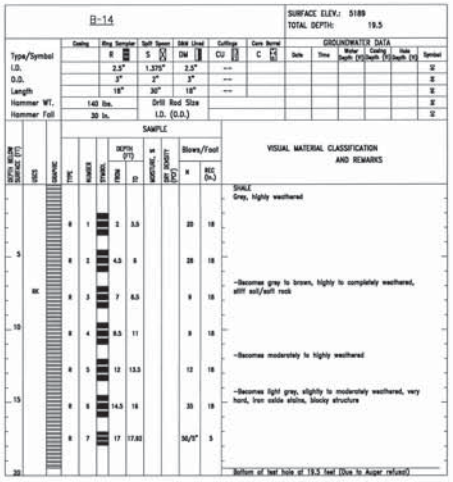
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	24

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC









NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 158134 SHEET #20

04/20/2012

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SOIL BORING LOGS

aps

SCALE: NONE
DATE: 12-15-09

DWN	APPROVED	W A
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173
CHD: MLD		
EXD: BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	25

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23448038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

2060 Alton Place
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Borehole B-15

Page 1 of 3

Project Name: Ash Pond 5 West Embankment
Project Number: 92-0971
Client: Arizona Public Service
Site Location: Four Corners Power Plant
Rig Type: CME - 75
Drilling Method: 7" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 Inches

Date Drilled: 12/3/2009
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: Approx. 49.5 feet during drilling
Logged By: Don Baldwin
Remarks: Reviewed by: LEC

Laboratory Results | Blows per 6" | Sample Type & Length (in) | Recovery | USCS | Soil Symbol | Depth (ft) | Soil Description

Depth (ft)	USCS	Soil Description
1	SM	SILTY SAND with gravel, gray, fine- to coarse-grained, loose, moist (BOTTOM ASH)
2–23	CL	LEAN CLAY, brown, stiff, moist (FILL) occasional salt crystals occasional gravel-size shale fragments
24–27	SM	SILTY SAND with gravel, gray, fine- to coarse-grained, very loose, moist (BOTTOM ASH) SILTY SAND with gravel, gray, fine- to coarse-grained, very loose, moist (BOTTOM ASH)
28–45	CL	SANDY LEAN CLAY, brown, soft to stiff, moist (FILL) increased sand content, medium stiff to stiff
46–50	SC	CLAYEY SAND with gravel, gray, fine- to coarse-grained, loose, wet (NATIVE)
51–60	SH	SHALE, gray, highly weathered, soft, massive dark gray, moderately soft, weakly flasile
61–66	SH	moderately weathered, moderately soft to moderately hard, flasile
66		Total Depth 66.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

Borehole B-16

Page 1 of 4

Project Name: Ash Pond 5 West Embankment
Project Number: 92-0971
Client: Arizona Public Service
Site Location: Four Corners Power Plant
Rig Type: CME - 75
Drilling Method: 7" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 Inches

Date Drilled: 12/2/2009
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: Approx. 68 feet during drilling
Logged By: Don Baldwin
Remarks: Reviewed by: LEC

Laboratory Results | Blows per 6" | Sample Type & Length (in) | Recovery | USCS | Soil Symbol | Depth (ft) | Soil Description

Depth (ft)	USCS	Soil Description
1–24	CL	LEAN CLAY, brown, stiff, moist (FILL) occasional salt crystals brown to olive-gray
25–29	CL	SANDY LEAN CLAY, yellow-brown, with occasional gravel-size shale fragments, stiff to very stiff, moist (FILL)
30–44	CL	LEAN CLAY with trace gravel, olive-gray, stiff, moist (FILL) brown to gray, no gravel
45–47	CL	SANDY LEAN CLAY with trace gravel, brown, stiff, moist (FILL)
48–59	CL	LEAN CLAY, brown, very stiff, moist (FILL) LEAN CLAY, brown, very stiff, moist (FILL)
60–61	CL	SANDY LEAN CLAY with gravel-size shale fragments, brown, very stiff, moist (FILL)
62–68	CL	LEAN CLAY with trace gravel-size shale fragments, brown, very stiff, moist
69–74	SC	CLAYEY SAND with gravel, brown, fine- to coarse-grained, medium dense, moist to wet (NATIVE) wet
75–80	SH	SHALE, brown to dark gray, highly weathered, moderately soft, weakly flasile slightly weathered
81		Total Depth 81.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

Borehole B-17

Page 1 of 3

Project Name: Ash Pond 5 West Embankment
Project Number: 92-0971
Client: Arizona Public Service
Site Location: Four Corners Power Plant
Rig Type: CME - 75
Drilling Method: 7" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 Inches

Date Drilled: 12/3/2009
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: Approx. 55 feet during drilling
Logged By: Don Baldwin
Remarks: Reviewed by: LEC

Laboratory Results | Blows per 6" | Sample Type & Length (in) | Recovery | USCS | Soil Symbol | Depth (ft) | Soil Description

Depth (ft)	USCS	Soil Description
1–24	SM	SILTY SAND with gravel, gray, fine- to coarse-grained, loose to medium dense, moist (BOTTOM ASH)
25–35	SM	SILTY SAND with gravel, gray, fine- to coarse-grained, loose to medium dense, moist (BOTTOM ASH)
36–50	CL	LEAN CLAY, brown to gray, stiff, moist (FILL) dark gray, with gravel-size shale fragments LEAN CLAY, brown to gray, stiff, moist (FILL) increased sand content
51–60	SC	CLAYEY SAND with gravel, brown, fine- to coarse-grained, loose to medium dense, wet (NATIVE)
61–66	SH	SHALE, gray, highly weathered, soft, massive to blocky weakly flasile
66		Total Depth 66.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

Borehole B-18

Page 1 of 2

Project Name: Ash Pond 5 West Embankment
Project Number: 92-0971
Client: Arizona Public Service
Site Location: Four Corners Power Plant
Rig Type: CME - 75
Drilling Method: 7" O.D. Hollow Stem Auger
Sampling Method: Split spoon sample
Hammer Weight: 140 lbs
Hammer Fall: 30 Inches

Date Drilled: 12/3/2009
Latitude: Not Determined
Longitude: Not Determined
Elevation: Not Determined
Boring Location: See Site Plan
Groundwater Depth: Approx. 45 feet during drilling
Logged By: Don Baldwin
Remarks: Reviewed by: LEC

Laboratory Results | Blows per 6" | Sample Type & Length (in) | Recovery | USCS | Soil Symbol | Depth (ft) | Soil Description

Depth (ft)	USCS	Soil Description
1–25	SM	SILTY SAND with gravel, gray, fine- to coarse-grained, medium dense, moist (BOTTOM ASH)
26–35	SM	SILTY SAND with gravel, gray, fine- to coarse-grained, medium dense, moist (BOTTOM ASH) loose loose
36–45	SH	SHALE, dark gray, highly weathered, soft, weakly flasile slightly weathered, moderately hard, flasile
45		Total Depth 45.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SOIL BORING LOGS

aps

SCALE NOTED DATE 12-14-09

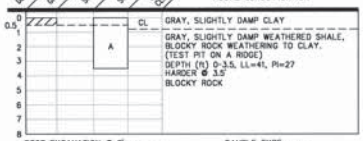
DWN	APPROVED	W.A.
SMS	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173
CHD MLD		
EXD BRC		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	26

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EDC

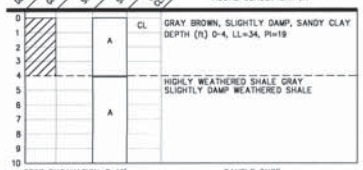
TEST PIT T-1



STOP EXCAVATION @ 8'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-2



STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

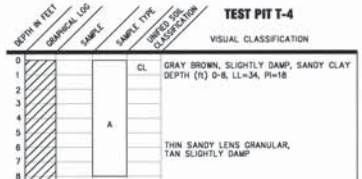
SAMPLE TYPE
A=AUGER CUTTINGS

TEST PIT T-3

STOP EXCAVATION @ 8'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

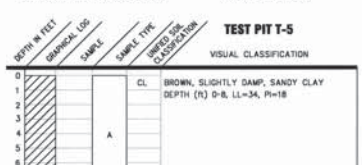
TEST PIT T-4



STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

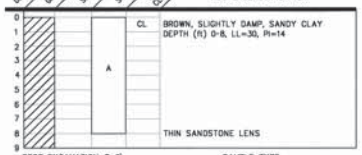
TEST PIT T-5



STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

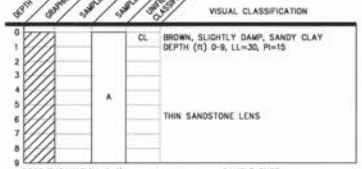
TEST PIT T-6



STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

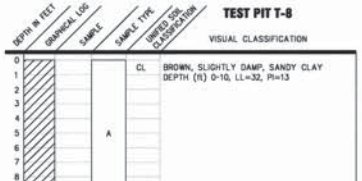
TEST PIT T-7



STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

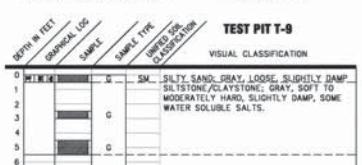
TEST PIT T-8



STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
A=AUGER CUTTINGS

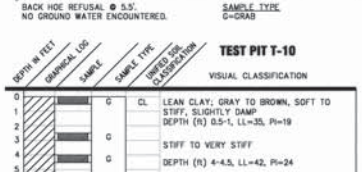
TEST PIT T-9



BACK HOE REFUSAL @ 5.5'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
G=GRAB

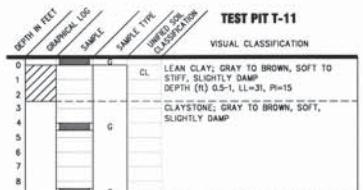
TEST PIT T-10



STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
G=GRAB

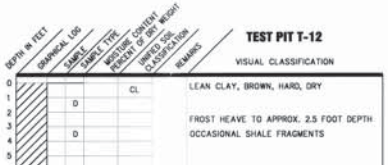
TEST PIT T-11



STOP EXCAVATION @ 9'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
G=GRAB

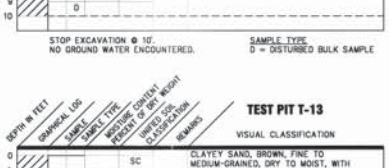
TEST PIT T-12



STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

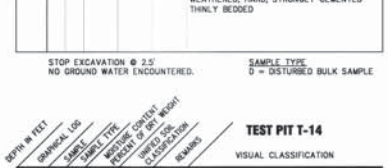
TEST PIT T-13



STOP EXCAVATION @ 2.5'
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

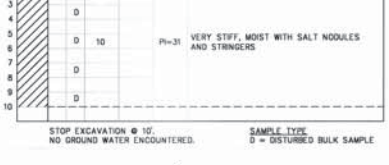
TEST PIT T-14



STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

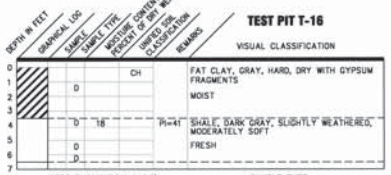
TEST PIT T-15



STOP EXCAVATION @ 3.5'
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

TEST PIT T-16



STOP EXCAVATION @ 6.5'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

BYRON R. CONRAD
NEW MEXICO
13248
REGISTERED PROFESSIONAL ENGINEER
04/20/2012

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
BORROW AREA SOIL TEST PIT LOGS

aps

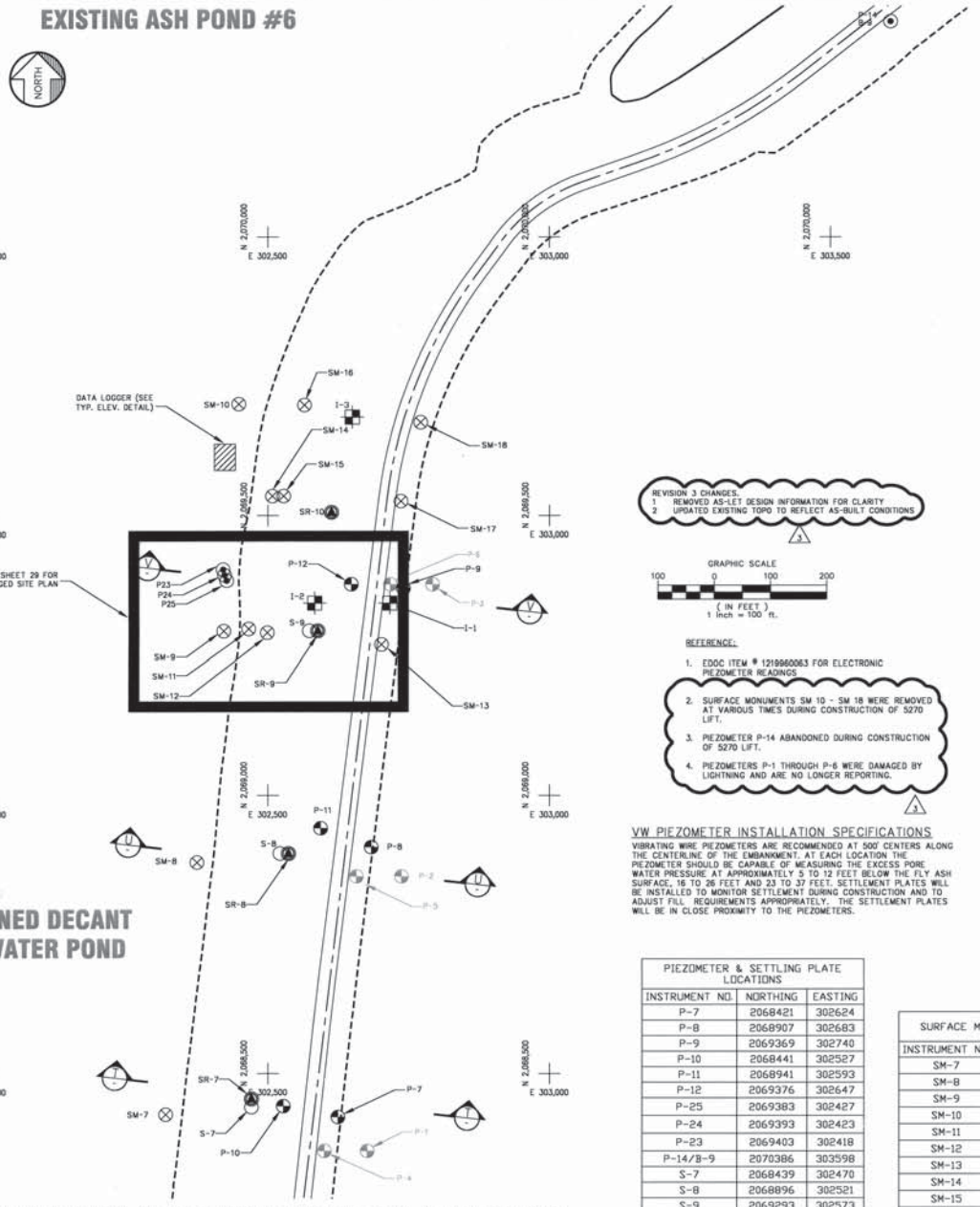
SCALE NOTED DATE 12-15-09

DWN	SMS	APPROVED	W A
CHD	MLD	JOHN D. MITCHELL ENGINEERING SUPERVISOR	FAC90173
EXD	BRC		
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	27

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EOC

EXISTING ASH POND #6



VIBRATING WIRE PIEZOMETER CLUSTER & SETTLING PLATE LOCATIONS
1"=100'
CONTOUR INTERVAL=2'

REVISION 3 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

3

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

REFERENCE:

1. EDOC ITEM # 1219960063 FOR ELECTRONIC PIEZOMETER READINGS
2. SURFACE MONUMENTS SM 10 - SM 18 WERE REMOVED AT VARIOUS TIMES DURING CONSTRUCTION OF 5270 LIFT.
3. PIEZOMETER P-14 ABANDONED DURING CONSTRUCTION OF 5270 LIFT.
4. PIEZOMETERS P-1 THROUGH P-6 WERE DAMAGED BY LIGHTNING AND ARE NO LONGER REPORTING.

3

VW PIEZOMETER INSTALLATION SPECIFICATIONS

VIBRATING WIRE PIEZOMETERS ARE RECOMMENDED AT 500' CENTERS ALONG THE CENTERLINE OF THE EMBANKMENT. AT EACH LOCATION THE PIEZOMETER SHOULD BE CAPABLE OF MEASURING THE EXCESS PORE WATER PRESSURE AT APPROXIMATELY 5 TO 12 FEET BELOW THE FLY ASH SURFACE, 16 TO 26 FEET AND 23 TO 37 FEET. SETTLEMENT PLATES WILL BE INSTALLED TO MONITOR SETTLEMENT DURING CONSTRUCTION AND TO ADJUST FILL REQUIREMENTS APPROPRIATELY. THE SETTLEMENT PLATES WILL BE IN CLOSE PROXIMITY TO THE PIEZOMETERS.

PIEZOMETER & SETTLING PLATE LOCATIONS		
INSTRUMENT NO.	NORTHING	EASTING
P-7	2068421	302624
P-8	2068907	302683
P-9	2069369	302740
P-10	2068441	302527
P-11	2068941	302593
P-12	2069376	302647
P-25	2069383	302427
P-24	2069393	302423
P-23	2069403	302418
P-14/B-9	2070386	303598
S-7	2068439	302470
S-8	2068896	302521
S-9	2069293	302573

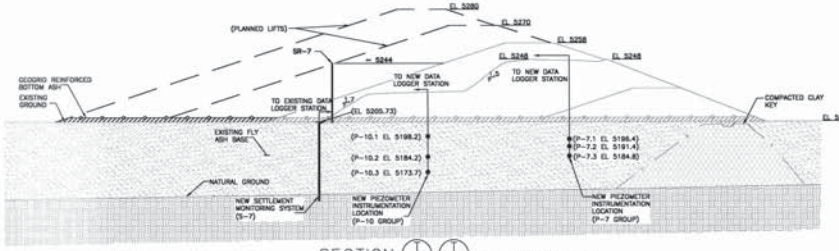
PIEZOMETER POINTS
(TIED TO STATE COORDINATES)

SURFACE MONUMENTS LOCATIONS		
INSTRUMENT NO.	NORTHING	EASTING
SM-7	2068426	302319
SM-8	2068880	302374
SM-9	2069294	302420
SM-10	2069701	302449
SM-11	2069297	302467
SM-12	2069290	302499
SM-13	2069269	302702
SM-14	2069535	302508
SM-15	2069535	302528
SM-16	2069699	302565
SM-17	2069526	302736
SM-18	2069668	302771

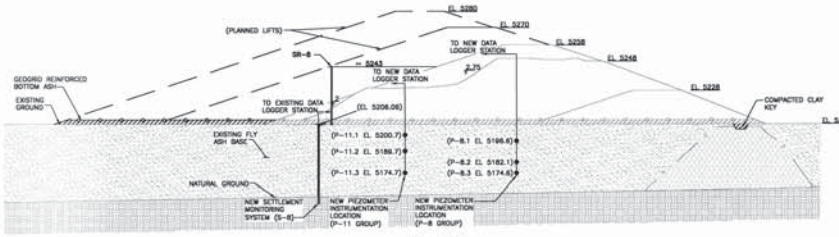
INCLINOMETER AND SETTLEMENT ROD LOCATIONS					
INSTRUMENT NO.	NORTHING	EASTING	TARGET ELEVATION	APPROXIMATE GROUND SURFACE ELEVATION	LOCATION DESCRIPTION
SR-7	2068454	302471	5205	5244	
SR-8	2068896	302536	5205	5243	
SR-9	2069293	302588	5205	5232	
SR-10	2069506	302613	5205	5232	
I-1	2069343	302717	5175	5232	
I-2	2069343	302583	5175	5232	
I-3	2069677	302650	5175	5233	

NOTES:

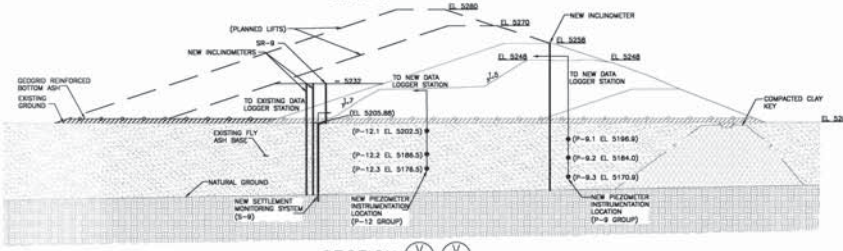
1. VIBRATING WIRE PIEZOMETERS P7, P8, P9, P10, P11, P12 ELEVATIONS HERE PROVIDED BY URS CORPORATION



SECTION T T PIEZOMETER CROSS SECTION
SCALE: 1"=40'



SECTION U U PIEZOMETER CROSS SECTION
SCALE: 1"=40'



SECTION V V PIEZOMETER CROSS SECTION
SCALE: 1"=40'

LEGEND

- P-7 VIBRATING WIRE PIEZOMETER GROUP
- S-7 SETTLING PLATE LOCATIONS
- EXISTING FLY ASH BASE
- ORIGINAL EMBANKMENT
- NATURAL GROUND
- P-11 STAND PIPE PIEZOMETERS
- SM-7 SURFACE MONUMENTS
- SR-8 SETTLEMENT ROD
- I-2 INCLINOMETER

BYRON R. CONROD 13248 REGISTERED PROFESSIONAL ENGINEER
04/20/2012

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
3	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
2	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173
1	07-09-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
PIEZOMETER & SETTLING PLATE LOCATIONS

aps

SCALE: NOTED DATE: 01-04-10

DWN	SMS
CHD	MLD
EXD	BRC
RVWD	

APPROVED
DENNIS DEL GROSSO
ENGINEERING SUPERVISOR

W.A. FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	28

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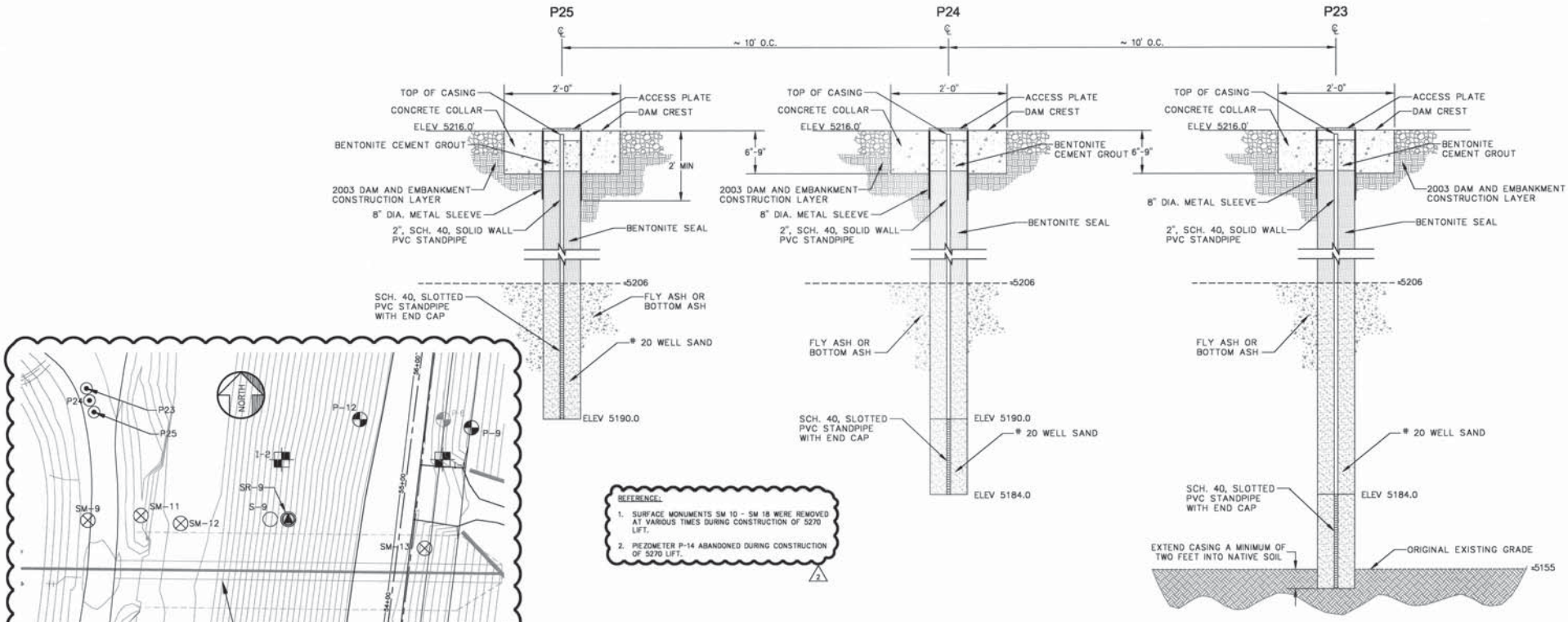


REFERENCE:
1. SURFACE MONUMENTS SM 10 - SM 18 WERE REMOVED AT VARIOUS TIMES DURING CONSTRUCTION OF 5270 LIFT.
2. PIEZOMETER P-14 ABANDONED DURING CONSTRUCTION OF 5270 LIFT.

DETAIL (1) TYP. STANDPIPE PIEZOMETER PAIR
NONE

ENLARGED SITE PLAN
SCALE: 1"=50'
2' CONTOUR INTERVALS

GRAPHIC SCALE
50 0 50 100
(IN FEET)
1 inch = 50 ft.

LEGEND
- EXISTING EMBANKMENT
- FLY ASH OR BOTTOM ASH
- SAND
- ORIGINAL EXISTING GRADE
- CONCRETE
- BENTONITE CEMENT GROUT
- BENTONITE SEAL
- P-7 VIBRATING WIRE PIEZOMETER GROUP
- S-7 SETTLING PLATE LOCATIONS
- STAND PIPE PIEZOMETERS

LEGEND
- P-7 VIBRATING WIRE PIEZOMETER GROUP
- S-7 SETTLING PLATE LOCATIONS
- P-11 STAND PIPE PIEZOMETERS
- SM-7 SURFACE MONUMENTS
- SR-8 SETTLEMENT ROD
- I-2 INCLINOMETER

NOTES
1. PIEZOMETERS SHALL BE INSTALLED ALONG THE EMBANKMENT CREST CENTERLINE.

REVISION 2 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173
1	08-30-10	MODIFICATION PER NEW MEXICO STATE ENGINEERS OFFICE	RDJ	MLD	BRC		DDG	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
SECTIONS AND DETAILS

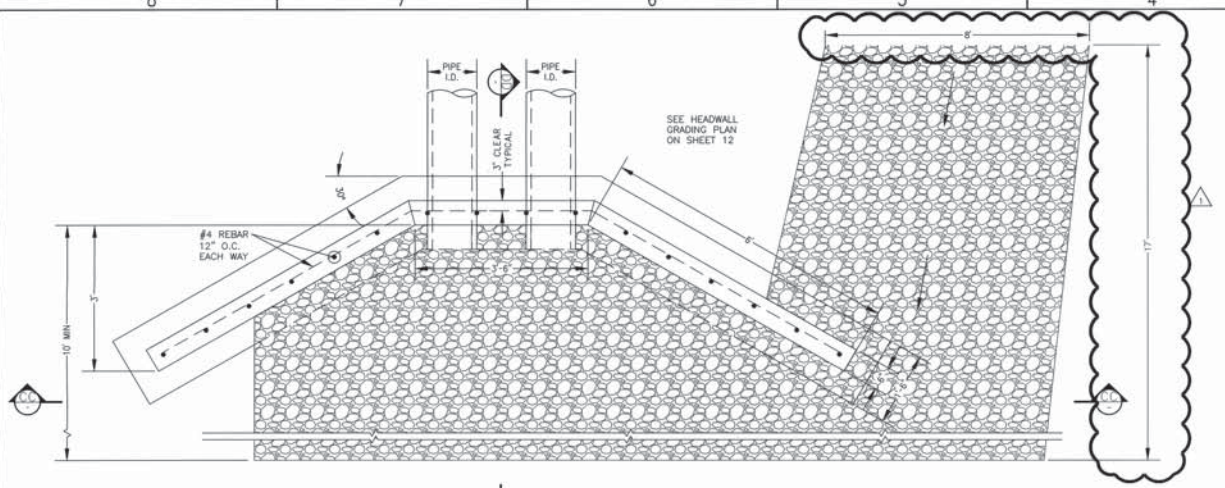
aps

SCALE NOTED DATE 12-15-09
DWN SMS CHD MLD EXD BRC RVWD
APPROVED JOHN D. MITCHELL ENGINEERING SUPERVISOR W A FAC90173

UNIT	DISC.	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	29

WORK SAFELY TODAY

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_EOC



DETAIL (7/12) HEAD WALL DETAIL
NOT TO SCALE

GENERAL NOTES FOR CONCRETE STRUCTURES:

1. ALL CONCRETE REINFORCING SHALL CONFORM TO ASTM A615, GRADE 60.

2. NUMBER 3 AND NUMBER 4 REINFORCING BARS USED FOR TIES MAY BE ASTM A615, GRADE 40.

3. CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI. SLUMP SHALL BE 4 INCHES ± 1 INCH. CLASS F FLY ASH IS REQUIRED AND SHALL REPLACE A MINIMUM OF 25% CEMENT CONTENT BY WEIGHT. MINIMUM CEMENT AND FLY ASH CONTENT SHALL THEN BE 470 LB PER CUBIC YARD. MIX DESIGN SHALL BE SUBMITTED FOR REVIEW A MINIMUM OF TWO WEEKS PRIOR TO PLACEMENT OF CONCRETE.

4. ALL CONCRETE MATERIALS AND INSTALLATION SHALL CONFORM TO APS FOSSIL GENERATION STANDARD CS04-000010, LATEST REVISION.

5. ALL MASONRY MATERIALS AND INSTALLATION SHALL CONFORM TO APS FOSSIL GENERATION STANDARD CS04-000060.

6. ALL BACKFILL AND EXCAVATION MATERIAL AND INSTALLATION SHALL CONFORM TO APS FOSSIL GENERATION STANDARD CS04-00020.

7. ALL CEMENT AND EPOXY GROUT MATERIAL AND INSTALLATION SHALL CONFORM TO APS FOSSIL GENERATION STANDARD CS04-00050.

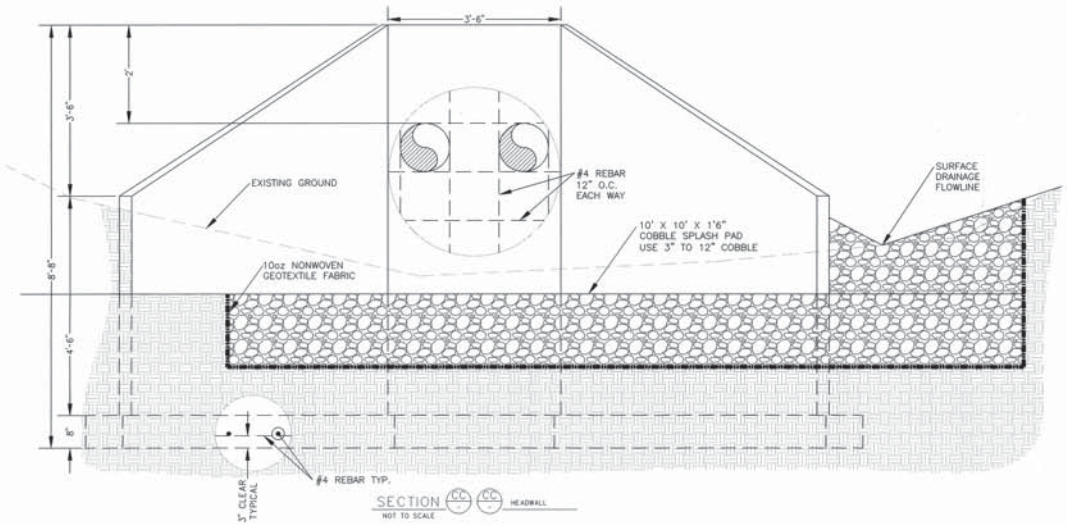
8. ANY WELDED REBAR FOR EMBEDS, OR SPECIFICALLY APPROVED APPLICATIONS SHALL CONFORM TO ASTM A706.

9. REBAR LAPS ARE TO BE IN ACCORDANCE WITH ACI STANDARDS.

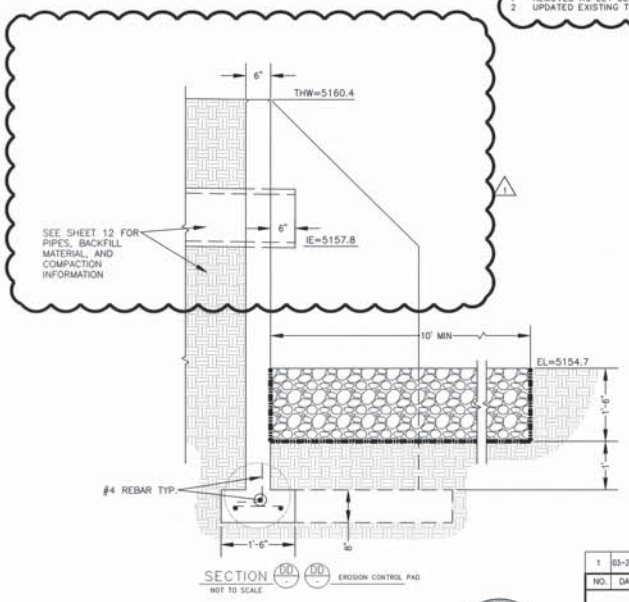
10. THE CONTRACTOR IS NOTIFIED THAT UNDERGROUND FACILITIES (REFERED TO HEREIN AS SUBGRADE UTILITIES, CONDUITS, DRAINAGE DEVICES, PIPING, VALVES, ETC.) ARE OR CAN BE LOCATED BENEATH THE SITE OR IN THE VICINITY OF THE PROJECT LOCATION. PRIOR TO COMMENCING CONSTRUCTION THE CONTRACTOR SHALL CONTACT THE ENGINEER OR PLANT MANAGER FOR UTILITY LOCATION (BLUE STAKE).

11. USE CAUTION DURING EXCAVATION TO AVOID DAMAGING EXISTING FACILITIES.

REVISION 1 CHANGES.
1 REMOVED AS-LET DESIGN INFORMATION FOR CLARITY
2 UPDATED EXISTING TOPO TO REFLECT AS-BUILT CONDITIONS



SECTION (CC/-) (CC/-) HEADWALL
NOT TO SCALE



SECTION (DD/-) (DD/-) EROSION CONTROL PAD
NOT TO SCALE

BYRON R. CONROD NEW MEXICO 13248 REGISTERED PROFESSIONAL ENGINEER
04/10/2014

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JLT	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LIFT LINED ASH IMPOUNDMENT
HEADWALL DETAILS

aps

SCALE NOTED DATE 10-18-10

DWN	RDJ	APPROVED	W.A.
CHD	MLD	DENNIS DEL GROSSO ENGINEERING SUPERVISOR	FAC90173
EXD	BRC		
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	158134	30

WORK SAFELY TODAY

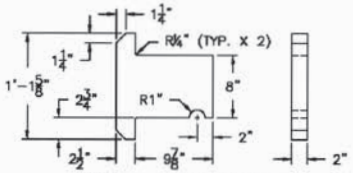
DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CA

NOTES:

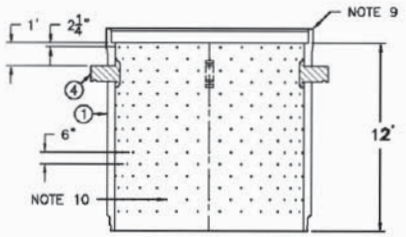
1. EMBEDMENT SHOULD BE PLACED AROUND THE MANHOLE RISER FOR THE FULL HEIGHT OF THE MANHOLE.
2. EMBEDMENT SHALL EXTEND A MINIMUM OF THREE AND A HALF (3.5) FEET FROM THE RISER OR TO THE TRENCH WALL; WHICHEVER IS THE GREATER DISTANCE.
3. EMBEDMENT AROUND MANHOLE RISER IS REQUIRED TO BE CLASS I OR II MATERIAL PER ASTM D2321, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.
4. MANHOLES SHALL BE INSTALLED IN A DRY TRENCH WITH A STABLE FOUNDATION. THE FOUNDATION SHOULD CONSIST OF A MINIMUM OF 8" OF CLASS I MATERIAL COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
5. WHEN VEHICLE LOADS ARE PRESENT, A CONCRETE CAP OR OTHER SUCH STRUCTURE DESIGNED TO WITHSTAND THESE LOADS SHOULD BE PLACED OVER THE MANHOLE SO THAT THE LOADS ARE TRANSMITTED INTO THE SURROUNDING SOIL AND NOT DIRECTLY INTO THE RISER.
6. THE FOLLOWING PARAMETERS WERE ASSUMED:
   A) MAXIMUM SOIL DENSITY OF 120 LBS/FT.^{3}
   B) GROUND WATER NOT TO EXCEED TOP OF THE MANHOLE. FLOTATION OF MANHOLE MAY NEED TO BE ADDRESSED. WHEN A POLYETHYLENE ANCHOR CONNECTION RING IS INCLUDED, IT MUST BE USED IN CONJUNCTION WITH A CONCRETE ANCHOR BY OTHERS. THE PE ANCHOR CONNECTION RING IS NOT DESIGNED TO RESTRAIN THE STRUCTURE BY ITSELF.
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 708664. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. (621) ½"Ø PERFORATIONS WILL BE DRILLED INTO THE RISER. PERFORATIONS WILL BE ANGLED 30° DOWN TO THE SPIGOT END. THE HOLES WILL BE ON 11 INCH CENTERS (OF ID) WITH 27 HOLES PER ROW. THE ROWS WILL BE 6 INCHES APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2 INCHES. THEIR WILL BE A TOTAL OF 23 ROWS.
11. TWO SETS OF WOOD SUPPORTS WILL BE INCLUDED TO HOLD THE PIPE AS ROUND AS POSSIBLE FOR SHIPPING.

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	12	FT.	–	–	96" I.D.	CLASS 315	HDPE – SW RISER STOCK (B X S)
2	4	EA.	–	–	2" THK	–	LIFTING LUGS (SEE LIFTING LUG DETAIL)



ITEM 4 – LIFTING LUG DETAIL
EXTRUDER WELD INSIDE & OUT



SAFETY NOTE TO OWNER/PURCHASER

MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	03-29-12	AS-BUILTS	JJ	JH	BRC		AK	FAC90173

FOUR CORNERS COMMON
ASH HANDLING SYSTEM
5270 LFT LINED ASH IMPOUNDMENT
DROP INLET PIPE VENDOR DRAWING (5270)

APS

SCALE: NONE DATE: 10-22-10

WORK SAFELY TODAY

DWN: ROJ
CHD: MLD
EXD: BRC
RVWD:
APPROVED: DENNIS DEL GROSSO, ENGINEERING SUPERVISOR
W.A.: FAC90173

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	158134	31

DRAWING: P:\WRES\Arizona_Public_Service\23446038_APS_Four_Corners_5270_PH_3\5_0_Technical\5_6_CADD\APS_FDI

5280 LIFT AS-BUILT DRAWINGS

(URS, 2014)

DAM OWNER'S CERTIFICATE

I, DAVID A. HANSEN, BEING FIRST DULY SWORN, UPON MY OATH, STATE THAT I AM A VICE PRESIDENT OF ARIZONA PUBLIC SERVICE CO, A CORPORATION DULY ORGANIZED UNDER THE LAWS OF THE STATE OF ARIZONA, THAT THE ACCOMPANYING CONSTRUCTION DRAWINGS CONSISTING OF 38 SHEETS, FOR THE 5280 LIFT LINED ASH IMPOUNDMENT DAM WERE MADE UNDER AUTHORITY OF SAID CORPORATION AND THAT I HAVE READ AND EXAMINED THE STATEMENTS AND REPRESENTATIONS AND ALL THAT IS SHOWN HEREIN IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

ARIZONA PUBLIC SERVICE COMPANY
CLAIMANT

David A Hansen 4/23/14

BY: DAVID A HANSEN, VICE-PRESIDENT — DATE
FOSSIL GENERATION

SUBSCRIBED AND SWORN TO BEFORE ME THIS 23RD DAY OF APRIL, 2014.

