March 29, 2019

2018 ANNUAL PERFORMANCE MONITORING AND SITE-WIDE STATUS REPORT

APACHE POWDER SUPERFUND SITE
COCHISE COUNTY, ARIZONA

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Apache Powder Superfund Site
Cochise County, Arizona

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Prepared for
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2018 ANNUAL PERFORMANCE MONITORING AND SITE-WIDE STATUS REPORT

APACHE POWDER SUPERFUND SITE

COCHISE COUNTY, ARIZONA

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ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
AAWQS	Arizona Aquifer Water Quality Standards
ACM	asbestos containing material
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
ADWR	Arizona Department of Water Resources
ADWSP	Alternate Domestic Water Supply Plan
ammonia-N	ammonia as nitrogen
ANA	aerobic nitrification area
ANPI	Apache Nitrogen Products, Inc.
bls	below land surface
bmp	below measuring point
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
COCs	chemicals of concern
COD	chemical oxygen demand
COP	Community Outreach Plan
CSM	conceptual site model
CY	calendar year
DCP	design confirmation piezometer
DEUR	Declaration of Environmental Use Restriction
DNT	dinitrotoluene
DO	dissolved oxygen
EC	electrical conductivity
EFF-L	primary discharge location for NARS wetland
ESD	Explanation of Significant Differences
EPA	U.S. Environmental Protection Agency
ET	evapotranspiration
FDA	final denitrification area

ACRONYMS AND ABBREVIATIONS (continued)

ft/ft	feet per foot
FYR	five-year review report
GIS	geographic information system
gpm	gallons per minute
GWSI	Groundwater Site Inventory
H+A	Hargis + Associates, Inc.
HBGL	Health-Based Guidance Level
HGI	hydroGEOPHYSICS
ICs	institutional controls
LBP	lead-based paint
LCU	laterally confining unit
LR	linear regression
MCA	Molinos Creek Sub-Aquifer
MCL	Maximum Contaminant Level
mg/l	milligrams per liter
MK	Mann-Kendall
MNA	monitored natural attenuation
msl	mean sea level
NAPA	Northern Area Performance Assessment Model
NARS	Northern Area Remediation System
NG	nitroglycerin
nitrate-N	nitrate as nitrogen
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
O&M	operation and maintenance
ORP	oxidation-reduction potential
PDA	primary denitrification area
pH	hydrogen ion potential
PMP	Performance Monitoring Plan
QAPP	Quality Assurance Project Plan

ACRONYMS AND ABBREVIATIONS (continued)

PZ-A	Perched Zone A (in area of formerly-active evaporation ponds)
PZ-B	Perched Zone B (formerly referred to as MCA)
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RPD	relative percent difference
RPM	Remedial Project Manager
ROD	Record of Decision
SCIPEE	Source Control Plan/Engineering Evaluation
SEW	shallow aquifer extraction well
the Site	Apache Powder Superfund Site located in Cochise County, Arizona
SRL	Arizona Soil Remediation Level (Title 18, Chapter 7)
TCRA	Time-Critical Removal Action
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TNT	trinitrotoluene
TOC	total organic carbon
TOSA	Temporary On-Site Storage Area
TSS	total suspended solids
µg/l	micrograms per liter

2018 ANNUAL PERFORMANCE MONITORING AND SITE-WIDE STATUS REPORT
APACHE POWDER SUPERFUND SITE
COCHISE COUNTY, ARIZONA

EXECUTIVE SUMMARY

This document reports on the annual performance of ongoing groundwater remedial actions as well as the status of other media remedial components at the Apache Powder Superfund Site (the Site) in Cochise County, Arizona, as of the end of Calendar Year (CY) 2018 (Figure 1). The Site remedial actions are being performed pursuant to a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) order under the oversight of the U.S. Environmental Protection Agency (EPA, 1994b, 2009b). Performance monitoring of ongoing remedial actions is performed according to the respective performance monitoring plans (PMPs) and Operation and Maintenance (O&M) plans approved by the U.S. Environmental Protection Agency (EPA) (Hargis + Associates, Inc. [H+A], 2007a, 2007b, 2008b and 2009a).

Groundwater Remedies

The chemicals of concern (COCs) for groundwater at the site are nitrate as nitrogen (nitrate-N) in the Northern Area and nitrate-N and perchlorate in the Southern Area. The Record of Decision (ROD) selected cleanup standards for the Site are 10 milligrams per liter (mg/l) for nitrate-N (EPA, 1994a) and 14 micrograms per liter (µg/l) for perchlorate (EPA, 2005). These standards represent the Federal Maximum Contaminant Level (MCL) for nitrate-N in drinking water and the Arizona Department of Health Services (ADHS) Health-Based Guidance Level (HBGL) for perchlorate, respectively.

Performance monitoring results for groundwater remedies during 2018 indicate that the current remedies of institutional controls (ICs) and long-term groundwater monitoring in the Southern Area and monitored natural attenuation (MNA) and pump-and-treat in the Northern Area were both effective in reducing the volume and areal extent of contaminated groundwater in the

EXECUTIVE SUMMARY (continued)

Northern and Southern Areas of the Site, reducing risk, and protecting human health and the environment (Figure 2). Changes to the groundwater remedies have been made over the years. Pumping and treating shallow aquifer groundwater in the Northern and Southern Areas of the Site was selected as a remedy in the original ROD (EPA, 1994a). Later, MNA was selected as a remedy for contaminated shallow aquifer groundwater in the Southern Area of the Site by a 2005 Amended ROD (EPA, 2005). MNA was selected as a remedy for contaminated shallow aquifer groundwater in a portion of the Northern Area. The selection of MNA followed from several investigations and studies to identify the extent of groundwater contamination as well as the dynamics of solute transport within the aquifer (H+A, 2003a, 2003b, 2003c, 2005a, 2005b, 2006a, 2008a, and 2008c).

In July 2017, EPA issued Explanation of Significant Differences (ESD) #4, which modified the remedy for the Southern Area Groundwater by eliminating MNA, while, retaining ICs and long-term monitoring. This decision was based on the determination that the Molinos Creek Sub-Aquifer (MCA) is not a potable water supply because it is not hydraulically connected to the shallow aquifer in the Southern Area. Instead it is an isolated, artificially created perched zone similar to the original perched zone. The MCA was renamed Perched Zone B (PZ-B), and the original perched zone is now known as Perched Zone A (PZ-A), (EPA, 2017c).

In September 2017, EPA completed its fourth Five Year Review Report for the Site. The Report stated that, for the original perched zone (PZ-A), continuing the pilot dewatering program is not necessary and that the “remedy is protective of human health and the environment for both groundwater and soils because there is no current exposure” (EPA, 2017c).

Southern Area Groundwater

During CY 2018 groundwater levels and concentrations of both nitrate-N and perchlorate were monitored quarterly in PZ-A (area of formerly-active evaporation ponds) and annually, semi-annually or quarterly in PZ-B (formerly known as the Molinos Creek Sub-Aquifer or MCA). Since cessation of wastewater discharges to evaporation ponds in 1995, the areal extent and volume of PZ-A and PZ-B groundwater has decreased significantly. The overall volume of PZ-A groundwater has trended downward as has the volume of groundwater present in PZ-B (Appendix A). However, as the volume of groundwater trended downward, nitrate-N concentrations at some wells in PZ-A and PZ-B have increased, while perchlorate concentrations remained stable. In particular, these trends were observed at piezometer P-03 in PZ-A and at monitor well MW-21 in PZ-B. The phenomenon of increasing concentration with downward trending of volume is believed to be related to vertical stratification of contaminant concentrations. Specifically, in 1995 Apache Nitrogen Products, Inc. (ANPI) released a large volume of freshwater into the unlined evaporation ponds during its testing of a storage tank. This water infiltrated into PZ-A forming a lens of fresh ground water atop the underlying highly contaminated water in perched zone A. The fresh water lens atop PZ-A eventually dissipated by seeping laterally into PZ-B, where it settled atop the underlying highly contaminated water in PZ-B, thus creating the situation of vertical stratification. Evidently, early perched water sampling events were biased by the mix of deeper, more highly concentrated water with shallower, fresher water. But as this shallower, fresher water was displaced, the more highly concentrated water in the deeper zones influenced the samples. In other words, the freshwater fraction of the column was decreasing with time in relation to the underlying contaminated fraction. This is further substantiated by recent effects wherein the concentration trend has decreased in response to apparent recharge effects, likely due to higher annual precipitation recorded in the period from 2014 to 2016. In 2018 concentrations increased slightly in May in conjunction with a decreased saturated thickness of PZ-A, as would be expected with a negative correlation between concentration and saturated thickness influenced by recharge effects. In particular, contaminant concentrations in groundwater in piezometer P-03 and monitor well MW-21 are expected to remain relatively higher in concentration due to their proximity to historical sources (unlined evaporation ponds), the thickness of the saturated sediments at these locations, and the fact that the extremely low gradients and lack of recharge are not expected to carry away or otherwise dilute water from these relatively stagnant areas.

EXECUTIVE SUMMARY (continued)

Recent exploration and characterization in PZ-B has produced information leading to an update of the previous conceptual site model (CSM; H+A 2017d. Specifically, in contrast to the previous CSM, which suggested a more or less continuous basin-like body of contaminated groundwater, it appears that, due to areal heterogeneities in the distribution of sedimentary facies, the PZ-B comprises a discontinuous distribution of smaller pockets of contaminated groundwater. This is essentially similar to the situation in PZ-A, where residual pockets of contaminated groundwater are present in depressions on the erosional surface of the St. David clay.

As a source control measure in the Southern Area, PZ-A groundwater was periodically extracted from piezometer P-03. This measure began in 2002 and continued through September 2017 when it was ended with the concurrence of EPA (EPA, 2017d). This source control measure was ended because ESD #4 documented the isolation of the Southern Area Perched System from the shallow aquifer and the perched system's inability to be a viable groundwater supply which then made the source control measure unnecessary (EPA, 2017c). The estimated volume of groundwater removed from the PZ-A during the period of operation from 2002 through September 2017 was 108,000 gallons. PZ-A piezometer monitoring confirmed that lateral groundwater seepage from the perched zone eastward into PZ-B has not occurred since late 2003.

Recent hydrogeological characterization work in the Southern Area has resulted in setting the monitor well MW-24 area separate from PZ-B (H+A, 2017d). Basically, there appears to be no hydrogeologic or hydraulic association with PZ-B. Nitrate-N and perchlorate concentrations in monitor well MW-24 are below the ROD standards. Given such, this well was removed from the monitoring network per EPA approval in 2018.

In the Southern Area, nitrate-N concentrations in the shallow aquifer were not detected. Both nitrate-N and perchlorate were detected at PZ-A piezometer P-03 and PZ-A monitor well MW-03 at concentrations exceeding the respective cleanup standards in 2018 and 2017, respectively. Both nitrate-N and perchlorate were detected at PZ-B monitor wells MW-21, MW-39, and MW-43 at concentrations exceeding the respective cleanup standards. Nitrate-N concentrations at monitor well MW-23 exceeded the cleanup standard in 2018, exhibiting an increase from recent years, however, it remained below the cleanup standard for perchlorate, at a concentration at 3.6 µg/l. Monitor Well MW-15 remained dry for all sampling events in 2018.

Northern Area Groundwater

The remedy in the Northern Area of the shallow aquifer comprises two components: MNA and a pump-and-treat system, referred to as the Northern Area Remediation System (NARS). The NARS comprises two extraction wells from which contaminated groundwater is pumped and routed to a treatment wetland for denitrification. The water flows under gravity through a series of five treatment ponds. Discharge is routed to a wash (Wash 3), where it infiltrates into the underlying alluvium. During 2018, the NARS was expanded to include a second shallow extraction well (SEW), formerly known as test well TW-01 (renamed SEW-02), which went online in July 2018. In total, the NARS extracted and treated over 34 million gallons of contaminated groundwater which contained approximately 21,600 pounds of nitrate-N in 2018.

The far northern portion of the Northern Area is situated north and outside the influence of the NARS capture zone. Presently, this area relies on natural attenuation to reduce concentrations of nitrate-N in groundwater. The feasibility of MNA in this area was originally assessed during the period of 2005 through 2007 both by a program of field data collection of parameters and model projections. Although the investigations indicated that there were essential components for natural attenuation by biodegradation mechanisms there is not clear evidence that biodegradation has occurred. Therefore, it is believed that hydromechanical dispersion has been the major factor in decreasing concentrations in the shallow aquifer. Dispersion is suggested to have attenuated the nitrate-N in the Northern Area since the organic carbon that is needed for biological denitrification is postulated to be along the San Pedro River.

In 2008, ANPI developed a model for Northern Area Performance Assessment (NAPA). The NAPA model applied field data with an attenuation half-life of two years to project the rate of attenuation of the areal distribution of nitrate-N over time. Since that time, field data indicate that attenuation has occurred at a rate consistent with the model (H+A, 2008c). The 2018 water quality data indicate that all shallow aquifer wells in the Northern MNA management zone are still below the nitrate-N cleanup standard and have been since the middle of 2013, when the nitrate-N concentration at private well D(18-21)06bcb dropped below the standard of 10 mg/l. The position of this particular well is important, considering that it is at the edge of the capture zone of extraction well SEW-01, a component of the pump-and-treat component of the Northern Area remediation system. Concentrations at this well are largely managed by the pumping rate at SEW-01.

Recent Groundwater Studies, Investigations and CSM Refinement

In 2018, efforts were directed towards the acceleration of the NARS performance to expedite the achievement of remedial action goals. As part of this effort, ANPI conducted a pilot testing program using extraction well SEW-02, which began pumping in July 2018 throughout the remainder of the year. In addition, a series of five Northern Area piezometers were constructed along the western bank of the San Pedro to evaluation the potential for capture of San Pedro River subflow during SEW-02 pumping. Additional investigations, including a geophysical survey and the drilling of four potential extraction wells and five exploratory borings were conducted in November 2018. Data from these investigations were incorporated into the CSM to refine the model and close data gaps. The additional data added definition and more evidence to support the heterogeneity driving the transport of contaminants in the model area. Although these data add complexity to the CSM, the refined CSM is generally consistent with the former model, as discussed in detail herein.

Per EPA approval and in accordance with the proposed 2018 performance monitoring schedule, several recommendations in an effort to re-prioritize monitoring efforts and scale back data collection at locations with significant periods of historic record were implemented in 2018. Frequency of sampling of select wells in the Southern Area and Northern Area were reduced and/or eliminated entirely from the 2018 schedule. These changes were based on whether the data collected thus far was deemed sufficient, the well location had been dry for several years, or there were access restrictions which substantially impeded monitoring efforts. Conversely, the monitor wells, extraction wells and piezometers installed in 2018 are recommended to be added to the 2019 performance monitoring schedule, as presented herein.

Building Demolition Activities

Twenty structures were demolished in 2018. A total of approximately 200 buildings and structures, including four buildings classified as historically demolished, have been demolished since 2012.Soil sampling utilizing the incremental sampling methodology was performed at approximately 48 buildings and structures during 2018.

Soils Remedy for Formerly Active Evaporation Ponds

Formerly-active evaporation ponds are ponds that were receiving ANPI wastewaters at the time of the Remedial Investigation (RI) until about 1995. The 2005 ROD Amendment selected a remedy to address soil contamination in such formerly-active evaporation ponds on ANPI property (EPA, 2005). The formerly-active evaporation ponds include Ponds 1A, 1B, 2A, 2B, 3A, 3B, Pond 7, and the Dynagel Pond. The 2005 ROD Amendment designated the Arizona Soil Remediation Levels (SRLs) (Arizona Administrative Code [AAC] R-18), as the cleanup standards for the remedy. The selected remedy included emplacement of a native soil cover to isolate pond soil and sediments containing residual COCs in excess of the SRLs and the imposition of certain ICs. The COCs exceeding SRLs included antimony, arsenic, and beryllium. Soil cover emplacement was completed in 2007 (H+A, 2008a). During 2018, the Pond covers were inspected. As part of the ICs, a Declaration of Environmental Use Restriction (DEUR) for Property with Engineering Control and Non-Residential Restriction was recorded in Cochise County in 2008, according to an approved plan (Arizona Department of Environmental Quality [ADEQ], 2008 and H+A, 2008b).

EXECUTIVE SUMMARY (continued)

Property Boundary

ANPI recently acquired approximately 123 acres of private property at the Site. The acquisition was mainly in the Northern Area near and north of the recent aquifer testing at SEW-02.

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1.0 INTRODUCTION

This document reports on the annual performance of ongoing groundwater remedial actions as well as the status of other media remedial components at the Apache Powder Superfund Site (the Site) in Cochise County, Arizona, as of the end of Calendar Year 2018 ([CY 2018] Figure 1). The Site remedial actions are being performed pursuant to a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) order under the oversight of the U.S. Environmental Protection Agency (EPA, 1994b, 2009c). Performance monitoring of ongoing remedial actions is performed according to the respective performance monitoring plans (PMPs) and Operation and Maintenance (O&M) plans approved by the U.S. Environmental Protection Agency (EPA) (Hargis + Associates, Inc. [H+A], 2007a, 2007b, 2008b and 2009a).

1.1 SITE DESCRIPTION

The Site comprises an area of approximately nine square miles of mixed industrial and rural properties located in Cochise County, approximately seven miles southeast of the town of Benson, Arizona (Figure 1). The Apache Nitrogen Products, Inc. (ANPI) property comprises approximately 1,300 acres of land, located in a portion of section 31, Township 17 South (T.17 S.), Range 21 East (R.21 E.), a portion of section 12, T.18 S., R.20 E. and portions of Section 6, 7, and 8 in T.18 S., R. 21 E. (Figure 1).

Most of the upland areas of the Site can be described geomorphologically as “badlands terrain”. Badlands are characterized by a hummocky topography, dissected by fine ephemeral drainages. Softer sedimentary rocks and clay-rich soils have been extensively eroded by wind and water processes. In appearance, badlands are characterized by steep slopes, minimal vegetation, lack of a substantial regolith, and high drainage density (Parsons and Abrahams, 2009). Lowland areas found in the floodplain areas along the San Pedro River are riparian. Rural homesteads surround the ANPI property, some of which are farms and livestock properties, while others are primarily residential.

ANPI recently acquired approximately 123 acres of private property at the Site (Figure 1). The acquisition was in the so-called Northern Area of the Site. With this property acquisition, the nitrate as nitrogen (nitrate-N) plume within the shallow alluvial aquifer along the west side of the San Pedro River is now approximately 58 percent beneath the ANPI property boundary. The total plume area is approximately 73.5 acres and approximately 43.5 acres is now on ANPI property.

1.2 REPORTING

Remedy performance is evaluated by means of ongoing performance monitoring and operations and maintenance (O&M) programs. Weekly, monthly, quarterly, and annual reports are prepared and transmitted to the respective regulatory agencies. This annual report includes a summary of the data collected for the various active remedies, evaluation of data trends, discussion of performance and effectiveness of remedy, summary of the quality assurance/quality control of the sampling analysis activities, and recommendations for modifications to the monitoring schedule focusing on the CY 2018.

Performance monitoring plans have been prepared for the respective ongoing Site remedies. These comprise four separate documents titled:

- *Operation and Maintenance Plan Northern Area Remediation System, Revision 3.0* [NARS O&M Plan] (H+A, 2007a),
- *Southern Area Performance Monitoring Plan, Revision 2.0* [Southern Area PMP] (H+A, 2007b),
- *Soils Engineering Control Plan* [Soils O&M Plan] (H+A, 2008b), and
- *Performance Monitoring Plan for Monitored Natural Attenuation of Shallow Aquifer Groundwater in the Northern Area of the Apache Superfund Site, Revision 1.0*, [Northern Area PMP] (H+A, 2009a).

1.3 REMEDY COMPONENTS

The Site media (or remedy) components that are currently being monitored for remedy performance include the Southern Area Perched System Perched Zone A (PZ-A; area of formerly-active evaporation ponds 1A, 1B, 2A, 3A, 3B, Pond 7 and the Dynagel Pond), the Southern Area Perched System Perched Zone B (PZ-B; formerly referred to as the Molinos Creek Sub-Aquifer [MCA]), and the formerly-active evaporation ponds in the Southern Area of the Site. Media Component 8, Legacy Soils Area, was recently added by the Explanation of Significant Differences (ESD) #4 (EPA, 2017a). This component was added to address the cleanup of potential soil contamination that may be uncovered during the demolition of legacy structures and buildings from historical manufacturing processes. ANPI started its demolition project in 2012. In the Northern Area shallow aquifer groundwater is also an ongoing component of the remedy. These media components are listed in Table 1.

Other media components relating to various areas of contaminated soils and waste materials have included the White Waste and Vanadium Pentoxide Storage Areas, Temporary On-Site Storage Area (TOSA), Wash 5 Drum Disposal Area, and the dinitrotoluene (DNT) Drum Storage Area. A removal action was performed in the “Wash 3 DNT Drum Disposal Area” beginning in 1993 and completed in 2000 (EPA, 1993). A Time-Critical Removal Action (TCRA) was performed in the “Trinitrotoluene (TNT) Contaminated Area. The TNT TCRA was completed in 2000. Remedial action implementation reports were issued for all media (H+A, 2002b and 2002c). In 2014, EPA issued another TCRA addressing a finding involving nitroglycerin (NG) and detonating cord wastes in an abandoned building slated for demolition (EPA, 2014). This removal action was implemented in 2014 (H+A, 2016).

Prior to 2016, remedial actions for the Southern Area media components included the perched groundwater both beneath the formerly-active evaporation pond areas and in the MCA and decommissioning of ANPI’s formerly-active evaporation ponds. Suppling bottled drinking water to potentially affected properties that relied on shallow aquifer groundwater for domestic consumption was instituted in the early 1990s. Discharge from PZ-A to PZ-B ceased after all formerly-active evaporation ponds stopped receiving industrial wastewater discharges in 1995. The remedy for the Southern Area also included the institutional control (ICs) for the Site and monitored natural attenuation (MNA). These measures were implemented pursuant to the 2005 Amended Record of Decision (ROD) (Figure 2) (EPA, 2005). Subsequently, native soil covers were emplaced over the formerly-active evaporation Ponds in December 2007 (H+A, 2008a). A Declaration of Environmental Use Restriction (DEUR) for Property with Engineering Control and Non-Residential Restriction was recorded in Cochise County in 2008, according to an approved plan (Arizona Department of Environmental Quality [ADEQ], 2008 and H+A, 2008b). Requisite ICs were, and continue to be, implemented per the ROD Amendment (EPA, 2005).

After a study of the Southern Area perched zone pursuant to recommendations in the third five-year review (FYR) (EPA, 2012), ANPI updated its Conceptual Site Model (CSM) for the Southern Area (H+A, 2017d). The MCA was determined to be a second area of perched groundwater and renamed Perched Zone B (PZ-B), whereas the original perched zone was renamed Perched Zone A (PZ-A). Both PZ-A and PZ-B are experiencing declining water levels and have been determined to be hydraulically isolated from each other and from the shallow alluvial aquifer along the San Pedro River in the Southern Area.

Based on the new CSM, EPA modified its Media Component 1 called out in the 1994 ROD from "Perched Groundwater", which included only the groundwater beneath the formerly-active evaporation ponds, to the "Southern Area Perched System." Therefore, Media Component 1 now includes both PZ-A (the groundwater beneath the formerly active evaporation ponds) and PZ-B (Tables 1 and 2). In addition, the revised CSM report documented the attempts to use *in situ* methods to supplement MNA within the PZ-B footprint. However, the *in situ* methods were unsuccessful due to the lack of a sufficiently extensive body of water in PZ-B and poor hydraulic communication across the sedimentary strata. Due to the lack of hydraulic connection between PZ-B and the shallow aquifer, including the lack of hydraulic flow through PZ-B, and poor yield indicating a lack of a potable water supply, PZ-B was determined to be a fully isolated perched zone similar to PZ-A. As a result, in July 2017, EPA signed an ESD #4 eliminating MNA as a component of the remedy for the Southern Area perched system. Further, pumping and evaporation of PZ-A perched water, which had been performed since 2002, was deemed unnecessary since the previously established ICs and long-term groundwater monitoring were considered sufficient for this isolated groundwater body (EPA, 2017c).

EPA's ESD #4 added media component 8, Legacy Soils Area, to the Southern Area. Demolition of on-site historical structures deemed to be unnecessary for future manufacturing has been ongoing since 2012 in the ANPI operations area. The Legacy Soils Area component was added to cover the cleanup of potential soils contamination that may be uncovered during this demolition work.

The groundwater remedy for the Northern Area still comprises both an active pump-and-treat component known as the Northern Area Remediation System (NARS) and an MNA component. Nitrate-contaminated groundwater is extracted by shallow aquifer extraction wells (SEW-01 and SEW-02) and treated in a wetlands treatment system to remove (denitrify) the nitrate-N (Figure 2). North of the extraction well SEW-01 and SEW-02 capture envelope, nitrate-N is reduced within the aquifer through various mechanisms of natural attenuation (EPA, 2008).

As discussed above, ICs have been implemented at the Site to prevent access to contaminated soils and groundwater. Other ICs have been implemented to provide surveillance measures to ensure that the remedy remained protective of human health (Table 2). More detailed information concerning ICs is provided in Section 6.0.

1.4 OTHER ACTIONS

During CY 2018, ANPI continued demolition actions directed toward the modernization and upgrading of plant operations. These actions require the demolition of approximately 180 obsolete and unused buildings on the plant that supported former and since discontinued manufacturing operations. Demolition activities are subject to pre-demolition sampling for hazardous materials and wastes (lead and asbestos) as described in a separate workplan (H+A, 2012). All work is being completed under the oversight of EPA and ADEQ. A summary of all demolition activities conducted between 2012 and 2016 was prepared and submitted to EPA (H+A, 2017a). A final report summarizing all demolition activities between 2012 through 2018 is in preparation for submittal to the EPA upon completion.

1.5 PROJECT ORGANIZATION

An organization chart showing responsibilities for implementing performance monitoring and O&M activities at the Site has been prepared (Figure 3). The organization chart indicates the respective roles of government agencies and contractors involved with the project. The primary governmental agencies include EPA and ADEQ. The responsible party is ANPI. ANPI is supported by its consultant, contractors, and laboratories.

1.6 SITE REMEDIATION STANDARDS

EPA has selected remediation standards for the cleanup of groundwater at the Site. The chemicals of concern (COCs) identified for groundwater are nitrate-N and perchlorate. Perchlorate is limited to PZ-A and PZ-B in the Southern Area; whereas nitrate-N is the only COC for Northern Area groundwater. The EPA selected the Maximum Contaminant Level (MCL) for drinking water of 10 milligrams per liter (mg/l) as the Site cleanup standard for nitrate-N (EPA, 1994a). The Arizona Department of Health Services (ADHS) Health-Based Guidance Level (HBGL) for drinking water of 14 micrograms per liter (µg/l) was selected for perchlorate in Site groundwater (EPA, 2005). The COCs for the formerly-active evaporation ponds are antimony, arsenic, and beryllium which remain in concentrations above the Arizona residential Soil Remediation Levels (SRLs) (EPA, 2000; ADEQ, 2009; Arizona Administrative Code [AAC] Title 18). The ROD-selected remedy permitted leaving contaminated sediments in place beneath a native soil cover (cap) (EPA, 2005). For demolition activities, the cleanup standards for soils are the Arizona non-residential SRLs.

2.0 SOUTHERN AREA

The Southern Area of the Site includes most of the historical and current ANPI manufacturing areas and the immediately-surrounding areas along the San Pedro River and upland. This is the area drained by ephemeral washes designated as Wash 5 and Wash 6 (Figure 2). This area incorporates principally PZ-A and PZ-B, MW-24, the Southern Area Shallow Aquifer, and formerly-active evaporation ponds.

It is important to understand the hydrologic relationship between PZ-B and PZ-A, which is situated to the west of PZ-B and underlying the formerly-active evaporation ponds. The hydrogeologic conceptualization of PZ-B features an essentially stagnant alluvial system that was created mostly by artificial recharge of industrial wastewater. PZ-B is isolated hydraulically from the laterally-adjacent, shallow alluvial aquifer system along the San Pedro River to the east. This lateral isolation occurs as a result of fine-grained, overbank deposits that separate the San Pedro system from the coarse-grained alluvium in PZ-B (H+A, 2003a). The fine-grained sediments that result in this lateral isolation are referred to as the Laterally-Confining Unit (LCU). Underlying and forming the base of PZ-B as well as the base of the shallow alluvial aquifer along the San Pedro River is a clay unit of the St. David Formation. The St. David clay is the upper unit of the St. David Formation and comprises a hard, red-brown clay stratum 200 or more feet thick at the Site.

Much of the groundwater in PZ-B is present as a result of seepage from PZ-A. PZ-A was created as a result of groundwater mounding due to leakage from ANPI's formerly-active unlined evaporation ponds. Due to the subsurface topography, the elevation of PZ-A groundwater is notably higher than both that of PZ-B and the shallow aquifer. The hydrogeology of PZ-A was first interpreted during the Site Remedial Investigation (RI) and later studied by Deane (Deane, 2000). Specifically, Deane's interpretation was largely based on the paleogeomorphology of the St. David clay surface, which he identified as a paleodrainage system. As such, paleochannels were "etched" into the underlying clay surface. These, now buried, paleochannels serve to both collect water that infiltrated historically through the formerly-active evaporation pond bottoms and also direct drainage away from the PZ-A groundwater mound. Deane identified such paleofeatures in the field on the basis of both exploratory drilling and seismic reflection surveys.

Historically, under sufficient hydraulic mounding of PZ-A groundwater in terrace deposit sediments overlying the clay (informally referred to as the Granite Wash unit), water seeped eastward from PZ-A into PZ-B. Presently the volume and water level elevations of PZ-A groundwater are insufficient to sustain lateral flow into PZ-B (H+A, 2017d). This is confirmed in the field by measurements within a, roughly north-south, line of perched zone monitor wells constructed across the edge of PZ-B (MW-29, MW-30, MW-31, and MW-32). This field evidence confirms the elimination of PZ-A as a source for PZ-B, despite persistence of small remnants of PZ-A water at the piezometer P-01 and P-03 locations (Figure 4).

2.1 SOUTHERN AREA REMEDY

Voluntary pumping and evaporation of water was being conducted since 2002 at the original perched zone (PZ-A) and MNA was the EPA remedy of the MCA (PZ-B) prior to ESD #4 (EPA, 2017a). The EPA determined that the dewatering pilot program at PZ-A was no longer necessary based on the documentation of the hydraulic isolation of PZ-A and PZ-B from each other and the shallow aquifer groundwater along with a lack of a potable water supply in PZ-A and PZ-B (EPA, 2017c). ESD #4 also abandoned MNA as a remedy for PZ-B, while retaining long-term groundwater monitoring and ICs as the remedy for the Southern Area (EPA, 2017a).

With respect to the shallow alluvial aquifer along the San Pedro River, the COCs found in PZ-A and PZ-B are not present, presumably as a result of the hydraulic isolation afforded by the LCU. Nevertheless, long-term groundwater monitoring and ICs remain in effect as preventive measures.

During CY 2018, groundwater samples were collected from PZ-A monitor wells, PZ-B monitor wells, and Southern Area shallow alluvial aquifer monitor wells in accordance with an approved schedule as outlined in the Southern Area PMP (H+A, 2007b) (Table 3). The results of PMP quarterly monitoring have been provided in separate quarterly reports to EPA. The November 2018 quarterly report result figures are included in this annual report in Appendix B.

2.2 PERCHED ZONE A GROUNDWATER

As discussed earlier, the PZ-A groundwater underlies ANPI's primary operations area, which is in the southern portion of the ANPI property and in the vicinity of the formerly-active evaporation ponds (Ponds 1A, 1B, 2A, 2B, 3A, and 3B) (Figures 2 and 5). These ponds received process wastewaters from 1971 until approximately February 1995. When the brine concentrator facility was brought online in 1995, ANPI eliminated all former discharges of process wastewater to the ponds.

PZ-A groundwater is present in this area within underlying alluvial materials overlying the erosional surface of the St. David clay under unconfined conditions. It is important to note that the quality of water discharged to ponds varied significantly over the years. Additionally, the rate of evaporation and hence concentration of dissolved solids in the infiltrating wastewaters varied seasonally. First, the quality of the water in ANPI's waste stream compared with the quality of PZ-A groundwater indicates that the PZ-A generally had a much a higher concentration of dissolved solids. This was suggested by a Source Control Plan/Engineering Evaluation (SCIPEE) study contracted by ANPI, which involved sampling of various waste streams in the plant (H+A, 1990; Malcolm Pirnie, 1991). In turn, this suggests that evaporation of water detained in the ponds played a significant role in concentrating dissolved solids including the COCs, nitrate-N and perchlorate.

By 1995, many process improvements had been implemented by ANPI, such that the quality of wastewater discharged to the formerly-active evaporation ponds had greatly improved. In fact, the last volume of water discharged to the ponds was actually fresh makeup water produced from ANPI production well ANP-4. This water had been used to pressure test the 1.2-million gallon surge tank associated with the new brine concentrator facility constructed in the mid-1990s. The fresh water remained in the ponds for some time. Thus, it is believed that a significant percentage of this fresh water infiltrated into PZ-A, creating a lens over the older, more contaminated water, and thereby resulting in vertical stratification of water quality. As such, the concentration of dissolved solids increased with increasing depth. Such vertical stratification has been reported by multiple authors (e.g., Schmidt, 1977; Parker, et al., 1983).

Ongoing quarterly monitoring of water levels in PZ-A piezometers and monitor wells confirms both cessation of lateral seepage into PZ-B and the shrinkage of the areal extent and volume of PZ-A. Presently, remnants of PZ-A perched groundwater are only present at the P-01 and P-03 locations, unless a localized lens is created by piping leaks or overly-aggressive landscape irrigation. Groundwater levels and COC concentrations at these locations fluctuate, potentially due to local recharge as well as the intermittent groundwater extraction at P-03 conducted from 2002 to 2018. Historical water levels measured at PZ-A monitor well MW-29, situated at the edge of PZ-B, indicate that seepage from the perched zone into the PZ-B has not occurred since late 2003 (Figure 4).

PZ-A comprises part of the Southern Area performance monitoring network (Figure 6). As discussed earlier, PZ-A represents a potential source area for PZ-B because of historical discharges of nitrate-N and perchlorate-bearing groundwater to this area. The goal of PZ-A performance monitoring is primarily to verify that these discharges do not resume. In addition to performance monitoring, ICs provide another level of protection in association with the Southern Area remedy. For example, as a provision of the DEUR, groundwater resource development in this area of the ANPI property is precluded. Section 6.0 provides further details on ICs.

During CY 2018, performance monitoring was performed quarterly in PZ-A (Table 3). The monitoring included quarterly measurements of water level elevations and collection of water quality samples. The PZ-A performance monitoring network includes piezometers P-01, P-03, P-10 and perched monitor well MW-29 (Figure 6). The implementation of the 2018 performance monitoring schedule per EPA approval reduced the PZ-A performance monitoring network, beginning in the third quarter of 2018 (Table 3). Perched monitor wells MW-03 and MW-04 were removed from the schedule and piezometer P-10 was reduced to water level monitoring only at this time. While historically other monitor wells and piezometers were used to characterize groundwater conditions across the PZ-A, the dissipation of PZ-A water has obviated the need to continue monitoring at these sites. Perched zone piezometers P-02, P-04, P-05, P-06, P-07, P-08, P-09, P-11, and monitor wells MW-02, MW-03, MW-04 and MW-07 are dry and no longer monitored (Figure 4). PZ-A piezometer P-10 and perched monitor wells MW-29, MW-30, MW-31, and MW-32 are monitored quarterly for water level elevation to confirm that communication between PZ-A and PZ-B has not resumed (Figure 4). The P-10 and MW-29 locations are believed to represent a paleochannel on the surface of the St. David clay and are therefore monitored to assess potential seepage from PZ-A into PZ-B (Deane, 2000).

2.2.1 Water Level

During CY 2018, water level elevations were measured quarterly in PZ-A piezometers P-01, P-03, and P-10, and perched monitor wells MW-03, MW-04 (discontinued in the third quarter of 2018), and MW-29 through MW-32. PZ-A piezometers P-01 and P-03 were the only monitoring locations where groundwater depths were sufficient to measure during each monitoring event (Table 4; Figure 4). The water levels at piezometer P-01 recovered by December 2018 to a similar elevation than reported in First Quarter 2018, while the water level at P-03 decreased during 2018 (Figures A-1 and A-2 in Appendix A). This decrease may be attributed to sparse precipitation as compared to 2014 and 2016. Extraction from piezometer P-03 was discontinued in 2017 per discussions with the EPA and therefore should not have contributed to the decline in the water level (Table 6). Occasional water level increases at piezometers P-01 and P-03 are believed to be attributed to natural and/or artificial recharge such as the increased local precipitation in 2014 and 2016 (Table 18). Natural recharge occurs from infiltration of precipitation and/or overland runoff, particularly where water may be detained at the surface, while artificial recharge might occur from water line leaks, irrigation, or other water handling practices. Despite short term fluctuations in water level measurements within PZ-A, the decline in water levels is an overall long-term trend. However, the overall long-term declining water levels in PZ-A are attributed to coupling both the cessation of wastewater discharges to the formerly-active evaporation ponds in 1995 and the declines caused by pumping from the recently de-activated pilot dewatering program. Groundwater was only detected in PZ-A monitor well MW-03 in the second quarter in 2018 (Table 4; Figure 4). PZ-A monitor wells MW-29, MW-30, MW-31 and MW-32 remained dry in 2018, confirming that seepage from PZ-A into PZ-B was not occurring.

The saturated thickness of PZ-A ranged from approximately 3.49 to 4.19 feet at perched zone A piezometer P-01 and from approximately 8.33 to 9.62 feet at piezometer P-03. The saturated thickness was 1.72 feet at monitor well MW-03 in August 2018 and monitor well MW-04 was dry throughout 2018 (Table 5; Figures 4 and 7). Water level elevations ranged from approximately 3,638.60 feet above mean sea level (msl) at monitor well MW-03, to approximately 3,666.42 feet above msl at piezometer P-01 in 2018 (Table 4; Figures 4 and 7). The comparatively significant difference in elevation is typical of groundwater perching due to differences in the elevation of the underlying perching unit (St. David clay). The surface of the St. David clay is the low permeability unit upon which the perched groundwater rests. To the east, the clay forms the base of the shallow alluvial aquifer along the San Pedro River. It further serves to confine the deep regional aquifer 200 or more feet below the land surface. In the geologic past, this unit was subjected to subaerial erosion, which resulted in uneven depressions or pockets on the clay surface, and thus created areas that collect groundwater. These were described as geomorphic paleofeatures by Deane (2000). These perched pockets of groundwater occur at different elevations due to the different elevations of the clay unit. Despite the differences in elevation, there is no hydraulic connection that would facilitate lateral groundwater movement (Figure 7).

2.2.2 Perched Zone A Dewatering

In 2002, operation of a pilot extraction/treatment system was initiated. This system provided for additional source control for the PZ-B and further accelerated PZ-A dewatering. The dewatering operation initially involved the pumping of groundwater from PZ-A piezometer P-03 using a submersible pump (H+A, 2002a). Extracted PZ-A groundwater was discharged into lined pools and allowed to evaporate. The pools were replaced with lined, steel stock tanks in 2009. Operation of the dewatering has continued since 2002. In April 2008, the submersible pump failed and was removed from piezometer P-03. In its place, a wind-powered air-lifting device was installed. Not long after installation, that system failed and groundwater could no longer be extracted. The dewatering system remained inoperative through the remainder of 2008, with the exception of occasional groundwater withdrawals using a small submersible pump powered by a portable generator. In 2009, pumping was resumed. On May 9, 2010, a solar powered submersible pump was installed for groundwater extraction at piezometer P-03. As discussed earlier, the pilot dewatering program at P-03 was ended in 2017 per a determination of the Fourth FYR, and ESD #4 (EPA, 2017a and b). During previous years quarterly PMP sampling rounds the pump is run at an estimated two gallons a minute until three borehole volumes were purged. The purged volume from the periodic purging events represents the total volume discharged from piezometer P-03 per year. This information was reported in the ANPI Monthly Performance Reports. Since the system was initially installed in 2002, an estimated 108,378 gallons have been removed (Table 6).

2.2.3 Water Quality

Groundwater samples were collected from PZ-A piezometer P-03 during 2018 quarterly groundwater monitoring. Nitrate-N detections in samples collected from the PZ-A piezometer P-03 decreased from 6,100 mg/l in February 2018 to approximately 5,900 mg/l in December 2018 (Table 7) (Figure A-2 in Appendix A). Conversely, perchlorate detections in samples collected from the PZ-A piezometer P-03 increased from 420 µg/l in February to an estimated concentration of 580 µg/l in December during 2018 (Table 7; Figure A-2).

PZ-A piezometer P-01 was also monitored quarterly during 2018. All nitrate-N and perchlorate concentrations were less than their respective cleanup standards, except for the nitrate-N concentration in May 2018 at 34 mg/l in both the original and duplicate sample and in August 2018 with an estimated concentration of 13 mg/l in both the original and duplicate sample (Table 7; Figure A-1). PZ-A monitor wells MW-03 and MW-04 were not sampled in 2018 due to a lack of sufficient water (Table 7). Last sampled in early 2017, nitrate-N in both wells was at concentrations greater than the cleanup standard. Perchlorate was above the cleanup standard only in monitor well MW-03. Per EPA approval, monitoring of fluoride and ammonia as nitrogen (ammonia-N) was discontinued in the perched zone in 2009 (EPA, 2009a).

2.2.4 Perched Zone A Status

Current data are consistent with the current conceptual understanding of the PZ-A hydrogeology. Source control measures initiated in 1995 have been effective in reducing the extent of the perched zone and have eliminated the transport of PZ-A groundwater into the PZ-B (Figure 6). Perched zone monitoring and IC measures confirm that there are no potential receptors and no new sources for perched groundwater. PZ-A piezometer P-03 is the only location in PZ-A where nitrate-N and perchlorate consistently persist in concentrations greatly exceeding the cleanup standards. Increasing trends in COC concentrations have been observed and are expected to continue at perched piezometer P-03. This phenomenon is explained by the vertical stratification of groundwater quality in the perched zone as discussed in Section 2.2. As aforementioned, the pilot dewatering program at piezometer P-03 was discontinued per EPA's decision.

2.3 PERCHED ZONE B

Groundwater-bearing alluvium referred to as the PZ-B is isolated from the shallow aquifer along the San Pedro River to the east due to hydraulic isolation associated with the LCU. The PZ-B is believed to be an area that historically was created largely as a result of artificial recharge from the unlined formerly active evaporation ponds in the southern portion of the ANPI plant. Prior to the construction of the evaporation ponds in 1971, the industrial wastewater stream was mostly routed offsite via unlined ditches leading to Wash 6 (Figure 6). Infiltration of these discharge waters as well as storm water runoff began to accumulate within the alluvial sediments in the PZ-B. Thus, it is likely that PZ-A began to develop even before the operation of the formerly-active evaporation ponds due to leakage from these unlined wastewater conveyances and general non-point discharges. Depending on the volume of the mound that accreted from this ongoing process of infiltration, seepage from PZ-A into PZ-B is also believed to have contributed to the aforementioned artificial recharge. Presently, hydrographic data indicate that groundwater levels in PZ-B are declining, presumably owing to a lack of such sources of artificial recharge and concurrent losses via other mechanisms (Appendix A). Based on the flatness of the hydraulic gradient across PZ-B, there appears to be little, if any, lateral groundwater movement. This is an important realization because it provides further evidence of hydraulic isolation between the PZ-B and shallow aquifer.

No less than 40 percent of the footprint of PZ-B is believed to underlie property owned by ANPI. This estimate could be conservative based on limited distribution of monitor wells to the east. Moreover, groundwater-bearing sediments probably do not occupy the entire footprint as outlined. Further refinement is limited due to the inability to obtain permission to construct wells on the private properties. It is known, however, from records and conversations that adjacent property owners do not extract shallow groundwater. ICs, such as surveillance of new or petitioned well drilling activities and community outreach, provide further control over potential exposures to contaminated groundwater. Surveillance includes observing any changes in land use and annual updating of the site-wide well inventory. Well inventory updates are completed and reported as an appendix in the Annual Report. The ADEQ performs an ongoing review of notices of intent

(NOIs) for proposed new wells near the PZ-B. Section 6.0 provides further details on ICs.

The PZ-B comprises part of the Southern Area performance monitoring network (Figure 6). Performance monitoring in this perched zone was performed quarterly, semi-annually or annually in CY 2018. Monitor wells located in the PZ-B include MW-15, MW-21, MW-23, MW-39, MW-43, MW-44 and MW-47 (Figure 6). Groundwater samples were collected from the PZ-B monitor wells MW-21, MW-23, MW-39 and MW-47 quarterly and MW-43 annually during 2018 when sufficient water was present (Table 7). During the third quarter 2018, sampling of these wells reduced to an annual frequency per EPA approval in accordance with the 2018 Performance Monitoring Schedule (Table 3). PZ-B monitor wells MW-43 and MW-44, previously monitored for water levels only, were removed entirely from the 2018 monitoring schedule. Performance monitoring included quarterly and/or annual measurements (commencing in August 2018) of water level elevations and water quality sampling for nitrate-N and perchlorate (Table 3).

2.3.1 PZ-B Water Levels

Water level elevations in PZ-B monitor wells MW-15, MW-21, MW-23, MW-39, MW-43, MW-44 and MW-47 decreased during CY 2018 (Table 4; Appendix A). PZ-B monitor well MW-15 was dry during third and fourth quarter monitoring and therefore was not sampled according to the proposed schedule. PZ-A monitor wells MW-29, MW-30, MW-31, and MW-32 were sounded for groundwater during 2018, and never had measurable groundwater present. These wells are situated along the PZ-A/PZ-B boundary. Monitor well MW-29 has been dry since late 2003 confirming the absence of seepage between PZ-A and PZ-B (Table 4).

Water level elevations at monitor wells MW-21, MW-23, MW-39, MW-43, MW-44, and MW-47 in the PZ-B increased between the last quarter monitoring event in 2017 and May 2018. Between May and August in 2018, water levels declined in each PZ-B well monitored (MW-21, MW-23, MW-47 and MW-39). The highest water levels were measured in May for PZ-B. In general, water levels are on a declining trend in perched zone B after the most recent rise in 2016 (Figures A-7 through A-13 in Appendix A).

Water level elevations ranged from approximately 3,656.89 feet msl at perched zone B well MW-44 to approximately 3,662.87 feet msl at perched zone B well MW-21 in 2018 (Table 4). As aforementioned, comparatively significant differences in elevation are typical of groundwater perching due to differences in the elevation of the St. David clay (Figure 7).

2.3.2 PZ-B Water Quality

Nitrate-N detections in groundwater quality samples collected in PZ-B monitor wells ranged from 1.9 mg/l at monitor well MW-23 in May 2018 to an estimated concentration of 3,200 mg/l at monitor well MW-21 in August 2018 (Table 7; Appendices A and B).

Perchlorate detections in groundwater samples collected in the PZ-B ranged from less than 2.9 µg/l at monitor well MW-47 in August 2018 to 190 µg/l at monitor well MW-21 in August 2018 (Figures A-7 through A-13).

Per the EPA's approval of the 2018 performance monitoring schedule, nitrate-N and perchlorate analyses are no longer performed quarterly in the PZ-B well network. The monitoring frequency for has been reduced to an annual event conducted in the month of August (Table 3).

Per EPA approval, analysis for ammonia-N were discontinued at monitor well MW-15 (EPA, 2009a). Previously, ammonia-N concentrations had been analyzed for monitor wells MW-15 and MW-21 since February 1998 (ADEQ, 1998). Starting in 2013, the frequency of sampling and analysis of ammonia-N in groundwater at MW-21 was increased to establish baseline conditions for a potential pilot study. The revived interest in ammonia was related to its potential to inhibit denitrification. The increased frequency of ammonia monitoring was continued through CY 2018. The ammonia-N concentration at MW-21 in the annual monitoring event in August 2018 was 1,700 mg/l, an increase from the previous result of 1,400 mg/L in November 2017. Due to the decision not to perform *in situ* testing or remedial action within PZ-B, ammonia-N monitoring is no longer needed.

2.3.3 PZ-B Remedial Status

Water level monitoring indicates a decreasing trend in water level elevations in the PZ-B (Figures A-7 through A-13 in Appendix A). Water levels throughout the PZ-B were at their maximum elevation in May 2018 followed by a seasonal decline in August 2018.

The data collected in PZ-B and PZ-A together generally support the revised Southern Area conceptualization. It is anticipated that COC concentrations detected at MW-21 may continue to increase as a result of the same vertical stratification phenomena described for PZ-A in Section 2.2, unless significant natural recharge is occurring. Additionally, groundwater level declines are expected to continue as a result of various factors such as transpiration losses and lateral and downward infiltration of PZ-B groundwater into adjacent dry soils along the margins of the PZ-B. Finally, it is apparent that natural attenuation is not a major process for reduction of nitrate-N or perchlorate as originally conceptualized. Although studies indicated the presence of the requisite microflora, there is a deficiency of the necessary nutrients to support efficient reduction of the COC oxyanions.

During 2018, ICs were effective and no changes in land use were observed. Section 6.0 provides further details of ICs.

2.3.4 Conceptual Site Model Revision

After a study of the Southern Area perched zone pursuant to recommendations in the third FYR (EPA, 2012), ANPI updated the CSM for the Southern Area (H+A, 2017d). As a result, it was decided that the MCA was effectively a second perched zone. The original perched zone is now referred to as PZ-A and the MCA has be renamed PZ-B. PZ-A and PZ-B are experiencing declining water levels and have been determined to be hydraulically isolated from each other and from the shallow alluvial aquifer along the San Pedro River in the Southern Area. Based on the field work done in the Southern Area, EPA modified Media Component 1 from “Perched Groundwater”, which included only the groundwater beneath the formerly-active evaporation ponds, to the “Southern Area Perched System”, which includes both PZ-A and PZ-B (Tables 1 and 2). In addition, the revised CSM report documented the attempts to use *in situ* methods to supplement MNA within the PZ-B footprint (H+A, 2017d). The *in situ* denitrification and dechlorination was determined unfeasible due to the lack of an extensive body of water in PZ-B and the poor hydraulic communication in the sedimentary strata. Moreover, PZ-B, by virtue of the LCU was shown to be hydraulically isolated from the shallow alluvial aquifer along the San Pedro River to the east. The poor yield from the perched system and lack of a potable water supply in PZ-A and PZ-B indicated that there was low potential for future groundwater resource development. Accordingly, EPA abandoned MNA as a remedy for the PZ-B, but kept the previously established ICs in place along with long-term monitoring for the Southern Area Perched System (EPA, 2017a). Pumping and evaporation of perched water from PZ-A was also discontinued at the end of 2017, because the previously established ICs and long-term groundwater monitoring were deemed sufficient for this isolated groundwater body (EPA, 2017c).

2.4 MW-24 AREA

The recent hydrogeological characterization work in the Southern Area that resulted in the reclassification of the MCA into PZ-B also resulted in separating monitor well MW-24 from PZ-B into its own area (H+A, 2017d). The well was not sampled in CY 2018 as it was removed from the 2018 performance monitoring schedule per EPA approval. The last sample collected was in December 2015 when the nitrate-N concentration was 0.88 mg/l (Figure A-14). The nitrate-N concentration in groundwater dropped below the cleanup standard in 2000.

ANPI constructed monitor wells MW-22, MW-14, and MW-24 (E-W) along a roughly east-west transect in the northernmost portion of the Southern Area (Figure 6). This configuration was designed to investigate the nature of the anomalous water levels in the monitor well MW-24 area as well as a potential flowpath from south to north, as suggested by Deane (2000). Specifically, the water level in monitor well MW-24 is significantly lower than that measured in monitor wells MW-14 and MW-22. Additionally, nitrate-N and perchlorate were present in monitor well MW-24 and sporadically present in the two wells to the east (post 1997). Initially, it was postulated that there was a paleochannel extending from PZ-B to the monitor well MW-24 area (Deane, 2000). However, subsequent exploratory drilling showed that such a through-running feature was not present, and that the MW-24 area is essentially isolated and surrounded by the fine-grained sediments of the LCU (H+A, 2017d).

2.4.1 Water Level

Water level elevations were measured in monitor well MW-24 in August 2018 at 3,599.95 ft msl (Table 4; Figure A-14). This represents an increase since the previous measurement in November 2017 at 3,598.56 ft msl. Historically, monitor well MW-24 exhibits the same wider seasonal water level fluctuations as the wells in the PZ-B versus MW-14 and MW-22, the hydrographs of which are more typical of other wells in the Southern Area shallow alluvial aquifer along the San Pedro River. This may result from the relative hydraulic isolation as is also the case for PZ-B.

2.4.2 Water Quality

Groundwater samples were collected annually for nitrate-N and perchlorate from MW-24 prior to the inoperable pump status (Table 7). During 2012 to 2015, the concentrations of nitrate-N and perchlorate remained stable from 0.88 to 1.1 mg/l and from 1.3 to 2.8 µg/l, respectively. As aforementioned, MW-24 was removed from the performance monitoring network in 2018 (Table 3).

2.4.3 MW-24 Status

Monitor well MW-24, although close to monitor wells MW-14 and MW-22, behaves differently. The water level elevations at MW-24 are approximately seven to eight feet lower than measured in monitor wells MW-14 and MW-22. Groundwater in monitor well MW-24 typically contains nitrate-N and perchlorate below the standards, whereas monitor wells MW-14 and MW-22 may sporadically indicate detections of nitrate-N and perchlorate below the standards. Based on the findings of the CSM revision for the Southern Area it is apparent the MW-24 area was always hydraulically isolated from PZ-B and from the portion of the shallow aquifer situation to the east. The seasonalities observed in the water level measurements bear similarity to PZ-B hydrographs and therefore may further indicate isolation.

2.5 SOUTHERN AREA SHALLOW AQUIFER

The lithology of the shallow aquifer primarily consists of gravel, sand, and silt sediments. These unconsolidated sediments generally range between 40 and 100 feet in thickness, but locally may be as much as 150 feet thick. Locally, the aquifer may yield as much as 2,000 gallons per minute (gpm) to properly constructed wells. Depths to groundwater in the shallow aquifer generally range from 20 to 80 feet below land surface (bls), depending upon surface topography. In certain locations along the San Pedro River, the water level in the shallow aquifer may be at or near the river bottom. Movement of shallow aquifer groundwater is generally northward, and typically groundwater is under semi-confined conditions in the vicinity of the Site. As discussed earlier, the shallow (or San Pedro) aquifer is hydraulically isolated from the PZ-B owing to an intervening, low hydraulic conductivity unit referred to as the LCU. It is apparent from the areal distribution of sediments that there is no hydraulic connection between PZ-B and the shallow alluvial aquifer. This is based on the various lithologic borings across the LCU as well as the direction of the hydraulic gradient across the LCU, which is westward from the shallow aquifer toward the PZ-B.

2.5.1 Regional Aquifer

Groundwater also occurs in the lower portion of the St. David Formation and the underlying older sedimentary rocks. These lithologic units comprise a single, confined hydrostratigraphic unit, referred to as the regional or deep aquifer. The upper unit of the deep aquifer consists of clayey and silty gravel beds near the mountains and clay, silt, and sandy silt, with interbeds of gypsum in the central part of the Basin. Near the Site, the upper unit of the deep aquifer is encountered at depths ranging from approximately 300 to 400 feet bls. The upper unit of the deep aquifer ranges from 300 to 800 feet in thickness. The lower unit of the deep aquifer is composed of older sedimentary rocks including lenses of gravel, sandstone, and siltstone. Gypsiferous silt lacustrine sediments may also be present (Roeske and Werrell, 1973). The lower unit of the deep aquifer is encountered at depths below 600 feet bls at the Site, and ranges in thickness from several tens of feet, near the edge of the valley, to more than 1,000 feet beneath the San Pedro River (H+A, 1990). Water in the regional aquifer in the St. David area is under artesian pressure, and in most areas, the elevation of its potentiometric surface is higher than the water table in the shallow aquifer, thereby indicating an upward vertical gradient. In lower elevations near the central part of the San Pedro Valley, wells tapping the regional aquifer may be artesian flowing, although depressurization has occurred as a result of increasing development and associated groundwater exploitation.

The performance monitoring network in the Southern Area of the shallow aquifer includes monitor wells MW-01, MW-06, MW-14, MW-22, MW-25, and MW-33 (Table 3; Figure 6). Monitor wells MW-06 and MW-01 are considered to be situated upgradient from the Site, and therefore monitor background conditions in the shallow aquifer.

ICs for the Southern Area of the shallow aquifer include surveillance and community outreach to assure that no groundwater resource development occurs within areas where the shallow aquifer may be contaminated. Surveillance also includes observing any changes in land use and updating the well inventory to query for new well permits filed near the Site. Section 6.0 provides further details on ICs.

2.5.2 Shallow Aquifer Water Levels

Shallow aquifer water level elevations in shallow aquifer monitor wells in the Southern Area were monitored in the first and second quarter for water level elevation prior to the implementation of the 2018 performance monitoring schedule in which the monitoring frequency reduced to an annual event in August, per EPA approval (Figures A-15 through A-20 in Appendix A). Water level elevations in the Southern Area ranged from approximately 3,597.31 feet above msl in August 2018 in shallow aquifer monitor well MW-25, and approximately 3,625.52 feet above msl in February 2018 in monitor well MW-06 (Table 4).

The apparent hydraulic gradients estimated for August 2018 within the Southern Area shallow aquifer groundwater were approximately 0.003 feet per foot (ft/ft) calculated between the locations of monitor wells MW-06 and MW-01, and approximately 0.004 calculated between monitor wells MW-22 and MW-33 (Figure B-2 in Appendix B; H+A, 2018e). These gradients are in contrast to the essentially flat hydraulic gradients (if in fact there is a gradient at all) for PZ-B wells, and reflect a more typical groundwater flow system.

Water level elevations in shallow aquifer monitor wells in the Southern Area showed typical seasonal fluctuations. Historically, water level elevations observed in the Southern Area shallow aquifer wells in proximity of the San Pedro River typically increase during the summer monsoon season due to increased runoff in the River and infiltration. In 2018, seasonal summer recharge was significant. Rather, water level elevations in each Southern Area well (MW-01, MW-06, MW-14, MW-22, MW-25 and MW-33) decreased from February to August and water levels were not measured in the last quarter of 2018, in accordance with the 2018 performance monitoring schedule (Figures A-15 through A-20 in Appendix A). In addition to recharge during seasonal rainfall-runoff, groundwater levels are affected by seasonal pumping cycles from nearby residential and agricultural use, which typically are higher in the warmer seasons.

2.5.3 Water Quality

Groundwater samples were collected from upgradient Southern Area shallow aquifer monitoring wells MW-01 and MW-06 in February and August 2018 and additionally in May 2018 for MW-01 only. Groundwater samples were collected from monitor wells MW-14, MW-22 and MW-33 in February and August 2018, with the exception of a sample collected in May rather than August 2018 at monitor well MW-22. Southern area shallow aquifer monitor well sampling was reduced in 2018 to an annual frequency (in August) per EPA approval. Water quality is not monitored at monitor well MW-25, however this well would be monitored contingent upon results from monitor well MW-33. In addition, monitor well MW-22 is no longer sampled in accordance with the 2018 performance monitoring schedule (Table 3).

Nitrate-N was not detected in Southern Area shallow aquifer monitoring wells during 2018, with the exception of a low-level detection of 0.13 mg/l from a split sample in August 2018 from monitor well MW-06 (the original sample was below the laboratory reporting limit of 0.50 mg/l) and an estimated concentration of 1.3 mg/l detected in monitor well MW-14 in February 2018, well below the site-specific cleanup standard and the HBGL (Table 7). Perchlorate was not detected in Southern Area shallow aquifer monitoring wells MW-01, MW-14, MW-22 and MW-33 during 2018, with the exception of one detection of perchlorate in February 2018 from well MW-06 at an estimated concentration of 5.2 µg/l (Table 7; Figure 6).

2.5.4 Southern Area Shallow Aquifer Status

Data collected during 2018 support the current conceptualization of the shallow aquifer in the Southern Area and its relationship to the PZ-B. The LCU provides hydraulic separation between the PZ-B and shallow aquifer. Nitrate-N was not detected at sentinel wells, upgradient wells and buffer zone wells in 2018. In general, perchlorate was not detected at Southern Area shallow aquifer monitor wells in 2018, with the exception of a single low-level detection in monitor wells MW-06 and MW-14. Historically, nitrate-N has been detected at several locations in the shallow aquifer. Nitrate-N concentrations exceeding the cleanup standard of 10 mg/l have not been detected in the Southern Area shallow alluvial aquifer since 1991, and since 1999, detected concentrations have remained less than 3 mg/l. Historically, perchlorate has not been detected in the shallow aquifer with the following exceptions; an original sample in MW-14 in February 2017

(0.7 µg/l), a field duplicate in monitor well MW-22 in February 2017 (0.67 µg/l) and a split sample in monitor well MW-22 in February 2008 (4.4 µg/l).

ICs were effective and no important changes in land use were observed during 2018.

3.0 NORTHERN AREA

The Northern Area is the portion of the shallow aquifer into which the Wash 1, 2, 3, and 4 watersheds drain. The Northern Area extends from the vicinity of shallow aquifer monitor well MW-13 north toward shallow aquifer private well D(17-20)25bad (Figure 8). Within this area, the shallow aquifer boundary widens to the east of the San Pedro River and incorporates large tracts of farmland in St. David, across the San Pedro River. Moving further downgradient, the aquifer then narrows to the north of Dragoon Wash. Generally, groundwater flow is to the north-northwest paralleling the course of the San Pedro River. Further information about the regional aquifer is provided in the first paragraph in Section 2.5.1.

Nitrate-N is the only COC in the Northern Area. The San Pedro River itself forms the eastern boundary of the nitrate-N plume (as defined by concentrations exceeding the 10 mg/l MCL) (Figure 2). The nitrate-N plume is believed to have resulted from historical discharges of plant wastewaters and runoff originating within Wash 4, 5, and 6 watersheds, based on the primary locations of ANPI's industrial operations (Table 7; Figure 2). Both groundwater and surface water transport mechanisms are believed to control the dynamics of the nitrate-N plume.

Two separate remedies are operating in the Northern Area, the NARS and the Northern Area MNA. The NARS is an active remedy that captures nitrate-N groundwater via extraction well SEW-01 and the newly installed SEW-02 (operational as of July 2018) and routes it into the NARS treatment wetland for denitrification. The treated water is then discharged back into Wash 3, where it infiltrates back into the shallow aquifer. Extraction well SEW-01 creates a definable capture envelope within the shallow aquifer. Extraction well SEW-02 was added to the NARS to accelerate attainment of remedy standards by extraction of contaminated groundwater upgradient from extraction well SEW-01. Where the shallow aquifer extends northward of SEW-01 the remedy is based on MNA. These areas are discussed separately in this section.

The NARS is located in the northwest section of the ANPI property (Figure 9). The MNA performance network in the Northern Area comprises a management zone, buffer zone, sentinel well, and upgradient zone (Table 3; Figure 8) (H+A, 2009a). Performance monitoring is performed in the Northern Area to evaluate the NARS and MNA performance pursuant to the Northern Area PMP and the NARS operations and maintenance manual (H+A, 2007a, 2009a). Monitoring of the NARS is performed in both weekly and monthly rounds, while shallow aquifer groundwater monitoring occurred on a quarterly basis during CY 2018 (Table 3; Appendix C).

The regional (deep) aquifer is the primary aquifer used for domestic purposes throughout the St. David area (H+A, 2009b). Several private wells tap the shallow aquifer for irrigation purposes. A limited number of residences are relying on shallow aquifer water for domestic purposes, however, these are located outside of the area of contamination. Three private well owners in the study area are currently using the shallow aquifer for domestic usage. Currently groundwater at each of these private wells is below the cleanup standard for nitrate-N (Table 7).

ICs for the Northern Area include community outreach, surveillance, and an Alternate Domestic Water Supply Plan (ADWSP), which provided household water to residents that relied solely on affected shallow aquifer wells. Section 6.0 provides further details on ICs. Remedial actions addressing nitrate-N contamination in the Northern Area comprise both an active component based on pump-and-treat technology and a passive remedy based on natural attenuation.

3.1 NORTHERN AREA REMEDIATION SYSTEM PERFORMANCE

By means of the NARS, nitrate-N in extracted groundwater is reduced in the wetland by means of biological denitrification. The goal of this system is to reduce the nitrate-N in the groundwater to concentrations less than the cleanup standard of 10 mg/l as specified in the ROD (EPA, 1994). NARS monitoring is performed to assist operational decisions regarding wetland operation and to verify that the treated effluent discharge meets Arizona Aquifer Water Quality Standards (AAWQS). Construction of the NARS was completed in 1997, but began full-scale operations in 2005 after the wetland flora were fully established and the recent expansion of the NARS to include the area immediately upgradient of SEW-01 by way of extraction well SEW-02 was operational in July 2018.

The NARS consists of four subsystems including extraction, delivery, treatment, and return systems. The extraction system includes extraction wells SEW-01 and SEW-02, which pump nitrate-bearing groundwater from the shallow aquifer (Figure 9). The delivery system conveys water withdrawn from extraction wells to the treatment system via approximately 9,300 feet of above- and below-grade pipe. The treatment system consists of a 4.3-acre constructed wetland, comprising five separate treatment cells. The first three treatment cells denitrify the groundwater extracted from SEW-01 and SEW-02. Fundamentally, in the anoxic conditions artificially-created and maintained in the bottoms of the wetland ponds, bacteria utilize oxygen on the nitrate radical for their metabolic processes, thereby liberating free nitrogen to the atmosphere. Additional nitrate removal is realized as a result of nutrient uptake by cattails (*Typha latifolia*) cultivated in the wetland ponds. The fourth treatment cell is designed to oxidize any ammonia residuals originating in the influent water. This is accomplished through an oxidation process created as a result of oxygen liberation from photosynthesis. The fifth treatment cell relies on the same denitrification processes to remove any residual nitrate-N. Treated water is returned via approximately 2,900 feet of above- and below-grade piping. This piping conveys the treated effluent to a return location in Wash 3, where it mostly recharges back into the shallow aquifer or otherwise flows into the San Pedro River (Figures 9 and 10).

3.1.1 NARS Operations and Maintenance

Proper operation of the NARS requires maintenance of the groundwater extraction system, and groundwater treatment system (wetland), and confirmation that treated effluent return system components are working properly and efficiently. By regularly inspecting and maintaining each system component and keeping accurate maintenance records, problems can often be discovered and corrected before a serious malfunction or system upset occurs. NARS maintenance also consists of conducting equipment inspections, repairing or replacing damaged equipment or equipment parts, and exercising good housekeeping. Equipment maintenance is performed according to recommendations of the respective manufacturers. These are compiled in Appendix C of the NARS O&M manual (H+A, 2007a). The NARS O&M manual also includes guidelines for pest control and abatement. These guidelines provide the operator with procedures for monitoring and implementing control of harmful pests, such as caterpillars or invasive plants. Information regarding amendment loading and monitoring procedures is also presented in the O&M manual, in addition to specifications for ranges of normal operating parameters, routine operation duties, and reporting forms (H+A, 2007a).

The following sections describe various routine and non-routine O&M actions performed during 2018.

3.1.1.1 Maintenance and Repairs

During CY 2018, routine maintenance was conducted included cleaning out the hydraulic distribution piping, outlet structures, and outlet structure gratings, which became clogged with plant debris. Periodic maintenance was performed to remove sediment that filled treatment cell inlet open trays. This typically occurs mainly at the final denitrification area (FDA), where the bank slope meets the inlet tray (Figure 10).

To account for the temperature-dependent rate of denitrification, the pumping regimen at extraction well SEW-01 and SEW-02 must be adjusted seasonally. In addition, because extraction pumping was initiated at shallow aquifer extraction well SEW in July 2018, it was necessary to adjust the pumping regimen at SEW-01 to accommodate test pumping and extraction well pumping from SEW-02, particularly during the winter months when the rate of denitrification is more limited.

The rationale of adjusting the pumping time of SEW-01 and SEW-02 is that at lower temperatures denitrification is limited, therefore, as a precautionary measure to allow a longer residence time for treatment in the wetland cells, the pumping time at the extraction wells is reduced in the winter months and then increased again as temperature increases in the warmer months. Nitrate-N concentration within pond effluent remains under nitrate-N MCL of 10 mg/l. Extraction well SEW-01 remained running for 365 days in 2018 Extraction well SEW-02 began operation in July 2018, pumping for 169 days in 2018.

3.1.1.2 Emergent Plant Monitoring

Monitoring of cattail vitality is performed during the growing season. During 2018, monitoring of emergent plants indicated acceptable vitality based on their healthy green coloration; large, well developed catkins; and an area coverage over approximately 90 percent of pond surfaces. Typically, the cattails in Pond PDA-S green-up earlier than in the other primary denitrification area (PDAs) and FDA. This is attributed to the comparatively warmer influent water temperatures into PDA-S in early spring. Water surfaces in the downstream ponds are exposed to atmospheric temperatures that are typically cooler than the relatively constant temperature of the influent from extraction wells SEW-01 and SEW-02.

3.1.1.3 Invasive Species Control

Routine measures to control invasion of insect and plant pests were performed in 2018. *Simyra henrici* (*Sh*), commonly known as cattail caterpillars, were not observed in the treatment cells in 2018.

Mosquito monitoring was also performed routinely. Mosquitoes were not observed in significant numbers during inspections conducted in 2018. It is believed that mosquito populations are largely in balance due to predatory species of birds and bats.

Non-wetland plants were observed in and around the treatment cells during 2018. Invasive plant removal was performed at the treatment wetland to remove Tamarisk (*Tamarisk chinensis*), commonly known as salt cedar, and also tumbleweed (*Salsola tragus*). The tamarisk and tumbleweeds were removed.

3.1.1.4 Ecological Monitoring

During 2018, active controls for invasive animal species were not required. The wetlands are well-populated with a variety of avian species. Some of the species observed include sharp-shinned hawk, red-tailed hawk, mourning dove, common raven, northern rough-winged swallow, tree swallow, marsh wren, ruby-crowned kinglet, chipping sparrow, Brewer's sparrow, vesper sparrow, black-throated sparrow, white-crowned sparrow and yellow-headed blackbird. A number of reptiles and mammalian species have also been observed. Frogs, rattlesnakes, javelina, bats, and coyote were noted most often. Ecological monitoring is performed primarily to assess whether wildlife activity is causing damage to the treatment cells. In the past, when treatment cell water levels were low, javelina were noted entering the treatment cells to dig up cattail roots. This created conditions vulnerable to bank erosion.

3.1.1.5 Amendment Loading

During 2018, molasses was dosed into the wetland as a carbon amendment to support dissolved oxygen (DO) suppression in the water column and to sustain the proper dissolved organic carbon concentration. The total volume of molasses added from January through December 2018 was approximately 13,700 gallons all added at Pond PDA-S (Table 8; Figure 11). Personnel checked the area surrounding the wetland to assure that excessive molasses loading had not created offensive odors from hydrogen sulfide off-gassing. Such odors were not detected to any significant degree, and when detected, the odors were limited to the immediate wetland area.

During 2018, it was determined that phosphorus supplements (in the form of B-52) were not needed based on cattail vitality. Phosphorus is believed to recycle into the water column in the winter when plants senesce; therefore, the nutrient is utilized by plants only during the growing season. Molasses may also be providing an added source of available phosphorus within this system.

3.2 WATER LEVEL AND SYSTEM MONITORING

Hydrologic conditions in the wetland are monitored to ensure proper hydraulic routing through the wetland. Hydraulic routing is affected by treatment cell water levels, preferred flow pathways through the treatment cells, and influent and effluent volume and rate. Visual observation provides the basis for determining potential short-circuiting of the intended flow path through the cells.

3.2.1 Influent Monitoring

The rate and volume of extracted groundwater delivered to the treatment wetland is monitored on a weekly basis as part of O&M and monitoring activities. Two parameters are measured weekly: totalized flow volume (in gallons), and instantaneous flow in gallons per minute (Figure 12). Table 10 summarizes the totalized flow volume measured at SEW-01 and SEW-02 during 2018. Figure 13 provides a graphic depiction of the cumulative pumpage history at extraction wells SEW-01 and SEW-02 through December 2018. Extraction wells SEW-01 and SEW-02 pumpage time was variable from January to December of 2018, ranging from four to eight hours per day and from seven to 15 hours per day, respectively (Figure 12).

During CY 2018, the instantaneous flow rate at extraction wells SEW-01 and SEW-02 were maintained at approximately 190 to 210 gpm and from 40 to 45 gpm, respectively (Table 10). The volume of groundwater extracted from the shallow aquifer via SEW-01 and SEW-02 during the 2018 reporting period was 29,601,550 and 4,905,555 gallons, respectively, for a total of 34,507,105 gallons (Table 10). It is estimated that a total volume of 911,667,067 gallons has been removed since pumping of extraction well SEW-01 commenced in 1997 (Figure 13). According to vendor specifications, the precision of the flow meters at extraction wells SEW-01 and SEW-02 is typically ± 2 percent of the actual flow. Thus, the uncertainty due to flow measurement during 2018 was approximately ± 690,100 gallons, and during the entire operational history of the NARS, from 1997 to the present, uncertainty is approximately ± 18,200,000 gallons.

Water levels are measured quarterly in extraction wells SEW-01 and SEW-02 as part of O&M and performance monitoring. A hydrograph presenting water level elevations at SEW-01 and SEW-02 are provided (Figure D-1 in Appendix D).

The last static water level measurement at SEW-01 was measured in March 2008, when the pumping was temporarily shut down for servicing. The apparent difference between the pumping and static water levels measured at that time was approximately eight feet. However, the “static” water level was possibly still affected by residual drawdown from pumping. Static water levels measured in SEW-02 ranged from 3,586.38 ft above msl in February to 3,585.31 ft above msl in December 2018. The pumping water level measured in SEW-02 in August was approximately 30 ft below this average (Figure D-1 in Appendix D).

3.2.2 Effluent Monitoring

In accordance with normal operation, discharge to the primary location in Wash 3 was continuous during CY 2018 (Figure 9). The average effluent flow rate estimated at the Parshall flume was 51 gpm (Table 10). The 2018 annual volume of treated water discharged from the primary location into Wash 3 was approximately 32,633,072 gallons (Table 10). No complaints concerning discharge odors were received from neighbors in CY 2018. The monitoring location for detecting discharge odors is located at Apache Powder Road and Wash 3 (Figure 9).

3.2.3 Water Budget

A water budget facilitates evaluation of operational performance of the wetland system. Monitoring inflow and outflow volumes allows the operator to determine mass removal rates of nitrate-N, identify if leakage is occurring, and estimate a recharge volume of treated water. The water budget is one of the components that help guide in the operation of the wetland; however, long-term operation of the NARS is guided by monitoring water levels, water quality, adjustments to inflow, carbon loading, and biological parameters (Kadlec & Knight, 1996).

Water budget for the NARS is calculated based on the best available data for the system inputs *(I)* and outputs *(O)*. The resulting equation is:

$$I - O = \Delta S \pm \varepsilon$$

Where ΔS = change in storage and ε = total error in measurement and/or estimation.

Input data included data collected from the SEW-01 and SEW-02 flow meters and precipitation data collected on site. The surface area of the treatment cells was used to calculate the precipitation volume based on the ANPI rain gauge. The remaining watershed was not included because the soils at the wetland consist of high-permeability, sandy and gravelly soils that generally infiltrate a large percentage of the rainfall. Once these soils reach saturation, a percentage of runoff is diverted along the road, or along the open distribution piping. Vegetation also acts to intercept smaller amounts of precipitation. In the past, erosion has occurred only in response to extremely heavy precipitation and mainly near the wetland shed, near the FDA inlet tray, and near the influent piping (Figure 10). Thus, based on these assumptions, CY 2018 input to the system from precipitation, SEW-01 and SEW-02 was estimated to be approximately 36,418,634 gallons (Table 9).

Output from the system includes evapotranspiration (ET) losses, evaporation losses from open water areas, and discharge at the Parshall flume. ET is a combination of evaporation and transpiration. Evaporation accounts for water losses from soil and water, and transpiration is water loss from photosynthesis by emergent flora. Evaporation measurements were collected by means of an atmometer (ET gage™ Model A) located near the wetland storage shed. The monthly ET rate was multiplied by a factor of 1.5 during the growing season, specifically for the months June, July and August, to account for transpiration from cattails. These data were compared to estimated rates for reference crop ET and pan/lake evaporation rates. A referenced pan evaporation rate of 93 inches per year was used for the open water area (Sellers and Hill, 1974) (Table 9). During October 2007, a sonic flow meter was installed at the Parshall flume to provide a method to measure totalized discharge. However, this instrument performed inconsistently in 2007, 2008, and most of 2009. During that time, discharge estimates were calculated from the rate of outflow as measured weekly from the Parshall flume. Output from the system was calculated to be approximately 43,923,366 gallons in 2018. Of this amount, an estimated 32,633,072 gallons were discharged (Table 9).

Uncertainties to the water budget calculations, in addition to measurement uncertainties for the output, include changes in storage and infiltration losses into underlying, adjacent soils, as well as estimation of ET rates. Input errors include rainfall, runoff and percent error with the SEW-01 and SEW-02 totalizers. Based on these calculations, the difference between input volume produced at extraction wells SEW-01 and SEW-02 and the outflow volume estimated at the Parshall flume is approximately 7,504,732 gallons with approximately 100 percent of the input being discharged (Table 9). However, this level of apparent gain is probably due to uncertainties/errors in the various component measurements. The Parshall flume totalizer had mechanical difficulties and had stopped measuring flow intermittently throughout 2018, resulting in a total of 21 weeks when flow volume was estimated using the average volume of the previous four consecutive readings when the totalizer had been functioning properly. Weeks with estimated volumes likely contributed to the overestimation of total output in 2018.

3.2.4 Treatment Cell Water Level Monitoring

Water levels were measured weekly in the PDA, aerobic nitrification area (ANA), and FDA treatment cells (Appendix D). A table presenting treatment cell water levels is included (Table D-1 in Appendix D). Every effort was made to operate treatment cells at maximum operating depths from January through December 2018 (Table D-1 in Appendix D). This goal was intended to maximize residence times through the wetland.

3.2.5 Design Confirmation Piezometer

A design confirmation piezometer (DCP), DCP-12, was installed below the toe of the FDA (Figure 9). The primary purpose of this piezometer was to monitor for potential leakage across the clay cutoff wall installed within the FDA berm and intended to minimize leakage out of the pond. During initial filling of the FDA in 1997, water seeped through the cutoff wall and appeared in the piezometer. This leakage was believed to be due to the temporary desiccation of the clay materials in the cutoff wall between the time of construction and the filling of the wetland. In the subsurface, infiltrating waters leaked through the desiccation cracks and migrated toward the piezometer. At the same time during continued operation of the FDA, subsurface water was rewetting, swelling the clay, and healing over the desiccation cracks, thus restoring the functionality of the clay cutoff wall. Since 1997, water levels in piezometer DCP-12 have remained relatively static. This seems to indicate that the water in the vicinity of the piezometer must be resting within a depression in the Saint David clay, which underlies the alluvial sediments associated with Wash 3. The water level elevation at DCP-12 ranged from approximately 3,668.90 feet above msl in February 2018 to 3,670.88 feet above msl in December 2018, with an average depth to water of 21.99 feet below measuring point (bmp) and an average saturated screened interval of approximately 2.91 feet during 2018 (Table 11). The slight fluctuations in the hydrographic data may be in part due to local recharge effects along Wash 3 and/or ET due to phreatophytes.

3.2.6 Monitor Well MW-10

Monitor well MW-10 is located in the Wash 3 alluvium, downstream from the primary discharge location (Figure 9). From the time it was installed in 1990 until wetland discharge was initiated at the primary Wash 3 location in May 2005, monitor well MW-10 remained dry. Water level elevations at monitor well MW-10 ranged from approximately 3,616.03 feet above msl in February, March and August 2018 to 3,617.98 feet above msl in August 2018 with an average depth to water of 15.72 feet bmp during 2018 (Table 11). The average saturated screened interval at monitor well MW-10 in CY 2018 was approximately 3.08 feet.

3.3 NARS WATER QUALITY MONITORING

Monitoring influent and effluent water at the NARS provides the essential basis for evaluating wetland operational and performance efficiency. Nitrate-N is monitored at these and other key locations weekly using a field probe. Monthly samples are also collected and transmitted to an Arizona-licensed laboratory for nitrate-N analysis by EPA Method 300.0 and ammonia-N analysis by Standard Method SM4500-NH3 B, C. Other parameters are monitored monthly, quarterly, and annually according to an approved schedule (Tables C-1 through C-4 in Appendix C). These parameters are used for evaluation of potential operational issues and therefore provide possible information of trends that may be leading to an upset condition. Water quality monitoring was performed at extraction wells SEW-01 and SEW-02, within wetland treatment cells, at the wetland effluent discharge location, at monitor well MW-10, and piezometer DCP-12 as part of the O&M monitoring program.

3.3.1 Influent /Effluent Water Quality

Water quality samples were collected at shallow aquifer extraction wells SEW-01 and SEW-02 and analyzed for nitrate-N on a monthly basis; total phosphorus and ammonia-N on a quarterly basis; and bicarbonate, calcium, chloride, fluoride, orthophosphate, potassium, magnesium, sodium, sulfate, and total dissolved solids (TDS) on an annual basis, as outlined in the extraction well monitoring schedule (Tables 12 and 13; Table C-1 in Appendix C). Field parameters hydrogen ion potential (pH), electrical conductivity (EC), and temperature were monitored monthly at the extraction well. Field nitrate is monitored weekly (Table E-1 in Appendix E).

Water quality samples were collected at the primary discharge location (EFF-L) and analyzed for nitrate-N and ammonia-N on a monthly basis; TDS, total phosphorus, and total suspended solids (TSS) on a quarterly basis; and bicarbonate, chloride, fluoride, sulfate, orthophosphate, potassium, magnesium, calcium, and sodium on an annual basis, as outlined in the effluent monitoring schedule (Tables 12 and 13; Table C-3 in Appendix C). Field parameters pH, EC, and temperature were monitored monthly at the primary discharge location (Table E-1 in Appendix E). Field nitrate is monitored weekly (Table E-1 in Appendix E).

Nitrate-N concentrations ranged from 50 mg/l in January to 64 mg/l in April 2018 in water quality samples collected monthly from extraction well SEW-01 and from 170 mg/l in October and November to 220 mg/l in December 2018 from extraction well SEW-02 (Table 12; Figure D-3 in Appendix D). The 2018 average nitrate-N concentration in SEW-01 and SEW-02 was 56 mg/l and 190 mg/l respectively. At the end of the reporting period, the total estimated mass of nitrate-N removed from the shallow aquifer since pumping commenced in 1997 was 724,400 pounds. The total estimated mass of nitrate-N removed from January through December 2018 was approximately 21,600 pounds, 8,000 pounds greater than that removed by SEW-01 alone in 2017 (Figure 14).

Nitrate-N concentrations in wetland effluent were less than the ROD cleanup standard of 10 mg/l. Nitrate-N concentrations were less than 0.5 mg/l in 2018 in water quality samples collected monthly at the primary discharge location EFF-L, with the exception of a split sample from August 2018 with a concentration of 0.16 mg/l (Table 12; Figure D-6 in Appendix D).

Ammonia-N concentrations ranged from less than 0.50 mg/l in November in quarterly samples collected from SEW-01 and SEW-02 to 5.0 mg/l in February and 13 mg/l in August 2018, respectively (Table 12). Ammonia-N concentrations in wetland effluent water samples collected monthly from EFF-L were less than 0.5 mg/l for 2018 (Table 12).

The concentration of nitrate-N in groundwater sampled at extraction well SEW-01 is higher than the concentration of nearby monitor wells MW-08, MW-17, MW-18 and MW-19, which are located along the aquifer boundary and in the “backwater” area of the extraction well. Monitor wells MW-17 and MW-18 are essentially co-located, but represent different sampling depths at the same location. These wells are believed to be along the northern edge of the extraction well SEW-01 capture envelope.

3.3.1.1 Effluent Field Nitrate

Field monitored nitrate-N concentrations ranged from 0.32 mg/l to 3.12 mg/l in effluent discharge (Table E-1 in Appendix E). Field nitrate-N was compared to analytical laboratory results and the relative percent difference (RPD) was calculated (Table E-2 in Appendix E). If the analytical result from the lab and the nitrate field probe was 1 mg/l or less, the RPD was not calculated. The data suggest that the field probe results are generally higher than the laboratory results (Table E-2 in Appendix E). The reasons for the fairly consistent offset between the probe and lab data is uncertain. Initial thoughts are that there may be some degree of denitrification occurring in transit to the laboratory. However, the critical operational decisions pending on the sampling results are such that it would be preferable to base the decision on falsely higher analytical results than falsely lower results. Thus, the present method of operation is conservative. Additionally, it is possible that the field probe may be the more representative value because it is taken soon after the time of sample collection, whereas laboratory analyses have a holding time of up to 48 hours. During this time denitrification may be occurring.

3.3.2 Treatment Cells Water Quality

Water quality samples were collected monthly from the PDA, ANA, and FDA treatment cells and analyzed for nitrate-N and ammonia-N as part of normal operation of the NARS (Table 12; Figures D-3 through D-5 in Appendix D). In addition, samples were also collected for chemical oxygen demand (COD), total phosphorus, total Kjeldahl nitrogen (TKN), and total organic carbon (TOC) (Tables 14 and 15).

Nitrate-N concentrations detected in original water samples ranged from less than 0.5 mg/l at ANA, FDA, PDA-S, PDA-C and PDA-N to 60 mg/l at PDA-S (Table 12; Figures D-3 through D-5 in Appendix D). The 2018 average nitrate-N concentrations were 22.93 mg/l at PDA-S, 8.67 mg/l at PDA-C, 1.38 mg/l at PDA-N, less than 0.5 mg/l at ANA, and less than 0.50 mg/l at FDA, calculated from monthly detections from original samples. During 2018, denitrification performance was consistent in the PDA and FDA treatment cells.

It was believed that historically increasing trends in nitrate-N concentration of the effluent resulted from falling air temperatures at the site when approaching freezing conditions. Colder temperatures suppress denitrification processes in the treatment cells. In November and December 2018, pumping was reduced to four hours per day. Pumping duration reduction from eight in the summer months down to four hours per day in the winter months at extraction well SEW-01 decreased the nitrate loading into the wetland and increased the residence time through the treatment cells. No increases in nitrate-N concentrations in the effluent were observed in CY 2018.

Water quality sampling for ammonia-N was performed monthly. Ammonia concentrations detected in original water samples were less than 0.5 mg/l at ANA, FDA, PDA-C, PDA-N, and PDA-S between January and March 2018 (Table 12). The 2018 average ammonia-N concentrations were 6.51 mg/l at PDA-S, 2.0 mg/l at PDA-C, 0.64 mg/l at PDA-N, 0.74 at ANA and less than 0.5 mg/l at FDA, calculated from monthly detections. These concentrations of ammonia-N are favorable in terms of potential issues related to reconversion of ammonia to nitrate.

Water quality sampling for COD was performed quarterly in 2018, according to the treatment cell monitoring schedule (Table 15, Appendix C). COD concentrations in samples ranged from less than 20 mg/l at PDA-C and PDA-S in February, FDA in May, and PDA-N in November 2018 to 320 mg/l in November 2018 at PDA-S (Table 15). The critical COD value for denitrification is 40-60 mg/l (HSU, 2002). The COD values have increased as more detrital material has accumulated and decomposed in the treatment cells.

Water quality sampling for TOC was performed quarterly in 2018. TOC concentrations detected in samples ranged from 3.7 mg/l in February 2018 to 110 mg/l at PDA-S in November 2018 (Table 15). TOC concentrations in CY 2018 were slightly higher compared to CY 2017 concentrations. The volume of molasses added in CY 2018 was twice as much as that added in CY 2017. The increase in molasses addition did not appear to greatly affect TOC concentrations based on the results from both 2017 and 2018 when increased molasses was applied. It is also possible that the wetlands system itself is contributing to the reduction in TOC concentrations.

Water quality sampling for TKN was performed in August 2018. TKN concentrations detected in water samples ranged from 3.6 mg/l at FDA to 11 mg/l at PDA-S (Table 14).

Water quality sampling for phosphorus was performed quarterly in CY 2018. Total phosphorus concentrations detected in samples ranged from less than 0.1 mg/l at PDA-S, PDA-C, PDA-N, FDA, and ANA in February and November 2018, to 0.51 mg/l at PDA-S in March 2018 (Table 15). During the growing season, phosphorus concentrations are typically low due to uptake from cattails. Once cattails enter their senescent phase, concentrations detected in water samples should increase. The November 2018 results ranged from less than 0.10 mg/l to 0.22 mg/l (Table 15). Phosphorus supplements (in the form of B-52) were not added in 2018.

Selected water quality parameters were evaluated from water samples collected monthly from the wetland treatment cells with field meters during the period from January through December 2018. NARS parameters included DO, pH, EC, nitrate-N, and temperature (Tables E-1 and E-3 in Appendix E). Field nitrate-N was compared to analytical laboratory results and the RPD was calculated (Table E-2 in Appendix E). Field parameters showed little fluctuations during CY 2018. DO was detected at concentrations less than 5 mg/l in all treatment cells during CY 2018

(Table E-3). The measurements at the ANA were at higher concentrations than at the other treatment cells. Because the ANA treatment cell is designed to be aerobic, higher DO at ANA is not an issue. Suppression of DO concentrations in other cells is a favorable condition for the denitrification process. During CY 2018, EC did not increase as treatment water moved through subsequent treatment cells as was observed during the establishment phase of the wetland when dissolved solids concentrated and stressed the wetland plants. The pH remained within an optimal range for denitrification during CY 2018. Molasses was loaded into cell PDA-S to suppress DO concentrations thereby facilitating the denitrification process (Table 8).

3.3.3 Design Confirmation Piezometer Water Quality

Water samples were collected from piezometer DCP-12 during the February, May, August and December 2018 quarterly groundwater activities. These samples were analyzed for nitrate-N (Table 12). The nitrate-N concentration in water samples collected at piezometer DCP-12 ranged between 4.7 mg/l in December 2018 to 41 mg/l in May 2018 (Figure D-7 in Appendix D). Sampling of this piezometer is performed using a bailer to manually extract three borehole volumes before sampling occurs. During the past few years, the piezometer has typically gone dry before purging the requisite three borehole volumes (approximately eight to ten gallons). This may help to explain the occasional increase in nitrate-N concentrations in the samples. Specifically, and as discussed earlier, there may be some level of local recharge. At the same time, there may also be vertical stratification in the water at that location such that more concentrated water is situated at the bottom of the piezometer. This concentrated water is probably reflective of water that was leaked during the initial filling of the wetland, considering the nitrate-N concentrations are much higher than any waters that have been in the FDA in recent years.

3.3.4 Monitor Well MW-10 Water Quality

Water samples were collected from monitor well MW-10 during the February, May, August, and December 2018 quarterly groundwater activities. These samples were analyzed for nitrate-N and ammonia-N (Table 12). Ammonia-N concentrations in samples collected at monitor well MW-10 were less than 0.5 mg/l for February, May, August and December 2018 (Table 12). Nitrate-N concentrations in water samples were less than 0.5 mg/l for February, May, and December and detected at 0.85 mg/l in August in 2018 (Table 12; Figure D-7 in Appendix D). Water quality at monitor well MW-10 is used to monitor the quality of water recharging to the shallow aquifer to determine if compliance with the AAWQS of 10 mg/l for nitrate-N is being met (AAC, Title 18, Chapter 11). Ammonia-N is monitored to evaluate if nitrate-N conversion is occurring through oxidation because ammonia-N inhibits denitrification.

3.3.5 NARS Remediation Status

The NARS remedy was effective during CY 2018 in that a large mass of nitrate-N was removed from the shallow aquifer. The treatment cells provided the essential conditions for denitrification to occur. Even through the winter months of CY 2018, nitrate-N concentrations remained at less than 0.5 mg/l in effluent samples (Table 12). Nitrate-N was not detected in original samples collected at the effluent from January through December 2018. A low-level detection below in a split sample collected in August 2018 at 0.16 mg/l was reported, however nitrate-N was not detected above the reporting limit of 0.50 mg/l in the associated original sample in August 2018. The NARS was effective in capturing and treating contaminated groundwater, based on decreasing nitrate-N concentrations north of the extraction well SEW-01 capture envelope. In addition, the NARS effectively treated contaminated water extracted from both SEW-01 and SEW-02 after pumping commenced in the new extraction well in July 2018.

Highlights through CY 2018 include removal of 34,507,105 gallons of contaminated groundwater; removal of an estimated 21,600 pounds of nitrate-N mass; operations of the SEW-01 and SEW-02 extraction wells for 365 days, respectively; continuous discharge of treated effluent to the primary discharge location; and non-detections of ammonia-N concentrations and non-detections of nitrate-N at Wash 3 monitor well MW-10. The number of pounds removed in CY 2018 is higher compared to CY 2017 (Figure 14). Nitrate-N concentrations ranged between 50 mg/l and 64 mg/l in water quality samples collected monthly from extraction well SEW-01 and from 170 mg/l to 220 mg/l in 2018 from SEW-02 (Table 12; Figure D-3 in Appendix D). The highest historical nitrate-N concentrations detected at extraction well SEW-01 were sampled in the late 2003, early 2004 time period (Figure D-6). At that time, concentrations were approximately 390 mg/l.

3.4 Northern Area Groundwater

The Northern Area groundwater monitoring activities were performed according to the schedule outlined in the Northern Area PMP (H+A, 2009a). Groundwater samples were collected from Northern Area shallow aquifer monitor wells and shallow aquifer private wells in accordance with an approved schedule to evaluate performance of the NARS and MNA (Table 3). The shallow aquifer monitor wells in the network include MW-08, MW-11, MW-13, MW-17 through MW-20, MW-34, MW-35, MW-36 , MW-38, MW-40, MW-41A, MW-41B, MW-42, MW-45 and SEW-02 (TW-01) (Figure 8). In 2018, Monitor wells MW-20, MW-38, MW-40, MW-41A, MW-41B and MW-42 were reduced from semi-annual to biennial monitoring for water quality and water level measurements per approval by the EPA. These wells are scheduled to be monitored in August 2019. The remaining NARS Northern Area wells are monitored for water levels and water quality quarterly, with the exception of semi-annual sampling at MW-13, MW-17 and MW-28 and annual sampling at MW-11 (Table 3). During the CY 2018, eight new shallow wells were installed in the northern area for the purpose of remedy acceleration. They are identified as monitor wells PB-2A, PB-4, PB-7 and piezometers NAP-1 through NAP-5. In addition, PB-5A was installed in February 2019 and will be proposed for extraction in 2019, as SEW-3.

Shallow aquifer private wells have also been incorporated into the Northern Area performance monitoring network. However in 2018 these wells were not monitored due to the water level monitoring frequency reduction from annual to biennial for private wells D(17-20)36aad1, D(17-20)36caa, D(17-20)36caa2, D(17-20)36cdb, D(17-20)36ddc, and D(18-20)01aad per EPA approval, to be conducted in August 2019. These wells in addition to D(17-20)25bad were reduced to biennially water quality sampling. Inversely, in 2018 monitoring of the Jones well (private well D(18-21)06bcb) in the Northern Area increased frequency from semi-annual to quarterly monitoring because of the potential impact to the capture zone in the vicinity of this well during extraction at SEW-02. Because the well is a private well located just north of the capture zone envelope of SEW-01, it will be monitored more closely as the pumping regime is changes.

3.4.1 Northern Area Water levels

Water levels were measured quarterly and water level contour maps were prepared to evaluate groundwater flow dynamics in the Northern Area of the shallow aquifer (Appendix B). Water level monitoring is essential in the determination of possible shifts in flow direction, which could cause migration of nitrate-N to areas where it previously had not been present. The general pattern of groundwater flow in the Northern Area shallow aquifer is sub-parallel to the course of the San Pedro River, which flows north to northwest.

Water level elevations in the Northern Area shallow aquifer around and upgradient of the NARS ranged from approximately 3,565.86 feet above msl in monitor well MW-18 in August 2018, to approximately 3,593.60 feet above msl in monitor well MW-13 in February 2018 (Table 4). A localized depression in the shallow aquifer near monitor wells MW-08, MW-17, MW-18, and MW-19 has developed as a result of long-term pumping at NARS extraction well SEW-01 (Figure B-3 in Appendix B). Water level elevations in the Northern Area shallow aquifer wells in the MNA management zone ranged from 3,550.86 at MW-41B in May 2018 to 3,616.00 at D(18-21)06bcc2 in February 2018.

Water level elevations in shallow aquifer monitor wells feature typical seasonal fluctuations. These effects include increases due to winter recharge and decreases due to pumping increases and ET losses during the summer. In previous years, water levels in shallow aquifer wells not influenced by extraction well SEW-01 pumping increased slightly during summer monsoon. This seasonal influence was not observed in the August 2018 water levels, however the monitoring was conducted in early August near the middle of the monsoon season (Table 4; Figures A-33 through A-38). The monsoon precipitation for CY 2018 at 7.57 inches totaled for the months of June through September was slightly below the average precipitation of 7.86 inches at the National Oceanic and Atmospheric Administration (NOAA) Benson 6E station totaled for the same months

The apparent horizontal hydraulic gradient calculated in February 2018 within the Northern Area shallow aquifer was approximately 0.003 ft/ft, calculated between monitor wells MW-40 and

MW-41B (Figure B-3 in Appendix B; H+A, 2018d) The measured gradient was consistent with the November 2017 result (H+A, 2018c).

3.4.2 Northern Area Water Quality

Water quality sampling for nitrate-N contamination was performed on a quarterly, semi-annual, annual or biennial basis according to an approved schedule (Table 3). Time series water quality graphs for nitrate-N concentrations were prepared to examine trends (Appendix A).

Nitrate-N concentrations, detected in shallow aquifer groundwater samples collected from upgradient monitor wells around and upgradient of the NARS, ranged from less than 0.5 mg/l at monitor well MW-34 during the first three quarters of CY 2018 to 240 mg/l at monitor well MW-45 in August 2018 (Table 7). Nitrate-N was detected at concentrations greater than 10 mg/l in samples collected from upgradient Northern Area monitor wells MW-08, MW-13, MW-17, MW-18, MW-19, MW-35, MW-36, and MW-45 during CY 2018 (Table 7; Figures A-21, A-23, A-24, A-26, A-28, A-29, A-30 and A-32 in Appendix A). Overall, nitrate-N concentrations in the area either decreased (MW-11, MW-13, MW-17, MW-19, MW-35, MW-36, MW-45 and) or remained the same (MW-08, MW-34 and MW-45) with the exception of MW-18 which increased during 2018. Past increases in the area have been attributed to upgradient high concentrations that are lingering due to poor circulation and/or aquifer heterogeneities. It is important to understand that these high concentrations of nitrate-N in upgradient monitor wells in the Northern Area are not comparable to the low background concentrations seen in the upgradient monitor wells in the Southern Area. The Southern Area upgradient monitor wells were well upgradient of the location where historical discharges from the site occurred. Additionally, agricultural activities and domestic sewage discharged to septic systems which may contribute to nitrate concentrations in the shallow aquifer are common in the Northern Area. For this reason, shallow aquifer private wells have been incorporated into the monitoring network. Those land uses may also add to the nitrate-N background in groundwater. In contrast, upgradient from the Northern Area MNA area, the NARS is operative as an active component of the remedy. Therefore, the high nitrate-N concentrations detected in monitor wells, such as MW-36, are controlled by the capture of extraction well SEW-01 (Figures 8 and B-6).

Nitrate-N concentrations were less than 10 mg/l within the MNA management zone wells (Table 7). Management zone well D(18-21)06bcb is located just north of the SEW-01 extent of capture zone as determined from particle tracking and water level monitoring data, and is largely managed by the pumping rate at SEW-1 (H+A, 2005b). Nitrate-N concentrations in well D(18-21)06bcb ranged from 5.0 mg/l in December 2018 to an estimated concentration of 9.5 mg/l in August 2018. At this location, the concentrations of nitrate-N in the well might be expected to fluctuate if agricultural pumping were sufficiently intense. Due to the reduction in sampling frequency of the MNA Northern Area management zone, monitoring was not conducted at the majority of these wells with the exception of MW-42 and private well D(18-21)06bcb. In addition, the new NARS piezometers NAP-1 through NAP-5 were sampled in July 2018 and were all below the laboratory detection limit of 0.50 mg/l.

MNA parameters had been collected on an annual basis at MNA management zone monitor wells MW-38, MW-40, MW-41B, MW-42, and D(17-20)25bad through 2016. Samples had been analyzed for alkalinity, dissolved manganese, dissolved iron, and sulfate by an approved laboratory, and DO, oxidation-reduction potential (ORP), and TDS. The nitrate-N concentrations in groundwater in these wells have been below the cleanup standard since May 2013. The EPA agreed during the May 17, 2017, annual meeting that these analyses were no longer needed to track MNA parameter monitoring.

3.4.3 Northern Area Shallow Aquifer Status

The shallow aquifer in the Northern Area showed decreasing concentrations of nitrate-N across the MNA network monitor wells, so much so that the nitrate-N plume extent has decreased closer to the extraction well (Figure 2). Private well D(18-21)06bcb nitrate-N concentrations increased from 2017 to an estimated maximum concentration of 9.5 mg/l in August and declined to 5.0 mg/l in December 2018.The only notable difference in the area of the plume is shown in the vicinity of monitor well MW-46, which is still within the NARS capture envelope. However, it should be pointed out that this difference does not represent an actual enlargement of the plume, but rather the delineation of the plume in an area where data were not previously available. This delineation was enabled after monitor wells MW-45 and MW-46 and test well TW-01 (SEW-02) were constructed in 2015 and subsequently sampled for nitrate-N.

In the area around and upgradient of the NARS, nitrate-N concentrations at shallow aquifer monitor wells MW-19 and MW-34 indicated little fluctuation during CY 2018. Monitor well MW-19 concentrations ranged from 12 to 17 mg/l, and MW-34 concentrations were below 0.5 mg/l throughout CY 2018, with the exception of an estimated concentration of 1.7 mg/l in December 2018. Concentrations at monitor well MW-35 and MW-17 ranged from 58 to 78 mg/l and from 3.7 to 18 mg/l in CY 2018, respectively. This is attributed to upgradient high concentrations that are lingering due to poor circulation and/or aquifer heterogeneities. Further monitoring at these locations will be conducted in CY 2019. This is consistent with water level patterns and flow line analyses expected along the aquifer boundary which in places is quite irregular. Nitrate-N concentrations at monitor well MW-08 remained steady in 2018. This monitor well is within the capture zone of extraction well SEW-01.

ICs were effective during CY 2018. The well inventory was updated and no additional domestic wells were identified as within or reasonably close to (within 0.7 miles) the nitrate-N plume. Details on the CY 2018 well inventory are in Section 6.1. Currently, bottled water is supplied to one well owner, D(18-21)06bcb. This residence is located just north of SEW-01. Currently the nitrate-N concentration is below 10 mg/l as it has been since 2013. This private well will be monitored quarterly in CY 2019 to verify that nitrate-N concentrations remain below 10 mg/l, particularly during potential changes in the extraction well SEW-01 pumping regimen associated with pumping upgradient at extraction well SEW-02. Details on ICs are provided in Section 6.0.

3.5 OVERVIEW OF NORTHERN AREA SHALLOW ALLUVIAL AQUIFER

For the purposes of this Site investigation and for various practical reasons, the shallow aquifer is referenced in terms of a Southern Area and Northern Area. This division was based on:

- The position of tributary watersheds that enter the San Pedro River, with the Southern Area drained primarily by Wash 6, and the Northern Area by Washes 1, 2, 3, 4, and 5.
- The types of COCs present, with both nitrate-N and perchlorate present in the Southern Area, and only nitrate-N present in the Northern Area.
- The presence of perched groundwater systems in the Southern Area as a result of historical plant operational activities.
- A mound-like protrusion of the aquifer boundary extending along the western aquifer boundary just to the south of Wash 5.
- Differences in the remedies operating in these respective areas.

Basically, in the Southern Area, based on a determination of low risk to human health and for contaminant migration, a program of long-term monitoring is in place according to the U.S. Environmental Protection Agency's (EPA) 2017 Explanation of Significant Differences (ESD). For the Northern Area, two separate remedies are operating, a pump-and-treat remedy known as the Northern Area Remediation System (NARS) established pursuant to EPA's 1994 Record of Decision (ROD), and a larger area, which is under monitored natural attenuation (MNA) as a result of EPA's 2008 ESD.

The Northern Area of the shallow alluvial aquifer within the Apache Powder Superfund Site occurs within the heterogeneous alluvial strata along the San Pedro River (Figure 15). Groundwater flows across the area in a general southeast to northwest direction, roughly parallel to the course of the River. Intermittent flow along this reach is facilitated by groundwater-surface water exchanges, wherein the River is alternately a gaining and a losing stream, owing to River location and flow conditions. These conditions were confirmed via a detailed wellpoint survey conducted during low-flow conditions in the River (H+A, 2003).

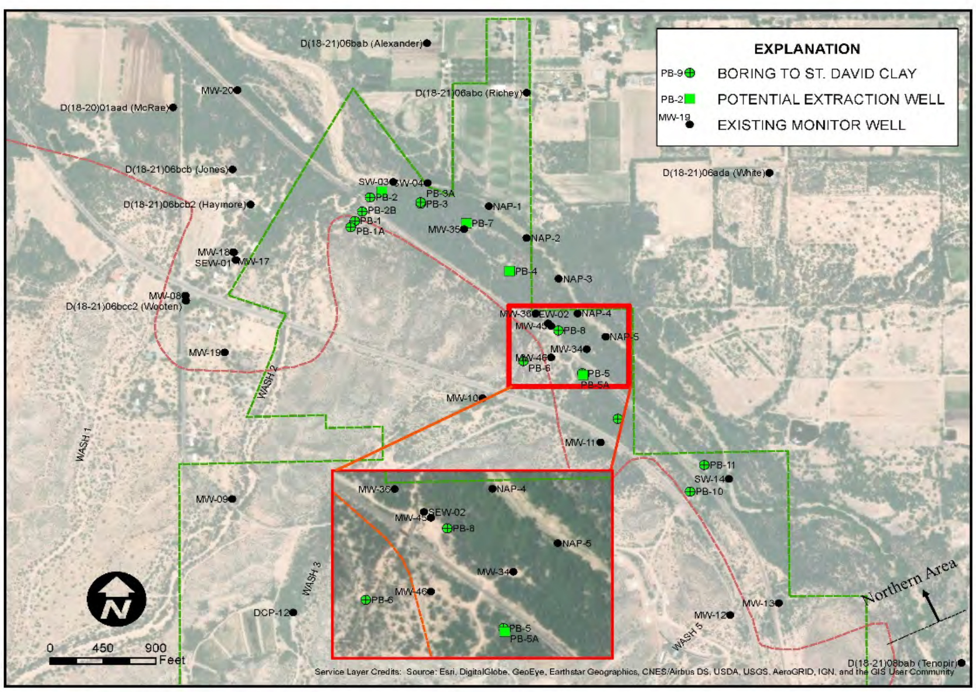

Figure 15. Northern Area of the shallow alluvial aquifer along the San Pedro River, Apache Powder Superfund Site showing monitor wells, extraction wells, and recent exploratory drilling.

The aquifer is present within a diverse assemblage of stratigraphic units ranging from silty clays to sands and gravels. These units comprise both Holocene alluvial materials, associated with the San Pedro River, and older, reworked materials of the St. David Formation as described by Gray (1965 and 1967, Figure 16). The general stratigraphic section of the St. David Formation comprises strata of Pliocene to Pleistocene age. Notably, Gray has described a lower clay unit as predominantly red clays and mudstones to depths of as much as 2,600 feet near St. David (Gray, 1967). At the Site, this unit has been referred to as the “St. David clay,” and is considered the base of the shallow alluvial aquifer. The St. David clay also forms a confining unit for underlying artesian aquifers in the St. David Formation. Generally, these artesian aquifers are present at considerable depths (>200-500 feet) below the clay surface and are commonly exploited for public, agricultural, and domestic water supplies.

As stated earlier, the lower clay unit of the St. David Formation is considered the base of the shallow alluvial aquifer for the purposes of this investigation. The configuration of the surface of this clay base was interpreted from resistivity and induced polarization surveys performed in 2018 (hydroGEOPHYSICS [HGI], 2018). The interpretation indicates trough-like structure or a basin sloping roughly towards the position of the present San Pedro River and plunging towards the northwest. Generally, the St. David clay is encountered at a maximum depth under the River (Figure 17). Owing to historical wastewater discharges from the ANPI plant manufacturing operations, the shallow alluvial water has been contaminated with nitrate-N. Thus, the clay unit also marks the deepest limit of the vertical migration of nitrate-nitrogen within the shallow aquifer. Further, the clay prevents further downward migration by virtue of its low hydraulic conductivity and the upward vertical gradient of the deeper artesian aquifer(s).

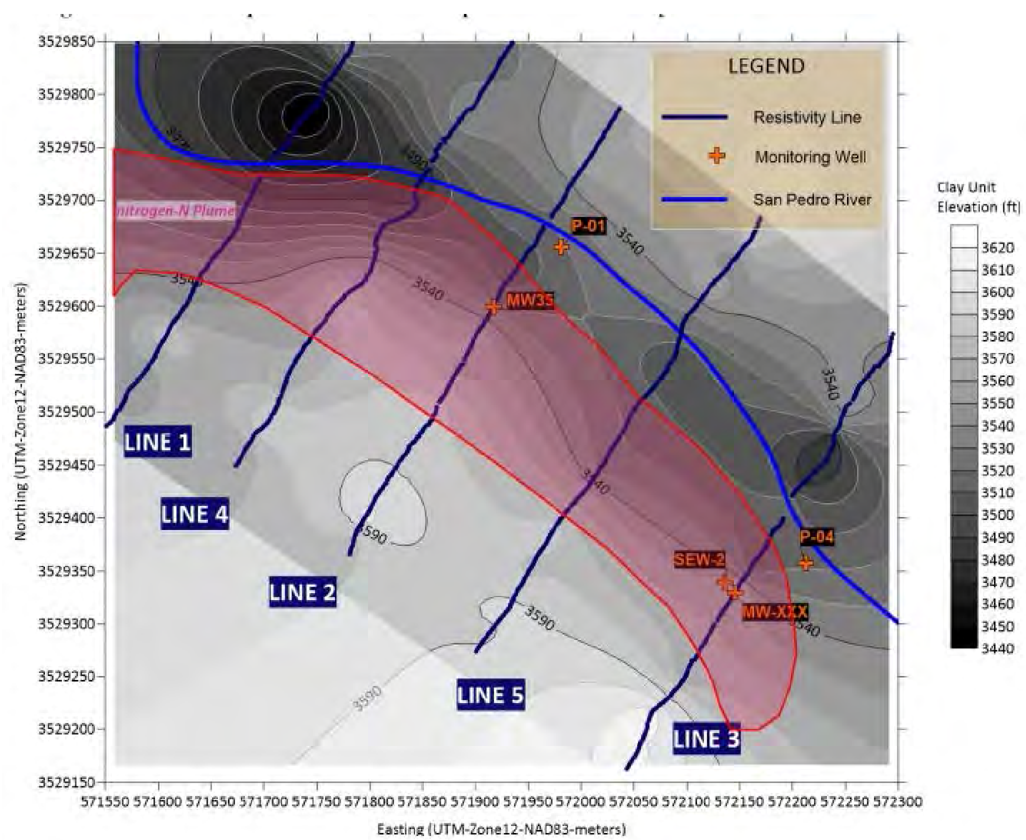

Figure 17. Interpreted surface of St. David clay unit (after HGI, 2018).

As for the extent of the Northern Area of the Shallow Aquifer at the Site, an extension of the western boundary of the shallow aquifer was designated as the boundary between the Northern and Southern Areas (Figure 15). The basis for this designation is discussed below. The northern extent of the shallow alluvial aquifer extends along the San Pedro River, narrowing significantly to the northwest. The eastern and western boundaries of the shallow alluvial aquifer basis are also discussed further below.

3.5.1 Stratigraphic Heterogeneities

It is important to recognize that the shallow alluvial aquifer within the Site area is asymmetrical in the sense that its lateral extent to the west of the San Pedro River is much narrower than on the eastern side (Figure 15). The alluvial material forming the shallow aquifer abuts against a boundary to the west, which comprises old terrace deposits and strata of the St. David Formation.

In contrast, the shallow aquifer on the east side of the San Pedro River is quite broad in the vicinity of the Town of St. David, Arizona, owing to the greater distance to the boundary and the aforementioned asymmetry.

Due to the heterogeneous nature of these alluvial strata, the distribution of groundwater as well as nitrate is likewise highly variable in space, sometimes varying significantly over short distances. Figure 18 illustrates conceptually how an ancient alluvial system such as the San Pedro River can develop complex stratigraphic heterogeneities over its geomorphic history.

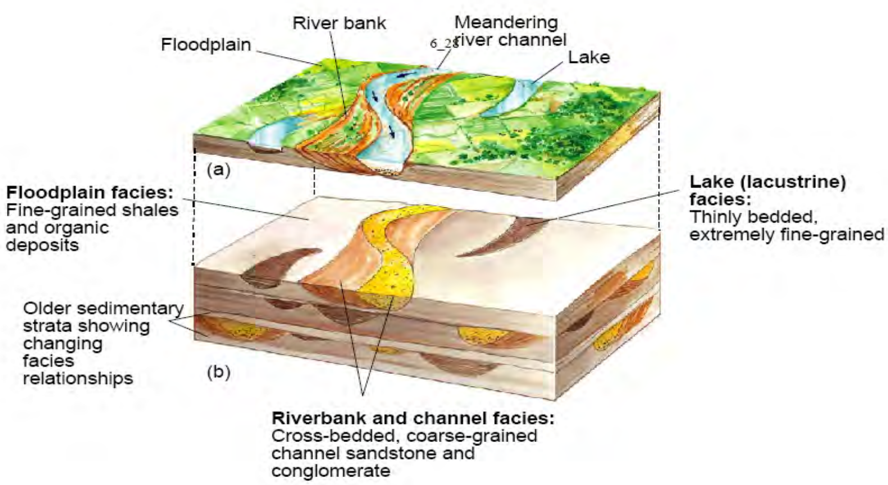

Figure 18. Conceptualized development of alluvial deposition illustrating the formation of heterogeneities (after http://www.geo.wvu.edu/~kammer/g3%5CFacies.pdf).

3.5.2 Heterogeneity and distribution of contaminants

In understanding the occurrence and distribution of contaminants in a heterogeneous system such as the shallow alluvial aquifer, it is first important to understand how heterogeneities can control groundwater pathways. In such a system, groundwater may follow a tortuous pathway, flowing more easily and more rapidly through coarser units and more slowly through fine-grained materials. Such pathways, regardless of how tortuous, are often referred to as “preferred” or “preferential” pathways. The fastest pathways of flowing groundwater often divert around finer-grained features. Thus contaminants that are conservatively transported (such as nitrate-N) are said to advect along the preferred pathways. In contrast, contaminants may slowly enter finer materials through diffusion. In turn, contaminants are slow to diffuse out. Still, it should be considered that the overall direction of groundwater flow, despite the direction of flow within localized pathways in the Northern Area is from southwest to northwest.

Figure 19 below shows a theoretical comparison of how heterogeneities in an aquifer can influence contaminant migration. Panel (a) illustrates plume movement through a homogeneous porous medium. In this system, dispersion occurs along the longitudinal pathway. In contrast, Panel (b) depicts how the plume would move through a system of layered beds and lenses with contrastingly higher hydraulic conductivity than the surrounding porous medium. Finally, Panel (c) depicts comparatively similar layering, but within irregular lenses. Thus it is seen how plume migration can be variable. Freeze and Cherry (1979) note that layered heterogeneities can sometimes be mapped, but small-scale heterogeneities often cannot be correlated, even from borehole to borehole.

> *"Hydraulic conductivity contrasts as large as an order of magnitude can occur as a result of almost unrecognizable variations in grain-size characteristics. For example, a change of silt or clay content of only a few percent in a sandy zone can have a large effect on the hydraulic conductivity."* (Freeze and Cherry, 1979)

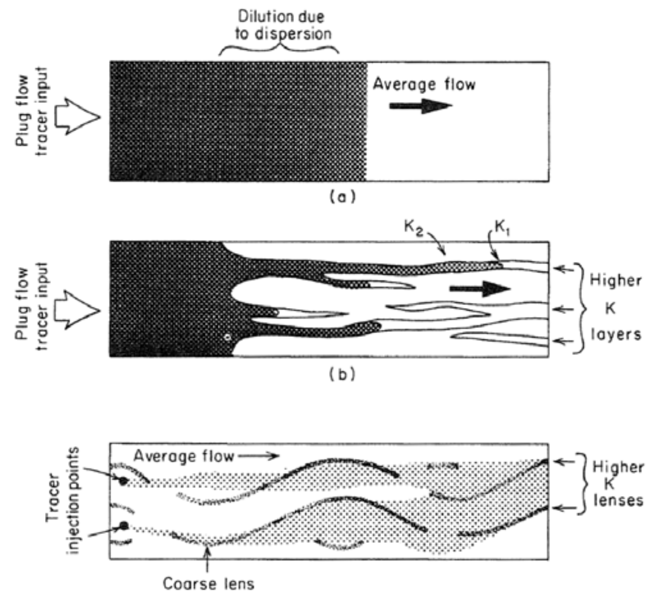

Figure 19. Comparison of migration pathways developed within porous media with different degrees and types of heterogeneity (after Freeze and Cherry, 1979).

While this illustration does not exactly portray the heterogeneities in the shallow alluvial aquifer at the Site, it does on a small scale illustrate the role of heterogeneity in affecting groundwater pathways. The shallow alluvial aquifer along the San Pedro River, as previously described, is highly heterogeneous, particularly along the western side of the River. An appreciation for the influences of such heterogeneities is necessary for understanding plume dynamics and for designing an effective remedy involving the extraction of contaminated groundwater.

Figure 20 below is illustrative of the type of "badland topography" present throughout the upland areas surrounding the San Pedro Basin in the vicinity of St. David, Arizona. Note the erosional pattern that has developed along the slope and the colluvial material that has begun to fill the arroyos. This type of terrain is believed to be similar to that which extended at depth within the San Pedro Basin prior to episodes of lateral degradation and aggradation of the ancestral river. Again, this assists in understanding the role of heterogeneities in the alluvial basin, particularly along the basin margin. It further helps to explain some of the lithologic data observed during recent exploratory drilling.

Figure 20. Exposure of St. David Formation materials within the Apache Powder Superfund Site area illustrating badlands topography.

In examining the stratigraphy of the St. David Formation, coarser units ("stringers") are commonly noted among the fine-grained units (Gray, 1965, 1967; Figure 16). Such stringers have been commonly observed in the materials that form the western boundary of the shallow aquifer. So depending on the elevations of historical water levels, contaminated groundwater can saturate such materials and become trapped if groundwater levels recede.

Incision by drainages (ephemeral washes) coming off the upland area west of the boundary into the alluvium are evident. In particular, such incisions are noted in the areas where Washes 1 and 2, Wash 4, and Wash 5 debouch onto the alluvial plain. The initial remedial investigation required the construction of monitor wells at each of these locations. And in the early days of the investigation, some of the highest concentrations of nitrate-N were detected in groundwater sampled from these wells. It is evident that these areas are not in the primary pathway of groundwater flow, which is predominantly to the east along the San Pedro River. Hence, nitrate-N that entered into these areas did not readily advect out.

3.5.3 Contaminant Source History

It is important to understand factors relating to the operational history and the fate and transport of wastewater from ANPI's manufacturing plant. As mentioned earlier, an oxyanion such as nitrate-N is highly soluble and essentially advects with the flowing groundwater. Little, if any, retardation of the nitrate-N occurs during transport. While biodegradation (denitrification) is possible, studies at the Site have concluded that the availability of total organic carbon in the aquifer is insufficient to sustain such processes in a significant way.

ANPI has operated at the Site continuously for nearly 100 years (since 1922). While nitrogen products have been the primary production line during that time, the processes, feedstocks, and disposal practices have changed in both type and location on the property. Figure 21 is a timeline showing how these factors varied over this timeframe. Nevertheless, the presence of nitrate-N has been constant during the plant's entire operational history.

Notably, wastewater disposal practices occurred primarily if not exclusively within Wash 5 and 6 watersheds. Wash 5 received wastewater from the Powder Line, where nitroglycerin dynamite was manufactured though the mid-1980's, employing nitric acid produced on site as a primary ingredient. Wash 5 discharges into the shallow alluvial aquifer in the Northern Area. Wash 6 received wastewater from the bulk of the nitric and sulfuric acid operations until the early 1970's. During this early phase, wastewater was routed through unlined ditches directly to the washes. Anecdotal evidence suggests that the flow volume in Wash 6 at times was sufficient to flow all the way to the San Pedro River. As a result of field inspections about that time, the ADHS issued a requirement to treat the plant's wastewater stream in lieu of direct discharges to the washes. ANPI responded by constructing evaporation ponds. Unfortunately, these ponds were unlined and leaked water into the underlying sediments, thus creating bodies of perched groundwater atop the underlying surface of the St. David clay unit. To worsen the condition, evaporation resulted in concentration of solutes in the wastewater discharged to the ponds. Wash 5 discharges within the Northern Area, whereas Wash 6 discharges within the Southern Area. This condition persisted until about 1995 when ANPI brought its Brine Concentration facility online. Subsequently, all plant wastewaters were routed to a newly-constructed Brine Concentrator facility, thereby entirely eliminating wastewater discharges from the plant.

Similarly, wastewaters from dynamite manufacturing operations along the Powder Line had been routed to Wash 5, until the evaporation ponds were constructed. Subsequently, Powder Line operations were discontinued in the mid-1980s. Cord plant operations began in the late 1960's and were terminated in 1994. During this time, wastewater from the Cord Plant was routed to Ponds 9, 9A, and 9B, which were located in the Wash 6 watershed. Perched groundwater was also noted beneath Pond 9.

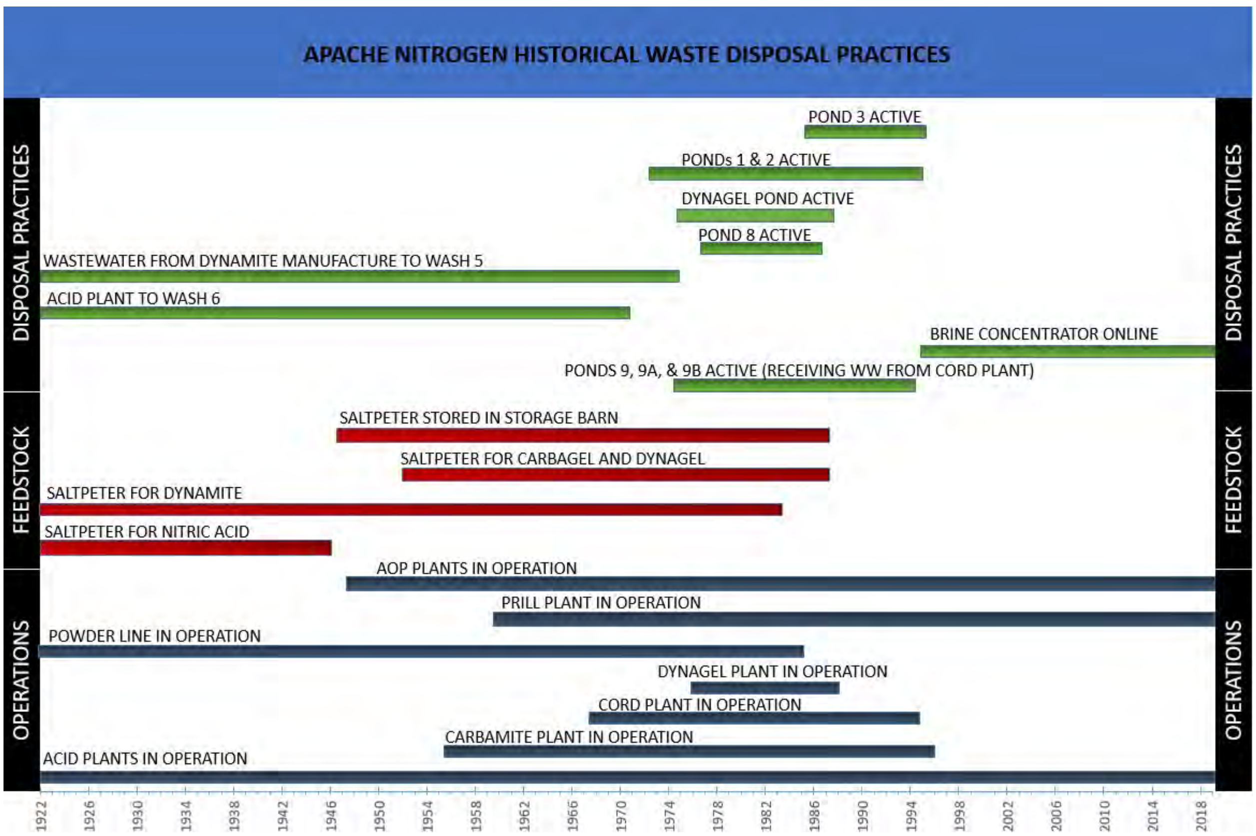

Figure 21. Timeline of operations, feedstock materials, and wastewater disposal practices at ANPI.

Another important process in the plant's history was the use of a Chile saltpeter feedstock in various manufacturing processes including the production of nitric acid, nitroglycerin, carbagel, and dynagel. Pure Chile saltpeter comprises sodium nitrate ($NaNO_3$). The feedstock used by

ANPI was purchased from a supplier in Los Angeles, but was imported from a mine in Chile. Recent research indicates that such products originating in the Atacama Desert of Chile contain perchlorate (ClO_4^-) impurities in the range of 0.7 to 1.9 mg/g (Urbansky, *et al.*). Hence, the wastewater stream from such manufacturing operations probably contained trace amounts of perchlorate, which migrated into and were transported with the groundwater. This product was used and stored in the main plant operations area and, hence, perchlorates were only discharged into the Wash 6 watershed. Based on sampling performed in late 1998 and during subsequent monitoring events, perchlorate has only been detected in perched groundwater in the Southern Area.

So, considering the number of changes in the materials and sources of contamination that occurred over the long operational history of ANPI, one must consider that the occurrence of the chemicals of concern (COCs) in the shallow alluvial aquifer would be heterogeneous, irrespective of hydrostratigraphy. With the types of operations, locations and methods of wastewater discharges, and various feedstocks it would be expected that the plume would be quite complex in terms of the distribution of contaminants as compared with a single source input. To illustrate, Figure 22 provides a conceptualization of how plume types can develop based on various source inputs within a uniform flow field. Note that the flow fields shown are all homogeneous, in contrast to the actual situation at the Site.

Panel (a) illustrates plume migration from a continuous point source. The plume is dispersing both in longitudinal and transverse planes over successive time periods. Panel (b) shows the migration of a plume developed from an instantaneous point source or release. The plume travels downgradient, again while dispersing in in longitudinal and transverse planes over time. Finally, Panel (c) illustrates composite plumes created from multiple instantaneous point sources. While the pattern is similar to that shown in Panel (b), contaminants for the individual sources commingle creating more complex zones of contamination.

While these exact scenarios are not intended to represent how the present plume at the Site developed, they do illustrate that plume development, in consideration of the aforementioned source variables, probably contributed to the presently-observed complexities in addition to complexities owing to hydrostratigraphic heterogeneities. In particular, it is believed that the earliest wastewater discharges that were routed into Washes 5 and 6, probably represented sufficient flow volume to reach the San Pedro River. Once in the River and the faster moving groundwater subsurface pathway along the River, more rapid northward distribution of the nitrate-N occurred than would have happened via the groundwater pathway alone.

It is also important to recognize that, although manufacturing operations are ongoing and are similar to those performed in the past, the sources that contributed to present-day contamination are historical, essentially from past wastewater management practices. Past wastewater discharges came from a variety of locations, mechanisms, processes, conveyances, etc. At one time or another, some would be considered "continuous" and others may have been "instantaneous." But no instantaneous or continuous sources are now present. The plume observed in the present time is historical.

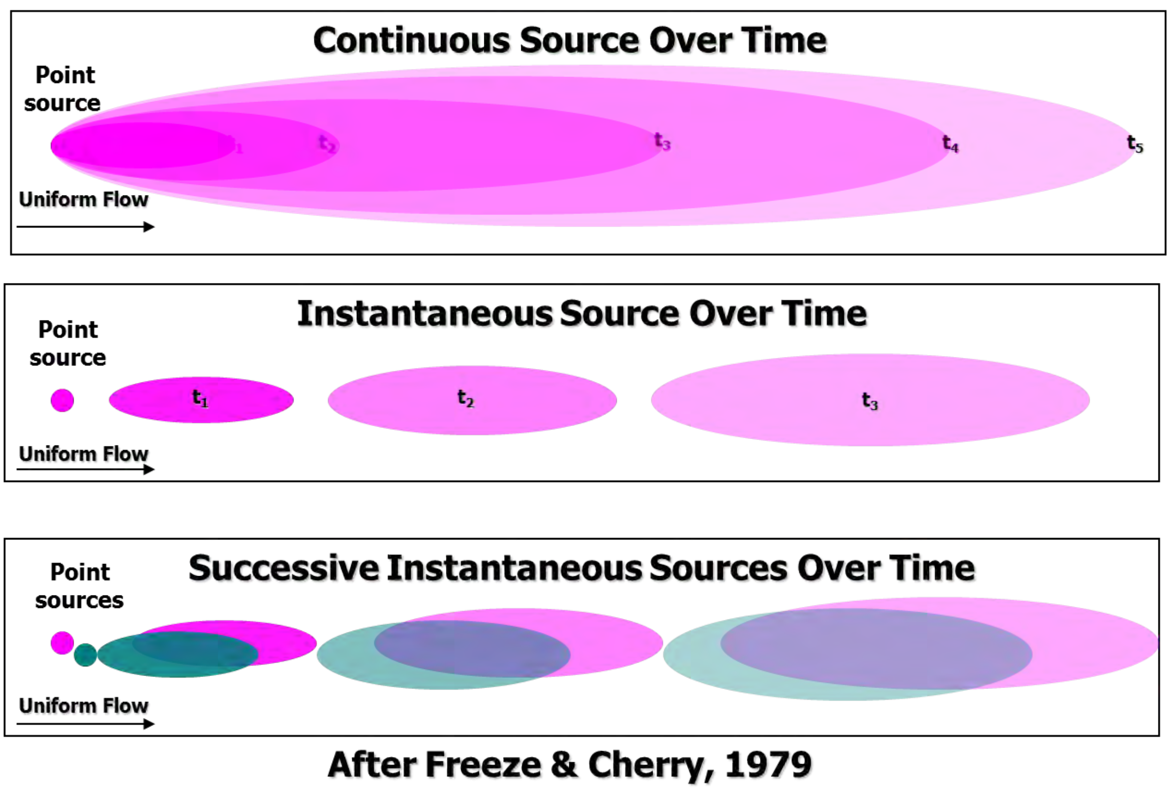

Figure 22. Conceptual comparison of plume development under various source release scenarios (after Freeze and Cherry, 1979).

3.6 NORTHERN AREA REMEDIATION SYSTEM

While performance with regard to the remedial activities in both the Southern Area and in the MNA portion of the Northern Area is essentially in a static/maintenance status, recent efforts have been directed towards the acceleration of NARS performance in an effort to attain the remedial action goals sooner than has been projected. This program has been undertaken in light of:

- Further denitrification capacity available in the NARS treatment wetland.
- Acquisition of additional parcels of land in the Northern Area by ANPI.
- Successful pilot testing of a new extraction well (SEW-02) in the Northern Area.
- Geophysical surveys and exploratory drilling in the Northern Area providing further hydrostratigraphic information on optimal locations for emplacement of additional extraction wells.

During CY 2018, ANPI conducted a pilot testing program using extraction well SEW-02 (formerly test well TW-01). Extraction well SEW-02 was equipped with a five horsepower submersible pump, supplied with line power. A discharge line was hooked up to the assembly and run along Wash 3, under the railroad trestle and through the culvert underneath Apache Powder Road. The line was routed along Old Apache Powder Road, joining the pipeline from extraction well SEW-01 and running parallel to the top of the NARS treatment wetland (Figure 23). Over the course of this routing, it is a pumping lift of approximately 140 feet from the dynamic pumping level in SEW-02.

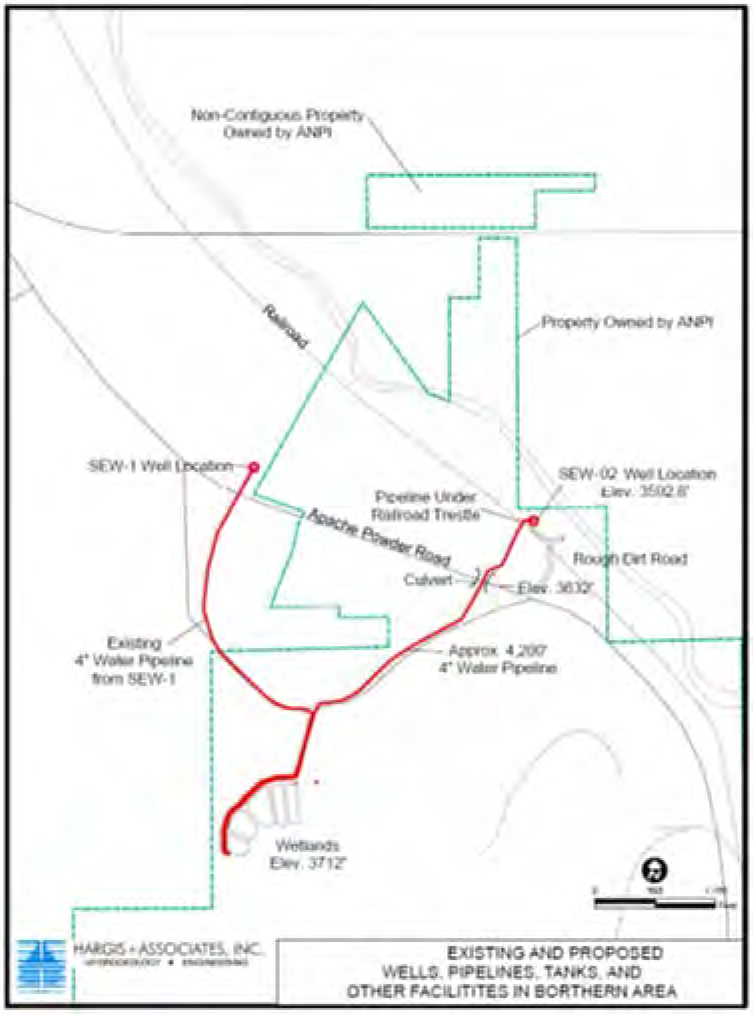

Figure 23. Configuration of pipeline routing from extraction wells SEW-01 and SEW-02 (TW-01) to the NARS treatment wetland.

Based on concerns raised regarding the potential for capture of San Pedro River subflow due to more rigorous pumping in the Northern Area, a series of five Northern Area piezometers (NAP-1 through NAP-5) was constructed along the western bank of the San Pedro River using hollow stem auger methods (Figure 24). Borings were drilled to depths of 22 to 40 feet below land surface and screened across intervals where first water was encountered. Each was sampled and analyzed for initial water quality parameters and equipped with pressure transducers. Appendix F provides additional details regarding the piezometer construction procedures and results (H+A, 2019b). These piezometers enable monitoring of water levels and water quality along the San Pedro River in the subflow region. Generally, water level responses in the piezometers indicate changes in response to surface flow effects in the San Pedro River. Specifically, surface water/groundwater interactions are apparent.

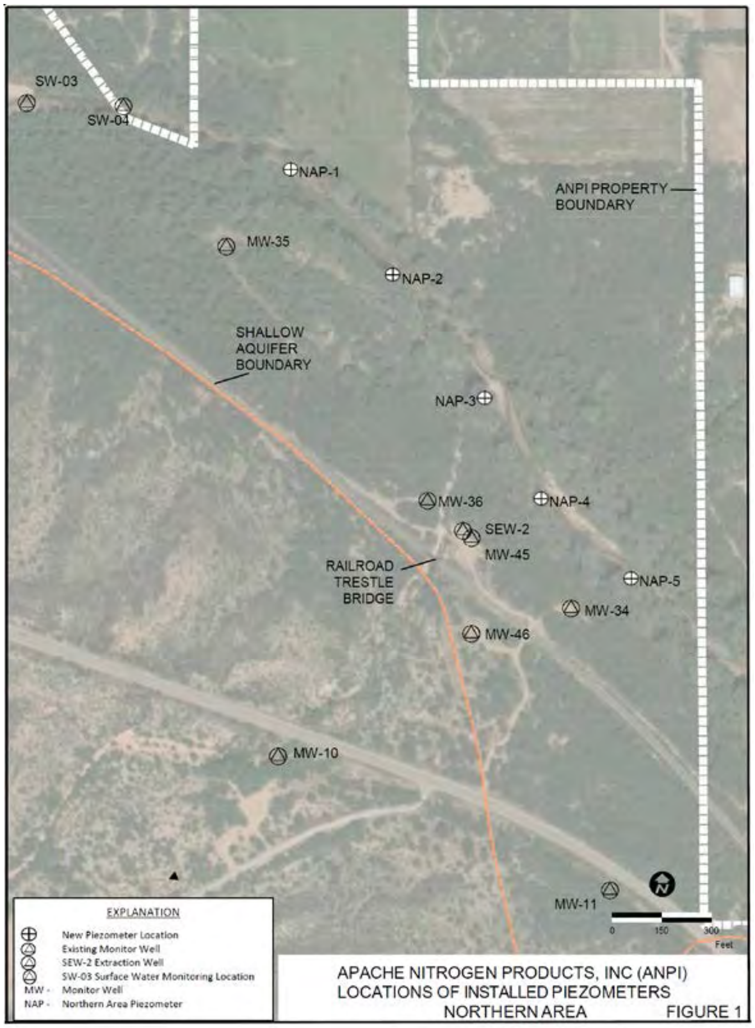

Figure 24. Network of Northern Area piezometers installed along San Pedro River to measure potential effects of pumping on subflow conditions.

It is useful to examine such hydrographic responses against those observed at distances farther away from the River. For example, a comparison of the hydrographs in piezometer NAP-4 and monitor well MW-45 (nearest pair), shows apparent correlation in hydrographic response related to river flow at both locations (Figure 25). The water level in piezometer NAP-4 shows slight fluctuations in response to pumping cycles at extraction well SEW-02, whereas the fluctuations at nearby monitor well MW-45 are quite pronounced. In fact, the monitor well MW-45 hydrograph is shown with a separation, thus creating an appearance of two trends. Again, this is a response to periodic pumping at extraction well SEW-02.

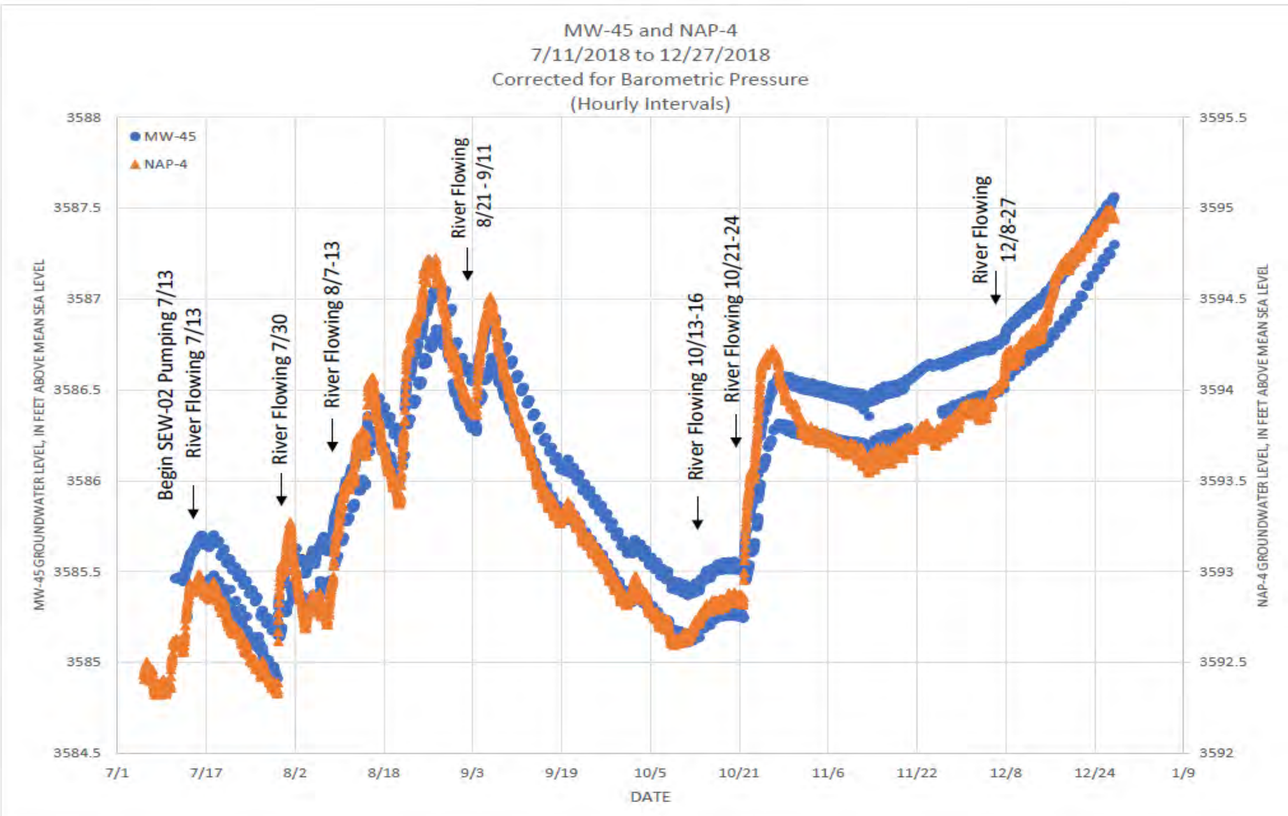

Figure 25. Comparison of hydrographic responses observed along the San Pedro River at piezometer NAP-4 and farther inland at monitor well MW-45. (Note that the hydrograph for monitor well MW-45 appears as two separated trends due to water-level drawdown during pumping cycles at extraction well SEW-02).

Similarly, groundwater samples were collected for analysis of major ion comparisons between piezometer NAP-4 and monitor well MW-45 show distinctly different water types (Figure 26). This difference has remained consistent during the operation of extraction well SEW-02. Thus, based on examination of both hydrographic and hydrochemical data, it is inferred that the water pumped from extraction well SEW-02 is not being drawn from the subflow region of the San Pedro River. Further presentation of the hydrographic information since the startup of pumping at extraction well SEW-02 is presented in Appendix F.

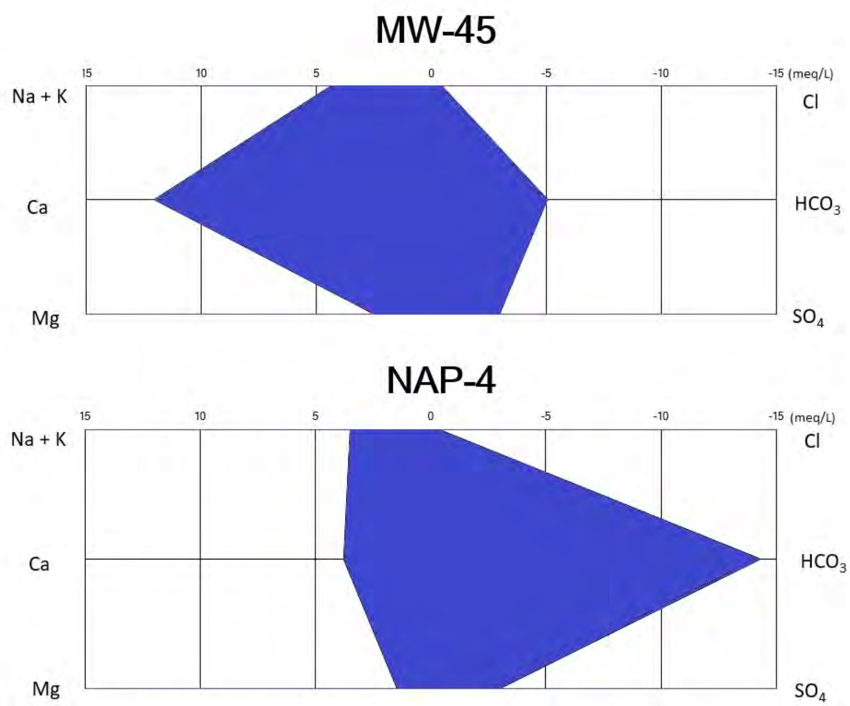

Figure 26. Comparison of water types present at piezometer NAP-4 vs. monitor well MW-45.

As mentioned earlier, during CY 2018, ANPI completed a geophysical survey along five roughly southwest-northeast transects in the Northern Area (Figure 17). The survey included both electrical resistivity and induced polarization methods in an effort to help define subsurface features with a goal of assisting in the siting of locations for potential new exploratory borings and extraction wells. The field work was performed over the period from July 27 through August 13, 2018, and a report was completed in September 2018 (HGI, 2018; see Appendix G).

Based on the survey results, six locations were selected for exploratory drilling. Drilling was performed beginning on November 1, 2018 and continued through November 10, 2018, during which time four potential extraction wells and five exploratory borings were drilled using sonic methods. Six-inch cores were collected, logged, and photographed at each location. The results will be submitted in a forthcoming report.

The resulting information led to consideration of a supplemental drilling program to address certain data gaps. The proposed workplan for this exploratory phase was submitted to EPA for approval on January 3, 2019. This drilling was performed in February 2019. Upon completion of this exploration, the locations were surveyed for position and elevation control. From that information stratigraphic cross-sections were interpreted. These are discussed below and will assist in preparing the architecture for a digital model. The model will be exercised as a means of optimizing the wellfield for accelerating the remedy.

3.7 CONCLUSIONS REGARDING SITE CONCEPTUAL MODEL

Elements of the CSM for the Northern Area of the shallow alluvial aquifer along the San Pedro River has been presented and discussed in the previous sections. Most notably, as a result of the additional exploration during 2018 and continuing into 2019, the areal extent of the nitrate-N plume is extended further south than previously reported. This is the result of filling in data gaps due to the limited extent of the monitor well network within the NARS area in prior reports.

The northward limits of the groundwater plume remain the same owing to the capture envelope created by the operation of extraction well SEW-01. Therefore, efforts to accelerate attainment of remedy standards have focused on optimal extraction of contaminated groundwater within positions upgradient from extraction well SEW-01. This effort began in July 2018 with pumping at extraction well SEW-02. Aggressive pumping at that location resulted in nearly doubling the rate of nitrate-N mass extraction from the shallow aquifer. This has resulted from a combination of the decrease in influent concentrations to extraction well SEW-01 and the capture of higher nitrate-N concentrations at extraction well SEW-02. It is anticipated that, with the strategic incorporation of the newer extraction wells into the remedy network, attainment of the remedial standards can be achieved sooner.

Much discussion has focused on the existence of preferred migration pathways of the plume. A corollary to the concept of preferred pathways would then be “lesser” pathways. As discussed earlier, the shallow alluvial aquifer is highly heterogeneous. As such there is an abundance of such “lesser” pathways, wherein nitrate-N solute is not easily “flushed” or otherwise “pulled” out of finer-grained materials. The irregularity of the western aquifer boundary and its role in creating “dead ends” for advective flow has been presented. Without some mechanism of flushing or pulling, contaminants residing in such dead ends would not readily move. This is how it is possible that the existing contamination is quite old, potentially persisting since decades in the past when it was discharged in a less controlled manner from the plant.

So primarily it is believed that preferred pathways probably exist closest to the San Pedro River, where the sediments are deepest, groundwater-surface water exchange is present, and the sediments are coarser. It will be relatively easy to continue to extract nitrate-N mass from the areas of preferred flow pathways. The challenge will be extracting from the finer-grained materials and areas where groundwater circulation is impaired. The matter of San Pedro River subflow capture is problematic, but it is believed that with a strategic pumping regimen this can be managed.

Based on the exploratory drilling performed in 2018 and 2019, an effort has been put forth to prepare hydrostratigraphic cross-sections in the NARS portion of the Northern Area of the shallow alluvial aquifer. These represent further refinement of the CSM. The cross-sections were developed on the basis of lithologic logs from both prior and recent exploration, and represent data recorded from a variety of boring and logging methods. The recent drilling programs were performed using continuous coring methods and are therefore believed to be more reliable than the earlier drilling by conventional rotary methods. The position of these new cross-sections is shown on Figure 27. Examination of cross-sections A-A′, B-B′ and C-C′ easily demonstrate the degree of heterogeneity in the system on the western side of the San Pedro River (Figures 28, 29 and 30, respectively).

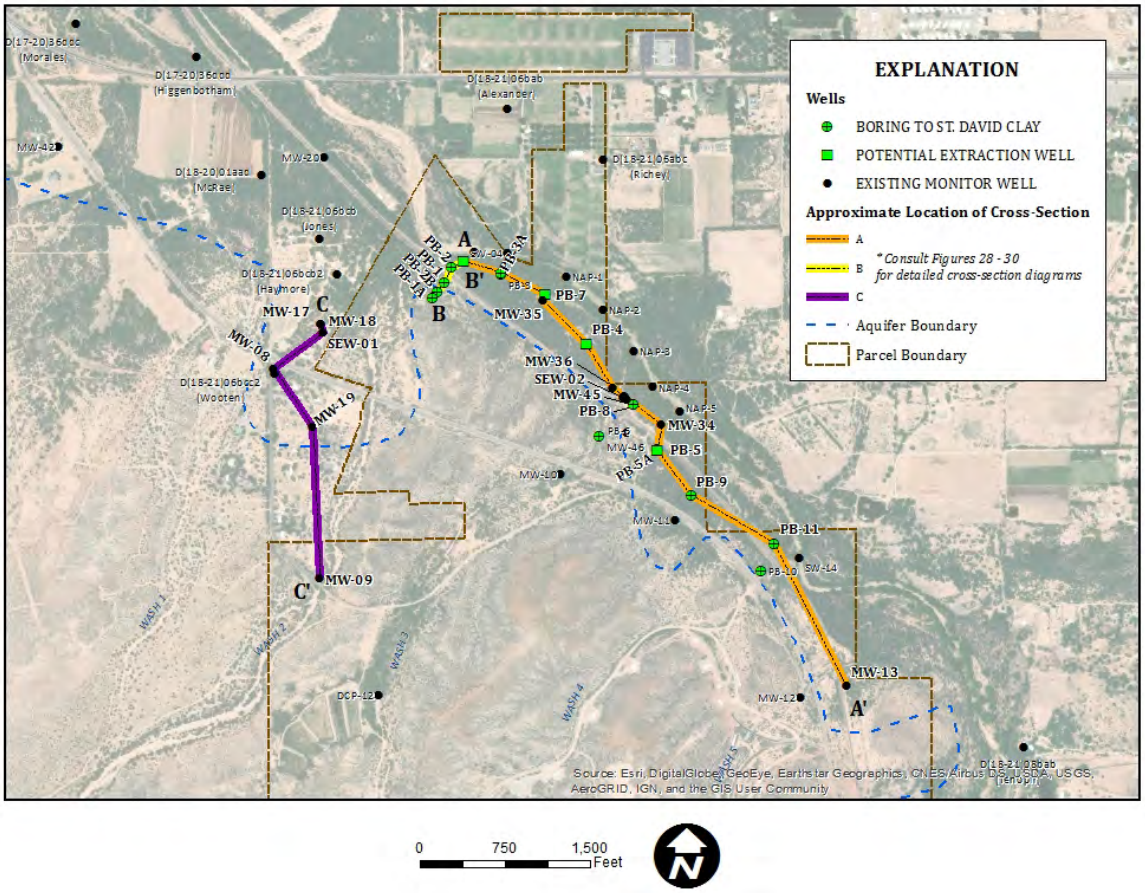

Figure 27. Northern Area Plan View of Conceptual Cross Sections.

Based on the field logging results, the hydrostratigraphy was interpreted as four groupings of materials. These included sands and gravels, silty or clayey sands, silts and clays, and St. David clay. Respectively, these roughly represent decreasing ranges in the hydraulic conductivity. Notably, the distribution of more highly transmissive aquifer materials thins out southward of borehole PB-5A, suggesting that the primary flowpath from south to north is east of where the aquifer boundary is shown on Figure 15, probably near the San Pedro River to the east of boring PB-11 (Figure 28). This would be consistent with the monitoring history at monitor well MW-34, which has consistently shown low to non-detectable concentrations of nitrate-N. In other words, groundwater in the area south of boring PB-5A probably does not circulate much (Figure 28).

This suggestion may further explain the isolation of monitor well MW-13, which is situated near the mouth of Wash 5 and which has had persistent concentrations of nitrate-N throughout its monitoring record (Figure 28). Such low circulation area might also explain the exceedingly high concentration of nitrate-N (660 mg/l) present at boring PB-5A.

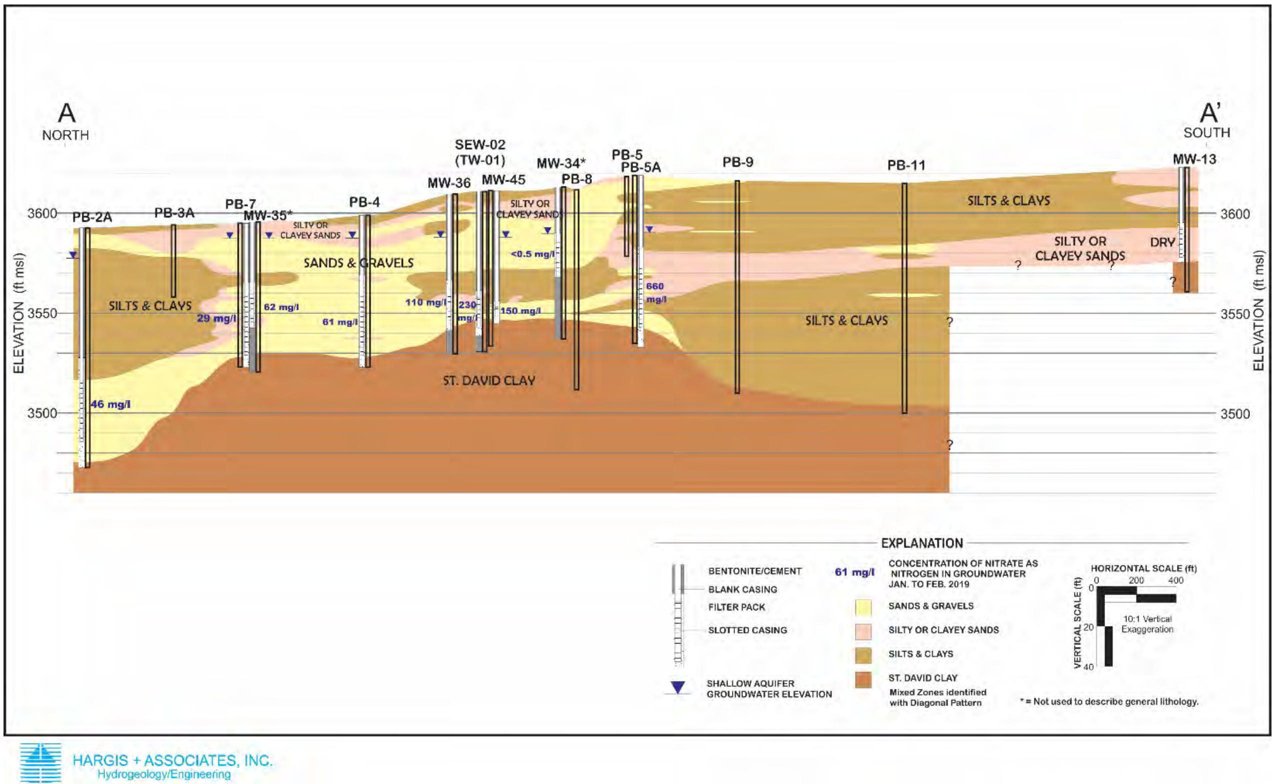

Figure 28. Northern Area Conceptual Cross Section A-A'.

