GROUNDWATER MONITORING NETWORK CERTIFICATION REPORT
FOR THE RETURN WATER POND
Coal Combustion Residuals Rule Groundwater Monitoring System Compliance
Four Corners Power Plant
Fruitland, New Mexico

Submitted to:

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Submitted by:

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LIST OF ACRONYMS AND ABBREVIATIONS

§	Section
Amec Foster Wheeler	Amec Foster Wheeler, Environment & Infrastructure, Inc.
amsl	above mean sea level
APS	Arizona Public Service
CCR	coal combustion residuals
CFR	Code of Federal Regulations
CSM	Conceptual Site Model
CWTP	Combined Waste Treatment Pond
DFADA	Dry Fly Ash Disposal Area
FCPP	Four Corners Power Plant
ft	foot, feet
LAI	Lined Ash Impoundment
LDWP	Lined Decant Water Pond
MCL	Maximum Contaminant Level
Multiunit 1	CCR multiunit comprised of the LAI and LDWP
PVC	Polyvinyl Chloride
RWP	Return Water Pond
SAP	Sampling and Analysis Plan
Sch	Schedule
SDAWP	Statistical Data Analysis Work Plan
SSI	statistically significant increase
SSL	statistically significant level
URS	Upper Retention Sump
USEPA	United States Environmental Protection Agency
Wood	Wood Environment & Infrastructure Solutions, Inc.

1.0 INTRODUCTION

On behalf of Arizona Public Service Company (APS), Wood Environment & Infrastructure Solutions, Inc. (Wood) prepared this Coal Combustion Residuals (CCR) Groundwater Monitoring System Certification Report (Certification Report) for the Return Water Pond (RWP), a lined CCR impoundment constructed in 2019 at the Four Corners Power Plant (FCPP) in Fruitland, New Mexico. This Certification Report is supplemental to a Certification Report prepared in 2017 by AECOM Technical Services, Inc. (AECOM) for the remaining CCR units constructed at FCPP (AECOM, 2017). Both Certification Reports were prepared pursuant to 40 Code of Federal Regulations (CFR) Part 257 (herein referred to as the CCR Rule; Federal Register, 2018) to support groundwater monitoring requirements for CCR units.

The CCR Rule became effective on October 19, 2015 and established standards for the disposal of CCR in landfills and surface impoundments (CCR units) at applicable sites. Included in the CCR Rule are requirements for a groundwater monitoring system for the purpose of monitoring and characterization of groundwater within the uppermost aquifer underlying the respective CCR unit (40 CFR §257.91). The groundwater monitoring system must be certified as compliant with the CCR Rule by a professional engineer (40 CFR §257.91[f]). This report documents the installation and certification of a groundwater monitoring network at the RWP.

A description of the power generating facility operations and environmental setting is presented in Section 2.0. A summary of the exploratory borings advanced prior to monitoring well installation is provided in Section 3.0, while Section 4.0 documents the RWP well installation field activities. The RWP monitoring network design is discussed in Section 5.0, and Section 6.0 contains report references.

2.0 SITE DESCRIPTION

2.1 Facility and CCR Unit Description

Facility Description. FCPP is an operating power plant owned by APS and four other utilities. The plant burns low sulfur coal in two electrical generating units (Units 4 and 5) and has a net generating capacity of 1,540 megawatts. FCPP formerly had five generating units and a capacity of 2,040 megawatts; Units 1, 2, and 3 were retired in December 2013 and decommissioned between 2014 and 2016. Coal burned at the plant is generally sourced from the nearby Navajo Mine (Navajo Transitional Energy Company, 2016).

Facility Location. The plant and associated infrastructure are located approximately 20 miles southwest of the city of Farmington, in the Colorado Plateau physiographic province of northwestern New Mexico (Figure 1). The land on which the plant resides is leased from the Navajo Nation and is primarily located in Section 36, Township 29 North, and Range 16 West.

CCR Unit Description. Not including the recently-constructed RWP, plant infrastructure includes three single CCR units and one CCR multiunit (referred to as Multiunit 1) which are located in the main plant area and to the west of the plant within the FCPP lease boundary (also known as the disposal area) (Figure 2). Table 1 summarizes the location, function, operation, size/construction, and history of each unit. The boundaries of CCR units depicted in Figure 2 are based on available historical plans for the units.

RWP Description. The RWP is a lined, dual-celled CCR surface impoundment constructed by APS in 2019 to separately and temporarily store flue gas desulfurization (FGD) system waste and water from the seepage collection system downgradient of the FCPP disposal area. Water from this system was historically routed from the Pond 3 Pump House and discharged into the Lined Decant Water Pond (LDWP) but in anticipation of Multiunit 1 closure, the RWP will receive water from the pump house going forward and convey the collected water back to the plant for reuse. The location of the RWP is depicted on Figure 2. The RWP is constructed with an alternative composite liner and leak collection and recovery system (LCRS) that meets the requirements of 40 CFR §257.72. Upon completion of the RWP, APS obtained certification that the liner was constructed in accordance with the requirements of the CCR Rule. A copy of the certification was placed in the facility's operating record and posted to APS's CCR information webpage on December 20, 2019.

2.2 Environmental Setting

Unless otherwise noted, the following information is abstracted from AECOM, 2017.

Climate. The plant is located in a semi-arid climate on the western flank of the San Juan Basin. The area receives an average of 8.6 inches of precipitation and 12.6 inches of snow per year.

Topography. The main plant area of the FCPP is located at an elevation of approximately 5,340 to 5,360 feet (ft) above mean sea level (amsl). The topography of the FCPP area is characterized by rolling terrain, steep escarpments, and incised drainages/arroyos. In the vicinity of the plant, the ground surface is relatively flat, sloping to the west at approximately 20 ft per mile; however, surface drainage immediately near Morgan Lake flows towards the lake. About one mile west of the plant, the level ground surface drops rapidly to 5,200 ft amsl. Chaco Wash (a.k.a. Chaco River) is located west of this abrupt change in elevation and ephemerally flows north to the San Juan River.

Surface Water Hydrology. FCPP is situated on the southern bank of Morgan Lake, an approximately 1,300-acre man-made lake that has a maximum storage capacity of 39,000 acre-ft of water and supplies cooling water to the plant. Morgan Lake was formed by damming a westerly flowing stream (now known as 'No Name Wash') and is replenished by an underground pipeline (i.e., aqueduct) that routes flow from the San Juan River located approximately 3 miles north of the FCPP. The typical water surface elevation of the lake is 5,330 ft amsl. Morgan Dam discharges to 'No Name Wash' which flows west of the lake to Chaco Wash.

Site Geology. The San Juan Basin is a structural depression that lies at the eastern edge of the Colorado Plateau (Dames & Moore, 1988). The dominant geographic feature in the vicinity of FCPP is the Hogback Monocline located to the west of the plant; this monocline is a steep (38 degree) eastward-dipping flank composed of Cretaceous sedimentary rock (Dames & Moore, 1988).

There are two 'uppermost geologic units' that underlie the FCPP site and immediate vicinity. These units are expected to influence groundwater flow and variations in naturally occurring constituent concentrations across the site. The units are as follows:

- Pictured Cliffs Sandstone: The Pictured Cliffs Sandstone is the uppermost geologic unit beneath the plant and the CCR units located in this vicinity (i.e., the Upper Retention Sump [URS], the Combined Waste Treatment Pond [CWTP], and the RWP, as depicted in Figure 2). This unit is a fine- to medium-grained marine sandstone. The lower portions of the Pictured Cliffs Sandstone represent a transitional sequence between this formation and the underlying Lewis Shale as indicated by alternating thin beds of very fine-grained sandstone and silty shale. The Pictured Cliffs Sandstone forms a capstone on an exposed cliff face located between the plant site and the CCR units located to the west (i.e., the Lined Ash Impoundment [LAI], LDWP and the Dry Fly Ash Disposal Area [DFADA]).

- Lewis Shale: The Lewis Shale is a marine shale that contains evaporite deposits resulting in naturally occurring saline groundwater conditions. The Lewis Shale is the uppermost geologic unit that underlies the LAI, LDWP, and DFADA and spans west of the Pictured Cliffs Sandstone cliff face approximately 1.5 miles westward to the base of the Hogback Monocline. The regional thickness of the Lewis Shale is approximately 500 ft and is underlain by Cliff House Sandstone. The Lewis Shale consists of a weathered shale subunit overlying a hard, unweathered shale subunit. The thickness of the weathered shale varies between 11 and 47 ft with an average thickness of 30 ft within the vicinity of the site (Dames & Moore, 1988). The weathered shale is not as thick when overlain by Pictured Cliffs Sandstone in the vicinity of the plant site and can be difficult to differentiate within the fine-grained rocks that comprise the gradational contact between the Pictured Cliffs Sandstone and underlying Lewis Shale. The Weathered Lewis Shale contains thin sandstone lenses that vary in thickness from 1 to 7 ft; the sandstone is fine- to very fine-grained and cemented by calcium carbonate (Dames & Moore, 1988). The unweathered shale is significantly less permeable than the weathered shale. The unweathered shale is very fine-grained to silty, and contains periodic siltstone and sandstone lenses (Dames & Moore, 1988). The surface of the unweathered shale slopes towards the Chaco Wash at approximately the same slope as land surface (Dames & Moore, 1988) but displays some irregularity resulting in varying levels of saturated thickness in the weathered shale. The weathered subunit of the Lewis Shale is variably saturated and hydraulically interconnected with alluvial deposits of Chaco Wash. The low-permeability unweathered shale underlying the Pictured Cliffs Sandstone results in a perched saturated zone beneath the plant.

Applicable Hydrostratigraphy. Three general hydrostratigraphic units are conceptualized beneath the FCPP that have the potential to interact with releases from CCR units, if they occur. These units form the basis for the Conceptual Site Model (CSM) developed by AECOM (2017) for the purpose of designing the site CCR groundwater monitoring system and establish the working basis for statistically evaluating groundwater conditions underlying the site.

The first hydrostratigraphic unit (Pictured Cliffs Sandstone) is dominant only under the plant area, which is located in an elevated area south of Morgan Lake (Figure 2). The former URS, CWTP, and RWP reside within this area. The Pictured Cliffs Sandstone is the uppermost water bearing unit for the plant area and extends from ground surface (between approximately 5,340 to 5,360 ft amsl) to approximately 5,300 ft amsl in the plant area. Groundwater in this area is locally influenced by Morgan Lake (at a surface elevation of approximately 5,330 ft amsl) and operations at the Plant (e.g., the former URS and the CWTP) and generally flows northward towards the lake. However, construction and operations of the plant have resulted in disturbed ground conditions and associated impacts are not well understood.

The second hydrostratigraphic unit (Weathered Lewis Shale/Alluvium) underlies the Pictured Cliffs Sandstone in the plant area and the Multiunit 1/DFADA CCR units in the disposal area, approximately 1 mile west of the plant (Figure 2). The Weathered Lewis Shale and the hydraulically connected alluvial deposits along Chaco Wash are designated as the uppermost water bearing unit in the disposal area. Although the Lewis Shale is geologically continuous in this area, it is unsaturated in the vicinity of the DFADA. The water table in the Weathered Lewis Shale can exhibit local seasonal fluctuations that are attributed to interactions between rates of groundwater recharge and discharge (Dames & Moore, 1988) from/to Morgan Lake, historical unlined ponds, and Chaco Wash. Groundwater flow generally follows the surface topography and descends to the west-southwest in the disposal area, mainly in the weathered shale and in local alluvial channels that drain toward the Chaco Wash (APS, 2013).