Karen McLaughlin
NOTARY PUBLIC

MY COMMISSION EXPIRES _____ (SEAL)

ENGINEER'S CERTIFICATE

I, BYRON R. CONRAD, STATE THAT I AM A QUALIFIED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW MEXICO, THAT I HAVE SUPERVISED THE CONSTRUCTION OF THE 5280 LIFT LINED ASH IMPOUNDMENT DAM AND APPURTENANT STRUCTURES AND FIND THEM TO BE COMPLETED IN ACCORDANCE WITH THE RECORD CONSTRUCTION DRAWINGS AND SPECIFICATIONS AND ARE NOW IN A SATISFACTORY CONDITION FOR ACCEPTANCE.

Byron R. Conrad, LICENSE NUMBER 13248
BYRON R. CONRAD
DATE: 4/23/14

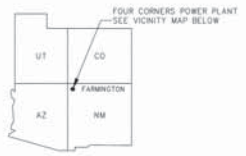
STATE ENGINEER'S CERTIFICATE

I HEREBY CERTIFY THAT THE ACCOMPANYING DRAWINGS FOR THE 5280 LIFT LINED ASH IMPOUNDMENT DAM AND RELATED APPURTENANCES HAS BEEN DULY EXAMINED BY ME AND ACCEPTED FOR FILING ON THE _____ DAY OF _____, 2011.

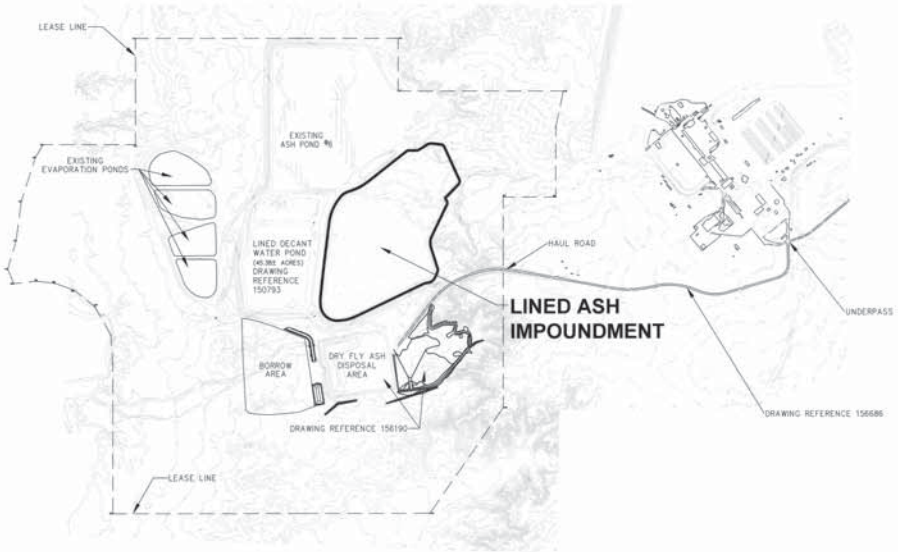
NEW MEXICO STATE ENGINEER

LIST OF DRAWINGS

LINED ASH IMPOUNDMENT 5280 LIFT
FOR THE
FOUR CORNERS POWER PLANT, UNITS 1-3
ARIZONA PUBLIC SERVICE COMPANY
LOCATED IN
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 34, T29N, R16W
OF SAN JUAN COUNTY, STATE OF NEW MEXICO



VICINITY MAP
N.T.S.



PROJECT SITE
N.T.S.

DATUM CONTROL
HV-53
(ACTUAL LOCATION OFF DRAWING SEE BELOW FOR INFORMATION)

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, N.G.V.D. 1929

REFERENCE:
FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE PHOENIX, AZ 85017

5275 LIFT AS-BUILT TOPO BY SOUDER, MILLER AND ASSOCIATES ON 04-17-2013

5280 LIFT AS-BUILT TOPO BY SAKURA ENGINEERING 125 WEST MAIN STREET FARMINGTON, NEW MEXICO 87401

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOUDAY — NEW MEXICO — 19940 — PROFESSIONAL ENGINEER

2 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

LINED ASH IMPOUNDMENT 5280 LIFT
FOR THE
FOUR CORNERS POWER PLANT, UNITS 1-3
ARIZONA PUBLIC SERVICE COMPANY
LOCATED IN SAN JUAN COUNTY, STATE OF NEW MEXICO

THE UNDERSIGNED APS COMPANY, CLAIMANT, WHOSE ADDRESS IS POST OFFICE BOX 53933, MAIL STATION 3190, CITY OF PHOENIX, COUNTY OF MARICOPA, STATE OF ARIZONA, CONSTRUCTED ASH DISPOSAL DAMS 3 & 4 AT THE FOUR CORNERS POWER PLANT. WE PROPOSE TO CONSTRUCT A LINED ASH IMPOUNDMENT ON THE EMBANKMENT BETWEEN PONDS 3 & 4 AND RELATED APPURTENANCES AS DESCRIBED AND INDICATED, HEREBY THIS MAKES THESE SEVERAL STATEMENTS RELATIVE AND OFFERS THOSE DRAWINGS AND STATEMENTS FOR ACCEPTANCE AND FILING IN COMPLIANCE WITH THE LAWS OF THE STATE OF NEW MEXICO.

5280 LIFT LINED ASH IMPOUNDMENT CHARACTERISTICS STATED BELOW PER SECTION 19.25.12.11.D(6) NMAC:

(A) NAME OF DAM; LINED ASH IMPOUNDMENT (LAI)
(B) TYPE OF DAM (MATERIAL); EARTHEN/ TAILINGS TYPE
(C) HAZARD POTENTIAL CLASSIFICATION; SIGNIFICANT HAZARD POTENTIAL
(D) MAXIMUM HEIGHT ABOVE THE DOWNSTREAM TOE IN FEET; APPROXIMATELY 107 FEET FOR THIS LIFT (DOWNSTREAM TOE ELEV: 5173 & CREST ELEV: 5280)
(E) MAXIMUM LENGTH IN FEET; APPROXIMATELY 6,400 FEET IN LENGTH, STATION 18+50 TO STATION 82+50
(F) CREST WIDTH IN FEET; 30 FEET
(G) SLOPE OF THE UPSTREAM FACE; SOUTH EMBANKMENT 2 HORIZONTAL TO 1 VERTICAL, WEST EMBANKMENT 3 HORIZONTAL TO 1 VERTICAL
(H) SLOPE OF THE DOWNSTREAM FACE; SOUTH EMBANKMENT 2 HORIZONTAL TO 1 VERTICAL, WEST EMBANKMENT 3 HORIZONTAL TO 1 VERTICAL
(I) ELEVATION OF THE DAM CREST; ELEVATION OF THE DAM CREST IS 5280
(M) ELEVATION OF OUTLET CONDUIT FLOW LINE; FLOW LINE ELEVATION 5220
(N) FREEBOARD IN FEET; 4.8 FEET AT WEST EMBANKMENT STA 40+00 TO 66+00
(P) MAXIMUM OUTLET CONDUIT DISCHARGE CAPACITY IN CUBIC FEET PER SECOND; 29.00 CFS.
(Q) TYPE OF OUTLET CONDUIT; 16 INCH DR11 HDPE PIPE
(S) LOCATION OF THE OUTLET WORKS INTAKE STRUCTURE (NEW MEXICO STATE PLANE COORDINATE SYSTEM); NORTHING IS 2,069,229 AND EASTING IS 302,886

THE DAM WILL BE COMPACTED EARTH FILL AND PLACED ON TOP OF THE EXISTING DAMS, AND IMPOUNDED FLY ASH.

DISCLAIMER:

THE 5280 LIFT DRAWINGS HAVE BEEN DESIGNED TO TIE INTO THE 5270 LIFT OF THE LAI. THE 5270 LIFT WAS UNDER CONSTRUCTION DURING THE DESIGN PHASE OF THE 5280 LIFT. THEREFORE, THE TOE OF THE 5280 LIFT HAS BEEN DETERMINED BY PROJECTING THE CREST ONTO THE MAY 2010 AERIAL TOPOGRAPHY OF THE SITE. THE LAI HAS BEEN CONSTRUCTED IN THE PAST FROM THE DOWNSTREAM TOE UPWARD TOWARDS THE CREST. THIS TOE LINE SHALL BE UPDATED ONCE THE 5270 LIFT AS-BUILT DATA HAS BEEN COMPLETED. THE 5270 LIFT ALIGNMENT AND UPSTREAM TOE WERE USED AS THE CONTROL TO DESIGN THE 5280 LIFT ALIGNMENT. THE ALIGNMENT OF THE 5280 LIFT CREST MAY BE ADJUSTED DURING CONSTRUCTION TO ACCOUNT FOR ANY VARIATIONS IN THE 5270 LIFT ALIGNMENT. ADJUSTMENTS TO THE ALIGNMENTS IS REFLECTED IN THESE 5280 LIFT AS-BUILTS.

DRAWING REFERENCE LIST

SEE APS DRAWING 100003 FOR 1974 APS FCPP EXISTING GRADE

SEE APS DRAWING 158134 SHEETS 1-33 FOR PREVIOUSLY APPROVED 5270 LIFT CONSTRUCTION AND AS-BUILTS

SEE APS DRAWING 156687 SHEETS 1-25 FOR PREVIOUSLY APPROVED CONSTRUCTION AND AS-BUILTS

SEE APS DRAWING SET 150515 SHEETS 1-18 FOR 5248 LIFT AND 5228 LIFT AS-BUILTS

SEE APS DRAWING SET 144440 SHEETS 1-6 FOR THE ASH DEPOSIT CHANNEL SYSTEM

SEE APS DRAWING SET 152857 SHEETS 1&2 FOR THE DRAIN PIPE TO LINED DECANT POND

SEE APS DRAWING SET 152408 FOR THE 5248 LIFT OF THE LAI AS-BUILTS OF FML LINER

SEE APS DRAWING SET 150793 SHEETS 1-7 FOR THE LINED DECANT WATER POND

SEE APS DRAWING SET 156868 SHEET 2 FOR THE 5258 AS-BUILT FML LINER CONNECTION DETAILS

2 SEE APS DRAWING SET 158144 FOR THE 5270 LIFT AS-BUILTS OF THE LAI FML LINER

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AMT	JDM	JBH	AMG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AMG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
FILING SHEET

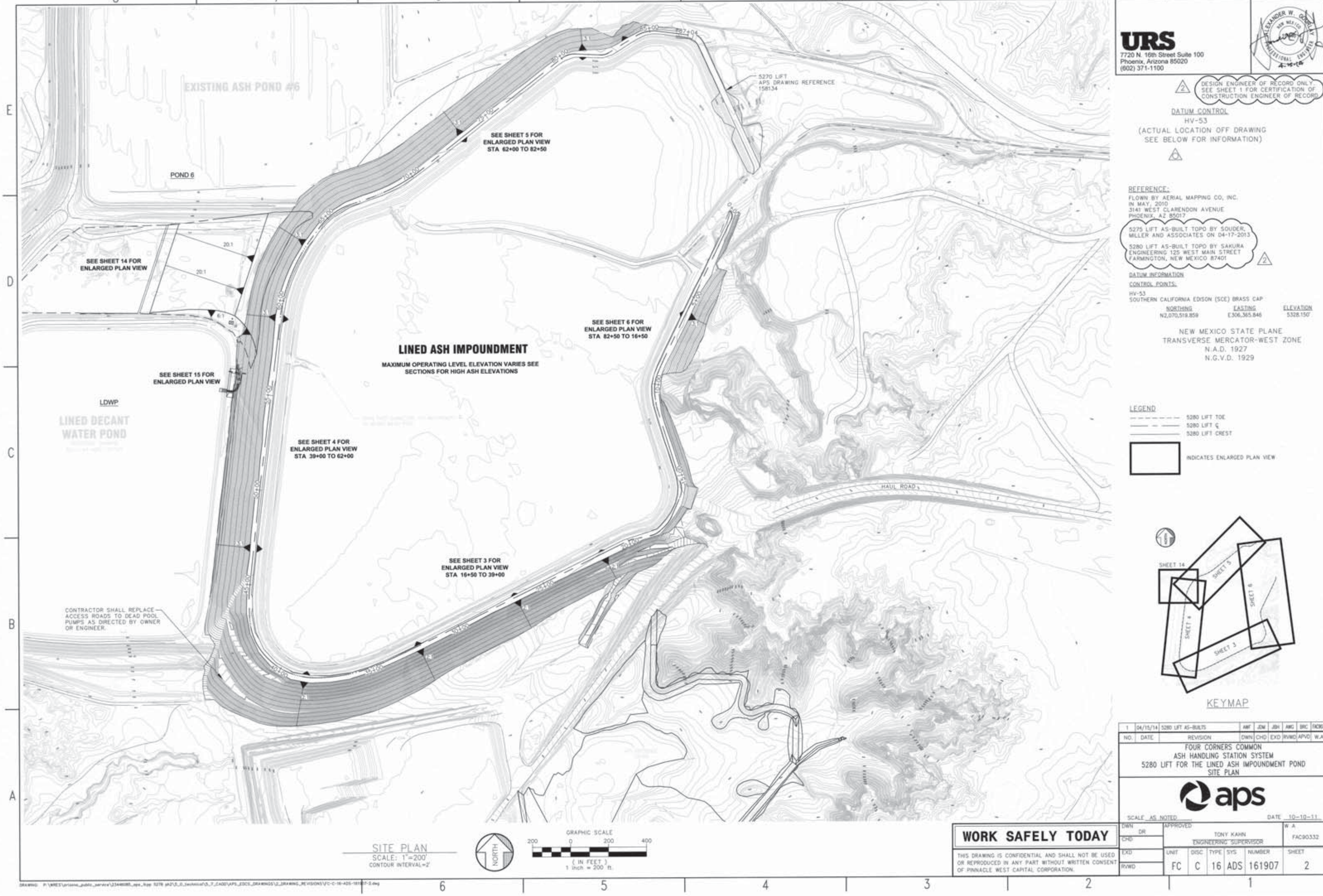
aps

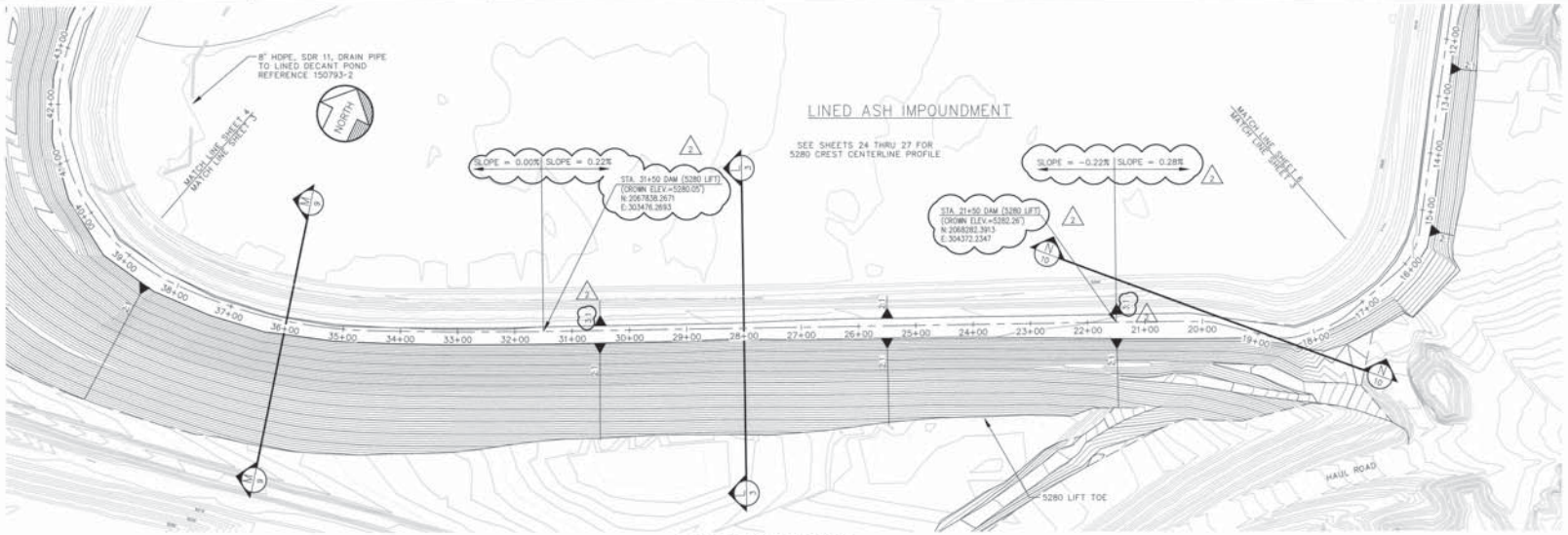
SCALE: AS NOTED — DATE: 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD		UNIT: FC	DISC: C	TYPE: 41	SYS: ADS	NUMBER: 161907	SHEET: 1
RVWD			

WORK SAFELY TODAY

DRAWING: P:\ARES\arizona_public_service\23446085_aps_fcpp 5270 ph2\2_0_technical\2_7_CADD\APS_DSCS_DRAWINGS\2_DRAWING_REVISIONS\FC-C-41-ADS-161907-1.dwg


EXISTING ASH POND #6
POND 6
SEE SHEET 14 FOR ENLARGED PLAN VIEW
SEE SHEET 15 FOR ENLARGED PLAN VIEW
LDWP
LINED DECANT WATER POND
SEE SHEET 5 FOR ENLARGED PLAN VIEW STA 62+00 TO 82+50
SEE SHEET 6 FOR ENLARGED PLAN VIEW STA 82+50 TO 16+50
SEE SHEET 4 FOR ENLARGED PLAN VIEW STA 39+00 TO 62+00
SEE SHEET 3 FOR ENLARGED PLAN VIEW STA 16+50 TO 39+00
LINED ASH IMPOUNDMENT
MAXIMUM OPERATING LEVEL ELEVATION VARIES SEE SECTIONS FOR HIGH ASH ELEVATIONS
5270 LIFT APS DRAWING REFERENCE 158134
CONTRACTOR SHALL REPLACE ACCESS ROADS TO DEAD POOL PUMPS AS DIRECTED BY OWNER OR ENGINEER.
HAUL ROAD
URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100
DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD
DATUM CONTROL
HV-53
(ACTUAL LOCATION OFF DRAWING SEE BELOW FOR INFORMATION)
REFERENCE:
FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE PHOENIX, AZ 85017
5275 LIFT AS-BUILT TOPO BY SOUDER, MILLER AND ASSOCIATES ON 04-17-2013
5280 LIFT AS-BUILT TOPO BY SAKURA ENGINEERING 125 WEST MAIN STREET FARMINGTON, NEW MEXICO 87401
DATUM INFORMATION
CONTROL POINTS:
HV-53
SOUTHERN CALIFORNIA EDISON (SCE) BRASS CAP
NORTHING N2,070,519.859 EASTING E306,365.846 ELEVATION 5328.150'
NEW MEXICO STATE PLANE TRANSVERSE MERCATOR-WEST ZONE N.A.D. 1927 N.G.V.D. 1929
LEGEND
5280 LIFT TOE
5280 LIFT ℄
5280 LIFT CREST
INDICATES ENLARGED PLAN VIEW
SHEET 14
SHEET 5
SHEET 6
SHEET 4
SHEET 3
KEYMAP
1 04/15/14 5280 LIFT AS-BUILTS
NO. DATE REVISION DWN CHD EXD RVWD APVD W.A.
FOUR CORNERS COMMON ASH HANDLING STATION SYSTEM 5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND SITE PLAN
aps
SCALE AS NOTED DATE 10-10-11
APPROVED TONY KAHN ENGINEERING SUPERVISOR
FAC90332
UNIT FC DISC C TYPE 16 SYS ADS NUMBER 161907 SHEET 2
WORK SAFELY TODAY
THIS DRAWING IS CONFIDENTIAL AND SHALL NOT BE USED OR REPRODUCED IN ANY PART WITHOUT WRITTEN CONSENT OF PINNACLE WEST CAPITAL CORPORATION.
SITE PLAN
SCALE: 1"=200'
CONTOUR INTERVAL=2'
NORTH
GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

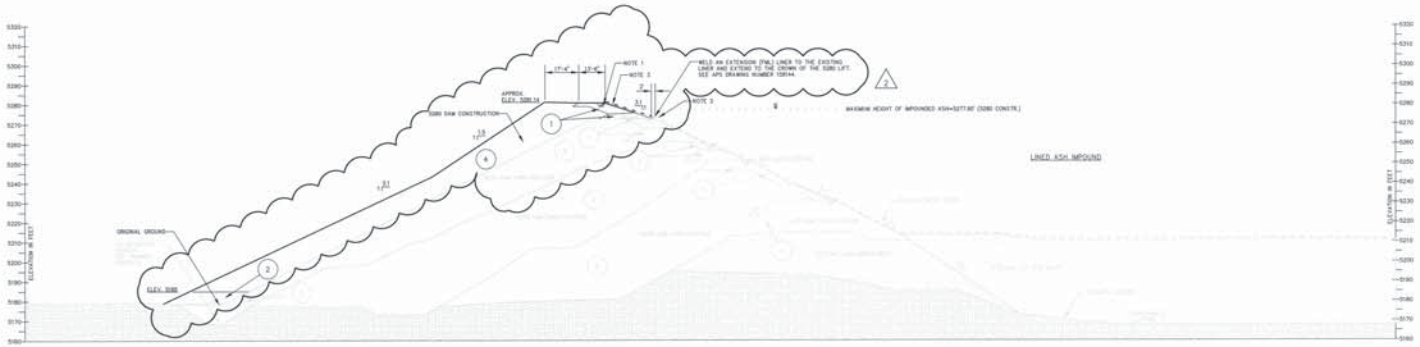


SOUTH EMBANKMENT

5280 LIFT CENTER LINE PLAN VIEW STA 16+50 TO STA 39+00

SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION L/3 L/3 SOUTH SIDE OF POND
HORZ: 1"=30' APPROX. STA 28+00

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

REFERENCE:
FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES 2101 SAN JUAN BLVD. FARMINGTON, NM 87401 ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC. FARMINGTON, NM ON FEBRUARY 23, 2014

URS
7720 N 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GRANT — NEW MEXICO — 19946 — PROFESSIONAL ENGINEER — 4-19-14

2 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

NOTES

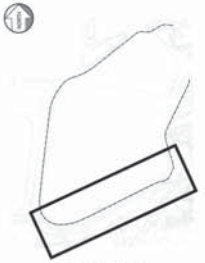
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158868 SH.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158868 SH.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-15240, SHT. 4.
4. DETAILS OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE. FOR STATIONS SHOWN, THE 5280 LIFT PENETRATES STATION MAP / BEEN BASED ON THE 5280 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THE TIME OF THE 5280 LIFT DESIGN. THEREFORE, STATIONING IS SHOWN FOR VISUAL PURPOSES ONLY. 2

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8' IS COMPACTED BOTTOM ASH) 2

LEGEND

- ORIGINAL POND 4 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- 5280 LIFT STATIONING ALIGNMENT
- 5280 LIFT TOE
- PROPOSED LIFT EMBANKMENT
- EXISTING LIFTS
- FML LINER
- MAX ASH LEVEL



KEYMAP

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AWG	FAC90332

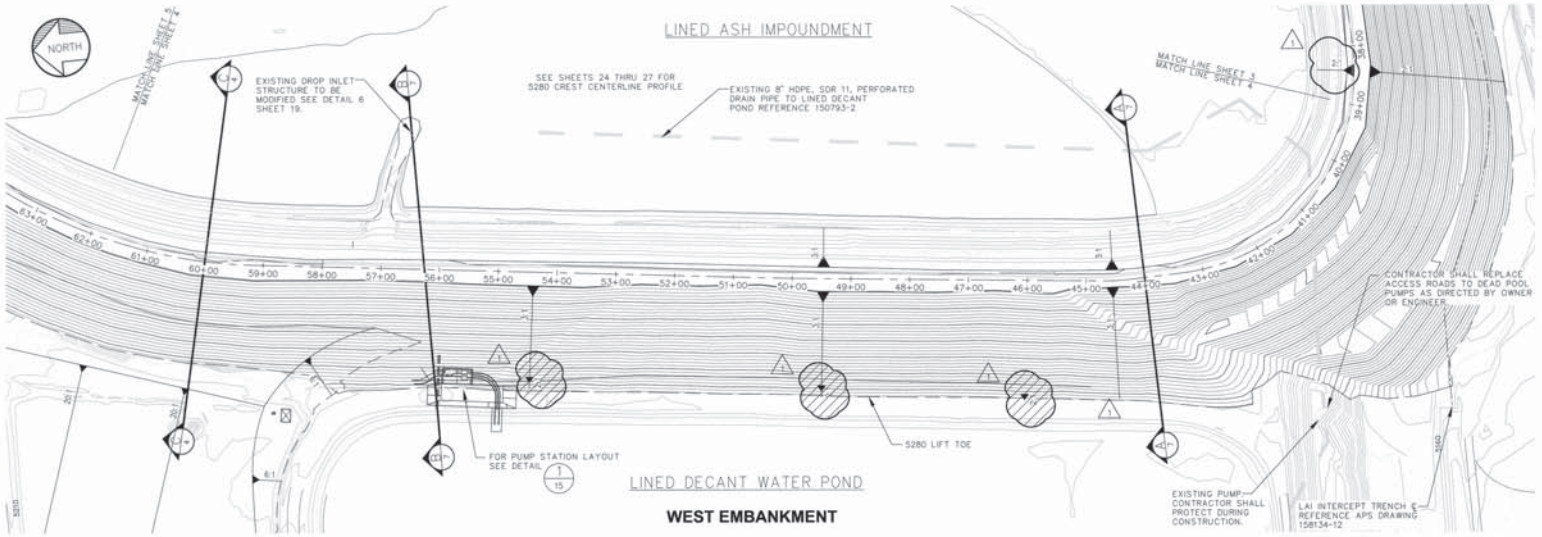
FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
PLAN AND SECTION STA 16+50 TO STA 39+00

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD		UNIT FC / DISC C / TYPE 47 / SYS ADS / NUMBER 161907	SHEET 3
RVWD			

WORK SAFELY TODAY



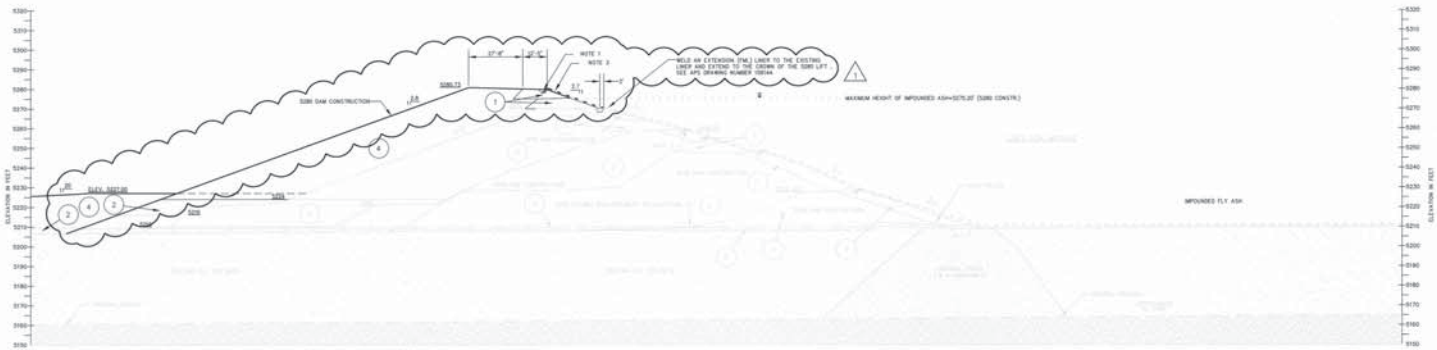
LINED DECANT WATER POND

WEST EMBANKMENT

5280 LIFT CENTER LINE PLAN VIEW STA 39+00 TO STA 62+00

SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION C/4 C/4 NORTHWEST SIDE OF POND
APPROX STA 60+00
HORZ: 1"=30'
VERT: 1"=30'

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

FLOWN BY AERIAL MAPPING CO, INC.
IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOLDEN NEW MEXICO 15040 PROFESSIONAL ENGINEER 4-15-14

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES

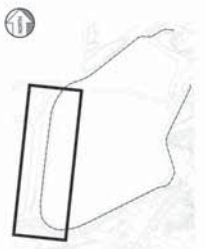
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 156868 SH.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 156868 SH.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-15240, SHT. 4.
4. BECAUSE OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE, FOR STATIONS SHOWN, THE 5280 LIFT CENTERLINE STATION HAS BEEN BASED ON THE 5270 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THIS TIME AS THE 5280 LIFT DESIGN. THEREFORE, STATIONING IS SHOWN FOR VISUAL PURPOSES ONLY. 1

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH) 1

LEGEND

- ORIGINAL POND 3 & 4 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- 5280 LIFT STATIONING ALIGNMENT
- 5280 LIFT TOE
- PROPOSED EMBANKMENT
- EXISTING LIFTS
- GEOGRID REINFORCEMENT
- FML LINER
- MAX ASH LEVEL



KEYMAP

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMT	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
PLAN AND SECTION STA 39+00 TO STA 62+00

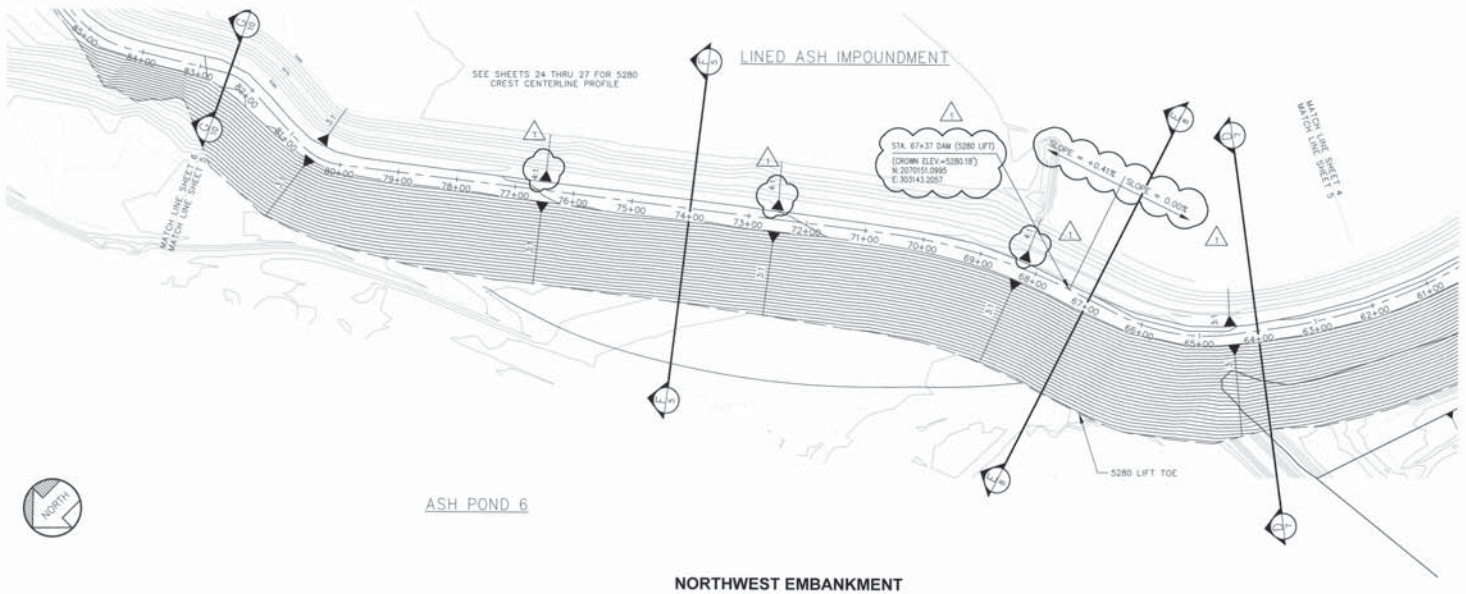
aps

SCALE AS NOTED DATE 10-10-11

DWN	APPROVED	W.A.
DR	TONY KAHN ENGINEERING SUPERVISOR	FAC90332
CHD		
EXD		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	47	ADS	161907	4

DRAWING: P:\WRES\arizona_public_service\23440085_aps_hpp 5270 ph2\5_0_technical\5_1_CADD\APS_EDCS_DRAWINGS\2_DRAWING_REVISIONS\FC-C-47-ADS-161907-4.dwg

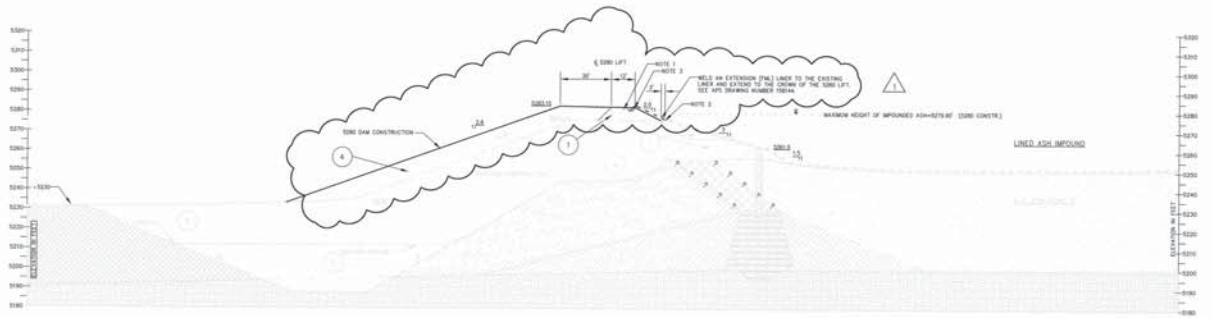


NORTHWEST EMBANKMENT

5280 LIFT CENTER LINE PLAN VIEW STA 62+00 TO STA 82+50

HORIZONTAL SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION F/5 F/5 WEST SIDE OF POND APPROX STA 74+00

HORZ: 1"=30
VERT: 1"=30

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

FLOWN BY AERIAL MAPPING CO, INC.
IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. DOUGLAS — NEW MEXICO — 19840 — REGISTERED PROFESSIONAL ENGINEER — 4-16-14

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

NOTES

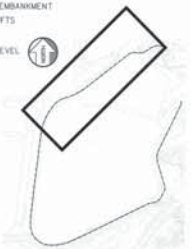
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 156868 SH.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 156868 SH.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-15240, SHT. 4.
4. LAYERS OF SYSTEM EMBANKMENT MATERIAL ARE APPROXIMATE. FOR STATIONS SHOWN, THE 5280 LIFT CENTERLINE STATION 1453 BEEN BASED ON THE 5280 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THIS TIME. BY THE 5280 LIFT DESIGN THE RECORD STATIONING IS SHOWN FOR VISUAL PURPOSES ONLY.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8' IS COMPACTED BOTTOM ASH)

LEGEND

- EXISTING POND 5 EMBANKMENT BROKEN SHALE
- EXISTING POND 5 EMBANKMENT BROKEN SHALE AND BOTTOM ASH
- CLAY CORE POND 5 ABOVE 5230
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- CLAY CORE POND 5
- SLURRY WALL
- COMPACTED BOTTOM ASH
- 5280 LIFT STATIONING ALIGNMENT
- 5280 LIFT TOE
- PROPOSED EMBANKMENT
- EXISTING LIFTS
- FML LINER
- MAX ASH LEVEL



KEYMAP

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMT	JDM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
PLAN AND SECTION STA 62+00 TO STA 82+50

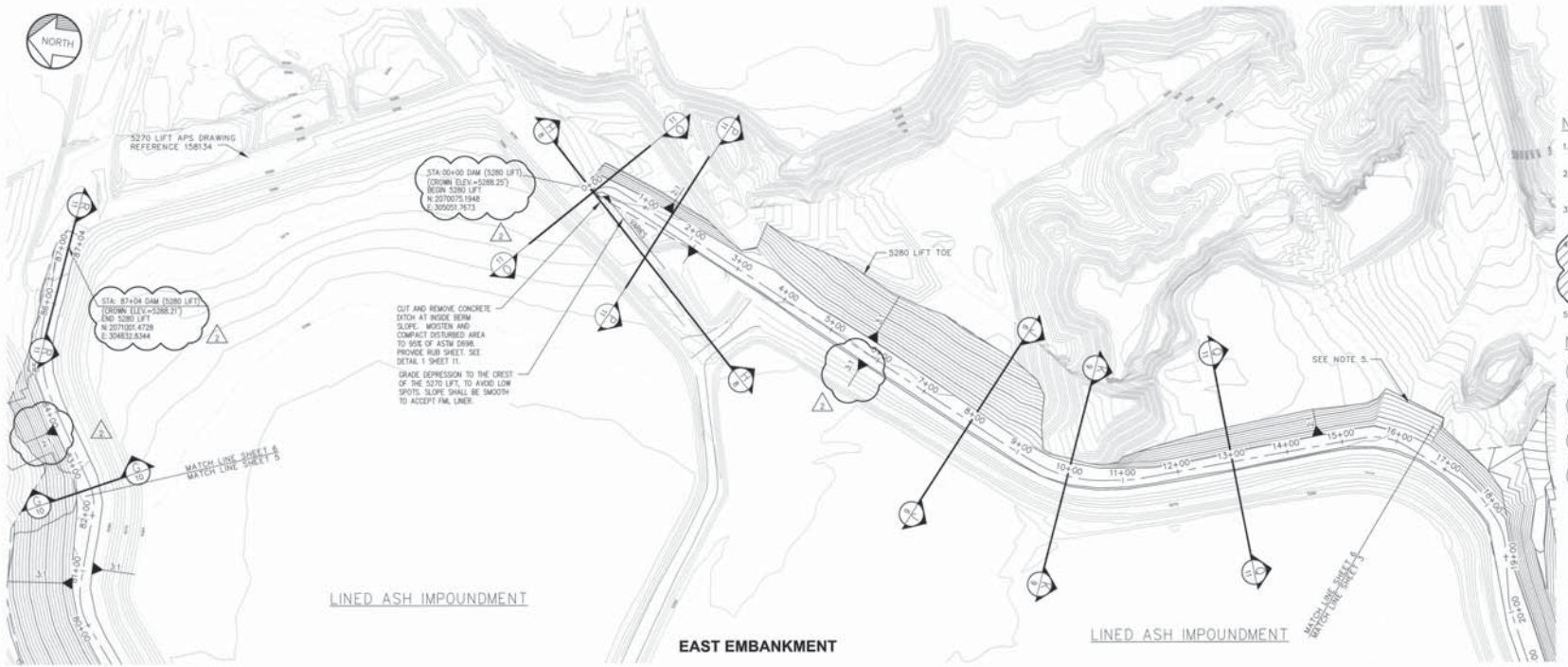
aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	47	ADS	161907	5

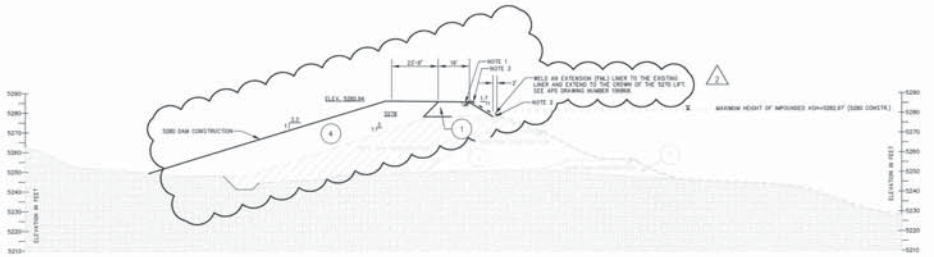
WORK SAFELY TODAY



5280 LIFT CENTER LINE PLAN VIEW STA 82+50 TO 87+04 AND 0+00 TO 16+50

SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.