North of borehole PB-5A, there appears to be a better pathway beginning just south of monitor well MW-45 and continuing northward towards monitor well MW-35. Still farther north, the aquifer appears to deepen and the flowpath at lesser depths is somewhat "obstructed" by a mass of silts and clays until the sands and gravels are found at a greater depth in the vicinity of borehole PB-2A (Figure 28 and 29). This zone may have hydraulic connection with the sands and gravel present at extraction well SEW-01 (Figure 30).

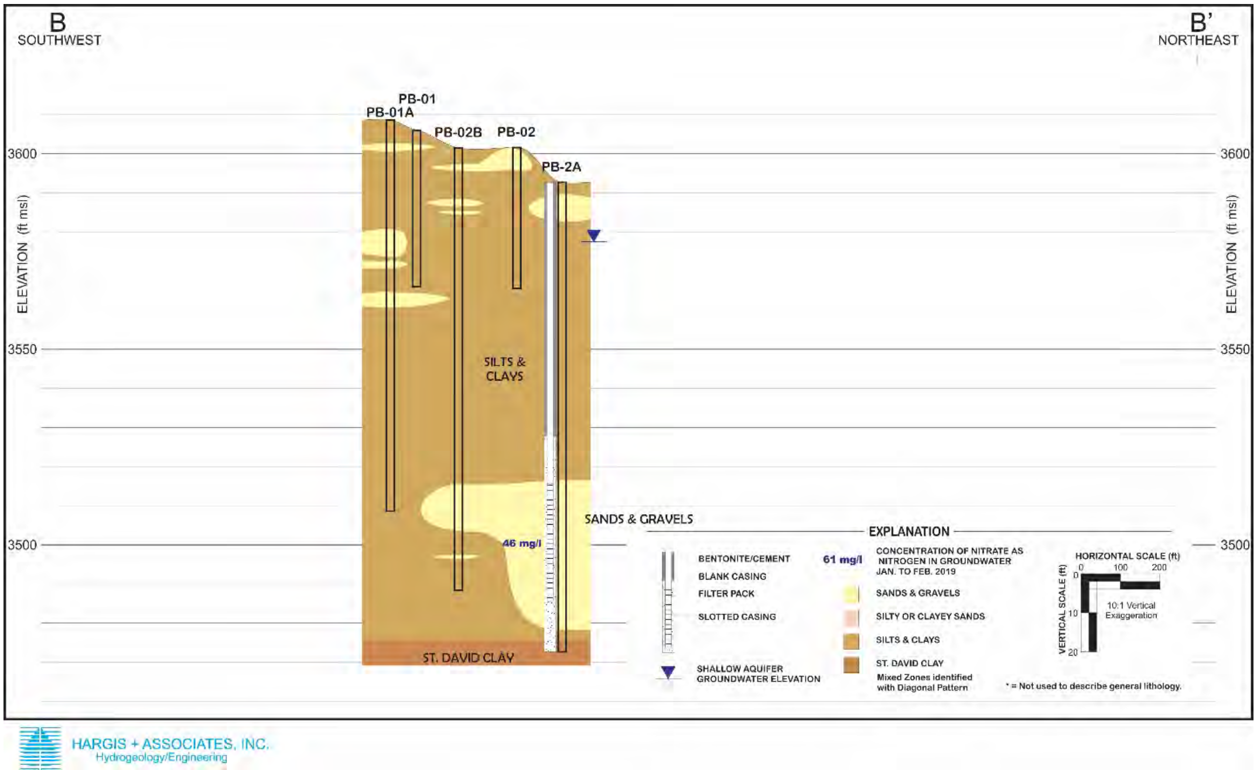

Figure 29. Northern Area Conceptual Cross Section B-B'.

A cross-sectional diagram was prepared along geophysical transect Line 1 (Figure 17; Figure 29). This short transect shows that the westward aquifer boundary forms the eastern boundary of the "embayment" of the shallow alluvial aquifer in the vicinity of Wash 1 and Wash 2 (Figure 15). Cross-section C-C' illustrates that this "embayment" is quite deeply incised into the St. David clay at this location (Figure 30). The depth of this incision may further explain the persistence of high concentrations of nitrate-N at this location prior to the initiation of groundwater pumping at extraction well SEW-01.

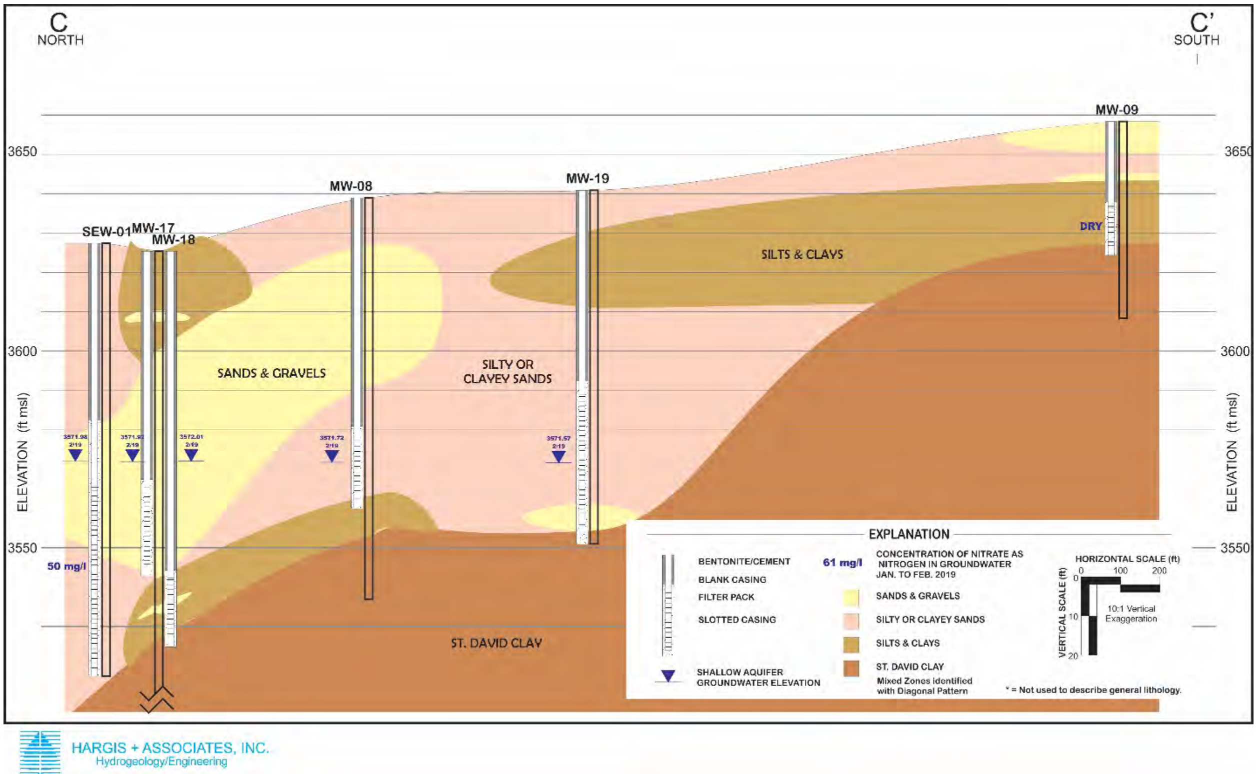

Figure 30. Northern Area Conceptual Cross Section C-C'.

4.0 SAN PEDRO RIVER

The San Pedro River is the primary hydrologic feature within the basin and is interactive with the shallow aquifer. The interactions are controlled largely by hydrostratigraphic and geomorphic factors. For example, lithologic logging in the vicinity of monitor well MW-35 indicates semi-confinement by a fine-grained stratum in the vicinity of monitor well MW-35, however, moving eastward toward the River, this stratum does not appear to be present in outcrop, likely owing to historic downcutting along the River meander. Accordingly, throughout the study area, the San Pedro River alternates between gaining and losing reaches (Figure 31). Groundwater-surface water interactions are particularly evident during baseflow conditions. In addition, ephemeral tributaries entering the San Pedro River from the west, probably contribute some degree of recharge to the shallow aquifer during periods of intense runoff. Detailed investigations of the groundwater-surface water interactions along the San Pedro River have been performed as part of the Site RIs (H+A, 2003c). Additionally, similar investigations have been performed by other investigators upstream and downstream from the site (Black and Veatch, 1988).

The 10 mg/l surface water quality standard for the San Pedro River along the Curtiss Reach was reassigned by ADEQ in December 2008 to match the criteria for designated use under full-body contact (FBC) and partial body contact (PBC) of3,733 mg/l for nitrate-N (ADEQ, 2016).

During CY 2018, the five surface water stations of the site were monitored for flow: SW-03, SW-04, SW-12, SW-13 and SW-14 (Figure B-1). Surface water flow was detected during one quarterly event, August 2018, and water quality and surface water discharge rates were monitored at the four flowing surface water monitoring stations along the San Pedro River at that time (Table 7 and Figure 32). Water quality monitoring in the San Pedro River is opportunistic due to the intermittent nature of its flow. Sections of the streamflow perennial due to groundwater discharge, whereas other reaches are dry during most of the year. During more extreme runoff events, the stream can flow bank-to-bank or occasionally overbank throughout the Site. Therefore, measurement and sampling are contingent on flow conditions.

4.1 DISCHARGE

San Pedro River surface water discharge conditions during the 2018 monitoring period were dry to moderate (Table 17). Surface water flow was measured at the four flowing stations in February 2018, SW-03, SW-04, SW-12 and SW-13. Surface water discharge ranged from an estimated 1 cubic feet per second (cfs) at surface water locations SW-03 and SW-04 in February to 52.5 cfs at surface water location SW-03 in August 2018.

4.2 SAN PEDRO RIVER WATER QUALITY

During 2018, surface water quality samples were scheduled for collection at the five monitoring stations along the San Pedro River (Figure B-1 in Appendix B). Surface water samples collected from monitoring stations SW-03, SW-04, SW-12 and SW-14 are analyzed for nitrate-N (Table 7). Surface water samples collected at SW-14 are also analyzed for perchlorate because it is situated near the Southern Area.

Nitrate-N concentrations in samples collected from San Pedro River surface water stations ranged from than 0.51 mg/l at SW-03 in February 2018 to 1.2 mg/l at SW-03 and SW-04 in August 2018 (Table 7; Figures A-43 through A-47 in Appendix A).

4.2.1 San Pedro River Status

Surface water flow was observed in all of the 5 locations in 2018 quarterly sampling events (Table 17; Figure 32). The highest nitrate-N concentration in 2018 was observed at monitoring station SW-03 and SW-04 (Figure 8). The SW-03/04 reach has historically recorded the highest nitrate-N concentrations. These data are consistent with the CSM for the Northern Area.

5.0 INACTIVE AND FORMERLY ACTIVE PONDS

The remedy for the Inactive and Formerly Active ponds on ANPI property involved the emplacement of a native soil cover over the footprint of the former ponds (Figure 5). ICs are used to further prevent potential for exposures to pond soils containing COCs greater than SRLs. The ICs are intended to be protective of groundwater users and those that might be subject to direct exposure to contaminants within the ponds. This remedy was selected in the 2005 EPA-amended ROD (EPA, 2005). Pursuant to the August 22, 2008 DEUR, an annual pond inspection was performed during December 2018 (ADEQ, 2008). The full inspection report is included in an Appendix to this report (Appendix H; H+A, 2019a). The DEUR was recorded in Cochise County on July 28, 2008, and subsequently approved by ADEQ on August 22, 2008 (ADEQ, 2008). The DEUR restricts the use of the property to non-residential, restricts the use of contaminated groundwater beneath the ANPI property, and provides details on institutional and engineering controls for maintaining pond covers.

Pond cover maintenance activities performed during CY 2018 included backfilling along the side slopes, filling surface channels, and replacing damaged wattles, where applicable, based on the 2008 DEUR (H+A, 2019a). Details of the pond locations requiring maintenance and current photographs showing the conditions of the pond covers as of the annual inspection are provided (Appendix H).

5.1 PONDS STATUS

Pond cover inspections were performed in accordance with the “Soil Engineering Control Plan”. Quarterly pond inspections were performed by ANPI throughout CY 2018 and in response to extreme weather events and according to the O&M manual (H+A, 2008b). It was observed during CY 2018 maintenance activities at Pond 2 that erosion control devices were out of place and deteriorated at Ponds 1, 2, 3 and Dynagel. In addition, the warning chains at Pond 7 and Dynagel were in need of repair. Erosion channel(s) less than 2 inches deep were noted at Ponds 1, 2, and 7 side slopes. Repairs to the abovementioned items were recommended after annual winter rainy season. Overall, the pond covers continue to provide effective containment of contaminated soils. ICs including the DEUR, signage and fencing ensure a further degree of protectiveness.

At the end of 2018, the Pond covers were generally in good condition. Erosion control devices showed signs of deterioration, however, native vegetation has re-established to the point where erosion control devices are considered optional. Erosion channels greater than two inches deep were observed on the slopes of Pond 2, 3, and 7. It is recommended that these areas be re-graded, compacted, and new erosion control devices be installed, as detailed in the report. Warning signs that were blocked or missing were recommended for replacement or relocation (Appendix H).

6.0 INSTITUTIONAL CONTROLS

ICs for groundwater have been imposed pursuant to an amendment to the ROD (EPA, 2005). The ICs required by the ROD amendment and the DEUR for the ponds included Site access restriction, community education and outreach, and well inventory for the purpose of determining potential exposure risk. In addition, ANPI implemented a revised ADWSP and a Community Outreach Plan (COP) (ANPI, 2007 and H+A, 2009b).

6.1 WELL INVENTORY

The primary purposes of the well inventory are to identify shallow aquifer wells in the vicinity of the ANPI study area and track well development and construction as it may relate to potential human exposure pathways associated with contaminated groundwater associated with the Site. The well inventory comprises an assemblage of well information managed in both electronic and hardcopy formats. The electronic media are stored within Microsoft Access Database and a Geographic Information System (GIS) based on ArcView 10.1 architecture. Data sources for the well inventory include the Arizona Department of Water Resources (ADWR) Wells 55 database, Groundwater Site Inventory (GWSI) database, and field data collected by ANPI. The well inventory is updated annually, once ADWR completes their revised database. The complete CY 2018 well inventory update is provided (Appendix I).

Based on the August 2018 nitrate-N plume, one additional domestic wells was identified within 0.7 miles of the nitrate-N plume. This well, 55-229719, was authorized to drill in late November 2018 and is anticipated to be a deep well with a grout plug at least 50 ft into the St David. In total, three new registration records were added to the database between CY 2017 and CY 2018. During CY 2018, ANPI drilled eight new shallow wells for the purpose of remedy acceleration. They are identified as monitor wells PB-2A, PB-4, PB-7 and piezometers NAP-1 through NAP-5. The well inventory within the proximity of the site continues to be a useful tool for evaluating potential receptors for contaminated shallow groundwater. Previously, the broader geographic area of the inventory appears to be providing little useful information so the detailed extent of the well inventory report has been used since 2015. Future inventory reports will limit the area of study to the area labeled "Detailed Extent of Well Inventory" as shown on Figure 1 of Appendix I, based on discussions with EPA.

In addition to this annual well inventory, ADWR reviews NOI files for proposed domestic water supply wells close to the ANPI facility to determine if they are within the DEUR or one mile of the Site plume (Figure 33). If the well location is within these limits, the ADWR forwards the NOI to ADEQ for consultation on well impact pursuant to R12-15-1302. At the same time, ADWR sends a courtesy copy to the EPA Remedial Project Manager (RPM). After consultation with ADEQ, ADWR decides whether to issue the permit, to require a hydrological study from the applicant or to deny the permit.

6.2 COMMUNITY OUTREACH

The COP was prepared in 2007 (ANPI, 2007). The COP specifies outreach activities designed to inform the community in the vicinity of the Site of ongoing remediation activities as well as other information that may be useful in understanding plant operations. Activities associated with the COP include mailings to nearby residents to communicate remediation status, maps showing the extent of contamination, and community meetings to provide updates on the Superfund project. ANPI also maintains a website at URL http://www.apachenitrogen.com. This website is another component of the outreach program. The Benson Library also contains a repository of information on the Apache Superfund Site for public viewing.

The following information was reported by ANPI's Community Outreach Coordinator:

"ANPI has a strong commitment to the communities in Cochise County and to key State and National groups that participate in the mining and agricultural industries. The following are a few specific functions, activities, and areas of support ANPI provides support to, and/or participates in."

- Apache Community Advisory Council – In 2014, ANPI saw the need for and the benefit of developing a council of area citizens to serve as a community relations resource for Benson, St. David, and Cochise County. The Council, composed of a dozen recruited business leaders, educators, retirees, and thought leaders, is kept informed of company initiatives, plans, issues, donations, and other pertinent organizational information at a grassroots level. ANPI utilizes the members as a barometer regarding local sentiment, concerns, or issues, allowing the company to notify and educate the public proactively about ongoing activities and opportunities for improving our trustworthiness, reputation, and standing in the community. The Council currently includes, among others, the Superintendent of St. David Schools, the Director of the Southeastern Arizona Economic Development Group, the CEO of the Benson Hospital, a local Pastor and past President of the Benson Chamber of Commerce, the Director of Cochise County Emergency Services, and three former Mayors of Benson. The group meets quarterly at the offices of ANPI for updates and exchanges of information.

- Other Local Clubs/Organizations - ANPI personnel from all levels of the company are active in civic groups, kids programs, etc. Following are some of those activities. Benson Rotary Club, Benson Clean & Beautiful Board of Directors, coaching in Little League baseball and adult softball teams, Benson Chamber of Commerce Board, Cochise County Local Emergency Planning Committee (LEPC), and St. David Heritage & Cultural Arts Society.

- Community Functions Support – ANPI participates in numerous local community events, including St. David Pioneer Days, Benson Butterfield Stage Days, Benson Community Heath Fair, St. David Broadway & Beyond, the 4th of July & Christmas parades, and the County Science Fair.

- Apache Good Neighbor Program – ANPI has established a program for neighbors or interested parties to sign up to receive occasional mail flyers from the company providing updates for ongoing or upcoming plant activities, projects, or functions.

- Donations and Contributions - ANPI provides tens of thousands of dollars annually to support local financial needs, including six scholarships for Benson and St. David students, sponsorships for fundraising efforts such as Meals on Wheels, Community Food Bank, VFW and American Legion Golf events, News in Education program for area schools, Benson Butterfield Rodeo, Friends of Kartchner Caverns 5k, Benson Museum, Benson Shop with a Cop, 4th of July fireworks, and numerous others.

- State & National Support – ANPI supports several State and National Trade groups who are involved in the mining and agricultural industries, including AMIGOS, ANNA (Ammonium Nitrate & Nitric Acid) Conference, and The Fertilizer Institute.

"Apache has had a long history and heritage in the San Pedro River Valley, and it is very important to us to present and maintain a positive and open relationship with our neighbors and surrounding communities. Our efforts have been well received, and we are pleased to continue with them, always seeking continuous improvements." (ANPI, 2018).

6.3 ALTERNATE DOMESTIC WATER SUPPLY PLAN

The ADWSP describes measures taken to address the contamination of domestic wells that were contaminated as a result of historical discharge of nitrate. This included construction of replacement wells drilled into the deep aquifer at eight residences and the identification of procedures for newly-identified at risk domestic supply wells (H+A, 2009b). The ADWSP applies only to residences where the sole water supply is from the shallow aquifer.

The procedures involve contacting the well owner and determining whether the well is used for domestic consumption or some other purpose. If the nitrate-N concentration is above 10 mg/l and the well is used for domestic purposes, a confirmation sample is collected. If the sample analysis indicates a concentration of nitrate-N greater than 10 mg/l, delivery of bottled water is immediately provided to the well owner. The private well is then monitored on a quarterly basis. If the nitrate-N is less than 10 mg/l, quarterly monitoring continues until EPA approves a reduction to either semi-annually or annually. Then the well is monitored for an additional two years (H+A, 2009b). When the nitrate-N concentrations in the domestic well are less than 10 mg/l for four consecutive quarters, bottled water deliveries are discontinued. During CY 2018, no new shallow aquifer wells were identified for monitoring and bottled water. Only one private well owner, D(18-21)06bcb, currently receives bottled water. According to samples collected in 2018, private well D(18-21)06bcb nitrate-N concentrations were below 10 mg/l (Table 7). Nitrate-N concentrations at D(18-21)06bcb have been below the goal of 10 mg/l since May 2013.

6.4 DEUR AND FENCING

As previously stated, a DEUR was filed in 2008. The DEUR binds to the property deed and restricts the land use of the area where the native soil covers were constructed over the formerly-active evaporation ponds. The DEUR also provides a declaration, which outlines requirements for an engineering control plan for native soil covers and ICs for the ANPI property. Perimeter fencing was inspected quarterly during the pond cover inspections and repairs were required during 2018. ANPI intends to complete the items as soon as possible in 2019. Fencing around ANPI property restricts Site access, thereby affording a safety buffer for the general public as well as for security. In 2008, additional 10-foot barbed wire fencing was installed around ANPI operations area. Pond 7 and Dynagel are within the barbed fenced area and the formerly-active evaporation ponds are within the property fencing. Appendix H presents the results of the annual pond cover inspection. Attachment A in Appendix H provides a copy of the DEUR.

Newly-added Media Component 8, Legacy Soils Area, expands the ICs for the site with the potential filing of another DEUR for ANPI. The component was added by EPA in its ESD #4 (EPA, 2017a). The Legacy Soils Area covers the operations area where ANPI has been demolishing historical structures since 2012 (H+A, 2017a). After removal of the structures, there is the potential for soil contamination to be found. The cleanup standards for Component 8 soils are based on the ADEQ's non-residential SRLs (Table 19). If any soils are to be left onsite with concentrations between the residential and non-residential SRLs, then ANPI is required to file a DEUR for the soil.

6.5 DESCRIPTION OF PREVIOUS WASTE DISPOSAL

Previous remedial actions at ANPI include the collection, transportation, treatment, and disposal of waste materials and contaminated media associated with the Waste Storage Area (Media Component 4), Wash 3 Area (Media Component 5), and other locations outside of Wash 3 containing DNT waste (Media Component 7) (H+A, 2001 and 2002b). Previous actions also include removal of TNT from a TNT-contaminated area, which predated ANPI operations. Waste materials associated with media components 4, 5, and 7 were disposed in various disposal facilities including Beatty, Nevada; Huachuca City, and La Paz landfills in Arizona; and Ensco, Safety Kleen, and East Carbon Development Corp. in Utah. A remedial action implementation report for the TNT-contaminated area was submitted to EPA in July 2002 (H+A, 2002c). Remedial actions included removal of TNT material by conducting a pretreatment onsite burn and then shipment of residual materials to a disposal facility. A total of six burns were conducted onsite and the residual material from the burns, equating to 870 tons, were sent to Beatty Landfill for disposal.

ANPI has been demolishing legacy structures and buildings from historical manufacturing processes since 2012. Although the process continues, in 2017 a report was issued that documented all work through the end of 2016 (H+A, 2017a). The report documented the waste disposal of:

2012

- 39 tons of scrap metal to Liberty Iron and Metal Southwest LLC, Phoenix, Arizona

2013

- 47.93 tons of asbestos debris to Cactus Regional Landfill, Florence Arizona
- 17 tons of scrap metal to Amcep Metals, Tucson, Arizona

2014

- 2 tons of asbestos debris to Cactus Regional landfill, Florence Arizona
- 11 tons of scrap metal to Desert Metals Recycling, Tucson, Arizona

2015

- 80 tons of asbestos debris to Cactus Regional landfill, Florence Arizona
- 1,002 tons of general building waste debris to Los Reales Landfill, Tucson, Arizona

- 16 tons of general building waste debris to Apache Junction Landfill, Apache Junction, Arizona
- 4,090 tons of non-hazardous demolition debris to Cactus Regional landfill, Florence Arizona
- 17 tons of scrap metal transported to American Metals Recycling, Chandler, Arizona

2016

- 24 tons of lead-based paint disposed to Beatty Nevada Landfill.
- 553 tons of mixed soil and elemental sulfur to Cactus Regional landfill near Florence Arizona
- 14 tons of scrap metal to the SA Recycling, Tucson, Arizona

The final report will include the abovementioned demolitions and all subsequent demolition activities through 2018 (H+A, in preparation).

7.0 REMEDY EVALUATION

Water level and water quality trending was used for the evaluation of the performance of the groundwater remedy. The following sections discuss the metrics associated with these tools.

7.1 SOUTHERN AREA REMEDIAL PERFORMANCE EVALUATION

After a study of the Southern Area perched zone pursuant to recommendations in the third FYR (EPA, 2012), ANPI updated the CSM for the Southern Area (H+A, 2017d). The MCA was determined to be a second perched zone. The original perched zone was now referred to as PZ-A and the MCA was referred to as PZ-B. PZ-A and PZ-B are experiencing declining water levels and were determined to be hydraulically isolated from each other and from the shallow alluvial aquifer along the San Pedro River to the east in the Southern Area. Accordingly, based on the field work done in the Southern Area, EPA modified Media Component 1 from “Perched Groundwater”, which included only the groundwater beneath the formerly-active evaporation ponds, to the “Southern Area Perched System”, which includes both PZ-A (the groundwater beneath the formerly-active evaporation ponds) and PZ-B (Tables 1 and 2).

In addition, the revised CSM report documented the attempts to use *in situ* methods to supplement MNA within the PZ-B footprint (H+A, 2017d). The *in situ* methods were not feasible due to the lack of an extensive body of water in PZ-B and the poor hydraulic conditions in the sedimentary materials. Due to isolation from the shallow aquifer and poor potential for water resource development from the perched system, EPA abandoned the MNA remedy for the PZ-B, but kept the previously established ICs in place along with long-term monitoring for the Southern Area Perched System (EPA, 2017a). Pumping and evaporation of perched water from PZ-A was also discontinued at the end of 2017 because the previously established ICs and long-term groundwater monitoring were deemed sufficient for this isolated groundwater body (EPA, 2017c).

Overall, the PZ-A and PZ-B groundwater areal extent is shrinking and water levels have declined. PZ-A perimeter monitoring confirmed that groundwater seepage from the PZ-A into PZ-B has not occurred since 2003.

Water level elevations across PZ-A and PZ-B have declined overall since 1995 (Figures A-1 through A-13 in Appendix A). However, water level elevations increased between 2014 and 2016 in some piezometers and wells such as P-01 (Figure A-1), P-03 (Figure A-2), MW-21 (Figure A-8), and MW-23 (Figure A-9) due to increased precipitation. At the same time the nitrate-N concentrations decreased in these wells. The decrease in concentrations is believed to indicate that precipitation infiltration introduces a higher quality of water than the ambient water in the perched zones. Moreover, the infiltration does not appear to leach contaminants from the overlying vadose zone.

Further evaluation of monitoring data was conducted using the MAROS software. MAROS software was developed on behalf of the U.S. Air Force Center for Engineering and the Environment (AFCEE) and is used as a data management tool to improve long-term groundwater monitoring programs (GSI, 2012). The MAROS software was applied to Site monitoring data from 2012 to 2017 to calculate Mann-Kendall (MK) statistics and perform linear regression (LR) analyses. In the 2017 Annual Performance Monitoring and Site-Wide Status Report data representing piezometer P-03 in PZ-A was selected for analysis and in PZ-B, monitor wells MW-21, MW-23, MW-39, MW-43 and MW-47 (H+A, 2018c). The overall results of the MK analysis indicated that half of the wells are experiencing decreasing nitrate-N and perchlorate trends (P-03, MW-39, MW-43). Likewise, the LR analysis provides a further basis for characterizing the data trend. The overall results indicated that the majority of wells were experiencing decreasing nitrate-N and perchlorate trends (H+A, 2018c; Table 19; P-03, MW-21, MW-23 and MW-39).

7.2 NORTHERN AREA REMEDIATION EVALUATION

Water quality data indicate that MNA and the NARS in the Northern Area is operating properly and successfully. Nitrate-N concentrations are decreasing in the SEW-01 capture envelope. In addition, the MNA management area located north of the capture envelope has met the cleanup standards. On July 13, 2018, SEW-02 began pumping to acquire baseline parameters, followed by continual operation starting July 16, 2018. Extraction upgradient of the SEW-01 capture zone has proven acceleration of remedial efforts by the nitrate-N concentrations extracted (nearly double) from the shallow aquifer and treated through the treatment ponds. This has resulted from a combination of the decrease in influent concentrations to extraction well SEW-01 and the capture of higher nitrate-N concentrations at extraction well SEW-02. As previously discussed, it is anticipated that, with the strategic incorporation of the newer extraction wells into the remedy network, attainment of the remedial standards can be achieved sooner.

7.2.1 NARS Evaluation

The NARS extraction well operated 365 days in CY 2018, with SEW-02 operational 169 number of days. Discharge to the primary lower location in Wash 3 was continuous during CY 2018. It is estimated that 21,600 pounds of nitrate-N was removed from the shallow aquifer in 2018. The number of pounds removed is higher by approximately 8,000 pounds as compared to CY 2017 (Figure 14). 2018 Nitrate-N concentrations ranged between 52 mg/l and 64 mg/l at SEW-01 and from 170 mg/l to 220 mg/l at SEW-02 (Table 12). The highest nitrate-N concentrations at SEW-01 were observed in the late 2003, early 2004 time period (Figure D-6). During this time, concentrations were as high as 390 mg/l.

7.2.2 Northern Area MNA Evaluation

The monitoring of nitrate-N in the Northern Area MNA management zone indicates that all areas are meeting the cleanup standard. This is believed to be largely due to the capture of high nitrate-N concentrations in groundwater by the NARS extraction well SEW-01, thereby stemming plume migration to the north. Further evaluation of nitrate-N trending in selected Northern Area wells performed in 2017 indicated that the majority of the wells are experiencing decreasing nitrate-N trends (D(17-20)36aad1, D(17-20)36caa, D(17-20)36caa2, D(18-21)06bcb, MW-40, MW-41B and MW-42). Nitrate-N was indicated to be probably decreasing in MW-41A and stable in MW-41A (H+A, 2018c).

7.3 INACTIVE AND FORMERLY ACTIVE PONDS REMEDIATION EVALUATION

At the end of CY 2018, the pond covers were in overall good condition (Appendix H). Some repairs are scheduled for early CY 2018 and pond inspections will be performed throughout CY 2018 in response to extreme weather events and according to the O&M manual.

8.0 QUALITY ASSURANCE/ QUALITY CONTROL

The quality of the data collected during the 2018 quarterly performance monitoring, monthly NARS, and building demolition activities were evaluated using data assessment procedures as specified in the Quality Assurance Project Plan (QAPP) and QAPP addendum (H+A, 2010a and 2013). Data assessment procedures are used to identify data that do not meet data quality objectives. Data assessment procedures included, but were not limited to, review of holding times; preservation methods; chain-of-custody documentation; field and rinsate blank results; matrix spike and matrix spike duplicate results; field duplicate and split sample comparison results; reporting detection limits; and data trending. Data assessment is a means of identifying deficiencies in laboratory or in field procedures. Such deficiencies increase the risk of failure to attain data quality objectives. Accordingly, assessment assists in the identification of appropriate corrective actions and/or the type of data qualification that should be applied (H+A, 2010a and 2013). A CY 2018 data assessment and validation summary is provided in Appendix J.

9.0 DEMOLITION ACTIVITIES

The overall demolition-related area includes approximately 200 buildings or structures covering an area approximately 92,500 square feet within the ANPI property boundaries. The area surrounding the ANPI property is a mix of agricultural, rural residences, and undeveloped land. All of the project-related sampling areas are on ANPI property. A comprehensive ANPI demolition program has involved efforts to demolish obsolete buildings in an effort to modernize ANPI's plant. Initially, ANPI separated the demolition project into seven phases, however, since 2015 the use of demolition phases was discontinued and is now managed as a single project. Sampling of building materials and/or adjacent soils has been performed before building demolition to assess site-specific demolition hazards such as lead and asbestos. The remaining soil sampling has been conducted after building foundation removal and when additional sampling was determined to be warranted.

Demolition activities from 2012 to 2016 were documented in a recent report, *2012 – 2016 Building Demolition Summary Report, Revision 1.0, Apache Powder Superfund Site, Cochise County, Arizona*, dated March 31, 2017 and revised June 9, 2017 (H+A, 2017a). This 2017 summary report is a preliminary synopsis that provides a foundation for an eventual completion report to the forthcoming demolition report which will include a cumulative summary of activities from 2012 through the first quarter 2019 (H+A, in preparation).. In July 2017, ANPI issued a revised building demolition program sampling and analysis plan (SAP REV 4.0) (H+A, 2017c) which was approved by EPA in July 2017 (EPA, 2017b). A total of twenty structures were demolished in 2018, these included eight concrete foundations, four buildings, six wooden bridges and two self-standing test units). During 2018 demolitions, approximately 50 tons of scrap metal and approximately 500 cubic yards of asbestos containing materials, including 440 cubic yards of soil from the dormitory cafeteria complex were disposed. All remaining concrete was crushed, including 500 yards from building foundations and the dormitory cafeteria complex. Additional details from demolition activities and disposal records will be provided in the forthcoming demolition report (H+A, in preparation). .

Separate from the building demolition activities, is the soil beneath the demolished buildings. In ESD #4, the EPA designated the soils work conducted with the removal of the historical structures on the ANPI property as Media Component 8 – Legacy Soils Area (EPA, 2017a). The remedy is to excavate and send residually contaminated soil offsite or to do on-Site treatment or encapsulation. Non-residential SRLs were chosen as the soil cleanup standard and if any soils are to be left onsite with concentrations between the residential and non-residential SRLs than a DEUR will be filed. Soil sampling was conducted at approximately 48 building or structures demolition locations utilizing the incremental sampling methodology during 2018. A proposed soil sampling schedule was provided and approved in early 2018 (H+A, 2018a).

10.0 SUMMARY

Performance monitoring was performed on active remedial components for respective Site Media Components during CY 2018. These active remedial components are discussed in further detail in this annual report and include Southern Area Perched System, NARS and Northern Area Groundwater MNA Management Zone, and the formerly-active evaporation ponds. From the data gathered during 2018, performance of these remedial systems are trending as expected. Performance trends indicate effective source control and continue to support the CSM. Additionally, it is concluded that the active remedies combined with effective ICs are protective of public health. Detailed summaries and discussions of remedial components are provided in the following sections.

10.1 SOUTHERN AREA GROUNDWATER

Recent characterization work has warranted a revision in the CSM of the Southern Area (Section 2.3.4). The original perched zone is now identified as Perched Zone A (PZ-A; Section 2.2); the MCA is now identified as Perched Zone B (PZ-B; Section 2.3) in recognition of the fact that it is not an actual aquifer; and monitor well MW-24 is considered within its own area (Section 2.4), separate from PZ-B (H+A, 2017d). For the purposes of the study, Southern Area groundwater comprises the PZ-A, PZ-B, the MW-24 area, and the shallow alluvial aquifer along the San Pedro River. Each of these areas appear to be hydraulically isolated from one another as has been discussed in this and in past reports (H+A, 2006b, 2007b, 2009c, 2010b and 2017c).

10.1.1 Perched Zone A

During CY 2018, groundwater levels measured in PZ-A indicate that PZ-A groundwater is not discharging into PZ-B (Figure 4). Monitor wells MW-29, MW-30, MW-31 and MW-32, the monitoring locations that provide indications of PZ-A to PZ-B drainage, remained dry (Table 4). Prior to 2004, PZ-A groundwater had been present at all these locations. However, since mid-2004 through 2015, no measurable PZ-A water has been present in these wells, thereby indicating a disruption of the former flowpath of groundwater from PZ-A into PZ-B. This condition is taken as an indication of the effectiveness of the source control measures. However, under the new CSM, which recognizes that the PZ-B and PZ-A are both perched systems, hydraulically distinct from the shallow aquifer, the potential for seepage between PZ-A and PZ-B is less important.

Water level fluctuations in the perched groundwater bodies are expected due to weather cycles and seasonal factors, but the overall water level trend is declining. Thus, the only remaining locations where PZ-A groundwater consistently remains are at piezometers P-01 and P-03. (Table 4, Figure A-2).

The increases in perched groundwater levels at piezometer P-03 therefore are believed to have resulted from (1) lesser rate of withdrawal by ANPI during operation of its former pilot project, and (2) higher seasonal precipitation as occurred from 2014 to 2016. It is not likely that these water level rises resulted from uncontrolled losses from water distribution lines. ANPI, as part of its plant expansion and modernization efforts, constructed a new water distribution system that was completed in 2012. It is believed that if there had been artificial recharge from leaking distribution lines to the PZ-A this improvement would have eliminated that factor.

Overall, water levels decreased in CY 2018, consistent with previous trends. However, the extraction pilot project at PZ-A piezometer P-03 was terminated in 2017 because EPA determined it did not have a significant effect on the overall remedy.

Nitrate-N concentrations detected in piezometer P-03 decreased slightly overall while perchlorate concentrations increased during CY 2018 (Table 7). Concentrations of nitrate-N remained approximately one order of magnitude higher than perchlorate. This is consistent with the fact that ammonium nitrate is ANPI's manufacturing product, whereas perchlorate is only present as a result of trace impurities in a process feedstock that was used onsite for a limited period of time dating back decades. The time-series concentrations of nitrate-N and perchlorate occasionally trend in opposite directions. No particular significance is attributed to this observation, except a possible indication of a historical change in the source of perchlorate from a process standpoint. In CY 2018, this variation was observed for nitrate-N, opposite of the general trend of increasing concentration with decreasing PZ-A water levels (H+A, 2007b).

A total of approximately 108,400 gallons with an associated nitrate-N mass removed of approximately 5,100 pounds has been treated historically since 2002 from extraction at piezometer P-03. Extraction of groundwater at piezometer PZ-03 ceased in 2017. During operation, a maximum mass removal from PZ-A of nitrate-N occurred in CY 2014 at 758 pounds, and a maximum removal of perchlorate from PZ-A of 0.07 pounds occurred in 2003 (Table 6). Maximum groundwater withdrawal of 14,739 gallons was recorded in CY 2003.

The EPA recently reclassified the PZ-A and PZ-B as the Southern Area Perched System in ESD #4. This reclassification was based on field work conducted since 2013 that has shown that both PZ-A and PZ-B now consist of pockets of water that are isolated from each other and the shallow aquifer in the Southern Area (H+A, 2017d). Given the limited extent of groundwater and lack of a potable water supply in either PZ-A or PZ-B, the EPA eliminated the MNA as a remedy for PZ-B (EPA, 2017a). Because remedial actions for PZ-B have been suspended per ESD #4, ammonia-N monitoring, which was a parameter related to inhibition of the denitrification process, is no longer needed. The Fourth FYR stated that dewatering in the PZ-A was no longer necessary (EPA, 2017c). The operation of the pilot dewatering system at piezometer P-03 was shut down at the end of September 2017.

Previously many of the monitor wells and piezometers were sampled on a quarterly basis. Per EPA approval in 2018, wells P-01 and P-03 remain on the quarterly sampling schedule, however, all other PZ-A wells are monitored quarterly for water levels only in accordance with Table 3.

10.1.2 Perched Zone B

Owing to little to no recharge or discharge in PZ-B, groundwater, where it is present, is essentially stagnant. This is further evidenced by essentially no hydraulic gradient across the area. Groundwater levels in PZ-B monitor wells continue to exhibit seasonalities with characteristically higher groundwater levels in the winter and declines in the summer. Superimposed onto the seasonal variations, all PZ-B monitor wells exhibit long-term downward water-level trends (Figures A-7 through A-13 in Appendix A). LR analysis indicated rates of decline between CY 2007 and CY 2015 that ranged from 0.22 feet per year at monitor well MW-21 to 0.66 feet per year at monitor well MW-23. The trend over that period was strongly influenced by prevalent drought conditions. However, beginning in CY 2014, the area received much higher precipitation, thereby causing rises in water across PZ-B (Figures A-8, A-9 and A-10). Nevertheless, the prior lowering trend is sufficient to illustrate conceptually the influences on the PZ-B system.

At the same time that water levels were declining in PZ-B, water levels observed in monitor wells MW-01 and MW-06, which are in the shallow alluvial aquifer along the San Pedro River and upgradient from the Site, did not exhibit declining trends, nor did they have significant seasonal amplitudes compared to water levels observed in PZ-B monitor wells (Figures A-15 and A-16 in Appendix A). This observation is taken to indicate the hydraulic isolation of PZ-B from the shallow alluvial aquifer. It is also indicative that the seasonalities in PZ-B groundwater levels are not likely the effect of groundwater pumping, but rather the effects of transpiration losses in this small groundwater basin. By contrast, in the adjacent portions of the shallow alluvial aquifer, groundwater is flowing through the basin from south to north, under a measurable hydraulic gradient, and groundwater-surface water exchanges with the San Pedro River are occurring at certain locations.

As has been the case since CY 2010, monitor well MW-15 had insufficient water to collect samples throughout 2018. Monitor well MW-15 will continue to be monitored in 2018 to see if there is an opportunity to collect a groundwater sample from the well. PZ-B monitor well MW-23 is also trending towards dry conditions, where water levels dropped below the top of the pump after CY 2010. The pump was lowered in CY 2011 to allow continued collection of groundwater samples. While the water level elevation increased from high precipitation recorded in 2016, the water levels measured in 2018 have declined to near the historic low observed in 2012. Monitor wells MW-15, MW-21, MW-23, MW-39, and MW-47 will continue to be monitored in 2019.

The mass of nitrate-N and mass of perchlorate remained fairly stable or decreased between CY 2017 and CY 2018 (Table 7; Figure A-7 to A-13). The exception to this general trend was observed by an increase in nitrate-n concentrations in August 2018 at wells MW-23 and MW-47. Despite these local increases, there is no reason to believe that there is any new or old source of COCs entering PZ-B based on lack of inflow from the PZ-A to the PZ-B and the declining water levels in the PZ-B. Therefore, any apparent mass increases would likely to be attributable to limitations in the ability to precisely define the COC distributions. This is further evident from drilling activities performed in the vicinity of monitor well MW-21 during CY 2013, which led to the update of the CSM for PZ-B (H+A, 2017d). Given the limited extent of groundwater and lack of a potable water supply in either PZ-A or PZ-B, the EPA eliminated the MNA as a remedy for PZ-B (EPA, 2017a).

Currently, PZ-B wells are sampled on an annual basis in August, in accordance with the 2018 EPA approved performance monitoring schedule. Nitrate-N and perchlorate concentrations from 2012 to 2017 were evaluated in monitor wells MW-21, MW-23, MW-39, MW-43 and MW-47 by MK statistics and LR analyses. The nitrate-N and perchlorate concentrations of monitor wells MW-23 and MW-39 were determined to be decreasing in both evaluations.

10.1.3 MW-24 Area

The monitor well MW-24 area is essentially isolated from both the PZ-B and the shallow aquifer and surrounded by the fine-grained sediments of the LCU. Therefore, the monitor well MW-24 area is no longer considered a part of PZ-B. Water levels in monitor well MW-24 exhibit a seasonal amplitude as in PZ-B. This is most likely due to the effects of transpiration losses. The water level elevations at monitor well MW-24 are on a slight downward trend since they recovered in 2016 following a high precipitation year (Figure A-14).

The concentrations of COCs in monitor well MW-24 have been below the respective cleanup standards through 2015, the last time it was sampled. Considering the hydraulic isolation between monitor well MW-24 and PZ-B there is no reason to believe the COC concentrations at monitor MW-24 will increase above the cleanup standards in the future.

Monitor well MW-24 was removed from the 2018 performance monitoring schedule per EPA approval and is not proposed for future monitoring.

10.1.4 Southern Area Shallow Aquifer

Groundwater quality trends at monitor well MW-01 and MW-06 continue to indicate no sources of contamination upgradient in the shallow aquifer. Nitrate-N was either not detected or detected below their respective laboratory reporting limits at monitor wells MW-01, MW-06, MW-14, MW-22, and MW-33. Nitrate-N is occasionally detected at low concentrations in each of these wells, but is believed to be from background sources (e.g., agriculture, septic, etc.). Collectively, these data continue to support a CSM based on a stagnant system receiving little to no flow or transport from the shallow aquifer to the PZ-B or in the reverse direction.

Groundwater quality sampling is conducted annually at upgradient wells MW-01, MW-06, MW-14 and MW-33 and water levels are measured semi-annually, in accordance with the 2018 performance monitoring schedule.

10.2 NORTHERN AREA GROUNDWATER

The remedial action components in the Northern Area comprise the NARS and MNA to the north of the NARS capture envelope (Figure 8).

10.2.1 NARS

Performance monitoring of the NARS indicates effectiveness of the remedy in terms of consistent withdrawal of nitrate-N bearing groundwater from NARS extraction wells SEW-01 and SEW-02, as well as the trend of nitrate-N concentrations in upgradient performance network wells (Figures 8 and 9). Groundwater levels in monitor wells in the vicinity of extraction well SEW-01, specifically monitor wells MW-08, MW-17, MW-18, and MW-19, indicate that they are affected by the pumping cone of depression as well as their proximity to the shallow aquifer boundaries (Figure B-1, Figure B-3). Pumping from extraction well SEW-01 is drawing the nitrate-N plume from upgradient into a “bounded” area of the shallow aquifer[1] and circulating part of the plume within that bounded area. Further upgradient, water levels in monitor wells MW-34, MW-35, MW-36 and MW-45 (Figures A-28, A-29, and A-30) declined to historic or near historically low water levels in August 2018 following operation of SEW-02 in July 2018. In prior years, the pattern in monitor wells MW-35 and MW-36 (Figures A-28 and A-29) was similar to shallow aquifer monitor wells upgradient of the Site, such as monitor wells MW-01 and MW-06 (Figures A-15 and A-16). In 2018, water level decline was observed in MW-01 and MW-06 as well. In addition to the hydrographic data, groundwater level mapping indicates a flowpath toward extraction well SEW-01 (Figure B-3 in Appendix B) and water quality contours also indicate movement towards extraction well SEW-01 (Figure B-6 in Appendix B). Updates to the CSM discussed in Section 3.7 further supports this flowpath. These contours suggest a capture zone that extends across the lateral limits of the upgradient plume of nitrate-N defined by the 10 mg/l isoconcentration line. The addition of capture at extraction well SEW-02 within the upgradient portion of the nitrate-N plume defined by the 100 mg/l nearly doubled the amount of nitrate-N treated in 2018 vs. 2017 and is anticipated to lessen the extraction needed in the downgradient extraction well SEW-01 with time.

Water quality trends representing nitrate-N concentrations in all monitor wells within the capture envelope of NARS extraction well SEW-01 are declining.

As a result of extraction well SEW-01 drawing water from far upgradient, temporarily increasing concentrations of nitrate-N have been observed intermittently at monitor wells MW-13, MW-34 and MW-36. Potential rationale for these short-duration increases include; (1) an indication that NARS extraction well SEW-01 is affecting gradients and concentrations at upgradient monitor wells, and; (2) there are some areas upgradient from monitor well MW-36, probably along the aquifer boundary, where high concentrations linger due to poor circulation and/or aquifer heterogeneities. Another possibility may relate to the relative proportion of uncontaminated water from San Pedro River subflow or from the east side of the San Pedro River being captured by extraction well SEW-01. An increase in nitrate-N occurred at monitor well MW-13 in November

[1] This “bounded area of the shallow aquifer” refers to the shape of the westward boundary of the shallow aquifer in the vicinity of extraction well SEW-01. Specifically, the boundary juts out to the south in roughly a semicircular way as shown on Figure 2.

2015 and continued throughout 2017. The nitrate-N concentration has since declined by half and is expected to continue to decline based on trends at monitor wells MW-34 and MW-36. Additionally, seasonal pumping and recharge factors may have been involved. The proximity of SEW-02 immediately upgradient of monitor well MW-36 appears to have reduced the nitrate-N concentration in the well by nearly half after SEW-02 began extraction (August 2018). Monitor well MW-35, further downgradient, exhibited a slight decline in nitrate-N while in monitor well MW-45, adjacent to SEW-02, nitrate-N concentrations remained stable following continuous operation of SEW-02 in 2018.

Occasionally, higher concentration areas within the nitrate-N plume are referred to as “hot spots.” However, it is important to recognize that such so called hot spots are not the result of continuing sources. Rather, the plume is heterogeneous in terms of the distribution of nitrate-N concentrations within it. Such contaminant distribution heterogeneity would be expected considering the variable history of contaminant release as well as variation of hydraulic properties in the aquifer.

The Northern Area Groundwater Model (H+A, 2005b) showed that extraction well SEW-01 is capturing water from the areas of monitor wells MW-08, MW-35 and MW-36. The radius of drawdown influence from SEW-01 probably does not significantly affect gradients in the area of monitor wells MW-35 and MW-36, as compared to its effect at nearby wells, such as monitor well MW-08. Hence the travel time from the monitor well MW-36 area to the extraction well is great. During SEW-02 pilot testing activities which commenced in July 2018, water level data obtained from adjacent monitor well MW-45, downgradient monitor well MW-36, and piezometer NAP-4 all exhibited a slight decline in water level (listed from greatest to least magnitude) following pumping operations.

The CY 2018 influent nitrate-N concentrations from extraction wells into the NARS Wetland increased, with the major contribution from the new extraction well SEW-02. The nitrate-N mass extracted in CY 2018 was about 60 percent more than the mass extracted in CY 2017, while the cumulative volume of groundwater extracted from SEW-01 and SEW-02 increased by 7 percent in 2018 compared to 2017 (Figure 14). This was anticipated due to the increase in influent concentrations and total volume of groundwater contributed from SEW-02 pumping for half of the 2018 CY.

10.2.2 Northern Area MNA

Water levels in shallow aquifer monitor wells north of the NARS extraction well SEW-01 capture envelope exhibit greater seasonal variations as compared with those in the extraction well SEW-01 capture zone. Monitor wells north of extraction well SEW-01 capture envelope that experience seasonal fluctuation in water levels include monitor wells MW-20, MW-40, and MW-42 (Figure 34). These seasonal fluctuations are likely attributable to either the effects of groundwater and surface water exchange in the vicinity of the San Pedro River and/or local irrigation pumping (Figure 8).

Groundwater quality across the Northern Area has improved substantially over the past years such that, in CY 2017 and 2018 the nitrate-N concentrations detected in all wells were less than the cleanup standard of 10 mg/l. Many of these shallow aquifer wells in the MNA management zone had achieved the remediation goal by 2008 and the remainder reached the goal by mid-2013. These data are consistent with numerical model projections based on a two-year half-life for natural attenuation of nitrate-N. Nitrate-N concentrations in private well D(18-20)06bcb, which is on the edge of the extraction well SEW-01 capture envelope, in CY 2018 remained below the cleanup standard of 10 mg/l (H+A, 2008c).

In accordance with the 2018 performance monitoring schedule, the Northern Area Management Zone wells are sampled on a biennial basis. As such, these wells were not sampled in 2018, with the exception of D(18-21)06bcb, and MW-42.

MNA parameters had been collected on an annual basis at MNA management zone monitor wells MW-38, MW-40, MW-41B, MW-42, and D(17-20)25bad through 2016. Samples had been analyzed for alkalinity, dissolved manganese, dissolved iron, and sulfate by an approved laboratory, and DO, ORP, and TDS. The nitrate-N concentrations in groundwater in these wells have been below the cleanup standard since May 2013. The EPA agreed during the May 17, 2017, annual meeting that these analyses were no longer needed to track MNA parameter monitoring.

10.3 SAN PEDRO RIVER SURFACE WATER

Nitrate-N concentrations detected in surface water were less than 10 mg/l during CY 2018 at surface water stations SW-03, SW-04, SW-12, and SW-13 (Table 7). The highest nitrate-N concentration in CY 2018 of 1.2 mg/l was detected in August at station SW-03 and SW-04. The San Pedro River did not have high flow rates during the quarterly PMP sampling events for CY 2018. Samples were obtained in February and August. Surface water station SW-12 located in the Southern Area is monitored to evaluate upgradient surface water quality and detect possible new sources. Nitrate-N was detected at an estimated concentration of 1.0 mg/l in the August sample collected from SW-12 during 2018. Nitrate-N was not detected at this station in the February surface sample collected.

It should be noted that, in 2009, the ADEQ reassigned the narrative standard along this (Curtiss) reach of the San Pedro River (ADEQ, 2009). The standard was changed from 10 mg/l nitrate-N to 3,733 mg/l, consistent with other similarly designated streams in southern Arizona.

ANPI will continue to monitor surface water flow, and will take samples when adequate flow is observed.

10.4 POND COVERS

During CY 2018, the pond covers were inspected and maintenance was performed in order to restore side slopes to specifications of the approved plan and DEUR (Figure 5) (H+A, 2008b). ICs implemented during 2018 included inspection of perimeter fencing and posted signs. Overall, the remedy remains effective in terms of isolating the buried contaminants (Appendix H; H+A, 2019a).

10.5 BUILDING DEMOLITION ACTIVITIES

The overall demolition-related area includes approximately 180+ buildings covering an area approximately 92,500 square feet within the ANPI property boundaries. Demolition activities from 2012 to 2016 were documented in a recent report that provides a foundation for an eventual demolition report to be submitted to the EPA in the future (H+A, 2017a;, in preparation). Twenty structures were demolished in 2018.

Separate from the building demolition activities is the soil beneath the demolished buildings. In ESD #4, the EPA designated the soils work conducted with the removal of the historical structures on the ANPI property as Media Component 8 – Legacy Soils Area (EPA, 2017a). The remedy calls for excavation of contaminated soils and transport offsite to a licensed disposal facility or to do onsite treatment or encapsulation. Non-Residential SRLs were chosen as the soil cleanup standard. If any soils are to be left onsite with concentrations between the residential and non-residential SRLs then a DEUR must be filed. Soil sampling was conducted at approximately 48 building or structures demolition locations utilizing the incremental sampling methodology during 2018. A proposed soil sampling schedule was provided and approved in early 2018 (H+A, 2018a).

11.0 RECOMMENDATIONS

In light of the previous discussions, ANPI is proposing the following changes in its PMP for consideration by EPA. Revisions to the monitoring schedule will be implemented upon EPA's approval. Proposed changes to the monitoring schedule were determined based on evaluation of data collected during CY 2018 from existing and newly installed wells and exploratory borings, historical data, and the updated CSM as presented in Section 3.5. A table of the proposed CY 2019 monitoring schedule has been developed based on these recommendations (Table 16). Recommendations specific to each portion of the Site are presented in the following sections of this chapter.

11.1 SOUTHERN AREA GROUNDWATER RECOMMENDATIONS

For CY 2019, the following recommendations for Southern Area Groundwater are offered for consideration based on the 2018 sampling program results and remedy changes by the EPA (EPA, 2017a, 2017b). It is believed that this proposed program will continue to offer continued protection of human health and the environment.

11.1.1 Perched Zone A

For PZ-A, no changes are proposed to the groundwater sampling and water level measurement frequency for these wells.

11.1.2 Perched Zone B

For PZ-B, no changes are proposed to the groundwater sampling and water level measurement frequency for these wells. With EPA eliminating the MNA as a remedy for PZ-B (EPA, 2017a), an annual frequency, as originally proposed in 2018, is sufficient to verify that there is no change in the status of perched groundwater relative to the new remedy of ICs and long-term groundwater monitoring.

11.1.3 Southern Area Shallow Aquifer

In the shallow aquifer, no changes are proposed to the groundwater sampling and water level measurement frequency for the southern area wells (Table 16). The current frequencies are sufficient to track water quality and water level gradients in the area.

11.2 NORTHERN AREA GROUNDWATER RECOMMENDATIONS

With regard to the Northern Area Groundwater, the following recommendations are offered for EPA's consideration based on the installation of new monitoring wells, piezometers, and potential extraction wells. It is believed that this proposed program will continue to offer continued protection of human health and the environment and provide sufficient frequency of data collection at the new locations.

11.2.1 NARS AREA

The NARS treatment cell sediment sampling collected in CY 2016 (conducted every five years) showed only a few instances where the 2016 concentrations were higher than their respective baseline concentrations detected in 1997 (H+A, 2017b). This reflects measurements made over a 20-year period of wetland operation. In all instances where constituent concentrations have increased, the change was been relatively slight, less than a factor of two. After these results were evaluated at the time of the 2016 Annual Monitoring Report, ANPI recommended that sediment sampling be discontinued. EPA approved this request on May 23, 2017 and the sediment sampling has been discontinued as of April 2018.

ANPI currently recommends the wells installed in 2018 and early 2019 are incorporated into the existing quarterly monitoring schedule for nitrate-N sampling and water level measurements. This includes exploratory borings that were constructed as monitor wells PB-2A, PB-4, PB-5A and PB-7. These well locations will be renamed as monitor wells and/or extraction wells, to be proposed in the forthcoming well construction report. Since these wells are not equipped with dedicated pumps, the recommended method for sampling these wells is with hydrasleeves. Well PB-5A will be considered for extraction due to the water quality results reported from this well. This will be discussed in further detail in the forthcoming well construction report. In addition to these wells, NARS piezometers in the northern area installed in 2018 are recommended for periodic manual water level measurements and will be equipped with pressure transducers to continuously log changes in water level elevation to evaluate potential impacts to subflow along the San Pedro River while SEW-02 is operational (Table 16).

Sampling at extraction well SEW-01 shall continue in accordance with the pre-existing extraction well SEW-01 as follows; monthly nitrate-N, quarterly ammonia and water levels, annual metals analysis and perchlorate sampling analysis, and weekly nitrate-N with field methods, total phosphorus and major ions (Table 16).

It is believed that this program will offer continued protection of human health and the environment.

11.2.2 Northern Area MNA

Data collected over the past several years have demonstrated that the Northern Area outside of the NARS capture envelope has cleaned up according to model projections. Presently, the network of monitor wells indicate that groundwater sampled at all locations is below the cleanup standard and has been below the cleanup standard since mid-2013. The EPA agreed during the May 17, 2017, annual meeting that MNA parameter sampling was no longer needed. The following recommendations are offered for EPA's consideration.

ANPI proposes to keep all current wells in the monitoring program (Table 16). In 2018, sampling at D(18-21)06bcb increased in frequency to quarterly due to testing at SEW-02 (TW-01) (H+A, 2018b). Due to the potential reduction in pumping rate at extraction well SEW-01 with the addition of SEW-02 as part of the NARS, and the location of this well located just north of the SEW-01 capture zone envelope, quarterly sampling at this well is also proposed in 2019.

It is believed that 2019 performance monitoring frequency proposed for the MNA Management Zone PMP and Long-Term Site-Wide Plan offers continued protection of human health and the environment and provide information relative to groundwater flow and gradients throughout the study area.

11.3 DATA ASSESSMENT AND VALIDATION

Per EPA approval in 2018, ANPI plans to conduct data validation on a minimum of 10 percent of the original data on an annual basis beginning in 2019. ANPI will continue to perform screening (Level II) data assessment procedures on 100% of the sampling analytical data.

11.4 SUMMARY OF RECOMMENDATIONS FOR EPA CONSIDERATION

The following is a bulleted summary of all program changes for EPA's consideration (Table 16).

11.4.1 Northern Area MNA

- The incorporation of well locations PB-2A, PB-4, PB-5A and PB-7 into the current quarterly monitoring schedule for northern area PMP and Long-Term Site-Wide Plan (Table 16).
- NAP-1 through NAP-5 are proposed for water level elevation monitoring, including the installation of pressure transducers and periodic manual measurements as needed to evaluate potential impacts to subflow from pumping.
- Monthly nitrate-N, quarterly ammonia and water levels, annual metals analysis and perchlorate sampling analysis, and weekly nitrate-N with field methods, total phosphorus and major ions to be conducted at SEW-02 (TW-01).

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TABLES

TABLE 1

SITE REMEDIES

MEDIA COMPONENT	LOCATION	REMEDY
Formerly Active Ponds / Southern Area Perched System-Perched Zone A	Southern Area	Native soil cover and institutional controls
Southern Area Perched System-Perched Zone B (formerly Molinos Creek Sub-Aquifer)	Southern Area	Institutional controls and long-term groundwater monitoring
Shallow Aquifer Groundwater	Northern Area	Northern Area Remediation System (NARS) and MNA
Legacy Soils Area (investigative activities not yet completed)	Southern Area	Cleanup to non-residential standards and institutional controls

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TABLE 2

SITE INSTITUTIONAL CONTROLS

MEDIA COMPNENT	LOCATION	INSTITUTIONAL CONTROL
Southern Area Perched System-Perched Zone A	Southern Area	DEUR*, Fencing (access restriction)
Southern Area Perched System-Perched Zone B (formerly Molinos Creek Sub-Aquifer)	Southern Area	DEUR*, Well Inventory, Community Outreach
Formerly Active Ponds	Southern Area	DEUR*, Fencing, Signage, Community Outreach
Legacy Soils Area (investigative activities not yet completed)	Southern Area	Fencing, Community Outreach, possible DEUR
Shallow Aquifer Groundwater	Northern Area	Well Inventory, Community Outreach, Alternate Domestic Water Supply Plan

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TABLE 3

2018 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[1]	ClO4		
NARS MONITORING WELLS (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan]*							
MW-08	ANPI	Q				Q	
MW-11	ANPI	A - Aug				Q	
MW-13	ANPI	S - Feb/Aug				Q	
MW-17	ANPI	S - Feb/Aug				Q	
MW-18	ANPI	S - Feb/Aug				Q	
MW-19	ANPI	Q				Q	
MW-34	ANPI	Q				Q	
MW-35	ANPI	Q				Q	
MW-36	ANPI	Q				Q	
TW-01	ANPI	Q				Q	
MW-45	ANPI	Q				Q	
MNA MANAGEMENT ZONE (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan]*							
MW-20	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-38	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-41A	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-41B	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-42	ANPI	B - Aug 2019				B - Aug 2019	
D(17-20)36aad1	Jacobs	B - Aug 2019				B - Aug 2019	
D(17-20)36caa2	Hyder	B - Aug 2019				B - Aug 2019	
D(17-20)36caa	Gaynor	B - Aug 2019				B - Aug 2019	
MNA MANAGEMENT ZONE (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan]*							
D(17-20)36cdb	Woolever	B - Aug 2019				B - Aug 2019	Access limited by owner availability
D(17-20)36ddc	Morales	B - Aug 2019				B - Aug 2019	
D(18-20)01aad	McRae	B - Aug 2019				B - Aug 2019	Access limited by owner availability

TABLE 3

2018 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[(1)]	ClO4		
MNA MANAGEMENT ZONE (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan] - CONT'D*							
D(18-21)06bcb	Jones	Q				Q	
D(17-20)36aad3	Acuna					B - Aug 2019	Water level only
D(17-20)36cad1	McCann					B - Aug 2019	Water level only
D(17-20)36dad	Ohlde					B - Aug 2019	Water level only
D(18-21)06ada	White					B - Aug 2019	Water level only
D(18-21)06bab	Alexander					B - Aug 2019	Water level only
D(18-21)06bcc2	Wooten					B - Aug 2019	Water level only
D(18-21)08bab	Tenopir					B - Aug 2019	Water level only
SENTINEL WELLS (NORTHERN AREA) [*Northern Area PMP]*							
MW-40	ANPI	B - Aug 2019				B - Aug 2019	
MNA BUFFER ZONE WELLS (NORTHERN AREA) *[Northern Area PMP]*							
D(17-20)25bad	Spears	B - Aug 2019				NM	Access limited by owner availability
NORTHERN AREA REMEDIATION SYSTEM [*NARS O&M]*							
SEW-1	ANPI	M	Q	Sep-21	A - Sep	Q	Weekly nitrate-N with field methods. Additional parameters include total phosphorus (Q), major ions (A)
MW-10	ANPI	Q	Q			Weekly	
DCP-12	ANPI	Q		Feb-21		Q	
TREATMENT CELLS (surface water)	ANPI	M	M			Weekly	Weekly nitrate-N with field methods. Additional parameters include total phosphorus, chemical oxygen demand, and total organic carbon (Q), total kjeldahl nitrogen, organic nitrate (A).
TREATMENT CELL (sediments)	ANPI						Proposed for Deletion in March 2017.
EFFLUENT	ANPI	M	M	Sep-21			Additional parameters include total phosphorus, total kjeldahl nitrogen, organic nitrogen, total dissolved solids, and total suspended solids (Q). Major ions (A)

TABLE 3

2018 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[1]	ClO4		
NATIVE POND COVERS *[Soils Engineering Control Plan]*							
POND 1	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
POND 2	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
POND 3	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
POND 7	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
DYNAGEL	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
SAN PEDRO RIVER SURFACE WATER MONITORING STATIONS (NORTHERN AREA)							
SW-03	NA	Q				Q	If flow is present
SW-04	NA	Q				Q	If flow is present
SW-13	NA	Q				Q	If flow is present
SW-14	NA	Q			Q	Q	If flow is present
PERCHED ZONE A (SOUTHERN AREA)							
P-01	ANPI	Q			Q	Q	
P-03	ANPI	Q			Q	Q	
P-10	ANPI					Q	Water level only
MW-29	ANPI					Q	Water level only
MW-30	ANPI					Q	Water level only
MW-31	ANPI					Q	Water level only
MW-32	ANPI					Q	Water level only
PERCHED ZONE B (SOUTHERN AREA)							
MW-15	ANPI	A - Aug			A - Aug	A - Aug	If sufficient water exist to sample
MW-21	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
MW-23	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
MW-39	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
MW-47	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	

TABLE 3

2018 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[1]	ClO4		
UPGRADIENT WELLS (SOUTHERN AREA)							
MW-01	ANPI	A - Aug			A - Aug	S - Feb/Aug	Access limited by owner availability
MW-06	ANPI	A - Aug			A - Aug	S - Feb/Aug	
SOUTHERN AREA							
MW-14	ANPI	A - Aug			A - Aug	S - Feb/Aug	
MW-22	ANPI					S - Feb/Aug	Water level only
MW-25	ANPI	C			C	S - Feb/Aug	
MW-33	ANPI	A - Aug			A - Aug	S - Feb/Aug	
SAN PEDRO RIVER SURFACE WATER MONITORING STATIONS (SOUTHERN AREA)							
SW-12	NA	Q				Q	If flow is present

ABBREVIATIONS/ACRONYMS:

A= Annually
ANPI= Apache Nitrogen Products, Inc.
B= Biennial (occurs every two years)
ClO_4= Perchlorate
C= Contingent on MW-33 results
H+A= Hargis + Associates, Inc.
M= Monthly
NARS= Northern Area Remediation System
NM= Not measured
O&M= Operation and maintenance
PMP= Performance Monitoring Plan
Q= Quarterly
S= Semi-Annually

NOTES:

(1) = Metals List every 5 years:
SEW-1 and Effluent: aluminum, antimony, arsenic, barium, beryllium, cadmium, total chromium, copper, iron, lead, managanese, mercury, selenium, silver, thallium and zinc.
DCP-12: barium, beryllium, total chromium, lead, mercury and thallium.
Treatment Cells Sediment: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, zinc; calcium, magnesium, sodium, potassium, orthophosphate, chloride, fluoride, sulfate, alkalinity, pH; total nitrogen by calculation, total organic carbon, total phosphorus, ammonia-nitrogen, nitrate-nitrogen, total kjedahl nitrogen.
Standard Field Parameters - Temp (^oC), pH, Electrical Conductivity (µs/cm) are collected every time a well is sampled

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
PERCHED ZONE A PIEZOMETERS				
P-01	2/21/2017	3688.93	21.84	3667.09
	5/23/2017		21.37	3667.56
	8/28/2017		22.23	3666.70
	11/16/2017		22.35	3666.58
	2/16/2018		22.53	3666.40
	5/14/2018		22.85	3666.08
	8/3/2018		23.21	3665.72
	12/3/2018		22.51	3666.42
P-03	2/21/2017	3674.45	34.48	3639.97
	5/23/2017		34.38	3640.07
	8/29/2017		34.96	3639.49
	11/16/2017		35.70	3638.75
	2/19/2018		35.80	3638.65
	5/15/2018		35.98	3638.47
	8/3/2018		36.55	3637.90
	12/3/2018		37.09	3637.36
P-10	2/21/2017	3669.12	DRY	---
	5/23/2017		DRY	---
	8/28/2017		DRY	---
	11/16/2017		DRY	---
	2/16/2018		DRY	---
	5/14/2018		DRY	---
	8/3/2018		DRY	---
	12/3/2018		DRY	---
PERCHED ZONE A MONITOR WELLS				
MW-03	2/21/2017	3670.69	29.40	3641.29
	5/23/2017		30.15	3640.54
	8/28/2017		32.23	3638.46
	11/16/2017		DRY	---
	5/21/2018		32.09	3638.60
MW-04	2/21/2017	3685.20	21.53	3663.67
	5/23/2017		21.67	3663.53
	8/28/2017		22.69	3662.51
	11/21/2017		DRY	---

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
PERCHED ZONE A MONITOR WELLS				
MW-29	2/17/2017	3664.91	DRY	---
	5/19/2017		DRY	---
	8/25/2017		DRY	---
	11/16/2017		DRY	---
	2/16/2018		DRY	---
	5/14/2018		DRY	---
	8/3/2018		DRY	---
	12/3/2018		DRY	---
MW-30	2/17/2017	3664.28	DRY	---
	5/19/2017		DRY	---
	8/25/2017		DRY	---
	11/17/2017		DRY	---
	2/16/2018		DRY	---
	5/14/2018		DRY	---
	8/3/2018		DRY	---
	12/3/2018		DRY	---
MW-31	2/17/2017	3662.58	DRY	---
	5/19/2017		DRY	---
	8/25/2017		DRY	---
	11/17/2017		DRY	---
	2/16/2018		DRY	---
	5/14/2018		DRY	---
	8/3/2018		DRY	---
	12/3/2018		DRY	---
MW-32	2/17/2017	3659.37	DRY	---
	5/19/2017		DRY	---
	8/25/2017		DRY	---
	11/17/2017		DRY	---
	2/16/2018		DRY	---
	5/14/2018		DRY	---
	8/3/2018		DRY	---
	12/3/2018		DRY	---
PERCHED ZONE B MONITOR WELLS				
MW-15	2/17/2017	3655.59	53.92	3601.67
	5/19/2017		DRY	---
	8/25/2017		54.80	3600.79
	11/16/2017		DRY	---
	2/16/2018		DRY	---
	5/14/2018		DRY	---

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
PERCHED ZONE B MONITOR WELLS				
MW-15	8/3/2018	3655.59	DRY	---
	12/5/2018		DRY	---
MW-21	2/21/2017	3662.87	60.52	3602.35
	5/22/2017		59.95	3602.92
	8/30/2017		62.22	3600.65
	11/16/2017		63.43	3599.44
	2/19/2018		62.43	3600.44
	5/15/2018		61.64	3601.23
	8/3/2018		63.89	3598.98
MW-23	2/17/2017	3660.66	58.83	3601.83
	5/22/2017		58.88	3601.78
	8/25/2017		61.27	3599.39
	11/16/2017		62.21	3598.45
	2/16/2018		60.62	3600.04
	5/15/2018		60.12	3600.54
	8/3/2018		62.59	3598.07
MW-39	2/21/2017	3649.14	47.14	3602.00
	5/22/2017		47.36	3601.78
	8/30/2017		49.95	3599.19
	11/16/2017		50.60	3598.54
	2/19/2018		49.00	3600.14
	5/15/2018		48.43	3600.71
	8/3/2018		51.18	3597.96
MW-43	2/17/2017	3657.21	60.45	3596.76
	5/22/2017		59.85	3597.36
	8/25/2017		62.04	3595.17
	12/8/2017		63.33	3593.88
	5/14/2018		61.45	3595.76
MW-44	2/17/2017	3656.89	60.25	3596.64
	5/22/2017		59.71	3597.18
	8/25/2017		61.92	3594.97
	12/8/2017		63.25	3593.64
	5/14/2018		61.25	3595.64
MW-47	2/21/2017	3652.63	50.01	3602.62
	5/22/2017		50.26	3602.37
	11/20/2017		53.51	3599.12
	2/21/2018		51.88	3600.75

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
PERCHED ZONE B MONITOR WELLS				
MW-47	5/15/2018	3652.63	51.41	3601.22
	8/3/2018		54.14	3598.49
MW-24 AREA				
MW-24	2/17/2017	3624.50	23.08	3601.42
	5/19/2017		24.05	3600.45
	8/25/2017		25.75	3598.75
	11/16/2017		25.94	3598.56
	5/14/2018		24.55	3599.95
SOUTHERN AREA SHALLOW AQUIFER MONITOR WELLS				
MW-01	2/22/2017	3631.00	18.31	3612.69
	5/16/2018		19.40	3611.60
	8/8/2018		19.69	3611.31
MW-06	2/22/2017	3648.44	22.82	3625.62
	5/19/2017		23.36	3625.08
	8/29/2017		22.91	3625.53
	11/17/2017		23.40	3625.04
	2/21/2018		22.92	3625.52
	5/14/2018		23.27	3625.17
	8/8/2018		23.74	3624.70
MW-14	2/20/2017	3623.59	14.53	3609.06
	5/19/2017		15.22	3608.37
	8/25/2017		15.05	3608.54
	11/17/2017		15.65	3607.94
	2/19/2018		14.75	3608.84
	5/14/2018		15.29	3608.30
	8/3/2018		16.22	3607.37
MW-22	2/20/2017	3624.96	16.17	3608.79
	5/19/2017		16.78	3608.18
	8/25/2017		16.53	3608.43
	11/17/2017		17.23	3607.73
	2/19/2018		16.45	3608.51
	5/16/2018		17.00	3607.96
	8/3/2018		17.78	3607.18
MW-25	2/17/2017	3621.01	20.20	3600.81
	5/19/2017		20.90	3600.11
	8/25/2017		21.75	3599.26
	11/17/2017		22.15	3598.86
	2/16/2018		21.04	3599.97
	5/14/2018		21.30	3599.71

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
SOUTHERN AREA SHALLOW AQUIFER MONITOR WELLS				
MW-25	8/3/2018	3621.01	23.70	3597.31
MW-33	2/20/2017	3623.69	18.72	3604.97
	5/19/2017		19.67	3604.02
	8/25/2017		20.51	3603.18
	11/17/2017		20.63	3603.06
	2/21/2018		19.15	3604.54
	5/14/2018		19.40	3604.29
	8/3/2018		21.19	3602.50
NARS SHALLOW AQUIFER MONITOR WELLS				
MW-08	2/20/2017	3638.95	64.09	3574.86
	5/23/2017		65.57	3573.38
	8/29/2017		66.84	3572.11
	11/17/2017		68.71	3570.24
	2/19/2018		68.95	3570.00
	5/15/2018		68.37	3570.58
	8/3/2018		70.79	3568.16
	12/3/2018		69.83	3569.12
MW-11	2/17/2017	3615.67	25.93	3589.74
	5/19/2017		27.12	3588.55
	8/29/2017		26.70	3588.97
	11/17/2017		28.22	3587.45
	2/16/2018		26.33	3589.34
	5/14/2018		27.52	3588.15
	8/3/2018		28.95	3586.72
	12/3/2018		27.65	3588.02
MW-13	2/20/2017	3622.12	28.98	3593.14
	5/19/2017		29.06	3593.06
	9/26/2017		29.70	3592.42
	11/20/2017		31.01	3591.11
	2/21/2018		28.52	3593.60
	5/14/2018		29.14	3592.98
	8/3/2018		31.61	3590.51
	12/3/2018		29.20	3592.92
MW-17	2/20/2017	3624.57	49.90	3574.67
	5/19/2017		53.48	3571.09
	8/28/2017		54.11	3570.46
	11/17/2017		56.57	3568.00
	2/19/2018		53.95	3570.62
	5/14/2018		54.59	3569.98
	8/3/2018		56.90	3567.67

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
NARS SHALLOW AQUIFER MONITOR WELLS				
MW-17	12/3/2018	3624.57	55.75	3568.82
MW-18	2/20/2017	3624.53	49.90	3574.63
	5/19/2017		51.71	3572.82
	8/28/2017		52.44	3572.09
	11/17/2017		54.82	3569.71
	2/19/2018		53.85	3570.68
	5/14/2018		56.34	3568.19
	8/3/2018		58.67	3565.86
	12/3/2018		57.41	3567.12
MW-19	2/20/2017	3641.08	66.33	3574.75
	5/23/2017		67.54	3573.54
	8/29/2017		69.36	3571.72
	11/17/2017		70.60	3570.48
	2/19/2018		70.27	3570.81
	5/15/2018		70.47	3570.61
	8/3/2018		73.00	3568.08
	12/3/2018		72.04	3569.04
MW-34	2/20/2017	3614.00	25.94	3588.06
	5/19/2017		26.90	3587.10
	8/31/2017		26.25	3587.75
	11/17/2017		27.82	3586.18
	2/20/2018		26.00	3588.00
	5/16/2018		27.47	3586.53
	8/3/2018		28.38	3585.62
	12/3/2018		27.38	3586.62
MW-35	2/20/2017	3596.16	10.67	3585.49
	5/19/2017		11.29	3584.87
	8/31/2017		11.22	3584.94
	11/20/2017		11.97	3584.19
	2/20/2018		11.11	3585.05
	5/16/2018		11.81	3584.35
	8/3/2018		12.78	3583.38
	12/3/2018		11.74	3584.42
MW-36	2/20/2017	3609.52	23.23	3586.29
	5/19/2017		24.03	3585.49
	8/31/2017		23.70	3585.82
	11/20/2017		24.80	3584.72
	2/20/2018		23.55	3585.97
	5/16/2018		24.56	3584.96

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
NARS SHALLOW AQUIFER MONITOR WELLS				
MW-36	8/3/2018	3609.52	25.68	3583.84
	12/3/2018		24.53	3584.99
MW-45	2/20/2017	3612.07	25.08	3586.99
	5/19/2017		25.90	3586.17
	11/21/2017		26.66	3585.41
	2/21/2018		25.42	3586.65
	5/16/2018		26.49	3585.58
	8/3/2018		27.73	3584.34
	12/3/2018		26.42	3585.65
MW-46	2/17/2017	3622.82	35.58	3587.24
	5/19/2017		36.51	3586.31
	8/31/2017		36.15	3586.67
	11/21/2017		37.55	3585.27
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER MONITOR WELLS				
MW-20	11/17/2017	3601.22	30.19	3571.03
	2/16/2018		28.45	3572.77
	5/14/2018		30.15	3571.07
MW-40	5/24/2017	3589.43	26.92	3562.45
	8/29/2017		24.07	3565.36
	2/20/2018		29.40	3560.03
MW-41A	2/22/2017	3574.93	16.95	3557.98
	5/23/2017		18.90	3556.03
	8/29/2017		18.91	3556.02
	11/17/2017		20.89	3554.04
	2/16/2018		20.85	3554.08
	5/14/2018		21.50	3553.43
MW-41B	2/22/2017		18.70	3556.23
	5/23/2017		21.37	3553.56
	8/29/2017		20.18	3554.75
	11/17/2017		23.38	3551.55
	2/16/2018		23.29	3551.64
	5/14/2018		24.07	3550.86
MW-42	2/23/2017	3603.29	34.64	3568.65
	5/19/2017		37.19	3566.10
	8/28/2017		35.67	3567.62
	11/17/2017		39.72	3563.57
	2/16/2018		39.27	3564.02
	5/14/2018		40.11	3563.18

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER MONITOR WELLS				
MW-42	12/3/2018	3603.29	40.95	3562.34
NORTHERN AREA MANAGEMENT ZONE SHALLOW AQUIFER PIEZOMETERS				
NAP-1*	8/3/2018	3596.42	11.35	3585.07
	12/5/2018		10.25	3586.17
NAP-2*	8/3/2018	3596.15	11.08	3585.07
	12/5/2018		9.84	3586.31
NAP-3*	8/3/2018	3598.52	12.80	3585.72
	12/5/2018		11.70	3586.82
NAP-4*	8/3/2018	3599.91	12.57	3587.34
	12/5/2018		12.20	3587.71
NAP-5*	8/3/2018	3599.30	11.65	3587.65
	12/5/2018		10.59	3588.71
NORTHERN AREA EXTRACTION WELLS				
PB-2A*	12/3/2018	3594.98	19.71	3575.27
PB-4*	12/3/2018	3600.98	14.70	3586.28
PB-7*	12/3/2018	3597.23	11.13	3586.10
SEW-02 (TW-01)	2/20/2017	3611.38	24.70	3586.68
	5/19/2017		25.52	3585.86
	8/31/2017		25.23	3586.15
	11/16/2017		26.35	3585.03
	2/21/2018		25.00	3586.38
	5/16/2018		26.10	3585.28
	8/3/2018	3612.00	56.63 (PWL)	3555.37
	12/3/2018		26.69	3585.31
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER PRIVATE WELLS				
D(17-20)36aad1 (Jacobs)	2/23/2017	3581.34	20.47	3560.87
	8/28/2017		21.25	3560.09
	11/21/2017		24.50	3556.84
	2/16/2018		24.80	3556.54
D(17-20)36aad3 (Acuña)	2/23/2017	3582.00	19.58	3562.42
	8/28/2017		20.58	3561.42
	11/21/2017		24.90	3557.10
	2/16/2018		25.25	3556.75
	5/14/2018		25.53	3556.47

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER PRIVATE WELLS				
D(17-20)36caa (Gaynor)	2/22/2017	3589.65	26.84	3562.81
	5/19/2017		36.34	3553.31
D(17-20)36caa (Gaynor)	8/25/2017		28.27	3561.38
	11/17/2017		31.51	3558.14
	2/16/2018		31.15	3558.50
	5/14/2018		32.04	3557.61
D(17-20)36caa2(Hyder)	2/22/2017	3588.84	27.95	3560.89
	5/19/2017		30.55	3558.29
	8/25/2017		29.85	3558.99
	11/17/2017		32.81	3556.03
	2/16/2018		32.62	3556.22
	5/14/2018		33.30	3555.54
D(17-20)36cad1 (McCann)	11/17/2017	3591.69	33.25	3558.44
	2/16/2018		33.30	3558.39
	5/14/2018		33.75	3557.94
D(17-20)36dad (Ohlde)	8/25/2017	3600.00	29.20	3570.80
D(17-20)36ddc (Morales)	2/22/2017	3590.60	25.23	3565.37
	5/19/2017		27.82	3562.78
	8/28/2017		26.27	3564.33
	11/17/2017		30.51	3560.09
	2/16/2018		30.11	3560.49
	5/14/2018		30.82	3559.78
D(18-21)06ada (White)	2/17/2017	3626.00	36.94	3589.06
	5/19/2017		39.22	3586.78
	8/25/2017		38.50	3587.50
D(18-21)06bab (Alexander)	2/17/2017	3610.00	27.74	3582.26
	5/19/2017		30.58	3579.42
	8/25/2017		28.86	3581.14
	11/17/2017		32.40	3577.60
	2/16/2018		30.30	3579.70
	5/14/2018		34.00	3576.00
D(18-21)06bcb (Jones)	11/17/2017	3612.80	UTM	---
	2/16/2018		UTM	---
	5/14/2018		UTM	---
	8/3/2018		UTM	---
	12/3/2018		UTM	---

TABLE 4

WATER LEVEL ELEVATION

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER PRIVATE WELLS				
D(18-21)06bcc2 (Wooten)	2/17/2017	3635.00	61.35	3573.65
	5/19/2017		62.90	3572.10
	11/17/2017		66.15	3568.85
	5/14/2018		19.00	3616.00
D(18-21)08bab (Tenopir)	2/17/2017	3625.00	23.22	3601.78
	5/19/2017		24.45	3600.55
	8/25/2017		24.52	3600.48
	11/17/2017		25.10	3599.90
	2/16/2018		24.25	3600.75
	5/14/2018		24.87	3600.13

ABBREVIATIONS/ACRONYMS:

* = Well constructed in 2018, surveyed by Rick Engineering on 11/28/18, Mesuring Point Elevation reported in NAVD88 datum.
bmp = below measuring point
feet msl = feet above mean sea level
NM = not measured
PWL = pumping water level
RP = recently pumped
UTM = unable to measure

TABLE 5

SATURATED THICKNESS OF PERCHED ZONE A

IDENTIFIER	DATE MEASURED	WATER LEVEL ELEVATION (feet msl)	ELEVATION OF SCREEN BOTTOM (feet msl)	SATURATED THICKNESS OF PERCHED ZONE (feet)
P-01	2/21/2017	3667.09	3662.23	4.86
	5/23/2017	3667.56		5.33
	8/28/2017	3666.70		4.47
	11/16/2017	3666.58		4.35
	2/16/2018	3666.40		4.17
	5/14/2018	3666.08		3.85
	8/3/2018	3665.72		3.49
	12/3/2018	3666.42		4.19
P-03	2/21/2017	3639.97	3629.03	10.94
	5/23/2017	3640.07		11.04
	8/29/2017	3639.49		10.46
	11/16/2017	3638.75		9.72
	2/19/2018	3638.65		9.62
	5/15/2018	3638.47		9.44
	8/3/2018	3637.90		8.87
	12/3/2018	3637.36		8.33
P-10	2/21/2017	DRY	3622.78	0.00
	5/23/2017	DRY		0.00
	8/28/2017	DRY		0.00
	11/16/2017	DRY		0.00
	2/16/2018	DRY		0.00
	5/14/2018	DRY		0.00
	8/3/2018	DRY		0.00
	12/3/2018	DRY		0.00
MW-03	2/21/2017	3641.29	3636.88	4.41
	5/23/2017	3640.54		3.66
	8/28/2017	3638.46		1.58
	11/16/2017	DRY		0.00
	5/21/2018	3638.60		1.72
MW-04	2/21/2017	3663.67	3662.32	1.35
	5/23/2017	3663.53		1.21
	8/28/2017	3662.51		0.19
	11/21/2017	DRY		0.00

ABBREVIATIONS/ACRONYMS:

feet msl = feet above mean sea level

TABLE 6

PERCHED ZONE A PIEZOMETER P-03
EXTRACTION/TREATMENT PERFORMANCE

Year	Total Pumped (gal)	NO_3-N Mass Removed (lbs)	ClO_4 Mass Removed (lbs)
12/30/2002	3,524	62	0.01
12/30/2003	14,739	289	0.07
12/30/2004	11,513	243	0.05
12/30/2005	12,587	363	0.05
12/30/2006	10,073	315	0.05
12/30/2007	6,991	280	0.03
12/30/2008	2,887	122	0.01
12/30/2009	9,795	571	0.05
12/30/2010	4,764	290	0.02
12/30/2011	6,049	427	0.02
12/30/2012	4,286	337	0.02
12/30/2013	5,271	522	0.03
12/30/2014	8,143	758	0.03
12/30/2015	2,793	243	0.01
12/30/2016	666	35	0.002
12/30/2017	4,298	199	0.013
TOTAL	108,378	5,056	0.48

ABBREVIATIONS/ACRONYMS:

ClO_4 = perchlorate
gal = gallons
lbs = pounds
NO_3-N = nitrate-Nitrogen

NOTES:

Totalized values were collected at the P-03 flow meter.

TABLE 7

GROUNDWATER QUALITY DATA
(NITRATE-N AND PERCHLORATE)

IDENTIFIER	SAMPLE DATE	NITRATE-N (mg/l)	PERCHLORATE (µg/l)	SAMPLE TYPE
PERCHED ZONE A PIEZOMETERS				
P-01	2/23/2017	3.2	<2.0	ORG
	5/24/2017	0.5	<2.0	ORG
	5/24/2017	6.1	2.3	SPT
	8/31/2017	2.0	<6.0E	ORG
	11/21/2017	21	5.8	ORG
	11/21/2017	24	5.7	SPT
	2/21/2018	3.3E	<2.0	ORG
	5/16/2018	34	5.6	FD
	5/16/2018	34	5.8	ORG
	8/8/2018	13E	5.3	FD
	8/8/2018	13E	4.9	ORG
	12/5/2018	<0.50	<1.0	ORG
	12/5/2018	0.3	<1.0	SPT
P-03	2/21/2017	5700	430	ORG
	5/23/2017	5500	380	ORG
	8/29/2017	5600	360	ORG
	11/16/2017	6200	480	ORG
	2/19/2018	6100	420	ORG
	5/15/2018	6600	410	ORG
	5/15/2018	6600E	400	SPT
	8/6/2018	6600E	490	FD
	8/6/2018	6500E	470	ORG
	12/4/2018	5900E	580E	ORG
PERCHED ZONE A MONITOR WELLS				
MW-03	5/23/2017	990	40	ORG
MW-04	2/21/2017	120	<2.0	FD
	2/21/2017	32	<2.0	ORG
PERCHED ZONE B MONITOR WELLS				
MW-21	2/21/2017	2700	170	ORG
	5/22/2017	2700	150	ORG
	11/16/2017	2700	170	ORG
	2/19/2018	2600	160	FD
	2/19/2018	2700	170	ORG
	5/15/2018	2900	170	ORG
	5/15/2018	3100E	170	SPT

TABLE 7

GROUNDWATER QUALITY DATA
(NITRATE-N AND PERCHLORATE)

IDENTIFIER	SAMPLE DATE	NITRATE-N (mg/l)	PERCHLORATE (µg/l)	SAMPLE TYPE
PERCHED ZONE B MONITOR WELLS				
MW-21	8/6/2018	3200E	190	ORG
MW-23	5/22/2017	2.2	3.7	FD
	5/22/2017	1.9	3.0	ORG
	11/16/2017	1.7	4.7	ORG
	5/15/2018	1.9	<2.0	ORG
	8/6/2018	14	3.6	ORG
	8/6/2018	13	3.3	SPT
MW-39	2/21/2017	33	53	ORG
	5/22/2017	26	44	ORG
	11/16/2017	30	43	ORG
	11/16/2017	31	41	SPT
	2/19/2018	34	50	ORG
	5/15/2018	28	36	ORG
	8/6/2018	26	37	ORG
MW-43	5/22/2017	2800	<2.0	ORG
	5/15/2018	2900	160	FD
	5/15/2018	2900	160	ORG
MW-47	2/21/2017	4.0	8.1	ORG
	5/22/2017	3.8	7.4	ORG
	11/21/2017	1.7	2.8	FD
	11/21/2017	1.7	3.4	ORG
	2/21/2018	2.3	3.9	ORG
	2/21/2018	2.4	3.9E	SPT
	5/15/2018	3.9	5.3	ORG
	8/6/2018	7.3	2.9	ORG
SOUTHERN AREA SHALLOW AQUIFER MONITOR WELLS				
MW-01	2/22/2017	< 0.50	< 2.0	ORG
	2/22/2017	< 0.10	< 1.0	SPT
	5/16/2018	<0.50	<2.0	ORG
	8/8/2018	<0.50	<2.0	ORG
MW-06	2/22/2017	<0.50	<2.0	FD
	2/22/2017	<0.50	<2.0	ORG
	8/29/2017	<0.50	<2.0	ORG
	2/21/2018	<0.50	5.2E	ORG
	8/8/2018	<0.50	<2.0	ORG
	8/8/2018	0.13	<1.0	SPT
MW-14	2/20/2017	<0.50	<2.0	ORG
	2/19/2018	1.3E	<2.0	ORG
	8/8/2018	<0.50	<2.0	ORG

TABLE 7

GROUNDWATER QUALITY DATA
(NITRATE-N AND PERCHLORATE)

IDENTIFIER	SAMPLE DATE	NITRATE-N (mg/l)	PERCHLORATE (µg/l)	SAMPLE TYPE
SOUTHERN AREA SHALLOW AQUIFER MONITOR WELLS				
MW-22	2/20/2017	<0.50	<2.0	ORG
	5/16/2018	<0.50	<2.0	ORG
MW-33	2/20/2017	<0.50	<2.0	ORG
	2/21/2018	<0.50	<2.0	ORG
	2/21/2018	<0.10	<1.0E	SPT
	8/8/2018	<0.50	<2.0	ORG
NARS SHALLOW AQUIFER MONITOR WELLS				
MW-08	2/20/2017	23	---	ORG
	5/23/2017	22	---	ORG
	8/29/2017	25	---	ORG
	11/20/2017	23	---	ORG
	2/19/2018	24	---	ORG
	5/15/2018	25	---	ORG
	5/15/2018	26E	---	SPT
	8/7/2018	24	---	ORG
	12/5/2018	24	---	ORG
MW-11	8/29/2017	4.2	---	ORG
	8/7/2018	2.0	---	ORG
MW-13	2/20/2017	49	---	FD
	2/20/2017	48	---	ORG
	11/20/2017	40	---	FD
	11/20/2017	39	---	ORG
	2/21/2018	56	---	ORG
	2/21/2018	60	---	SPT
	8/8/2018	50E	---	ORG
	8/8/2018	52	---	SPT
MW-17	2/20/2017	16	---	ORG
	8/28/2017	20	---	ORG
	2/19/2018	18	---	ORG
	8/7/2018	3.7	---	ORG
MW-18	2/20/2017	8.8	---	ORG
	8/28/2017	3.4	---	FD
	8/28/2017	3.3	---	ORG
	2/19/2018	7.5	---	ORG
	8/7/2018	31	---	ORG
MW-19	2/20/2017	21	---	ORG
	5/23/2017	16	---	ORG
	8/29/2017	21	---	FD
	8/29/2017	22	---	ORG
	11/20/2017	16	---	ORG
	2/19/2018	17	---	ORG
	5/15/2018	17	---	ORG
	8/7/2018	15	---	ORG
	12/5/2018	12	---	ORG

TABLE 7

GROUNDWATER QUALITY DATA
(NITRATE-N AND PERCHLORATE)

IDENTIFIER	SAMPLE DATE	NITRATE-N (mg/l)	PERCHLORATE (µg/l)	SAMPLE TYPE
NARS SHALLOW AQUIFER MONITOR WELLS				
MW-34	2/20/2017	<0.50	---	ORG
	5/23/2017	<0.50	---	ORG
	9/26/2017	<0.50E	---	ORG
	11/20/2017	<0.50	---	ORG
	2/20/2018	<0.50	---	ORG
	5/16/2018	<0.50	---	ORG
	7/5/2018	<0.50	---	ORG
	8/7/2018	<0.50	---	ORG
	12/4/2018	1.7E	---	ORG
	12/4/2018	<0.10E	---	SPT
MW-35	2/20/2017	76	---	ORG
	5/23/2017	69	---	ORG
	9/26/2017	74E	---	ORG
	11/20/2017	73	---	ORG
	2/20/2018	78	---	ORG
	5/16/2018	73	---	ORG
	7/5/2018	66	---	ORG
	7/5/2018	68	---	SPT
	8/7/2018	66	---	ORG
	12/4/2018	58E	---	FD
	12/4/2018	61E	---	ORG
MW-36	2/20/2017	180	---	ORG
	5/23/2017	180	---	ORG
	9/26/2017	160E	---	ORG
	11/20/2017	130	---	ORG
	11/20/2017	130E	---	SPT
	2/20/2018	160	---	ORG
	5/16/2018	180	---	ORG
	7/5/2018	160E	---	FD
	7/5/2018	160E	---	ORG
	8/7/2018	150	---	ORG
	12/4/2018	71E	---	ORG
MW-45	2/20/2017	240	---	ORG
	5/22/2017	210	---	ORG
	8/31/2017	220	---	ORG
	8/31/2017	240E	---	SPT
	11/1/2017	180	---	ORG
	11/21/2017	180	---	ORG
	2/21/2018	190	---	ORG
	5/16/2018	220	---	FD
	5/16/2018	220	---	ORG
	7/5/2018	200E	---	ORG
	8/6/2018	240	---	ORG
	12/4/2018	180E	---	ORG
MW-46	7/11/2018	160	---	ORG

TABLE 7

GROUNDWATER QUALITY DATA
(NITRATE-N AND PERCHLORATE)

IDENTIFIER	SAMPLE DATE	NITRATE-N (mg/l)	PERCHLORATE (µg/l)	SAMPLE TYPE
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER MONITOR WELLS				
MW-40	5/24/2017	0.70	---	ORG
	8/29/2017	<0.50	---	ORG
MW-41A	2/22/2017	0.60	---	ORG
MW-41B	2/22/2017	2.0	---	ORG
MW-42	2/23/2017	4.0	---	ORG
	12/4/2018	6.3	---	ORG
NORTHERN AREA MANAGEMENT ZONE SHALLOW AQUIFER PIEZOMETERS				
NAP-1	7/5/2018	<0.50	---	ORG
NAP-2	7/5/2018	<0.50	---	ORG
NAP-3	7/5/2018	<0.50	---	ORG
NAP-4	7/5/2018	<0.50	---	ORG
NAP-5	7/5/2018	<0.50	---	ORG
NORTHERN AREA EXTRACTION WELLS				
PB-2A	11/15/2018	49	---	ORG
PB-4	11/14/2018	43	---	ORG
PB-7	11/15/2018	71	---	ORG
SEW-02 (TW-01)	2/20/2017	210	---	ORG
	5/22/2017	200	---	FD
	5/22/2017	200	---	ORG
	8/31/2017	200	---	ORG
	10/3/2017	220	<2.0	ORG
	11/1/2017	160	---	ORG
	2/21/2018	170	---	ORG
	5/16/2018	190	---	ORG
	8/7/2018	220	---	FD
	8/7/2018	200	---	ORG
	12/4/2018	210E	---	ORG
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER PRIVATE WELLS				
D(17-20)36aad1 (Jacobs)	2/23/2017	1.1	---	ORG
D(17-20)36caa (Gaynor)	2/22/2017	0.68	---	ORG
D(17-20)36caa2(Hyder)	2/22/2017	1.7	---	ORG

TABLE 7

GROUNDWATER QUALITY DATA
(NITRATE-N AND PERCHLORATE)

IDENTIFIER	SAMPLE DATE	NITRATE-N (mg/l)	PERCHLORATE (μg/l)	SAMPLE TYPE
NORTHERN AREA MNA MANAGEMENT ZONE SHALLOW AQUIFER PRIVATE WELLS				
D(18-21)06bcb (Jones)	2/22/2017	2.4	---	ORG
	2/22/2017	2.7	---	SPT
	5/24/2017	1.0	---	ORG
	5/24/2017	1.1	---	SPT
	8/8/2018	9.5E	---	ORG
	12/5/2018	5.0	---	ORG
SURFACE WATER				
SW-03	2/23/2017	0.56	---	ORG
	2/22/2018	0.51	---	FD
	2/22/2018	0.63	---	ORG
	8/8/2018	1.2	---	ORG
SW-04	2/23/2017	0.58	---	ORG
	2/22/2018	0.57	---	ORG
	8/8/2018	1.2	---	ORG
SW-12	2/22/2017	< 0.50	---	ORG
	8/8/2018	1.0E	---	ORG
SW-13	2/23/2017	< 0.50	---	ORG
SW-14	8/8/2018	0.90E	<2.0	ORG

ABBREVIATIONS/ACRONYMS:

(<)= Not detected, numerical value is less than the method detection limit.
-- = not analyzed
E = Estimated
mg/l = milligrams per liter
ORG = original sample
SPT = Split sample

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
PDA-S	1/5/18	0	0
	1/12/18	0	0
	1/19/18	0	0
	1/26/18	0	0
	2/2/18	0	0
	2/8/18	0	0
	2/16/18	0	0
	2/22/18	0	0
	3/2/18	0	0
	3/9/18	0	0
	3/16/18	0	0
	3/23/18	0	0
	3/29/18	0	0
	4/6/18	0	0
	4/13/18	500	0
	4/20/18	500	0
	4/27/18	500	0
	5/4/18	500	0
	5/11/18	0	0
	5/18/18	0	0
	5/24/18	0	0
	5/31/18	0	0
	6/8/18	0	0
	6/15/18	0	0
	6/22/18	0	0
	6/28/18	0	0
	7/6/18	0	0
	7/13/18	0	0
	7/20/18	0	0
	7/27/18	0	0
	8/3/18	1,000	0
	8/10/18	0	0
	8/17/18	0	0
	8/24/18	340	0
	8/30/18	0	0
	9/7/18	370	0

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
PDA-S	9/14/18	0	0
	9/21/18	800	0
	9/27/18	840	0
	10/5/18	0	0
	10/12/18	0	0
	10/19/18	500	0
	10/26/18	0	0
	11/1/18	0	0
	11/8/18	1,000	0
	11/16/18	1,000	0
	11/21/18	1,100	0
	11/30/18	1,200	0
	12/7/18	1,900	0
	12/14/18	450	0
	12/21/18	0	0
	12/28/18	1,200	0
TOTAL (PDA-S)		**13,700**	**0**
PDA-C	1/5/18	0	0
	1/12/18	0	0
	1/19/18	0	0
	1/26/18	0	0
	2/2/18	0	0
	2/8/18	0	0
	2/16/18	0	0
	2/22/18	0	0
	3/2/18	0	0
	3/9/18	0	0
	3/16/18	0	0
	3/23/18	0	0
	3/29/18	0	0
	4/6/18	0	0
	4/13/18	0	0
	4/20/18	0	0

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
PDA-C	4/27/18	0	0
	5/4/18	0	0
	5/11/18	0	0
	5/18/18	0	0
	5/24/18	0	0
	5/31/18	0	0
	6/8/18	0	0
	6/15/18	0	0
	6/22/18	0	0
	6/28/18	0	0
	7/6/18	0	0
	7/13/18	0	0
	7/20/18	0	0
	7/27/18	0	0
	8/3/18	0	0
	8/10/18	0	0
	8/17/18	0	0
	8/24/18	0	0
	8/30/18	0	0
	9/7/18	0	0
	9/14/18	0	0
	9/21/18	0	0
	9/27/18	0	0
	10/5/18	0	0
	10/12/18	0	0
	10/19/18	0	0
	10/26/18	0	0
	11/1/18	0	0
	11/8/18	0	0
	11/16/18	0	0
	11/21/18	0	0
	11/30/18	0	0
	12/7/18	0	0
	12/14/18	0	0
	12/21/18	0	0
	12/28/18	0	0
TOTAL (PDA-C)		**0**	**0**

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
PDA-N	1/5/18	0	0
	1/12/18	0	0
	1/19/18	0	0
	1/26/18	0	0
	2/2/18	0	0
	2/8/18	0	0
	2/16/18	0	0
	2/22/18	0	0
	3/2/18	0	0
	3/9/18	0	0
	3/16/18	0	0
	3/23/18	0	0
	3/29/18	0	0
	4/6/18	0	0
	4/13/18	0	0
	4/20/18	0	0
	4/27/18	0	0
	5/4/18	0	0
	5/11/18	0	0
	5/18/18	0	0
	5/24/18	0	0
	5/31/18	0	0
	6/8/18	0	0
	6/15/18	0	0
	6/22/18	0	0
	6/28/18	0	0
	7/6/18	0	0
	7/13/18	0	0
	7/20/18	0	0
	7/27/18	0	0
	8/3/18	0	0
	8/10/18	0	0
	8/17/18	0	0
	8/24/18	0	0
	8/30/18	0	0
	9/7/18	0	0

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
PDA-N	9/14/18	0	0
	9/21/18	0	0
	9/27/18	0	0
	10/5/18	0	0
	10/12/18	0	0
	10/19/18	0	0
	10/26/18	0	0
	11/1/18	0	0
	11/8/18	0	0
	11/16/18	0	0
	11/21/18	0	0
	11/30/18	0	0
	12/7/18	0	0
	12/14/18	0	0
	12/21/18	0	0
	12/28/18	0	0
TOTAL (PDA-N)		**0**	**0**
FDA	1/5/18	0	0
	1/12/18	0	0
	1/19/18	0	0
	1/26/18	0	0
	2/2/18	0	0
	2/8/18	0	0
	2/16/18	0	0
	2/22/18	0	0
	3/2/18	0	0
	3/9/18	0	0
	3/16/18	0	0
	3/23/18	0	0
	3/29/18	0	0
	4/6/18	0	0
	4/13/18	0	0
	4/20/18	0	0
	4/27/18	0	0
	5/4/18	0	0

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
FDA	5/11/18	0	0
	5/18/18	0	0
	5/24/18	0	0
	5/31/18	0	0
	6/8/18	0	0
	6/15/18	0	0
	6/22/18	0	0
	6/28/18	0	0
	7/6/18	0	0
	7/13/18	0	0
	7/20/18	0	0
	7/27/18	0	0
	8/3/18	0	0
	8/10/18	0	0
	8/17/18	0	0
	8/24/18	0	0
	8/30/18	0	0
	9/7/18	0	0
	9/14/18	0	0
	9/21/18	0	0
	9/27/18	0	0
	10/5/18	0	0
	10/12/18	0	0
	10/19/18	0	0
	10/26/18	0	0
	11/1/18	0	0
	11/8/18	0	0
	11/16/18	0	0
	11/21/18	0	0
	11/30/18	0	0
	12/7/18	0	0
	12/14/18	0	0
	12/21/18	0	0
	12/28/18	0	0
TOTAL (FDA)		**0**	**0**

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
ANA	1/5/18	0	0
	1/12/18	0	0
	1/19/18	0	0
	1/26/18	0	0
	2/2/18	0	0
	2/8/18	0	0
	2/16/18	0	0
	2/22/18	0	0
	3/2/18	0	0
	3/9/18	0	0
	3/16/18	0	0
	3/23/18	0	0
	3/29/18	0	0
	4/6/18	0	0
	4/13/18	0	0
	4/20/18	0	0
	4/27/18	0	0
	5/4/18	0	0
	5/11/18	0	0
	5/18/18	0	0
	5/24/18	0	0
	5/31/18	0	0
	6/8/18	0	0
	6/15/18	0	0
	6/22/18	0	0
	6/28/18	0	0
	7/6/18	0	0
	7/13/18	0	0
	7/20/18	0	0
	7/27/18	0	0
	8/3/18	0	0
	8/10/18	0	0
	8/17/18	0	0
	8/24/18	0	0
	8/30/18	0	0
	9/7/18	0	0

TABLE 8

AMENDMENT ADDITIONS LOG
JANUARY 2018 THROUGH DECEMBER 2018
(MOLASSES, SODIUM TRIPOLYPHOSPHATE)

TREATMENT CELLS	DATE	MOLASSES (Liquid Form) (gal)	B-52 Sodium Tripolyphosphate (lbs)
ANA	9/14/18	0	0
	9/21/18	0	0
	9/27/18	0	0
	10/5/18	0	0
	10/12/18	0	0
	10/19/18	0	0
	10/26/18	0	0
	11/1/18	0	0
	11/8/18	0	0
	11/16/18	0	0
	11/21/18	0	0
	11/30/18	0	0
	12/7/18	0	0
	12/14/18	0	0
	12/21/18	0	0
	12/28/18	0	0
TOTAL (ANA)		**0**	**0**

TABLE 9

NORTHERN AREA REMEDIATION SYSTEM WETLAND

WATER BUDGET

INPUTS	Units	2000	2001	2002	2003	2004	2005	2006	2016	2017	2018
SEW-1 [a]	gal	22,241,215	25,018,950	23,313,210	22,322,350	32,491,750	50,356,930	52,953,830	33,669,034	32,236,898	29,601,550
SEW-2 [a]	gal	--	--	--	--	--	--	--	--	--	4,905,555
Precip [b]	in	15	14	7	8	9	7.9	12.7	12	7	16
Precip	ft	1.2	1.2	0.6	0.6	0.8	0.7	1.1	1.0	0.6	1.3
Precip Vol	gal	1,777,722	1,680,951	833,905	909,171	1,123,023	940,233	1,511,303	1,433,647	836,294	1,911,529
INPUT TOTAL	gal	**24,018,937**	**26,699,901**	**24,147,115**	**23,231,521**	**33,614,773**	**51,297,163**	**54,465,133**	**35,102,681**	**33,073,192**	**36,418,634**
OUTPUTS	Units	2000	2001	2002	2003	2004	2005	2006	2016	2017	2018
ET RATE [c]	ft	7.5	7.5	7.5	7.5	7.5	8.6	7.3	7.0	7.8	7.9
ET	gal	8,088,722	8,088,722	8,088,722	8,088,722	8,088,722	9,275,068	7,905,378	7,549,474	8,412,271	8,520,121
Evap Rate [d]	ft	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Evap	gal	2,770,173	2,770,173	2,770,173	2,770,173	2,770,173	2,770,173	2,770,173	2,770,173	2,770,173	2,770,173
Discharge [e,f]	gal	0	4,151,520	163,900	4,423,680	20,750,400	32,760,000	44,042,400	22,385,536	24,173,394	32,633,072
OUTPUT TOTAL	**gal**	**10,858,896**	**15,010,416**	**11,022,796**	**15,282,576**	**31,609,296**	**44,805,241**	**54,717,951**	**32,705,183**	**35,355,838**	**43,923,366**
	Units	2000	2001	2002	2003	2004	2005	2006	2016	2017	2018
Input - Output *	**gal**	**13,160,041**	**11,689,485**	**13,124,319**	**7,948,945**	**2,005,478**	**6,491,922**	**-252,819**	**2,397,497**	**-2,282,646**	**-7,504,732**

ABBREVIATIONS/ACRONYMS:

ET = evapotranspiration
ft = feet
gal = gallons
Precip = precipatation
SEW-1 = shallow aquifer extraction well

Notes:

* = Uncertainty unaccounted for changes in storage, infiltration losses, and measurement error.
[a] = Measured from SEW wells' flow meter.
[b] = Measured from ANP weather station.
[c] = Measured from wetland atmometer.
[d] = Estimated from referenced pan evaporation Arizona climate 1931-1972, U of A Press, 1974.
[e] = Estimated from measurements at the Parshall flume until totalizer installed in October 2007.
[f] = The Parshall Flume totalizer was out of service for approximately 2 months in 2012, 2015 and 2016. The total for each year is estimated.

TABLE 10
INFLUENT AND EFFLUENT MEASUREMENTS

DATE RECORDED	INFLUENT				EFFLUENT	
	SEW-01		SEW-02		PARSHALL FLUME	
	TOTALIZED FLOW (gallons)	FLOW (GPM)	TOTALIZED FLOW (gallons)	FLOW (GPM)	TOTALIZED FLOW (gallons)	FLOW (GPM)
1/5/2018	219686442	205			391925303	69.47
1/12/2018	220206822	210			393256785	69.37
1/19/2018	220741602	210			393961598	64.31
1/26/2018	221260152	205			394434198	67.12
2/2/2018	221787132	210			394828041	50.66
2/8/2018	222240782	210			395253987	72.23
2/16/2018	222799432	210			396562251	62.71
2/22/2018	223256702	210			397212414	63.71
3/2/2018	223885812	210			397862577	43.21
3/9/2018	224424462	NL*			398512740	NL*
3/15/2018	224870182	210			399162903	NL
3/23/2018	225479972	210			399813066	75.46
3/29/2018	225892482	210			400463229	83.16
4/6/2018	226523682	210			401113392	NL
4/13/2018	227104032	210			401763555	70.67
4/20/2018	227810952	210			402640404	95.32
4/27/2018	228509822	210			403524444	81.28
5/4/2018	229173892	210			404406591	99.87
5/11/2018	229879482	210			405206187	80.52
5/18/2018	230591652	210			405953666	75.57
5/24/2018	231205342	210			406555836	68.44
5/31/2018	231870082	210			407159152	61.73
6/8/2018	232689102	210			407774191	51.23
6/15/2018	233389492	210			408257035	53.3
6/22/2018	234112922	210			408644640	46.31
6/28/2018	234725892	210			410209647	45.61
7/6/2018	235501222	210			410972270	NL
7/13/2018	236202522	210			411734893	NL
7/20/2018	236934482	210	76121	NL*	412497516	NL
7/27/2018	237614412	210	243903	45	413260139	NL
8/3/2018	238532492	210	454642	40	414022762	NL
8/10/2018	239025112	210	641695	43	414785385	NL
8/17/2018	239733832	210	896979	45	415548008	NL
8/24/2018	240474202	210	1160988	45	416310631	NL
8/30/2018	241016522	210	1366017	45	417073254	NL
9/7/2018	241821282	210	1654127	45	417835877	NL
9/14/2018	242525292	210	1906066	45	418598500	37.12
9/21/2018	243189162	NL*	2176808	45	419361123	NL
9/27/2018	243632692	210	2388013	45	420123746	NL
10/5/2018	244236182	210	2680391	45	420886369	14.01
10/12/2018	244733132	210	2927203	45	421170615	55.33
10/19/2018	245310082	210	3206743	45	421734150	27.47
10/26/2018	245842612	NL*	3503521	45	422358228	23.48
11/1/2018	246191982	210	3738123	45	422652673	21.87
11/8/2018	246451542	190	4034680	45	423169883	21.03
11/16/2018	246790322	190	4228799	45	423211154	16.83

TABLE 10
INFLUENT AND EFFLUENT
MEASUREMENTS

DATE RECORDED	INFLUENT				EFFLUENT	
	SEW-01		SEW-02		PARSHALL FLUME	
	TOTALIZED FLOW (gallons)	FLOW (GPM)	TOTALIZED FLOW (gallons)	FLOW (GPM)	TOTALIZED FLOW (gallons)	FLOW (GPM)
11/21/2018	247047982	190	4433193	NL*	423383317	8.7
11/30/2018	247453362	190	4474854	45	423540907	12.82
12/7/2018	247756272	190	4543682	NL*	423709867	14.83
12/14/2018	248050702	190	4628691	45	423931018	12.82
12/21/2018	248370642	190	4754211	45	424153553	21.16
12/28/2018	248709442	190	4905555	45	424456575	35.63

Total Effluent volume January through December 2018 = 32,633,072 gallons
Average Effluent flow rate January through December 2018 = 51 gpm
Total Influent volume January through December 2018 = 34,507,105 gallons
Average Influent flow rate January through December 2018 = 252 gpm

ABBREVIATIONS/ACRONYMS:

GPM = gallons per minute measured at the Flowmeters and/or Parshall Flume
NL= Not logging, meter was fixed.
NL* = Measured during daily pump down time.
SEW = Shallow Aquifer Extraction Well
-- = data not available

TABLE 11

WATER LEVEL DATA
(WELLS)

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
SHALLOW AQUIFER MONITOR WELL				
MW-10	1/5/2018	3632.73	15.20	3617.53
	1/12/2018		15.90	3616.83
	1/19/2018		15.20	3617.53
	1/26/2018		15.70	3617.03
	2/2/2018		16.20	3616.53
	2/8/2018		16.20	3616.53
	2/16/2018		16.00	3616.73
	2/20/2018		15.11	3617.62
	2/22/2018		15.80	3616.93
	3/2/2018		16.20	3616.53
	3/9/2018		16.00	3616.73
	3/23/2018		16.20	3616.53
	3/29/2018		16.00	3616.73
	4/6/2018		15.71	3617.02
	4/13/2018		15.70	3617.03
	4/20/2018		15.70	3617.03
	4/27/2018		15.70	3617.03
	5/4/2018		15.70	3617.03
	5/11/2018		15.70	3617.03
	5/16/2018		15.80	3616.93
	5/18/2018		15.70	3617.03
	5/24/2018		15.70	3617.03
	5/31/2018		15.70	3617.03
	6/8/2018		15.70	3617.03
	6/22/2018		15.70	3617.03
	6/28/2018		15.75	3616.98
	7/6/2018		16.50	3616.23
	7/13/2018		16.70	3616.03
	7/20/2018		16.10	3616.63
	7/27/2018		16.00	3616.73
	8/6/2018		15.80	3616.93
	8/10/2018		16.20	3616.53
	8/17/2018		16.20	3616.53
	8/24/2018		15.20	3617.53
	8/30/2018		14.75	3617.98
	9/7/2018		14.81	3617.92
	9/14/2018		14.85	3617.88
	9/21/2018		15.10	3617.63
	9/27/2018		15.10	3617.63
	10/5/2018		15.53	3617.20
	10/12/2018		15.61	3617.12
	10/19/2018		15.85	3616.88
	10/26/2018		15.91	3616.82
	11/1/2018		16.00	3616.73
	11/8/2018		16.00	3616.73
	11/16/2018		16.10	3616.63

TABLE 11

WATER LEVEL DATA
(WELLS)

IDENTIFIER	DATE MEASURED	MEASURING POINT ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	WATER LEVEL ELEVATION (feet msl)
SHALLOW AQUIFER MONITOR WELL				
MW-10	11/21/2018	3632.73	15.41	3617.32
	11/30/2018		15.50	3617.23
	12/5/2018		15.68	3617.05
	12/7/2018		15.61	3617.12
	12/14/2018		15.60	3617.13
	12/21/2018		15.61	3617.12
	12/28/2018		15.61	3617.12
EXTRACTION WELLS				
SEW-01	2/19/2018	3622.08	51.45	3570.63 (PWL)
	5/21/2018		60.10	3561.98 (PWL)
	8/3/2018		62.14	3559.94 (PWL)
	12/3/2018		60.80	3561.28 (PWL)
SEW-02 (TW-01)	8/3/2018	3612	56.63	3555.37 (PWL)
	12/3/2018		26.69	3585.31
DESIGN CONFIRMATION PIEZOMETER				
DCP-12	2/2/2018	3691.10	22.20	3668.90
	2/20/2018		20.47	3670.63
	2/22/2018		20.47	3670.63
	3/29/2018		21.50	3669.60
	4/27/2018		21.15	3669.95
	5/16/2018		21.84	3669.26
	5/24/2018		21.45	3669.65
	6/28/2018		21.11	3669.99
	7/27/2018		21.50	3669.60
	8/24/2018		21.35	3669.75
	9/27/2018		21.55	3669.55
	11/1/2018		21.75	3669.35
	11/21/2018		20.45	3670.65
	12/5/2018		20.22	3670.88
	12/21/2018		20.78	3670.32

ABBREVIATIONS/ACRONYMS:

bmp = below measuring point
msl = mean sea level
PWL = pumping water level

TABLE 12

WATER QUALITY DATA
(NITRATE-N AND AMMONIA-N)

IDENTIFIER	SAMPLE DATE	LAB	NITRATE-N (mg/l)	AMMONIA-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS					
ANA	1/30/2018	TURN	<0.5	<0.5	ORG
	2/22/2018	TURN	<0.5	<0.5	ORG
	3/27/2018	TURN	<0.5	<0.5	ORG
	4/24/2018	TURN	<0.5	<0.5	ORG
	5/21/2018	TURN	<0.5	<0.5	ORG
	5/21/2018	TAA	<0.1	<0.5	SPT
	6/26/2018	TURN	<0.50	<0.50	ORG
	7/23/2018	TURN	<0.50	<0.50	ORG
	8/21/2018	TURN	<0.50	<0.50	FD
	8/21/2018	TURN	<0.50	<0.50	ORG
	9/18/2018	TURN	<0.50	<0.50	ORG
	10/30/2018	TURN	<0.50	2.2	ORG
	11/19/2018	TURN	<0.50	1.3	ORG
	12/19/2018	TURN	<0.50	1.4	ORG
FDA	1/30/2018	TURN	<0.5	<0.5	ORG
	2/22/2018	TURN	<0.5	<0.5	ORG
	3/27/2018	TURN	<0.5	<0.5	ORG
	4/24/2018	TURN	<0.5	<0.5	ORG
	5/21/2018	TURN	<0.5	<0.5	ORG
	6/26/2018	TURN	<0.50	<0.50	ORG
	6/26/2018	TAA	0.15	<0.5	SPT
	7/23/2018	TURN	<0.50	<0.50	ORG
	8/21/2018	TURN	<0.50	<0.50	ORG
	9/18/2018	TURN	<0.50	<0.50	FD
	9/18/2018	TURN	<0.50	<0.50	ORG
	10/30/2018	TURN	<0.50	<0.50	ORG
	11/19/2018	TURN	<0.50	<0.50	ORG
	12/19/2018	TURN	<0.50	<0.50	ORG
PDA-C	1/30/2018	TURN	<0.5	<0.5	FD
	1/30/2018	TURN	<0.5	<0.5	ORG
	2/22/2018	TURN	12	<0.5	ORG
	2/22/2018	TAA	12	<0.5	SPT
	3/27/2018	TURN	20	<0.5	ORG
	4/24/2018	TURN	18E	<0.5	ORG
	5/21/2018	TURN	13	6.7	ORG
	6/26/2018	TURN	12	1.0	ORG
	7/23/2018	TURN	6.2	<0.50	ORG
	8/21/2018	TURN	3.4	6.2	ORG
	9/18/2018	TURN	3.7	<0.50	ORG
	10/30/2018	TURN	1.1	1.4	ORG
	11/19/2018	TURN	11	<0.50	ORG
	12/19/2018	TURN	3.1	8.7	ORG

TABLE 12

WATER QUALITY DATA
(NITRATE-N AND AMMONIA-N)

IDENTIFIER	SAMPLE DATE	LAB	NITRATE-N (mg/l)	AMMONIA-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS					
PDA-N	1/30/2018	TURN	<0.5	<0.5	ORG
	2/22/2018	TURN	<0.5	<0.5	ORG
	3/27/2018	TURN	3.7	<0.5	ORG
	4/24/2018	TURN	7.6	<0.5	ORG
	5/21/2018	TURN	<0.5	<0.5	ORG
	6/26/2018	TURN	<0.50	<0.50	ORG
	7/23/2018	TURN	<0.50	<0.50	ORG
	7/23/2018	TAA	<0.10	<0.50	SPT
	8/21/2018	TURN	<0.50	<0.50	ORG
	9/18/2018	TURN	<0.50	<0.50	ORG
	10/30/2018	TURN	0.6	1.6	ORG
	11/19/2018	TURN	0.63	<0.50	ORG
	12/19/2018	TURN	<0.50	0.92	FD
	12/19/2018	TURN	<0.50	0.96	ORG
PDA-S	1/30/2018	TURN	24	<0.5	ORG
	2/22/2018	TURN	28	<0.5	ORG
	3/27/2018	TURN	35	<0.5	ORG
	4/24/2018	TURN	16	3	ORG
	5/21/2018	TURN	3.8E	9.3	FD
	5/21/2018	TURN	3.6E	9.3	ORG
	6/26/2018	TURN	13	<0.50	ORG
	7/23/2018	TURN	37E	<0.50	ORG
	8/21/2018	TURN	4.8	6.9	ORG
	9/18/2018	TURN	28	4.5	ORG
	10/30/2018	TURN	25	5.9	ORG
	10/30/2018	TAA	22	7.3	SPT
	11/19/2018	TURN	60	<0.50	ORG
	12/19/2018	TURN	0.73E	42	ORG
SHALLOW AQUIFER MONITOR WELL					
MW-10	2/20/2018	TURN	<0.5	<0.5	ORG
	5/16/2018	TURN	<0.5	<0.5	ORG
	8/6/2018	TURN	0.85	<0.50	ORG
	12/5/2018	TURN	<0.50	<0.50	ORG
EXTRACTION WELLS					
SEW-01	1/30/2018	TURN	50	--	ORG
	1/30/2018	TAA	54	--	SPT
	2/22/2018	TURN	56	5.0	ORG
	3/27/2018	TURN	55	--	ORG
	4/24/2018	TURN	64	--	ORG
	5/21/2018	TURN	58	4.8	ORG
	6/26/2018	TURN	52	--	ORG
	7/23/2018	TURN	55E	--	ORG
	8/21/2018	TURN	53E	4.4	FD
	8/21/2018	TURN	54E	4.4	ORG

TABLE 12

WATER QUALITY DATA
(NITRATE-N AND AMMONIA-N)

IDENTIFIER	SAMPLE DATE	LAB	NITRATE-N (mg/l)	AMMONIA-N (mg/l)	SAMPLE TYPE
EXTRACTION WELLS					
SEW-01	9/18/2018	TURN	57	--	ORG
	10/30/2018	TURN	56	--	ORG
	11/19/2018	TURN	60	<0.50	ORG
	12/19/2018	TURN	56	--	ORG
SEW-02 (TW-01)	8/30/2018	TURN	210	13	ORG
	9/18/2018	TURN	180	--	ORG
	10/30/2018	TURN	170	--	ORG
	11/19/2018	TURN	170	<0.50	ORG
	12/19/2018	TURN	220	--	ORG
EFFLUENT					
EFF-L	1/30/2018	TURN	<0.5	<0.5	ORG
	2/22/2018	TURN	<0.5	<0.5	FD
	2/22/2018	TURN	<0.5	<0.5	ORG
	3/27/2018	TURN	<0.5	<0.5	ORG
	4/24/2018	TURN	<0.5	<0.5	ORG
	4/24/2018	TAA	<0.1	<0.5	SPT
	5/21/2018	TURN	<0.5	<0.5	ORG
	6/26/2018	TURN	<0.50	<0.50	ORG
	7/23/2018	TURN	<0.50	<0.50	ORG
	8/21/2018	TURN	<0.50	<0.50	ORG
	8/21/2018	TAA	0.16	<0.50	SPT
	9/18/2018	TURN	<0.50	<0.50	ORG
	10/30/2018	TURN	<0.50	<0.50	ORG
	11/19/2018	TURN	<0.50	<0.50	ORG
	12/19/2018	TURN	<0.50	<0.50	ORG
DESIGN CONFIRMATION PIEZOMETER					
DCP-12	2/20/2018	TURN	11	--	FD
	2/20/2018	TURN	11	--	ORG
	5/16/2018	TURN	41	--	ORG
	8/6/2018	TURN	37	--	ORG
	12/5/2018	TURN	4.7	<0.50	ORG
BLANKS					
Field Blank	1/30/2018	TURN	<0.5	<0.5	FB
	2/20/2018	TURN	<0.5	<0.5	FB
	2/22/2018	TURN	<0.5	<0.5	FB
	3/27/2018	TURN	<0.5	<0.5	FB
	4/24/2018	TURN	<0.5	<0.5	FB
	5/21/2018	TURN	<0.5	<0.5	FB
	6/26/2018	TURN	<0.50	<0.50	FB

TABLE 12

WATER QUALITY DATA
(NITRATE-N AND AMMONIA-N)

IDENTIFIER	SAMPLE DATE	LAB	NITRATE-N (mg/l)	AMMONIA-N (mg/l)	SAMPLE TYPE
BLANKS					
Field Blank	7/23/2018	TURN	<0.50	<0.50	FB
	8/21/2018	TURN	<0.50	<0.50	FB
	8/30/2018	TURN	<0.50	<0.50	FB
	9/18/2018	TURN	<0.50	<0.50	FB
	10/30/2018	TURN	<0.50	<0.50	FB
	11/19/2018	TURN	<0.50	<0.50	FB
	12/19/2018	TURN	<0.50	<0.50	FB

ABBREVIATIONS/ACRONYMS:

(<) = Not detected, numerical value is less than the method detection limit.
-- = not analyzed
E = Estimated
FB = Field Blank sample
mg/l = milligrams per liter
ORG = original sample
SPT = Split sample
TAA = Test America Analytical Laboratories, Inc.
TURN = Turner Laboratories, Inc.

TABLE 13

WATER QUALITY DATA
NORMAL OPERATION ADDITIONAL ANALYTES
INFLUENT AND EFFLUENT

SAMPLE DATE	LAB	ANALYTES	SEW-1	EFF-L	UNITS	SAMPLE TYPE
8/21/2018	TURN	bicarbonate	270	570	mg/L	ORG
		carbonate	< 2.0	< 2.0	mg/L	ORG
		chloride	21	36	mg/L	ORG
		fluoride	1.0	1.2	mg/L	ORG
		sulfate	380	410	mg/L	ORG
		ortho-phosphate	< 0.50 E	< 0.50 E	mg/L	ORG
		phosphorus	<0.10	<0.10	mg/L	ORG
		potassium	5.1	28	mg/L	ORG
		magnesium	31	48	mg/L	ORG
		calcium	170	180	mg/L	ORG
		sodium	140	190	mg/L	ORG
		total dissolved solids	1,200	1,300	mg/L	ORG
		total suspended solids	NA	15 E	mg/L	ORG

ABBREVIATIONS/ACRONYMS:

E = Estimated
mg/l = milligrams per liter
NA = not analyzed
ORG = original sample
TURN = Turner Laboratories, Inc.

NOTES:

(<) = Not detected, numerical value is less than the method detection limit.

TABLE 14

WATER QUALITY DATA
NORMAL OPERATION (NITROGEN SPECIES)

Identifier	SAMPLE DATE	LAB	Total Kjeldahl Nitrogen (TKN) (mg/l)	ORGANIC NITROGEN (mg/l)	SAMPLE TYPE
TREATMENT CELLS					
PDA-S	8/21/2018	TURN	11	3.8	ORG
PDA-C	8/21/2018	TURN	10	4.2	ORG
PDA-N	8/21/2018	TURN	4.5	4.5	ORG
ANA	8/21/2018	TURN	3.7	3.7	ORG
ANA-D	8/21/2018	TURN	3.5	3.5	FD
FDA	8/21/2018	TURN	3.6	3.6	ORG

ABBREVIATIONS/ACRONYMS:

FD = field duplicate sample
mg/l = milligrams per liter
ORG = original sample
TURN = Turner Analytical Laboratories Inc.

NOTES:

(<) = Not detected, numerical value is less than the method detection limit.

TABLE 15

WATER QUALITY DATA
NORMAL OPERATION (NUTRIENTS)

IDENTIFIER	SAMPLE DATE	LAB	CHEMICAL OXYGEN DEMAND (mg/l)	TOTAL ORGANIC CARBON (mg/l)	TOTAL PHOSPHORUS (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
ANA	2/22/2018	TURN	66E	11	<0.1	ORG
	5/21/2018	TAA	28	9.1	<0.1	SPT
	5/21/2018	TURN	25	11	0.15	ORG
	8/21/2018	TURN	94	27	0.11	FD
	8/21/2018	TURN	97	27	0.11	ORG
	11/19/2018	TURN	42	15	<0.10	ORG
FDA	2/22/2018	TURN	32E	13	0.12	ORG
	5/21/2018	TURN	<20	14	0.29	ORG
	8/21/2018	TURN	82	21	0.17	ORG
	11/19/2018	TURN	27	13	0.22	ORG
PDA-C	2/22/2018	TAA	28	5.6	<0.1	SPT
	2/22/2018	TURN	<20	7.1	0.12	ORG
	5/21/2018	TURN	260	46	0.32	ORG
	8/21/2018	TURN	160	27	0.27	ORG
	11/19/2018	TURN	<20	7.3	0.13	ORG
PDA-N	2/22/2018	TURN	36E	9.9	<0.1	ORG
	5/21/2018	TURN	55	25	<0.1	ORG
	8/21/2018	TURN	98	27	0.11	ORG
	11/19/2018	TURN	<20	8	0.12	ORG
PDA-S	2/22/2018	TURN	<20	3.7	<0.1	ORG
	5/21/2018	TURN	170	25	0.49	FD
	5/21/2018	TURN	170	24	0.51	ORG
	8/21/2018	TURN	76	15	0.21	ORG
	11/19/2018	TURN	320	110	0.18	ORG

ABBREVIATIONS/ACRONYMS:

(<) = Not detected, numerical value is less than the method detection limit.
E = Estimated
FD = field duplicate sample
mg/l = milligrams per liter
ORG = original sample
SPT = Split sample
TURN = Turner Laboratories, Inc.
TAA = Test America Analytical Laboratories, Inc.

TABLE 16

2019 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[1]	ClO4		
NARS MONITORING WELLS (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan]*							
MW-08	ANPI	Q				Q	
MW-11	ANPI	A - Aug				Q	
MW-13	ANPI	S - Feb/Aug				Q	
MW-17	ANPI	S - Feb/Aug				Q	
MW-18	ANPI	S - Feb/Aug				Q	
MW-19	ANPI	Q				Q	
MW-34	ANPI	Q				Q	
MW-35	ANPI	Q				Q	
MW-36	ANPI	Q				Q	
MW-45	ANPI	Q				Q	
PB-2A	ANPI	Q				Q	
PB-4	ANPI	Q				Q	
PB-5A[2]	ANPI	Q				Q	
PB-7	ANPI	Q				Q	
NARS PIEZOMETERS (NORTHERN AREA)							
NAP-1	ANPI					Periodic	Watel level monitoring via transducers with periodic downloads and static water level measurements
NAP-2	ANPI					Periodic	
NAP-3	ANPI					Periodic	
NAP-4	ANPI					Periodic	
NAP-5	ANPI					Periodic	
MNA MANAGEMENT ZONE (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan]*							
MW-20	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-38	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-41A	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-41B	ANPI	B - Aug 2019				B - Aug 2019	Access limited by owner availability
MW-42	ANPI	B - Aug 2019				B - Aug 2019	
D(17-20)36aad1	Jacobs	B - Aug 2019				B - Aug 2019	
D(17-20)36caa2	Hyder	B - Aug 2019				B - Aug 2019	
D(17-20)36caa	Gaynor	B - Aug 2019				B - Aug 2019	
D(17-20)36cdb	Woolever	B - Aug 2019				B - Aug 2019	Access limited by owner availability

TABLE 16

2019 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[(1)]	ClO4		
MNA MANAGEMENT ZONE (NORTHERN AREA) [*Northern Area PMP and Long-Term Site-Wide Plan] - CONT'D*							
D(17-20)36ddc	Morales	B - Aug 2019				B - Aug 2019	
D(18-20)01aad	McRae	B - Aug 2019				B - Aug 2019	Access limited by owner availability
D(18-21)06bcb	Jones	Q				Q	
D(17-20)36aad3	Acuna					B - Aug 2019	Water level only
D(17-20)36cad1	McCann					B - Aug 2019	Water level only
D(17-20)36dad	Ohlde					B - Aug 2019	Water level only
D(18-21)06ada	White					B - Aug 2019	Water level only
D(18-21)06bab	Alexander					B - Aug 2019	Water level only
D(18-21)06bcc2	Wooten					B - Aug 2019	Water level only
D(18-21)08bab	Tenopir					B - Aug 2019	Water level only
SENTINEL WELLS (NORTHERN AREA) [*Northern Area PMP]*							
MW-40	ANPI	B - Aug 2019				B - Aug 2019	
MNA BUFFER ZONE WELLS (NORTHERN AREA) *[Northern Area PMP]*							
D(17-20)25bad	Spears	B - Aug 2019				NM	Access limited by owner availability
NORTHERN AREA REMEDIATION SYSTEM *[NARS O&M]*							
SEW-1	ANPI	M	Q	Sep-21	A - Sep	Q	Weekly nitrate-N with field methods. Additional parameters include total phosphorus (Q), major ions (A)
SEW-2 (TW-01)	ANPI	M	Q	Sep-21	A - Sep	Q	Weekly nitrate-N with field methods. Additional parameters include total phosphorus (Q), major ions (A)
MW-10	ANPI	Q	Q			Weekly	
DCP-12	ANPI	Q		Feb-21		Q	
TREATMENT CELLS (surface water)	ANPI	M	M			Weekly	Weekly nitrate-N with field methods. Additional parameters include total phosphorus, chemical oxygen demand, and total organic carbon (Q), total kjeldahl nitrogen, organic nitrate (A).
TREATMENT CELL (sediments)	ANPI						Proposed for Deletion in March 2017.
EFFLUENT	ANPI	M	M	Sep-21			Additional parameters include total phosphorus, total kjeldahl nitrogen, organic nitrogen, total dissolved solids, and total suspended solids (Q). Major ions (A)

TABLE 16

2019 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[(1)]	ClO4		
NATIVE POND COVERS *[Soils Engineering Control Plan]*							
POND 1	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
POND 2	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
POND 3	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
POND 7	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
DYNAGEL	ANPI	ANPI performs quarterly inspections and after heavy rainfall, H+A performs annual inspection.					
SAN PEDRO RIVER SURFACE WATER MONITORING STATIONS (NORTHERN AREA)							
SW-03	NA	Q				Q	If flow is present
SW-04	NA	Q				Q	If flow is present
SW-13	NA	Q				Q	If flow is present
SW-14	NA	Q			Q	Q	If flow is present
PERCHED ZONE A (SOUTHERN AREA)							
P-01	ANPI	Q			Q	Q	
P-03	ANPI	Q			Q	Q	
P-10	ANPI					Q	Water level only
MW-29	ANPI					Q	Water level only
MW-30	ANPI					Q	Water level only
MW-31	ANPI					Q	Water level only
MW-32	ANPI					Q	Water level only
PERCHED ZONE B (SOUTHERN AREA)							
MW-15	ANPI	A - Aug			A - Aug	A - Aug	If sufficient water exist to sample
MW-21	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
MW-23	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
MW-39	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
MW-47	ANPI	A - Aug	A - Aug		A - Aug	A - Aug	
UPGRADIENT WELLS (SOUTHERN AREA)							
MW-01	ANPI	A - Aug			A - Aug	S - Feb/Aug	Access limited by owner availability
MW-06	ANPI	A - Aug			A - Aug	S - Feb/Aug	

TABLE 16

2019 PERFORMANCE MONITORING SCHEDULE
FOR GROUNDWATER, SOIL, AND NARS REMEDIES

SITE ID	WELL OWNER	PROPOSED MONITORING FREQUENCY/PARAMETERS				WATER LEVELS	COMMENTS
		NITRATE-N	AMMONIA	METALS[1]	ClO4		
SOUTHERN AREA							
MW-14	ANPI	A - Aug			A - Aug	S - Feb/Aug	
MW-22	ANPI					S - Feb/Aug	Water level only
MW-25	ANPI	C			C	S - Feb/Aug	
MW-33	ANPI	A - Aug			A - Aug	S - Feb/Aug	
SAN PEDRO RIVER SURFACE WATER MONITORING STATIONS (SOUTHERN AREA)							
SW-12	NA	Q				Q	If flow is present

ABBREVIATIONS/ACRONYMS:

A = Annually
ANPI = Apache Nitrogen Products, Inc.
B = Biennial (occurs every two years)
ClO_4 = Perchlorate
C = Contingent on MW-33 results
H+A = Hargis + Associates, Inc.
M = Monthly
NARS = Northern Area Remediation System
NM = Not measured
O&M = Operation and maintenance
PMP = Performance Monitoring Plan
Q = Quarterly
S = Semi-Annually

NOTES:

Newly installed wells and/or wells proposed for a change in monitoring schedule from the formerly approved 2018 schedule.

(1) = Metals List every 5 years:
SEW-1 and Effluent: aluminum, antimony, arsenic, barium, beryllium, cadmium, total chromium, copper, iron, lead, managanese, mercury, selenium, silver, thallium and zinc.
DCP-12: barium, beryllium, total chromium, lead, mercury and thallium.
Treatment Cells Sediment: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese,

mercury, nickel, selenium, silver, thallium, zinc; calcium, magnesium, sodium, potassium, orthophosphate, chloride, fluoride, sulfate, alkalinity, pH; total nitrogen by calculation, total organic carbon, total phosphorus, ammonia-nitrogen, nitrate-nitrogen, total kjedahl nitrogen.

(2) = Monitor well PB-5A is proposed for extraction in 2019. The well ID will be renamed to SEW-3 subsequent to repurposing.
Standard Field Parameters - Temp (^oC), pH, Electrical Conductivity (µs/cm) are collected every time a well is sampled

TABLE 17
2018 SURFACE WATER STATION QUARTERLY DISCHARGE MEASUREMENTS

PMP Quarterly Sampling Event	Surface Water Station SW-03 Discharge (cfs)	Surface Water Station SW-04 Discharge (cfs)	Surface Water Station SW-12 Discharge (cfs)	Surface Water Station SW-13 Discharge (cfs)	Surface Water Station SW-14 Discharge (cfs)
February	1 E	1 E	NF	NA	NF
May	NF	NF	NF	NF	NF
August	52.5	38.5	49.5	NA	11.2
November	NF	NF	NA	NF	NF

ABBREVIATIONS/ACRONYMS:

cfs = cubic feet per second
E = Estimated due to equipment malfunction
NA = surface water station not accessible
NF = no flow within the San Pedro River
NT = measurement not taken due to unsafe flow conditions

TABLE 18

ANNUAL PRECIPITATION (1)
BENSON, ARIZONA

	PRECIPITATION (INCHES)	
PRECIPITATION (RAIN SEASON)	TOMBSTONE(2) (028619)	BENSON 6 SE(2) (020683)
1979	8.07	9.64
1980	10.95	9.39
1981	10.90	9.66
1982	17.96	17.28
1983	16.79	17.94
1984	23.01	19.82
1985	13.73	14.32
1986	17.35	17.64
1987	13.50	11.31
1988	16.06	17.39
1989	9.01	11.63
1990	17.24	14.27
1991	15.31	19.45
1992	18.09	15.69
1993	7.67	13.61
1994	18.46	14.28
1995	8.79	10.09
1996	14.06	8.19
1997	14.98	14.65
1998	8.07	8.51
1999	14.22	14.47
2000	22.51	16.72
2001	9.00	11.79
2002	10.55	8.08
2003	14.92	9.91
2004	9.45	7.92
2005	5.19	5.66
2006	10.94	14.82
2007	10.83	6.23
2008	20.06	8.26
2009	12.40	4.19

TABLE 18

ANNUAL PRECIPITATION (1)
BENSON, ARIZONA

	PRECIPITATION (INCHES)	
PRECIPITATION (RAIN SEASON)	TOMBSTONE(2) (028619)	BENSON 6 SE(2) (020683)
2010	10.01	9.58
2011	14.00	8.17
2012	14.04	7.08
2013	10.12	9.51
2014	26.13	16.37
2015	10.84	12.21
2016	15.83	11.64
2017	10.36	7.80
2018	13.64(3)	13.60(3)
Average:	13.63	11.93

NOTES:

(1) Annual Precipitation calculated as a rainfall year season from June to the following May.

(2) Stations: Tombstone, Arizona (028619) Period of Record: 7/1/1893 - 1/31/2019.
Apache Powder Company, Arizona (020309) Period of Record: 07/01/1923 to 04/30/1990.
Benson 6 SE, Arizona (020683) Period of Record: 05/01/1990 to 1/31/2019.

(3) Contains data from June 1, 2018 through January 31, 2019.

TABLE 19
APACHE POWDER SUPERFUND SITE - SOIL CLEANUP STANDARDS

Chemical of Potential Concern (COPC)	. . . Milligrams per Kilogram . . . Arizona SRL Residential[1]	Arizona SRL Non-Residential[2]	Proposed Cleanup Standard
INORGANICS			
ASBESTOS	NS	NS	Refer to Footnote [3]
NITRATE AS NITROGEN	NS	NS	100,000[4]
PERCHLORATE	55	720	720
EXPLOSIVES (NITROAROMATICS AND NITRAMINES)			
1,3-DINITROBENZENE	6.1	62	62
1,3,5-TRINITROBENZENE	1,800	18,000	18,000
2-NITROTOLUENE	0.93	22	22
2,4-DINITROTOLUENE	120	1,200	1,200
2,6-DINITROTOLUENE	61	620	620
2,4,6-TRINITROTOLUENE	18	310	310
3-NITROTOLUENE	730	1,000	1,000
4-NITROTOLUENE	13	300	300
HMX	3,100	31,000	31,000
NITROBENZENE	20	100	100
NITROGLYCERIN	39	1,200	1,200
PETN	NS	NS	570[5]
RDX	5.0	160	160
TETRYL	NS	NS	2,300[6]
SEMIVOLATILE ORGANIC COMPOUNDS (SVOCs)			
BENZO[A]ANTHRACENE	0.69	21	21
BENZO[A]PYRENE	0.069	2.1	2.1
BENZO[B]FLUORANTHENE	0.69	21	21
CARBAZOLE	27	860	860
CHRYSENE	68	2,000	2,000
DIBENZO(A,H)ANTHRACENE	0.69	2.1	2.1
DIBENZOFURAN	140	140	140
FLUORANTHENE	2,300	22,000	22,000
FLUORENE	2,700	26,000	26,000
INDENO(1,2,3-CD)PYRENE	1	21	21
NAPHTHALENE	56	190	190
PENTACHLOROPHENOL	3.2	90	90
PYRENE	2,300	29,000	29,000

TABLE 19
APACHE POWDER SUPERFUND SITE - SOIL CLEANUP STANDARDS

Chemical of Potential Concern (COPC)	. . . Milligrams per Kilogram . . . Arizona SRL Residential[1]	Arizona SRL Non-Residential[2]	Proposed Cleanup Standard
TOTAL HYDROCARBONS (TPHs)			
TOTAL FUEL HYDROCARBONS (C10-C32)	4,100[7]	18,000[7]	18,000[7]
DIESEL RANGE ORGANICS (C10-C22)	4,100[7]	18,000[7]	18,000[7]
OIL RANGE ORGANICS (C22-C32)	4,100[7]	18,000[7]	18,000[7]
METALS			
ANTIMONY	31	410	410
ARSENIC	10	10	Refer to Footnote[8]
BARIUM	15,000	170,000	170,000
BERYLLIUM	150	1,900	1,900
CHROMIUM, TOTAL	NS	NS	4,500[9]
LEAD	400	800	800
MANGANESE	3,300	32,000	32,000
MISCELLANEOUS INORGANICS			
VANADIUM	78	1,000	1,000
VANADIUM PENTOXIDE	78	1,000	1,000

ABBREVIATIONS AND ACRONYMS:
EPA = U.S. Environmental Protection Agency
NS = No specified Arizona SRL
SRL = Soil Remediation Level

FOOTNOTES:
EPA selected cleanup standards are based on the 2009 Arizona Administrative Code (AAC) Title 18; Ch. 7 Appendix A non-residential Arizona Soil Remediation Levels (SRL), except where noted in footnotes below:

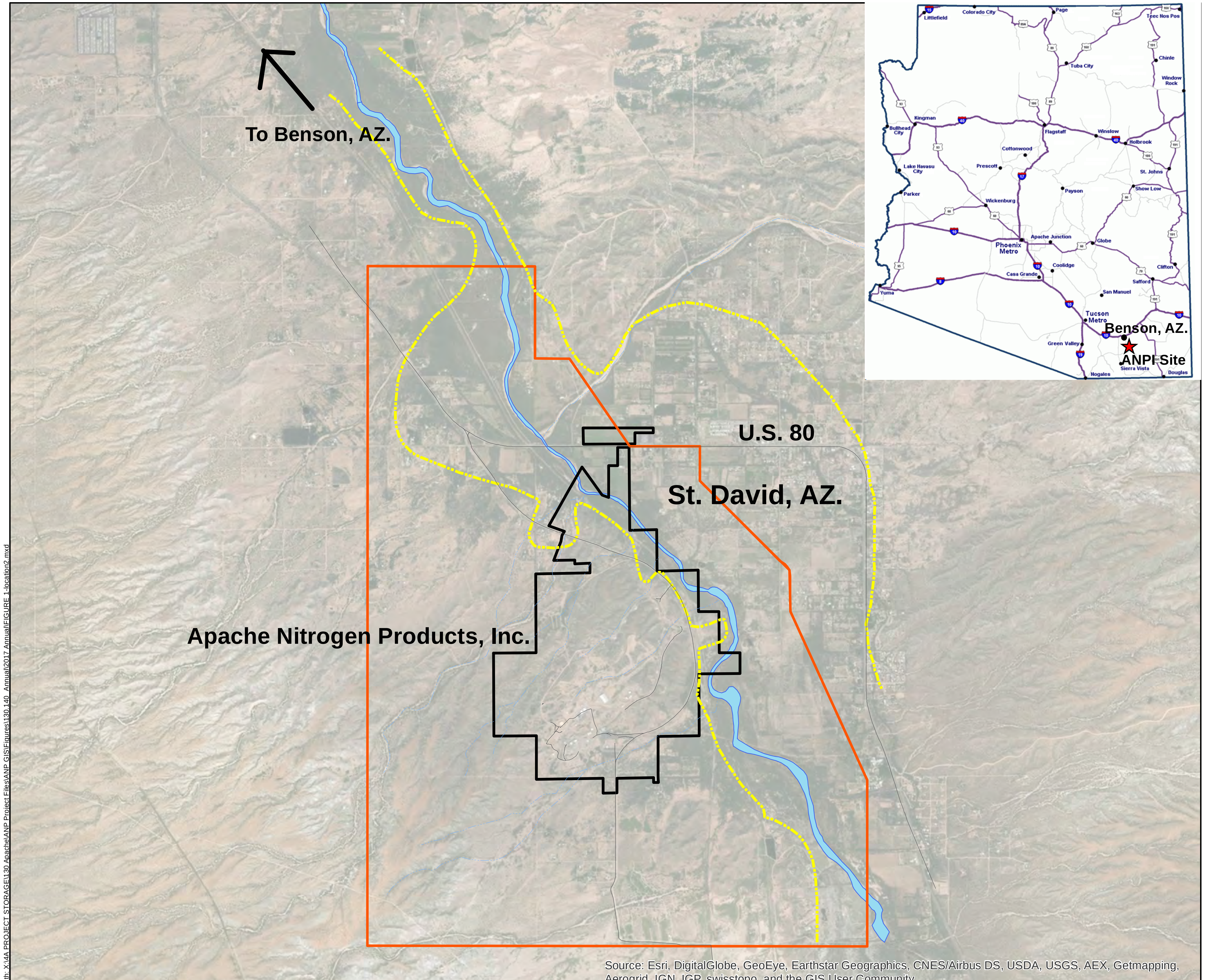
1 = Residential - 2009 Arizona Administrative Code (AAC) Title 18; Ch. 7, Appendix A Residential SRLs, March 31, 2009.
2 = Non-Residential - 2009 Arizona Administrative Code (AAC) Title 18; Ch. 7, Appendix A Non-Residential SRLs, March 31, 2009.
3 = Asbestos - Cleanup Standard: (1) Step 1-Look for visual evidence; (2) Step 2-Clean up to non-visual to a minimum depth of 1 foot below ground surface (bgs).
4 = Nitrate as Nitrogen - 2000 EPA Superfund Explanation of Significant Differences: Apache Powder Co. EPA ID: AZD008399263 OU 01 St. David, AZ Table 2 - Comparison of Potential Cleanup Levels and EPA Selected Cleanup Standards for Contaminated Soils and Waste Materials, EPA Selected Cleanup Standard ESD #2 09/29/2000..
5 = PETN - 2017 EPA Region IX Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) Industrial Soil, June 2017.
6 = Tetryl - 2017 EPA Region IX Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) Industrial Soil, June 2017.
7 = Total Fuel Hydrocarbons - 2009 Arizona Administrative Code (AAC) Title 18; Ch. 7, Appendix B 1997 Soil Remediation Levels (SRLs), March 31, 2009.

FOOTNOTES (con'td):

[8] = Arsenic - Site-specific soil background concentrations were calculated according to the methodology specified in AAC R18-7-204, using concentrations of all background soil samples collected during the remedial investigation (i.e., SS-01 through -04, S-1, and S-2). Applying the rule, the 95% upper confidence level of the mean concentrations yielded concentrations of 24.58 mg/kg for surficial soils; 17.00 mg/kg for granite wash sediments; and 36.29 mg/kg for St. David clay. This methodology is consistent with EPA Guidance 9285.708I.

[9] =Total Chromium - 2009 Arizona Administrative Code (AAC) Title 18; Ch. 7, Appendix B 1997 Soil Remediation Levels (SRLs), March 31, 2009.