The third hydrostratigraphic unit (Unweathered Lewis Shale) consists of the Unweathered Lewis Shale and is a regionally extensive confining unit that forms the base of the uppermost aquifers in the plant and disposal areas. Although minor amounts of water may be present in the Unweathered Lewis Shale, this unit is sufficiently thick (hundreds of feet) and acts as an aquitard between the Weathered Lewis Shale/Alluvium and the underlying Cliff House Sandstone.

Ambient Groundwater Quality. APS began evaluating groundwater and the hydrogeology in the area of the Plant as early as 1971. Due to the natural heterogeneity of the geologic and hydrogeologic conditions underlying the FCPP, background constituent concentrations are expected to be spatially heterogeneous (varying) across the site. The site is also expected to exhibit both spatial and temporal heterogeneity attributable to local climatic regimes, potential leakage from Morgan Lake, and potential operational activity at the site.

2.3 Geologic and Hydrogeologic Conditions Beneath the RWP

Previous site investigations indicate that the RWP is underlain by unsaturated and fine-grained sedimentary rocks which comprise the gradational contact between the Pictured Cliffs Sandstone and the underlying Lewis Shale (EBASCO, 1959). The gradational contact consists of weathered, permeable, and intercalated very-fine grained sandstone, siltstone, and shale; these weathered and permeable rocks are underlain by a zone of unweathered and impermeable shale and siltstone (EBASCO, 1959). The top of the unweathered shale and siltstone, i.e. the Unweathered Lewis Shale, was identified at depths ranging between 33 and 39.5 ft below ground surface (bgs) in geotechnical borings drilled near the RWP (EBASCO, 1959).

The rock sequence described above is consistent with the Pictured Cliffs Sandstone hydrostratigraphic unit, which consists of relatively permeable sedimentary rocks underlain by the relatively impermeable Unweathered Lewis Shale (AECOM, 2017). The hydrogeologic conditions suggest that a release from the RWP would migrate vertically downward through the permeable and weathered rocks to the aquitard created by the Unweathered Lewis Shale. The release would then migrate laterally along the surface of the Unweathered Lewis Shale in the dip direction of the unit. Based on this conceptual interpretation, the downgradient waste boundary of the RWP is defined as the location on the side of the RWP where the elevation of the underlying Unweathered Lewis Shale is lowest.

3.0 EXPLORATORY BORING ADVANCEMENT

Exploratory borings were drilled prior to well installation to determine and verify the depth and orientation of the Unweathered Lewis Shale in the vicinity of the RWP and confirm the suspected absence of groundwater within the Pictured Cliffs Sandstone hydrostratigraphic unit.

Site health and safety was addressed via a site-specific Health and Safety Plan and field personnel attendance at APS Contractor Safety Training. Utility clearance around the RWP was performed by ground penetrating radar, and each boring location was hydroexcavated to a depth of approximately 5 ft bgs.

Exploratory borehole drilling occurred between December 3 and 6, 2019. Wood contracted with Cascade Drilling LP (a licensed New Mexico driller) to advance the exploratory borings using a truck-mounted Sonic drill rig. The borings were drilled to total depths ranging from 37 to 52 ft bgs. Formation samples and moisture content at each boring were logged by the Wood field geologist. Lithologic logs for the exploratory borings are included as Appendix A, and photographs of the formation samples from each boring are provided as Appendix B.

The depth of the Unweathered Lewis Shale at each boring location was identified and compared to land surface elevations obtained from an aerial elevation survey conducted by APS in 2014 and hand-held Global

Positioning System. The resulting elevations of the Unweathered Lewis Shale were then used to determine the dip orientation of the unit in the vicinity of the RWP. The exploratory boring locations and associated Unweathered Lewis Shale elevations are depicted on Figure 3 and summarized in Table 2.

Results from the exploratory borings can be summarized as follows:

- The RWP is directly underlain by weathered and interbedded fine-grained rocks which comprise the gradational contact between the lower portion of the Pictured Cliffs Sandstone and underlying Lewis Shale. The gradational contact consists of interbedded and weathered sandstone, siltstone, claystone, and shale. Gypsum stringers are variably present throughout the weathered rocks.

- The weathered rocks of the lower Pictured Cliffs Sandstone are underlain by the Unweathered Lewis Shale, which consists of a hard, unweathered, blue-gray colored shale interbedded with very-fine grained sandstone, and is present at depths ranging from 31 to 40 ft bgs beneath the RWP. Gypsum is not present in the Unweathered Lewis Shale.

- The Unweathered Lewis Shale dips towards the northeast beneath the RWP (Figure 3).

- No groundwater was encountered in the exploratory borings.

The exploratory boring results indicate that the RWP is underlain by the Pictured Cliffs Sandstone hydrostratigraphic unit, which is unsaturated beneath the RWP. The weathered subunit of the Lewis Shale, which is typically observed in borings drilled in the disposal area to consist of relatively thick sequences of brown-colored, weathered, and oxidized shale and gypsum, was not observed in the exploratory borings.

Accordingly, the three exploratory borings drilled on the northeastern edge of the RWP were selected for monitoring well installation directly above the aquitard formed by the Unweathered Lewis Shale. Exploratory borings RW-02 and RW-05 were abandoned using native materials and cement grout. Exploratory borings RW-03, RW-01, and RW-04 were designated as RWP monitoring wells MW-88, MW-89, and MW-90, respectively. The monitoring well installation activities are summarized in the following section (Section 4.0).

4.0 RWP GROUNDWATER MONITORING WELL INSTALLATION

4.1 Well Installation

Monitoring well installation took place between December 5 and December 7, 2019. The exploratory borings designated for monitoring well installation (RW-01, RW-03, and RW-04), were backfilled with hydrated bentonite chips to the depths at which the Unweathered Lewis Shale was identified in each boring. The MW-88, MW-89, and MW-90 wells each consist of a 10-ft screened interval installed within the Pictured Cliffs Sandstone hydrostratigraphic unit directly above the surface of the Unweathered Lewis Shale. The monitoring wells are each constructed of 4-inch nominal diameter Schedule (Sch) 80 polyvinyl chloride (PVC) well casings and 4-inch Sch 80 PVC well screens with 0.020-inch slots. Filter pack material consists of 10-20 silica sand accompanied by a transition seal consisting of 20-40 silica sand installed above the filter pack. A 2- to 3-ft-thick bentonite seal was installed above the transition sand, followed by a surface seal consisting of cement grout. Surface completions consist of 2-ft above-grade steel vaults in a concrete pad surrounded by traffic bollards. Well construction details are presented in Table 3, and well construction diagrams are included as Appendix A.

4.2 Well Development

Because the wells were dry at the time of installation, well development was not performed.

4.3 Management of Investigation-Derived Waste

Investigation-derived waste (IDW) included formation materials generated during boring advancement. The formation materials were placed on plastic sheeting for logging and photographing by the Wood field geologist, then temporarily placed in a self-dumping trailer adjacent to the drill rig. The formation materials were ultimately disposed of in the DFADA according to APS instructions. A total of approximately 2.9 cubic yards of IDW were generated from boring advancement at the RWP.

4.4 Geodetic Survey

The locations, surface elevations, and top of casing elevations of the new RWP wells and surface elevations of the abandoned exploratory borings were surveyed on March 13, 2020 by Sakura Engineering, a New Mexico registered land surveyor. The surveyed location of each well is depicted on Figure 4. Survey data are summarized in Table 3, and the complete survey results are included as Appendix C.

5.0 RWP GROUNDWATER MONITORING WELL NETWORK DESIGN

Per 40 CFR §257.91(a), the groundwater monitoring system must be capable of yielding groundwater samples that meet the following performance standards:

- Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit; and

- Accurately represent the quality of groundwater passing the waste boundary of the CCR unit.

The RWP downgradient wells are depicted on Figure 4 with other nearby CCR monitoring system wells. The downgradient RWP groundwater monitoring network consists of wells MW-88, MW-89, and MW-90. As previously indicated, these wells are installed at the downgradient waste boundary of the RWP, based on conditions observed in the exploratory borings and previous site investigations. Although the uppermost hydrostratigraphic unit underlying the RWP (i.e. the Pictured Cliffs Sandstone) is dry in this area, the wells are screened directly along the surface of the aquitard created by the Unweathered Lewis Shale. As such, the wells are expected to adequately detect potential introduction of groundwater into the uppermost hydrostratigraphic unit, be it from natural recharge conditions or leakage from the RWP.

Due to the unsaturated conditions observed in the exploratory borings drilled on the western edge of the RWP (RW-02 and RW-05), a background well was not installed upgradient of the CCR unit. Therefore, Wood recommends inclusion of existing site CCR background wells installed in saturated portions of the Pictured Cliffs Sandstone into the RWP monitoring network as background wells. These wells, MW-71, MW-72, and MW-73, currently serve as background wells for the former URS and CWTP and are screened in the Pictured Cliffs Sandstone Hydrostratigraphic Unit. While these wells are not located upgradient of the RWP, 40 CFR §257.91 (a)(1)(ii) allows their inclusion into the RWP groundwater monitoring network if the data collected from the wells is representative of background water quality relative to the downgradient RWP monitoring wells.

Documentation and certification of MW-71, MW-72, and MW-73 as background wells for the URS and CWTP monitoring networks is provided in the 2017 report titled *CCR Monitoring Well Network, Report, and Certification* (AECOM, 2017). The 2017 report indicates that well MW-73 was installed as part of the CWTP and URS monitoring well network in January 2017 and is located approximately 0.30 miles northeast of the RWP. Wells MW-71 and MW-72 were installed in early 2016 and are located approximately 0.55 to 0.75 miles east of the RWP, respectively, in the vicinity of the former URS. MW-73 was installed because groundwater elevation data collected from MW-71 and MW-72 during the establishment of a detection monitoring program per 40 CFR §257.94(b) indicated localized groundwater mounding around the URS (AECOM, 2017). Although the two wells were certified for inclusion as background monitoring wells on the basis that the wells are screened in the same hydrostratigraphic unit as the downgradient URS and CWTP monitoring wells and are located upgradient of CCR units in the plant area, the water quality data collected from these background wells are routinely evaluated during statistical assessments to evaluate the continued suitability of the wells as background wells. Water quality data collected to date support the conclusion that MW-71 and MW-72 have not been impacted from leakage from the URS. Boron and fluoride, two compounds that are mobile and conservative (i.e., not reactive) in groundwater and commonly used as indicator compounds in CCR environments, are present in concentrations two orders of magnitude below concentrations observed in downgradient URS wells (in the case of boron) or are not detected above laboratory reporting limits despite being present in downgradient URS wells (in the case of fluoride). Concentrations of boron at MW-71 and MW-72 are also lower than those observed at MW-73.