SECTION J/- J/- TYPICAL
HORZ: 1"=30'
VERT: 1"=30'
APPROX FROM STA 4+00 TO 10+00

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

FLOWN BY AERIAL MAPPING CO, INC.
IN MAY, 2010.
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLEY — NEW MEXICO — 19648 — PROFESSIONAL ENGINEER — 4-15-14

DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES

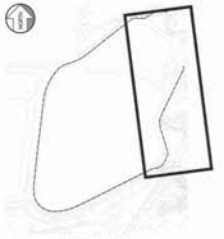
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158868 SA.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158868 SA.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-155240, SHT. 4.
4. OUTLINE OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE. FOR STATIONS SHOWN, THE 5280 LIFT CENTERLINE STATION HAS BEEN BASED ON THE 5270 LIFT DESIGN, WHICH HAS NOT BEEN AS-BUILT AT THE TIME OF THE 5280 LIFT DESIGN. THEREFORE, STATIONING IS SHOWN FOR VISUAL PURPOSES ONLY.
5. ACCESS RAMP ADDED DURING 5270 LIFT CONSTRUCTION.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH)

LEGEND

- COMPACTED SHALE BLANKET
- ORIGINAL GROUND SURFACE
- EXCAVATION AREAS
- EXISTING FLY ASH BASE
- COMPACTED BOTTOM ASH
- 5280 LIFT STATIONING ALIGNMENT
- 5280 LIFT TOE
- PROPOSED EMBANKMENT
- EXISTING LIFTS
- FML LINER
- MAX ASH LEVEL



KEYMAP

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JSH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JSH	BRC	AWG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
PLAN AND SECTION STA 82+50 TO STA 16+50

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED		W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR		FAC90332
EXD		UNIT	DISC	TYPE	SYS	NUMBER	SHEET
RVWD		FC	C	47	ADS	161907	6

DRAWING: P:\URES\arizona_public_service\23440085_aps_hopi 5278 ph2\US_D_technical\5_7_CADD\APS_EDCS_DRAWINGS\Z_DRAWING_REVISIONS\FD-C-47-ADS-161907-6.dwg

SECTION A/4 A/4 SOUTHWEST SIDE OF POND
HORZ: 1"=30' APPROX. STA 42+00 TO 58+50

SECTION B/4 B/4 WEST SIDE OF POND
HORZ: 1"=30' VERT: 1"=30' APPROX. STA 56+00

SECTION D/5 D/5 WEST SIDE OF POND
HORZ: 1"=30' VERT: 1"=30' APPROX. FROM STA 64+00 TO STA 65+00

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010.
2141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOUDIE NEW MEXICO 19848 PROFESSIONAL ENGINEER

2 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE 156868 SH.2 DETAIL
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE 156868 SH.2 DETAIL
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-162140, SHT. 4.
4. DETAILS OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE. TOPOGRAPHY SHOWN IS THE 5280 LIFT CENTERLINE STA FROM AS-BUILTS DATED MARCH, ON THE 5270 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THE TIME OF THE 5280 LIFT DESIGN. THEREFORE, EXTENTIONS IS SHOWN FOR VISUAL PURPOSES ONLY. 2

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH) 2

LEGEND

- ORIGINAL PONDS 3, 4 & 6 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- PROPOSED EMBANKMENT
- EXISTING LIFTS
- COMPACTED CLAY
- FML LINER
- MAX ASH LEVEL

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JBH	AMG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AMG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SECTIONS

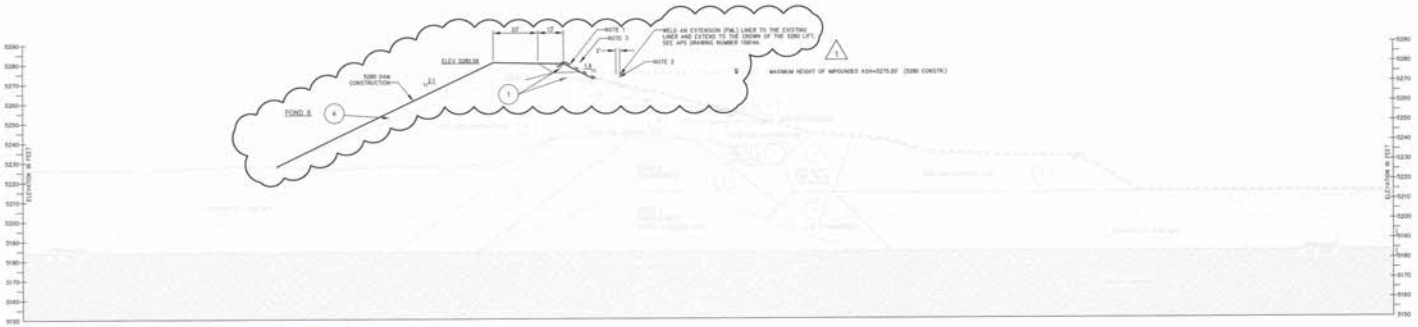
aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	7

WORK SAFELY TODAY



SECTION E/5 E/5 WEST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'
APPROX. STA 67+00

SECTION H/6 H/5 NORTH SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'
STA 0+00

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010.
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY — NEW MEXICO — 19646 — PROFESSIONAL ENGINEER

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE 150868 SH.2 DETAIL
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE 150868 SH.2 DETAIL
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-152401, SHT. 4.
4. DETAILS OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE. FOR ESTIMATES SHOWN, THE 5280 LIFT CENTERLINE STATION HAS BEEN BASED ON THE 5220 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THE TIME OF THIS 5280 LIFT DESIGN. THEREFORE, STATIONING IS SHOWN FOR VISUAL REFERENCE ONLY. 1

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH) 1

LEGEND

- ORIGINAL PONDS 3, 4 AND 6 EMBANKMENT
- COMPACTED SHALE BLANKET
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- COMPACTED BOTTOM ASH
- PROPOSED EMBANKMENT
- EXISTING LIFTS
- COMPACTED CLAY
- FML LINER
- MAX ASH LEVEL

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SECTIONS

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD		UNIT FC	DISC C	TYPE 65	SYS ADS	NUMBER 161907	SHEET 8
RVWD							

WORK SAFELY TODAY

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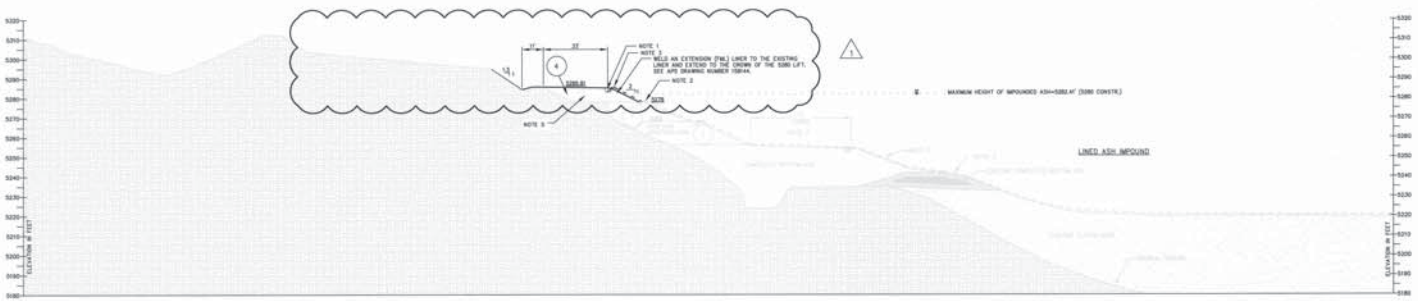
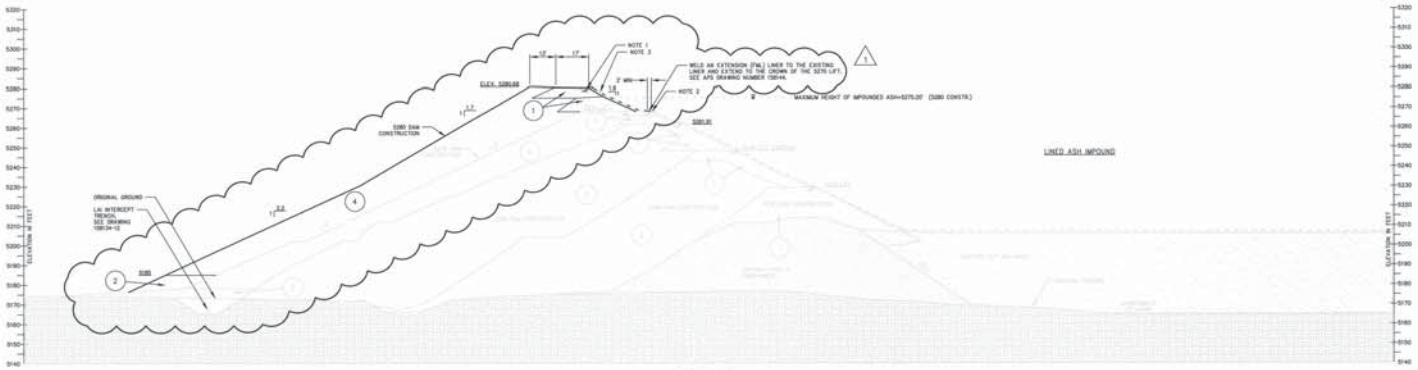
URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GONDEK NEW MEXICO 19948 REGISTERED PROFESSIONAL ENGINEER

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.



SECTION K/6 K/6 EAST SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'
APPROX. STA 10+00



SECTION M/3 M/3 SOUTH SIDE OF POND
HORZ: 1"=30'
VERT: 1"=30'
APPROX. STA 36+00

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 156868 SH.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 156868 SH.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-15240, SHT. 4.
4. BOTTOM OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE FOR STATIONS SHOWN. THE 5280 LIFT EMBANKING STATION HAS BEEN BASED ON THE 5230 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THE TIME OF THE 5280 LIFT DESIGN. THEREFORE, STATIONING IS APPROXIMATE AND SUBJECT TO CHANGE. 1
5. FROM STA 4+00 TO 10+00 CLAY (1)
   FROM STA 10+00 TO 19+00 (4)

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH) 1

LEGEND

- ORGINAL POND 3 & 4 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- PROPOSED EMBANKMENT
- EXISTING LIFTS
- FML LINER
- LAI INTERCEPT TRENCH
- MAX ASH LEVEL

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
   2101 SAN JUAN BLVD.
   FARMINGTON, NM 87401
   ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
   FARMINGTON, NM
   ON FEBRUARY 23, 2014

1

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JSH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND SECTIONS

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	9

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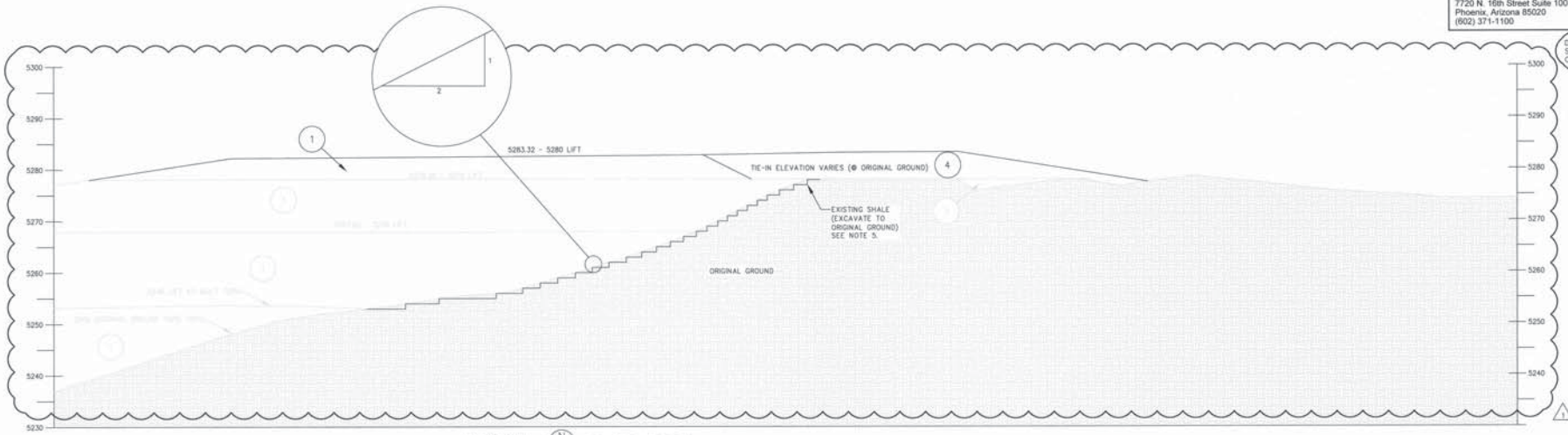
URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

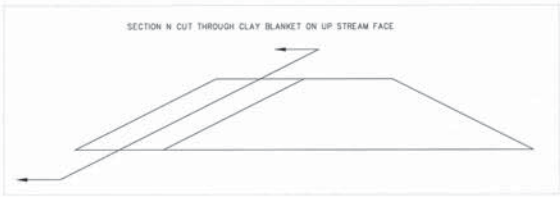
ALEXANDER W. GOURLAY — NEW MEXICO — 10846 — PROFESSIONAL ENGINEER

DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD



SECTION N/3 TIE-IN (SOUTH ABUTMENT)
1"=10' HORIZONTAL
1"=10' VERTICAL

GRAPHIC SCALE
10 0 10 20
(IN FEET)
1 inch = 10 ft.



NOTES

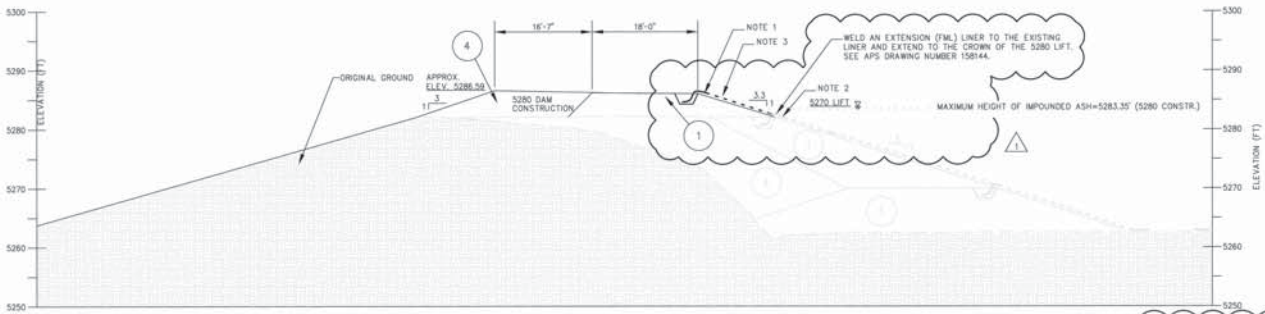
1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 156868 SH.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 156868 SH.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-15340, SHT. 4.
4. DETAILS OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE. FOR STATIONS SHOWN, THE 5280 LIFT CENTERLINE STATION HAS BEEN BASED ON THE 5270 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THE TIME OF THE 5280 LIFT DESIGN. THEREFORE, STATIONING IS SHOWN FOR VISUAL PURPOSES ONLY. 1
5. ONLY KEY IN CLAY TO NATURAL GROUND PER SECTION N-10

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH) 1

LEGEND

ORIGINAL GROUND SURFACE



SECTION G/5 G/5 NORTHWEST SIDE OF POND
HORZ: 1"=30' APPROX. STA. 82+50

GRAPHIC SCALE
10 0 10 20
(IN FEET)
1 inch = 10 ft.

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY: 1
1. SOUDER, MILLER AND ASSOCIATES 2101 SAN JUAN BLVD. FARMINGTON, NM 87401 ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC. FARMINGTON, NM ON FEBRUARY 23, 2014

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JBH	AWG	SRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SECTIONS

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	10

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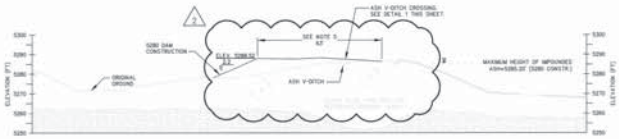
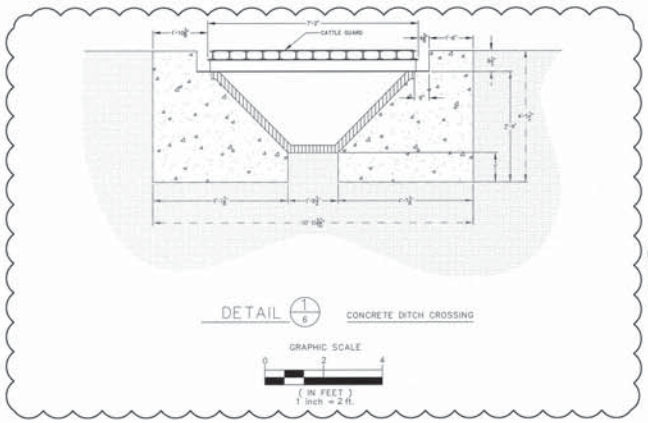
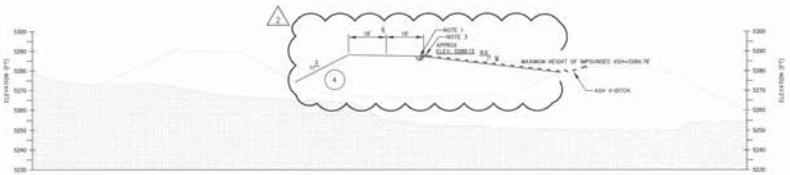


SECTION Q/6 Q/6 EAST SIDE OF POND
HORZ: 1"=30' APPROX STA 0+00

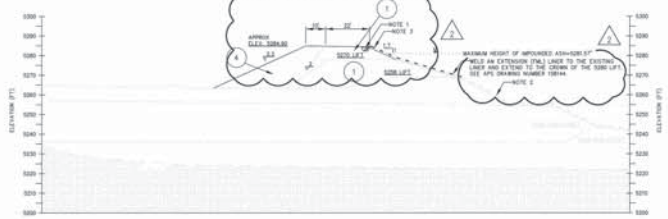
GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.





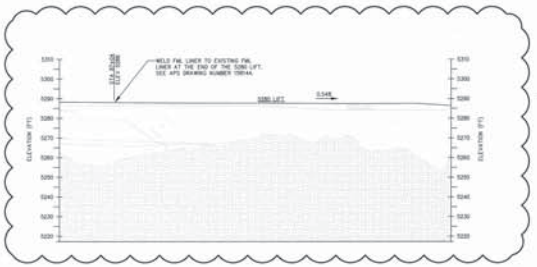
SECTION P/6 P/6 EAST SIDE OF POND
HORZ: 1"=30' APPROX STA 1+50

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.



SECTION Q/6 Q/6 EAST SIDE OF POND
HORZ: 1"=30' STA 13+00

GRAPHIC SCALE
0 30 60
(IN FEET)
1 inch = 30 ft.



SECTION R/6 R/6 PARALLEL TO ALIGNMENT
HORZ: 1"=30' STA 86+00

GRAPHIC SCALE
0 30

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLEY NEW MEXICO 19548 REGISTERED PROFESSIONAL ENGINEER

DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES

1. ANCHOR TRENCH FOR GEOSYNTHETIC (FML) LINER. (4) SEE DETAIL 158868 SH.2
2. WORK BENCH FOR WELDING GEOSYNTHETIC (FML) LINER. (5) SEE DETAIL 158868 SH.2
3. 1-LAYER OF GEOSYNTHETIC (FML) LINER ON THE UPSTREAM FACE OF LINED ASH IMPOUNDMENT. REFERENCE DRAWING FC-C-39-ADS-15240, SHT. 4.
4. DETAILS OF EXISTING EMBANKMENT MATERIALS ARE APPROXIMATE. FOR ASTALOSLY SHOWN, THE 5280 LIFT CENTERLINE STATION HAS BEEN BASED ON THE 5210 LIFT DESIGN WHICH HAS NOT BEEN AS-BUILT AT THIS TIME OF THE 5280 LIFT DESIGN THEREFORE, STATIONING IS APPROXIMATE FOR VISUAL PURPOSES ONLY.
5. CREST OF DAM IS WIDER DUE TO ORIENTATION OF CROSS SECTION.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH)

LEGEND

- ORIGINAL POND 4 EMBANKMENT
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE
- CONCRETE
- V-DITCH LINER
- 5280 LIFT STATIONING ALIGNMENT
- 5280 LIFT TOE
- PROPOSED LIFT EMBANKMENT
- EXISTING LIFTS
- FML LINER
- MAX ASH LEVEL

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES 2101 SAN JUAN BLVD. FARMINGTON, NM 87401 ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC. FARMINGTON, NM ON FEBRUARY 23, 2014

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AMT	JDM	JBH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AWG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SECTIONS

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	11

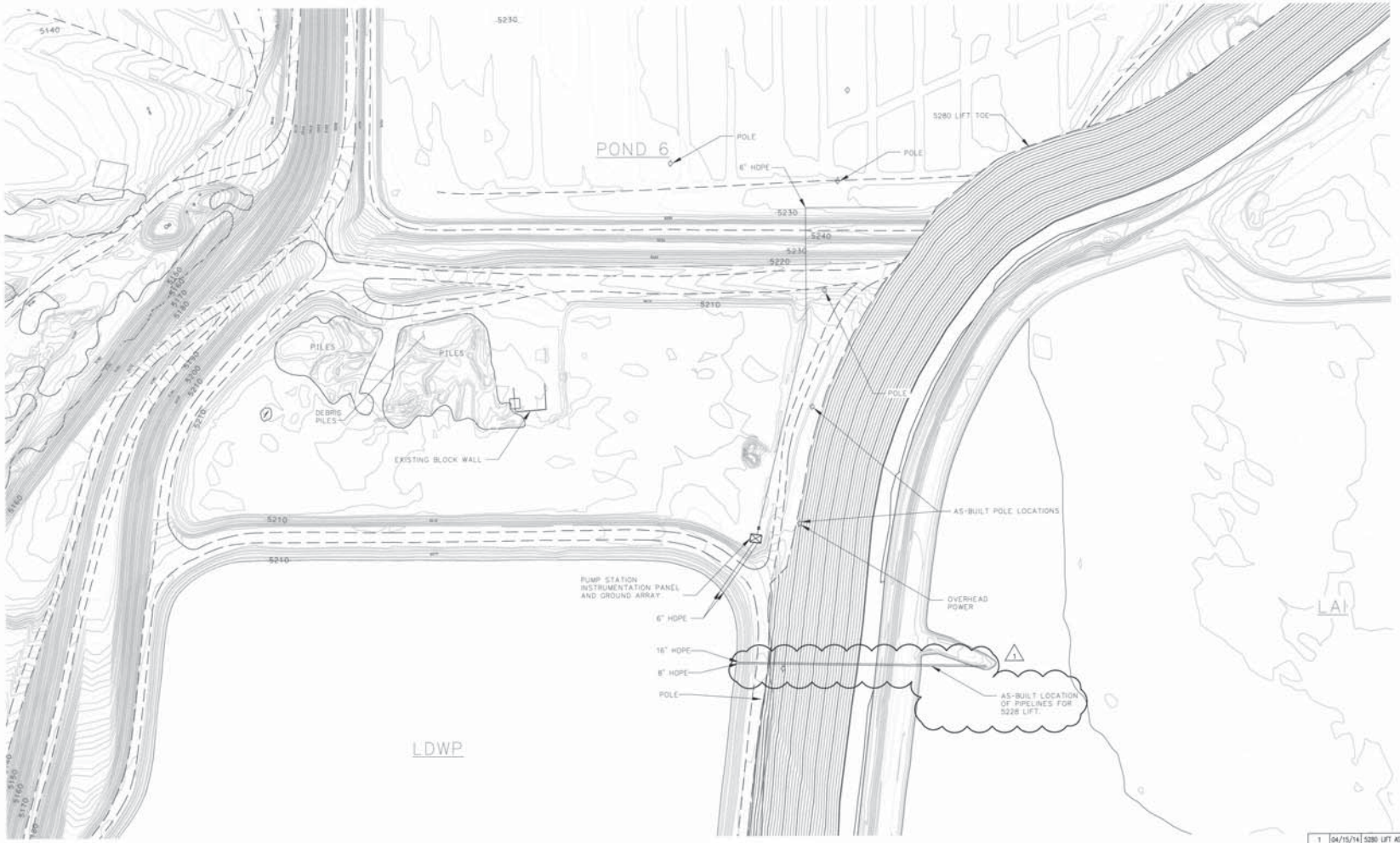
WORK SAFELY TODAY

DRAWING: P:\BRES\arizona_public_service\234460185_aps_fcgs 5278 ph2\5_0_technical\5_7_CADD\APS_ECDS_DRAWINGS\2_DRAWING_REVISIONS\FC-C-65-ADS-161907-11.dwg

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. DOBRILOVIC NEW MEXICO 19846 PROFESSIONAL ENGINEER

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD



NORTH

EXISTING CONDITIONS PLAN
SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

1 FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JSM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD EXISTING CONDITIONS

aps

SCALE AS NOTED DATE 10-10-11

DWN	APPROVED	W.A.
MT	TONY KAHN ENGINEERING SUPERVISOR	FAC90332
CHD		
EXD		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	17	ADS	161907	12

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Phoenix, Arizona 85020
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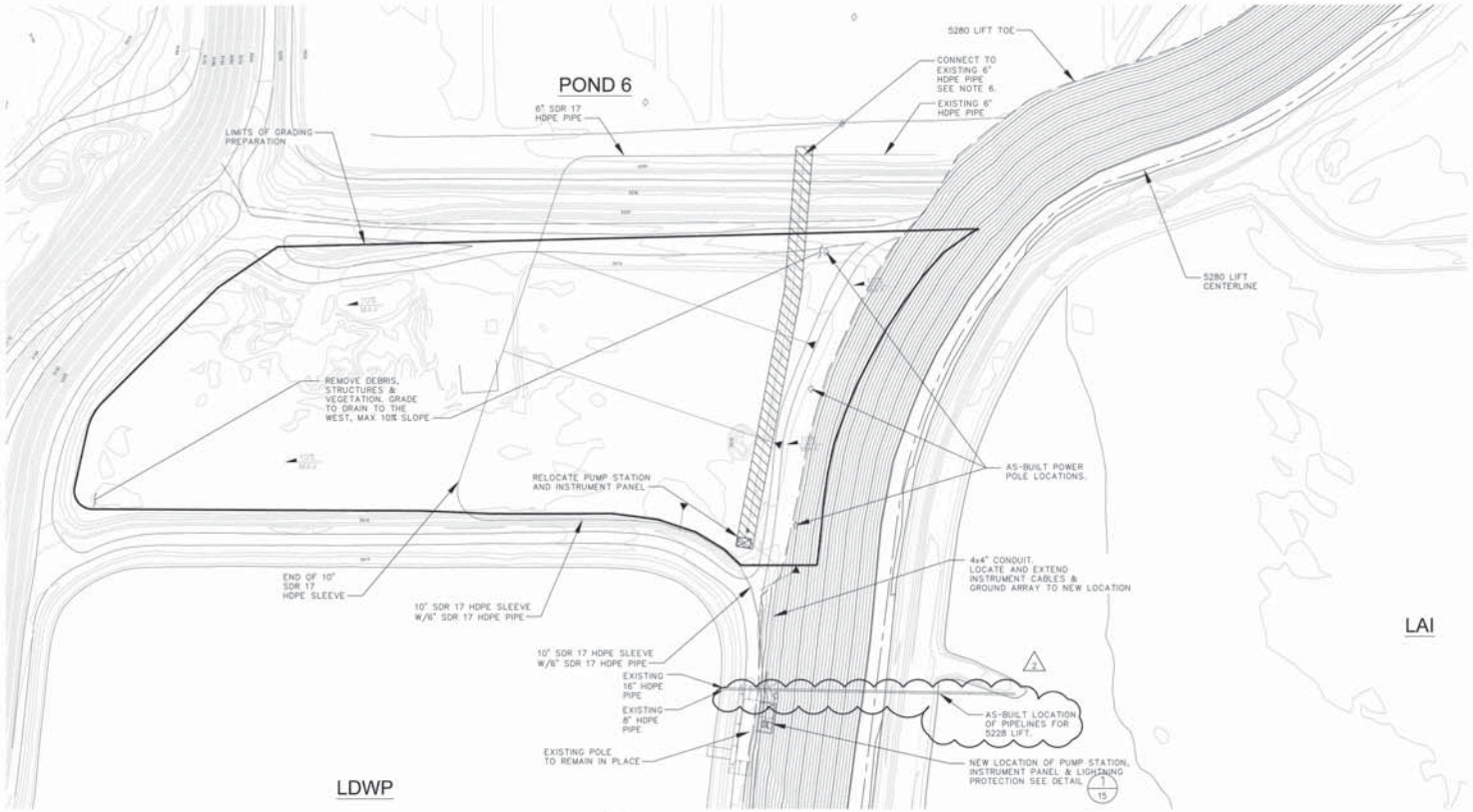
ALEXANDER W. GOURLEY NEW MEXICO 19646 PROFESSIONAL ENGINEER

2 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD



NORTH

SITE PREPARATION & UTILITY PLAN

SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

LEGEND

LIMITS OF GRADING

GENERAL UTILITY NOTES:

1. WHERE HDPE PIPE IS SUBJECTED TO VEHICULAR LOADS, IT IS RECOMMENDED TO INSTALL IT UNDER AT LEAST ONE PIPE DIAMETER OR 18" OF COVER WHICHEVER IS GREATER.
2. ALL HIGH-DENSITY POLYETHYLENE (HDPE) PIPING SHALL BE INSTALLED PER MANUFACTURE RECOMMENDATIONS.
3. FLUSH ALL PIPING BEFORE CONNECTING TO PUMPS.
4. THE CONTRACTOR SHALL OBSERVE PRECAUTIONS NECESSARY FOR PROTECTION OF ANY FIELD INSTRUMENTATION DEVICES. THE CONTRACTOR SHALL PAY FOR THE REPLACEMENT OF ANY INSTRUMENTATION EQUIPMENT THAT IS DAMAGED AS A RESULT OF ITS OPERATION.
5. EXCAVATE AND REMOVE EXISTING POWER POLES AS NOTED, BACKFILL AND COMPACT PER CONSTRUCTION SPECIFICATIONS. 2
6. EXISTING 6" HDPE PIPE TO BE REMOVED AS SHOWN.

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010. 3141 WEST CLARENDON AVENUE PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES 2101 SAN JUAN BLVD. FARMINGTON, NM 87401 ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC. FARMINGTON, NM ON FEBRUARY 23, 2014

2

WORK SAFELY TODAY

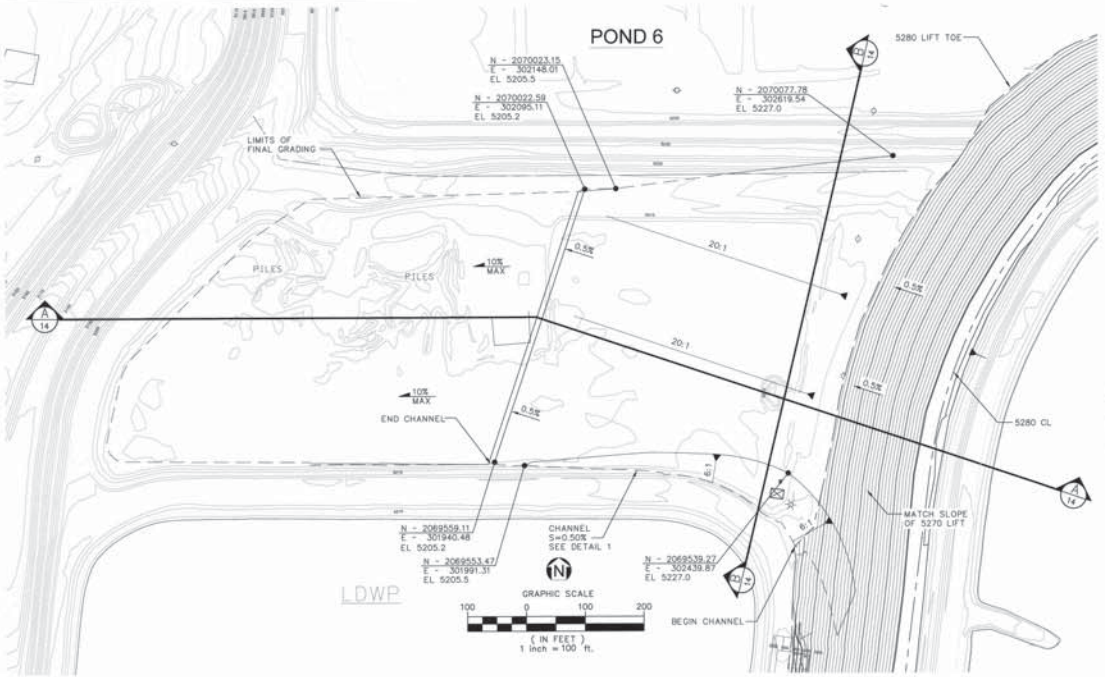
NO.	DATE	REVISION	DWN	CHD	EXD	PVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AWG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD SITE PREPARATION AND UTILITY PLAN

aps

SCALE AS NOTED DATE 10-10-11

DWN: DL	APPROVED	W. A.
CHD	TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD	UNIT	DISC	TYPE	SYS	NUMBER	SHEET
PVWD	FC	C	66	ADS	161907	13



GRADING NOTES:

I. STAGING PLAN. SEE SECTION A/14

FILL ZONE 1 - 5 WITH BOTTOM ASH TO 1.5' DEPTH
1. ZONE 1 - PLACE FLY ASH IN COMPACTED LIFTS TO A 2' THICKNESS.
2. ZONE 2 - PLACE FLY ASH IN COMPACTED LIFTS TO A 2' THICKNESS.
3. ZONE 3 - PLACE FLY ASH IN COMPACTED LIFTS TO A 2' THICKNESS
4. ZONE 4 - PLACE FLY ASH IN COMPACTED LIFTS TO A 2' THICKNESS

REPEAT STEPS 1-4 UNTIL GRADING IS REACHED AS SHOWN ON PLANS OR AS DIRECTED BY ENGINEER. FILLING MAY BE SUSPENDED UPON NOTIFICATION FROM ENGINEER, FOR A TIME TO BE DETERMINED BY THE ENGINEER. ENGINEER MAY DIRECT CONTRACTOR TO FILL AN ALTERNATIVE ZONE ON THE PRE-LOAD AREA. ENGINEER WILL NOTIFY CONTRACTOR WHEN FILLING MY BEGIN AGAIN. FILL IS TO BE PLACED IN HORIZONTAL LIFTS. THE FINAL SLOPES WILL BE ACHIEVED UPON COMPLETION OF THE FILL WITH THE REQUIRED FILL LIFTS. ZONES 1 & 5 WILL HAVE A FINAL SLOPE OF 0.5% ZONES 2-4 WILL A FINAL SLOPE OF 20:1.

II. THE CONTRACTOR SHALL OBSERVE PRECAUTIONS NECESSARY FOR PROTECTION OF ANY FIELD INSTRUMENTATION DEVICES. THE CONTRACTOR SHALL PAY FOR THE REPLACEMENT OF ANY INSTRUMENTATION EQUIPMENT THAT IS DAMAGED AS A RESULT OF ITS OPERATIONS.

III. ALL CONSTRUCTION WITHIN THE PRE-LOAD WILL BE BUILT ACCORDING TO THE 5280 DAM SPECIFICATIONS.

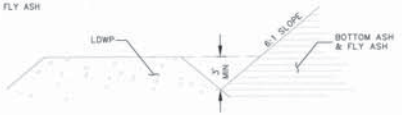
IV. NO RAMPS FOR CONSTRUCTION HAUL ROUTES SHALL BE BUILT OUTSIDE OF THE TOE OF THE 5280 LIFT WITHIN THE PRE-LOAD AREA.