FIGURES



EXPLANATION

- streets
- Shallow Aquifer Boundary
- Study Area Boundary
- Ephemeral Wash
- Property Boundary
- San_Pedro

N

0 5,500 11,000
Feet

APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

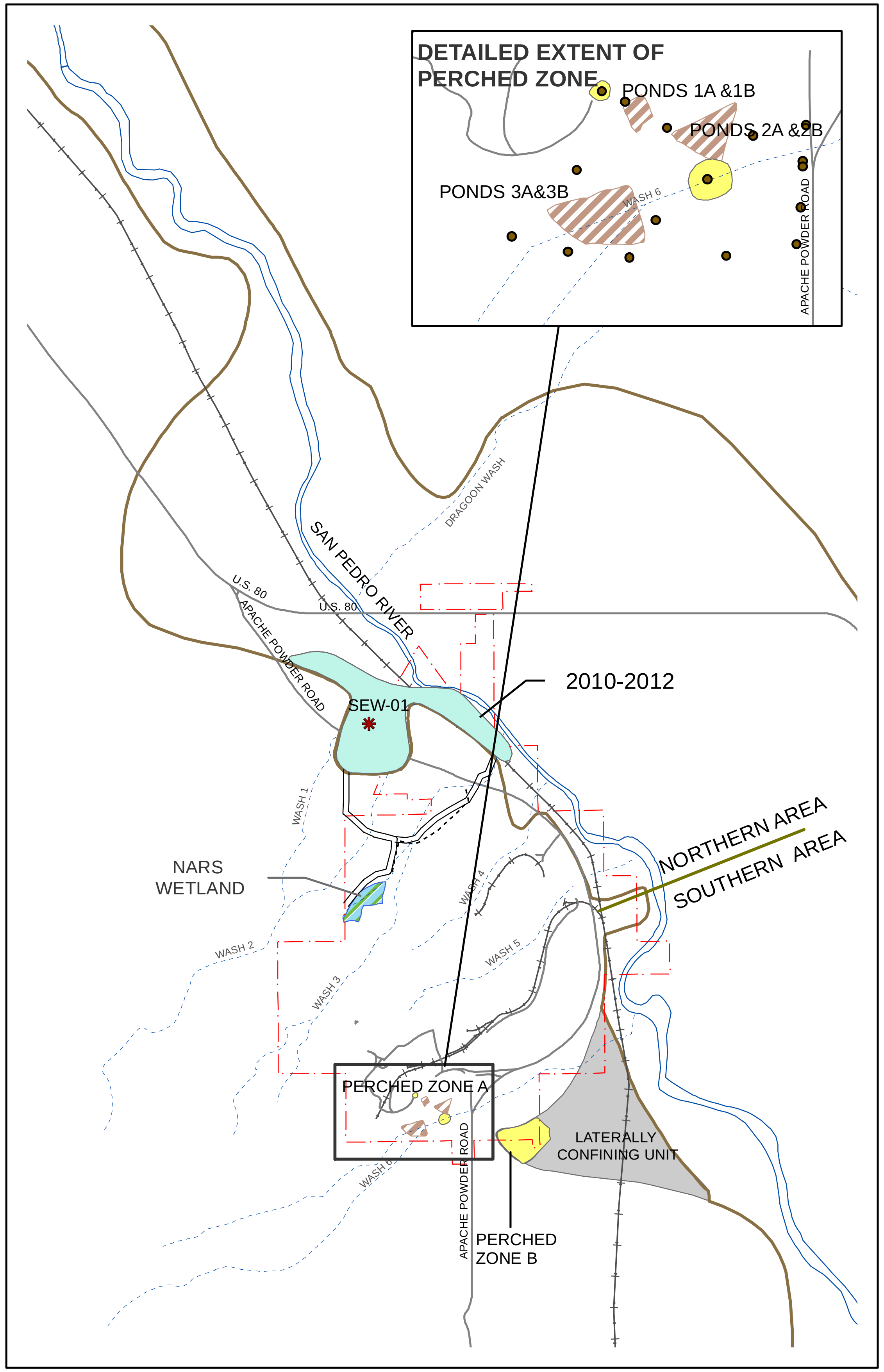
APACHE NITROGEN PRODUCTS, INC.
SITE LOCATION

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

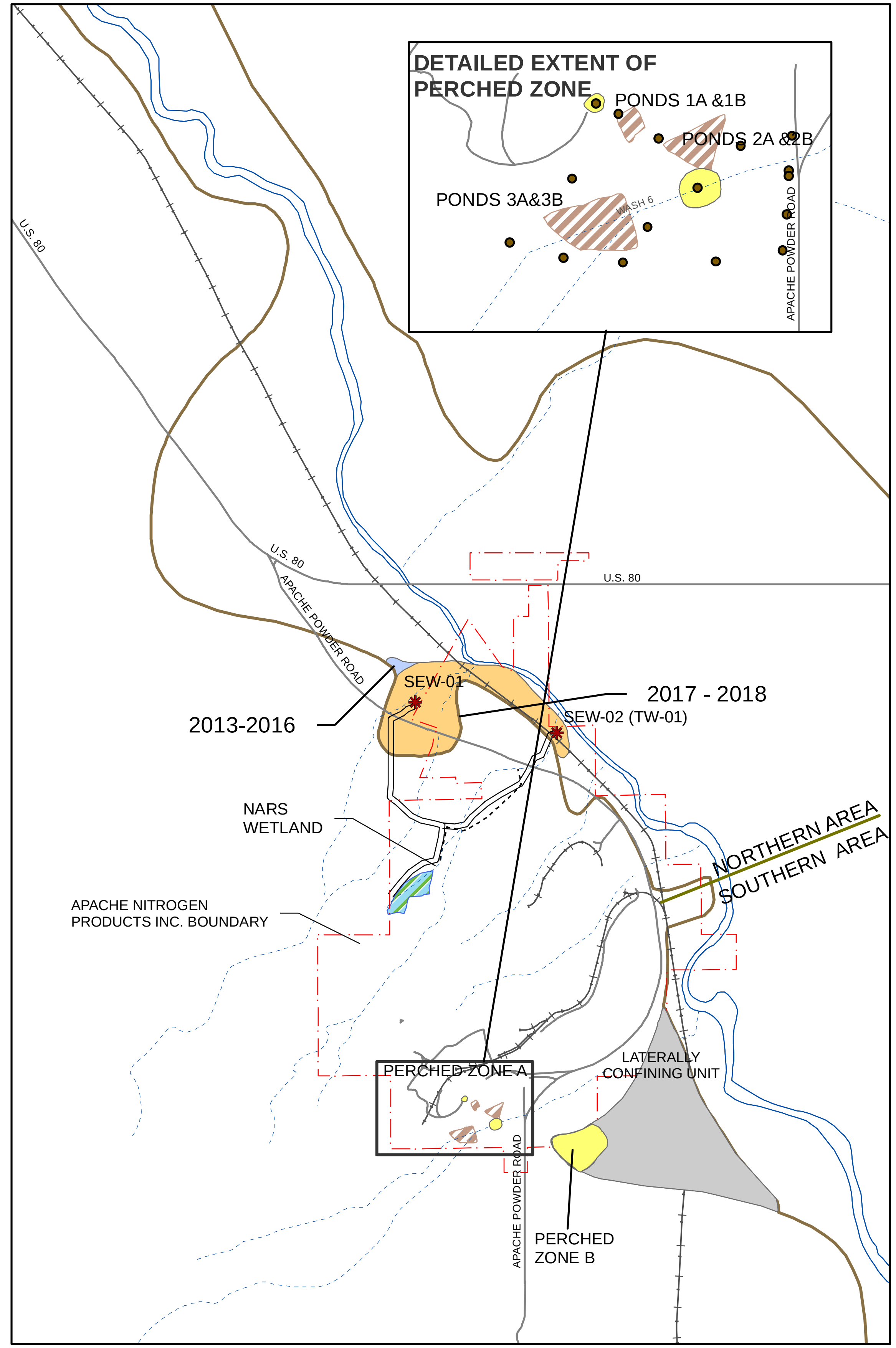
FIGURE 1

PREP BY: DLG REV BY: LSL	2/9/2018 File: FIGURE 1-location2	130.140

Path: X:\4A PROJECT STORAGE\130 Apache\ANP Project Files\ANP GIS\Figures\130.140_Annual\2017 Annual\FIGURE 1-location2.mxd



YEARS 2010-2012



YEARS 2013-2018

EXPLANATION

EXTENT OF NITRATE-N CONCENTRATIONS ABOVE THE CLEAN-UP STANDARD OF 10 mg/l IN 2010-2012

EXTENT OF NITRATE-N CONCENTRATIONS ABOVE THE CLEAN-UP STANDARD OF 10 mg/l IN 2013-2016

EXTENT OF NITRATE-N CONCENTRATIONS ABOVE THE CLEAN-UP STANDARD OF 10 mg/l IN 2017-2018

EXTENT OF PERCHLORATE CONCENTRATIONS ABOVE 14 ug/l IN THE PERCHED ZONE A AND PERCHED ZONE B AQUIFERS IN 2010-2018

FORMERLY ACTIVE PONDS (1A, 1B, 2A, 2B, 3A, 3B)

SHALLOW AQUIFER EXTRACTION WELLS [SEW-01 AND SEW-02 (TW-01)]

APPROXIMATE BOUNDARY OF SHALLOW AQUIFER

N

0 3,000 6,000
Feet

APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

APPROXIMATE EXTENT OF NITRATE-N AND PERCHLORATE CONTAMINATION FROM 2010-2018

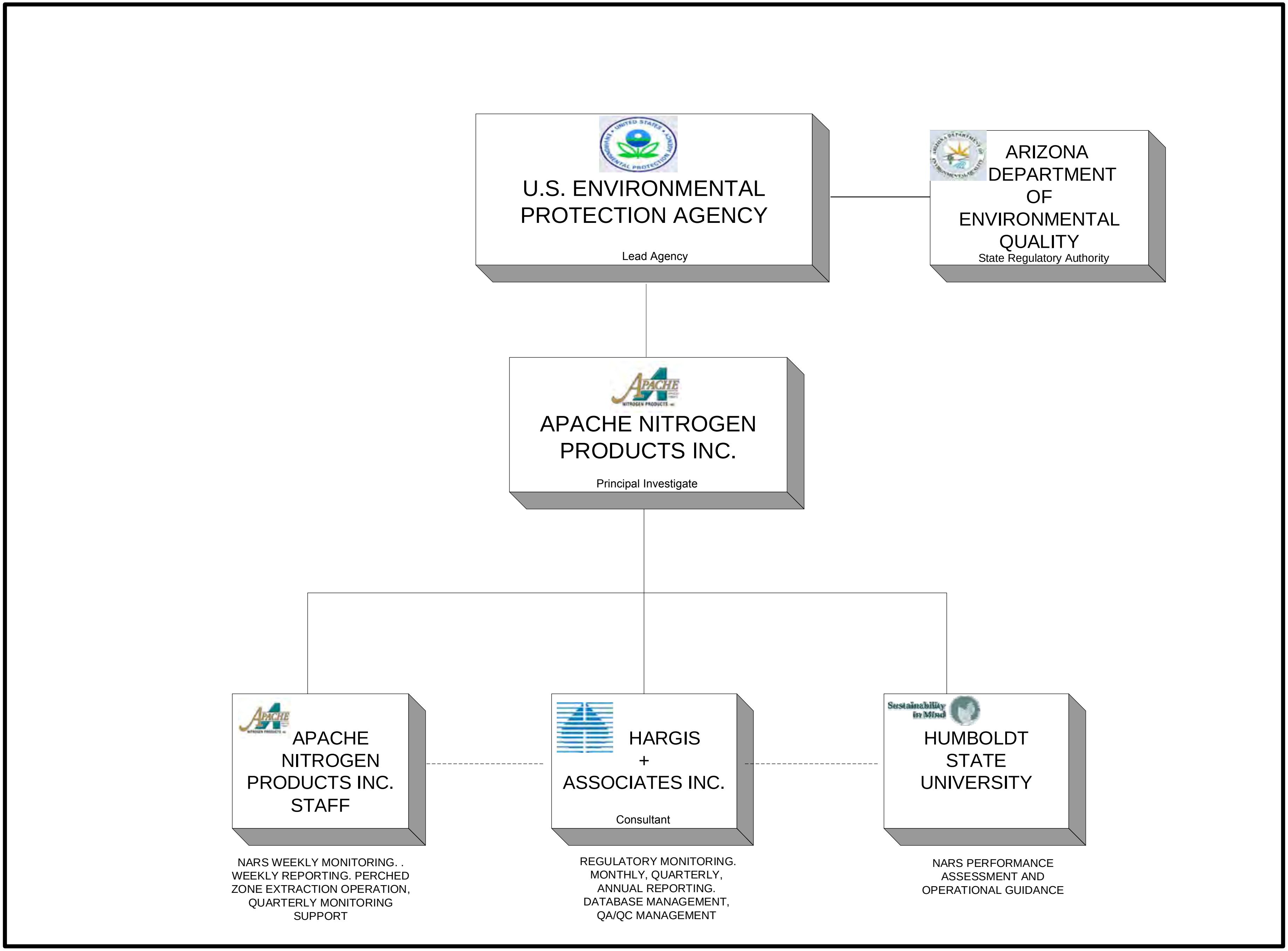
HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

2/25/2019

FIGURE 2

PREP BY RGW REV BY LSL RPT NO 130.140

T:\H+A_GIS FILES\130_Apache\130.140 Annual Report 2018\ Figure 02-areaCOC_2018



HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 3. ORGANIZATIONAL CHART, APACHE POWDER SUPERFUND SITE

EXPLANATION

MW-02 ⊕	PERCHED ZONE A MONITOR WELL
P-10 ○	PERCHED ZONE A PIEZOMETER
MW-16 ●	SHALLOW AQUIFER MONITOR WELL
(9.08)	SATURATED THICKNESS OF PERCHED ZONE (IN FEET), FEBRUARY 1995)
4.35	SATURATED THICKNESS OF PERCHED ZONE (IN FEET) DECEMBER 2018
	APPROXIMATE SURFACE OUTCROP OF ST. DAVID CLAY (WITHIN STUDY AREA)
	MAXIMUM LATERAL EXTENT OF PERCHED ZONE SATURATED SEDIMENTS, FEBRUARY 1995
	MAXIMUM LATERAL EXTENT OF PERCHED ZONE SATURATED SEDIMENTS, DECEMBER 2018

N

0 510 1,020
Feet

APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

CHANGE IN AREAL EXTENT AND SATURATED THICKNESS OF PERCHED GROUNDWATER FEBRUARY 1995 TO DECEMBER 2018

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

2/7/2019

FIGURE 4

PREP BY RGW REV BY LSL RPT NO 130.140

T:\H+A_GIS FILES\130_Apache\130.140 Annual Report 2018\ Figure 04 PZ_MaxThickness_2018

EXPLANATION

PONDS WITH NATIVE SOIL COVERS

ANPI BORDER

N

0 290 580
Feet

APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

LOCATION OF PONDS (NATIVE SOIL COVERS)

HARGIS + ASSOCIATES, INC.
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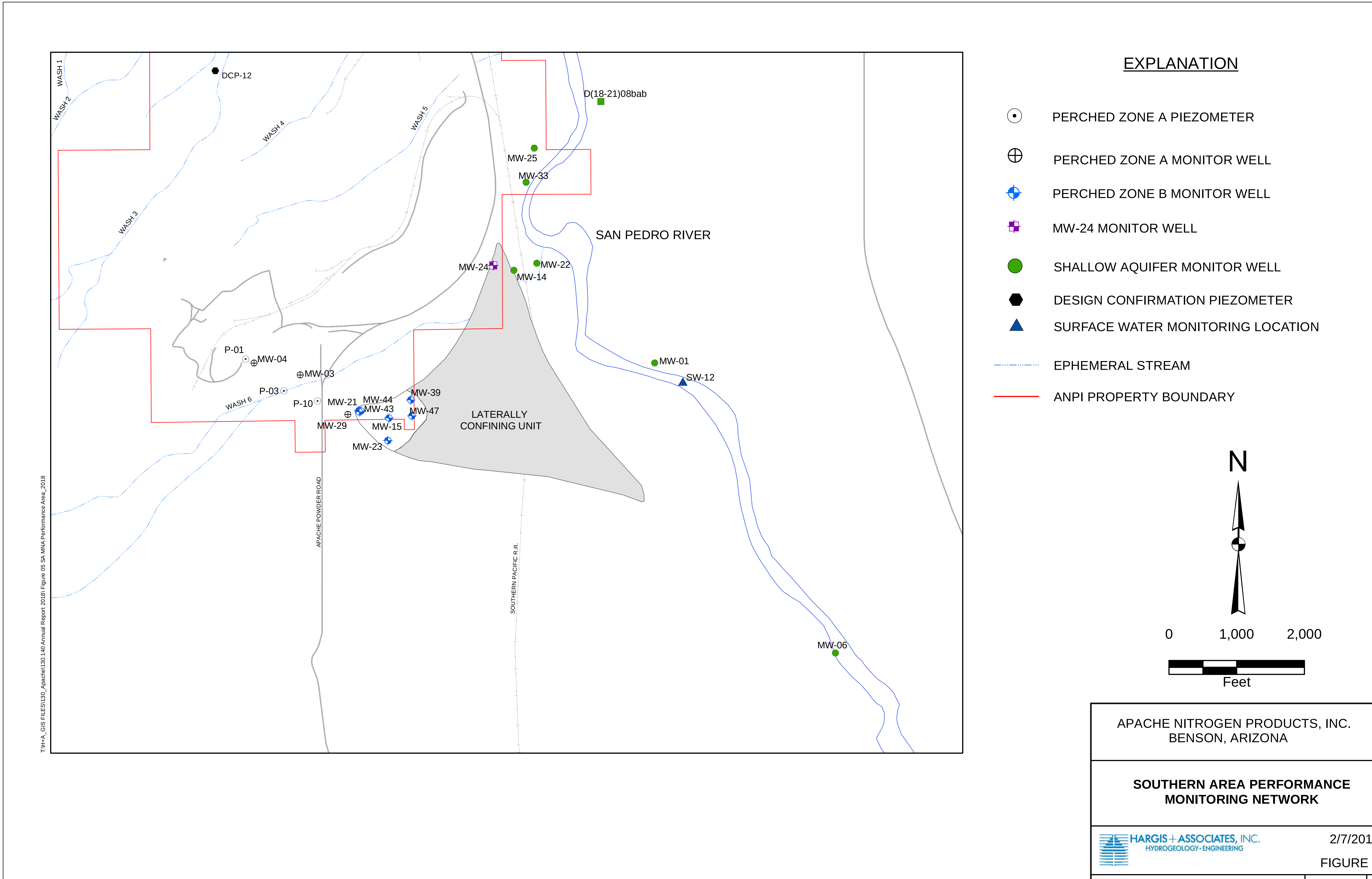
2/7/2019

FIGURE 5

PREP BY RGW REV BY LSL RPT NO 130.140

T:\H+A_GIS FILES\130_Apache\130.140 Annual Report 2018\ Figure 14 Ponds_2018



APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

SOUTHERN AREA PERFORMANCE MONITORING NETWORK

HARGIS + ASSOCIATES, INC.
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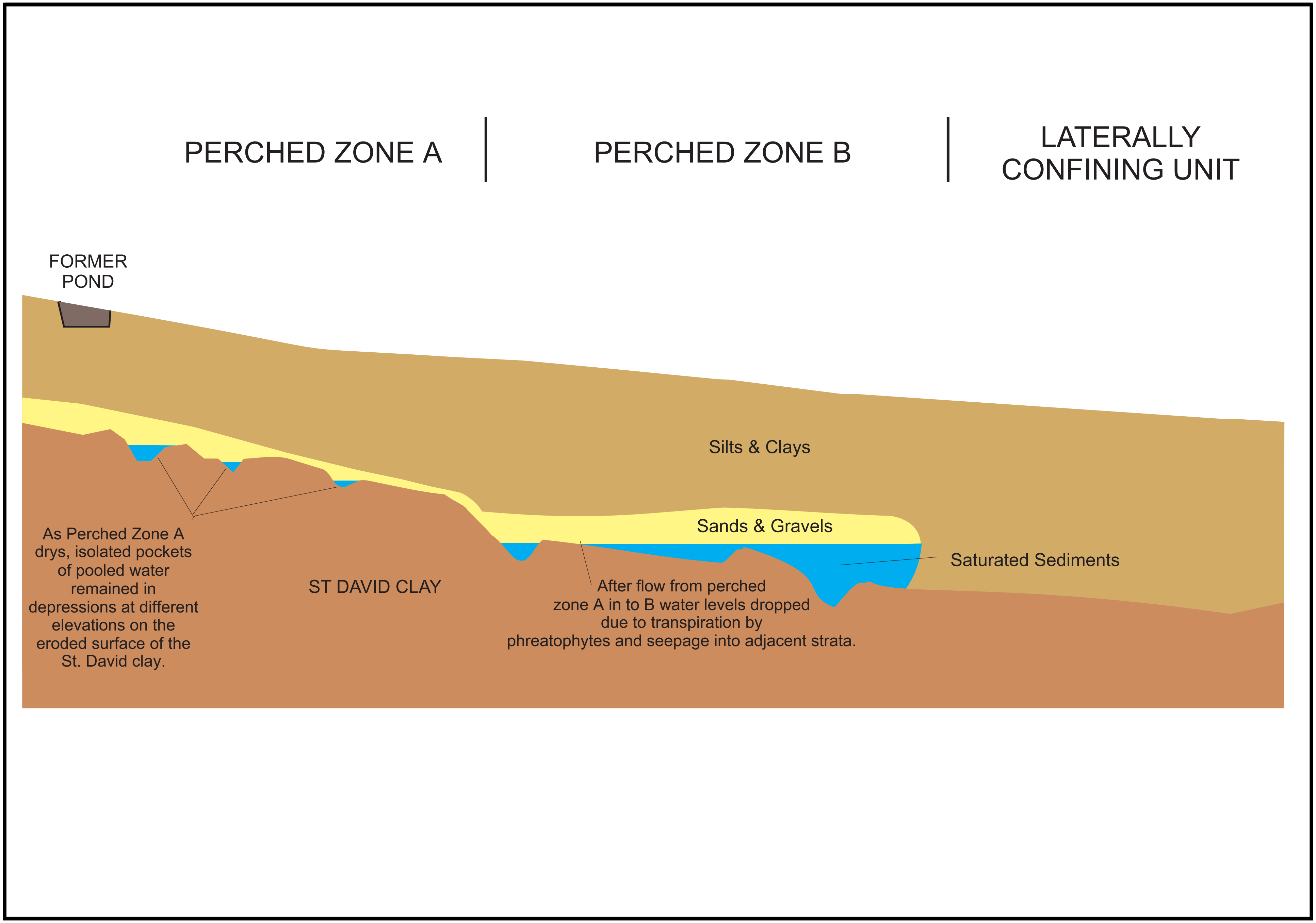
2/7/2019

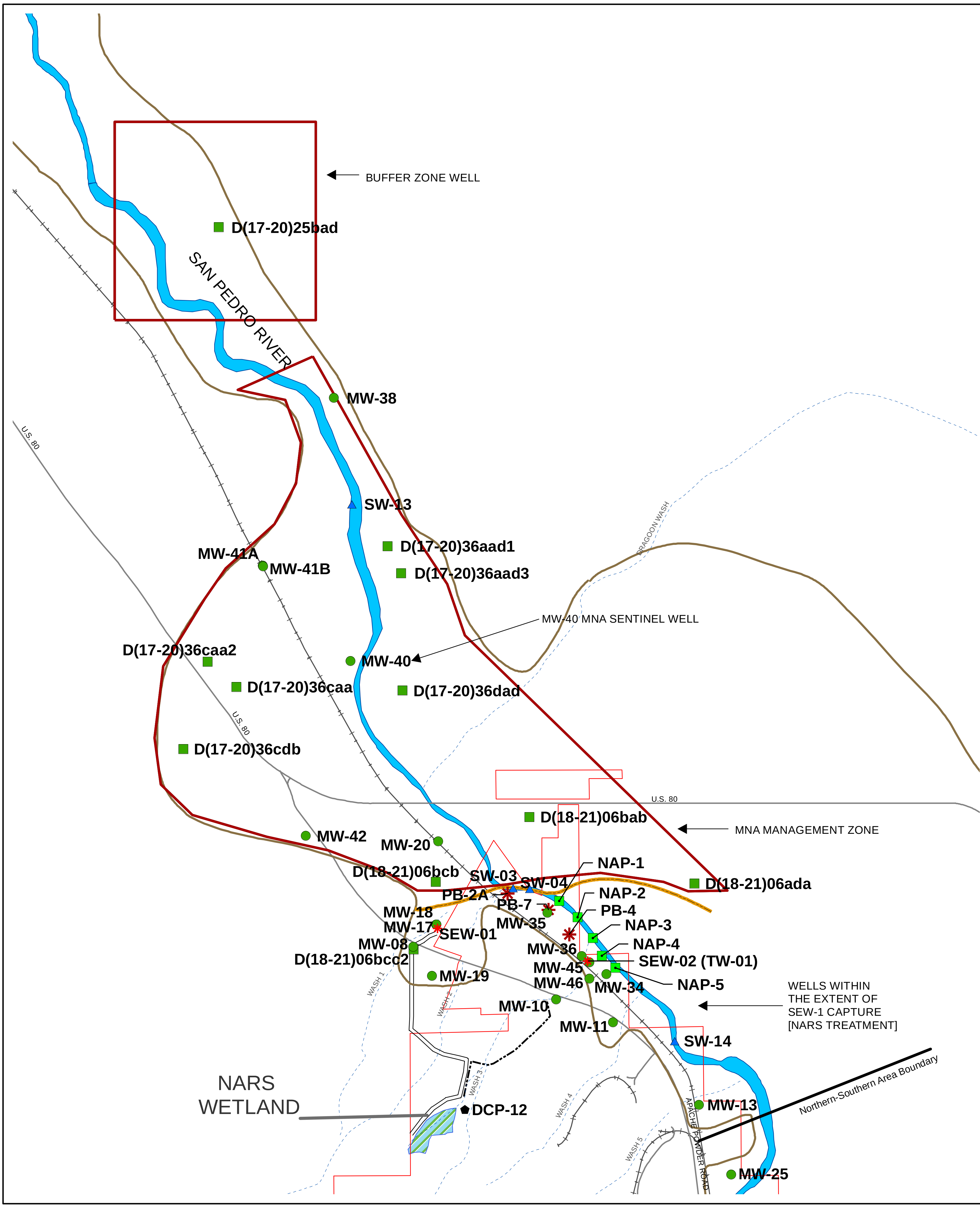
FIGURE 6

PREP BY RGW REV BY LSL RPT NO 130.140 ARC130.140-4 11



HARGIS + ASSOCIATES, INC.
Hydrogeology/Engineering

FIGURE 7. CROSS-SECTIONAL CONCEPTUALIZATION OF GROUNDWATER PERCHING AND ISOLATION IN DEPRESSIONS IN PERCHED ZONE A AND PERCHED ZONE B



T:\H+A_GIS FILES\130_Apache\130.140 Annual Report 2018\Figure 06 MNA_NA_Performance 11x17_2018

EXPLANATION

- EPHEMERAL STREAM
- COLLECTION SYSTEM PIPING
- TREATMENT EFFLUENT RETURN SYSTEM
- APPROXIMATE EXTENT OF SEW-1 CAPTURE
- APPROXIMATE BOUNDARY OF SHALLOW AQUIFER
- SHALLOW AQUIFER MONITOR WELL
- SURFACE WATER MONITORING LOCATION
- SHALLOW AQUIFER PRIVATE MONITOR WELL
- SHALLOW AQUIFER EXTRACTION WELLS
- SHALLOW AQUIFER PIEZOMETERS

N

0 1,100 2,200
Feet

APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

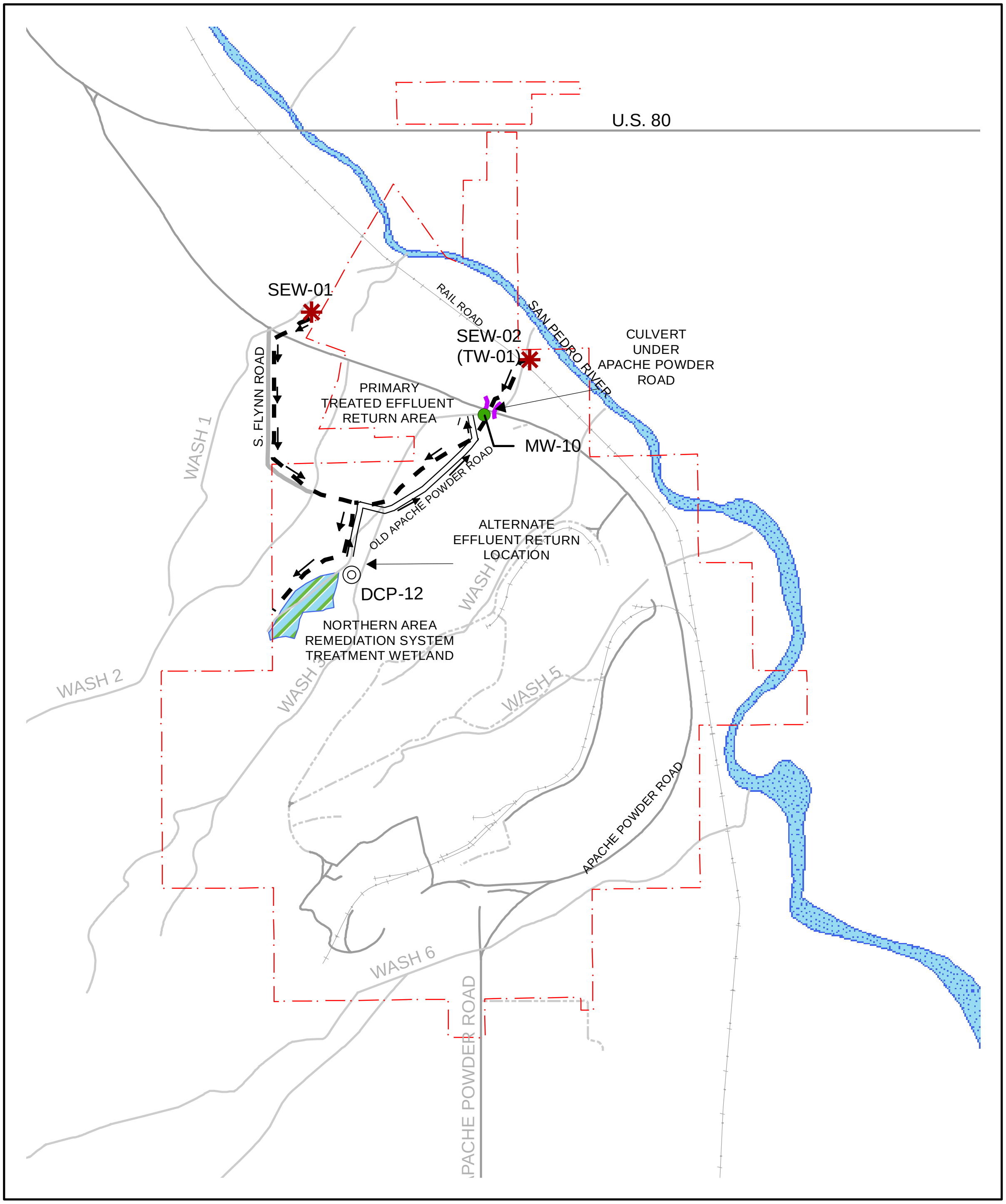
NORTHERN AREA PERFORMANCE MONITORING NETWORK

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

2/7/2019

FIGURE 8

PREP BY RGW REV BY LSL RPT NO 130.140



EXPLANATION

- DESIGN CONFIRMATION PIEZOMETER
- SHALLOW AQUIFER MONITOR WELL
- SHALLOW AQUIFER EXTRACTION WELLS
- FLOW DIRECTION
- COLLECTION SYSTEM PIPING
- TREATMENT EFFLUENT RETURN SYSTEM
- CULVERT
- APACHE NITROGEN PRODUCTS, INC. PROPERTY BOUNDARY

APACHE NITROGEN PRODUCTS, INC.

BENSON, ARIZONA

NORTHERN AREA REMEDIATION SYSTEMS PLOT PLAN

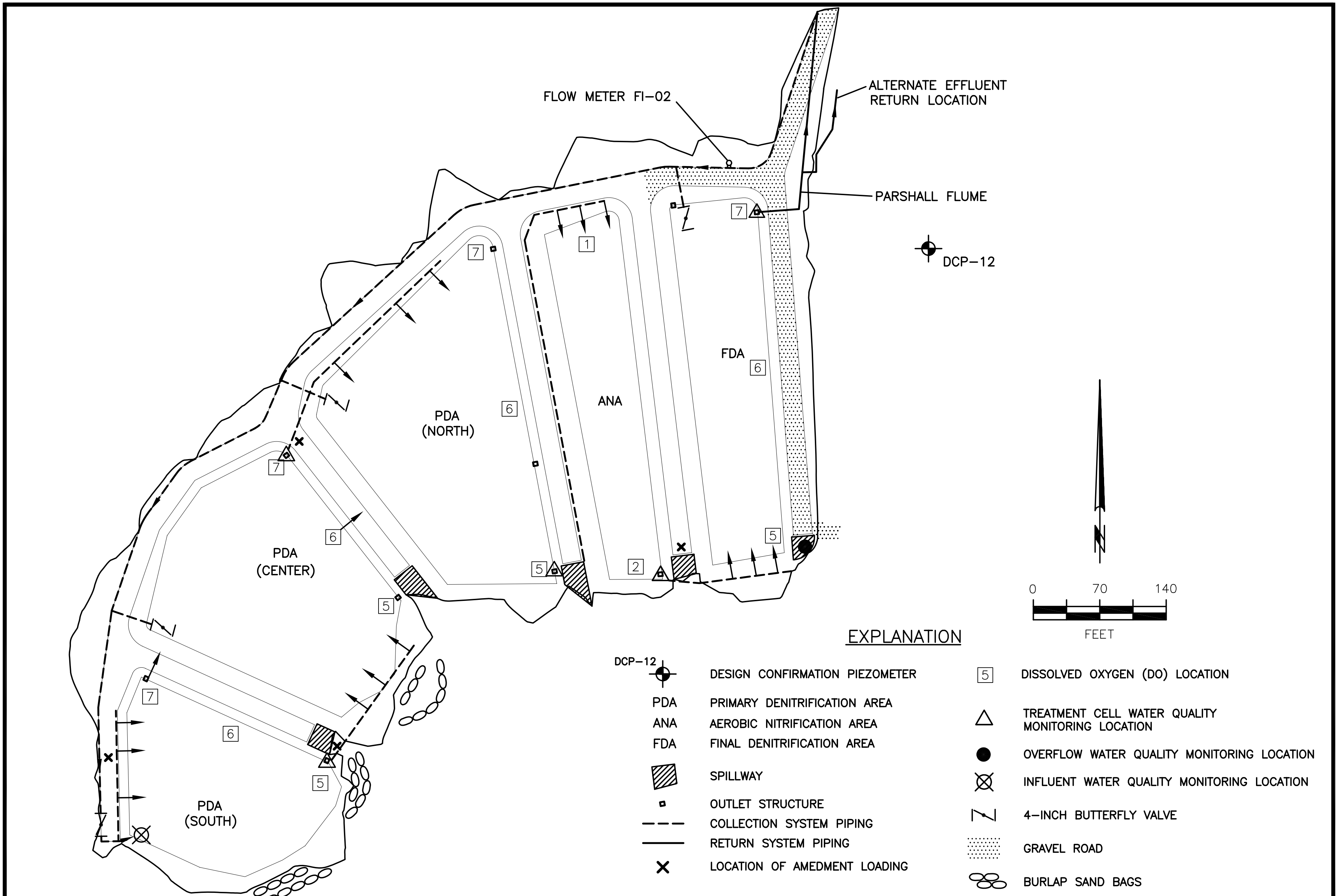
HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

2/25/2019

FIGURE 9

PREP BY BAM REV BY LSL RPT NO 130.140

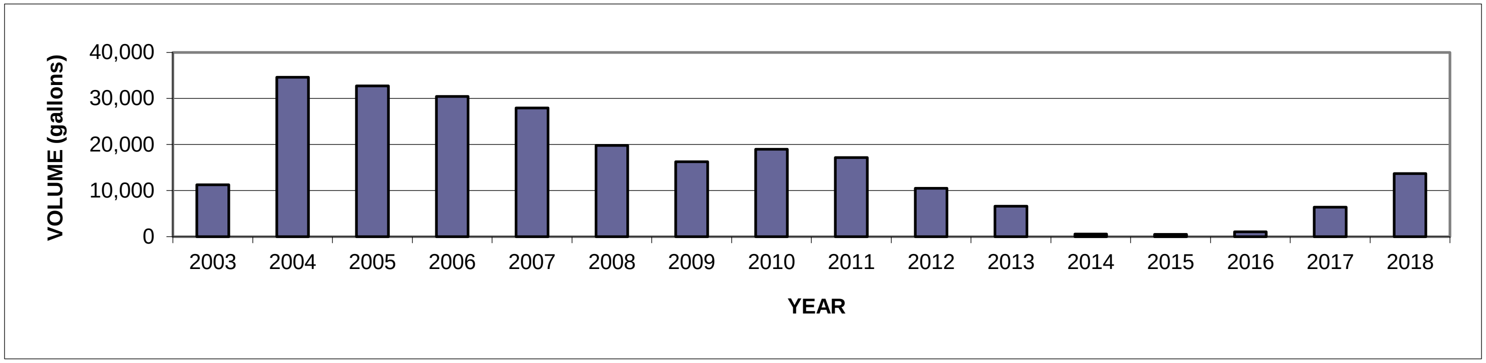
T:\H+A_GIS FILES\130_Apache\130.140 Annual Report 2018\ Figure 07 NARSPLOT_2018



3/09	RPT NO. 130.115	410-4785	C

HARGIS + ASSOCIATES, INC.
Hydrogeology/Engineering

FIGURE 10. NORTHERN AREA REMEDIATION SYSTEM TREATMENT WETLAND



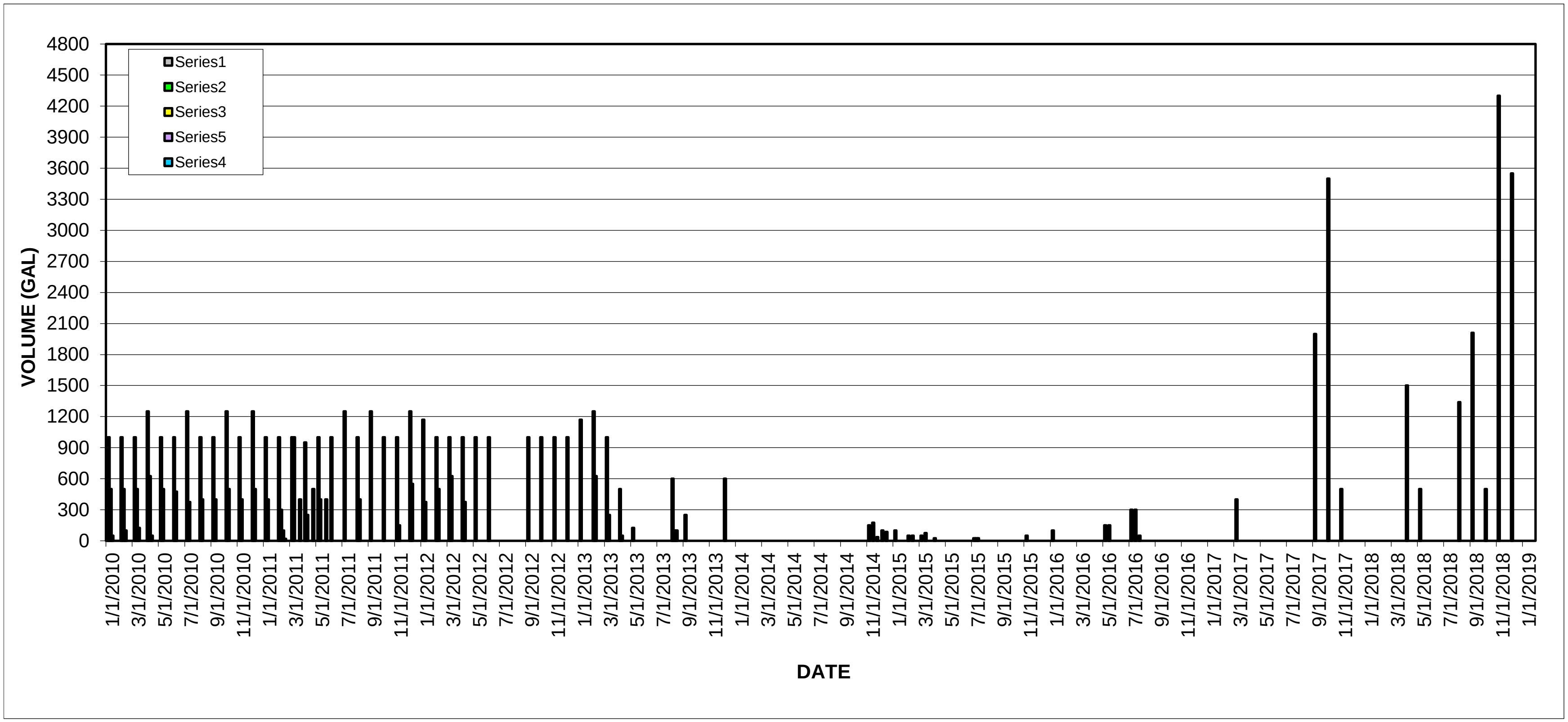
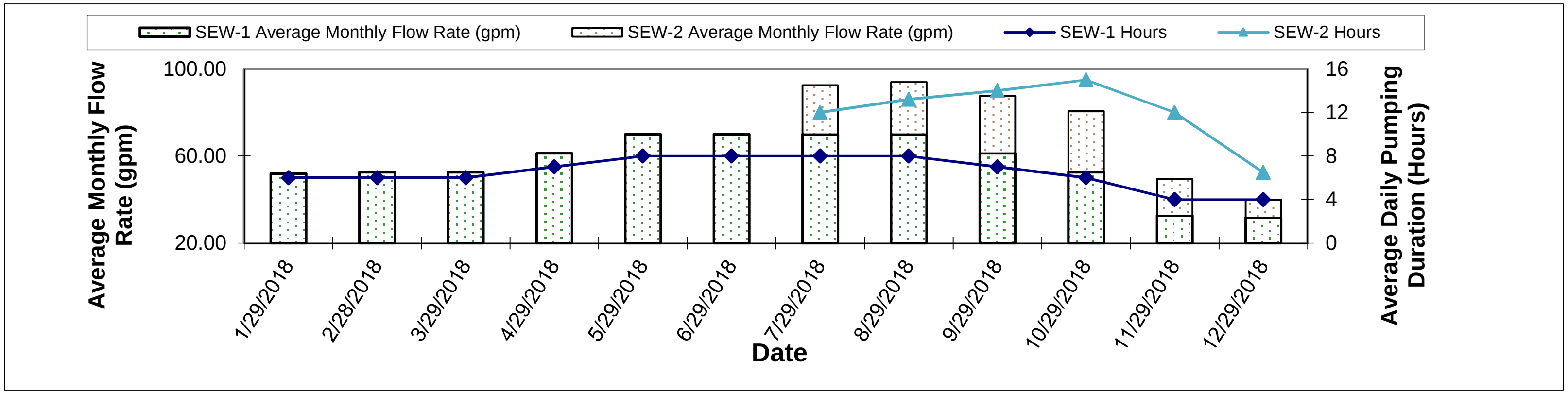


FIGURE 11. MONTHLY MOLASSES VOLUME AND ANNUAL VOLUME AT TREATMENT CELLS
PDA-S, PDA-C, PDA-N, ANA, AND FDA



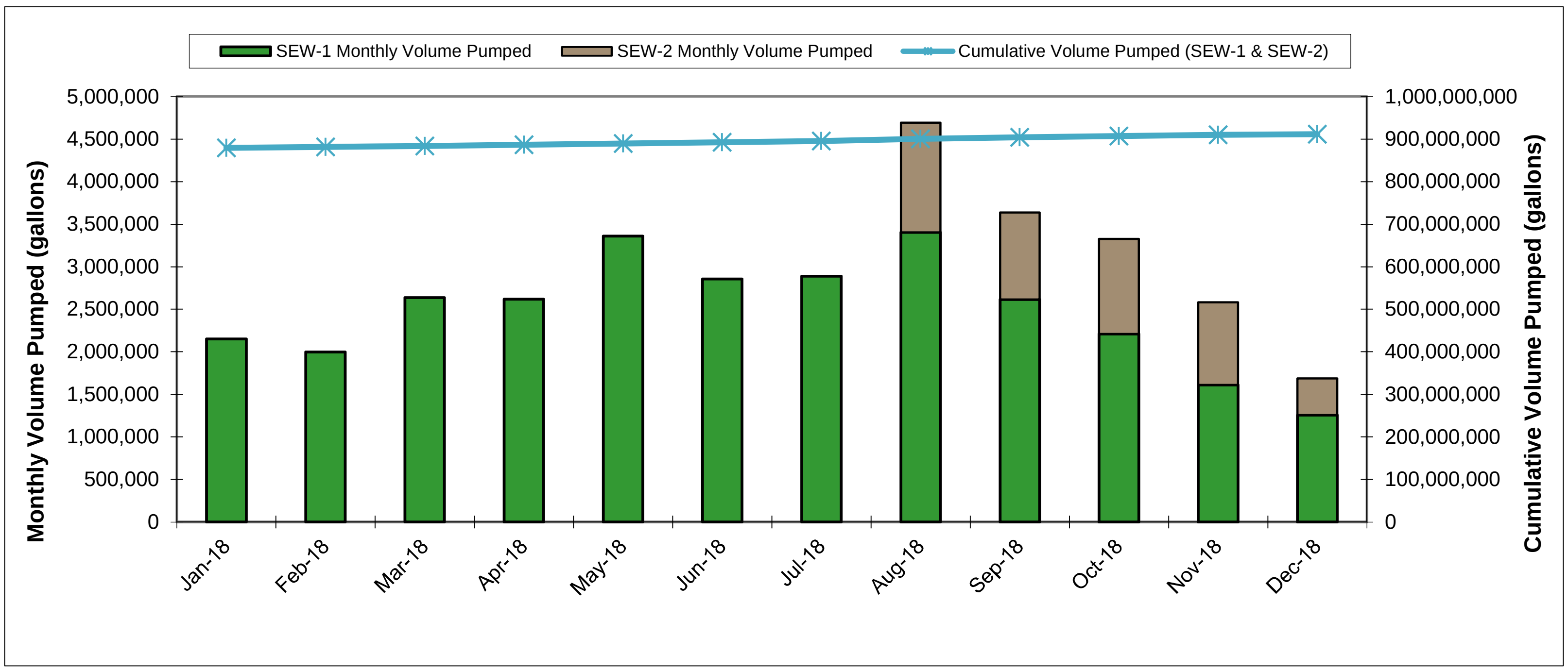


FIGURE 12. 2018 EXTRACTION WELL SEW-1 AND SEW-2 PERFORMANCE

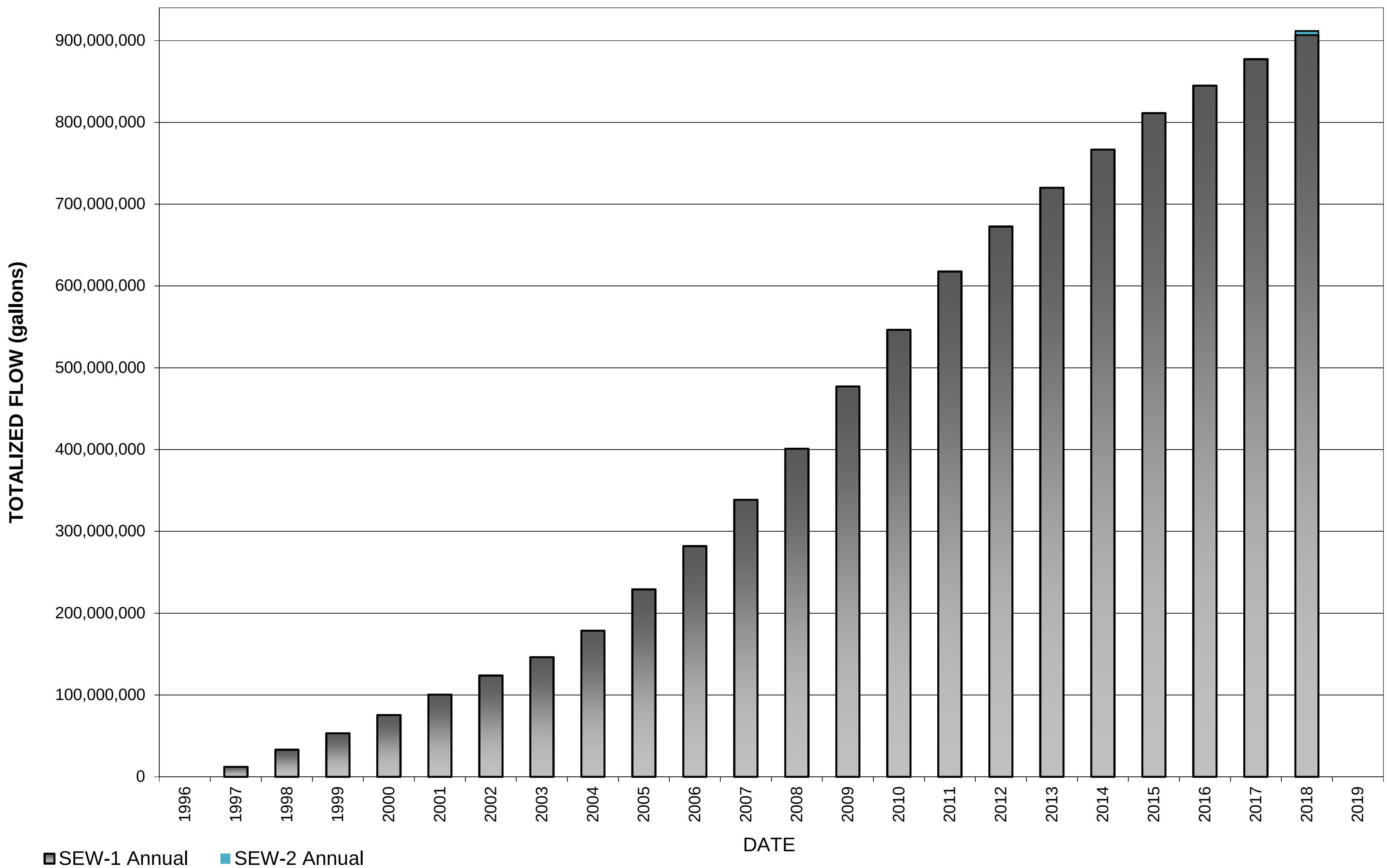


FIGURE 13. CUMULATIVE EXTRACTION WELL PUMPAGE

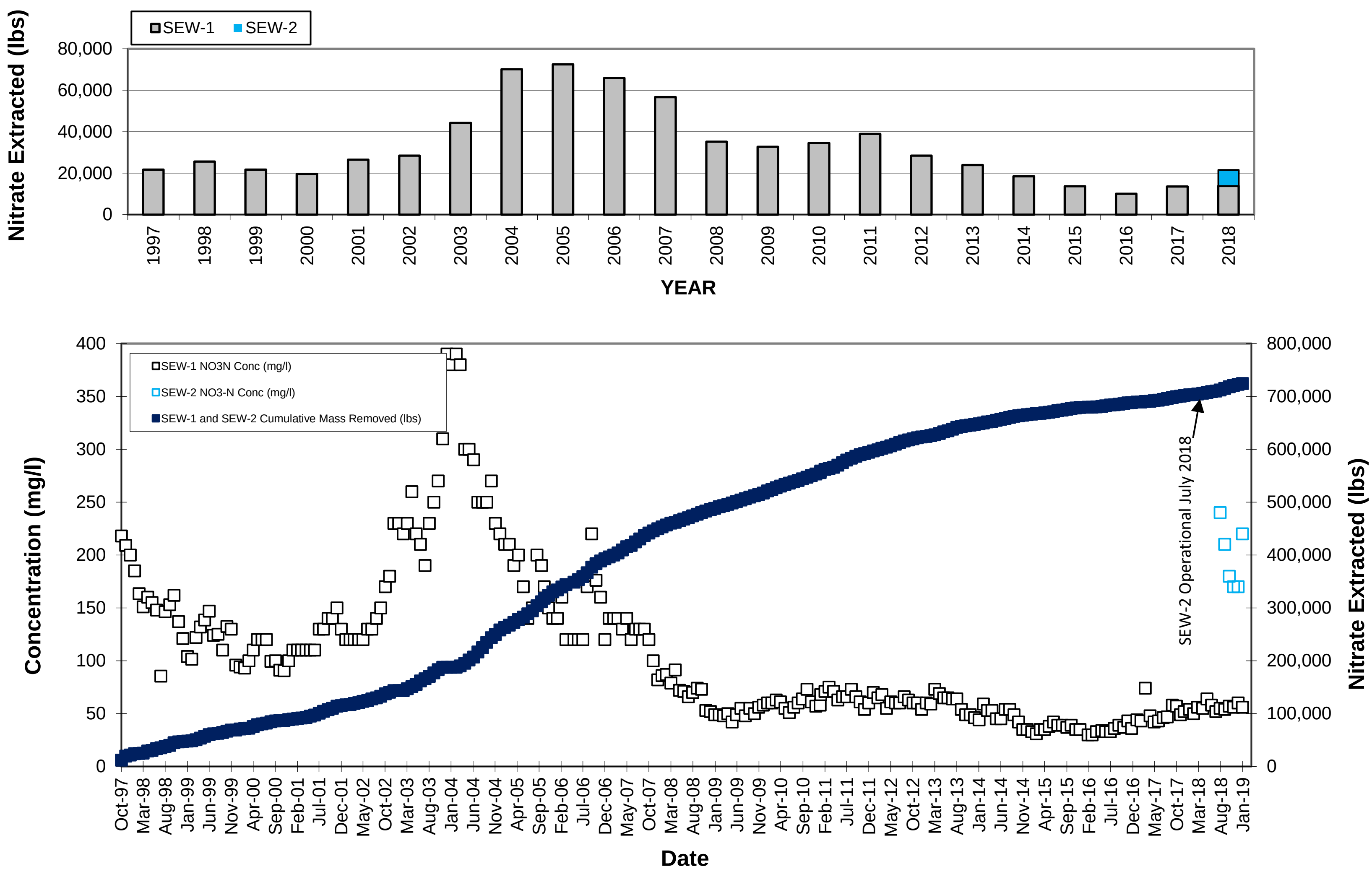
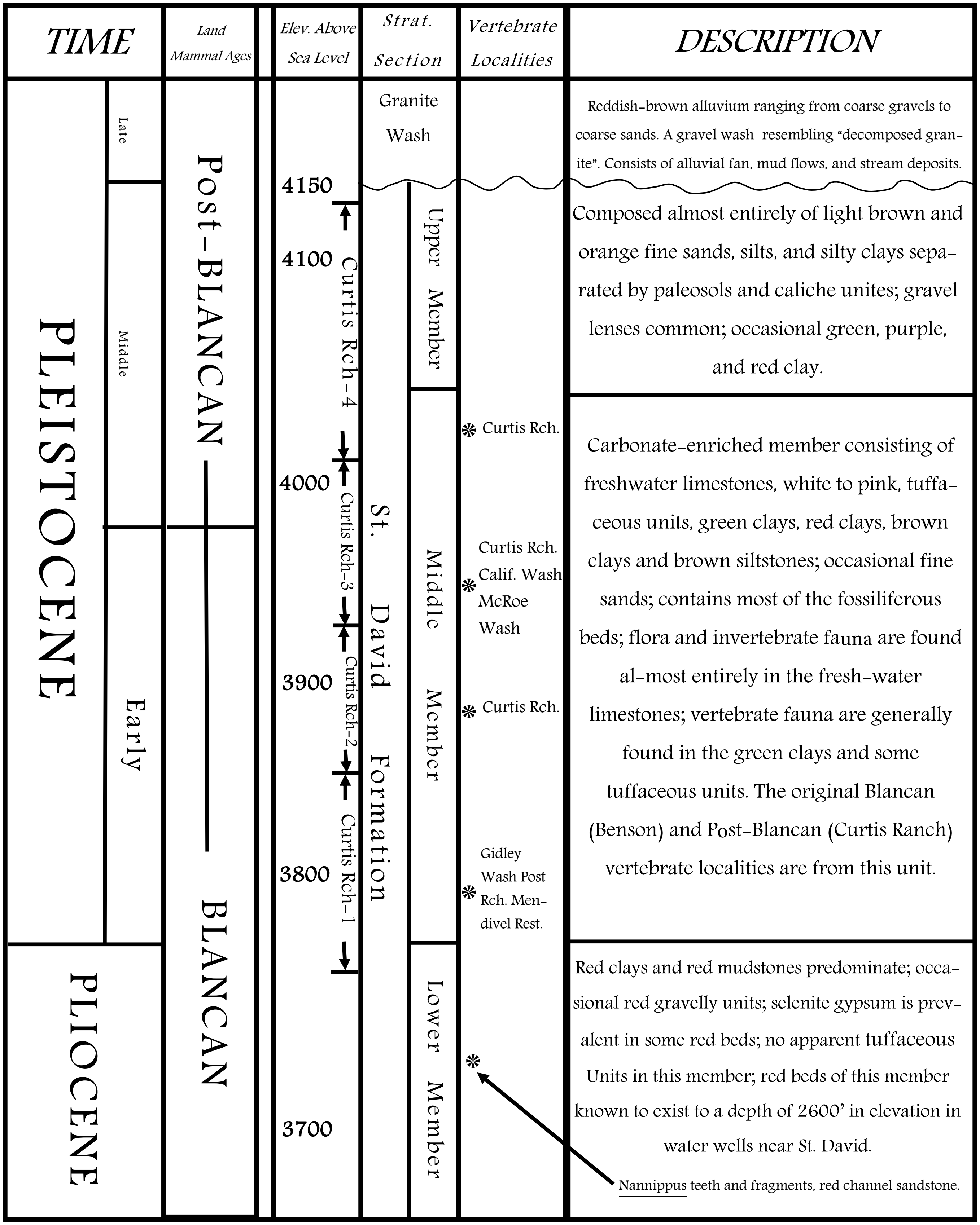


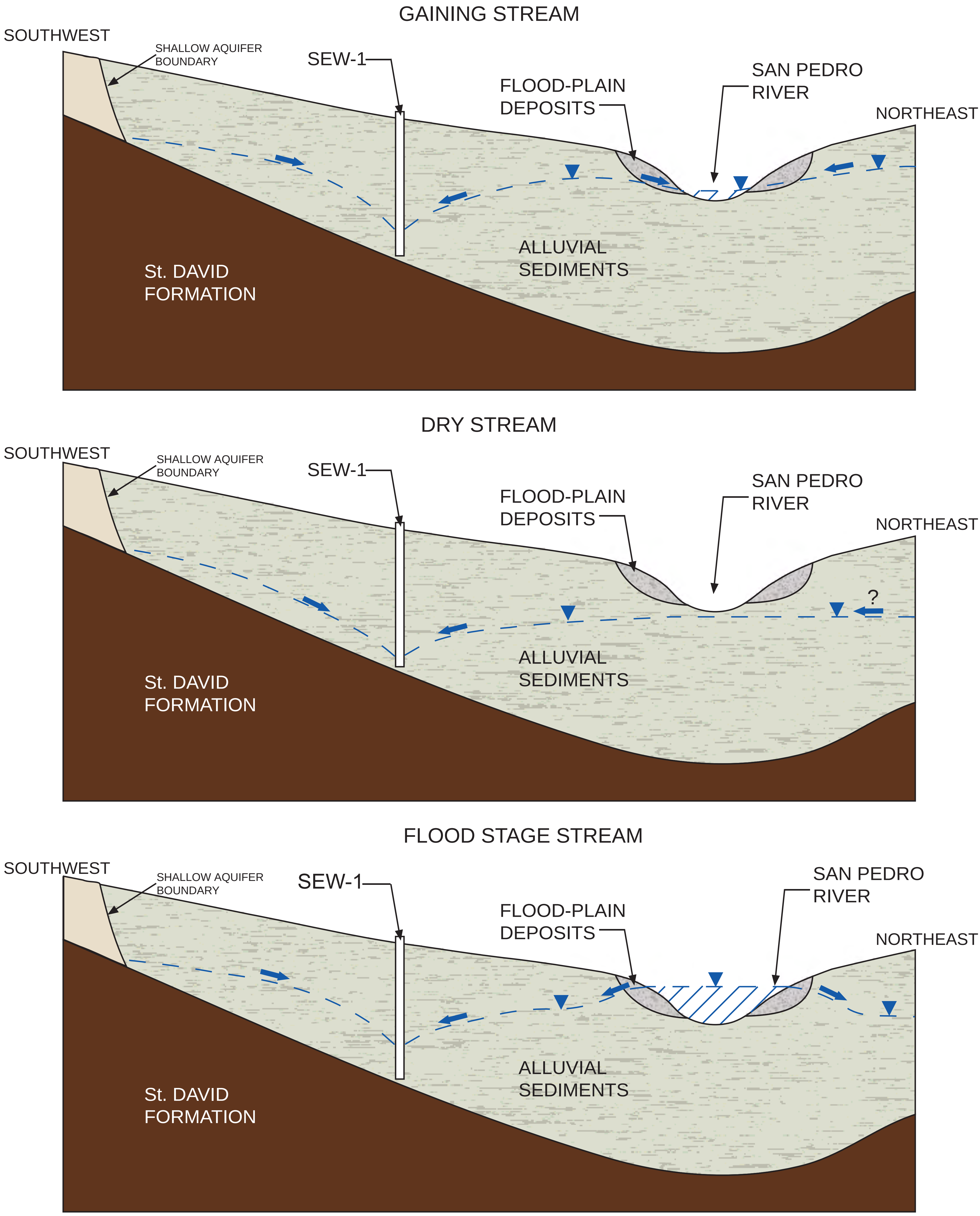
FIGURE 14. CUMULATIVE SHALLOW AQUIFER EXTRACTION WELLS' NITRATE-N REMOVAL

GENERAL STRATIGRAPHIC SECTION OF THE ST. DAVID FORMATION

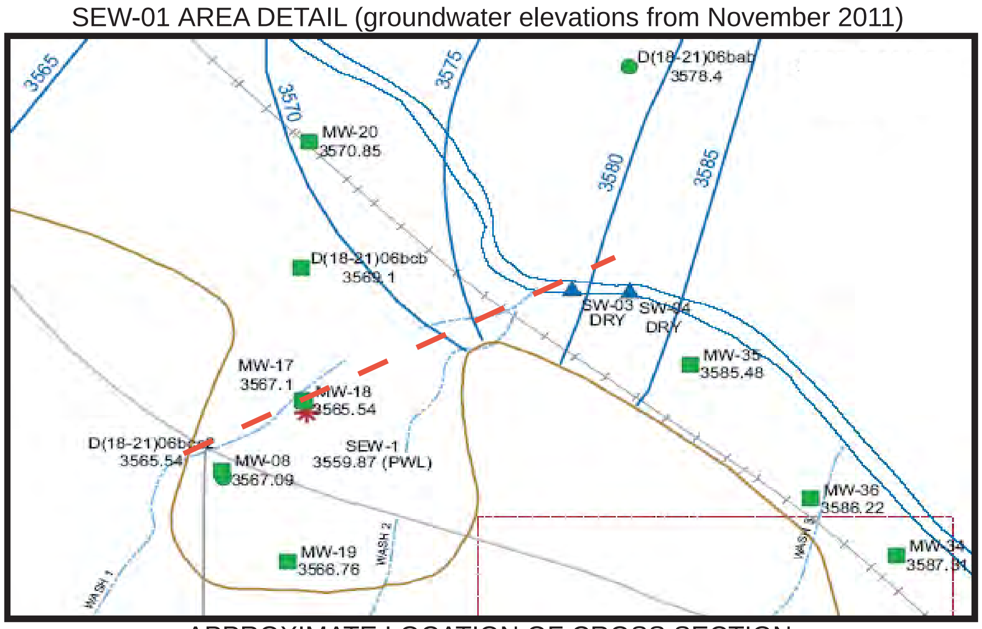


By: R. S. Gray, 1967

APACHE NITROGEN PRODUCTS, INC. BENSON, ARIZONA	**GENERAL STRATIGRAPHIC SECTION OF THE ST. DAVID FORMATION NEAR ST. DAVID, ARIZONA**	02/25/2019 Figure 16 PREP BY: AMW REV BY: AMB RPT NO: 130.140



SEW-01 AREA DETAIL (groundwater elevations from November 2011)



APPROXIMATE LOCATION OF CROSS SECTION

— —	Aprroximate level of water table
⬅	Approximate groundwater flow direction
— —	Approximate cross section location

SCHEMATIC ONLY: NOT TO SCALE

APACHE NITROGEN PRODUCTS INC
BENSON, ARIZONA

SCENARIOS OF SAN PEDRO RIVER STAGES AND RESULTING GROUNDWATER FLOW DIRECTIONS

HARGIS+ASSOCIATES, INC 06/26/2012

FIGURE 31

PREP BY DAT REV BY BAM RPT NO 130.124 Schematic SEW-1 to River.ai

HARGIS + ASSOCIATES, INC.

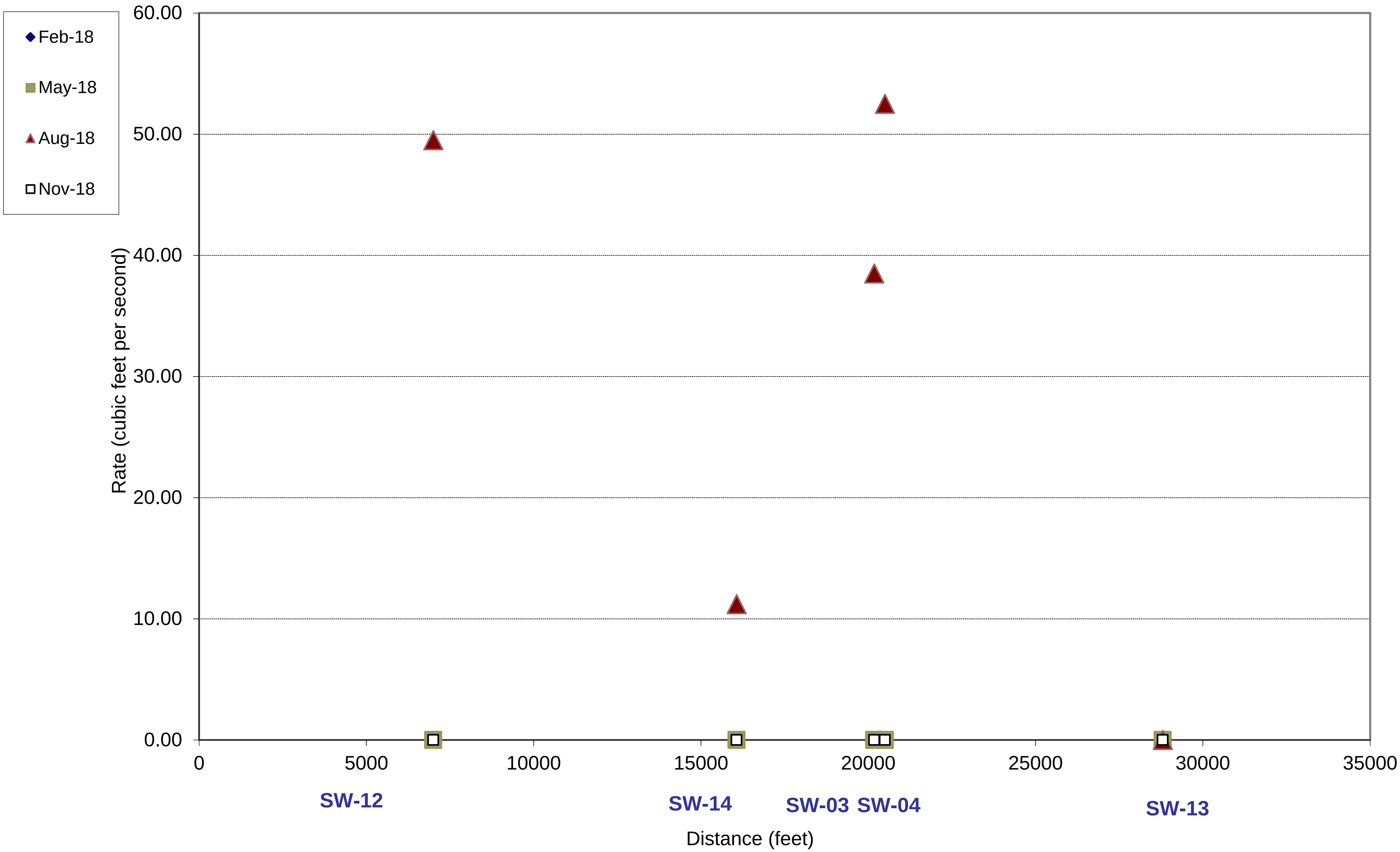
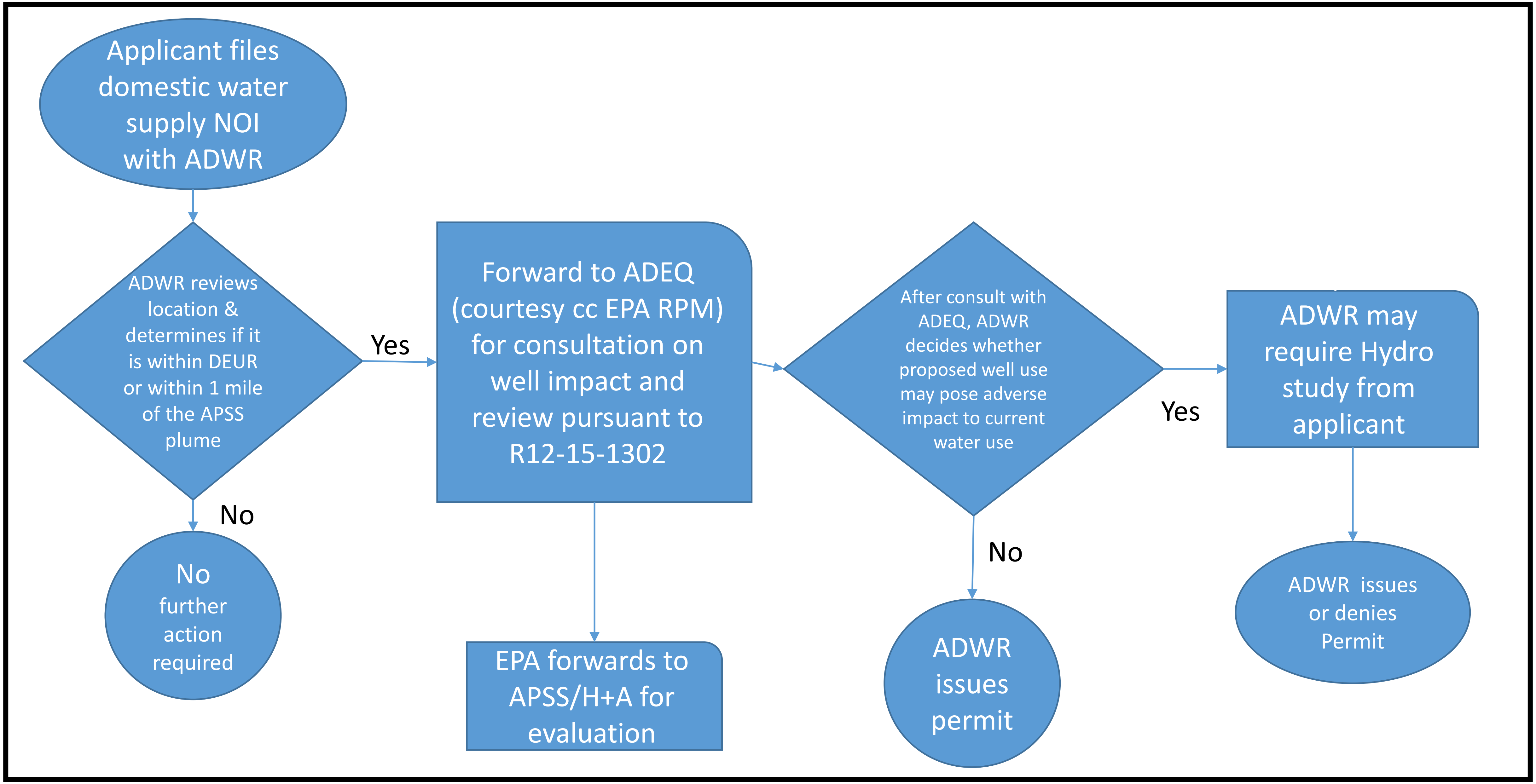
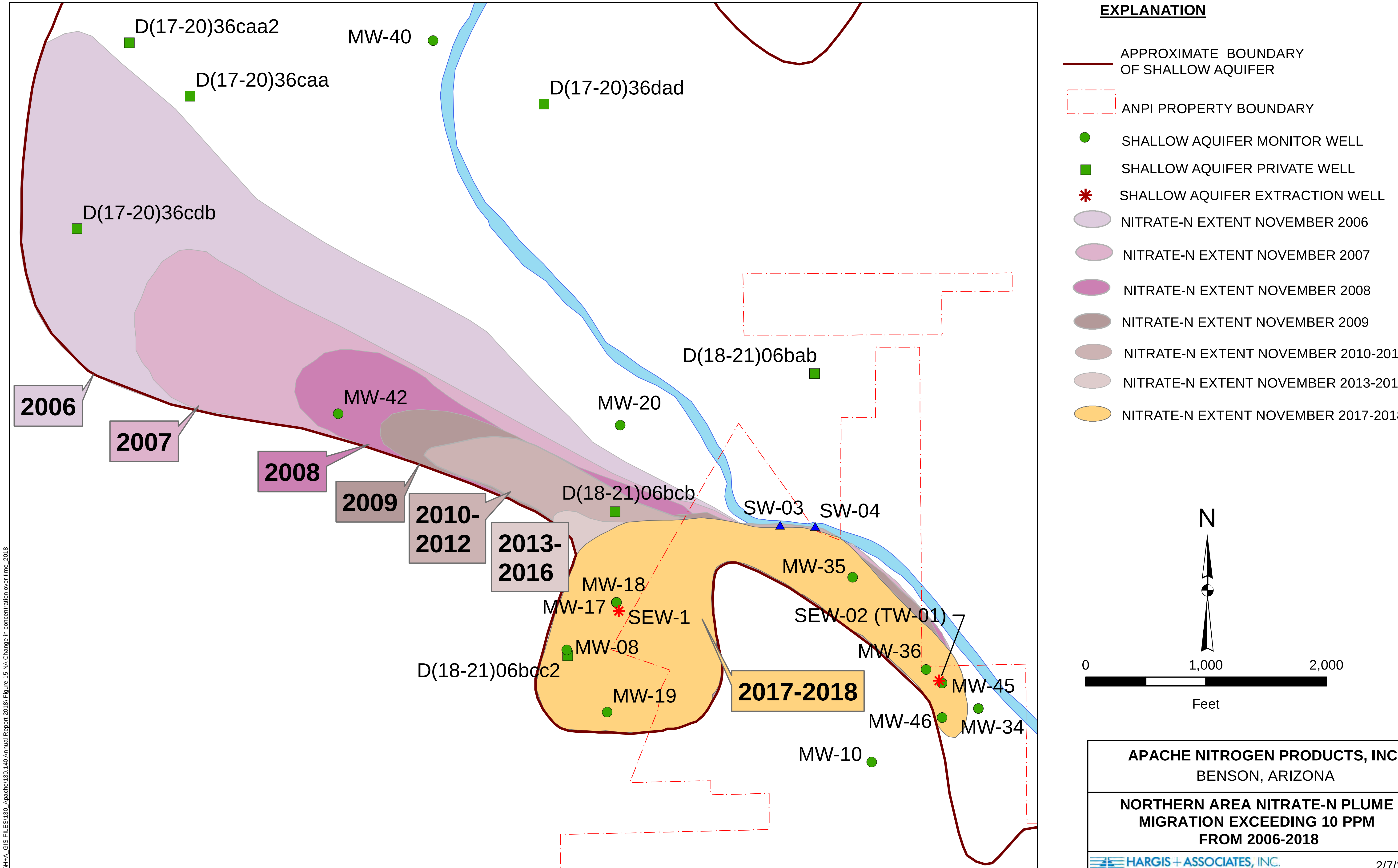


FIGURE 32. 2018 SURFACE WATER DISCHARGE AT SURFACE WATER MONITORING LOCATIONS SW-12, SW-14, SW-03, SW-04, AND SW-13



HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 33 NOI REVIEW PROCESS FOR APACHE POWDER SUPERFUND SITE



T:\H+A GIS FILES\130 Apache\130.140 Annual Report 2018\ Figure 15 NA Change in concentration over time 2018

APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

NORTHERN AREA NITRATE-N PLUME MIGRATION EXCEEDING 10 PPM FROM 2006-2018

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

2/7/2019

FIGURE 34

PREP BY: RGW
REV BY: LSL

PROJECT: 130.140

HARGIS + ASSOCIATES, INC.

APPENDIX A

WATER LEVEL AND WATER QUALITY HYDROGRAPHS

HARGIS + ASSOCIATES, INC.

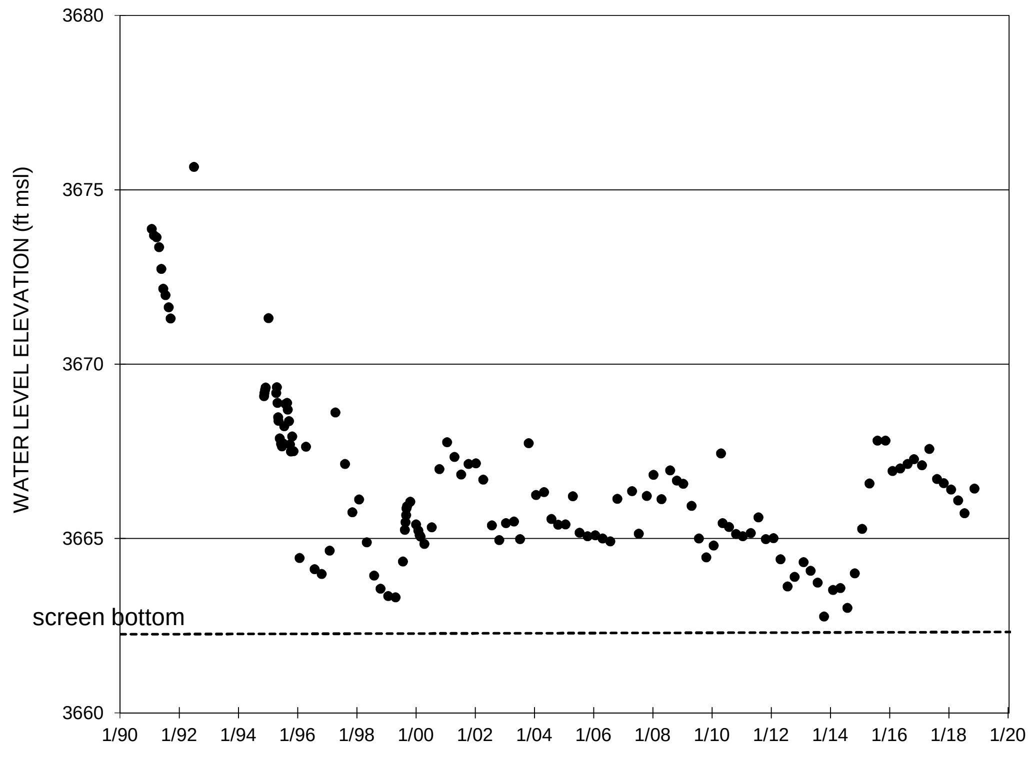
APPENDIX A

WATER LEVEL AND WATER QUALITY HYDROGRAPHS

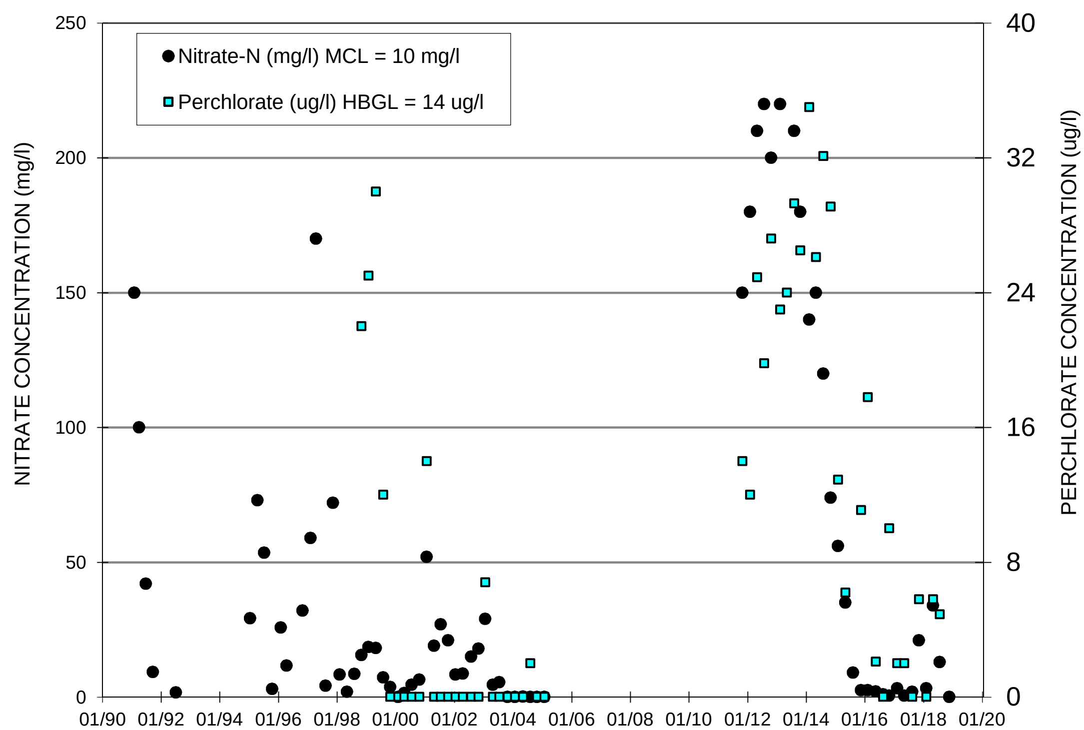
TABLE OF CONTENTS

Figure

HARGIS + ASSOCIATES, INC.



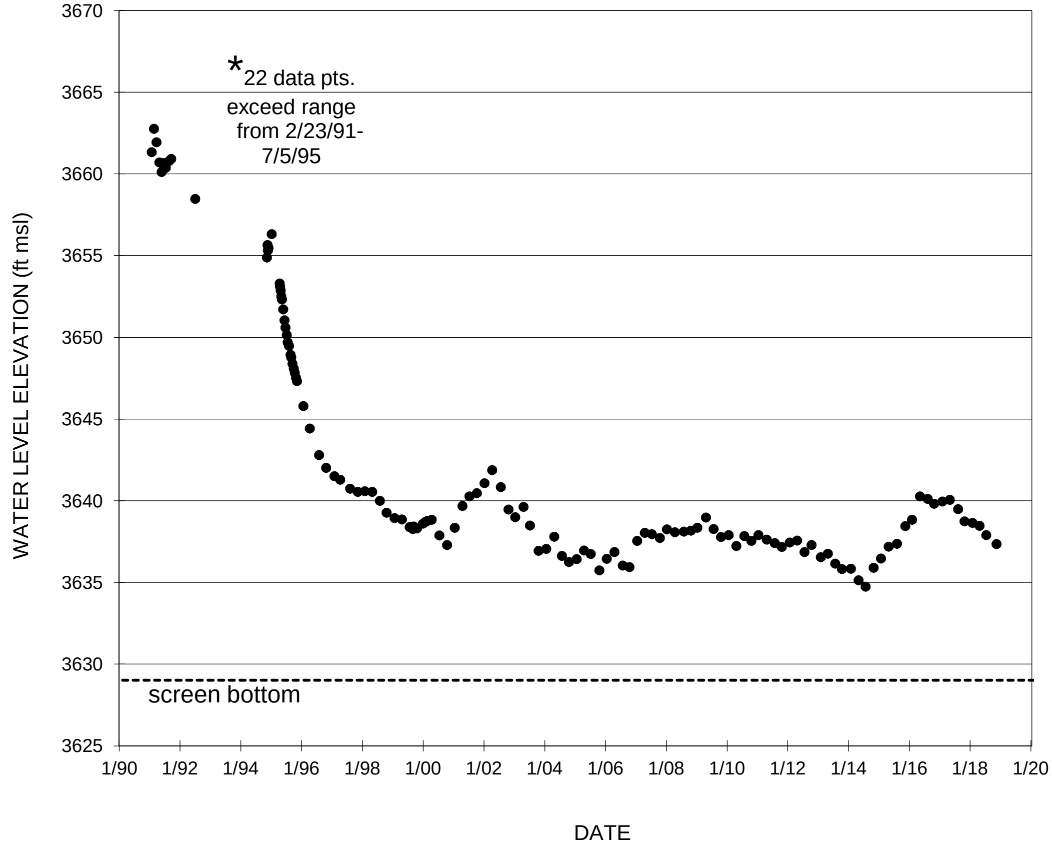
Perched Zone A Piezometer P-01



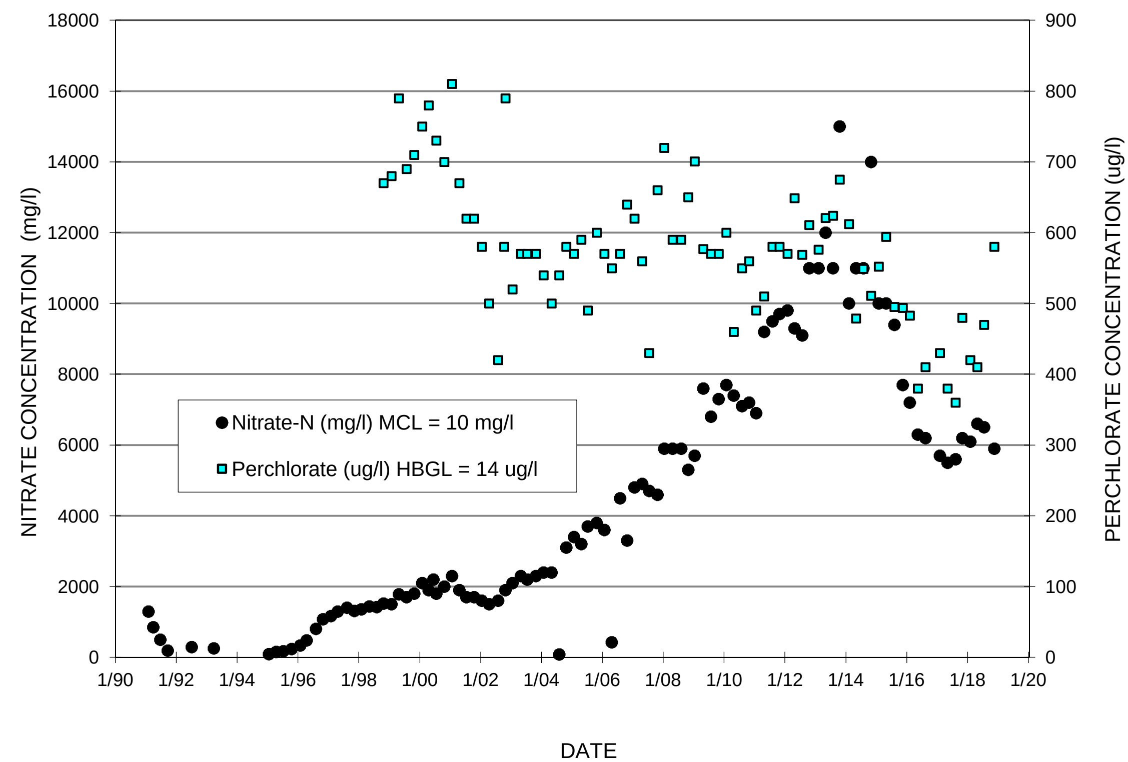
Perched Zone A Piezometer P-01

FIGURE A-1. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE A PIEZOMETER P-01

HARGIS + ASSOCIATES, INC.

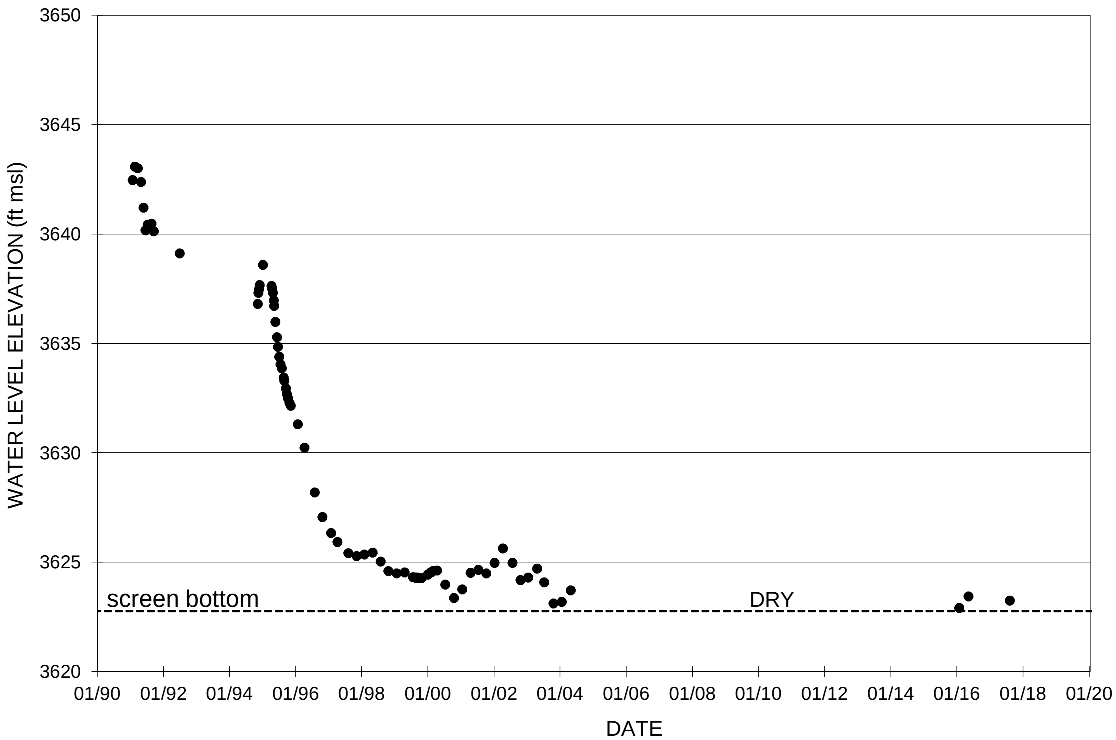


Perched Zone A Piezometer P-03

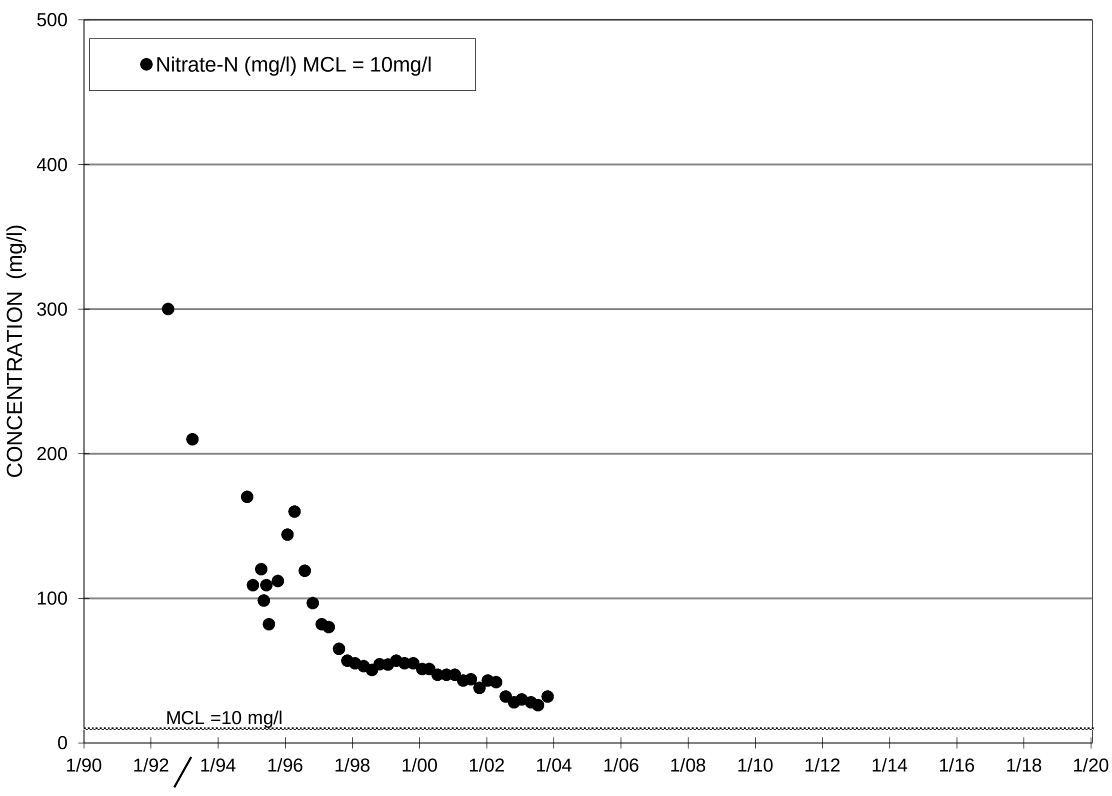


Perched Zone A Piezometer P-03

FIGURE A-2. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE A PIEZOMETER P-03

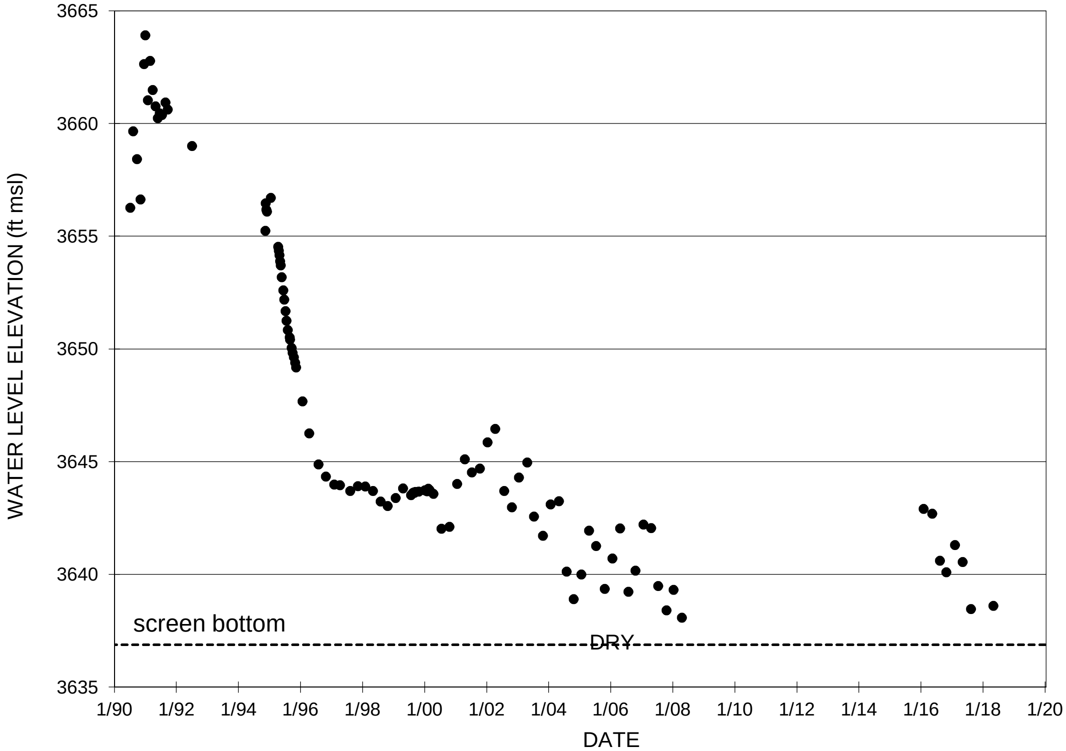


Perched Zone A Piezometer P-10

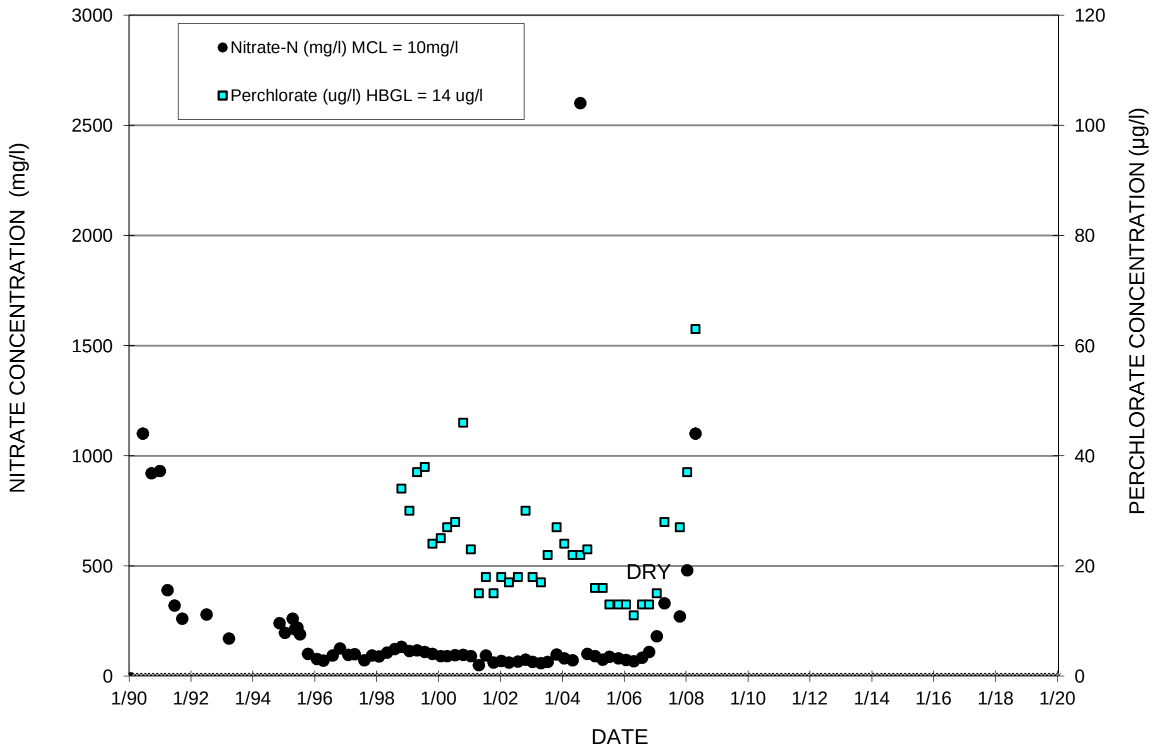


Perched Zone A Piezometer P-10

FIGURE A-3. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE A PIEZOMETER P-10



Perched Zone A Monitor Well MW-03



Perched Zone A Monitor Well MW-03

FIGURE A-4. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE A MONITOR WELL MW-03

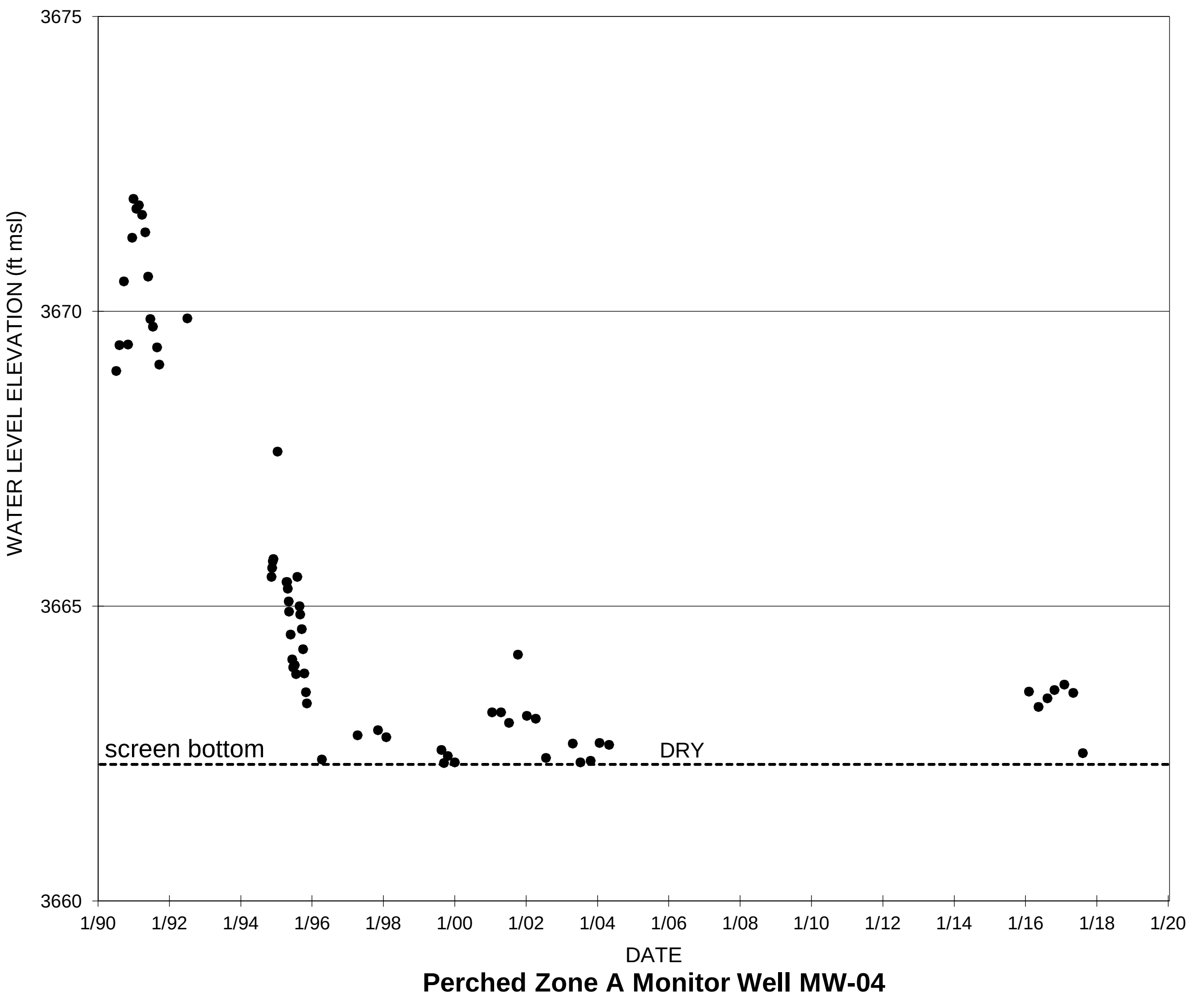
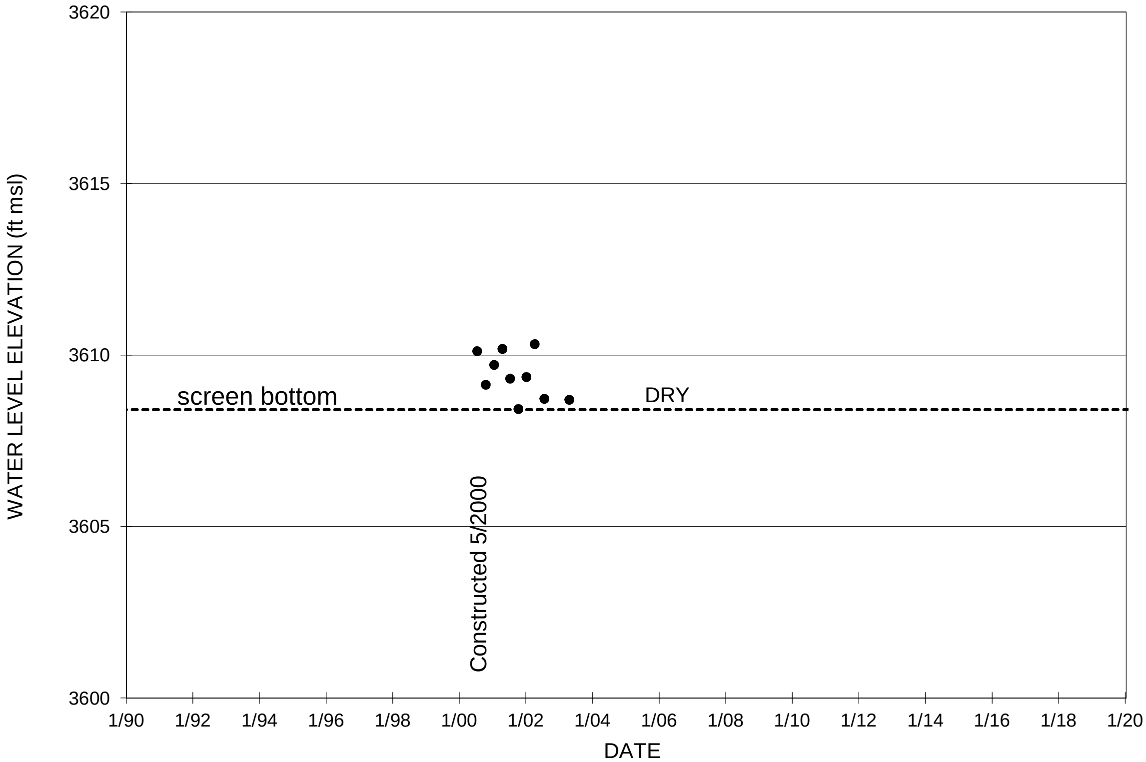
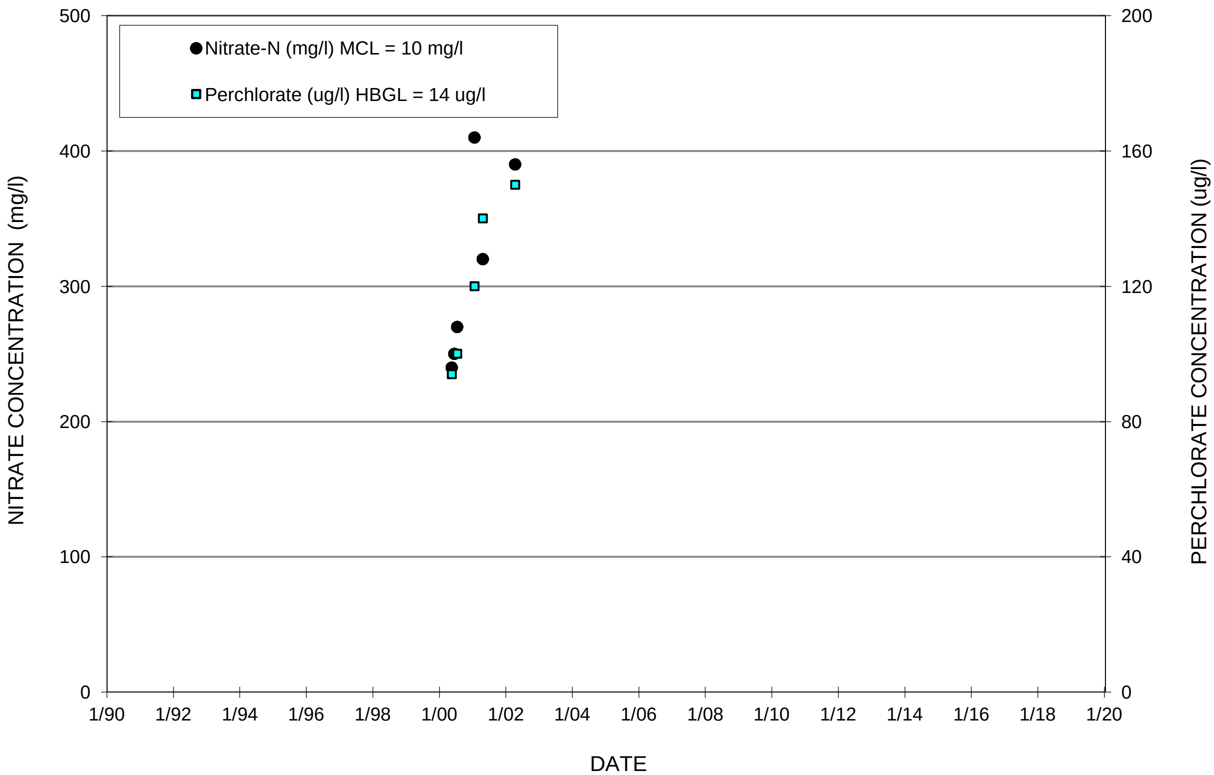


FIGURE A-5. WATER LEVEL HYDROGRAPH FOR PERCHED ZONE A MONITOR WELL MW-04

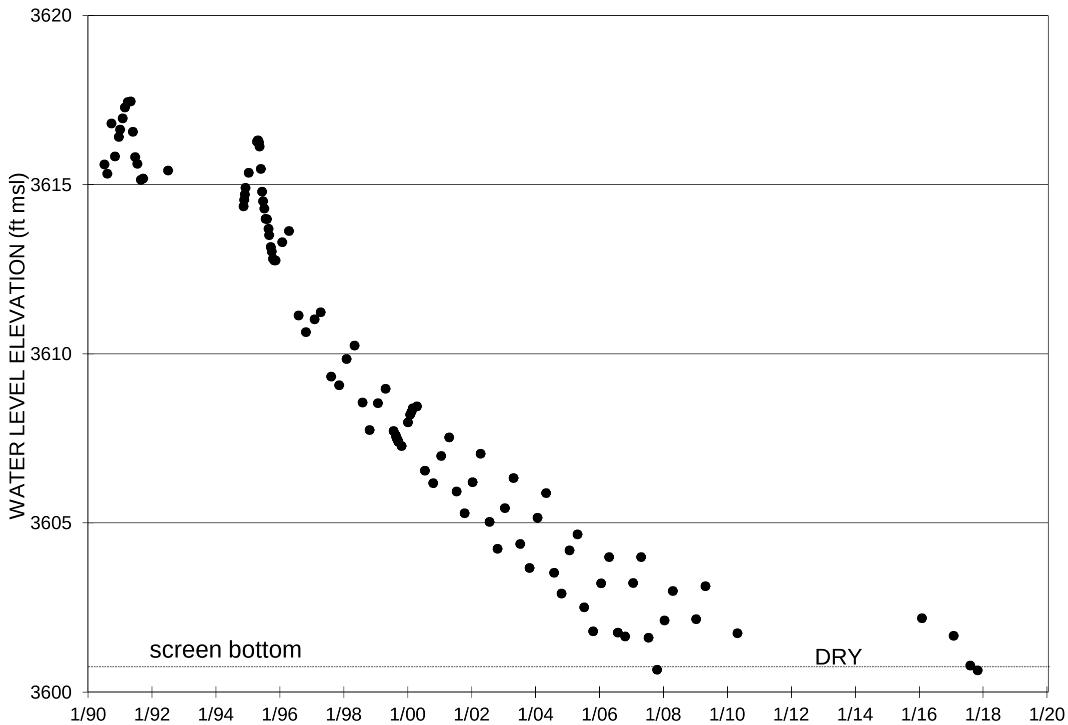


Perched Zone A Monitor Well MW-29

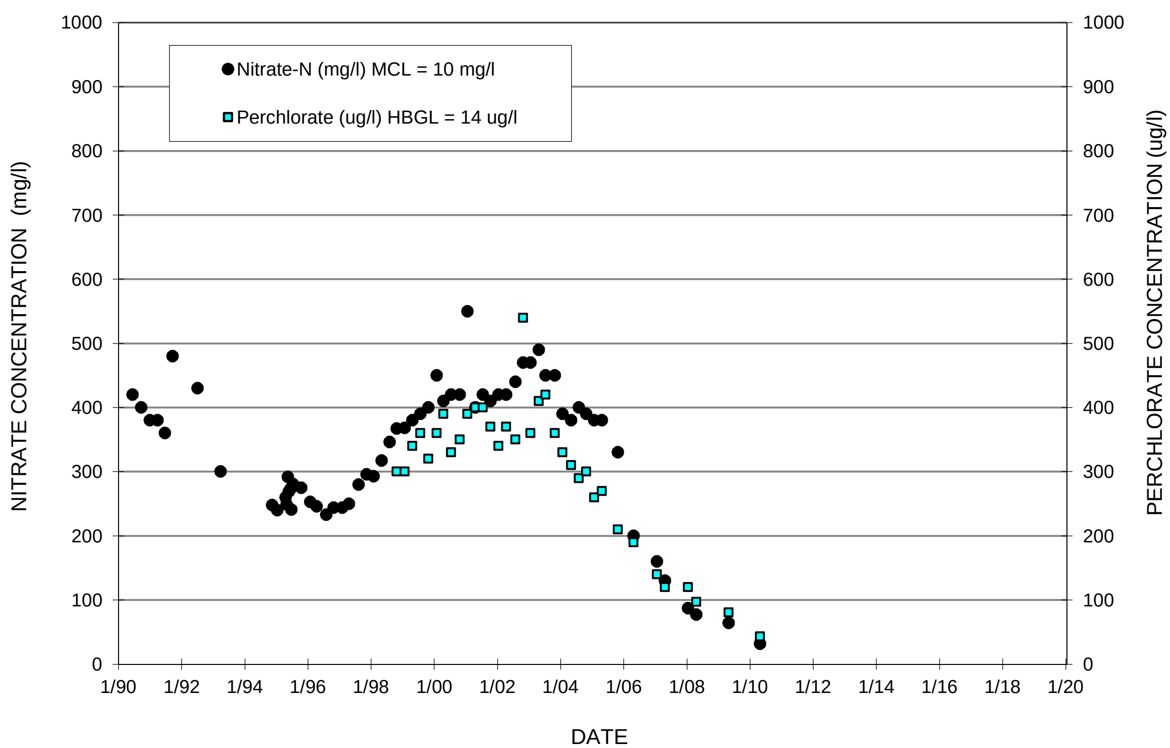


Perched Zone A Monitor Well MW-29

FIGURE A-6. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE A MONITOR WELL MW-29

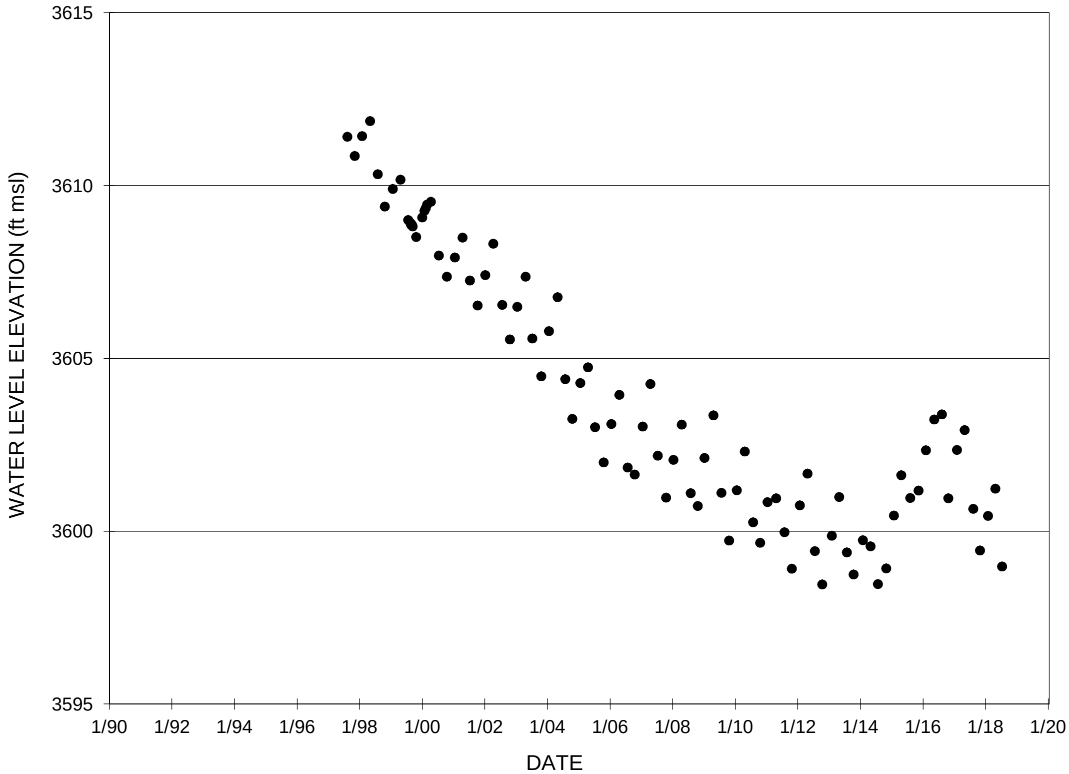


Perched Zone B Monitor Well MW-15

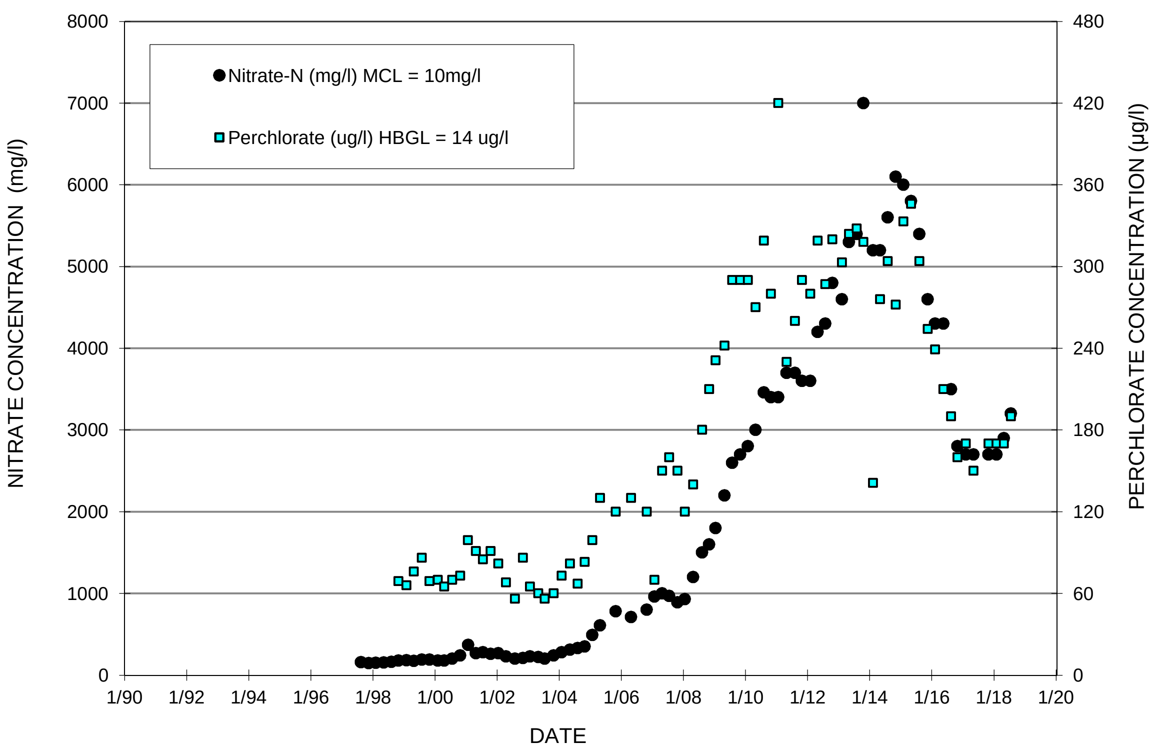


Perched Zone B Monitor Well MW-15

FIGURE A-7. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-15



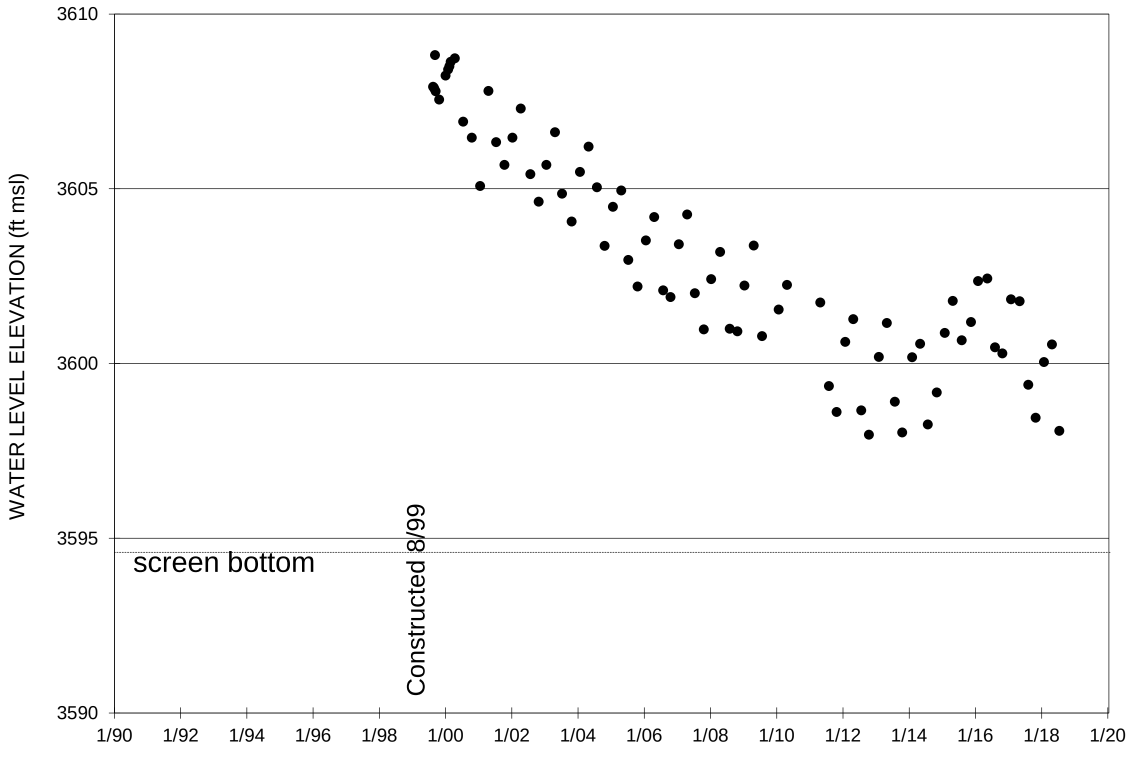
Perched Zone B Monitor Well MW-21



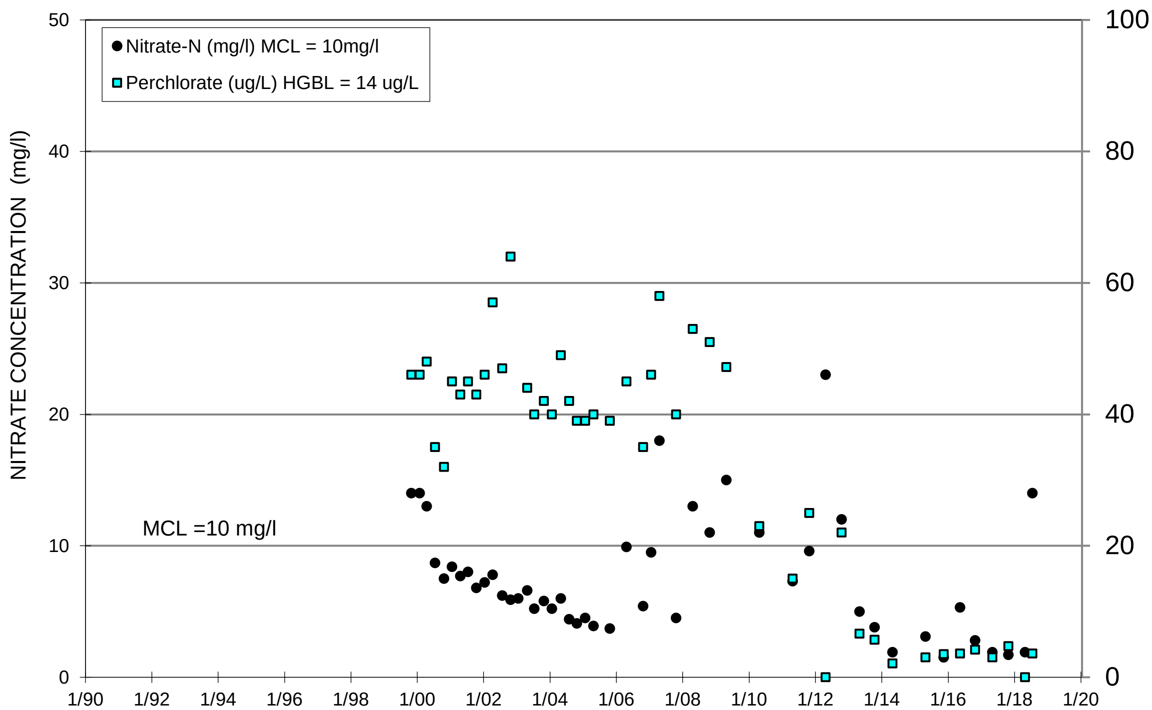
Perched Zone B Monitor Well MW-21

FIGURE A-8. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-21

HARGIS + ASSOCIATES, INC.

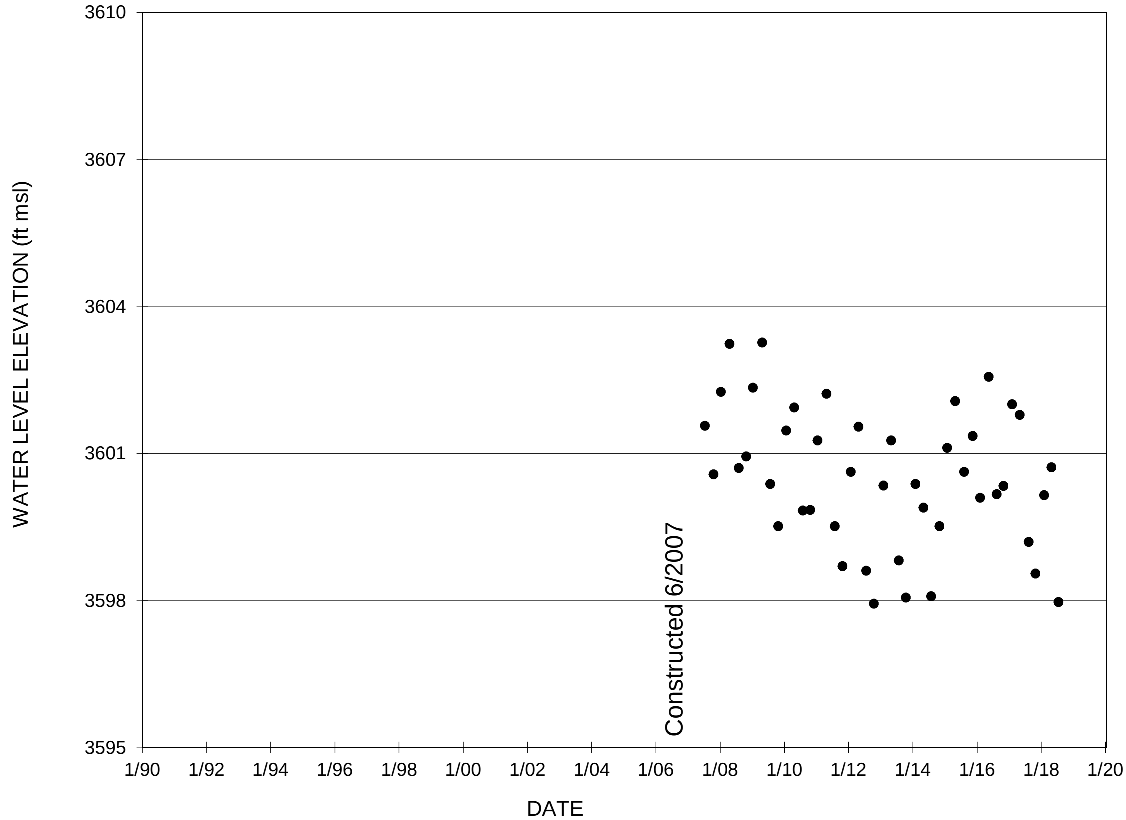


Perched Zone B Monitor Well MW-23

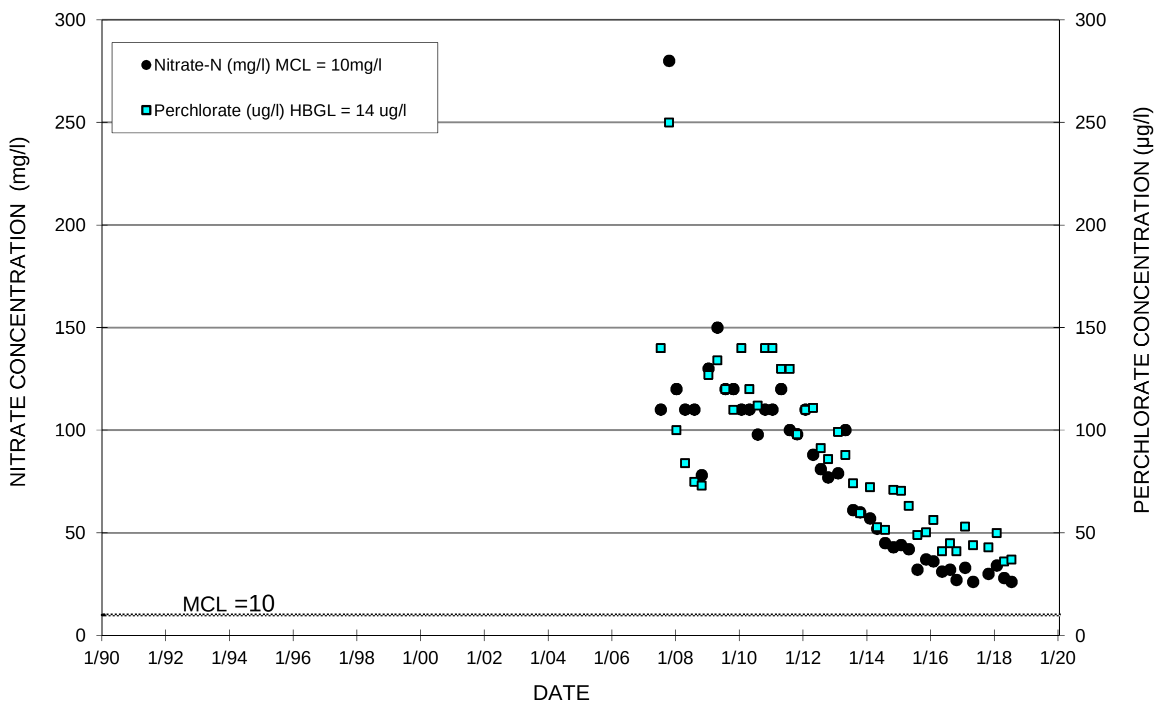


Perched Zone B Monitor Well MW-23

FIGURE A-9. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-23

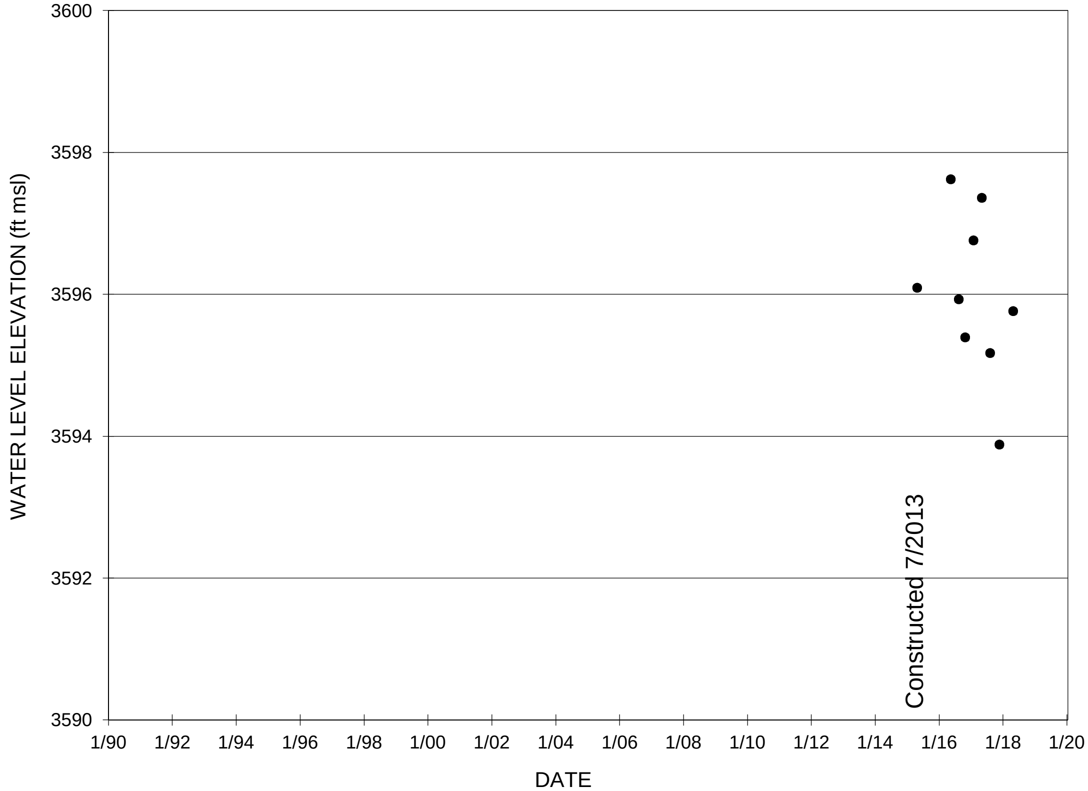


Perched Zone B Monitor Well MW-39

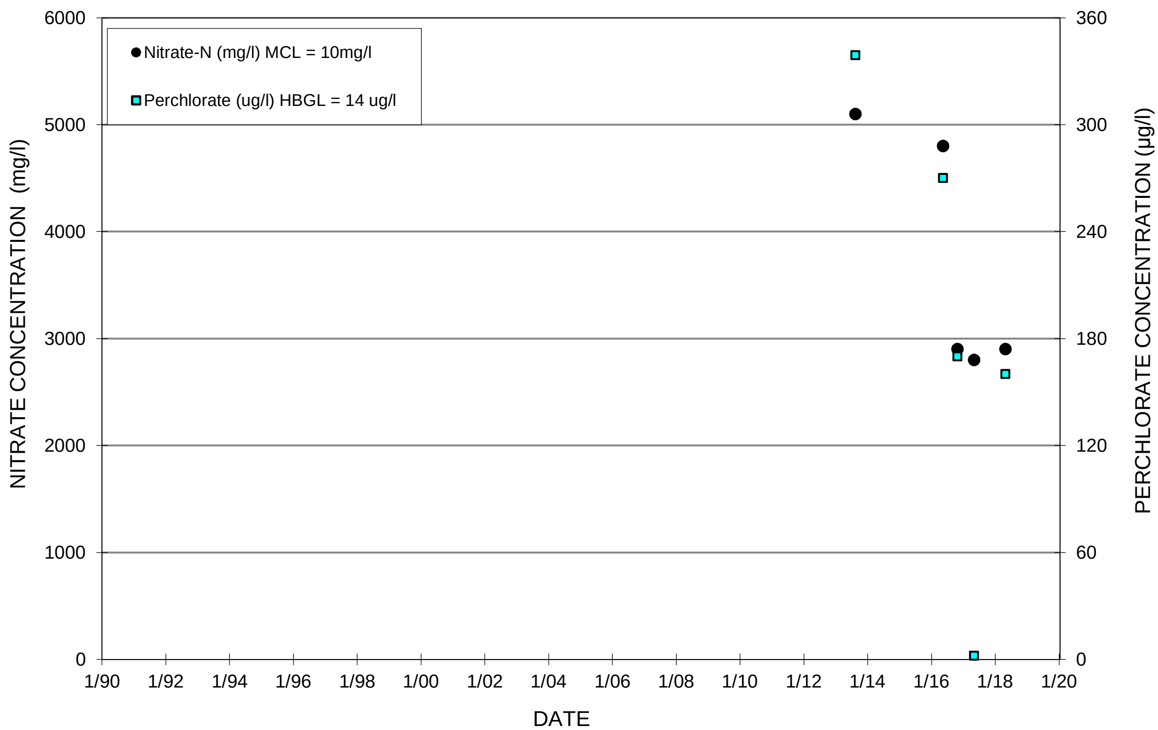


Perched Zone B Monitor Well MW-39

FIGURE A-10. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-39

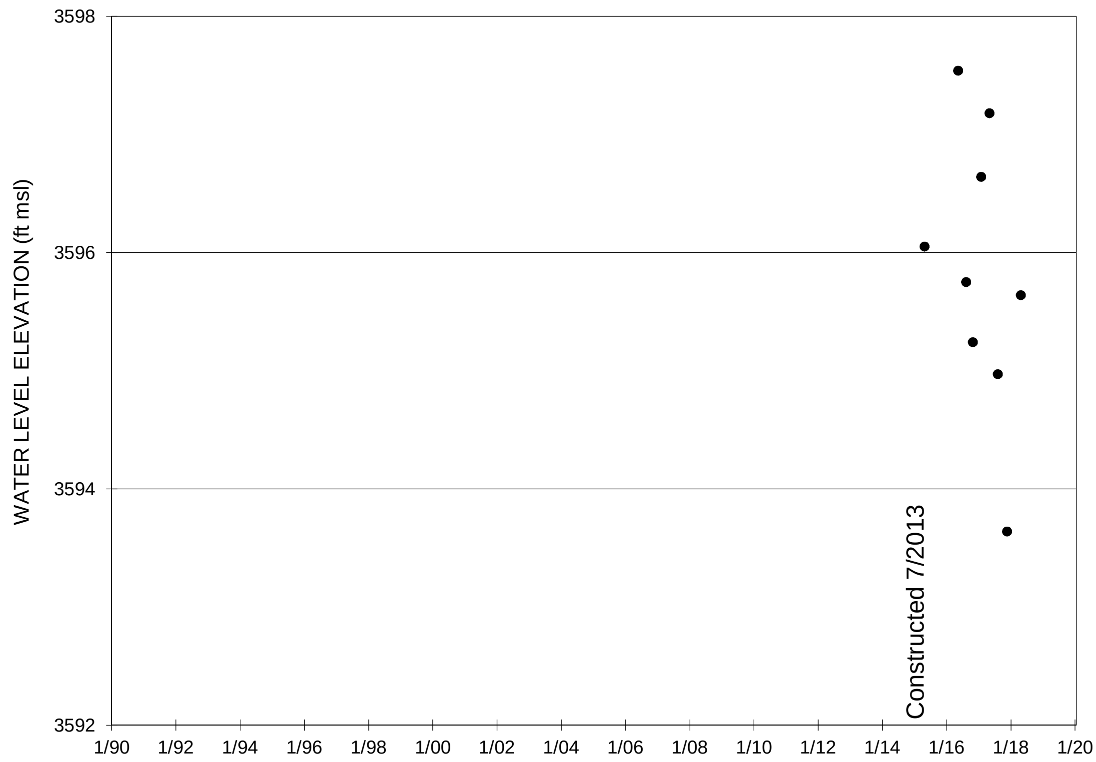


Perched Zone B Monitor Well MW-43

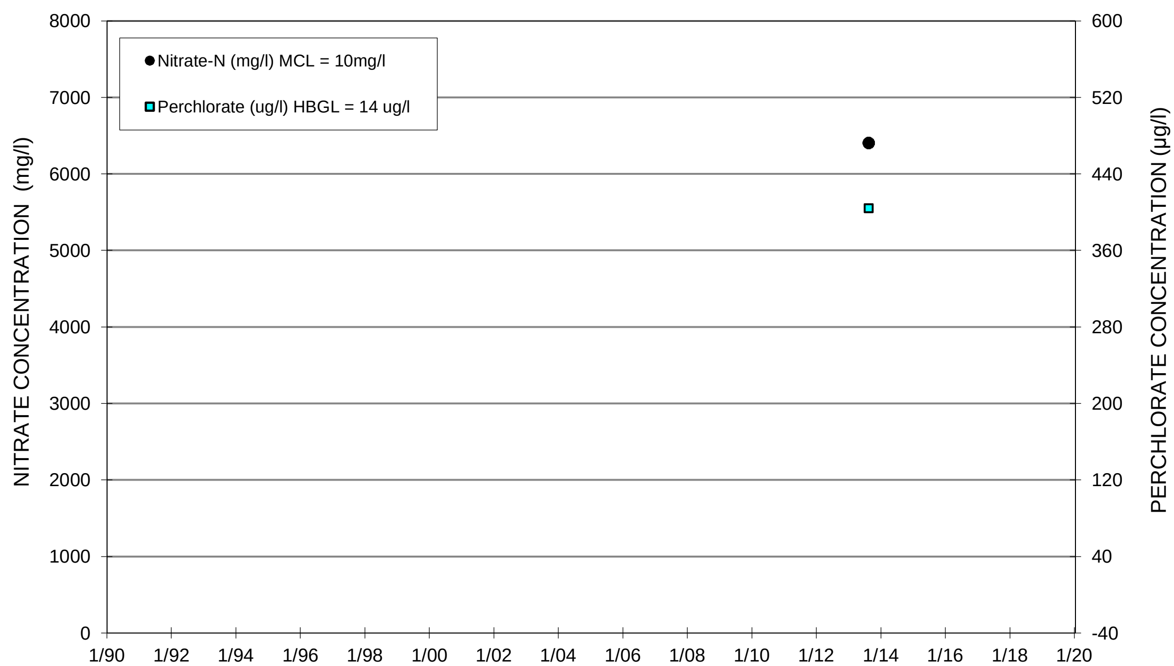


Perched Zone B Monitor Well MW-43

FIGURE A-11. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-43

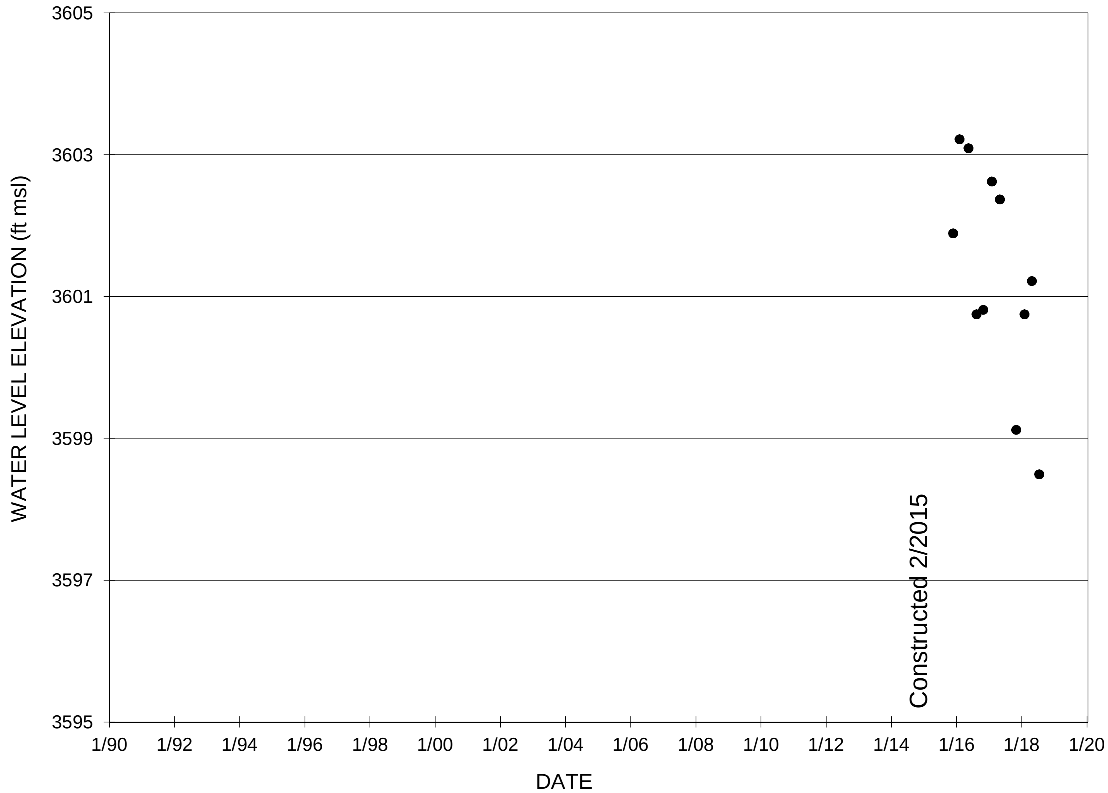


Perched Zone B Monitor Well MW-44



Perched Zone B Monitor Well MW-44

FIGURE A-12. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-44



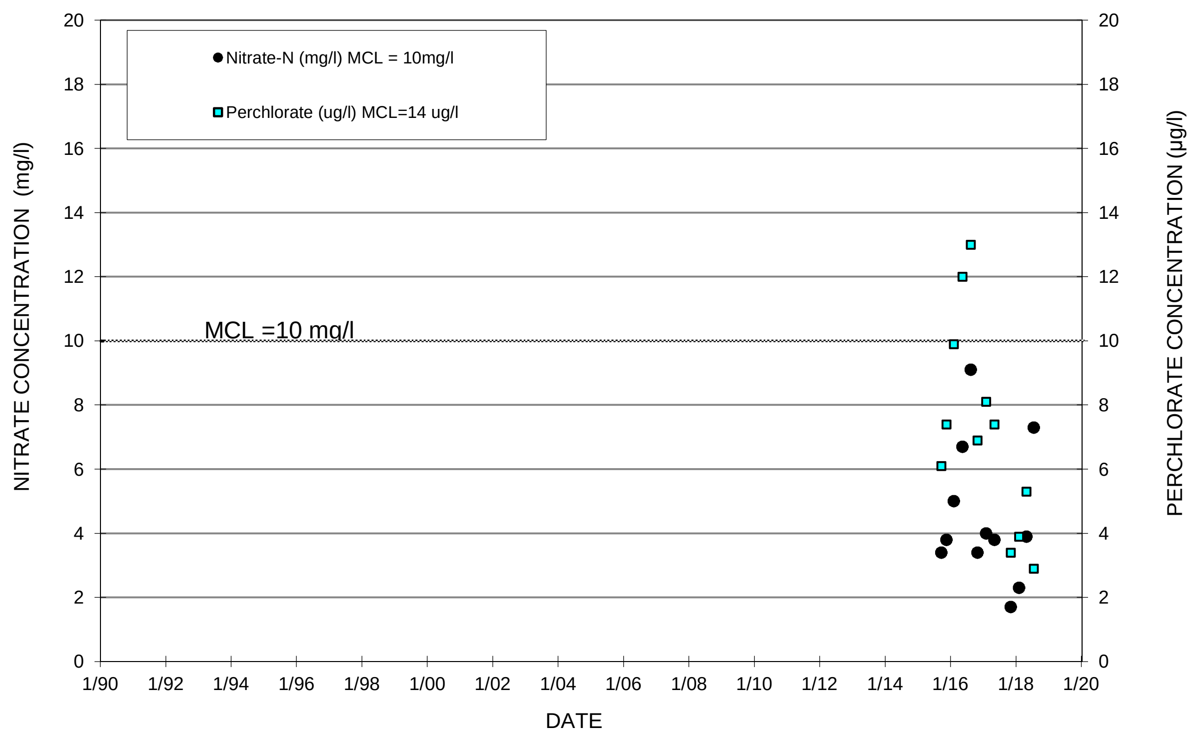
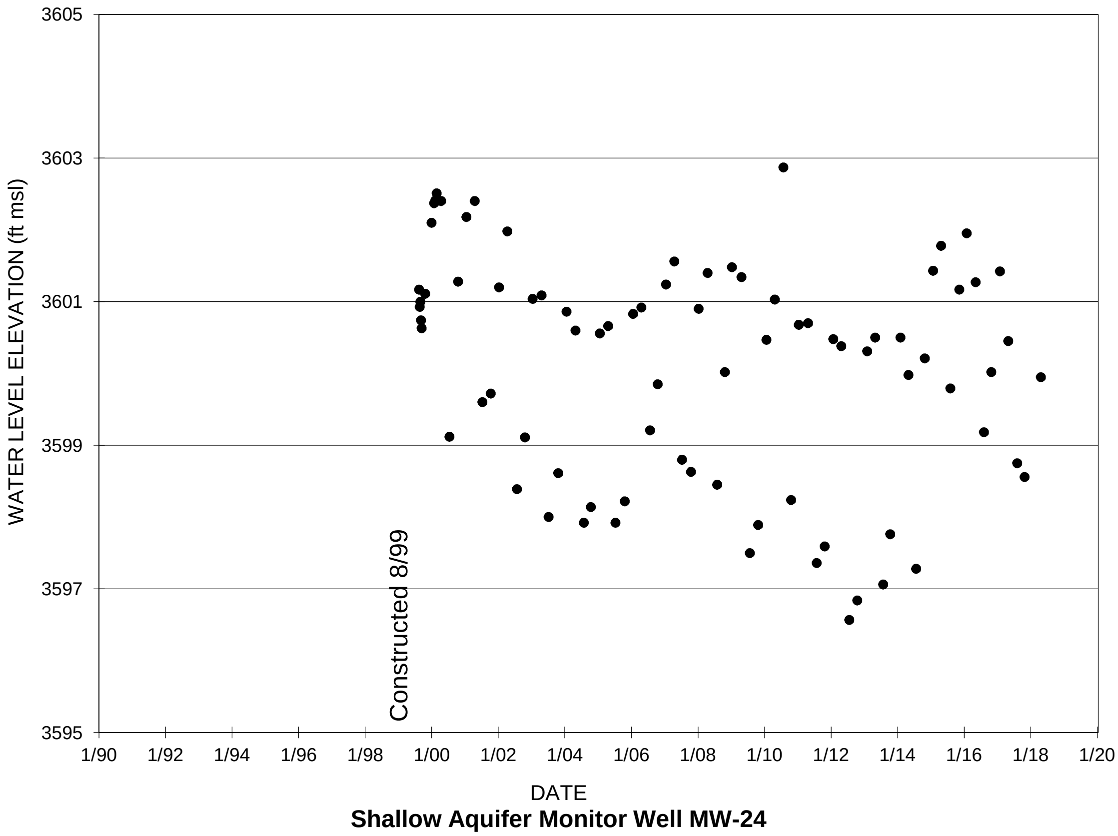


FIGURE A-13. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR PERCHED ZONE B MONITOR WELL MW-47

HARGIS + ASSOCIATES, INC.



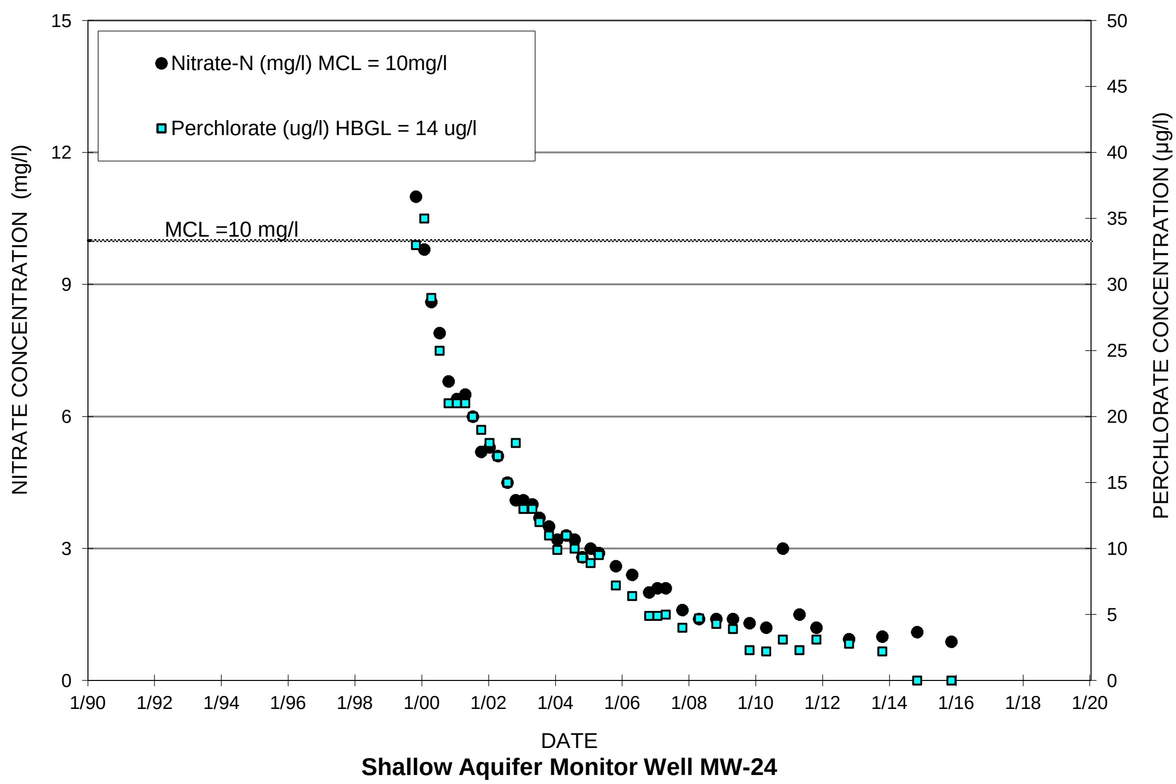
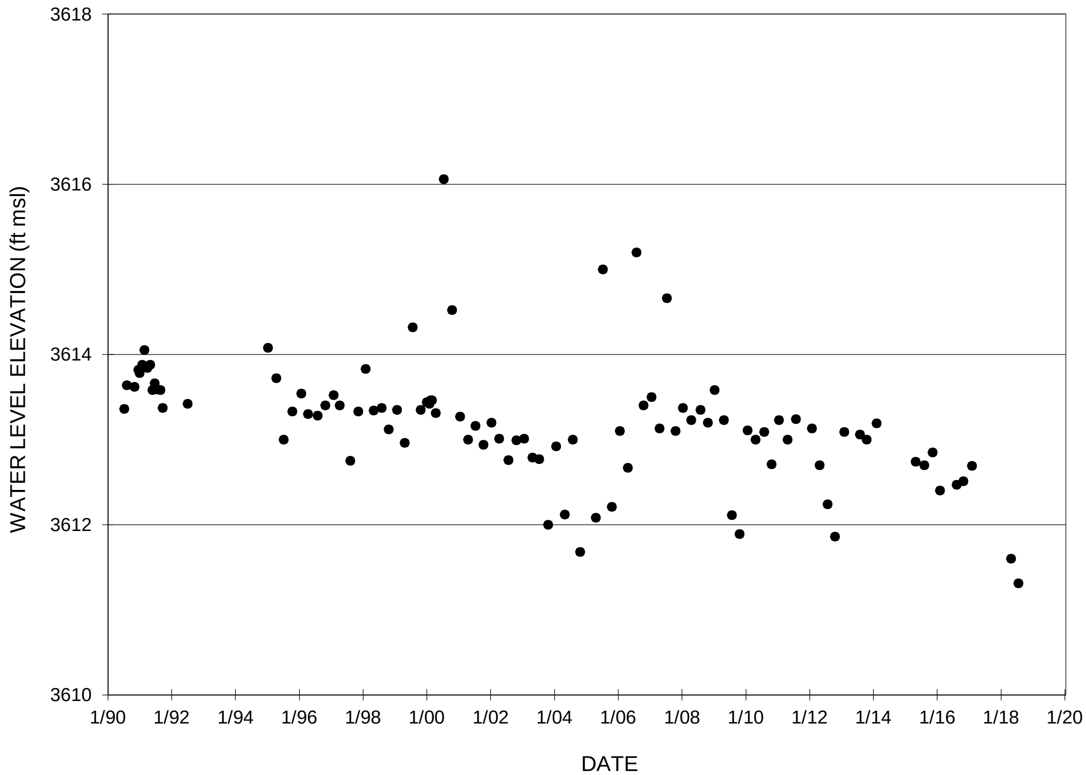
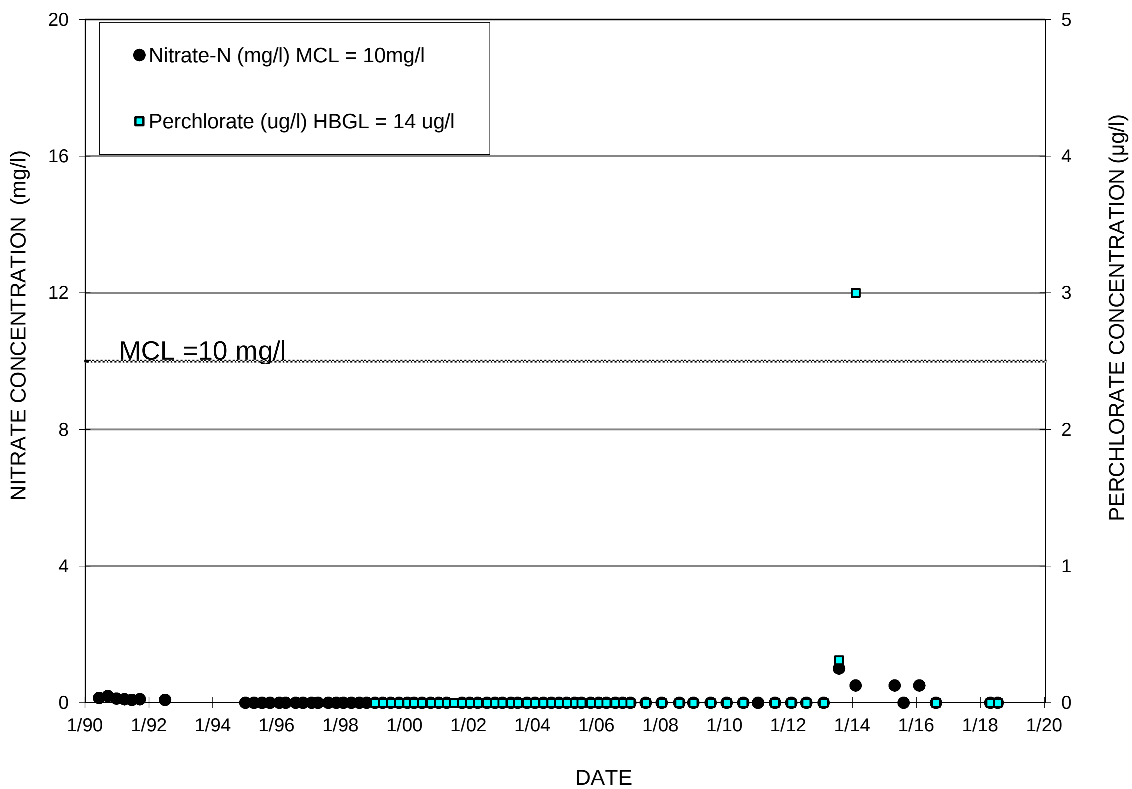


FIGURE A-14. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA UPGRADIENT MONITOR WELL MW-24

HARGIS + ASSOCIATES, INC.