The URS was removed in 2019 and replaced with the Upper Retention Tank, a tank system that is not a designated CCR unit. Following the removal of the URS, water levels in nearby monitoring wells were observed to drop, and the potentiometric surface in the vicinity of MW-71 and MW-72 no longer indicates mounding impacts. Therefore, Wood recommends inclusion of MW-71 and MW-72 along with MW-73 as background monitoring wells for the RWP on the basis that:

1) The two sets of wells (i.e. URS/CWTP background wells and RWP downgradient wells) are screened within the same hydrostratigraphic unit;

2) The influence of groundwater mounding around the URS is no longer indicated;

3) Water quality data collected from these wells indicates the wells are not impacted by releases from the former URS; and

4) Maintaining consistency with other CCR units (i.e., the CWTP) is warranted, as the CWTP, URS, and RWP monitoring networks are understood to be completed in the same hydrostratigraphic unit.

6.0 SUMMARY

The groundwater monitoring system at the RWP consists of six monitoring wells installed in the Pictured Cliffs Sandstone hydrostratigraphic unit: three wells installed at the downgradient RWP waste boundary (MW-88, MW-89, and MW-90) and three background monitoring wells (MW-71, MW-72, and MW-73). Prior to placing the RWP into service, APS will conduct eight rounds of initial monitoring at the RWP monitoring well network in accordance with 40 CFR §257.94(b)(2). Additionally, monitoring and statistical assessment of collected data from the RWP will be conducted in accordance with an updated Sampling Analysis Plan (Amec Foster Wheeler, 2018) and Statistical Data Analysis Work Plan (Wood, 2018), revised to include the RWP, prior to the unit receiving CCR.

7.0 CERTIFICATION

Certification Statement 40 CFR §257.91(f) — Design and construction of Groundwater Monitoring Systems for following CCR units:

- Return Water Pond (existing lined CCR Surface Impoundment)

I, Emily LoDolce, P.E., 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 is prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Units, that the design and construction of the groundwater monitoring system as included in the Groundwater Monitoring Network Certification Report dated June 5, 2020 meets the requirements of 40 CFR 257.91.

Emily H. LoDolce

Printed Name

June 5, 2020

Date

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6/5/2020

8.0 REFERENCES

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TABLES

Table 1
Description of Coal Combustion Residual Units

CCR Unit	Location	Function	Operation	Size/Construction	History
Upper Retention Sump (URS)	*Plant Area* NW1/4 of Section 36, T29N, R16W	*Single CCR unit*. Impoundment. Surge pond for FGD system.	FGD system discharge is discharged into the sump via 10 plus controlled/monitored lines. Pond contents are recirculated back into the FGD process via a pump chamber located on the south end of the pond. Solids are periodically removed from the sump.	- 1.07 acres in areal extent - Soil-cement liner on bottom and inside slopes	Placed in service around 1983.
Combined Waste Treatment Pond (CWTP)	*East of Plant, Adjacent to Morgan Lake* SE1/4 of Section 25, T29N, R16W	*Single CCR Unit*. Impoundment. Detention pond used for NPDES treatment; settling and stabilization basin for ash-impacted and other Plant wastewater flows prior to discharge to Morgan Lake in accordance with an NPDES permit.	The primary source of water to the CWTP is from hydrobins which separate transport water from bottom ash generated in plant Units 4 and 5. Seven earthen basins in the western edge of the CWTP promote sediment settling prior to the water decanting into the main portion of the CWTP and then overflowing into the cooling water discharge canal at the northeast corner of the pond.	- 13.4 acres in areal extent	Constructed in 1978.
Lined Ash Impoundment (LAI)	*Disposal Area* E1/2 of Section 34, T29N, R16W	*Part of a CCR multiunit with the LDWP* that receives fly ash, flue gas desulfurization (FGD) waste and associated residuals as a slurry from the plant.	Waste is discharged into the pond in the northeast portion of the pond. Decanted flow discharges via a vertical drop inlet structure and through a toe drain into the LDWP.	- 126.8 acres in areal extent (high water line) - 60 mil HDPE liner - 5,364 acre-ft design capacity - 5,275.2 ft AMSL maximum working level	Constructed on top of closed Ash Ponds 4 and 5 and placed in service in 2004.
Lined Decant Water Pond (LDWP)	*Disposal Area* E1/2 of Section 34, T29N, R16W	*Part of a CCR multiunit with the LAI* that receives decanted water from the LAI. Impoundment.	Decanted water is discharged into the pond from the LAI via gravity; the water is pumped from the LDWP back to the plant for reuse in operations.	- 45 acres in areal extent - Two 60 mil HDPE liners separated by a leak detection layer - 435 acre-ft design capacity - 5,213.2 ft AMSL maximum working level	Constructed on top of closed Ash Pond 3 and placed in service in 2004.
Dry Fly Ash Disposal Area (DFADA)	*Disposal Area* SE1/4 of Section 34, T29N, R16W	*Single CCR unit*. Landfill. Disposal of dry fly ash, bottom ash, and construction debris. In the future, FGD solids will be mixed with fly ash at the plant and landfilled in the DFADA.	The DFADA is filled in general accordance with a stacking plan. Leachate generated from the DFADA cells is pumped into trucks and used for dust control or can be transferred to the LDWP.	- 3 conjoined cells (DFADA 1, 2, and 3) with an areal extent of 94.8 acres total - 3,125 acre-ft design capacity - DFADA 1: compacted clay overlain by 60 mil HDPE liner and drainage layer - DFADA 2 and 3: geosynthetic clay liner overlain by 60 mil HDPE liner and drainage layer - Leachate collection system drains each DFADA cell - DFADA 4 is planned and under construction in 2020	Constructed in 2007 (DFADA 1), 2012 (DFADA 2), and 2014 (DFADA 3).

Table 1
Description of Coal Combustion Residual Units

CCR Unit	Location	Function	Operation	Size/Construction	History
Return Water Pond (RWP)	*Plant Area* NW1/4 of Section 36, T29N, R16W	*Single CCR unit.* Lined impoundment for the temporary storage of FGD system waste, drain down from the LAI, treated sewage wastewater flow, and water pumped from the site seepage collection system.	The RWP consists of two cells; FGD system waste generated at the plant can be discharged into an FGD cell while all other liquids are discharged into a liquid cell. A spillway between the two cells allows liquid in the FGD system waste to decant into the liquid cell. Liquids from the liquid cell are pumped back to the plant for reuse in plant operations.	- 5.1 acres in areal extent - Composite liner system and associated LCRS comprised of a primary 60 mil HDPE liner, a geosynthetic drainage layer, a secondary 60 mil HDPE liner, and an underlying geosynthetic clay liner - 38.6 acre-ft design capacity - 5379 ft AMSL maximum working level	Constructed in 2019 and placed in service June 2020.

Abbreviations:
AMSL - above mean sea level
CCR - Coal combustion residuals
CWTP - Combined Waste Treatment Pond
DFADA - Dry Fly Ash Disposal Area
FGD - flue gas desulfurization
ft - feet
HDPE - high density polyethylene
LAI - Lined Ash Impoundment
LCRS - leak collection and removal system
LDWP - Lined Decant Water Pond
NPDES - National Pollutant Discharge Elimination System
RWP - Return Water Pond
URS - Upper Retention Sump

Table 2
Exploratory Borings Summary

Exploratory Boring	Monitoring Well Designation	Date Drilled	Total Depth (ft bgs)	Depth to Unweathered Lewis Shale (ft bgs)	Ground Surface Elevation (ft amsl)	Unweathered Lewis Shale Elevation (ft amsl)
RW-01	MW-89	12/3/2019	51	34	5367.51	5333.51
RW-02*	---	12/4/2019	42	38	5380.55	5342.55
RW-03	MW-88	12/5/2019	48	31	5362.71	5331.71
RW-04	MW-90	12/4/2019	52	40	5372.93	5332.93
RW-05*	---	12/5/2019	37	34	5375.75	5341.75

Notes:
**Boring not designated for well installation*
Source of elevation information presented is from Sakura Engineering & Surveying, 2020
Vertical datum is NAVD 88

Abbreviations:
amsl - above mean sea level
bgs - below ground surface
ft - feet

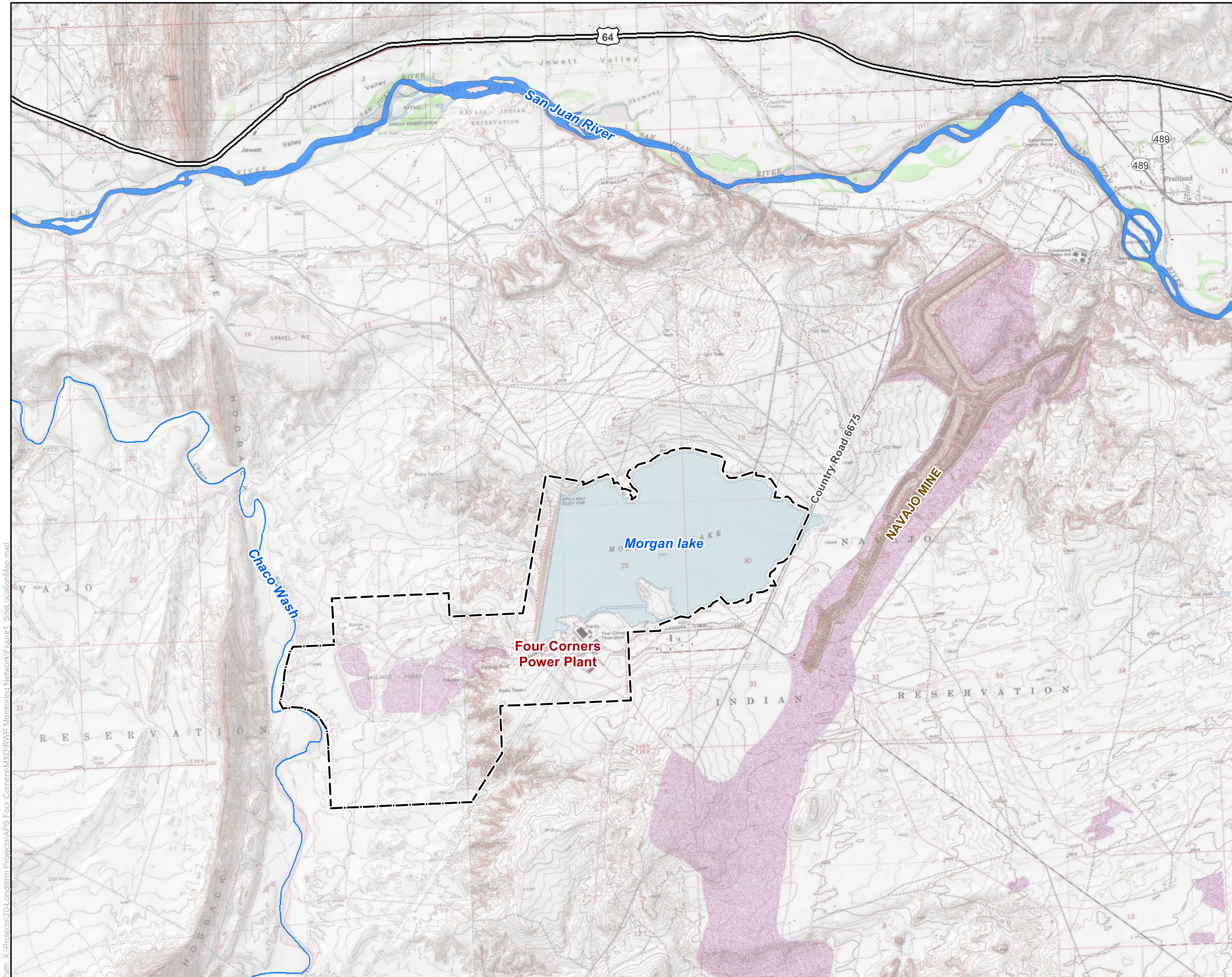
Table 3
RWP Monitoring Well Network Construction Summary