V. ANY CUT SLOPE AGAINST EXISTING EMBANKMENTS TO BE MAINTAINED AT 3:1 SLOPE.

NEW DAM EMBANKMENT MATERIALS

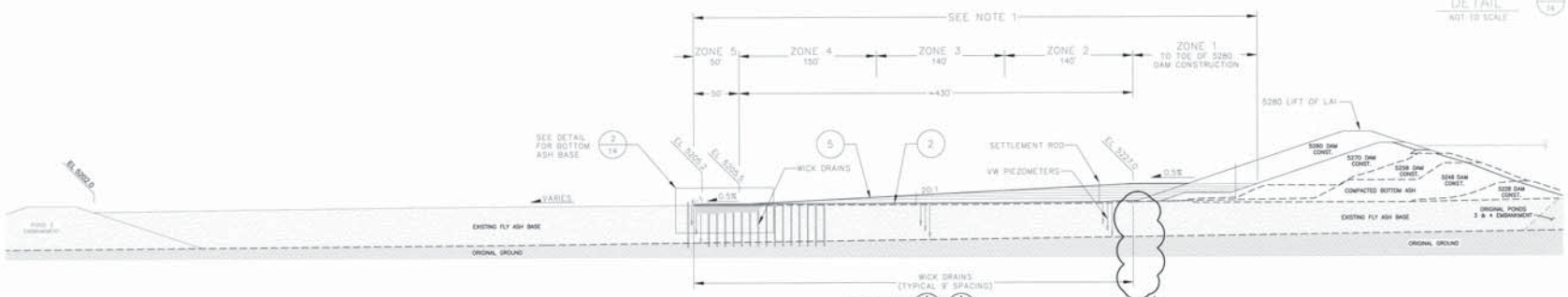
1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH
5. COMPACTED FLY ASH

LEGEND
- ORIGINAL POND 4 EMBANKMENT
- COMPACTED BOTTOM ASH
- EXISTING FLY ASH BASE
- ORIGINAL GROUND SURFACE

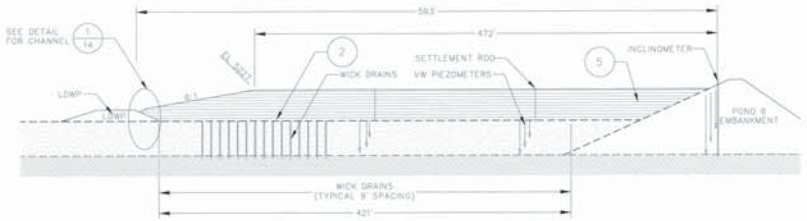


DETAIL 1/14 SOUTH SIDE CHANNEL DETAIL
NOT TO SCALE

DETAIL 2/14 BOTTOM ASH BASE TYPICAL ALL ZONES
NOT TO SCALE



SECTION A/14 A/14 SOIL BALLAST & STAGING PLAN
HORZ: 1"=60' TYPICAL WEST-EAST



SECTION B/14 B/14 SOIL BALLAST
HORZ: 1"=60' TYPICAL SOUTH-NORTH

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
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2. FOUR CORNERS SURVEYING, INC. FARMINGTON, NM ON FEBRUARY 23, 2014

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY NEW MEXICO 19646 PROFESSIONAL ENGINEER 4-11-14

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AWF	JSM	JBH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AWG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD FINAL GRADING PLAN

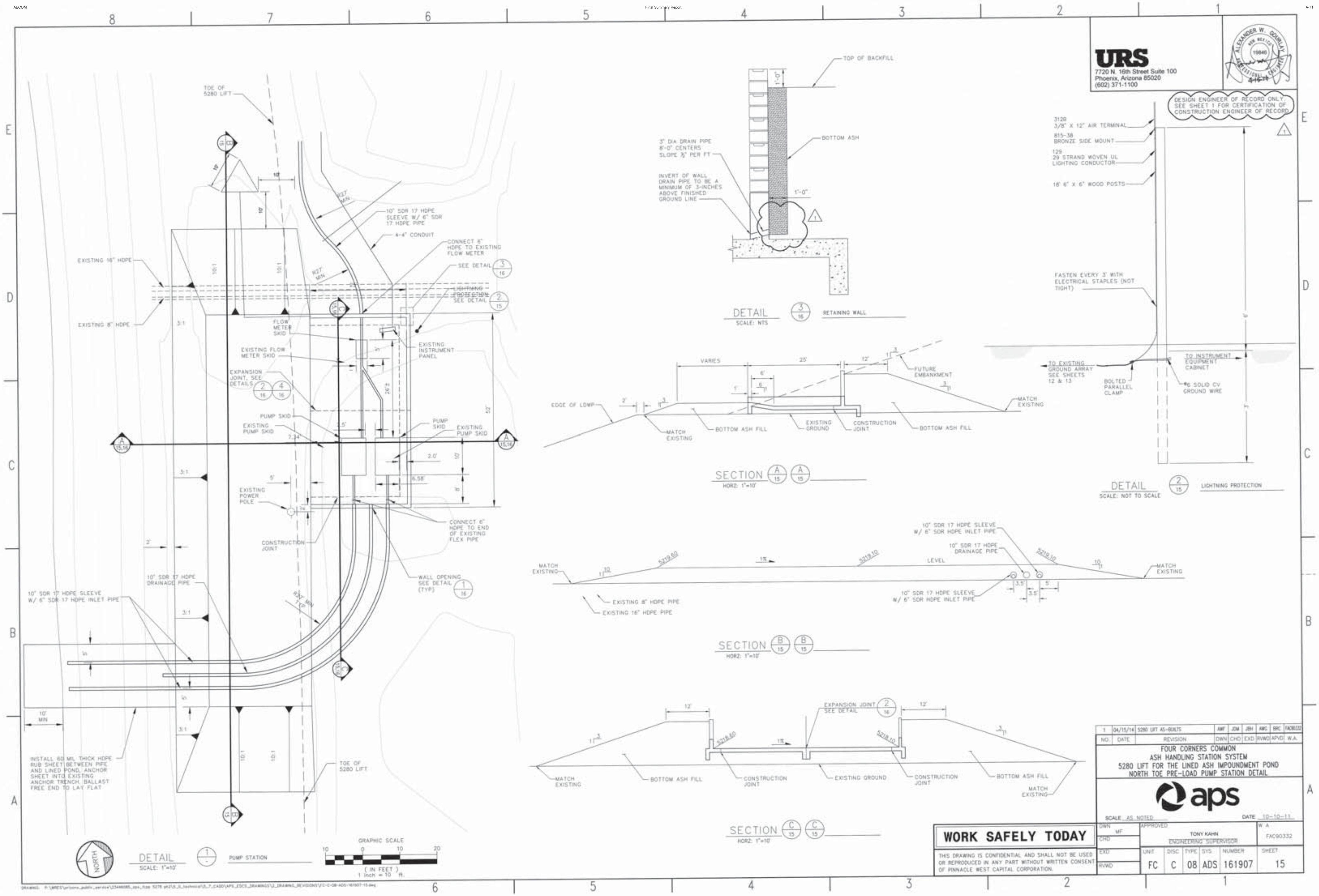
aps

SCALE AS NOTED DATE 10-10-11

DWN	APPROVED	W.A.
DR	TONY KAHN ENGINEERING SUPERVISOR	FAC90332

CHD	EXD	RVWD

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	161907	14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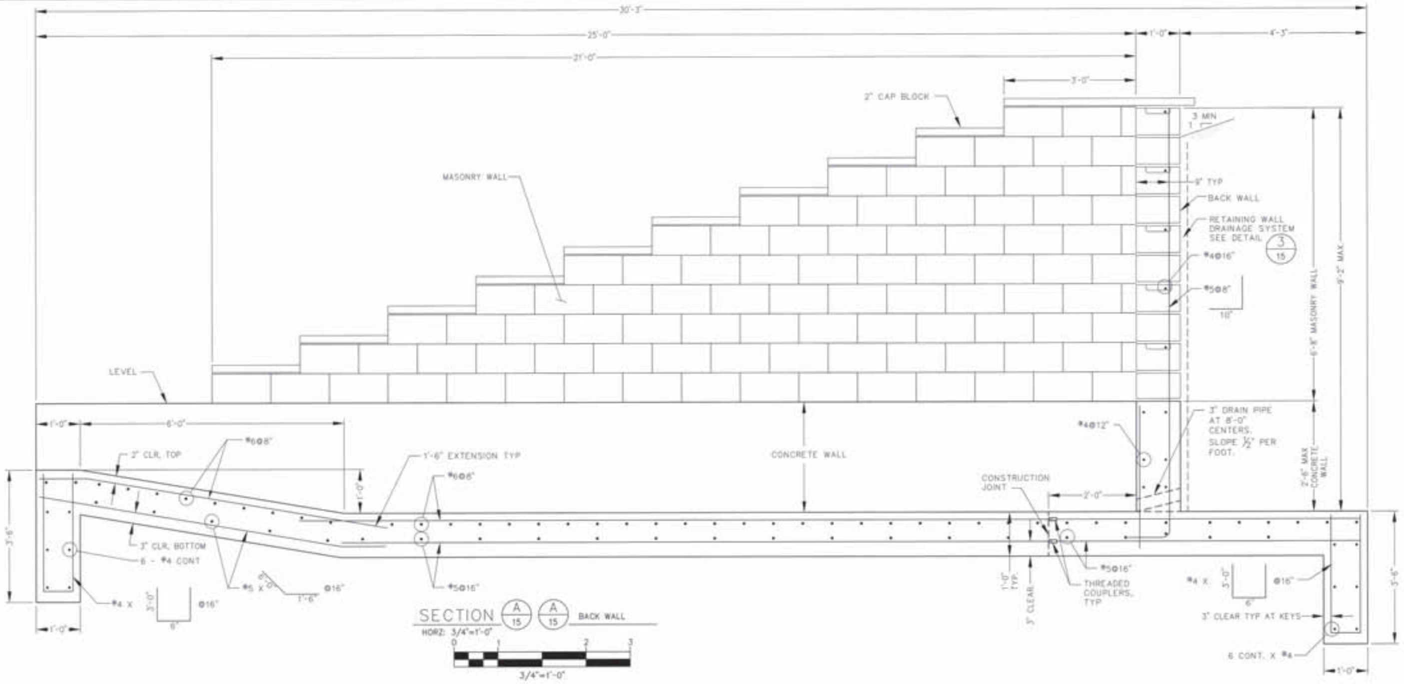
Phoenix, Arizona 85020
(602) 371-1100
DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD
TOE OF 5280 LIFT
EXISTING 16" HDPE
EXISTING 8" HDPE
10" SDR 17 HDPE SLEEVE W/ 6" SDR 17 HDPE PIPE
4-4" CONDUIT
CONNECT 6" HDPE TO EXISTING FLOW METER
SEE DETAIL
LIGHTNING PROTECTION SEE DETAIL
FLOW METER SKID
EXISTING FLOW METER SKID
EXISTING INSTRUMENT PANEL
EXPANSION JOINT, SEE DETAILS
PUMP SKID
EXISTING PUMP SKID
EXISTING POWER POLE
CONNECT 6" HDPE TO END OF EXISTING FLEX PIPE
CONSTRUCTION JOINT
WALL OPENING SEE DETAIL (TYP)
10" SDR 17 HDPE DRAINAGE PIPE
10" SDR 17 HDPE SLEEVE W/ 6" SDR 17 HDPE INLET PIPE
INSTALL 60 MIL THICK HDPE RUB SHEET BETWEEN PIPE AND LINED POND, ANCHOR SHEET INTO EXISTING ANCHOR TRENCH, BALLAST FREE END TO LAY FLAT
DETAIL 1 PUMP STATION
SCALE: 1"=10'
GRAPHIC SCALE
(IN FEET)
1 inch = 10 ft.
TOP OF BACKFILL
BOTTOM ASH
3" DIA DRAIN PIPE 8'-0" CENTERS SLOPE ⅛" PER FT
INVERT OF WALL DRAIN PIPE TO BE A MINIMUM OF 3-INCHES ABOVE FINISHED GROUND LINE
DETAIL 3/16 RETAINING WALL
SCALE: NTS
VARIES
FUTURE EMBANKMENT
EDGE OF LDWP
MATCH EXISTING
BOTTOM ASH FILL
EXISTING GROUND
CONSTRUCTION JOINT
SECTION A/15 A/15
HORZ: 1"=10'
3128 3/8" X 12" AIR TERMINAL
815-38 BRONZE SIDE MOUNT
129 29 STRAND WOVEN UL LIGHTING CONDUCTOR
16' 6" X 6" WOOD POSTS
FASTEN EVERY 3' WITH ELECTRICAL STAPLES (NOT TIGHT)
TO EXISTING GROUND ARRAY SEE SHEETS 12 & 13
BOLTED PARALLEL CLAMP
TO INSTRUMENT EQUIPMENT CABINET
#6 SOLID CV GROUND WIRE
DETAIL 2/15 LIGHTNING PROTECTION
SCALE: NOT TO SCALE
10" SDR 17 HDPE SLEEVE W/ 6" SDR HDPE INLET PIPE
10" SDR 17 HDPE DRAINAGE PIPE
LEVEL
EXISTING 8" HDPE PIPE
EXISTING 16" HDPE PIPE
SECTION B/15 B/15
HORZ: 1"=10'
EXPANSION JOINT SEE DETAIL
SECTION C/15 C/15
HORZ: 1"=10'
1 04/15/14 5280 LIFT AS-BUILTS
NO. DATE REVISION DWN CHD EXD RVWD APVD W.A.
FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD PUMP STATION DETAIL
aps
SCALE AS NOTED
DATE 10-10-11
WORK SAFELY TODAY
THIS DRAWING IS CONFIDENTIAL AND SHALL NOT BE USED OR REPRODUCED IN ANY PART WITHOUT WRITTEN CONSENT OF PINNACLE WEST CAPITAL CORPORATION.
DWN MF
APPROVED TONY KAHN ENGINEERING SUPERVISOR
W A FAC90332
UNIT FC DISC C TYPE 08 SYS ADS NUMBER 161907 SHEET 15
NORTH



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7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. DOUGHERTY, 19846, PROFESSIONAL ENGINEER, 4-15-14

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES:

CONCRETE: f'c = 3,000 PSI

MASONRY: f'm = 1,500 PSI, ASTM C90, MEDIUM OR NORMAL WEIGHT, RUNNING BOND, SLUMP BLOCK UNLESS NOTED OTHERWISE.

MORTAR: ASTM C270, TYPE S, CUBE STRENGTH 1800 PSI, ASTM C91 CEMENT.

GROUT: ASTM C476, TYPE COARSE, CUBE STRENGTH 2000 PSI. ALL CELLS TO BE FULLY GROUTED.

REINFORCING STEEL: ASTM A615, GRADE 60.

THREADED COUPLERS SHALL BE CAPABLE OF DEVELOPING 125% OF THE STRENGTH OF THE COUPLED BARS.

CHAMFER ALL EXPOSED CORNERS 3/4", EXCEPT UNDER MASONRY WALL.

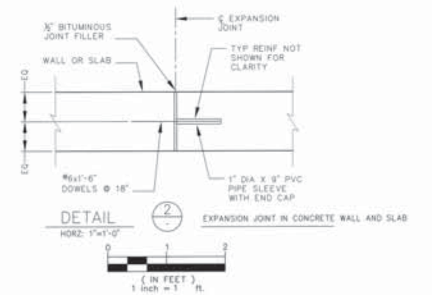
ALL REINFORCING BARS SHALL HAVE 2" OF CONCRETE COVER UNLESS NOTED OTHERWISE.

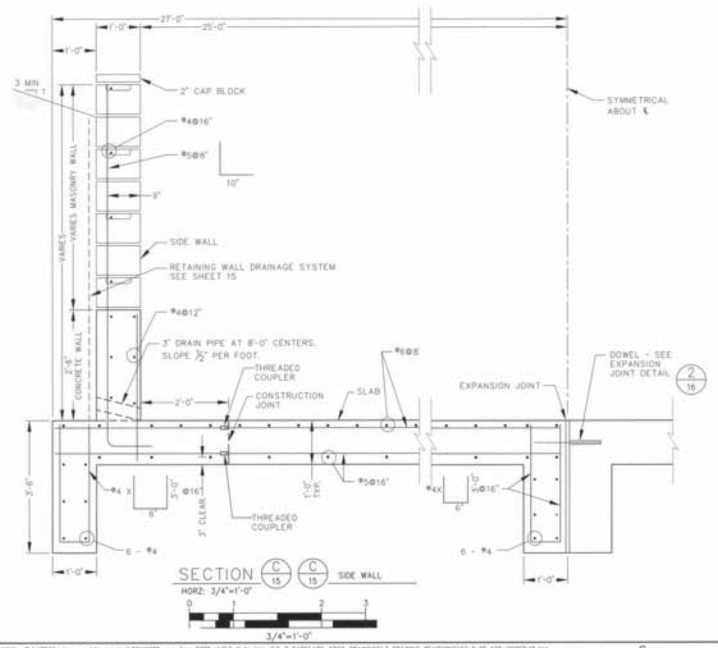
BACKFILL PROPERTIES

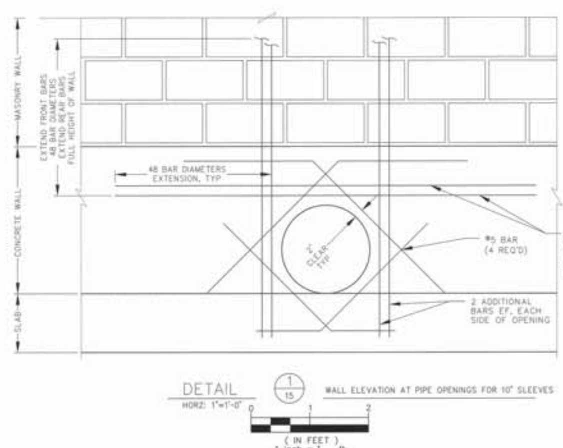
UNIT WEIGHT: = 90 pcf
MAXIMUM SLOPE: TAN (p)=1/3
EFFECTIVE AT-REST PRESSURE: Po = 45 pcf

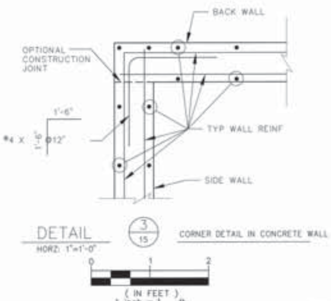
FOUNDATION FILL PROPERTIES

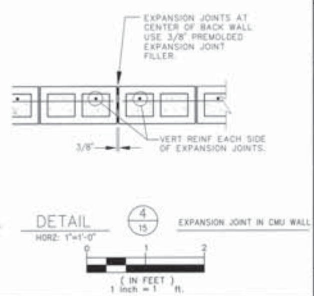
UNIT WEIGHT: = 90 pcf
PASSIVE RESISTANCE Pp = 288 pcf
FRICTION COEFFICIENT: = 0.30
ALLOWABLE BEARING PRESSURE: Q = 2000 psf











NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD WALL DETAILS

aps

SCALE AS NOTED DATE 10-10-11

WORK SAFELY TODAY

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

DWN DR	APPROVED TONY KAHN ENGINEERING SUPERVISOR	W.A. FAC90332
CHD		
EXD		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	16

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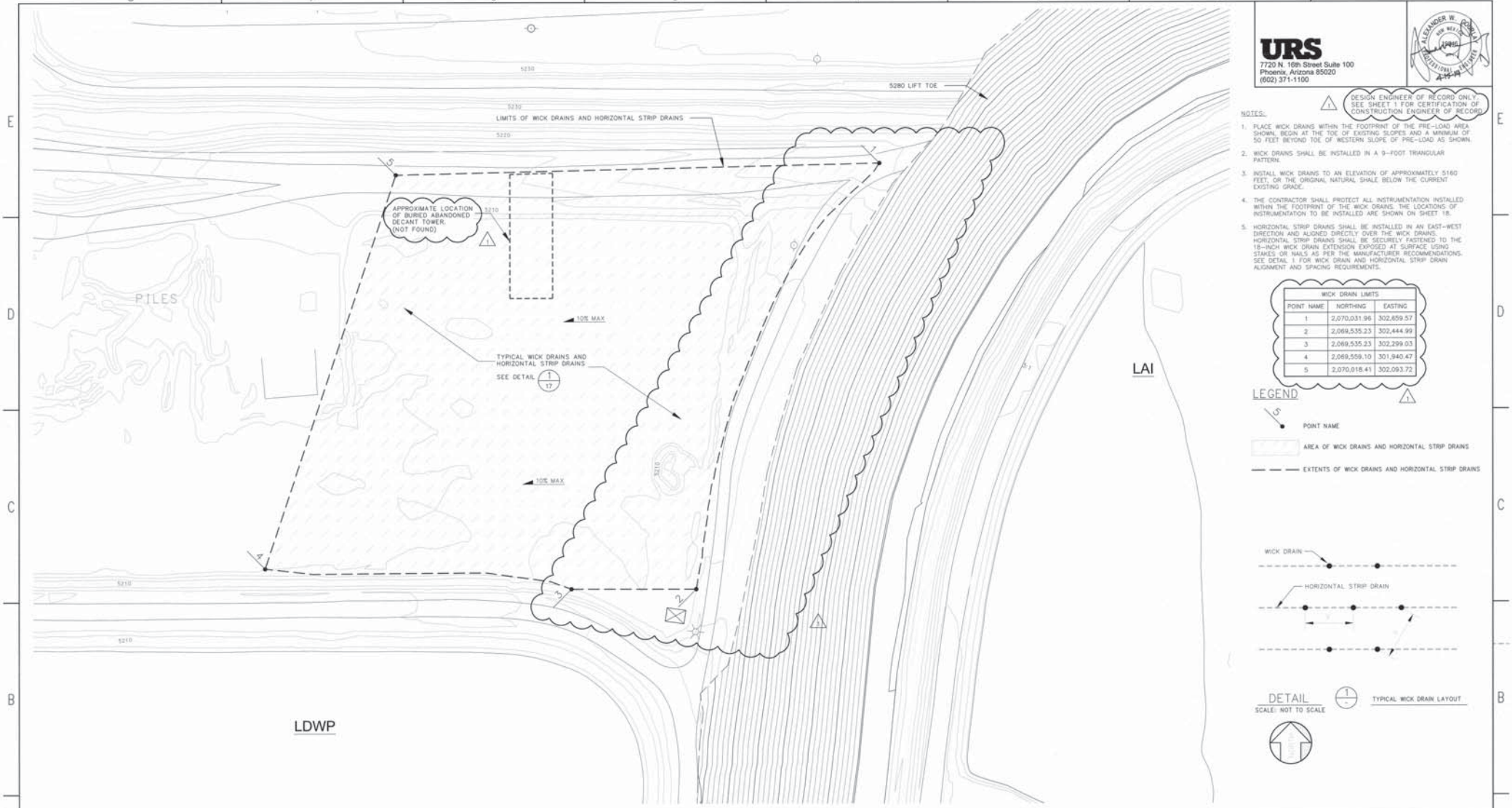

WICK DRAIN PLAN
SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
50 0 50 100
(IN FEET)
1 inch = 50 ft.

FLOWN BY AERIAL MAPPING CO, INC.
IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
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FARMINGTON, NM
ON FEBRUARY 23, 2014

WORK SAFELY TODAY

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7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. CRAIG — NEW MEXICO — PROFESSIONAL ENGINEER — 14719

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES:

1. PLACE WICK DRAINS WITHIN THE FOOTPRINT OF THE PRE-LOAD AREA SHOWN, BEGIN AT THE TOE OF EXISTING SLOPES AND A MINIMUM OF 50 FEET BEYOND TOE OF WESTERN SLOPE OF PRE-LOAD AS SHOWN.
2. WICK DRAINS SHALL BE INSTALLED IN A 9-FOOT TRIANGULAR PATTERN.
3. INSTALL WICK DRAINS TO AN ELEVATION OF APPROXIMATELY 5160 FEET, OR THE ORIGINAL NATURAL SHALE BELOW THE CURRENT EXISTING GRADE.
4. THE CONTRACTOR SHALL PROTECT ALL INSTRUMENTATION INSTALLED WITHIN THE FOOTPRINT OF THE WICK DRAINS. THE LOCATIONS OF INSTRUMENTATION TO BE INSTALLED ARE SHOWN ON SHEET 18.
5. HORIZONTAL STRIP DRAINS SHALL BE INSTALLED IN AN EAST-WEST DIRECTION AND ALIGNED DIRECTLY OVER THE WICK DRAINS. HORIZONTAL STRIP DRAINS SHALL BE SECURELY FASTENED TO THE 18-INCH WICK DRAIN EXTENSION EXPOSED AT SURFACE USING STAKES OR NAILS AS PER THE MANUFACTURER RECOMMENDATIONS. SEE DETAIL 1 FOR WICK DRAIN AND HORIZONTAL STRIP DRAIN ALIGNMENT AND SPACING REQUIREMENTS.

WICK DRAIN LIMITS

POINT NAME	NORTHING	EASTING
1	2,070,031.96	302,659.57
2	2,069,535.23	302,444.99
3	2,069,535.23	302,299.03
4	2,069,559.10	301,940.47
5	2,070,018.41	302,093.72

1

LEGEND

5 POINT NAME

AREA OF WICK DRAINS AND HORIZONTAL STRIP DRAINS

EXTENTS OF WICK DRAINS AND HORIZONTAL STRIP DRAINS

DETAIL 1/- TYPICAL WICK DRAIN LAYOUT
SCALE: NOT TO SCALE

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD WICK DRAIN

aps

SCALE: AS NOTED DATE: 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS.	NUMBER	SHEET
FC	C	65	ADS	161907	17

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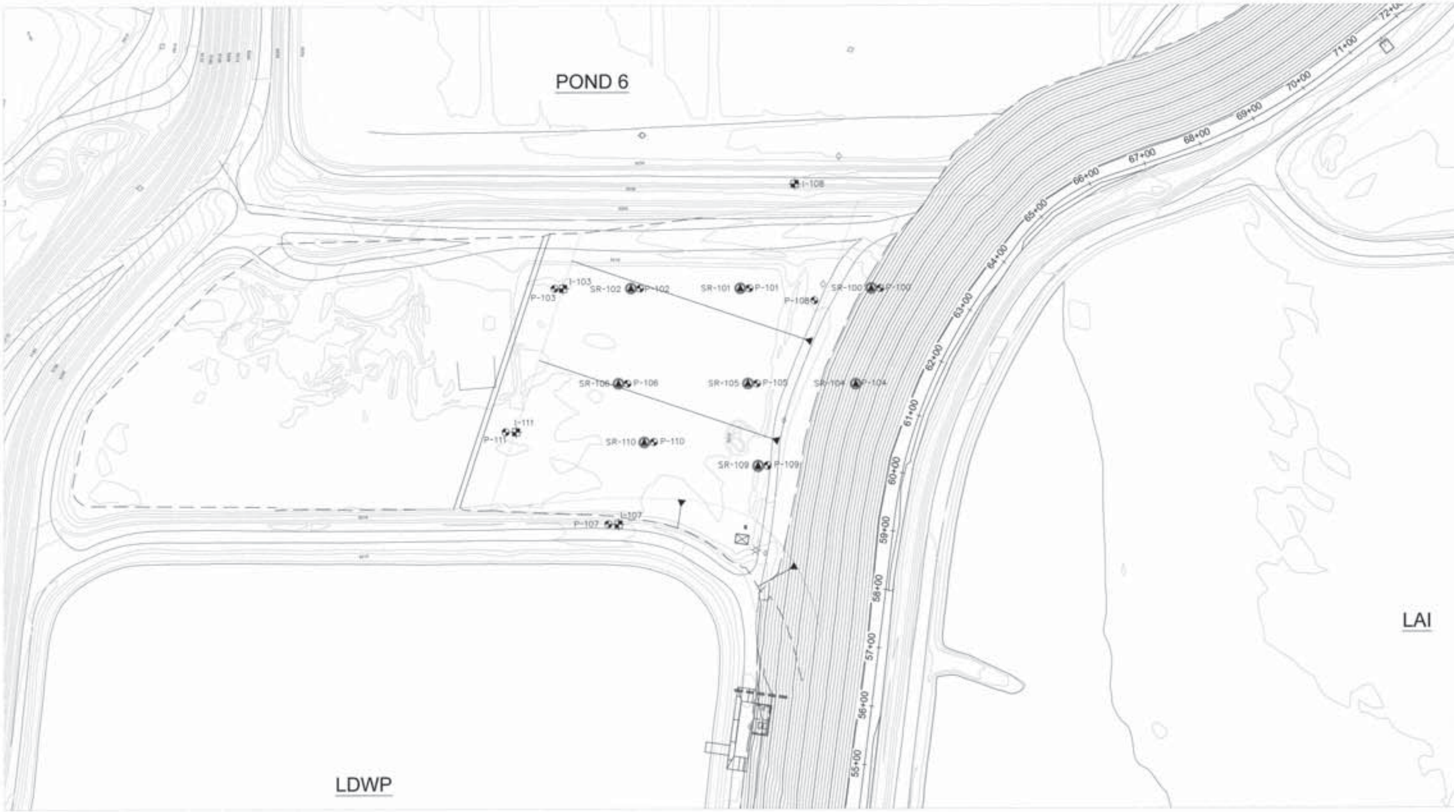
DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD



INSTRUMENTATION NOTES:

1. SOME INSTRUMENTATION MAY BE INSTALLED BEFORE INSTALLATION OF WICKS, AT DISCRETION OF THE ENGINEER.
2. CONTRACTOR SHALL REFER TO INDIVIDUAL SCOPE OF WORK AND THE CONSTRUCTION SPECIFICATIONS FOR FURTHER DETAILS.

Instrument #	Easting	Northing
P-100	302,656.94	2,069,929.07
P-101	302,434.11	2,069,929.07
P-102	302,248.08	2,069,929.07
P-103	302,102.43	2,069,929.07
P-104	302,614.95	2,069,766.64
P-105	302,446.78	2,069,767.56
P-106	302,226.31	2,069,767.56
P-107	302,193.35	2,069,530.00
P-108	302,544.70	2,069,908.35
P-109	302,464.69	2,069,628.51
P-110	302,270.99	2,069,668.18
P-111	302,018.61	2,069,685.42
SR-100	302,641.47	2,069,929.07
SR-101	302,418.64	2,069,929.07
SR-102	302,232.62	2,069,929.07
SR-104	302,614.95	2,069,766.64
SR-105	302,431.31	2,069,767.56
SR-106	302,210.85	2,069,767.56
SR-109	302,448.48	2,069,627.84
SR-110	302,254.79	2,069,667.53
I-103	302,116.93	2,069,929.07
I-107	302,210.58	2,069,529.79
I-108	302,511.69	2,070,106.83
I-111	302,036.38	2,069,685.58

LEGEND:

- I-4 INCLINOMETER
- P-14 VIBRATING WIRE PIEZOMETER CLUSTER
- SR-5 SETTLEMENT ROD

INSTRUMENTATION LOCATION PLAN

SCALE: 1"=100'
CONTOUR INTERVAL=2'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES 2101 SAN JUAN BLVD. FARMINGTON, NM 87401 ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC. FARMINGTON, NM ON FEBRUARY 23, 2014

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
NORTH TOE PRE-LOAD INSTRUMENTATION LOCATION PLAN

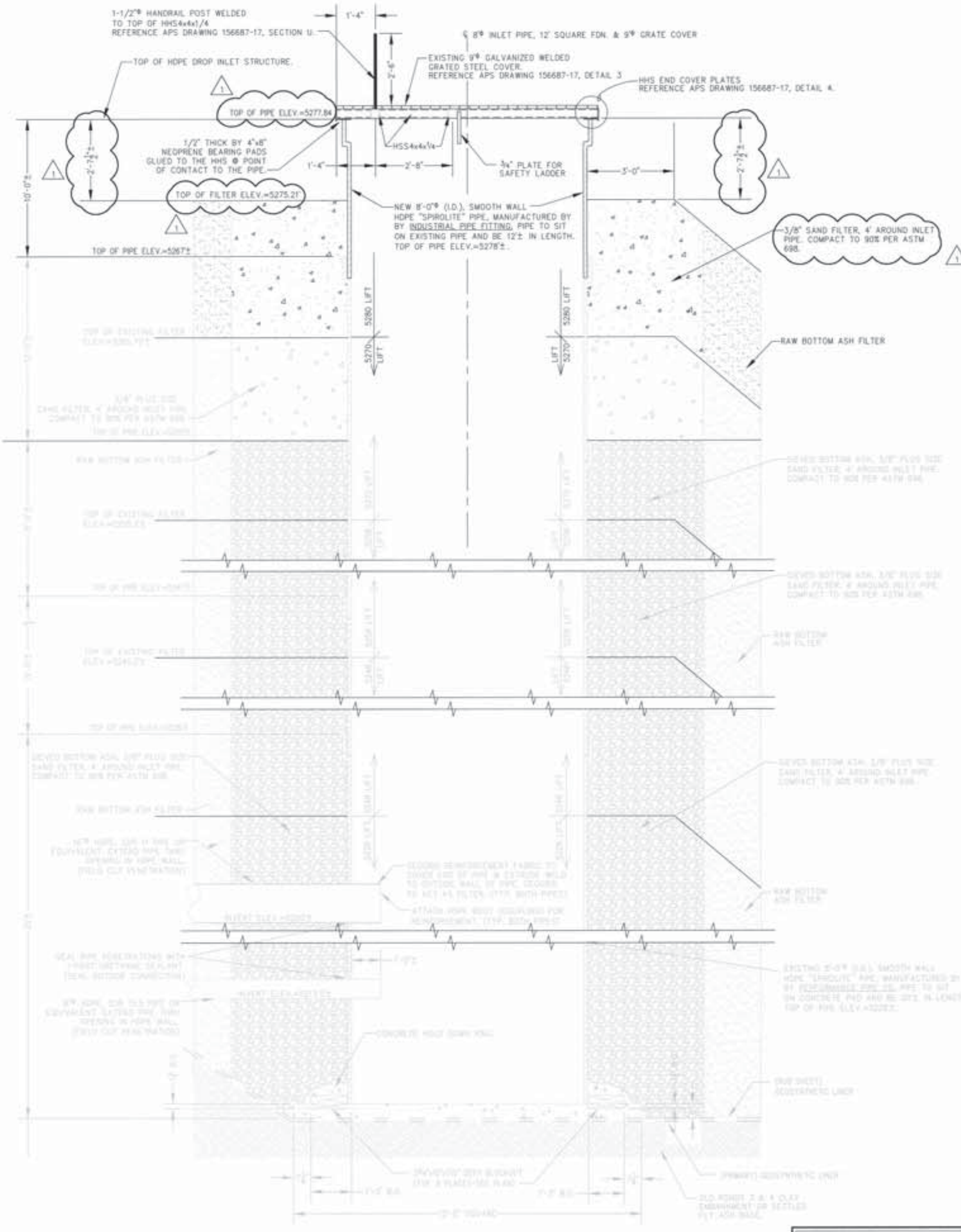
aps

SCALE AS NOTED DATE 01-23-2012
DWN DL
APPROVED TONY KAHN ENGINEERING SUPERVISOR
W.A. FAC90332

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	66	ADS	161907	18

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.



NOTES:

1. 8'Φ PIPE TO HAVE PERCOLATION SLOTS DRILLED INTO THE THE PIPE WALLS PER SPECIFICATIONS.
2. 8'-0" IS THE INSIDE DIA. OF THE PIPE. (BELL FITTING I.D. IS SLIGHTLY LARGER)
3. ACCESS DOOR IN GRATE AND GRATING REINFORCING NOT SHOWN FOR CLARITY. REFERENCE APS DRAWING 156687-17, DETAIL 3.
4. 3/8" SAND FILTERS TO BE COMPACTED TO 90% PER ASTM 698, AROUND PIPE.
5. BOTTOM ASH FULL LENGTH BACK TO THE DAM.

DETAIL 6 NEW 10 DROP INLET PIPE
SCALE: NOT TO SCALE

REQUIRED SIGNATURE FOR CONFINED SPACE

SAFETY REPRESENTATIVE DATE

WORK SAFELY TODAY

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.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
DROP INLET PIPE DETAIL

aps

SCALE AS NOTED DATE 10-10-11

DWN DR	APPROVED TONY KAHN ENGINEERING SUPERVISOR				W A FAC90332
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	19

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY — NEW MEXICO — 13846 — PROFESSIONAL ENGINEER — 4-15-14

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES:

1. EMBEDMENT SHOULD BE PLACED AROUND THE MANHOLE RISER FOR THE FULL HEIGHT OF THE MANHOLE.
2. EMBEDMENT SHALL EXTEND A MINIMUM OF THREE AND A HALF (3.5) FEET FROM THE RISER OR TO THE TRENCH WALL; WHICHEVER IS THE GREATER DISTANCE.
3. EMBEDMENT AROUND MANHOLE RISER IS REQUIRED TO BE CLASS I OR II MATERIAL PER ASTM D2321, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.
4. MANHOLES SHALL BE INSTALLED IN A DRY TRENCH WITH A STABLE FOUNDATION. THE FOUNDATION SHOULD CONSIST OF A MINIMUM OF 8" OF CLASS I MATERIAL COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
5. WHEN VEHICLE LOADS ARE PRESENT, A CONCRETE CAP OR OTHER SUCH STRUCTURE DESIGNED TO WITHSTAND THESE LOADS SHOULD BE PLACED OVER THE MANHOLE SO THAT THE LOADS ARE TRANSMITTED INTO THE SURROUNDING SOIL AND NOT DIRECTLY INTO THE RISER.
6. THE FOLLOWING PARAMETERS WERE ASSUMED:
   A) MAXIMUM SOIL DENSITY OF 120 LBS/FT³.
   B) GROUND WATER NOT TO EXCEED TOP OF THE MANHOLE. FLOTATION OF MANHOLE MAY NEED TO BE ADDRESSED. WHEN A POLYETHYLENE ANCHOR CONNECTION RING IS INCLUDED, IT MUST BE USED IN CONJUNCTION WITH A CONCRETE ANCHOR BY OTHERS. THE PE ANCHOR CONNECTION RING IS NOT DESIGNED TO RESTRAIN THE STRUCTURE BY ITSELF.
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 70B664. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. 1,080 1/2"ø PERFORATIONS WILL BE DRILLED INTO THE RISER. THE HOLES WILL BE ON 11-INCH CENTERS WITH 27 HOLES PER ROW. THE ROWS WILL BE 6" APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2".

SAFETY NOTE TO OWNER/PURCHASER

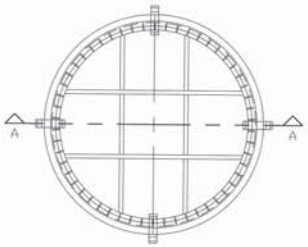
MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

QUOTE NUMBER: S-6930
CUSTOMER: BYRON CONRAD
PROJECT: ARIZONA PUBLIC SERVICE COMMISSION
SHEET 1 OF 1
PLOT DATE: 10/2/03

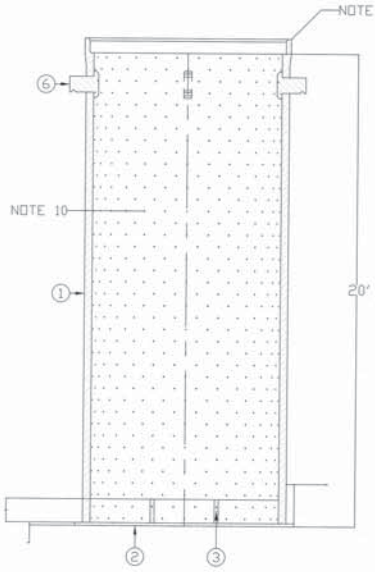
SUBMITTAL AND APPROVAL STAMP	
CUSTOMER:	HUGHES
ORDER/QUOTE #:	S-6943
APPROVED FOR FABRICATION	
SIGNATURE:	
DATE:	

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	20	FT.	–	–	96" I.D.	CLASS 315	HDPE - SW RISER STOCK (PE X B)
2	86.7	SQFT.	–	–	1-1/2" THICK	–	HDPE - PLATE STOCK (BOTTOM)
3	30.4	SQFT.	–	–	2" THICK	–	HDPE - PLATE STOCK (GUSSETS)
DELETED ~~4~~	~~1~~	~~EA.~~			~~16" IPS~~	~~DR 11~~	~~HDPE - STUB OUT 2' LONG (SHIP LOOSE)~~
DELETED ~~5~~	~~1~~	~~EA.~~			~~8" IPS~~	~~DR 11/15.5~~	~~HDPE - STUB OUT 2' LONG (SHIP LOOSE)~~
6	4	EA.	–	–	–	–	LIFTING LUGS



PLAN VIEW



SECTION VIEW A - A

REV.	DESCRIPTION	DWN. DATE
1	DELETED THE 8" (ITEM 5) & 16" (ITEM 4) STUB-OUTS FROM THE BILL OF MATERIAL	PTC 10/03

DEPT.	APPROVAL	DATE
MFG.		
MKT.		
TECH.		

Performance Pipe
a division of
Chevron Phillips Chemical Company LP

TITLE: 96" I.D. CLASS 315 HDPE PERFORATED MANHOLE - 20' TALL
DRAWING NUMBER: CU91B619 REVISION: 1

DRAWN BY: PTC
DATE: 9/12/03
CHECKED BY:
SCALE: NONE
TOLERANCES:
DECIMAL: ±2"
FRACTIONAL: ±2"
ANGULAR: ±2"

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JSH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
DROP INLET PIPE (VENDOR) (5228 LIFT)

aps

SCALE: AS NOTED DATE: 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			SHEET
RVWD		UNIT FC DISC C TYPE 39 SYS ADS NUMBER 161907	20

WORK SAFELY TODAY

DRAWING: P:\ARES\arizona_public_service\23446080_aps_hop 5278 ph2\3_0_technical\3_7_CAD\APS_EDCS_DRAWING\12_DRAWING_REVISIONS\FC-C-39-ADS-161907-20.dwg

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES:

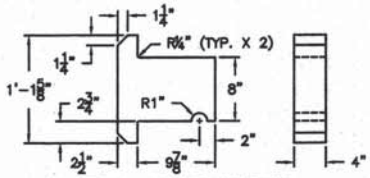
1. EMBEDMENT SHOULD BE PLACED AROUND THE MANHOLE RISER FOR THE FULL HEIGHT OF THE MANHOLE.
2. EMBEDMENT SHALL EXTEND A MINIMUM OF THREE AND A HALF (3.5) FEET FROM THE RISER OR TO THE TRENCH WALL; WHICHEVER IS THE GREATER DISTANCE.
3. EMBEDMENT AROUND MANHOLE RISER IS REQUIRED TO BE CLASS I OR II MATERIAL PER ASTM D2321, COMPACTED TO A MINIMUM OF 90% STANDARD PROCTOR DENSITY.
4. MANHOLES SHALL BE INSTALLED IN A DRY TRENCH WITH A STABLE FOUNDATION. THE FOUNDATION SHOULD CONSIST OF A MINIMUM OF 8" OF CLASS I MATERIAL COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
5. WHEN VEHICLE LOADS ARE PRESENT, A CONCRETE CAP OR OTHER SUCH STRUCTURE DESIGNED TO WITHSTAND THESE LOADS SHOULD BE PLACED OVER THE MANHOLE SO THAT THE LOADS ARE TRANSMITTED INTO THE SURROUNDING SOIL AND NOT DIRECTLY INTO THE RISER.
6. THE FOLLOWING PARAMETERS WERE ASSUMED:
   A) MAXIMUM SOIL DENSITY OF 120 LBS/FT.^{3}
   B) GROUND WATER NOT TO EXCEED TOP OF THE MANHOLE. FLOTATION OF MANHOLE MAY NEED TO BE ADDRESSED. WHEN A POLYETHYLENE ANCHOR CONNECTION RING IS INCLUDED, IT MUST BE USED IN CONJUNCTION WITH A CONCRETE ANCHOR BY OTHERS. THE PE ANCHOR CONNECTION RING IS NOT DESIGNED TO RESTRAIN THE STRUCTURE BY ITSELF.
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 70B664. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. 999 1/2"ø PERFORATIONS WILL BE DRILLED INTO THE RISER. THE HOLES WILL BE ON 11-INCH CENTERS WITH 27 HOLES PER ROW. THE ROWS WILL BE 6" APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2".
11. TWO SETS OF WOOD SUPPORTS WILL BE INCLUDED TO HOLD THE PIPE AS ROUND AS POSSIBLE FOR SHIPPING.

SAFETY NOTE TO OWNER/PURCHASER

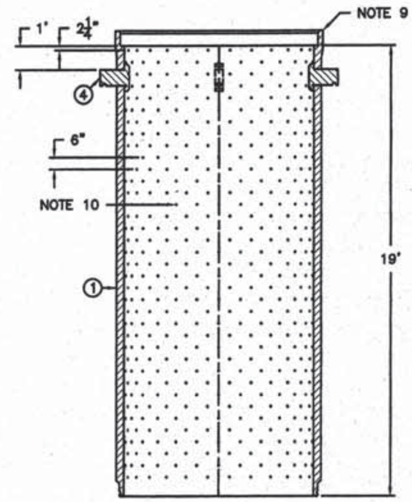
MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	19	FT.	–	–	96" I.D.	CLASS 315	HDPE – SW RISER STOCK (B X S)
2	4	EA.	–	–	4" THK	–	LIFTING LUGS (SEE LIFTING LUG DETAIL)



ITEM 4 – LIFTING LUG DETAIL
EXTRUDER WELD INSIDE & OUT



SECTION VIEW A – A

SUBMITTAL AND APPROVAL STAMP	
CUSTOMER:	ARIZONA PUBLIC SERVICE COM.
ORDER/QUOTE #:	IPF-1082
APPROVED FOR FABRICATION	
SIGNATURE:	
DATE:	

NOTES:

1.) ALL DIMENSIONS ARE IN INCHES.
2.) FRACTIONAL TOLERANCE ± 2"
3.) ANGULAR TOLERANCE ± 2°

REFERENCE DRAWINGS

DO NOT SCALE DRAWING

REV.	DESCRIPTION	BY	CHK.	APP.	DATE
1	CHANGED FLAT BOTTOM TO SPIGOT END	MJW			3/20/08

DRAWN BY: mjw DATE: 2-15-06
SCALE: N.T.S

INDUSTRIAL PIPE FITTINGS
6020 OSBORN ST
HOUSTON, TEXAS 77033
Phone: 713-645-2858
Fax: 713-645-1758

96" CLASS 315
HDPE PERFORATED MANHOLE
20' TALL
ARIZONA PUBLIC SERVICE CO.