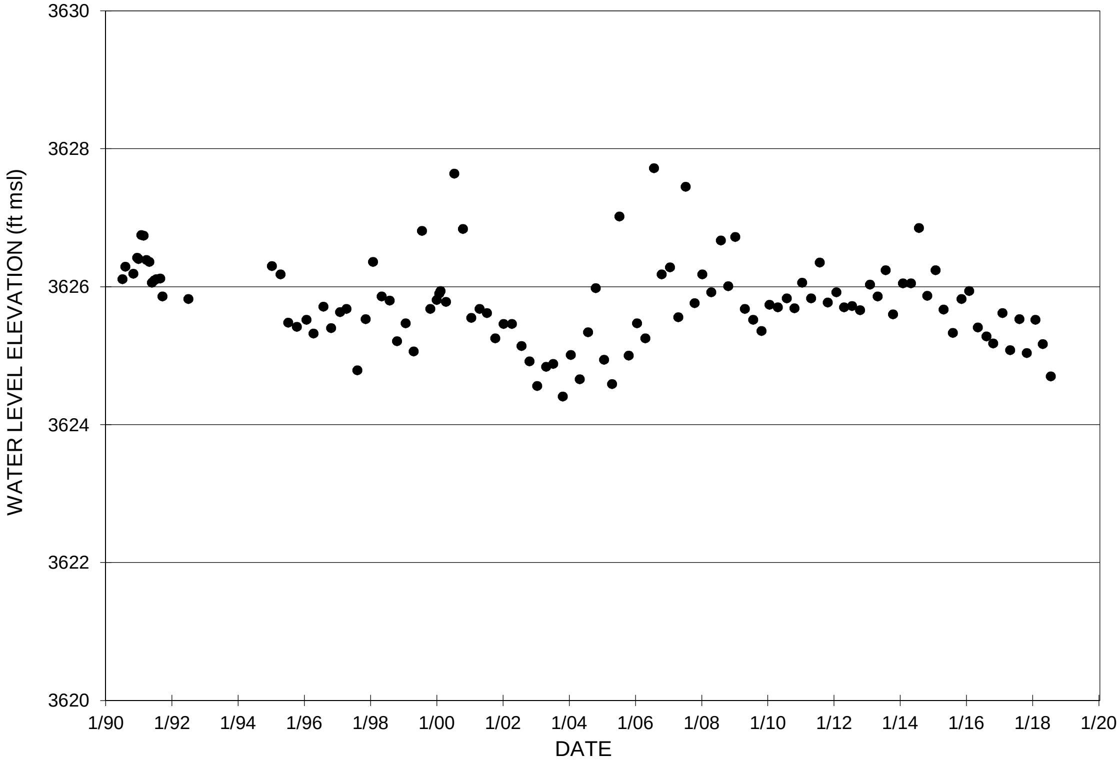
Shallow Aquifer Monitor Well MW-01



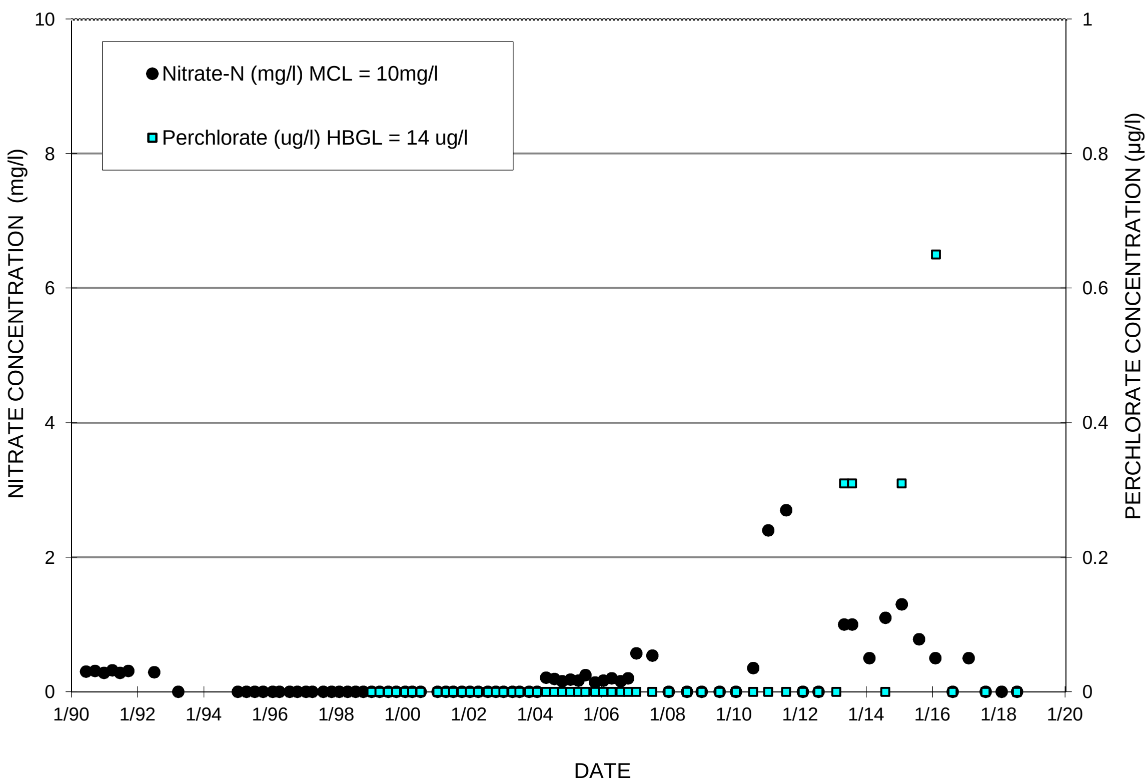
Shallow Aquifer Monitor Well MW-01

FIGURE A-15. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA UPGRADIENT MONITOR WELL MW-01

HARGIS + ASSOCIATES, INC.

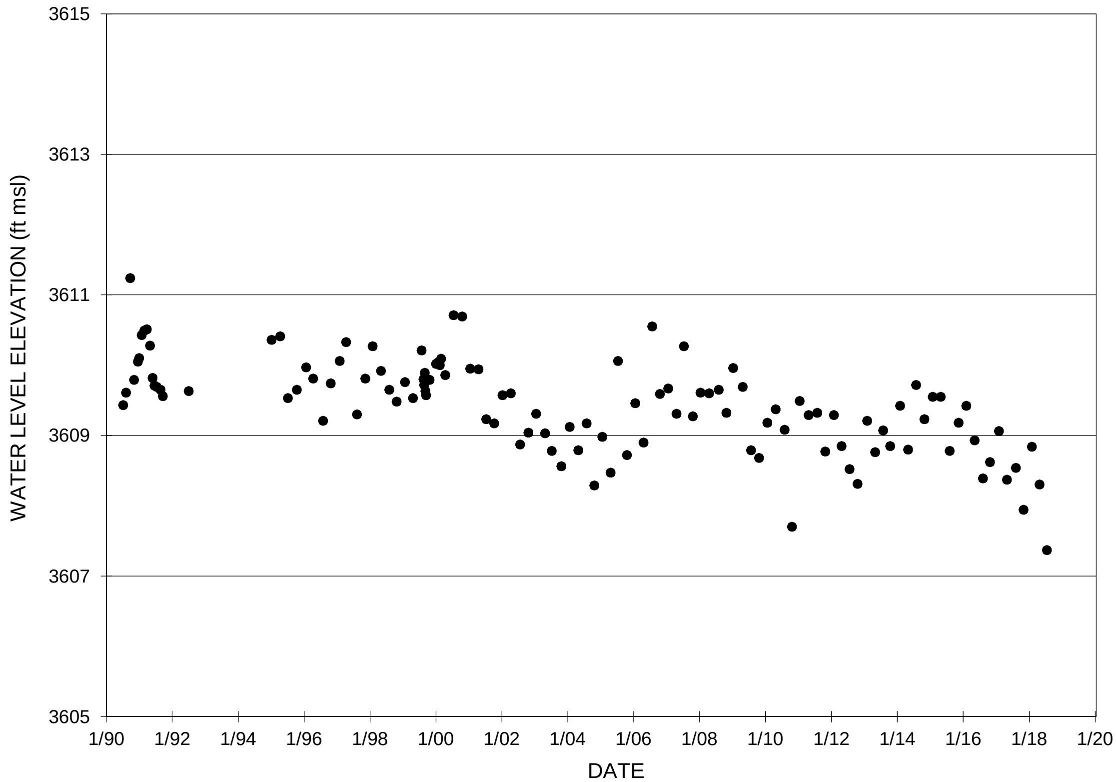


Shallow Aquifer Monitor Well MW-06

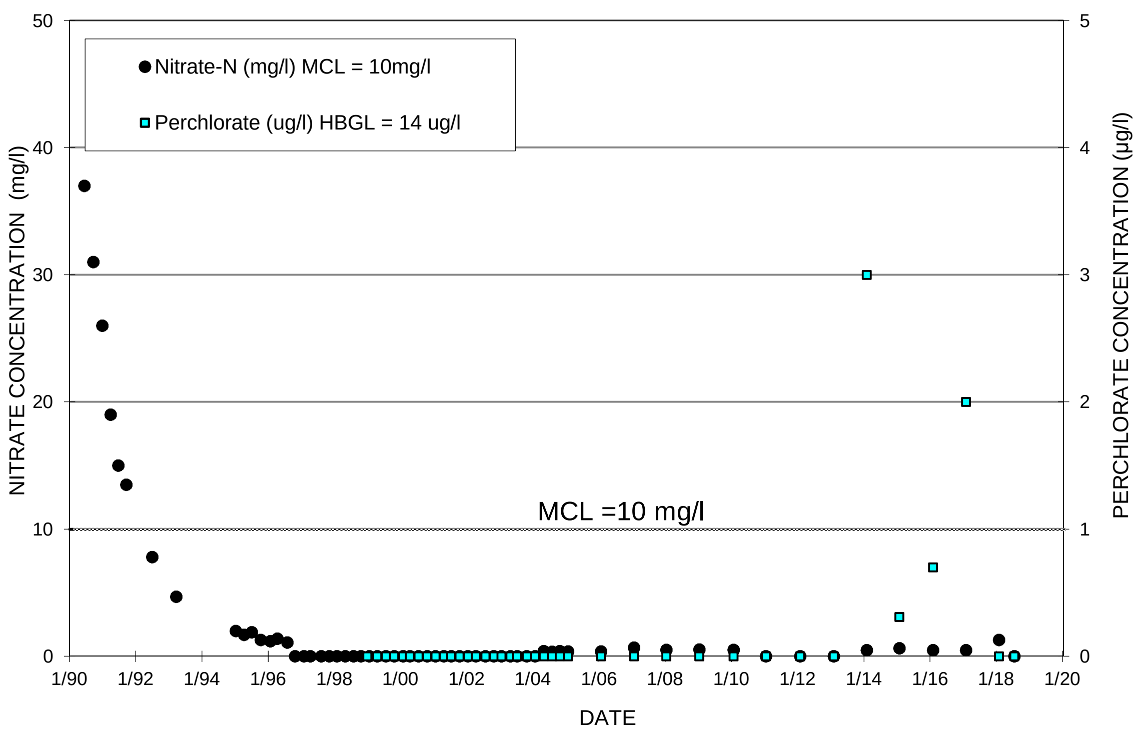


Shallow Aquifer Monitor Well MW-06

FIGURE A-16. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA UPGRADIENT MONITOR WELL MW-06

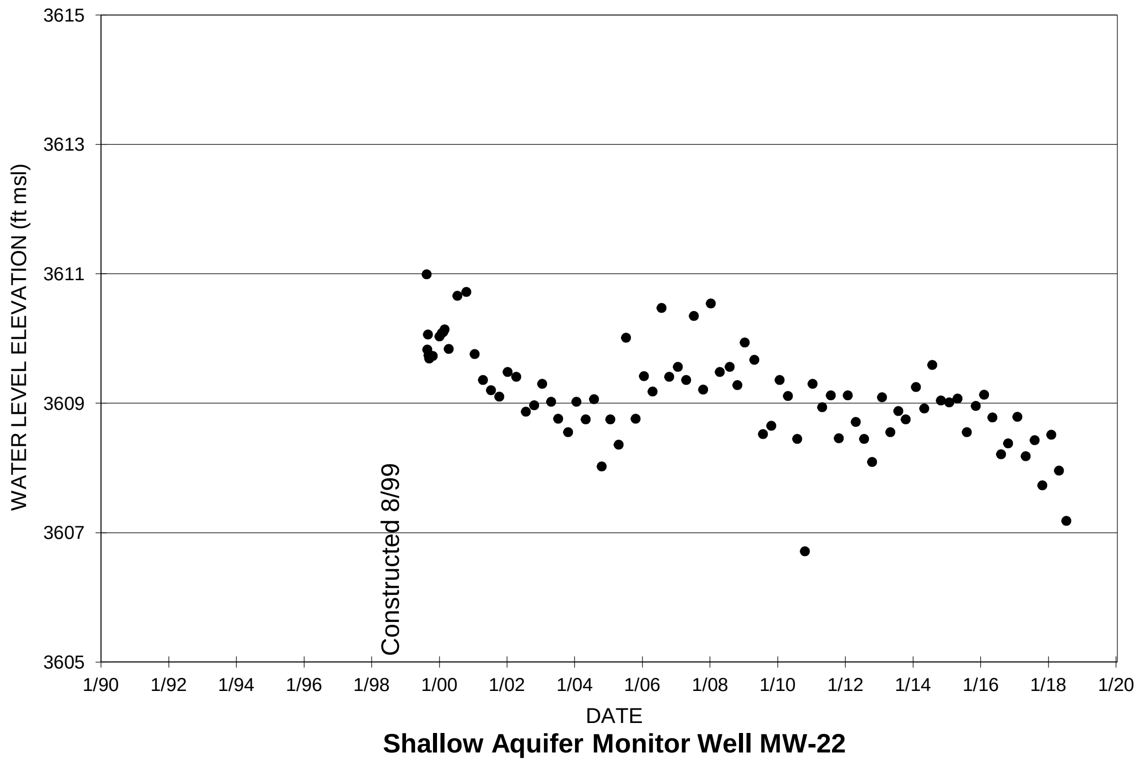


Shallow Aquifer Monitor Well MW-14



Shallow Aquifer Monitor Well MW-14

FIGURE A-17. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA SENTINEL MONITOR WELL MW-14



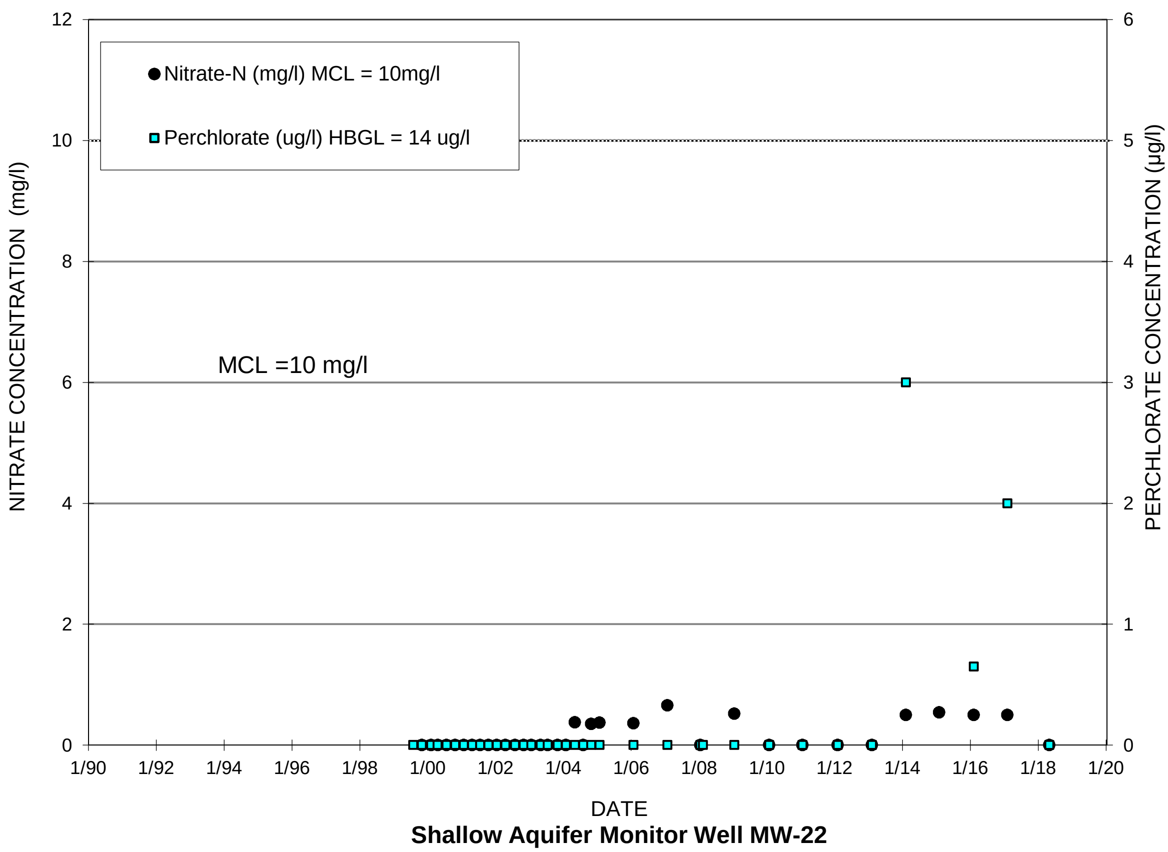
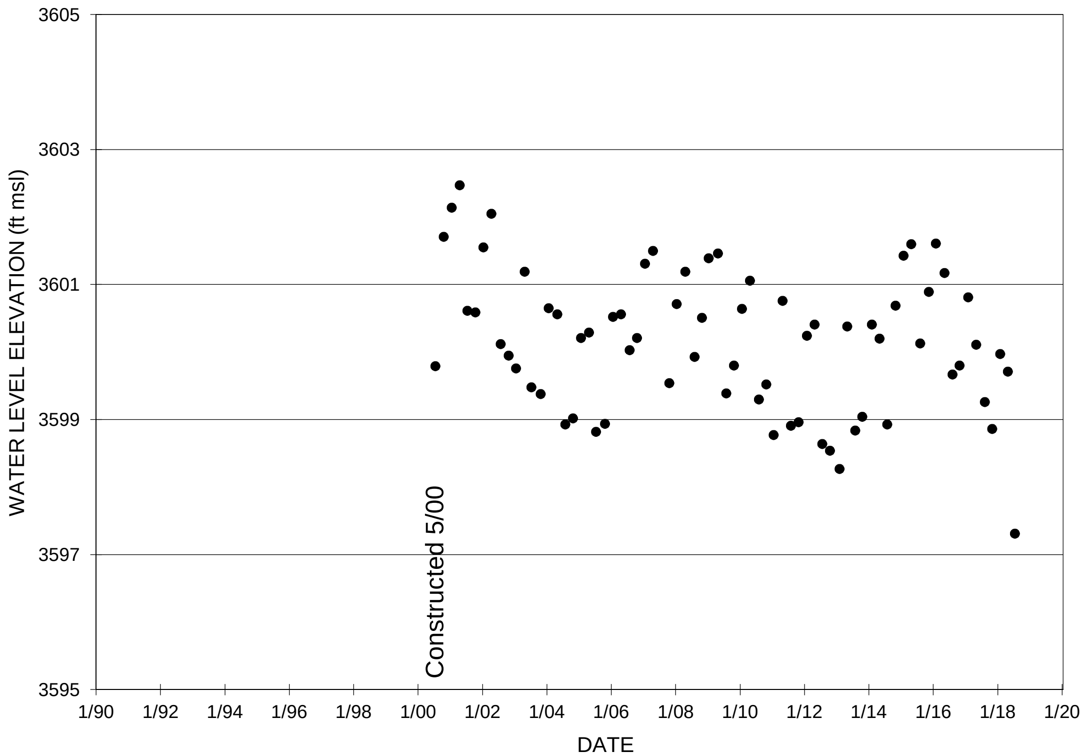
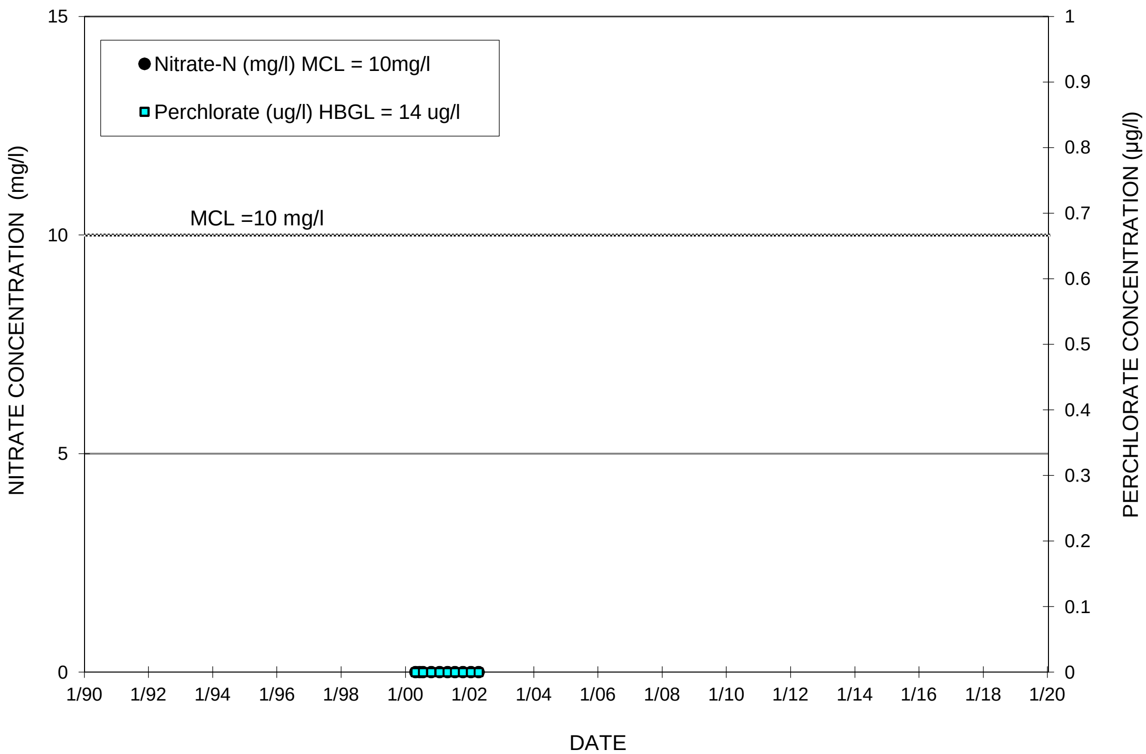


FIGURE A-18. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA SENTINEL MONITOR WELL MW-22

HARGIS + ASSOCIATES, INC.



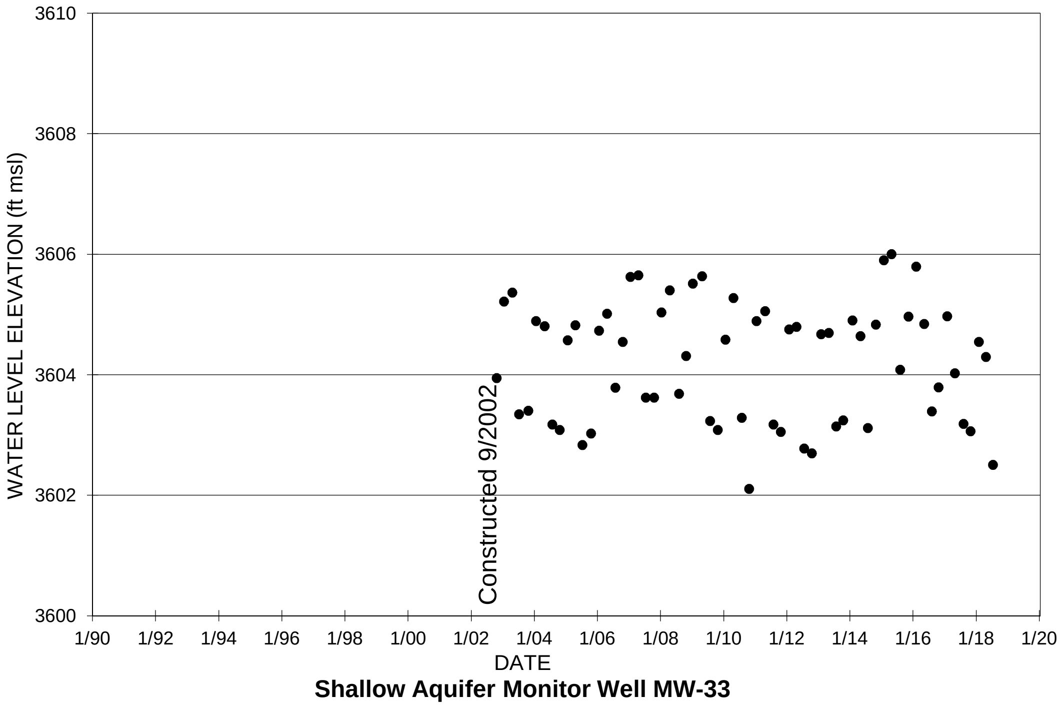
Shallow Aquifer Monitor Well MW-25



Shallow Aquifer Monitor Well MW-25

FIGURE A-19. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA BUFFER ZONE MONITOR WELL MW-25

HARGIS + ASSOCIATES, INC.



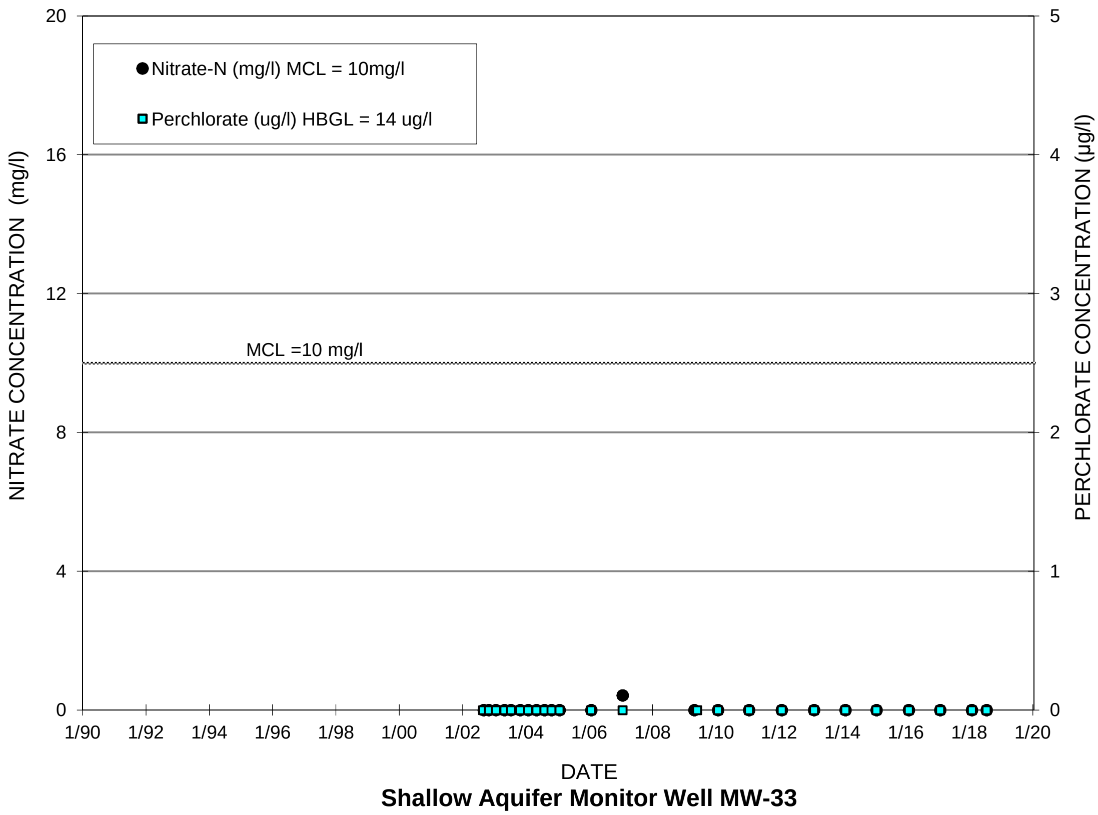
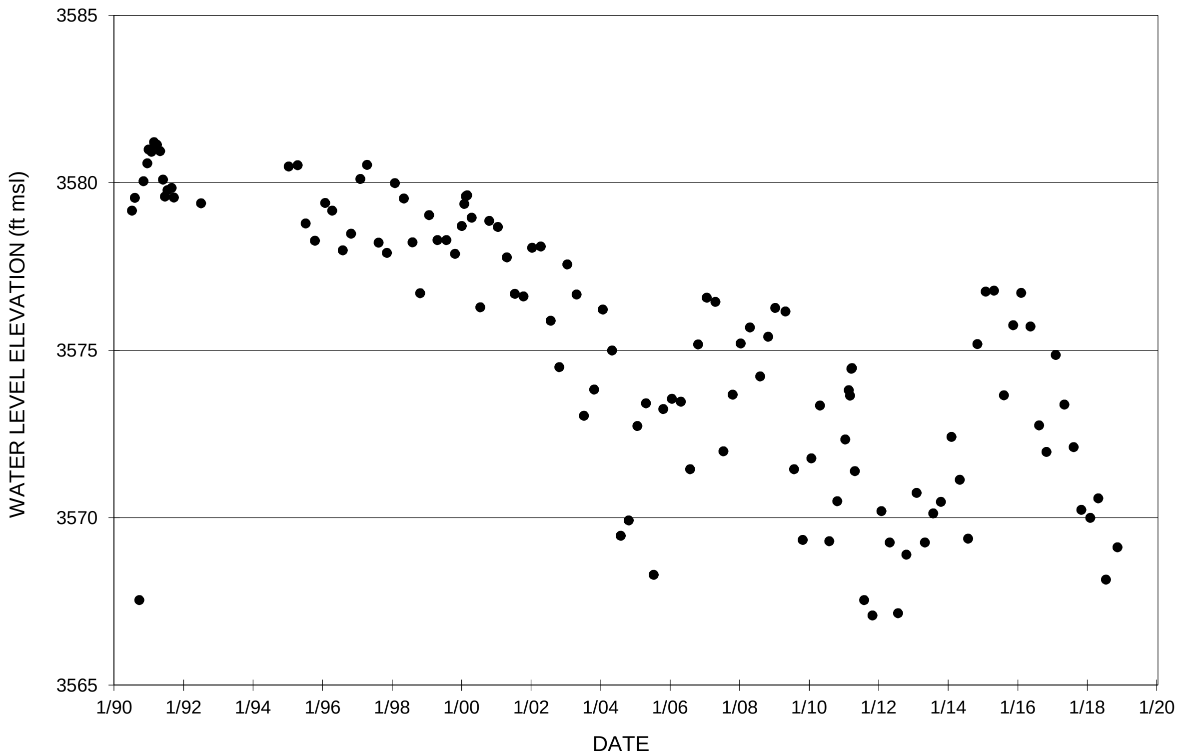
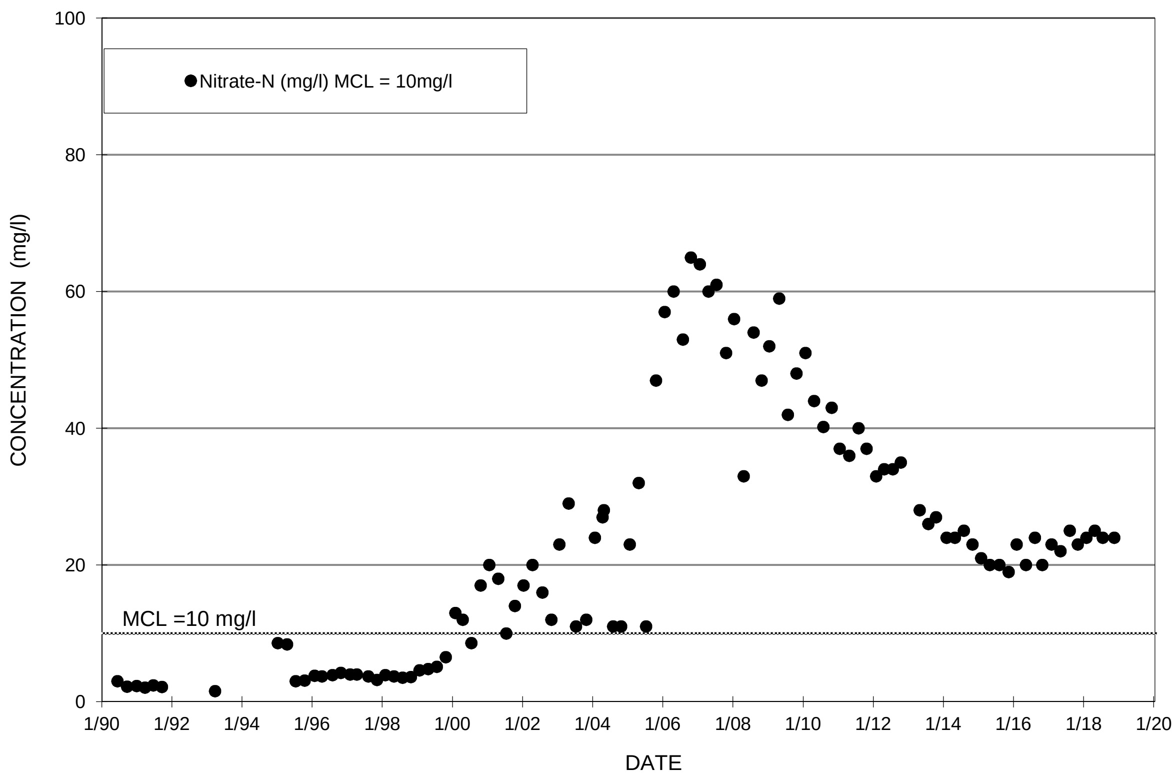


FIGURE A-20 WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SOUTHERN AREA MNA BUFFER ZONE MONITOR WELL MW-33

HARGIS + ASSOCIATES, INC.

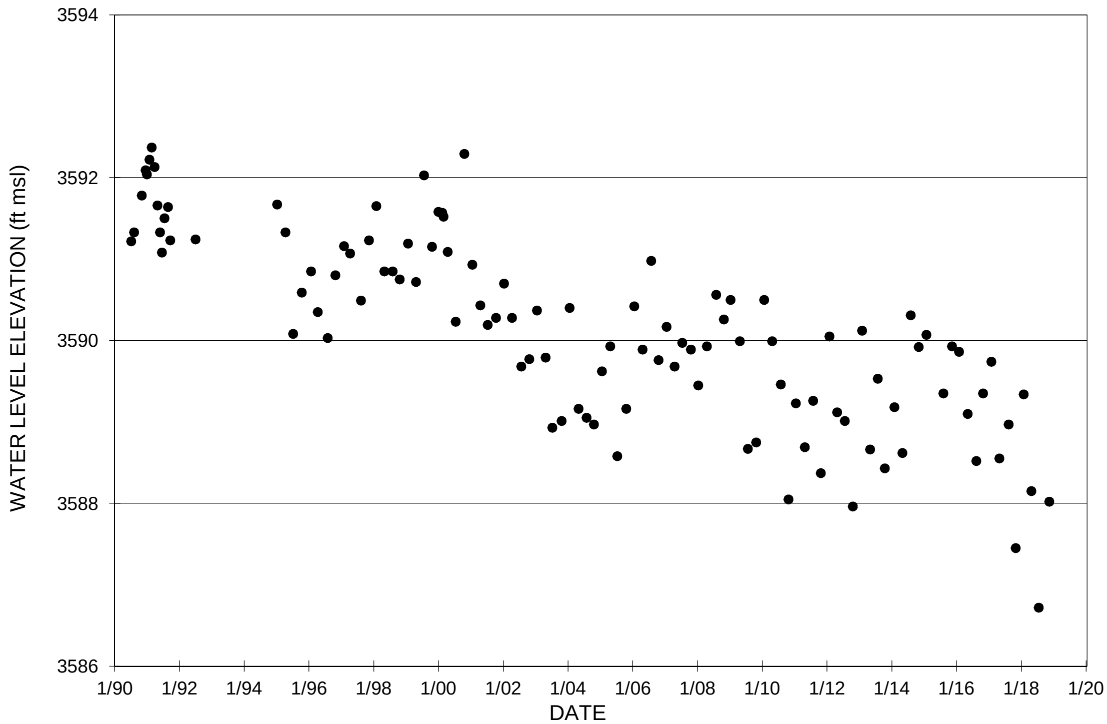


Shallow Aquifer Monitor Well MW-08

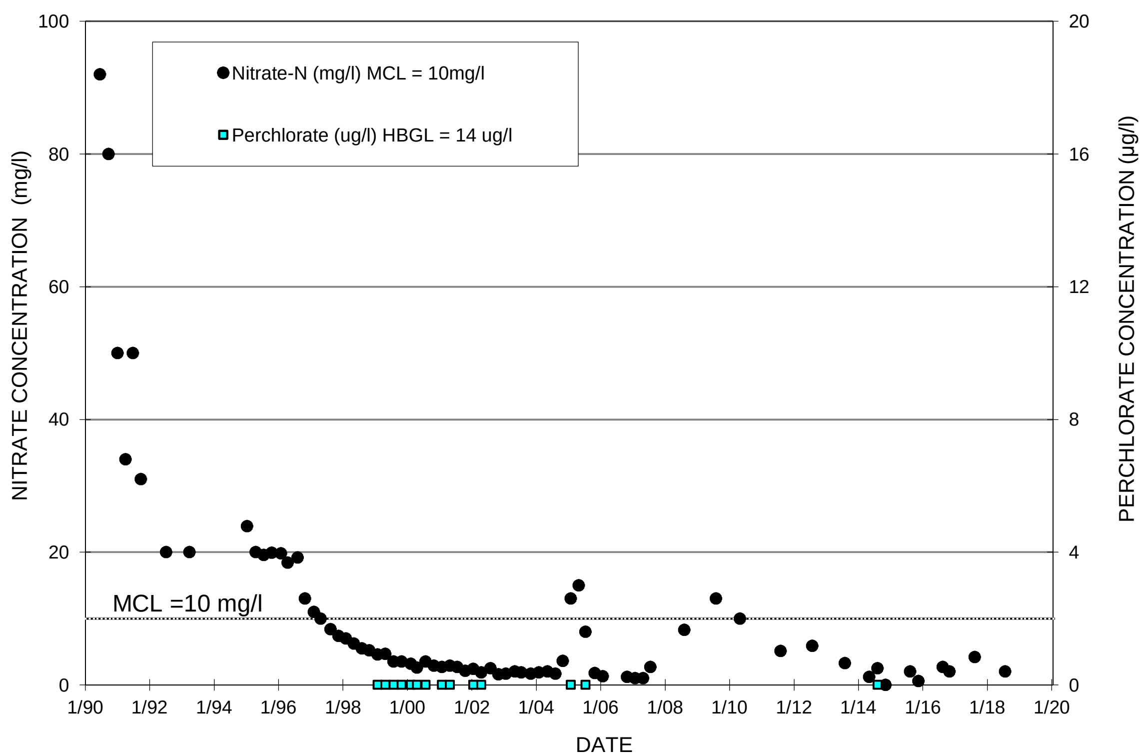


Shallow Aquifer Monitor Well MW-08

FIGURE A-21. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-08

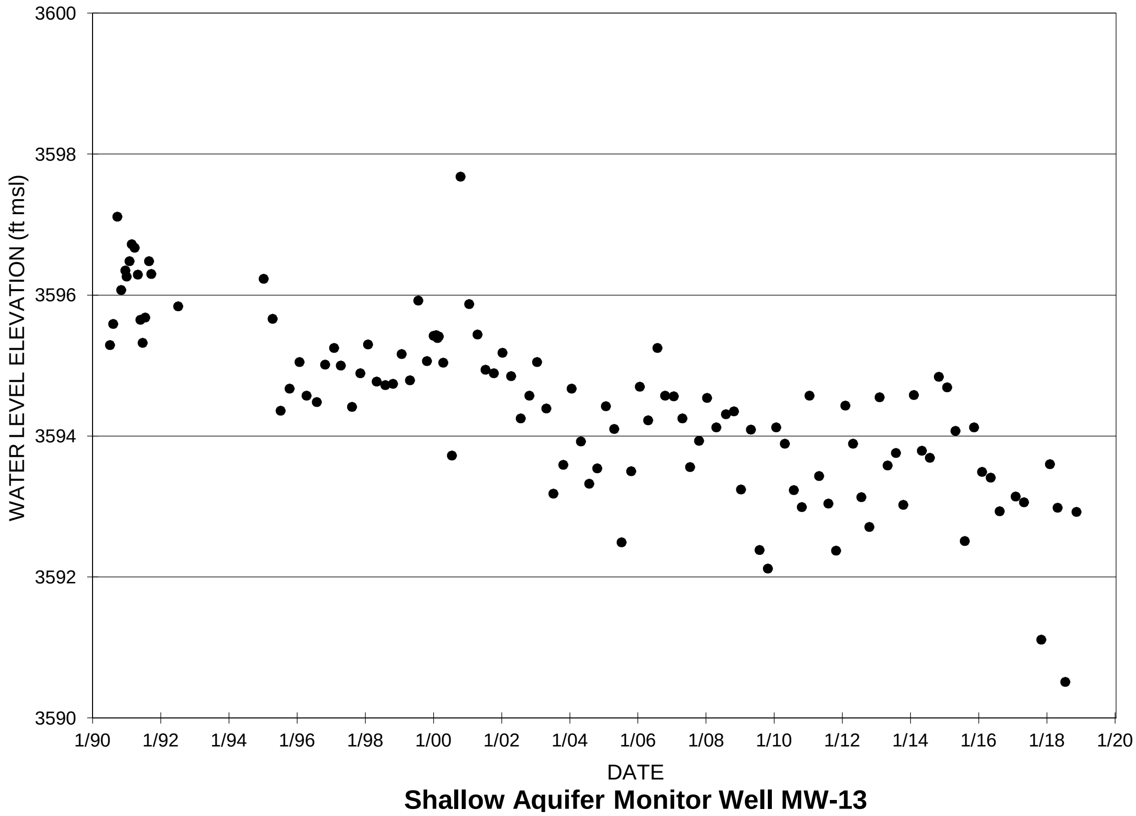


Shallow Aquifer Monitor Well MW-11



Shallow Aquifer Monitor Well MW-11

FIGURE A-22. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-11



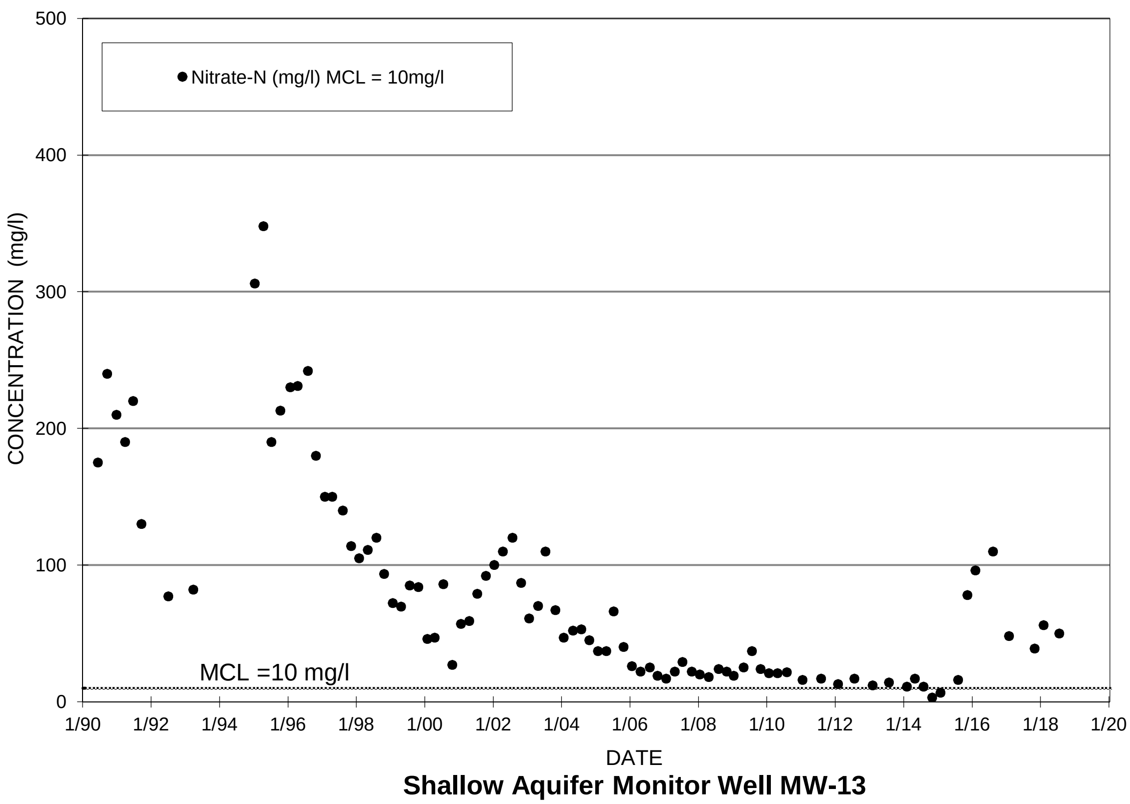
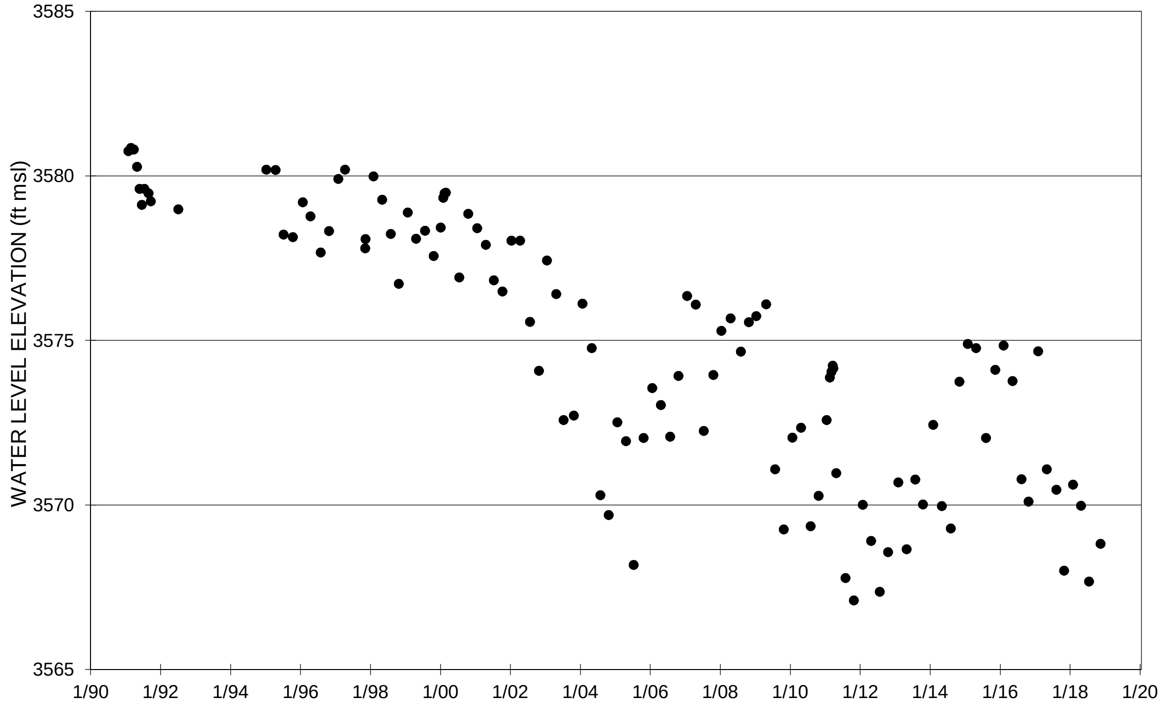
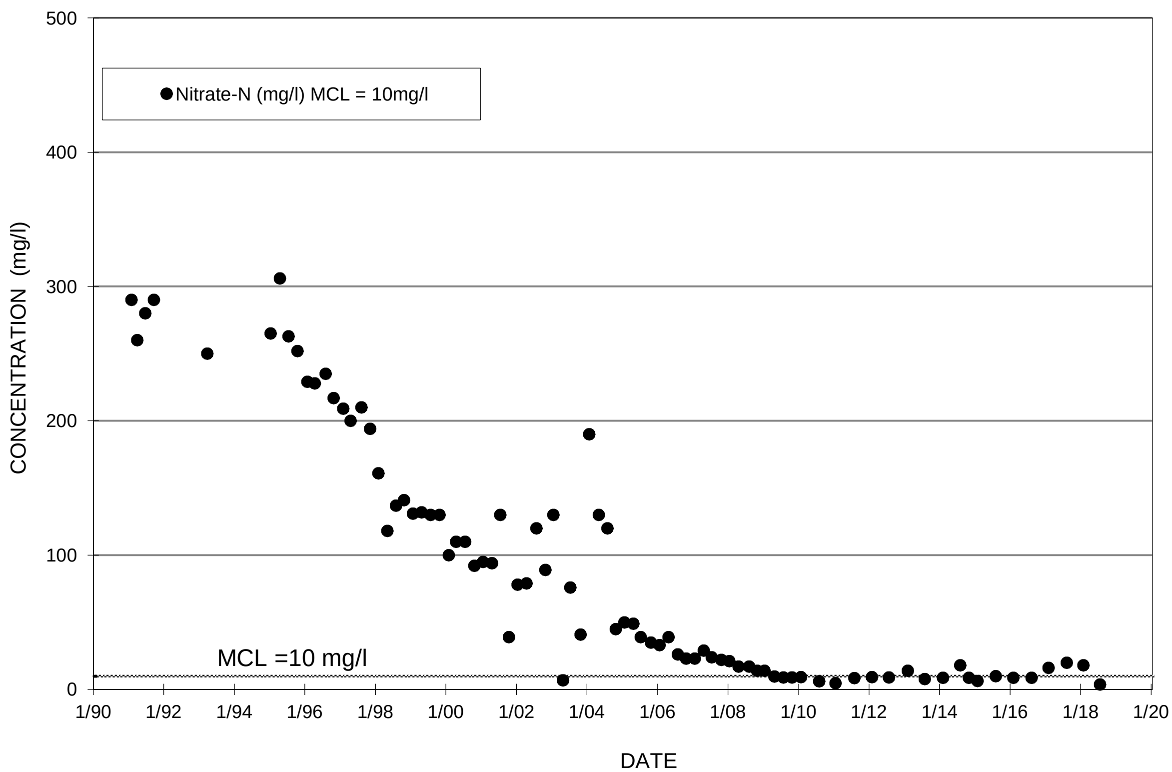


FIGURE A-23. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-13



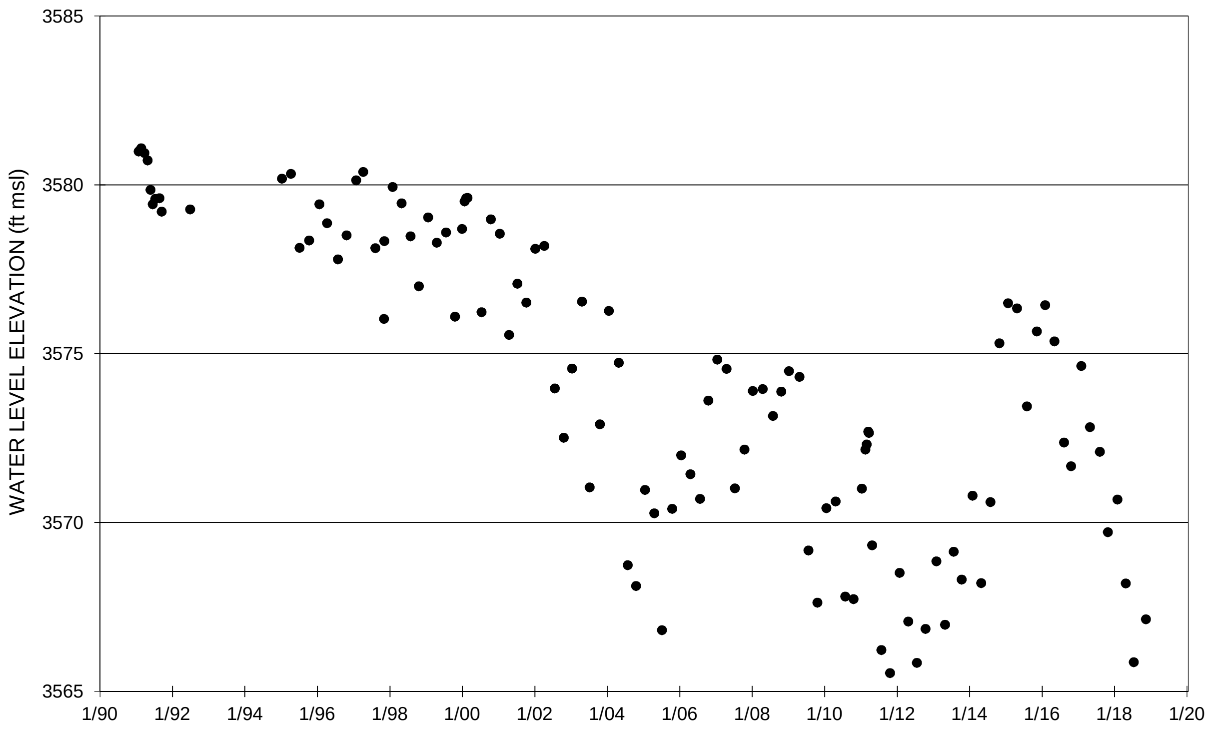
Shallow Aquifer Monitor Well MW-17



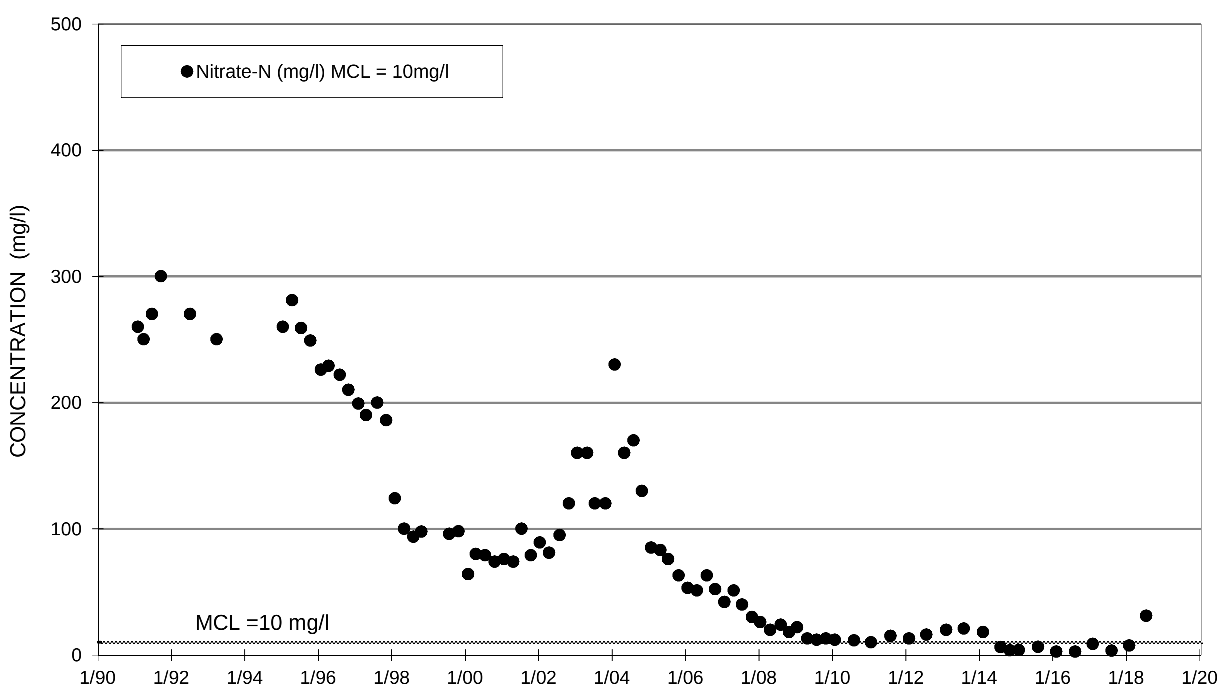
Shallow Aquifer Monitor Well MW-17

FIGURE A-24. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS WELL MW-17

HARGIS + ASSOCIATES, INC.

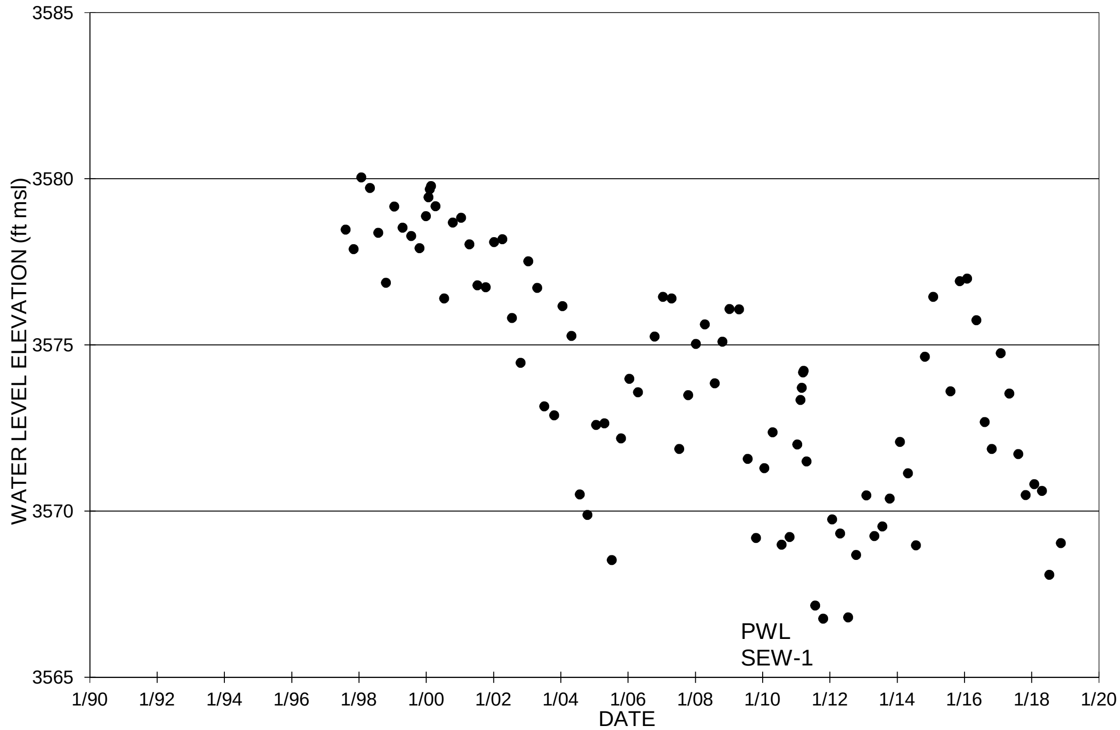


Shallow Aquifer Monitor Well MW-18

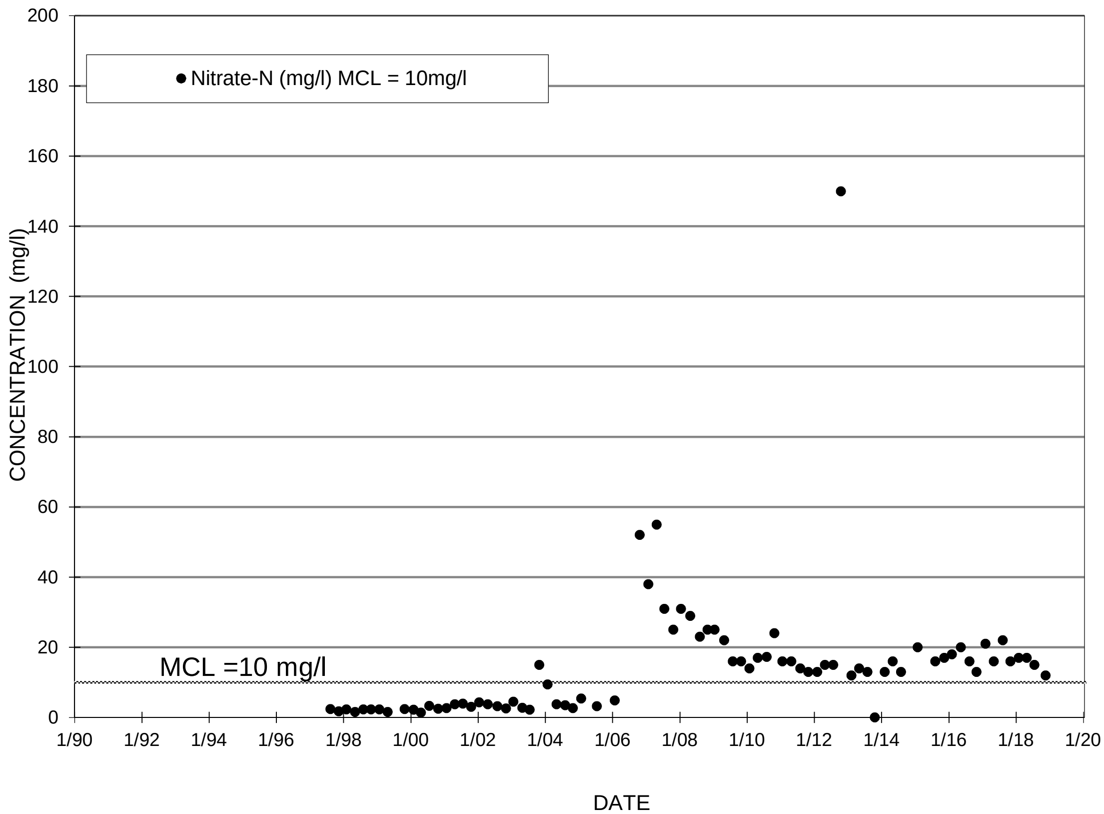


Shallow Aquifer Monitor Well MW-18

FIGURE A-25. WATER LEVEL AND WATER QUALITY HYDROGRAPHS
FOR NARS WELL MW-18

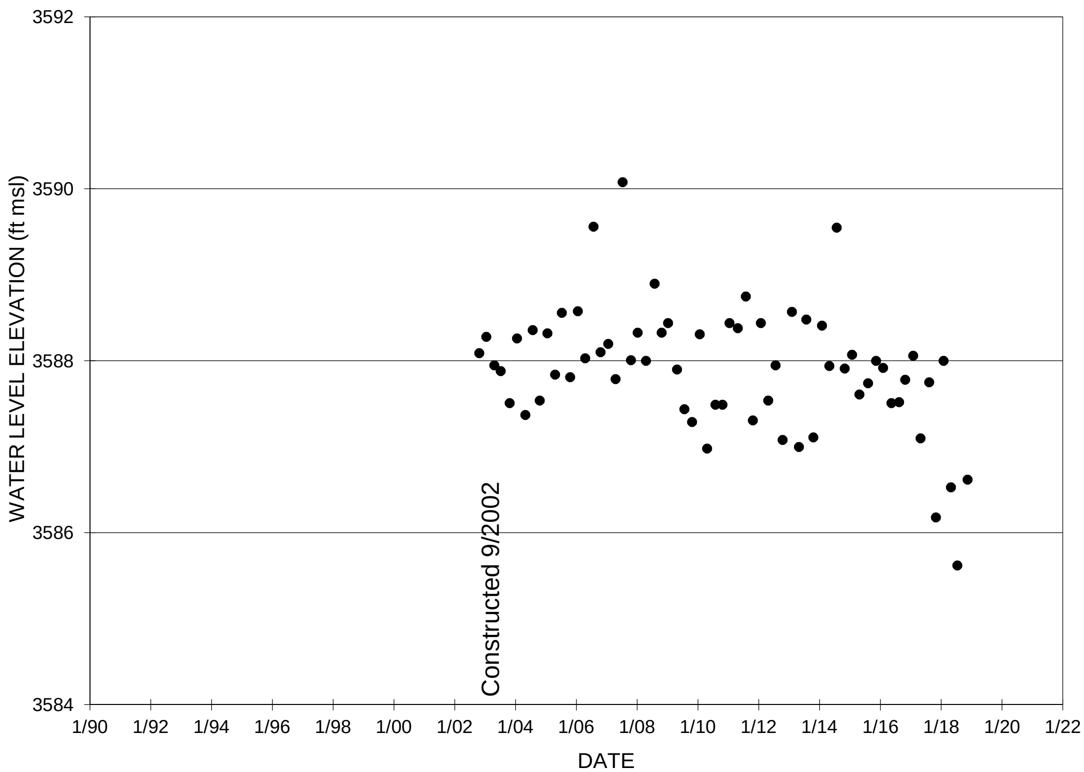


Shallow Aquifer Monitor Well MW-19

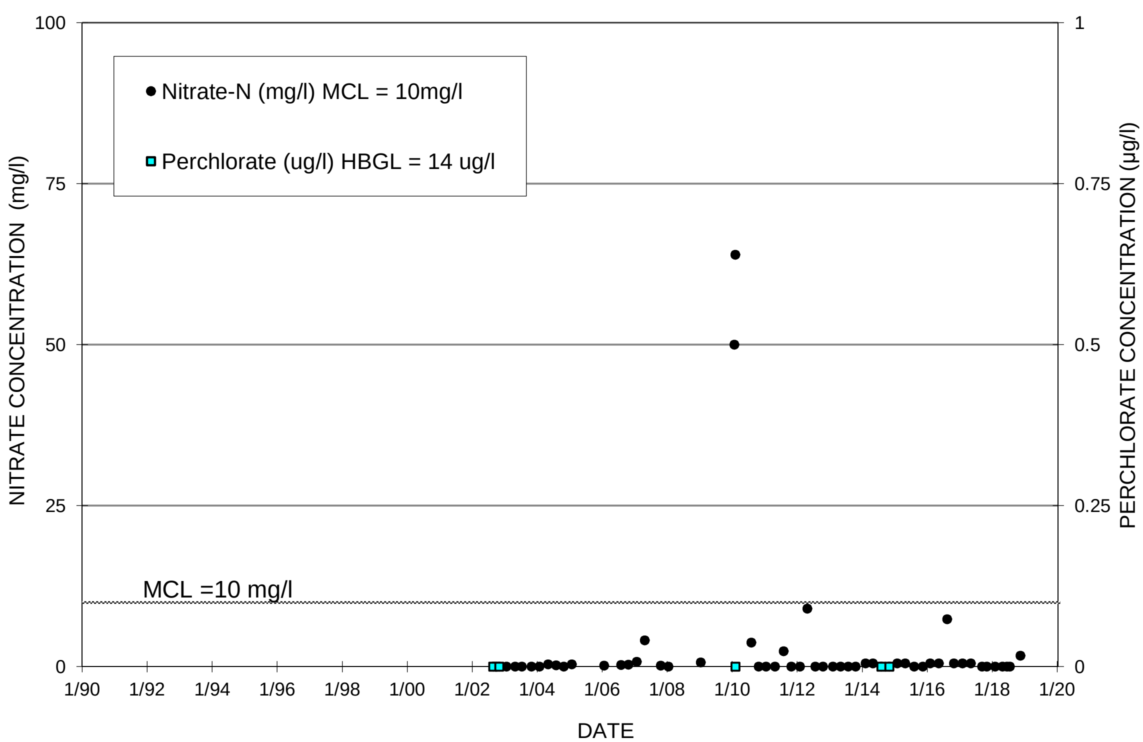


Shallow Aquifer Monitor Well MW-19

FIGURE A-26. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-19



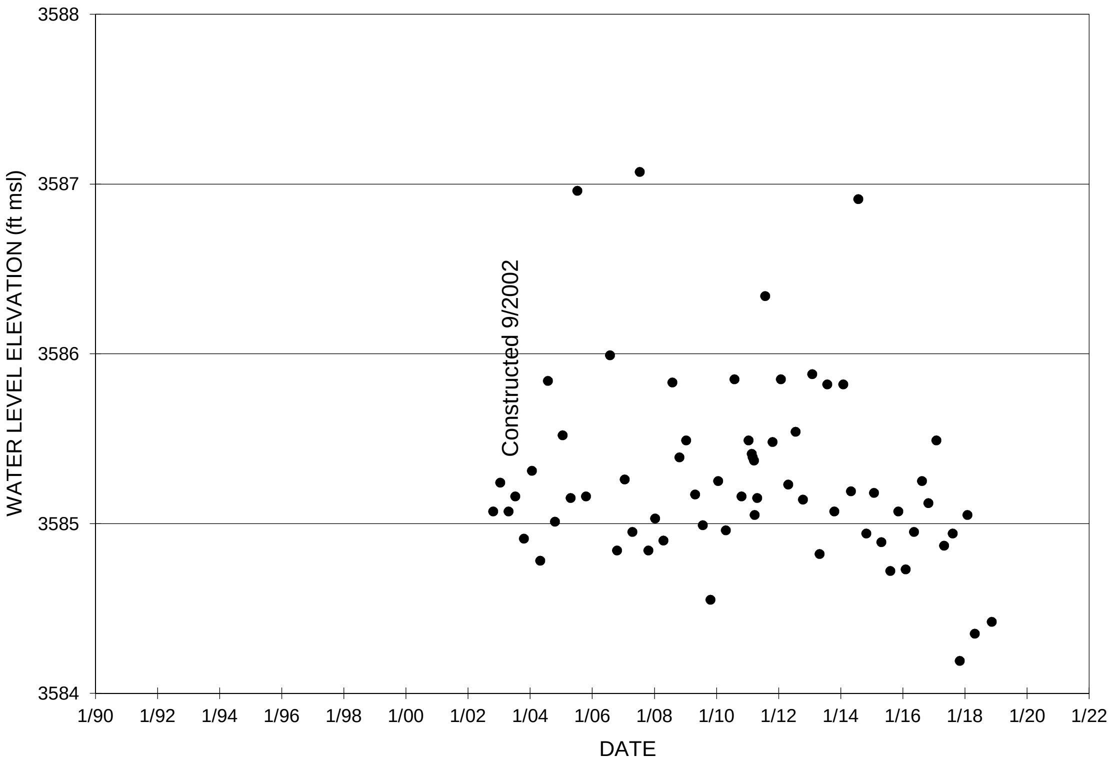
Shallow Aquifer Monitor Well MW-34



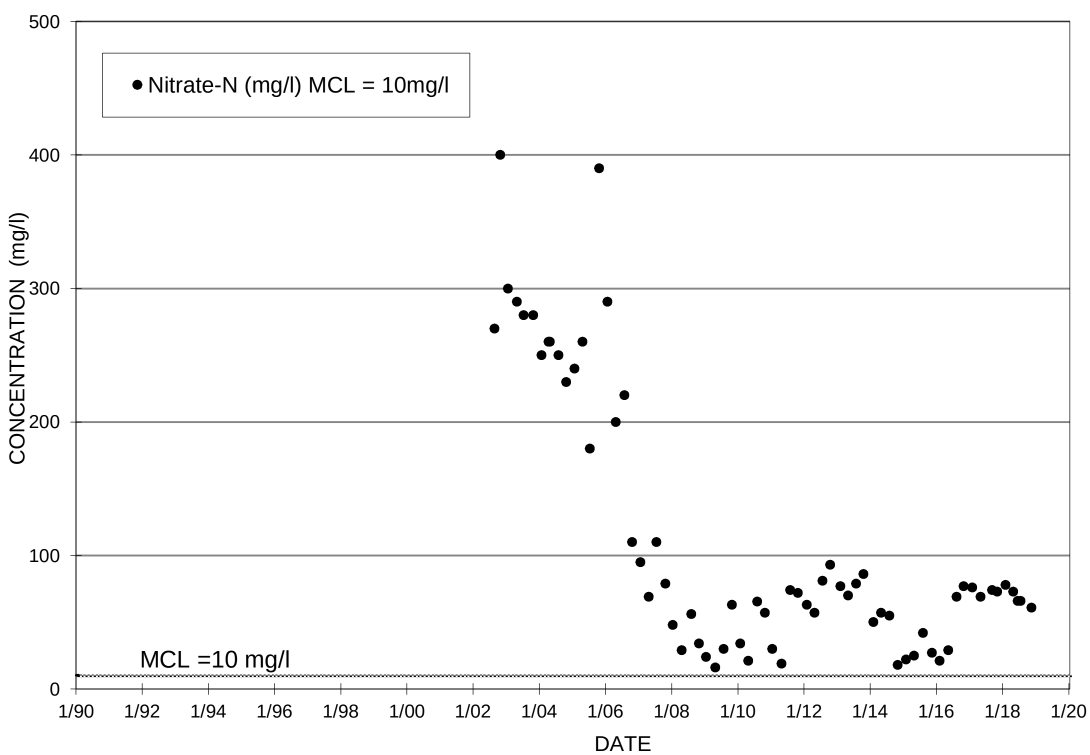
Shallow Aquifer Monitor Well MW-34

FIGURE A-27. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-34

HARGIS + ASSOCIATES, INC.



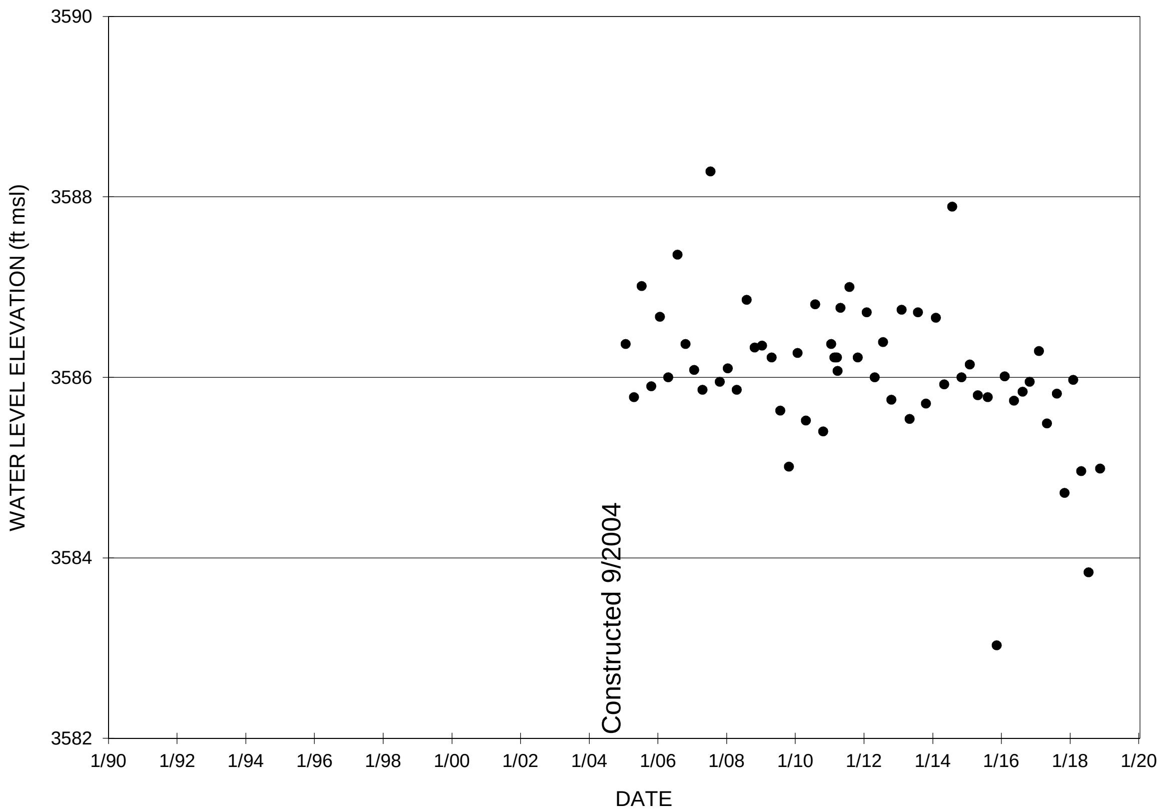
Shallow Aquifer Monitor Well MW-35



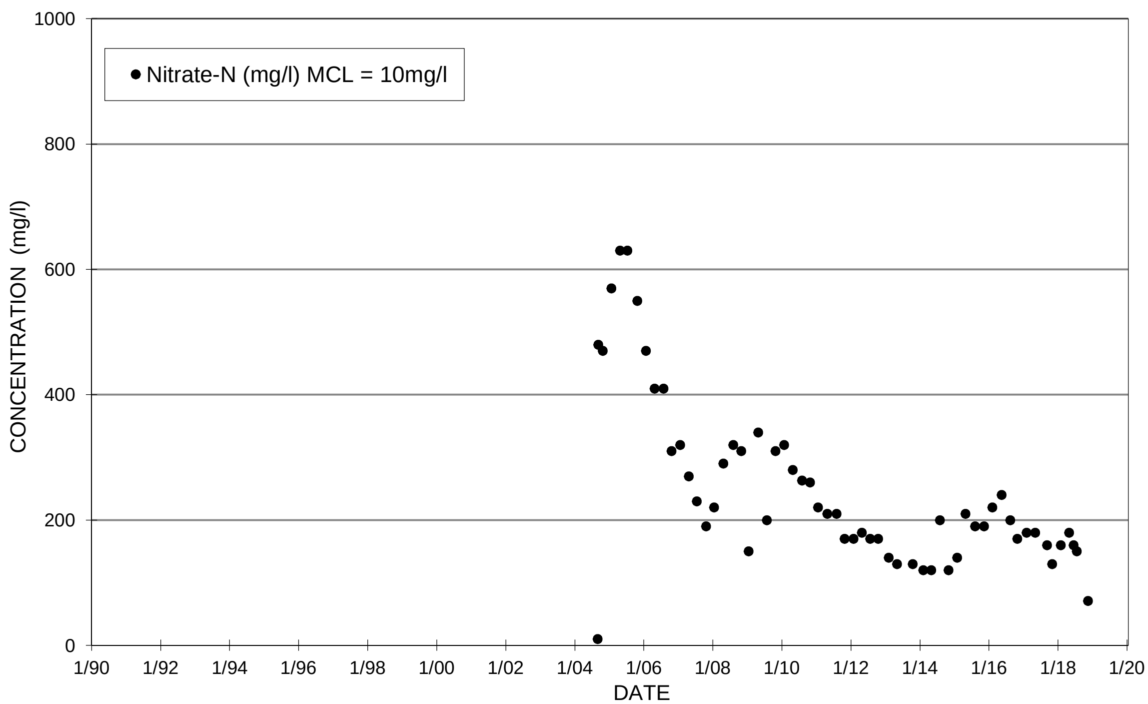
Shallow Aquifer Monitor Well MW-35

FIGURE A-28. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-35

HARGIS + ASSOCIATES, INC.



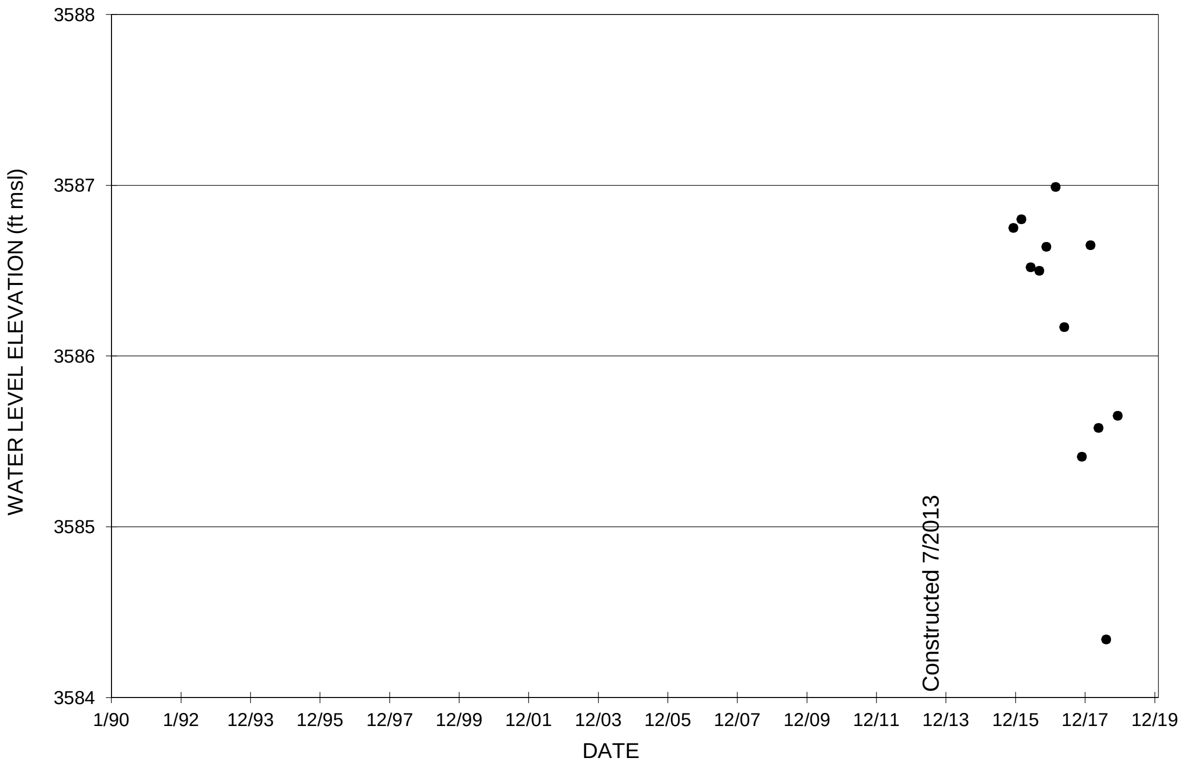
Shallow Aquifer Monitor Well MW-36



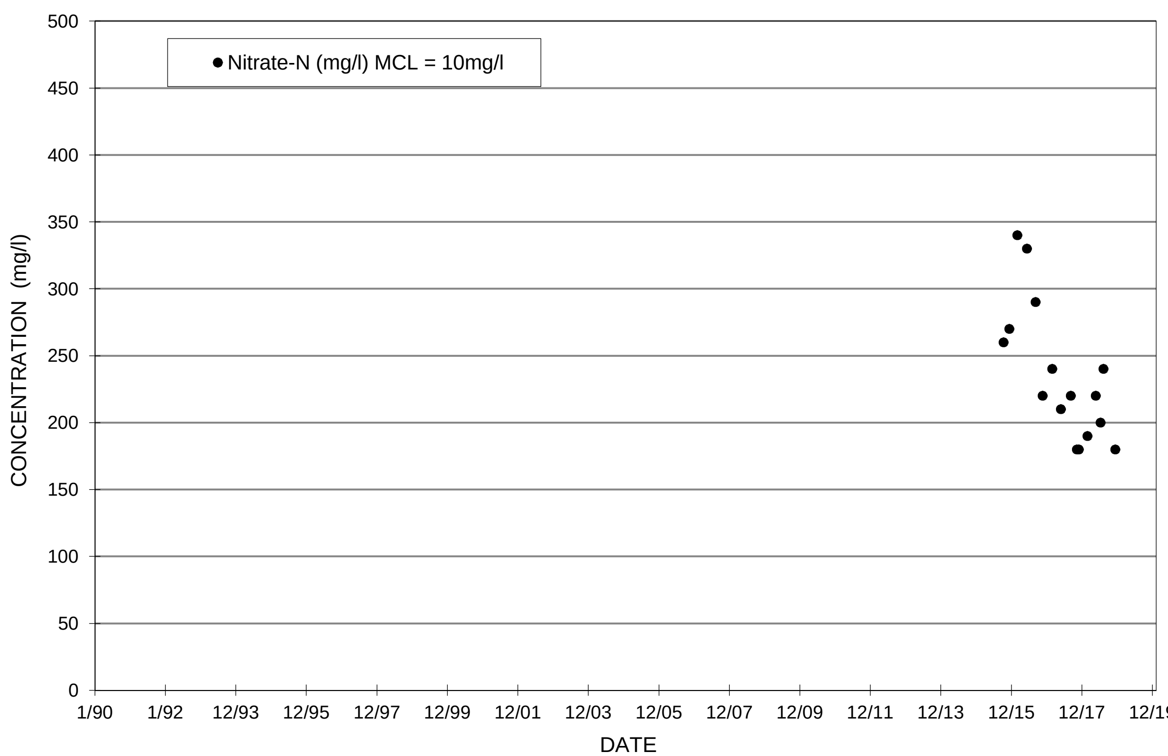
Shallow Aquifer Monitor Well MW-36

FIGURE A-29. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-36

HARGIS + ASSOCIATES, INC.



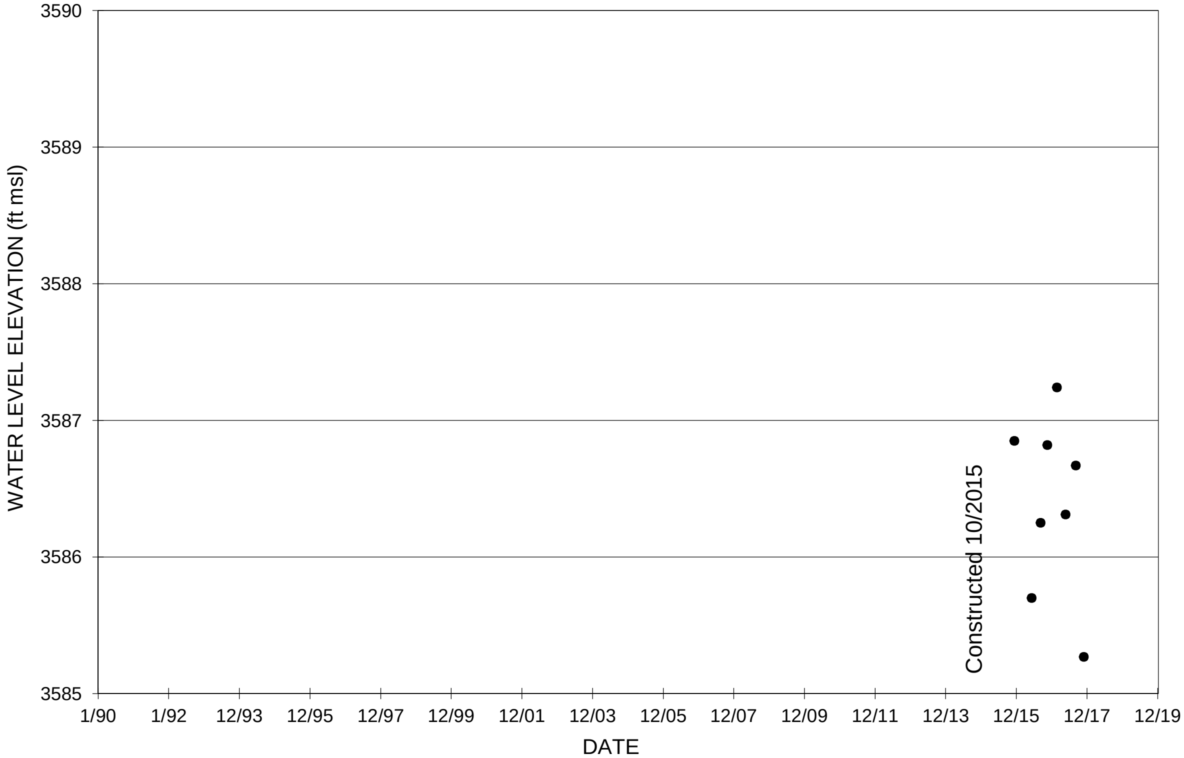
Shallow Aquifer Monitor Well MW-45



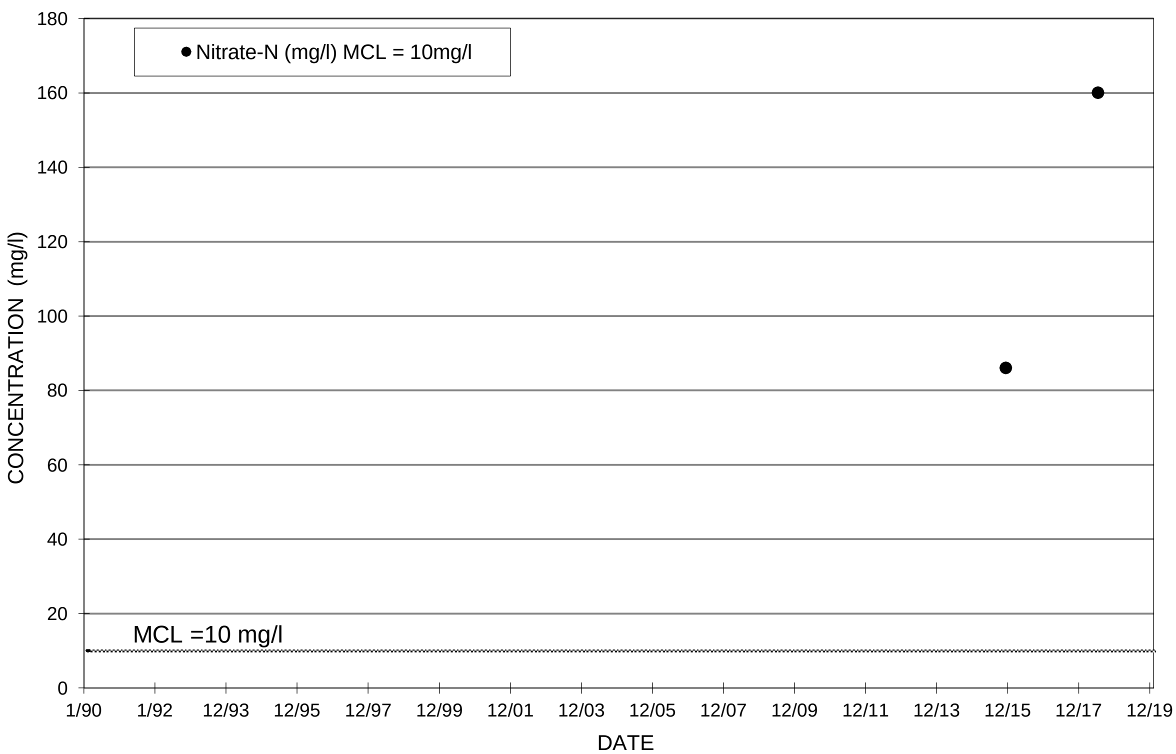
Shallow Aquifer Monitor Well MW-45

FIGURE A-30. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-45

HARGIS + ASSOCIATES, INC.



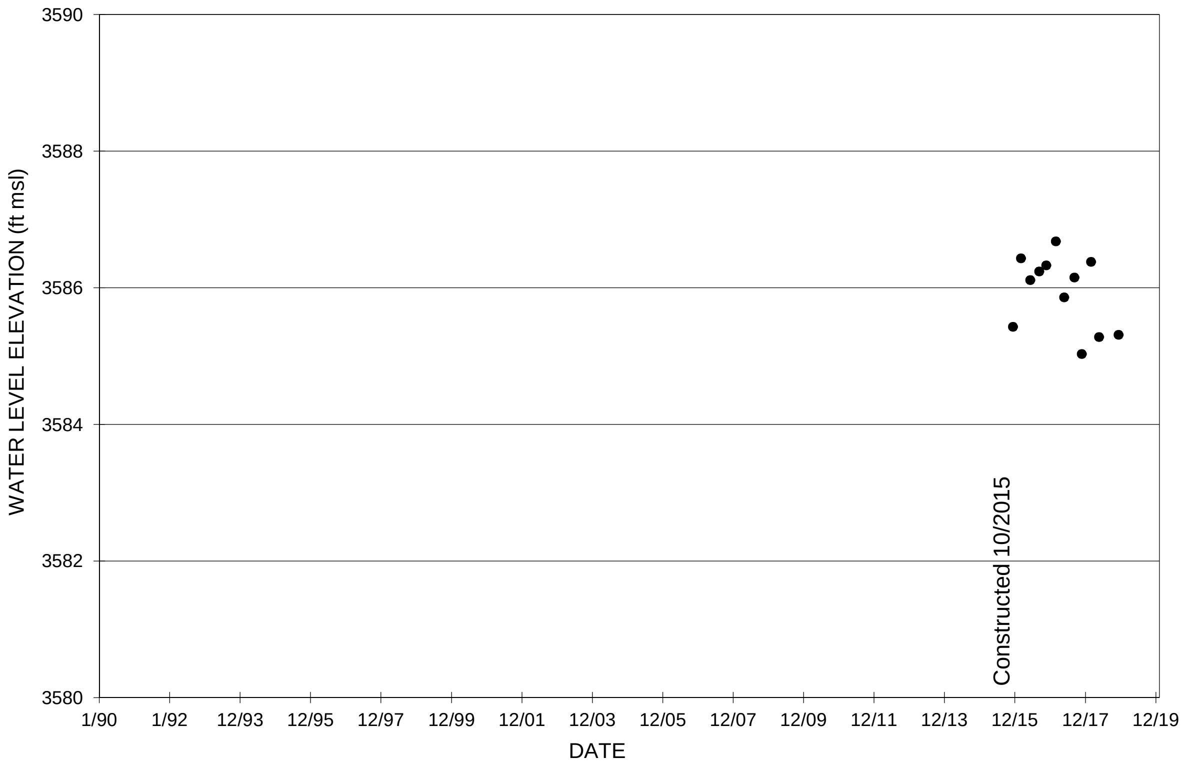
Shallow Aquifer Monitor Well MW-46



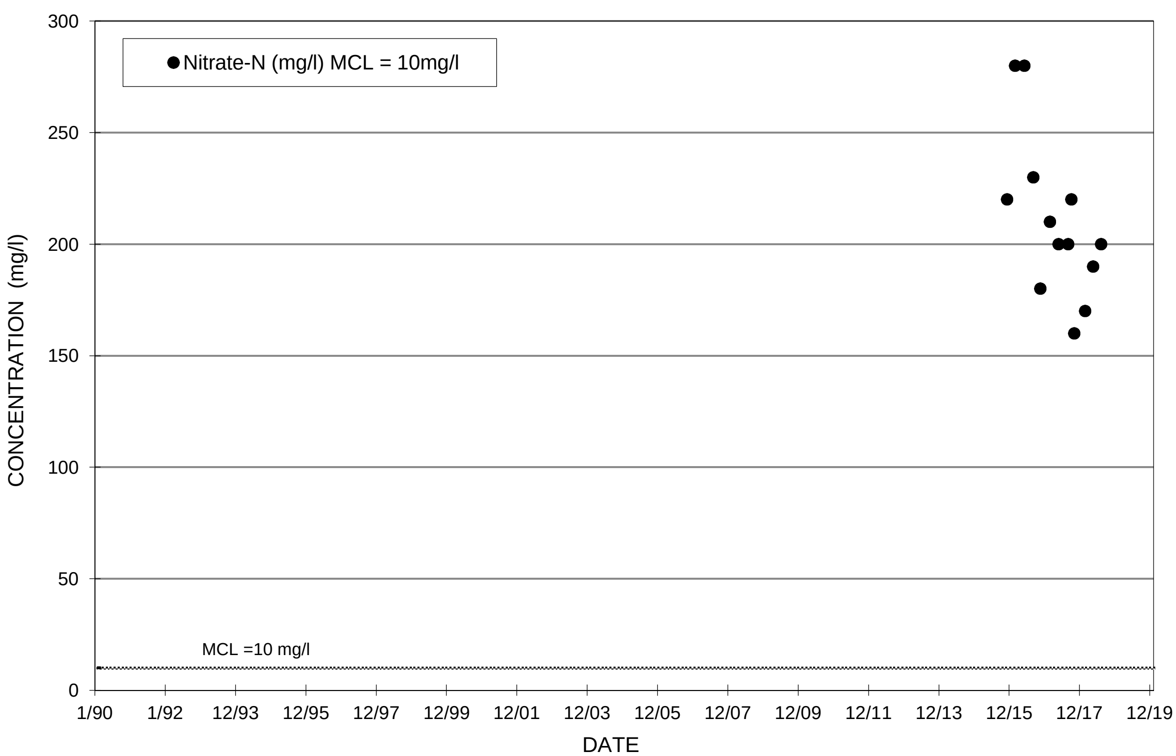
Shallow Aquifer Monitor Well MW-46

FIGURE A-31. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NARS MONITOR WELL MW-46

HARGIS + ASSOCIATES, INC.



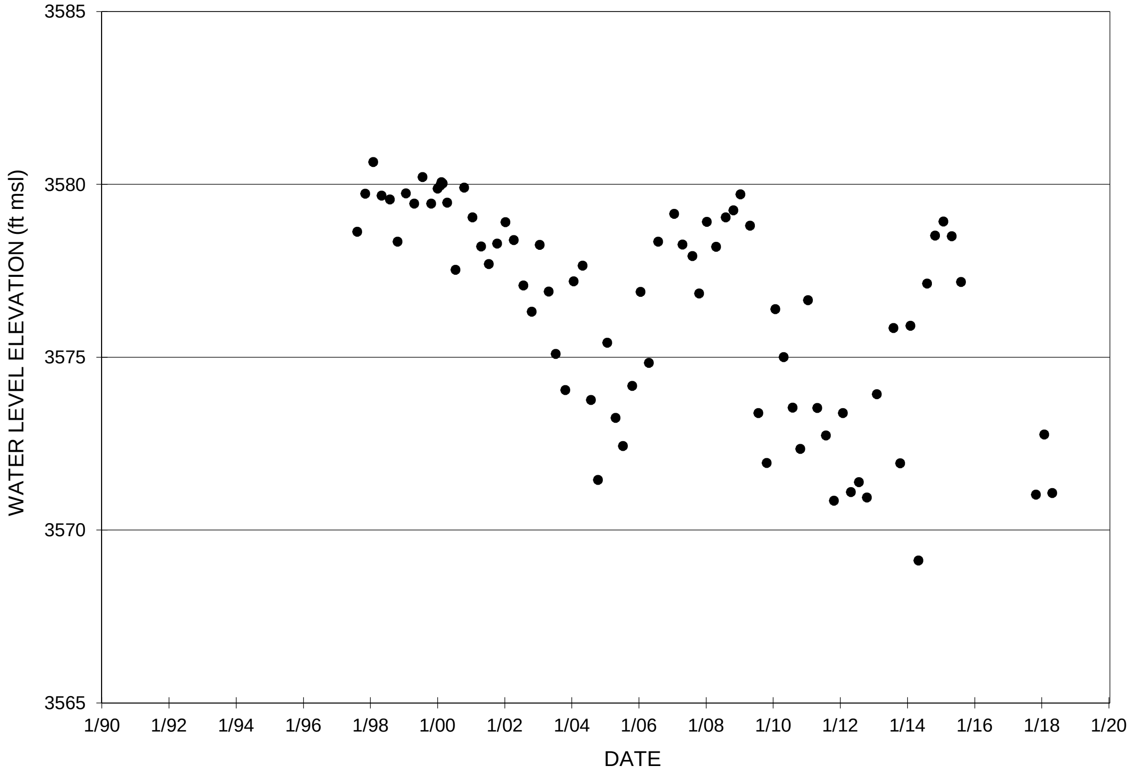
Shallow Aquifer Test Well SEW-02



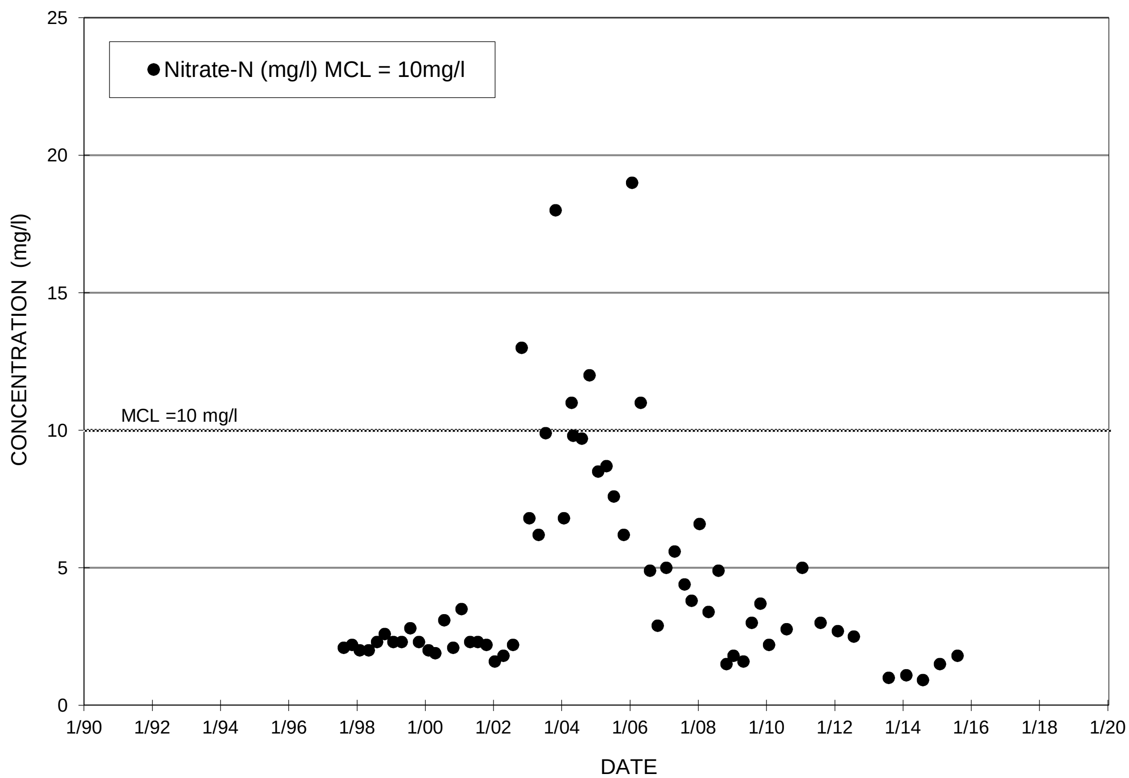
Shallow Aquifer Test Well SEW-02

FIGURE A-32. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR SHALLOW AQUIFER EXTRACTION WELL SEW-02 (FORMERLY TEST WELL TW-01)

HARGIS + ASSOCIATES, INC.

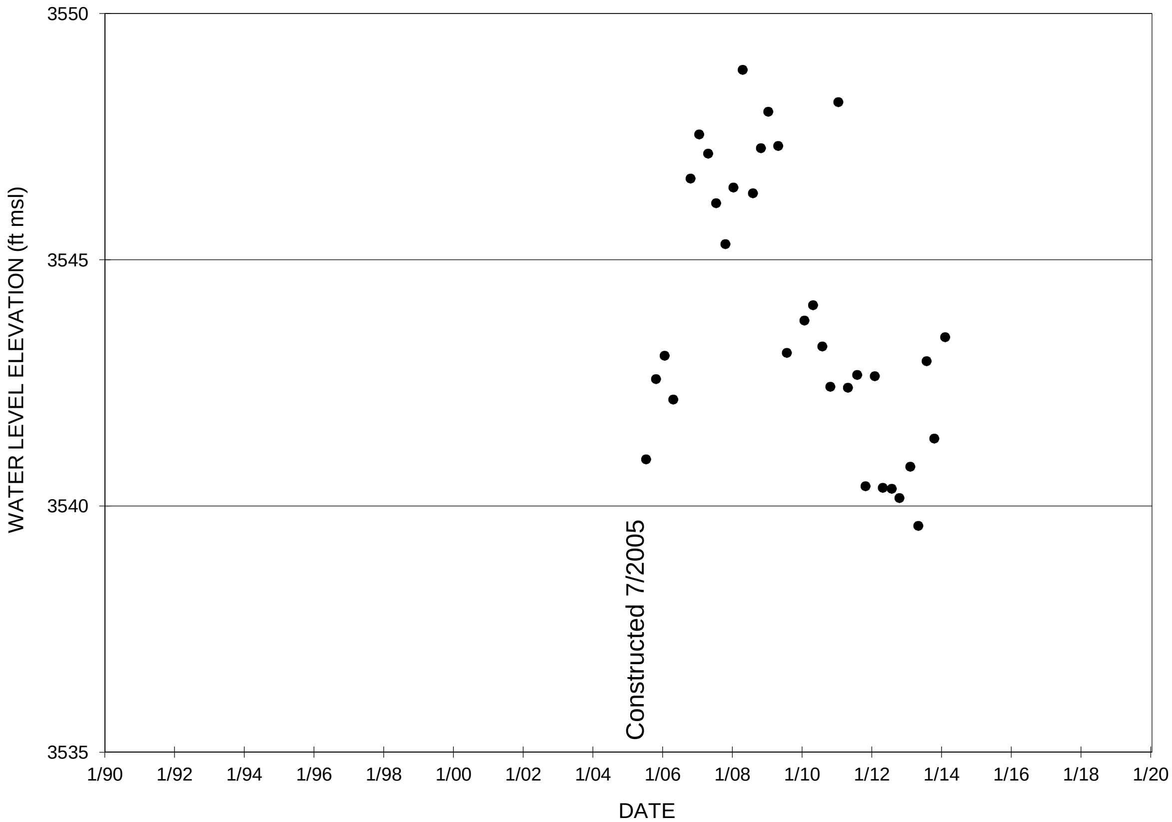


Shallow Aquifer Monitor Well MW-20

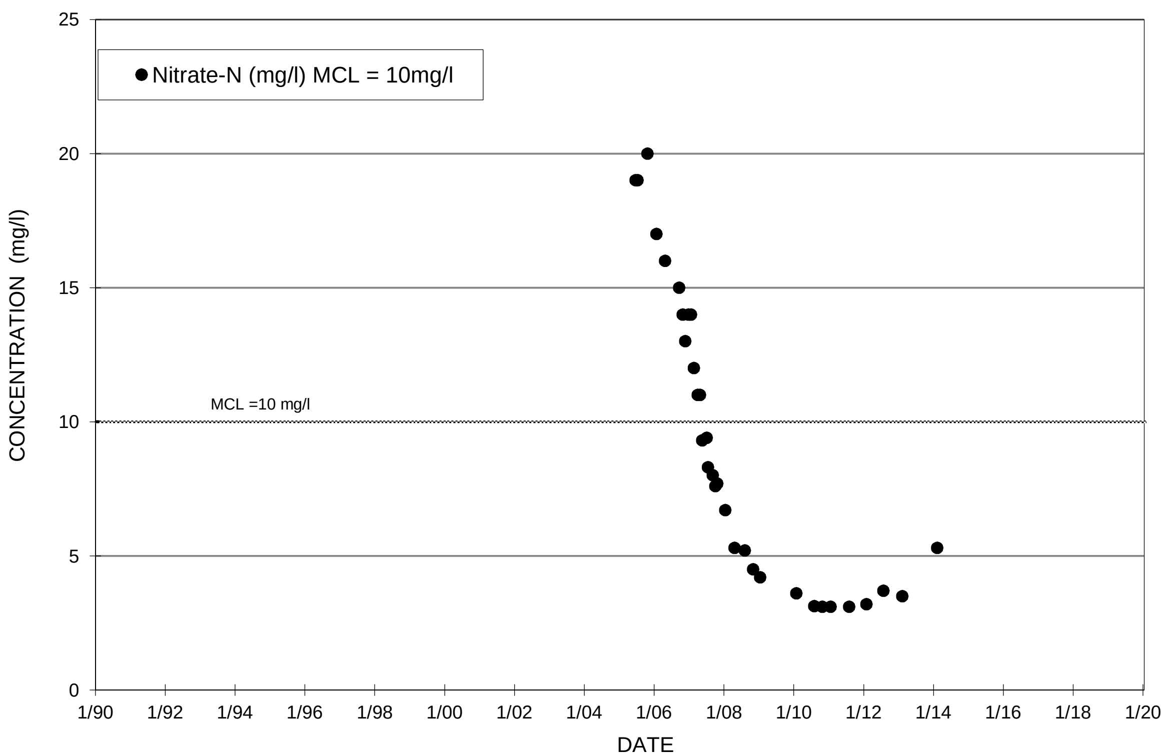


Shallow Aquifer Monitor Well MW-20

FIGURE A-33. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE MONITOR WELL MW-20

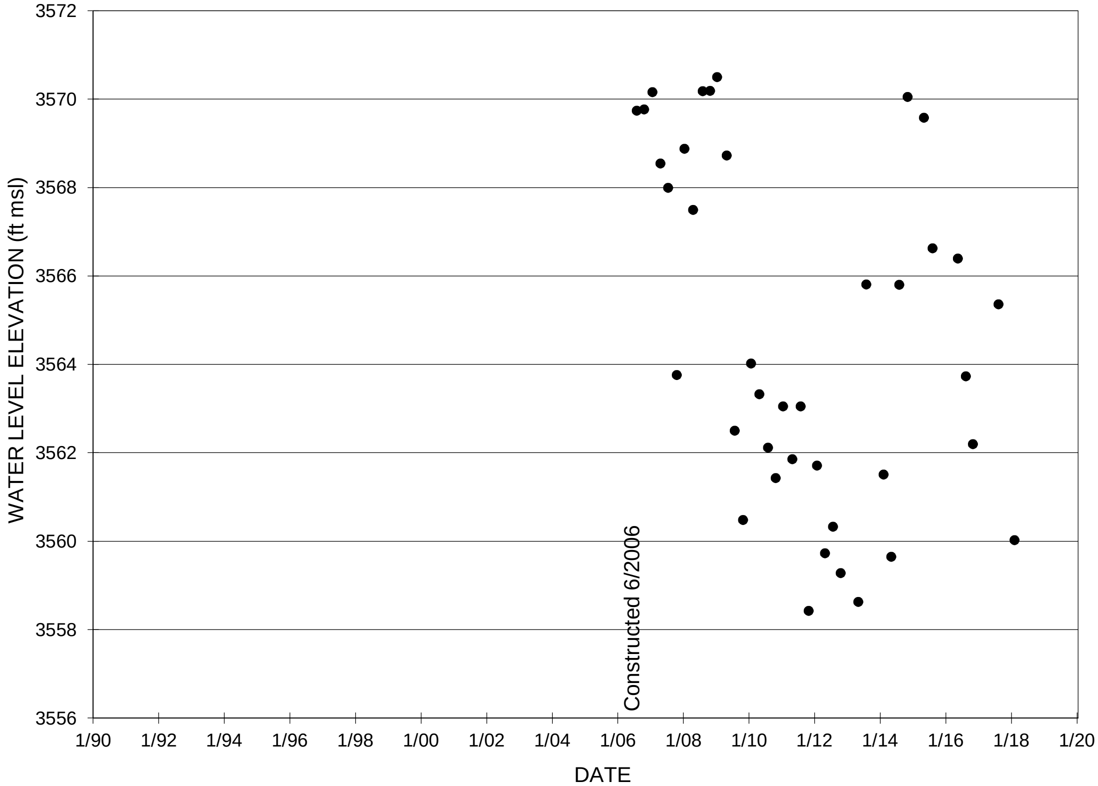


Shallow Aquifer Monitor Well MW-38

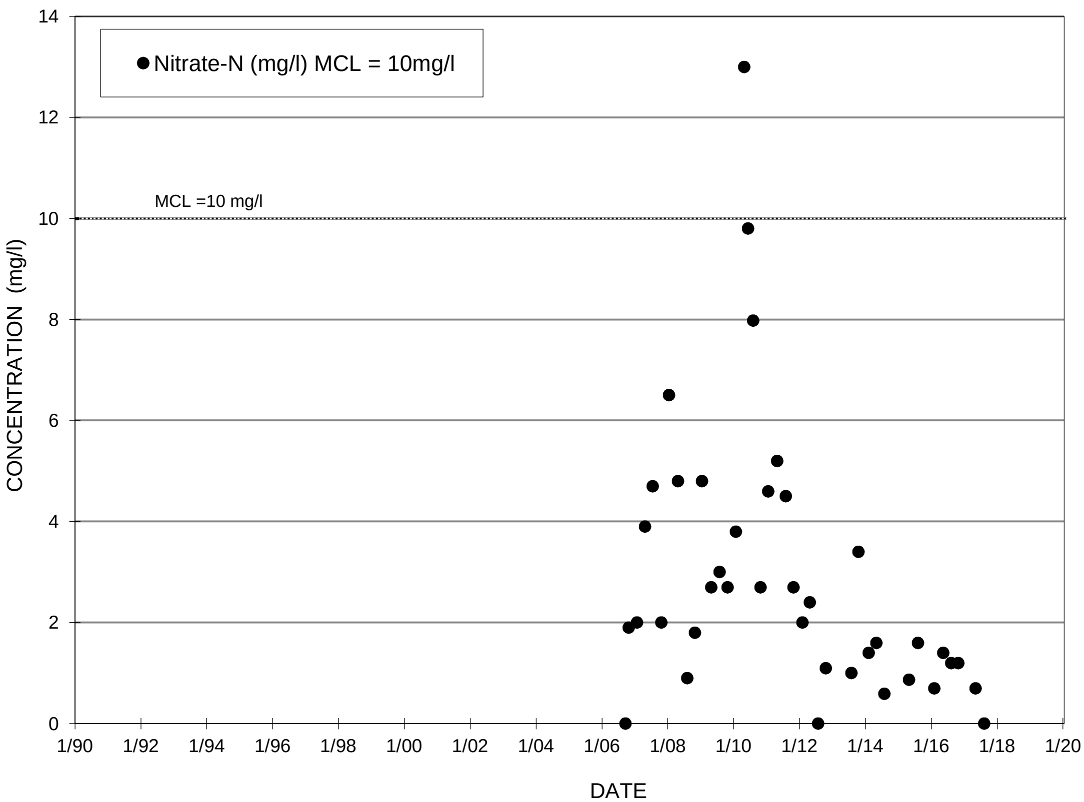


Shallow Aquifer Monitor Well MW-38

FIGURE A-34. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE MONITOR WELL MW-38

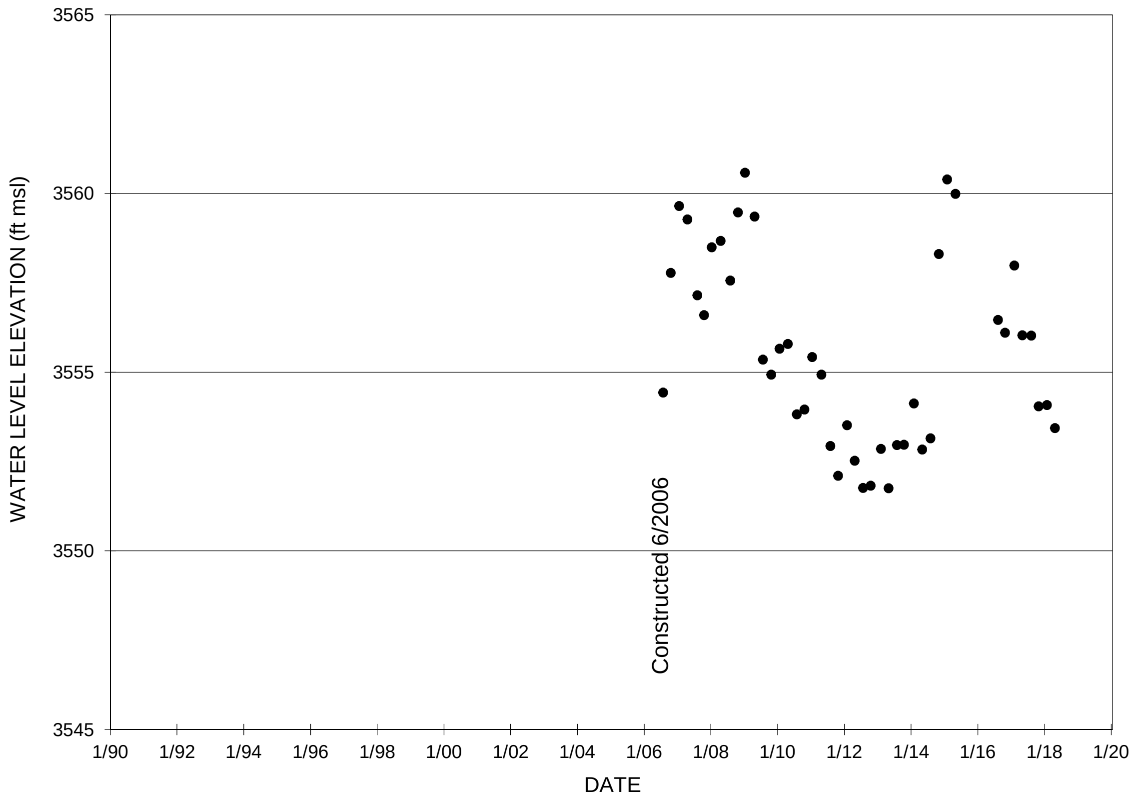


Shallow Aquifer Monitor Well MW-40

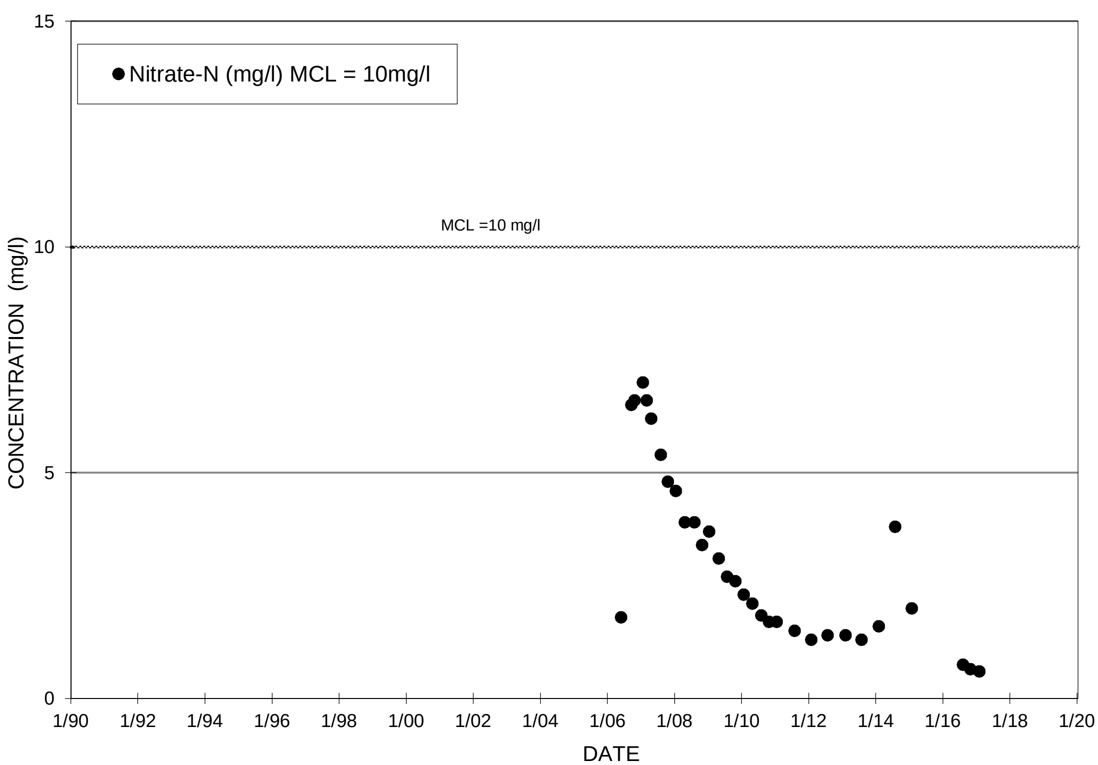


Shallow Aquifer Monitor Well MW-40

FIGURE A-35. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA SENTINEL MONITOR WELL MW-40



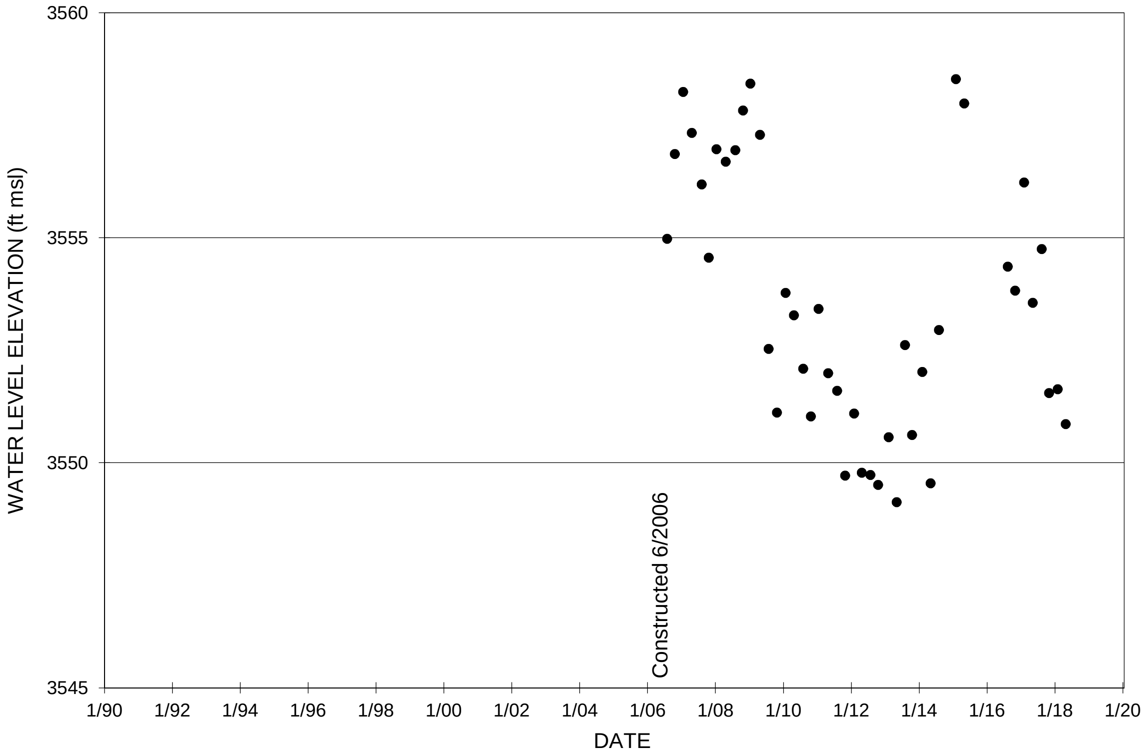
Shallow Aquifer Monitor Well MW-41A



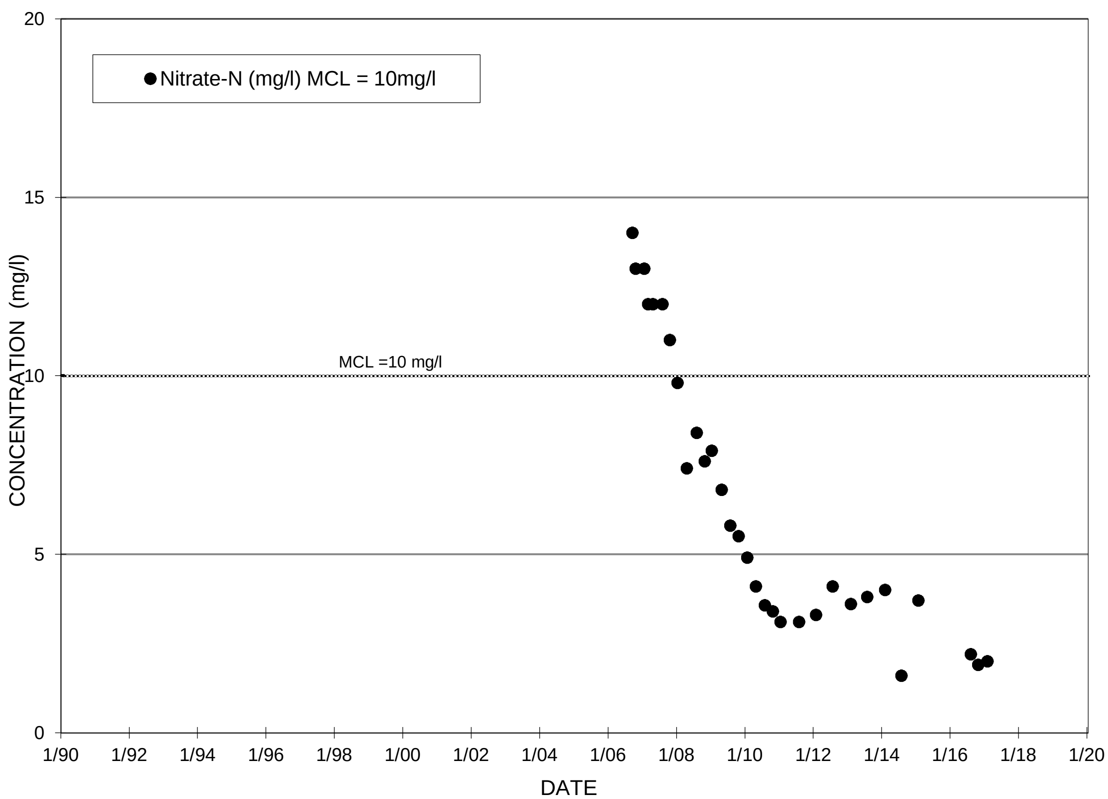
Shallow Aquifer Monitor Well MW-41A

FIGURE A-36. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE MONITOR WELL MW-41A

HARGIS + ASSOCIATES, INC.

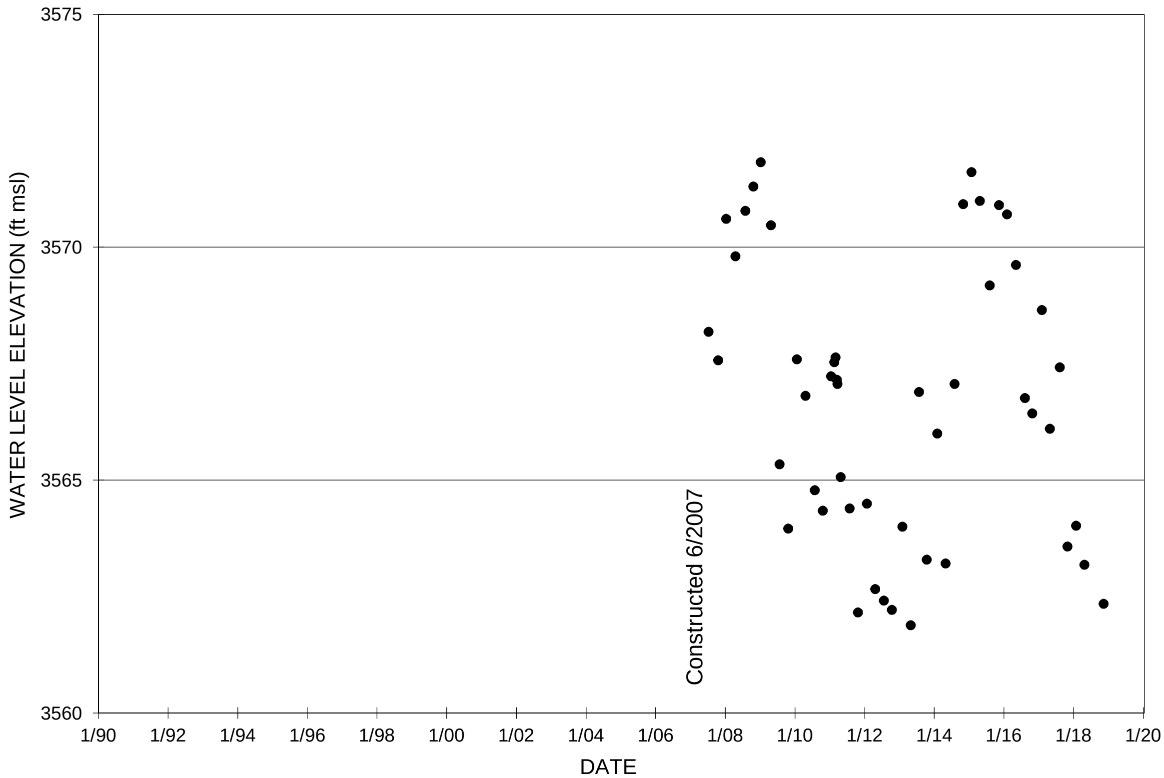


Shallow Aquifer Monitor Well MW-41B

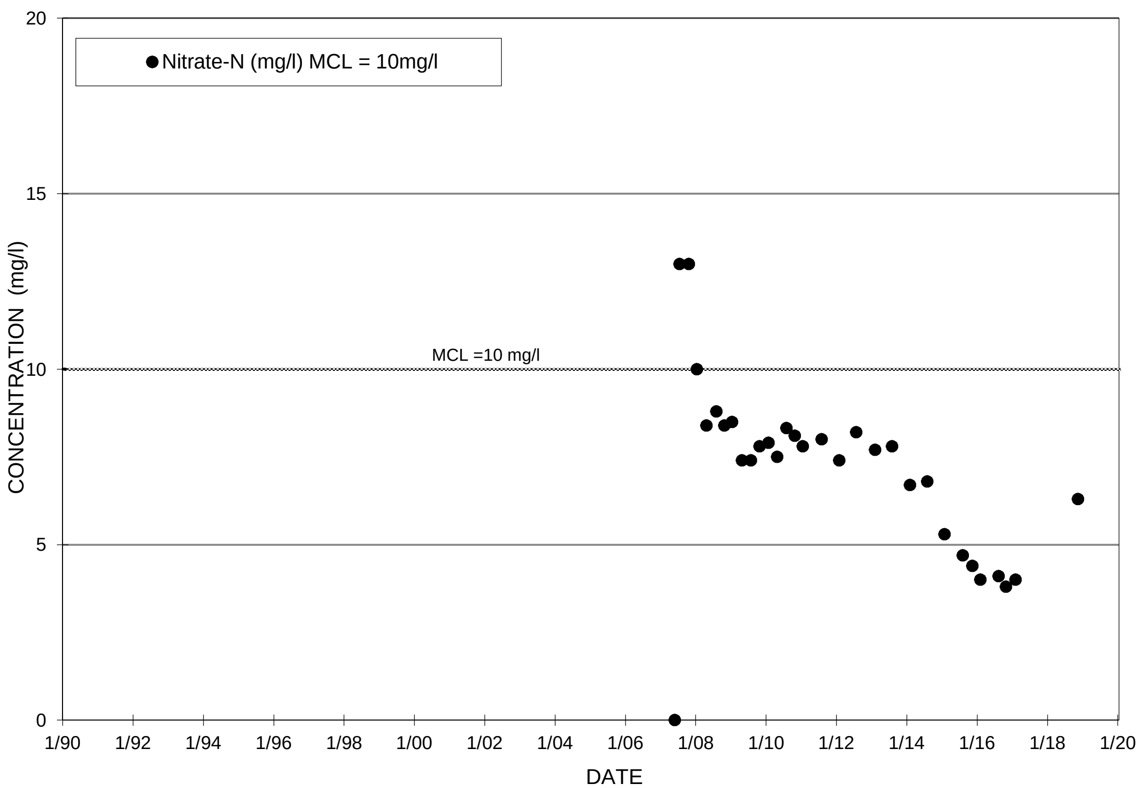


Shallow Aquifer Monitor Well MW-41B

FIGURE A-37. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE MONITOR WELL MW-41B



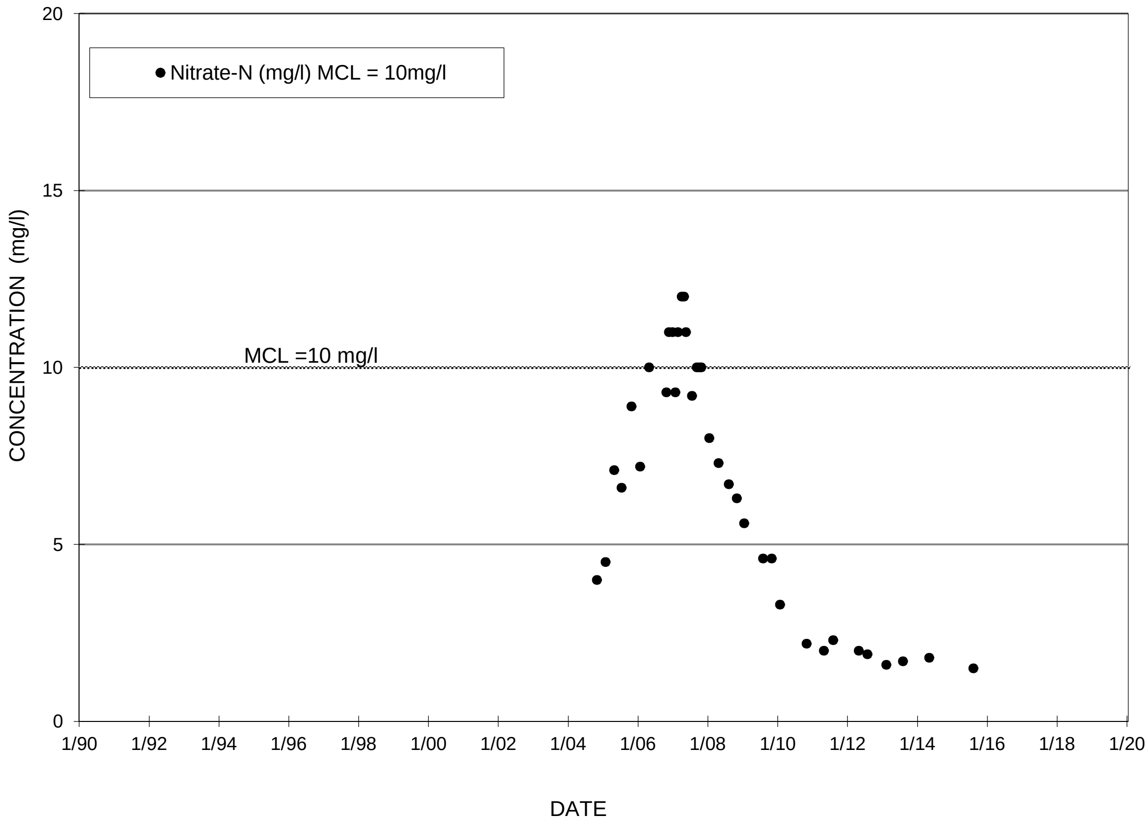
Shallow Aquifer Monitor Well MW-42

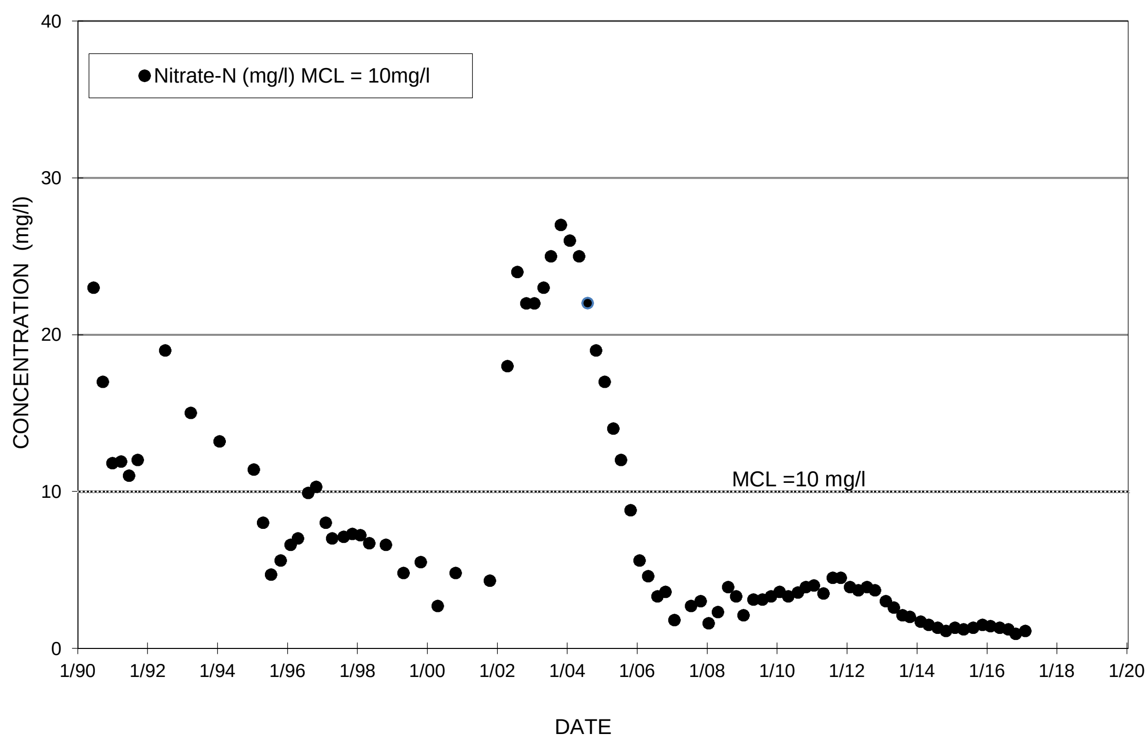


Shallow Aquifer Monitor Well MW-42

FIGURE A-38. WATER LEVEL AND WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE MONITOR WELL MW-42

HARGIS + ASSOCIATES, INC.

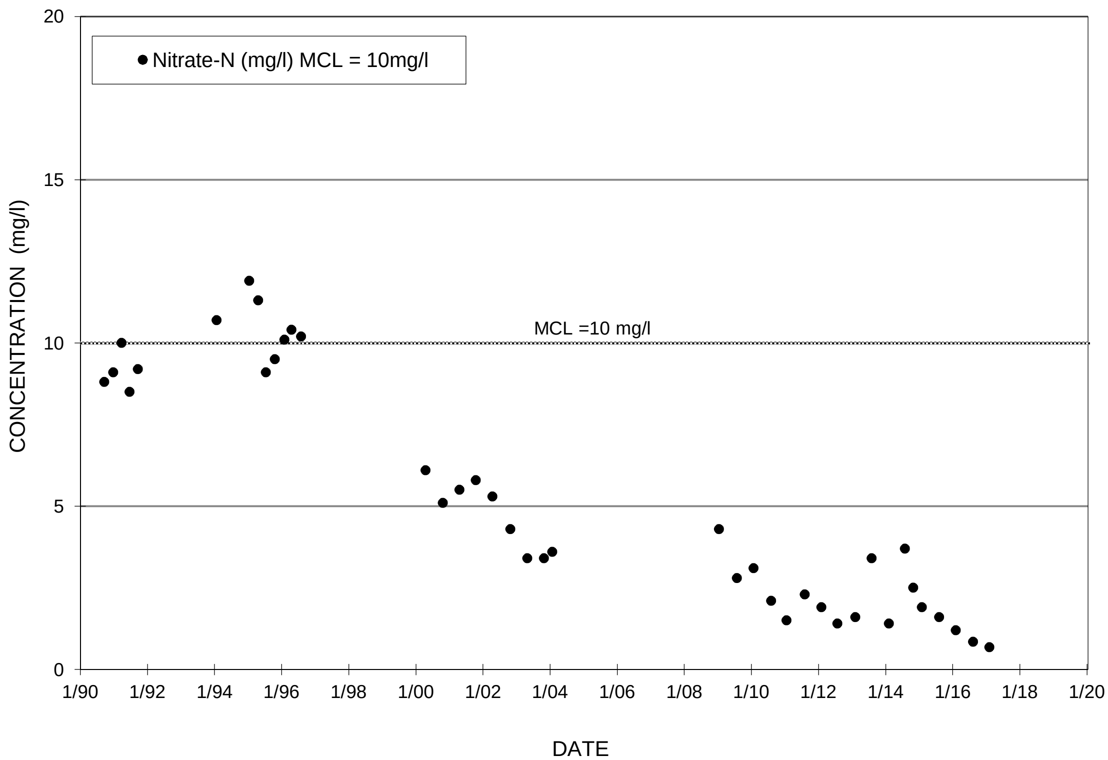




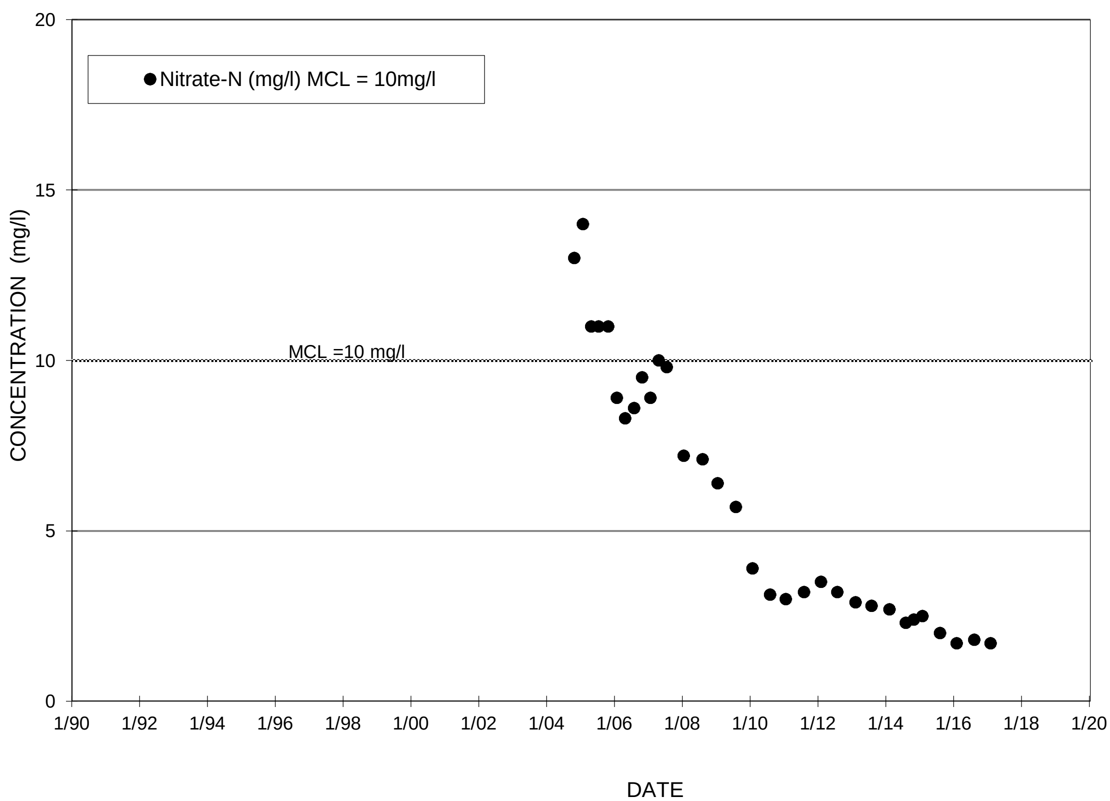
Shallow Aquifer Private Well D(17-20)36aad1

FIGURE A-39. WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE PRIVATE WELLS D(17-20)25bad AND D(17-20)36aad1

HARGIS + ASSOCIATES, INC.



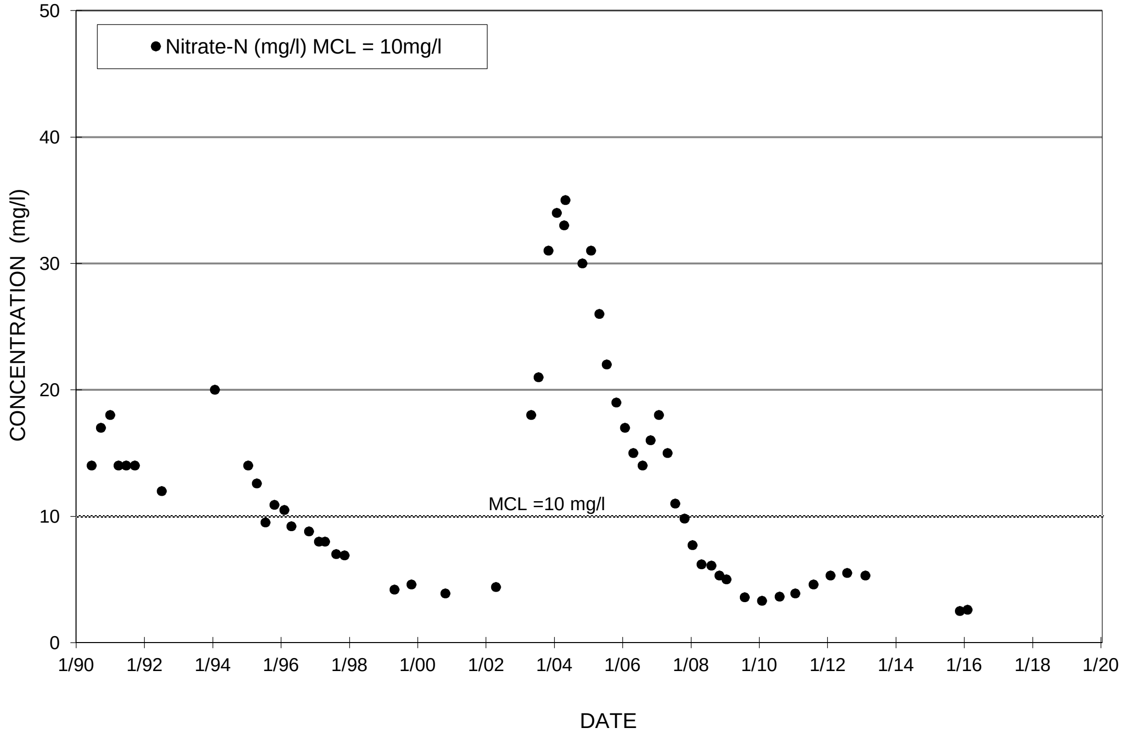
Shallow Aquifer Private Well D(17-20)36caa



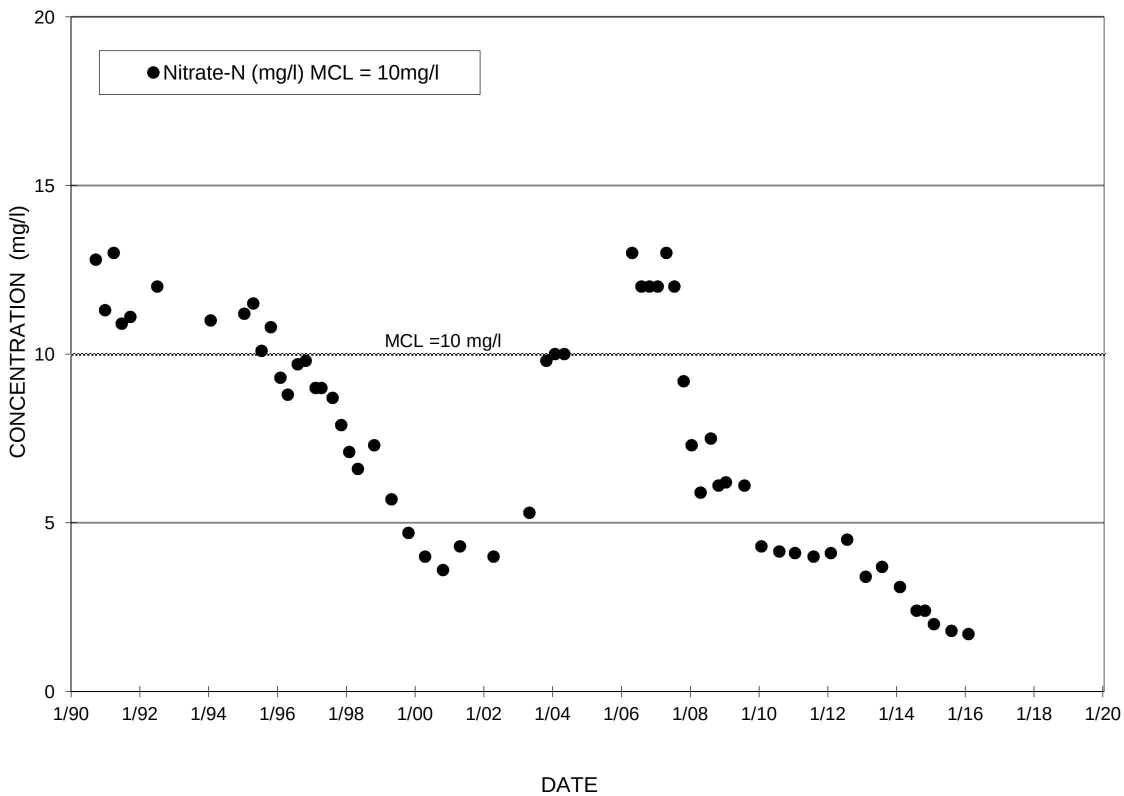
Shallow Aquifer Private Well D(17-20)36caa2

FIGURE A-40. WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE PRIVATE WELLS D(17-20)36caa AND D(17-20)36caa2

HARGIS + ASSOCIATES, INC.