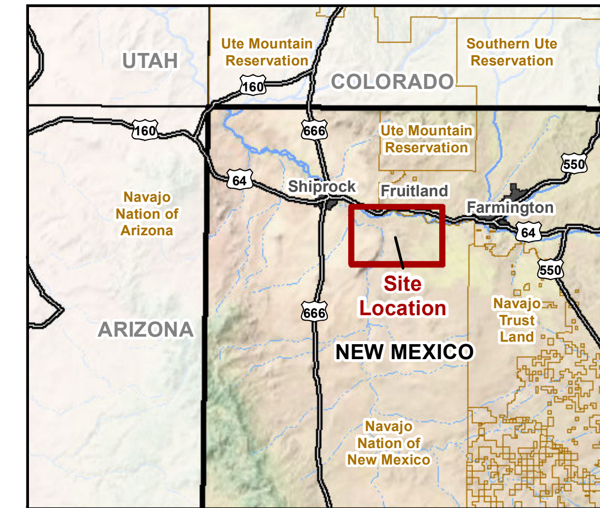
Well	CCR Unit(s)	Well Designation for RWP CCR Unit	Hydrostratigraphic Unit	Date Installed	Borehole Depth (ft bgs)	Top of Casing Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length (ft)	Top Screen Elevation (ft amsl)	Bottom Screen Elevation (ft amsl)	Bottom Borehole Elevation (ft amsl)
MW-88	RWP	Downgradient	Pictured Cliffs Sandstone	12/6/2019	31	5365.25	5362.71	20	30	10	5342.71	5332.71	5331.71
MW-89	RWP	Downgradient	Pictured Cliffs Sandstone	12/6/2019	35	5370.21	5367.51	24	34	10	5343.51	5333.51	5332.51
MW-90	RWP	Downgradient	Pictured Cliffs Sandstone	12/7/2019	40	5374.08	5372.93	29	39	10	5343.93	5333.93	5332.93
MW-71	RWP/CWTP/URS	Background	Pictured Cliffs Sandstone	3/1/2016	50	5362.91	5363.60	22.5	42.5	20	5341.10	5321.10	5313.60
MW-72	RWP/CWTP/URS	Background	Pictured Cliffs Sandstone	3/2/2016	61	5318.62	5379.10	50.7	60.7	10	5328.40	5318.40	5318.10
MW-73	RWP/CWTP/URS	Background	Pictured Cliffs Sandstone	1/18/2017	45	5353.95	5351.90	28.9	43.9	15	5323.00	5308.00	5306.90

Notes:
Source of elevation information presented is from Sakura Engineering & Surveying, 2019 and 2020
Vertical datum is NAVD 88

Abbreviations:
amsl - above mean sea level
bgs - below ground surface
CWTP - Combined Waste Treatment Pond
ft - feet
RWP - Return Water Pond
URS - Upper Retention Sump

FIGURES





Area of Detail

Legend

Four Corners Power Plant Lease Boundary

0 0.4 0.8 Miles

N

Arizona Public Service
Four Corners Power Plant
Fruitland, New Mexico

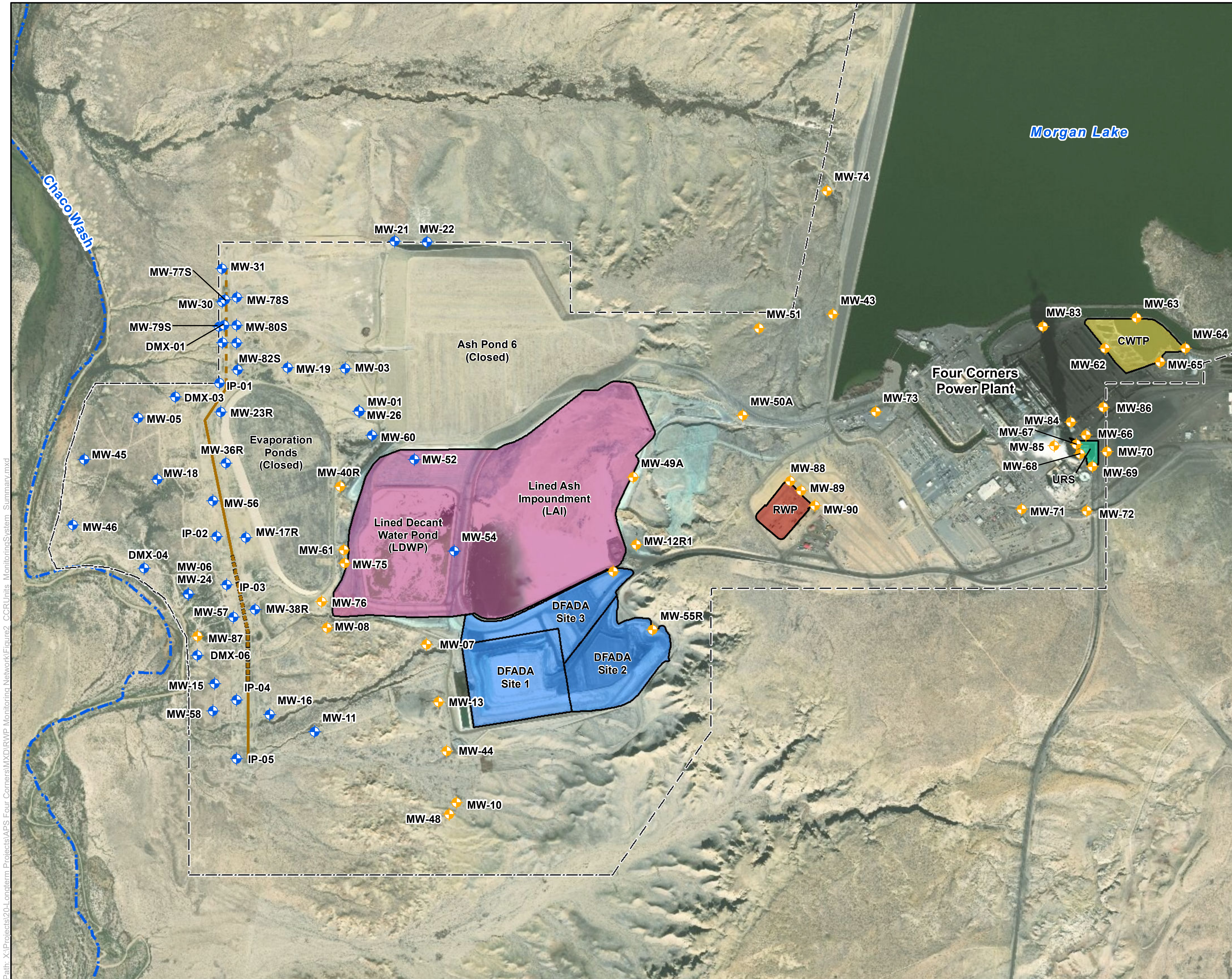
FIGURE 1

Site Location Map

Job No.	14-2018-2068
PM:	EHL
Date:	4/23/2020
Scale:	1"= 0.8 miles

wood.

Path: X:\Projects\20-Longterm Projects\APS Four Corners\MXD\RWP Monitoring Network\Figure1_SiteLocationMap.mxd



Legend

- CCR Monitoring Well Location
- Supplementary Site Monitoring Well Location
- FCPP Lease Boundary
- North Intercept Trench
- South Intercept Trench
- Approximate Extent of High Flow Zone
- Ephemeral Surface Water Feature

CCR Units

- Multiunit 1(LAI and LDWP)
- Dry Fly Ash Disposal Area (DFADA)
- Combined Waste Treatment Pond (CWTP)
- Upper Retention Sump (URS)
- Return Water Pond (RWP)

Notes:

CCR	Coal Combustion Residuals
CWTP	Combined Waste Treatment Pond
DFADA	Dry Fly Ash Disposal Area
FCPP	Four Corners Power Plant
LAI	Lined Ash Impoundment
LDWP	Lined Decant Water Pond
URS	Upper Retention Sump
RWP	Return Water Pond

0 350 700 1,400 Feet

N

Arizona Public Service
Four Corners Power Plant
Fruitland, New Mexico

FIGURE 2

CCR Units and Monitoring System Summary

Job No.	14-2018-2068
PM:	EHL
Date:	4/24/2020
Scale:	1" = 1400'

Path: X:\Projects\20-Longterm Projects\APS Four Corners\MXD\RWP Monitoring Network\Figure2_CCRUnits_MonitoringSystem_Summary.mxd

Legend

- Exploratory Boring Location
- Return Water Pond (RWP)

Notes:

RW-01	Exploratory Boring Identification
5333.51	Unweathered Lewis Shale elevation ft amsl
ft amsl	Feet above mean sea level
RWP	Return Water Pond

0 150 300 Feet

N

Arizona Public Service
Four Corners Power Plant
Fruitland, New Mexico

FIGURE 3

Exploratory Boring Location Map
Unweathered Lewis Shale Elevations

Job No. 14-2018-2068
PM: EHL
Date: 4/23/2020
Scale: 1" = 150'

wood.

Legend

- CCR Monitoring Well Location
- Boring Location (Abandoned)

CCR Units

- Combined Waste Treatment Pond (CWTP)
- Upper Retention Sump (URS)
- Return Water Pond (RWP)

Notes:

CCR	Coal Combustion Residuals
CWTP	Combined Waste Treatment Pond
URS	Upper Retention Sump
RWP	Return Water Pond

0 500 1,000 Feet

N

Arizona Public Service
Four Corners Power Plant
Fruitland, New Mexico

FIGURE 4

RWP Monitoring Network

Job No. 14-2018-2068
PM: EHL
Date: 4/23/2020
Scale: 1" = 500'

wood.