DWG. NO. MH 91B110 SHEET 1 OF 1 REV. 1

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
DROP INLET PIPE (VENDOR) (5248 LIFT)

aps

SCALE AS NOTED DATE 10-10-11

WORK SAFELY TODAY

DWN DR
CHD
EXD
RVWD

APPROVED TONY KAHN, ENGINEERING SUPERVISOR
W A FAC90332

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	21

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOMEZ — NEW MEXICO — 19646 — PROFESSIONAL ENGINEER — 4-15-14

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES:
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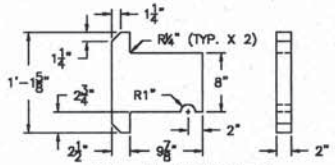
   C) AMBIENT (73.4° F) OPERATING TEMPERATURE.
   D) STRUCTURAL LOADS APPLIED TO HDPE MANHOLE NOT TO EXCEED 1000 LBS. LOAD TO BE EQUALLY DISTRIBUTED ABOUT CIRCUMFERENCE OF MANHOLE.
7. PLACE LIFTING LUGS PER 708564. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. (405) 1/2"ø PERFORATIONS WILL BE DRILLED INTO THE RISER. THE HOLES WILL BE ON 11-INCH CENTERS (OF ID) WITH 27 HOLES PER ROW. THE ROWS WILL BE 6" APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2".
11. TWO SETS OF WOOD SUPPORTS WILL BE INCLUDED TO HOLD THE PIPE AS ROUND AS POSSIBLE FOR SHIPPING.

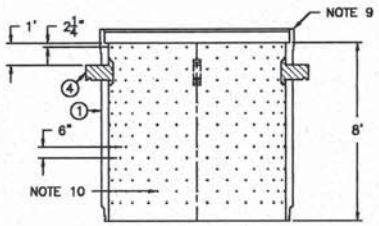
SAFETY NOTE TO OWNER/PURCHASER
MANHOLES AND TANKS PRESENT CONFINED SPACE HAZARDS AND FALL HAZARDS. IT IS THE RESPONSIBILITY OF THE OWNER/PURCHASER OF THE PLEXCO MANHOLE OR TANK TO TRAIN, EQUIP, AND REQUIRE ALL ENTRANTS TO FOLLOW APPLICABLE OSHA CONFINED SPACE ENTRY PROCEDURES AND TO REQUIRE USE OF A FALL PROTECTION DEVICE FOR ENTRY INTO ALL MANHOLES OR TANKS.

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	8	FT.	–	–	96" I.D.	CLASS 315	HDPE – SW RISER STOCK (B X S)
2	4	EA.	–	–	2" THK	–	LIFTING LUGS (SEE LIFTING LUG DETAIL)



ITEM 4 – LIFTING LUG DETAIL
EXTRUDER WELD INSIDE & OUT



SUBMITTAL AND APPROVAL STAMP
CUSTOMER: ARIZONA PUBLIC SERVICE COM
ORDER/ASSY. #: PX-1062
APPROVED FOR FABRICATION
SIGNATURE:
DATE:

NOTES:
1.) ALL DIMENSIONS ARE IN INCHES.
2.) FRACTIONAL TOLERANCE ± 2"
3.) ANGULAR TOLERANCE ± 2°

REFERENCE DRAWINGS
DO NOT SCALE DRAWING

NO.	DESCRIPTION	BY	CHK.	APP.	DATE
0	–	–			–

DRAWN BY: mjw 2-15-08
CHECKED BY:
ENGR. APP. BY:
MFG. APP. BY:
N.T.S
PT. DWG. NO.

INDUSTRIAL PIPE FITTINGS
6030 OSBORN ST
HOUSTON, TEXAS 77033
Phone: 713-845-2858
Fax: 713-845-1758

96" CLASS 315
HDPE PERFORATED MANHOLE
8' TALL (B X S)
ARIZONA PUBLIC SERVICE CO.

DWG. NO. MH 91B110 SHEET 1 OF 1 REV. 0

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMT	JDM	JBH	AWG	ERC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
DROP INLET PIPE (VENDOR) (5258 LIFT)

aps

SCALE AS NOTED DATE 10-10-11

DWN DR | CHD | EXD | RVWD
APPROVED TONY KAHN ENGINEERING SUPERVISOR
W.A. FAC90332

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	22

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY — NEW MEXICO — 19646 — PROFESSIONAL ENGINEER — 4-15-14

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTES:

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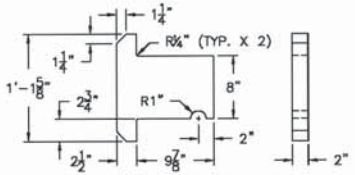
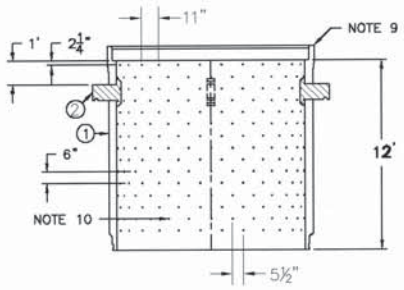
7. PLACE LIFTING LUGS PER 70B564. (FOR PRODUCTION USE ONLY)
8. CONTRACTOR TO VERIFY ALL DIMENSIONS AND MANHOLE DESIGN.
9. STANDARD BELL WITH THE EXCEPTION OF A 2.5" Tb THICKNESS.
10. (621) ½" Ø PERFORATIONS WILL BE DRILLED INTO THE RISER. PERFORATIONS WILL BE ANGLED 30° DOWN TO THE SPIGOT END. THE HOLES WILL BE ON 11 INCH CENTERS (OF ID) WITH 27 HOLES PER ROW. THE ROWS WILL BE 6 INCHES APART AND EVERY OTHER ROW WILL BE OFFSET BY 5-1/2 INCHES. THERE WILL BE A TOTAL OF 23 ROWS.
11. TWO SETS OF WOOD SUPPORTS WILL BE INCLUDED TO HOLD THE PIPE AS ROUND AS POSSIBLE FOR SHIPPING.

BILL OF MATERIALS

ITEM #	QTY.	UNIT MEAS.	PART #	DWG. #	SIZE	SDR/ CLASS	DESCRIPTION
1	12	FT.	–	–	96" I.D.	CLASS 315	HDPE – SW RISER STOCK (B X S)
2	4	EA.	–	–	2" THK	–	LIFTING LUGS (SEE LIFTING LUG DETAIL)



ITEM 4 – LIFTING LUG DETAIL
EXTRUDER WELD INSIDE & OUT



SAFETY NOTE TO OWNER/PURCHASER
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NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
DROP INLET PIPE (VENDOR) (5270 LIFT)

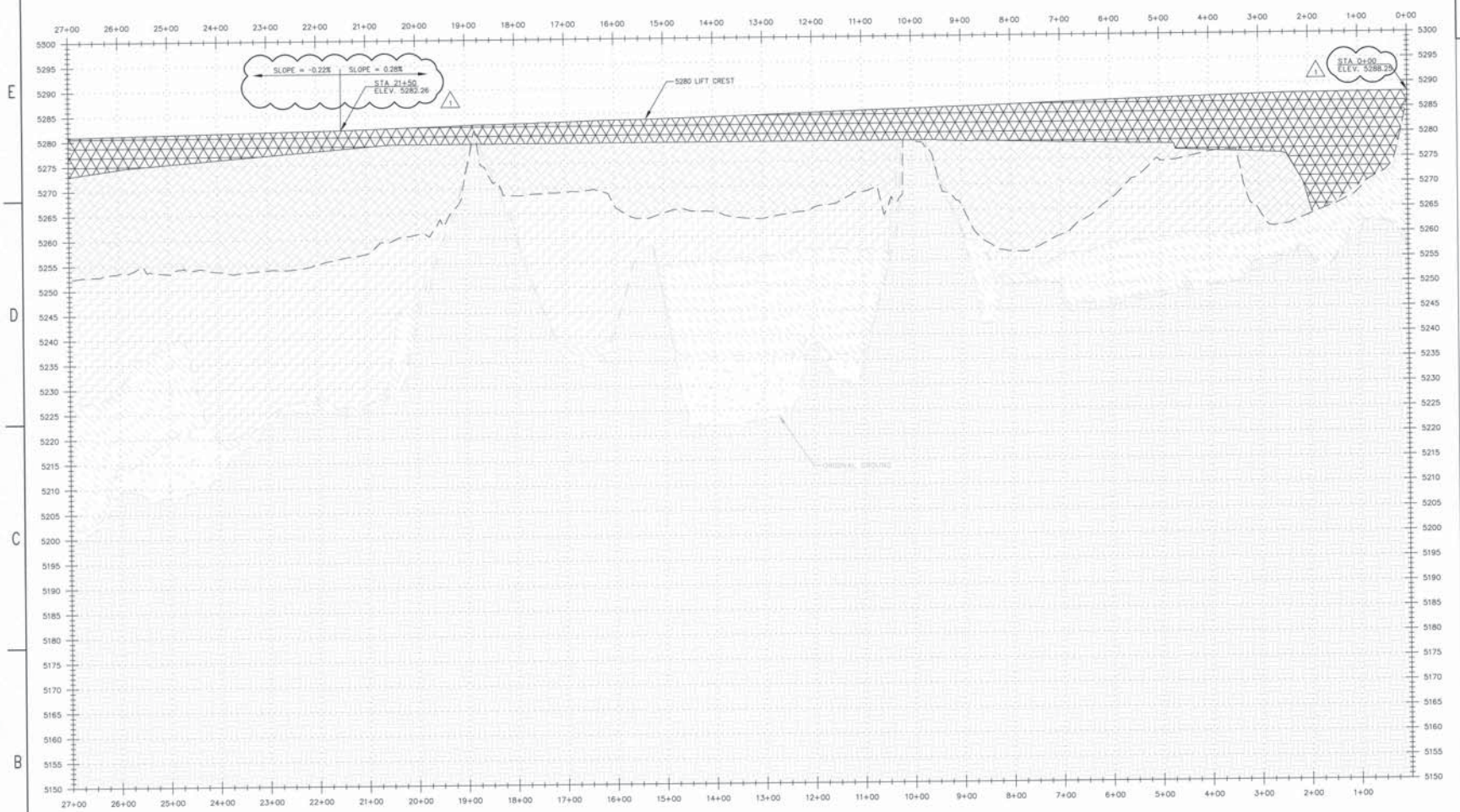
aps

SCALE AS NOTED — DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD		UNIT FC / DISC C / TYPE 39 / SYS ADS / NUMBER 161907	SHEET 23
RVWD			

WORK SAFELY TODAY

DRAWING: P:\URES\prisons_public_service\234460BS_aps_hpp 5270 ph2\3_0_technical\3_7_CAD\APS_DOCS_DRAWINGS\2_DRAWING_REVISIONS\FC-C-39-ADS-161907-23.dwg



5280 LIFT LONG SECTION STA 0+00 TO STA 27+00
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOUDEY NEW MEXICO 19846 REGISTERED PROFESSIONAL ENGINEER

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

LEGEND

- PROPOSED 5280 LIFT
- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO
- PROPOSED 5280 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH AND FLY ASH
- 5270 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH
- 5258 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 156687 CONSTRUCTION SET
- 5248 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEET 80
- 5228 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEETS 71-76
- POND 3 BOTTOM ASH EMBANKMENT DWG: 110559 SHEETS 1-5
- EXISTING GROUND SURFACE BEFORE POND CONSTRUCTION DWG: 144875 SHEET 1&2
- POND 3 FLY ASH DWG: 100003 SHEET 64

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JSH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
LONGITUDINAL CROSS SECTION

aps

SCALE AS NOTED DATE 10-10-11

DWN	APPROVED	W.A.
DR	TONY KAHN ENGINEERING SUPERVISOR	FAC90332
CHD		
EXD		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	24

WORK SAFELY TODAY

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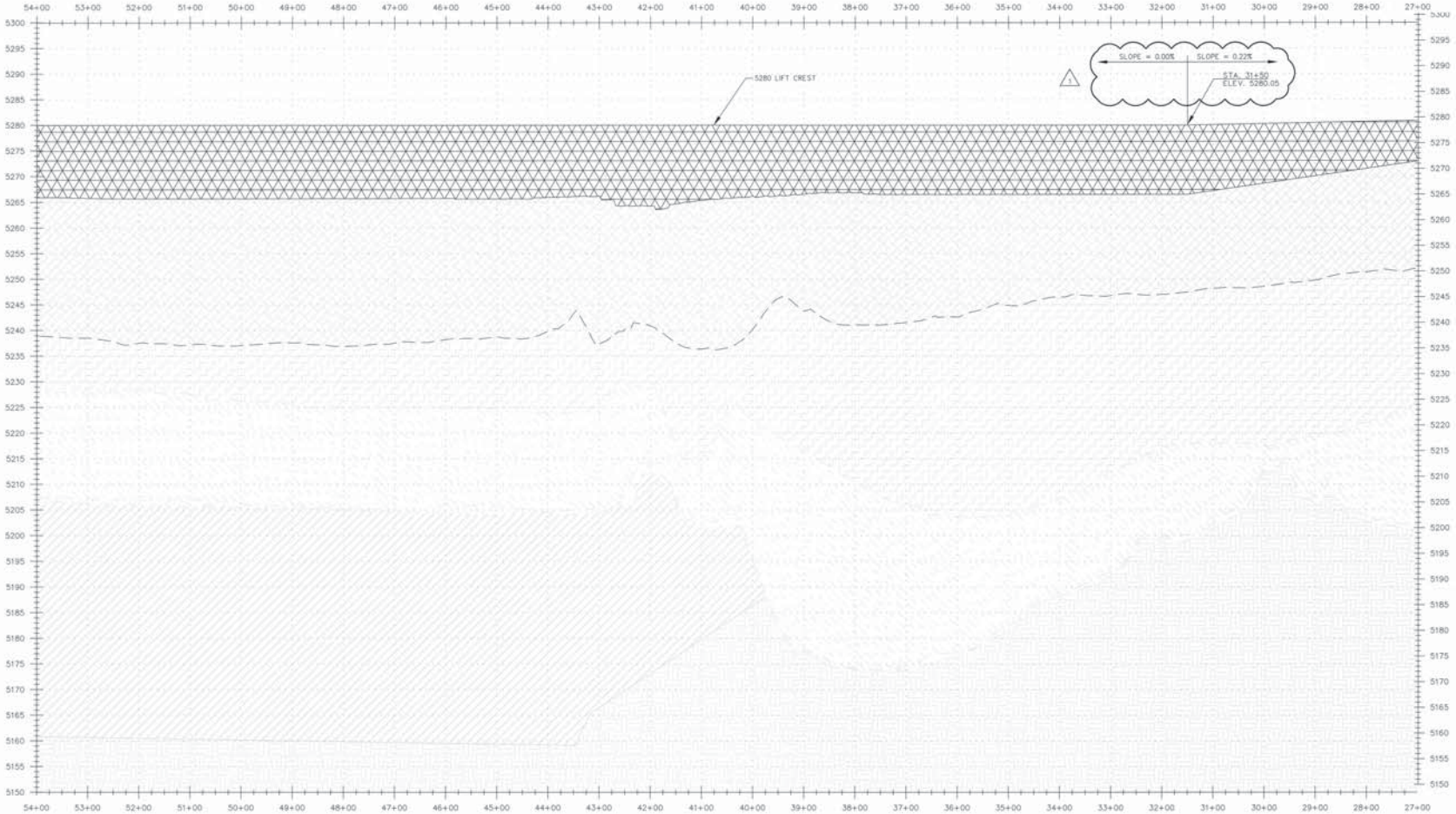

5280 LIFT LONG SECTION STA 27+00 TO STA 54+00
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

LEGEND

- PROPOSED 5280 LIFT
- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO
- PROPOSED 5280 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH AND FLY ASH
- 5270 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH
- 5258 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 156687 CONSTRUCTION SET
- 5248 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEET 80
- 5228 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEETS 71-76
- POND 3 BOTTOM ASH EMBANKMENT DWG: 110559 SHEETS 1-5
- EXISTING GROUND SURFACE BEFORE POND CONSTRUCTION DWG: 144875 SHEET 1&2
- POND 3 FLY ASH DWG: 100003 SHEET 64

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GROUNDS NEW MEXICO 10846 REGISTERED PROFESSIONAL ENGINEER 4-15-14

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
LONGITUDINAL CROSS SECTION

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	25

WORK SAFELY TODAY

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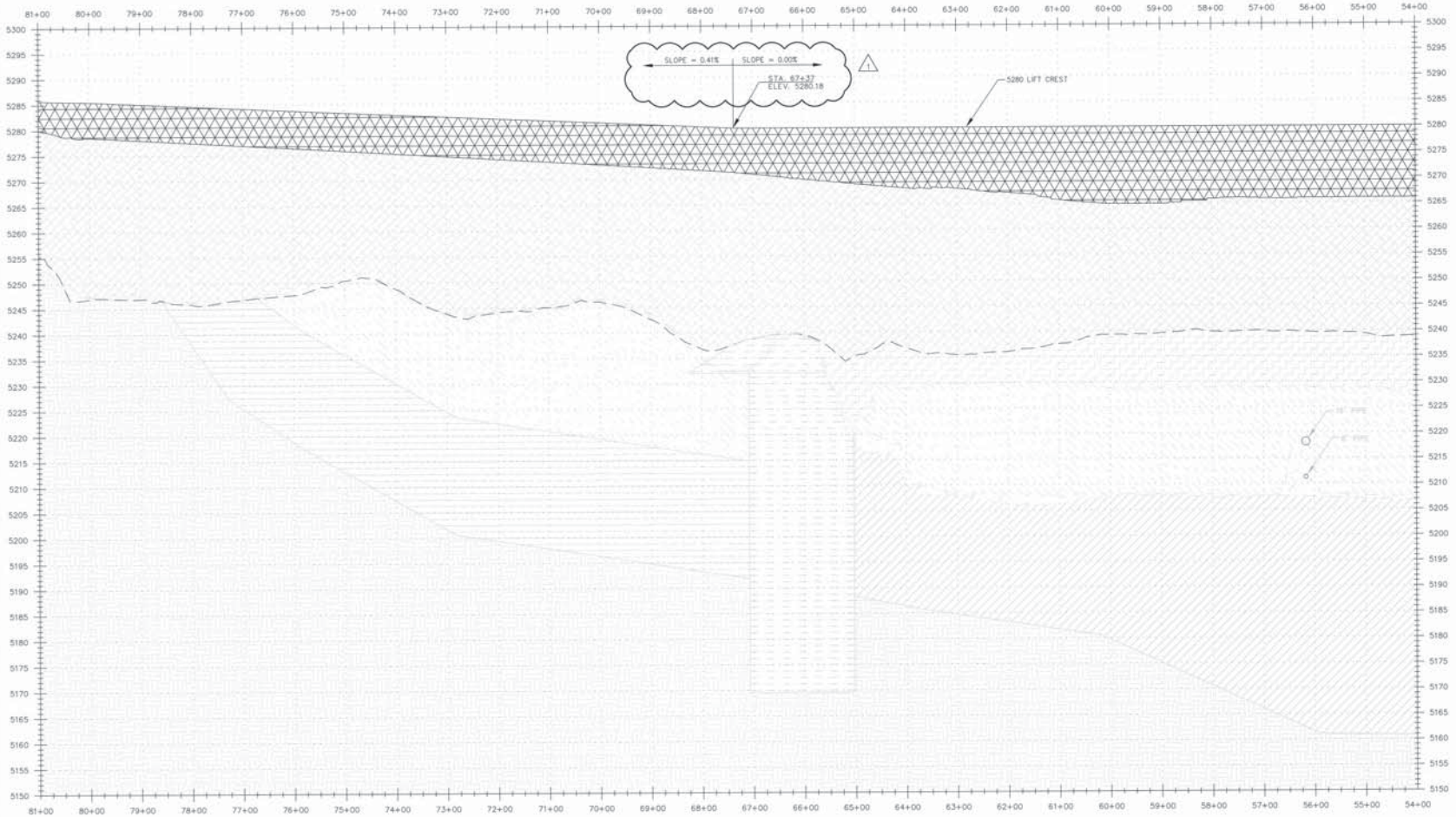


5280 LIFT LONG SECTION STA 54+00 TO STA 81+00
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY — NEW MEXICO — 19846 — REGISTERED PROFESSIONAL ENGINEER — 4-25-14

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

LEGEND

- PROPOSED 5280 LIFT
- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO
- PROPOSED 5280 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH AND FLY ASH (1)
- 5270 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH
- 5258 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 156687 CONSTRUCTION SET
- 5248 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEET 80
- 5228 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEETS 71-76
- POND 3 BOTTOM ASH EMBANKMENT DWG: 110559 SHEETS 1-5
- EXISTING GROUND SURFACE BEFORE POND CONSTRUCTION DWG: 144875 SHEET 1&2
- POND 3 FLY ASH DWG: 100003 SHEET 64

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
LONGITUDINAL CROSS SECTION

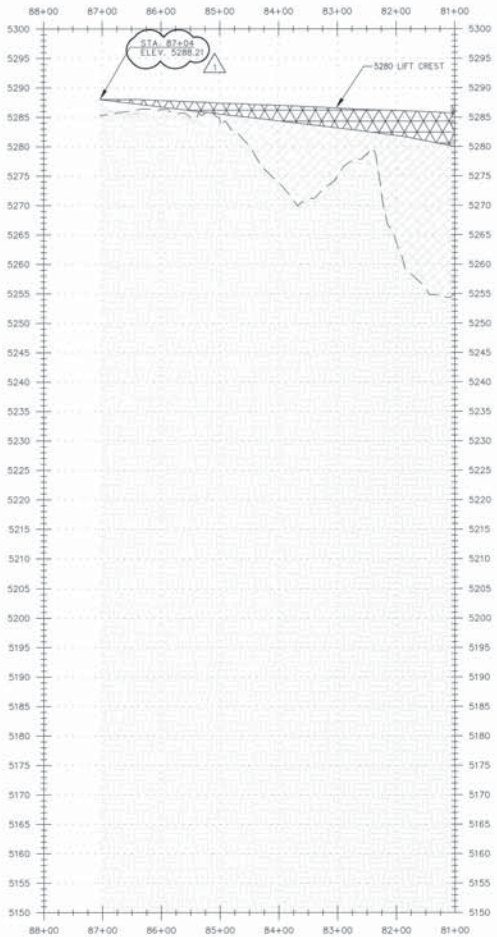
aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	26

WORK SAFELY TODAY



5280 LIFT LONG SECTION STA 81+00 TO STA 88+00
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=10'

GRAPHIC SCALE
100 0 100 200
(IN FEET)
1 inch = 100 ft.

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GRONAU
NEW MEXICO
12540
REGISTERED
PROFESSIONAL ENGINEER

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

LEGEND

- PROPOSED 5280 LIFT
- 5270 LIFT
- 5258 LIFT
- 5248 LIFT (2006 TOPO)
- 5228 LIFT (2004 TOPO)
- 2001 TOPO
- PROPOSED 5280 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH AND FLY ASH 1
- 5270 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH
- 5258 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 156687 CONSTRUCTION SET
- 5248 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEET 80
- 5228 LIFT EMBANKMENT CONSTRUCTION BOTTOM ASH DWG: 100003 SHEETS 71-76
- POND 3 BOTTOM ASH EMBANKMENT DWG: 110559 SHEETS 1-5
- EXISTING GROUND SURFACE BEFORE POND CONSTRUCTION DWG: 144875 SHEET 1&2
- POND 3 FLY ASH DWG: 100003 SHEET 64

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JEM	JBH	AWG	BRC	FAC80332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
LONGITUDINAL CROSS SECTION

aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC80332
EXD			
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	65	ADS	161907	27

WORK SAFELY TODAY

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

NORTH

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY — 19648 — REGISTERED — ARIZONA — 4-15-14

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

DATUM CONTROL
HV-53
(ACTUAL LOCATION OFF DRAWING SEE BELOW FOR INFORMATION)

2

REFERENCE:
FLOWN BY AERIAL MAPPING CO, INC IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

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
N.G.V.D. 1929

LEGEND
- 5280 LIFT TOE
- 5280 LIFT ℄
- 5280 LIFT CREST
- B-1 SOIL BORING LOCATIONS
- 2002 CPT LOCATION
- 2006 CPT LOCATION
- 2006 CPT LOCATION AND SP PIEZO LOCATION
- 2009 CPT LOCATION
- 2011 CPT LOCATION

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BFC	FAC80332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
GEOTECHNICAL INVESTIGATION PLAN

aps

SCALE AS NOTED DATE 10-10-11

DWN	APPROVED	W.A.
DR	TONY KAHN ENGINEERING SUPERVISOR	FAC80332
CHD		
EXD		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	161907	28

WORK SAFELY TODAY

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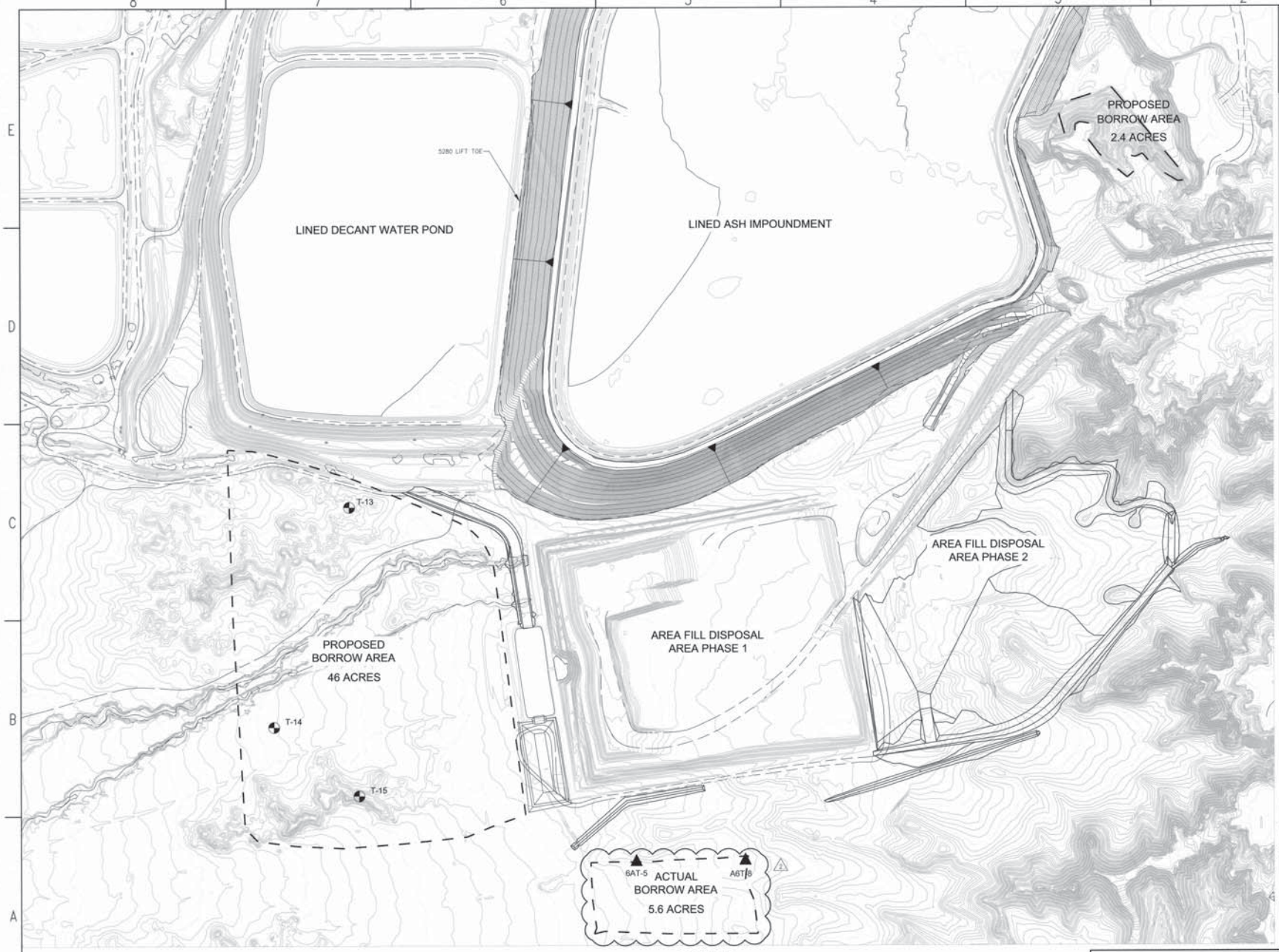


PLAN VIEW
1"=200'
CONTOUR INTERVAL=2'

NORTH

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. DOURTE — NEW MEXICO — 19640 — REGISTERED PROFESSIONAL ENGINEER — 2-15-14

2 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

DATUM CONTROL
HV-53

REFERENCE:
FLOWN BY AERIAL MAPPING CO, INC IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

2

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
N.G.V.D. 1929

HISTORICAL BORROW AREA TEST PIT COORDINATES

BORING NO.	(NORTHING)	(EASTING)
T-13	N 2,067,440	E 301,610
T-14	N 2,066,430	E 301,260
T-15	N 2,066,120	E 301,650

SEE SHEET 36 THIS SET FOR TEST PIT LOG DATA

LEGEND
- T-13 — TEST PIT LOCATIONS
- 5280 TOE
- 5280 ℄
- DRY FLY ASH DISPOSAL AREA
- EXISTING GRADE
- OUTLINE OF PROPOSED BORROW AREA
- 6AT-5 — TEST PIT LOCATION - SEE APS DRAWING NUMBER 162617 FOR TEST PIT LOG DATA

2

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AWG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
BORROW AREA PLAN

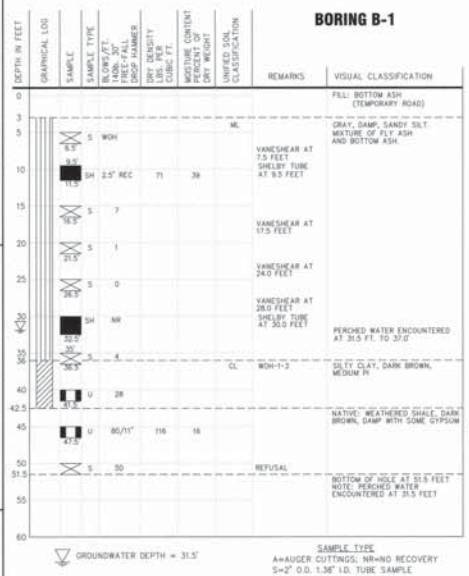
aps

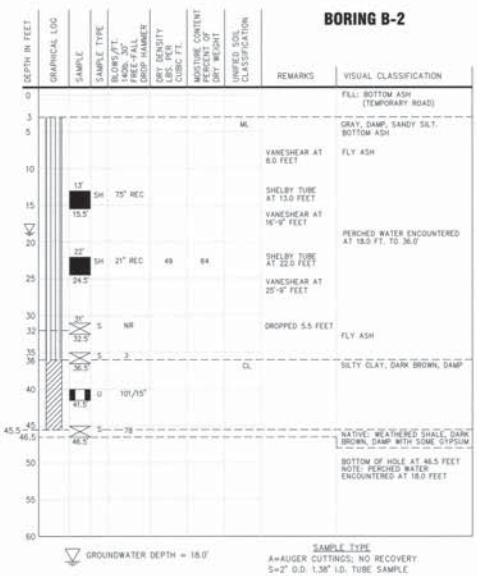
SCALE AS NOTED DATE 10-10-11

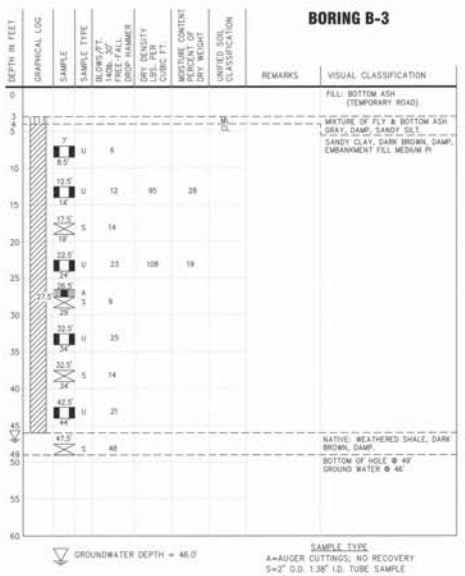
DWN DR	APPROVED	W.A.
CHD	TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD		
RVWD		

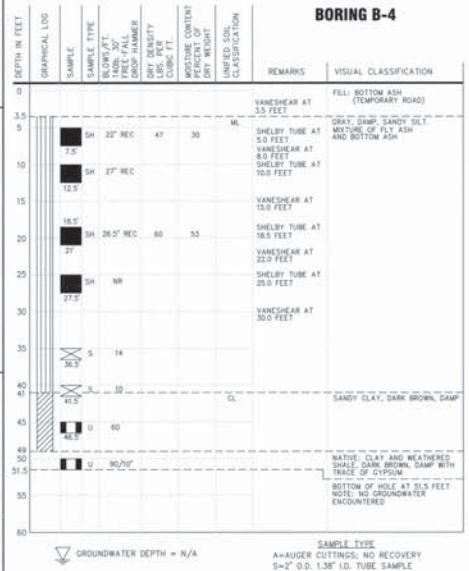
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	16	ADS	161907	29

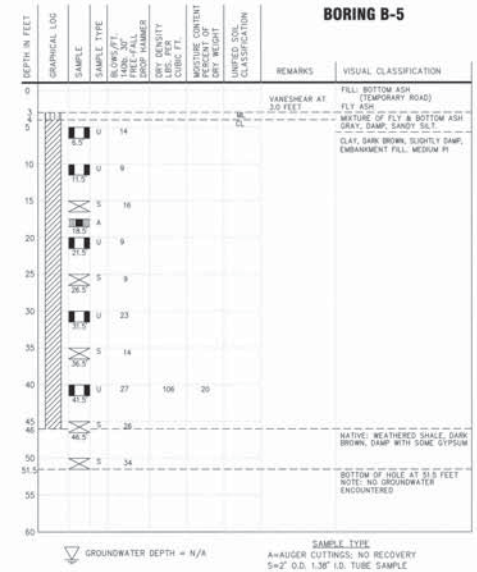
WORK SAFELY TODAY

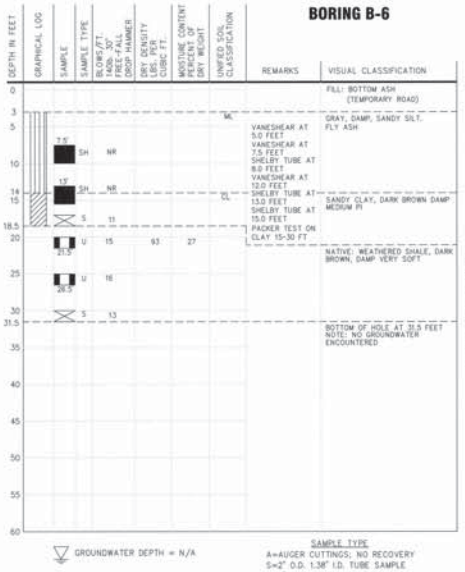








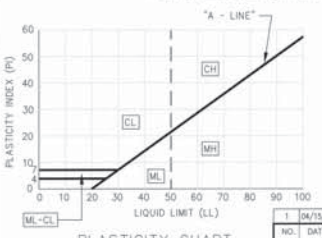




SAMPLE TYPE
A=AUGER CUTTINGS; NR=NO RECOVERY
S=2" O.D. 1.38" I.D. TUBE SAMPLE
U=3" O.D. 2.42 I.D. TUBE SAMPLE
SH=3" O.D. THIN WALLED SHELBY TUBE

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, GRAVELLY 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



PLASTICITY CHART

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 161907 SHEET #28
BORING LOGS B1-B6 PRODUCED BY AMEC.