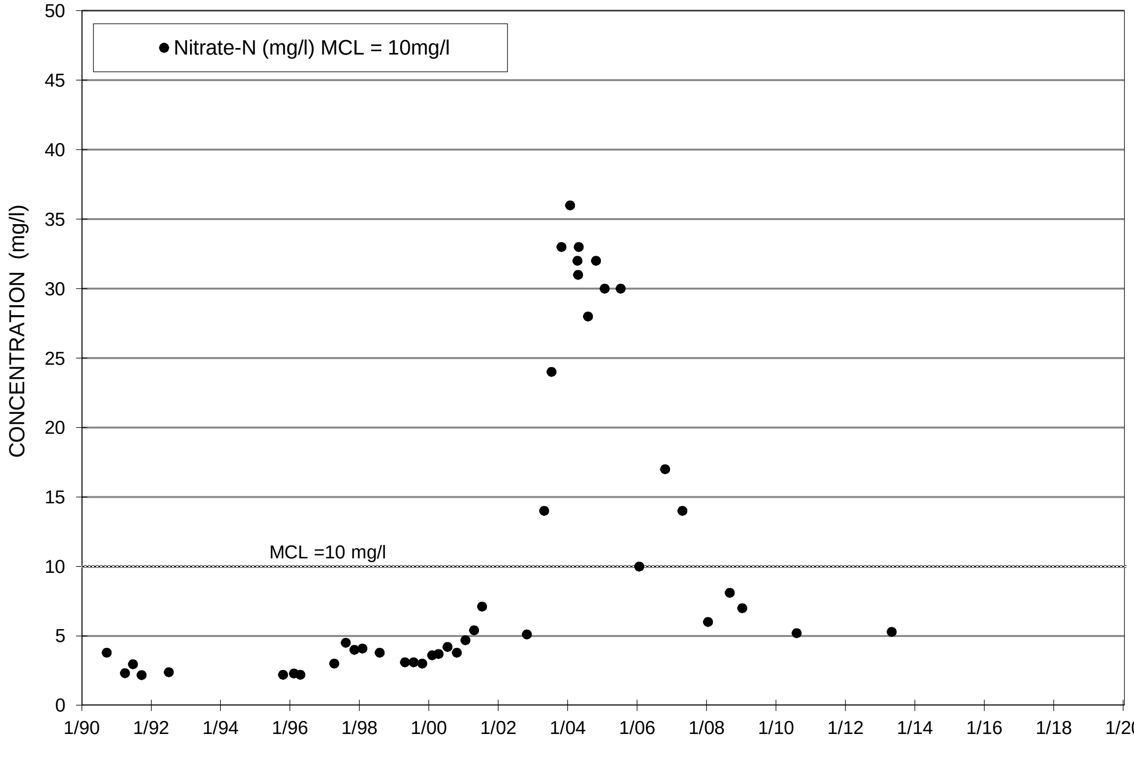


Shallow Aquifer Private Well D(17-20)36cdb

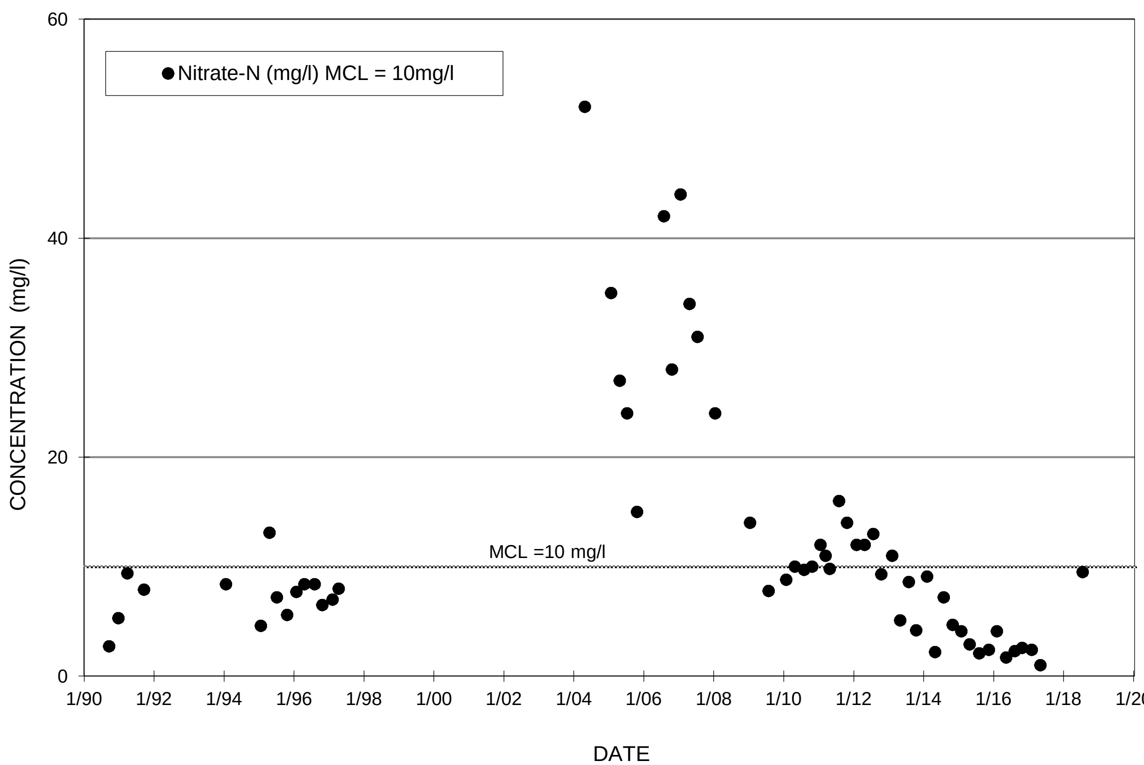


Shallow Aquifer Private Well D(17-20)36ddc

FIGURE A-41. WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE PRIVATE WELLS D(17-20)36cdb AND D(17-20)36ddc

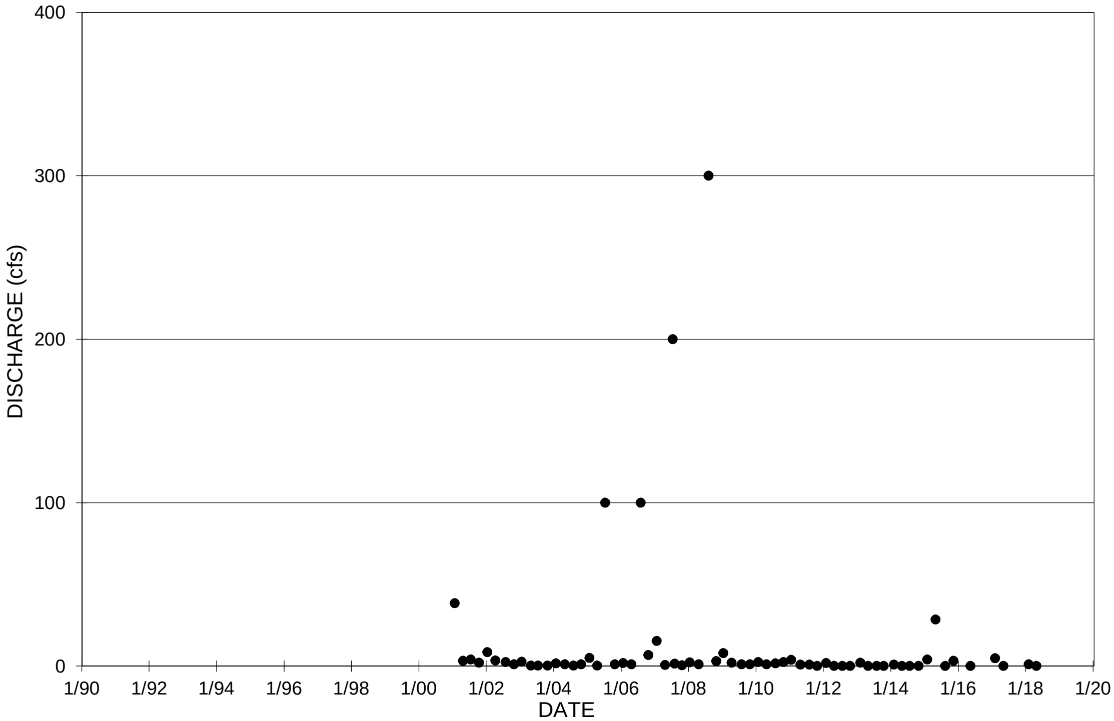


Shallow Aquifer Private Well D(18-20)01aad

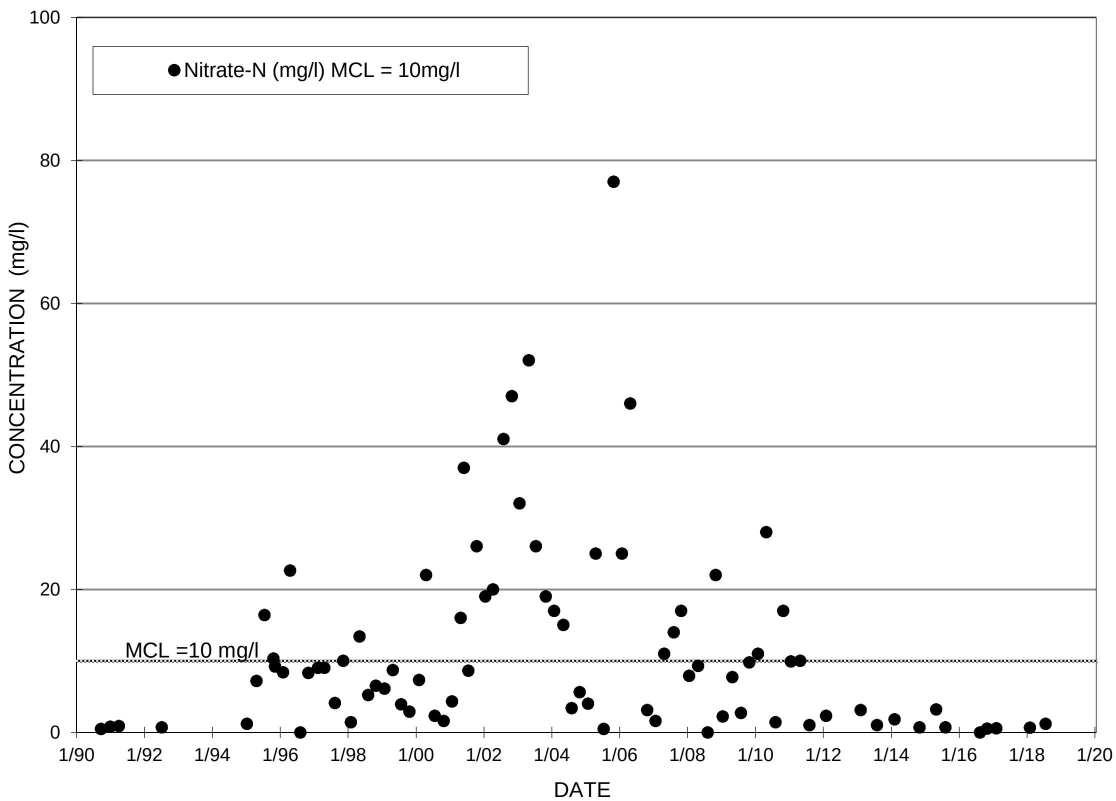


Shallow Aquifer Private Well D(18-21)06bcb

FIGURE A-42. WATER QUALITY HYDROGRAPHS FOR NORTHERN AREA MNA MANAGEMENT ZONE PRIVATE WELLS D(18-20)01aad AND D(18-21)06bcb

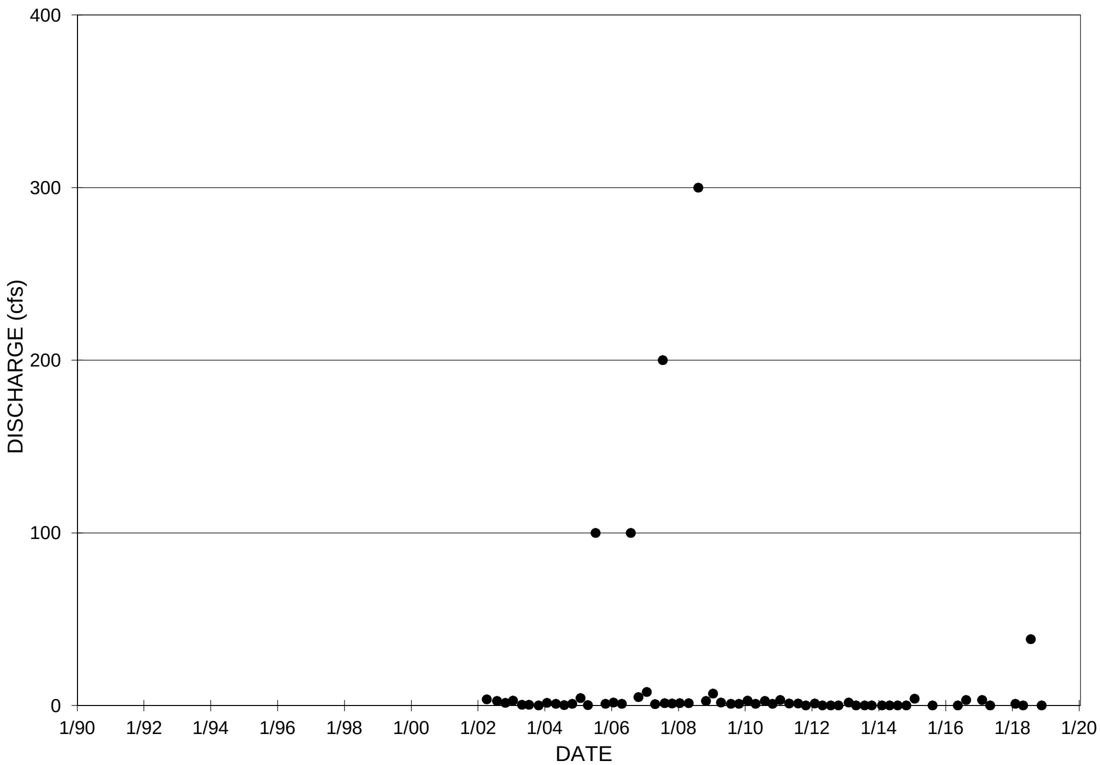


Surface Water Location SW-03

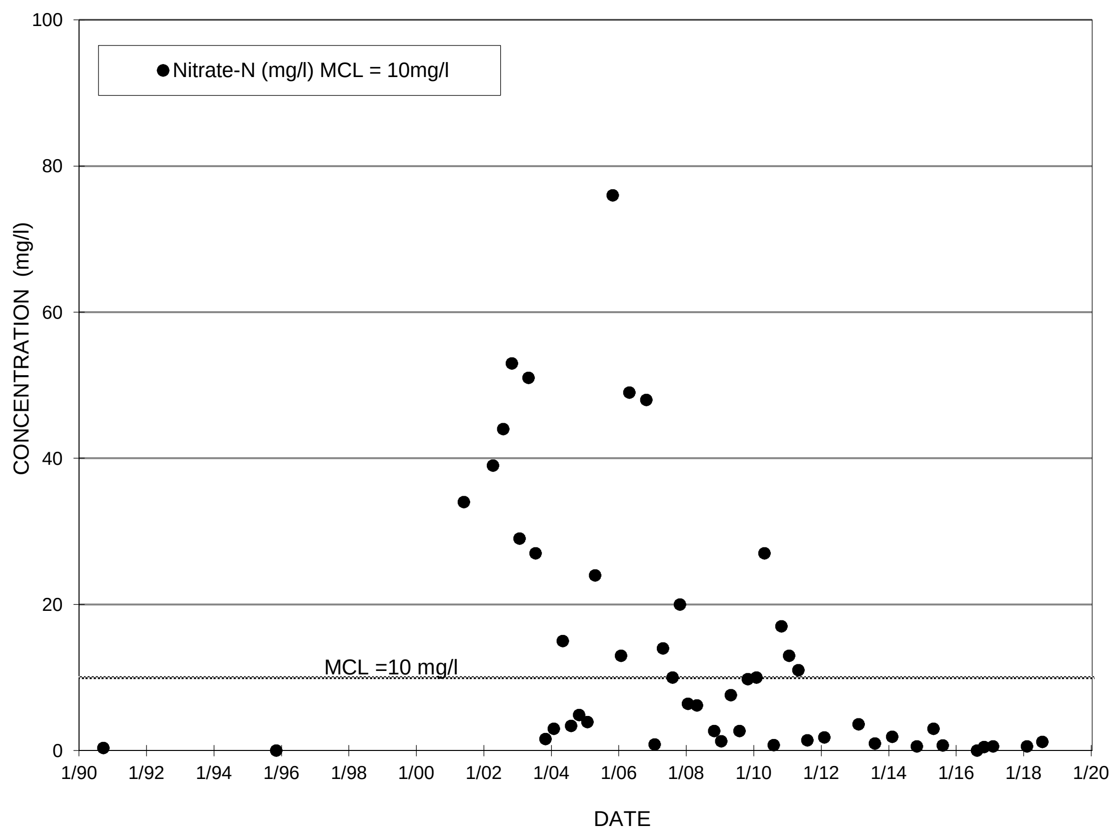


Surface Water Location SW-03

FIGURE A-43. SURFACE FLOW AND WATER QUALITY HYDROGRAPHS FOR SURFACE WATER LOCATION SW-03



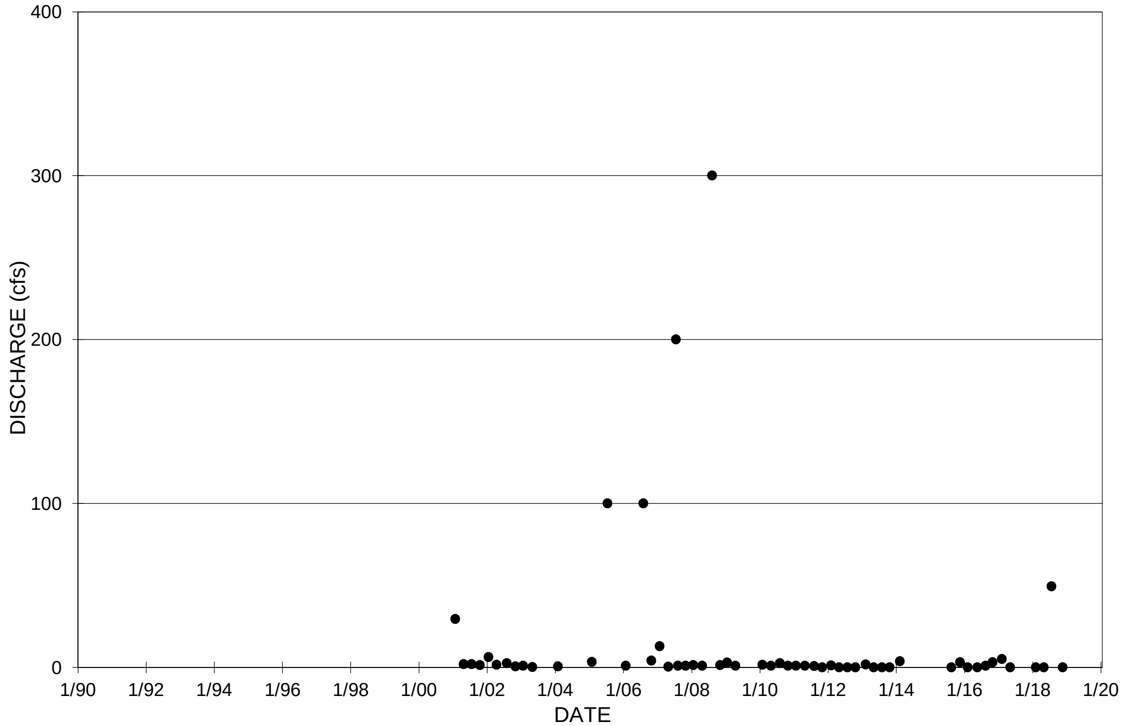
Surface Water Location SW-04



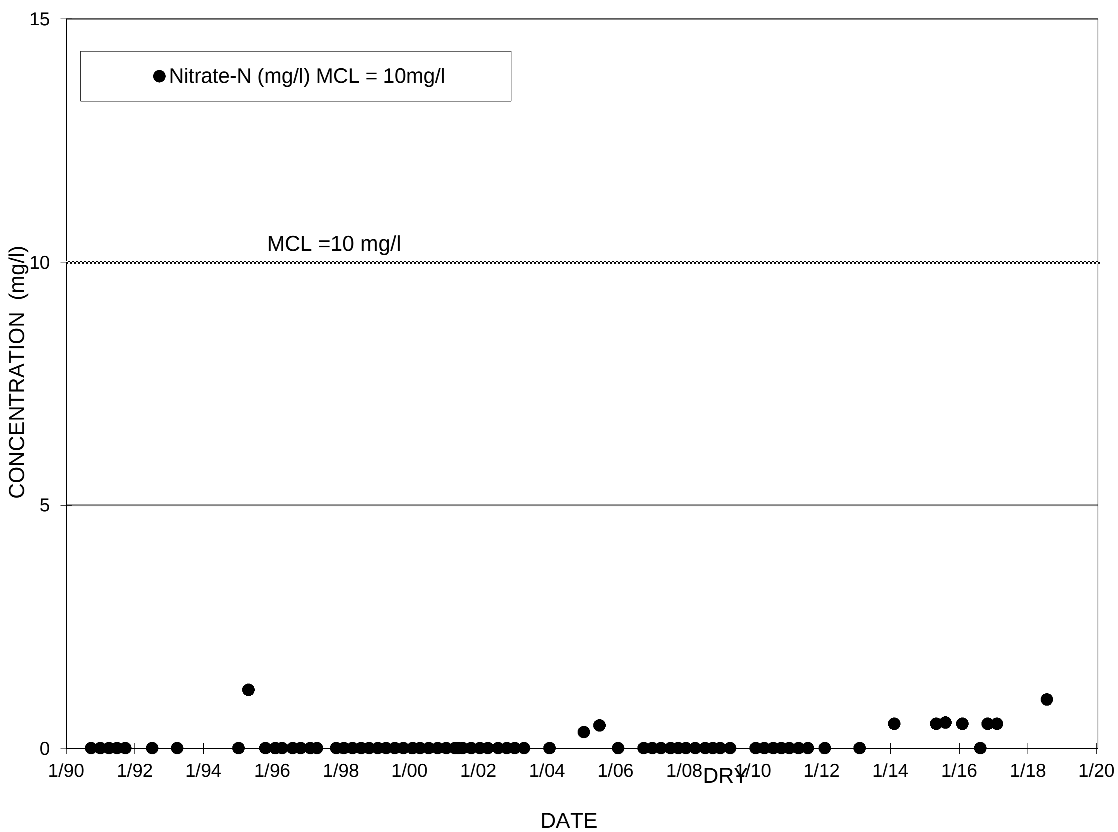
Surface Water Location SW-04

FIGURE A-44. SURFACE FLOW AND WATER QUALITY HYDROGRAPHS FOR SURFACE WATER LOCATION SW-04

HARGIS + ASSOCIATES, INC.

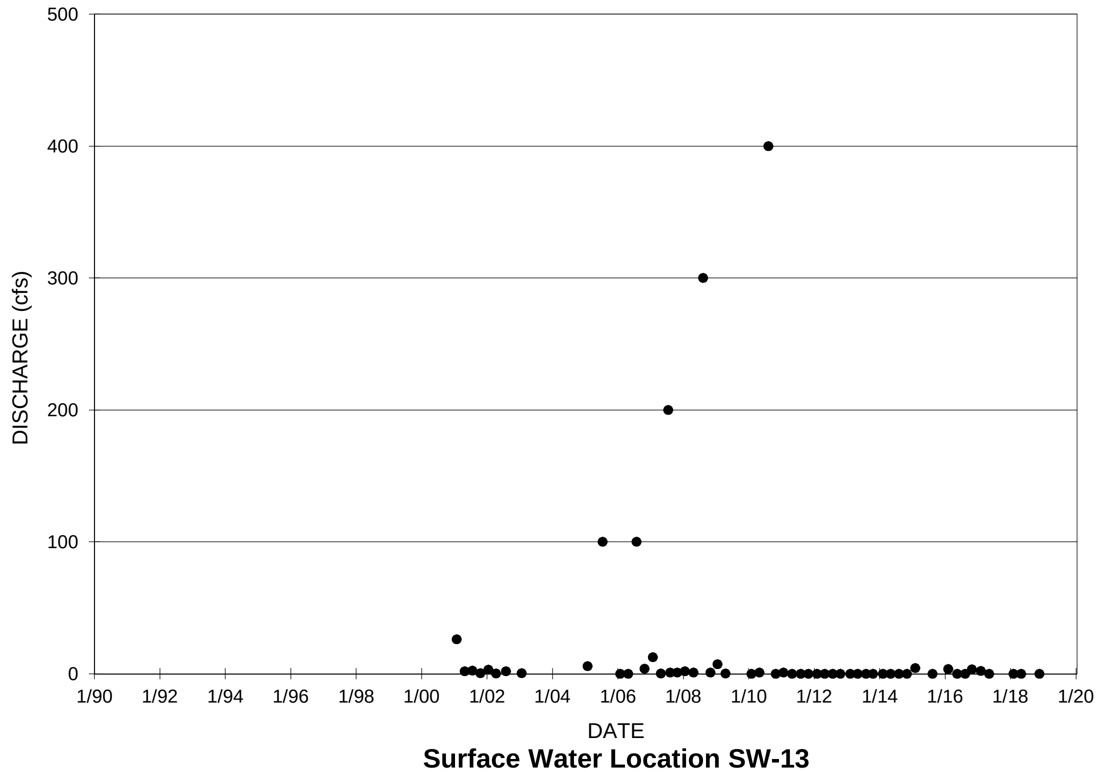


Surface Water Location SW-12



Surface Water Location SW-12

FIGURE A-45. SURFACE FLOW AND WATER QUALITY HYDROGRAPHS FOR SURFACE WATER LOCATION SW-12



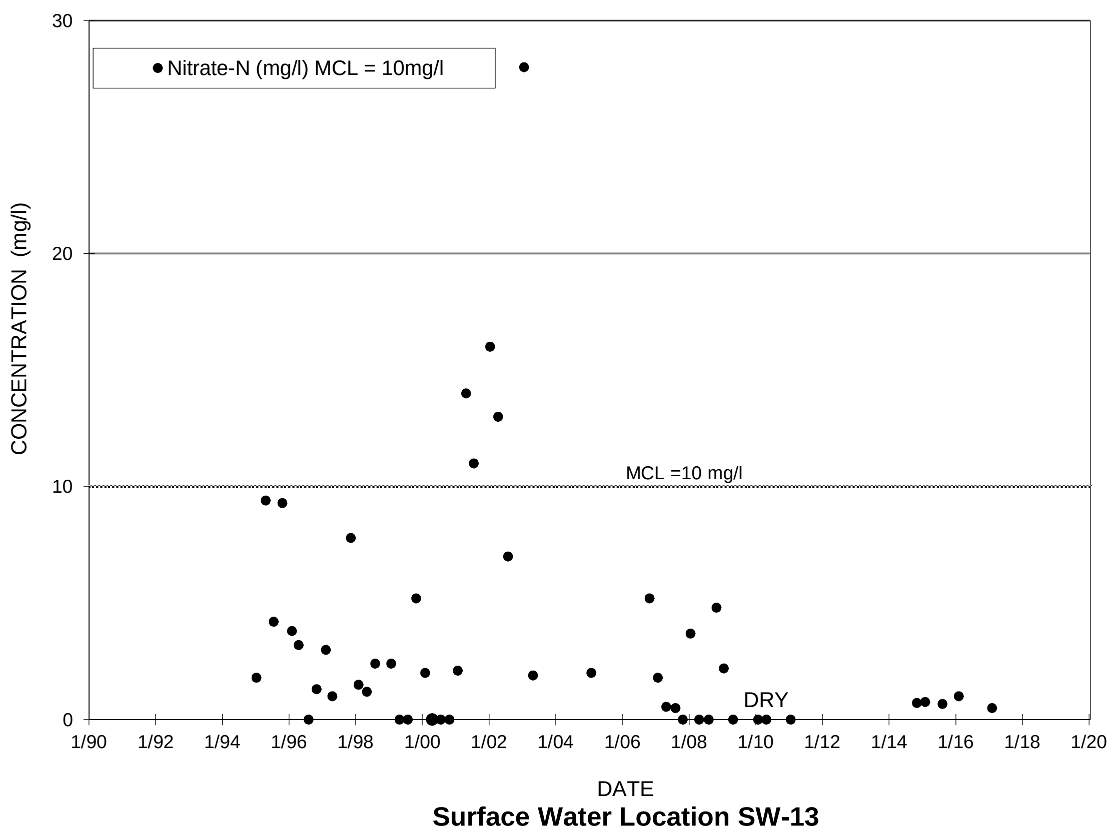
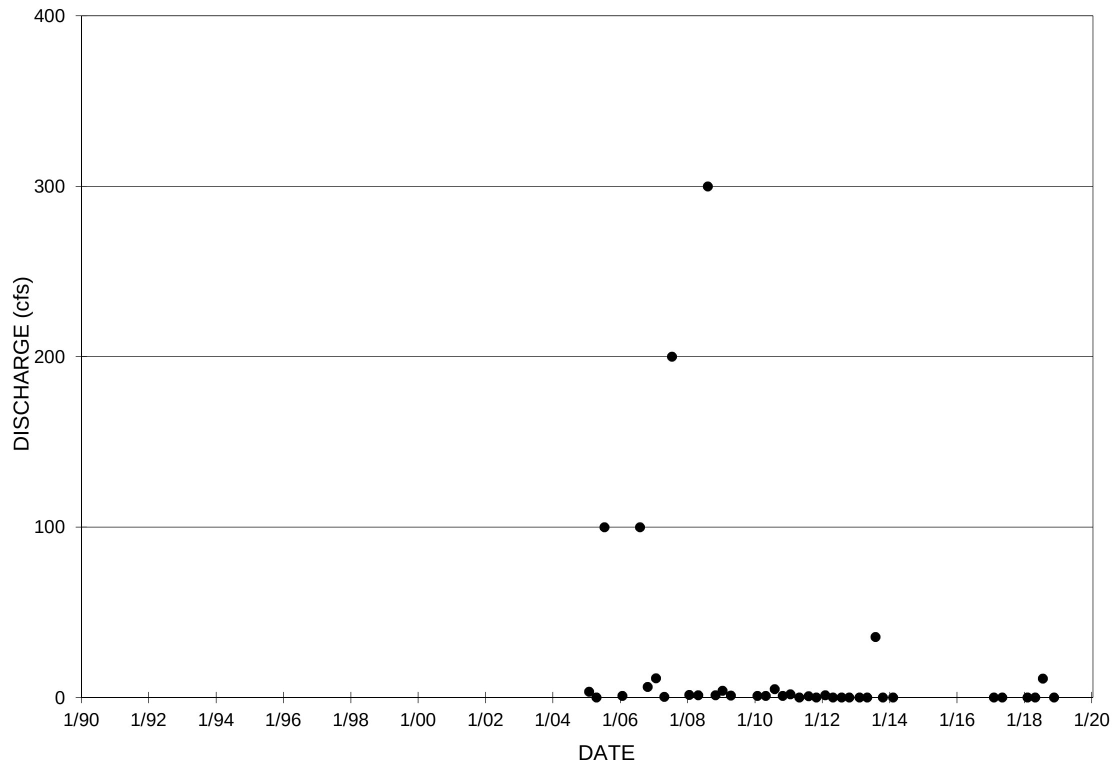
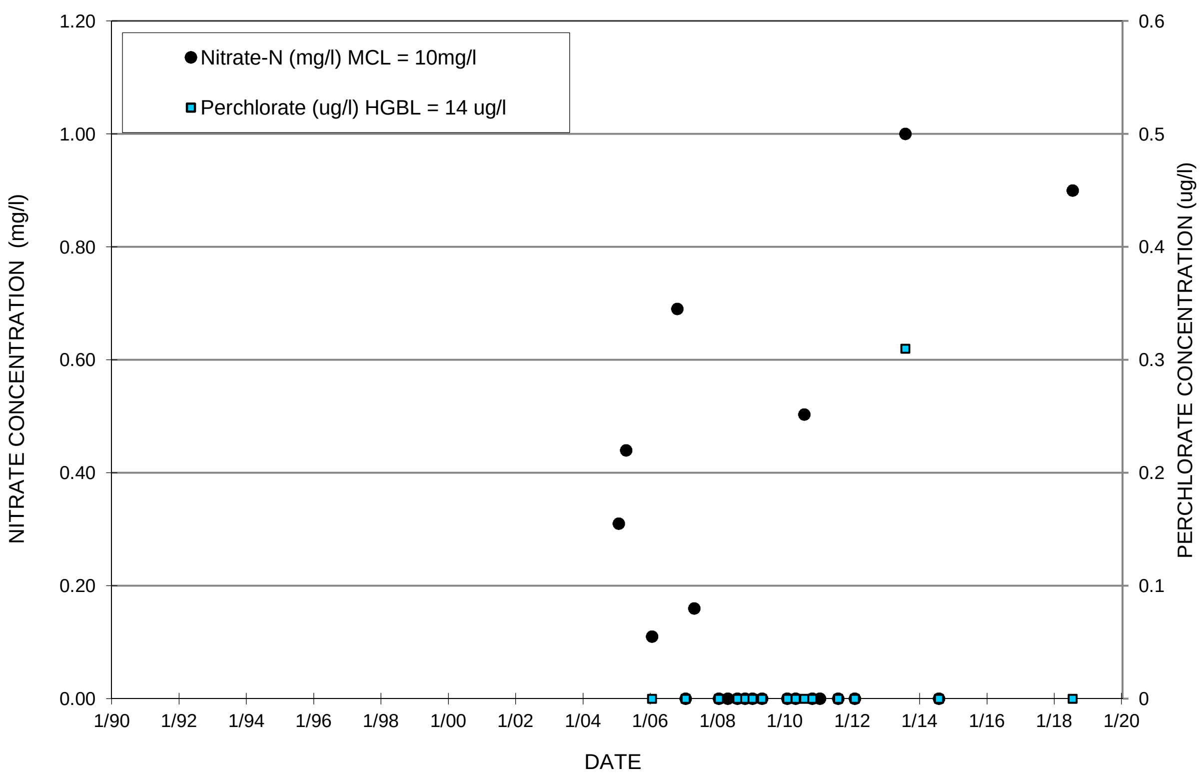


FIGURE A-46. SURFACE FLOW AND WATER QUALITY HYDROGRAPHS FOR SURFACE WATER LOCATION SW-13

HARGIS + ASSOCIATES, INC.



Surface Water Location SW-14

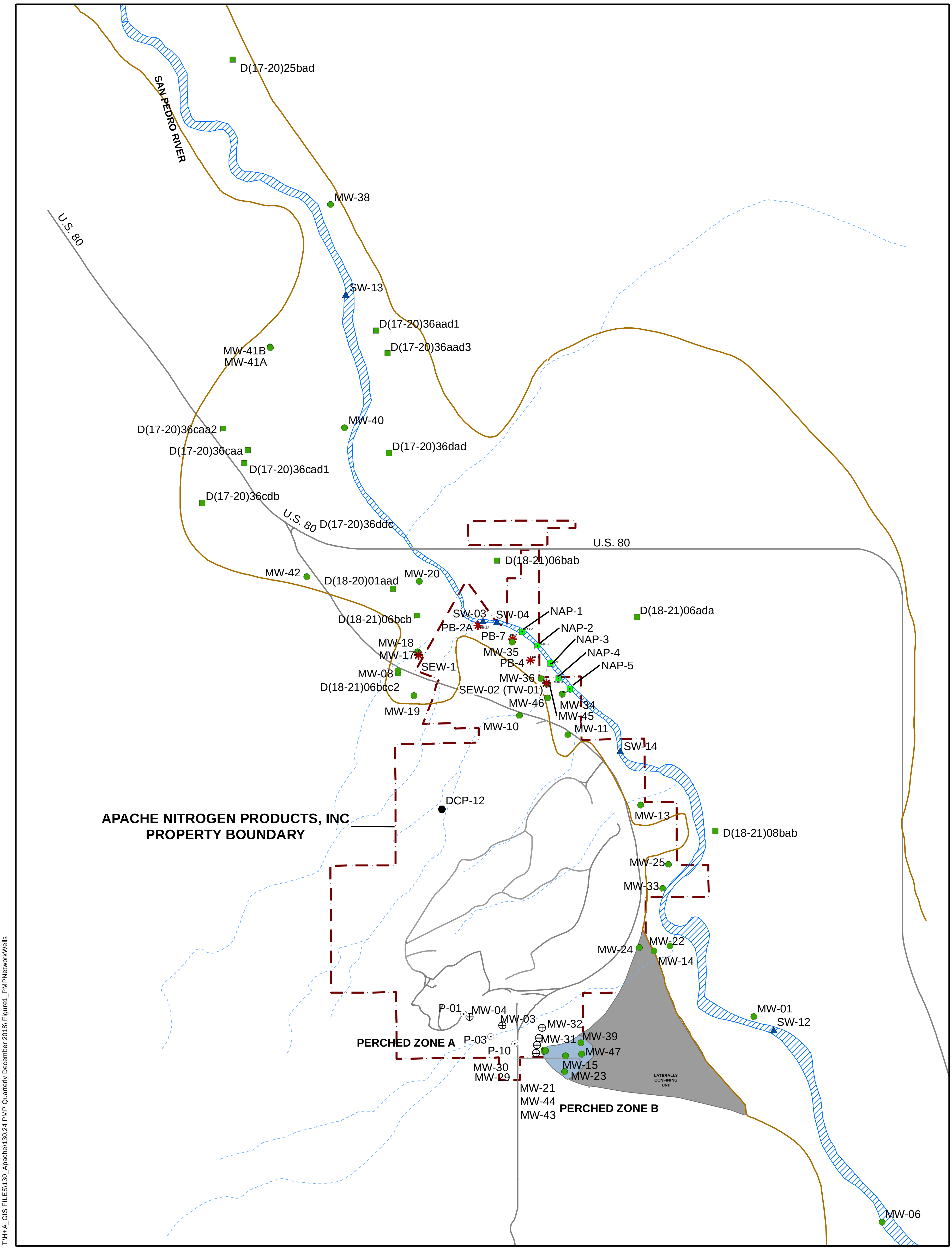


Surface Water Location SW-14

FIGURE A-47. SURFACE FLOW AND WATER QUALITY HYDROGRAPHS FOR SURFACE WATER LOCATION SW-14

APPENDIX B

PERCHED ZONE AND SHALLOW AQUIFER WATER LEVEL AND WATER QUALITY FIGURES, DECEMBER 2018



EXPLANATION

- SHALLOW AQUIFER PRIVATE WELL
- SHALLOW AQUIFER MONITOR WELL
- SHALLOW AQUIFER EXTRACTION WELL
- PERCHED ZONE PIEZOMETER
- PERCHED MONITOR WELL
- NORTHERN AREA PIEZOMETERS
- SAN PEDRO RIVER SURFACE WATER MONITORING STATION
- EPHEMERAL STREAM
- APPROXIMATE BOUNDARY OF SHALLOW AQUIFER

N

0 1,000 2,000 Feet

APACHE NITROGEN PRODUCTS, INC.

BENSON, ARIZONA

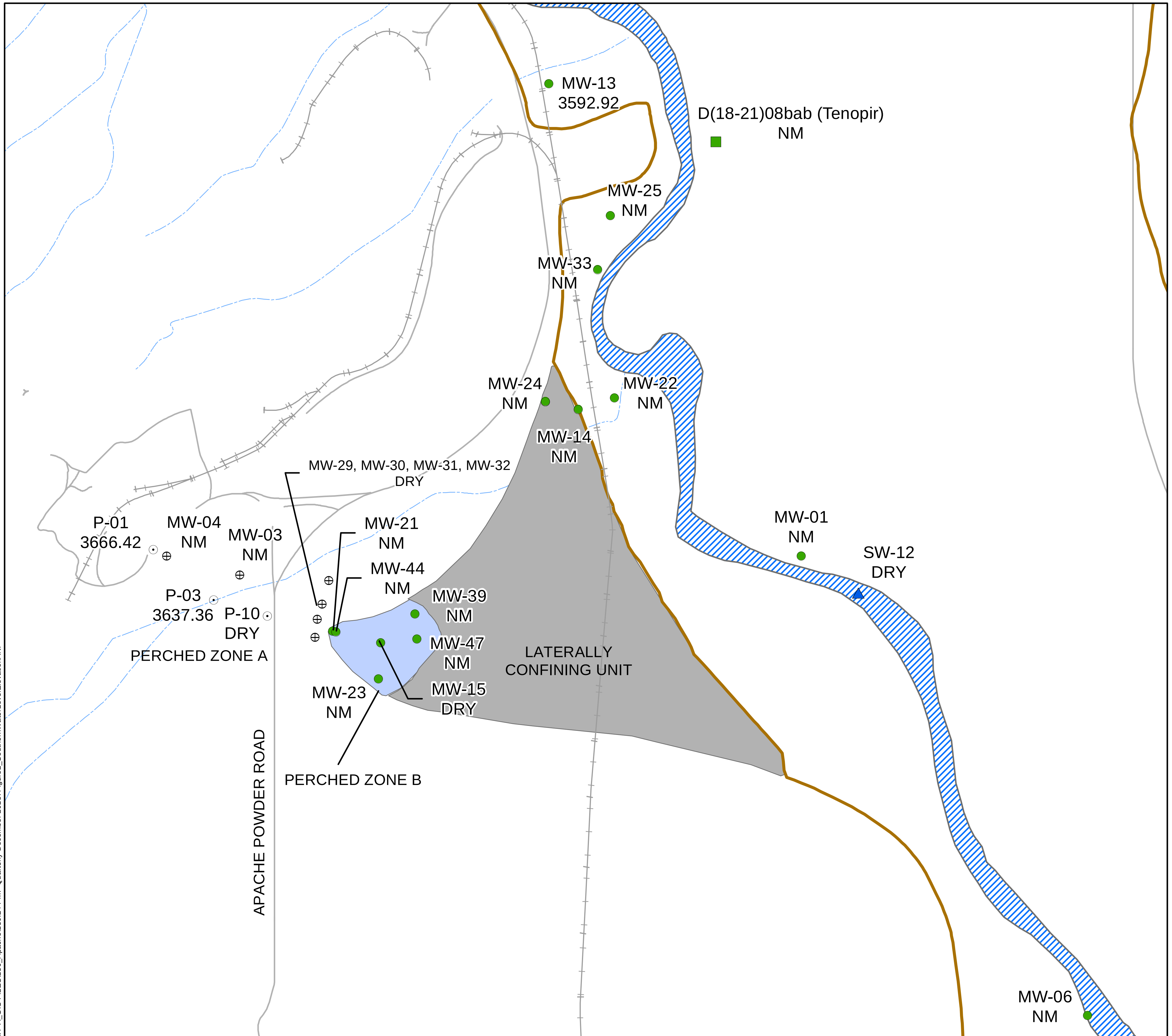
PERFORMANCE MONITORING NETWORK WELLS

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1/17/2019

FIGURE B-1

PREP BY RGW REV BY JSD RPT NO 130.24



EXPLANATION

D(18-21)08bab NM — SHALLOW AQUIFER PRIVATE WELL AND WATER LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL

MW-13 3592.92 — SHALLOW AQUIFER MONITOR WELL AND WATER LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL

SW-12 DRY — SAN PEDRO RIVER SURFACE MONITORING STATION

EPHEMERAL STREAM

APPROXIMATE BOUNDARY OF SHALLOW AQUIFER

SAN PEDRO RIVER

N

0 1,000 2,000
Feet

APACHE NITROGEN PRODUCTS, INC.
BENSON, ARIZONA

WATER LEVEL ELEVATIONS IN THE SOUTHERN AREA SHALLOW AQUIFER DECEMBER 2018

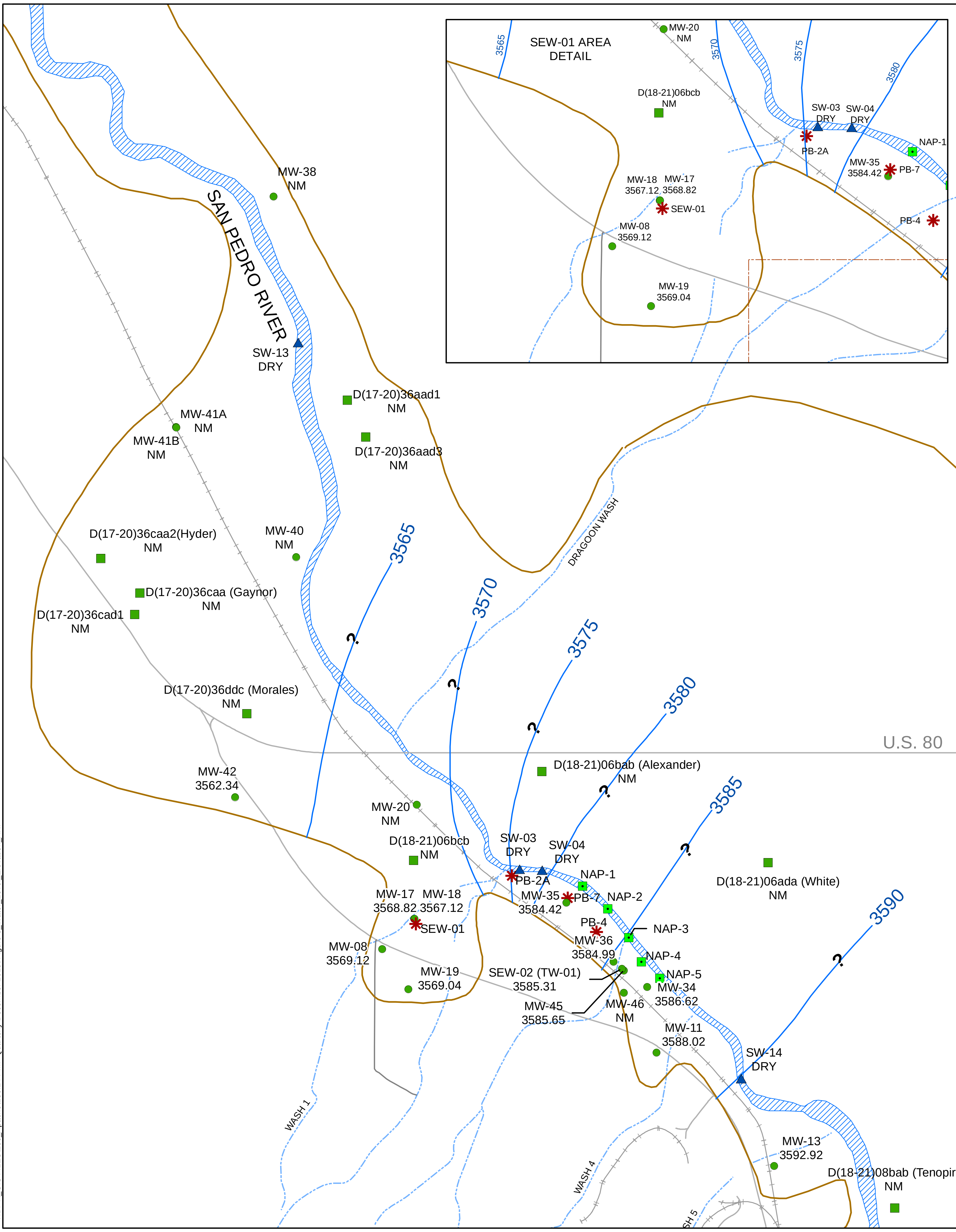
HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1/21/2019

FIGURE B-2

PREP BY RGW REV BY JSD RPT NO 130.24

T:\H+A_GIS FILES\130_Apache\130.24 PMP Quarterly December 2018\ Figure2_SouthernWaterLevelElevationANP



T:\H+A_GIS FILES\130_Apache\130.24 PMP Quarterly December 2018\ Figure 3_Water_Level_Elevation_ANP

EXPLANATION

D(17-20)36aad3 NM (square)	SHALLOW AQUIFER PRIVATE WELL AND WATER LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL
MW-11 3588.02 (circle)	SHALLOW AQUIFER MONITOR WELL AND WATER LEVEL ELEVATION IN FEET ABOVE MEAN SEA LEVEL
SW-14 DRY (triangle)	SAN PEDRO RIVER SURFACE MONITORING STATION
PB-4	NORTHERN AREA PIEZOMETERS
3580	APPROXIMATE LINE OF EQUAL WATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
SEW-01 *	SHALLOW AQUIFER EXTRACTION WELL RESULT USED FOR CONTOURING PURPOSES ONLY. DATA REPORTED UNDER SEPARATE REPORT
PWL	PUMPING WATER LEVEL
NM	NOT MEASURED
	EPHEMERAL STREAM
	APPROXIMATE BOUNDARY OF SHALLOW AQUIFER

N

0 2,000 4,000
Feet

APACHE NITROGEN PRODUCTS, INC.

BENSON, ARIZONA

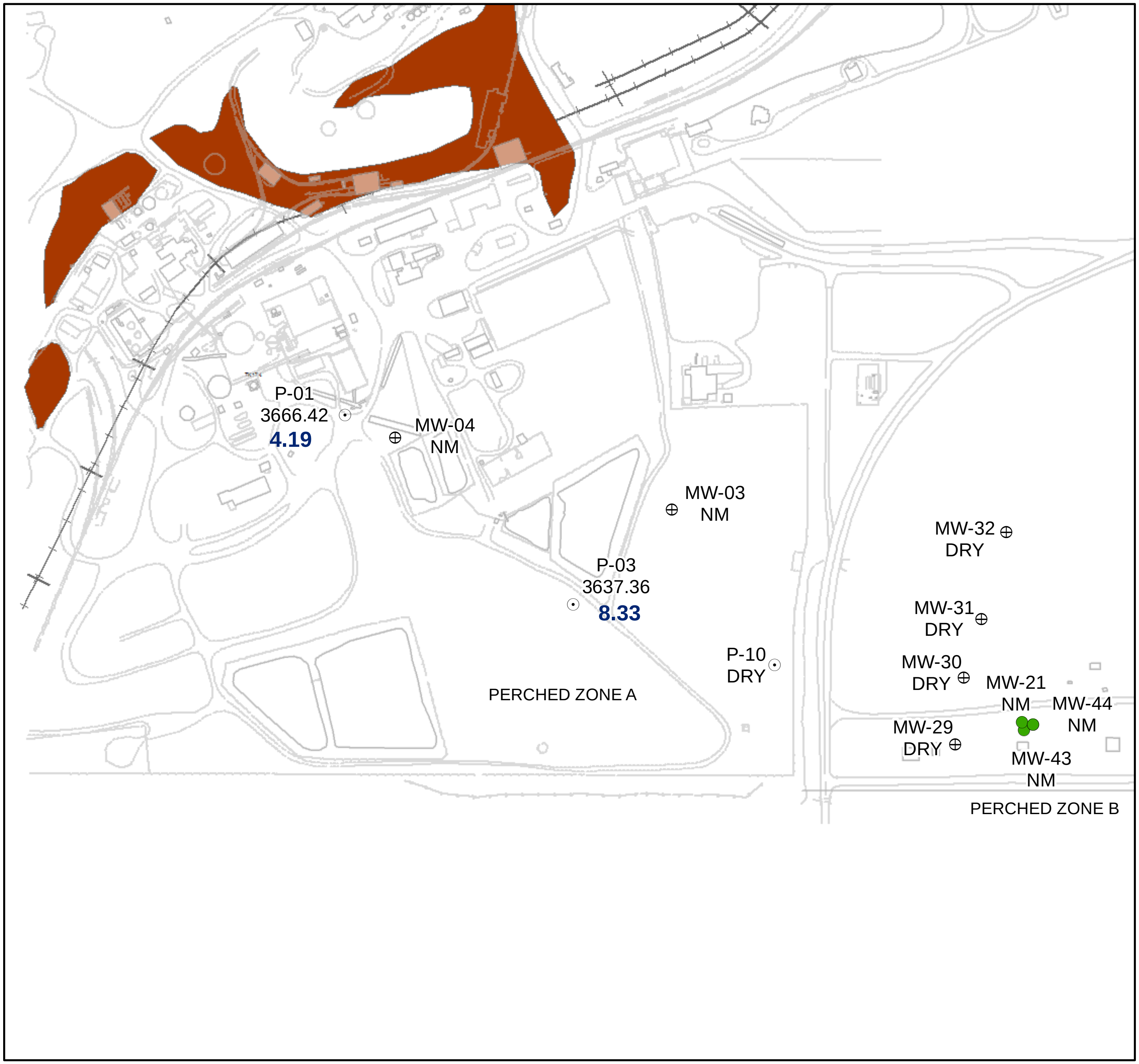
WATER LEVEL ELEVATIONS IN THE NORTHERN AREA SHALLOW AQUIFER GROUNDWATER, DECEMBER 2018

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1/28/2019

FIGURE B-3

PREP BY RGW REV BY JSD RPT NO 130.24



EXPLANATION

MW-03	PERCHED ZONE A MONITOR WELL
P-03	PERCHED ZONE A PIEZOMETER
MW-21	PERCHED ZONE B MONITOR WELL
3637.36	ELEVATION OF PERCHED GROUNDWATER (IN FEET ABOVE MEAN SEA LEVEL)
8.33	MEASURED SATURATED THICKNESS IN FEET
	APPROXIMATE SURFACE OUTCROP OF ST. DAVID CLAY

N

0 240 480

Feet

APACHE NITROGEN PRODUCTS, INC.

BENSON, ARIZONA

WATER LEVEL ELEVATIONS AND SATURATED THICKNESS IN PERCHED ZONES A AND B GROUNDWATER, DECEMBER 2018

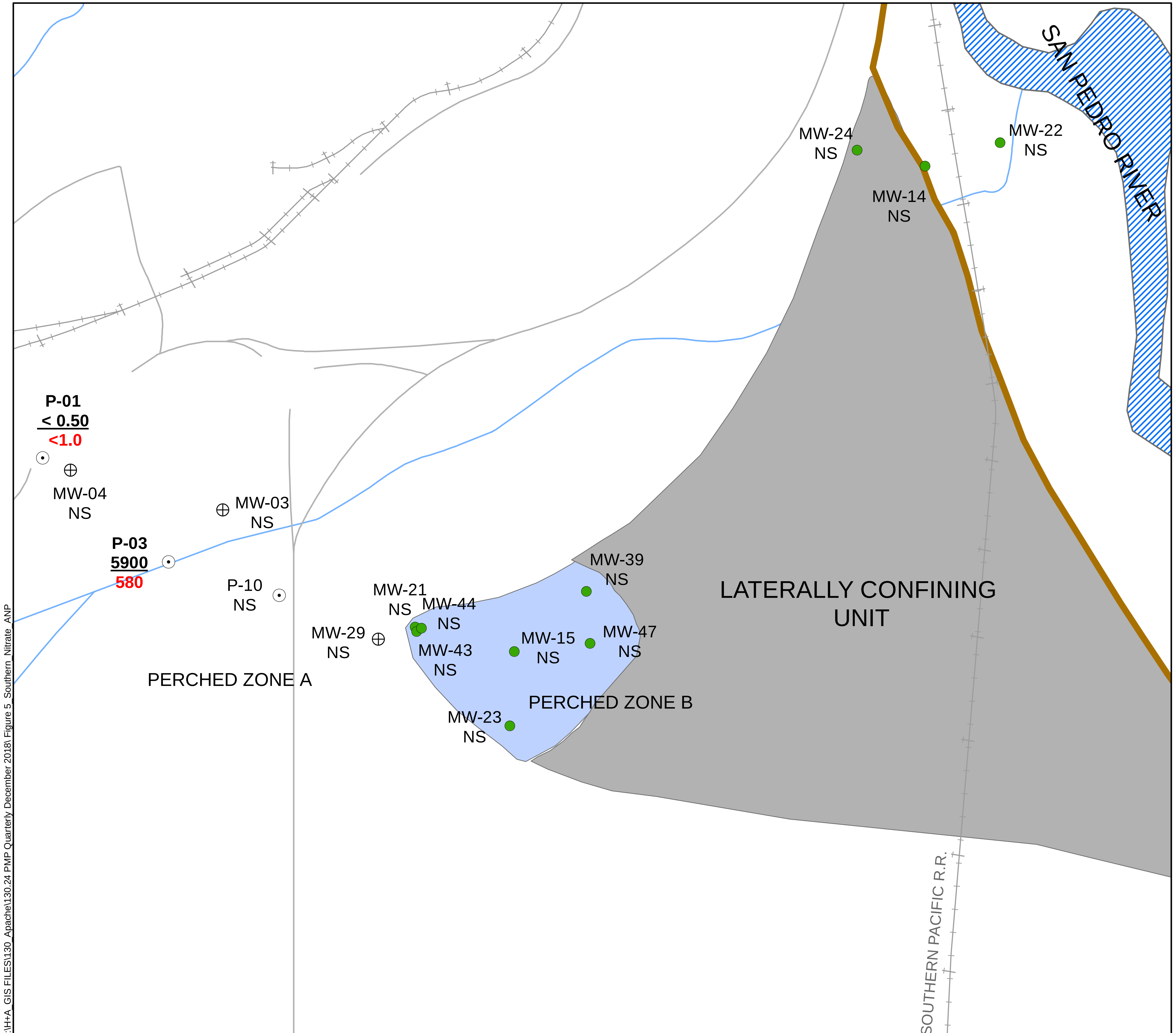
HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1/18/2019

FIGURE B-4

PREP BY RGW REV BY JSD RPT NO 130.24

T:\H+A_GIS FILES\130_Apache\130.24 PMP Quarterly December 2018\ Figure 4_Perched_Water_Level_ANP



EXPLANATION

MW-21	PERCHED ZONE B MONITOR WELL
SW-12	SAN PEDRO RIVER SURFACE MONITORING STATION
P-03	PERCHED ZONE A PIEZOMETER
MW-03	PERCHED ZONE A MONITOR WELL
5900	NITRATE-NITROGEN CONCENTRATION IN MILLIGRAMS PER LITER
580	PERCHLORATE CONCENTRATION IN MICROGRAMS PER LITER
	APPROXIMATE BOUNDARY OF SHALLOW AQUIFER
NS	NOT SAMPLED (SAMPLED ON SEMI-ANNUAL OR ANNUAL BASIS)
ND	NOT DETECTED

N

0 600 1,200

Feet

APACHE NITROGEN PRODUCTS, INC.

BENSON, ARIZONA

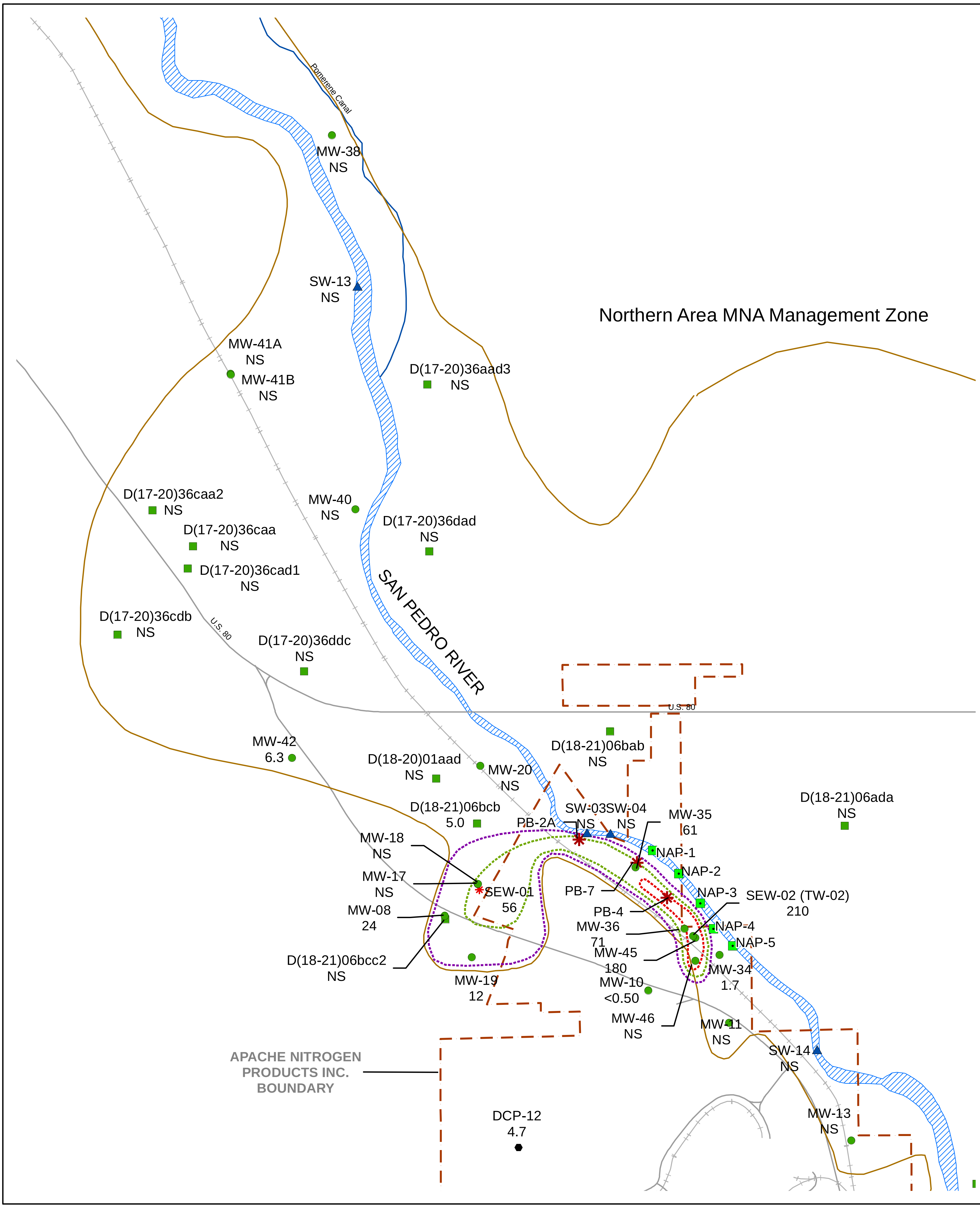
NITRATE-N AND PERCHLORATE IN SOUTHERN AREA PERCHED ZONES A AND B GROUNDWATER, DECEMBER 2018

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1/21/2019

FIGURE B-5

PREP BY RGW REV BY JSD RPT NO 130.24



E:\Documents\ANP\GIS work\130.24 PMP Quarterly December 2018\Figure 6_Nitrate_SAquifer_ANP.mxd

EXPLANATION

MW-35 61 — SHALLOW AQUIFER MONITOR WELL NITRATE-NITROGEN CONCENTRATION IN MILLIGRAMS PER LITER

D(18-21)06bcb — SHALLOW AQUIFER PRIVATE WELL

SW-13 — SAN PEDRO RIVER MONITORING STATION

PB-4 — NORTHERN AREA PIEZOMETERS

APPROXIMATE LIMIT OF SHALLOW AQUIFER GROUNDWATER WITH NITRATE-NITROGEN:

- \> 10 MILLIGRAMS PER LITER
- \> 50 MILLIGRAMS PER LITER
- \> 100 MILLIGRAMS PER LITER

* RESULT USED FOR CONTOURING PURPOSES ONLY. DATA REPORTED UNDER SEPARATE COVER

APPROXIMATE BOUNDARY OF SHALLOW AQUIFER

EPHEMERAL STREAM

NS = NOT SAMPLED (SAMPLED ON SEMI-ANNUAL OR ANNUAL BASIS)

N

0 1,000 2,000

Feet

APACHE NITROGEN PRODUCTS, INC.

BENSON, ARIZONA

NITRATE-NITROGEN IN SHALLOW AQUIFER GROUNDWATER AND SURFACE WATER, DECEMBER 2018 NORTHERN AREA

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1/21/2019

FIGURE B-6

PREP BY RGW REV BY JSD RPT NO 130.24

APPENDIX C

NARS MONITORING SCHEDULES

TABLE C-1

EXTRACTION WELL MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
METALS		
aluminum	every 5 years	September 2021; September 2026
antimony	every 5 years	September 2021; September 2026
arsenic	every 5 years	September 2021; September 2026
barium	every 5 years	September 2021; September 2026
beryllium	every 5 years	September 2021; September 2026
cadmium	every 5 years	September 2021; September 2026
chromium (total)	every 5 years	September 2021; September 2026
copper	every 5 years	September 2021; September 2026
lead	every 5 years	September 2021; September 2026
iron	every 5 years	September 2021; September 2026
manganese	every 5 years	September 2021; September 2026
mercury	every 5 years	September 2021; September 2026
selenium	every 5 years	September 2021; September 2026
silver	every 5 years	September 2021; September 2026
thallium	every 5 years	September 2021; September 2026
zinc	every 5 years	September 2021; September 2026
NITROGEN SPECIES / NUTRIENTS		
nitrate-N	weekly	weekly monitoring may be performed utilizing field methods and verified monthly by lab
ammonia-N	quarterly	
total phosphorus	quarterly	

TABLE C-1

EXTRACTION WELL MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
MAJOR IONS		
bicarbonate	annual	
calcium	annual	
chloride	annual	
fluoride	annual	
magnesium	annual	
phosphate	annual	
potassium	annual	
sodium	annual	
sulfate	annual	
total dissolved solids (TDS)	annual	
FIELD PARAMETERS		
pH	monthly	
temperature	monthly	
specific conductance (EC)	monthly	
FLOW RATE	weekly	
WATER LEVELS	quarterly	

ABBREVIATIONS/ACRONYMS:

nitrate-N = nitrate-Nitrogen
pH = hydrogen ion potential

NOTES:

(a) = Treatment cell water quality analysis may be performed utilizing field methods / instrumentation where possible.

TABLE C-2

TREATMENT CELL MONITORING SCHEDULE

Analyte or Parameter to be Monitored (a)	Monitoring Frequency Normal Operation Period	Comment
NITROGEN SPECIES / NUTRIENTS		
ammonia-N	monthly	
total kejdahl nitrogen (TKN)	annual	
organic nitrogen	annual	
nitrate-N	weekly	weekly monitoring may be performed utilizing field methods and verified monthly by lab
total phosphorus	quarterly	
MISCELLANEOUS		
chemical oxygen demand (COD)	quarterly	
total organic carbon (TOC)	quarterly	
FIELD PARAMETERS		
dissolved oxygen (DO)	monthly	more frequently if needed
pH	monthly	more frequently if needed
specific conductance (EC)	monthly	more frequently if needed
temperature	monthly	more frequently if needed
WATER LEVELS	weekly	

ABBREVIATIONS/ACRONYMS:

nitrate-N = nitrate-Nitrogen
ph = hydrogen ion potential

TABLE C-3

WETLAND EFFLUENT MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
METALS		
aluminum	every 5 years	September 2021; September 2026
antimony	every 5 years	September 2021; September 2026
arsenic	every 5 years	September 2021; September 2026
barium	every 5 years	September 2021; September 2026
beryllium	every 5 years	September 2021; September 2026
cadmium	every 5 years	September 2021; September 2026
chromium (total)	every 5 years	September 2021; September 2026
copper	every 5 years	September 2021; September 2026
lead	every 5 years	September 2021; September 2026
iron	every 5 years	September 2021; September 2026
manganese	every 5 years	September 2021; September 2026
mercury	every 5 years	September 2021; September 2026
selenium	every 5 years	September 2021; September 2026
silver	every 5 years	September 2021; September 2026
thallium	every 5 years	September 2021; September 2026
zinc	every 5 years	September 2021; September 2026
NITROGEN SPECIES / NUTRIENTS		
nitrate-N	weekly	weekly monitoring may be performed utilizing field methods and verified monthly by lab
ammonia-N	weekly	
total ammonia	annual	
organic nitrogen	annual	
total kjeldahl nitrogen (TKN)	annual	
total phosphorus	quarterly	

TABLE C-3

WETLAND EFFLUENT MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
MAJOR IONS		
bicarbonate	annual	
calcium	annual	
chloride	annual	
fluoride	annual	
magnesium	annual	
phosphate	annual	
potassium	annual	
sodium	annual	
sulfate	annual	
MISCELLANEOUS		
total suspended solids (TSS)	quarterly	
total dissolved solids (TDS)	quarterly	
FIELD PARAMETERS		
pH	monthly	more frequently if needed
temperature	monthly	more frequently if needed
dissolved oxygen	monthly	more frequently if needed
specific conductance (EC)	monthly	more frequently if needed
FLOW RATE	weekly	Daily monitoring only following adjustments in flow rate, then weekly

ABBREVIATIONS/ACRONYMS:

nitrate-N = nitrate-Nitrogen
pH = hydrogen ion potential

NOTES:

(a) = Effluent water quality analysis may be performed utilizing field methods / instrumentation wher possible.

TABLE C-4
MONITOR WELL MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
Design Confirmation Piezometer DCP-12		
METALS		
barium	every 5 years	September 2021; September 2026
beryllium	every 5 years	September 2021; September 2026
chromium (total)	every 5 years	September 2021; September 2026
lead	every 5 years	September 2021; September 2026
mercury	every 5 years	September 2021; September 2026
thallium	every 5 years	September 2021; September 2026
NITROGEN SPECIES / NUTRIENTS		
nitrate-N	quarterly	quarterly monitoring performed by laboratory [a]
FIELD PARAMETERS		
pH	quarterly	
temperature	quarterly	
specific conductance (EC)	quarterly	
WATER LEVELS	monthly	[a]
Monitor Well MW-10		
NITROGEN SPECIES / NUTRIENTS		
nitrate-N	quarterly	quarterly monitoring performed by laboratory [a] [b]
ammonia-N	quarterly	quarterly monitoring performed by laboratory [a] [b]
FIELD PARAMETERS		
pH	quarterly	more frequently if needed
temperature	quarterly	more frequently if needed
specific conductance (EC)	quarterly	more frequently if needed
WATER LEVELS	weekly	

TABLE C-4
MONITOR WELL MONITORING SCHEDULE

ABBREVIATIONS/ACRONYMS:

nitrate-N = nitrate-Nitrogen
pH= hydrogen ion potential

NOTES:

(a) = More frequent monitoring will be required at DCP-12 if treatment cell overflow occurs. More frequent monitoring will be required at MW-10 if AWQS standard is exceeded.

(b) = Water quality analysis may be performed utilizing field methods / instrumentation where possible.

TABLE C-5

TREATMENT CELL SOIL MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
METALS		
aluminum	every 5 years	September 2021; September 2026
antimony	every 5 years	September 2021; September 2026
arsenic	every 5 years	September 2021; September 2026
barium	every 5 years	September 2021; September 2026
beryllium	every 5 years	September 2021; September 2026
cadmium	every 5 years	September 2021; September 2026
chromium	every 5 years	September 2021; September 2026
copper	every 5 years	September 2021; September 2026
lead	every 5 years	September 2021; September 2026
iron	every 5 years	September 2021; September 2026
manganese	every 5 years	September 2021; September 2026
nickel	every 5 years	September 2021; September 2026
mercury	every 5 years	September 2021; September 2026
selenium	every 5 years	September 2021; September 2026
silver	every 5 years	September 2021; September 2026
thallium	every 5 years	September 2021; September 2026
zinc	every 5 years	September 2021; September 2026
NITROGEN SPECIES / NUTRIENTS		
nitrate-N	every 5 years	September 2021; September 2026
ammonia-N	every 5 years	September 2021; September 2026
total kjeldahl nitrogen (TKN)	every 5 years	September 2021; September 2026
total nitrogen (calculation)	every 5 years	September 2021; September 2026
total organic carbon	every 5 years	September 2021; September 2026
total phosphorus	every 5 years	September 2021; September 2026

TABLE C-5

TREATMENT CELL SOIL MONITORING SCHEDULE

Analyte or Parameter to be Monitored	Monitoring Frequency Normal Operation Period	Comment
MAJOR IONS		
bicarbonate	every 5 years	September 2021; September 2026
calcium	every 5 years	September 2021; September 2026
carbonate	every 5 years	September 2021; September 2026
chloride	every 5 years	September 2021; September 2026
fluoride	every 5 years	September 2021; September 2026
magnesium	every 5 years	September 2021; September 2026
phosphate	every 5 years	September 2021; September 2026
pH	every 5 years	September 2021; September 2026
potassium	every 5 years	September 2021; September 2026
sodium	every 5 years	September 2021; September 2026
sulfate	every 5 years	September 2021; September 2026

ABBREVIATIONS/ACRONYMS:

nitrate-N = nitrate-Nitrogen
pH= hydrogen ion potential

APPENDIX D

NARS WATER LEVEL AND WATER QUALITY HYDROGRAPHS

TABLE

TABLE D-1

WATER LEVEL DATA
(TREATMENT CELLS)

IDENTIFIER	DATE MEASURED	WATER DEPTH (feet)
ANA	1/5/2018	4.75
	1/12/2018	4.75
	1/19/2018	4.75
	1/26/2018	4.75
	2/2/2018	4.75
	2/8/2018	4.75
	2/16/2018	4.75
	2/22/2018	4.75
	3/2/2018	4.75
	3/9/2018	4.75
	3/15/2018	4.75
	3/23/2018	4.75
	3/29/2018	4.75
	4/6/2018	4.75
	4/13/2018	4.75
	4/20/2018	4.75
	4/27/2018	4.75
	5/4/2018	4.75
	5/11/2018	4.75
	5/18/2018	4.75
	5/24/2018	4.75
	5/31/2018	4.75
	6/8/2018	4.75
	6/15/2018	4.75
	6/22/2018	4.75
	6/28/2018	4.75
	7/6/2018	4.75
	7/13/2018	4.75
	7/20/2018	4.75
	7/27/2018	4.75
	8/3/2018	4.75
	8/10/2018	4.75
	8/17/2018	4.75
	8/24/2018	4.75
	8/30/2018	4.75
	9/7/2018	4.75
	9/14/2018	4.75
	9/21/2018	4.75
	9/27/2018	4.75
	10/5/2018	4.75
	10/12/2018	4.75
	10/19/2018	4.75
	10/26/2018	4.75
	11/1/2018	4.75
	11/8/2018	4.75
	11/16/2018	4.75
	11/21/2018	4.75
	11/30/2018	4.75
	12/7/2018	4.75

TABLE D-1

WATER LEVEL DATA
(TREATMENT CELLS)

IDENTIFIER	DATE MEASURED	WATER DEPTH (feet)
ANA	12/14/2018	4.75
	12/21/2018	4.75
	12/28/2018	4.75
FDA	1/5/2018	2.20
	1/12/2018	2.20
	1/19/2018	2.20
	1/26/2018	2.20
	2/2/2018	2.20
	2/8/2018	2.20
	2/16/2018	2.20
	2/22/2018	2.20
	3/2/2018	2.20
	3/9/2018	2.20
	3/15/2018	2.20
	3/23/2018	2.20
	3/29/2018	2.20
	4/6/2018	2.20
	4/13/2018	2.20
	4/20/2018	2.20
	4/27/2018	2.20
	5/4/2018	2.20
	5/11/2018	2.20
	5/18/2018	2.20
	5/24/2018	2.20
	5/31/2018	2.20
	6/8/2018	2.20
	6/15/2018	2.20
	6/22/2018	2.20
	6/28/2018	2.20
	7/6/2018	2.20
	7/13/2018	2.20
	7/20/2018	2.20
	7/27/2018	2.20
	8/3/2018	2.20
	8/10/2018	2.20
	8/17/2018	2.20
	8/24/2018	2.20
	8/30/2018	2.20
	9/7/2018	2.20
	9/14/2018	2.20
	9/21/2018	2.20
	9/27/2018	2.20
	10/5/2018	2.20
	10/12/2018	2.20
	10/19/2018	2.20
	10/26/2018	2.20
	11/1/2018	2.20
	11/8/2018	2.20
	11/16/2018	2.20

HARGIS + ASSOCIATES, INC.

TABLE D-1

WATER LEVEL DATA
(TREATMENT CELLS)

IDENTIFIER	DATE MEASURED	WATER DEPTH (feet)
FDA	11/21/2018	2.20
	11/30/2018	2.20
	12/7/2018	2.20
	12/14/2018	2.20
	12/21/2018	2.20
	12/28/2018	2.20
PDA-C	1/5/2018	3.00
	1/12/2018	3.00
	1/19/2018	3.00
	1/26/2018	3.00
	2/2/2018	3.00
	2/8/2018	3.00
	2/16/2018	3.00
	2/22/2018	3.00
	3/2/2018	3.00
	3/9/2018	3.00
	3/15/2018	3.00
	3/23/2018	3.00
	3/29/2018	3.00
	4/6/2018	3.00
	4/13/2018	3.00
	4/20/2018	3.00
	4/27/2018	3.00
	5/4/2018	3.00
	5/11/2018	3.00
	5/18/2018	3.00
	5/24/2018	3.00
	5/31/2018	3.00
	6/8/2018	3.00
	6/15/2018	3.00
	6/22/2018	3.00
	6/28/2018	3.00
	7/6/2018	3.00
	7/13/2018	3.00
	7/20/2018	3.00
	7/27/2018	3.00
	8/3/2018	3.00
	8/10/2018	3.00
	8/17/2018	3.00
	8/24/2018	3.00
	8/30/2018	3.00
	9/7/2018	3.00
	9/14/2018	3.00
	9/21/2018	3.00
	9/27/2018	3.00

TABLE D-1

WATER LEVEL DATA
(TREATMENT CELLS)

IDENTIFIER	DATE MEASURED	WATER DEPTH (feet)
PDA-C	10/5/2018	3.00
	10/12/2018	3.00
	10/19/2018	3.00
	10/26/2018	3.00
	11/1/2018	3.00
	11/8/2018	3.00
	11/16/2018	3.00
	11/21/2018	3.00
	11/30/2018	3.00
	12/7/2018	3.00
	12/14/2018	3.00
	12/21/2018	3.00
	12/28/2018	3.00
PDA-N	1/5/2018	2.20
	1/12/2018	2.20
	1/19/2018	2.20
	1/26/2018	2.20
	2/2/2018	2.20
	2/8/2018	2.20
	2/16/2018	2.20
	2/22/2018	2.20
	3/2/2018	2.20
	3/9/2018	2.20
	3/15/2018	2.20
	3/23/2018	2.20
	3/29/2018	2.20
	4/6/2018	2.20
	4/13/2018	2.20
	4/20/2018	2.20
	4/27/2018	2.20
	5/4/2018	2.20
	5/11/2018	2.20
	5/18/2018	2.20
	5/24/2018	2.20
	5/31/2018	2.20
	6/8/2018	2.20
	6/15/2018	2.20
	6/22/2018	2.20
	6/28/2018	2.20
	7/6/2018	2.20
	7/13/2018	2.20
	7/20/2018	2.20
	7/27/2018	2.20
	8/3/2018	2.20
	8/10/2018	2.20

TABLE D-1

WATER LEVEL DATA
(TREATMENT CELLS)

IDENTIFIER	DATE MEASURED	WATER DEPTH (feet)
PDA-N	8/17/2018	2.20
	8/24/2018	2.20
	8/30/2018	2.20
	9/7/2018	2.20
	9/14/2018	2.20
	9/21/2018	2.20
	9/27/2018	2.20
	10/5/2018	2.20
	10/12/2018	2.20
	10/19/2018	2.20
	10/26/2018	2.20
	11/1/2018	2.20
	11/8/2018	2.20
	11/16/2018	2.20
	11/21/2018	2.20
	11/30/2018	2.20
	12/7/2018	2.20
	12/14/2018	2.20
	12/21/2018	2.20
	12/28/2018	2.20
PDA-S	1/5/2018	2.50
	1/12/2018	2.50
	1/19/2018	2.50
	1/26/2018	2.50
	2/2/2018	2.50
	2/8/2018	2.50
	2/16/2018	2.50
	2/22/2018	2.50
	3/2/2018	2.50
	3/9/2018	2.50
	3/15/2018	2.50
	3/23/2018	2.50
	3/29/2018	2.50
	4/6/2018	2.50
	4/13/2018	2.50
	4/20/2018	2.50
	4/27/2018	2.50
	5/4/2018	2.50
	5/11/2018	2.50
	5/18/2018	2.50
	5/24/2018	2.50
	5/31/2018	2.50
	6/8/2018	2.50
	6/15/2018	2.50
	6/22/2018	2.50

TABLE D-1

WATER LEVEL DATA
(TREATMENT CELLS)

IDENTIFIER	DATE MEASURED	WATER DEPTH (feet)
PDA-S	6/28/2018	2.50
	7/6/2018	2.50
	7/13/2018	2.50
	7/20/2018	2.50
	7/27/2018	2.50
	8/3/2018	2.50
	8/10/2018	2.50
	8/17/2018	2.50
	8/24/2018	2.50
	8/30/2018	2.50
	9/7/2018	2.50
	9/14/2018	2.50
	9/21/2018	2.50
	9/27/2018	2.50
	10/5/2018	2.50
	10/12/2018	2.50
	10/19/2018	2.50
	10/26/2018	2.50
	11/1/2018	2.50
	11/8/2018	2.50
	11/16/2018	2.50
	11/21/2018	2.50
	11/30/2018	2.50
	12/7/2018	2.50
	12/14/2018	2.50
	12/21/2018	2.50
	12/28/2018	2.50

NOTES and ABBREVIATIONS:

1. Water depths are measured with staff gauges located in outlet structures.

FIGURES

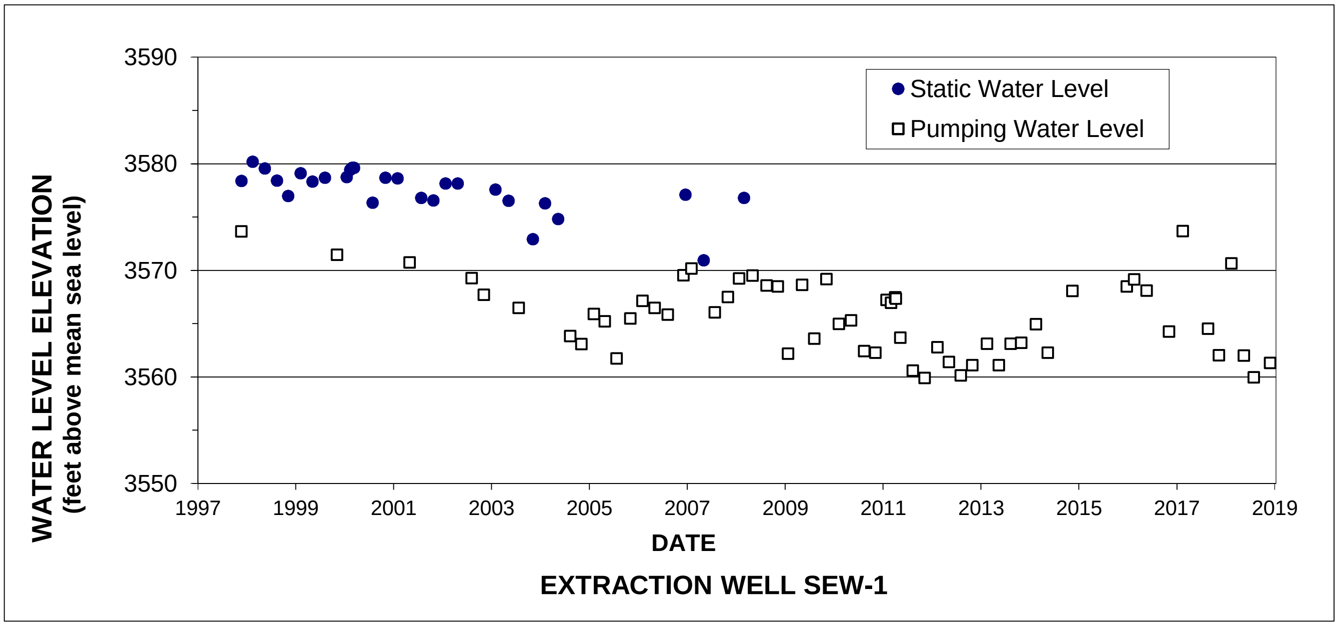
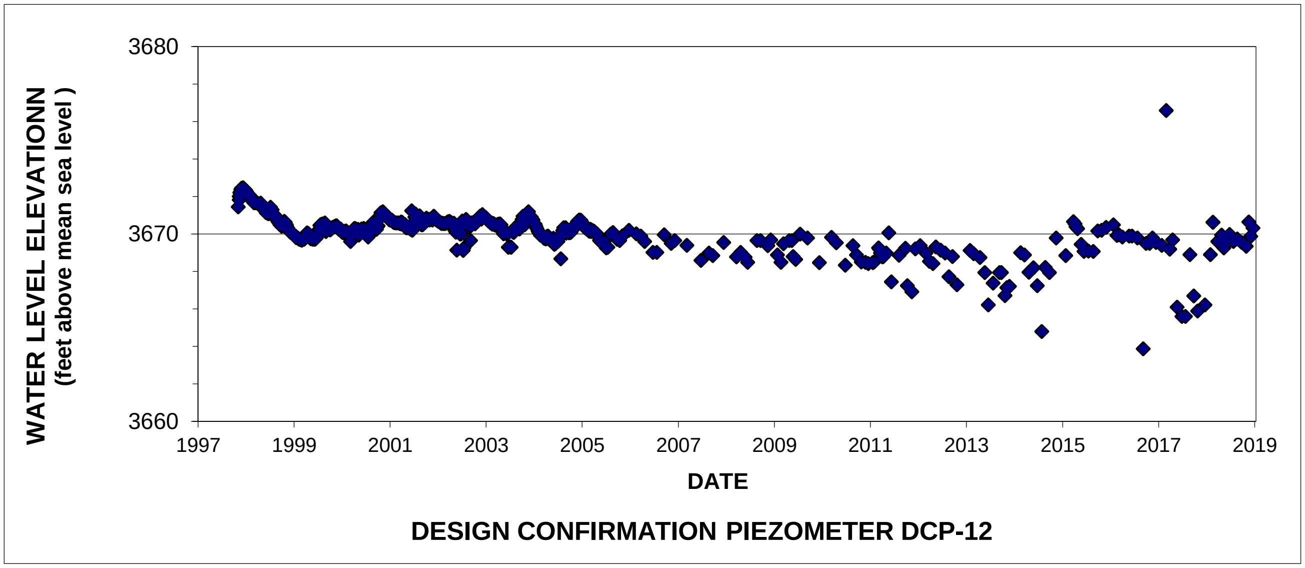


FIGURE D-1. WATER LEVEL HYDROGRAPHS FOR EXTRACTION WELL SEW-1 AND EXTRACTION WELL SEW-2



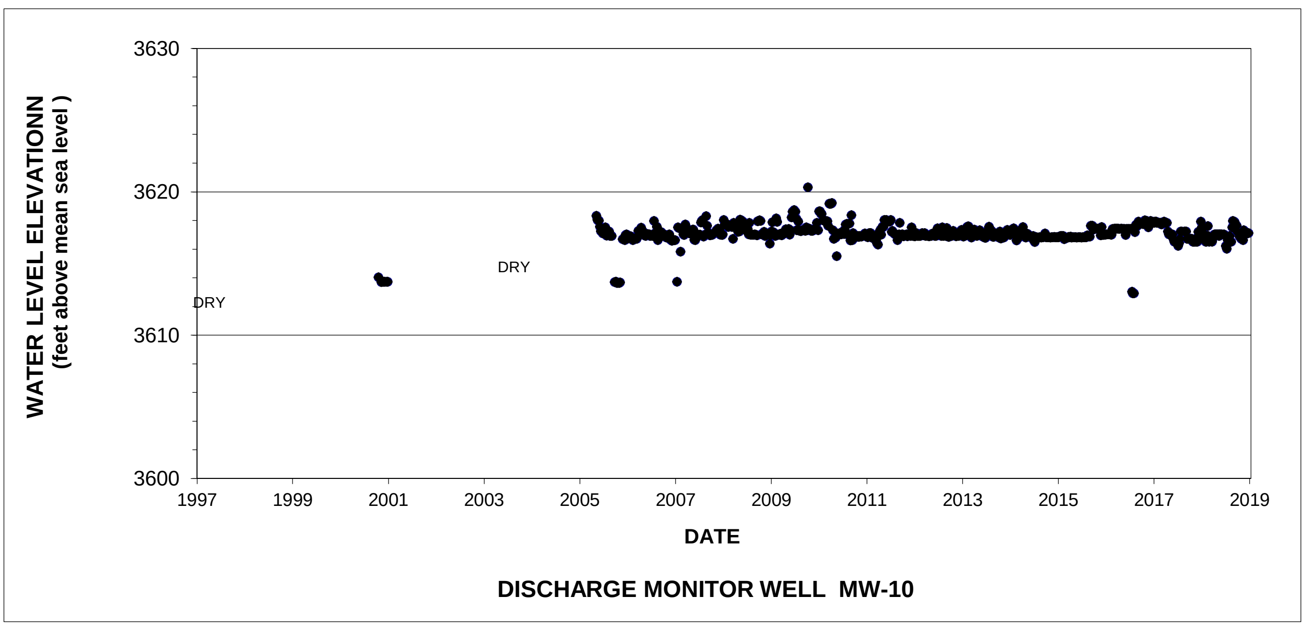
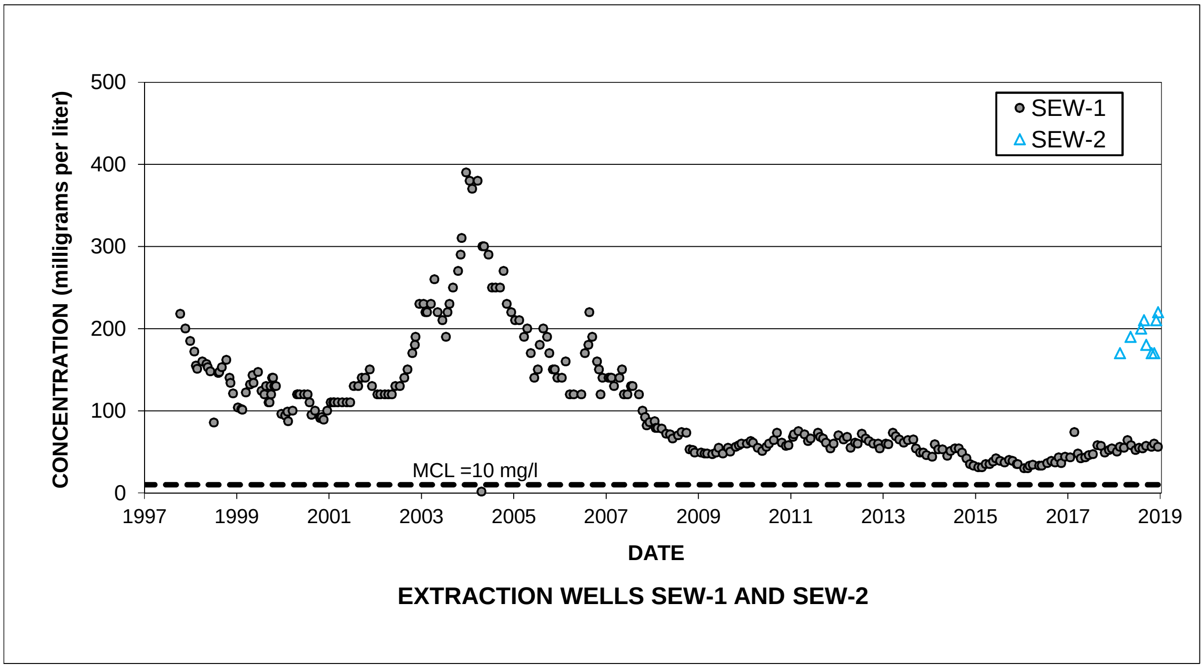
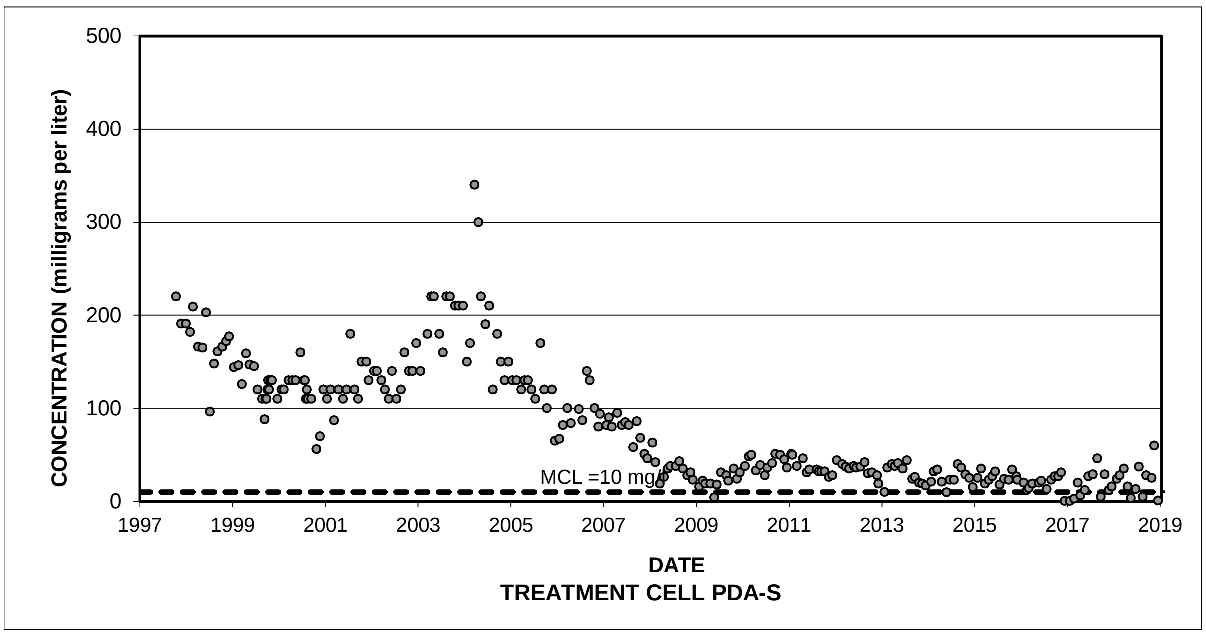


FIGURE D-2. WATER LEVEL HYDROGRAPHS FOR DESIGN CONFIRMATION PIEZOMETER DCP-12 AND MONITOR WELL MW-10



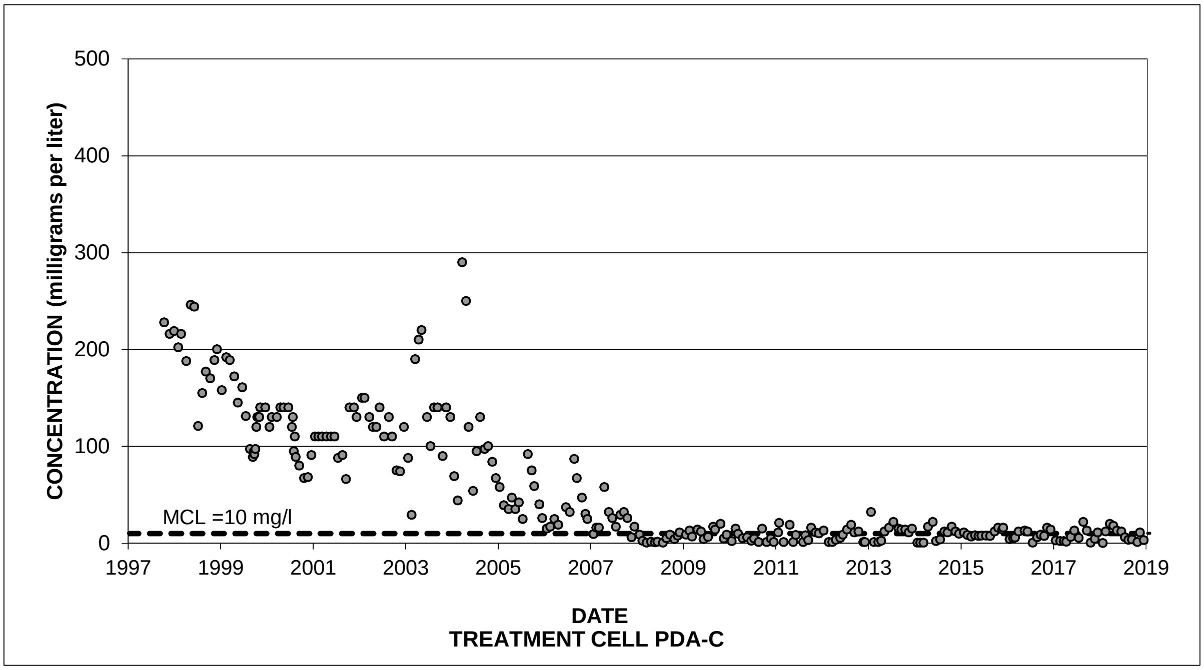


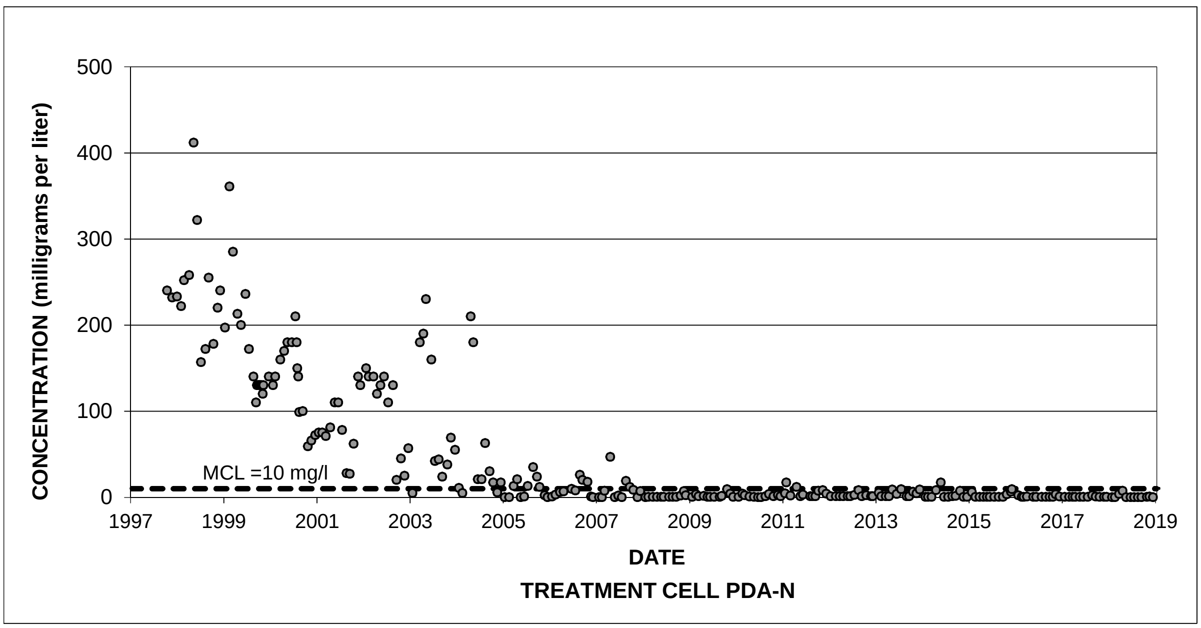
Notes:

MCL = Federal Maximum Contaminant Level

NO_3-N = Nitrate as Nitrogen

FIGURE D-3. WATER QUALITY HYDROGRAPHS FOR NO3-N IN NARS EXTRACTION WELL SEW-1 AND TREATMENT CELL PDA-S



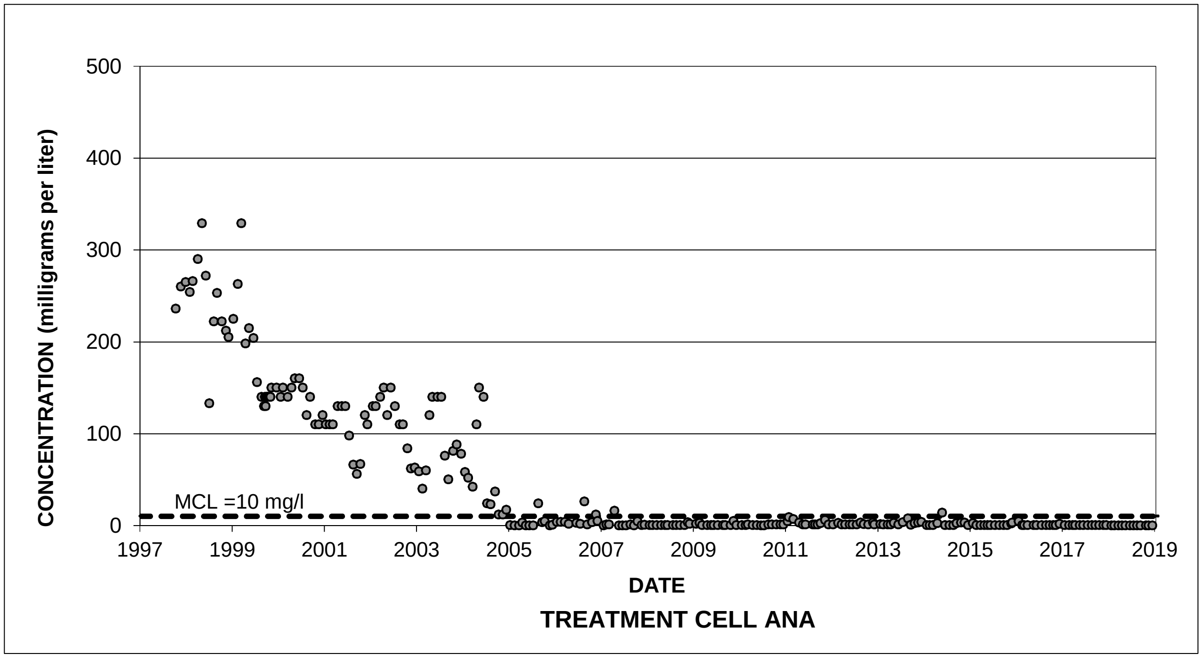


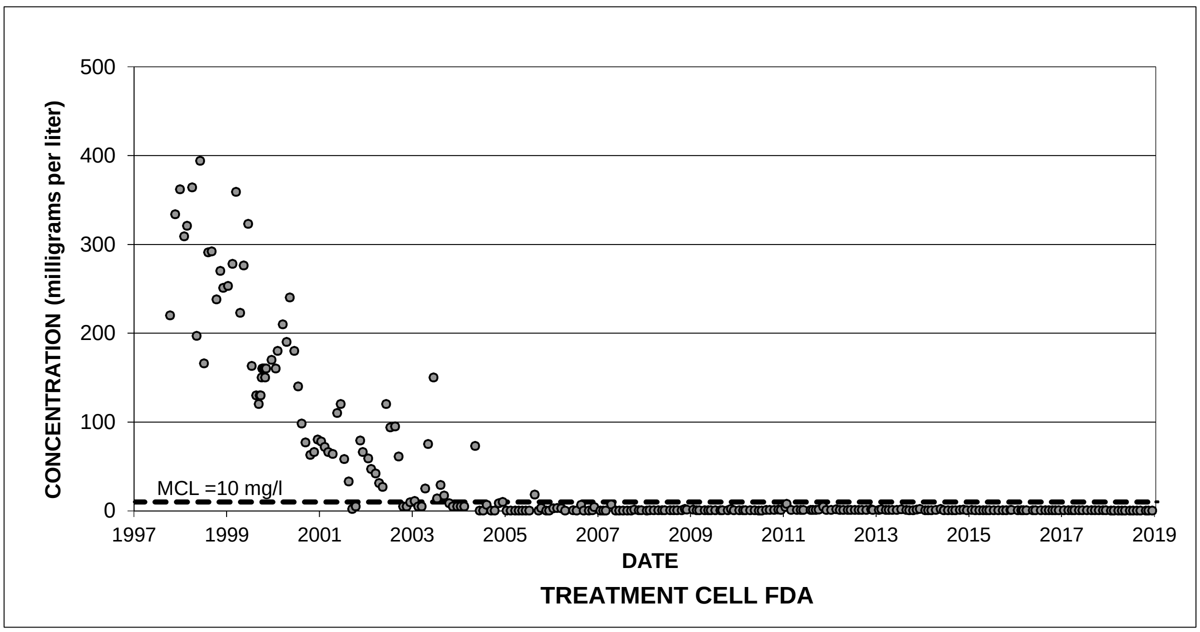
Notes:

MCL = Federal Maximum Contaminant Level

NO_3-N = Nitrate as Nitrogen

FIGURE D-4. WATER QUALITY HYDROGRAPHS FOR NO3-N IN NARS TREATMENT CELLS PDA-C AND PDA-N



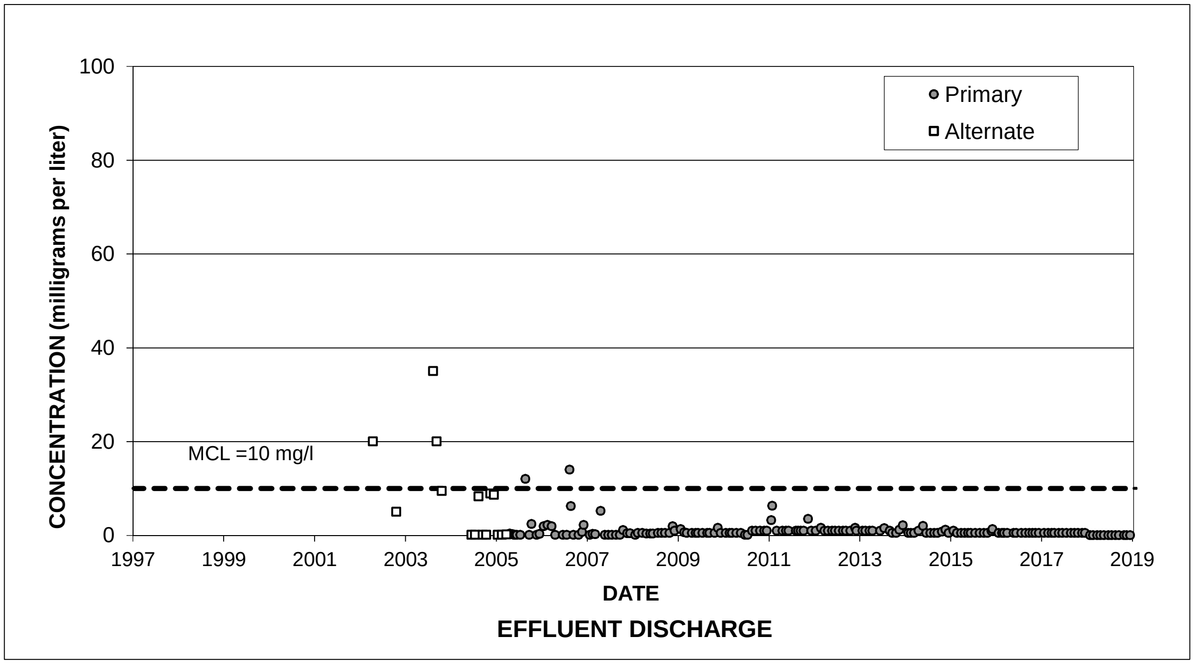


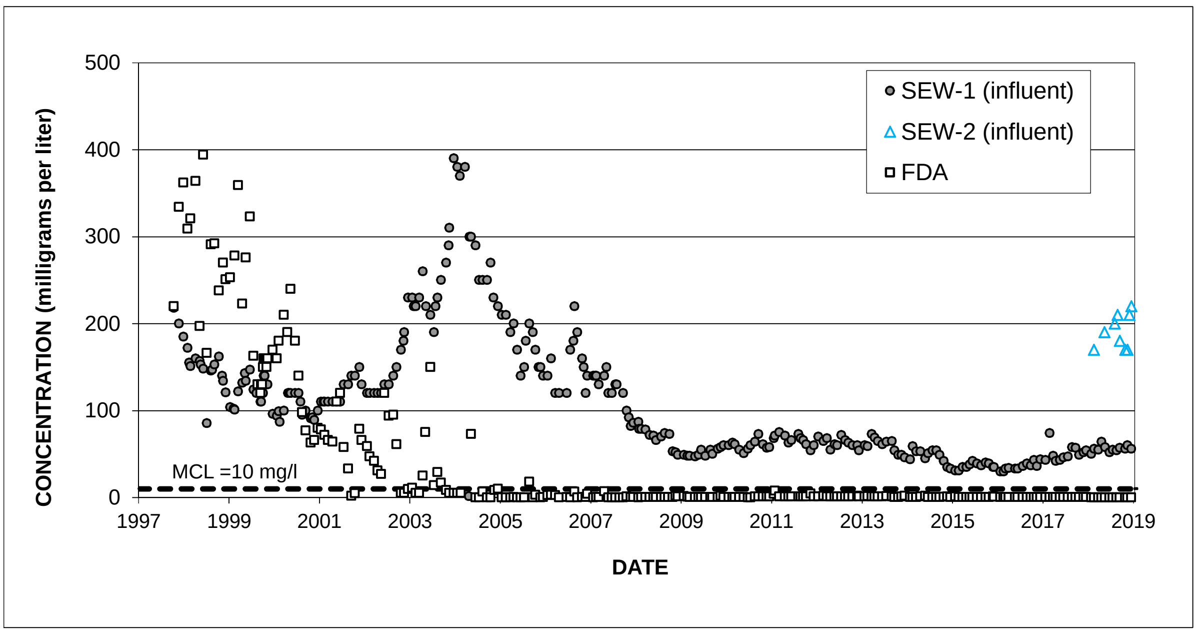
Notes:

MCL = Federal Maximum Contaminant Level

NO_3-N = Nitrate as Nitrogen

FIGURE D-5. WATER QUALITY HYDROGRAPHS FOR NO3-N IN NARS TEATMENT CELLS ANA AND FDA



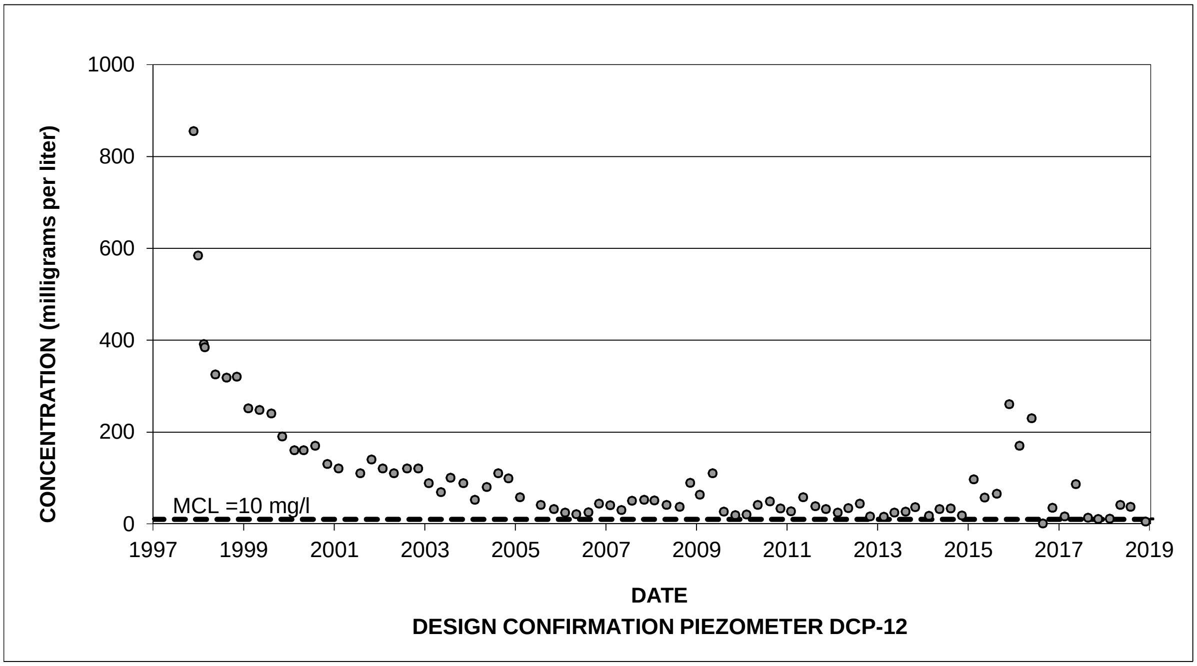


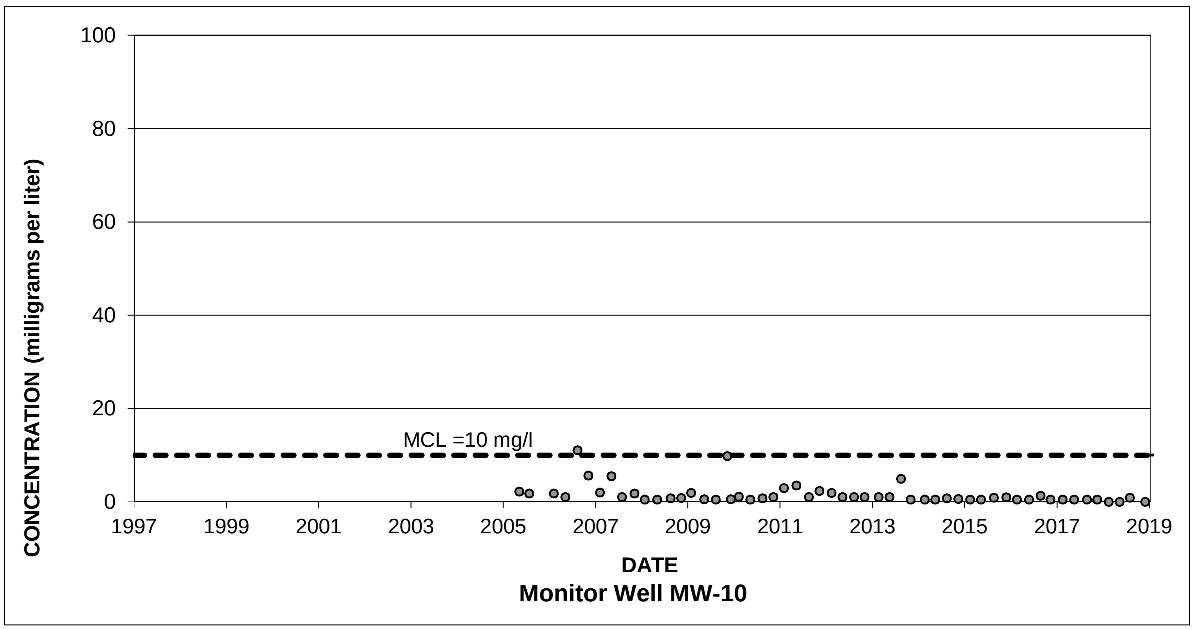
Notes:

MCL = Federal Maximum Contaminant Level

NO_3-N = Nitrate as Nitrogen

FIGURE D-6. WATER QUALITY HYDROGRAPHS FOR NO3-N AT NARS EFFLUENT AND INFLUENT





Notes:

MCL = Federal Maximum Contaminant Level

NO_3-N = Nitrate as Nitrogen

FIGURE D-7. WATER QUALITY HYDROGRAPHS FOR NO3-N IN DESIGN CONFIRMATION PIEZOMETER AND MW-10

APPENDIX E

NARS FIELD DATA

TABLES

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
ANA	1/5/2018	---	---	6.7	0.99	ORG
	1/12/2018	---	---	7.5	0.94	ORG
	1/19/2018	---	---	7.0	0.34	ORG
	1/26/2018	---	---	5.4	0.81	ORG
	1/30/2018	7.51	1.185	5.3	0.75	ORG
	2/2/2018	---	---	7.1	0.61	ORG
	2/8/2018	---	---	8.0	0.30	ORG
	2/16/2018	---	---	9.8	0.58	ORG
	2/22/2018	7.33	1.270	7.1	0.43	ORG
	3/2/2018	---	---	7.4	0.45	ORG
	3/9/2018	---	---	10.7	0.67	ORG
	3/15/2018	---	---	11.4	0.22	ORG
	3/23/2018	---	---	13.1	0.52	ORG
	3/27/2018	7.31	1.288	10.8	0.93	ORG
	3/29/2018	---	---	9.6	0.95	ORG
	4/6/2018	---	---	13.5	0.67	ORG
	4/13/2018	---	---	12.9	0.89	ORG
	4/20/2018	---	---	12.8	0.44	ORG
	4/24/2018	7.26	1.212	14.7	0.71	ORG
	4/27/2018	---	---	16.7	0.79	ORG
	5/4/2018	---	---	13.5	0.76	ORG
	5/11/2018	---	---	16.6	0.59	ORG
	5/18/2018	---	---	16.1	0.37	ORG
	5/21/2018	7.22	1.243	15.2	0.21	ORG
	5/24/2018	---	---	17.8	0.57	ORG
	5/31/2018	---	---	15.8	0.74	ORG
	6/8/2018	---	---	18.5	0.49	ORG
	6/15/2018	---	---	19.1	1.13	ORG
	6/22/2018	---	---	20.2	1.35	ORG
	6/26/2018	7.47	1.436	20.1	1.29	ORG
	6/28/2018	---	---	18.9	1.00	ORG
	7/6/2018	---	---	17.1	0.97	ORG
	7/13/2018	---	---	17.2	1.01	ORG
	7/20/2018	---	---	22.7	0.71	ORG
	7/23/2018	7.32	1.917	23.1	0.85	ORG
	7/27/2018	---	---	23.1	0.96	ORG
	8/3/2018	---	---	23.6	0.86	ORG
	8/10/2018	---	---	22.4	0.71	ORG
	8/17/2018	---	---	21.3	2.59	ORG
	8/21/2018	7.53	1.759	21.9	1.98	ORG
	8/24/2018	---	---	21.7	1.17	ORG
	8/30/2018	---	---	20.7	1.28	ORG
	9/7/2018	---	---	19.5	1.43	ORG
	9/14/2018	---	---	19.0	2.01	ORG
	9/18/2018	7.33	1.752	20.3	3.73	ORG
	9/21/2018	---	---	20.9	1.08	ORG
	9/27/2018	---	---	19.1	1.37	ORG
	10/5/2018	---	---	17.7	1.07	ORG
	10/12/2018	---	---	14.3	0.49	ORG
	10/19/2018	---	---	13.6	0.76	ORG
	10/26/2018	---	---	14.1	0.50	ORG
	10/30/2018	7.42	1.326	13.3	1.17	ORG
	11/1/2018	---	---	12.4	0.49	ORG
	11/8/2018	---	---	10.6	0.99	ORG
	11/16/2018	---	---	6.8	0.72	ORG
	11/19/2018	7.31	1.092	6.2	0.65	ORG
	11/21/2018	---	---	6.6	0.55	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
ANA	11/30/2018	---	---	6.9	0.59	ORG
	12/7/2018	---	---	8.0	0.81	ORG
	12/14/2018	---	---	7.4	0.94	ORG
	12/19/2018	7.38	1.132	5.9	0.60	ORG
	12/21/2018	---	---	5.2	0.45	ORG
	12/28/2018	---	---	5.2	0.59	ORG
FDA	1/5/2018	---	---	8.2	0.96	ORG
	1/12/2018	---	---	9.5	0.88	ORG
	1/19/2018	---	---	7.8	0.32	ORG
	1/26/2018	---	---	6.2	1.20	ORG
	1/30/2018	7.17	1.219	5.6	0.95	ORG
	2/2/2018	---	---	6.9	0.67	ORG
	2/8/2018	---	---	8.0	0.51	ORG
	2/16/2018	---	---	9.8	0.89	ORG
	2/22/2018	7.14	1.370	7.9	1.05	ORG
	3/2/2018	---	---	7.1	0.49	ORG
	3/9/2018	---	---	8.7	1.08	ORG
	3/15/2018	---	---	10.4	0.20	ORG
	3/23/2018	---	---	10.7	0.58	ORG
	3/27/2018	7.00	1.306	10.6	0.98	ORG
	3/29/2018	---	---	9.7	1.12	ORG
	4/6/2018	---	---	11.5	0.75	ORG
	4/13/2018	---	---	11.5	0.97	ORG
	4/20/2018	---	---	10.9	0.59	ORG
	4/24/2018	6.99	1.200	12.0	0.76	ORG
	4/27/2018	---	---	13.3	0.84	ORG
	5/4/2018	---	---	12.4	0.94	ORG
	5/11/2018	---	---	14.3	0.81	ORG
	5/18/2018	---	---	14.1	0.48	ORG
	5/21/2018	6.83	1.298	13.3	0.35	ORG
	5/24/2018	---	---	14.7	0.40	ORG
	5/31/2018	---	---	13.5	0.74	ORG
	6/8/2018	---	---	15.2	0.48	ORG
	6/15/2018	---	---	15.8	0.64	ORG
	6/22/2018	---	---	17.8	0.88	ORG
	6/26/2018	6.80	1.611	17.4	0.80	ORG
	6/28/2018	---	---	17.8	0.83	ORG
	7/6/2018	---	---	17.3	0.92	ORG
	7/13/2018	---	---	17.1	0.95	ORG
	7/20/2018	---	---	18.9	0.62	ORG
	7/23/2018	6.91	1.702	20.1	0.68	ORG
	7/27/2018	---	---	19.2	0.67	ORG
	8/3/2018	---	---	20.7	1.16	ORG
	8/10/2018	---	---	19.4	0.78	ORG
	8/17/2018	---	---	20.0	1.41	ORG
	8/21/2018	7.17	1.792	19.6	1.13	ORG
	8/24/2018	---	---	20.6	1.16	ORG
	8/30/2018	---	---	18.7	0.79	ORG
	9/7/2018	---	---	17.9	0.99	ORG
	9/18/2018	7.08	1.822	17.9	1.31	ORG
	9/21/2018	---	---	18.7	0.76	ORG
	9/27/2018	---	---	17.7	1.27	ORG
	10/5/2018	---	---	16.8	1.02	ORG
	10/12/2018	---	---	14.1	0.42	ORG
	10/19/2018	---	---	13.0	0.84	ORG
	10/26/2018	---	---	14.0	0.51	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
FDA	10/30/2018	7.23	1.430	13.5	0.96	ORG
	11/1/2018	---	---	12.9	0.23	ORG
	11/8/2018	---	---	11.6	0.95	ORG
	11/16/2018	---	---	6.8	0.68	ORG
	11/19/2018	7.24	1.179	6.7	0.74	ORG
	11/21/2018	---	---	8.3	0.54	ORG
	11/30/2018	---	---	8.7	0.71	ORG
	12/7/2018	---	---	9.0	0.78	ORG
	12/14/2018	---	---	7.7	1.28	ORG
	12/19/2018	7.10	1.267	7.8	0.81	ORG
	12/21/2018	---	---	7.3	0.76	ORG
	12/28/2018	---	---	6.5	0.91	ORG
PDA-C	1/5/2018	---	---	8.2	15.17	ORG
	1/12/2018	---	---	9.1	17.63	ORG
	1/19/2018	---	---	8.0	11.73	ORG
	1/26/2018	---	---	6.7	13.77	ORG
	1/30/2018	7.42	1.098	5.4	10.88	ORG
	2/2/2018	---	---	7.0	12.53	ORG
	2/8/2018	---	---	7.6	11.51	ORG
	2/16/2018	---	---	9.4	20.19	ORG
	2/22/2018	7.16	1.334	8.5	15.10	ORG
	3/2/2018	---	---	7.4	15.22	ORG
	3/9/2018	---	---	8.5	22.27	ORG
	3/15/2018	---	---	9.9	15.91	ORG
	3/23/2018	---	---	10.4	15.99	ORG
	3/27/2018	7.03	1.196	10.4	20.11	ORG
	3/29/2018	---	---	9.6	19.81	ORG
	4/6/2018	---	---	11.2	18.11	ORG
	4/13/2018	---	---	11.7	22.42	ORG
	4/20/2018	---	---	11.6	17.31	ORG
	4/24/2018	7.03	1.209	12.8	16.41	ORG
	4/27/2018	---	---	13.1	11.56	ORG
	5/4/2018	---	---	12.7	16.07	ORG
	5/11/2018	---	---	14.3	12.81	ORG
	5/18/2018	---	---	14.5	11.03	ORG
	5/21/2018	7.52	1.523	14.1	10.62	ORG
	5/24/2018	---	---	14.4	10.40	ORG
	5/31/2018	---	---	14.4	14.13	ORG
	6/8/2018	---	---	15.8	13.02	ORG
	6/15/2018	---	---	16.4	16.23	ORG
	6/22/2018	---	---	17.0	9.32	ORG
	6/26/2018	6.85	1.701	17.4	11.90	ORG
	6/28/2018	---	---	17.3	8.56	ORG
	7/6/2018	---	---	18.0	10.31	ORG
	7/13/2018	---	---	18.1	14.22	ORG
	7/20/2018	---	---	20.2	5.59	ORG
	7/23/2018	6.99	1.730	20.8	3.51	ORG
	7/27/2018	---	---	20.6	8.72	ORG
	8/3/2018	---	---	21.1	18.73	ORG
	8/10/2018	---	---	21.3	5.82	ORG
	8/17/2018	---	---	20.8	7.81	ORG
	8/21/2018	7.16	1.860	21.3	7.16	ORG
	8/24/2018	---	---	21.2	2.70	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
PDA-C	8/30/2018	---	---	20.3	3.40	ORG
	9/7/2018	---	---	19.6	4.81	ORG
	9/14/2018	---	---	19.0	4.96	ORG
	9/18/2018	7.08	1.675	19.5	7.64	ORG
	9/21/2018	---	---	19.7	2.34	ORG
	9/27/2018	---	---	19.1	3.47	ORG
	10/5/2018	---	---	18.4	4.25	ORG
	10/12/2018	---	---	16.3	1.71	ORG
	10/19/2018	---	---	14.9	1.85	ORG
	10/26/2018	---	---	15.4	1.24	ORG
	10/30/2018	7.27	1.326	14.9	2.80	ORG
	11/1/2018	---	---	14.1	0.76	ORG
	11/8/2018	---	---	12.9	5.55	ORG
	11/16/2018	---	---	9.6	13.51	ORG
	11/19/2018	7.33	1.115	9.0	10.42	ORG
	11/21/2018	---	---	9.5	5.65	ORG
	11/30/2018	---	---	9.3	3.21	ORG
	12/7/2018	---	---	9.6	4.61	ORG
	12/14/2018	---	---	8.3	3.31	ORG
	12/19/2018	7.02	1.464	8.4	2.11	ORG
	12/21/2018	---	---	8.1	2.11	ORG
	12/28/2018	---	---	7.7	1.81	ORG
PDA-N	1/5/2018	---	---	7.1	0.72	ORG
	1/12/2018	---	---	7.7	0.79	ORG
	1/19/2018	---	---	6.6	0.25	ORG
	1/26/2018	---	---	5.0	0.75	ORG
	1/30/2018	7.40	1.094	4.7	0.85	ORG
	2/2/2018	---	---	5.9	0.84	ORG
	2/8/2018	---	---	6.7	0.59	ORG
	2/16/2018	---	---	8.6	2.04	ORG
	2/22/2018	7.46	1.261	5.6	0.80	ORG
	3/2/2018	---	---	6.2	1.28	ORG
	3/9/2018	---	---	8.6	2.93	ORG
	3/15/2018	---	---	9.4	1.73	ORG
	3/23/2018	---	---	10.8	2.85	ORG
	3/27/2018	7.34	1.163	8.5	4.21	ORG
	3/29/2018	---	---	7.3	4.65	ORG
	4/6/2018	---	---	10.9	4.10	ORG
	4/13/2018	---	---	10.6	5.28	ORG
	4/20/2018	---	---	10.7	5.47	ORG
	4/24/2018	7.27	1.135	12.3	8.38	ORG
	4/27/2018	---	---	13.4	5.32	ORG
	5/4/2018	---	---	11.0	3.23	ORG
	5/11/2018	---	---	13.9	0.61	ORG
	5/18/2018	---	---	13.2	0.42	ORG
	5/21/2018	7.23	1.240	12.5	0.26	ORG
	5/24/2018	---	---	14.0	0.69	ORG
	5/31/2018	---	---	12.4	0.75	ORG
	6/8/2018	---	---	15.0	0.47	ORG
	6/15/2018	---	---	15.7	0.93	ORG
	6/22/2018	---	---	16.7	0.78	ORG
	6/26/2018	6.93	1.829	16.7	1.10	ORG
	6/28/2018	---	---	18.1	0.64	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
PDA-N	7/6/2018	---	---	17.0	0.54	ORG
	7/13/2018	---	---	17.2	0.85	ORG
	7/20/2018	---	---	19.6	0.49	ORG
	7/23/2018	7.03	1.982	20.1	0.60	ORG
	7/27/2018	---	---	19.7	0.95	ORG
	8/3/2018	---	---	20.4	0.78	ORG
	8/10/2018	---	---	20.1	0.68	ORG
	8/17/2018	---	---	19.9	2.36	ORG
	8/21/2018	7.31	1.874	20.2	2.95	ORG
	8/24/2018	---	---	20.6	1.20	ORG
	8/30/2018	---	---	19.0	1.16	ORG
	9/7/2018	---	---	18.0	1.41	ORG
	9/14/2018	---	---	17.3	1.52	ORG
	9/18/2018	7.21	1.763	18.5	3.63	ORG
	9/21/2018	---	---	18.9	1.00	ORG
	9/27/2018	---	---	17.9	1.26	ORG
	10/5/2018	---	---	16.7	1.63	ORG
	10/12/2018	---	---	14.5	0.47	ORG
	10/19/2018	---	---	13.2	0.66	ORG
	10/26/2018	---	---	14.0	0.55	ORG
	10/30/2018	7.51	1.304	13.2	1.87	ORG
	11/1/2018	---	---	11.8	0.42	ORG
	11/8/2018	---	---	11.0	0.93	ORG
	11/16/2018	---	---	6.6	0.85	ORG
	11/19/2018	7.46	1.023	5.9	1.06	ORG
	11/21/2018	---	---	7.3	0.51	ORG
	11/30/2018	---	---	7.8	0.45	ORG
	12/7/2018	---	---	8.1	0.74	ORG
	12/14/2018	---	---	5.6	0.91	ORG
	12/19/2018	7.43	1.113	6.6	0.58	ORG
	12/21/2018	---	---	5.9	0.54	ORG
	12/28/2018	---	---	5.9	0.66	ORG
PDA-S	1/5/2018	---	---	11.6	19.02	ORG
	1/12/2018	---	---	11.9	22.57	ORG
	1/19/2018	---	---	11.3	26.44	ORG
	1/26/2018	---	---	9.8	27.68	ORG
	1/30/2018	7.17	1.263	10.6	30.96	ORG
	2/2/2018	---	---	11.1	30.19	ORG
	2/8/2018	---	---	11.7	35.11	ORG
	2/16/2018	---	---	13.8	34.62	ORG
	2/22/2018	7.06	1.406	12.5	37.75	ORG
	3/2/2018	---	---	10.9	38.01	ORG
	3/9/2018	---	---	13.0	41.05	ORG
	3/15/2018	---	---	14.1	34.59	ORG
	3/23/2018	---	---	14.9	33.57	ORG
	3/27/2018	6.96	1.316	14.6	36.53	ORG
	3/29/2018	---	---	13.8	40.46	ORG
	4/6/2018	---	---	15.8	43.92	ORG
	4/13/2018	---	---	14.6	43.23	ORG
	4/20/2018	---	---	14.8	13.89	ORG
	4/24/2018	6.95	1.450	15.8	18.76	ORG
	4/27/2018	---	---	17.2	19.63	ORG
	5/4/2018	---	---	15.3	11.14	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
TREATMENT CELLS						
PDA-S	5/11/2018	---	---	17.1	6.87	ORG
	5/18/2018	---	---	16.8	7.67	ORG
	5/21/2018	6.91	1.524	16.4	12.64	ORG
	5/24/2018	---	---	17.4	12.84	ORG
	5/31/2018	---	---	17.2	9.61	ORG
	6/8/2018	---	---	18.6	13.33	ORG
	6/15/2018	---	---	19.1	17.12	ORG
	6/22/2018	---	---	19.4	13.85	ORG
	6/26/2018	6.98	1.606	19.7	15.02	ORG
	6/28/2018	---	---	20.4	8.68	ORG
	7/6/2018	---	---	20.1	16.16	ORG
	7/13/2018	---	---	19.9	26.55	ORG
	7/20/2018	---	---	21.4	23.01	ORG
	7/23/2018	7.00	1.700	21.6	26.64	ORG
	7/27/2018	---	---	21.8	52.11	ORG
	8/3/2018	---	---	22.1	7.99	ORG
	8/10/2018	---	---	22.8	5.91	ORG
	8/17/2018	---	---	21.6	12.40	ORG
	8/21/2018	7.04	1.857	22.6	11.07	ORG
	8/24/2018	---	---	22.0	27.07	ORG
	8/30/2018	---	---	21.5	15.53	ORG
	9/7/2018	---	---	20.9	29.35	ORG
	9/14/2018	---	---	20.7	24.66	ORG
	9/18/2018	6.93	1.830	21.5	43.84	ORG
	9/21/2018	---	---	21.9	38.17	ORG
	9/27/2018	---	---	20.6	15.61	ORG
	10/5/2018	---	---	19.2	14.07	ORG
	10/12/2018	---	---	18.3	11.58	ORG
	10/19/2018	---	---	17.4	20.55	ORG
	10/26/2018	---	---	16.1	26.61	ORG
	10/30/2018	6.97	1.464	17.3	23.45	ORG
	11/1/2018	---	---	16.1	15.88	ORG
	11/8/2018	---	---	15.3	45.01	ORG
	11/16/2018	---	---	12.8	43.21	ORG
	11/19/2018	6.68	1.497	12.6	63.01	ORG
	11/21/2018	---	---	12.6	35.27	ORG
	11/30/2018	---	---	11.8	11.18	ORG
	12/7/2018	---	---	12.8	4.66	ORG
	12/14/2018	---	---	11.0	3.41	ORG
	12/19/2018	6.10	2.242	12.0	3.57	ORG
	12/21/2018	---	---	11.7	1.91	ORG
	12/28/2018	---	---	10.1	9.98	ORG
EXTRACTION WELLS						
SEW-01	1/5/2018	---	---	---	66.71	ORG
	1/12/2018	---	---	---	66.52	ORG
	1/19/2018	---	---	---	65.22	ORG
	1/26/2018	---	---	---	61.24	ORG
	1/30/2018	7.30	1.625	19.0	59.71	ORG
	2/2/2018	---	---	---	52.44	ORG
	2/8/2018	---	---	---	59.31	ORG
	2/16/2018	---	---	---	65.73	ORG
	2/22/2018	7.21	1.573	18.2	80.03	ORG
	3/2/2018	---	---	---	66.91	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
EXTRACTION WELLS						
SEW-01	3/9/2018	---	---	---	68.84	ORG
	3/15/2018	---	---	---	55.71	ORG
	3/23/2018	---	---	---	58.98	ORG
	3/27/2018	7.12	1.516	18.7	62.58	ORG
	3/29/2018	---	---	---	65.84	ORG
	4/6/2018	---	---	---	60.11	ORG
	4/13/2018	---	---	---	71.09	ORG
	4/20/2018	---	---	---	65.22	ORG
	4/24/2018	6.99	1.608	19.0	59.63	ORG
	4/27/2018	---	---	---	58.73	ORG
	5/4/2018	---	---	---	73.13	ORG
	5/11/2018	---	---	---	63.75	ORG
	5/18/2018	---	---	---	64.05	ORG
	5/21/2018	7.18	1.636	21.2	79.00	ORG
	5/24/2018	---	---	---	66.28	ORG
	5/31/2018	---	---	---	67.44	ORG
	6/8/2018	---	---	---	61.84	ORG
	6/15/2018	---	---	---	60.25	ORG
	6/22/2018	---	---	---	53.50	ORG
	6/26/2018	7.34	1.705	23.1	57.21	ORG
	6/28/2018	---	---	---	61.23	ORG
	7/6/2018	---	---	---	58.55	ORG
	7/13/2018	---	---	---	58.21	ORG
	7/20/2018	---	---	---	53.05	ORG
	7/23/2018	6.99	1.598	21.1	50.87	ORG
	7/27/2018	---	---	---	63.81	ORG
	8/3/2018	---	---	---	71.38	ORG
	8/10/2018	---	---	---	56.21	ORG
	8/17/2018	---	---	---	62.92	ORG
	8/21/2018	7.66	1.654	20.8	63.20	ORG
	8/24/2018	---	---	---	50.81	ORG
	8/30/2018	---	---	---	62.76	ORG
	9/7/2018	---	---	---	64.18	ORG
	9/14/2018	---	---	---	63.21	ORG
	9/18/2018	7.31	1.741	22.1	68.58	ORG
	9/21/2018	---	---	---	65.15	ORG
	9/27/2018	---	---	---	58.86	ORG
	10/5/2018	---	---	---	55.05	ORG
	10/12/2018	---	---	---	59.40	ORG
	10/19/2018	---	---	---	60.16	ORG
	10/26/2018	---	---	---	61.23	ORG
	10/30/2018	7.16	1.510	20.7	62.81	ORG
	11/1/2018	---	---	---	62.31	ORG
	11/8/2018	---	---	---	61.17	ORG
	11/16/2018	---	---	---	69.95	ORG
	11/19/2018	7.38	1.406	17.9	69.40	ORG
	11/21/2018	---	---	---	63.45	ORG
	11/30/2018	---	---	---	54.91	ORG
	12/7/2018	---	---	---	61.25	ORG
	12/14/2018	---	---	---	59.59	ORG
	12/19/2018	6.95	1.547	19.0	62.57	ORG
	12/21/2018	---	---	---	58.11	ORG
	12/28/2018	---	---	---	45.71	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
EXTRACTION WELLS						
SEW-02 (TW-01)	7/20/2018	---	---	---	269.71	ORG
	7/27/2018	---	---	---	222.88	ORG
	8/3/2018	---	---	---	256.00	ORG
	8/10/2018	---	---	---	175.24	ORG
	8/17/2018	---	---	---	212.48	ORG
	8/24/2018	---	---	---	185.21	ORG
	8/30/2018	---	---	---	247.80	ORG
	9/7/2018	---	---	---	184.84	ORG
	9/14/2018	---	---	---	237.80	ORG
	9/18/2018	6.92	2.079	20.8	246.81	ORG
	9/21/2018	---	---	---	178.64	ORG
	9/27/2018	---	---	---	182.44	ORG
	10/5/2018	---	---	---	164.16	ORG
	10/12/2018	---	---	---	134.64	ORG
	10/19/2018	---	---	---	160.96	ORG
	10/26/2018	---	---	---	165.32	ORG
	10/30/2018	7.04	1.841	20.6	190.64	ORG
	11/1/2018	---	---	---	117.58	ORG
	11/8/2018	---	---	---	202.42	ORG
	11/16/2018	---	---	---	224.09	ORG
	11/19/2018	6.98	1.882	19.3	222.00	ORG
	11/21/2018	---	---	---	238.44	ORG
	11/30/2018	---	---	---	241.43	ORG
	12/7/2018	---	---	---	238.41	ORG
	12/14/2018	---	---	---	226.89	ORG
	12/19/2018	6.86	2.412	19.6	238.04	ORG
	12/21/2018	---	---	---	264.85	ORG
	12/28/2018	---	---	---	273.41	ORG
EFFLUENT						
EFF-L	1/5/2018	---	---	---	0.92	ORG
	1/12/2018	---	---	---	0.85	ORG
	1/19/2018	---	---	---	0.51	ORG
	1/26/2018	---	---	---	0.99	ORG
	1/30/2018	7.50	1.430	12.0	0.80	ORG
	2/2/2018	---	---	---	0.69	ORG
	2/8/2018	---	---	---	0.52	ORG
	2/16/2018	---	---	---	0.77	ORG
	2/22/2018	7.53	1.450	10.6	0.77	ORG
	3/2/2018	---	---	---	0.68	ORG
	3/9/2018	---	---	---	0.98	ORG
	3/15/2018	---	---	---	0.32	ORG
	3/23/2018	---	---	---	0.71	ORG
	3/27/2018	7.45	1.453	15.4	1.28	ORG
	3/29/2018	---	---	---	1.19	ORG
	4/6/2018	---	---	---	1.07	ORG
	4/13/2018	---	---	---	1.03	ORG
	4/20/2018	---	---	---	0.95	ORG
	4/24/2018	7.51	1.497	16.2	0.97	ORG
	4/27/2018	---	---	---	1.24	ORG
	5/4/2018	---	---	---	0.71	ORG
	5/11/2018	---	---	---	1.21	ORG
	5/18/2018	---	---	---	0.93	ORG
	5/21/2018	7.45	1.485	20.5	0.74	ORG

TABLE E-1

SUMMARY OF FIELD WATER QUALITY
JANUARY THROUGH DECEMBER 2018

IDENTIFIER	SAMPLE DATE	HYDROGEN ION POTENTIAL (pH Units)	ELECTRICAL CONDUCTIVITY (mS/cm)	TEMPERATURE (C)	NITRATE-N (mg/l)	SAMPLE TYPE
EFFLUENT						
EFF-L	5/24/2018	---	---	---	0.77	ORG
	5/31/2018	---	---	---	0.91	ORG
	6/8/2018	---	---	---	0.77	ORG
	6/15/2018	---	---	---	0.75	ORG
	6/22/2018	---	---	---	1.24	ORG
	6/26/2018	7.69	1.974	28.0	1.02	ORG
	6/28/2018	---	---	---	0.97	ORG
	7/6/2018	---	---	---	0.82	ORG
	7/13/2018	---	---	---	1.05	ORG
	7/20/2018	---	---	---	0.61	ORG
	7/23/2018	7.57	1.958	27.3	0.93	ORG
	7/27/2018	---	---	---	0.82	ORG
	8/3/2018	---	---	---	1.07	ORG
	8/10/2018	---	---	---	0.91	ORG
	8/17/2018	---	---	---	2.87	ORG
	8/21/2018	7.58	1.873	22.4	2.30	ORG
	8/24/2018	---	---	---	0.95	ORG
	8/30/2018	---	---	---	1.75	ORG
	9/7/2018	---	---	---	1.78	ORG
	9/14/2018	---	---	---	1.85	ORG
	9/18/2018	7.43	1.937	21.7	2.11	ORG
	9/21/2018	---	---	---	2.14	ORG
	9/27/2018	---	---	---	3.12	ORG
	10/5/2018	---	---	---	2.02	ORG
	10/12/2018	---	---	---	0.95	ORG
	10/19/2018	---	---	---	0.95	ORG
	10/26/2018	---	---	---	0.78	ORG
	10/30/2018	7.54	1.444	15.3	1.62	ORG
	11/1/2018	---	---	---	0.87	ORG
	11/8/2018	---	---	---	1.12	ORG
	11/16/2018	---	---	---	0.92	ORG
	11/19/2018	7.60	1.213	8.5	1.63	ORG
	11/21/2018	---	---	---	0.88	ORG
	11/30/2018	---	---	---	0.91	ORG
	12/7/2018	---	---	---	0.92	ORG
	12/14/2018	---	---	---	1.02	ORG
	12/19/2018	7.20	1.293	9.7	0.73	ORG
	12/21/2018	---	---	---	0.88	ORG
	12/28/2018	---	---	---	0.93	ORG

ABBREVIATIONS/ACRONYMS:

--- = not analyzed
C = Centigrade
mg/l = milligrams per liter
ms/cm = MilliSiemens per centimeter
NO3-N = Nitrate-Nitrogen
ORG = original sample
pH = Hydrogen ion potential

NOTES:

Field data collected with a YSI Pro Multimeter.

TABLE E-2
DATA COMPARISON TABLE
(Nitrate as Nitrogen)
(mg/l)

IDENTIFIER	SAMPLE DATE	LAB	ANP	RPD (%)
PDA-S	1/30/2018	24	30.96	25
	2/22/2018	28	37.75	30
	3/27/2018	35	36.53	4
	4/24/2018	16	18.76	16
	5/21/2018	3.6	12.64	111
	6/26/2018	13	15.02	14
	7/23/2018	37	26.64	33
	8/21/2018	4.8	11.07	79
	9/18/2018	28	43.84	44
	10/30/2018	25	23.45	6
	11/19/2018	60	63.01	5
	12/19/2018	0.73	3.57	132
PDA-C	1/30/2018	<0.5	10.88	NC
	2/22/2018	12	15.10	23
	3/27/2018	20	20.11	1
	4/24/2018	18	16.41	9
	5/21/2018	13	10.62	20
	6/26/2018	12	11.90	1
	7/23/2018	6.2	3.51	55
	8/21/2018	3.4	7.16	71
	9/18/2018	3.7	7.64	69
	10/30/2018	1.1	2.80	87
	11/19/2018	11	10.42	5
	12/19/2018	3.1	2.11	38
PDA-N	1/30/2018	<0.5	0.85	NC
	2/22/2018	<0.5	0.80	NC
	3/27/2018	3.7	4.21	13
	4/24/2018	7.6	8.38	10
	5/21/2018	<0.5	0.26	NC
	6/26/2018	<0.5	1.10	NC
	7/23/2018	<0.5	0.60	NC
	8/21/2018	<0.5	2.95	NC
	9/18/2018	<0.5	3.63	NC
	10/30/2018	0.60	1.87	103
	11/19/2018	0.63	1.06	51
	12/19/2018	<0.5	0.58	NC

TABLE E-2
DATA COMPARISON TABLE
(Nitrate as Nitrogen)
(mg/l)

IDENTIFIER	SAMPLE DATE	LAB	ANP	RPD (%)
ANA	1/30/2018	<0.5	0.75	NC
	2/22/2018	<0.5	0.43	NC
	3/27/2018	<0.5	0.93	NC
	4/24/2018	<0.5	0.71	NC
	5/21/2018	<0.5	0.21	NC
	6/26/2018	<0.5	1.29	NC
	7/23/2018	<0.5	0.85	NC
	8/21/2018	<0.5	1.98	NC
	9/18/2018	<0.5	3.73	NC
	10/30/2018	<0.5	1.17	NC
	11/19/2018	<0.5	0.65	NC
	12/19/2018	<0.5	0.60	NC
FDA	1/30/2018	<0.5	0.95	NC
	2/22/2018	<0.5	1.05	NC
	3/27/2018	<0.5	0.98	NC
	4/24/2018	<0.5	0.76	NC
	5/21/2018	<0.5	0.35	NC
	6/26/2018	<0.5	0.80	NC
	7/23/2018	<0.5	0.68	NC
	8/21/2018	<0.5	1.13	NC
	9/18/2018	<0.5	1.31	NC
	10/30/2018	<0.5	0.96	NC
	11/19/2018	<0.5	0.74	NC
	12/19/2018	<0.5	0.81	NC
EXTRACTION WELLS				
SEW-1	1/30/2018	50	59.71	18
	2/22/2018	56	80.03	35
	3/27/2018	55	62.58	13
	4/24/2018	64	59.63	7
	5/21/2018	58	79.00	31
	6/26/2018	52	57.21	10
	7/23/2018	55	50.87	8
	8/21/2018	54	63.20	16
	9/18/2018	57	68.58	18
SEW-1	10/30/2018	56	62.81	11
	11/19/2018	60	69.40	15
	12/19/2018	56	62.57	11

TABLE E-2
DATA COMPARISON TABLE
(Nitrate as Nitrogen)
(mg/l)

IDENTIFIER	SAMPLE DATE	LAB	ANP	RPD (%)
SEW-2	9/18/2018	180	246.81	31
	10/30/2018	170	190.64	11
	11/19/2018	170	222.00	27
	12/19/2018	220	238.04	8
EFFLUENT				
EFF-L	1/30/2018	<0.5	0.80	NC
	2/22/2018	<0.5	0.77	NC
	3/27/2018	<0.5	1.28	NC
	4/24/2018	<0.5	0.97	NC
	5/21/2018	<0.5	0.74	NC
	6/26/2018	<0.5	1.02	NC
	7/23/2018	<0.5	0.93	NC
	8/21/2018	<0.5	2.30	NC
	9/18/2018	<0.5	2.11	NC
	10/30/2018	<0.5	1.62	NC
	11/19/2018	<0.5	1.63	NC
	12/19/2018	<0.5	0.73	NC

ABBREVIATIONS/ACRONYMS:

mg/l = milligrams per liter
NA = Resuts not available
NC = Not calculated; lab or probe results less than 0.5 mg/l.
RPD = Relative percent difference

TABLE E-3

FIELD WATER QUALITY DATA
(DISSOLVED OXYGEN)
(mg/l)

		LOCATION		
IDENTIFIER	SAMPLE DATE	5	6	7
TREATMENT CELLS				
PDA-S				
	1/30/2018	2.33	2.67	2.51
	2/22/2018	2.66	3.17	3.98
	3/27/2018	2.56	2.98	3.77
	4/24/2018	2.63	2.17	3.42
	5/21/2018	3.65	3.22	3.75
	6/26/2018	3.25	3.05	2.97
	7/23/2018	3.30	3.20	3.10
	8/21/2018	1.20	2.70	3.90
	9/18/2018	1.30	2.60	3.50
	10/30/2018	1.40	2.40	2.70
	11/19/2018	3.90	3.90	4.20
	12/19/2018	3.00	2.70	3.90
PDA-C				
	1/30/2018	2.77	2.46	2.37
	2/22/2018	2.13	1.89	1.67
	3/27/2018	2.21	1.91	1.59
	4/24/2018	2.31	2.01	1.89
	5/21/2018	3.11	3.63	3.25
	6/26/2018	2.56	3.51	3.77
	7/23/2018	2.80	3.60	3.80
	8/21/2018	1.10	2.30	3.70
	9/18/2018	2.50	4.10	3.90
	10/30/2018	2.20	2.50	2.70
	11/19/2018	3.80	4.10	4.50
	12/19/2018	3.60	3.70	3.20
PDA-N				
	1/30/2018	2.12	2.44	2.73
	2/22/2018	2.07	2.21	2.75
	3/27/2018	2.20	2.45	2.89
	4/24/2018	2.18	2.68	2.77
	5/21/2018	2.67	2.31	3.21
	6/26/2018	2.44	2.89	3.11
	7/23/2018	2.30	2.90	3.50
	8/21/2018	2.20	3.60	4.10
	9/18/2018	2.70	4.00	4.50
	10/30/2018	2.60	3.10	3.50
	11/19/2018	2.50	2.70	3.10
	12/19/2018	2.50	2.80	3.20

TABLE E-3

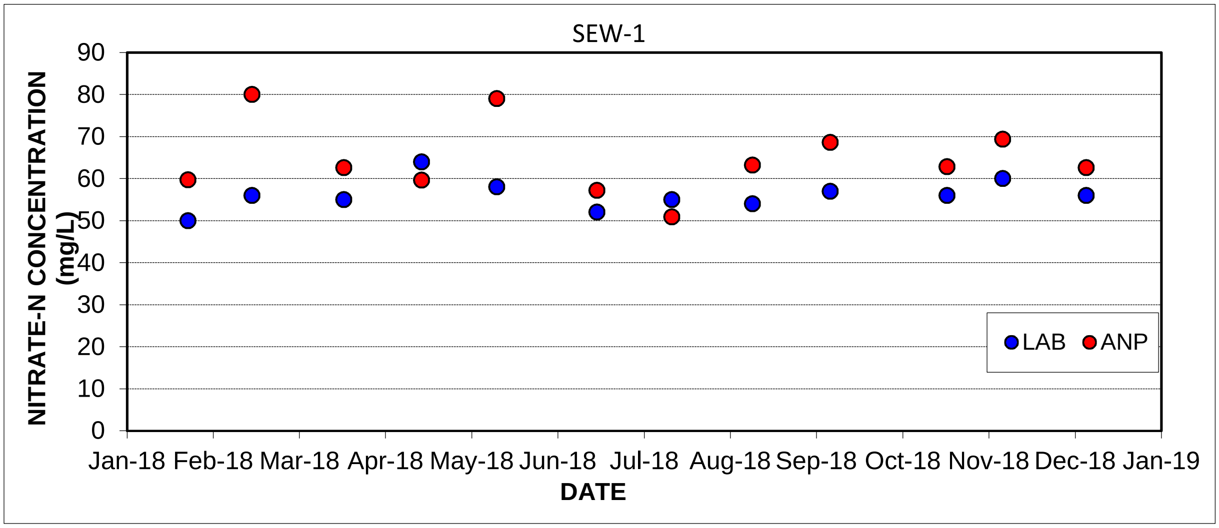
FIELD WATER QUALITY DATA
(DISSOLVED OXYGEN)
(mg/l)

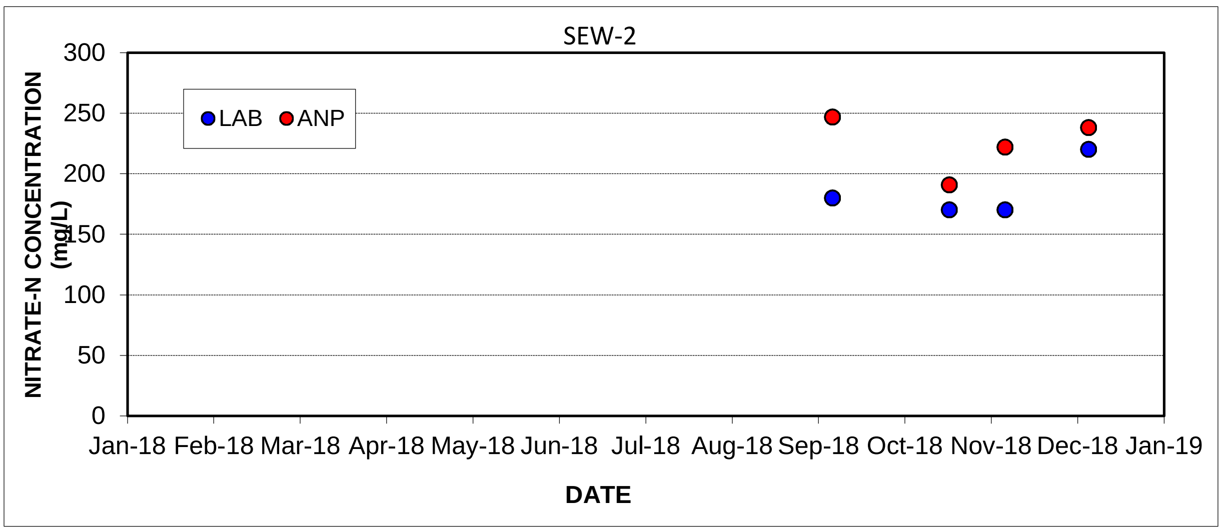
		LOCATION		
IDENTIFIER	SAMPLE DATE	5	6	7
FDA				
	1/30/2018	2.78	3.01	2.71
	2/22/2018	3.01	2.69	2.22
	3/27/2018	3.21	2.74	2.18
	4/24/2018	3.47	2.66	2.21
	5/21/2018	3.21	1.90	1.31
	6/26/2018	3.81	1.87	1.54
	7/23/2018	4.60	3.10	3.10
	8/21/2018	1.90	1.40	1.10
	9/18/2018	2.10	1.50	1.20
	10/30/2018	2.20	1.30	1.10
	11/19/2018	1.80	2.30	2.50
	12/19/2018	1.60	3.20	2.50
ANA				
	1/30/2018	4.50	4.11	
	2/22/2018	4.51	3.71	
	3/27/2018	4.75	3.98	
	4/24/2018	4.89	3.62	
	5/21/2018	4.51	3.73	
	6/26/2018	4.75	3.99	
	7/23/2018	4.80	4.20	
	8/21/2018	4.60	3.40	
	9/18/2018	4.70	3.50	
	10/30/2018	3.90	3.20	
	11/19/2018	4.50	4.20	
	12/19/2018	4.30	3.70	

ABBREVIATIONS/ACRONYMS:
mg/l = milligrams per liter

NOTES:
See Figure 8 for sampling locations.

FIGURE





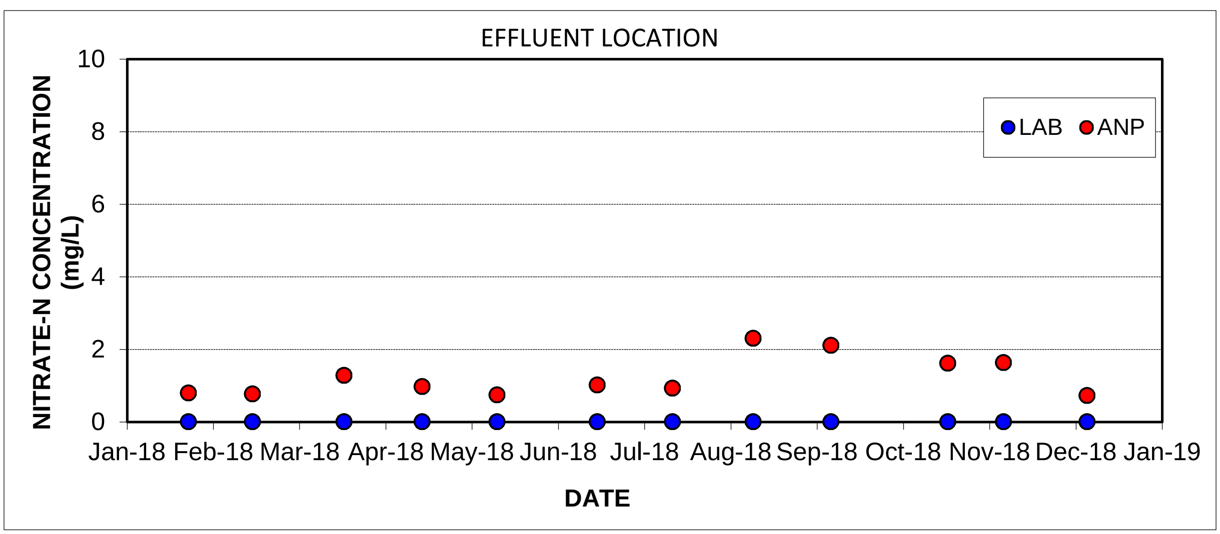


FIGURE E-1. Nitrate-N Concentrations for SEWs and EFF-L Lab Data vs YSI Pro Field Meter

HARGIS + ASSOCIATES, INC.

APPENDIX F

SUMMARY OF CONSTRUCTION AND DEVELOPMENT OF NORTHERN AREA PIEZOMETERS NAP-1 THROUGH NAP-5 TECHNICAL MEMORANDUM DATED FEBRUARY 1, 2019

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING
7400 North Oracle Road, Suite 202
Tucson, AZ 85704
Phone: 520.881.7300
Fax: 520.529.2141

Technical Memorandum

Via: Electronic Mail   Project No: 130.165

Date: February 1, 2019

To: D. Lickteig
Apache Nitrogen Products, Inc.
P.O. Box 700
Benson, AZ 85602

cc: Leo S. Leonhart, PhD, RG, Hargis + Associates, Inc.

From: James S. Davis, RG, Rebecca Stolar

Re: Summary of Construction and Development of Northern Area Piezometers NAP-1 through NAP-5

INTRODUCTION

Drilling, construction, and development of five piezometers, NAP-1 through NAP-5, were conducted from June 18 through 22, 2018, along the west bank of the San Pedro River at the Apache Powder Superfund Site (the Site). The work was performed by Geomechanics Southwest under the supervision of Hargis + Associates, Inc. Piezometer installation proceeded from north to south, beginning at NAP-1 and working successively to NAP-5. Locations of the piezometers are shown on Figure 1.

In order to provide drilling rig access to the piezometer sites, a path was cleared along Wash 3, an ephemeral wash that flows eastward between monitor well MW-36 and test well TW-01 (now identified as extraction well SEW-02) draining into the San Pedro River. Drilling was conducted using a limited access, track-mounted, hollow-stem auger (HSA) rig. The drill rig proceeded to the riverbed and ascended the river bank to gain access to each piezometer site. Cuttings samples were obtained at the surface of each borehole during drilling. Direct-push samples were also obtained at 5 foot intervals using California split-spoon devices. NAP-1 was drilled to 40 feet, then partially backfilled and cased to a depth of 22 feet. Piezometers NAP-2 through NAP-5 were each drilled to 22 feet. Casing materials consisted of 2-inch ID, schedule 40 PVC.

Schematic diagrams and lithologic logs for the piezometers are presented in Attachment A. The screened interval for each piezometer was 7 to 22 feet below land surface. Water levels measured in the piezometers ranged from about 8 to 10 feet below land surface. With exception of piezometer NAP-3, the cuttings consisted mainly of gravelly sand with some clay and silt. Cuttings from piezometer NAP-3 included more silty clay, and less sand and gravel. All piezometers were completed at the surface with locking 10-inch diameter steel monuments and concrete pads.

Development of the piezometers was conducted on June 21 and 22, 2018, using a combination of swabbing, bailing, and pumping with a small trash pump. Except at piezometer NAP-3, development resulted in production of nearly clear water with little to no suspended sediment. At piezometer NAP-3, well production was so limited that the piezometer was not completely developed.

The lithology at piezometer NAP-3 contained more clay and silt than the other piezometers. As a result, water production was much lower, drawdown much larger, and water level recovery time much longer at this location. Maximum production from piezometer NAP-3 was less than 0.5 gallons per minute (gpm), whereas sustained production at the other four piezometers was at least 5 gpm. Throughout the development process for each piezometer, the initial and final water levels were recorded as well as pumping rates, temperature, pH, EC, and nitrate concentrations. Field nitrate concentrations measured using a calibrated YSI nitrate probe were less than 0.5 milligrams per liter (mg/l) at all five piezometers, while pH values were approximately 7.4, and specific electrical conductance was in the range of 730 to 760 microsiemens per centimeter (µS/cm).

On July 5, 2018, water samples were collected from each piezometer using clean, disposable bailers. The samples were submitted to Turner Laboratories, Inc. for analysis of nitrate-N and other common inorganic ions including calcium, sodium, magnesium, potassium, chloride, carbonate, bicarbonate, sulfate, and fluoride. Results of laboratory analyses indicate that nitrate concentrations at each piezometer were less than 0.5 mg/l. Laboratory reports for the piezometer water samples are included in Attachment B.