APPENDIX A

LITHOLOGIC LOGS AND WELL CONSTRUCTION DIAGRAMS

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-88 (RW-03 BORING)

PROJECT:	APS Four Corners			**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
PROJECT MANAGER:	E. Lodolce			**PROJECT FEATURE:**	Return Water Pond
LOGGED BY:	I. Torres			**WOOD PROJECT #:**	14-2018-2068
DRILLER:	J. Vankirk			**ADWR REG. #:**	N/A
DRILLER FIRM:	Cascade Drilling LP			**COORDINATES:**	N2099671.787, E2530047.219
RIG I.D.:	N/A			**COORDINATE SYS:**	New Mexico West State Plane NAD83
RIG TYPE:	Sonic			**SURFACE ELEV. (FT):**	5362.705
BORING TYPE:	N/A	**BORING DIA.:**	8"	**MEAS. PT. ELEV (FT):**	5365.249
ORIENTATION:	90°			**VERTICAL DATUM:**	NAVD88
HAMMER TYPE:	N/A			**START DATE:**	12/5/2019 — **START TIME:** 08:45
HAMMER CALIBRATION-ENERGY TRANSFER RATIO:	N/A			**COMPLETION DATE:**	12/5/2019 — **COMPLETION TIME:** 12:00

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5362.7	0					Hydro-excavated from 0 to 5'	0	3' x 3' x 6" Concrete pad at surface From 0 to 15' Cement Grout
5357.7	5					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** Weathered and friable, oxidized, yellow to dark-brown colored, very-fine grained sandstone interbedded with weathered, yellow to light-grey colored siltstone and claystone. Relatively competent and well-cemented sandstone lens from 15.5' to 17'. Gypsum stringers from 13.5' to 15'. Dry throughout with slight moisture in weathered siltstone and claystone. Gradational contact with underlying unit.	5	From +2' to 20' 4" Nominal Diameter Schedule 80 PVC Blank Casing
5352.7	10						10	
5347.7	15						15	From 15' to 18' Bentonite Seal From 18' to 19' Transititon Sand (20-40) From 19' to 31' Filter Pack Silica Sand (10-20)
5342.7	20						20	

(Continued Next Page)

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

wood.

Environment & Infrastructure Solutions, Inc.
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Phoenix, Arizona 85034

BORING LOG I.D.: MW-88 (RW-03 BORING)

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5342.7	20					**WEATHERED SANDSTONE, SILTSTONE, SHALE:** Weathered and friable, tan to grey-colored, very-fine grained sandstone interbedded with weathered, tan-colored siltstone and weathered, grey to dark-grey colored shale. Relatively competent and well-cemented sandstone lenses from 20' to 21', 23' to 24', and 25' to 26'. Gypsum stringer and oxidized from 26' to 27'. Dry. Gradational contact with underlying unit.	20	(Continued) From 20' to 30' 4" Nominal Diameter Schedule 80 PVC Screen (Slots 0.020")
5337.7	25						25	From 19' to 31' Filter Pack Silica Sand (10-20)
5332.7	30						30	End Cap
						UNWEATHERED SHALE AND SANDSTONE: Unweathered and competent, dark-gray to blue-colored shale interbedded with unweathered, very-fine grained sandstone. Hard. Dry.		
5327.7	35						35	From 31' to 48' Bentonite Plug
5322.7	40						40	
5317.7	45						45	

(Continued Next Page)

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

wood.
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4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-88 (RW-03 BORING)

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5317.7	45					**UNWEATHERED SHALE AND SANDSTONE,** continued	45	(Continued)
								From 31' to 48' Bentonite Plug
						Total Depth = 48'		Total Depth = 48'
5312.7	50						50	
5307.7	55						55	
5302.7	60						60	
5297.7	65						65	
5292.7	70						70	

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
aps							MW-88

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-89 (RW-01 BORING)

PROJECT:	APS Four Corners			**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
PROJECT MANAGER:	E. Lodolce			**PROJECT FEATURE:**	Return Water Pond
LOGGED BY:	I. Torres			**WOOD PROJECT #:**	14-2018-2068
DRILLER:	J. Vankirk			**ADWR REG. #:**	N/A
DRILLER FIRM:	Cascade Drilling LP			**COORDINATES:**	N2069533.942, E2530205.136
RIG I.D.:	N/A			**COORDINATE SYS:**	New Mexico West State Plane NAD83
RIG TYPE:	Sonic			**SURFACE ELEV. (FT):**	5367.509
BORING TYPE:	N/A	**BORING DIA.:**	8"	**MEAS. PT. ELEV (FT):**	5370.208
ORIENTATION:	90°			**VERTICAL DATUM:**	NAVD88
HAMMER TYPE:	N/A			**START DATE:**	12/3/2019 — **START TIME:** 12:00
HAMMER CALIBRATION-ENERGY TRANSFER RATIO:	N/A			**COMPLETION DATE:**	12/3/2019 — **COMPLETION TIME:** 15:30

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5367.5	0					Hydro-excavated from 0 to 5'	0	3' x 3' x 6" Concrete pad at surface; From 0 to 19' Cement Grout
5362.5	5					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** Weathered and friable, yellow to light-brown colored, very-fine grained sandstone interbedded with tan to brown-colored siltstone and claystone. Oxidized from 26-27'. Competent and well-cemented sandstone lenses from 7' to 8' and 16' to 17'. Dry. Gradational contact with underlying unit.	5	From +2' to 24' 4" Nominal Diameter Schedule 80 PVC Blank Casing
5357.5	10						10	
5352.5	15						15	
						WEATHERED SANDSTONE, SILTSTONE, SHALE:		From 19' to 22' Bentonite Seal
5347.5	20						20	

(Continued Next Page)

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

aps

UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
						MW-89

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5347.5	20					**WEATHERED SANDSTONE, SILTSTONE, SHALE:** Weathered and friable, light-grey to tan colored, very-fine grained sandstone and siltstone interbedded with weathered, dark-grey colored shale. Relatively competent well-cemented sandstone lenses from 22' to 25', 27' to 28', and 31.5' to 32'. Oxidized from 26' to 27'. Dry. Gradational contact with underlying unit.	20	(Continued) From 19' to 22' Bentonite Seal From 22' to 23' Transititon Sand (20-40) From +2' to 24' 4" Nominal Diameter Schedule 80 PVC Blank Casing
5342.5	25						25	From 24' to 34' 4" Nominal Diameter Schedule 80 PVC Screen (Slots 0.020") From 23' to 35' Filter Pack Silica Sand (10-20)
5337.5	30						30	End Cap
						UNWEATHERED SHALE AND SANDSTONE: Unweathered and competent, dark-gray to blue-colored shale interbedded with unweathered and very-fine grained sandstone. Hard. Dry.		
5332.5	35						35	
5327.5	40						40	From 35' to 51' Bentonite Plug
5322.5	45						45	

(Continued Next Page)

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-89 (RW-01 BORING)

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5322.5	45					**UNWEATHERED SHALE AND SANDSTONE:** continued	45	(Continued)
								From 35' to 51' Bentonite Plug
5317.5	50						50	
						Total Depth = 51'		Total Depth = 51'
5312.5	55						55	
5307.5	60						60	
5302.5	65						65	
5297.5	70						70	

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

aps	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
							MW-89

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-90 (RW-04 BORING)

PROJECT:	APS Four Corners			PROJECT LOCATION:	APS Four Corners Power Plant, Fruitland, NM
PROJECT MANAGER:	E. Lodolce			PROJECT FEATURE:	Return Water Pond
LOGGED BY:	I. Torres			WOOD PROJECT #:	14-2018-2068
DRILLER:	J. Vankirk			ADWR REG. #:	N/A
DRILLER FIRM:	Cascade Drilling LP			COORDINATES:	N2069323.274, E2530400.262
RIG I.D.:	N/A			COORDINATE SYS:	New Mexico West State Plane NAD83
RIG TYPE:	Sonic			SURFACE ELEV. (FT):	5372.925
BORING TYPE:	N/A	BORING DIA.:	8"	MEAS. PT. ELEV (FT):	5374.082
ORIENTATION:	90°			VERTICAL DATUM:	NAVD88
HAMMER TYPE:	N/A			START DATE:	12/4/2019 START TIME: 09:00
HAMMER CALIBRATION-ENERGY TRANSFER RATIO:			N/A	COMPLETION DATE:	12/4/2019 COMPLETION TIME: 17:00

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5372.9	0					Hydro-excavated from 0 to 5'	0	3' x 3' x 6" Concrete pad at surface From 0 to 23' Cement Grout
5367.9	5					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** Weathered, friable, yellow to dark-brown colored, very-fine grained sandstone interbedded with yellow to dark-grey colored siltstone and claystone. Relatively competent well-cemented sandstone lenses from 5' to 6', 19' to 20', and 27' to 28'. Oxidized from 20' to 21'. Dry throughout with slight moisture in weathered siltstone and claystone. Gradational contact with underlying unit.	5	From +2' to 29' 4" Nominal Diameter Schedule 80 PVC Blank Casing
5362.9	10						10	
5357.9	15						15	
5352.9	20						20	

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

(Continued Next Page)

aps

UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
						MW-90

wood.

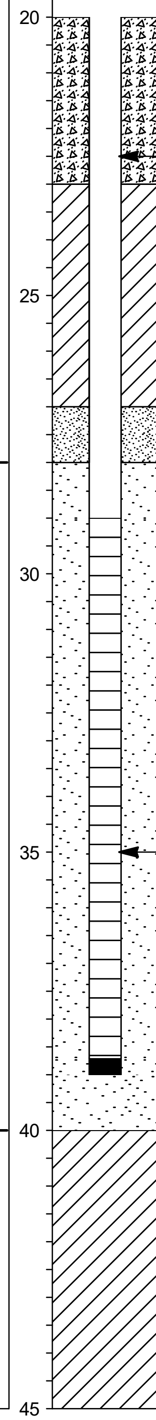
Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-90 (RW-04 BORING)

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)
5352.9	20					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** continued
5347.9	25					
	28					**WEATHERED SANDSTONE, SILTSTONE, SHALE:** Weathered and friable, light-grey to light-brown colored, very-fine grained sandstone and siltstone interbedded with weathered, friable, light-brown to dark-grey colored shale. Relatively competent and well-cemented sandstone lenses from 30' to 33' and 37.5' to 39'. Oxidized from 32' to 32.5' and 37' to 37.5'. Dry. Gradational contact with underlying unit.
5342.9	30					
5337.9	35					
5332.9	40					**UNWEATHERED SHALE AND SANDSTONE:** Unweathered and competent, dark-gray to blue-colored shale interbedded with unweathered, very-fine grained sandstone. Hard, dry.
5327.9	45					

WELL INFORMATION (Construction Details and/or Drilling Remarks)



(Continued)

From 0 to 23'
Cement Grout

From +2' to 29'
4" Nominal Diameter
Schedule 80 PVC
Blank Casing

From 23' to 27'
Bentonite Seal

From 27' to 28' Transititon
Sand (20-40)

From 28' to 40' Filter Pack
Silica Sand (10-20)

From 29' to 39'
4" Nominal Diameter
Schedule 80 PVC
Screen (Slots 0.020")

End Cap

From 40' to 52'
Bentonite Plug

(Continued Next Page)

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
∇		none	
▼			
▼			
▼			

METHOD N/A

aps	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
							MW-90

wood.
Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: MW-90 (RW-04 BORING)

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5327.9	45					**UNWEATHERED SHALE AND SANDSTONE:** continued	45	(Continued)
								From 40' to 52' Bentonite Plug
5322.9	50						50	
						Total Depth = 52'		Total Depth = 52'
5317.9	55						55	
5312.9	60						60	
5307.9	65						65	
5302.9	70						70	