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY — NEW MEXICO — 10840 — REGISTERED PROFESSIONAL ENGINEER — 2014

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMT	JDW	JSH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

aps

SCALE: AS NOTED — DATE: 10-10-11

DWN	DR	APPROVED	W.A.
CHD		TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD			
RVWD			

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	30

B-7

SURFACE ELEV.: 5249
TOTAL DEPTH: 60.5

	Casing	Ring Sampler	Split Spoon	D&M Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol

USCS	Type	Number	From (ft)	To (ft)	Blows/Foot N	Rec. (in.)	Visual Material Classification and Remarks
SM							BOTTOM ASH Gray, sandy, non-plastic, dry to moist, medium dense to dense
	R	1	2	3.5	20	18	
	R	2	4.5	6	20	18	-with some sand and gravel
	R	3	7	8.5	28	18	
	R	4	9.5	11	18	18	
	R	5	12	13.5	38	18	
	R	6	14.5	16	38	18	
	R	7	17	18.5	15	18	
	R	8	19.5	21	21	18	
	R	9	22	23.5	15	18	
	R	10	24.5	26	15	18	
	R	11	27	28.5	5	18	-Becomes dry
CL	R	12	29.5	31	4	18	CLAY (CL) (FILL) Brown, low to medium plasticity, moist, soft
							-Becomes mixture of bottom ash and clay fill
SM	R	13	32	33.5	29	18	BOTTOM ASH
	R	14	34.5	36	26	18	
	R	15	37	38.5	22	18	
RK	R	16	39.5	41	21	18	SHALE Brown to gray, highly weathered, hard
	R	17	42	43.5	19	18	
	R	18	44.5	46	16	18	-Becomes moist, highly to completely weathered, hard to very hard, high plasticity
	R	19	47	48.5	17	18	
	R	20	49.5	51	22	18	-Becomes dark brown, moist, highly weathered, medium plasticity
	R	21	52	53.5	19	18	-Moderately weathered
	R	22	54.5	56	20	18	
	R	23	57	58.5	22	18	-Becomes gray, dry to moist, slightly weathered, very hard, iron oxide stained, blocky structure
	R	24	59.5	60.5	50/6"	6	
							Bottom of test hole at 60.5 feet

B-8

SURFACE ELEV.: 5256.65
TOTAL DEPTH: 74

	Casing	Ring Sampler	Split Spoon	D&M Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
[illegible]	12:00 AM	70.0			
[illegible]	12:00 AM				

USCS	Type	Number	From (ft)	To (ft)	Blows/Foot N	Rec. (in.)	Visual Material Classification and Remarks
SM							BOTTOM ASH Light gray, sandy, dry, medium dense
	R	1	2	3.5	15	18	
	R	2	4.5	6	8	18	
	R	3	7	8.5	8	8	
	R	4	8.5	9.5	7	12	-Becomes damp
ML	R	5	9.5	11	4	18	FLY ASH Light gray, clayey, moist, medium stiff
	R	6	12	13.5	9	18	-Clay and flyash mix
CL	R	7	14.5	16	12	18	CLAY (CL) (FILL) Brown, with gray fly ash
	R	8	17	18.5	17	18	-Becomes moist, very stiff, low plasticity, with some gravel
	R	9	19.5	21	9	18	-Some coarse sand
	R	10	22	23.5	11	18	-Becomes brown and white
	R	11	24.5	26	15	18	-Becomes brown, with some claystone gravel
	R	12	27	28.5	16	18	
	R	13	29.5	31	14	18	-Becomes silty clay, moist, stiff, low to medium plasticity
	R	14	32	33.5	14	18	-Becomes stiff to very stiff
	R	15	34.5	36	8	18	
	R	16	37	38.5	19	18	
	R	17	39.5	41	10	18	
	R	18	42	43.5	27	18	
	R	19	44.5	46	15	18	-Becomes very stiff
	R	20	47	48.5	17	18	
	R	21	49.5	51	20	18	-Becomes low plasticity
	R	22	52	53.5	42	18	
RK	R	23	54.5	56	38	18	SHALE Highly to completely weathered, very soft rock/very hard soil
	R	24	57	58.5	30	18	
	R	25	59.5	61	23	18	
	R	26	62	63.5	24	18	-Becomes less weathered, blocky
	R	27	64.5	66	18	18	-Becomes completely weathered
	R	28	67	68.5	19	18	-Becomes highly to moderately weathered
	R	29	69.5	70.9	74/11"	11	-Becomes slightly weathered, very hard, calcite/gypsum and iron oxide infilling, blocky structure
	R	30	72	72.83	50/4"	4	
							Bottom of test hole at 74 feet (Due to Auger refusal)

B-9

SURFACE ELEV.: 5255.29
TOTAL DEPTH: 72

	Casing	Ring Sampler	Split Spoon	D&M Lined	Cuttings	Core Barrel
Type/Symbol		R	S	DM	CU	C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
[illegible]	12:00 AM	[illegible]			

USCS	Type	Number	From (ft)	To (ft)	Blows/Foot N	Rec. (in.)	Visual Material Classification and Remarks
SM							BOTTOM ASH Gray, sandy
	R	1	2	3.5	22	18	
	R	2	4.5	6	15	18	
	R	3	7	8.5	18	18	-Becomes gray mottled with black
	R	4	9.5	11	15	18	-Becomes gray
	R	5	12	13.5	17	18	
	R	6	14.5	16	12	18	
	R	7	17	18.5	25	18	-Some gravel
CL	R	8	19.5	21	16	18	CLAY (CL) (FILL) brown, medium plasticity
SM	R	9	22	23.5	24	18	BOTTOM ASH Some gravel
	R	10	24.5	26	19	18	
	R	11	27	28.5	21	18	
	R	12	29.5	31	23	18	
	R	13	32	33.5	19	18	
CL							CLAY (CL) (FILL) Brown to gray, moist, low plasticity, some reworked claystone
	R	14	34.5	36	19	18	
	R	15	37	38.5	15	18	
	R	16	39.5	41	20	18	
	R	17	42	43.5	16	18	-Some bottom ash in sample, wet, reworked shale
	R	18	44.5	46	20	18	-Becomes brown, reworked highly weathered shale, stiff to very stiff
	R	19	47	48.5	20	18	
SM							BOTTOM ASH
	R	20	49.5	51	34	18	
CL	R	21	52	53.5	33	18	CLAY (CL) (FILL) Dark brown, wet, low to medium plasticity, intermixed with bottom ash
	R	22	54.5	56	18	18	
	R	23	57	58.5	25	18	-Becomes brown highly weathered shale, moist, medium plasticity
	R	24	59.5	61	11	18	
CL	R	25	62	63.5	11	0	SANDY CLAY (CL) Brown, wet non-plastic to high plasticity, very stiff
	R	26	64.5	66	17	18	
	R	27	67	68.5	17	18	-Becomes coarse sand, some clay, medium dense
RK	R	28	69.5	71	44	18	SHALE Slightly weathered, very hard, iron oxide stains and calcite or gypsum infilling
							Bottom of test hole at 72.0 feet (Due to Auger refusal)

PIEZOMETER #14
- Bentonite / Cement
- 2" Dia. SCH 40 PVC
- Bentonite
- Sand
- Top of Screen

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY
NEW MEXICO
19846
PROFESSIONAL ENGINEER
4-15-14

1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 158134 SHEET #20

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDW	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

aps

SCALE AS NOTED
DATE 10-10-11

WORK SAFELY TODAY

DWN	DR	APPROVED	TONY KAHN, ENGINEERING SUPERVISOR	W A	FAC90332
CHD					
EXD		UNIT	FC	DISC	C
RVWD		TYPE	39	SYS	ADS
		NUMBER	161907	SHEET	31

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GOURLAY, NEW MEXICO, 19846, PROFESSIONAL ENGINEER, [illegible]

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD. (1)

Sampler and hammer data (same on every log):

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	DBM Lined DM	Cuttings CU	Core Barrel C
I.D.		2.5"	1.375"	2.5"	---	
O.D.		3"	2"	3"	---	
Length		18"	30"	18"	---	
Hammer WT.	140 lbs.	Drill Rod Size I.D. (O.D.)				
Hammer Fall	30 in.					

B-10

SURFACE ELEV.: 5255.27
TOTAL DEPTH: 58.25

GROUNDWATER DATA: (none recorded)

USCS	Type	Number	Depth From (ft)	Depth To (ft)	Blows/Foot N	Rec. (in.)
	R	1	2	3.5	11	18
	R	2	4.5	6	9	18
	R	3	7	8.5	11	18
	R	4	9.5	11	8	18
	R	5	12	13.5	8	18
CL	R	6	14.5	16	12	18
	R	7	17	18.5	19	18
	R	8	19.5	21	44	18
	R	9	22	23.5	9	0
	R	10	23.5	24.5	15	12
	R	11	24.5	26	14	18
	R	12	27	28.5	9	18
	R	13	29.5	31	13	18
	R	14	32	33.5	21	18
CL	R	15	34.5	36	17	18
	R	16	37	38.5	16	18
	R	17	39.5	41	19	18
	R	18	42	43.5	21	18
	R	19	44.5	46	33	18
	R	20	47	48.5	26	18
CL	R	21	49.5	51	23	18
	R	22	52	53.5	27	18
	R	23	54.5	56	29	18
	R	24	57	58.25	80/9"	9

VISUAL MATERIAL CLASSIFICATION AND REMARKS

BOTTOM ASH

FLY ASH
Moist, stiff
Light grey to brown fine-grained fly ash
-With some brown sandy clay
-Becomes moist, with brown clay in top half of sample

SANDY CLAY (CL) (FILL)
Brown mottled with white, moist, medium stiff, low plasticity

FLY ASH
Fine-grained
-Becomes light grey and brown, with clay fill in sample
-Becomes brown and light grey, with timber in sample, low plasticity, stiff, some fly ash

SILTY CLAY (CL/ML) (FILL)
Brown, moist, stiff, low plasticity
-Becomes dark brown to dark grey, moist, very stiff, low plasticity
-Becomes brown, low to medium plasticity
-Becomes brown to grey, low plasticity, possibly weathered shale

SANDY CLAY (CL)
Brown mottled with white, moist, very stiff, low plasticity
-With some gravel

SHALE
Dark grey, iron oxide stains, slightly to moderately weathered, weak rock/very hard soil

Bottom of test hole at 58.25 feet

B-11

SURFACE ELEV.: 5264.09
TOTAL DEPTH: 36

GROUNDWATER DATA:

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
[illegible]	10:00 AM	21.0			
[illegible]	10:00 AM				

USCS	Type	Number	Depth From (ft)	Depth To (ft)	Blows/Foot N	Rec. (in.)
SM	R	1	2	3.5	25	18
	R	2	4.5	6	34	18
	R	3	7	8.5	9	18
	R	4	9.5	11	4	18
	R	5	12	13.5	11	18
	R	6	14.5	16	5	18
	R	7	17	18.5	4	9
ML	R	8	19.5	21	5	18
	R	9	22	23.5	5	18
	R	10	24.5	26	3	9
	R	11	27	28.5	2	18
	R	12	30	32.5	WOH	0
	R	13	32.5	33.5	WOH	18
CL	R	14	34.5	36	28	18

VISUAL MATERIAL CLASSIFICATION AND REMARKS

BOTTOM ASH
Light grey, silt to sand size particles, dry, loose to medium dense

FLY ASH
Light grey, moist to wet, clay size particles, low plasticity
-Becomes very soft

SLIMES
Sampler driven by weight of hammer (WOH) from 30 to 33.5 feet

CLAY (CL)
Brown, moist, stiff, probably weathered shale

Bottom of test hole at 36.0 feet

B-12

SURFACE ELEV.: 5217.04
TOTAL DEPTH: 39

GROUNDWATER DATA:

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
[illegible]	12:00 AM	10.0			
[illegible]	12:00 AM	14.5			

USCS	Type	Number	Depth From (ft)	Depth To (ft)	Blows/Foot N	Rec. (in.)
SM	R	1	2	3.5	9	18
	R	2	4.5	6	5	18
ML	R	3	7	8.5	2	18
	R	4	9.5	12.5	WOH	0
	R	5	14.5	16	WOH	0
	R	6	17	18.5	WOH	0
	R	7	19.5	21	WOH	18
ML	R	8	22	23.5	5	18
	R	9	24.5	26	2	18
	R	10	27	28.5	5	18
	R	11	29.5	31	21	18
	R	12	32	33.5	37	8
RK	R	13	34.5	36	35	18
	R	14	37	38.17	85/8"	8

VISUAL MATERIAL CLASSIFICATION AND REMARKS

BOTTOM ASH

FLY ASH
Moist, low plasticity

SLIMES
Sampler driven by weight of hammer (WOH) from 9.5 to 21 feet

FLY ASH
Grey, wet, soft, medium plasticity
-Becomes with stiff brown clay contact in sample

SHALE
Brown to grey, moderately weathered, hard
-Becomes highly weathered
-Becomes unweathered to slightly weathered at 35.5 to 36.0 feet, grey, orange, very hard
-Becomes slightly weathered, very hard

Bottom of test hole at 39.0 feet (Due to Auger refusal)

B-13

SURFACE ELEV.: 5193.81
TOTAL DEPTH: 9

GROUNDWATER DATA: (none recorded)

USCS	Type	Number	Depth From (ft)	Depth To (ft)	Blows/Foot N	Rec. (in.)
RK	R	1	2	3.5	30	18
	R	2	4.5	6	77	12
	R	3	7	8.42	87/11"	11

VISUAL MATERIAL CLASSIFICATION AND REMARKS

SHALE
Very fresh shale or orange/black sandstone
-Becomes light grey, dry, very hard, low plasticity, possibly sandstone
-Becomes dark brown, orange, completely weathered, high plasticity

Bottom of test hole at 9.0 feet (Due to Auger refusal)

B-14

SURFACE ELEV.: 5189
TOTAL DEPTH: 19.5

GROUNDWATER DATA: (none recorded)

USCS	Type	Number	Depth From (ft)	Depth To (ft)	Blows/Foot N	Rec. (in.)
	R	1	2	3.5	20	18
	R	2	4.5	6	28	18
RK	R	3	7	8.5	8	18
	R	4	9.5	11	9	18
	R	5	12	13.5	12	18
	R	6	14.5	16	35	18
	R	7	17	17.82	50/5"	5

VISUAL MATERIAL CLASSIFICATION AND REMARKS

SHALE
Grey, highly weathered
-Becomes grey to brown, highly to completely weathered, stiff soil/soft rock
-Becomes moderately to highly weathered
-Becomes light grey, slightly to moderately weathered, very hard, iron oxide stains, blocky structure

Bottom of test hole at 19.5 feet (Due to Auger refusal)

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 161907 SHEET #28

WORK SAFELY TODAY

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

aps

SCALE AS NOTED DATE 10-10-11

DWN DR | CHD | EXD | RVWD
APPROVED TONY KAHN, ENGINEERING SUPERVISOR
W.A. FAC90332

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	32

Borehole B-15
Page 1 of 3

2060 Afton Place
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Field	Value	Field	Value
Project Name:	Ash Pond 5 West Embankment	Date Drilled:	12/3/2009
Project Number:	92-0971	Latitude:	Not Determined
Client:	Arizona Public Service	Longitude:	Not Determined
Site Location:	Four Corners Power Plant	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	Approx. 49.5 feet during drilling
Sampling Method:	Split spoon sample	Logged By:	Don Baldwin
Hammer Weight:	140 lbs	Remarks:	Reviewed by: LEC
Hammer Fall:	30 inches		

Depth (ft)	Soil Description
0	SILTY SAND with gravel, gray, fine- to coarse-grained, loose, moist (BOTTOM ASH)
2	LEAN CLAY, brown, stiff, moist (FILL)
15	occasional salt crystals; occasional gravel-size shale fragments
23	SILTY SAND with gravel, gray, fine- to coarse-grained, very loose, moist (BOTTOM ASH)
25	SILTY SAND with gravel, gray, fine- to coarse-grained, very loose, moist (BOTTOM ASH)
28	SANDY LEAN CLAY, brown, soft to stiff, moist (FILL)
45	increased sand content, medium stiff to stiff
50	CLAYEY SAND with gravel, gray, fine- to coarse-grained, loose, wet (NATIVE?)
56	SHALE, gray, highly weathered, soft, massive
60	dark gray, moderately soft, weakly fissile
65	moderately weathered, moderately soft to moderately hard, fissile
	Total Depth 66.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

Borehole B-16
Page 1 of 4

2060 Afton Place
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Field	Value	Field	Value
Project Name:	Ash Pond 5 West Embankment	Date Drilled:	12/2/2009
Project Number:	92-0971	Latitude:	Not Determined
Client:	Arizona Public Service	Longitude:	Not Determined
Site Location:	Four Corners Power Plant	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	Approx. 68 feet during drilling
Sampling Method:	Split spoon sample	Logged By:	Don Baldwin
Hammer Weight:	140 lbs	Remarks:	Reviewed by: LEC
Hammer Fall:	30 inches		

Depth (ft)	Soil Description
0	LEAN CLAY, brown, stiff, moist (FILL)
5	occasional salt crystals
8	brown to olive-gray
25	SANDY LEAN CLAY, yellow-brown, with occasional gravel-size shale fragments, stiff to very stiff, moist (FILL)
30	LEAN CLAY with trace gravel, olive-gray, stiff, moist (FILL)
33	brown to gray, no gravel
45	SANDY LEAN CLAY with trace gravel, brown, stiff, moist (FILL)
48	LEAN CLAY, brown, very stiff, moist (FILL)
50	LEAN CLAY, brown, very stiff, moist (FILL)
60	SANDY LEAN CLAY with gravel-size shale fragments, brown, very stiff, moist (FILL)
63	LEAN CLAY with trace gravel-size shale fragments, brown, very stiff, moist
69	CLAYEY SAND with gravel, brown, fine- to coarse-grained, medium dense, moist to wet (NATIVE?)
71	wet
75	SHALE, brown to dark gray, highly weathered, moderately soft, weakly fissile
79	slightly weathered
	Total Depth 81.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

Borehole B-17
Page 1 of 3

2060 Afton Place
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Field	Value	Field	Value
Project Name:	Ash Pond 5 West Embankment	Date Drilled:	12/3/2009
Project Number:	92-0971	Latitude:	Not Determined
Client:	Arizona Public Service	Longitude:	Not Determined
Site Location:	Four Corners Power Plant	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	Approx. 55 feet during drilling
Sampling Method:	Split spoon sample	Logged By:	Don Baldwin
Hammer Weight:	140 lbs	Remarks:	Reviewed by: LEC
Hammer Fall:	30 inches		

Depth (ft)	Soil Description
0	SILTY SAND with gravel, gray, fine- to coarse-grained, loose to medium dense, moist (BOTTOM ASH)
25	SILTY SAND with gravel, gray, fine- to coarse-grained, loose to medium dense, moist (BOTTOM ASH)
36	LEAN CLAY, brown to gray, stiff, moist (FILL)
45	dark gray, with gravel-size shale fragments
50	LEAN CLAY, brown to gray, stiff, moist (FILL); increased sand content
53	CLAYEY SAND with gravel, brown, fine- to coarse-grained, loose to medium dense, wet (NATIVE?)
61	SHALE, gray, highly weathered, soft, massive to blocky
65	weakly fissile
	Total Depth 66.5 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

URS
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(602) 371-1100

ALEXANDER W. GOURLAY, NEW MEXICO, 19846, PROFESSIONAL ENGINEER, 4-15-14

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

Borehole B-18
Page 1 of 2

2060 Afton Place
Farmington, NM 87401
Tel (505) 327-7928
Fax (505) 326-5721

Field	Value	Field	Value
Project Name:	Ash Pond 5 West Embankment	Date Drilled:	12/3/2009
Project Number:	92-0971	Latitude:	Not Determined
Client:	Arizona Public Service	Longitude:	Not Determined
Site Location:	Four Corners Power Plant	Elevation:	Not Determined
Rig Type:	CME - 75	Boring Location:	See Site Plan
Drilling Method:	7" O.D. Hollow Stem Auger	Groundwater Depth:	Approx. 45 feet during drilling
Sampling Method:	Split spoon sample	Logged By:	Don Baldwin
Hammer Weight:	140 lbs	Remarks:	Reviewed by: LEC
Hammer Fall:	30 inches		

Depth (ft)	Soil Description
0	SILTY SAND with gravel, gray, fine- to coarse-grained, medium dense, moist (BOTTOM ASH)
25	SILTY SAND with gravel, gray, fine- to coarse-grained, medium dense, moist (BOTTOM ASH); loose
35	loose
38	SHALE, dark gray, highly weathered, soft, weakly fissile
45	slightly weathered, moderately hard, fissile
	Total Depth 45.3 feet

A = Auger Cuttings GRAB = Hand Sample MC = Modified California (Ring Sample) SS = Split Spoon

NOTE
BORING LOCATIONS SHOWN ON DRAWING NO. 161907 SHEET #28

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAD6032

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

aps

SCALE: AS NOTED DATE: 10-10-11

WORK SAFELY TODAY

DWN	DR	APPROVED	TONY KAHN, ENGINEERING SUPERVISOR	W.A.	39
CHD		UNIT	FC	DISC	C
EXD		TYPE	39	SYS	ADS
RVWD		NUMBER	161907	SHEET	33

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD.

ALEXANDER W. GOURLAY NEW MEXICO 19846 PROFESSIONAL ENGINEER 4-15-14

BORING LOG: B-19

URS, 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET	1 of 1
URS PROJECT #	23446085
PROJECT	LAI – 5280 Lift
CLIENT	APS
CONTRACTOR	Yellow Jacket
DRILLER	Gabe Escamillo
FIELD TECHNICIAN	Lee Wright
COORDINATES	N: 2,069,684.36 E: 302,717
REF. ALIGNMENT	N/A
STATION	N/A
OFFSET	N/A
LOCATION	Four Corners Power Plant
RIG TYPE	CME 85
DRILLING METHOD	Hollow Stem Auger
HAMMER TYPE	AUTO HAMMER
COMMENTS	4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.	5265.422
TOTAL DEPTH	99.3 FT
START DATE	06/24/2011 TIME: 09:30 AM
FINISH DATE	06/24/2011 TIME: 03:00 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
06/24/11	12:00 PM	78.0		99.3	

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- Top 8.25" – Light gray FLY ASH. Breaks into beds ~1/4" – 3/8" thick. Dry.
- Medium dense to very dense dark gray BOTTOM ASH. 1/4" clinker evident (~20% of sample). Dry.
- Bottom 1' – moist.
- Medium dense to very dense dark gray BOTTOM ASH. Clinker evident (~20% of sample). Dry.
- Medium dense – dense light gray FLY ASH. Friable. Dry.
- Very dense dark gray BOTTOM ASH. 1/4" clinker evident (~15% of sample). Dry.
- Medium dense to very dense light gray FLY ASH. Dry.
- Medium dense to dense dark gray BOTTOM ASH. Friable. Spots of brownish red and red composing ~10% of sample. Dry.
- Medium dense to dense dark gray BOTTOM ASH. Friable. Spots of brownish red and red composing ~10% of sample. Dry.
- Samples contain trace cenospheres near 45'.
- Medium dense to dense dark gray BOTTOM ASH. Friable. Spots of brownish red and red composing ~10% of sample. Dry.
- Geogrid encountered at 58.75'. Clinker pieces up to 1" x 1/2".
- Very soft gray WET FLY ASH.
- Very soft gray WET FLY ASH.
- Medium dense gray BOTTOM ASH. Clinker – 1/4" – 1" in diameter (25% of sample). Moist – wet.
- Driller reports water at 78'.
- Very hard brown SILTY CLAY – WEATHERED SHALE. Possible calcium carbonate crystals comprise ~ 15% of sample. Highly overconsolidated. Moist.
- Very hard brown SILTY CLAY – WEATHERED SHALE. Possible calcium carbonate crystals comprise ~ 15% of sample. Highly overconsolidated. Moist.
- End of Boring at 99.3'.

BORING LOG: B-20

URS, 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET	1 of 2
URS PROJECT #	23446085
PROJECT	LAI – 5280 Lift
CLIENT	APS
CONTRACTOR	Yellow Jacket
DRILLER	Gabe Escamillo
FIELD TECHNICIAN	Lee Wright
COORDINATES	N: 2,069,342.02 E: 302,502.82
REF. ALIGNMENT	N/A
STATION	N/A
OFFSET	N/A
LOCATION	Four Corners Power Plant
RIG TYPE	CME 85
DRILLING METHOD	Hollow Stem Auger
HAMMER TYPE	AUTO HAMMER
COMMENTS	4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.	5220
TOTAL DEPTH	50 FT
START DATE	06/26/2011 TIME: 02:30 PM
FINISH DATE	06/26/2011 TIME: 03:30 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA: Water Depth – None

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- Medium dense gray BOTTOM ASH. Clinker (fine gravel – coarse sand) composes ~50% of sample. Dry.
- Medium dense gray BOTTOM ASH. Clinker (fine gravel – coarse sand) throughout. Dry.
- Very loose gray FLY ASH. Occasional pieces of clinker. Moist. Geogrid encountered at 20'.
- Very loose gray FLY ASH. Occasional pieces of clinker. Moist. Geogrid encountered at 20'.
- Very soft gray WET FLY ASH. Low plasticity.
- Loose gray FLY ASH. Friable. Moist.
- End of Boring at 50'.

BORING LOG: B-21

URS, 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET	1 of 2
URS PROJECT #	23446085
PROJECT	LAI – 5280 Lift
CLIENT	APS
CONTRACTOR	Yellow Jacket
DRILLER	Gabe Escamillo
FIELD TECHNICIAN	Lee Wright
COORDINATES	N: 2,069,949.17 E: 302,450.06
REF. ALIGNMENT	N/A
STATION	N/A
OFFSET	N/A
LOCATION	Four Corners Power Plant
RIG TYPE	CME 85
DRILLING METHOD	Hollow Stem Auger
HAMMER TYPE	AUTO HAMMER
COMMENTS	4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.	5207.91
TOTAL DEPTH	50 FT
START DATE	06/26/2011 TIME: 10:25 AM
FINISH DATE	06/26/2011 TIME: 01:30 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA: Water Depth – None

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- FILL – Bottom ash road constructed 6/23/11 – 6/24/11 for drilling access.
- Medium dense black BOTTOM ASH with some Silt and Clay.
- Medium dense light gray FLY ASH. Breaks readily into 5/16" – 5/8" layers. Moist.
- Medium dense light gray FLY ASH. Breaks readily into 5/16" – 5/8" layers. Moist.
- Very soft gray WET FLY ASH. Strong hydrogen sulfide smell.
- Very soft gray WET FLY ASH. No strength, slumps immediately. Strong hydrogen sulfide smell.
- Very soft gray WET FLY ASH. Strong hydrogen sulfide smell.
- Very stiff brown SILTY CLAY – WEATHERED SHALE. Moist.
- End of Boring at 50'.

BORING LOG: B-22

URS, 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET	1 of 2
URS PROJECT #	23446085
PROJECT	LAI – 5280 Lift
CLIENT	APS
CONTRACTOR	Yellow Jacket
DRILLER	Gabe Escamillo
FIELD TECHNICIAN	Lee Wright
COORDINATES	N: 2,069,686.07 E: 302,472.65
REF. ALIGNMENT	N/A
STATION	N/A
OFFSET	N/A
LOCATION	Four Corners Power Plant
RIG TYPE	CME 85
DRILLING METHOD	Hollow Stem Auger
HAMMER TYPE	AUTO HAMMER
COMMENTS	4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.	5210
TOTAL DEPTH	49.5 FT
START DATE	06/23/2011 TIME: 08:10 AM
FINISH DATE	06/23/2011 TIME: 01:30 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA: Water Depth – None

VISUAL MATERIAL CLASSIFICATION AND REMARKS

- Loose coarse – fine black – dark gray BOTTOM ASH. Moist.
- Light gray FLY ASH. Low plasticity. Dry.
- Very soft gray WET FLY ASH. High plasticity. High moisture content.
- Very soft gray WET FLY ASH. High plasticity. High moisture content.
- Hard brown – dark brown SILTY CLAY – WEATHERED SHALE. Contains possible calcium carbonate crystals (~25% of matrix) laminated along planes 1/16" thick. Moist.
- End of Boring at 49.5'.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

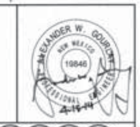
aps

SCALE AS NOTED DATE 10-10-11

DWN	DR	APPROVED	TONY KAHN, ENGINEERING SUPERVISOR	W.A.	FAC90332
CHD					
EXD		UNIT FC	DISC C	TYPE 39	SYS ADS
RVWD		NUMBER 161907	SHEET 34		

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100



△1 DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

BORING LOG: B-23

URS — 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET 1 of 2 — URS PROJECT #: 23446085

PROJECT: LAI - 5280 Lift
CLIENT: APS
CONTRACTOR: Yellow Jacket
DRILLER: Gabe Escamillo
FIELD TECHNICIAN: Lee Wright

COORDINATES N: 2,069,676.59 E: 302,382.99 — REF. ALIGNMENT: N/A — STATION: N/A — OFFSET: N/A
LOCATION: Four Corners Power Plant
RIG TYPE: CME 85 — DRILLING METHOD: Hollow Stem Auger — HAMMER TYPE: AUTO HAMMER
COMMENTS: 4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.: 5205.47 — TOTAL DEPTH: 49.25 FT
START DATE: 06/23/2011 TIME: 02:40 PM — FINISH DATE: 06/23/2011 TIME: 06:00 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
06/23/11	04:40 PM	35.0		40.0	

USCS	Type	Number	From (ft)	To (ft)	Moisture %	Dry Density (PCF)	0/6	6/12	12/18	N	Rec. (in.)
ML	R	1	3.5	5	15.0	56.0	2	6	6	12	18"
ML	U	S-1	9	11.5	20.2 / 32.7 / 18.1	62.4 / 56.5 / 61.2				PUSH	24"
ML	R	3	18.5	20	52.0	56.0	1	1	1	2	18"
ML	U	S-a	24	26.5						PUSH	3"
ML	U	S-2	27.5	30						PUSH	3"
ML	R	6	38.5	40			1	1	2	3	0"
ML	R	7, 7a	43.5	45	52.0 / 41.0	58.0 / 72.0	11	24	23	47	18"
ML / CL	R	8, 8a	48.5	49.25	38.0	70.0	37	50/5"		50+	9"

VISUAL MATERIAL CLASSIFICATION AND REMARKS

Medium dense light gray FLY ASH with some Bottom Ash. Little - no cohesion. Dry.

Medium dense light gray FLY ASH with some Bottom Ash. Little - no cohesion. Dry.

Very loose gray FLY ASH. Apparent cohesion, but breaks readily into 1/4" - 5/16" beds. Moisture content increasing toward bottom of sample.

Due to low recovery, sample was thrown out.

Sample kept in spite of low recovery. Hydrogen sulfide smell noted.

Very loose gray FLY ASH. Apparent cohesion, but breaks readily into 1/4" - 5/16" beds. Moisture content increasing toward bottom of sample.
Driller reports water at 35'.

Soft gray WET FLY ASH with trace Sand. Low plasticity. Appears cohesive.

Dense gray FLY ASH with trace coarse Sand. No plasticity.

Very soft gray WET FLY ASH. No strength. High plasticity.

Very hard light brown SILTY CLAY - WEATHERED SHALE. Interbedded tan seams. Dry.

End of Boring at 49.25'.

BORING LOG: B-24

URS — 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET 1 of 2 — URS PROJECT #: 23446085

PROJECT: LAI - 5280 Lift
CLIENT: APS
CONTRACTOR: Yellow Jacket
DRILLER: Gabe Escamillo
FIELD TECHNICIAN: Lee Wright

COORDINATES N: 2,069,936.71 E: 302,265.65 — REF. ALIGNMENT: N/A — STATION: N/A — OFFSET: N/A
LOCATION: Four Corners Power Plant
RIG TYPE: CME 85 — DRILLING METHOD: Hollow Stem Auger — HAMMER TYPE: AUTO HAMMER
COMMENTS: 4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.: 5208 — TOTAL DEPTH: 59.33 FT
START DATE: 06/25/2011 TIME: 09:30 AM — FINISH DATE: 06/25/2011 TIME: 05:45 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
		None			

USCS	Type	Number	From (ft)	To (ft)	Moisture %	Dry Density (PCF)	0/6	6/12	12/18	N	Rec. (in.)
ML	R	1	8.5	10	15.0	63.0	3	4	6	10	18"
ML	U	GUS-1	20	22.5						PUSH	2"
					74.0						
ML	CU	3A	25		35.0	72.0					
ML	U	GUS-2	25	27.5						PUSH	24"
ML	R	4	28.5	30			WOH	WOH	WOH	0	18"
ML	U	GUS-3	37.5	40						PUSH	
SP	R	6	48.5	50	23.0	106.0	3	4	5	11	18"
CL	R	7, 7A	58.5	59.33			23	50/4"		50+	10"

VISUAL MATERIAL CLASSIFICATION AND REMARKS

FILL - Bottom ash road constructed 6/23/11 - 6/24/11 for drilling access. (SM)

Loose light gray FLY ASH. Friable (3/8" - 5/16" beds). Dry.

Loose light gray FLY ASH. Friable (3/8" - 5/16" beds). Dry.

Very soft gray WET FLY ASH with trace Sand. Low plasticity. High moisture content.

Very soft gray WET FLY ASH with trace Sand. Low plasticity. High moisture content.

Medium dense medium brown SAND. Moist.

Very soft gray WET FLY ASH with trace Sand. Low plasticity. High moisture content. (SM)

Hard brown SILTY CLAY - WEATHERED SHALE. Possible calcium carbonate crystals (~20% of matrix), 2-3 mm maximum diameter. Dry.

End of Boring at 59.33'.

BORING LOG: B-25

URS — 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET 1 of 2 — URS PROJECT #: 23446085

PROJECT: LAI - 5280 Lift
CLIENT: APS
CONTRACTOR: Yellow Jacket
DRILLER: Gabe Escamillo
FIELD TECHNICIAN: Lee Wright

COORDINATES N: 2,067,884.3 E: 303,794.37 — REF. ALIGNMENT: N/A — STATION: N/A — OFFSET: N/A
LOCATION: Four Corners Power Plant
RIG TYPE: CME 85 — DRILLING METHOD: Hollow Stem Auger — HAMMER TYPE: AUTO HAMMER
COMMENTS: 4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.: 5194.401 — TOTAL DEPTH: 29.5 FT
START DATE: 06/22/2011 TIME: 02:45 PM — FINISH DATE: 06/22/2011 TIME: 03:30 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
		None			

USCS	Type	Number	From (ft)	To (ft)	Moisture %	Dry Density (PCF)	0/6	6/12	12/18	N	Rec. (in.)
CH	R	1	3.5	5			3	3	5	8	18"
CH	R	2	8.5	10			4	8	12	20	18"
CH	R	3	13.5	15			2	7	9	16	18"
CH	R	4	18.5	19			12	50/1"		50+	7"
CH	R	5	23.5	24			50/4"			50+	4"
CH	R	6	28.5	29.5			14	50/5"		50+	11"

VISUAL MATERIAL CLASSIFICATION AND REMARKS

Dark gray BOTTOM ASH. Haul road. Medium coarse - fine grained. Dry. (GW)

Medium stiff - stiff medium brown SILTY CLAY with little Sand. Moist.

Very stiff mottled gray and tan SILTY CLAY with some Sand and Gravel. Highly weathered and altered Shale. Clay filled joints, inclusions of calcium carbonate crystals, and black grains ~1 - 5 mm in diameter. Moist.

Very stiff mottled gray and tan SILTY CLAY with some Sand and Gravel. Highly weathered and altered Shale. Clay filled joints, inclusions of calcium carbonate crystals, and black grains ~1 - 5 mm in diameter. Moist.

Hard brown and gray SILTY CLAY - WEATHERED SHALE. Horizontal bedding. Dry.

Possible calcium carbonate crystals >5 mm in diameter. Crystals appear in laminations between beds.

End of Boring at 29.5'.

BORING LOG: B-26

URS — 7720 N 16th Street, Suite 100, Phoenix, AZ 85020, 602-371-1100, 602-371-1615 (Fax)

SHEET 1 of 2 — URS PROJECT #: 23446085

PROJECT: LAI - 5280 Lift
CLIENT: APS
CONTRACTOR: Yellow Jacket
DRILLER: Gabe Escamillo
FIELD TECHNICIAN: Lee Wright

COORDINATES N: 2,068,085.71 E: 304,277.92 — REF. ALIGNMENT: N/A — STATION: N/A — OFFSET: N/A
LOCATION: Four Corners Power Plant
RIG TYPE: CME 85 — DRILLING METHOD: Hollow Stem Auger — HAMMER TYPE: AUTO HAMMER
COMMENTS: 4-1/4" I.D. auger bit (two spades, two bullets)
SURFACE ELEV.: 5211.581 — TOTAL DEPTH: 24.5 FT
START DATE: 06/22/2011 TIME: 11:07 AM — FINISH DATE: 06/22/2011 TIME: 12:15 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	D&M Lined DM	Shelby Tube U	Cuttings CU
I.D.		2.5"	1.375"	2.5"	2.8"	---
O.D.		3"	2"	3"	3"	---
Length		18"	30"	18"	30"	---
Hammer WT.	140 lbs.		Drill Rod Size			
Hammer Fall	30 in.		I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
		None			

USCS	Type	Number	From (ft)	To (ft)	Moisture %	Dry Density (PCF)	0/6	6/12	12/18	N	Rec. (in.)
CH	R	1	3.5	5			15	35	7	35+	15"
CH	R	2	8.5	10			14	38	50	88	11.5"
CH	R	3	13.5	15			37	50/4"		50+	8.5"
CH	R	4	18.5	20			16	50		50+	10.5"
CH	R	5	23.5	24.5			18	50/5"		50+	11"

VISUAL MATERIAL CLASSIFICATION AND REMARKS

Hard medium brown SILTY CLAY with some well-graded Sand and trace Gravel. Clay has moderate - high plasticity. Dry.

Hard brown SILTY CLAY - WEATHERED SHALE. 1/8" thick laminations of calcium carbonate crystals. Sample is fractured slightly. Moderate - high plasticity. Dry.

Color grades to darker brown with some discolored lenses of lighter brown. Possible calcium carbonate crystals ~1 mm thick are oriented vertically and appear moderately spaced.

End of Boring at 24.5'.

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JDM	JBH	AMG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
SOIL BORING LOGS

aps

SCALE: AS NOTED — DATE: 10-10-11

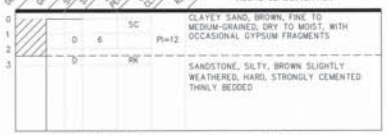
DWN: DR — CHD — EXD — RVWD
APPROVED: TONY KAHN, ENGINEERING SUPERVISOR — W.A.: FAC90332

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	35

WORK SAFELY TODAY

TEST PIT T-13

VISUAL CLASSIFICATION

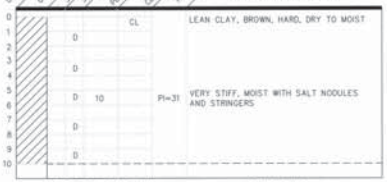


STOP EXCAVATION @ 2.5'
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

TEST PIT T-14

VISUAL CLASSIFICATION

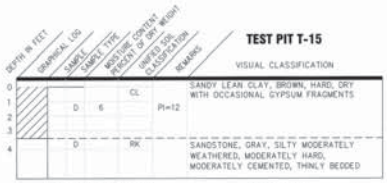


STOP EXCAVATION @ 10'.
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

TEST PIT T-15

VISUAL CLASSIFICATION



STOP EXCAVATION @ 3.5'
NO GROUND WATER ENCOUNTERED.

SAMPLE TYPE
D = DISTURBED BULK SAMPLE

URS
7720 N 16th Street, Suite 100
Phoenix, AZ 85020
602-371-1615 (Fax)

BORING LOG: B-27
SHEET 1 of 3
URS PROJECT #: 23446085

PROJECT: LAI – 5280 Lift
CLIENT: APS

CONTRACTOR: Yellow Jacket
DRILLER: Gabe Escamillo
FIELD TECHNICIAN: Lee Wright

COORDINATES N: 2,069,949.17 REF. ALIGNMENT: N/A
E: 302,215.06 STATION: N/A
LOCATION: Four Corners Power Plant OFFSET: N/A

RIG TYPE: CME 85
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: AUTO HAMMER

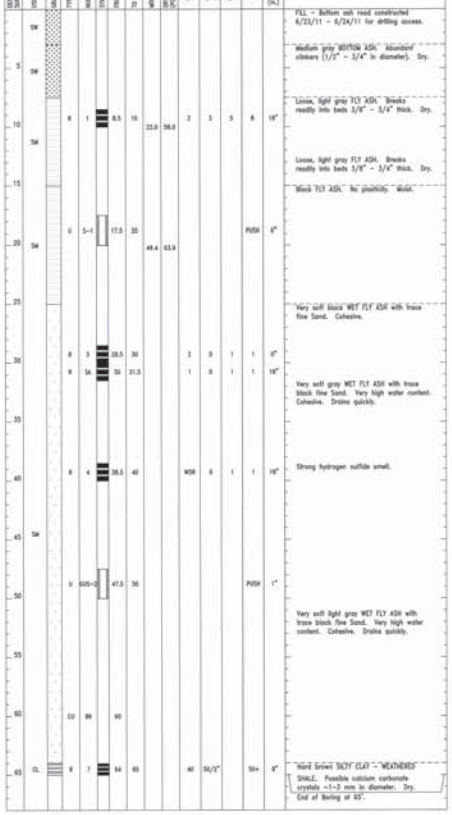
COMMENTS: 4-1/4" I.D. auger bit (two spades, two bullets)

SURFACE ELEV.: 5207
TOTAL DEPTH: 65 FT
START DATE: 06/25/2011 TIME: 08:00 PM
FINISH DATE: 06/25/2011 TIME: 09:45 PM

Type/Symbol	Casing	Ring Sampler R	Split Spoon S	Shelby Tube U	Cuttings CU
I.D.	2.5"	1.375"	2.5"	2.8"	---
O.D.	3"	2"	3"	3"	---
Length	10'	30"	18"	30"	---
Hammer WT.	140 lbs.	Drill Rod Size			
Hammer Fall	30 in.	I.D. (O.D.)			

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)	Symbol
		None			U
					R
					S
					U



NOTE
TEST PIT LOGS PRODUCED BY TERRACON.
TEST PIT LOCATIONS SHOWN ON DRAWING NO. 161907 SHEET #29.