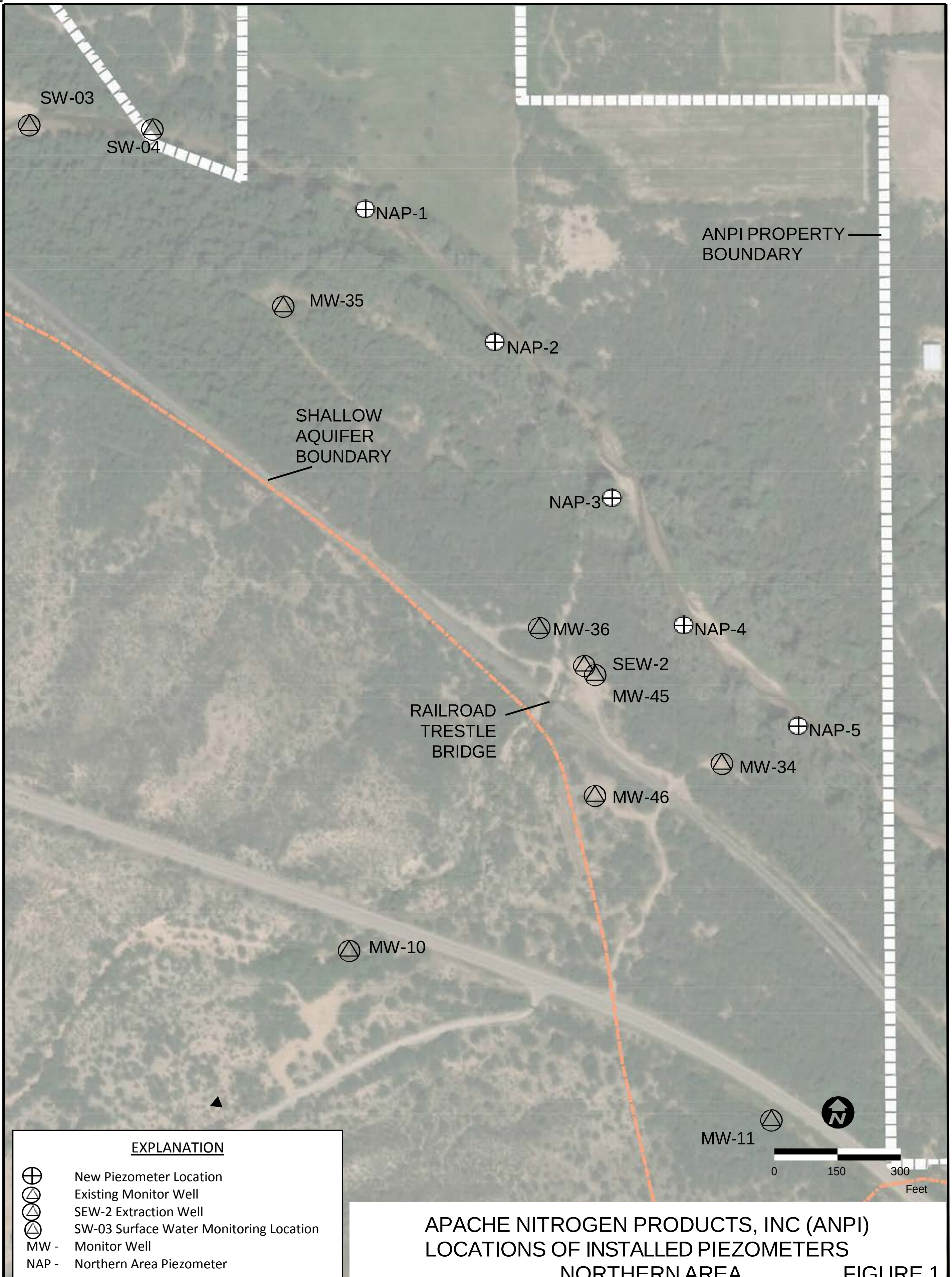
Following piezometer installation and sampling, a pressure transducer/datalogger was installed in each NAP piezometer and in Northern Area monitor wells MW-34, MW-35, MW-36, and MW-45 for continuous monitoring of Northern Area groundwater levels. Water level hydrographs for the NAP piezometers and select monitor wells during the latter part of 2018 are included as Attachment C.

LIST OF ATTACHMENTS

HARGIS + ASSOCIATES, INC.

FIGURE

HARGIS + ASSOCIATES, INC.



APACHE NITROGEN PRODUCTS, INC (ANPI)
LOCATIONS OF INSTALLED PIEZOMETERS
NORTHERN AREA

FIGURE 1

ATTACHMENT A

SCHEMATIC DIAGRAMS AND LITHOLOGIC LOGS

NAP-1

DATE DRILLED :	*6/18/2018*	DRILLING METHOD:	*HSA*
DRILLING COMPANY:	*Geomechanics Southwest, INC*	BOREHOLE DIA.:	*8 inches*
LOGGED BY:	*J. Davis*	CHECKED BY:	
TOTAL DEPTH OF BORING:	*40 feet bls*	DEPTH TO WATER:	*N/A*
LAND SURFACE ELEV:		TOP OF CASING ELEV:	

PROJECT: *Northern Area Piezometer Installation*

PROJECT NUMBER: *130.165*

LOCATION: *Apache Nitrogen*

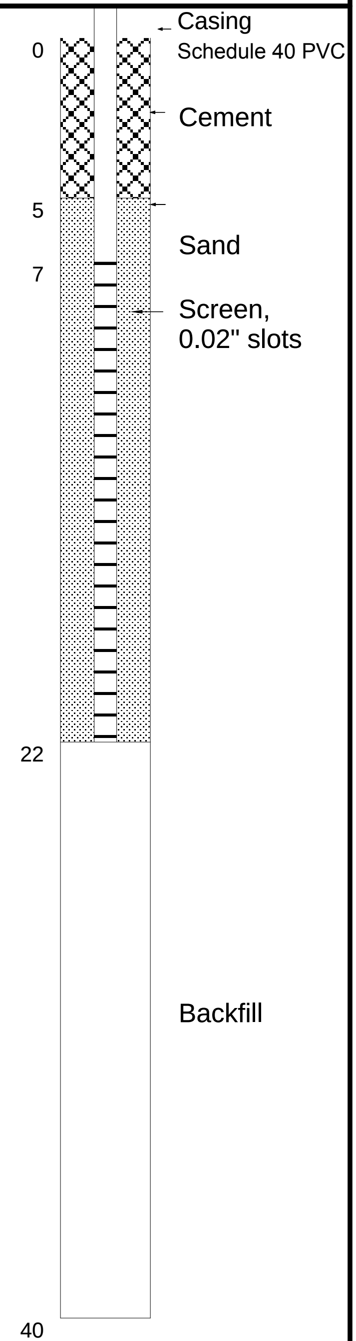
COMMENTS:

bls: below land surface

Split-spoon sampler

Depth (feet)	BLOWS (per 6 inches)	USCS	LITHOLOGIC DESCRIPTION OF MATERIAL
0–9	5 7 13	SM	SILTY SAND (0/60/40) (7.5YR 4/4), medium dense, fine- to medium-grained; FINES: nonplastic.
9–11	7 5 4	SC	CLAYEY SAND (0/60/40) (7.5YR 5/4), loose, fine- to medium-grained.
11–15	31 27 16	SM	GRAVELY SAND (0/60/40) (7.5YR 5/4), very dense, fine- to medium-grained, subangular to subrounded; FINES: nonplastic.
15–20	4 7 8	SM	GRAVELY SAND (30/50/20) (7.5YR 4/4), medium dense, fine- to coarse-grained, subangular to subrounded; FINES: low plasticity.
20–25	6 8 12	N/A	NO SAMPLE.
25–30	3 4 7	GC	SANDY GRAVEL (60/25/15) (7.5YR 5/4), fine- to coarse-grained, subangular to subrounded; FINES: low plasticity.
30–35	16 23 23	GP	SANDY GRAVEL (75/20/5) (7.5YR 5/4), fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.
35–36.5		SP	SAND (0/95/5) (7.5YR 5/4), dense, fine- to medium-grained; FINES: nonplastic
36.5–40	6 14 27	GP	SANDY GRAVEL (75/20/5) (7.5YR 5/4), dense, fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.

WELL CONSTRUCTION DIAGRAM



TOTAL DEPTH OF BORING -
40 FEET BELOW LAND SURFACE
CASED TO 22 FEET BELOW LAND SURFACE

FIGURE 1. LITHOLOGIC LOG, NAP-1

NAP-2

DATE DRILLED : *6/19/2018*

DRILLING METHOD: *HSA*

DRILLING COMPANY: *Geomechanics Southwest, INC*

BOREHOLE DIA.: *8 inches*

LOGGED BY: *J. Davis*

CHECKED BY:

TOTAL DEPTH OF BORING: *22 feet bls*

DEPTH TO WATER: *8.3 feet bls*

LAND SURFACE ELEV:

TOP OF CASING ELEV:

PROJECT: *Northern Area Piezometer Installation*

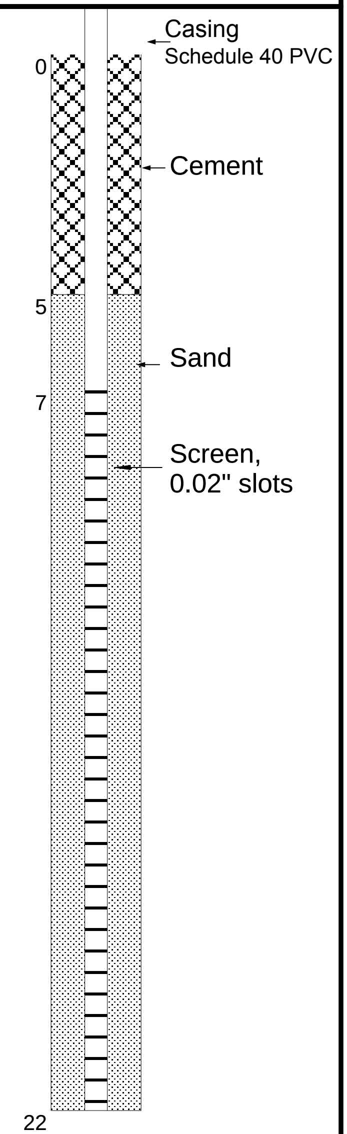
PROJECT NUMBER: *130.165*

LOCATION: *Apache Nitrogen*

COMMENTS:
bls: below land surface
Split-spoon sampler

Depth (feet)	BLOWS (per 6 inches)	USCS	LITHOLOGIC DESCRIPTION OF MATERIAL
0–6	4 5 5	SM	SILTY SAND (0/30/70) (7.5YR 4/4), loose, fine- to medium-grained; FINES: low plasticity.
6–10	3 2 1	SM	SILTY SAND (10/60/30) (7.5YR 4/4), fine- to coarse-grained; FINES: nonplastic.
10–11.5		CL	SANDY CLAY (0/20/80) (7.5YR 4/4), soft, sticky, low plasticity; SAND: fine- to medium-grained.
11.5–15	12 11 12	SM	GRAVELY SAND (45/45/10) (7.5YR 4/4), medium- to coarse-grained, subangular to subrounded; FINES: nonplastic.
15–16.5		SP	SAND (5/95/0) (7.5YR 4/4), medium dense, medium- to coarse-grained, subangular to subrounded.
16.5–20		GP	SANDY GRAVEL (80/15/5) (7.5YR 4/3), medium- to coarse-grained, subangular to subrounded; FINES: nonplastic.
20–22	3 4 4	SC	SILTY CLAY (30/40/30) (7.5YR 4/1), loose, medium- to coarse-grained, subangular to subrounded; FINES: low plasticity.

WELL CONSTRUCTION DIAGRAM



TOTAL DEPTH OF BORING -
22 FEET BELOW LAND SURFACE

FIGURE 2. LITHOLOGIC LOG, NAP-2

NAP-3

DATE DRILLED : *6/19/2018*

DRILLING METHOD: *HSA*

DRILLING COMPANY: *Geomechanics Southwest, INC*

BOREHOLE DIA.: *8 inches*

LOGGED BY: *J. Davis*

CHECKED BY:

TOTAL DEPTH OF BORING: *22 feet bls*

DEPTH TO WATER: *12 feet bls*

LAND SURFACE ELEV:

TOP OF CASING ELEV:

PROJECT: *Northern Area Piezometer Installation*

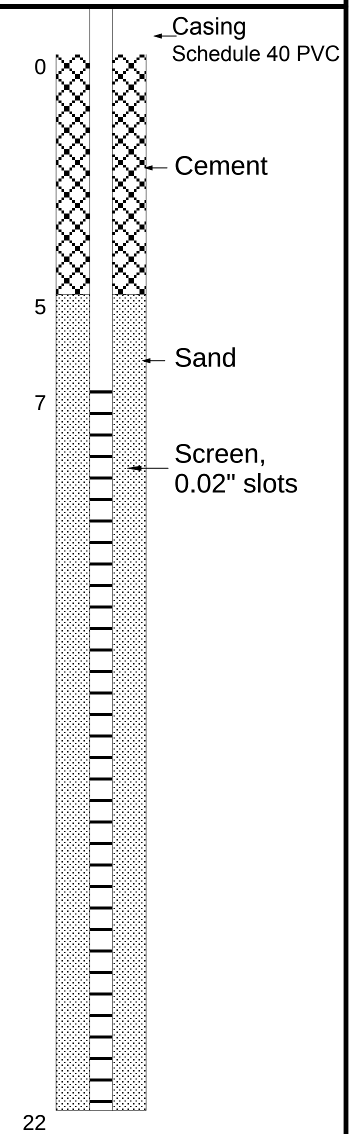
PROJECT NUMBER: *130.165*

LOCATION: *Apache Nitrogen*

COMMENTS:
bls: below land surface
Split-spoon sampler

Depth (feet)	BLOWS (per 6 inches)	USCS	LITHOLOGIC DESCRIPTION OF MATERIAL
0–6	7 13 9	SM	SILTY SAND (0/60/40) (7.5YR 4/3), medium dense, fine-grained; FINES: low plasticity.
6–11	2 1 1	SM	SILTY SAND (0/65/35) (7.5YR 4/4), loose, fine- to medium-grained; FINES: low plasticity.
11–15	1 1 1	SM	SILTY SAND (0/80/20) (7.5YR 4/4), fine- to coarse-grained; FINES: nonplastic.
15–16.5		SM	SILTY SAND (0/80/20) (7.5YR 4/4), loose, coarse-grained; FINES: nonplastic.
16.5–20	4 4 6	SM	SILTY SAND (10/70/20) (7.5YR 4/4), fine- to coarse-grained; FINES: nonplastic.
20–22		OL	SILTY CLAY (15/15/70) (7.5YR 4/4), loose, low plasticity; dark organic matter, SAND: medium- to coarse-grained, subangular to subrounded.

WELL CONSTRUCTION DIAGRAM



TOTAL DEPTH OF BORING -
27.5 FEET BELOW LAND SURFACE

FIGURE 3. LITHOLOGIC LOG, NAP-3

NAP-4

DATE DRILLED : *6/20/2018*

DRILLING METHOD: *HSA*

DRILLING COMPANY: *Geomechanics Southwest, INC*

BOREHOLE DIA.: *8 inches*

LOGGED BY: *J. Davis*

CHECKED BY:

TOTAL DEPTH OF BORING: *22 feet bls*

DEPTH TO WATER: *12.2 feet bls*

LAND SURFACE ELEV:

TOP OF CASING ELEV:

PROJECT: *Northern Area Piezometer Installation*

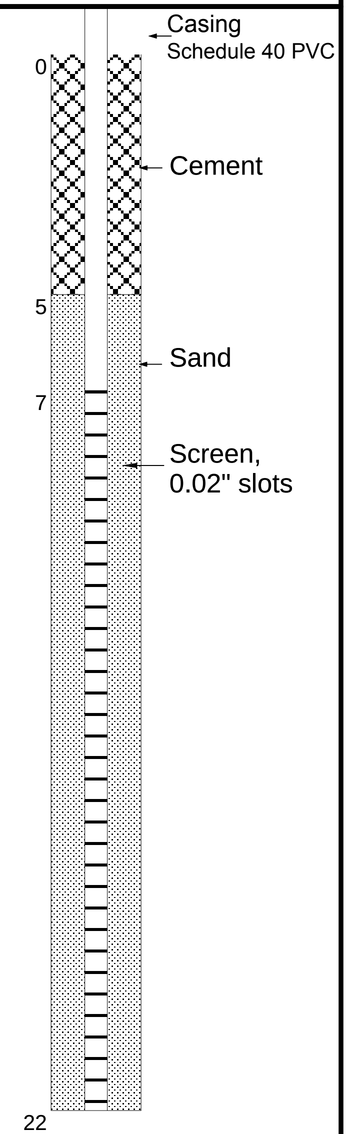
PROJECT NUMBER: *130.165*

LOCATION: *Apache Nitrogen*

COMMENTS:
bls: below land surface
Split-spoon sampler

Depth (feet)	BLOWS (per 6 inches)	USCS	LITHOLOGIC DESCRIPTION OF MATERIAL
0		SM	SILTY SAND (0/60/40) (7.5YR 4/3), fine-grained; FINES: nonplastic.
5	3 5 4	SP	GRAVELLY SAND (0/70/30) (7.5YR 4/3), loose, fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.
		SM	GRAVELLY SAND (30/50/20) (7.5YR 4/3), fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.
10	3 2 3	ML	SANDY SILT (0/30/70) (7.5YR 4/3), medium stiff; SAND: fine-grained.
		SM	GRAVELLY SAND (30/50/20) (7.5YR 4/3), fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.
	2 2 2	ML	SANDY SILT (0/20/80), soft, low plasticity; SAND: fine-grained.
	3 2 4	SM	SILTY SAND (25/40/35), loose, medium- to coarse-grained, subangular to subrounded; FINES: low plasticity.
22			

WELL CONSTRUCTION DIAGRAM



TOTAL DEPTH OF BORING -
25.5 FEET BELOW LAND SURFACE

FIGURE 4. LITHOLOGIC LOG, NAP-4

NAP-5

DATE DRILLED : *6/20/2018*

DRILLING METHOD: *HSA*

DRILLING COMPANY: *Geomechanics Southwest, INC*

BOREHOLE DIA.: *8 inches*

LOGGED BY: *J. Davis*

CHECKED BY:

TOTAL DEPTH OF BORING: *22 feet bls*

DEPTH TO WATER: *9.1 feet bls*

LAND SURFACE ELEV:

TOP OF CASING ELEV:

PROJECT: *Northern Area Piezometer Installation*

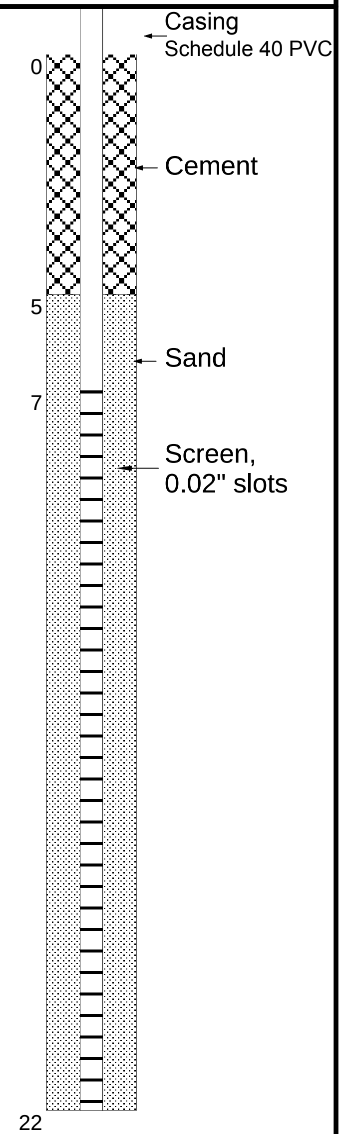
PROJECT NUMBER: *130.165*

LOCATION: *Apache Nitrogen*

COMMENTS:
bls: below land surface
Split-spoon sampler

Depth (feet)	BLOWS (per 6 inches)	USCS	LITHOLOGIC DESCRIPTION OF MATERIAL
0–6	11 20 11	ML	SANDY SILT (0/40/60) (7.5YR 4/3), very stiff, nonplastic; SAND: fine-grained.
6–11.5	4 2 1	SM	SILTY SAND (20/50/30) (7.5YR 4/3), loose, fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.
11.5–15	3 2 4	SM	SILTY SAND (20/50/30) (7.5YR 5/3), fine- to coarse-grained, subangular to subrounded; FINES: nonplastic.
15–16.5		SM	GRAVELLY SAND (25/60/15) (7.5YR 5/3), loose, medium- to coarse-grained, subangular to subrounded; FINES: nonplastic.
16.5–20		SM	GRAVELLY SAND (30/50/20) (7.5YR 5/3), medium- to coarse-grained, subangular to subrounded; FINES: nonplastic.
20–22	4 5 7	CL	CLAYEY SILT (10/20/70) (7.5YR 5/3), medium dense, low plasticity; SAND: fine- to coarse-grained, subangular to subrounded.

WELL CONSTRUCTION DIAGRAM



TOTAL DEPTH OF BORING - 25.5 FEET BELOW LAND SURFACE

FIGURE 5. LITHOLOGIC LOG, NAP-5

ATTACHMENT B

LABORATORY ANALYTICAL REPORTS FOR WATER SAMPLES

ATTACHMENT B

LABORATORY ANALYTICAL REPORTS FOR WATER SAMPLES

1.0 INTRODUCTION

In an effort to get a baseline comparison of the water quality in the shallow groundwater adjacent to the San Pedro River and that of the deeper groundwater in the vicinity of the inland monitor wells, samples were collected and analyzed for major ions. In doing so, a distinct contrast became evident with the piezometer water samples having ionic similarity and the monitor wells sharing a different ionic similarity. Groundwater sampled from monitor well MW-46, however, appeared to have its own unique ionic signature. This is believed to be due to its proximity to the aquifer boundary and the unit within which it is screened, which is shallower than the screened interval for monitor well MW-45.

July 27, 2018

Barbara Murphy
Hargis & Associates, Inc.
7400 North Oracle Road, Suite 202
Tucson, AZ 85704

TEL (520) 881-7300
FAX

Work Order No.: 18G0157
Order Name: 130.165

RE: NARS Quarterly

Dear Barbara Murphy,

Turner Laboratories, Inc. received 11 sample(s) on 07/05/2018 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Elizabeth Kasik
Business Development

Client: Hargis & Associates, Inc.
Project: NARS Quarterly
Work Order: 18G0157
Date Received: 07/05/2018

Order: 130.165

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
18G0157-01	NAP-1	Non-Potable Water	07/05/2018 0945
18G0157-02	NAP-2	Non-Potable Water	07/05/2018 1020
18G0157-03	NAP-3	Non-Potable Water	07/05/2018 1045
18G0157-04	NAP-5	Non-Potable Water	07/05/2018 1115
18G0157-05	NAP-4	Non-Potable Water	07/05/2018 1140
18G0157-06	MW-45	Non-Potable Water	07/05/2018 1305
18G0157-07	MW-34	Non-Potable Water	07/05/2018 1350
18G0157-08	MW-34-B	Non-Potable Water	07/05/2018 1355
18G0157-09	MW-35	Non-Potable Water	07/05/2018 1422
18G0157-10	MW-36	Non-Potable Water	07/05/2018 1456
18G0157-11	MW-36-D	Non-Potable Water	07/05/2018 1501

Client:	Hargis & Associates, Inc.
Project:	NARS Quarterly
Work Order:	18G0157
Date Received:	07/05/2018

Case Narrative

H2 Initial analysis was performed within holding time. Reanalysis for the required dilution was past holding time.

M3 The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND Not Detected at or above the PQL

PQL Practical Quantitation Limit

DF Dilution Factor

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	NAP-1
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 0945
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-01	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	310	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1655	MH
Magnesium	47	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1655	MH
Potassium	15	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1655	MH
Sodium	73	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1655	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	12	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1604	AP
Fluoride	1.7	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1604	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1604	AP
Sulfate	110	25		mg/L	5	07/10/2018 1000	07/10/2018 1138	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	1100	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	1100	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	NAP-2
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1020
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-02	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	340	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1659	MH
Magnesium	47	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1659	MH
Potassium	17	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1659	MH
Sodium	71	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1659	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	13	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1622	AP
Fluoride	1.5	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1622	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1622	AP
Sulfate	110	25		mg/L	5	07/10/2018 1000	07/10/2018 1156	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	1000	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	1000	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	NAP-3
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1045
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-03	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	180	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1702	MH
Magnesium	31	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1702	MH
Potassium	10	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1702	MH
Sodium	75	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1702	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	15	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1641	AP
Fluoride	1.8	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1641	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1641	AP
Sulfate	120	25		mg/L	5	07/10/2018 1000	07/10/2018 1215	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	520	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	520	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	NAP-5
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1115
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-04	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	190	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1706	MH
Magnesium	31	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1706	MH
Potassium	9.9	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1706	MH
Sodium	74	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1706	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	14	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1659	AP
Fluoride	1.2	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1659	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1659	AP
Sulfate	130	25		mg/L	5	07/10/2018 1000	07/10/2018 1233	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	460	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	460	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	NAP-4
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1140
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-05	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	270	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1710	MH
Magnesium	35	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1710	MH
Potassium	12	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1710	MH
Sodium	81	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1710	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	15	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1718	AP
Fluoride	2.0	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1718	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1718	AP
Sulfate	140	25		mg/L	5	07/10/2018 1000	07/10/2018 1252	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	820	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	820	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	MW-45
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1305
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-06	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	260	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1735	MH
Magnesium	32	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1735	MH
Potassium	5.9	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1735	MH
Sodium	99	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1735	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	17	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1736	AP
Fluoride	1.2	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1736	EJ
Nitrogen, Nitrate (As N)	200	25	H2	mg/L	50	07/10/2018 1000	07/10/2018 1310	AP
Sulfate	160	50		mg/L	10	07/10/2018 1000	07/10/2018 1328	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	240	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	240	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client: Hargis & Associates, Inc.
Project: NARS Quarterly
Work Order: 18G0157
Lab Sample ID: 18G0157-07

Client Sample ID: MW-34
Collection Date/Time: 07/05/2018 1350
Matrix: Non-Potable Water
Order Name: 130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	78	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1739	MH
Magnesium	18	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1739	MH
Potassium	ND	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1739	MH
Sodium	81	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1739	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	15	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1754	AP
Fluoride	1.7	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1754	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1754	AP
Sulfate	150	50		mg/L	10	07/10/2018 1000	07/10/2018 1347	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	290	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	290	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	MW-34-B
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1355
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-08	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	ND	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1743	MH
Magnesium	ND	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1743	MH
Potassium	ND	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1743	MH
Sodium	ND	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1743	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	ND	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1813	AP
Fluoride	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1813	EJ
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1813	AP
Sulfate	ND	5.0		mg/L	1	07/06/2018 1230	07/06/2018 1813	EJ
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	9.0	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	9.0	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	MW-35
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1422
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-09	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	150	4.0	M3	mg/L	1	07/06/2018 1020	07/10/2018 1521	MH
Magnesium	26	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1521	MH
Potassium	ND	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1521	MH
Sodium	130	5.0	M3	mg/L	1	07/06/2018 1020	07/10/2018 1521	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	22	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1314	AP
Fluoride	1.7	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1314	EJ
Nitrogen, Nitrate (As N)	66	10		mg/L	20	07/06/2018 1230	07/06/2018 1256	AP
Sulfate	250	100		mg/L	20	07/06/2018 1230	07/06/2018 1256	EJ
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	320	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	320	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	MW-36
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1456
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-10	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	230	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1747	MH
Magnesium	29	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1748	MH
Potassium	ND	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1748	MH
Sodium	100	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1748	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	17	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1831	AP
Fluoride	1.4	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1831	EJ
Nitrogen, Nitrate (As N)	160	25	H2	mg/L	50	07/10/2018 1000	07/10/2018 1538	AP
Sulfate	160	50		mg/L	10	07/10/2018 1000	07/10/2018 1405	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	250	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	250	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client:	Hargis & Associates, Inc.	**Client Sample ID:**	MW-36-D
Project:	NARS Quarterly	**Collection Date/Time:**	07/05/2018 1501
Work Order:	18G0157	**Matrix:**	Non-Potable Water
Lab Sample ID:	18G0157-11	**Order Name:**	130.165

Analyses	Result	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)								
Calcium	230	4.0		mg/L	1	07/06/2018 1020	07/10/2018 1752	MH
Magnesium	28	3.0		mg/L	1	07/06/2018 1020	07/10/2018 1752	MH
Potassium	ND	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1752	MH
Sodium	100	5.0		mg/L	1	07/06/2018 1020	07/10/2018 1752	MH
Anions by Ion Chromatography-E300.0 (2.1)								
Chloride	17	1.0		mg/L	1	07/06/2018 1230	07/06/2018 1945	AP
Fluoride	1.5	0.50		mg/L	1	07/06/2018 1230	07/06/2018 1945	EJ
Nitrogen, Nitrate (As N)	160	25	H2	mg/L	50	07/10/2018 1000	07/10/2018 1556	AP
Sulfate	160	50		mg/L	10	07/10/2018 1000	07/10/2018 1519	AP
Alkalinity-SM2320B								
Alkalinity, Bicarbonate (As CaCO3)	260	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Carbonate (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Hydroxide (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Phenolphthalein (As CaCO3)	ND	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ
Alkalinity, Total (As CaCO3)	260	2.0		mg/L	1	07/19/2018 1400	07/19/2018 1800	EJ

Client: Hargis & Associates, Inc.
Project: NARS Quarterly
Work Order: 18G0157
Date Received: 07/05/2018

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1807071 - E200.7 (4.4)										
Blank (1807071-BLK1)				Prepared: 07/06/2018 Analyzed: 07/10/2018						
Calcium	ND	4.0	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (1807071-BS1)				Prepared: 07/06/2018 Analyzed: 07/10/2018						
Calcium	9.3	4.0	mg/L	10.00		93	85-115			
Magnesium	9.7	3.0	mg/L	10.00		97	85-115			
Potassium	9.9	5.0	mg/L	10.00		99	85-115			
Sodium	10	5.0	mg/L	10.00		104	85-115			
LCS Dup (1807071-BSD1)				Prepared: 07/06/2018 Analyzed: 07/10/2018						
Calcium	9.4	4.0	mg/L	10.00		94	85-115	1	20	
Magnesium	9.9	3.0	mg/L	10.00		99	85-115	1	20	
Potassium	10	5.0	mg/L	10.00		101	85-115	2	20	
Sodium	11	5.0	mg/L	10.00		107	85-115	3	20	
Matrix Spike (1807071-MS1)	**Source: 18G0157-09**			Prepared: 07/06/2018 Analyzed: 07/10/2018						
Calcium	160	4.0	mg/L	10.00	150	50	70-130			M3
Magnesium	35	3.0	mg/L	10.00	26	95	70-130			
Potassium	15	5.0	mg/L	10.00	4.6	101	70-130			
Sodium	130	5.0	mg/L	10.00	130	51	70-130			M3
Matrix Spike (1807071-MS2)	**Source: 18G0062-03**			Prepared: 07/06/2018 Analyzed: 07/10/2018						
Calcium	73	4.0	mg/L	10.00	66	71	70-130			
Magnesium	28	3.0	mg/L	10.00	18	100	70-130			
Potassium	29	5.0	mg/L	10.00	19	97	70-130			
Sodium	200	5.0	mg/L	10.00	190	52	70-130			M3

Client: Hargis & Associates, Inc.
Project: NARS Quarterly
Work Order: 18G0157
Date Received: 07/05/2018

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1807220 - SM2320B										
LCS (1807220-BS1)				Prepared & Analyzed: 07/19/2018						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		98	90-110			
LCS Dup (1807220-BSD1)				Prepared & Analyzed: 07/19/2018						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		98	90-110	0	10	
Matrix Spike (1807220-MS1)	**Source: 18G0163-01**			Prepared & Analyzed: 07/19/2018						
Alkalinity, Total (As CaCO3)	380	2.0	mg/L	250.0	130	97	85-115			
Matrix Spike Dup (1807220-MSD1)	**Source: 18G0163-01**			Prepared & Analyzed: 07/19/2018						
Alkalinity, Total (As CaCO3)	380	2.0	mg/L	250.0	130	98	85-115	0.5	10	

Turner Laboratories, Inc.

Date: 07/27/2018

Client: Hargis & Associates, Inc.
Project: NARS Quarterly
Work Order: 18G0157
Date Received: 07/05/2018

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1807060 - E300.0 (2.1)										
Blank (1807060-BLK1)				Prepared & Analyzed: 07/06/2018						
Chloride	ND	1.0	mg/L							
Fluoride	ND	0.50	mg/L							
Nitrogen, Nitrate (As N)	ND	0.50	mg/L							
Sulfate	ND	5.0	mg/L							
LCS (1807060-BS1)				Prepared & Analyzed: 07/06/2018						
Chloride	13	1.0	mg/L	12.50		107	90-110			
Fluoride	2.1	0.50	mg/L	2.000		107	90-110			
Nitrogen, Nitrate (As N)	5.2	0.50	mg/L	5.000		104	90-110			
Sulfate	13	5.0	mg/L	12.50		105	90-110			
LCS Dup (1807060-BSD1)				Prepared & Analyzed: 07/06/2018						
Chloride	13	1.0	mg/L	12.50		107	90-110	0.4	10	
Fluoride	2.1	0.50	mg/L	2.000		107	90-110	0.09	10	
Nitrogen, Nitrate (As N)	5.2	0.50	mg/L	5.000		104	90-110	0.2	10	
Sulfate	13	5.0	mg/L	12.50		105	90-110	0.2	10	
Matrix Spike (1807060-MS1)	**Source: 18G0157-09**			Prepared & Analyzed: 07/06/2018						
Chloride	14		mg/L	12.50	1.5	102	80-120			
Nitrogen, Nitrate (As N)	8.5		mg/L	5.000	3.3	104	80-120			
Sulfate	24		mg/L	12.50	12	94	80-120			
Matrix Spike (1807060-MS2)	**Source: 18G0157-09RE1**			Prepared & Analyzed: 07/06/2018						
Fluoride	3.6	0.50	mg/L	2.000	1.7	96	80-120			
Matrix Spike (1807060-MS3)	**Source: 18G0157-08**			Prepared & Analyzed: 07/06/2018						
Chloride	13	1.0	mg/L	12.50	0.60	99	80-120			
Fluoride	2.2	0.50	mg/L	2.000	ND	108	80-120			
Nitrogen, Nitrate (As N)	5.2	0.50	mg/L	5.000	0.22	99	80-120			
Sulfate	13	5.0	mg/L	12.50	1.3	94	80-120			
Matrix Spike Dup (1807060-MSD1)	**Source: 18G0157-09**			Prepared & Analyzed: 07/06/2018						
Chloride	14		mg/L	12.50	1.5	102	80-120	0.3	10	
Nitrogen, Nitrate (As N)	8.5		mg/L	5.000	3.3	103	80-120	0.3	10	
Sulfate	24		mg/L	12.50	12	93	80-120	0.3	10	
Matrix Spike Dup (1807060-MSD2)	**Source: 18G0157-09RE1**			Prepared & Analyzed: 07/06/2018						
Fluoride	3.6	0.50	mg/L	2.000	1.7	94	80-120	0.9	10	
Matrix Spike Dup (1807060-MSD3)	**Source: 18G0157-08**			Prepared & Analyzed: 07/06/2018						
Chloride	13	1.0	mg/L	12.50	0.60	98	80-120	1	10	
Fluoride	2.1	0.50	mg/L	2.000	ND	106	80-120	1	10	
Nitrogen, Nitrate (As N)	5.1	0.50	mg/L	5.000	0.22	98	80-120	1	10	
Sulfate	13	5.0	mg/L	12.50	1.3	92	80-120	1	10	

HARGIS+ASSOCIATES, INC. HYDROGEOLOGY • ENGINEERING

APACHE NITROGEN PRODUCTS, INC.

1860157

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST FORM

Date: 6/5/18
Page 1 of 1

~~130.24 PMP~~ 130.165 QUARTERLY

PROJECT: APACHE NITROGEN PRODUCTS, INC.
TASK: PMP 130.24
CLIENT: H+A

Project Manager Leo Leonhart
QA Manager Mary Tyer
Phone 520-881-7300
Fax 520-529-2141

#130.165

Project ~~PMP~~ ~~130.24~~

Monthly ____
Quarterly ____

Laboratory
Turner Laboratories
2445 N. Coyote Dr. Ste. 104
Tucson, AZ 85745
520-882-5880
Attn: Kevin Brim

Normal TAT

LAB ID	SAMPLE ID	Date (Sample Collection)	Time (Sample Collection)	Matrix: Lab prepared water	Matrix: Groundwater	Matrix: Surface Water	Preservation: HCl	Preservation: HNO3	Preservation: H2SO4	Preservation: Unpreserved	Preservation: Ice	Containers: 40-ml VOA	Containers: 125-ml poly	Containers: 250-ml poly	Containers: 250-ml amber glass	Containers: 500-ml poly	Analysis: Nitrate-N (E300)	Analysis: Perchlorate (E314)	Analysis: Ammonia-N (SM4500 B,C)	Analysis: Common Ions - Ca, Na, Mg, K, SO4, HCO3, CO3, Cl, TDS	Special Handling: 48-Hour Hold Time	Special Handling: MS/MSD & Level IV DVP Requested	Special Handling: Laboratory filter / acidify	Field Filtered	REMARKS
	NAP-1	7/5/18	09:45					1		1	X			X		X	X			X	X				
	NAP-2	" "	10:20					1		1	X			X		X	X			X	X				
	NAP-3	" "	10:45					1		1	X			X		X	X			X	X				
	NAP-5	" "	11:15					1		1	X			X		X	X			X	X				
	NAP-4	" "	11:40					1		1	X			X		X	X			X	X				
	MW-45	" "	13:05					1		1	X			X		X	X			X	X				
	MW-34	" "	13:50					1		1	X			X		X	X			X	X				
	MW-34B	" "	13:55					1		1	X			X		X	X			X	X				
	MW-35	" "	14:22					1		1	X			X		X	X			X	X	X			
	MW-36	" "	14:50					1		1	X			X		X	X			X	X				
	MW-36-D	" "	15:01					1		1	X			X		X	X			X	X				
Total number of containers per analysis:								11		11															Total No. of Containers 22

Relinquished By:	Date	Received By:	
James Davis	6/5/18	Turner Labs	6/5/18
Company:	Time	Company:	
Hargis and Associates	16:30	[signature]	1630

☒ No. of containers correct
☒ Received in good condition
☐ Custody seals secure
☒ Conforms to COC document

0°C Temperature on receipt

Send Results to:
Hargis + Associates, Inc. Mary Tyer mtyer@hargis.com
7400 N. Oracle Rd., Ste 202
Tucson, AZ 85704

Send Invoice to:
ANPI accounts payable
ap@ApacheNitro.com & cc:David Lickteig
dlickteig@apachenitro.com

Instructions
1. Fill out form completely and sign only after verified for completeness.
2. Complete in ballpoint pen. Draw one line through error, initial and date correction.
3. Indicate the number of sample containers in analytical request space.
4. Note applicable preservatives, special instructions, and deviations from typical environmental samples.
5. Consult project QA documents for specific instructions.

ATTACHMENT C

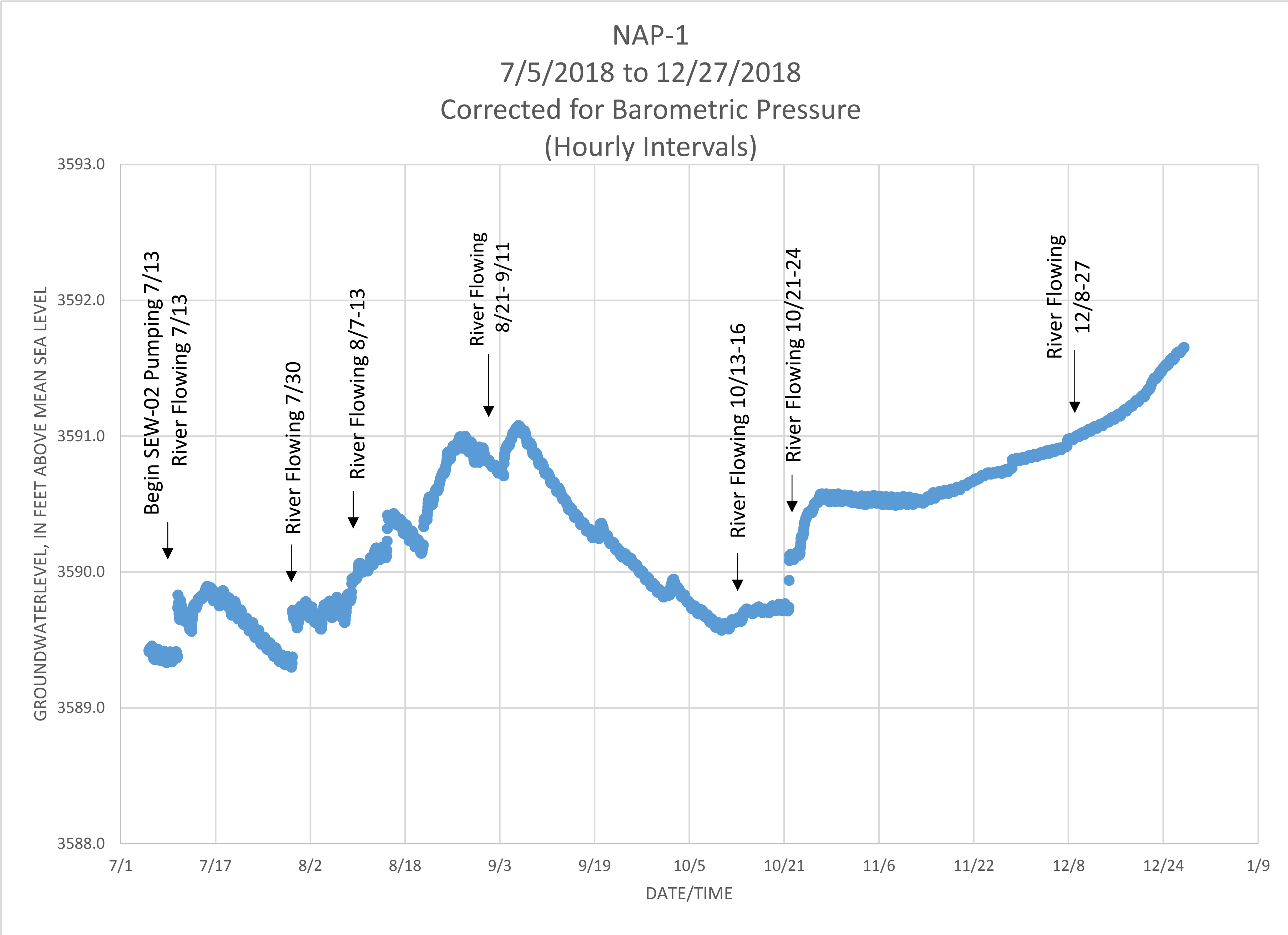
WATER LEVEL HYDROGRAPHS

ATTACHMENT C

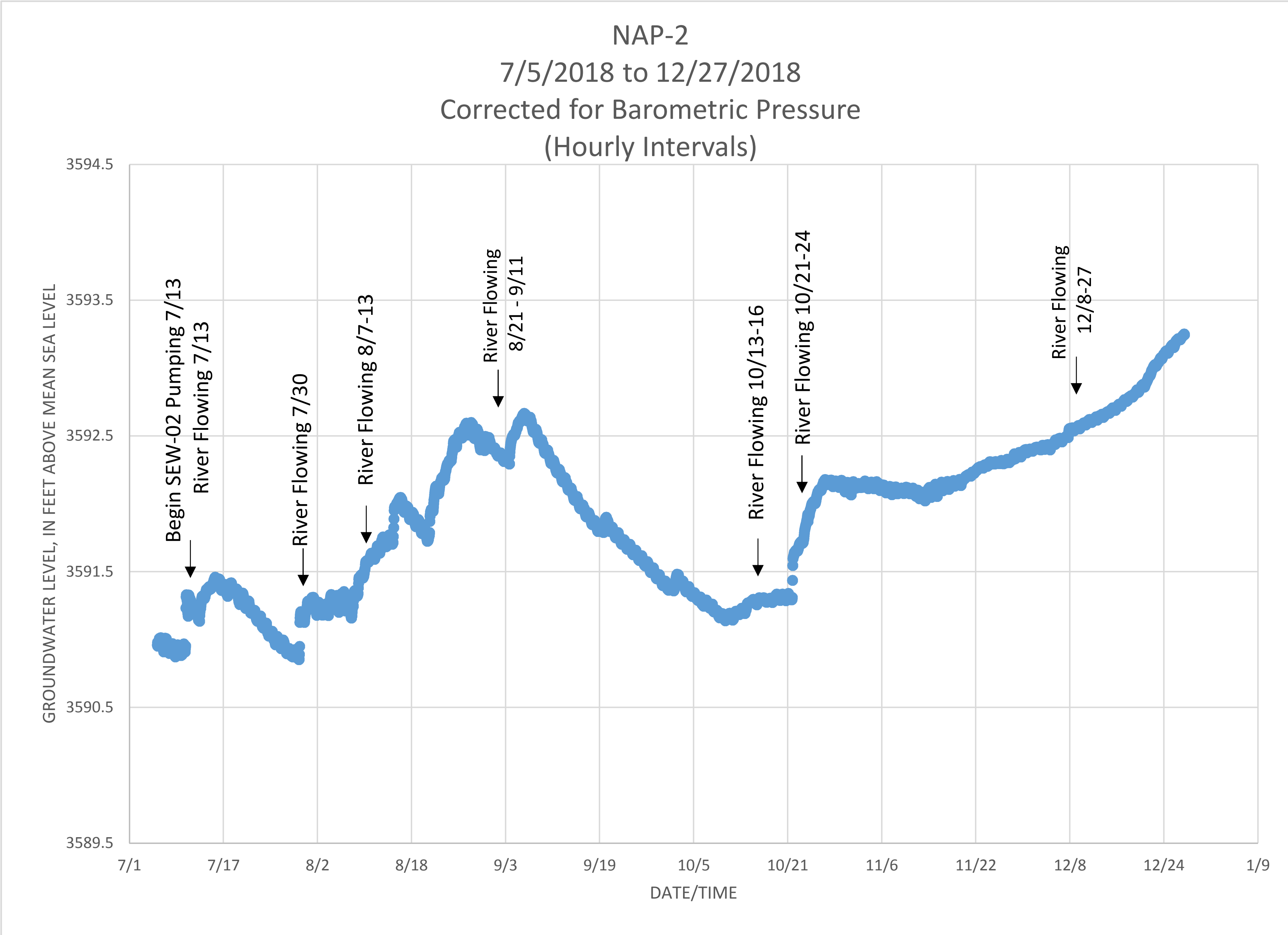
WATER LEVEL HYDROGRAPHS

1.0 INTRODUCTION

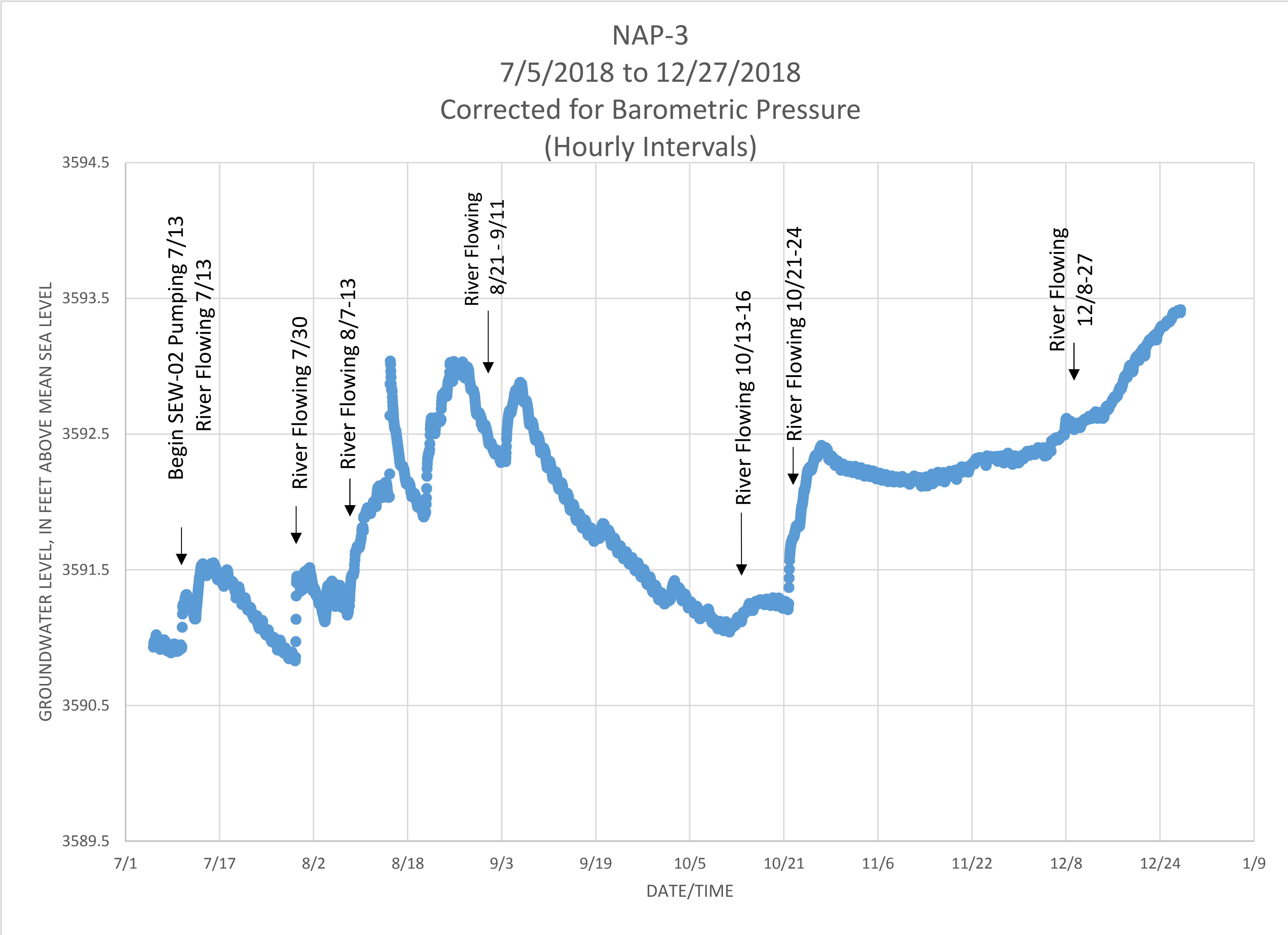
The hydrographs show water level changes in piezometers NAP-1 through NAP-5, as well as nearby monitor wells MW-34, -35, -36, and -45 during the last half of 2018. These were recorded at hourly intervals using Solinst Levelogger Model 3100 pressure transducers, corrected for barometric pressure changes. Also annotated on the hydrographs are intervals when the San Pedro River was flowing, as recorded upstream at U.S. Geological Survey streamflow gage 09471550 near Tombstone, Arizona. This gage is located approximately 13 miles upstream from the Apache Powder Superfund site, as shown on the map in Attachment C. All hydrographs respond to the streamflow and, to some degree, to pumping intervals at extraction well SEW-02, which pumped from 4 to 12 hours per day during this period. The water level effect of the pumping is particularly evident in the monitor well MW-45 hydrograph, and less evident in other monitor wells. Monitor well MW-45 is approximately 50 feet upgradient from extraction well SEW-02.



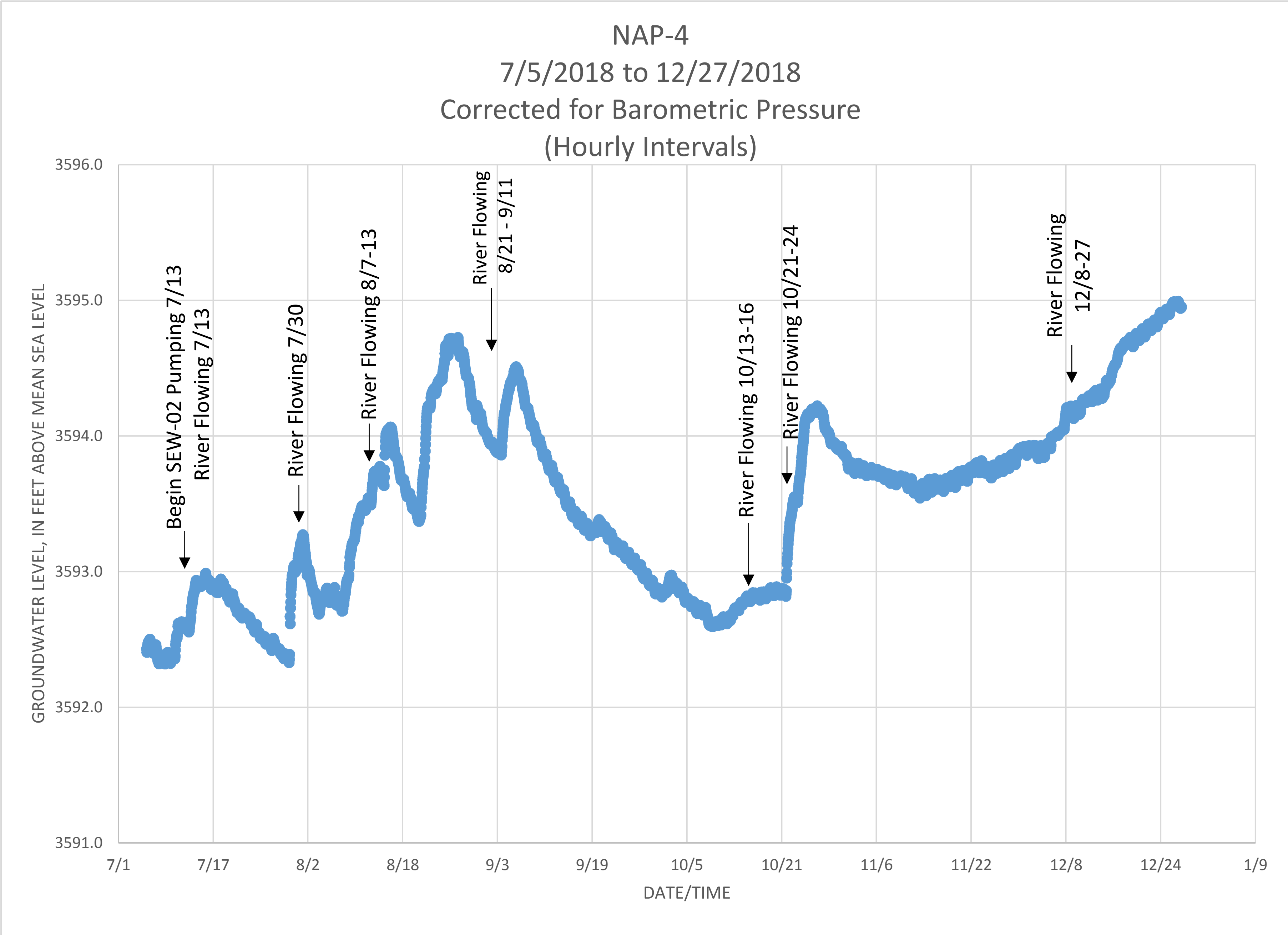
NAP-1
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATERLEVEL, IN FEET ABOVE MEAN SEA LEVEL
3593.0
3592.0
3591.0
3590.0
3589.0
3588.0
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
DATE/TIME
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing
8/21-9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing
12/8-27



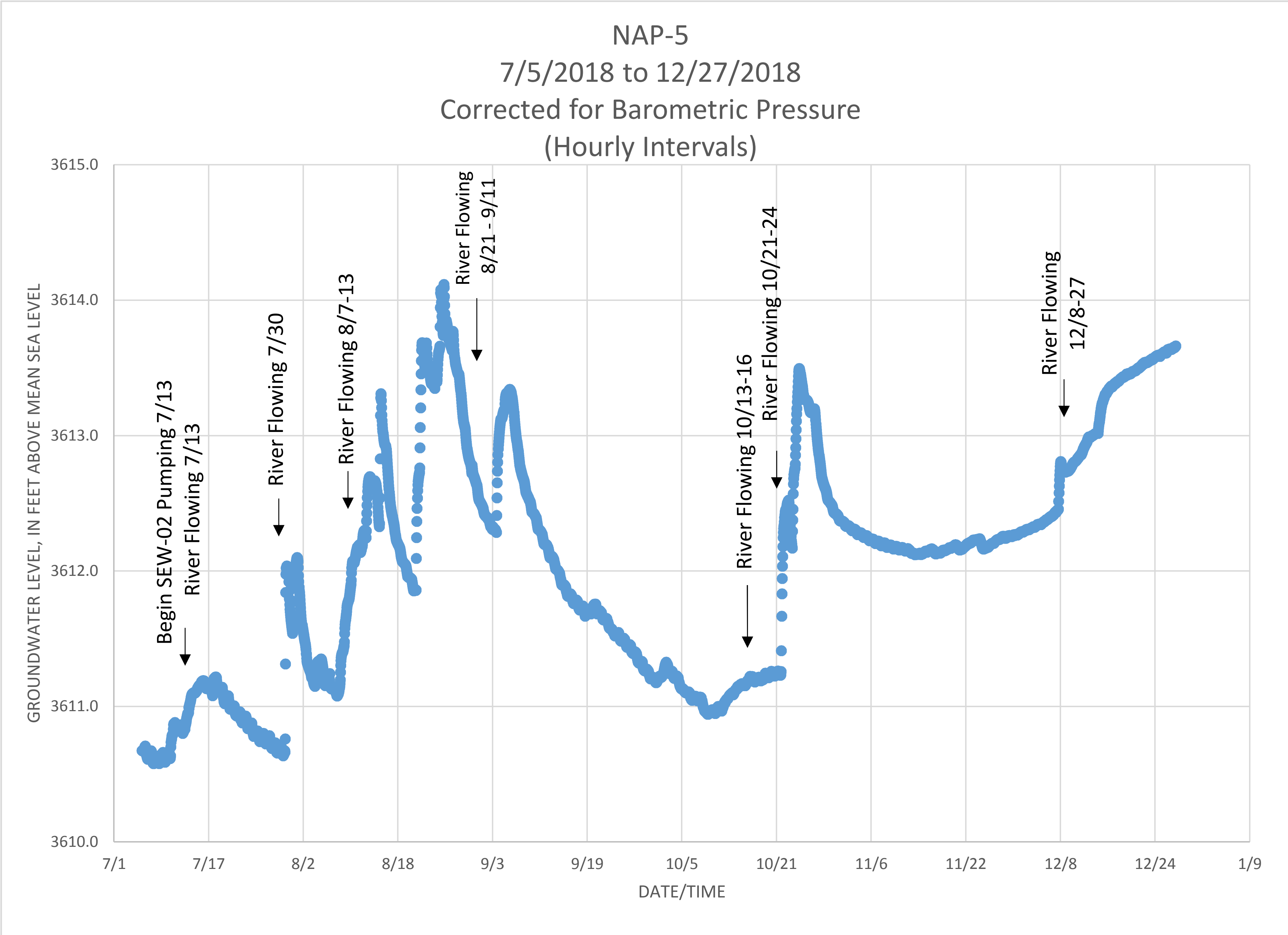
NAP-2
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3594.5
3593.5
3592.5
3591.5
3590.5
3589.5
DATE/TIME
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing 8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing 12/8-27



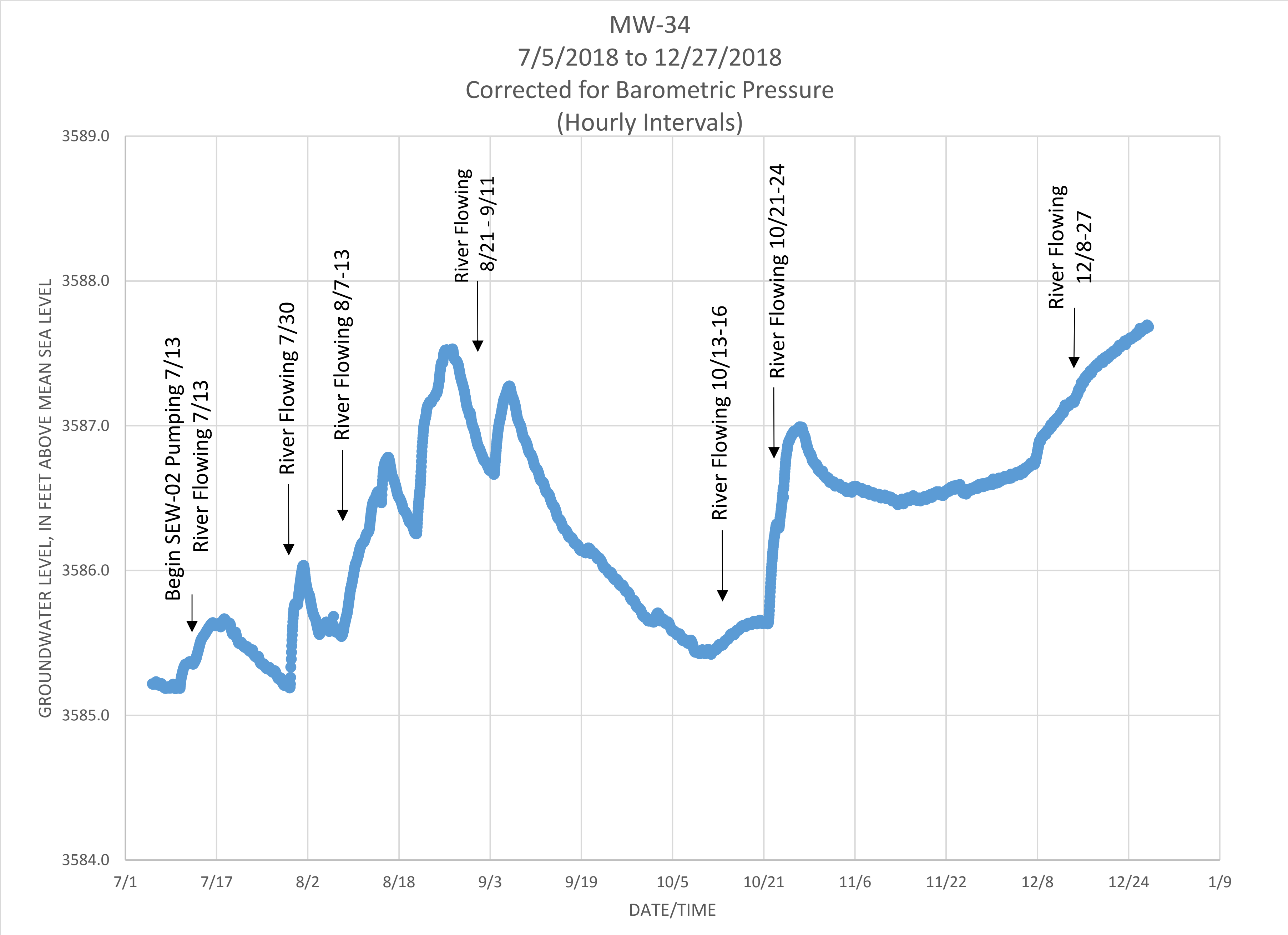
NAP-3
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3594.5
3593.5
3592.5
3591.5
3590.5
3589.5
DATE/TIME
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing
8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing
12/8-27

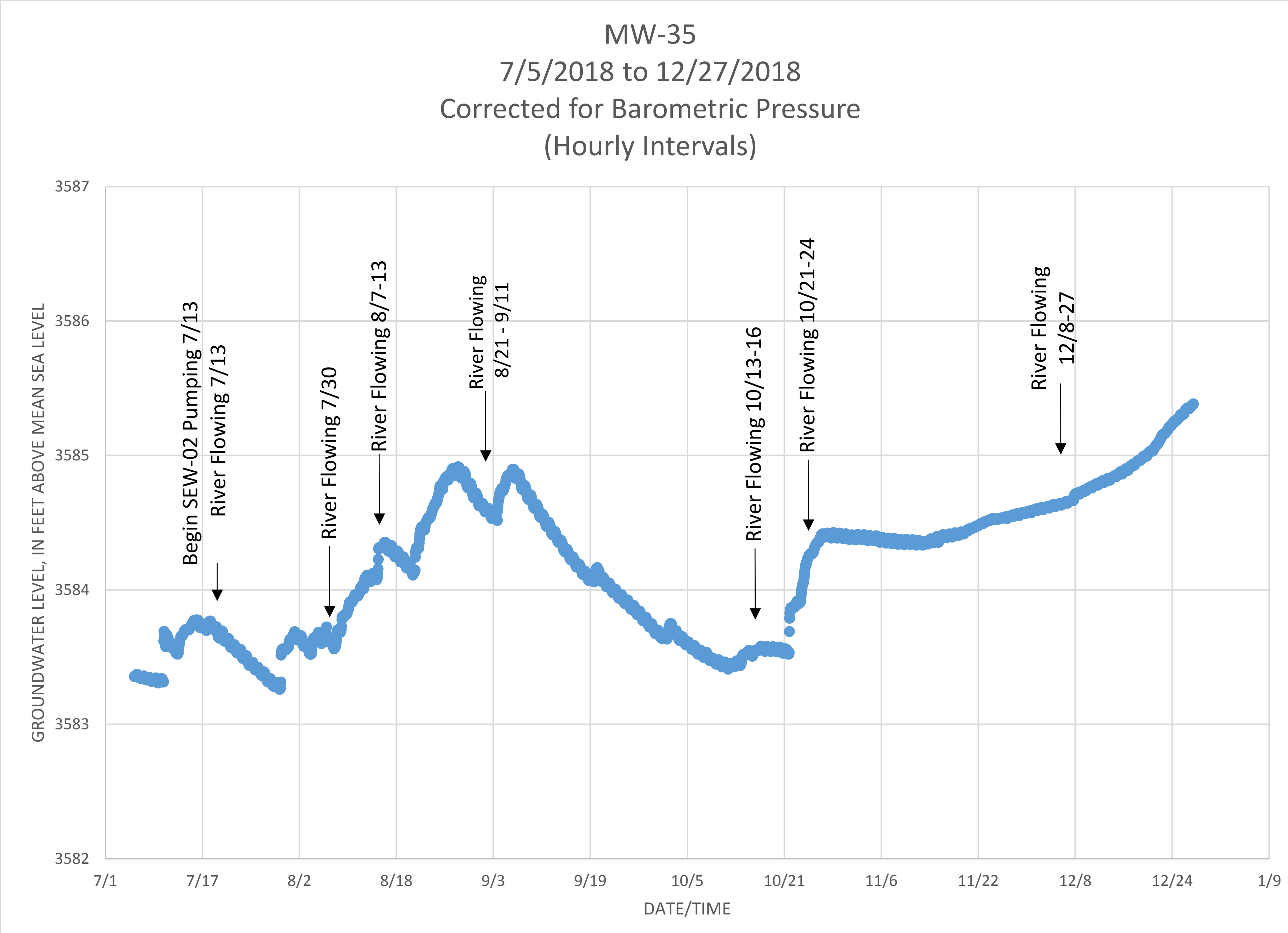


NAP-4
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3596.0
3595.0
3594.0
3593.0
3592.0
3591.0
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
DATE/TIME
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing 8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing 12/8-27

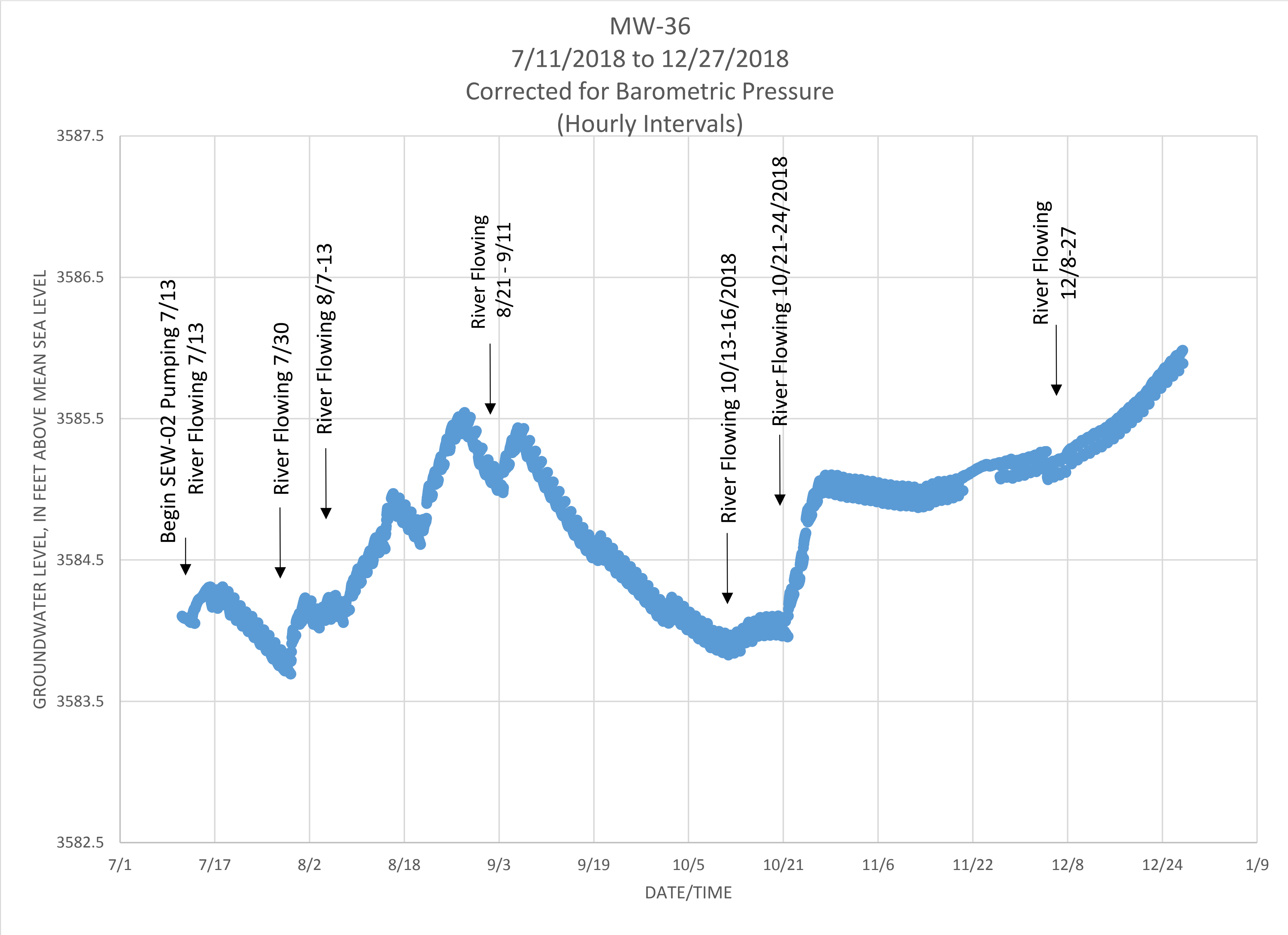


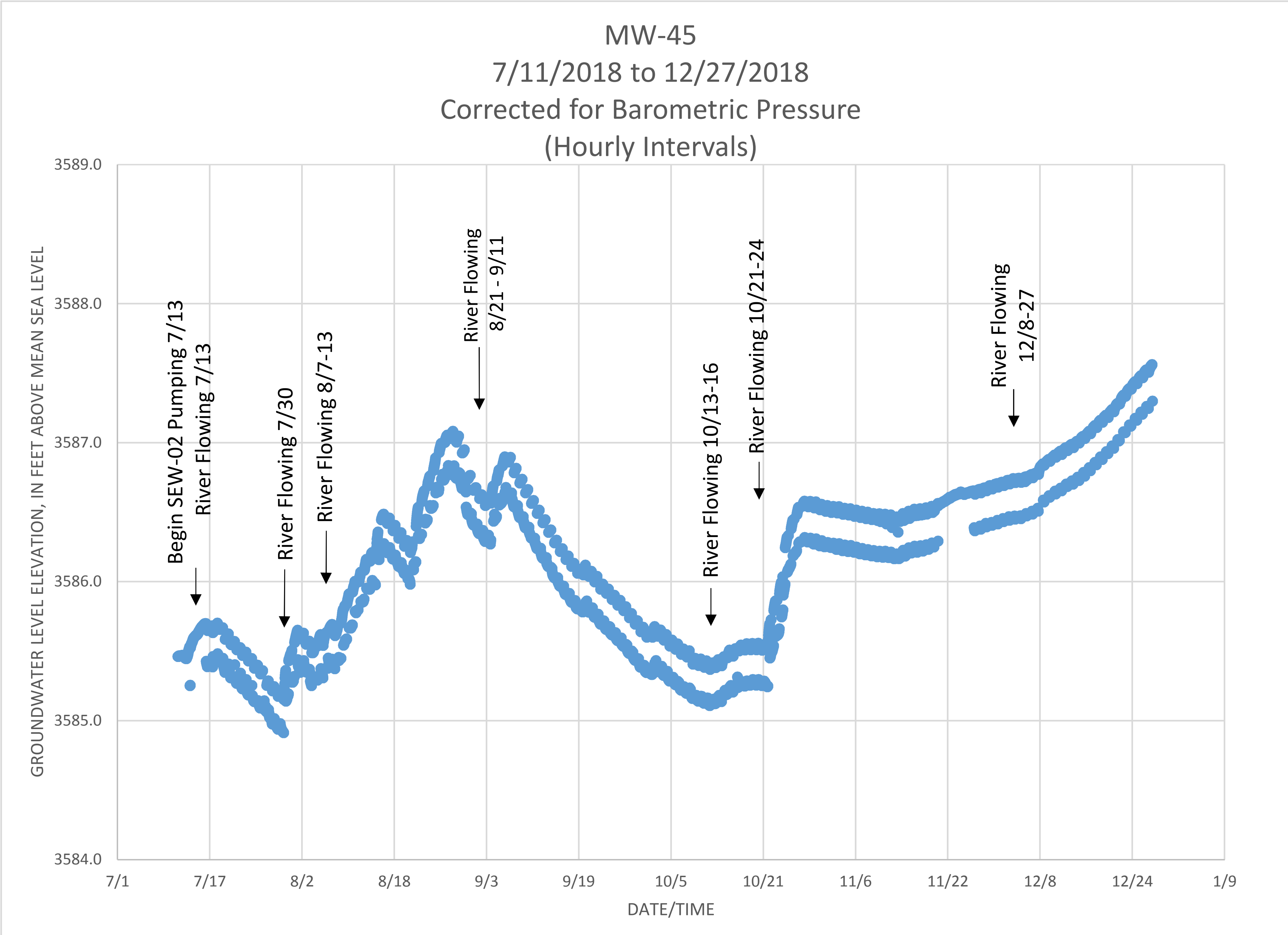
NAP-5
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3615.0
3614.0
3613.0
3612.0
3611.0
3610.0
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
DATE/TIME
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing
8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing
12/8-27


MW-34
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3589.0
3588.0
3587.0
3586.0
3585.0
3584.0
DATE/TIME
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing 8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing 12/8-27

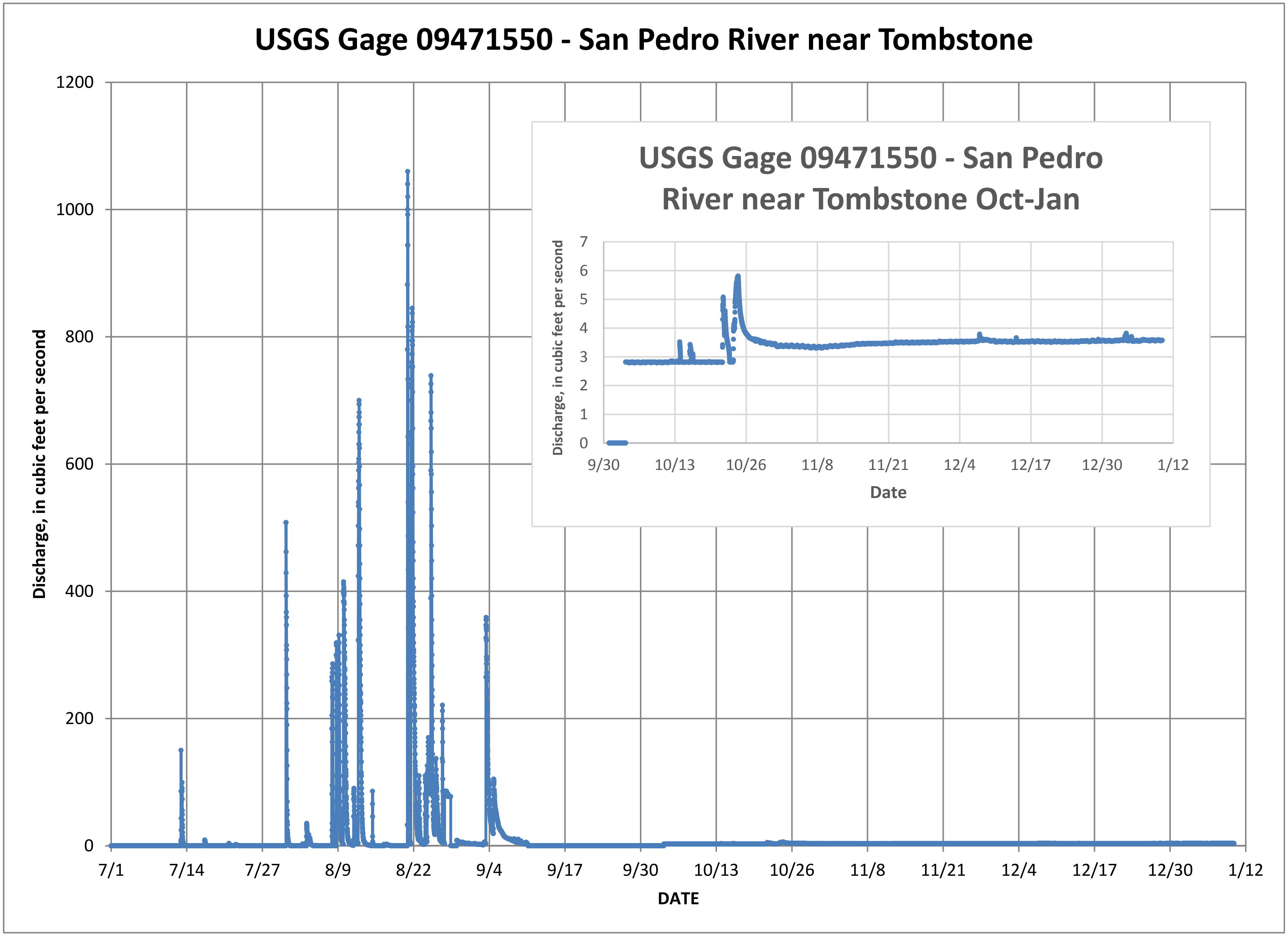


MW-35
7/5/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3587
3586
3585
3584
3583
3582
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing 8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing 12/8-27
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
DATE/TIME

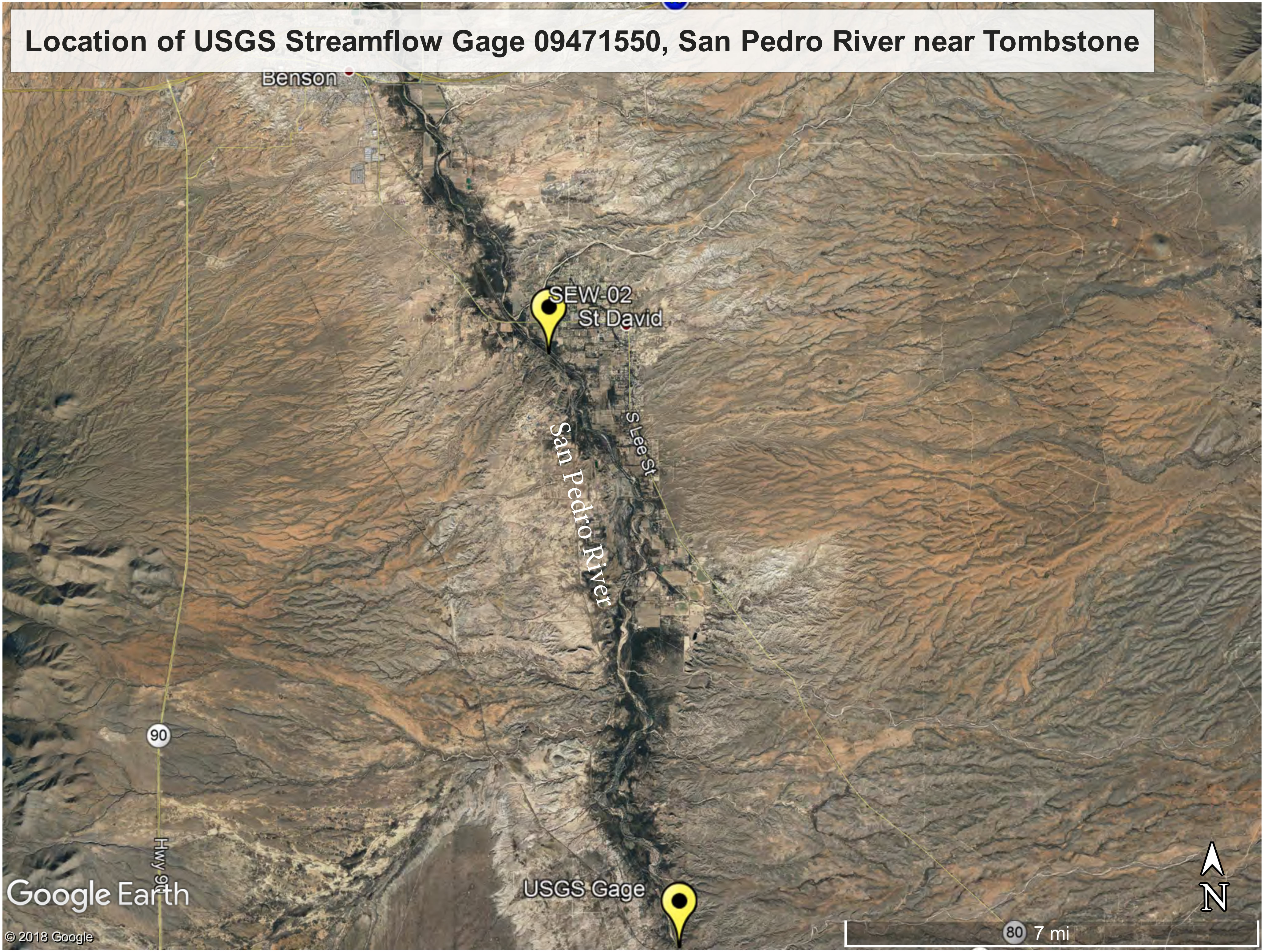

MW-36
7/11/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL, IN FEET ABOVE MEAN SEA LEVEL
3587.5
3586.5
3585.5
3584.5
3583.5
3582.5
DATE/TIME
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing
8/21 - 9/11
River Flowing 10/13-16/2018
River Flowing 10/21-24/2018
River Flowing
12/8-27



MW-45
7/11/2018 to 12/27/2018
Corrected for Barometric Pressure
(Hourly Intervals)
GROUNDWATER LEVEL ELEVATION, IN FEET ABOVE MEAN SEA LEVEL
3589.0
3588.0
3587.0
3586.0
3585.0
3584.0
7/1
7/17
8/2
8/18
9/3
9/19
10/5
10/21
11/6
11/22
12/8
12/24
1/9
DATE/TIME
Begin SEW-02 Pumping 7/13
River Flowing 7/13
River Flowing 7/30
River Flowing 8/7-13
River Flowing
8/21 - 9/11
River Flowing 10/13-16
River Flowing 10/21-24
River Flowing
12/8-27



USGS Gage 09471550 - San Pedro River near Tombstone
Discharge, in cubic feet per second
1200
1000
800
600
400
200
0
7/1
7/14
7/27
8/9
8/22
9/4
9/17
9/30
10/13
10/26
11/8
11/21
12/4
12/17
12/30
1/12
DATE
USGS Gage 09471550 - San Pedro River near Tombstone Oct-Jan
Discharge, in cubic feet per second
7
6
5
4
3
2
1
0
9/30
10/13
10/26
11/8
11/21
12/4
12/17
12/30
1/12
Date


Location of USGS Streamflow Gage 09471550, San Pedro River near Tombstone
Benson
SEW-02
St David
S Lee St
San Pedro River
90
Hwy 90
USGS Gage
Google Earth
© 2018 Google
80
7 mi
N

APPENDIX G

HGI HYDROGEOPHYSICS REPORT RPT-2018-026, REVISION 1 ELECTRICAL RESISTIVITY AND IP CHARACTERIZATION – PREPARED APACHE NITROGEN PRODUCTS INC. DATED SEPTEMBER 2018

HGI HYDROGEOPHYSICS REPORT RPT-2018-026a, DRILLING ADDENDUM TO THE ELECTRICAL RESISTIVITY AND IP CHARACTERIZATION – PREPARED APACHE NITROGEN RPODUCTS INC. DATED DECEMBER 2018

RPT-2018-026, Rev. 1

ELECTRICAL RESISTIVITY AND IP CHARACTERIZATION – APACHE NITROGEN PRODUCTS INC.

B. Cubbage
D. Rucker, PhD
G. Noonan
J. Cain

2302 N Forbes Blvd., Tucson AZ 85745 USA

Date Published:
September 2018

Prepared for:
Apache Nitrogen Products, Inc.

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Northern Area of the Apache Powder Superfund Site comprises a shallow alluvial aquifer along the San Pedro River, within which a contaminant plume of nitrate-nitrogen has been documented. A geophysical survey that includes electrical resistivity and induced polarization (IP) was proposed to assist in interpreting both the occurrence of the plume as well as certain stratigraphic features, such as the surface configuration of the St. David clay and potentially preferential pathways within the shallow alluvial aquifer.

This report provides the final results of five lines of electrical resistivity and IP. The electrical resistivity method allows for characterization of resistive versus conductive targets (high TDS plume material and clays), which can help determine the depth and lateral extent of the plume, sandy vs clayey lithology, and potentially the water table. The IP method is a second-order resistivity measurement that quantifies the charge storage capacity of earth materials. The IP data are being used to identify moderately clayey material (e.g., sandy clay) to help augment our understanding of any conductive anomalies as identified in the resistivity data to have increased or decreased amounts of clay, which will help guide well placement. We expect massive clays to have little to no IP effect due to the short-circuiting of charge along the mineral grain surface.

1.2 LOCATION AND BACKGROUND

The Apache Nitrogen Products, Inc. (ANPI) property comprises an area of approximately nine square miles, located in Cochise County, seven miles southeast of the town of Benson, Arizona (Figure 1).

Most of the upland areas of the site can be described geomorphologically as “badlands terrain” (Hargis, 2018). Badlands are characterized by a hummocky topography, dissected by fine ephemeral drainages. Softer sedimentary rocks and clay-rich soils have been extensively eroded by wind and water processes. In appearance, badlands are characterized by steep slopes, minimal vegetation, lack of a substantial regolith, and high drainage density.

ANPI recently acquired approximately 123 acres of private property at the site. (Hargis, 2018). The acquisition was in the northern area of the site, where the current geophysical survey was conducted. With this property acquisition, the nitrate as nitrogen (nitrate-N) plume within the shallow alluvial aquifer along the west side of the San Pedro River is now approximately 58 percent beneath the ANPI property boundary. The total plume area is approximately 73.5 acres and approximately 43.5 acres is now on ANPI property.

A geologic map, adapted from the Arizona Geological Survey's Digital Geologic Map for Saint David (Youberg and Cook, 2009), is presented in Figure 3; it presents surface geology with the location of the survey lines overlain. The map shows that the survey lines primarily traverse alluvium and river terrace deposits of varying ages.

1.3 OBJECTIVE OF INVESTIGATION

The objective of the geophysical characterization was to help define subsurface features to aid in the cleanup of the contaminant plume. Ultimately, this information is expected to be helpful in the strategic siting of new extraction wells that will accelerate attainment of the groundwater remediation goal for the site pump-and-treat remedy.

Figure 2 shows the specific layout of the survey, which is shown to cross the San Pedro. The lines are approximately 1600 ft long, with stainless steel electrodes used to pass current, measure voltage, and record voltage decay for the IP effect, placed approximately every 10 ft (exactly 3m).

Figure 1. General Location Map of the Apache Nitrogen Geophysical Survey

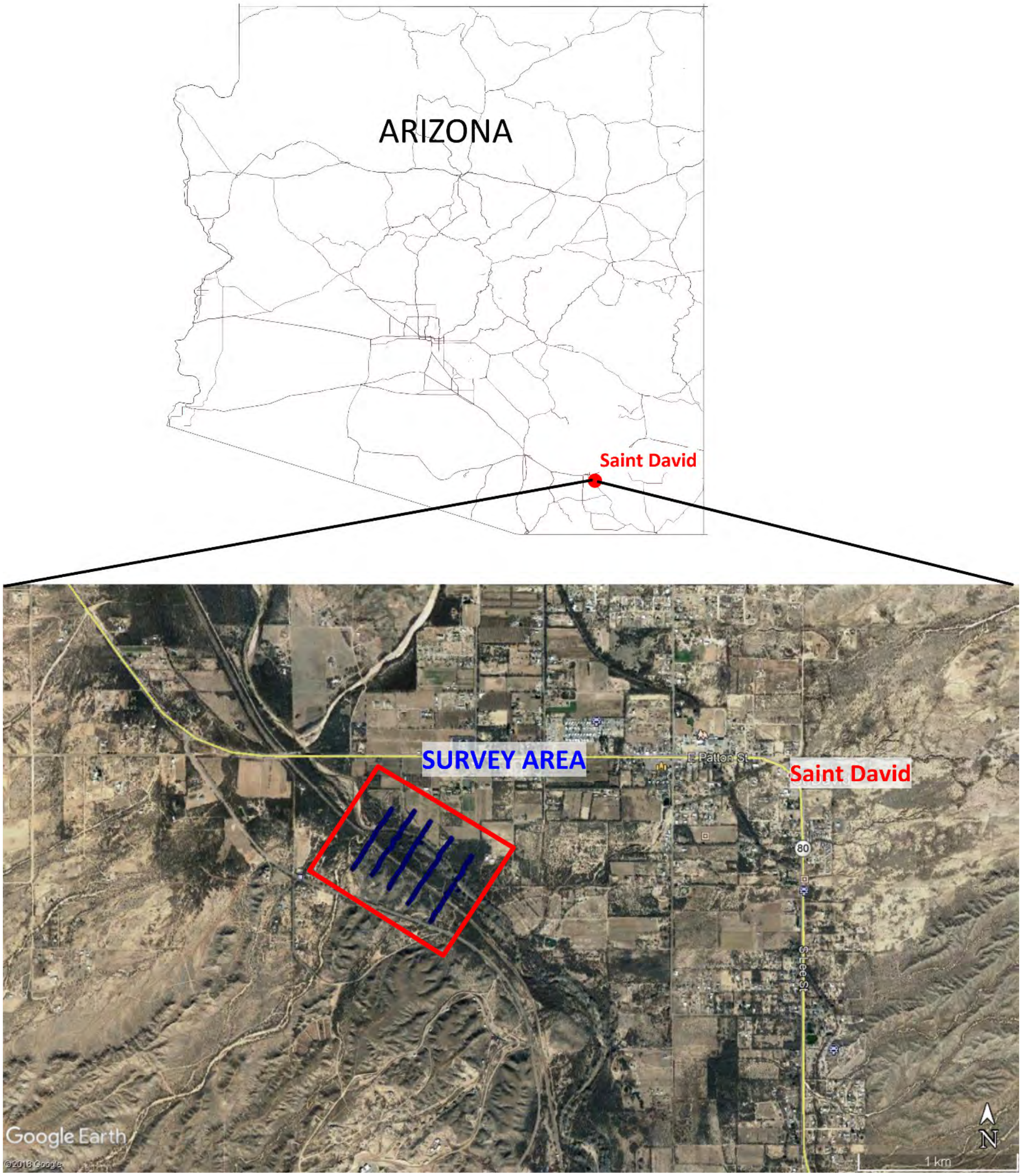


Figure 2. Apache Nitrogen Geophysical Characterization Detailed Survey Layout.

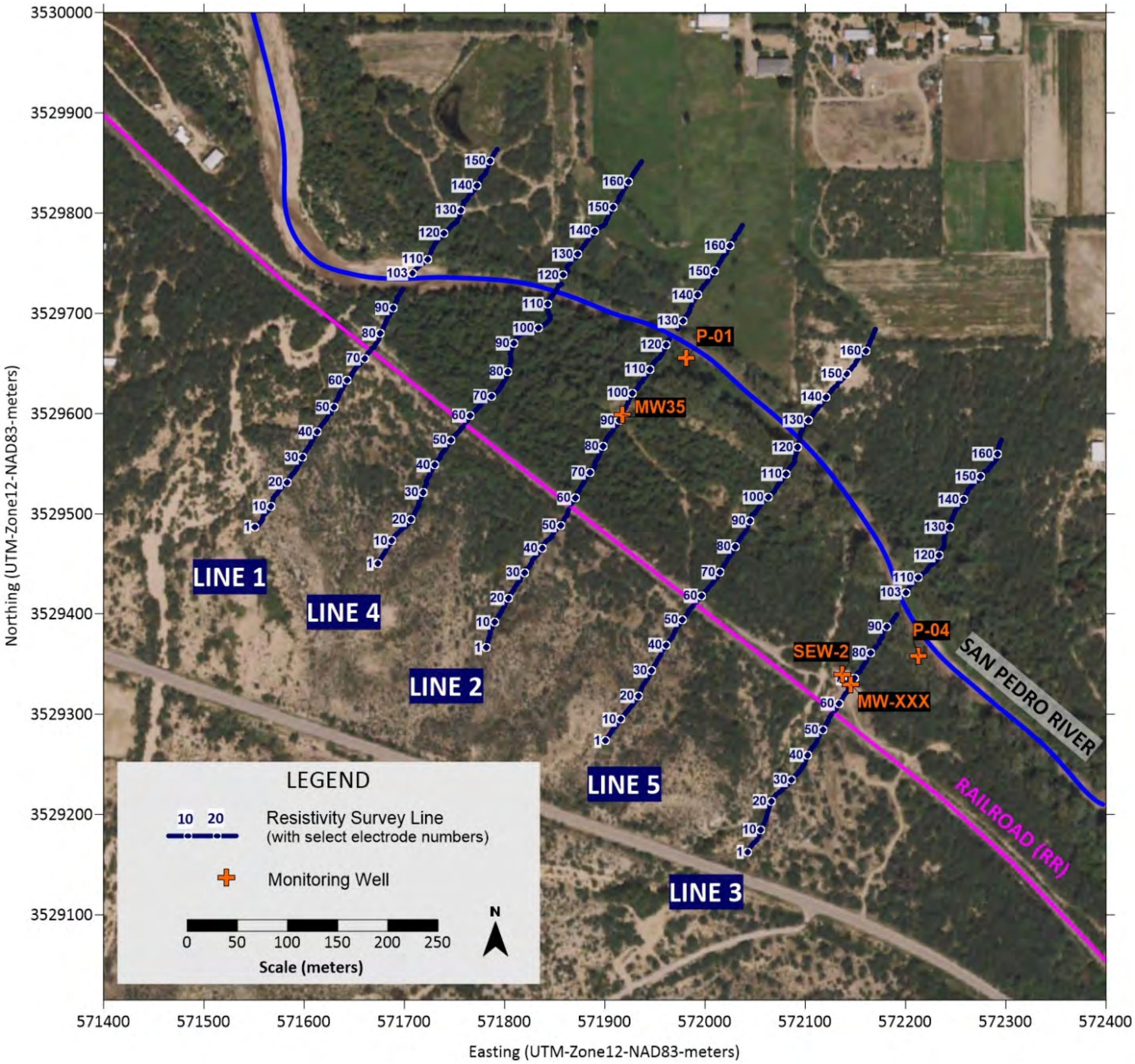
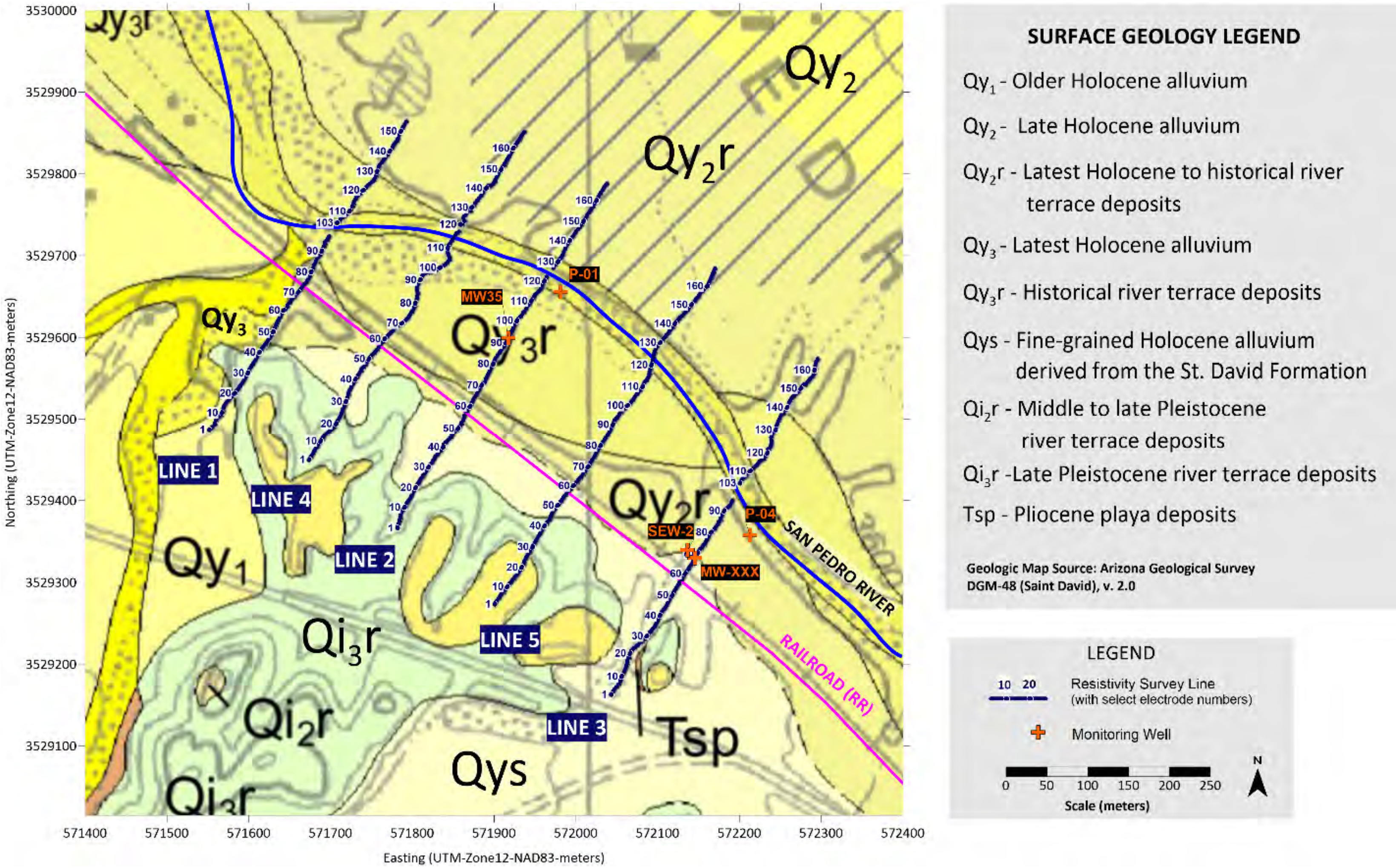


Figure 3. Geologic Map of the Survey Area



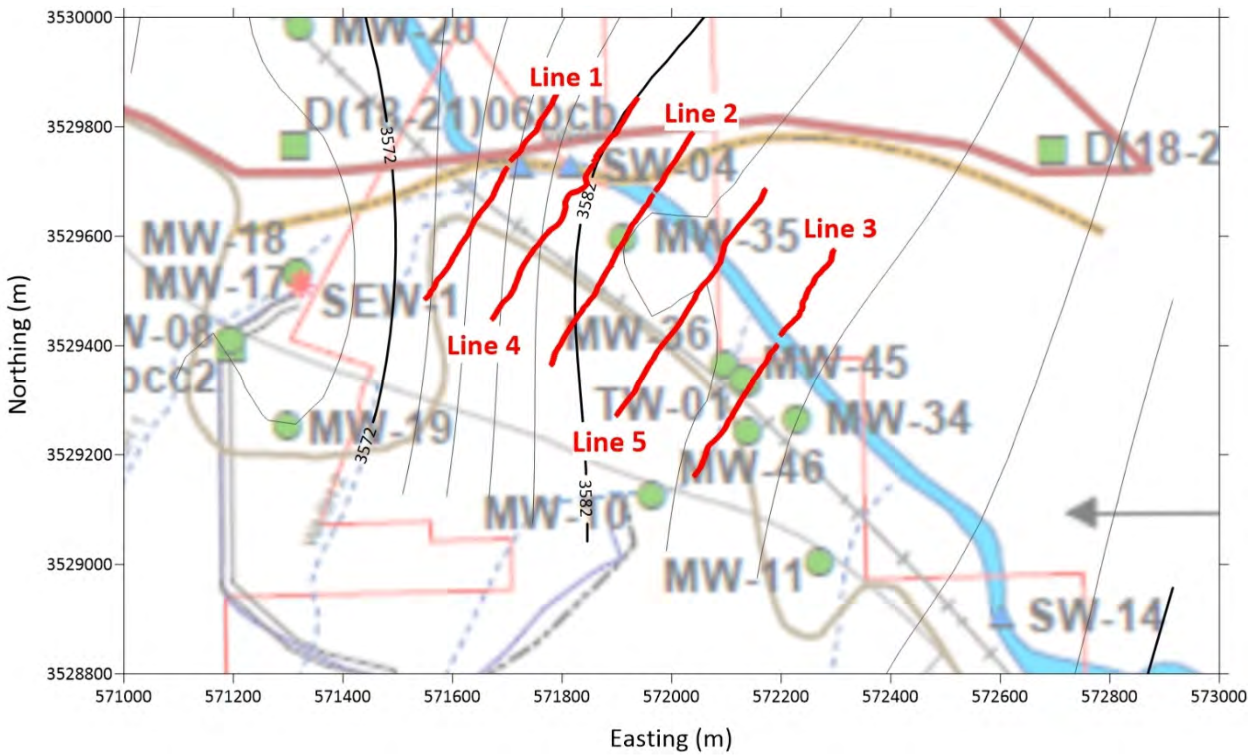
2.0 NORTHERN AREA GROUNDWATER

As a matter of record, this section describing the groundwater in the Northern Area was taken from a Hargis and Associates report titled “2017 Annual Performance Monitoring and Site-Wide Status Report”, dated March 28, 2018.

> The remedy in the Northern Area of the shallow aquifer comprises two components: MNA and a pump- and-treat system, referred to as the Northern Area Remediation System (NARS). The NARS comprises an extraction well from which contaminated groundwater is pumped and routed to a treatment wetland where the water flows under gravity through a series of five treatment ponds. Discharge is routed to a wash (Wash 3), where it infiltrates into the underlying alluvium.
>
> During 2017, the NARS extracted and treated over 32 million gallons of contaminated groundwater which contained approximately 13,600 pounds of nitrate-N that was removed from groundwater. The far northern portion of the Northern Area is situated north and outside the influence of the NARS capture zone. Presently, this area relies on natural attenuation to reduce concentrations of nitrate-N in groundwater. The feasibility of MNA in this area was originally assessed during the period of 2005 through 2007 both by a program of field data collection of parameters and model projections. Although the investigations indicated that there were essential components for natural attenuation by biodegradation mechanisms, it is believed that hydromechanical dispersion may be the major factor in decreasing concentrations in the shallow aquifer.
>
> In 2008, ANPI developed a model for Northern Area Performance Assessment (NAPA). The NAPA model applied field data with an attenuation half-life of two years to project the rate of attenuation of the areal distribution of nitrate-N over time. Since that time, field data indicate that attenuation is in fact occurring at a rate consistent with the model (H+A, 2008c). The 2017 water quality data indicate that all shallow aquifer wells in the Northern MNA management zone are still below the nitrate-N cleanup standard and have been since the middle of 2013 when the nitrate-N concentration at private well D(18-21)06bcb dropped below the standard of 10 mg/l.
>
> The position of this particular well is important, considering that it is apparently at the edge of the capture zone of extraction well SEW-01, a component of the pump-and-treat component of the Northern Area remediation system. The nitrate-N concentration in this well has been on a downward trend since 2004 and initially dropped below the cleanup standard in May of 2011. The lowest concentration at this well was recorded at 1.0 mg/l during May 2017. The nitrate-N concentrations at this well are expected to remain permanently below 10 mg/l, as extraction well SEW-01 continues to operate at the present rate.

Within the back of the Hargis report, groundwater elevations were reported for late 2017. These data were mapped by HGI to form a context from which the geophysical data could be interpreted. Figure 4 shows the groundwater elevation, geostatistically interpolated from 14 wells. The hydraulic gradient is from southeast to northwest. The southeast has a lower gradient, likely due to higher hydraulic conductivity values associated with sands and gravels. The gradient becomes larger in the northwest, where hydraulic conductivities decrease with higher percentages of silts and clay.

Figure 4. Groundwater Elevations Across the Northern Area



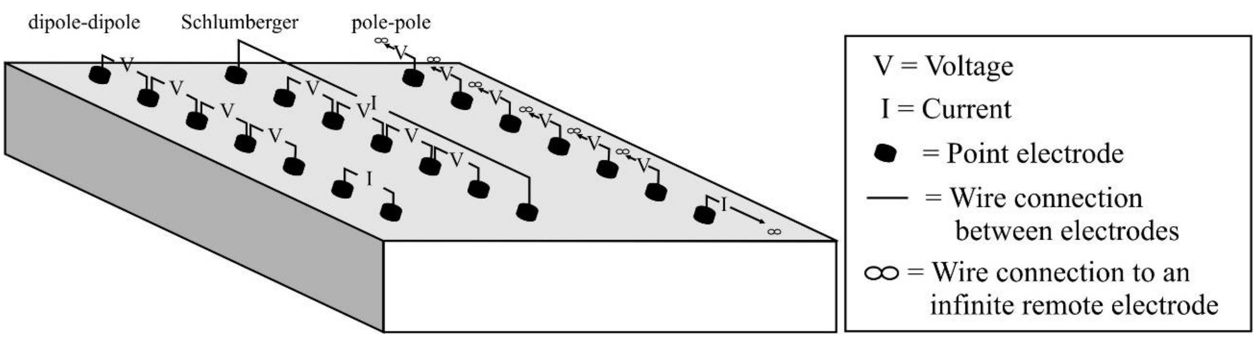
3.0 GEOPHYSICAL THEORY

3.1 ELECTRICAL RESISTIVITY

Electrical resistivity is a volumetric property that describes the resistance of electrical current flow within a medium (Rucker et al., 2011; Telford et al., 1990). Direct electrical current is propagated in rocks and minerals by electronic or electrolytic means. Electronic conduction occurs in minerals where free electrons are available, such as the electrical current flow through metal. Electrolytic conduction, on the other hand, relies on the dissociation of ionic species within a pore space and is more common in the partially saturated sandy alluvium and fractured bedrock. With electrolytic conduction, the movement of electrons varies with the mobility, concentration, and the degree of dissociation of the ions. Competent rock free of fissures and fractures will have a higher resistivity compared to less competent rock.

Mechanistically, the resistivity method uses electric current (I) that is transmitted into the earth through one pair of electrodes (transmitting dipole) that are in contact with the soil. The resultant voltage potential (V) is then measured across another pair of electrodes (receiving dipole). Numerous electrodes can be deployed along a transect (which may be anywhere from feet to miles in length), or within a grid. Figure 5 shows examples of electrode layouts for surveying. The figure shows transects with a variety of array types (dipole-dipole, Schlumberger, pole-pole). A complete set of measurements occurs when each electrode (or adjacent electrode pair) passes current, while all other adjacent electrode pairs are utilized for voltage measurements. Modern equipment automatically switches the transmitting and receiving electrode pairs through a single multi-core cable connection. Rucker et al. (2009) describe in more detail the methodology for efficiently conducting an electrical resistivity survey.

Figure 5. Possible Arrays for use in Electrical Resistivity Characterization



The modern application of the resistivity method uses numerical modeling and inversion theory to estimate the electrical resistivity distribution of the subsurface given the known quantities of electrical current, measured voltage, and electrode positions. A common resistivity inverse method incorporated in commercially available codes is the regularized least squares optimization method (Sasaki, 1989; Loke, et al., 2003). The objective function within the optimization aims to minimize the difference between measured and modeled potentials (subject to certain constraints, such as the type and degree of spatial smoothing or regularization) and the optimization is conducted iteratively due to the nonlinear nature of the model that describes the potential distribution. The relationship between the subsurface resistivity (ρ) and the measured voltage is given by the following equation (from Dey and Morrison, 1979):

$$-\nabla \cdot \left[\frac{1}{\rho(x,y,z)} \nabla V(x,y,z) \right] = \left(\frac{I}{U} \right) \delta(x - x_s) \delta(y - y_s) \delta(z - z_s) \qquad (1)$$

where I is the current applied over an elemental volume U specified at a point (x_s, y_s, z_s) by the Dirac delta function.

Equation (1) is solved many times over the volume of the earth by iteratively updating the resistivity model values using either the L_2-norm smoothness-constrained least squares method, which aims to minimize the square of the misfit between the measured and modeled data (de Groot-Hedlin & Constable, 1990; Ellis & Oldenburg, 1994):

$$\left(J_i^T J_i + \lambda_i W^T W\right)\Delta r_i = J_i^T g_i - \lambda_i W^T W r_{i-1} \qquad (2)$$

or the L_1-norm that minimizes the sum of the absolute value of the misfit:

$$\left(J_i^T R_d J_i + \lambda_i W^T R_m W\right)\Delta r_i = J_i^T R_d g_i - \lambda_i W^T R_m W r_{i-1} \qquad (3)$$

where g is the data misfit vector containing the difference between the measured and modeled data, J is the Jacobian matrix of partial derivatives, W is a roughness filter, R_d and R_m are the weighting matrices to equate model misfit and model roughness, Δr_i is the change in model parameters for the i^{th} iteration, r_i is the model parameters for the previous iteration, and λ_i = the damping factor.

3.2 INDUCED POLARIZATION

During resistivity measurements, the resistivity meter measures the voltage across a pair of electrodes, which is then normalized to obtain a transfer resistance (R):

$$R = \frac{V_p}{I} \ , \qquad (4)$$

where V_p is the primary voltage during current transmission (I). From the transfer resistance and geometric factor, an apparent resistivity (ρ_a) can be calculated (Rucker, 2009). For IP measurements, the resistivity meter measures the secondary voltage (V_s) decay curve after the current transmission is terminated to produce an apparent chargeability (m_a). This study used an improved firmware with self-potential noise reduction built into the resistivity meter during measurements of V_s both immediately after transmitter shut-off and in later windows. For the soils at the site, we expect IP chargeability to be controlled by clay mineral membrane polarization (Johansson et al., 2015).

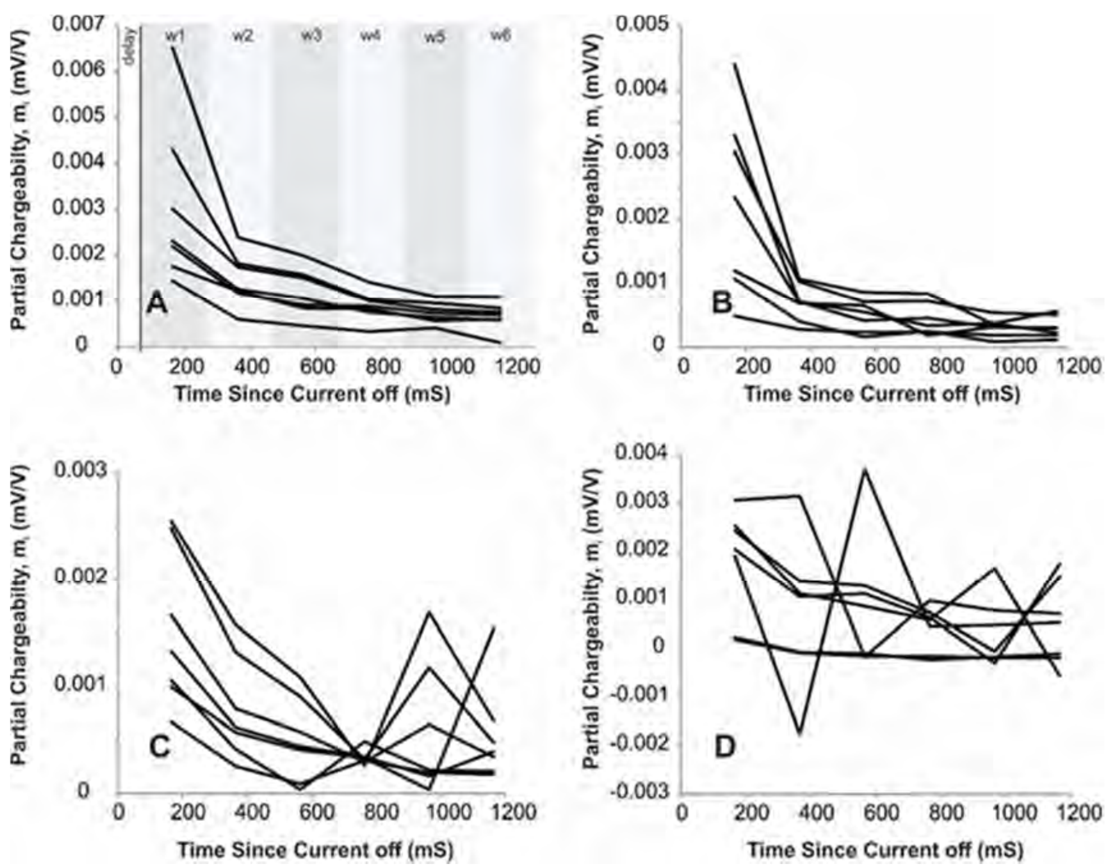
The secondary voltage is very small compared to the primary voltage, thus an integral measure of the decay curve is calculated (Ntarlagiannis et al., 2016):

$$m_a = \frac{1}{t_2 - t_1}\int_{t_1}^{t_2} \frac{V_s(t)}{V_p} dt \ , \qquad (5)$$

where t_1 is the initial delay (65 ms within our resistivity meter) and t_2 is the end of the integration of the curve. To be more accurate in the integration, the decay curve is parsed into six windows (or gates) that are linearly distributed across the measure time. For each of the six windows, w1 through w6, the equipment provides a partial chargeability value (Florsch et al., 2011), m_i, and the final summed apparent chargeability in the raw data file. Figure 6A shows examples of the partial values for several decay curves, where each window length is 200 ms, starting immediately after the initial 65 ms delay. For convenience of plotting, the integrated, partial chargeability value within each window is centered within the window on the time axis.

The full suite of subplots in Figure 6 shows a series of progressively noisier decay curves. Figures 6A and 6B are most likely useable for inverse modeling, judging by their smooth and monotonically decreasing values with time. Figures 6C and 6D are poor and unusable because the curves have partial chargeability values that are higher with time or are negative. Additionally, the best curves typically have values that are high overall. Chargeability is most strongly influenced by the earth materials and signal levels, which are controlled by transmitter power and the electrical coupling quality or contact resistance of the transmitter electrodes.

Figure 6. Example IP curves showing the partial chargeability value acquired within windows w1 through w6. A) high quality; B) moderate quality; C) poor quality; d) unusable.

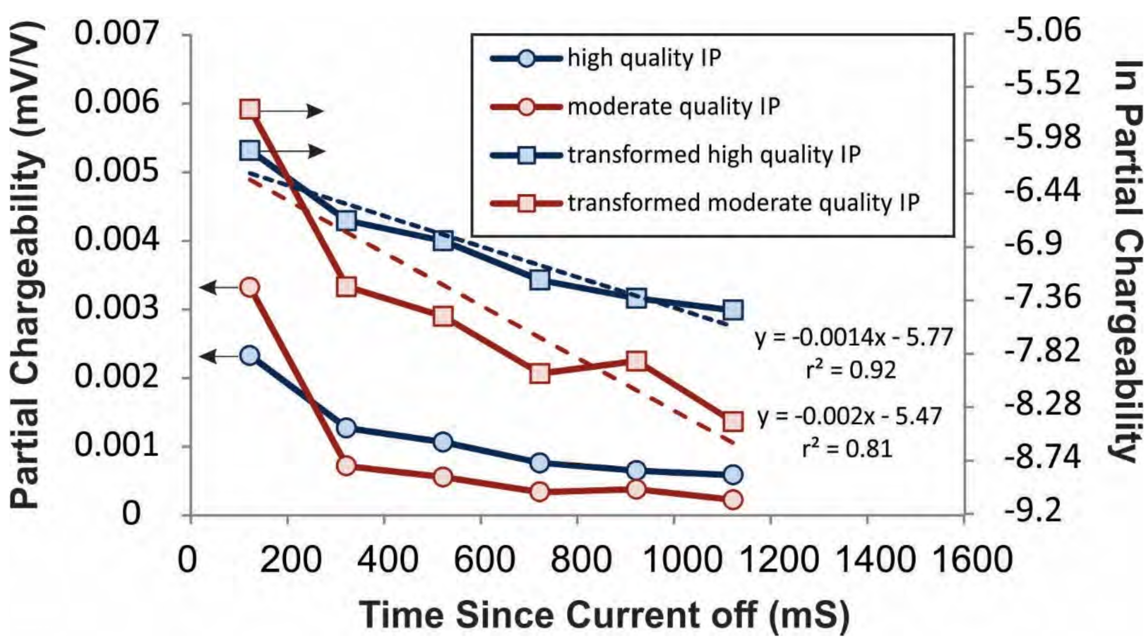


Processing of the chargeability data can be cumbersome given the large amount of information than can accompany an IP survey. Automated processing routines for data rejection can significantly reduce the time between acquisition and interpretation. For IP, automation can be in the form of curve matching to an expected shape of the decay curve, which is exponential in the form of (Florsch et al., 2011):

$$V(t) = V_p m e^{-t/\tau} \quad (6)$$

where τ is the characteristic time constant. In the automation of data rejection, we are less concerned with the parameterization of the decay than we are with how well the decay matches expectations. Figure 7 shows an example, where decay curves are transformed with the natural logarithm and modeled with a best fit line in semi-log space. The coefficient of determination, r^2, is subsequently used to judge the fit with a better fit to an exponential decay given to higher values. In Figure 6A, all of the decay curves have an $r^2>0.9$; the decay curves in Figure 6B have $0.8<r^2<0.9$. Furthermore, any curve with a negative partial chargeability must automatically be rejected from the dataset as this would cause problems in the transformation.

Figure 7. Processing voltage decay curves for automated filtering. The figure includes arithmetically scaled decay curves and a natural logarithm transformed IP curves with fitting functions and degree of fit as r^2.

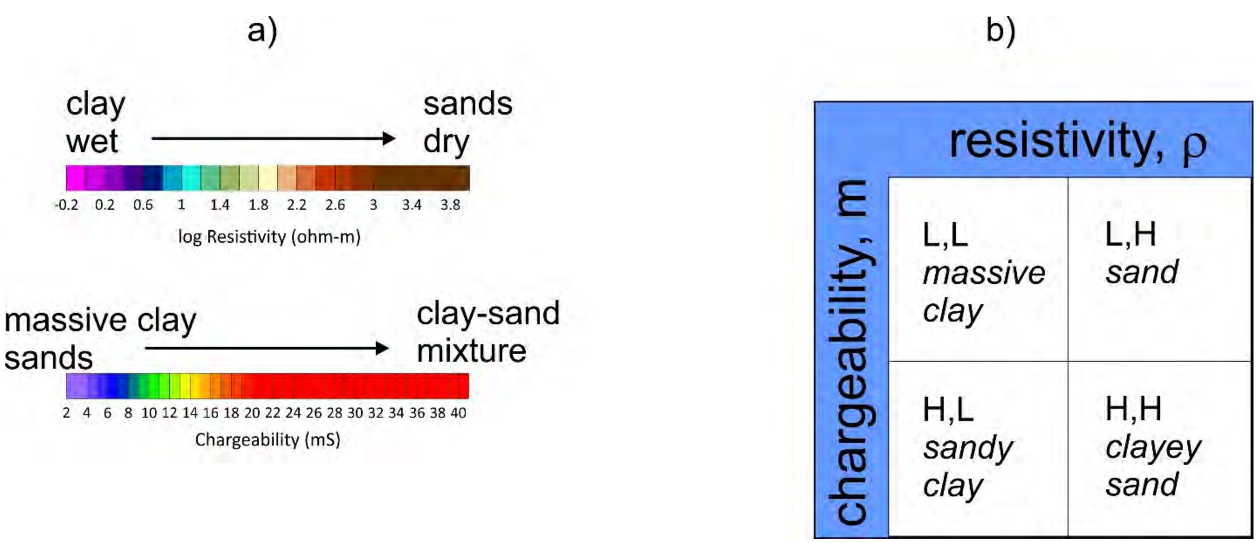


For the inversion of chargeability, we follow the approach outlined in Kemna (2000) and Kemna et al. (2000) as implemented in RES3DINVx64. Iteratively, the resistivity is solved first, followed by a solution for chargeability using the same smooth model, constrained optimization presented in Eq. (3).

3.3 INTERPRETATION

The final results of the resistivity and IP will be presented as color contoured sections. The resistivity generally ranged from 0.6 to 10,000 ohm-m and will be presented as a continuum across each profile. The chargeability ranged from 2 to 42 ms. In Figure 8a, we show how the color scales define end members for interpreting the geophysical sections. For example, lower resistivity vales can be associated with clay that may have some degree of saturation whereas the higher values will be associated with clean sands that are dry. Resistivity values in the middle of the scale will be determined by the context of what is around that value. For chargeability, low values associated with material that cannot hold electrical charge are likely massive clays and sands. High chargeability values are associated with a mixture of clays and sands. In Figure 8b, we use these end members to classify the soil types for broad generalizations of lithology. In the Results section, we show the resistivity overlain by a chargeability contour of 9 ms along with the classifications according to Figure 8b.

Figure 8. Lithological interpretations from resistivity and chargeability: a) color scales for resistivity and chargeability defining end members of lithological interpretation; b) general clustering of lithology based on having both resistivity and chargeability at the same location.



4.0 METHODOLOGY

4.1 SURVEY AREA AND LOGISTICS

A geophysical survey, including five survey lines of electrical resistivity and IP, was performed by hydroGEOPHYSICS, Inc. from July 27 to August 13, 2018. The survey utilized the Alt-3 Wenner array (Cubbage et. al, 2017) with 3-meter electrode spacing. Line lengths ranged from 1505 to 1643 feet, for a total of 8048 line-feet. Table 1 lists further details for the geophysical line layout.

Table 1. Geophysical Characterization Survey Layout Details.

Line #	Length	Number of Electrodes	Start Coordinates	End Coordinates
	(Feet)		(Easting, Northing, Elevation - NAD83 UTM – meters)	
1	1505	154	571551.3, 3529487.0, 1100.7	571792.2, 3529863.6, 1098.0
2	1643	168	571781.5, 3529366.2, 1106.9	572037.2, 3529787.3, 1099.0
3	1614	165	572042.7, 3529162.6, 1105.3	572295.2, 3529573.5, 1100.6
4	1643	168	571673.6, 3529449.9, 1108.0	571936.5, 3529851.0, 1099.3
5	1643	168	571900.6, 3529273.3, 1108.5	572169.9, 3529684.2, 1099.6
TOTAL	**8048**			

4.2 EQUIPMENT

Data were collected using a Supersting™ R8 multichannel electrical resistivity system (Advanced Geosciences, Inc. (AGI), Texas) and associated cables, electrodes, and battery power supply. The Supersting™ R8 meter is commonly used in surface geophysical projects and has proven itself to be reliable for long-term, continuous acquisition. The stainless steel electrodes were laid out along lines with a constant electrode spacing of approximately 10 feet (3 meters). Multi-electrode systems allow for automatic switching through preprogrammed combinations of four electrode measurements.

Electrode locations were determined based on the distance along the cable length, GLA personnel surveyed in the electrode locations and elevation using a sub-centimeter GPS unit.

4.3 DATA PROCESSING

4.3.1 Quality Control – Onsite

Data for each survey method were given a preliminary assessment for quality control (QC) in the field to assure quality of data before progressing the survey. Following onsite QC, the data were transferred to the HGI server for storage and detailed data processing and analysis.

4.3.2 Electrical Resistivity and IP Processing

4.3.2.1 Data Editing

The geophysical data for the resistivity survey, including measured voltage, current, measurement (repeat) error, and electrode position, were recorded digitally with the AGI SuperSting R8 resistivity meter. Each line of acquisition was recorded with a separate file name. Following field data collection, the raw resistivity data files were transmitted to the HGI server located in Tucson, Arizona. Data quality was inspected and checked for consistency with respect to adjacent line results, then data files were saved to designated folders on the server. The server was backed up nightly and backup tapes were stored at an offsite location on a weekly and monthly basis.

The raw data were evaluated for measurement noise. Those data that appeared to be extremely noisy and fell outside the normal range of accepted conditions were removed. Examples of conditions that would cause data to be removed include: negative or very low voltages, high-calculated apparent resistivity, extremely low current, and high repeat measurement error.

4.3.2.2 2D Inversion

RES2DINVx64 software (Geotomo, Inc.) was used for inverting individual lines in two dimensions. RES2DINVx64 is a commercial resistivity inversion software package available to the public from www.geoelectrical.com. An input file was created from the edited resistivity data and inversion parameters were chosen to maximize the likelihood of convergence. It is important to note that up to this point, no resistivity data values had been manipulated or changed, such as smoothing routines or box filters. Noisy data had only been removed from the general population.

The inversion process followed a set of stages that utilized consistent inversion parameters to maintain consistency between each model. Inversion parameter choices included the starting model, the inversion routine (robust or smooth), the constraint defining the value of smoothing and various routine halting criteria that automatically determined when an inversion was complete. Convergence of the inversion was judged whether the model achieved an RMS of less than 5% within three to five iterations.

4.3.2.3 2D Plotting

The inverted data were output from RES2DINVx64 into an .XYZ data file and were then gridded and color contoured in Surfer (Golden Software, Inc.). Electrode locations and other relevant line features were plotted on the resistivity sections to assist in data analysis. Qualified in-house inversion experts subjected each profile to a final review.

5.0 RESULTS & INTERPRETATION

5.1 TWO-DIMENSIONAL PROFILES

The two-dimensional (2D) resistivity model results are presented in this section as 2D cross-section profiles in Figures 9 through 23. Common color contouring scales were used throughout the 2D profile figures. For the resistivity profiles, electrically conductive (low resistivity) subsurface regions are represented by cool hues (magenta to blue) and electrically resistive regions are represented by warm hues (red to brown). For the IP profiles, a slightly different color scale was used. The blue values typify low chargeability materials, where charge cannot be stored (either due to short-circuiting from massive clays or from large pore spaces that lack the membrane polarization effect). The green to yellow contours represent a mid-value IP effect and chargeability values where we would expect to see a mix of mostly sand with low amounts of clay. Red contours represent a stronger IP effect, where membrane polarization is in effect from a higher mix of clays with sands.

Other general notes:

- The location (and assigned number) of the electrodes are indicated along the ground surface of the profiles. These electrodes can be directly linked to the electrode positions on the map of Figure 2.
- The location of the topography, as shot in by a survey-grade GPS by HGI, is shown as a solid black line atop the profiles.
- Features such as the position of the railroad and San Pedro River are marked along the profiles
- The water table as inferred from Figure 3 is presented in each profile as a white dotted line. The water table has been extrapolated beyond common conceptualization of where it terminates at the edge of the clay unit of the St. David Formation. The extrapolated portion of the water table is noted by '?' across the dotted line.
- While the full depth of the resistivity imaging is provided within these profiles, it should be noted that resolution decreases with model depth; hence, analysis at deeper portions of the profiles carries less confidence in these results.
- Full engineering drawings of the lines are provided in the appendix

5.1.1 Line 1

The geophysical survey for Line 1 is presented in Figure 9. The data are shown as the resistivity on top and IP on the bottom. The resistivity is shown to span multiple orders of magnitude from about 0.5 ohm-m to over 6000 ohm-m. For this reason, we plot the data in a logarithmically transformed scale. The chargeability from the IP survey spans from 2 to 40 mS and is presented in an arithmetic scale.

The resistivity of Line 1 is mostly on the conductive end of the scale owing to the massive clays that comprise part of the St. David Formation. The St. David clay is the upper unit of the St. David Formation and comprises a hard, red-brown clay stratum 200 or more feet thick at the site. From the resistivity, the clay is more shallow at the beginning of the line and becomes deeper under the San Pedro River. However, there are some indications of the clay becoming shallower on the right bank of the San Pedro (towards the end of the line). On top of the St. David clay appears to be a mix of coarser grained sediments, especially in the immediate vicinity of the San Pedro flood plain (located between electrodes 92 and 120). At the beginning of the line there also appears coarser grained sediments from the dry wash (exposed 100ft to the north) that likely replaced the clay in the near surface, causing the material to be resistive (between electrodes 1 and 37). This resistive feature is above the inferred water table so it is likely dry as well. Field notes reveal a mix of soil textures and rock outcrop. Other features along the line includes a broad conductive, shallow clayey material from electrodes 61 to 89 and a smaller conductive feature from electrodes 44 to 53.

The chargeability data of Line 1 shows mostly low values. The largest feature is at the beginning of the line, however, we have low confidence in the model results for this particular feature below the water table based on data density during modeling. Most other high chargeability targets are dotted along the line at or below the water table. These higher values are likely associated with enough clay in the lithology to cause a membrane polarization effect, but not so much clay as to cause a short circuit of charge along the mineral surface.

Figure 9. Resistivity and IP of Line 1

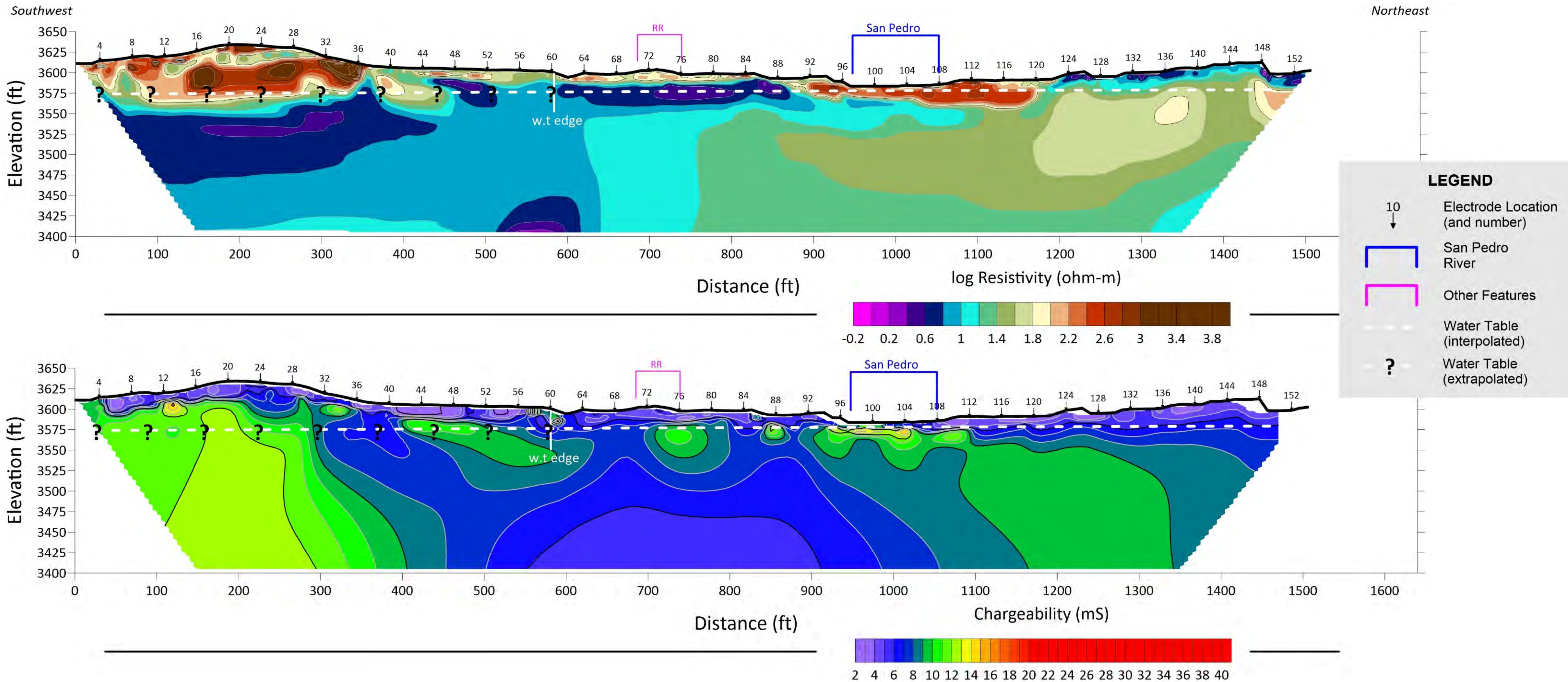
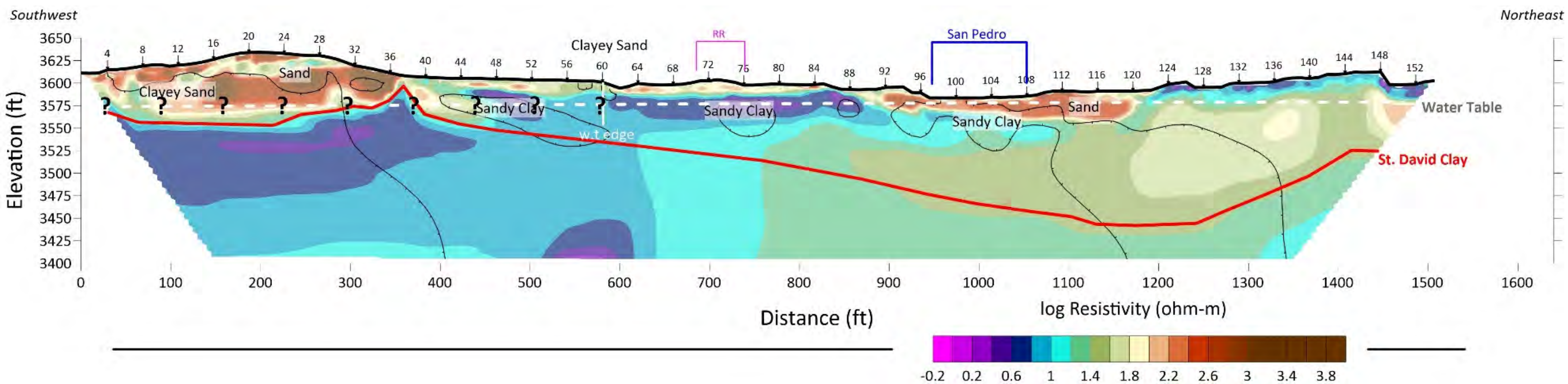


Figure 10 shows an interpretation of Line 1 using both resistivity and IP overlain on each other to highlight areas of coincident high chargeability and low resistivity. In this case, we define the cut-off between high and low chargeability at 9 mS. High chargeability and low resistivity areas would most likely represent a sandy clay environment. Region of high resistivity and high chargeability would likely have less clays and we generally refer to these as clayey sand. Low chargeability and high resistivity represents a much higher percentage of sand with little to no clay. Lastly, the clay unit of the St. David Formation is characterized by both low chargeability and low resistivity. We made a first-cut approximation to where we believe the clay unit may reside based on these data. The exact location would need to be verified by drilling and our models could be updated based on those results.

At around electrode 37, there is an unusual shape to the top of the clay unit that bisects the inferred water table. If all of these data truly represent subsurface conditions, then questions are raised as to the connectivity of the groundwater on either side of the feature. Could, for example, water on the left side have different nitrogen-N concentrations compared to that of the right side? During the monsoonal flooding periods, does the water table raise enough for the two to become connected?

The other interesting hydrologic/lithological features are the near surface sandy clays that are at or near the water table. Again, these units are represented by higher chargeability values and low resistivity. Questions for these units, if they truly represent finer grained soils that include elevated clay would be concerned with the possibility of contamination sorbed on the soil particles or contaminated water trapped in dead-end pore spaces during low water table conditions. One highly speculative scenario could be that these units become saturated during periods of flooding. If they do contain trapped nitrogen-N product, then the units could act as sources.

Figure 10. Interpretation of Line 1



5.1.2 Line 2

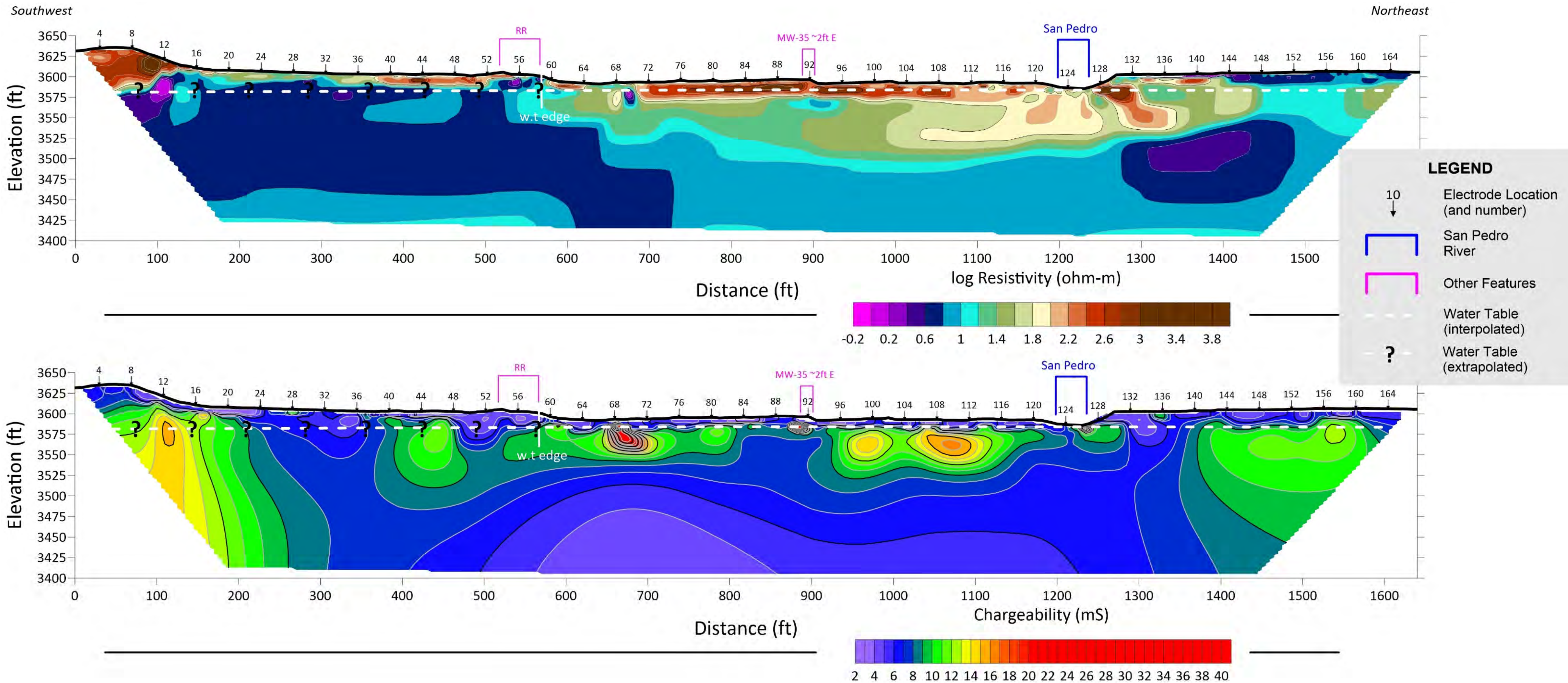
The models for Line 2 are presented in Figure 11. This line is approximately 850ft from Line 1 with Line 4 between Lines 1 and 2. Similar to Line 1, Line 2 is mostly comprised of low resistivity material that comprises the clay unit of the St. David Formation. It is shallower at the beginning of the line and the top of the unit dives under the San Pedro River. At the end of the line, on the right bank of the river, the unit starts to resurface. Although we can see an obvious transition from high to low resistivity, the exact depth to the clay unit will have some uncertainty in our interpretation. As shown in Figure 10, the interpreted location of the clay unit appears terraced as it deepens.

Broadly speaking, the bowl above the clay unit and below the river is comprised of coarser grained sediments. Dotted within these coarser sediments are small conductive lenses. At the beginning of the line, the topographic high has extremely high resistivity representing sands.

Dotted across the midsection of the profile are high chargeability targets that are just below the water table, but (mostly) above the unit we are classifying as massive clay. Again, this observation is similar to what we observed in Line 1. Where the high chargeability values appear deep in the profile, and into the massive clay, we have low confidence in the model results.

The chargeability results are overlain on the resistivity data in Figure 12. The chargeability is shown as a single stippled contour at 9 mS and can be used as a first-order approximation to broadly classify soil texture. Regions of sandy clay exist where the clay unit of St. David formation is shallow (at the beginning of the line). An interesting feature occurs in clay at around electrodes 44 to 48. Here, the shallow clay unit has a slightly higher resistivity section carved within it that coincides with an elevated chargeability. For now, we are classifying this as a sandy clay. Within the resistive material beneath the river, there are large areas of elevated chargeability that we classify as clayey sand.

Figure 11. Resistivity and IP of Line 2



Line 2 intersects monitoring well MW-35 at electrode 92, and is one of two wells for which we have lithological descriptions. Figure 13 shows the log along with resistivity and chargeability data taken from the profile presented in Figure 11. While the soil descriptions were taken (in abbreviated form) from the information provided to us, the coloring of the units were lumped according to what we would expect to see as similar units from the resistivity and chargeability. The upper most units of desiccated sands and gravels (yellow) correspond well to low chargeability and high resistivity. The next set of units with elevated clays exhibits high chargeability and a significantly decreasing resistivity. The water table intersects this unit contributing to a lowered resistivity. At around 23 ft, the next set of units has descriptions of varying amount of clay. Based on the slightly lower chargeability than the units above it, it may be that the clay content is lower, thus reducing the ability for this material to hold charge. The thick, inundated gravelly sand unit shows resistivity increasing subtly. At the bottom of the well, the massive clay unit of the St. David Formation is encountered. At this depth, both resistivity and IP start to decrease. The resistivity at this elevation is 28.5 ohm-m (log resistivity 1.45), and that is coincident with the position of the red lines outlining the St. David clay unit in Figures 10 and 12.

Figure 12. Interpretation of Line 2

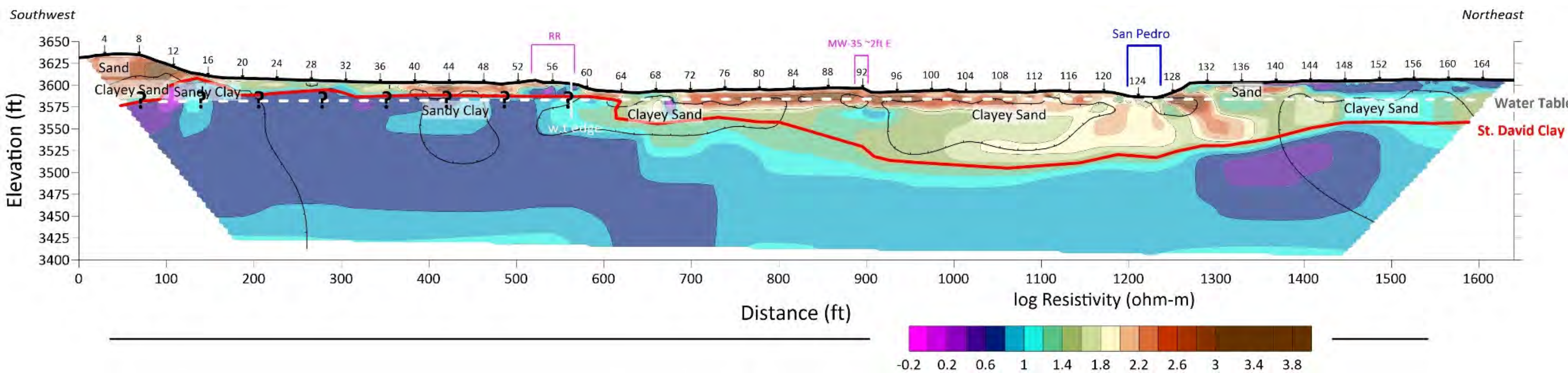
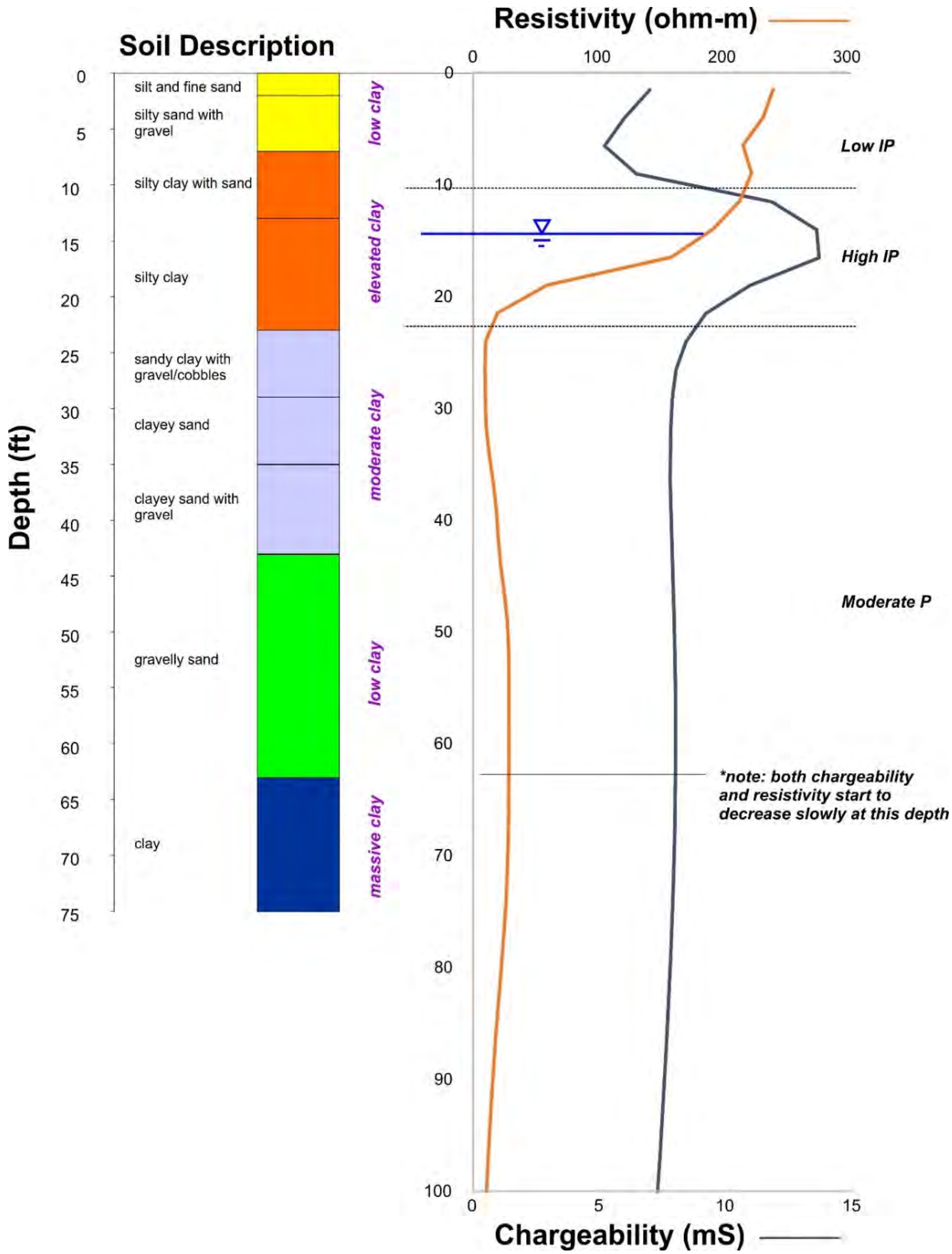


Figure 13. Lithological Descriptions, resistivity, and chargeability at MW-35



5.1.3 Line 3

The results for Line 3 are presented in Figure 14. This line was located in the southeastern corner of the survey site, approximately 1900ft from Line 1 and 1100ft from Line 2. Similar to both of those lines, the low resistivity, massive clay unit of the St. David Formation is shown throughout the majority of the resistivity section. The unit is shallower towards the beginning of the line, drops beneath the San Pedro River, and begins to increase elevation towards the end of the line. The topography of the clay in the shallow reaches of the profile appears highly variable and slightly terraced as in other lines. The material above the massive clay unit is a mixed variety of sands with varying amount of clay. The chargeability can confirm locations of moderate clay as these targets are dotted along the section at or near the water table.

Figure 15 shows the interpretation of the geophysical data when the chargeability is overlain on the resistivity data. One single stippled contour line represents a transition from low to high chargeability at 9 mS. We have low confidence in the chargeability model where elevated chargeability is deep within the profile and into the massive clay unit. Interestingly, the high chargeability data occupies most of the sediments above the clay unit suggesting some amount of clay throughout the area.

Figure 14. Resistivity and IP of Line 3

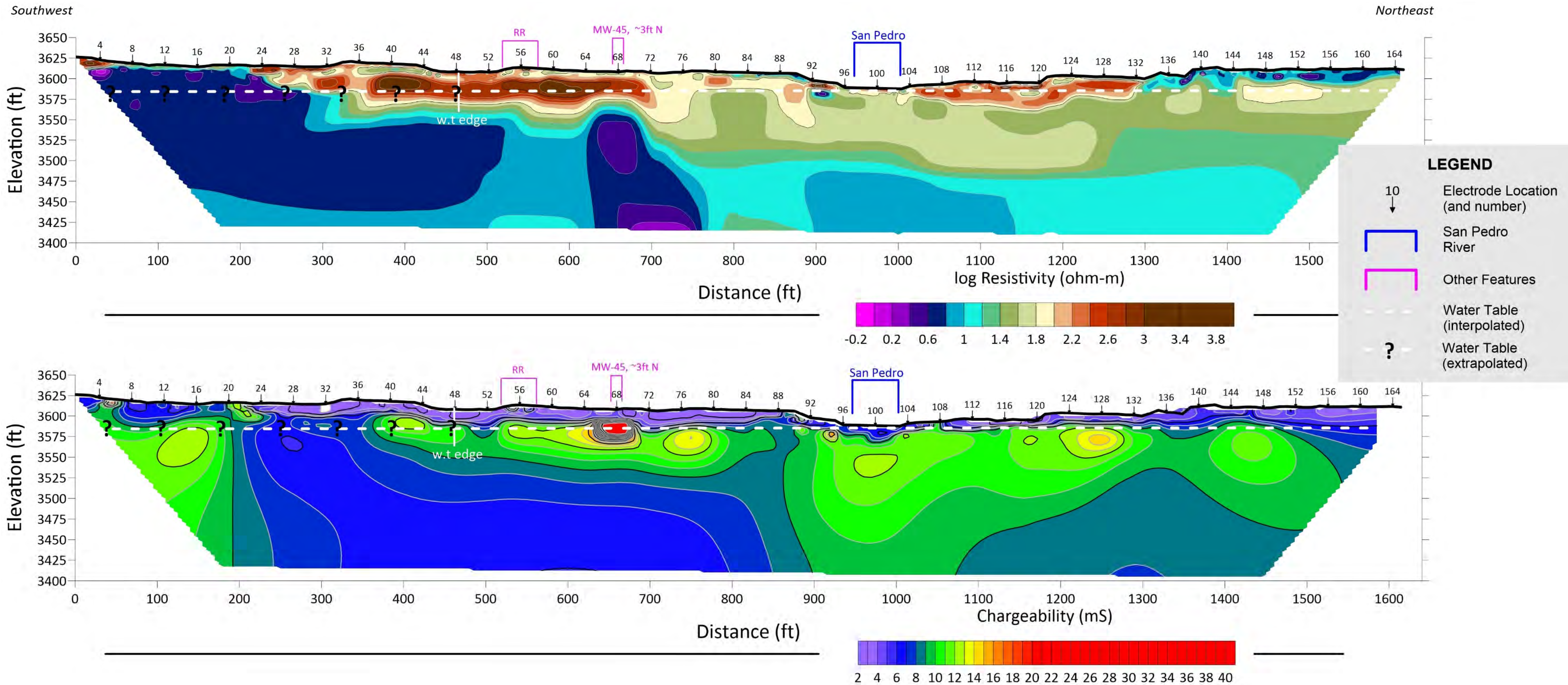
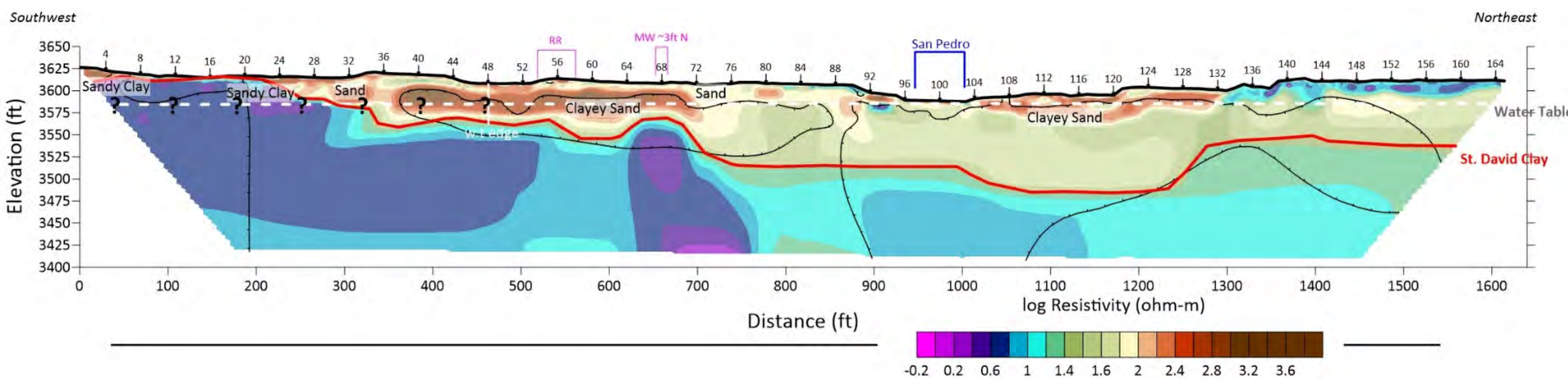


Figure 15. Interpretation of Line 3



Similar to the data comparisons for MW-35 and the geophysical data (Figure 13), Figure 16 shows comparisons between TW-01 and the resistivity and chargeability along Line 3. TW-01 is about 30ft from MW-45, shown at a position of around 660ft. The lithological data were grouped by expected chargeability outcomes of various clusters of clay percentage. The resistivity with depth on the right side of the plot shows a lower value at the very near surface, where silty or clayey sands have been identified in other wells. The chargeability has values of around 4 to 5 ms, similar to that observed in the very near surface of Line 2. Moving downward, the resistivity increases sharply and stays high until the water table (at a depth of around 22ft according to our extrapolated geostatistical rendering). In the same token, the chargeability is very high across the sandy, high resistivity material. These chargeability values are some of the highest across all lines and do not fit the paradigm of higher values associated with higher clays. Therefore, we suspect something else is contributing to the high chargeability: metallic infrastructure. Metal buried in the subsurface or nearby on the surface can cause the chargeability to be high. When investigating other lines, we see that Lines 2 and 4 (below) have the same high chargeability at around 660 to 670ft.