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

aps	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
							MW-90

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: RW-02

PROJECT:	APS Four Corners			**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
PROJECT MANAGER:	2			**PROJECT FEATURE:**	Return Water Pond
LOGGED BY:	I. Torres			**WOOD PROJECT #:**	14-2018-2068
DRILLER:	E. LoDolce			**ADWR REG. #:**	N/A
DRILLER FIRM:	Cascade Drilling LP			**COORDINATES:**	N2068762.671, E2529919.089
RIG I.D.:	N/A			**COORDINATE SYS:**	New Mexico West State Plane NAD83
RIG TYPE:	Sonic			**SURFACE ELEV. (FT):**	5380.546
BORING TYPE:	N/A	**BORING DIA.:**	8"	**MEAS. PT. ELEV (FT):**	- - -
ORIENTATION:	90°			**VERTICAL DATUM:**	NAVD88
HAMMER TYPE:	N/A			**START DATE:**	12/4/2019 — **START TIME:** 09:00
HAMMER CALIBRATION-ENERGY TRANSFER RATIO:	N/A			**COMPLETION DATE:**	12/4/2019 — **COMPLETION TIME:** 12:00

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5380.5	0					Hydro-excavated from 0 to 5'	0	No Well Contructed From 0 to 5' Cement Grout
5375.5	5					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** Weathered and friable, yellow to dark-brown colored, very-fine grained sandstone interbedded with yellow to brown-colored siltstone and claystone. Relatively competent sandstone lens from 14' to 15'. Dry. Gradational contact with underlying unit.	5	
5370.5	10						10	From 5' to 42' Native Fill
5365.5	15						15	
5360.5	20						20	

(Continued Next Page)

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

aps	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
							RW-02

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: RW-02

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5360.5	20					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** continued	20	(Continued)
5355.5	25						25	From 5' to 42' Native Fill
						WEATHERED SANDSTONE, SILTSTONE, SHALE: Weathered and friable, light-grey to light-brown colored, very-fine grained sandstone and siltstone interbedded with weathered, light-brown to dark-grey colored shale. Relatively competent and well-cemented sandstone lens from 28' to 30'. Dry. Gradational contact with underlying unit.		
5350.5	30						30	
5345.5	35						35	
						UNWEATHERED SHALE AND SANDSTONE: Unweathered, competent, dark-gray to blue-colored shale interbedded with unweathered, very-fine grained sandstone. Hard. Dry.		
5340.5	40						40	
						Total Depth = 42'		Total Depth = 42'
5335.5	45						45	

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

METHOD N/A

aps	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
							RW-02

wood.

Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: RW-05

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
PROJECT MANAGER:	E. Lodolce	**PROJECT FEATURE:**	Return Water Pond
LOGGED BY:	I. Torres	**WOOD PROJECT #:**	14-2018-2068
DRILLER:	J. Vankirk	**ADWR REG. #:**	N/A
DRILLER FIRM:	Cascade Drilling LP	**COORDINATES:**	N2069257.503, E2529536.136
RIG I.D.:	- - -	**COORDINATE SYS:**	New Mexico West State Plane NAD83
RIG TYPE:	Sonic	**SURFACE ELEV. (FT):**	5375.749
BORING TYPE:	- - - **BORING DIA.:** 8"	**MEAS. PT. ELEV (FT):**	- - -
ORIENTATION:	90°	**VERTICAL DATUM:**	NAVD88
HAMMER TYPE:	N/A	**START DATE:**	12/5/2019 **START TIME:** 09:30
HAMMER CALIBRATION-ENERGY TRANSFER RATIO:	- - -	**COMPLETION DATE:**	12/5/2019 **COMPLETION TIME:** 11:30

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5375.7	0					Hydro-excavated from 0 to 3'	0	No Well Contructed; From 0 to 5' Cement Grout
	3					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** Weathered and friable, yellow to dark-brown colored, very-fine grained sandstone interbedded with yellow to brown-colored siltstone and claystone. Relatively competent and well-cemented sandstone lenses from 7' to 8' and 18' to 20'. Dry. Gradational contact with underlying unit.		
5370.7	5						5	
5365.7	10						10	From 5' to 37' Native Fill
5360.7	15						15	
5355.7	20						20	

(Continued Next Page)

GROUNDWATER

DEPTH(ft bgs)	HOUR	DATE
	none	

METHOD N/A

aps

UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
- - -	- - -	- - -	- - -	- - -	- - -	- - -

wood.
Environment & Infrastructure Solutions, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona 85034

BORING LOG I.D.: RW-05

PROJECT:	APS Four Corners	**PROJECT LOCATION:**	APS Four Corners Power Plant, Fruitland, NM
ADWR REG. #:	N/A	**PROJECT FEATURE:**	Return Water Pond

Elevation in Feet	Depth in Feet	Graphical Log	Sample ID. or Date (Time)	PID Meter Reading (ppm)	Unified Soil Classification	VISUAL CLASSIFICATION (Color, Moist, % by wt., Plasticity, Dilatancy, Toughness, Dry Strength, Consistency)	Depth in Feet	WELL INFORMATION (Construction Details and/or Drilling Remarks)
5355.7	20					**WEATHERED SANDSTONE, SILTSTONE, CLAYSTONE:** continued	20	(Continued)
						WEATHERED SANDSTONE, SILTSTONE, SHALE: Weathered and friable, light-grey to light-brown colored, very-fine grained sandstone and siltstone interbedded with weathered and friable, light-brown to dark-grey colored shale. Relatively competent and well-cemented sandstone lens from 24' to 26' and 29' to 30'. Oxidized from 27' to 27.5'. Dry. Gradational contact with underlying unit.		
5350.7	25						25	From 5' to 37' Native Fill
5345.7	30						30	
						UNWEATHERED SHALE AND SANDSTONE: Unweathered, competent, dark-gray to blue colored shale interbedded with unweathered, very-fine grained sandstone. Hard. Dry.		
5340.7	35						35	
						Total Depth = 37'		Total Depth = 37'
5335.7	40						40	
5330.7	45						45	

GROUNDWATER

	DEPTH(ft bgs)	HOUR	DATE
▽		none	
▼			
▼			
▼			

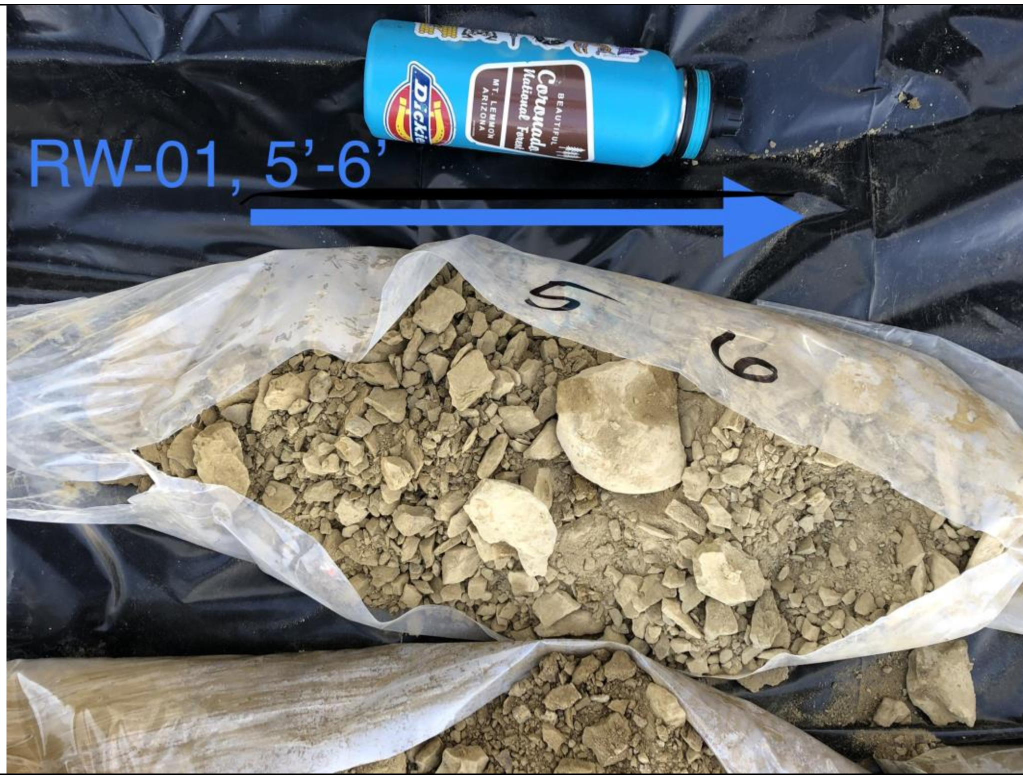
METHOD N/A

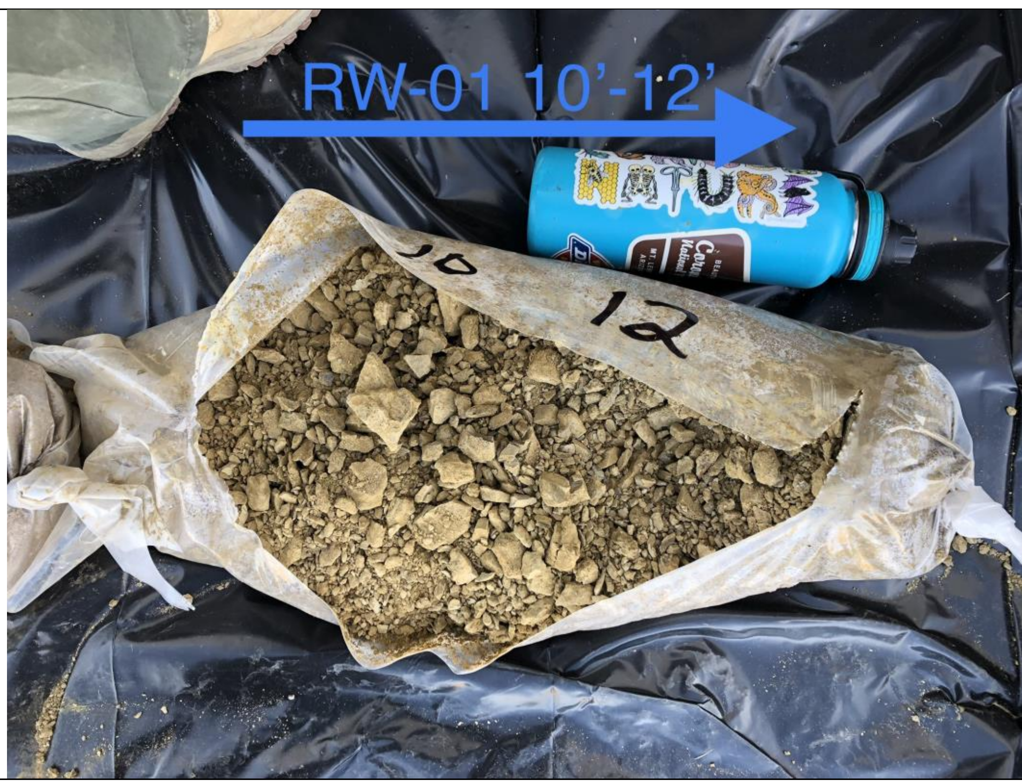
aps	UNIT	DISC.	TYPE	SYS	NUMBER	SHEET	WELL
	---	---	---	---	---	---	---

APPENDIX B

PHOTOGRAPH LOG

Appendix B - Photograph Log

Photograph 1. 5 to 6 feet below ground surface (ft bgs) formation samples from MW-89 (RW-01).	
Photograph 2. 6 to 8 ft bgs formation samples from MW-89 (RW-01).	