WORK SAFELY TODAY

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GEURKINK — NEW MEXICO — 19846 — PROFESSIONAL ENGINEER — 4-15-11

DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JSH	AWG	ERC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
TEST PIT AND SOIL BORING LOGS

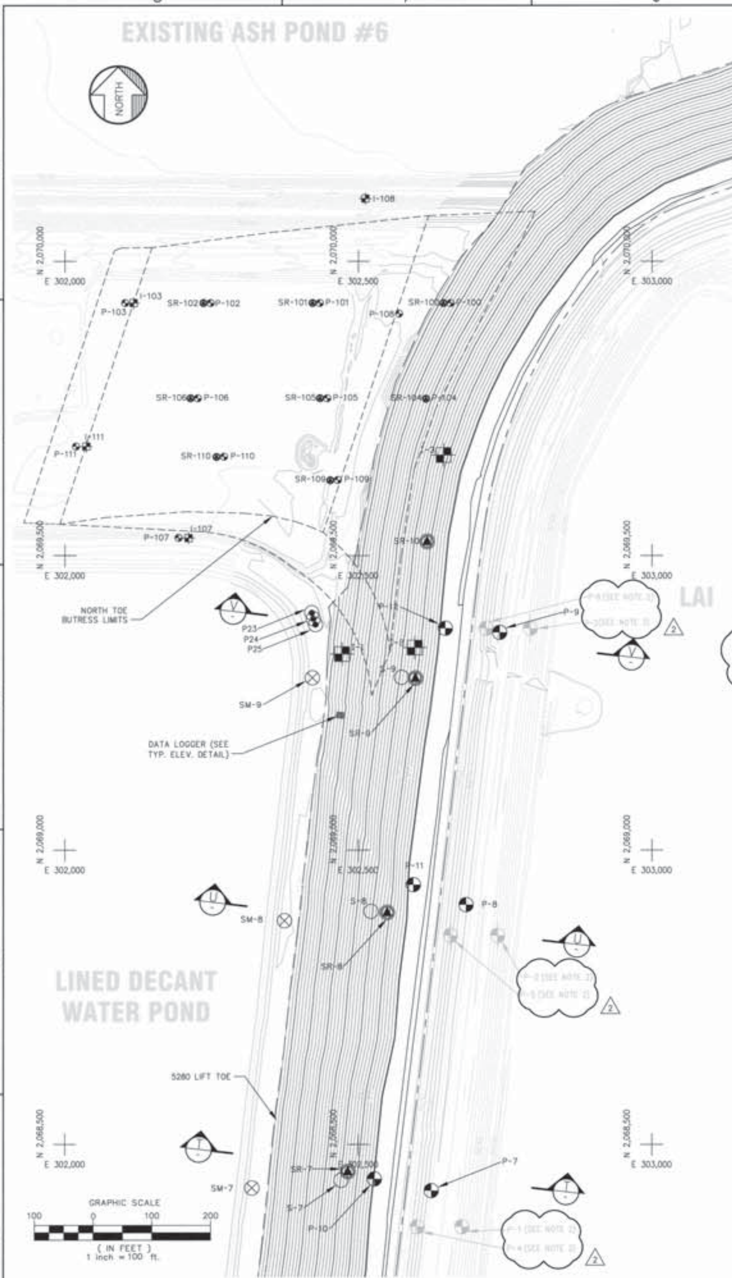
aps

SCALE AS NOTED DATE 10-10-11

DWN DR	APPROVED	W.A.
CHD	TONY KAHN ENGINEERING SUPERVISOR	FAC90332
EXD		
RVWD		

UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	36

DRAWING: P:\URES\arizona_public_service\23446085_aps_hpp 5278 ph2\5_0_technical\5_1_CADD\APS_ESCS_DRAWINGS\U_DRAWING_REVISIONS\FC-C-39-ADS-161907-36.dwg



VIBRATING WIRE PIEZOMETER CLUSTER & SETTLING PLATE LOCATIONS

1"=100'

CONTOUR INTERVAL=2'

VW PIEZOMETER INSTALLATION SPECIFICATIONS

VIBRATING WIRE PIEZOMETERS ARE RECOMMENDED AT 500' CENTERS ALONG THE CENTERLINE OF THE EMBANKMENT. AT EACH LOCATION THE PIEZOMETER SHOULD BE CAPABLE OF MEASURING THE EXCESS PORE WATER PRESSURE AT APPROXIMATELY 5 TO 12 FEET BELOW THE FLY ASH SURFACE, 16 TO 26 FEET AND 23 TO 37 FEET. SETTLEMENT PLATES WILL BE INSTALLED TO MONITOR SETTLEMENT DURING CONSTRUCTION AND TO ADJUST FILL REQUIREMENTS APPROPRIATELY. THE SETTLEMENT PLATES WILL BE IN CLOSE PROXIMITY TO THE PIEZOMETERS.

BIBLIOGRAPHY:

REFER TO EDOC ITEM # 1219960063 FOR ELECTRONIC PIEZOMETER READINGS

PIEZOMETER & SETTLING PLAT LOCATIONS		
INSTRUMENT NO.	NORTHING	EASTING
P-7	2068421	302624
P-8	2068907	302683
P-9	2069369	302740
P-10	2068441	302527
P-11	2068941	302593
P-12	2069376	302647
P-25	2069383	302427
P-24	2069393	302423
P-23	2069403	302418
P-14/B-9	2070386	303598
P-100	2069929	302656
P-101	2069929	302434
P-102	2069929	302248
P-103	2069929	302102
P-104	2069766	302614
P-105	2069767	302446
P-106	2069767	302226
P-107	2069529	302210
P-108	2070106	302497
P-109	2069628	302464
P-110	2069668	302270
P-111	2069685	302018
S-7	2068439	302470
S-8	2068896	302521
S-9	2069293	302573

PIEZOMETER POINTS

(TIED TO STATE COORDINATES)

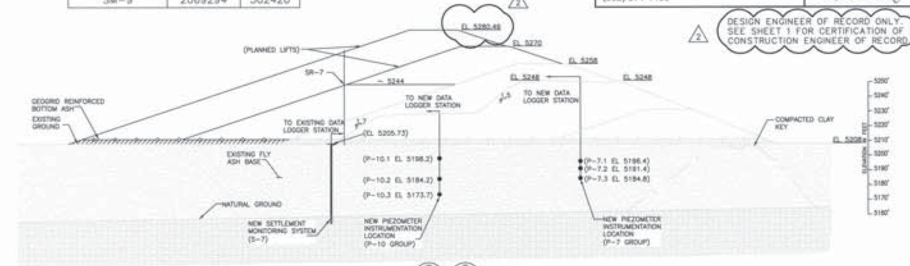
SURFACE MONUMENTS LOCATIONS		
INSTRUMENT NO.	NORTHING	EASTING
SM-7	2068426	302319
SM-8	2068880	302374
SM-9	2069294	302420

NOTES:

1. VIBRATING WIRE PIEZOMETERS P7, P8, P9, P10, P11, P12 ELEVATIONS HERE PROVIDED BY URS CORPERATION
2. VIBRATING WIRE PIEZOMETERS P1-P6 WERE STRUCK BY LIGHTENING AND ABANDONED

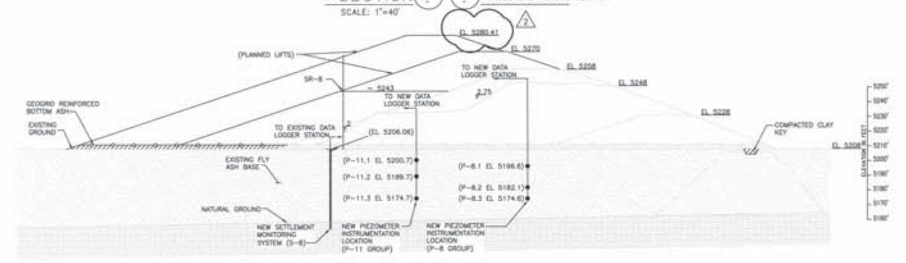
URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

DESIGN ENGINEER OF RECORD ONLY. SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD



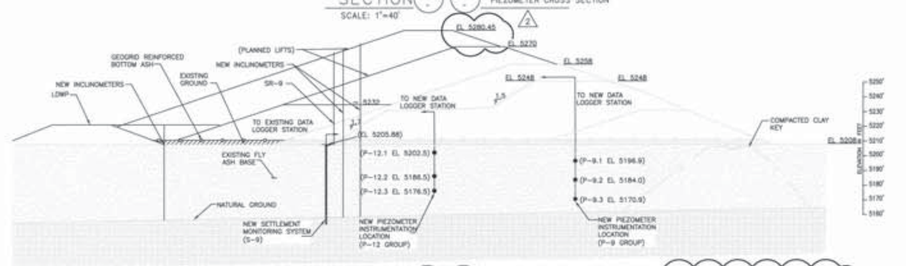
SECTION T PIEZOMETER CROSS SECTION

SCALE: 1"=40'



SECTION U PIEZOMETER CROSS SECTION

SCALE: 1"=40'



SECTION V PIEZOMETER CROSS SECTION

SCALE: 1"=40'

INCLINOMETER AND SETTLEMENT ROD LOCATIONS				
INSTRUMENT NO.	NORTHING	EASTING	BOTTOM ELEVATION	APPROXIMATE GROUND SURFACE ELEVATION
SR-7	2068454	302482	5205	5244
SR-8	2068894	302549	5205	5243
SR-9	2069292	302597	5205	5232
SR-10	2069524	302617	5205	5232
SR-100	2069926	302635	5222	5222
SR-101	2069936	302418	5206	5206
SR-102	2069925	302251	5205	5205
SR-104	2069769	302607	5219	5219
SR-105	2069765	302452	5206	5205
SR-106	2069773	302217	5206	5205
SR-109	2069633	302444	5207	5207
SR-110	2069671	302252	5206	5206
I-1	2069333	302472	5175	5232
I-2	2069344	302596	5175	5232
I-3	2069671	302645	5175	5233
I-103	2069929	302093	5139	5205
I-107	2069520	302210	5150	5216
I-108	2070119	302513	5145	5237
I-111	2069677	302017	5148	5206

LEGEND

- P-7 VIBRATING WIRE PIEZOMETER GROUP
- S-7 SETTLING PLATE LOCATIONS
- EXISTING FLY ASH BASE
- ORIGINAL EMBANKMENT
- NATURAL GROUND
- P-11 STAND PIPE PIEZOMETERS
- SM-7 SURFACE MONUMENTS
- SR-8 SETTLEMENT ROD
- I-2 INCLINOMETER

REFERENCE:

FLOWN BY AERIAL MAPPING CO, INC. IN MAY, 2010
3141 WEST CLARENDON AVENUE PHOENIX, AZ 85017

AS-BUILT TOPO SURVEY BY:
1. SOUDER, MILLER AND ASSOCIATES
2101 SAN JUAN BLVD.
FARMINGTON, NM 87401
ON DECEMBER 12, 2012
2. FOUR CORNERS SURVEYING, INC.
FARMINGTON, NM
ON FEBRUARY 23, 2014

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
2	04/15/14	5280 LIFT AS-BUILTS	AWF	JDM	JBH	AWG	BRC	FAC90332
1	02/12	NMOSE COMMENTS	DR	MSJ	JBH	BRC	AWG	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
INSTRUMENTATION DETAILS

aps

SCALE AS NOTED DATE 10-10-11

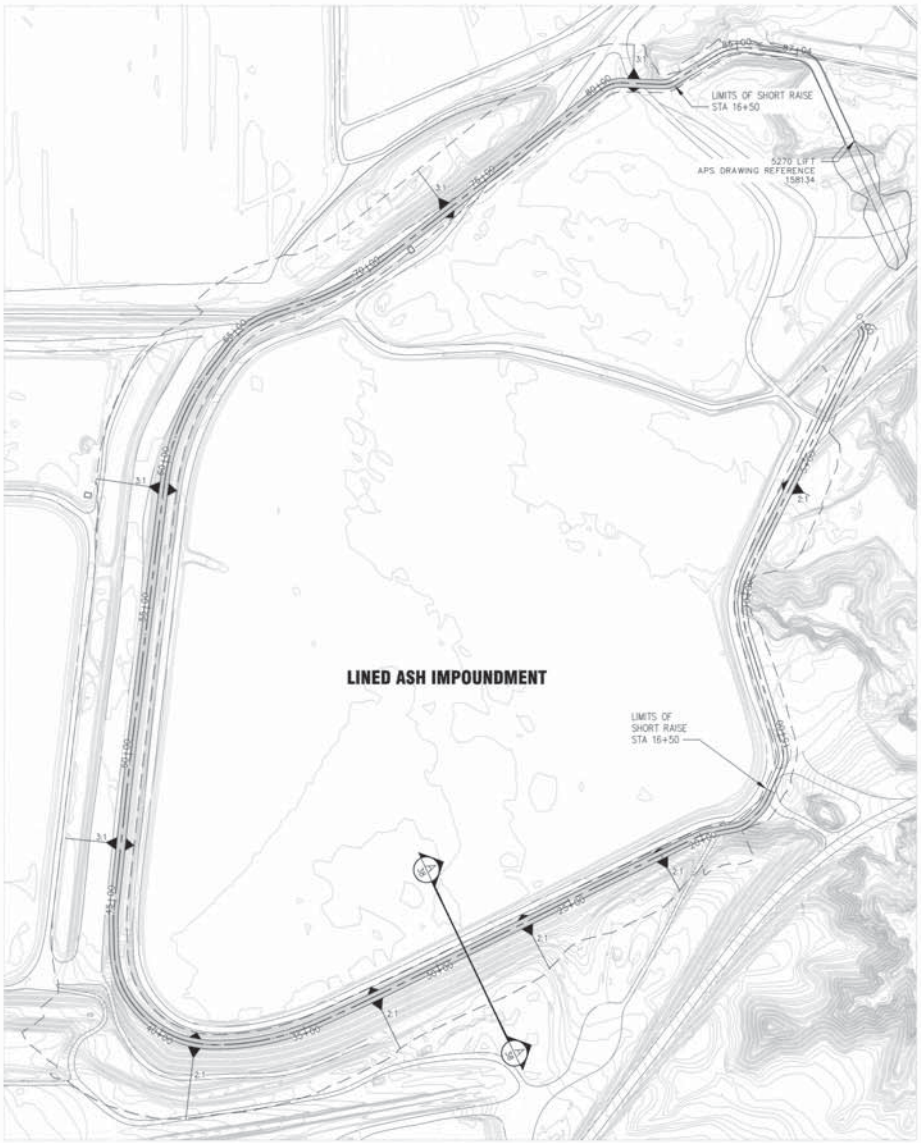
WORK SAFELY TODAY

DWN DR | CHD | EXD | RVWD

APPROVED TONY KHAN ENGINEERING SUPERVISOR

W A FAC90332

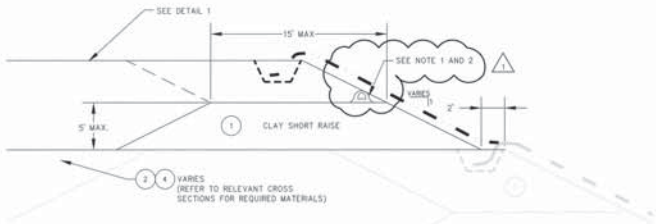
UNIT	DISC	TYPE	SYS	NUMBER	SHEET
FC	C	39	ADS	161907	37



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

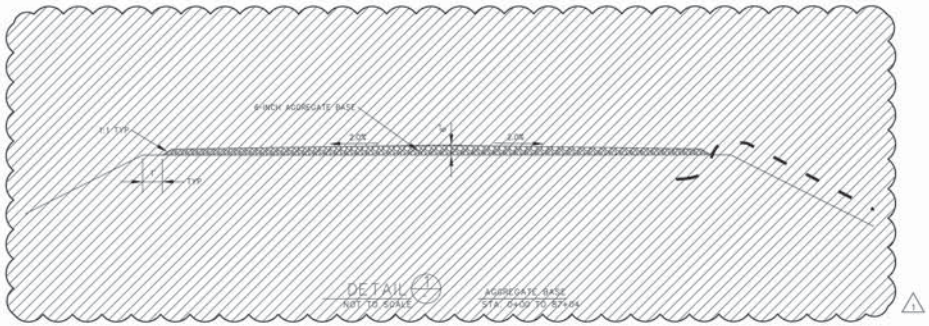
GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 inch = 200 ft.

NORTH



SECTION A/38 A/38 TYPICAL SHORT RAISE
HORZ: 1"=5' STA. 16+50 TO 67+37

GRAPHIC SCALE
5 0 5 10
(IN FEET)
1 inch = 5ft.



DETAIL AGGREGATE BASE
NOT TO SCALE STA. 6+00 TO 57+69

URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ALEXANDER W. GONG NEW MEXICO 19840 REGISTERED PROFESSIONAL ENGINEER 4-15-14

1 DESIGN ENGINEER OF RECORD ONLY SEE SHEET 1 FOR CERTIFICATION OF CONSTRUCTION ENGINEER OF RECORD

DATUM CONTROL
HV-53
(ACTUAL LOCATION OFF DRAWING
SEE BELOW FOR INFORMATION)

2 REFERENCE:
FLOWN BY AERIAL MAPPING CO, INC.
IN MAY, 2010
3141 WEST CLARENDON AVENUE
PHOENIX, AZ 85017
DATUM INFORMATION
CONTROL POINTS:

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
N.G.V.D. 1929

NOTES

1. SANDBAG BALLAST INCREMENT AS REQUIRED BY SPECIFICATIONS, 10 FOOT MAXIMUM.
2. CLAY BERM TO BE PLACED ALONG ENTIRE LENGTH OF LINER EXTENSION.

NEW DAM EMBANKMENT MATERIALS

1. COMPACTED CLAY/SOIL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.
2. COMPACTED BOTTOM ASH
3. SUB GRADE PREPARATION: GEOGRID REINFORCEMENT-BOTTOM ASH OR CLAY AS SPECIFIED.
4. COMPACTED BOTTOM ASH AND FLY ASH (TOP 8" IS COMPACTED BOTTOM ASH) 1

NO.	DATE	REVISION	DWN	CHD	EXD	RVWD	APVD	W.A.
1	04/15/14	5280 LIFT AS-BUILTS	AMF	JEM	JBH	AWG	BRC	FAC90332

FOUR CORNERS COMMON
ASH HANDLING STATION SYSTEM
5280 LIFT FOR THE LINED ASH IMPOUNDMENT POND
CLAY SHORT RAISE SECTIONS AND DETAILS

aps

SCALE AS NOTED DATE 10-10-11

DWN	APPROVED	W.A.
DR	TONY KAHN	FAC90332
CHD	ENGINEERING SUPERVISOR	

EXD	UNIT	DISC	TYPE	SYS	NUMBER	SHEET
RVWD	FC	C	16	ADS	161907	38

WORK SAFELY TODAY

Appendix B.
Safety Factor Calculation

URS | Quality - *It's Good Business*

QMS Form 3-4 (MM)

Date: September 2014

IE QMS

Check and Review Record

Project Name	Four Corners CCR Structural Integrity Assessments	**Client Name**	APS
Project Location	Four Corners Power Plant	**PM Name**	Frances Ackerman, R.G., P.E.
Project Number / Office Code	60445844	**PIC Name**	Alexander Gourlay, P.E.

Type

☐ Detail Check	☐ Coordination Review	☐ Constructability Review	☐ Bidability Review
☒ Independent Technical Review (ITR)	☐ Calculation Check *(can also use QMS Form 3-3)*	☐ Other:	*For Subconsultant, Client, or Third-Party Information Review, use Form 3-11.*

Identifying Information

(This section is to be completed by the Project Manager or the PM's Designee.)

Individual Assigned:	Jed Stoken, P.E.	Comments Required by:	
Work Product Originator:	Lee Wright, P.E.	Title of Work Product:	Lined Ash Impoundment Safety Factor Assessment

Review Scope

☒ Technical edit for elements such as grammar, punctuation and formatting.	☐ Completion of review of client and third-party information.	☒ Basis and validity of conclusion / recommendation.
☒ Detail Check of calculations and graphics.	☒ Soundness of approach/design.	☒ Organization, clarity and completeness.
☐ Completion of Detail Check	☒ Conformance with standards	☐ Application of Statements of Limitations.
☐ Other:		

Project Manager (or Designee) Signature — Date: 8/12/16

Comments

Select:

☐ Checker / Reviewer has no comments.

or

☒ Comments have been provided on:

- ☒ Marked directly on work product (electronically or on hard copy).
- ☐ Comment and Disposition Record (QMS Form 3-5).
- ☐ Other:

Checker / Reviewer Signature — Date: 7/14/16

Verification

(Note: Reviews and Checks are often iterative, requiring multiple rounds to verify accuracy and completeness of the work product. This section is to be completed by the Checker/Reviewer <u>after</u> verification of comment incorporation to include subsequent or new comments.)

Select:

☒ Checker / Reviewer has verified that comments have been adequately addressed. There are no outstanding issues.

or

☐ Checker / Reviewer has verified that comments have been adequately addressed. Any unresolved issues have been submitted to the Project Manager or Designee for final resolution.

<u>and</u>

☐ Checker / Reviewer confirms that the work product Check / Review is complete.

Checker / Reviewer Signature — Date: 7/14/16

URS Quality - It's Good Business	QMS Form 3-4 (MM)
	Date: September 2014
IE QMS	Check and Review Record

Approval

(This section is to be completed by the Project Manager or PM's designee.)

☐ Project Manager or Designee confirms that the Check / Review process has been followed.

Project Manager (or Designee) Signature — Date: 8/12/16

DISTRIBUTION	Project Central File – Quality File Folder Other – Specify:

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 1 of 20

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Figures

Tables

DESIGN CALCULATION				
Calculation Title:	**CCR Unit:**	**Project No:**	**Date:**	**Page No:**
Factor of Safety Assessment	Lined Ash Impoundment Safety Factor Assessment	60445844	7/13/16	Page 2 of 20

1 INTRODUCTION

The purpose of this calculation is to perform limit equilibrium slope stability analyses to assess the stability of the existing Coal Combustion Residual (CCR) surface impoundment embankments at Arizona Public Service (APS)'s Four Corner Power Plant in Fruitland, New Mexico. Specifically, the CCR surface impoundment embankments that will be evaluated are associated with the Lined Ash Impoundment (LAI).

2 ANALYSIS CRITERIA

The analyses were performed to meet the regulations set forth in the United States Environmental Protection Agency's (EPA) 40 CFR Part 257.73(e) Structural Integrity Criteria for existing CCR surface impoundments (the Rule) (EPA 2015). The Rule requires safety factor assessments be performed for units containing coal combustion residuals and the resulting safety factors for various embankment loading and tailwater conditions must meet the values outlined in the Rule. For the LAI, the following safety factors must be met:

- Long-term, maximum storage pool FS = 1.50
- Maximum surcharge pool FS = 1.40
- Seismic loading FS = 1.00
- Liquefaction loading FS = 1.20 (only for sites with liquefiable soils)

3 ANALYSIS INPUTS

The following inputs were used in the analysis:

- The geometry for the cross-sections was based on the as-built drawing set of the LAI 5280 lift (current embankment configuration; APS Drawing Number 161907), for Sections A (West Embankment), M (South Embankment), and X (North Toe Buttress) presented in the 5280 Lift Design Report (URS, 2012).
- The subsurface stratigraphy was replicated from stability model cross-sections developed as part of the design calculations in the 5280 Lift Design Report (URS, 2012).

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 3 of 20

- The safety factor calculations were performed using the software program SLOPE/W, commercially available through GEO-SLOPE International, Ltd. (GEO-SLOPE International, 2012).

- Material properties used in the safety factor assessment were based on previously reported material properties developed for the 5280 Lift Design Report (URS, 2012).

- Pore pressure distribution within the embankment was developed from an interpretation of water level readings using piezometers installed on and near the LAI embankment. Water level measurements are presented in the 2015 Annual CCR Impoundment and Landfill Inspection Report (APS and AECOM, 2016).

- The maximum operational water level at the southwest corner of the LAI is 5,275.2 feet, as presented in the 5280 Lift Design Report (URS, 2012).

- The maximum surcharge water level accounts for containment of the PMF on top of the maximum operational water level in the LAI. The maximum surcharge water level is 5,277.2 feet as presented in the 5280 Lift Design Report (URS, 2012).

- The seismic loading was developed from the deaggregated seismic hazard at the site based on the 2008 United States Geological Survey (USGS) National Earthquake Hazards Reduction Program (NEHRP) Provisions (USGS, 2008).

4 ASSUMPTIONS

Assumptions used in this calculation package include:

- The embankment geometry and subsurface conditions have not substantially changed from the 5280 lift design.

- Phreatic levels measured in and around the embankment are typical of the conditions present in the analysis cases considered.

- The residual strength ratio (S_r/σ'_{vo}) is applicable to the saturated sensitive fines beneath the North Toe Buttress in the Liquefaction Loading analysis.

5 SAFETY FACTOR CALCULATIONS

The safety factor assessments were performed for three cross-sections along the LAI embankment. The safety factor calculations were performed to document minimum factors of safety for loading conditions identified by 40 CFR Section 257.73(e) using the software program SLOPE/W (GEO-SLOPE International, Ltd. 2012). The analyses were performed using Spencer's Method, a limit equilibrium method of slices that satisfies both force and moment equilibrium in addition to incorporating the effects of interslice forces.

5.1 Critical Stability Cross-Sections

Factors of safety were calculated for critical cross-sections of the LAI West and South Embankments. Each of these cross-sections was developed and analyzed as part of the 5280 Lift Design. No revisions have been made to the previously defined stratigraphic conditions. The critical cross-section is the cross-section that is anticipated to be most susceptible to structural failure for a given loading condition. The critical cross-section thus represents a "most-severe" case. Section locations were selected based on variation in the embankment height and stratigraphic conditions to represent the most severe case.

Section A – West Embankment: The maximum section of the LAI West Embankment was modeled from Section A of the 5280 Lift Construction Drawings (URS, 2012). The West Embankment has an approximately 3 horizontal to 1 vertical (3H:1V) downstream slope and a crest width of 30 feet. The lower third of the 5280 Lift consists of a combination of compacted bottom and fly ash, the upper two-thirds consists of compacted bottom ash, and there is a 15-foot thick compacted clay layer on the upstream side of the embankment. The embankment is founded partially on the pre-existing Ash Pond 3 and 4 Divider Dike and partially on old hydraulically placed fly ash associated with Ash Pond 3.

Section M – South Embankment: The South Embankment of the LAI was modeled from the Section M of the Construction Drawings (URS, 2012). The embankment is founded on native weathered shale. The pre-existing Ash Pond 4 Embankment was used as a starter dam for building the South Embankment using a downstream construction method. The pre-existing Ash Pond 4 Embankment consists of compacted bottom ash with a 40-foot wide layer of compacted clay on the upstream face. The subsequent raises of the LAI impoundment consist of compacted bottom ash with a 15-foot wide blanket of compacted clay on the upstream

slope. The clay blanket on the upstream face of the LAI embankment is keyed into the clay of the existing (original) embankment.

The South Embankment has an approximately 2H:1V downstream slope and a crest width of 30 feet. A buried toe drain runs parallel with the embankment near the downstream toe. The drain consists of two, 10-inch inside diameter, perforated pipes surrounded by a two-stage sand and gravel filter within a drainage channel. The channel is 12-foot deep with a 13-foot wide bottom and 1.5H:1V to 1H:1V side slopes.

Section X – North Toe Buttress: The North Toe Buttress area of the LAI West Embankment was modeled from Section X-X of the Construction Drawings (URS, 2012). The North Toe Buttress was constructed against the base of the West Embankment to a height of 20 feet above the elevation at the toe of the West Embankment, and is inclined downward toward the west at approximately 20H:1V. The North Toe Buttress extends to the west approximately 400 feet. The buttress consists of a 1.5-foot thick bottom ash drain layer overlain by a combination of compacted bottom and fly ash to the approximate elevation of 5,227 feet at its highest point.

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 6 of 20

5.2 Material Properties

Material properties used in the safety factor assessment were based on previously reported material properties developed for the LAI 5280 Lift Design Report (URS, 2012), except as discussed in the following paragraphs. Table 1 presents these values.

Table 1 – Material Properties Used for the Safety Factor Assessment

Material	Material Properties						
	Moist Unit Weight, γ_m (pcf)	Saturated Unit Weight, γ_{sat} (pcf)	Drained Strength		Undrained Strength		Residual Strength
			Cohesion, c' (psf)	Friction Angle, ϕ' (degrees)	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Shear Strength Ratio (S_r/σ_v')
Compacted Bottom and Fly Ash	90	90	0	35	-	-	-
Existing Fly Ash (Top)	90	90	0	30	-	-	-
Existing Fly Ash (Bottom)	90	90	0	28	-	-	-
New Fly Ash (Impounded)	90	90	-	-	304	0	-
Compacted Bottom Ash	75.1	75.1	0	42	-	-	-
Compacted Clay	125	130	300	20	-	-	-
Weathered Shale (Native Ground)	120	125	-	-	500	30	-
Sensitive Fines (Drained)	80	-	0	18.5	-	-	-
Sensitive Fines (Liquefaction)	80	-	-	-	-	-	0.05
Buttress	75	-	0	20	-	-	-
Drain Sand	110	-	0	30	-	-	-

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 7 of 20

Based on the results of the liquefaction assessment performed as part of the 5280 Lift design, the saturated fly ash (sensitive fines) layer was found to be potentially liquefiable (URS, 2012). For this calculation, both post-cyclic shear strength ratios for the sensitive fines encountered beneath the North Toe Buttress were estimated using empirical correlations to CPT data. The post-cyclic, residual, shear strength was estimated using the Idriss and Boulanger (2008) method based on either SPT or CPT data. The current stability analysis includes developing residual shear strength ratios for the sensitive fines from CPT data to estimate the liquefaction loading safety factor for Section X.

The residual undrained shear strength ratio presented in Table 1 was calculated using the Idriss and Boulanger (2008) method based on the CPT results. The residual strength was estimated as follows:

CPT Locations

Eight CPT soundings were used to estimate the residual strength of the sensitive fines beneath the NTB. A general subsurface profile of the soundings consisted of fly ash over a shale bedrock. The eight CPT soundings, as presented in Figure 1, were CPT-8, CPT-9, CPT-10, CPT-11, CPT-12, CPT-13, CPT-16, and CPT-17.

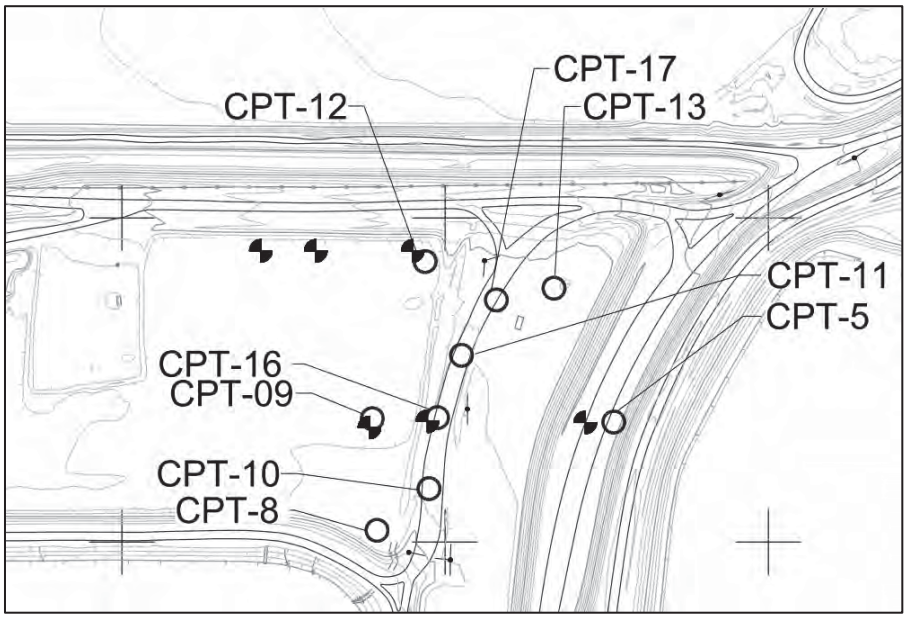


Figure 1 – URS 2011 Geotechnical Exploration CPT Sounding Locations

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 8 of 20

The groundwater level below the NTB was assumed to be at the top of the liquefaction-susceptible sensitive fines layer. This is a conservative assumption that will produce lower bound residual strength estimates.

Idriss and Boulanger (2008) Method

In accordance with the Idriss and Boulanger (2008) method, the residual strength of the sensitive fines without void redistribution effects (expected for the site) is defined by the following equation, which is presented graphically in Figure 2:

$$\frac{S_r}{\sigma'_{vo}} = exp\left(\frac{q_{c1Ncs-Sr}}{24.5} - \left(\frac{q_{c1Ncs-Sr}}{61.7}\right)^2 + \left(\frac{q_{c1Ncs-Sr}}{106}\right)^3 - 4.42\right)$$

$$\times \left(1 + exp\left(\frac{q_{c1Ncs-Sr}}{11.1} - 9.82\right)\right) \leq \tan\phi'$$

where:

S_r = Residual strength of the liquefied material
σ'_{vo} = Initial effective overburden stress
$q_{C1Ncs-Sr}$ = Equivalent clean sand CPT normalized corrected tip resistance
ϕ' = Effective friction angle

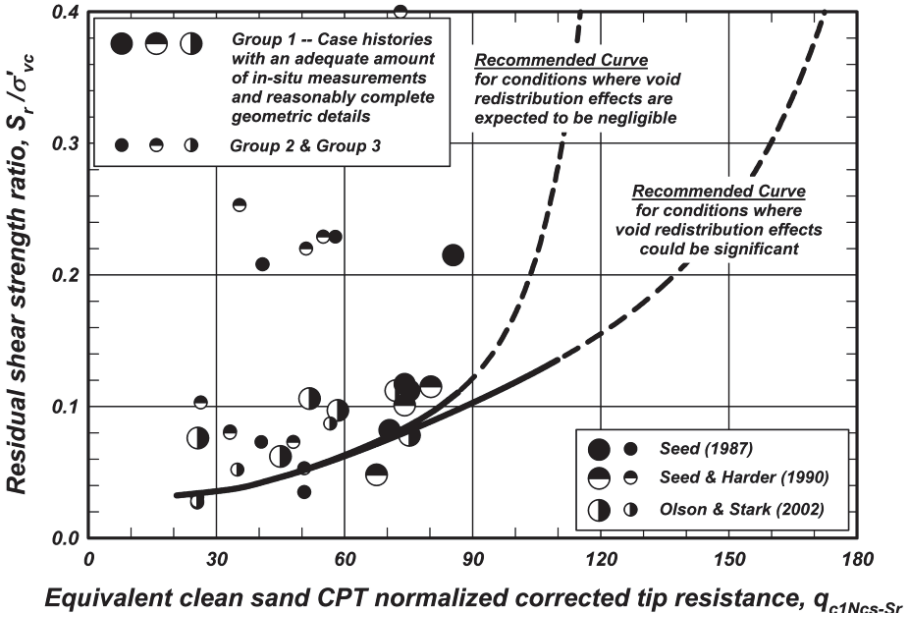


Figure 2 – Correlation between the normalized residual shear strength ratio for liquefied soils and overburden-corrected CPT penetration resistance from Figure 90 of Idriss and Boulanger (2008)

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 9 of 20

The equivalent clean sand CPT normalized corrected tip resistance, $q_{C1Ncs-Sr}$, is defined as the normalized corrected tip resistance corrected for fines content and may be estimated using the following equation from Idriss and Boulanger (2008):

$$q_{c1Ncs-Sr} = q_{c1N} + \Delta q_{c1N-Sr}$$

where:

$q_{C1Ncs-Sr}$ = Equivalent clean sand CPT normalized corrected tip resistance
q_{C1N} = CPT normalized corrected tip resistance
Δq_{C1N-Sr} = Equivalent clean sand adjustment values

The equivalent clean sand adjustment value can be determined using the table shown in Figure 3, which correlates the adjustment value to the fines content.

Fines content (% passing No. 200 sieve)	Δq_{c1N-Sr}
10	10
25	25
50	45
75	55

Figure 3 – Approximate values of Δq_{c1N-Sr} for CPT correlation with residual strengths from Table 5 of Idriss and Boulanger (2008)

An effective friction angle, ϕ', equal to 18.5 degrees was used in the analysis based on the estimated value developed for the fly ash material as part of the 5280 Lift Design (URS, 2012). This limits the residual strength ratio, S_r/σ'_{vo}, to a maximum value of the following:

$$\left(\frac{S_r}{\sigma'_{vo}}\right)_{max} = \tan\phi' = \tan(18.5°) = 0.335$$

Where: $(S_r/\sigma'_{vo})_{max}$ = Maximum residual strength ratio = 0.335
ϕ' = Effective friction angle = 18.5°

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 10 of 20

Residual Strength Analysis Results

The result of the CPT-based residual strength analysis is presented in Figure 4 below. Figure 4 presents the residual strength ratio calculated using the measured CPT tip resistance in the liquefaction-susceptible sensitive fines material based on the elevation where the measurement was recorded. The geometric mean value of the calculated residual strength ratio is S_r/σ'_{vo} = 0.058, which is rounded to 0.05 for the analysis as shown in the Figure below. This value is presented in Table 1 to characterize the strength of the sensitive fines beneath the NTB in stability analyses after liquefaction of the material.

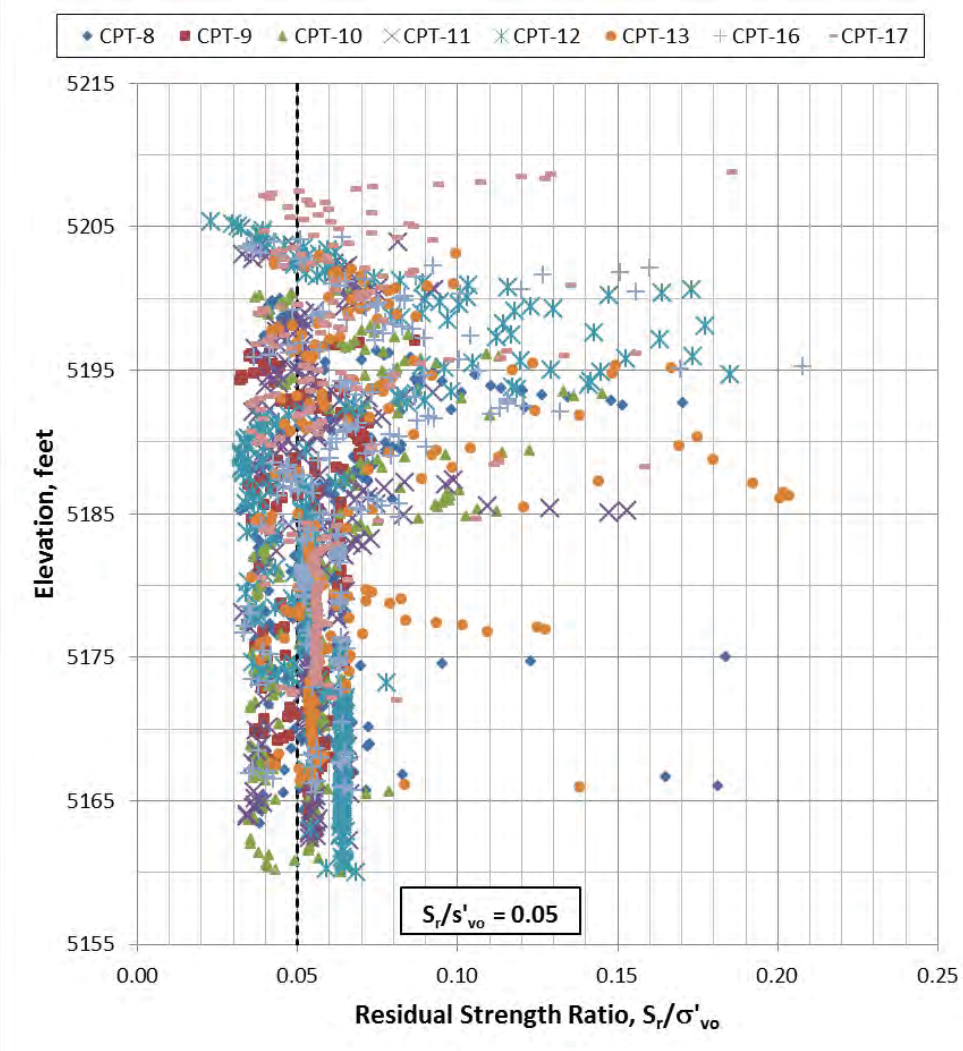


Figure 4 – Residual Strength Ratio Result for the Liquefaction-Susceptible Sensitive Fines Beneath the NTB

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 11 of 20

5.3 Embankment Pore Pressure Distribution

There are a total of 53 piezometers installed in and below the LAI and NTB. Water levels in these piezometers are monitored on a monthly basis and the maximum and minimum water levels in each are reported annually (APS and AECOM, 2016). These data were considered to be the most reliable indicators of pore pressure distribution in and below the embankment. The pore pressure distribution in each section was evaluated using water level measurements obtained from the piezometers.

Piezometers P-7, P-8, P-10, and P-11 were used to evaluate the porewater pressure conditions in the embankment in the vicinity of Sections A and M. No positive porewater pressures have been recorded in P-7, P-8 or P-10 between 2008 and 2016, although positive porewater pressures have been recorded in the existing fly ash in P-11 over the same time period. Although this condition has only been recorded in one of the three nested piezometers at the P-11 location, the recorded positive porewater pressure was conservatively included in the stability models for Sections A and M.

Piezometers P-100 through P-111 where used to evaluate the porewater pressure conditions in in the vicinity of the North Toe Buttress (Section X). Positive porewater pressures were recorded within the saturated fly ash below the North Toe Buttress and the recorded positive porewater pressures were included in the stability models for Section X.

The regional groundwater level in the vicinity of the LAI embankment was based on an AECOM 2016 Hydrogeologic assessment of the entire Four Corners Power Plant. Regional water levels below the embankment ranged from approximate 5,145 feet beneath the South Embankment section to 5,160 feet beneath the West Embankment section.

5.4 Embankment Loading Conditions

Per 40 CFR Section 257.73(e), the following loading conditions were considered for each selected stability cross-section:

- Long-term, maximum storage pool,
- Maximum surcharge pool,
- Seismic loading, and

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 12 of 20

- Liquefaction loading.