At the bottom of the section, towards the massive clays, the resistivity continues to drop. The value at the massive clay boundary is around 3 ohm-m, which is higher than the 28.5 ohm-m of Line 2. The value of 28.5 ohm-m falls on the boundary of the upper sandy aquifer and the silts and clays at around 40ft. It is likely that the bump in the contour plot at MW-45 was due to these materials and not the massive clays.

5.1.4 Line 4

The results of Line 4 are presented in Figure 17. This line is positioned about halfway between Lines 1 and 2. While the chargeability of Line 4 is quite similar to all other lines, the resistivity is more complicated. The demarcation between the massive clay unit of the St. David Formation is not as clear due to what is likely a sandy clay lens that exists deep below the San Pedro River. The resistivity of this lens is low, smearing the information between it and the massive clay. Another place we believe this is occurring is between electrodes 24 and 65. The surface is highly conductive and field notes suggest that the line was placed on a clay unit. However, the high chargeability just below the surface would suggest geophysically that the surficial clay may be different from the massive clay of the St. David Formation.

The interpretation of Line 4 is shown in Figure 18. The topography of the massive clay of the St. David Formation is outlined in red. It’s location beneath the river was guided to some degree by the interpretation of Lines 1 and 2. Regions of sandy clay are highlighted were the chargeability is elevated.

Figure 16. Lithological Descriptions, resistivity, and chargeability at TW-01

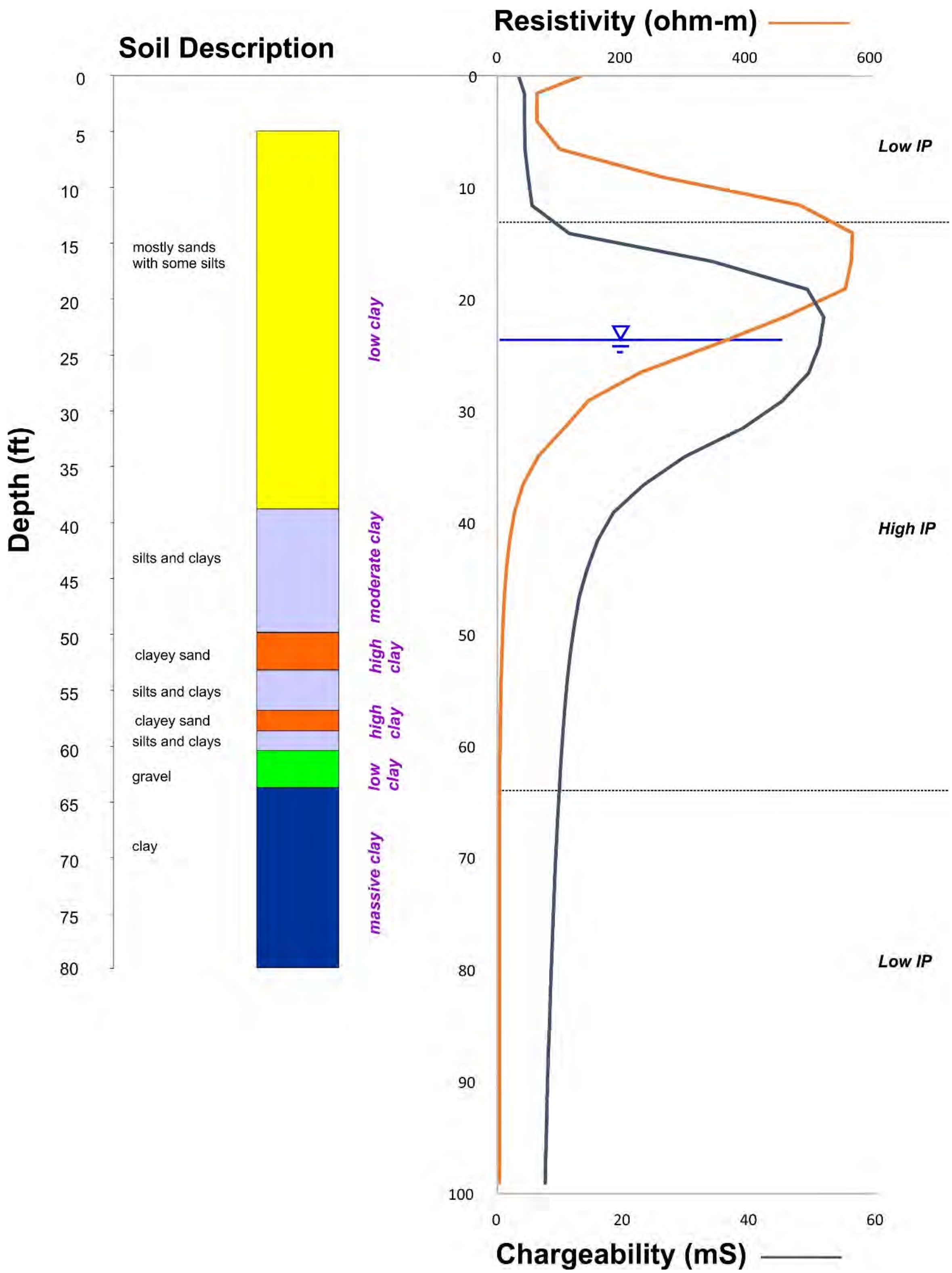


Figure 17. Resistivity and IP of Line 4

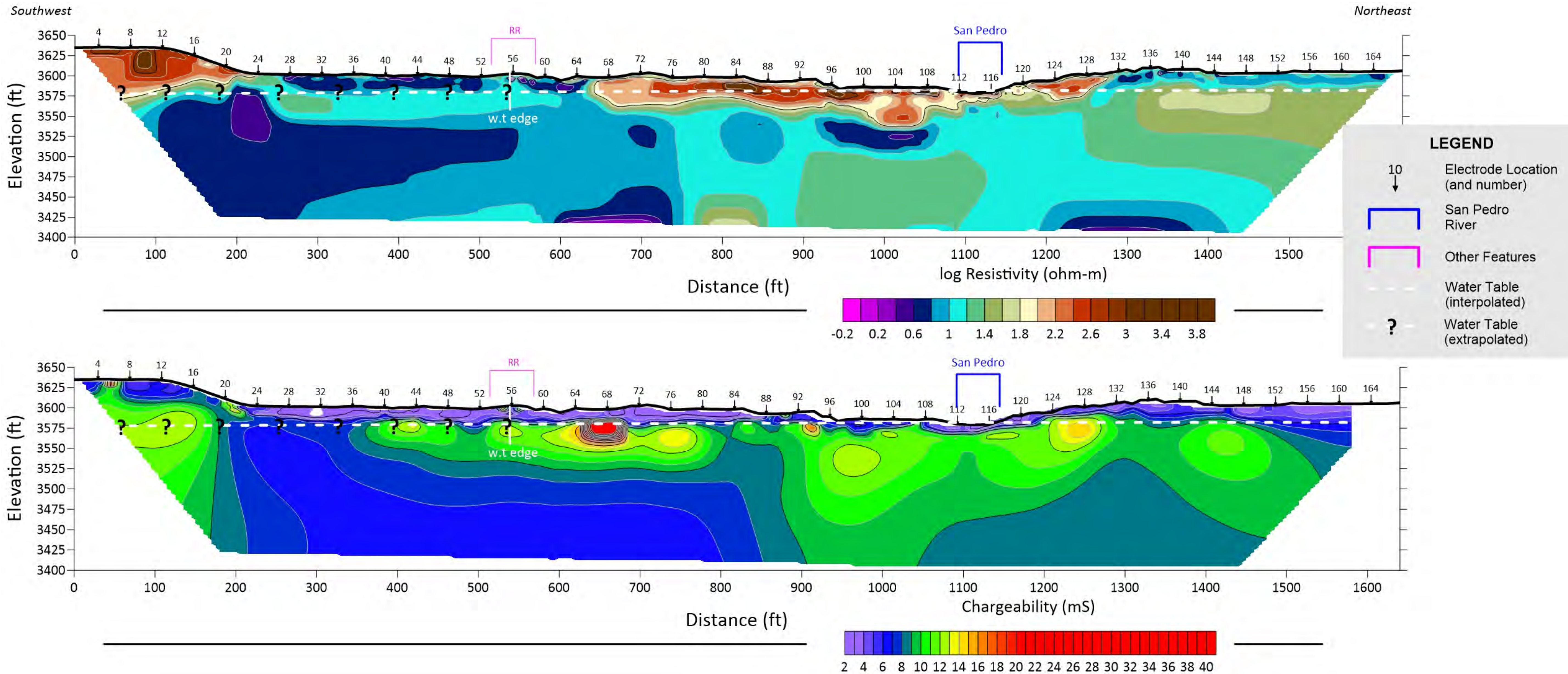
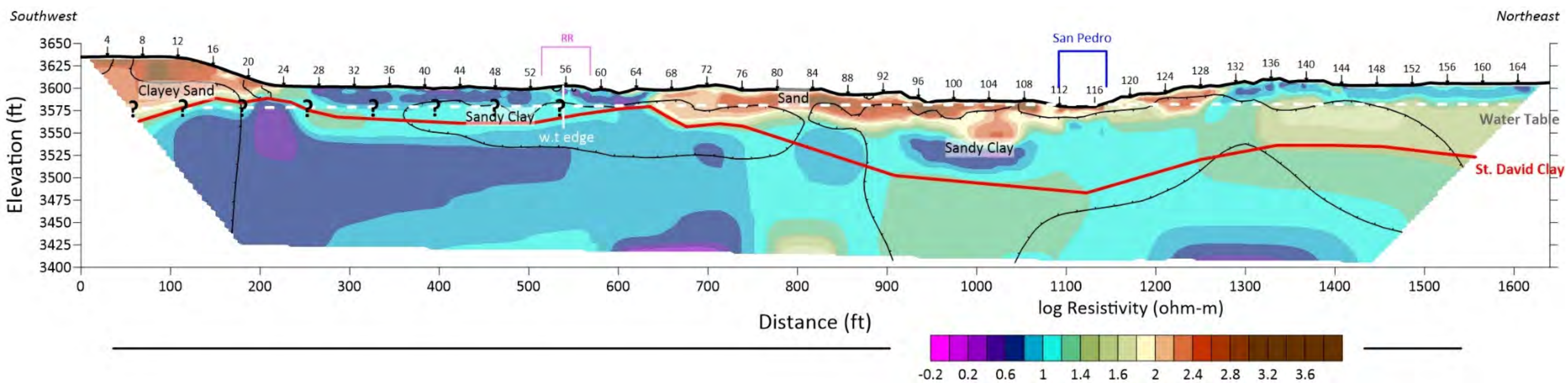


Figure 18. Interpretation of Line 4



5.1.5 Line 5

The last line to be acquired, Line 5, was positioned between Lines 2 and 3, towards the southeastern corner of the project site. Figure 19 shows the results of the resistivity and IP models. The massive clay unit of the St. David Formation is clearly visible in the lower parts of the resistivity section as a low resistivity layer. It is slightly more shallow at the beginning and ends of the line. Beneath the San Pedro River, the top of the unit is deeper. Above the suspected clay layer, the sediments are of higher resistivity and likely a mix of sand, clays, and gravels. The resistivity results of Line 5 are consistent with the other four lines.

The chargeability model in the bottom subplot of Figure 19 shows higher values more broadly dispersed across the section compared to other lines. We believe that based on the filtering of low quality data from the dataset prior to modeling, that the resolution is lost below a depth of about 65ft.

Figure 20 shows the interpreted section, suing the chargeability contoured data overlain on the resistivity data. A single stippled line at 9 mS separates high from low chargeability, and demarcates a generalized transition from clayey sand to sandy clay. Using the information from MW-35, we are also assuming that the top of the clay unit of the St. David Formation can be represented by a log value of 1.45, which is highlighted in red across the interpreted section.

Figure 19. Resistivity and IP of Line 5

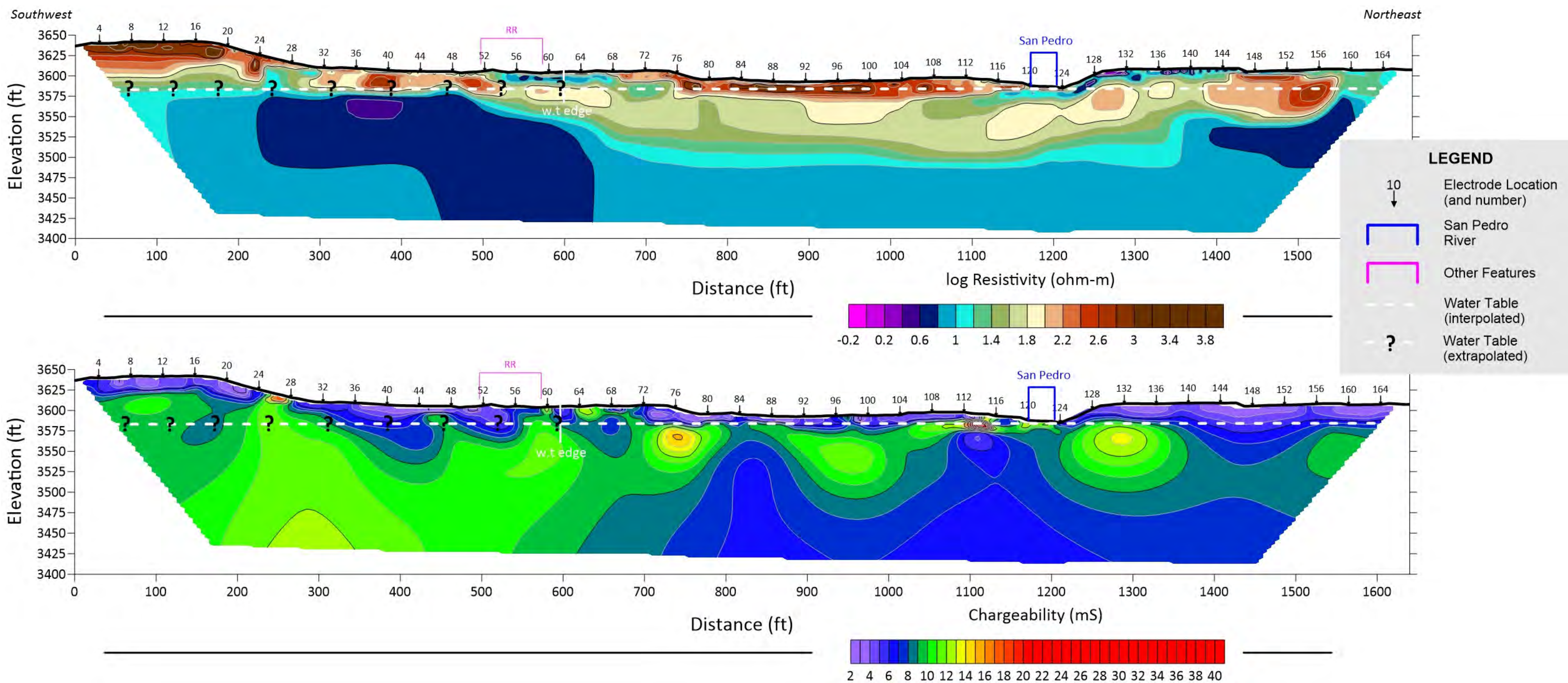
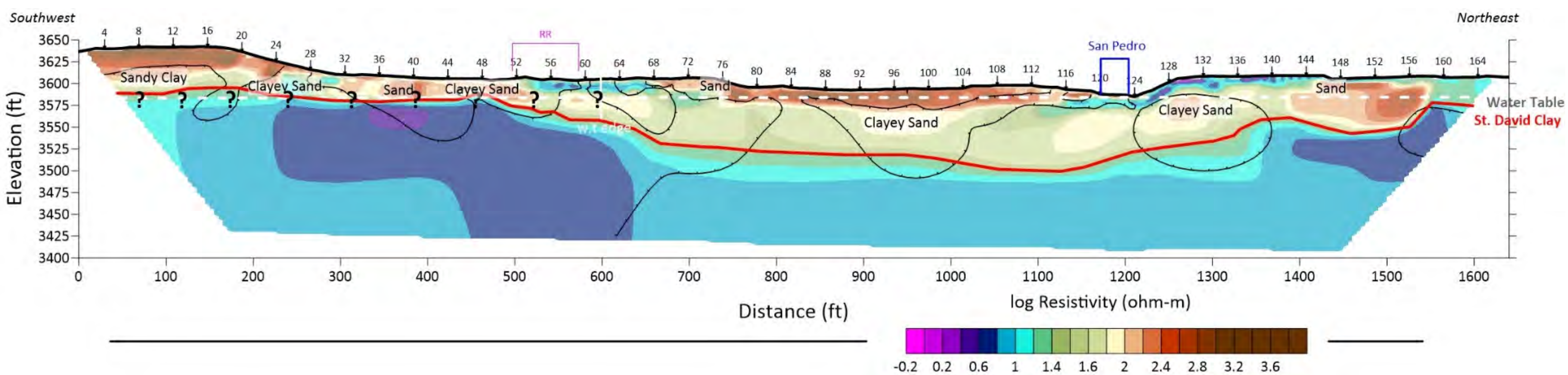


Figure 20. Interpretation of Line 5



5.2 COMPOSITE PROFILES

To help provide context to all of the lines acquired across the study area, composites of resistivity and chargeability were created, which stacked the profiles in spatial order. Figure 21 shows the resistivity data. In a general sense, the results of the lines are very similar. As described above, the low resistivity values in the lower part of each line likely represents the clay unit of the St. David Formation. It is shallower in the southwest and northeast, at the beginning and end of the lines. It is deeper in the middle beneath the San Pedro River. There are details and nuances to the clay topography that change from line to line, however. It may be information from these details that important on the contaminant clean up at the site. For example, is the channeling within the massive clay unit, nearer the surface (e.g. at the beginning of Line 1) an important consideration for mass transfer considerations or for the preferential movement or storage of contaminants during variable water table elevations.

For the IP models in Figure 22, we feel that the most value comes from delineating the material that is above the massive clay and recognizing the broad classification of mixed coarse and fined grained sediments. The higher chargeability data, where we have used a value of 9 mS to transition from low to high, are directly correlated to a higher clay content. In the explanation of results presented above, we generally state that the range of chargeability, depending on the resistivity, could represent clayey sands to sandy clays.

The stacked interpreted models are presented in Figure 23. In this figure, we represented all of our information and interpretations into a single plot. Overlain on the data are potential locations for wells, sited in material that would be most transmissive. Other criteria for well siting would be to remain at some distance from the river, in higher resistivity and lower chargeability media.

Figure 21. Resistivity of Lines 1 through 5

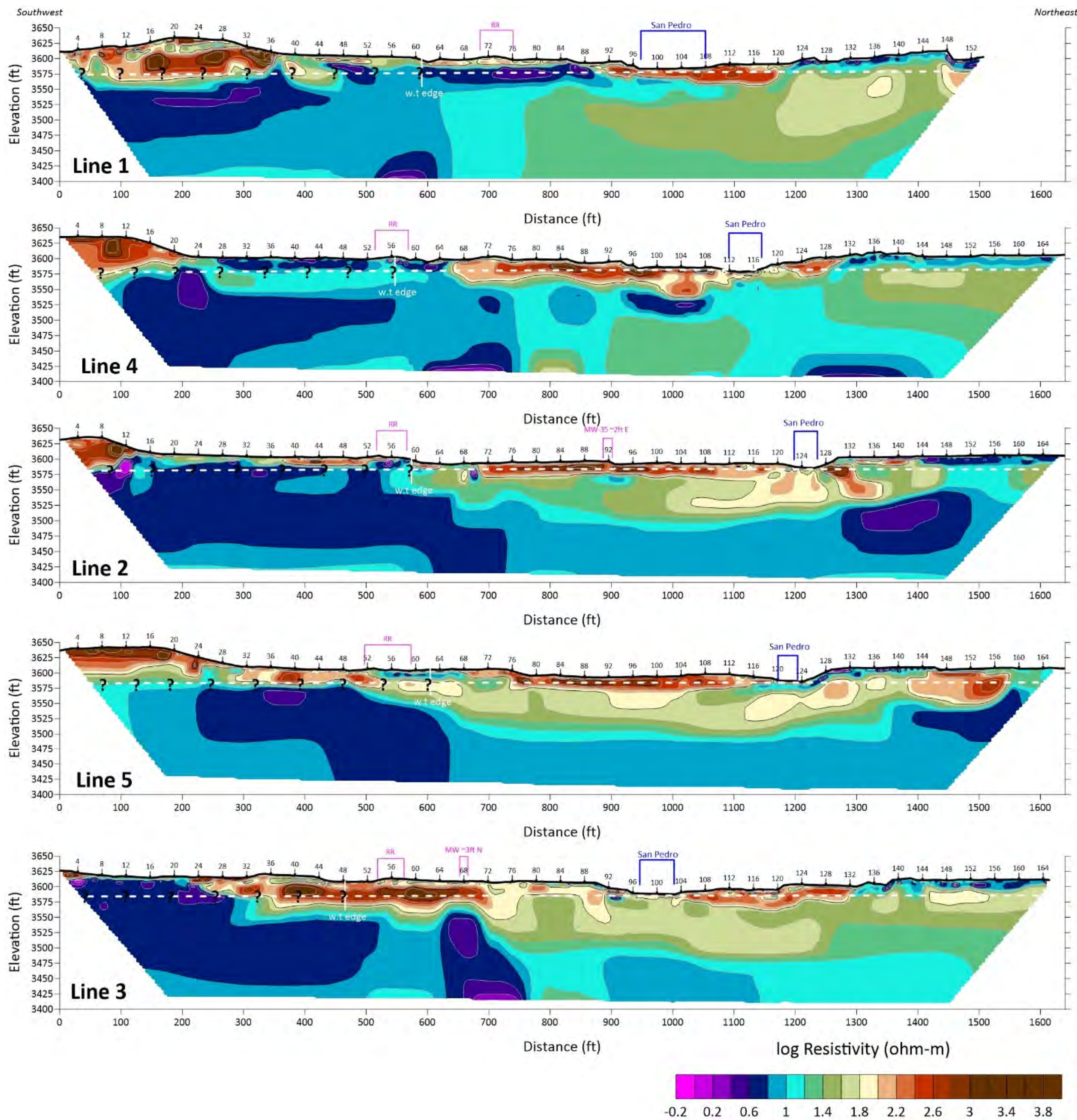


Figure 22. IP of Lines 1 through 5

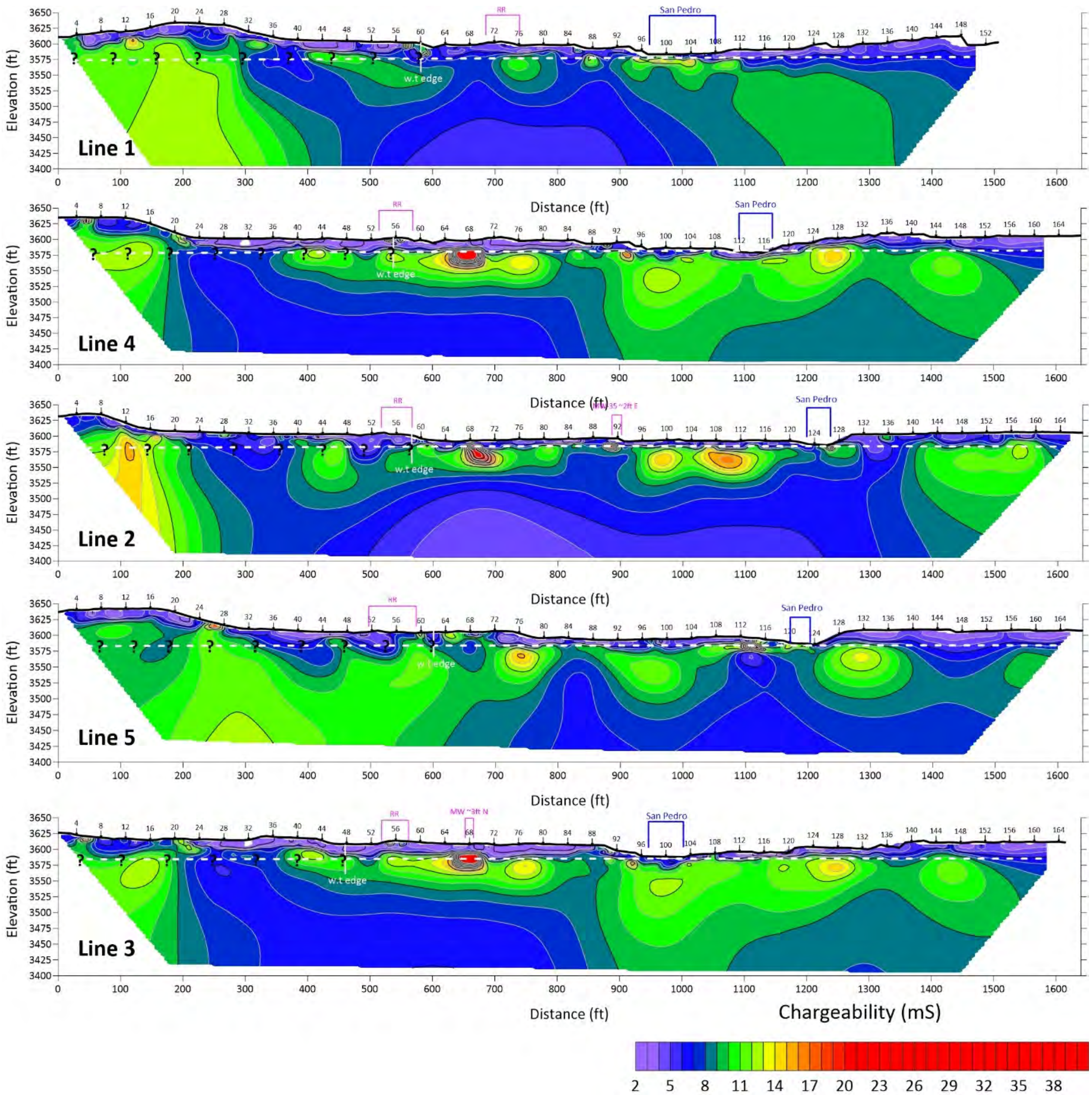
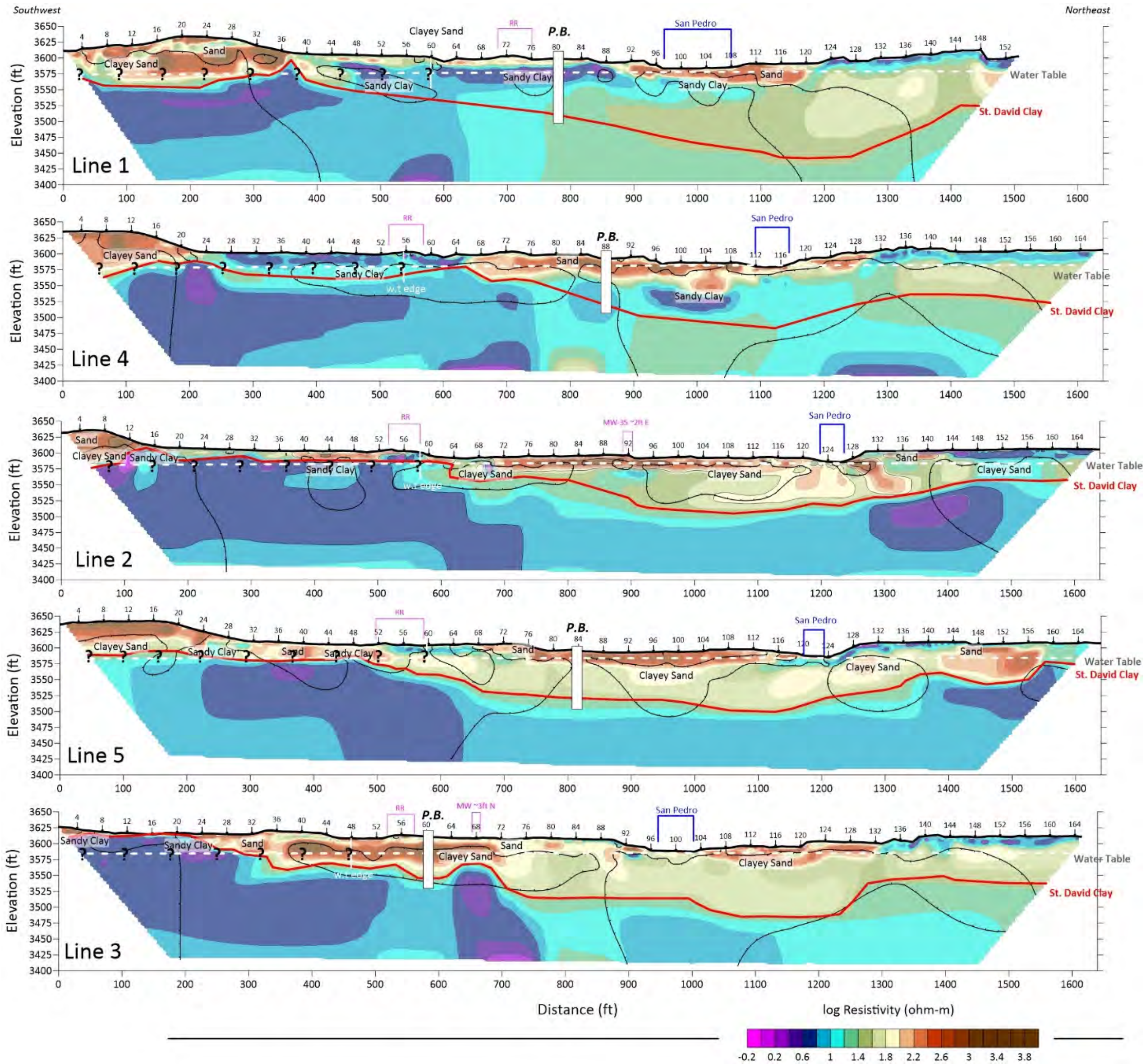


Figure 23. Interpreted Sections for Lines 1 through 5



5.3 THREE-DIMENSIONAL REPRESENTATION

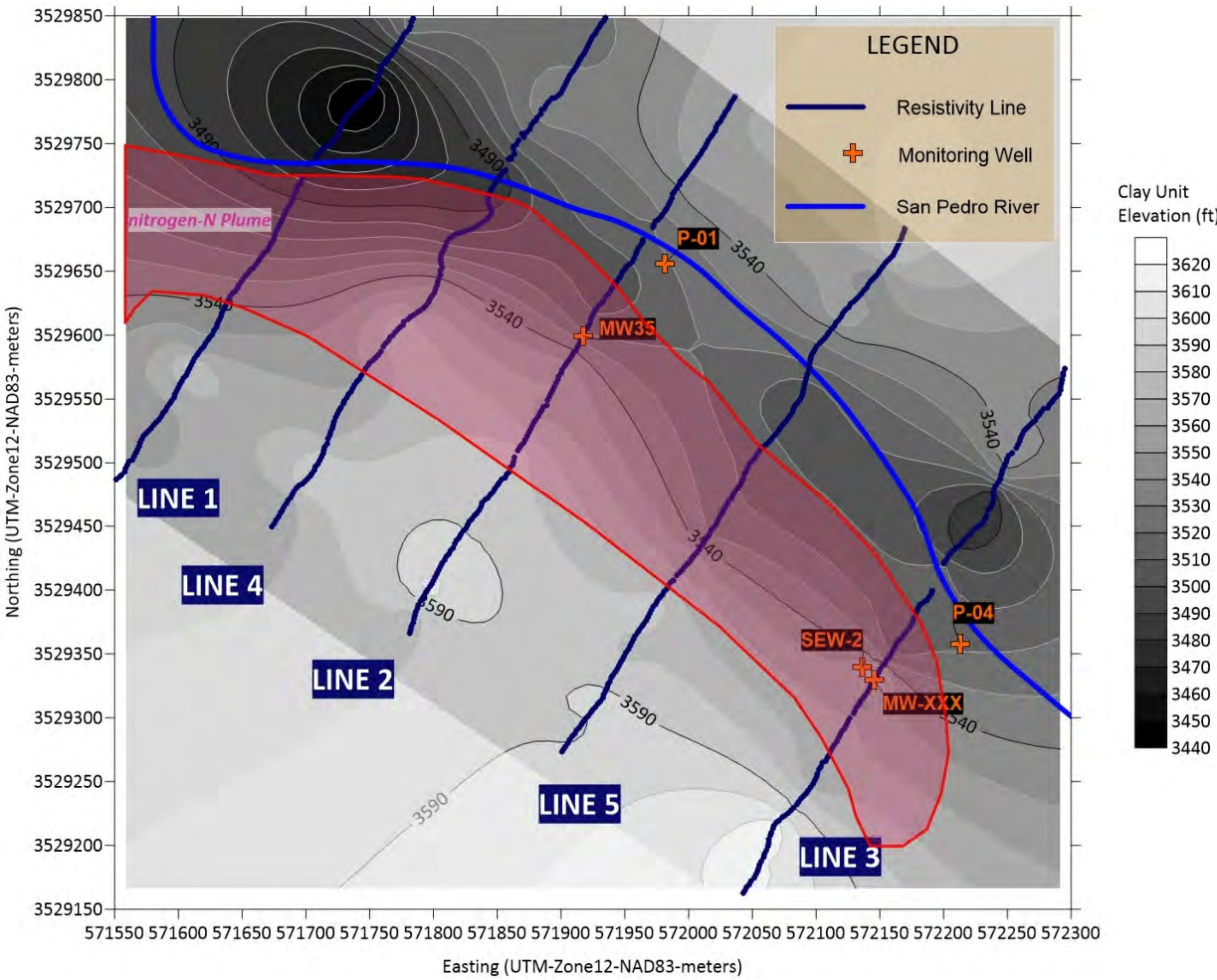
While all of the resistivity data were acquired along a set of parallel two-dimensional (2D) profiles, it is possible under certain circumstances to pull that data into a three-dimensional (3D) model. In order to create an effective 3D model, however, the lines must be spaced sufficiently close so that information between the lines are imaged effectively. A general rule of thumb for 2D profiles to be combined into a 3D model is that the line spacing is no greater than 5 times that of the electrode spacing of 3m. In cases where there is a lot of continuity between lines, we have extended the line separation to 10 times that of the electrode spacing. For the current dataset, line spacing varies from 40 to 60 times that of the electrode spacing. We attempt to run a 3D resistivity inversion model, but the line separation proved to be too much to overcome to provide useful data.

Instead of creating a true 3D model, we created a quasi-3D map of the elevation of the clay unit of the St. David Formation. The estimate of the massive clay depicted in Figure 23 was digitized and geo-referenced for geostatistical analysis. The elevation data were then kriged using a semi-variogram model that best represented the spatial correlation and characterization length across the lines.

The results of the interpolated elevation data are shown in Figure 24. The map shows the position of each geophysical line relative to the San Pedro River. The top of the clay unit is shown to be high towards the southwest and northeast. Beneath the river, however, there is a northeast trending channel that represents the lowest parts of the clay unit. The contour plots also have a few bulls-eye features of both low and high values indicating that line spacing is greater than the average size of distinct features, thus not allowing them to be connected across two or more lines.

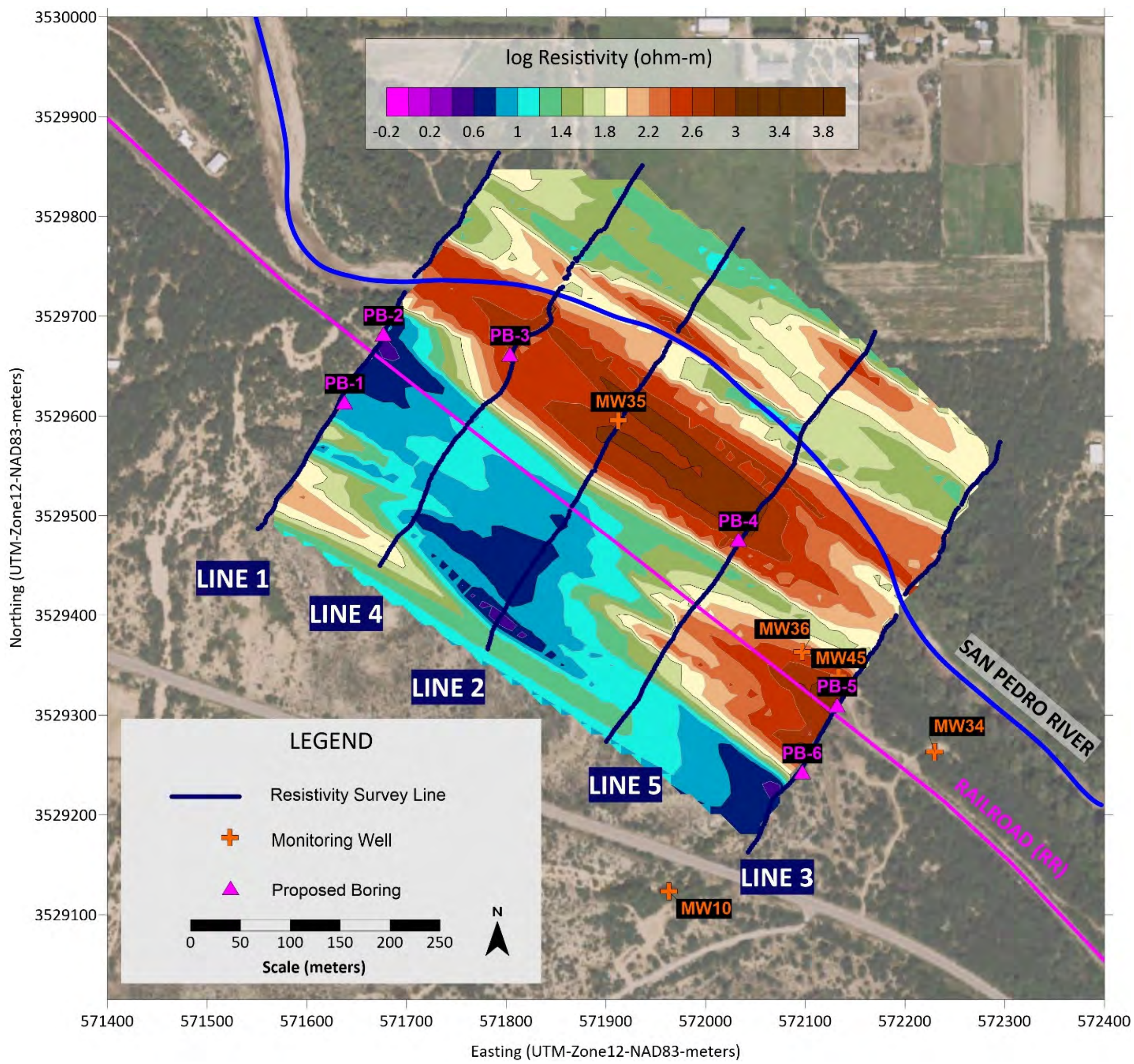
We also plotted the nitrogen-N plume from the Hargis annual monitoring report on top of the clay unit elevation map. The plume is shown to be between the river in the northeast and the high elevation mark of the clay unit in the southwest. The river provides a natural hydraulic gradient that prevents the plume from spreading to the other side of the river. The high elevation of the clay unit provides a natural boundary for the plume. Some of our geophysical data may suggest, however, that scours or channeling could exist in the St. David clay unit. This is especially evident in Line 1, where scouring from a nearby wash may have replaced the clay with sands and gravels. The line shows high resistivity data and an unnatural topography to the clay unit. When coupled with historical highs in water table elevation and natural fluctuations in the water table from monsoonal flooding, some nitrogen-N product may have seeped into these channels and became trapped when the water table receded. More drilling in the area is necessary to validate this hypothesis.

Figure 24. Interpolated Elevation map of the massive clay unit of the St. David Formation



Another view of the resistivity data is shown in Figure 25, where the resistivity at the water table was taken to map view and interpolated across the lines. Based on the geostatistical parameters from the semi-variogram, these data were not appropriate for kriging. Instead, we used simple triangularization and linear interpolation to create the map. The map shows a fair amount of continuity of highly resistive material coinciding with the trough in Figure 24. There is also high resistivity along Line 3, potentially giving the shape of the nitrogen-N plume in Figure 24. Overlain on the figure are a number of potential borings that could be used to validate the geophysical data and be used to monitor/pump the contaminant plume.

Figure 25. Interpolated resistivity at the water table elevation



6.0 SUMMARY

A geophysical characterization survey that included electrical resistivity and induced polarization (IP) was completed along the San Pedro River near the town of St. David. The survey included five parallel lines within an area of about 75 acres, with each line spanning around 1600ft. The objective of the survey was to map subsurface conditions to help with the remediation of a nitrate-N plume that exists along the west bank of the river. The electrical resistivity was specifically used to investigate potential targets related to the lithology and hydrology of the site. The IP was used to help discriminate clayey material and to help interpret different low resistivity targets. This information is expected to be helpful in the siting of additional extraction wells supporting the existing pump-and-treat remedy mandated by a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD) issued by the U.S. Environmental Protection Agency (EPA) in 1994. Based on the low concentrations of the plume relative to the target strength of the various lithological units, the plume was not directly observable in the data.

The electrical resistivity survey revealed a definite low resistivity massive clay unit across the site. The clay unit, as calibrated through the lithological log from ANPI monitor well MW-35, was represented by resistivity values less than 28.2 ohm-m. The shape of the unit was such that the elevation was high and near the surface in the southwestern portion of the survey area, decreasing elevation beneath the flood plain of the San Pedro River, and eventually gaining some elevation on the northeast. Beneath the flood plain, a low elevation channel is consistent across all lines and trends and deepens towards the northwest. Where the clay unit is close to the surface in the southeast, the topography of the buried erosional clay surface may vary by up to 20ft. It may be possible that channeling exists in the clay unit. A final map was created to highlight shape of the clay elevation as interpreted from the resistivity. The center of the survey area shows a trough with a thick sandy alluvium overlying the deep clay beneath the river's flood plain.

For the soils above the clay unit, there was a large range of soil types that included sands (with little to no clay), sands and gravels with some clay, and clays mixed with sand. Well MW-35 showed good consistency between the expected clay fraction from the lithological logs and chargeability. Well TW-01 had no consistency in chargeability and clay fraction, likely due to some interference from nearby metallic infrastructure. To discriminate the specific lithologies across all five lines, we used to chargeability from the IP survey to interpret the subsurface soils as they related to MW-35. For example, we expected that low resistivity, high chargeability soil was a clay-rich sandy soil, whereas high resistivity, low chargeability was representative of clay-poor and primarily sandy soil. While the shallow water table was not specifically mapped in these data, it did dampen the highs and lows of resistivity potentially masking some subtle lithological features within the data.

In summary, the following observations should be considered:

- Much of the calibration of data, and specifically the resistivity value used to demarcate the massive clay unit, was derived from the lithology represented at MW-35. TW-01 did not show chargeability correlation with expected clay content.
- For this survey, the line spacing was rather large. The large spacing prevented the successful 3D modeling of the resistivity data and led to discontinuous features that were not observed across multiple lines.
- Given the success of mapping the geological materials beneath this portion of the site, it is recommended that additional geophysical data be acquired in other contaminated areas to help define lithological constraints for plume movement and remediation.
- Based on the information produced from this survey, it is recommended that the following positions along the transects lines be investigated through exploratory drilling:
    - Line 1: 780ft
    - Line 4: 855ft
    - Line 5: 817ft
    - Line 3: 587ft

  The positions of these wells are based on finding sandy material that would potentially be favorable for highly transmissive soils and pumping locations. If these locations are proven to be favorable, ANPI should consider installation of additional extraction wells to support the remedial program.

7.0 REFERENCES

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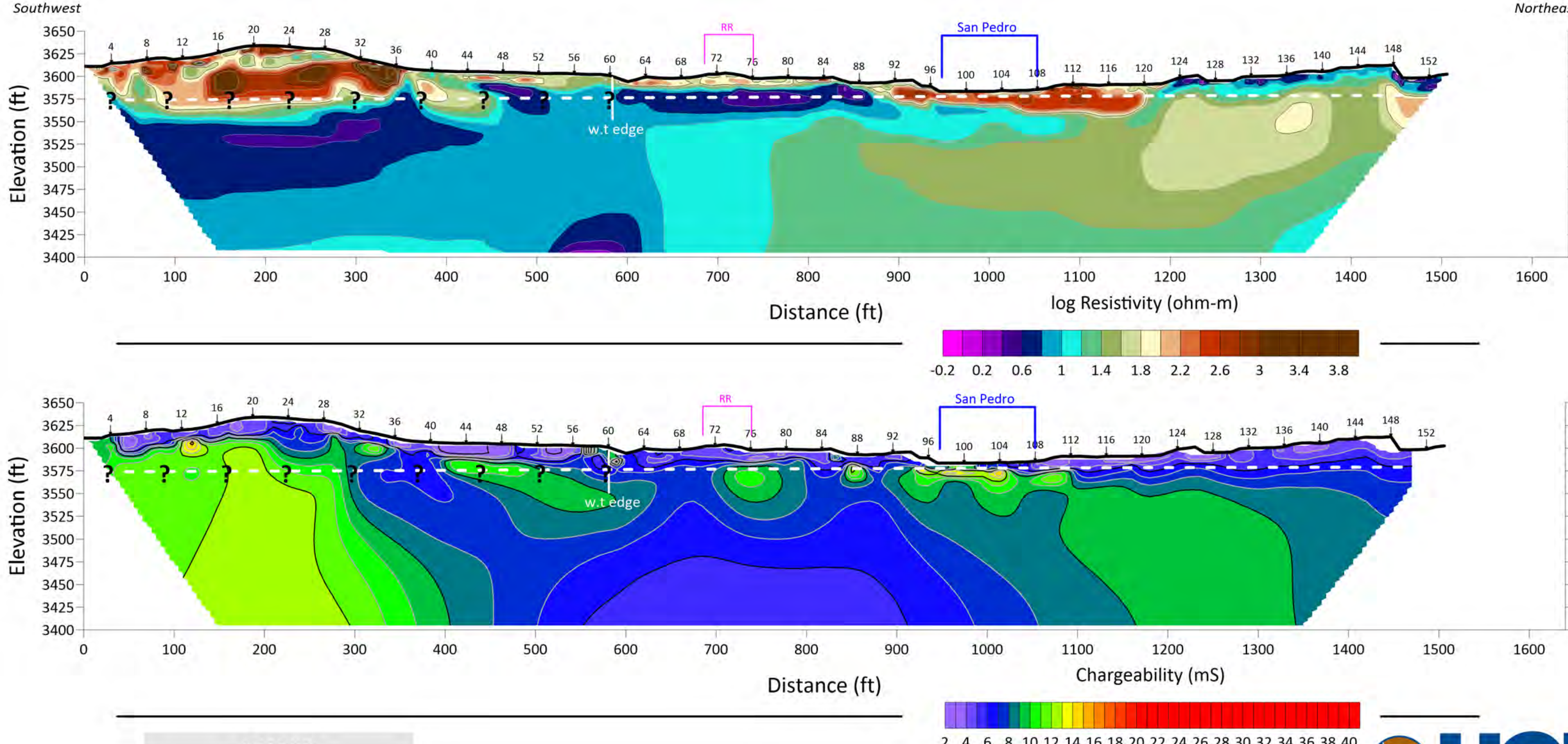

LEGEND

- 10 ↓ Electrode Location (and number)
- San Pedro River
- Other Features
- Water Table (interpolated)
- ? Water Table (extrapolated)

HGI hydroGEOPHYSICS

2018-026 Apache Nitrogen Resistivity and IP

Date: August 2018

Figure: Apache Nitrogen Resistivity and IP Results Line 1

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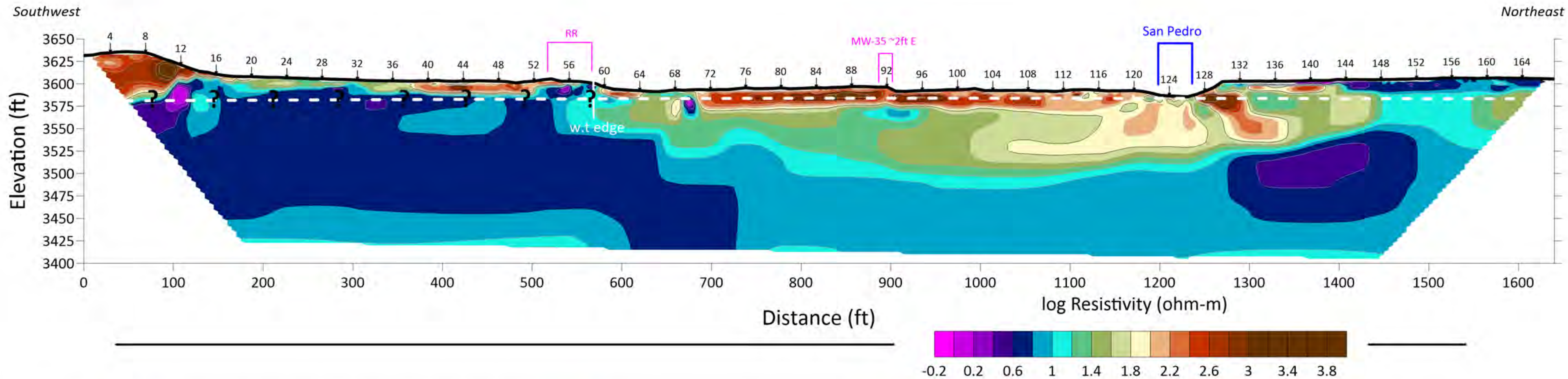

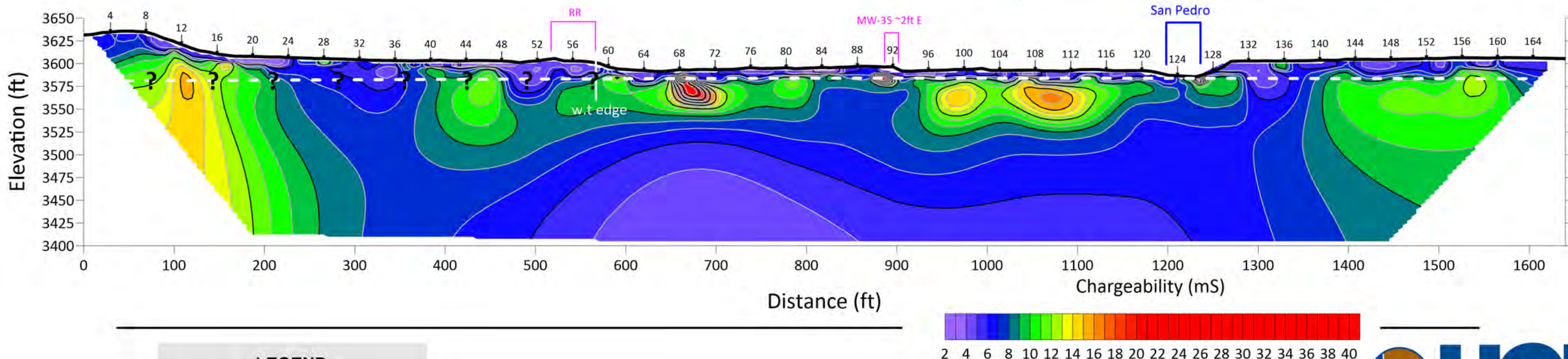

LEGEND

10 — Electrode Location (and number)

San Pedro River

Other Features

Water Table (interpolated)

? — Water Table (extrapolated)

hydroGEOPHYSICS

2018-026 Apache Nitrogen Resistivity and IP

Date: August 2018

Figure: Apache Nitrogen Resistivity and IP Results Line 2

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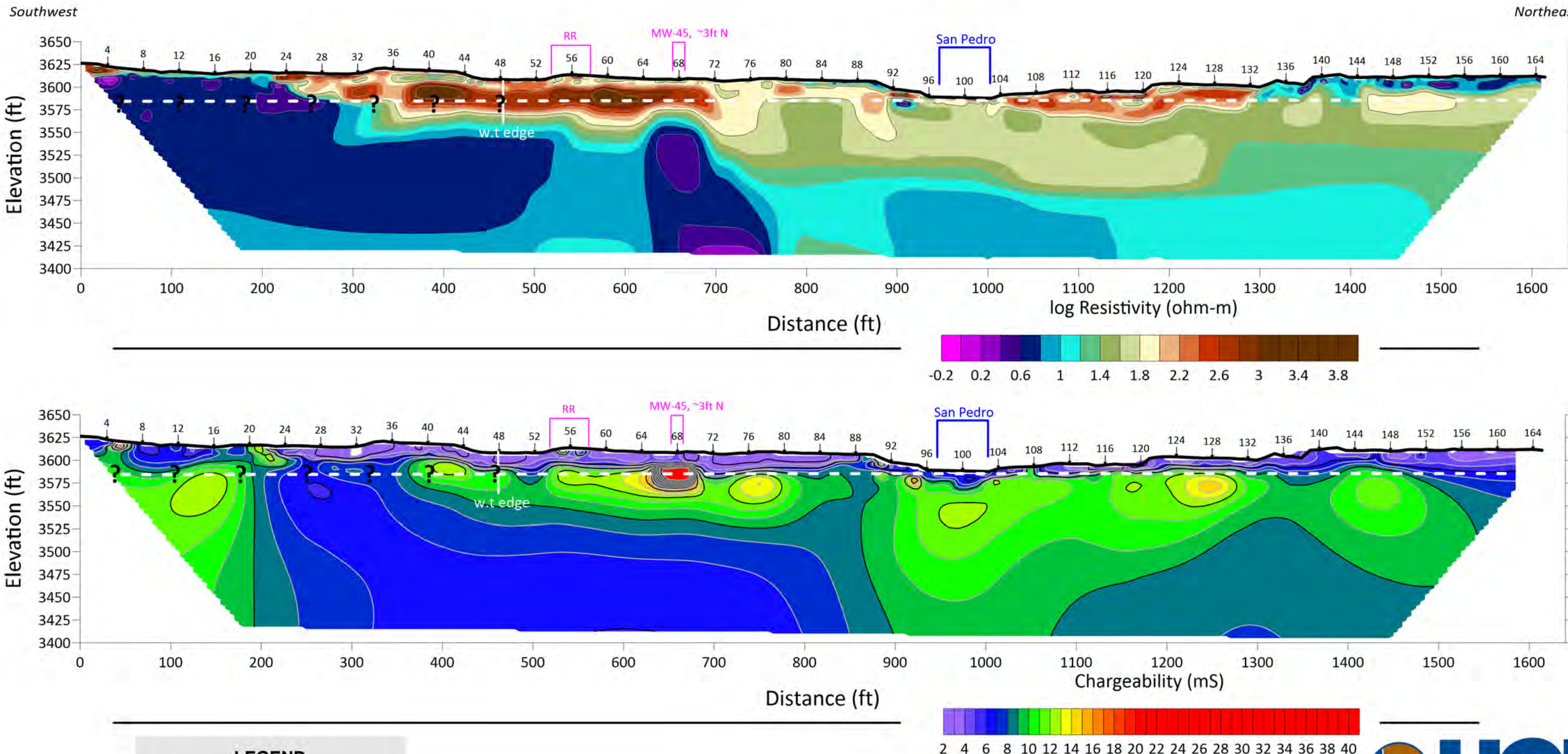


LEGEND

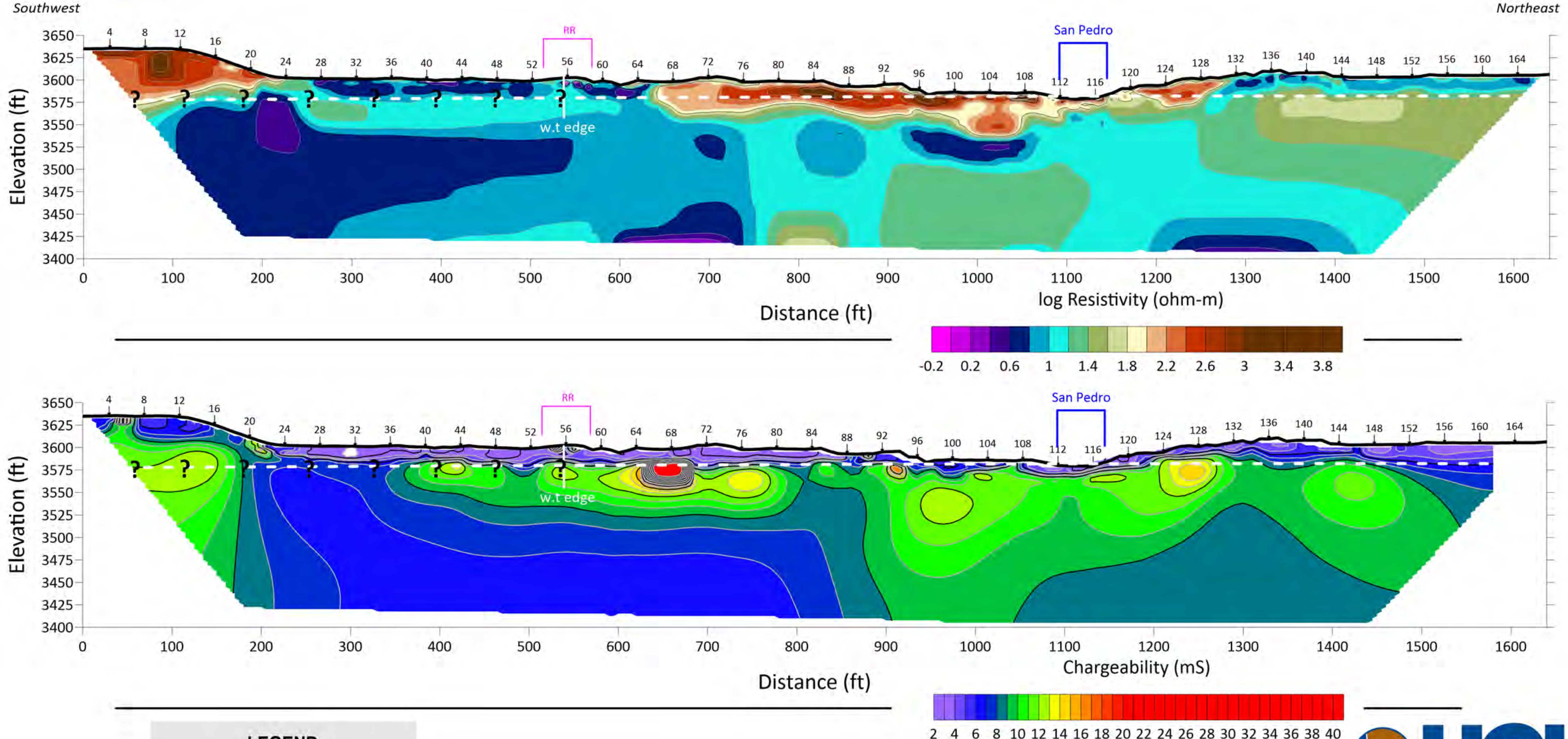
- 10 — Electrode Location (and number)
- San Pedro River
- Other Features
- Water Table (interpolated)
- ? — Water Table (extrapolated)

hydroGEOPHYSICS

2018-026 Apache Nitrogen Resistivity and IP

Date: August 2018

Figure: Apache Nitrogen Resistivity and IP Results Line 3



LEGEND

- 10 — Electrode Location (and number)
- San Pedro River
- Other Features
- Water Table (interpolated)
- ? — Water Table (extrapolated)

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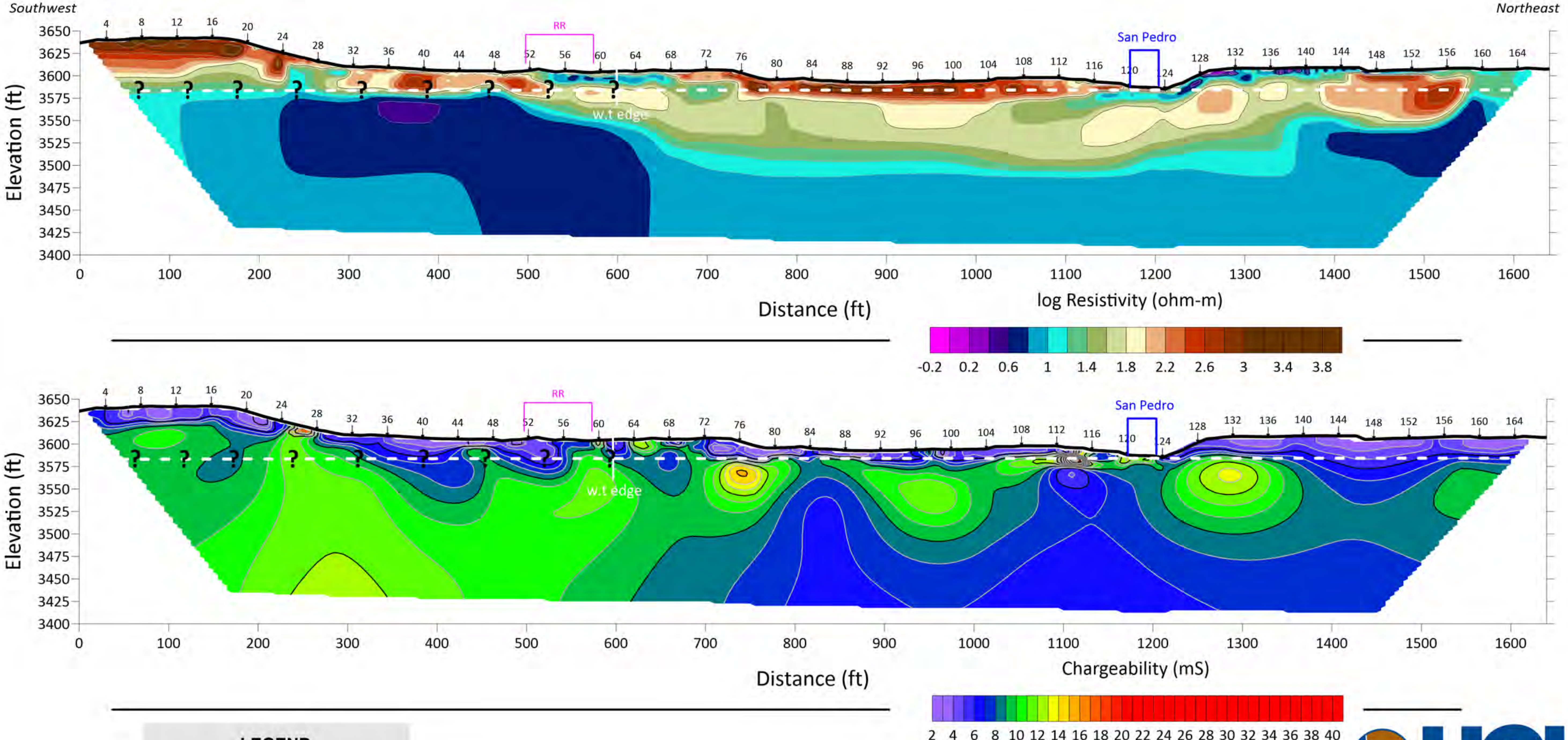
2018-026 Apache Nitrogen Resistivity and IP

Date: August 2018

Figure: Apache Nitrogen Resistivity and IP Results Line 4



LEGEND

10 ↓	Electrode Location (and number)
	San Pedro River
	Other Features
	Water Table (interpolated)
?	Water Table (extrapolated)

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2018-026 Apache Nitrogen Resistivity and IP

Date: August 2018

Figure: Apache Nitrogen Resistivity and IP Results Line 5

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RPT-2018-026a

DRILLING ADDENDUM TO THE

ELECTRICAL RESISTIVITY AND IP CHARACTERIZATION – APACHE NITROGEN PRODUCTS INC.

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B. Cubbage
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Date Published:
December 2018

Prepared for:
Apache Nitrogen Products, Inc.

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Northern Area of the Apache Powder Superfund Site comprises a shallow alluvial aquifer along the San Pedro River, within which a contaminant plume of nitrate-nitrogen has been documented. A geophysical survey that includes electrical resistivity and induced polarization (IP) was conducted to assist in interpreting stratigraphic features, such as the surface configuration of the St. David clay and potentially preferential pathways within the shallow alluvial aquifer. A secondary objective of the work was to investigate the extent of the contaminant plume. In general, the geophysical data showed a massive clay layer beneath the San Pedro River with various sequences of sands, silts, gravels, and other reworked clay above it. The massive clay was deepest beneath the river, likely due to scouring. It was the most shallow on the southwestern edge of the survey area.

Based on the geophysical findings, a set of wells and borings were drilled along the geophysical lines to verify targets (e.g., soil lithology, depth to clay, etc.). This report provides the results of the drilling in relation to the geophysical results as an addendum to the original report. Some of the sections and discussion from the original report are included in this report to ensure continuity.

1.2 LOCATION AND BACKGROUND

The Apache Nitrogen Products, Inc. (ANPI) property comprises an area of approximately nine square miles, located in Cochise County, seven miles southeast of the town of Benson, Arizona (Figure 1).

Most of the upland areas of the site can be described geomorphologically as “badlands terrain” (Hargis, 2018). Badlands are characterized by a hummocky topography, dissected by fine ephemeral drainages. Softer sedimentary rocks and clay-rich soils have been extensively eroded by wind and water processes. In appearance, badlands are characterized by steep slopes, minimal vegetation, lack of a substantial regolith, and high drainage density.

ANPI recently acquired approximately 123 acres of private property at the site. (Hargis, 2018). The acquisition was in the northern area of the site, where the current geophysical survey was conducted. With this property acquisition, the nitrate as nitrogen (nitrate-N) plume within the shallow alluvial aquifer along the west side of the San Pedro River is now approximately 58 percent beneath the ANPI property boundary. The total plume area is approximately 73.5 acres and approximately 43.5 acres is now on ANPI property.

A geologic map, adapted from the Arizona Geological Survey’s Digital Geologic Map for Saint David (Youberg and Cook, 2009), is presented in Figure 3; it presents surface geology with the location of the survey lines overlain. The map shows that the survey lines primarily traverse alluvium and river terrace deposits of varying ages.

Figure 2 shows the specific layout of the survey, which is shown to cross the San Pedro. The lines are approximately 1600 ft long, with stainless steel electrodes used to pass current, measure voltage, and record voltage decay for the IP effect, placed approximately every 10 ft (exactly 3m).

Figure 1. General Location Map of the Apache Nitrogen Geophysical Survey

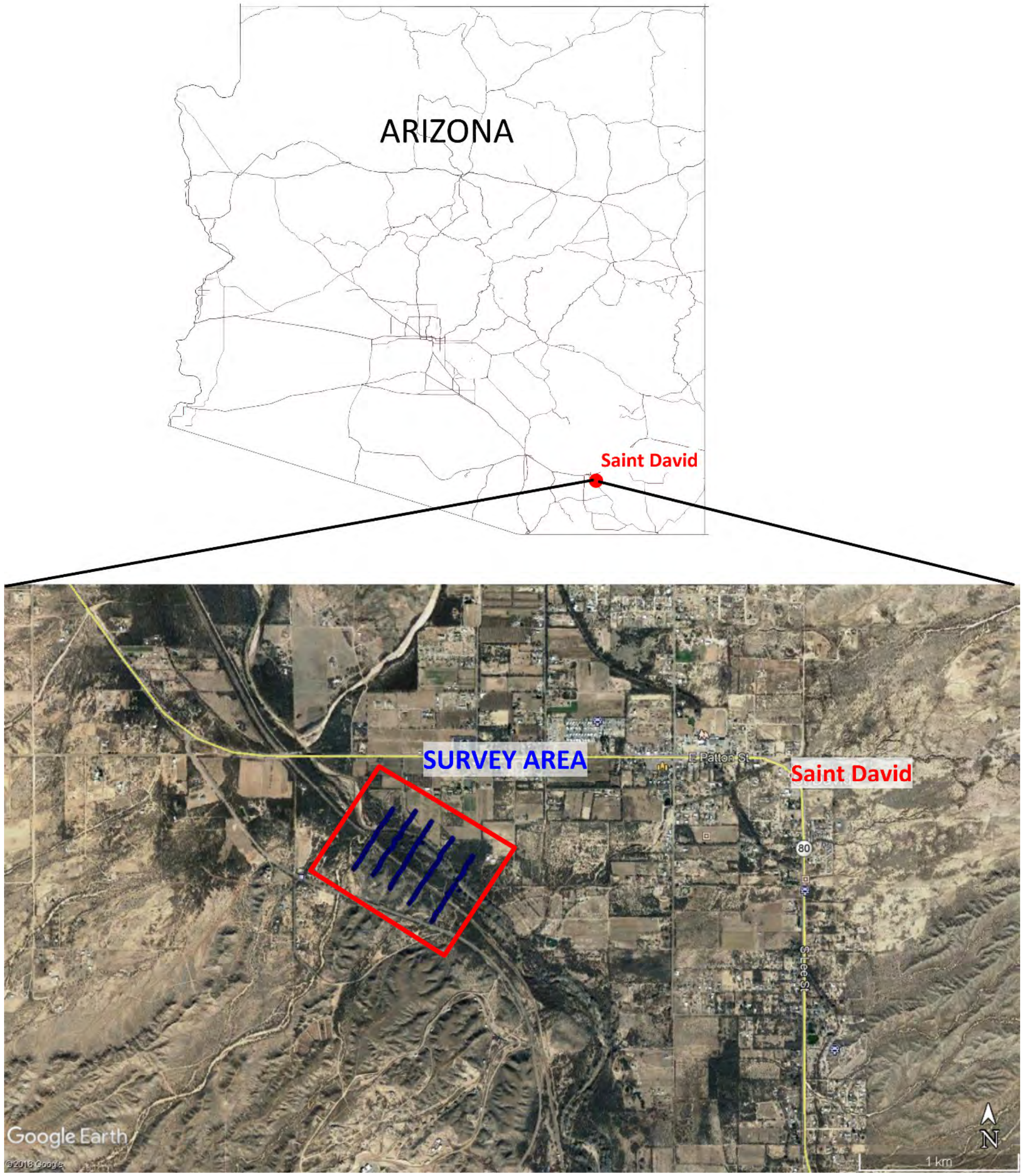


Figure 2. Apache Nitrogen Geophysical Characterization Detailed Survey Layout.

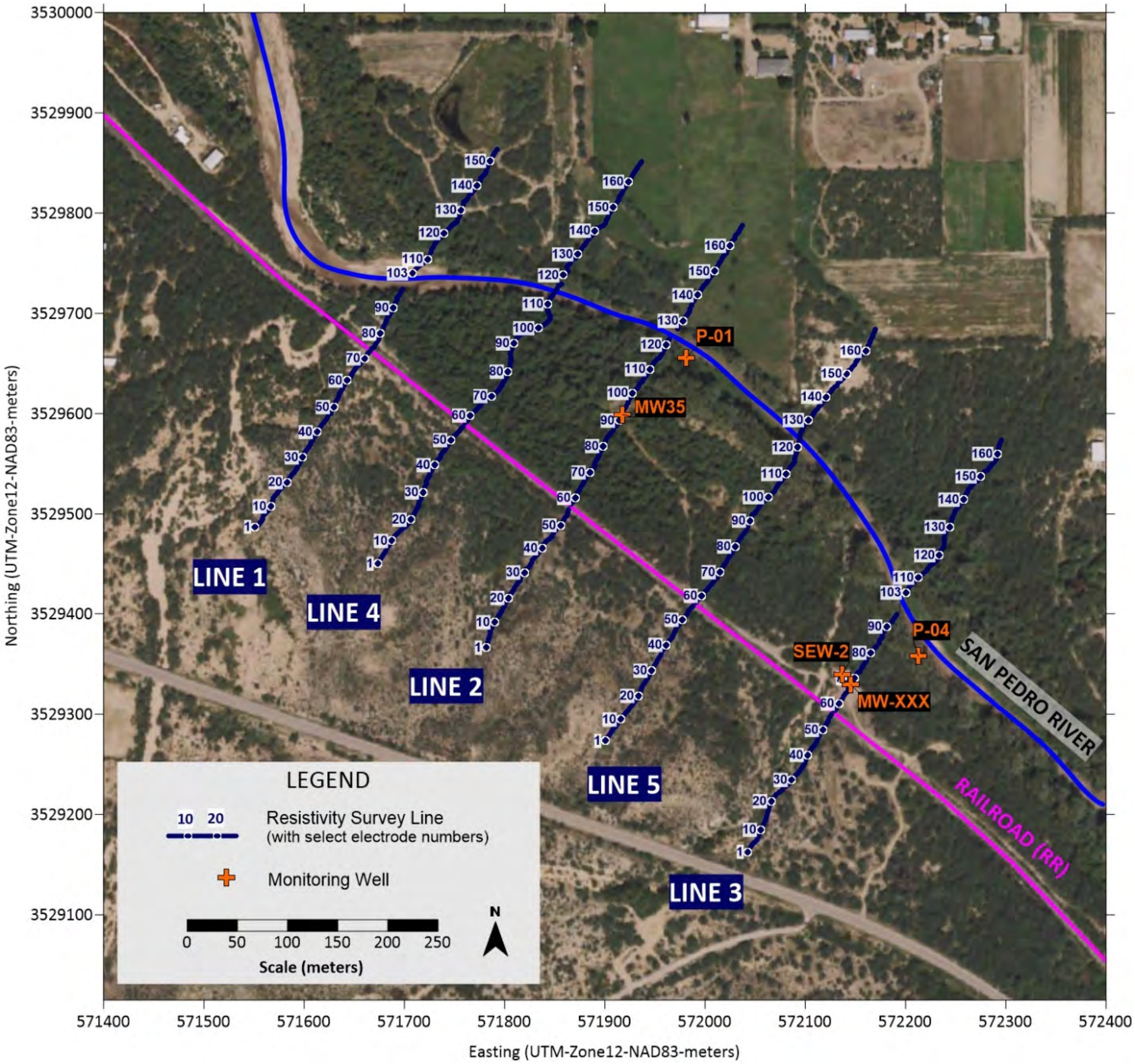
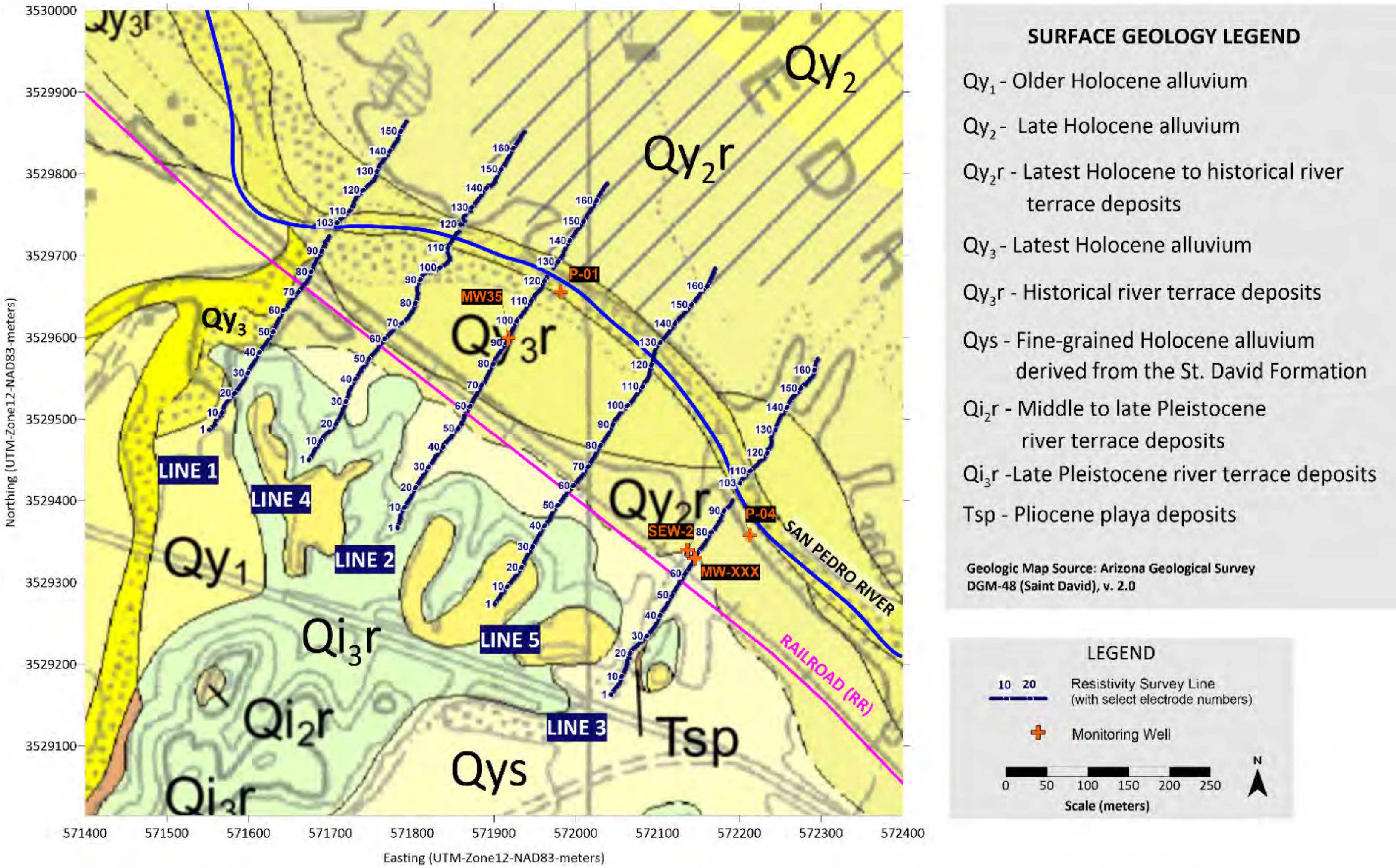


Figure 3. Geologic Map of the Survey Area



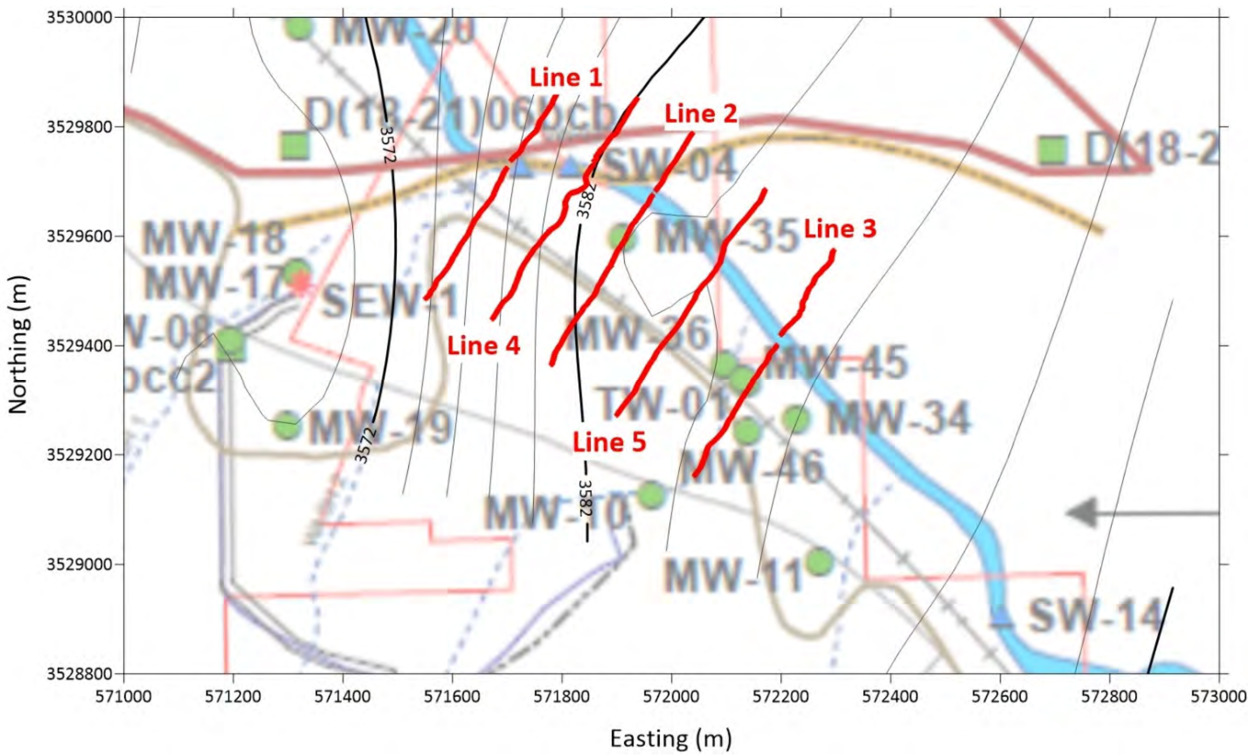
2.0 NORTHERN AREA GROUNDWATER

As a matter of record, this section describing the groundwater in the Northern Area was taken from a Hargis and Associates report titled "2017 Annual Performance Monitoring and Site-Wide Status Report", dated March 28, 2018.

> The remedy in the Northern Area of the shallow aquifer comprises two components: MNA and a pump- and-treat system, referred to as the Northern Area Remediation System (NARS). The NARS comprises an extraction well from which contaminated groundwater is pumped and routed to a treatment wetland where the water flows under gravity through a series of five treatment ponds. Discharge is routed to a wash (Wash 3), where it infiltrates into the underlying alluvium.
>
> During 2017, the NARS extracted and treated over 32 million gallons of contaminated groundwater which contained approximately 13,600 pounds of nitrate-N that was removed from groundwater. The far northern portion of the Northern Area is situated north and outside the influence of the NARS capture zone. Presently, this area relies on natural attenuation to reduce concentrations of nitrate-N in groundwater. The feasibility of MNA in this area was originally assessed during the period of 2005 through 2007 both by a program of field data collection of parameters and model projections. Although the investigations indicated that there were essential components for natural attenuation by biodegradation mechanisms, it is believed that hydromechanical dispersion may be the major factor in decreasing concentrations in the shallow aquifer.
>
> In 2008, ANPI developed a model for Northern Area Performance Assessment (NAPA). The NAPA model applied field data with an attenuation half-life of two years to project the rate of attenuation of the areal distribution of nitrate-N over time. Since that time, field data indicate that attenuation is in fact occurring at a rate consistent with the model (H+A, 2008c). The 2017 water quality data indicate that all shallow aquifer wells in the Northern MNA management zone are still below the nitrate-N cleanup standard and have been since the middle of 2013 when the nitrate-N concentration at private well D(18-21)06bcb dropped below the standard of 10 mg/l.
>
> The position of this particular well is important, considering that it is apparently at the edge of the capture zone of extraction well SEW-01, a component of the pump-and-treat component of the Northern Area remediation system. The nitrate-N concentration in this well has been on a downward trend since 2004 and initially dropped below the cleanup standard in May of 2011. The lowest concentration at this well was recorded at 1.0 mg/l during May 2017. The nitrate-N concentrations at this well are expected to remain permanently below 10 mg/l, as extraction well SEW-01 continues to operate at the present rate.

Within the back of the Hargis report, groundwater elevations were reported for late 2017. These data were mapped by HGI to form a context from which the geophysical data could be interpreted. Figure 4 shows the groundwater elevation, geostatistically interpolated from 14 wells. The hydraulic gradient is from southeast to northwest. The southeast has a lower gradient, likely due to higher hydraulic conductivity values associated with sands and gravels. The gradient becomes larger in the northwest, where hydraulic conductivities decrease with higher percentages of silts and clay.

Figure 4. Groundwater Elevations Across the Northern Area



3.0 GEOPHYSICAL RESULTS

Figure 5 shows the resistivity data. In a general sense, the results of the lines are very similar. The low resistivity values in the lower part of each line likely represents the clay unit of the St. David Formation. It is shallower in the southwest and northeast, at the beginning and end of the lines. It is deeper in the middle beneath the San Pedro River. There are details and nuances to the clay topography that change from line to line, however. It may be information from these details that important on the contaminant clean up at the site. For example, is the channeling within the massive clay unit, nearer the surface (e.g. at the beginning of Line 1) an important consideration for mass transfer considerations or for the preferential movement or storage of contaminants during variable water table elevations.

For the IP models in Figure 6, we feel that the most value comes from delineating the material that is above the massive clay and recognizing the broad classification of mixed coarse and fined grained sediments. The higher chargeability data, where we have used a value of 9 mS to transition from low to high, are directly correlated to a higher clay content. In the explanation of results presented above, we generally state that the range of chargeability, depending on the resistivity, could represent clayey sands to sandy clays.

The stacked interpreted models are presented in Figure 7. In this figure, we represented all of our information and interpretations into a single plot. Overlain on the data are potential locations for wells, sited in material that would be most transmissive. Other criteria for well siting would be to remain at some distance from the river, in higher resistivity and lower chargeability media.

Figure 5. Resistivity of Lines 1 through 5

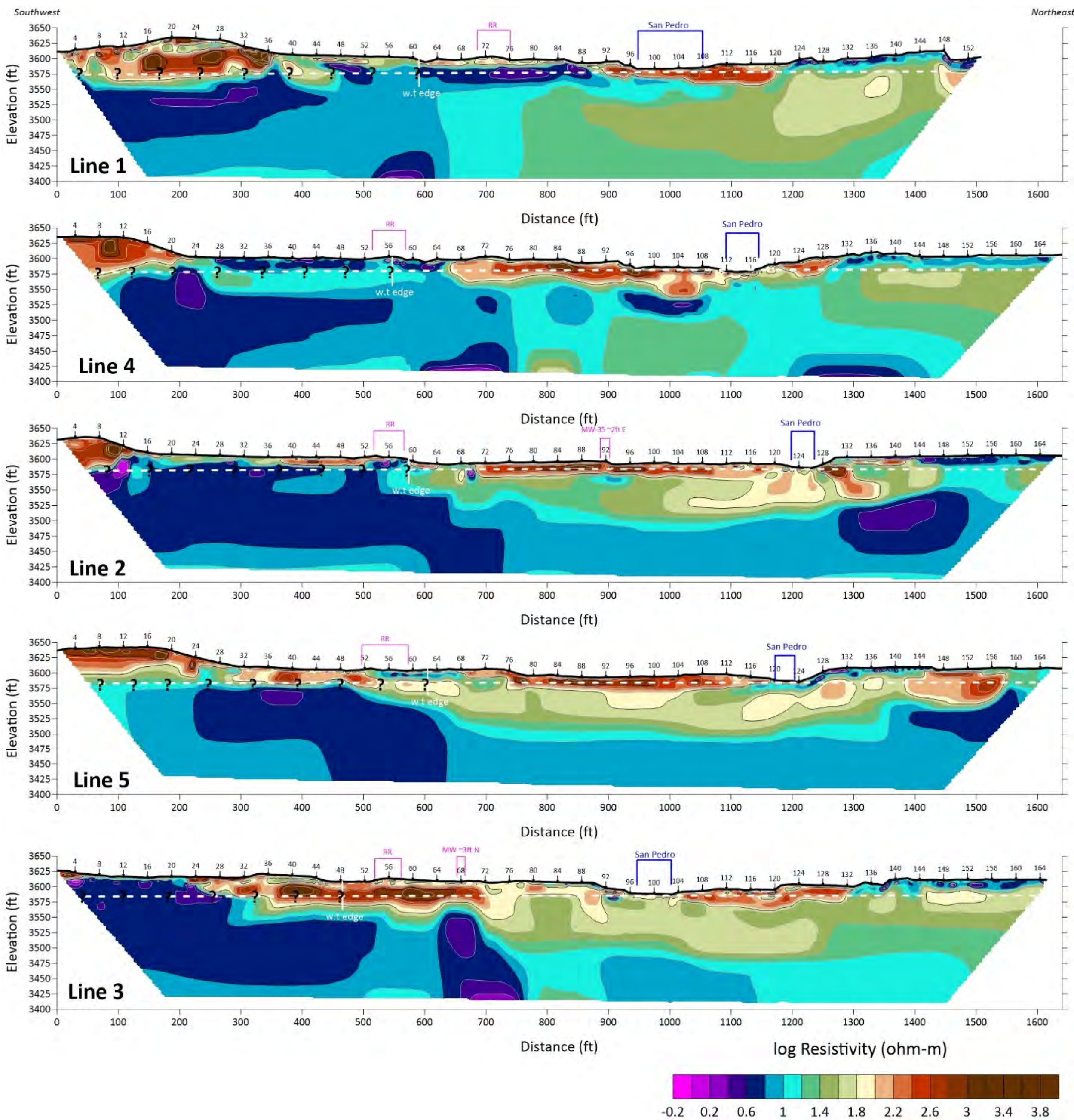


Figure 6. IP of Lines 1 through 5

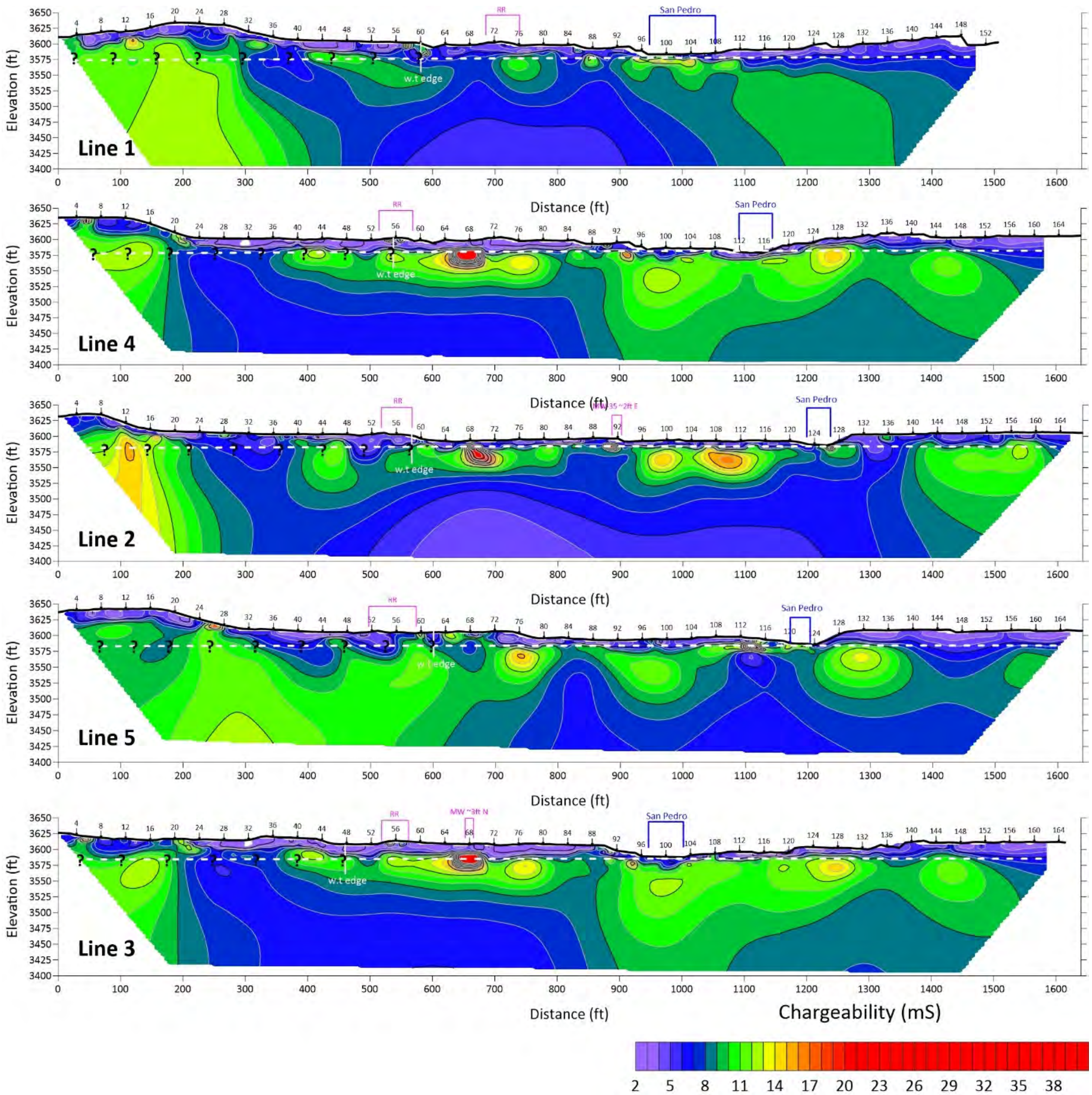
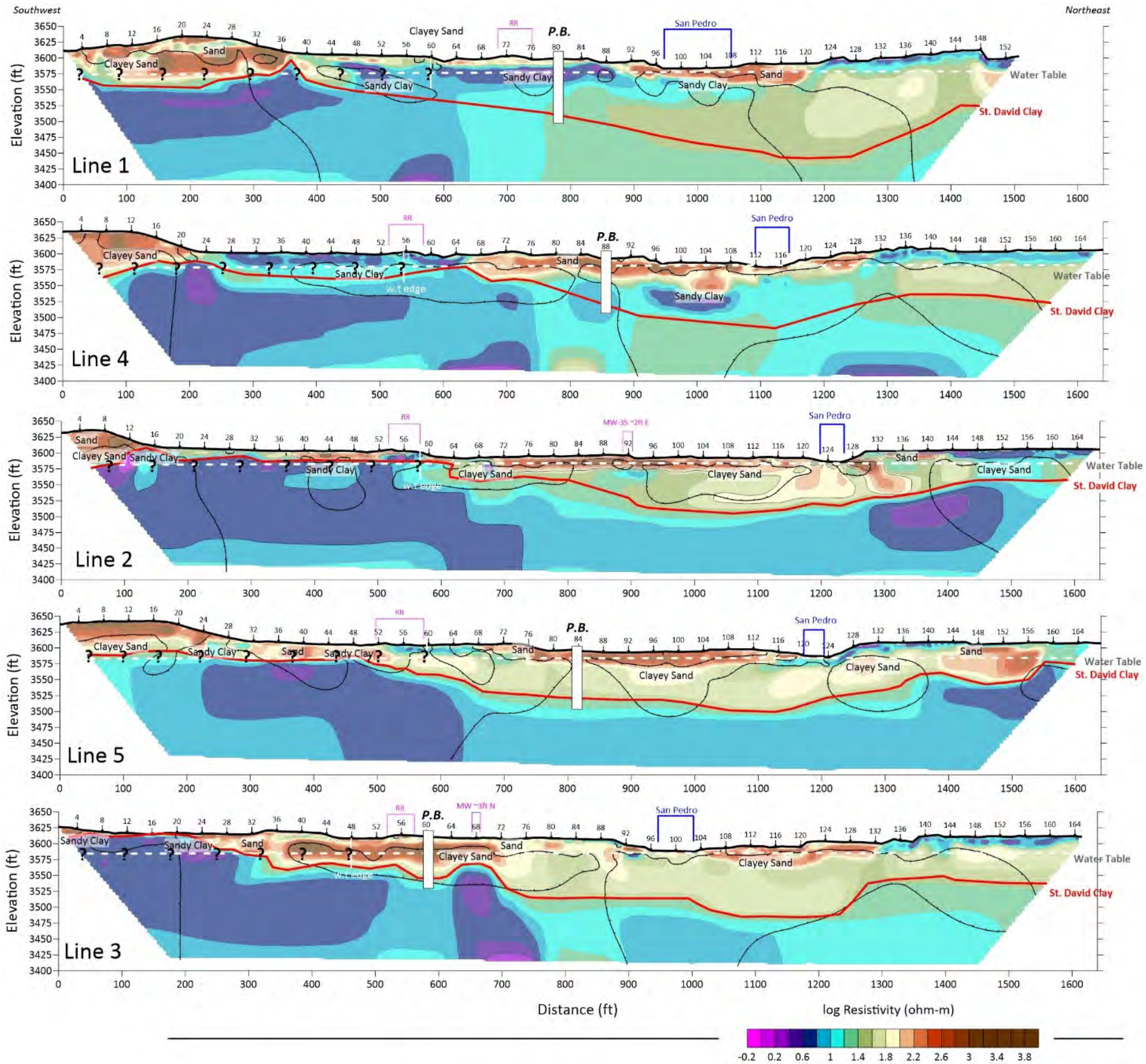


Figure 7. Interpreted Sections for Lines 1 through 5



4.0 GEOPHYSICAL SUMMARY (FROM ORIGINAL REPORT)

A geophysical characterization survey that included electrical resistivity and induced polarization (IP) was completed along the San Pedro River near the town of St. David. The survey included five parallel lines within an area of about 75 acres, with each line spanning around 1600ft. The objective of the survey was to map subsurface conditions to help with the remediation of a nitrate-N plume that exists along the west bank of the river. The electrical resistivity was specifically used to investigate potential targets related to the lithology and hydrology of the site. The IP was used to help discriminate clayey material and to help interpret different low resistivity targets. This information is expected to be helpful in the siting of additional extraction wells supporting the existing pump-and-treat remedy mandated by a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Record of Decision (ROD) issued by the U.S. Environmental Protection Agency (EPA) in 1994. Based on the low concentrations of the plume relative to the target strength of the various lithological units, the plume was not directly observable in the data.

The electrical resistivity survey revealed a definite low resistivity massive clay unit across the site. The clay unit, as calibrated through the lithological log from ANPI monitor well MW-35, was represented by resistivity values less than 28.2 ohm-m. The shape of the unit was such that the elevation was high and near the surface in the southwestern portion of the survey area, decreasing elevation beneath the flood plain of the San Pedro River, and eventually gaining some elevation on the northeast. Beneath the flood plain, a low elevation channel is consistent across all lines and trends and deepens towards the northwest. Where the clay unit is close to the surface in the southeast, the topography of the buried erosional clay surface may vary by up to 20ft. It may be possible that channeling exists in the clay unit. A final map was created to highlight shape of the clay elevation as interpreted from the resistivity. The center of the survey area shows a trough with a thick sandy alluvium overlying the deep clay beneath the river's flood plain.

For the soils above the clay unit, there was a large range of soil types that included sands (with little to no clay), sands and gravels with some clay, and clays mixed with sand. Well MW-35 showed good consistency between the expected clay fraction from the lithological logs and chargeability. Well TW-01 had no consistency in chargeability and clay fraction, likely due to some interference from nearby metallic infrastructure. To discriminate the specific lithologies across all five lines, we used to chargeability from the IP survey to interpret the subsurface soils as they related to MW-35. For example, we expected that low resistivity, high chargeability soil was a clay-rich sandy soil, whereas high resistivity, low chargeability was representative of clay-poor and primarily sandy soil. While the shallow water table was not specifically mapped in these data, it did dampen the highs and lows of resistivity potentially masking some subtle lithological features within the data.

In summary, the following observations should be considered:

- Much of the calibration of data, and specifically the resistivity value used to demarcate the massive clay unit, was derived from the lithology represented at MW-35. TW-01 did not show chargeability correlation with expected clay content.

- The shape of the shallow portion of the clay unit on the southwest side could have interesting hydrogeological implications for successful remediation of the nitrate-N plume. It could be that source is trapped in low-lying topography where the top of the erosional clay surface is near the extrapolated water table elevation.

- For this survey, the line spacing was rather large. The large spacing prevented the successful 3D modeling of the resistivity data and led to discontinuous features that were not observed across multiple lines.

- Given the success of mapping the geological materials beneath this portion of the site, it is recommended that additional geophysical data be acquired in other contaminated areas to help define lithological constraints for plume movement and remediation.

- Based on the information produced from this survey, it is recommended that the following positions along the transects lines be investigated through exploratory drilling:

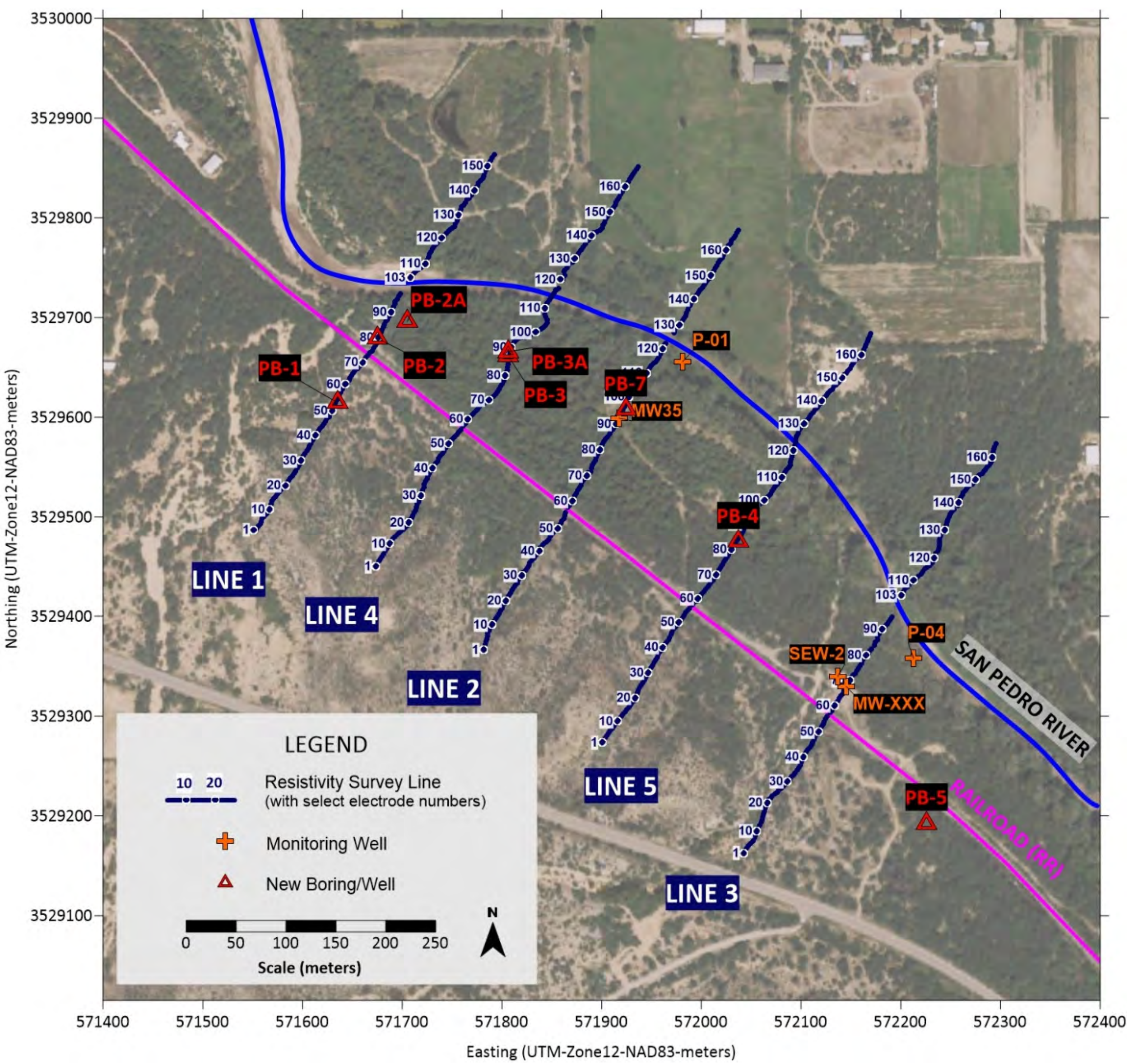
    - Line 1: 780ft
    - Line 4: 855ft
    - Line 5: 817ft
    - Line 3: 587ft

  The positions of these wells are based on finding sandy material that would potentially be favorable for highly transmissive soils and pumping locations. If these locations are proven to be favorable, ANPI should consider installation of additional extraction wells to support the remedial program.

5.0 DRILLING

Drilling of new wells and borings in the Northern Area of the Apache Powder Superfund Site was conducted in November 2018 and included eight locations. These locations were chosen partly on the geophysical results and are shown in Figure 8. The distribution shows that three of the drilling locations coincide with Line 1, two locations coincide with Line 4, and one location each along Lines 2 and 5. Another boring, PB-5, was placed too far from the survey area for comparing with the geophysical results.

Figure 8. New Borings and Wells at ANPI



5.1 PB-1

The locations of the borings along geophysical Line 1 are shown in Figure 9. PB-1 was placed south of the railroad tracks near electrode 54, in what appears to be massive clay based on the resistivity data. An interesting note is that the IP data are slightly elevated just below the water table.

Figure 10 shows the drilling log for PB-1 as well as the extracted resistivity and IP at this location. The boring was drilled to approximately 40 ft and shows a continuous core of clay. It is suspected that this clay is not in the St. David formation and instead is reworked clay from the south. It is different in color than what has been observed from the St. David clay. Another note about the log is that there was a transition from dry to moist material at around 12ft depth.

The geophysical data in Figure 10 shows high resistivity and low IP in the drier parts of the subsurface, with a change to low resistivity and higher IP in the wetter areas. In the previous report discussing massive clays, we did not expect an IP signature based on the electronic charge dissipating (or short circuiting) along the conductive clay surface. Here, we see that the reworked clay does have an IP signature. Although not shown, the IP does reduce significantly deeper than 45ft, suggesting that there is something other than this reworked clay beneath it. It would have been beneficial if this boring would have drilled through the reworked clay into the material below it. It is likely that a thin veneer of alluvium would have been mapped before actually reaching the massive clay of the St. David Formation.

Figure 9. Locations of PB Wells along Line 1

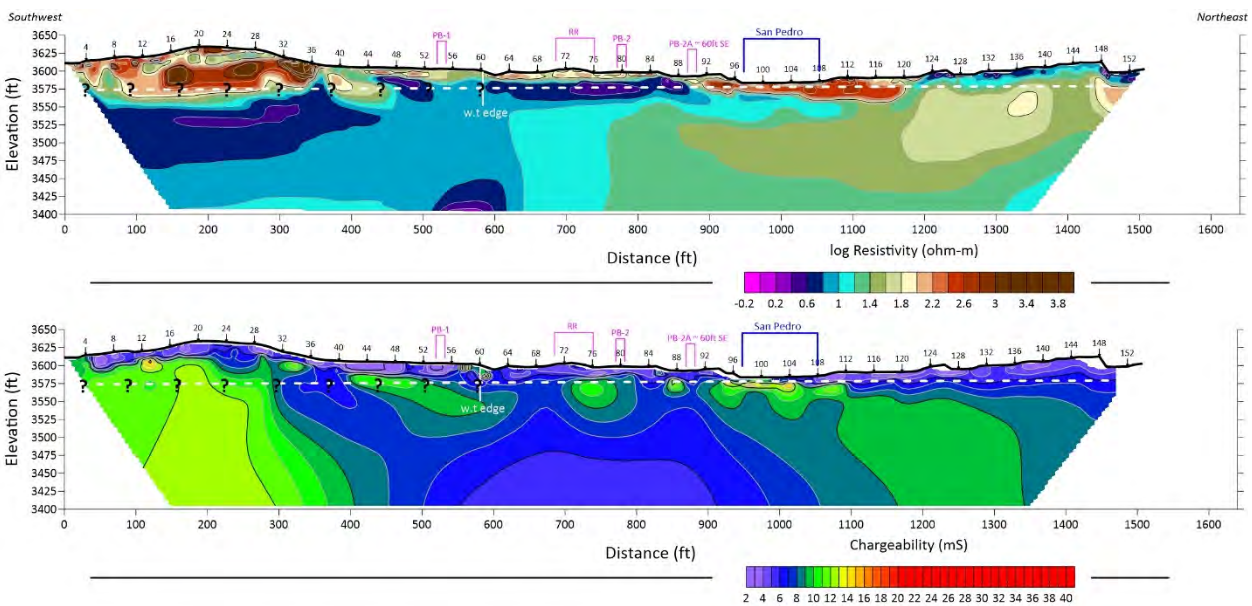
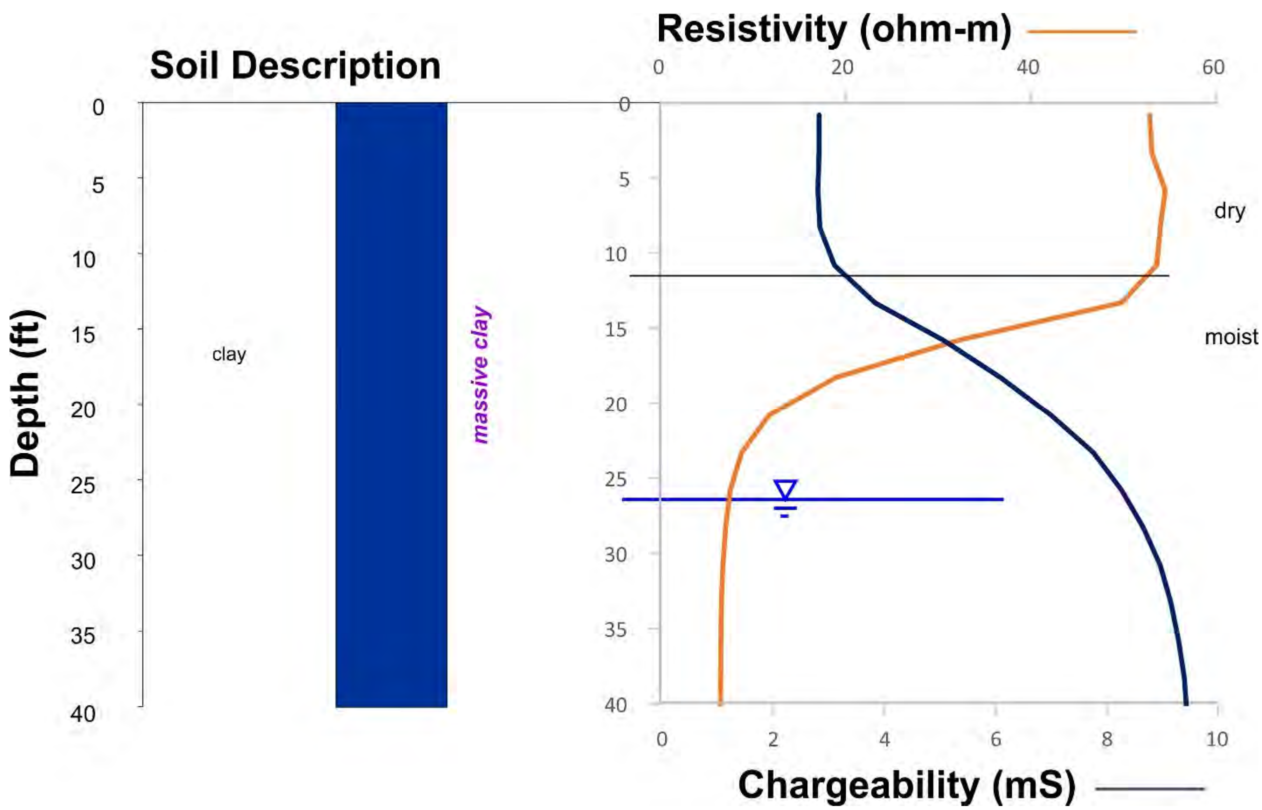


Figure 10. Results of PB-1

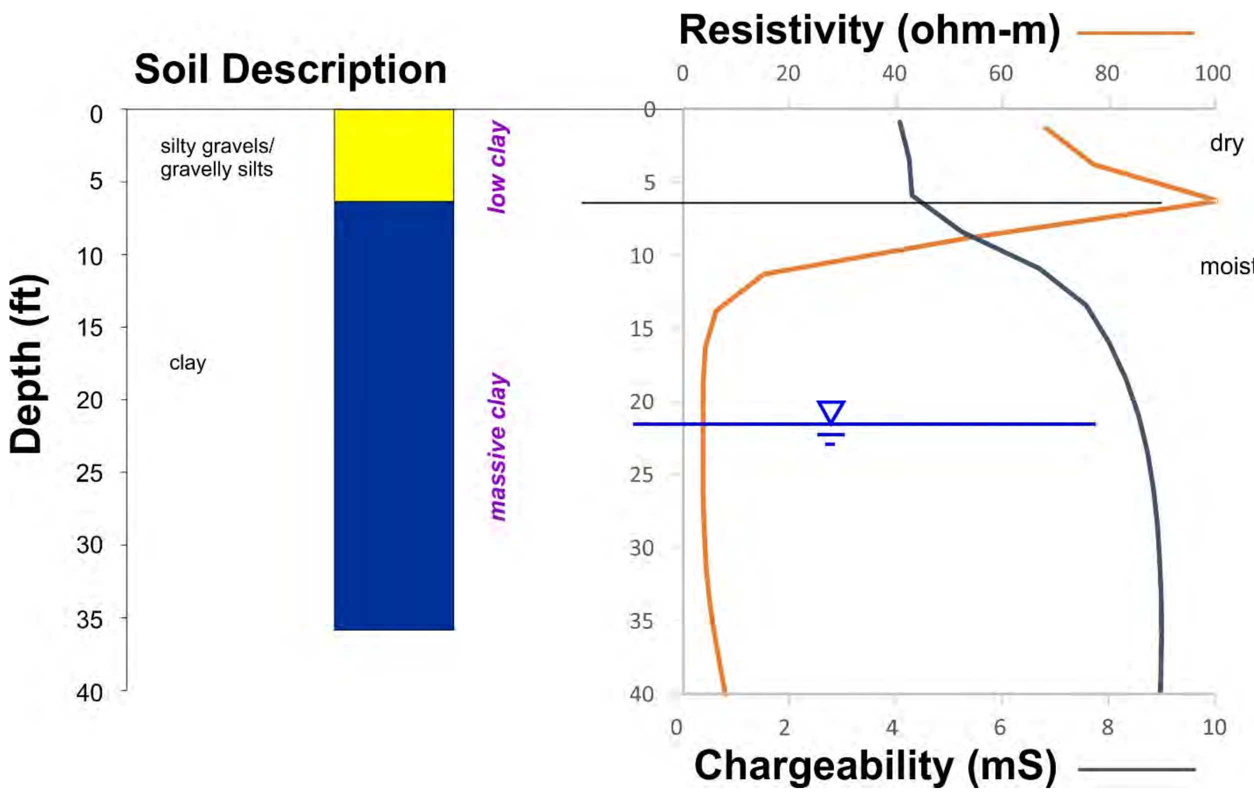


5.2 PB-2

Boring PB-2 was drilled near electrode 80 along Line 1, to a depth of approximately 35ft. Figure 11 shows the log, with the lithological units divided into regions that would be identifiable with the geophysics. The upper 6ft are comprised of dry silts and gravels. Below this and to the completion depth of the boring, massive clay is recorded as being moist. Again, this clay is likely not the St. David formation and is a reworked clay from the south.

The extracted geophysical data is similar to that of PB-1, where high resistivity lower IP is observed in the upper dry material. The resistivity decreases significantly and the IP increases as we move into the wetter clay. We observed this exact sequence in PB-1.

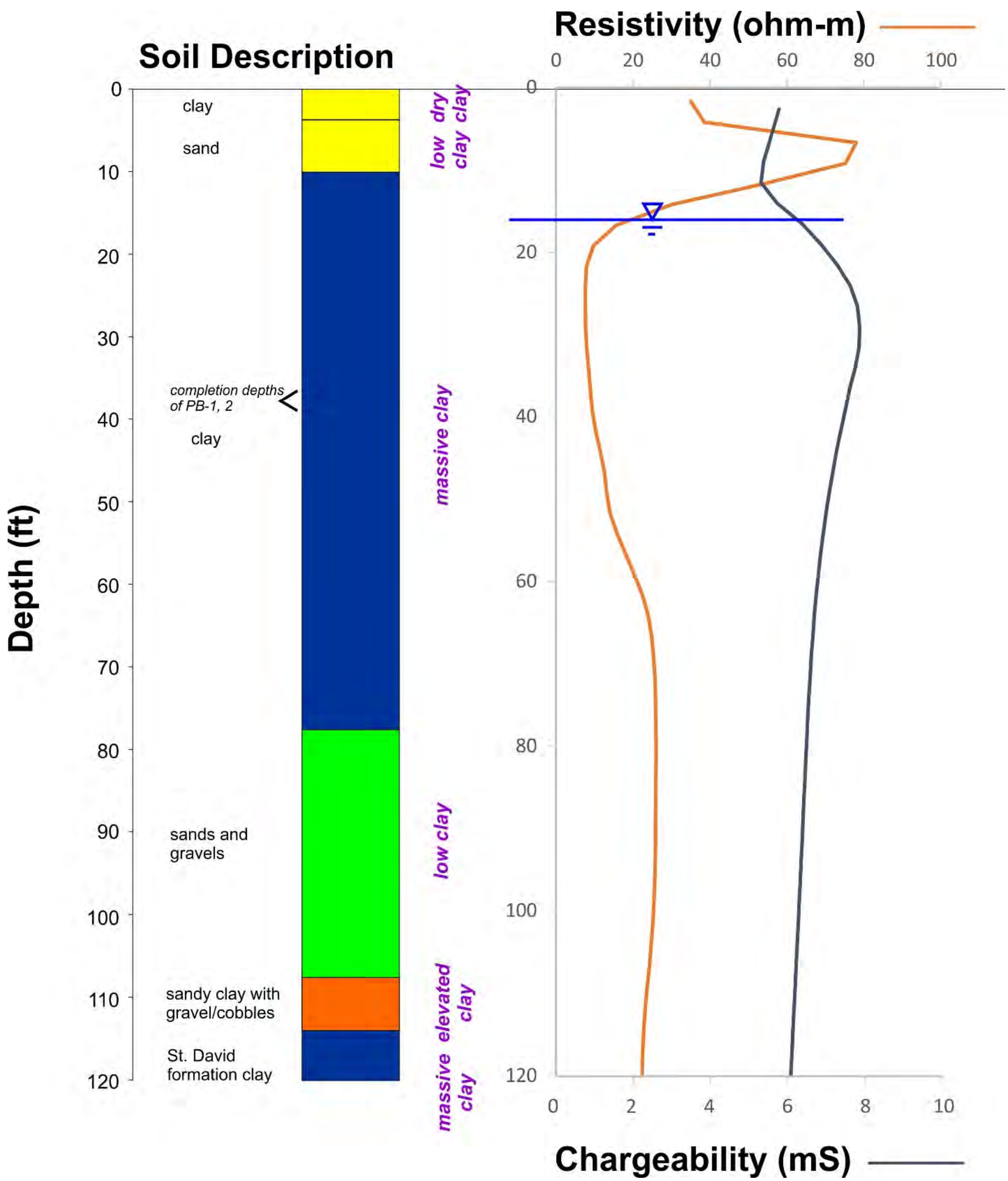
Figure 11. Results of PB-2



5.3 PB-2A

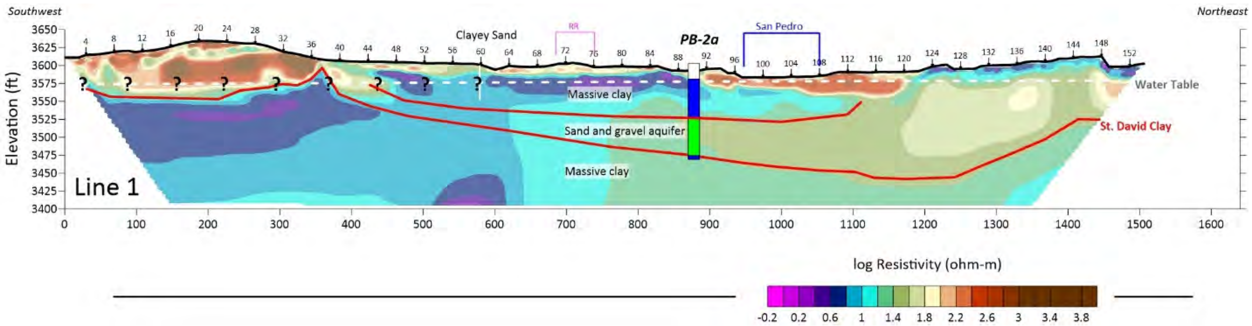
Boring PB-2a was drilled near electrode 90 along Line 1, to a depth of approximately 120ft. A well casing was put into the drillhole, with screen from 77 to 107ft. The log, in Figure 12, shows that the boring made it through the upper reworked clay and into the actual St. David formation at the bottom of the well. Between these two clay layers is an aquifer of sands, gravels, and cobbles with little to no clay. We suspect that this aquifer extends to the south beneath PB-1 and PB-2, but thinning and at lower depths. Based on this hypothesis, we recommend that the PB-1 boring be extended until the St. David clay is reached to verify the extent of the aquifer.

Figure 12. Results of PB-2a



Looking at the three lithological logs in the context of the geophysics, the original interpretation was almost what we predicted, with the location of the St. David clay about 10ft from what was presented before. Based on the new information, we updated the interpretation in Figure 13 to show the upper and lower massive clay units with the likely location of the sand and gravel aquifer.

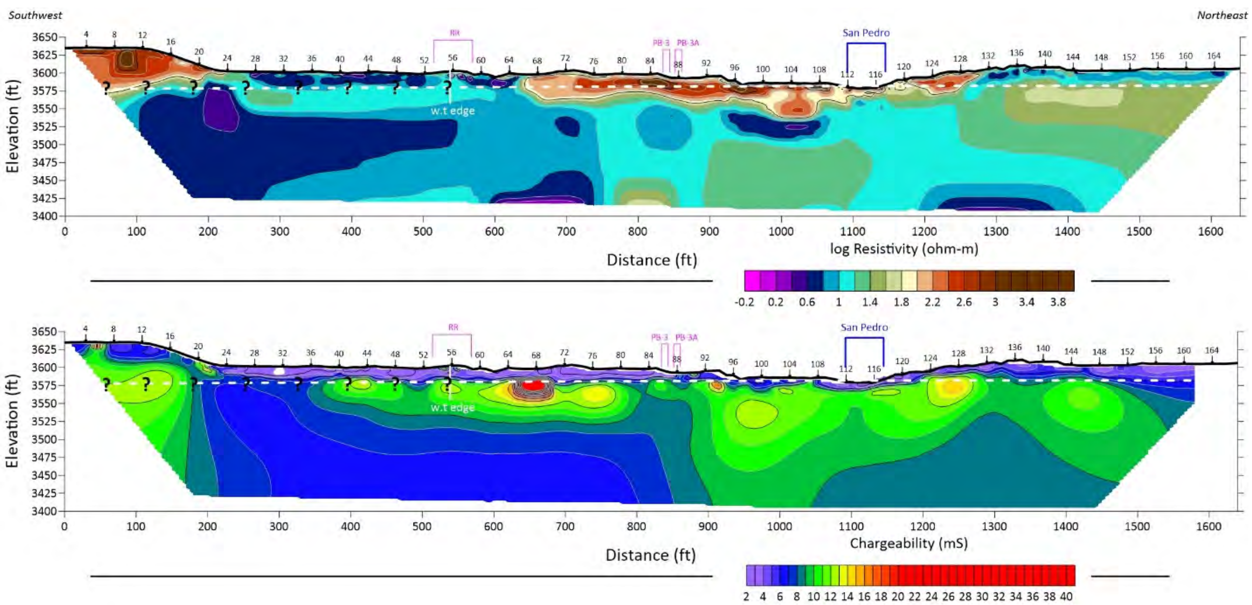
Figure 13. Reinterpretation of Line 1



5.4 PB-3 AND PB-3A

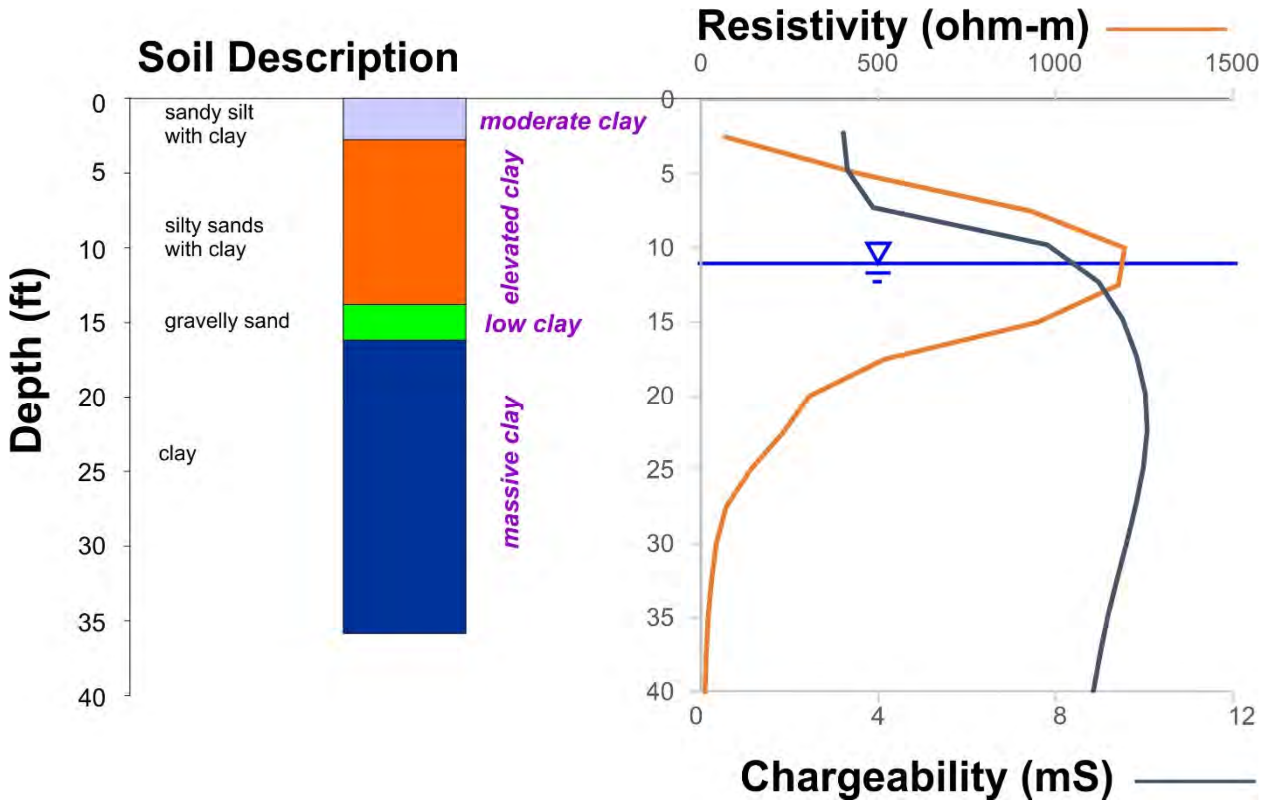
Borings PB-3 and PB-3a were placed along Line 4, near electrodes 86 and 88, respectively. The completion depth for the borings is about 36ft. Figure 14 shows the locations of the borings along with the geophysical data, which shows the upper material to be resistive and lower material to be conductive. The IP data shows a transition near these borings at depths of about 120ft.

Figure 14. Locations of PB Wells along Line 4



The logs for PB-3 and PB-3a are shown in Figures 15 and 16. Not surprisingly, they show near identical logs with similar geophysical responses. The resistivity starts low near the surface likely because of the elevated clay. The resistivity increases with depth until the water table, and then drops to very low values as the thick reworked clay unit is encountered. The IP data show low values until the clay, then increases based on that lithological sequence. This is a similar observation to the borings in Line 1.

Figure 15. Results of PB-3



It is unfortunate that the borings did not go deeper to find the bottom of the reworked clay and the upper surface of the St. David formation. Regardless, HGI made an attempt to reinterpret the lithostratigraphic sequence along the line to include the reworked and St. David clay. The exact depths are estimates based on what was shown in Line 1. We hypothesize that a sandy gravel aquifer could exist between the clays and we also show that a thin gravelly sand aquifer is above the reworked clay. If possible, another boring should be placed around electrode 100 and drilled to the St. David formation to better calibrate the data along this line.

Figure 16. Results of PB-3a

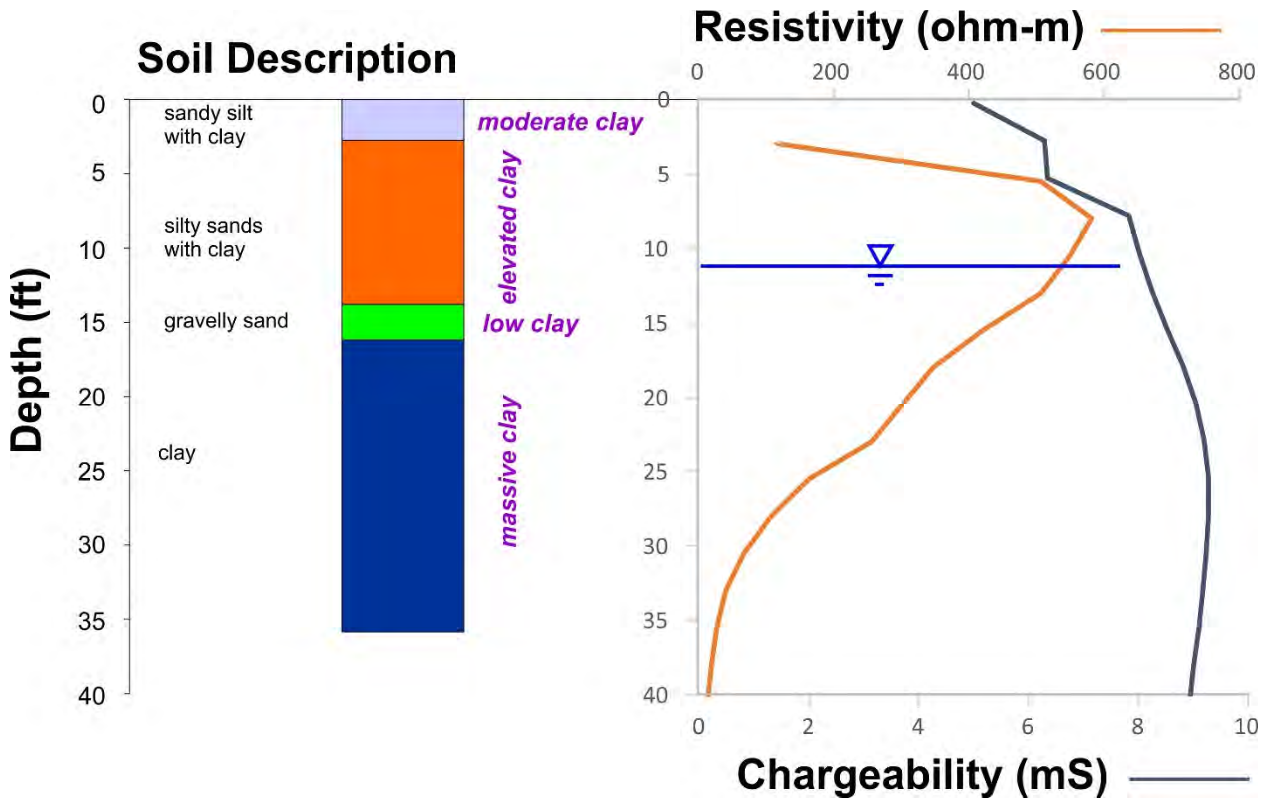
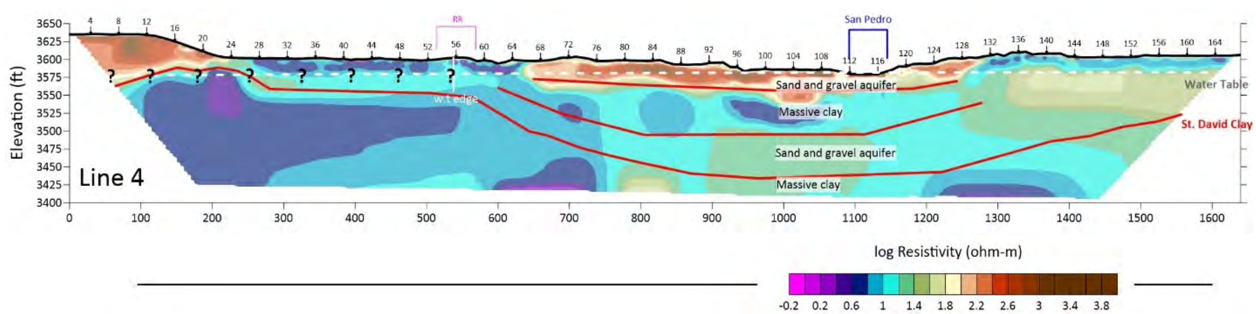


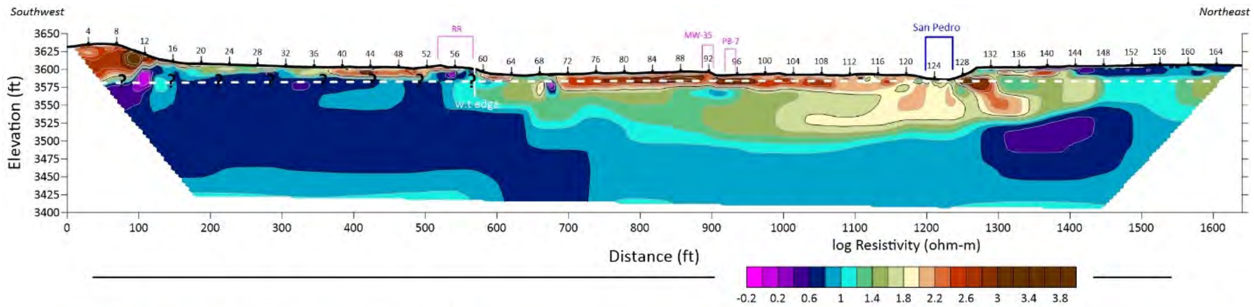
Figure 17. Reinterpretation of Line 4



5.5 PB-7 AND MW-35

The newer boring PB-7 and older well MW-35 were drilled along Line 2 (Figure 18). PB-7 was drilled to about 70ft and converted to a well with screen from 36 to 66ft. Figure 19 shows the soil descriptions along with the geophysical results for both wells. For PB-7, clay was encountered at a depth of about 66 ft but he color description is similar to the reworked clay of Lines 1 and 4. The borings along those lines does show a deepening of that surficial clay as we move upgradient along the San Pedro River. The borings also show thin sequences of sand and gravel acting as aquifers. Closer to the surface, there appears to be isolated stringers of thin clay rich layers showing up as conductive features in the geophysical data.

Figure 18. Locations of PB Wells along Line 2



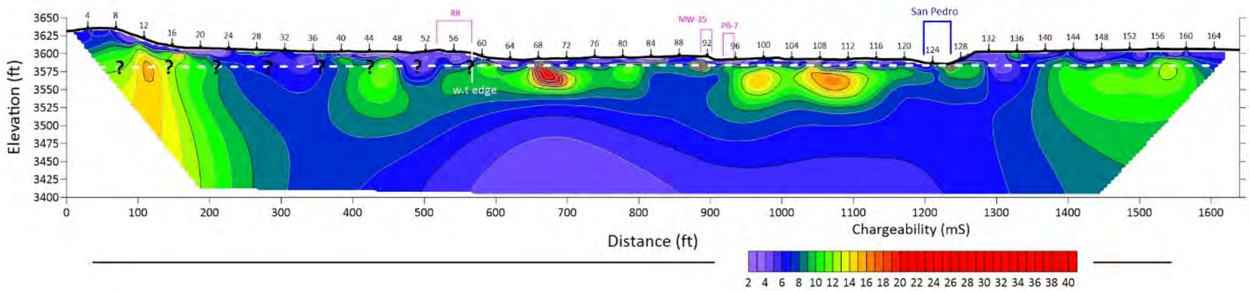
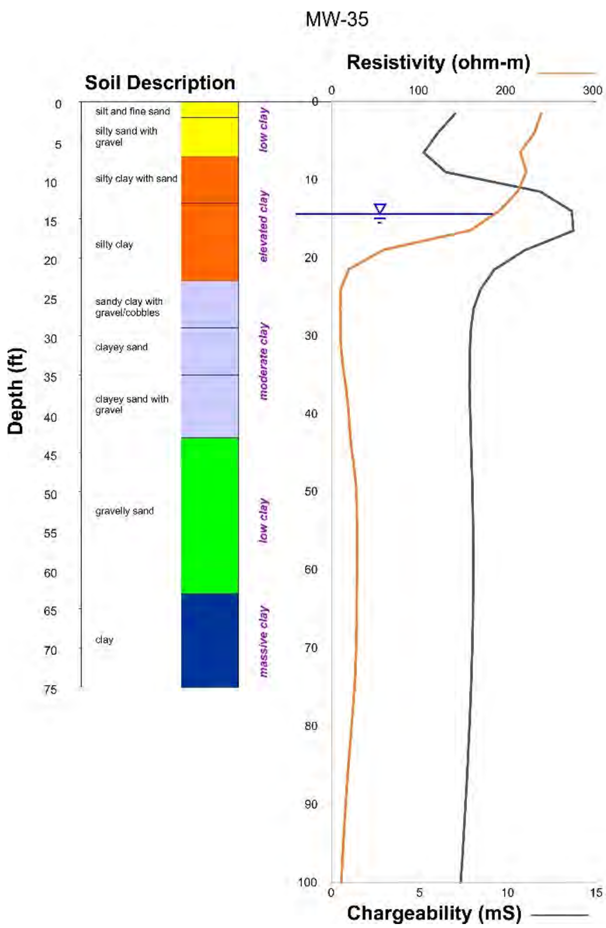
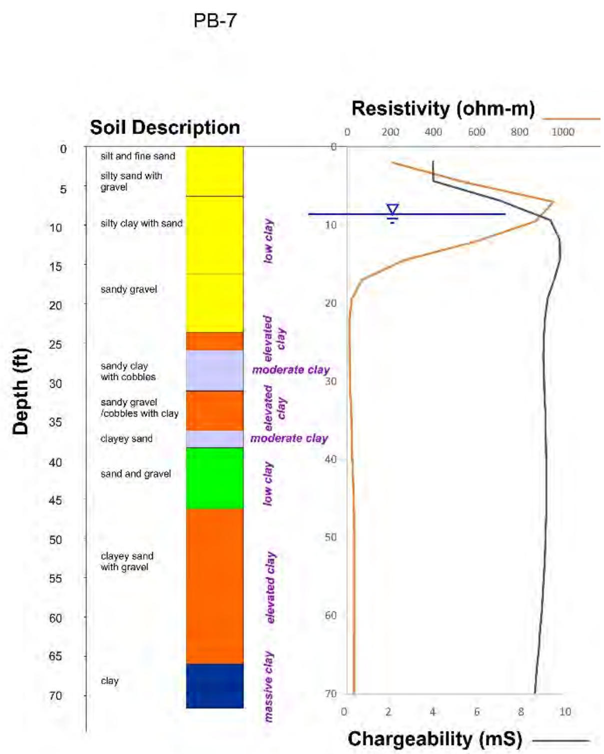


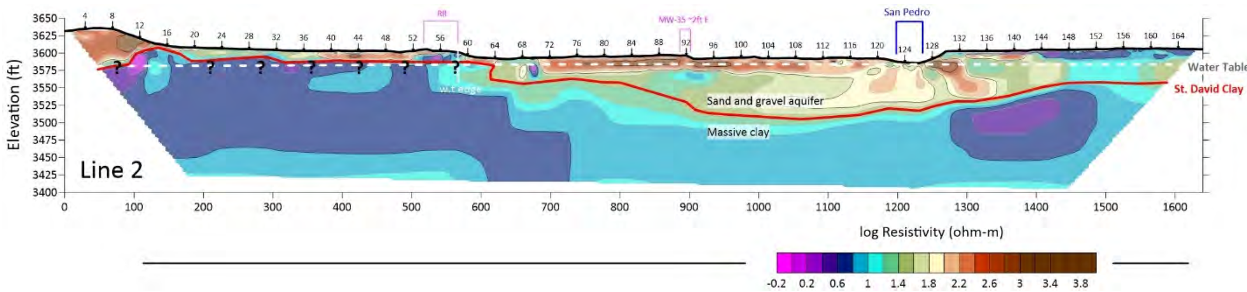
Figure 19. Results of PB-7 with MW-35





Based on the similarity of the two borings and the data from Lines 1 and 4, we are confident in the original placement of the clay layer. Figure 20 presents that interpretation. We are uncertain, however, if the clay at the transition is the reworked or that of the St. David formation.

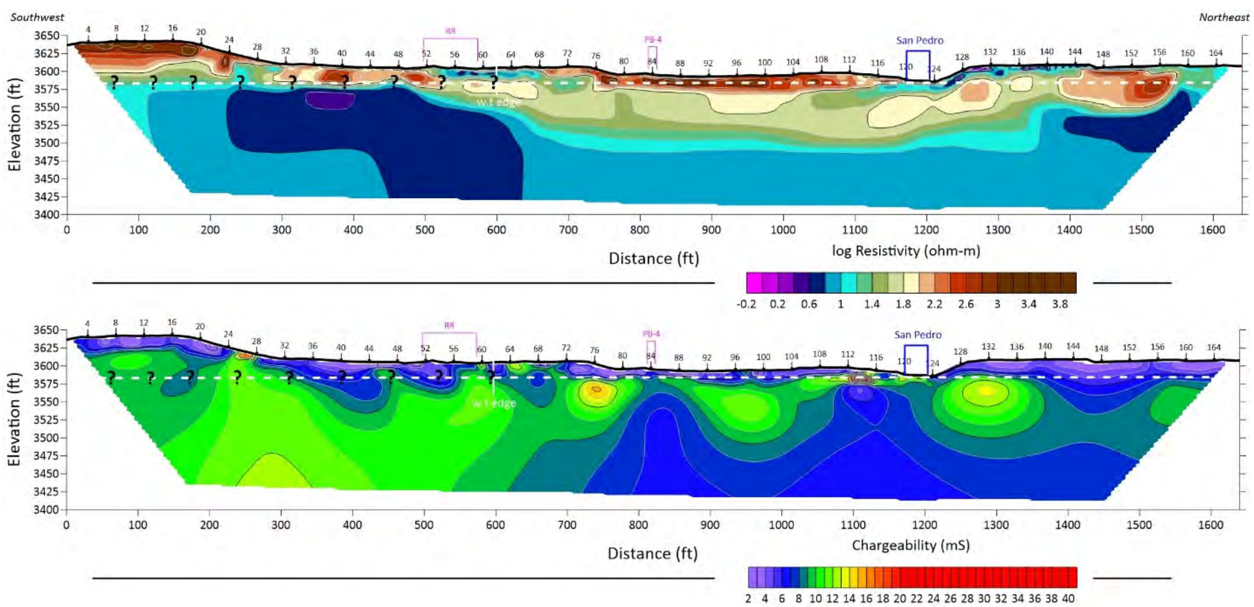
Figure 20. Original interpretation of Line 2



5.6 PB-4

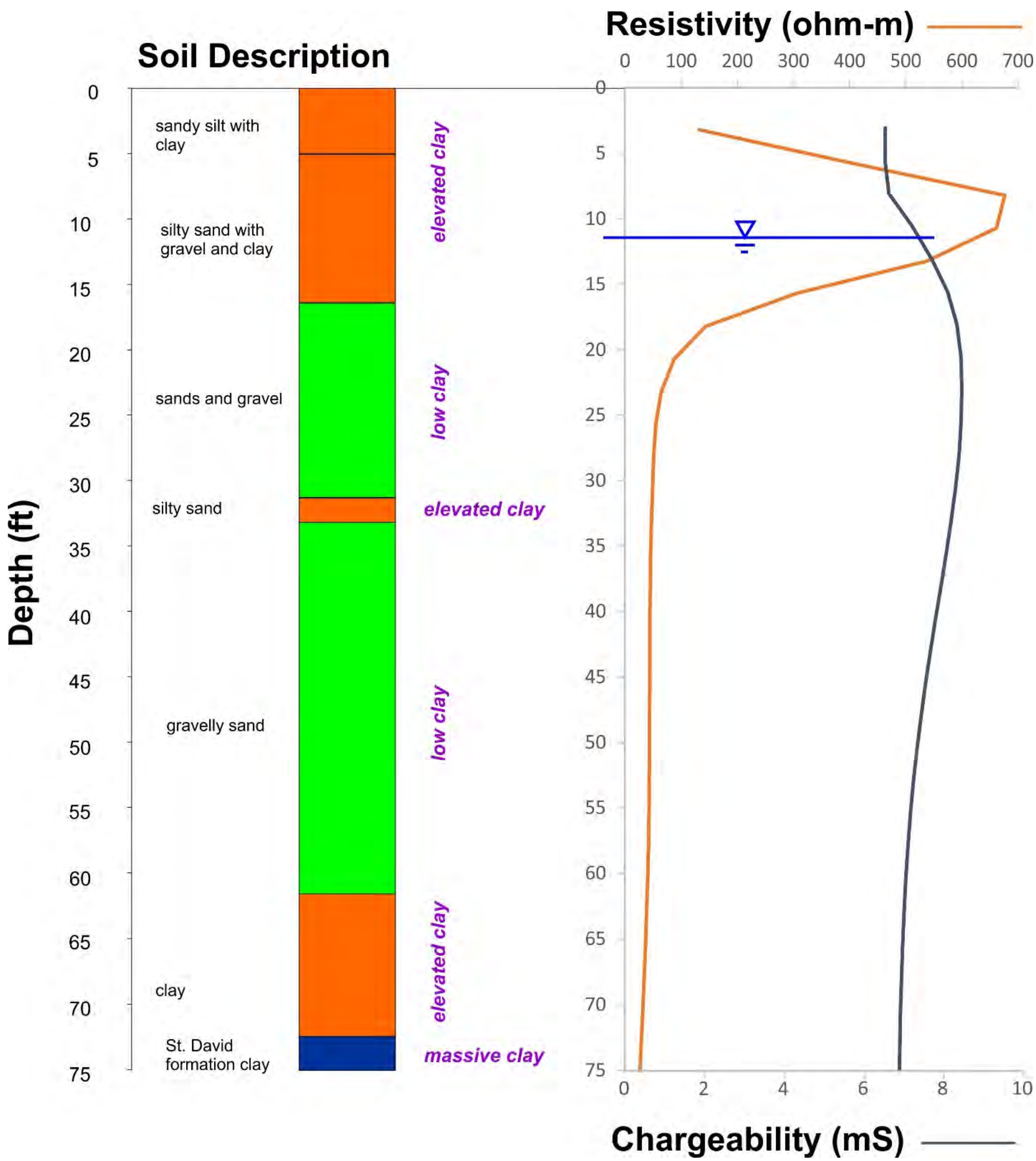
The southern most boring is PB-4, located along Line 5 near electrode 84 (see Figure 21). The boring was drilled to 76ft and completed with a well. Screen in the well is from 40 to 70ft. The bottom of the boring shows massive clay and is listed as the St. David formation. Unfortunately, no color information is given as there is typically a color distinction between the reworked upper clay layer and the deeper St. David clay.

Figure 21. Locations of PB Wells along Line 5



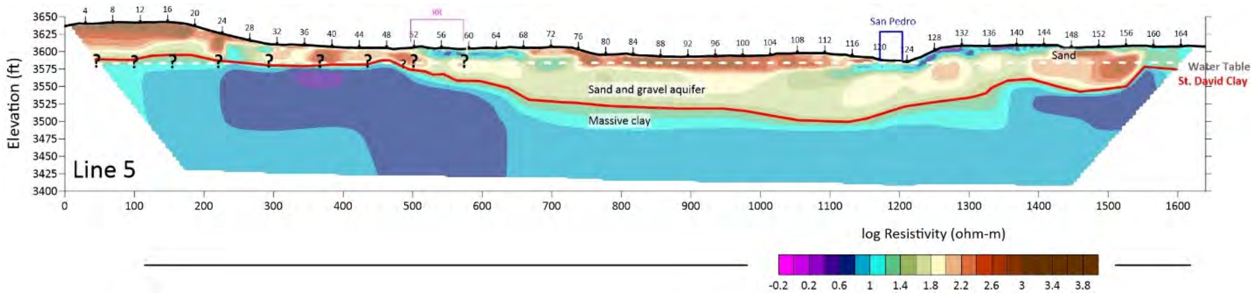
The information in the geophysical sections of Lines 2 and 5 are very similar. The boring logs for the two lines are also similar in that the clay is about 65-75ft below the surface and layers exist containing significant gravels and sands with no clay that act as aquifers. The aquifer is getting thicker as we move upgradient (south) along the river.

Figure 22. Results of PB-4



Based on the depth to the clay layer in PB-4, there is no reason to reinterpret the original resistivity data for marking the top of clay in Line 5. Figure 23 shows the original data and the interpreted clay, in this case called the St. David clay. Above the clay shows resistive materials that coincide with the sand and gravel aquifers.

Figure 23. Original interpretation of Line 5



6.0 CONCLUSIONS AND RECOMMENDATIONS

A drilling program was initiated to better understand the five lines of geophysical data collected at the Apache Powder Superfund Site. Three of the borings were converted to wells with 30ft screens placed in the sandy gravel portions of the aquifer.

In the original interpretation of the geophysical data, the lithological log of MW-35 was used to calibrate the location of the deep, massive clay layer across all of the lines. The IP and resistivity data were then used to help understand soil texture as it related to coarse vs fine grained media. The depth to clay was shown to be deepest under the river and shallower on the ends of the geophysical profiles. The southwestern portions of the lines, in particular, showed the clay coming near to the surface.

The new set of borings help validate those original findings for Lines 2 and 5. Borings PB-4 and PB-7 showed the clay layer to be where we predicted, within a few feet. The resistive material above the clay was shown to be a mix of soil with variable clay fractions and with thick sequences of sandy gravels that had no clay. The vertical resolution of the geophysics does not allow us to specifically map those horizons. However, the data do show that there exists a high level of continuity between Lines 2 and 5 and even further upgradient to Line 3. The borings along these lines confirm that the aquifer is easy to find when drilling.

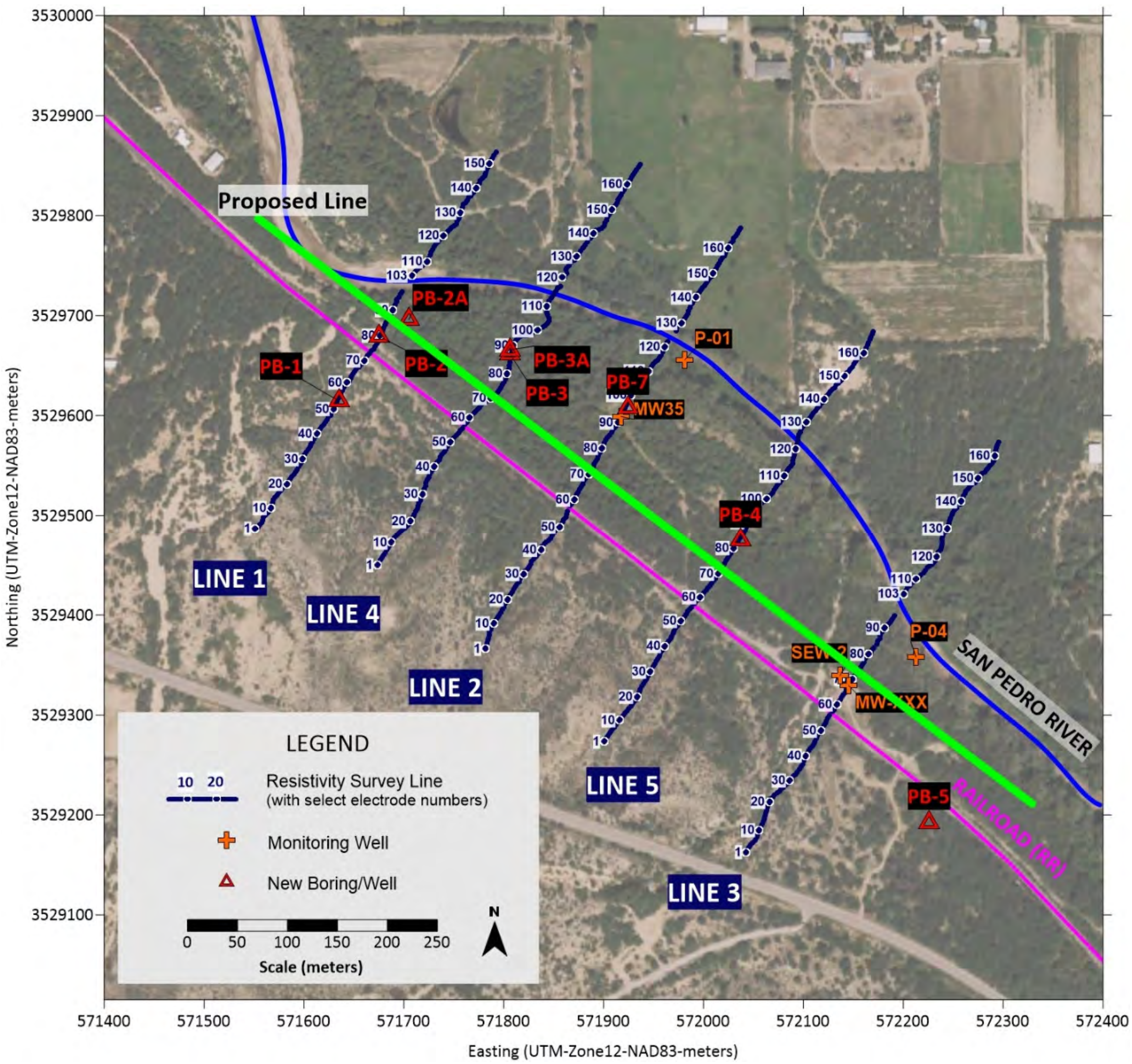
For Lines 1 and 4, the original interpretation was tweaked due to a near surface, reworked clay layer that challenged that interpretation. The St. David clay was actually deeper than originally predicted with the reworked clay lens being rather shallow in Line 1 and deepening as we move upgradient along the river. The borings also showed a sandy aquifer between the two clays. It is unfortunate that more of the shallow borings along Lines 1 and 4 were not deeper to confirm the thinning of the aquifer towards the southwest.

Based on the latest round of characterization, we recommend:

- the shallow borings along Lines 1 and 4 be deepened to investigate the location of the bottom of the reworked clay and top of the St. David clay. It is suspected that a sandy aquifer will be encountered between the clay, which will allow for a well to be set to withdraw or monitor groundwater.

- At least one more resistivity line be acquired to help bridge our understanding of the potential for shallow aquifers to exist beneath the surficial reworked clay layer. The line should be acquired perpendicular to the existing set of lines (see Figure 24) between the river and railroad tracks. This line should show how the reworked clay dips towards the southwest and possibly comingle or terminate near the St. David clay. For example, the deep clay layer encountered in PB-7 along Line 3 is listed as the same color as the surficial clay in PB-1. It would also serve to help understand subsurface conditions between Lines 1 and 4, where the highest degree of change is observed in the geophysical data.

Figure 24. Proposed new resistivity line



7.0 REFERENCES

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APPENDIX H

RESULTS OF 2018 ANNUAL POND COVER INSPECTION REPORT

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

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Tucson, AZ 85704
Phone: 520.881.7300
Fax: 520.529.2141

VIA EMAIL AND FEDERAL EXPRESS

January 7, 2019

Ms. Gwenn Ziegler
DEUR Program Coordinator
1110 W. Washington Street
Phoenix, AZ 85007

Re: Results of the 2018 Annual Pond Cover Inspection
Apache Nitrogen Products, Inc., Cochise County, Arizona

Dear Ms. Zeigler:

Pursuant to the August 22, 2008 Arizona Department of Environmental Quality (ADEQ) Declaration of Environmental Use Restriction for Property with Engineering Control and Non-Residential Restriction (DEUR), Hargis + Associates, Inc. (H+A), on behalf of its client, Apache Nitrogen Products, Inc. (ANPI), is submitting this annual inspection report for the above-referenced property (Figure 1). As required by the terms of the DEUR, this report:

- Describes the status of the institutional controls and the condition of the engineering controls for the pond areas;
- States the nature and cost of maintenance activities performed on engineering controls during the 2018 calendar year;
- Includes photographs depicting the condition of the engineering controls; and
- Describes the status of the financial assurance mechanism and certifies that the financial assurance mechanism is being maintained.

The main text of the DEUR is provided (Attachment A).