Photograph 3. 8 to 10 ft bgs formation samples from MW-89 (RW-01).	
Photograph 4. 10 to 12 ft bgs formation samples from MW-89 (RW-01).	

Photograph 5. 12 to 14 ft bgs formation samples from MW-89 (RW-01).	
Photograph 6. 14 to 16 ft bgs formation samples from MW-89 (RW-01).	

Appendix B - Photograph Log

Photograph 7. 16 to 17 ft bgs formation samples from MW-89 (RW-01).	
Photograph 8. 17 to 19 ft bgs formation samples from MW-89 (RW-01).	

Appendix B - Photograph Log

Photograph 9. 19 to 21 ft bgs formation samples from MW-89 (RW-01).	
Photograph 10. 21 to 23 ft bgs formation samples from MW-89 (RW-01).	

Appendix B - Photograph Log

Photograph 11. 23 to 25 ft bgs formation samples from MW-89 (RW-01).	
Photograph 12. 25 to 27 ft bgs formation samples from MW-89 (RW-01).	

Photograph 13. 27 to 28 ft bgs formation samples from MW-89 (RW-01).	
Photograph 14. 28 to 30 ft bgs formation samples from MW-89 (RW-01).	

Photograph 15. 30 to 32 ft bgs formation samples from MW-89 (RW-01).	
Photograph 16. 32 to 34 ft bgs formation samples from MW-89 (RW-01).	

Appendix B - Photograph Log

Photograph 17.

34 to 36 ft bgs formation samples from MW-89 (RW-01).

Photograph 18.

36 to 38 ft bgs formation samples from MW-89 (RW-01).

Appendix B - Photograph Log

Photograph 19. 38 to 40 ft bgs formation samples from MW-89 (RW-01).	
Photograph 20. 40 to 42 ft bgs formation samples from MW-89 (RW-01).	

Appendix B - Photograph Log

Photograph 21. 42 to 44 ft bgs formation samples from MW-89 (RW-01).	
Photograph 22. 44 to 46 ft bgs formation samples from MW-89 (RW-01).	

Photograph 23. 46 to 48 ft bgs formation samples from MW-89 (RW-01).	
Photograph 24. 47 to 49 ft bgs formation samples from MW-89 (RW-01).	

Appendix B - Photograph Log

Photograph 25. 49 to 51 ft bgs formation samples from MW-89 (RW-01).	
Photograph 26. 12 to 15 ft bgs formation samples from RW-02.	

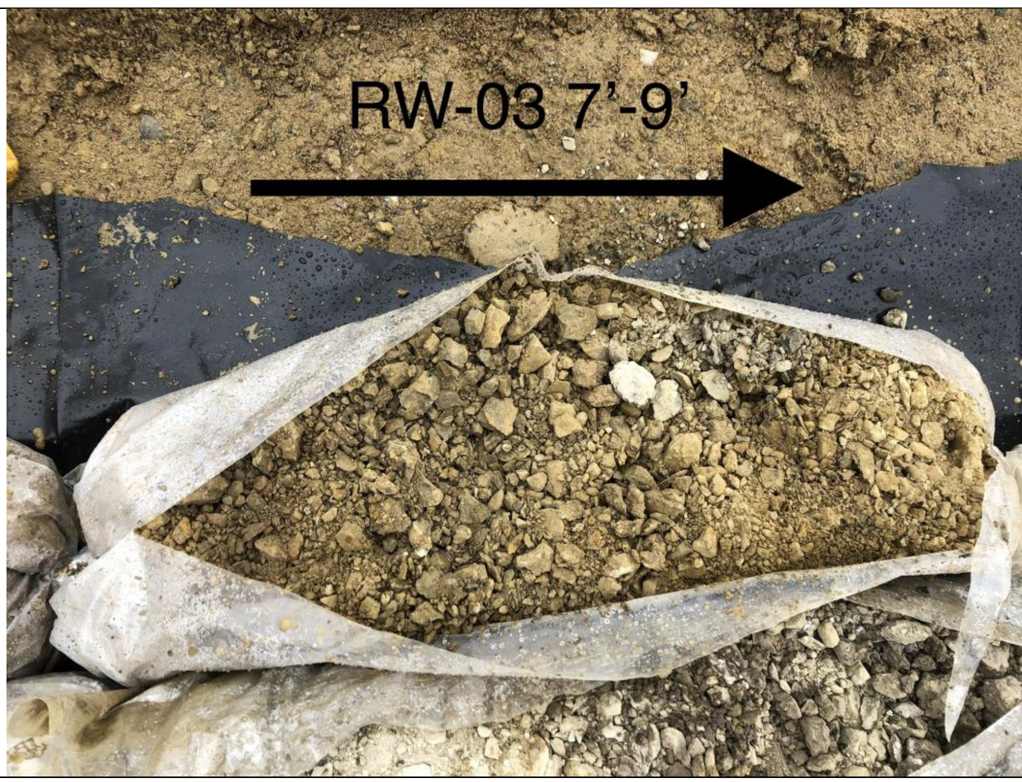
Photograph 27. 14 to 19 ft bgs formation samples from RW-02.	
Photograph 28. 19 to 27 ft bgs formation samples from RW-02.	

Photograph 29. 27 to 31 ft bgs formation samples from RW-02.	
Photograph 30. 31 to 35 ft bgs formation samples from RW-02.	

Appendix B - Photograph Log

Photograph 31. 35 to 38 ft bgs formation samples from RW-02.	
Photograph 32. 38 to 42 ft bgs formation samples from RW-02.	

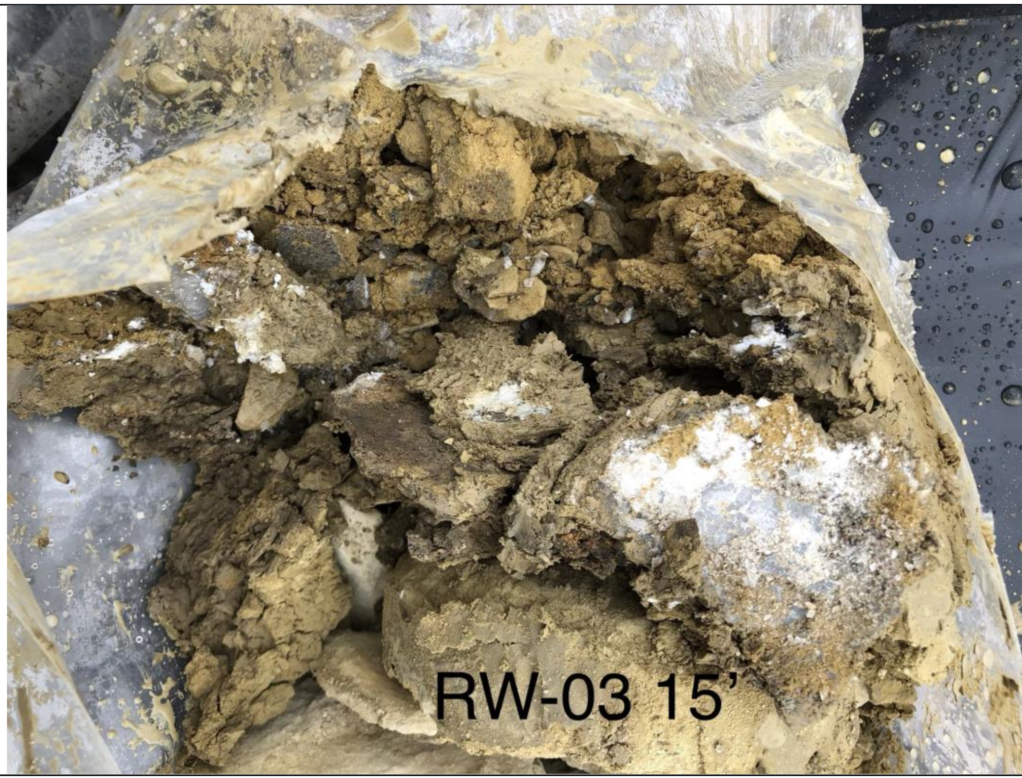
Appendix B - Photograph Log

Photograph 33. 5 to 7 ft bgs formation samples from MW-88 (RW-03).	
Photograph 34. 7 to 9 ft bgs formation samples from MW-88 (RW-03).	

Appendix B - Photograph Log

Photograph 35. 9 to 11 ft bgs formation samples from MW-88 (RW-03).	
Photograph 36. 11 to 13 ft bgs formation samples from MW-88 (RW-03).	

Photograph 37. 13 to 15 ft bgs formation samples from MW-88 (RW-03).	
Photograph 38. Gypsum from the 15 ft bgs interval at MW-88 (RW-03).	

Photograph 39. Weathered shale layer at the 15 ft bgs interval at MW-88 (RW-03).	
Photograph 40. 15 to 17 ft bgs formation samples from MW-88 (RW-03).	

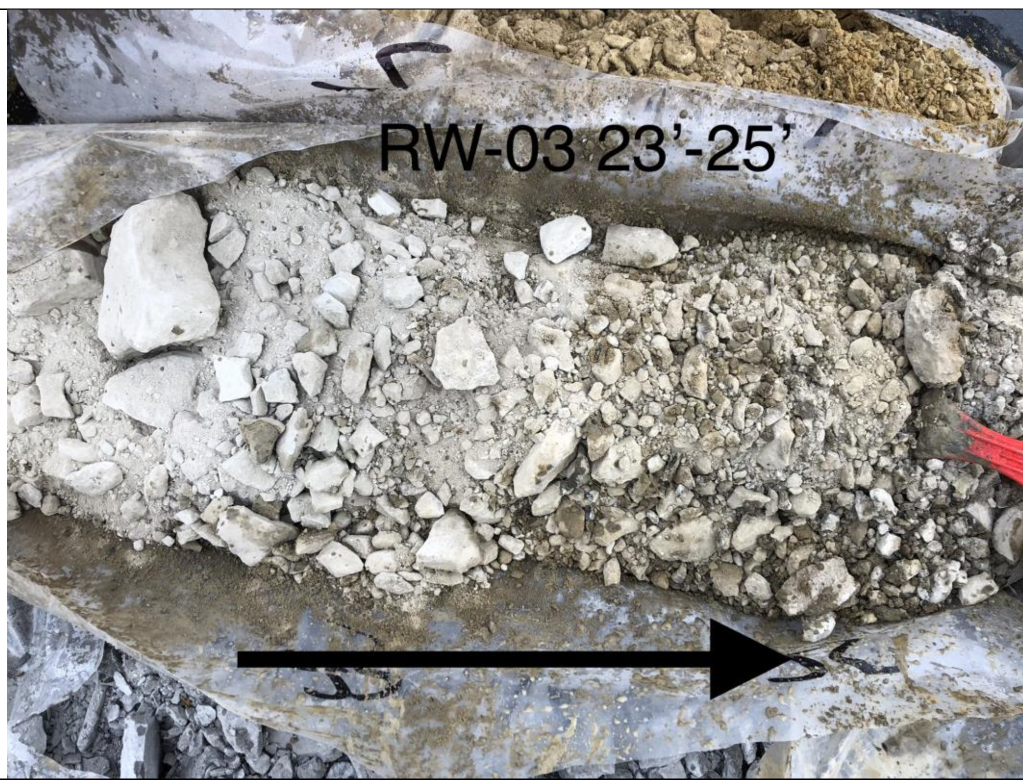
Appendix B - Photograph Log

Photograph 41.