The four loading conditions are described in the following subsections.

Long-Term, Maximum Storage Pool

The maximum storage pool loading is the maximum water level that can be maintained that will result in the full development of a steady-state seepage condition. This loading condition is evaluated to document whether the CCR surface impoundment can withstand a maximum expected pool elevation with full development of saturation in the embankment under long-term loading. The long-term, maximum storage pool water elevation used in the calculation was based on the maximum operating level developed as part of the LAI 5280 Lift design analysis (URS, 2012). Factors of safety were calculated using shear strengths expressed as effective stress, except the New Fly Ash was modeled using a total (undrained) shear strength based on the results of CPT testing and engineering judgement (URS, 2012).

For this analysis, the long-term maximum storage pool elevation at the southwest corner of the LAI was 5,275.2 feet (URS, 2012).

Maximum Surcharge Pool

The maximum surcharge pool loading is the temporary rise in pool elevation above the maximum storage pool elevation for which the CCR surface impoundment is normally subject under inflow design flood state. This loading condition is evaluated to document whether the CCR surface impoundment can withstand a short-term impact of a raised pool level on the stability of the downstream slope. The maximum surcharge pool considers a temporary pool elevation that is higher than the maximum storage pool which persists for a length of time sufficient for steady-state seepage or hydrostatic conditions to fully develop within the embankment. The maximum surcharge pool water level used in the calculation was based on the estimated water level associated with the PMF on top of the maximum operating level developed as part of the LAI 5280 Lift analysis (URS, 2012).

For this analysis, the maximum surcharge pool at the southwest corner of the LAI was 5,277.2 feet (URS, 2012).

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 13 of 20

Seismic Loading

Seismic loading was evaluated to document whether the CCR surface impoundment is capable of withstanding a design earthquake without damage to the foundation or embankment that would cause a discharge of its contents. The seismic loading is assessed under seismic loading conditions for a seismic loading event with a 2% probability of exceedance in 50 years, equivalent to a return period of approximately 2,500 years. A pseudostatic analysis was used to represent the seismic loading for Sections A and M. A post-cyclic analysis was used to represent the seismic loading condition for Section X. The post-cyclic analysis was performed due to the presence of potentially liquefiable sensitive fines in the foundation of the North Toe Buttress.

The peak horizontal bedrock acceleration for a Site Class "B" rock, based on the United States Geological Survey (USGS) National Seismic Hazard Map, with a 2% probability of exceedance in 50 years, is 0.05895g, as presented in Attachment A (USGS, 2008). A Site Classification of D "Stiff Soil" was assigned to the West Embankment and North Toe Buttress sections (Section A and Section X) based on the average properties in the top 100 feet, which consists of approximately 40 feet of fly ash above native weathered shale. A Site Classification of C "Very Dense Soil and Soft Rock" was assigned to the South Embankment section (Section M), which is founded on natural ground primarily consisting of weathered shale. Site Class definitions are summarized in Table 20.3-1 from ASCE 7-10 (ASCE 2013) and shown in Figure 5.

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard rock	>5,000 ft/s	NA	NA
B. Rock	2,500 to 5,000 ft/s	NA	NA
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 following characteristics: —Plasticity index $PI > 20$, —Moisture content $w \geq 40\%$, —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: 1 ft/s = 0.3048 m/s; 1 lb/ft^2 = 0.0479 kN/m^2.

Figure 5 – Table 20.3-1 Site Classification from ASCE 7-10 (2013)

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 14 of 20

The peak ground acceleration at the ground surface for site class C and Dat the crest is calculated using the following procedure:

$$PGA_{Ground\ Surface,M} = F_{PGA}(PGA_B)$$

$$PGA_{ground\ Suface,C} = 1.2(0.05895g) \qquad PGA_{Ground\ Suface,D} = 1.6(0.05895g)$$

$$PGA_{GroundSurface,C} = 0.071g \qquad PGA_{Ground\ Surface,D} = 0.094g$$

Where: $PGA_{ground\ Surface,M}$ = Maximum considered earthquake geometric mean peak ground acceleration adjusted for Site Class effects
PGA = Mapped maximum considered earthquake geometric mean peak ground acceleration
F_{PGA} = Site coefficient from International Code Council's 2015 International Building Code (IBC, 2015) as shown in Figure 6.

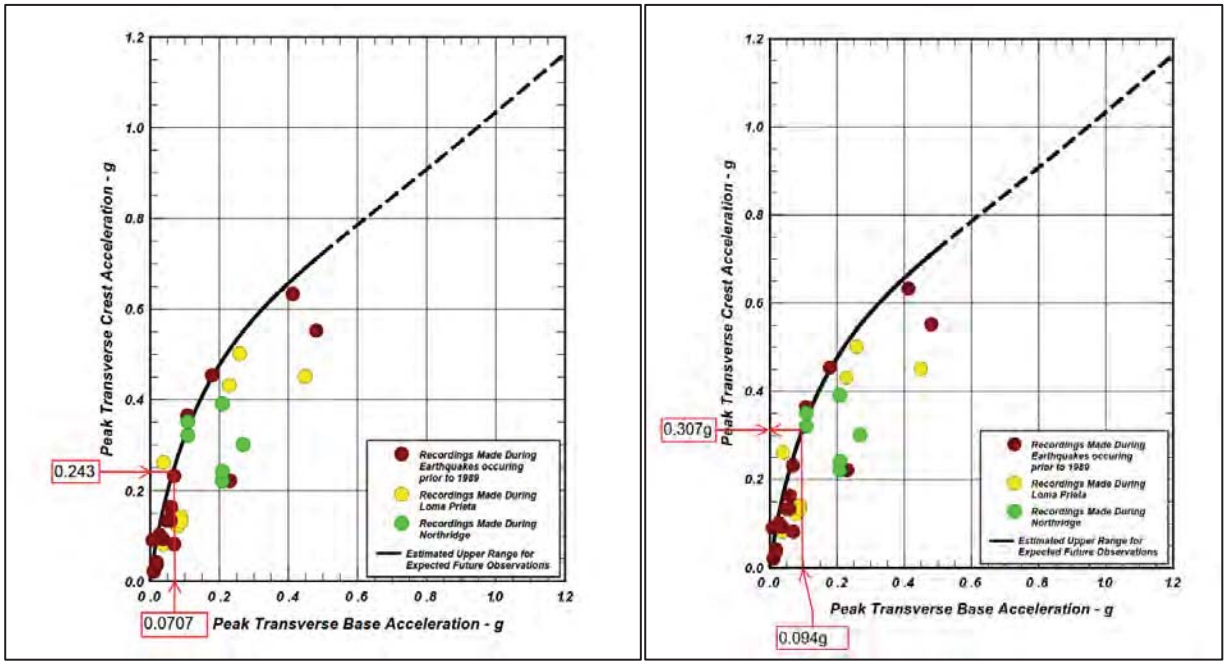
SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIOD				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_s.
b. Values shall be determined in accordance with Section 11.4.7 of ASCE 7.

Figure 6 – Table 1613.3.3(1) from the IBC (2015)

The PGA at the ground surface for Site Classes C and D ($PGA_{GroundSurface}$) were then used to estimate the peak transverse acceleration at the crest of the embankment, $PGA_{C,crest}$ = 0.243g and $PGA_{D,crest}$ = 0.307g as shown on Figure 7 and based on variations in recorded peak crest accelerations versus those recorded at the base of earth and rock fill dams recorded values for Loma Prieta and other earthquakes by Holzer (USGS, 1998).

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 15 of 20



Site Class C Site Class D

Figure 7 – Variations of Peak Transverse Crest Acceleration v. Peak Transverse Base Acceleration Based on Holzer (1998)

Makdisi and Seed (1977) note that the "maximum acceleration ratio" varies with the depth of the sliding mass relative to the embankment height. Figure 8 presents the relationship between maximum acceleration ratio (k_{max}/u_{max}) and depth of sliding mass (y/h). For deep-seated failure surfaces that involve the entire vertical profile of the embankment slope and extend from the crest to the toe, or below the toe, of the embankment into the foundation soils, the acceleration at the crest can be as low as approximately 34 percent of the maximum value:

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Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 16 of 20

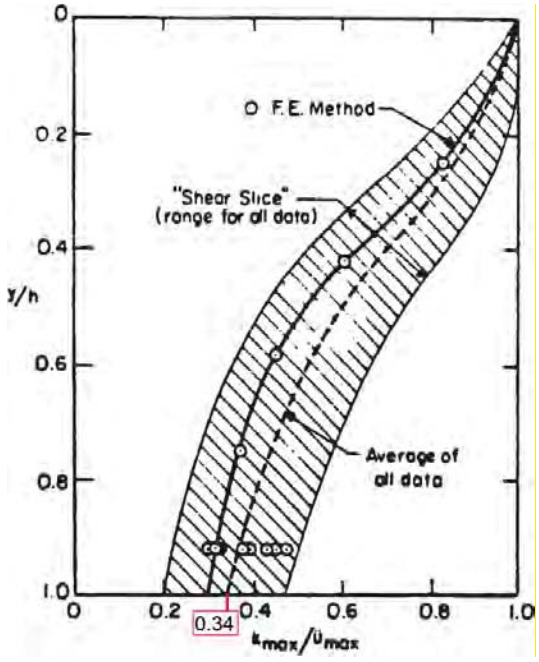

Figure 8 – Variation of "Maximum Acceleration Ratio" with depth of sliding mass after Makdisi and Seed (1977)

Therefore:

$$\frac{k_{max}}{u_{max}} = 0.34$$

Where: k_{max} = the maximum average acceleration for the potential sliding mass
u_{max} = the maximum crest acceleration

$$k_{max} = 0.34(u_{max})$$

$$k_{max,C} = 0.34(0.243g) \qquad k_{max,D} = 0.34(0.307g)$$

$$k_{max,C} = 0.083g \qquad k_{max,D} = 0.104g$$

The pseudostatic analyses incorporated a horizontal seismic coefficient of 0.083g for Section M and a horizontal seismic coefficient of 0.104 for Sections A and X.

The water level in the LAI for the seismic loading analysis was set to EL 5,275.2 feet to match the long-term, maximum storage pool. Drained shear strengths expressed as effective cohesion and friction angles, as summarized in Table 1, were used to define the strengths for free-

DESIGN CALCULATION				
Calculation Title: Factor of Safety Assessment	**CCR Unit:** Lined Ash Impoundment Safety Factor Assessment	**Project No:** 60445844	**Date:** 7/13/16	**Page No:** Page 17 of 20

draining soils (bottom ash) and the sensitive fines beneath the Section X toe buttress. The sensitive fines are potentially susceptible to liquefaction during the seismic event; the stability of the embankment under the reduced strength conditions caused by liquefaction of the sensitive fines is evaluated in the liquefaction loading case. Undrained shear strengths expressed as total cohesion and friction angles, as summarized in Table 1, were used for low-permeability soils (embankment fill, weathered shale) for the seismic loading condition based on Corps of Engineers recommendations (USACE, 2003).

Liquefaction Loading

A liquefaction triggering analysis was performed for the North Toe Buttress (Section X), as part of the 5280 Lift Design (URS, 2012). The CPT-based empirical liquefaction analysis indicated that lenses of the saturated fly ash with the potential to liquefy during the design earthquake are present in CPT soundings 8 through 13, 15, 16, and 17. The liquefiable materials were generally only thin lenses of materials identified by the Soil Behavior Type as sensitive fines ("clay-like" behavior classification).

The liquefaction triggering analysis results were based on the use of a relatively conservative K_α correction factor of 0.2 versus the recommended value of 0.9. The empirical analyses indicate significantly fewer and thinner lenses of liquefiable materials when the recommended K_α correction factor of 0.9 is used (URS, 2012). However, these empirical methods are based on natural geo-materials and not man-made materials like fly ash. A fact that is further supported by the discrepancy of the soil behavior classification of "clay-like" assigned by the CPT soundings versus the index property testing and general knowledge of the fly ash material that indicates that fly ash is a non-cohesive fine grained material. Therefore, a laboratory liquefaction triggering evaluation was performed using cyclic Direct Simple Shear (DSS) strength testing (URS, 2012).

The results of two cyclic DSS tests on pluviated samples indicated that under the maximum cyclic stress ratio (CSR) calculated in the empirical liquefaction analyses, the saturated fly ash in the North Toe Buttress area did not undergo liquefaction. However, two of the four specimens subjected to cyclic DSS tests exhibited contractive behavior, indicating they would be susceptible to liquefaction though they did not actually liquefy (URS, 2012).

Based on the results of the empirical analyses and the two cyclic DSS tests, the potential for liquefaction at the design earthquake magnitude is low but cannot unequivocally be stated that the saturated fly ash will not liquefy during the design earthquake for the project (URS, 2012). Consequently, the liquefaction loading condition was evaluated for Section X at the North Toe Buttress.

The water level in the LAI for the liquefaction loading analysis was set to EL 5,275.2 feet to match the long-term, maximum storage pool. The potentially liquefiable materials in the section were designated as the sensitive fines below the phreatic surface. Drained shear strengths expressed as effective cohesion and friction angles, as summarized in Table 1, were used to in the anlaysis, except for the potentially liquefiable sensitive fines which used a residual shear strength ratio of 0.05.

6 ANALYSIS RESULTS AND CONCLUSIONS

The safety factor assessment output figures are presented in Attachment B. Table 2 summarizes the results of the safety factor assessment.

Table 2 – Safety Factor Results

Loading Condition	Required Factor of Safety	Calculated Factor of Safety		
		Section A West Embankment	Section M South Embankment	Section X North Toe Buttress
Long-term, maximum storage pool	1.50	2.17	1.55	2.47
Maximum surcharge pool	1.40	2.08	1.55	2.41
Seismic	1.00	1.35	1.27	1.71
Liquefaction	1.20	--	--	1.90

7 REFERENCES

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DESIGN CALCULATION				
Calculation Title:	**CCR Unit:**	**Project No:**	**Date:**	**Page No:**
Factor of Safety Assessment	Lined Ash Impoundment Safety Factor Assessment	60445844	7/13/16	Page 20 of 20

8 ATTACHMENTS

ATTACHMENT A USGS Seismic Acceleration

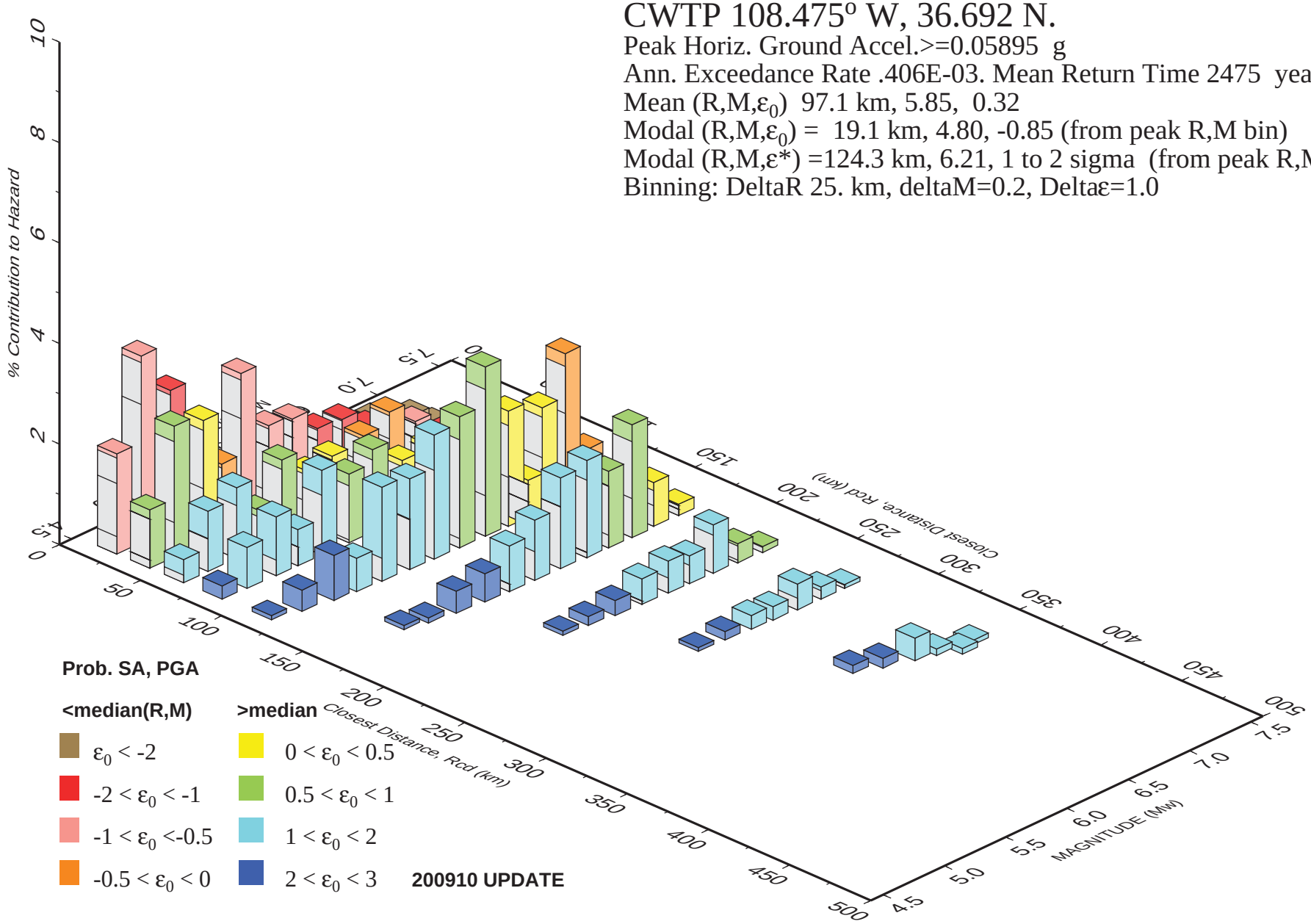
ATTACHMENT B SLOPE/W Output Figures

ATTACHMENT A

USGS Seismic Acceleration

PSH Deaggregation on NEHRP BC rock
CWTP 108.475º W, 36.692 N.

Peak Horiz. Ground Accel.>=0.05895 g
Ann. Exceedance Rate .406E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 97.1 km, 5.85, 0.32
Modal (R,M,ε_0) = 19.1 km, 4.80, -0.85 (from peak R,M bin)
Modal (R,M,ε*) =124.3 km, 6.21, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 25. km, deltaM=0.2, Deltaε=1.0



GMT 2016 Mar 3 19:41:05 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

ATTACHMENT B

SLOPE/W Output Figures

Slope Stability Analysis
Section A (West Embankment)
Lined Ash Impoundment

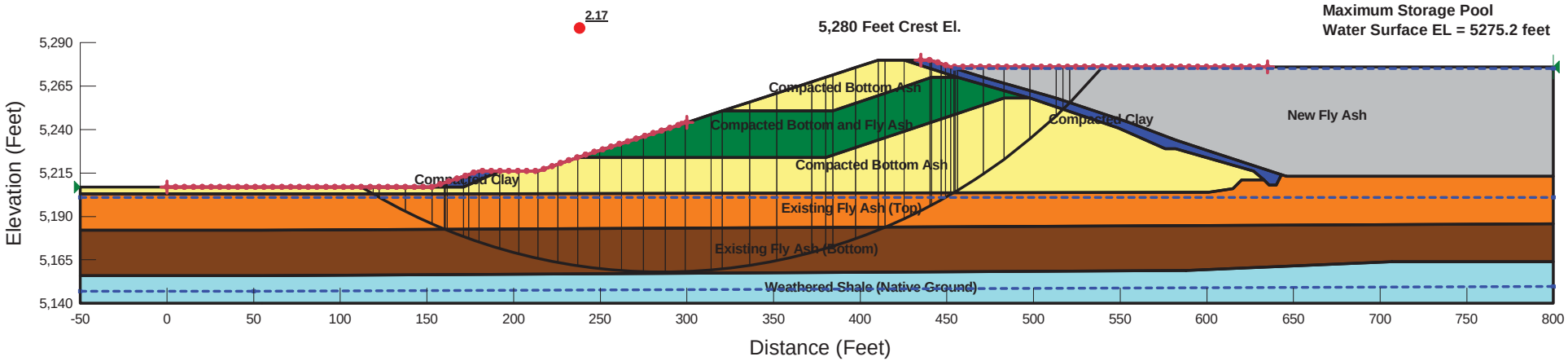
Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Figure 1) Long-Term, Maximum Storage Pool
File Name: Section A.gsz
Date: 7/13/2016
Method: Spencer

Factor of Safety: 2.17

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °



Slope Stability Analysis
Section A (West Embankment)
Lined Ash Impoundment

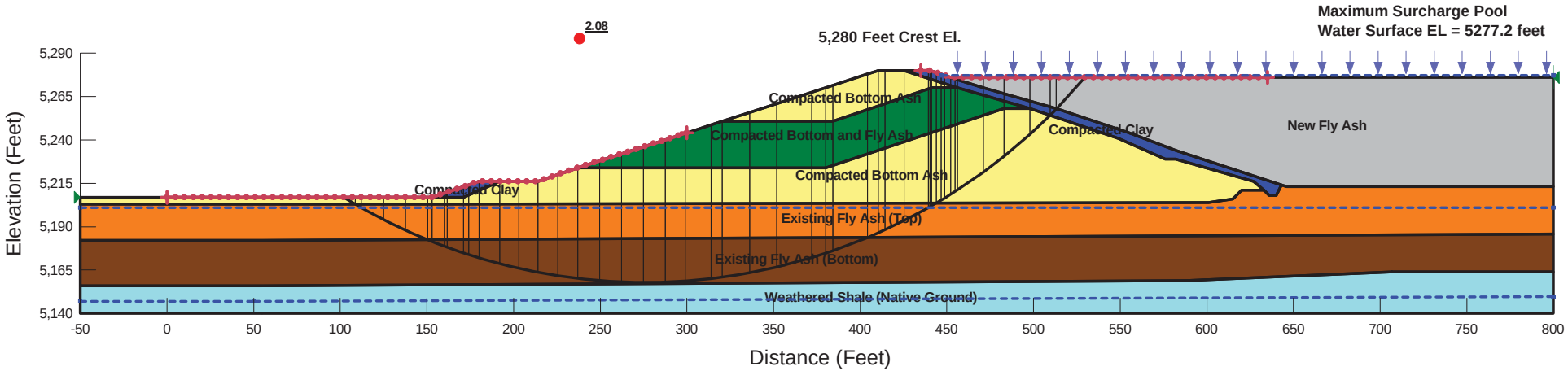
Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Figure 2) Maximum Surcharge Pool
File Name: Section A.gsz
Date: 7/13/2016
Method: Spencer

Factor of Safety: 2.08

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °



Slope Stability Analysis
Section A (West Embankment)
Lined Ash Impoundment

Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

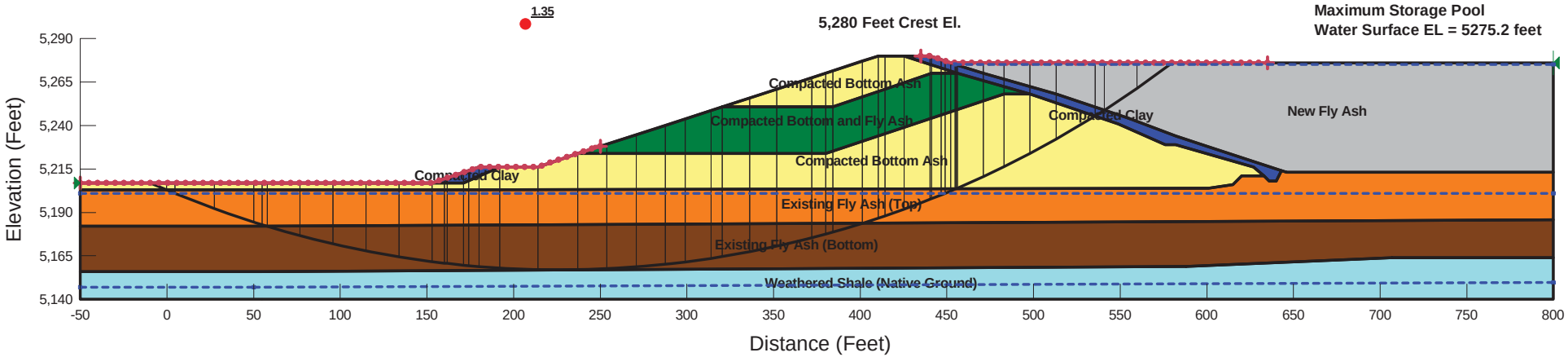
Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Figure 3) Seismic Loading
File Name: Section A.gsz
Date: 7/13/2016
Method: Spencer

Factor of Safety: 1.35

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °

Horz Seismic Coef.: 0.104



Slope Stability Analysis
Section M (South Embankment)
Lined Ash Impoundment

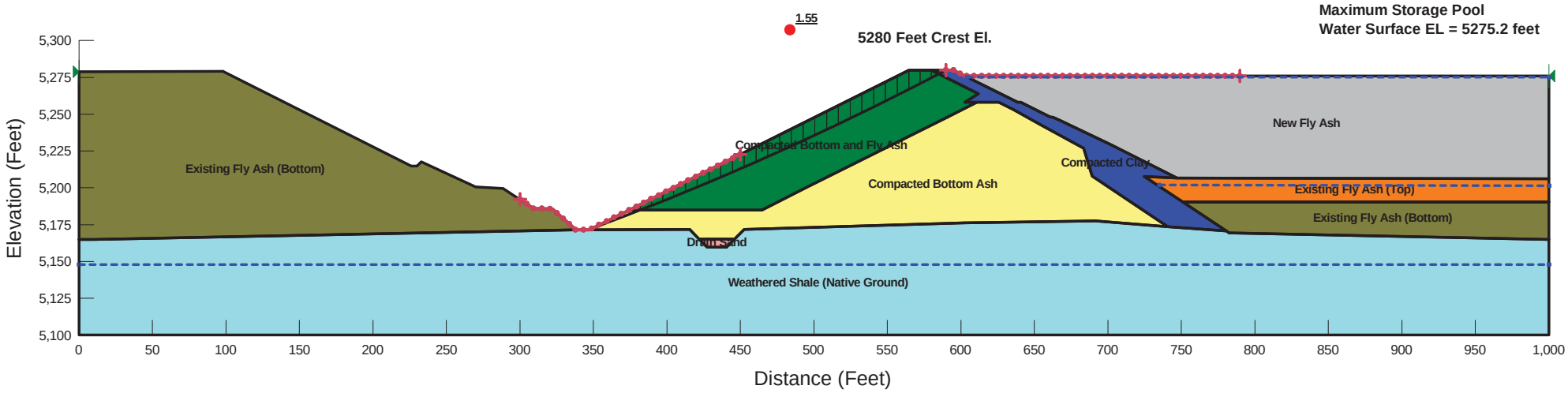
Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Figure 4) Long-Term, Maximum Storage Pool
File Name: Section M.gsz
Date: 7/13/2016
Method: Spencer

Factor of Safety: 1.55

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °
Drain Sand	110 pcf	0 psf	30 °



Slope Stability Analysis
Section M (South Embankment)
Lined Ash Impoundment

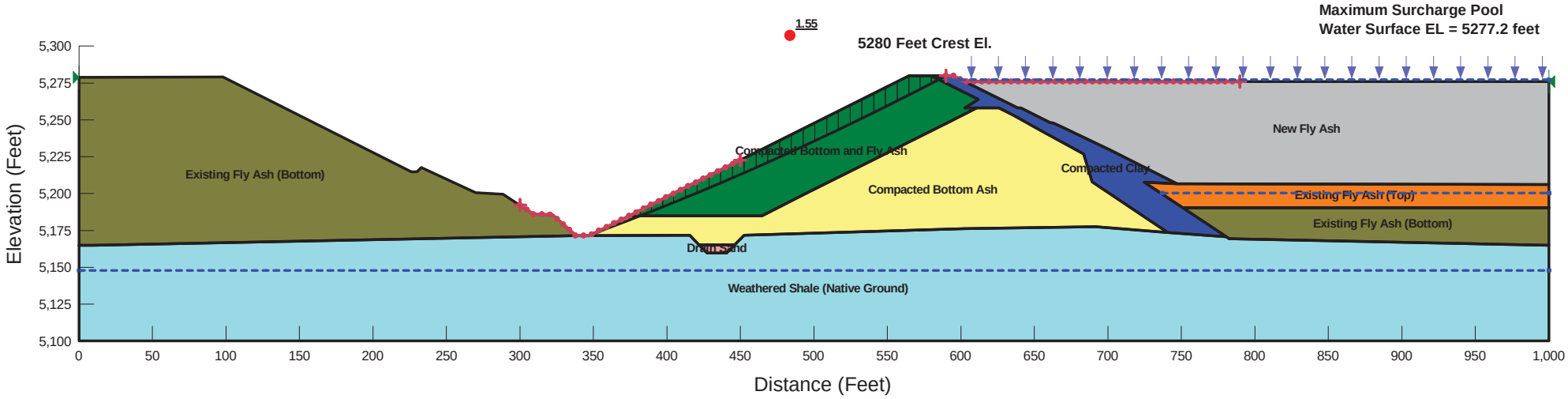
Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Figure 5) Maximum Surcharge Pool
File Name: Section M.gsz
Date: 7/13/2016
Method: Spencer

Factor of Safety: 1.55

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °
Drain Sand	110 pcf	0 psf	30 °



Slope Stability Analysis
Section M (South Embankment)
Lined Ash Impoundment

Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

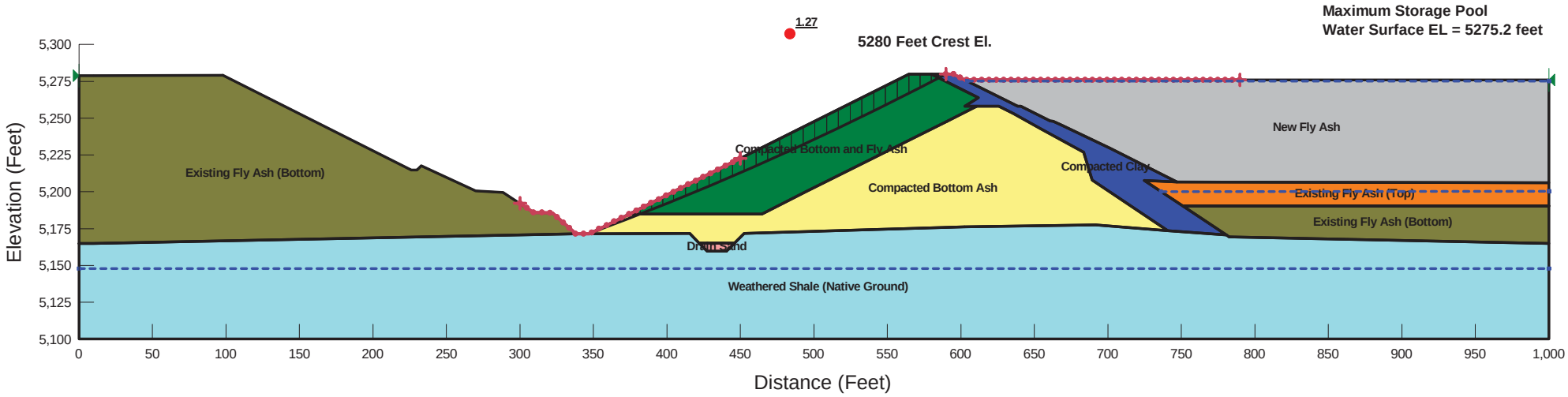
Note:
The results of the analysis shown here are based on available subsurface information, laboratory test results, and approximate soil properties. No warranties can be made regarding the continuity of subsurface conditions between the borings.

Figure 6) Seismic Loading
File Name: Section M.gsz
Date: 7/13/2016
Method: Spencer

Factor of Safety: 1.27

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °
Drain Sand	110 pcf	0 psf	30 °

Horz Seismic Coef.: 0.083



Slope Stability Analysis
Section X (North Toe Buttress)
Lined Ash Impoundment

Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
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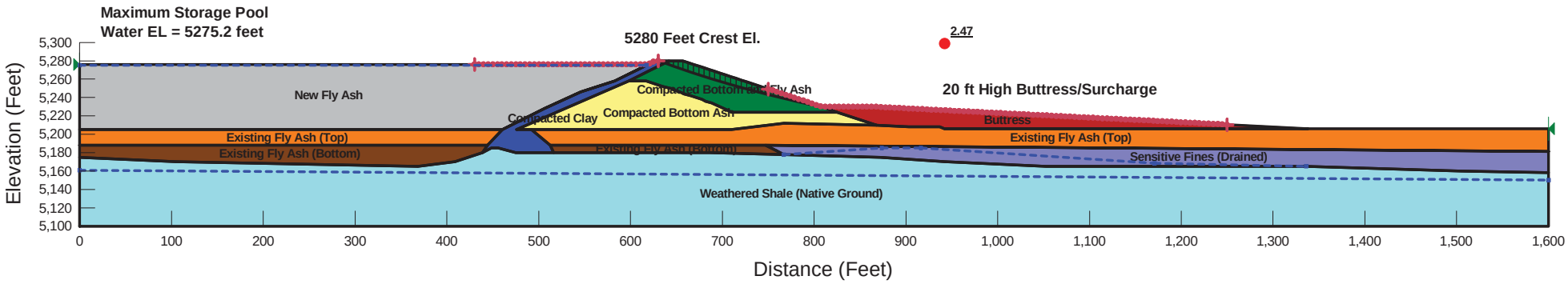
Figure 7) Long-Term, Maximum Storage Pool
File Name: Section X - Static.gsz
Date: 7/12/2016
Method: Spencer

Factor of Safety: 2.47

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °
Sensitive Fines (Drained)	80 pcf	0 psf	18.5 °
Buttress	75 pcf	0 psf	20 °



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Section X (North Toe Buttress)
Lined Ash Impoundment

Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

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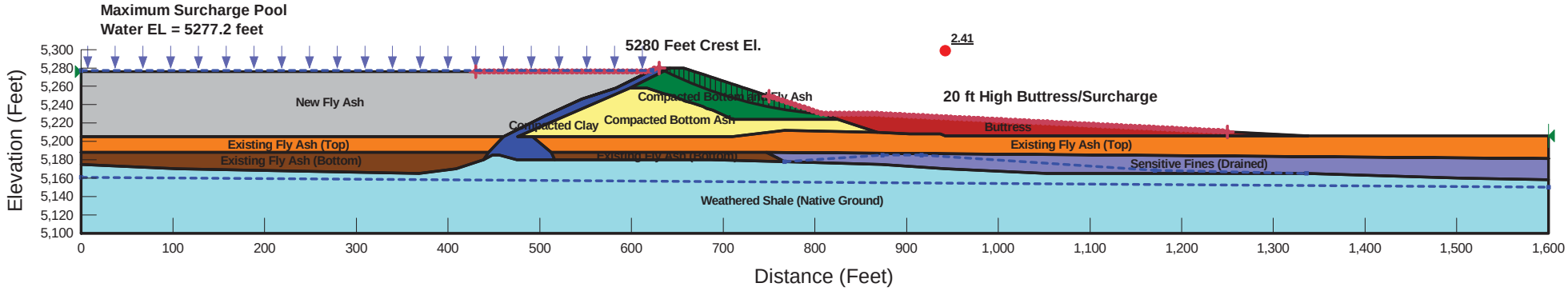
Figure 8) Maximum Surcharge Pool
File Name: Section X - Static.gsz
Date: 7/12/2016
Method: Spencer

Factor of Safety: 2.41

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °
Sensitive Fines (Drained)	80 pcf	0 psf	18.5 °
Buttress	75 pcf	0 psf	20 °



Slope Stability Analysis
Section X (North Toe Buttress)
Lined Ash Impoundment

Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
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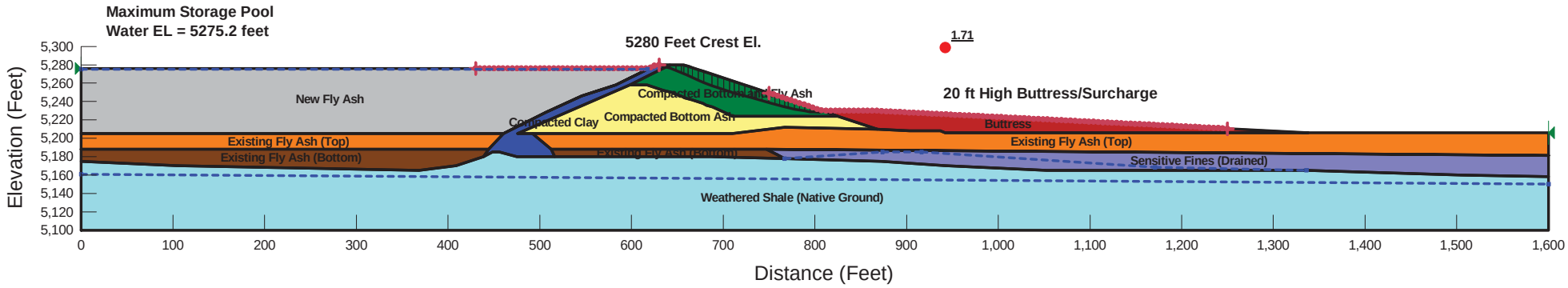
Figure 9) Seismic Loading
File Name: Section X - Seismic.gsz
Date: 7/12/2016
Method: Spencer

Factor of Safety: 1.71

Material Type:	Unit Weight:	Cohesion:	Friction Angle:
Compacted Bottom Ash	75.1 pcf	0 psf	42 °
Existing Fly Ash (Top)	90 pcf	0 psf	30 °
New Fly Ash	90 pcf	304 psf	0 °
Compacted Clay	125 pcf	300 psf	20 °
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °
Sensitive Fines (Drained)	80 pcf	0 psf	18.5 °
Buttress	75 pcf	0 psf	20 °

Horz Seismic Coef.: 0.104



Slope Stability Analysis
Section X (North Toe Buttress)
Lined Ash Impoundment

Four Corners Power Plant
Fruitland, New Mexico
Arizona Public Service

Note:
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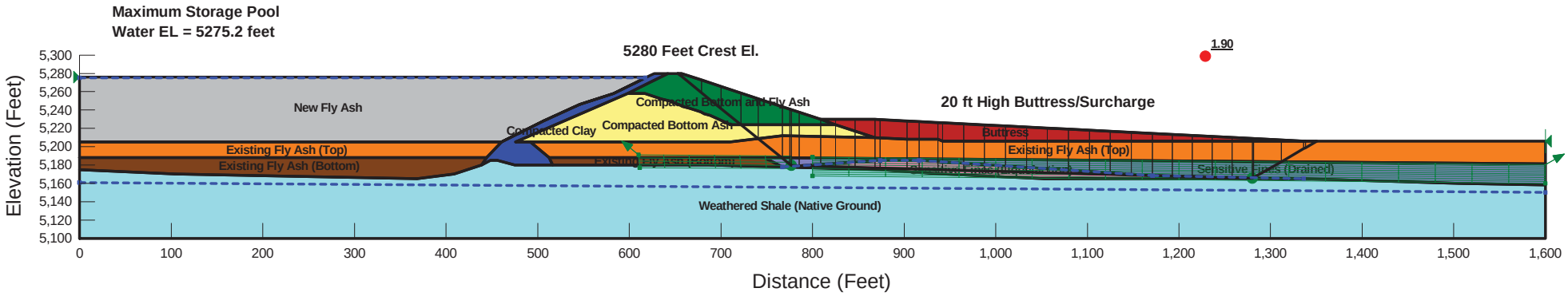
Figure 10) Liquefaction Loading
File Name: Section X - Post-Seismic.gsz
Date: 7/12/2016
Method: Spencer

Factor of Safety: 1.90

Material Type:	Unit Weight:	Cohesion:	Friction Angle:	Residual Strength Ratio (Sr/P):
Compacted Bottom Ash	75.1 pcf	0 psf	42 °	
Existing Fly Ash (Top)	90 pcf	0 psf	30 °	
New Fly Ash	90 pcf	304 psf	0 °	
Compacted Clay	125 pcf	300 psf	20 °	
Weathered Shale (Native Ground)	120 pcf	500 psf	30 °	
Existing Fly Ash (Bottom)	90 pcf	0 psf	28 °	
Compacted Bottom and Fly Ash	90 pcf	0 psf	35 °	
Sensitive Fines (Drained)	80 pcf	0 psf	18.5 °	
Buttress	75 pcf	0 psf	20 °	
Sensitive Fines (Liquefaction)	80 pcf			0.05



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