17 to 19 ft bgs formation samples from MW-88 (RW-03).

Photograph 42.

19 to 21 ft bgs formation samples from MW-88 (RW-03).

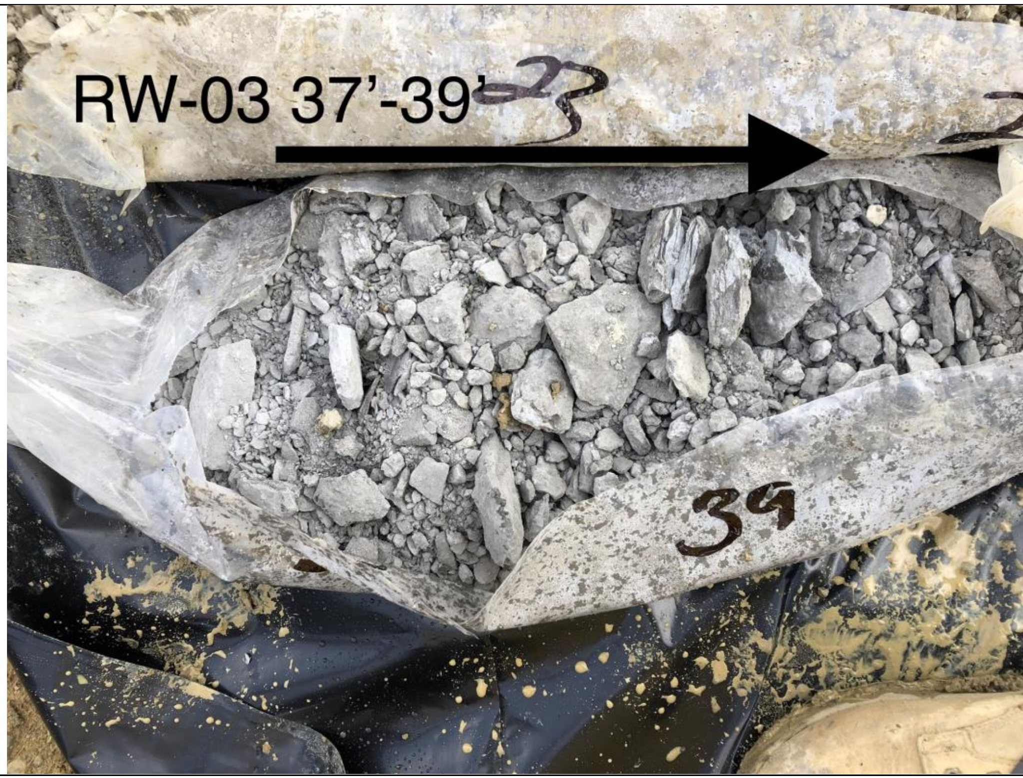
Photograph 43. 21 to 23 ft bgs formation samples from MW-88 (RW-03).	
Photograph 44. 23 to 25 ft bgs formation samples from MW-88 (RW-03).	

Photograph 45. 25 to 27 ft bgs formation samples from MW-88 (RW-03).	
Photograph 46. 27 to 29 ft bgs formation samples from MW-88 (RW-03).	

Photograph 47. 29 to 31 ft bgs formation samples from MW-88 (RW-03).	
Photograph 48. 31 to 33 ft bgs formation samples from MW-88 (RW-03).	

Photograph 49. 33 to 35 ft bgs formation samples from MW-88 (RW-03).	
Photograph 50. 35 to 37 ft bgs formation samples from MW-88 (RW-03).	

Appendix B - Photograph Log

Photograph 51. 37 to 39 ft bgs formation samples from MW-88 (RW-03).	
Photograph 52. 39 to 41 ft bgs formation samples from MW-88 (RW-03).	

Photograph 53. 41 to 43 ft bgs formation samples from MW-88 (RW-03).	
Photograph 54. 43 to 46 ft bgs formation samples from MW-88 (RW-03).	

Appendix B - Photograph Log

Photograph 55. 5 to 9 ft bgs formation samples from MW-90 (RW-04).	
Photograph 56. 9 to 12 ft bgs formation samples from MW-90 (RW-04).	

Photograph 57. 13 to 15 ft bgs formation samples from MW-90 (RW-04).	
Photograph 58. 15 to 19 ft bgs formation samples from MW-90 (RW-04).	

Photograph 59. 19 to 23 ft bgs formation samples from MW-90 (RW-04).	
Photograph 60. 23 to 28 ft bgs formation samples from MW-90 (RW-04).	

Photograph 61. 28 to 31 ft bgs formation samples from MW-90 (RW-04).	
Photograph 62. 31 to 33 ft bgs formation samples from MW-90 (RW-04).	

Photograph 63. 35 to 38 ft bgs formation samples from MW-90 (RW-04).	
Photograph 64. 38 to 40.5 ft bgs formation samples from MW-90 (RW-04).	

Appendix B - Photograph Log

Photograph 65. 40.5 to 42 ft bgs formation samples from MW-90 (RW-04).	
Photograph 66. 42 to 44 ft bgs formation samples from MW-90 (RW-04).	

Appendix B - Photograph Log

Photograph 67.

44 to 46 ft bgs formation samples from MW-90 (RW-04).

Photograph 68.

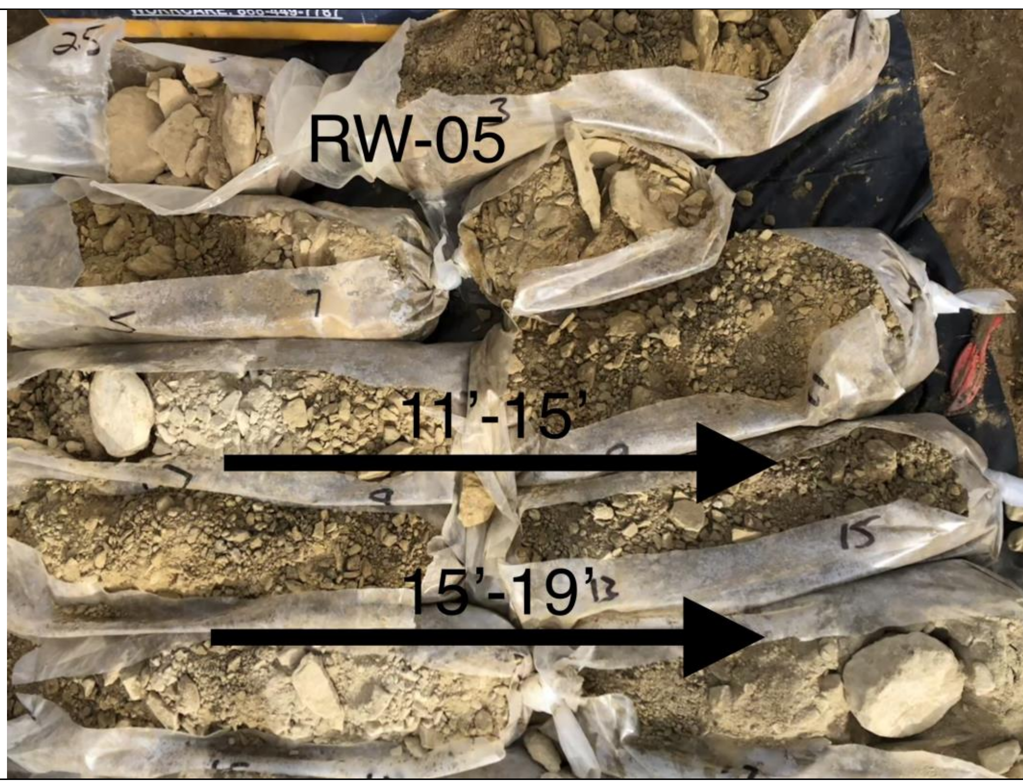
46 to 48 ft bgs formation samples from MW-90 (RW-04).

Photograph 69.

2.5 to 11 ft bgs formation samples from RW-05.

Photograph 70.

11 to 39 ft bgs formation samples from RW-05.



Photograph 71. 19 to 30 ft bgs formation samples from RW-05.	
Photograph 72. 30 to 37 ft bgs formation samples from RW-05.	

APPENDIX C

WELL SURVEY RESULTS

Sakura Engineering & Surveying

Designing for Your Future

CIVIL•STRUCTURAL•MECHANICAL
SURVEYING•GEOTECHNICAL

NEW MEXICO WEST STATE PLANE COORDINATE SYSTEM NAD83
NAVD 88
CONTROL POINT- HV53 N2070581.505, E 2529275.542, ELEV 5331.214

MW 88) N 2069671.787, E 2530047.219 ELEV 5362.705 NORTH SIDE OF DIRT/GRD
5365.249“X”NORTH SIDE OF PVC
5365.664 NORTH SIDE OF STEEL
MW 89) N 2069533.942, E 2530205.136 ELEV 5367.509 NORTH SIDE OF DIRT/GRD
5370.208 “X”NORTH SIDE OF PVC
5370.220 NORTH SIDE OF STEEL
MW 90) N 2069323.274, E 2530400.262 ELEV 5372.925 NORTH SIDE OF DIRT/GRD
5374.082 “X”NORTH SIDE OF PVC
5375.548 NORTH SIDE OF STEEL
RW 02) N 2068762.671, E 2529919.089 ELEV 5380.546

RW 05) N 2069257.503, E 2529536.136 ELEV 5375.749

CM 03) N 2070149.712, E 2534182.752 ELEV 5350.018 NORTH SIDE OF DIRT/GRD
5352.548 “X”NORTH SIDE OF PVC
5352.987 NORTH SIDE OF STEEL
CM 04) N 2070134.870, E 2534271.072 ELEV 5349.513 NORTH SIDE OF DIRT/GRD
5351.644 “X”NORTH SIDE OF PVC
5352.520 NORTH SIDE OF STEEL
CM 01) N 2070334.792, E 2534111.297 ELEV 5348.891 NORTH SIDE OF DIRT/GRD
5351.125 “X”NORTH SIDE OF PVC
5351.743 NORTH SIDE OF STEEL
CM 02) N 2070366.138, E 2534157.054 ELEV 5344.242 NORTH SIDE OF DIRT/GRD
5346.207 “X”NORTH SIDE OF PVC W
5347.420 NORTH SIDE OF STEEL

125 West Main
Suite “A”
Farmington New Mexico 87401

I, Scott A Martin, a New Mexico Professional Surveyor No. 21663, do hereby certify this Monitor Well Survey Report was prepared by me or under my supervision based on an actual survey on the ground that I am responsible for this survey; and that the survey and report meets the minimum standards for surveying in New Mexico.

SCOTT A MARTIN
NEW MEXICO
21663
3-30-2020
PROFESSIONAL SURVEYOR

125 West Main
Suite "A"
Farmington New Mexico 87401