Native soil covers (pond covers) were installed over Ponds 1A and 1B (1A/1B), Ponds 2A and 2B (2A/2B), Ponds 3A and 3B (3A/3B), Pond 7, and the Dynagel Pond (Figure 2) in accordance with the April 22, 2008, *Remedial Action Implementation Report for Pond Soils and Sediments* (H+A, 2008). A single pond cover was installed at each of the five pond locations, 1A/1B, 2A/2B, 3A/3B, 7, and the Dynagel Pond. Therefore, for the purposes of this report, Ponds 1A/1B, Ponds 2A/2B, and Ponds 3A/3B are referred to as Pond 1, Pond 2, and Pond 3, respectively (Figure 3).

Other Offices:
Mesa, AZ
Folsom, CA
San Diego, CA

Institutional and Engineering Controls

Pursuant to the terms of the DEUR, institutional controls are in place to limit the use of the ANPI property to non-residential use and prohibit the excavation or other disturbance of the pond covers. The institutional controls also prohibit the installation of shallow aquifer wells on the ANPI property except for wells used in the remediation and/or monitoring of the shallow aquifer.

Engineering controls include the five native soil pond covers, erosion control devices at each pond cover, perimeter fencing, native vegetation, and warning signs around the ponds. In accordance with the April 22, 2008 *Remedial Action Implementation Report for Pond Soils and Sediments* (H+A, 2008) quarterly maintenance requirements for the engineering controls include:

- Inspecting erosion control devices installed on the pond covers for damage or wear;
- Inspecting surface and side slopes of the pond covers for development of erosional channels;
- Repairing or replacing damaged erosion control devices until native vegetation has re-established;
- Replacing damaged, missing, or illegible warning signs;
- Filling in and compacting erosional channels greater than two inches deep; and
- Repairing any damage to the facility perimeter fence.

Quarterly inspections of engineering and institutional controls were performed by ANPI in March 2018 (First Quarter), May 2018 (Second Quarter), and August 2018 (Third Quarter). An annual inspection was performed by H+A in December 2018.

On March 10, 2018 the following findings were documented:

- Erosion control devices were noted as out of place on Pond 2. Erosion control devices at Ponds 1, 2, 3, and Dynagel were noted as deteriorated. The erosion control devices at Pond 7 were in good condition. Natural vegetation is taking over, lessening the need for erosion control devices.
- Erosion channel(s) less than 2 inches deep on Ponds 1 and 2 side slopes were noted. With respect to erosion channels, Ponds 3, 7, and Dynagel were in good condition.
- Warning signs were in place and in good condition at Ponds 1, 2, 3, 7 and Dynagel.
- The plastic yellow warning chains at Pond 7 and Dynagel were noted as needing repair.

On May 15, 2018 the following findings were documented:

- Erosion control devices were noted as out of place on Pond 2. Erosion control devices at Ponds 1, 2, 3, and Dynagel were noted as deteriorated. The erosion control devices at Pond 7 were in good condition. Natural vegetation continues to take over, lessening the need for erosion control devices.
- Erosion channel(s) less than 2 inches deep on Pond 1 side slopes were noted. With respect to erosion channels, Ponds 2, 3, 7, and Dynagel were in good condition.
- Warning signs were in place and in good condition at Ponds 1, 2, 3, 7 and Dynagel.
- The plastic yellow warning chains at Pond 7 and Dynagel were noted as needing repair.

On August 16, 2018 the following findings were documented:

- Erosion control devices were noted as needing repair at Ponds 1, 2, and Dynagel. Erosion control devices at Ponds 1, 2, 3, and Dynagel were noted as deteriorated. The erosion control devices at Pond 7 were in good condition. Repairs recommended after annual winter rainy season is over.
- Erosion channel(s) less than 2 inches deep on Ponds 1, 2, and 7 side slopes were noted. With respect to erosion channels, Ponds 3 and Dynagel were in good condition. Repairs recommended after annual winter rainy season is over.
- Warning signs were in place and in good condition at Ponds 1, 2, 3, 7 and Dynagel.
- The plastic yellow warning chains at Pond 7 and Dynagel were noted as needing repair.

On the December 7, 2018 annual inspection, the following findings were documented:

- Per DEUR Declaration G.1, the erosion control devices will be maintained until native vegetation re-establishes. The original engineering controls were installed December 2007 and the site exhibits 11 years of vegetation growth. Native vegetation was observed re-establishing at the erosion control devices at the time of the 2018 inspection, and included grasses, mesquite, and cactus. The native vegetation appears to be aiding in the production of natural soil cover and thereby replacing the erosion control devices with natural soil cover. Increased native vegetation was observed re-establishing at all the pond covers. As time passes, the need for erosion control devices will continue to decline.
- The Pond 1 cover was in good condition. Erosion control devices showed signs of deterioration, however, native vegetation has re-established to the point where erosion control devices are considered optional. No erosion was observed on Pond 1.
- The Pond 2 cover was generally in good condition with the following exceptions:
  - Erosion control devices showed signs of deterioration, however, native vegetation has re-established across the majority of the pond. Replacement of erosion control devices is recommended at the pond southeast corner.
  - Erosion channels greater than two inches deep were observed on the northeast slope. Recommend the area be re-graded, compacted, and new erosion control devices be installed.
  - One of the warning signs north of Pond 2 was blocked with overgrowth. It is recommended that the sign be moved.
- The Pond 3 cover was generally in good condition with the following exceptions:
  - Erosion control devices showed signs of deterioration, however, native vegetation has re-established across the majority of the pond.
  - Erosion channels greater than two inches deep were observed on the southern and eastern slopes. Recommend these areas be re-graded, compacted, and new erosion control devices be installed.
  - Two warning signs on the north side of Pond 2 were blocked with overgrowth. It is recommended that the signs be moved.

- The Pond 7 cover was generally in good condition with the following exceptions:
  - Erosion control devices showed signs of deterioration, however, native vegetation has re-established across the majority of the pond. At three locations, erosion control devices have moved out of place and require repair.
  - Erosion channels greater than two inches deep were observed on the eastern slope. Recommend the area be re-graded, compacted, and new erosion control devices be installed.
  - Plastic-chain warning fence installed immediately around the pond has fallen down. However, per the DUER, warning fence around individual ponds is not required. Therefore, repair of the warning fence is considered optional and not necessary.
- The Dynagel Pond cover was generally in good condition with the following exceptions:
  - Erosion control devices showed signs of deterioration, however, native vegetation has re-established across the majority of the pond. At two locations, erosion control devices have moved out of place and require repair.
  - One warning signs on the west side is leaning at a 45-degree angle. It is recommended that the sign be restored to an upright position.
  - Plastic-chain warning fence installed immediately around the pond has fallen down. However, per the DUER, warning fence around individual ponds is not required. Therefore, repair of the warning fence is considered optional and not necessary.
- Property perimeter chain-link fence in close proximity to the ponds was inspected and found to be in good condition. The complete property perimeter chain-link fence was not inspected.
- ANPI provided 1st, 2nd and 3rd quarter pond inspection reports.

On January 3, 2019, ANPI was provided a list of action items based on the inspection results described above and anticipates completion of the items by the next quarterly inspection (tentatively scheduled for March 2019).

Restoration Costs

ANPI provided maintenance and restoration costs to H+A on December 21, 2018. The 2018 total cost associated with the Engineering Control maintenance was $3,215.00. The total cost included labor costs of $3,215.00 and materials costs of $0. Annual maintenance and restoration costs typically range between $4,000 and $6,000.

Photographs of Engineering Controls

Photographs of the pond covers and engineering controls taken during the December 2018 annual inspection are provided (Attachment B).

Financial Assurance

ANPI has provided financial assurance using a Certificate of Deposit naming ADEQ as the Beneficiary. ANPI may not withdraw any portion of the principal without the written consent of the Director of ADEQ.

References

H+A, 2008. *Remedial Action Implementation Report for Pond Soils and Sediments (CERCLA Media Component 3 and Formerly Active Ponds), Revision 1.0, Apache Powder Superfund Site, Cochise County, Arizona.* April 22, 2008.

Please contact me if you have questions or need additional information.

Sincerely,

HARGIS + ASSOCIATES, INC.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
53826
ANTHONY R.
ROSSI
Date Signed
ARIZONA, U.S.A.
Expires 09/30/21

Anthony Rossi, PE
Senior Engineer

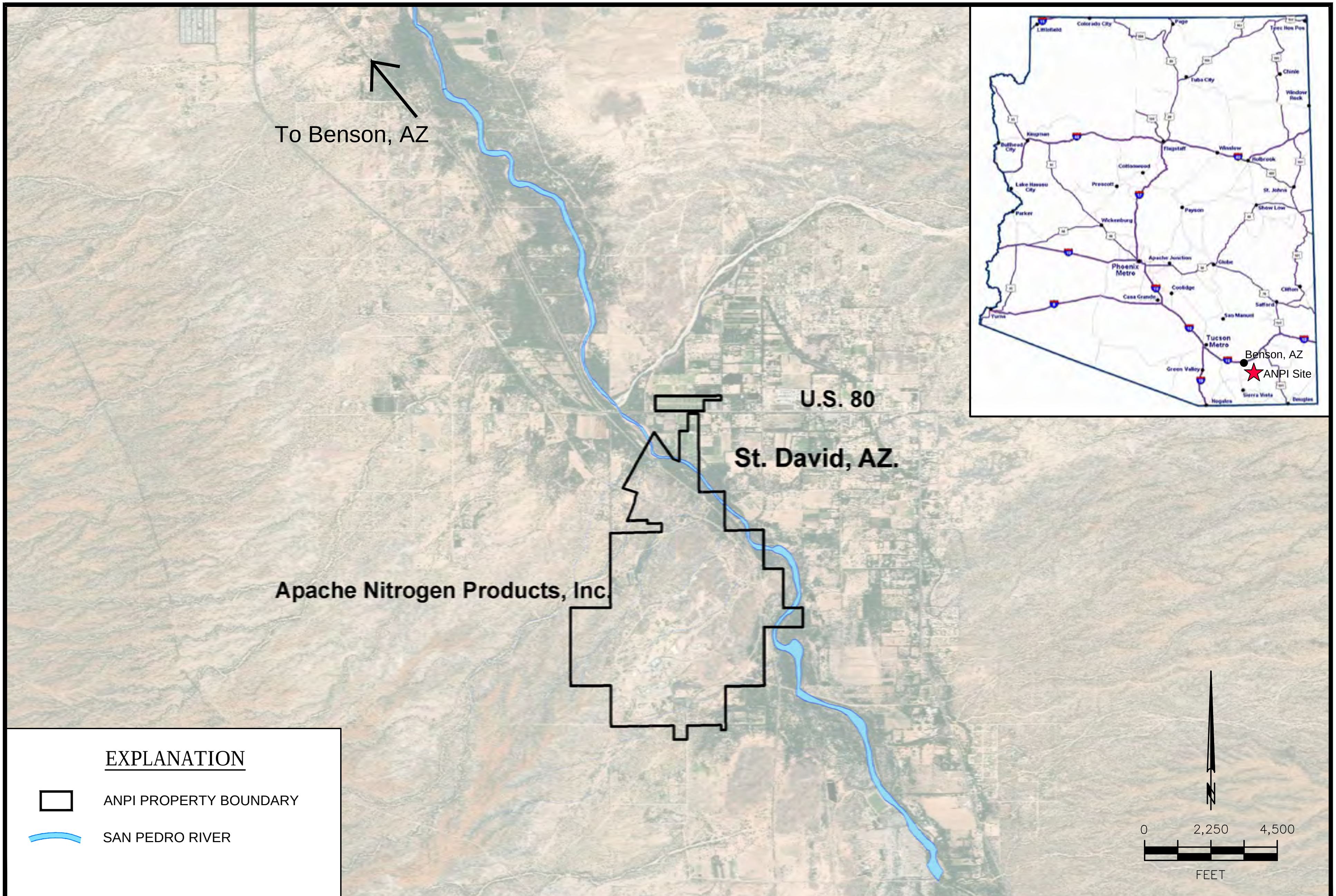
TRR/jak

Attachments:	Figure 1	Site Location
	Figure 2	Location of Covered Ponds
	Figure 3	Location of Covered and Former Ponds
	Attachment A	Declaration of Environmental Use Restriction For Property with Engineering Control and Non-Residential Restriction, dated 9/4/08
	Attachment B	2018 Photographic Documentation

cc: Andria Benner, EPA (Email only)
Jerry Helton, ADEQ (Email only)

130_H01_RptLtr01_2018_ANPI_PondInspectRpt

FIGURES

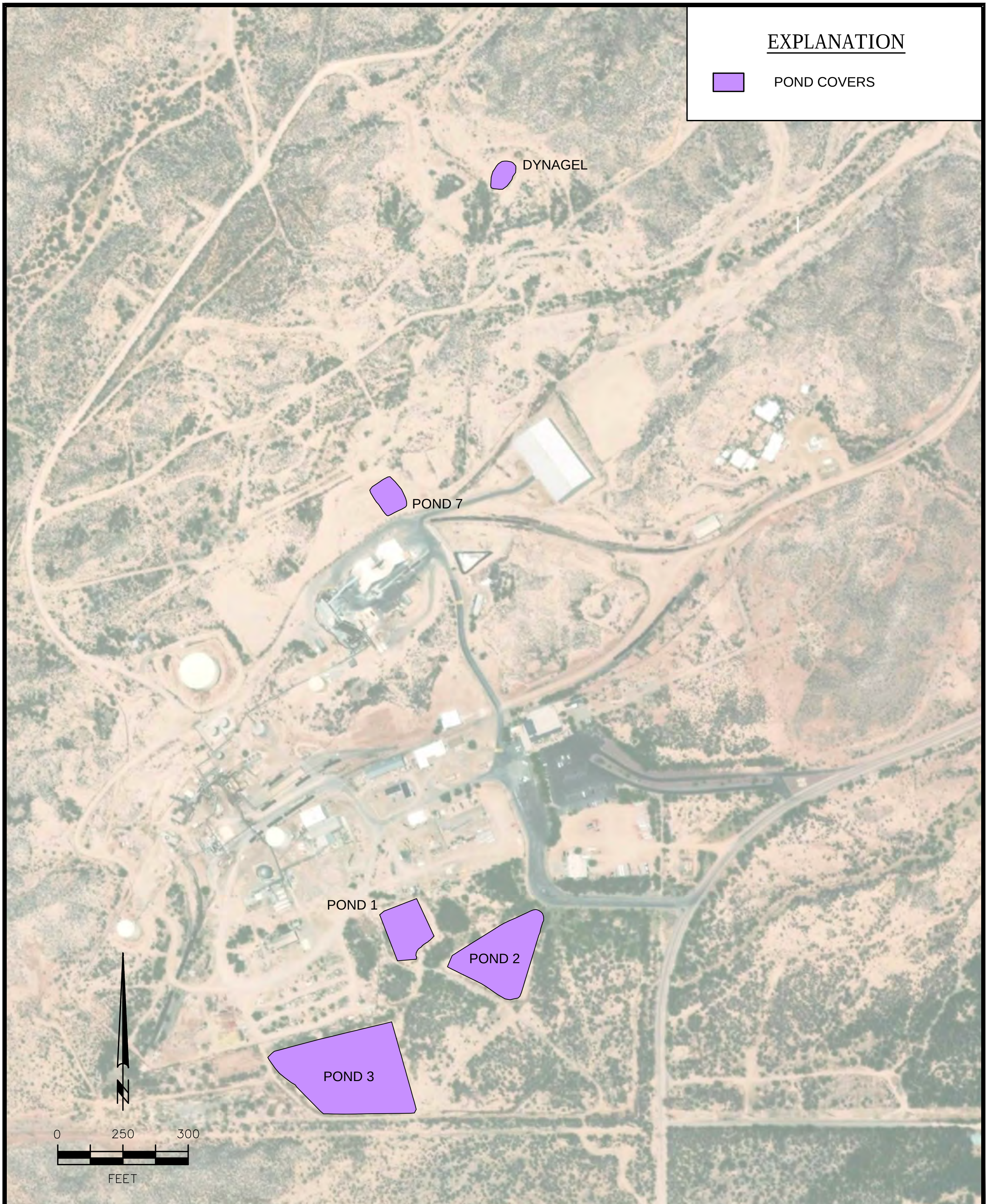


1/19	RPT NO.130.139	410-10020	A

Jan 03, 2019 - 3:10pm ESS - T:\2018\100-199\Apache\Hydrogeology\H+A Basemaps\410-10020.dwg

HARGIS + ASSOCIATES, INC.
Hydrogeology/Engineering

FIGURE 1.
SITE LOCATION
APACHE NITROGEN PRODUCTS, INC., COCHISE COUNTY, ARIZONA



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1/19	RPT NO.130.139	410-10021	A

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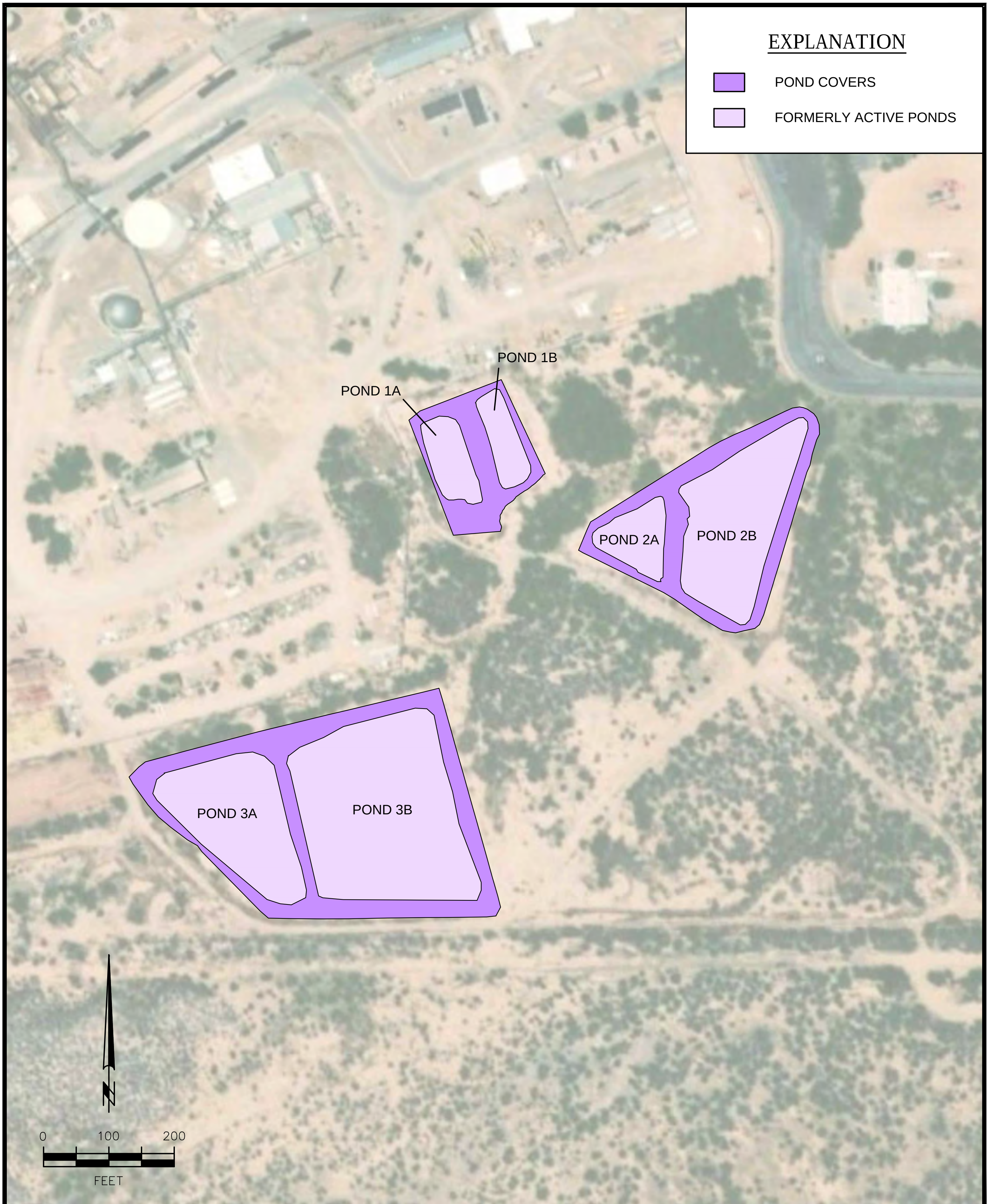
Hydrogeology/Engineering

FIGURE 2.
LOCATION OF COVERED PONDS
APACHE NITROGEN PRODUCTS, INC., COCHISE COUNTY, AZ



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1/19	RPT NO.130.139	410-10021	A

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Hydrogeology/Engineering

FIGURE 3.
LOCATION OF COVERED AND FORMER PONDS
APACHE NITROGEN PRODUCTS, INC.

HARGIS + ASSOCIATES, INC.

ATTACHMENT A

DECLARATION OF ENVIRONMENTAL USE RESTRICTION FOR PROPERTY WITH ENGINEERING CONTROL AND NON-RESIDENTIAL RESTRICTION

2008-23984
Page 1 of 40
Requested By: APACHE NITROGEN PRODUCTS
Christine Rhodes - Recorder
Cochise County, AZ
09-04-2008 01:19 PM Recording Fee $45.00

When recorded, return to:

Apache Nitrogen Products, Inc.
P.O. Box 700
Benson, AZ 85602

DECLARATION OF ENVIRONMENTAL USE RESTRICTION FOR PROPERTY WITH ENGINEERING CONTROL AND NON-RESIDENTIAL RESTRICTION

Superfund
Apache Nitrogen Products, Inc.
P.O. Box 700
Benson, AZ 85602

This Declaration of Environmental Use Restriction ("Declaration"), when recorded, is a covenant that runs with and burdens the Property, binds all owners and owners' heirs, successors and assigns, and inures to the benefit of the Arizona Department of Environmental Quality ("Department") and the State of Arizona.

This Declaration is executed and recorded by Apache Nitrogen Products, Inc., an Arizona Corporation.

DECLARATION

Owner covenants and agrees as follows:

A. Presence of Contamination. Environmental contaminants are present on a portion of real property located at 1436 S Apache Powder Road, St David, Arizona ("Property").

B. Warranty of Title. Owner is the only owner of, and holds equitable and legal title to, the Property and has authority to execute and record this Declaration.

C. Legal Description. Owner's deed setting forth the legal description of the Property at which the contamination is located is attached and marked "Exhibit 1." A legal description of the portion of the Property subject to this Declaration is attached and marked as "Exhibit 2."

The Property tax number is 121-01-005.

D. Maps. The location of the Property identified in "Exhibit 1" is depicted on a map attached and marked as "Exhibit 3"; the portion of the Property subject to this Declaration is depicted on a map attached and marked as "Exhibit 4."

E. Completion of Remediation. The date that remediation, remedial action, corrective action or response action was completed: April 2008. (Reference Remedial Action Implementation Plan & Engineering Control Plan)

F. Environmental Contaminant Information. Soil contaminants subject to this DEUR are listed in Exhibit 5. A site-specific statistical risk evaluation was conducted by ADEQ in 2004. This risk evaluation focused on the pond soils Contaminants of Concern (COCs) Beryllium (Be), Antimony (Sb), and Arsenic (As) in Ponds 1A, 1B, 2A, 2B, 3A, 3B, 7, and Dynagel. The concentrations of Be found in Ponds 2B, 3B, and 7 were only slightly greater than the residential SRL of 1.4 mg/kg, but below the non-residential SRL of 11 mg/kg. Therefore, the Be residuals were well below the threshold considered for ADEQ's risk evaluation. The concentrations of Sb at Dynagel pond, and for As at Ponds 1A, 1B, 2A, 2B, 3A, 3B, 7, and Dynagel were evaluated statistically. The analysis for Sb yielded a 95 percent UCL lower than the residential SRL for Sb; therefore, no additional risk-based evaluation for Sb was deemed necessary. The 95 percent UCL for As concentrations at all of the ponds except 2B and 3B exceeded the site-specific background concentration of 19.2 mg/kg; the respective residential and non-residential SRLs of 10 mg/kg; and the residential and non-residential health-based protection levels of 0.4 mg/kg and 1.6 mg/kg. Pond 2B contained one sample with a concentration of As greater than the background concentration while Pond 3B contained none.

COCs in the shallow groundwater at the site include nitrate and perchlorate, both of which are being remediated using a combination of active pump-and-treat (with constructed wetlands) and monitored natural attenuation. This DEUR also restricts the use of the contaminated aquifer beneath Apache's property.

G. Engineering/Institutional Control Statements. Because Owner is using an engineering control and an institutional control to satisfy the requirements of A.R.S. §§ 49-152 or 49-158, Owner agrees to the following:

1. The institutional controls limit the use of the Property to non-residential use as defined in A.R.S. § 49-151 where natural persons are not reasonably expected to be in frequent contact with the soil. These institutional controls prohibit excavation or other disturbance of the soil cover. The institutional controls also prohibit the installation of shallow aquifer wells on the Property except for wells used in the remediation and/or monitoring of the shallow aquifer.

The engineering controls consist of the following:

- The 2 foot native soil cover sides have a minimum 2 horizontal to 1 vertical slope.
- The surface of the covers were graded to promote surface runoff and sloped to approximate the slope of the surrounding native topography.
- Erosion control devices were installed and will be maintained until native vegetation re-establishes.
- Perimeter fence around the property.
- Signs around the perimeter of the ponds warning people not to enter.

2. The engineering controls were constructed in December 2007.

3. The maintenance requirements of the institutional controls are that Owner assures that the restricted area not be subject to residential use as defined in by A.R.S. § 49-151. The quarterly maintenance requirements of the engineering controls are:

- Inspect erosion control measures installed on the cover for damage or wear
- Inspect surface and side slopes of cover for development of erosional channels
- Repair or replace damaged erosion control measures
- Replace damaged, missing, or illegible warning signs
- Fill in and compact erosional channels greater than 2 inches deep
- Repair any damage to facility perimeter fence

The maintenance requirements for the engineering controls are specified in the Engineering Control Plan (Appendix A) document dated April 2008. Owner agrees to maintain the specified maintenance requirements and implement the procedures outlined in the document.

4. In order to protect the public health and the environment, the engineering controls and the institutional controls must remain in place because contaminant levels exceed residential soil standards, and because of the requirement to eliminate the potential for human exposure to contaminants of concern (COCs) present at concentrations that could pose a threat to human health and prevent migration.

5. If any person desires to cancel or modify the engineering controls or institutional controls in the future, the person shall obtain the Department's prior written approval. Any modification of the engineering or institutional controls without the Department's prior written approval is void and a violation of this Declaration.

6. Owner hereby grants to the Department and its representatives, authorized agents, attorneys, investigators, consultants, advisors, and contractors the right of access to the Property at all reasonable times to verify that the engineering controls and institutional controls are being maintained. The Department's right of access is continuing and runs with the land. If access to the Property is restricted, Owner shall have any barrier to entry opened or removed at the Department's request.

7. Owner shall incorporate the terms of this Declaration into any lease, license or other agreement that is signed by Owner and that grants a right with respect to the Property. The incorporation may be in full or by reference.

8. Owner agrees to provide a copy of the Engineering Control Plan document dated April 2008 to the subsequent purchaser of the property. Additional copies can be obtained through the Arizona Department of Environmental Quality (ADEQ), Waste Program Division, Site Assessment Unit.

H. Engineering Control Plans/Financial Assurance. The engineering control plans and financial assurance mechanism prescribed by A.R.S. § 49-152.01 are as follows:

The Engineering Control Plan submitted to ADEQ documents inspection and maintenance that will be performed to ensure the integrity of the closed ponds. In addition to quarterly inspections, monitoring of the native soil cover and physical components of the institutional controls will be performed monthly to ensure their long-term competency and to identify maintenance requirements. If necessary, future surveys will be performed to verify pond cover surface elevations. Permanent survey monuments installed near each pond cover will serve as benchmarks for future surveys.

Apache Nitrogen Products, Inc. has provided financial assurance using a Certificate of Deposit naming the Arizona Department of Environmental Quality as the Beneficiary (Appendix B).

I. Periodic Inspections and Reports. Because ANPI has elected to use an engineering control and institutional control to satisfy the requirements of A.R.S. §§ 49-152 or 49-158, ANPI shall maintain the controls to ensure that they continue to protect public health and the environment, and shall inspect the engineering control at least once each calendar year or more in accordance with the Engineering Control Plan Document dated April 2008. Within thirty days after the annual inspection to be conducted in December, ANPI shall submit to the Department a written report that:

1. Describes the condition of the engineering controls and the status of the institutional controls;

2. States the nature and cost of all restoration made to the engineering controls during the calendar year;

3. Includes current photographs of the engineering controls; and

4. Describes the status of the financial assurance mechanism prescribed by A.R.S. § 49-152.01, and a certification that the financial assurance mechanism is being maintained.

The inspection report shall be submitted to the DEUR Program Coordinator at the following address: 1110 W. Washington Street, Phoenix, Arizona 85007.

J. Additional Information. More detailed information on the remediation is maintained and available at the Department of Environmental Quality, located at 1110 W. Washington Street, Phoenix, Arizona 85007.

K. Release of this Declaration. Request for the release of this Declaration pursuant to A.R.S. §§ 49-152(D) or 49-158(L) may be filed by owners holding all equitable and legal title to the Property or having legal authority to file the request. The release portion of the fee specified in R18-7-604 was paid for this Declaration. If Owner elected, pursuant to R18-7-605, not to pay the release portion with the original fee, a release will not be granted until the Department receives payment of the release portion of the fee specified in R18-7-604, which is in effect at the time of the release request.

L. Sale or Transfer of the Property. At least five working days before the sale or other transfer of title to or an interest in the property or any portion of the property, the Owner and buyer or transferee shall provide written notice and written commitment as required by A.R.S. §49-152.01(C).

M. Failure to Comply. If Owner fails to comply with this declaration or to implement the Engineering Control Plan document dated April 2008, the Department shall give Owner written notice by certified mail of the failure. If Owner fails to take the action specified in the Department's notice, the Department may issue an order pursuant to A.R.S. §§ 49-152.02 and 49-158(I) and take any other action allowed by law.

N. Related Rules. If this Declaration is being used to comply with R18-12-263.01(B)(4)(d), the remaining information required by that rule is attached as Exhibits: *NA*.

Pamela J. Beilke, Director of Compliance & Quality
Owner *[state full name]*

Pamela J Beilke
[signature]

Apache Nitrogen Products, Inc.
P.O. Box 700
Benson, AZ 85602
[current address of Owner]

This Declaration of Environmental Use Restriction was subscribed and sworn before me this 25 day of July, 2008 by:
Pamela J. Beilke, Director of Compliance + Quality
[state full name and legal status of each Owner]

[signature]

KAREN T SMITH
NOTARY PUBLIC -- ARIZONA
COCHISE COUNTY
My Commission Expires
May 31, 2012

Notary Public
My commission expires: May 31, 2012

This Declaration of Environmental Use Restriction is approved this 22nd day of August, 2008 by the Arizona Department of Environmental Quality.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY, an agency of the State of Arizona,

by:

____
[signature of the Department's authorized agent]

Name Amanda Stone
[print name of the authorized agent]

Its Director, Waste Programs Division
[state person's official title]

This Declaration of Environmental Use Restriction was subscribed and sworn to before me this 22nd day of August, 2008 by:

Amanda E. Stone, Dir. WPD
[state full name and title of Department's agent]

____
Notary Public

OFFICIAL SEAL
FELICIA M. KRZYWICKI
NOTARY PUBLIC - State of Arizona
MARICOPA COUNTY
My Comm. Expires Jan. 19, 2009

My commission expires: Jan 19, 2009

ATTACHMENT B

2018 PHOTOGRAPH DOCUMENTATION

Pond 1, Looking SW
12/07/2018

Pond 1, Looking NW
12/07/2018

Pond 2, Looking E
12/07/2018

Pond 2, Looking N
12/07/2018

Pond 3, Looking W
12/07/2018

Pond 3, Looking N
12/07/2018

Pond 7, Looking NW
12/07/2018

Pond 7, Looking NE
12/07/2018

Dynagel Pond, Looking SE
12/07/2018

Dynagel Pond, Looking E
12/07/2018

APPENDIX I

2018 WELL INVENTORY UPDATE

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

7400 N. Oracle Rd.
Suite 202
Tucson, AZ 85704
Phone: 520.881.7300
Fax: 520.529.2141

VIA FEDERAL EXPRESS

March 29, 2019

Andria Benner
Remedial Project Manager
US EPA, Region 9
Superfund Division SFD-6-2
75 Hawthorne Street
San Francisco, CA 94105

Re: 2018 Well Inventory Update, Apache Powder Superfund Site, Cochise County, Arizona

Dear Ms. Benner:

As directed by the U.S. Environmental Protection Agency[1] (EPA), Apache Nitrogen Products, Inc. (ANPI) has completed its 2018 well inventory update. The well inventory area surrounds the Apache Powder Superfund Site and comprises an area of approximately 386 square miles. The primary purposes of the well inventory are to (1) identify shallow aquifer wells in the vicinity of the ANPI study area, and (2) track well development and construction as it may relate to human exposure pathways associated with contaminated groundwater associated with the Apache Powder Superfund Site.

The well inventory comprises an assemblage of well information managed in both electronic and hardcopy formats. The electronic media are stored within Microsoft Access Database and a Geographic Information System (GIS) based on ArcView 10 architecture. The hardcopy media consist of records contained within the Arizona Department of Water Resources' (ADWR) Imaged Records. ADWR's Imaged Records consist of scanned documents and correspondence between the well owner and ADWR. The following paragraphs describe the well inventory.

[1] EPA, 2005. Amendment to Record of Decision Apache Powder Superfund Site Benson, Arizona. September 2005.

Other Offices:
Mesa, AZ
San Diego, CA

INPUT DATA

Data sources for the well inventory include the ADWR Wells 55 database, Groundwater Site Inventory (GWSI) database, and field data collected by ANPI. The GWSI database was originally created by the U.S. Geological Survey, but is now managed by ADWR.

The ADWR Wells 55 database contains a large number of records, including registry IDs that have no associated imaged record. The database is not site-verified. It also includes all Notices of Intent (NOI) filed with ADWR. In addition to actual, completed water wells, NOIs may represent exploratory borings, dry wells that were never completed as water wells, foundation borings, denied or cancelled NOIs, etc. Additionally, property owners sometimes file NOIs, but do not actually drill the petitioned well. On the other hand, occasionally NOIs are filed with and accepted by ADWR and the well is actually completed, but the well driller does not file a well driller report with ADWR. ANPI routinely receives and reviews NOIs provided by Arizona Department of Environmental Water Quality (ADEQ). These NOIs are those that represent wells within a specified distance from the shallow aquifer which ADEQ review was requested as a matter of assuring against human exposure by plume avoidance or against aquifer cross-contamination via special construction design.

The GWSI database is site-verified, but it is not nearly as comprehensive as the Wells 55 database. GWSI data was used to supplement Wells 55 data in the ANPI well inventory and to verify that a well does exist.

Field data collected by ANPI, such as the 1990 Site Survey including a private well survey and quarterly groundwater monitoring knowledge, was used to correct known mistakes within the ADWR Wells 55 database or to verify the existence of a well. Additionally, reconnaissance is ongoing. ANPI personnel continuously monitor drilling activities within the area.

WELL LOCATION METHOD

ADWR's method of well location is to position the well within the center of the smallest division of the reported location. As a result, the cadastral location of wells reported in the Wells 55 database is not exact. For example, if the location in the driller's report is given as Township/Range/Section/160 Acres/40 acres/10 acres, its accuracy is assumed to be precise to within ten acres and its location is plotted in the center of that ten acre area. Often, locations are not reported to within ten acres. Thus, a map produced from well locations taken from the Wells 55 database often produces a grid like configuration. In fact, a well with only the Township/Range/Section information could be mislocated by as much as 0.7 miles.

METHODOLOGY

An area including the Apache Powder Superfund Site study area as defined at the outset of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigation was initially selected to assure inclusion of all potentially relevant records. This area was considerably larger than the actual extent of the study area as well as the affected portions of the shallow aquifer because it is intended to have a substantial buffer. More recently, EPA agreed that it would be appropriate to reduce the size of the area in consideration of the shrinking of the contaminant plume.[2]

ADWR's well data set was therefore "clipped" to include a more focused area and incorporates the ANPI study area, the affected areas of the shallow aquifer, and a buffer zone. This area is oriented roughly parallel to the course of the San Pedro River and is referred to as the "detailed" extent (Figure 1). All wells within this zone are included in both the electronic and hardcopy components of the well inventory. In addition to the hardcopy media, any wells within the detailed extent area having an available ADWR Imaged Record were hyperlinked to the corresponding well record. This provision facilitates viewing of further information for selected wells in the GIS.

Further descriptive information was added to the database as a means of identifying relevant information for each well within the inventory. This descriptive information includes the following categories:

- Aquifer
- Conf_aqui
- Conf_loc
- Comments
- Drill_log
- Loc_update
- Location

These categories are described in the following sections.

"Aquifer" defines the "water-bearing zone" tapped by the well. The "water-bearing zones" include the shallow aquifer, deep, or other aquifer. In some instances, the wells may be classified as dry and in others, as unknown. If the well depth was reported as less than 200 feet, the well was assumed to be tapping the shallow aquifer, initially. Further scrutiny of the well log, location, depth-to-water, etc. as reported in the Imaged Record or as ascertained from field knowledge was then made to verify shallow aquifer assignment. If the well depth was reported as greater than 200 feet, the well was assumed to be tapping the deep aquifer. In some cases, generally ones with field knowledge, the well was classified as "other" referring to wells in the ANPI perched zone or the design confirmation piezometer, monitoring the ANPI Northern Area Remediation System. If the well was described as "artesian" or "flowing" in the water well report, but well depth was not reported, its category was assigned as "unknown," because in technical terms, artesian simply means that the water level in the well is above a confining unit. This condition has been observed to exist both in the shallow and deep aquifers according to location and geologic conditions. If the well drilling did not encounter water, the well was classified as "dry."

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[2] See EPA comment letter and 2014 Annual Performance Monitoring and Site-Wide Status Report-Apache Powder Superfund Site dated April 1, 2015.

The **Conf_aqui** category contains information concerning a well's existence and history. For instance, if a well was verified by ANPI or by GWSI, it is so identified. It is also indicated if ADWR's Imaged Record only has an existing well registration, NOI, or if it contains a well driller's report among other things.

The **Conf_loc** category declares the actual confidence in the existence of a particular well. It is largely contingent on information reported in the **conf_aqui** category. One of five well groupings was assigned: "well not evaluated," "confirmed well," "unconfirmed well," "aborted/cancelled well," or "abandoned well." Most wells outside the detailed extent were assigned to "well not evaluated" grouping. Wells that have been site verified by either ANPI or the GWSI database, have a well driller report, or have an existing well registration were assigned to the "confirmed well" grouping. Wells that only have a NOI, or there is no Imaged Record, were assigned to the "unconfirmed well" grouping. Any well with an NOI denial or cancellation were assigned to the "aborted/cancelled well" grouping. Finally, wells with a Notice of Abandonment or known ANPI exploratory boreholes were assigned to the "abandoned wells" grouping.

The **Comments** category is for adding notes, specifically if a category originally filled out by ADWR was changed based on additional or new information.

The **Drill_log** category indicates whether a driller's report is available for the particular well. The column simply indicates "yes," "no," or "unknown." This provision facilitates searches for wells located within a certain area that have additional information available in the form of the driller's report.

The **Loc_update** category indicates whether a well location has been updated by ANPI. The column simply indicates "yes" or "no." In 2006, ANPI acquired an extensive set of Cochise County assessor maps. The assessor maps, imaged records, and field knowledge combined allowed for many shallow well locations within the detailed extent to be updated manually.

The **Location** category indicates which general area the well can be located, the study area, the northern area, the eastern area, or the northeastern area.

WELLS POTENTIALLY AT RISK

As stated earlier, the well inventory was designed with the intent to identify shallow aquifer wells within the vicinity of the ANPI study area that may be within the extent of the nitrate-nitrogen (nitrate-N) plume. After each well update, GIS is used to "filter" out deep or unknown wells within the detailed extent area. A determination of "wells potentially at risk" is based on an overlay of the extent of the limits of nitrate-N in concentrations exceeding ten milligrams per liter (10 mg/l) within the shallow aquifer, based on the most current sampling and analysis from quarterly monitoring rounds outlined in performance monitoring plans and the 2018 annual report.[3,4,5]

If any of the new, confirmed shallow wells are within, or reasonably close to, the extent of the plume, the well owners are notified. "Reasonably close to" is defined as a buffer zone of 0.7 miles from the extent of the nitrate-N plume. This buffer was chosen on the basis of maximum error associated with ADWR's convention of assuming the well is located at the center of the smallest areal division reported. Specifically, if only the Township, Range, and Section are reported, the distance from the center of the section to the corner is 0.7 miles.

RESULTS OF THE 2018 WELL INVENTORY UPDATE

The current well inventory is based on January 8, 2019 Wells 55 download from the ADWR within the reduced survey area. Based on the update, the inventory consists of 1,155 wells within the detailed extent (Figure 2). Within this area, 247 wells are confirmed shallow wells (Figure 3), 481 are confirmed deep wells (Figure 4), 22 are confirmed other aquifer wells, and the remaining are classified as unknown, aborted/cancelled, or abandoned wells.

Based on the November 2018 nitrate-N plume, the inventory identified no new wells as being considered at risk (Figure 5). Three additional registration records associated with non-ANPI owners were added to the database between 2017 and 2018 that include wells 55-229034, -229245, and -229719.

Well 55-229034 was authorized to drill in late June 2018. The driller proposed a 600 foot total depth for this well. Based on this anticipated total depth it is probably a deep well. The completion status of this well is currently unknown. More information will be added to the next well inventory update based on review of 2019 records.

Well 55-229245 was completed in early November 2018. Total depth of the well was 518 feet below land surface (bls) and a driller's log was filed for this well. Based on the completed depth and review of the driller's log, this well can be categorized as a deep well.

Well 55-229719 was authorized to drill in late November 2018. The driller proposed a 600 foot total depth for this well. The well is reported to be located in the area of the 0.7-mile radius from the November 2018 nitrate-N plume. Based on the proposed total depth and the intention of the driller to install a grout plug at least 50 feet into the St. David Formation, it is expected that this well will be a deep well. The completion status of this well is currently unknown. More information will be added to the next well inventory update based on review of 2019 records.

---

[3] H+A, 2007. *Southern Area Performance Monitoring Plan Revision 2.0.* September 19, 2007.

[4] H+A, 2009. *Performance Monitoring Plan for Monitored Natural Attenuation of Shallow Aquifer Groundwater in The Northern Area of the Apache Powder Superfund Site Revision 1.0.* February 12, 2009.

[5] H+A, 2017. *2017 Annual Performance Monitoring and Site-Wide Status Report Apache Powder Superfund Site.* March 28, 2018.

During calendar year 2018, ANPI drilled eight new shallow wells for the purpose of remedy acceleration. They are identified as extraction wells PB-2A, PB-4, PB-7 and piezometers NAP-1 through NAP-5.

Last year's well inventory included two new private wells for which status was unknown at the time of publication. Review of 2018 records for these wells indicate the following:

- Well 55-228110 was completed in early February 2018. The total depth of the well is 500 feet bls based on the driller's log. Based on the driller's log, this well is a confirmed deep well.

- Well 55-228133 was completed in early July 2018. Total depth of the well is 360 feet bls and is classified as a confirmed deep well based on review of the driller's log.

The nitrate-N plume delineated based on groundwater analyses collected during the November 2018 quarterly performance monitoring round was used to evaluate shallow wells completely within the plume and within 0.7 miles of the plume perimeter. The plume footprint in November 2018 was unchanged from the previous footprint based on August 2017 data. A total of 100 shallow wells were confirmed within this area (Figure 6; Table 1). Note that Table 1 was edited to remove all wells reported as "cancelled" in the ADWR well registry records. This resulted in removal of 16 wells that appeared on the 2017 table.

Thirty of the 100 shallow wells belong to either ANPI or are within the ANPI performance monitoring network. A significant number of the remaining wells are located east of the San Pedro River and south of the Dragoon Wash (aka Gila Wash). Due to the groundwater flow pattern from the St. David Area, it is believed that this area is at minimal risk from the nitrate-N plume. The owners of the remaining wells have been contacted by ANPI to determine the operational status of the wells and the type of groundwater usage.

INVENTORY UPDATES

The well inventory is updated on an annual basis. This update involves acquiring a database update using the latest ADWR Wells 55 database by downloading it from ADWR's URL site: (https://tinyurl.com/y56u6w3f). Next a query is run for new wells, a review is conducted of the imaged Records for new wells, and organizing of Imaged Records for new wells is performed. This update is performed in a manner that does not break the hyperlinks existing between wells and portable document files (pdf) of the Imaged Records. Every annual update also reevaluates the Imaged Records of the previous year's wells at potential risk to check for ownership updates, abandonment, etc. A new search for wells at potential risk using the most current nitrate-N plume is performed on the confirmed shallow wells. Any new wells at potential risk are reported along with any updates to wells on previous year's potential risk list in the annual letter report.

Approximately every five years, a more extensive update is performed. Five-year updates are timed to coincide with EPA's Five-Year Review. This update was during last year's inventory and is scheduled next during calendar year 2022. This activity involves updates of the Imaged Records for wells already within the inventory, as appropriate, reviewing Imaged Records for all wells, and organizing hardcopies of all new and updated wells. ADWR's Imaged Records are periodically updated with new ownership, abandonment data, availability of driller's logs etc.

The enclosed portable hard drive contains the well inventory database along with the image folder (1.2 GB in size). A "readme" file is included and it details instructions for the well inventory and how to link to the imaged records. The inventory database file has several queries included with it. These queries include: shallow, confirmed wells; deep, confirmed wells; other, confirmed wells; unconfirmed wells; aborted/cancelled wells; and abandoned wells.

Please contact me if there are any questions concerning this report.

Sincerely,

HARGIS + ASSOCIATES, INC.

LEO S. LEONHART, PHD, RG
Principal Hydrogeologist/Senior Technical Director

Enclosures: Table 1
Figures 1 through 6

cc w/encl: PMP Distribution

TABLE

TABLE I-1
ANPI 2018 WELL INVENTORY
SHALLOW WELLS WITHIN 0.7 MILES OF THE NITRATE-N PLUME

REGISTRY ID	CADASTRAL LOCATION	WELL DEPTH	INSTALLED	COMMENTS	Owner	DRILLER REPORT AVAILABLE IN IMAGED RECORDS	LOCATION
85222	D(18-21)06BAA	75	10/20/1980	Well location is East of SPR and South of Dragoon	MAYBERRY, JIM,	YES	SA
204298	D(18-21)06DBB	68	9/25/2004	ANP MW-36	APACHE NITROGEN PRODUCTS INC	YES	SA
206932	D(18-21)06AAB	121	38541	Well location is East of SPR and South of Dragoon	ERNEST & MARLA PESQUEIRA	YES	SA
209230	D(17-21)32CCC				SOUTHWEST GAS CORPORATION		
215849	D(17-20)36DCC	133	7/16/2007	ANP MW-42	APACHE NITROGEN PRODUCTS INC	NO	SA
218794	D(18-21)06ABB	140	4/20/2009	Well location is East of SPR south of U.S. 80.	DAMON TREJO	YES	SA
219483	D(18-21)06ADB				KENNETH WHITNEY		
220063	D(17-21)31DDA				DAVID DAUGHERTY		
501649	D(17-20)36DDD	125	6/24/1982	CGMP Private Well	VENICE J HIGGINBOTHAM, TRUSTEE	YES	SA
503019	D(18-21)05CAD	130	6/30/1982	Well location is East of SPR and South of Dragoon	PB & SD KARTCHNER	YES	SA
503534	D(17-20)36DDC	125	8/16/1982	CGMP Private Well	SCOTT,J	YES	SA
513537	D(18-21)06ADA	240	3/26/1986	CGMP Private Well	WHITE, EULAS,E	YES	SA
528008	D(18-21)07AAA	53			APACHE POWDER CO,		
528009	D(18-21)07CDC	62	5/11/1990	ANP MW-13	APACHE POWDER CO,	YES	SA
528018	D(18-21)06BCC	102	5/6/1990	ANP MW-08	APACHE POWDER CO,	YES	SA
528020	D(18-21)06CCB	50	5/7/1990	ANP MW-09 - DRY	APACHE POWDER CO,		
528021	D(18-21)06DBC	40	5/5/1990	ANP MW-10	APACHE POWDER CO,	YES	SA
528022	D(18-21)06DBD	62	5/8/1990	ANP MW-11	APACHE POWDER CO,	YES	SA
530043	D(18-21)06BBD	120	7/17/1991	ANP evaluated property owner for a deep replacement well was found to have a deep well (see 55-530042).	MITCHELL, HUGH,A	YES	SA
530522	D(18-21)06BCD	140	2/11/1991	ANP MW-17	APACHE NITROGEN PROD,	YES	SA
530523	D(18-21)06BCD	140	2/10/1991	ANP MW-18	APACHE NITROGEN PROD,	YES	SA
562198	D(18-21)07BBA	25	5/16/1997	ANP DCP-12	APACHE NITROGEN PRODUCTS INC	YES	SA
562927	D(18-21)06CBB	85	7/2/1997	ANP MW-19	APACHE NITROGEN PROD,	NO	SA
562928	D(18-21)06BBD	100	7/10/1997	ANP MW-20	APACHE NITROGEN PROD,	NO	SA
562930	D(18-21)06BCC	110	7/10/1997	ANP SEW-1	APACHE NITROGEN PROD,	YES	SA
576951	D(18-21)06ABA	120	12/18/1999	Well location is East of SPR and South of Dragoon	SAMUEL & RACHEL FRY	YES	SA
577270	D(18-21)06BCB	128	12/27/1999	CGMP Private Well	THOMAS S HAYMORE	YES	SA
579875	D(18-21)07AAA	27	6/1/2000		APACHE NITROGEN PRODUCTS INC		
594007	D(18-21)06DBD	45	9/11/2002	ANP MW-34	APACHE NITROGEN PRODUCTS INC	YES	SA
594008	D(18-21)06BDA	54	9/17/2002	ANP MW-35	APACHE NITROGEN PRODUCTS INC	YES	SA
594574	D(17-21)31DDD	140	3/4/2003	Well location is East of SPR and South of Dragoon	ANDREW MAYBERRY	YES	SA
594823	D(17-21)31DCC	155		Well location is East of SPR and South of Dragoon	JERRY & RUTH BRIMHALL	YES	SA
596097	D(18-21)06ABA	118		Well location is East of SPR and South of Dragoon	DAMON TREJO	YES	SA
606590	D(18-20)01AAA	138	6/20/1980	CGMP Private Well	LORIN P MCRAE	YES	SA
607625	D(18-21)06AD*	80	9/30/1962	Well location is East of SPR and South of Dragoon; Well owner has other shallow well in CGMP	WHITE,E E	NO	SA
607854	D(17-21)31DDA	80	8/1/1939	Well location is East of SPR and South of Dragoon	GOODMAN,D R	NO	E
607856	D(18-21)06AAA	60		Well location is East of SPR and South of Dragoon	JUDD,J V	NO	SA
607860	D(17-21)31DCA	132	2/2/1950	Well location is East of SPR and South of Dragoon	JERRY & RUTH BRIMHALL	NO	E
608770	D(18-20)01DCC				BRUCE J HANCOCK		
609235	D(18-21)06DAC	108	3/31/1977	Well location is East of SPR and South of Dragoon	SCOTT THACKER	NO	SA
609236	D(18-21)05CBB	115	1/1/1958	Well location is East of SPR and South of Dragoon	SCOTT THACKER	NO	SA
609244	D(18-21)05CBB				SCOTT THACKER		
609573	D(17-21)31DDD	125	8/1/1964	Well location is East of SPR and South of Dragoon	ALARCON,R	NO	SA
610200	D(17-21)31DDC	140		Well location is East of SPR and South of Dragoon	FENN,G L	NO	SA
612814	D(18-21)06ABB	100	1/1/1929	Well location is East of SPR and South of Dragoon	MAYBERRY,R	NO	SA
612815	D(18-21)06ABB				COCHISE COUNTY INVESTMENTS, LLC		
613372	D(17-21)31DDD				BOWMAN,G B		
618510	D(18-21)06AD*	0		Well location is East of SPR and South of Dragoon	CLINTON & BEVERLY HEPNER	NO	SA
619450	D(18-21)06ACA	104	10/4/1976	Well location is East of SPR and South of Dragoon; Included in 1990 Inventory	COCHISE COUNTY INVESTMENTS, LLC	NO	SA
620712	D(18-21)06B**	100	1/1/1977	CGMP Private Well	KEMPTON,G J	NO	SA
620713	D(18-21)06B**	40	1/1/1931	Kempton/Jones Well not in CGMP	KEMPTON,G J	NO	SA
620728	D(17-21)31DDC	150		Well location is East of SPR and South of Dragoon	SANDVE,P A	NO	SA
623460	D(17-21)31DDB	135	5/1/1970	Well location is East of SPR and South of Dragoon	REYNOLD MAX MORTENSON	NO	E
623461	D(17-21)31DDB	235	6/1/1970	Well location is East of SPR and South of Dragoon	JAMES PROCTOR	NO	E
625379	D(18-21)05BC*	160	1/1/1970	Well location is East of SPR and South of Dragoon	NEIL & APRIL GINTZ[1]	NO	SA
625380	D(18-21)05BC*	200	1/1/1969	Well location is East of SPR and South of Dragoon	BRANCH & ROSS,	NO	SA
627686	D(18-21)06ABB	105	1/1/1929	Well location is East of SPR and South of Dragoon	COCHISE COUNTY INVESTMENTS, LLC	NO	SA
627698	D(18-21)06BAA	105	1/1/1954	Well location is East of SPR and South of Dragoon	MAYBERRY,E J	NO	SA
627699	D(18-21)06ABB	60	1/1/1951	Well location is East of SPR and South of Dragoon	COCHISE COUNTY INVESTMENTS, LLC	NO	SA
627700	D(18-21)06BAA	105	1/1/1980	Well location is East of SPR and South of Dragoon	MAYBERRY,E J	NO	SA
628448	D(17-21)31DCC				COCHISE COUNTY INVESTMENTS, LLC		
628450	D(17-21)31DCB				COCHISE COUNTY INVESTMENTS, LLC		
628464	D(18-21)06AD*	100		Well location is East of SPR and South of Dragoon	JASON & CHRISTY POSEGATE	NO	SA
631237	D(17-21)31CC*	200	4/1/1949	Well location is East of SPR and near Dragoon	SIMEON AND JOSHUA R. COLEMAN[1]	NO	SA
631238	D(17-21)31CC*	200	4/1/1949	Well location is East of SPR and near Dragoon	CHILDS,F	NO	SA
631239	D(17-21)31CC*	200		Well location is East of SPR and near Dragoon	RILEY, ROBERT,A	NO	SA
631240	D(17-21)31CC*	200		Well location is East of SPR and near Dragoon	RILEY, ROBERT,A	NO	SA
631273	D(18-21)06BAA	95	6/6/1962	Well location is East of SPR and South of Dragoon	ALEXANDER,J W	NO	SA
631274	D(18-21)06BAA	30	12/31/1927	Well location is East of SPR and South of Dragoon	ALEXANDER, JAMES & B,	NO	SA
631275	D(18-21)06BAB	50	1/1/1925	CGMP Private Well	ALEXANDER,J W	NO	SA
631276	D(18-21)06BAA	50	6/1/1942	Well location is East of SPR and South of Dragoon	ALEXANDER,J W	NO	SA
631775	D(18-21)06AAB	125	12/31/1936	Well location is East of SPR and South of Dragoon	BRYCE, DANIEL,V	NO	SA
631777	D(18-21)06AAB	100	11/23/1977	Well location is East of SPR and South of Dragoon	BRYCE, DANIEL,V	NO	SA
631778	D(18-21)06ADB	100	11/23/1977	Well location is East of SPR and South of Dragoon	TREJO,A J	NO	SA
631795	D(17-21)31CBD				RILEY, ROBERT,A		
631796	D(17-21)31CCC	24	1/1/1930	Well location is East of SPR and near Dragoon	RILEY, ROBERT,A	NO	SA
631797	D(17-21)31CBD				RUSSELL & SHEILA HUNTER		
637271	D(18-21)06AD*				JASON & CRISTRY POSEGATE		
641700	D(17-21)31DD*	100	12/7/1974	Well location is East of SPR and South of Dragoon	MERRILL,G E	NO	E
642472	D(18-21)05B00				PYLANT,G E		
645416	D(18-21)06AAB	110	5/2/1976	Well location is East of SPR and South of Dragoon	ROBERT EDWARD BURG	NO	SA
647038	D(18-21)06AD*	80		Well location is East of SPR and South of Dragoon	JASON & CHRISTY POSEGATE	NO	SA
647428	D(18-21)05BBC	125	3/1/1965	Well location is East of SPR and South of Dragoon	MORTENSON,D O	NO	SA
647579	D(18-21)06AAA	100	9/1/1980	Well location is East of SPR and South of Dragoon	SMITH,G L	NO	SA
648981	D(18-21)06AA*				SMITH,D S		
648982	D(18-21)06AA*	80		Well location is East of SPR and South of Dragoon	ALBERT ZYWAR	NO	SA
648983	D(18-21)06AA*				SMITH,D S		
649691	D(18-21)06BCC	120		Carnes shallow well	CARNES,P L	NO	SA
806011	D(18-21)06BCB	100	12/31/1971	CGMP Private Well	WOOTEN, RANDAL,	NO	SA
918671	D(18-21)06DBB	80	9/28/2015	ANP TW-01 (SEW-02)	APACHE NITROGEN PRODUCTS INC	YES	SA
918673	D(18-21)06DBB	75	9/30/2015	ANP MW-45	APACHE NITROGEN PRODUCTS INC	YES	SA
918674	D(18-21)06DBB	60	9/25/2015	ANP MW-46	APACHE NITROGEN PRODUCTS INC	YES	SA
922340	D(18-21)06BDB	107	11/21/2018	ANP PB-2A	APACHE NITROGEN PRODUCTS, INC.	YES	NA
922342	D(18-21)06BDA	66	11/21/2018	ANP PB-7	APACHE NITROGEN PRODUCTS, INC.	YES	NA
922343	D(18-21)06ACD	70	11/20/2018	ANP PB-4	APACHE NITROGEN PRODUCTS, INC.	YES	NA
921793	D(18-21)06BDA	22	6/18/2018	ANP NAP-1	APACHE NITROGEN PRODUCTS, INC.	YES	NA
921794	D(18-21)06ACB	22	6/19/2018	ANP NAP-2	APACHE NITROGEN PRODUCTS, INC.	YES	NA
921795	D(18-21)06ACC	22	6/19/2018	ANP NAP-3	APACHE NITROGEN PRODUCTS, INC.	YES	NA
921796	D(18-21)06ACD	22	6/20/2018	ANP NAP-4	APACHE NITROGEN PRODUCTS, INC.	YES	NA
921797	D(18-21)06DBA	22	6/20/2018	ANP NAP-5	APACHE NITROGEN PRODUCTS, INC.	YES	NA

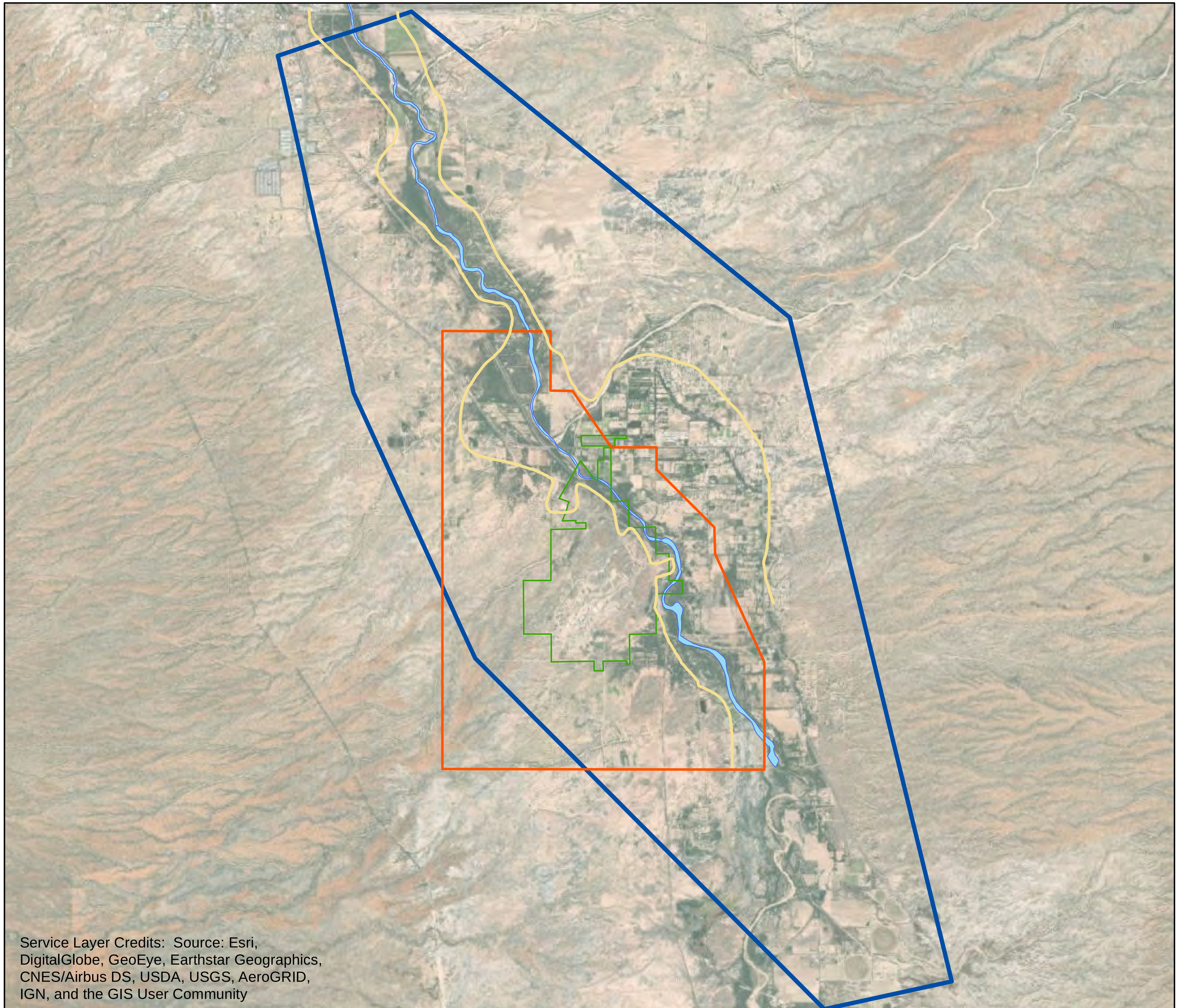
NOTE: Cancelled wells have been removed from the 2018

Footnotes:

* = Not available from ADWR

[1] = Change in ownership in 2018

FIGURES



EXPLANATION

- Shallow Aquifer Boundary
- Property Boundary
- Detailed Extent of Well Inventory
- Study Area
- San Pedro River

N

0 5,000 10,000

Feet

APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

DETAILED EXTENT OF WELL INVENTORY

HARGIS+ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 1

PREP BY: RGW REV BY: LSL	Date: 2/28/2019 File: APPH_2018_fig1	PROJECT: 130.104

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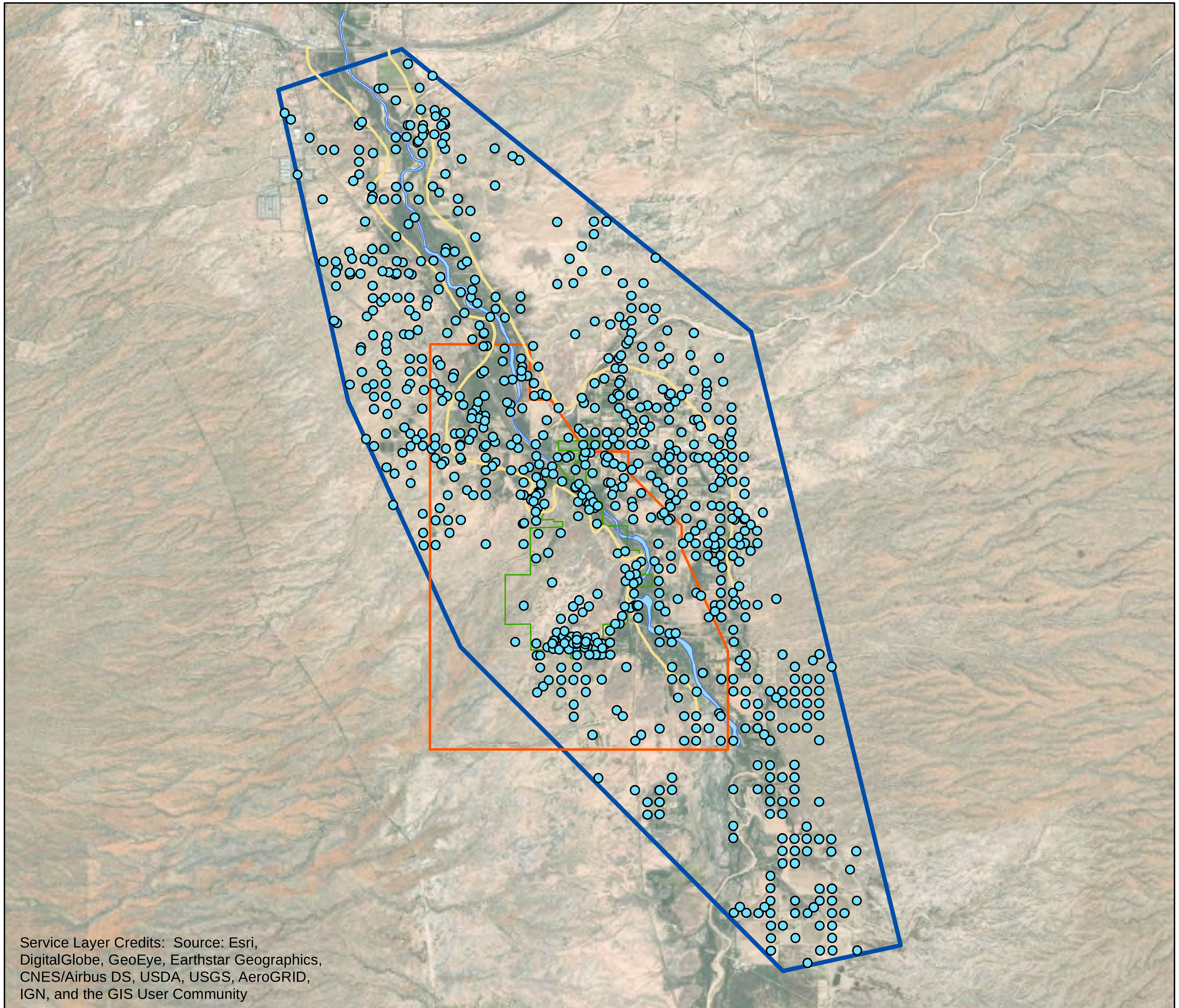

EXPLANATION

- 2018 Wells Within Detailed Extent
- Shallow Aquifer Boundary
- Property Boundary
- Detailed Extent of Well Inventory
- Study Area
- San Pedro River

N

0 5,000 10,000

Feet

APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

2018 WELLS WITHIN THE DETAILED EXTENT

HARGIS+ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 2

PREP BY: RGW REV BY: LSL	Date: 2/28/2019 File: APPH_2018_fig2	PROJECT: 130.104

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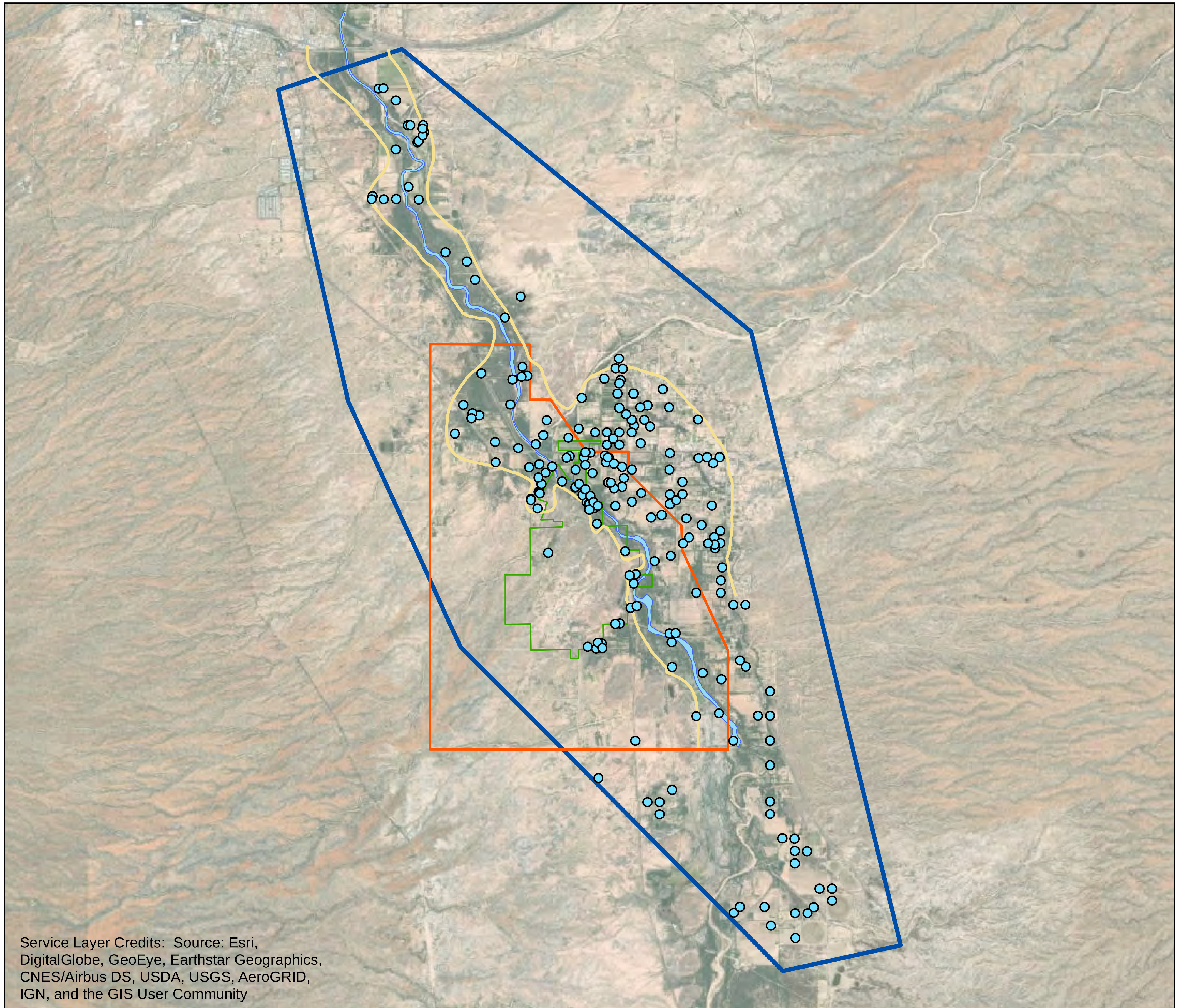

EXPLANATION

- 2018 Confirmed Shallow Wells
- Shallow Aquifer Boundary
- Property Boundary
- Detailed Extent of Well Inventory
- Study Area
- San Pedro River

N

0 5,000 10,000

Feet

APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

CONFIRMED SHALLOW WELLS WITHIN THE DETAILED EXTENT

HARGIS+ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 3

PREP BY: RGW REV BY: LSL	Date: 2/28/2019 File: APPH_2018_fig3	PROJECT: 130.104

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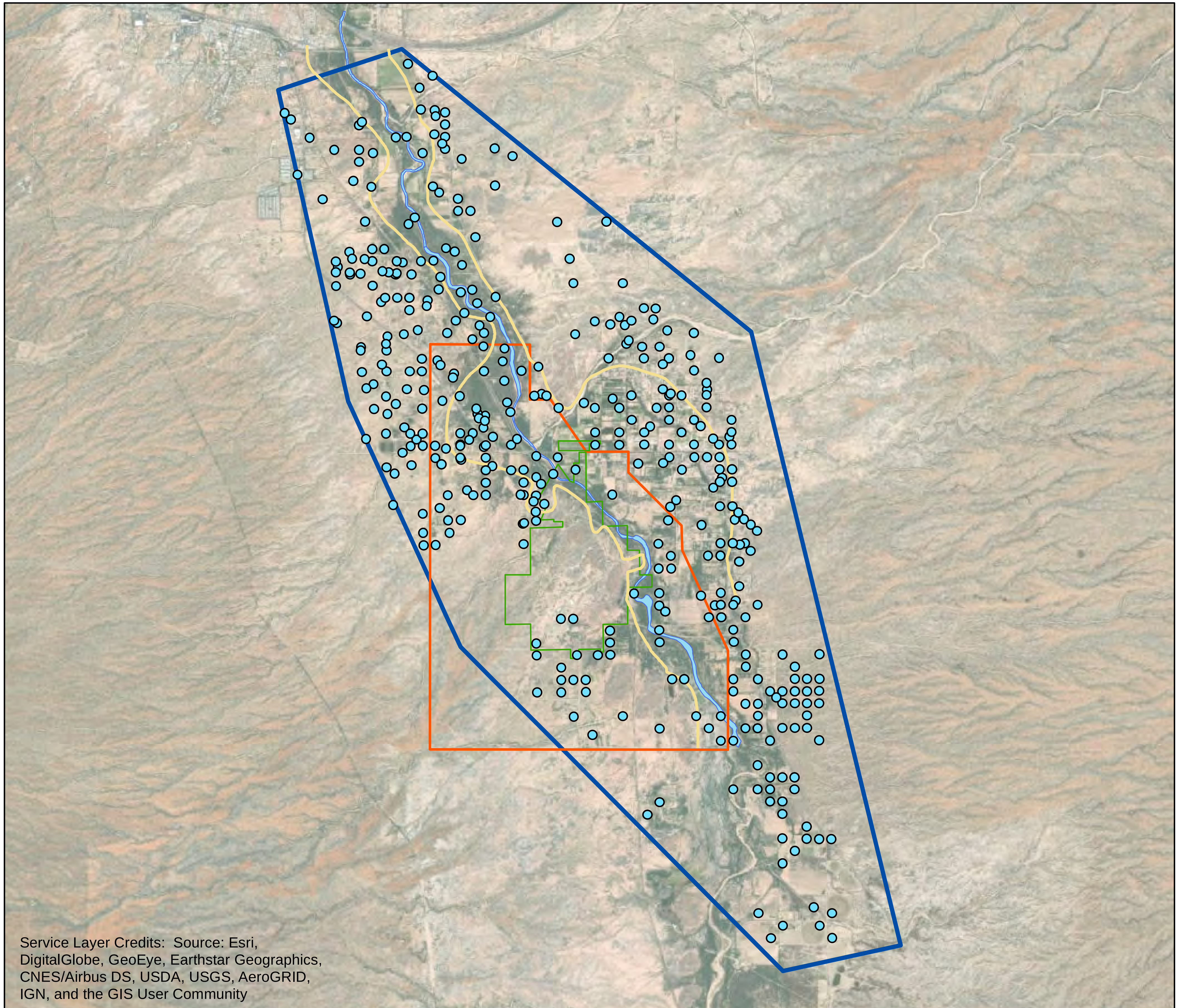

EXPLANATION

- 2018 Confirmed Deep Wells
- Shallow Aquifer Boundary
- Property Boundary
- Detailed Extent of Well Inventory
- Study Area
- San Pedro River

N

0 5,000 10,000

Feet

APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

CONFIRMED DEEP WELLS WITHIN THE DETAILED EXTENT

HARGIS+ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 4

PREP BY: RGW
REV BY: LSL
Date: 2/28/2019
File: APPH_2018_fig4
PROJECT: 130.104

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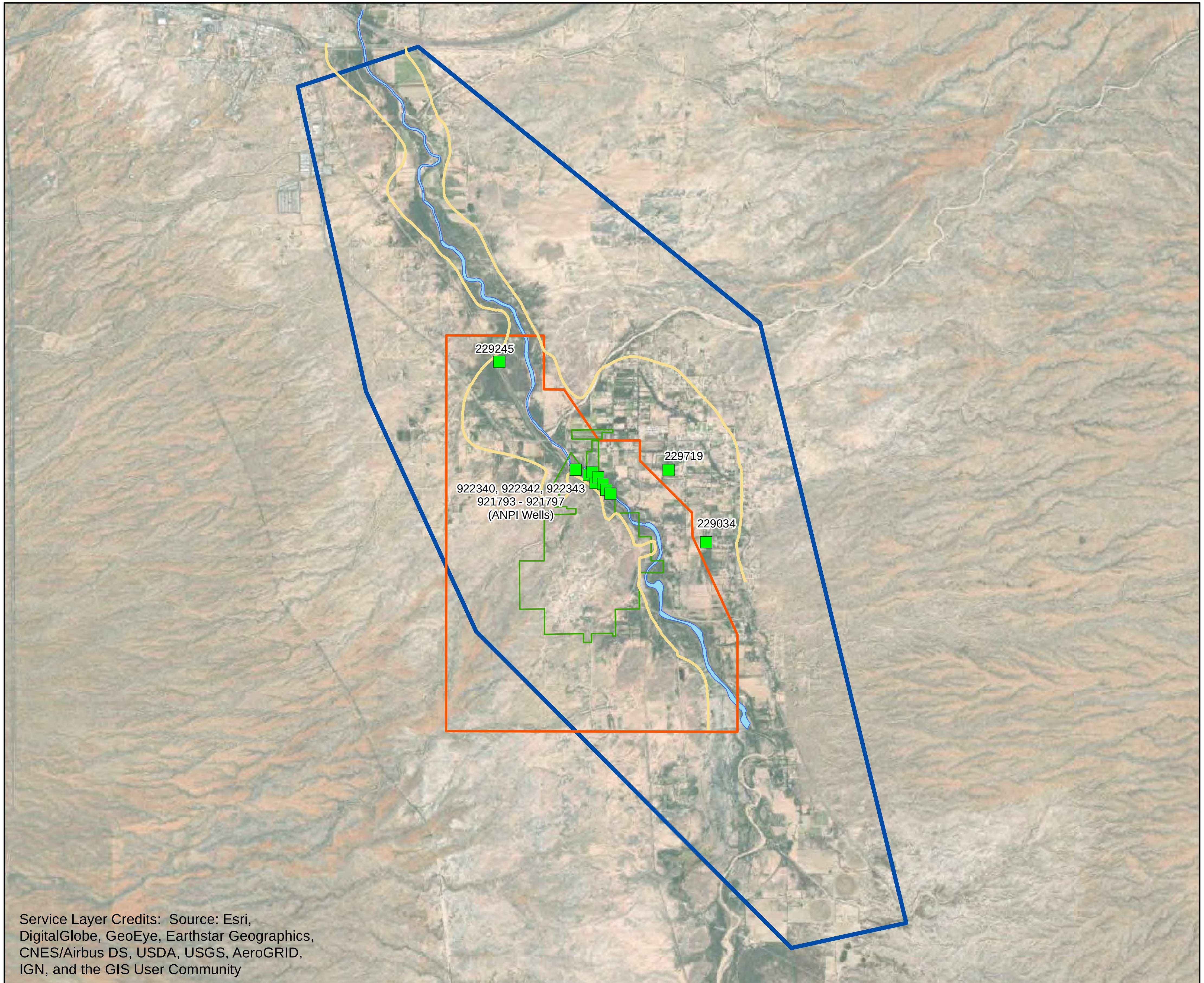

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EXPLANATION

- 2018 New Well Locations Within Inventory Extent
- Shallow Aquifer Boundary
- Property Boundary
- Detailed Extent of Well Inventory
- Study Area
- San Pedro River

N

0 5,500 11,000

Feet

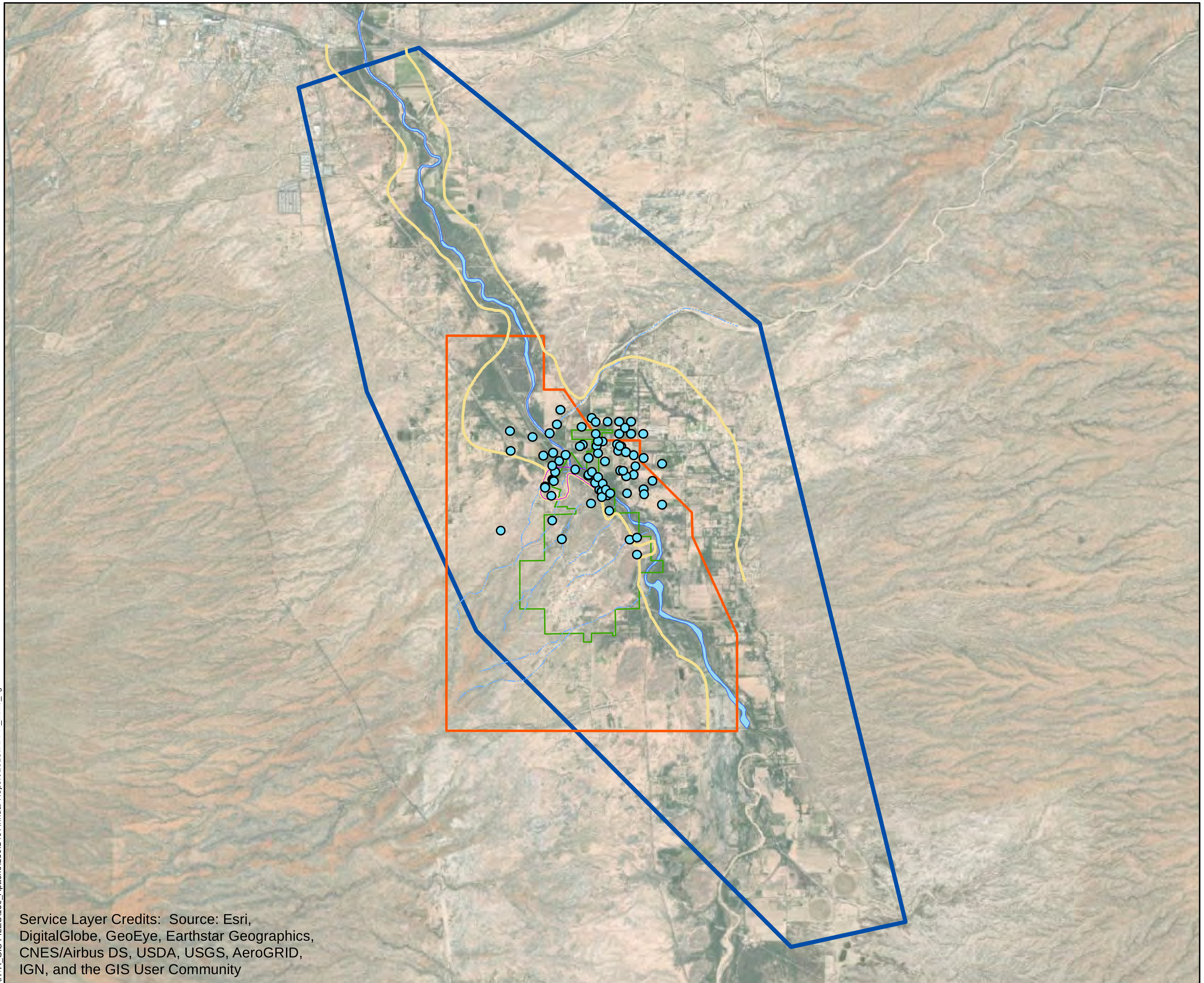
APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

2018 WELL INVENTORY UPDATE
WELLS IDENTIFIED IN THE
INVENTORY EXTENT

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 5

PREP BY: RGW REV BY: LSL	Date: 2/28/2019 File: APPH_2018_fig5	PROJECT: 130.104



EXPLANATION

- Shallow location within 0.7 miles of NO3 plume
- November 2018 Approximate Limit of Nitrate-Nitrogen Exceeding 10 miligrams per liter
- Ephemeral Wash
- Shallow Aquifer Boundary
- Property Boundary
- Detailed Extent of Well Inventory
- Study Area
- San Pedro River

N

0 3,000 6,000

Feet

APACHE NITROGEN PRODUCTS INC.
BENSON, ARIZONA

SHALLOW WELLS WITHIN 0.7 MILES OF THE NOVEMBER 2018 NITRATE-N PLUME

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

FIGURE 6

PREP BY: RGW REV BY: LSL	Date: 2/28/2019 File: APPH_2018_fig6	PROJECT: 130.104

APPENDIX J

DATA ASSESSMENT AND VALIDATION SUMMARY
2018 ANNUAL SUMMARY

APPENDIX J

DATA ASSESSMENT AND VALIDATION SUMMARY
2018 ANNUAL SUMMARY

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TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

%	Percent
ADEQ	Arizona Department of Environmental Quality
Ammonia-N	Ammonia as Nitrogen
ANPI	Apache Nitrogen Products, Inc.
COC	Chain-of-Custody
COD	Chemical Oxygen Demand
E	Estimated
EPA	U.S. Environmental Protection Agency
H+A	Hargis + Associates, Inc.
HU	Unusable
LCS	Laboratory Control Sample
LDC	Laboratory Data Consultants, Inc.
MDL	Method Detection Limit
MNA	Monitored Natural Attenuation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NARA	Northern Area Remediation Acceleration
NARS	Northern Area Remediation System
Nitrate-N	Nitrate as Nitrogen
O&M	Operations and Maintenance
pH	hydrogen ion potential
PMP	Performance Monitoring Plan
ROD	Record of Decision
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
SOPs	Standard Operating Procedures
TAL	TestAmerica Laboratories
TDS	Total Dissolved Solids

ACRONYMS AND ABBREVIATIONS (continued)

TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids
Turner	Turner Laboratory

APPENDIX J

DATA ASSESSMENT AND VALIDATION SUMMARY
2018 ANNUAL SUMMARY

1.0 INTRODUCTION

A laboratory and field data quality assurance/quality control (QA/QC) program has been established to ensure the reliability and validity of data gathered as part of the performance monitoring of groundwater remedies. The QA/QC program ensures that representative, consistent, defensible, and valid water quality and water level data is collected. To achieve these objectives, the QA/QC program is a comprehensive program from the planning stage to the reporting of the data.

Water quality data is extensively reviewed to ensure that quality control criteria have been met in accordance with standard operating procedures (SOPs) outlined in the following supporting documents:

- *Operation and Maintenance (O&M) Plan Northern Area Remediation System (NARS), Revision 3.0* (Hargis + Associates, Inc. [H+A,] 2007a);
- *Southern Area Performance Monitoring Plan (PMP)*, Revision 2.0 (H+A, 2007b);
- *Long-Term Site-Wide Performance Monitoring and O&M of Remedies, Revision 1.0* (H+A, 2009a);
- *PMP for Monitored Natural Attenuation (MNA) of Shallow Aquifer Groundwater in the Northern Area, Revision 1.0* (H+A, 2009b); and
- *Quality Assurance Project Plan (QAPP) Performance Monitoring and O&M of Remedies, Revision 1.0* (H+A, 2010).
- *Workplan to Decommission and Demolish Site Buildings* (H+A, 2012).
- *Northern Area Shallow Aquifer Testing Work Plan (H+A, 2016)*

- *ANPI Building Demolition Program Sampling and Analysis Plan*, Revision 4.0 (H+A, 2017).

QA/QC SOPs are implemented to ensure that the water and soil quality data obtained can be used to support decisions on site assessment and remedial actions. QA/QC SOPs, such as data assessment and validation, are specified in the QAPP (H+A, 2010). As required by the QAPP, SOPs assess the precision, accuracy, and completeness of field and laboratory data. Field data are reviewed to evaluate their completeness and correctness. Field duplicate results are used to evaluate the precision of the sampling technique. Field and equipment blank results are reviewed to verify that sample collection, handling, and transport processes did not affect the quality of the samples. Data generated by the laboratory for analysis of laboratory spike samples and internal laboratory duplicates are evaluated to determine laboratory accuracy and precision.

The following sections provide the 2018 data assessment summary for the monthly NARS, quarterly PMP, Building Demolition, and the Northern Area Remediation Acceleration Testing activities.

2.0 NORTHERN AREA REMEDIATION SYSTEM

NARS water quality samples were collected in accordance with the QAPP and O&M Plan (H+A, 2010 and 2007a). The January through December 2018 NARS analytical data have been extensively reviewed to ensure that QA/QC criteria have been met. Monthly NARS water quality samples were collected from extraction wells SEW-1 and SEW-2, primary effluent location (Effluent), and treatment cells ANA, FDA, PDA-C, PDA-N, and PDA-S. Monthly, samples collected at these locations were analyzed for nitrate as nitrogen (nitrate-N) and all locations except SEW-1 and SEW-2 were also analyzed for ammonia as nitrogen (ammonia-N) (Table 12). Quarterly, all locations were also analyzed for total phosphorus. In addition to total phosphorus Effluent samples were analyzed for total dissolved solids (TDS) and total suspended solids (TSS) and the treatment cell samples were analyzed for chemical oxygen demand (COD), total organic carbon (TOC) quarterly. Annually the Effluent, SEW-1 and SEW-2 samples were analyzed for alkalinity as bicarbonate, carbonate, and hydroxide along with calcium, magnesium, potassium, sodium, fluoride, chloride, orthophosphate, and sulfate. The effluent was also analyzed for total kjeldahl nitrogen (TKN) and organic nitrogen while SEW-1 and SEW-2 were analyzed for perchlorate on an annual basis. The treatment cells were analyzed for TKN and organic nitrogen annually (Tables 13 and 14).

Water quality samples from the design confirmation piezometer DCP-12 and monitor well MW-10 were collected on a quarterly basis. The quarterly DCP-12 and monitor well MW-10 samples were analyzed for nitrate-N and samples collected at monitor well MW-10 were also analyzed for ammonia-N (Table 12).

From January to December 2018, 483 laboratory analyses were performed for treatment cells, Effluent, SEW-1, DCP-12, and monitor well MW-10. The 483 laboratory analyses included 331 originals, 41 field duplicates, 41 splits, and 70 field blanks. See Table I-1 for the number and type of NARS analyses performed in 2018. Original water quality samples, field duplicates, and field blanks were submitted for analysis to Turner Laboratory (Turner) of Tucson, Arizona. Split samples were submitted for analysis to Test America Laboratories (TAL) of Phoenix, Arizona.

In addition to the above listed laboratory analyses, 1,156 field analyses for the treatment cells, SEW-1, SEW-2, and Effluent were performed for electrical conductivity, pH, temperature, dissolved oxygen, and nitrate-N (Appendix E and Table J-1). Field parameters were measured using the YSI Professional Plus direct-reading instrument for electrical conductivity, pH, and temperature, dissolved oxygen, and nitrate-N.

2.1 DATA ASSESSMENT

The NARS water quality data was evaluated using assessment procedures as specified in the QAPP (H+A, 2010). Level II data assessment procedures were performed on 100 percent of the 2018 sampling analytical data. NARS data derived from water quality samples collected from January through December 2018, were assessed by H+A including the evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Field blanks and laboratory reagent blanks;
- LCS recovery
- Matrix spike (MS) recovery;
- Matrix spike duplicate (MSD) analysis;
- Field duplicate analysis;
- Split sample analysis; and
- Data trending.

SOPs were used to assess data reported by the analytical laboratory and to assign H+A data qualifiers (H+A, 2010). The H+A data qualifiers were developed in order to differentiate data qualified by H+A from data qualified by the U.S. Environmental Protection Agency (EPA) (H+A, 2010) and the Arizona Department of Environmental Quality (ADEQ) (ADEQ, 2012). Data qualifiers are entered into the project database and have been tabulated with the analytical results (Tables 12 through 15).

2.2 DATA VALIDATION

Validation of NARS water quality data was performed according to EPA Level IV guidelines by Laboratory Data Consultants (LDC) of Carlsbad, California. The analyses were validated using the following documents, as applicable to each method: 1) USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2017 (EPA, 2017a), and 2) the QAPP (H+A, 2010). Validation is the comprehensive assessment of the raw data including the evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Ion chromatograph performance;
- Initial and continuing instrument calibrations;
- Field blanks;
- Laboratory reagent blanks;
- Laboratory control samples;
- MS recovery and MSD analysis; and
- Compound identification and compound quantitation.

Data validation was performed on the 2018 water quality data after data assessment issues were addressed. The QAPP requires a minimum of 20 percent of the original samples to be validated on an annual basis. Approximately 18 percent of the original data was validated by LDC for NARS water quality samples collected from January through December 2018 (i.e., 61 of the 331 total analyses were validated by LDC). Please note that blank samples were not included when determining the number of samples requiring data validation.

2.3 DATA ASSESSMENT AND VALIDATION RESULTS

Instances where 2018 NARS water quality data failed to meet data quality objectives and acceptance criteria established in the QAPP and EPA Level IV guidelines are summarized in Table J-2. Of the 483 data points, 18 data points were qualified as estimated, “E”. No data points were qualified as unusable, “HU” (Table J-2). All other NARS analytical results met data quality objectives and acceptance criteria.

3.0 GROUNDWATER PERFORMANCE MONITORING

PMP groundwater quality samples were collected in accordance with the SOPs outlined in the Southern Area PMP, PMP for MNA of Shallow Aquifer Groundwater in the Northern Area, and QAPP (H+A, 2007b, 2009b, and 2010). The PMP analytical data, collected quarterly from January through December 2018, have been reviewed to ensure that QA/QC criteria have been met. Water quality data have been reviewed in accordance with SOPs outlined in the QAPP (H+A, 2010). These SOPs are implemented to ensure that the groundwater water quality data obtained can be used to support decisions regarding site assessment and remedial actions. Specifically, SOPs for data assessment and validation are specified in the QAPP.

In accordance with the PMPs, the 2018 groundwater water quality samples were collected on a quarterly basis (i.e., February, May, August, and December). The groundwater quality samples were collected from the MNA groundwater well monitoring network, perched zone piezometers, and surface water locations and were analyzed for nitrate-N, perchlorate, and ammonia-N (Table 7) as required by the sample schedule (Table 3).

From January through December 2018, 170 analyses were performed for groundwater performance monitoring which included 115 originals, 16 duplicates, 23 splits and 16 field blanks. See Table I-3 for the number and type of PMP analyses performed in 2018. Original groundwater quality samples, field duplicates, and field blanks were submitted for analysis to Turner of Tucson, Arizona. Split samples were submitted for analysis to TAL of Phoenix, Arizona.

3.1 DATA ASSESSMENT

The PMP groundwater quality data was evaluated using assessment procedures as specified in the QAPP (H+A, 2010). Level II data assessment procedures were performed on 100 percent of the 2018 sampling analytical data. Procedures used to assess the 2018 quarterly groundwater quality data included evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Field blanks, trip blanks, and laboratory reagent blanks;

- LCS recovery
- MS recovery;
- MSD analysis;
- Field duplicate analysis;
- Split sample analysis; and
- Data trending.

SOPs were used to assess laboratory data and to assign H+A data qualifiers in accordance with the QAPP (H+A, 2010). The H+A data qualifiers were developed in order to differentiate data qualified by H+A from data qualified by the EPA and ADEQ (ADEQ, 2012). Data qualifiers are entered into the project database.

3.2 DATA VALIDATION

Validation of PMP groundwater quality data was performed according to EPA Level IV guidelines by LDC of Carlsbad, California. The analyses were validated using the following documents, as applicable to each method: 1) USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2017 (EPA, 2017a), and 2) the QAPP (H+A, 2010). Validation is the comprehensive assessment of the raw data including the evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Ion chromatograph performance;
- Initial and continuing instrument calibrations;
- Field blanks;
- Laboratory reagent blanks;
- Laboratory control samples;
- MS recovery and MSD analysis; and

- Compound identification and compound quantitation.

Data validation was performed on the 2018 PMP groundwater quality data after data assessment issues were addressed. The QAPP requires a minimum of 20 percent of the original data to be validated on an annual basis. Approximately 43 percent of the data was validated by LDC for PMP groundwater quality samples collected quarterly from January through December 2018 (i.e., 50 of the 115 total analyses were validated). Please note that blank samples were not included when determining the number of samples requiring data validation.

3.3 DATA ASSESSMENT AND VALIDATION RESULTS

Instances where 2018 PMP groundwater quality data failed to meet data quality objectives and acceptance criteria established in the QAPP and EPA Level IV guidelines are summarized in Table J-4. Of the 156 data points, 29 data points were qualified as estimated, “E”. No data points were qualified as unusable, “HU” (Table J-4). All other PMP analytical results met data quality objectives and acceptance criteria.

4.0 BUILDING DEMOLITION

Building demolition activities have, to date, generated approximately 1,280 tons of concrete and or brick debris. Some of the debris with stains and/or residue were segregated for sampling and characterization purposes. In November 2017 and 2018 stained-and/or residue covered concrete and or brick was selectively sampled in an effort to characterize the spectrum of staining types for disposal characterization. Multiple aliquots of types of stained concrete and or brick were collected, pulverized and composited for analysis. Aliquots were generally collected of the upper few inches of stained concrete or brick.

Samples were collected in accordance with the SOPs outlined in the Building Demolition Program Sampling and Analysis Plan, Revision 4.0 (H+A, 2017). The 2018 building demolition samples have been reviewed to ensure that QA/QC criteria have been met. Data have been reviewed in accordance with SOPs outlined in the QAPP and QAPP addendum (H+A, 2010 and 2013). These SOPs are implemented to ensure that the building demolition data obtained can be used to support decisions regarding post-building demolition to solve the problem, make decisions, and achieve the necessary cleanup standards. The total number of analyses performed for the 2018 building demolition program is summarized in Table J-5.

From January through December 2018, 2007 analyses were performed for Apache Nitrogen Products, Inc. (ANPI) demolition soil, concrete, residue, and product samples. This included 1292 originals, 198 field duplicates, and 517 equipment and field blanks. See Table J-5 for the number and type of demolition analyses performed in 2018. The primary laboratory for demolition sample analysis samples was TAL of Denver, Colorado. Additional analyses were performed by Turner.

4.1 DATA ASSESSMENT

The building demolition data was evaluated using assessment procedures as specified in the QAPP (H+A, 2010). Level II data assessment procedures were performed on 100 percent of the 2018 sampling analytical data. Procedures used to assess the 2018 building demolition program data included evaluation of the following:

- Sample holding times;

- Analytical methods and data reporting;
- Equipment blanks and laboratory reagent blanks;
- LCS recovery
- MS recovery;
- MSD analysis;
- Field duplicate analysis;
- Data trending.

SOPs were used to assess laboratory data and to assign H+A data qualifiers in accordance with the QAPP (H+A, 2010). The H+A data qualifiers were developed in order to differentiate data qualified by H+A from data qualified by the EPA and ADEQ (ADEQ, 2012). Data qualifiers are entered into the project database.

4.2 DATA VALIDATION

Validation of building demolition quality data was performed according to EPA Level IV guidelines by LDC of Carlsbad, California. The analyses were validated using the following documents, as applicable to each method: 1) USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review, January 2017 (EPA, 2017b), 2) USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2017 (EPA, 2017a), and 3) the QAPP (H+A, 2010). Validation is the comprehensive assessment of the raw data including the evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Ion chromatograph performance;
- Initial and continuing instrument calibrations;
- Field blanks;
- Laboratory reagent blanks;
- Laboratory control samples;

- MS recovery and MSD analysis; and
- Compound identification and compound quantitation.

For 2018 Demolition samples approximately 20.5 percent of the data was validated by LDC for PMP groundwater quality samples collected quarterly from January through December 2018 (i.e., 265 of the 1292 total analyses were validated). Please note that blank samples were not included when determining the number of samples requiring data validation.

4.3 DATA ASSESSMENT AND VALIDATION RESULTS

Instances where 2018 building demolition program data failed to meet data quality objectives and acceptance criteria established in the QAPP are summarized in Table J-6. For the demolition samples, 78 data points were qualified as estimated, “E” (Table J-6). An additional 1078 results were also qualified as estimated, “E”, due to the analyte reported down to Method Detection Limit (MDL) per project specification (e.g., that is, the target analyte was not detected in the sample or detected at a concentration below the analyte’s reporting limit). Three data points were qualified as unusable, “HU” due to low LCS recovery. All other building demolition analytical results met data quality objectives and acceptance criteria.

5.0 NORTHERN AREA REMEDIATION ACCELERATION TESTING

Recently, ANPI has undertaken a program to determine the feasibility of accelerating the groundwater remedy in the Northern Area of the Apache Powder Superfund Site. Specifically, this program is directed towards attainment of the standard for nitrate-N within the shallow alluvial aquifer as directed in the 1994 Record of Decision (ROD). The standard selected was 10 mg/l nitrate-N. This program has involve a staged investigation directed at refining the characterization of the hydrostratigraphy and the occurrence of nitrate-N in groundwater within the NARS capture zone. As part of this effort, ANPI has undertaken a pilot program involving the construction and operation of a new extraction well (SEW-2). Additionally, a program of exploratory drilling and well construction was initiated in November 2018 and a second phase began in February 2019. The exploration also involved construction of a line of five piezometers along the west bank of the San Pedro River.

The purpose of the piezometers is to determine whether any NARS groundwater extraction might be affecting the subflow region of the San Pedro River. This is determined via two types of data acquisition, water levels and hydrochemistry. For time-variant water level data, the piezometers and selected monitor wells were instrumented with Solinst Levelogger Model 3100 pressure transducers. These produced digital hydrographic data that was correlated to stresses including streamflow, pumping, and barometric pressure changes. Secondly, water samples were collected for the purpose of comparing major ion chemistry in the piezometers against the inland monitor wells.

The Northern Area Remediation Acceleration (NARA) analytical data, collected July through December, 2018 have been reviewed to ensure that QA/QC criteria have been met. Water quality data have been reviewed in accordance with SOPs outlined in the QAPP (H+A, 2010). These SOPs are implemented to ensure that the groundwater water quality data obtained can be used to support decisions regarding site assessment and remedial actions. Specifically, SOPs for data assessment and validation are specified in the QAPP.

A majority of the NARA groundwater samples were collected from the shallow extraction well SEW-2. Additional samples were collected from shallow monitor wells MW-34, MW-35, MW-36, and MW-45 and the five piezometers constructed along the west bank of the San Pedro River. These samples were analyzed for major anions (nitrate, sulfate, chloride, fluoride) and cations (calcium, magnesium, potassium, sodium), along with alkalinity.

From July through December 2018, 431 analyses were performed for NARA monitoring which included 392 originals, 13 duplicates, 13 splits and 13 field blanks. See Table J-7 for the number and type of NARA analyses performed in 2018. Original NARA groundwater samples, field duplicates, and field blanks were submitted for analysis to Turner of Tucson, Arizona. Split samples were submitted for analysis to TAL of Phoenix, Arizona.

5.1 DATA ASSESSMENT

The NARA groundwater data was evaluated using assessment procedures as specified in the QAPP (H+A, 2010). Level II data assessment procedures were performed on 100 percent of the 2017 sampling analytical data. Procedures used to assess the 2018 quarterly groundwater quality data included evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Field blanks, trip blanks, and laboratory reagent blanks;
- LCS recovery
- MS recovery;
- MSD analysis;
- Field duplicate analysis;
- Split sample analysis; and
- Data trending.

SOPs were used to assess laboratory data and to assign H+A data qualifiers in accordance with the QAPP (H+A, 2010). The H+A data qualifiers were developed in order to differentiate data qualified by H+A from data qualified by the EPA and the ADEQ (ADEQ, 2012). Data qualifiers are entered into the project database.

5.2 DATA VALIDATION

Validation of NARA groundwater data was performed according to EPA Level IV guidelines by LDC of Carlsbad, California. The analyses were validated using the following documents, as applicable to each method: 1) USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, January 2017 (EPA, 2017a), and 2) the QAPP (H+A, 2010). Validation is the comprehensive assessment of the raw data including the evaluation of the following:

- Sample holding times;
- Analytical methods and data reporting;
- Ion chromatograph performance;
- Initial and continuing instrument calibrations;
- Field blanks;
- Laboratory reagent blanks;
- Laboratory control samples;
- MS recovery and MSD analysis; and
- Compound identification and compound quantitation.

Data validation was performed on the 2018 NARA groundwater data after data assessment issues were addressed. These samples were collected for informational purposes and were not subject to the data validation requirements of the QAPP. Approximately 1 percent of the data was validated by LDC for NARA groundwater quality samples collected quarterly from January through December 2018 (i.e., 6 of the 431 total analyses were validated).

5.3 DATA ASSESSMENT AND VALIDATION RESULTS

Instances where 2018 NARA groundwater data failed to meet data quality objectives and acceptance criteria established in the QAPP and EPA Level IV guidelines are summarized in

Table J-8. Of the 431 data points, 13 data points were qualified as estimated, “E” (Table J-8). No data points were qualified as unusable, “HU” (Table J-8). All other NARA analytical results met data quality objectives and acceptance criteria.

6.0 LABORATORY AUDITS

As per QAPP requirements (H+A, 2010), on-site laboratory audits of the laboratories are to be performed on a biannual basis. The LDC audits focused on QA systems and data generated for the Apache Powder Superfund Project. A laboratory audit was performed in 2018. The final report for the Apache Superfund laboratory audit performed on Turner Laboratories, Tucson AZ, is provided in Appendix J-1. The on-site audit was performed by LDC on November 29, 2018. In summary, the laboratory was assessed as having adequate capability and quality systems to support the Apache Superfund Project.

7.0 FINDINGS AND CORRECTIVE ACTIONS

The QA Manager documents any findings and corrective action requirements that ensue from the review of laboratory reports and field documents. Corrective action/comments on variations such as missing data, and chain-of-custody (COC) record errors are recorded and the results of the review and corresponding corrective action requests are documented. Instances where 2018 laboratory data failed to meet data quality objectives and acceptance criteria established in the QAPP and EPA Level IV guidelines are summarized in Tables J-2, J-4, J-6, and J-8. A summary of 2018 laboratory and field quality control findings and corrective actions is provided in Table J-9.

8.0 CONCLUSION

All 2018 analytical results met data quality objectives and acceptance criteria with the following exceptions:

- Of the 483 NARS water quality data points, 18 data points were qualified as estimated, “E” (Table J-2).
- Of the 156 PMP water quality data points, 29 data points were qualified as estimated, “E” (Table J-4).
- Of the 2007 Demolition data points, 78 data points were qualified as estimated, “E” (Table J-6). An additional 1078 results were also qualified as estimated, “E”; due to the analyte reported down to MDL per project specification and was not detected or detected at a concentration between the MDL and the analyte’s reporting limit. Three data points were qualified as unusable, “HU”
- Of the 431 Northern Area Remediation Acceleration water quality data points, 13 data points were qualified as estimated, “E” (Table J-8).

9.0 REFERENCES CITED

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TABLES

TABLE J-1

2018 NORTHERN AREA REMEDIATION SYSTEM
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY		
No. of Analyses	Analyte	
9	Ca	Calcium
9	Cl	Chloride
5	ClO4	Perchlorate
9	CO3	Carbonate Alkalinity
27	COD	Chemical Oxygen Demand
9	F	Fluoride
9	HCO3	Bicarbonate Alkalinity
9	K	Potassium
9	Mg	Magnesium
9	N	Calculated Nitrogen
9	Na	Sodium
111	NH3-N	Ammonia - Nitrogen
128	NO3-N	Nitrate - Nitrogen
9	OH	Hydroxide, Alkalinity
7	OP	Orthophosphate
1	PALK	Phenolphthalein, Alkalinity
42	P	Phosphorus (Total)
9	SO4	Sulfate
9	TALK	Total Alkalinity
11	TDS	Total Dissolved Solids
8	TKN	Total Kjeldahl Nitrogen
29	TOC	Total Organic Carbon
6	TSS	Total Suspended Solids
483	Total Laboratory Analyses	

TABLE J-1

2018 NORTHERN AREA REMEDIATION SYSTEM TOTAL NUMBER OF ANALYSES PERFORMED

FIELD		
No. of Analyses	Analyte	
168	DO	Dissolved Oxygen
88	EC	Electrical Conductivity
469	NO3-N	Nitrate – Nitrogen
88	pH	pH
343	TEMP	Temperature
1,156	Total Field Measurements	

TABLE J-2

2018 NORTHERN AREA REMEDIATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
PDA-C-B	2/22/2018	18B0590-04	COD			27	mg/L	--	--	B		COD detected in FB at conc. of 27 mg/L
PDA-S	2/22/2018	18B0590-02	COD		<	20	mg/L	None, COD not detected in sample	--	ORG	TC	COD detected in FB at conc. of 27 mg/L
PDA-C	2/22/2018	18B0590-03	COD		<	20	mg/L	None, COD not detected in sample	--	ORG	TC	COD detected in FB at conc. of 27 mg/L
PDA-N	2/22/2018	18B0590-05	COD			36	mg/L	E	--	ORG	TC	COD detected in FB at conc. of 27 mg/L
ANA	2/22/2018	18B0590-06	COD			66	mg/L	E	--	ORG	TC	COD detected in FB at conc. of 27 mg/L
FDA	2/22/2018	18B0590-07	COD			32	mg/L	E	--	ORG	TC	COD detected in FB at conc. of 27 mg/L
EFF-L	2/22/2018	18B0590-08	TSS		<	10	mg/L	E	Q9	ORG	EF	Insufficient sample volume to meet QC requirements
EFF-L-D	2/22/2018	18B0590-09	TSS		<	10	mg/L	E	Q9	FD	EF	Insufficient sample volume to meet QC requirements
PDA-C	4/24/2018	18D0613-03	NO3-N	14797-55-8		18	mg/L	E	H2	ORG	TC	Required dilution of sample analyzed after holding time expiration, See Abbreviations
PDA-S	5/21/2018	18E0544-02	NO3-N	14797-55-8		3.6	mg/L	E	H2	ORG	TC	Required dilution of sample analyzed after holding time expiration, See Abbreviations
PDA-S-D	5/21/2018	18E0544-03	NO3-N	14797-55-8		3.8	mg/L	E	H2	FD	TC	Required dilution of sample analyzed after holding time expiration, See Abbreviations

TABLE J-2

2018 NORTHERN AREA REMEDIATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
SEW-1	7/23/2018	18G0624-01	NO3-N	14797-55-8		55	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
PDA-S	7/23/2018	18G0624-02	NO3-N	14797-55-8		37	mg/L	E	H2	ORG	TC	Required dilution of sample analyzed after holding time expiration, See Abbreviations
PDA-N-S	7/23/2018	550-106565-1	NH3-N	7664-41-7	<	0.5	mg/L	None; method QC criteria met	N1	SPT	TC	Ammonia – LCSD not spike in LCSD; LCS/MS/MSD all acceptable
SEW-1	8/21/2018	18H0605-01	NO3-N	14797-55-8		54	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-1-D	8/21/2018	18H0605-02	NO3-N	14797-55-8		53	mg/L	E	H2	FD	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
EFF-L	8/21/2018	18H0605-10	TSS	—		10	mg/L	E	Q9	ORG	EF	Insufficient sample volume to meet QC requirements
SEW-1-B	8/21/2018	18G0605-03	Bicarb Alk	—		30	mg/L	—	—	B	EW	Bicarb Alk detected at conc. of 30 mg/L
SEW-1	8/21/2018	18G0605-01	Bicarb Alk	—		270	mg/L	None – sample conc. >5X FB conc.	--	ORG	EW	Bicarb Alk detected in associated FB SEW-1-B at conc. of 30 mg/L
SEW-1-D	8/21/2018	18H0605-02	Bicarb Alk	—		270	mg/L	None – sample conc. >5X FB conc.	--	FD	EW	Bicarb Alk detected in associated FB SEW-1-B at conc. of 30 mg/L

TABLE J-2

2018 NORTHERN AREA REMEDIATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
EFF-L	8/21/2018	18H0605-10	Bicarb Alk	—		570	mg/L	None – sample conc. >5X FB conc.	--	ORG	EF	Bicarb Alk detected in associated FB SEW-1-B at conc. of 30 mg/L
SEW-1-B	8/21/2018	18G0605-03	Total Alk	—		30	mg/L	—	—	B	EW	Total Alkalinity detected at conc. of 30 mg/L
SEW-1	8/21/2018	18G0605-01	Total Alk	—		270	mg/L	None – sample conc. >5X FB conc.	--	ORG	EW	Total Alk detected in associated FB SEW-1-B at conc. of 30 mg/L
SEW-1-D	8/21/2018	18H0605-02	Total Alk	—		270	mg/L	None – sample conc. >5X FB conc.	--	FD	EW	Total Alk detected in associated FB SEW-1-B at conc. of 30 mg/L
EFF-L	8/21/2018	18H0605-10	Total Alk	—		570	mg/L	None – sample conc. >5X FB conc.	--	ORG	EF	Total Alk detected in associated FB SEW-1-B at conc. of 30 mg/L
SEW-1-B	8/21/2018	18H0605-03	TDS	—		94	mg/L	—	—	B	EW	TDS detected at conc. of 94 mg/L
SEW-1	8/21/2018	18H0605-01	TDS	—		1200	mg/L	None – sample conc. >5X FB conc.	--	ORG	EW	TDS detected in associated FB SEW-1-B at conc. of 94 mg/L
SEW-1-D	8/21/2018	18H0605-02	TDS	—		1200	mg/L	None – sample conc. >5X FB conc.	--	FD	EW	TDS detected in associated FB SEW-1-B at conc. of 94 mg/L
EFF-L	8/21/2018	18H0605-10	TDS	—		1300	mg/L	None – sample conc. >5X FB conc.	--	ORG	EF	TDS detected in associated FB SEW-1-B at conc. of 94 mg/L
EFF-L	8/21/2018	18H0605-10	Ortho-P	—	<	0.5	mg/L	E	M2	ORG	EF	MS/MSD %R < laboratory criteria; See abbreviations
EFF-L	8/21/2018	18H0605-10	Ortho-P	—	<	0.5	mg/L	None, sample ND	V1	ORG	EF	CCV %R > method criteria; See Abbreviations
SEW-1	8/21/2018	18H0605-01	Ortho-P	—	<	0.5	mg/L	E	—	ORG	EW	MS/MSD %R < laboratory criteria; See abbreviations

HARGIS + ASSOCIATES, INC.

TABLE J-2

2018 NORTHERN AREA REMEDIATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
SEW-1-D	8/21/2018	18H0605-02	Ortho-P	—	<	0.5	mg/L	E	—	FD	EW	MS/MSD %R < laboratory criteria; See abbreviations
SEW-B	8/21/2018	18H0605-03	Ortho-P	—	<	0.5	mg/L	E	—	B	EW	MS/MSD %R < laboratory criteria; See abbreviations
EFF-L-S	8/21/2018	550-108451-1	Ca	7440-70-2		180	mg/L	—	M3	SPT	EF	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
EFF-L-S	8/21/2018	550-108451-1	Na	7440-23-5		190	mg/L	—	M3	SPT	EF	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-02-B	8/30/2018	18H0825-02	Bicarb Alk	—		30	mg/L	—	—	B	EW	Bicarb Alk detected at conc. of 5 mg/L
SEW-02	8/30/2018	18H0825-01	Bicarb Alk	—		250	mg/L	None - sample conc. >5X conc. in FB.	—	ORG	EW	Bicarb Alk detected in associated FB SEW-02-B at conc. of 5 mg/L
SEW-02-B	8/30/2018	18H0825-02	Total Alk	—		30	mg/L	—	—	ORG	EW	Total Alk detected at conc. of 5 mg/L
SEW-02	8/30/2018	18H0825-01	Total Alk	—		250	mg/L	None - sample conc. >5X conc. in FB.	—	ORG	EW	Total Alk detected in associated FB SEW-02-B at conc. of 5mg/L.
SEW-02	8/30/2018	18H0825-01	Ortho-P	—	<	1	mg/L	None – Analyte not detected	L5	ORG	EW	Batch LCS %R > laboratory criteria; See Abbreviations
SEW-02-B	8/30/2018	18H0825-02	F	16984-48-8	<	0.5	mg/L	None – Analyte not detected	L5	B	EW	Batch LCS %R > laboratory criteria; See Abbreviations
SEW-02-B	8/30/2018	18H0825-02	Ortho-P	—	<	1	mg/L	None – Analyte not detected	L5	B	EW	Batch LCS %R > laboratory criteria; See Abbreviations

TABLE J-2

2018 NORTHERN AREA REMEDIATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
SEW-02	8/30/2018	18H0825-01	Ortho-P	—	<	1	mg/L	None – Analyte not detected	V1	ORG	EW	CCV %R > laboratory criteria; See Abbreviations
SEW-02-B	8/30/2018	18H0825-02	F	16984-48-8	<	0.5	mg/L	None – Analyte not detected	V1	B	EW	CCV %R > laboratory criteria; See Abbreviations
SEW-02-B	8/30/2018	18H0825-02	Ortho-P	—	<	1	mg/L	None – Analyte not detected	V1	B	EW	CCV %R > laboratory criteria; See Abbreviations
PDA-S-S	10/30/2018	550-112652-1	NO3-N	14797-55-8		22	mg/L	--	M3	TC	SPT	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
SEW-2	10/30/2018	18J0735-09	Ca	7440-70-2		280	mg/L	--	M3	EW	ORG	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
SEW-2	10/30/2018	18J0735-09	Mg	7439-95-4		31	mg/L	--	M3	EW	ORG	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
SEW-2	10/30/2018	18J0735-09	Na	7440-23-5		100	mg/L	--	M3	EW	ORG	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
ANA-B	11/19/2018	18K0473-07	TOC	7440-44-0		0.52	mg/L	--	--	TC	B	TOC detected in FB at conc. of 0.52 mg/L
PDA-S	11/19/2018	18K0473-03	TOC	7440-44-0		110	mg/L	None – sample conc. >5X FB conc.	--	TC	ORG	TOC detected in associated FB at conc. of 0.52 mg/L
PDA-C	11/19/2018	18K0473-04	TOC	7440-44-0		7.3	mg/L	None – sample conc. >5X FB conc.	--	TC	ORG	TOC detected in associated FB at conc. of 0.52 mg/L

TABLE J-2

2018 NORTHERN AREA REMEDIATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
PDA-N	11/19/2018	18K0473-05	TOC	7440-44-0		8	mg/L	None – sample conc. >5X FB conc.	--	TC	ORG	TOC detected in associated FB at conc. of 0.52 mg/L
ANA	11/19/2018	18K0473-06	TOC	7440-44-0		15	mg/L	None – sample conc. >5X FB conc.	--	TC	ORG	TOC detected in associated FB at conc. of 0.52 mg/L
FDA	11/19/2018	18K0473-08	TOC	7440-44-0		13	mg/L	None – sample conc. >5X FB conc.	--	TC	ORG	TOC detected in associated FB at conc. of 0.52 mg/L
PDA-S	12/19/2018	18L0560-07	NO3-N	14797-55-8		0.73	mg/L	E	C4	TC	ORG	Original analysis within hold time. Confirmation analysis past hold time. See Abbreviations
SEW-2	12/19/2018	18L0560-09	Ca	7440-70-2		310	mg/L	--	M3	EW	ORG	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
SEW-2	12/19/2018	18L0560-09	Na	7440-23-5		100	mg/L	--	M3	EW	ORG	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations

TABLE J-2

2018 NORTHERN AREA REMEDIATION SYSTEM
DATA QUALIFIERS SUMMARY

Abbreviations/Acronyms:

<	=	Less Than
>	=	Greater Than
%R	=	% Recovery
ADHS	=	Arizona Department of Health Services
Alk	=	Alkalinity
B	=	Field Blank
Bicarb	=	Bicarbonate
C4	=	Confirmatory analysis was past holding time
Ca	=	Calcium
CAS	=	Chemical Abstracts Service
CCV	=	Continuing Calibration Verification Standard
COD	=	Chemical Oxygen Demand
Conc.	=	Concentration
E	=	Estimated
EF	=	ARS Wetland primary discharge location
EW	=	Shallow Aquifer Extraction Well
F	=	Fluoride
FB	=	Field Blank
FD	=	Field Duplicate
H2	=	Hold Time: Initial analysis within holding time; Reanalysis for the required dilution was past holding time.
HA	=	Hargis + Associates, Inc.
L5	=	The associated blank spike recovery was above laboratory/method acceptance limits. This analyte was not detected in the sample.
LCS/LCSD	=	Laboratory Control Sample/Laboratory Control Sample Duplicate
M2	=	Matrix spike recovery was low, the associated blank spike recovery was acceptable.
M3	=	Matrix Spike: Matrix spike recovery value was unusable; the analyte concentration in the sample is disproportionate to the spike level.
Mg	=	Magnesium
mg/L	=	Milligrams per Liter
MS/MSD	=	Matrix Spike/Matrix Spike Duplicate
N1	=	See case narrative

TABLE J-2

2018 NORTHERN AREA REMEDIATION SYSTEM
DATA QUALIFIERS SUMMARY

Abbreviations/Acronyms:

Na	=	Sodium
ND	=	Non-detect
NH3-N	=	Ammonia-Nitrogen
NO3-N	=	Nitrate - Nitrogen
ORG	=	Original
Ortho-P	=	Dissolved Ortho-Phosphorus
Q9	=	Insufficient sample received to meet method QC requirements
QA	=	Quality Assurance
QC	=	Quality Control
SPT	=	Split
TC	=	Treatment Cell
TDS	=	Total Dissolved Solids
TOC	=	Total Organic Carbon
TSS	=	Total Suspended Solids
VI	=	CCV recovery was above method acceptance limits. This target analyte was not detected in the sample.

TABLE J-3

2018 PERFORMANCE MONITORING PLAN
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY		
No. of Analyses	Analyte	
46	ClO4	Perchlorate
21	NH3-N	Ammonia -Nitrogen
103	NO3-N	Nitrate – Nitrogen
170	Total Laboratory Analyses	

HARGIS + ASSOCIATES, INC.

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
MW-21-B	2/19/2018	18B0490-02	NO3-N	14797-55-8		0.98	mg/L	--	--	B	--	NO3-N detected in FB MW-21-Bat conc. of 0.98 mg/L
MW-21	2/19/2018	18B0490-01	NO3-N	14797-55-8		2700	mg/L	None, result > 5X conc. in FB	--	ORG	SM	NO3-N detected in FB MW-21-B
MW-21-D	2/19/2018	18B0490-03	NO3-N	14797-55-8		260	mg/L	None, result > 5X conc. in FB	--	FD	SM	NO3-N detected in FB MW-21-B
MW-39	2/19/2018	18B0490-04	NO3-N	14797-55-8		34	mg/L	None, result > 5X conc. in FB	--	ORG	SM	NO3-N detected in FB MW-21-B
P-03	2/19/2018	18B0490-05	NO3-N	14797-55-8		6100	mg/L	None, result > 5X conc. in FB	--	ORG	PP	NO3-N detected in FB MW-21-B
MW-14	2/19/2018	18B0490-06	NO3-N	14797-55-8		1.3	mg/L	E	--	ORG	SM	NO3-N detected in FB MW-21-B
MW-08	2/19/2018	18B0490-07	NO3-N	14797-55-8		24	mg/L	None, result > 5X conc. in FB	--	ORG	SM	NO3-N detected in FB MW-21-B
MW-19	2/19/2018	18B049-08	NO3-N	14797-55-8		17	mg/L	None, result > 5X conc. in FB	--	ORG	SM	NO3-N detected in FB MW-21-B
MW-18	2/19/2018	18B0490-09	NO3-N	14797-55-8		18	mg/L	None, result > 5X conc. in FB	--	ORG	SM	NO3-N detected in FB MW-21-B
MW-17	2/19/2018	18B0490-10	NO3-N	14797-55-8		7.5	mg/L	None, result > 5X conc. in FB	--	ORG	SM	NO3-N detected in FB MW-21-B
MW-06	2/21/2017	18B0571-05	ClO4	14797-73-0		5.2	µg/L	E	--	ORG	SM	Result could not be confirmed by multiple re-analyses of sample
MW-47-S	2/21/2018	550-98399-01	ClO4	14797-73-0		3.9	µg/L	E	N1	SPT	SM	MS/MSD not prepared/analyzed with batch
MW-33-S	2/21/2018	550-98399-03	ClO4	14797-73-0	<	1	µg/L	E	N1	SPT	SM	MS/MSD not prepared/analyzed with batch
P-01	2/21/2018	18B0571-01	NO3-N	14797-55-8		3.3	mg/L	E	H1	ORG	PP	NO3-N HT exceeded; See Abbreviations

HARGIS + ASSOCIATES, INC.

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
MW-21-S	5/15/2018	550-103011-2	NO3-N	14797-55-8		3100	mg/L	E	M2	SPT	SM	MS/MSD % R below acceptance criteria; See Abbreviations
P-03-S	5/15/2018	550-103011-2	NO3-N	14797-55-8		3100	mg/L	E	--	SPT	PP	MS/MSD % R below acceptance criteria; See Abbreviations
MW-08-S	5/15/2018	550-103011-2	NO3-N	14797-55-8		3100	mg/L	E	--	SPT	SM	MS/MSD % R below acceptance criteria; See Abbreviations
MW-43	5/15/2018	18E0461-02	NH3-N	7664-36-0		1700	mg/L	E	N1	ORG	SM	Original analysis within hold time. Reanalysis past hold time did not confirm original results but was within historical range and matched field duplicate result. Reanalysis reported. Reanalysis past hold time exp.
P-03	8/6/2018	18H0201-01	NO3-N	14797-55-8		6500	mg/L	E	H2	ORG	PP	Required dilution of sample analyzed after holding time expiration, See Abbreviations
P-03-D	8/6/2018	18H0201-02	NO3-N	14797-55-8		6600	mg/L	E	H2	FD	PP	Required dilution of sample analyzed after holding time expiration, See Abbreviations

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
MW-21	8/6/2018	18H0201-04	NO3-N	14797-55-8		3200	mg/L	E	H2	FD	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-21-B	8/6/2018	18H0201-05	NO3-N	14797-55-8	<	0.5	mg/L	E	N1	B	SM	Sample reanalyzed past HT for confirmation, result did not confirm, reanalysis reported; See Abbreviations
SEW-02 (TW-01)-D	8/7/2018	18H0257-06	NO3-N	14797-55-8		220	mg/L	--	M3	FD	SM	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
MW-34	8/7/2018	18H0257-01	NO3-N	14797-55-8	<	0.5	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-35	8/7/2018	18H0257-02	NO3-N	14797-55-8		66	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-35-B	8/7/2018	18H0257-03	NO3-N	14797-55-8	<	0.5	mg/L	--	--	B	--	Associated MS/MSD % R not calculated; See Abbreviations.
MW-36	8/7/2018	18H0257-04	NO3-N	14797-55-8		150	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
SEW-02 (TW-01)	8/7/2018	18H0257-05	NO3-N	14797-55-8		200	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-11	8/7/2018	18H0257-07	NO3-N	14797-55-8		2	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
MW-17	8/7/2018	18H0257-08	NO3-N	14797-55-8		3.7	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-18	8/7/2018	18H0257-09	NO3-N	14797-55-8		31	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-19	8/7/2018	18H0257-10	NO3-N	14797-55-8		15	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-08	8/7/2018	18H0257-11	NO3-N	14797-55-8		24	mg/L	--	--	ORG	SM	Associated MS/MSD % R not calculated; See Abbreviations.
MW-13	8/8/2018	18H0329-07	NO3-N	14797-55-8		50	mg/L	--	M4	ORG	SM	NO3-N MS/MSD %R not applicable; See Abbreviations
P-01	8/8/2018	18H0329-01	NO3-N	14797-55-8		13	mg/L	--	--	ORG	PP	Assoc. MS/MSD %R not applicable; See Abbreviations
P-01-D	8/8/2018	18H0329-02	NO3-N	14797-55-8		13	mg/L	--	--	FD	PP	Assoc. MS/MSD %R not applicable; See Abbreviations
D(18-21)06bcb	8/8/2018	18H0329-09	NO3-N	14797-55-8		9.5	mg/L	--	--	ORG	SP	Assoc. MS/MSD %R not applicable; See Abbreviations
P-01	8/8/2018	18H0329-01	NO3-N	14797-55-8		13	mg/L	E	H2	ORG	PP	Required dilution of sample analyzed after holding time expiration, See Abbreviations
P-01-D	8/8/2018	18H0329-02	NO3-N	14797-55-8		13	mg/L	E	H2	FD	PP	Required dilution of sample analyzed after holding time expiration, See Abbreviations

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
MW-13	8/8/2018	18H0329-07	NO3-N	14797-55-8		50	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
D(18-21)06bcb (Jones)	8/8/2018	18H0329-09	NO3-N	14797-55-8		9.5	mg/L	E	H2	ORG	SP	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SW-12	8/8/2018	18H0329-13	NO3-N	14797-55-8		1	mg/L	E	H1	ORG	SW	NO3-N analysis past hold time; See Abbreviations
SW-14	8/8/2018	18H0329-12	NO3-N	14797-55-8		0.9	mg/L	E	H1	ORG	SW	NO3-N analysis past hold time; See Abbreviations
P-03	12/4/2018	18L0159-01	NO3-N	14797-55-8		5900	mg/L	E	H2	ORG	PP	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-35	12/4/2018	18L0159-03	NO3-N	14797-55-8		61	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-35-D	12/4/2018	18L0159-04	NO3-N	14797-55-8		58	mg/L	E	H2	FD	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
MW-36	12/4/2018	18L0159-05	NO3-N	14797-55-8		71	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-45	12/4/2018	18L0159-07	NO3-N	14797-55-8		180	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
(SEW-2) TW-01	12/4/2018	18L0159-08	NO3-N	14797-55-8		210	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-34	12/4/2018	18L0159-02	NO3-N	14797-55-8		1.7	mg/L	E	C4	ORG	SM	NO3-N; Original analysis within hold time. Confirmation analysis past hold time. See Abbreviations
P-03	12/4/2018	18L0159-01	ClO4	14797-73-0		580	µg/L	E	L3	ORG	PP	ClO4 LCSD %R outside of limits. See Abbreviations
MW-34-	12/4/2018	18L0159-02	NO3-N	14797-55-8		1.7	mg/L	E	--	ORG	SM	Split sample results not within project criteria
MW-34-S	12/4/2018	550-114365-01	NO3-N	14797-55-8	<	0.1	mg/L	E	--	SPT	SM	Split sample results not within project criteria
P-01-S	12/5/2018	550-114505-1	NO3-N	14797-55-8		0.3	mg/L	None, conc. detected by split lab < primary lab RL	--	SPT	PP	Split sample results not within project criteria

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Laboratory ID	Parameter	CAS Number	Value Flag	Laboratory Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Qualifier Comments
P-01	12/5/2018	18L0212-01	ClO4	14797-73-0	<	1	µg/L	None – LCSD %R high, sample ND	L5	ORG	PP	LCSD %R outside of limits. See Abbreviations
P-01	12/5/2018	18L0212-01	NO3-N	14797-55-8	<	0.5	mg/L	None, split lab detect < primary lab RL	--	ORG	PP	Split sample results not within project criteria

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

ABBREVIATIONS/ACRONYMS:

<	=	Less Than
>	=	Greater Than
% R	=	Percent Recovery
µg/l	=	Micrograms per Liter
ADHS	=	Arizona Department of Health Services
B	=	Field Blank
C4	=	Confirmatory analysis was past holding time
CAS	=	Chemical Abstracts Service
ClO4	=	Perchlorate
Conc.	=	Concentration
E	=	Estimated
FB	=	Field Blank
FD	=	Field Duplicate
H1	=	Hold Time: Sample analysis performed past holding time.
H2	=	Hold Time: Initial analysis within holding time; Reanalysis for the required dilution was past holding time.
HA	=	Hargis + Associates, Inc.
HT	=	Hold Time
L3	=	The associated blank spike recovery was above method acceptance limits
L5	=	The associated blank spike recovery was above the laboratory/method acceptance limits. This analyte was not detected in the sample
LCSD	=	Laboratory Control Sample Duplicate
M2	=	Matrix spike recovery was low, the associated blank spike recovery was acceptable.
M3	=	Matrix Spike: The spike recovery value is unusable, the analyte concentration in the sample is disproportionate to the spike level; the associated blank spike recovery was acceptable.
M4	=	The analysis of the spiked sample required a dilution such that the calculation does not provide useful information The associated LCS/LCSD recovery was acceptable
mg/L	=	Milligrams per Liter
MS/MSD	=	Matrix Spike/Matrix Spike Dupliate
N1	=	See Case Narrative
ND	=	Non-detect
NH3-N	=	Ammonia-Nitrogen
NO3-N	=	Nitrate-Nitrogen
ORG	=	Original
PP	=	Perched Zone Piezometer

TABLE J-4

2018 PERFORMANCE MONITORING PLAN
DATA QUALIFIERS SUMMARY

ABBREVIATIONS/ACRONYMS (cont'd):

QA	=	Quality Assurance
RL	=	Reporting Limit
SM	=	Shallow Monitor Well
SP	=	Shallow Private Well
SPT	=	Split
SW	=	Surface Water

TABLE J-5

2018 BUILDING DEMOLITION PROGRAM
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY			
Laboratory Method	No. of Analyses	Analyte	Sample Activity Category
SW9056	10	NITRATE as N	Blank Samples
SW9056	63	NITRATE as N	Soil Samples
SW1311/6010C	1	AG (Silver)	Product Samples
SW1311/6010C	1	AG (Silver)	Blank Samples
SW1311/6010C	13	AG (Silver)	Concrete Samples
SW1311/6010C	2	AG (Silver)	Demolition Material Samples
SW1311/6010C	1	AG (Silver)	Residue Samples
SW6010C	9	AS (Arsenic)	Blank Samples
SW6010C	17	AS (Arsenic)	Soil Samples
SW1311/6010C	1	AS (Arsenic)	Blank Samples
SW1311/6010C	13	AS (Arsenic)	Concrete Samples
SW1311/6010C	2	AS (Arsenic)	Demolition Material Samples
SW1311/6010C	1	AS (Arsenic)	Product Samples
SW1311/6010C	1	AS (Arsenic)	Residue Samples
SW1311/6010C	13	BA (Barium)	Blank Samples
SW1311/6010C	13	BA (Barium)	Concrete Samples
SW1311/6010C	2	BA (Barium)	Demolition Material Samples
SW1311/6010C	1	BA (Barium)	Product Samples
SW1311/6010C	1	BA (Barium)	Residue Samples
SW1311/6010C	1	CD (Cadmium)	Blank Samples
SW1311/6010C	13	CD (Cadmium)	Concrete Samples
SW1311/6010C	2	CD (Cadmium)	Demolition Material Samples
SW1311/6010C	1	CD (Cadmium)	Product Samples
SW1311/6010C	1	CD (Cadmium)	Residue Samples
SW1311/6010C	1	CR (Chromium)	Blank Samples
SW1311/6010C	13	CR (Chromium)	Concrete Samples
SW1311/6010C	2	CR (Chromium)	Demolition Material Samples
SW1311/6010C	1	CR (Chromium)	Product Samples
SW1311/6010C	1	CR (Chromium)	Residue Samples
SW1311/6010C	1	HG (Mercury)	Blank Samples
SW1311/6010C	13	HG (Mercury)	Concrete Samples
SW1311/6010C	2	HG (Mercury)	Demolition Material Samples
SW1311/6010C	1	HG (Mercury)	Product Samples
SW1311/6010C	1	HG (Mercury)	Residue Samples
SW6010C	13	PB (Lead)	Blank Samples
SW6010C	13	PB (Lead)	Concrete Samples
SW6010C	2	PB (Lead)	Demolition Material Samples
SW6010C	1	PB (Lead)	Product Samples
SW6010C	1	PB (Lead)	Residue Samples
SW6010C	20	PB (Lead)	Soil Samples
SW1311/6010C	13	PB (Lead)	Concrete Samples
SW1311/6010C	2	PB (Lead)	Demolition Material Samples

TABLE J-5

2018 BUILDING DEMOLITION PROGRAM
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY			
Laboratory Method	No. of Analyses	Analyte	Sample Activity Category
SW1311/6010C	1	PB (Lead)	Product Samples
SW1311/6010C	1	PB (Lead)	Residue Samples
SW1311/6010C	1	SE (Selenium)	Blank Samples
SW1311/6010C	13	SE (Selenium)	Concrete Samples
SW1311/6010C	2	SE (Selenium)	Demolition Material Samples
SW1311/6010C	1	SE (Selenium)	Product Samples
SW1311/6010C	1	SE (Selenium)	Residue Samples
8015AZR1	2	C10-C22 (Diesel Range Organics)	Blank Samples
8015AZR1	13	C10-C22 (Diesel Range Organics)	Concrete Samples
8015AZR1	2	C10-C22 (Diesel Range Organics)	Demolition Material Samples
8015AZR1	1	C10-C22 (Diesel Range Organics)	Product Samples
8015AZR1	1	C10-C22 (Diesel Range Organics)	Residue Samples
8015AZR1	2	C10-C32 (Total)	Blank Samples
8015AZR1	13	C10-C32 (Total)	Concrete Samples
8015AZR1	2	C10-C32 (Total)	Demolition Material Samples
8015AZR1	1	C10-C32 (Total)	Product Samples
8015AZR1	1	C10-C32 (Total)	Residue Samples
8015AZR1	2	C22-C32 (Oil Range Organics)	Blank Samples
8015AZR1	13	C22-C32 (Oil Range Organics)	Concrete Samples
8015AZR1	2	C22-C32 (Oil Range Organics)	Demolition Material Samples
8015AZR1	1	C22-C32 (Oil Range Organics)	Product Samples
8015AZR1	1	C22-C32 (Oil Range Organics)	Residue Samples
8015AZR1	2	C6-C10 (Gasoline Range Organics)	Blank Samples
8015AZR1	13	C6-C10 (Gasoline Range Organics)	Concrete Samples
8015AZR1	2	C6-C10 (Gasoline Range Organics)	Demolition Material Samples
8015AZR1	1	C6-C10 (Gasoline Range Organics)	Product Samples
8015AZR1	1	C6-C10 (Gasoline Range Organics)	Residue Samples
8015D	1	C10-C28	Soil Samples
8015D	1	C10-C36	Soil Samples
8015D	1	JP-8 (C8-C12)	Soil Samples
8015D	1	Motor Oil (C20-C38)	Soil Samples
SW8260B	4	1,1,1,2-TETRACHLOROETHANE	Blank Samples
SW8260B	4	1,1,1-TRICHLOROETHANE	Blank Samples
SW8260B	4	1,1,2,2-TETRACHLOROETHANE	Blank Samples
SW8260B	4	1,1,2-TRICHLOROETHANE	Blank Samples
SW8260B	2	1,1,2-TRICHLOROTRIFLUOROETHANE	Blank Samples
SW8260B	4	1,1-DICHLOROETHANE	Blank Samples
SW8260B	4	1,1-DICHLOROETHENE	Blank Samples
SW8260B	4	1,1-DICHLOROPROPENE	Blank Samples
SW8260B	4	1,2,3-TRICHLOROBENZENE	Blank Samples
SW8260B	4	1,2,3-TRICHLOROPROPANE	Blank Samples
SW8260B	4	1,2,4-TRICHLOROBENZENE	Blank Samples

TABLE J-5

2018 BUILDING DEMOLITION PROGRAM
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY			
Laboratory Method	No. of Analyses	Analyte	Sample Activity Category
SW8260B	4	1,2,4-TRIMETHYLBENZENE	Blank Samples
SW8260B	4	1,2-DIBROMO-3-CHLOROPROPANE	Blank Samples
SW8260B	4	1,2-DIBROMOETHANE (EDB)	Blank Samples
SW8260B	4	1,2-DICHLOROBENZENE	Blank Samples
SW8260B	4	1,2-DICHLOROETHANE	Blank Samples
SW8260B	4	1,2-DICHLOROPROPANE	Blank Samples
SW8260B	4	1,3,5-TRIMETHYLBENZENE	Blank Samples
SW8260B	4	1,3-DICHLOROBENZENE	Blank Samples
SW8260B	4	1,3-DICHLOROPROPANE	Blank Samples
SW8260B	4	1,4-DICHLOROBENZENE	Blank Samples
SW8260B	4	2,2-DICHLOROPROPANE	Blank Samples
SW8260B	4	2-BUTANONE (MEK)	Blank Samples
SW8260B	4	2-CHLOROTOLUENE	Blank Samples
SW8260B	4	2-HEXANONE	Blank Samples
SW8260B	4	4-CHLOROTOLUENE	Blank Samples
SW8260B	2	4-ISOPROPYLTOLUENE	Blank Samples
SW8260B	4	4-METHYL-2-PENTANONE (MIBK)	Blank Samples
SW8260B	4	ACETONE	Blank Samples
SW8260B	2	ACRYLONITRILE	Blank Samples
SW8260B	4	BENZENE	Blank Samples
SW8260B	13	BENZENE	Concrete Samples
SW8260B	2	BENZENE	Demolition Material Samples
SW8260B	1	BENZENE	Product Samples
SW8260B	1	BENZENE	Residue Samples
SW1311/8260B	2	BENZENE	Blank Samples
SW1311/8260B	13	BENZENE	Concrete Samples
SW1311/8260B	2	BENZENE	Demolition Material Samples
SW1311/8260B	1	BENZENE	Product Samples
SW1311/8260B	1	BENZENE	Residue Samples
SW8260B	4	BROMOBENZENE	Blank Samples
SW8260B	4	BROMOCHLOROMETHANE	Blank Samples
SW8260B	4	BROMODICHLOROMETHANE	Blank Samples
SW8260B	4	BROMOFORM	Blank Samples
SW8260B	4	BROMOMETHANE	Blank Samples
SW8260B	4	CARBON DISULFIDE	Blank Samples
SW8260B	4	CARBON TETRACHLORIDE	Blank Samples
SW8260B	4	CHLOROBENZENE	Blank Samples
SW8260B	4	CHLORODIBROMOMETHANE	Blank Samples
SW8260B	4	CHLOROETHANE	Blank Samples
SW8260B	4	CHLOROFORM	Blank Samples
SW8260B	4	CHLOROMETHANE	Blank Samples
SW8260B	4	CIS-1,2-DICHLOROETHENE	Blank Samples

TABLE J-5

2018 BUILDING DEMOLITION PROGRAM
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY			
Laboratory Method	No. of Analyses	Analyte	Sample Activity Category
SW8260B	4	CIS-1,3-DICHLOROPROPENE	Blank Samples
SW8260B	4	DIBROMOMETHANE	Blank Samples
SW8260B	4	DICHLORODIFLUOROMETHANE	Blank Samples
SW8260B	4	ETHYLBENZENE	Blank Samples
SW8260B	13	ETHYLBENZENE	Concrete Samples
SW8260B	2	ETHYLBENZENE	Demolition Material Samples
SW8260B	1	ETHYLBENZENE	Product Samples
SW8260B	1	ETHYLBENZENE	Residue Samples
SW8260B	4	HEXACHLOROBUTADIENE	Blank Samples
SW8260B	4	IODOMETHANE	Blank Samples
SW8260B	4	ISOPROPYLBENZENE	Blank Samples
SW8260B	4	M,P-XYLENES	Blank Samples
SW8260B	2	METHYL TERT-BUTYL ETHER	Blank Samples
SW8260B	4	METHYLENE CHLORIDE	Blank Samples
SW8260B	4	NAPHTHALENE	Blank Samples
SW8260B	4	N-BUTYLBENZENE	Blank Samples
SW8260B	4	N-PROPYLBENZENE	Blank Samples
SW8260B	4	O-XYLENE	Blank Samples
SW8260B	2	P-ISOPROPYLTOLUENE	Blank Samples
SW8260B	4	SEC-BUTYLBENZENE	Blank Samples
SW8260B	4	STYRENE	Blank Samples
SW8260B	4	TERT-BUTYLBENZENE	Blank Samples
SW8260B	4	TETRACHLOROETHENE	Blank Samples
SW8260B	4	TOLUENE	Blank Samples
SW8260B	13	TOLUENE	Concrete Samples
SW8260B	2	TOLUENE	Demolition Material Samples
SW8260B	1	TOLUENE	Product Samples
SW8260B	1	TOLUENE	Residue Samples
SW8260B	4	TRANS-1,2-DICHLOROETHENE	Blank Samples
SW8260B	4	TRANS-1,3-DICHLOROPROPENE	Blank Samples
SW8260B	2	trans-1,4-Dichloro-2-butene	Blank Samples
SW8260B	4	TRICHLOROETHENE	Blank Samples
SW8260B	4	TRICHLOROFLUOROMETHANE	Blank Samples
SW8260B	4	VINYL ACETATE	Blank Samples
SW8260B	4	VINYL CHLORIDE	Blank Samples
SW8260B	4	XYLENES, TOTAL	Blank Samples
SW8260B	13	XYLENES, TOTAL	Concrete Samples
SW8260B	2	XYLENES, TOTAL	Demolition Material Samples
SW8260B	1	XYLENES, TOTAL	Product Samples
SW8260B	1	XYLENES, TOTAL	Residue Samples
SW8330B	10	1,3,5-TRINITROBENZENE	Blank Samples
SW8330B	60	1,3,5-TRINITROBENZENE	Soil Samples

TABLE J-5

2018 BUILDING DEMOLITION PROGRAM
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY			
Laboratory Method	No. of Analyses	Analyte	Sample Activity Category
SW8330B	10	1,3-DINITROBENZENE	Blank Samples
SW8330B	60	1,3-DINITROBENZENE	Soil Samples
SW8330B	10	2,4,6-TRINITROTOLUENE	Blank Samples
SW8330B	60	2,4,6-TRINITROTOLUENE	Soil Samples
SW8330B	10	2,4-DINITROTOLUENE	Blank Samples
SW8330B	60	2,4-DINITROTOLUENE	Soil Samples
SW8330B	10	2,6-DINITROTOLUENE	Blank Samples
SW8330B	60	2,6-DINITROTOLUENE	Soil Samples
SW8330B	10	2-AMINO-4,6-DINITROTOLUENE	Blank Samples
SW8330B	60	2-AMINO-4,6-DINITROTOLUENE	Soil Samples
SW8330B	10	3,5-DINITROTOLUENE	Blank Samples
SW8330B	60	3,5-DINITROTOLUENE	Soil Samples
SW8330B	10	4-AMINO-2,6-DINITROTOLUENE	Blank Samples
SW8330B	60	4-AMINO-2,6-DINITROTOLUENE	Soil Samples
SW8330B	10	HMX	Blank Samples
SW8330B	60	HMX	Soil Samples
SW8330B	10	m-NITROTOLUENE	Blank Samples
SW8330B	60	m-NITROTOLUENE	Soil Samples
SW8330B	10	NITROBENZENE	Blank Samples
SW8330B	60	NITROBENZENE	Soil Samples
SW8330B	10	NITROGLYCERINE	Blank Samples
SW8330B	60	NITROGLYCERINE	Soil Samples
SW8330B	10	o-NITROTOLUENE	Blank Samples
SW8330B	60	o-NITROTOLUENE	Soil Samples
SW8330B	10	PETN	Blank Samples
SW8330B	60	PETN	Soil Samples
SW8330B	10	PICRIC ACID	Blank Samples
SW8330B	60	PICRIC ACID	Soil Samples
SW8330B	10	p-NITROTOLUENE	Blank Samples
SW8330B	60	p-NITROTOLUENE	Soil Samples
SW8330B	10	RDX	Blank Samples
SW8330B	60	RDX	Soil Samples
SW8330B	10	TETRYL	Blank Samples
SW8330B	60	TETRYL	Soil Samples
	2007	TOTAL NUMBER OF ANALYSES	

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B213	1/22/2018	550-96731-01	9056	Nitrate as N	14797-55-8		12	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.521 mg/Kg
B213	1/22/2018	550-96731-01	6010B	Arsenic	7440-38-2		1.8	mg/Kg	E	E4	ORG	Result Between RL and MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
B213	1/22/2018	550-96731-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.0083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E EB detect none, not detected in sample	E8	ORG	HMX detected in EB at 0.20 µg/L
B213	1/22/2018	550-96731-01	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	Nitrobenzene	98-95-3	<	0.078	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B213	1/22/2018	550-96731-01	8330B	RDX	121-82-4	<	0.04	mg/Kg	E for E8 qualifier EB detect none, not detected in sample	E8	ORG	RDX detected in EB at 0.17 µg/L Result evaluated to MDL; See abbreviations.

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B213	1/22/2018	550-96731-01	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria; See abbreviations.
B215	1/22/2018	550-96731-02	9056	Nitrate as N	14797-55-8		120	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.521 mg/Kg
B215	1/22/2018	550-96731-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
B215	1/22/2018	550-96731-02	8330B	2,4-Dinitrotoluene	121-14-2	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.0083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.027	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E for E8 qualifier EB detect none, not detected in sample	E8	ORG	RDX detected in EB at 0.17 µg/L Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	Nitrobenzene	98-95-3	<	0.078	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	p-Nitrotoluene	99-99-0	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B215	1/22/2018	550-96731-02	8330B	RDX	121-82-4	<	0.039	mg/Kg	E for E8 qualifier EB detect none, not detected in sample	E8	ORG	RDX detected in EB at 0.17 µg/L Result evaluated to MDL; See abbreviations.
B215	1/22/2018	550-96731-02	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	HU	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
B316	1/22/2018	550-96731-04	9056	Nitrate as N	14797-55-8		61	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.521 mg/Kg
B316	1/22/2018	550-96731-04	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
B316	1/22/2018	550-96731-04	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	3,5-Dinitroaniline	618-87-1	<	0.0085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E for E8 Qualifier EB detect none, not detected in sample	E8	ORG	Result evaluated to MDL; HMX detected in EB at 0.20 µg/L See abbreviations.
B316	1/22/2018	550-96731-04	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B316	1/22/2018	550-96731-04	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	RDX	121-82-4	<	0.041	mg/Kg	E for E8 Qualifier EB detect none, not detected in sample	E8	ORG	RDX detected in EB at 0.17 µg/L Result evaluated to MDL; See abbreviations.
B316	1/22/2018	550-96731-04	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	HU	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
B317	1/22/2018	550-96731-03	9056	Nitrate as N	14797-55-8		88	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.521 mg/Kg
B317	1/22/2018	550-96731-03	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
B317	1/22/2018	550-96731-03	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	3,5-Dinitroaniline	618-87-1	<	0.0086	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E for E8 Qualifier EB detect none, not detected in sample	E8	ORG	Result evaluated to MDL; HMX detected in EB at 0.20 µg/L See abbreviations.
B317	1/22/2018	550-96731-03	8330B	m-Nitrotoluene	99-08-1	<	0.061	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	Nitrobenzene	98-95-3	<	0.081	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B317	1/22/2018	550-96731-03	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	RDX	121-82-4	<	0.041	mg/Kg	E for E8 Qualifier EB detect none, not detected in sample	E8	ORG	RDX detected in EB at 0.17 µg/L Result evaluated to MDL; See abbreviations.
B317	1/22/2018	550-96731-03	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	HU	E8 L4	ORG	Result evaluated to MDL; LCS recovery below criteria See abbreviations.
EB-20180122	1/22/2018	550-96731-05	6010C	Arsenic	7440-38-2	<	0.0062	mg/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.2	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	1,3-Dinitrobenzene	99-65-0	<	0.089	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.073	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	2,4-Dinitrotoluene	121-14-2	<	0.084	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	2,6-Dinitrotoluene	606-20-2	<	0.065	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.051	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	3,5-Dinitroaniline	618-87-1	<	0.13	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
EB-20180122	1/22/2018	550-96731-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.058	ug/L	E	E8 L4 R1	B	Result evaluated to MDL; See abbreviations, LCS % R below acceptance criteria; LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	HMX	2691-41-0		0.2	ug/L	E	E4 C8	B	Result Between RL and MDL, RPD between columns > 40%; See abbreviations.
EB-20180122	1/22/2018	550-96731-05	8330B	m-Nitrotoluene	99-08-1	<	0.084	ug/L	E	E8 L4	B	Result evaluated to MDL; See abbreviations, LCS % R below acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	Nitrobenzene	98-95-3	<	0.091	ug/L	E	E8 L4	B	Result evaluated to MDL; See abbreviations, LCS % R below acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	Nitroglycerin	55-63-0	<	0.92	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	o-Nitrotoluene	88-72-2	<	0.086	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	PETN	78-11-5	<	0.42	ug/L	E	E8 R6	B	Result evaluated to MDL; See abbreviations, LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	Picric acid	88-89-1	<	0.044	ug/L	E	E8 L4 R1	B	Result evaluated to MDL; See abbreviations, LCS % R below acceptance criteria; LCS/LCSD %RPD exceeded acceptance criteria; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	p-Nitrotoluene	99-99-0	<	0.2	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20180122	1/22/2018	550-96731-05	8330B	RDX	121-82-4		0.18	ug/L	E	E4 C8 R6	B	Result Between RL and MDL, RPD between columns > 40%, LCS/LCSD %RPD exceeded acceptance criteria See abbreviations.
EB-20180122	1/22/2018	550-96731-05	8330B	Tetryl	479-45-8	<	0.079	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
EB-20180122	1/22/2018	550-96731-05	9056A	Nitrate as N	14797-55-8	<	0.051	mg/L	E	E8	B	Result evaluated to MDL; See abbreviations
B183	1/23/2018	550-96810-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B183	1/23/2018	550-96810-01	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E for E8 qualifier None for EB detect not detected in sample	E8	ORG	HMX detected in EB at 0.21 µg/L; Result Between RL and MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	RDX	121-82-4	<	0.043	mg/Kg	E for E8 qualifier None for EB detect not detected in sample	E8	ORG	RDX detected in EB at 0.19 µg/L; Result evaluated to MDL; See abbreviations.
B183	1/23/2018	550-96810-01	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B236	1/23/2018	550-96810-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.0087	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E for E8 Qualifier EB detect none, not detected in sample	E8	ORG	HMX detected in EB at 0.21 µg/L; Result Between RL and MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	m-Nitrotoluene	99-08-1	<	0.062	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	Nitrobenzene	98-95-3	<	0.082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	RDX	121-82-4	<	0.041	mg/Kg	E for E8 Qualifier EB detect none, not detected in sample	E8	ORG	RDX detected in EB at 0.19 µg/L; Result evaluated to MDL; See abbreviations.
B236	1/23/2018	550-96810-02	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-026	1/26/2018	550-96983-03	8015D	C10-C28	PHCC10C28		3400	mg/Kg	E for surrogate %R MB detect none, sample conc. >5X MB	S8	ORG	Compounds detected in MB: C10-C28 at 1.08 mg/Kg; JP-8 at 0.975 mg/Kg; C10-C36 at 1.64 mg/Kg; Surrogate %R outside criteria; See abbreviations
B-026	1/26/2018	550-96983-03	8015D	C10-C36	PHCC10C36		4200	mg/Kg	E for surrogate %R MB detect none, sample conc. >5X MB	S8	ORG	Compounds detected in MB: C10-C28 at 1.08 mg/Kg; JP-8 at 0.975 mg/Kg; C10-C36 at 1.64 mg/Kg; Surrogate %R outside criteria; See abbreviations
B-026	1/26/2018	550-96983-03	8015D	JP-8 (C8-C12)	PHCC8C12		1100	mg/Kg	E for surrogate %R MB detect none, sample conc. >5X MB	S8	ORG	Compounds detected in MB: C10-C28 at 1.08 mg/Kg; JP-8 at 0.975 mg/Kg; C10-C36 at 1.64 mg/Kg; Surrogate %R outside criteria; See abbreviations
B-026	1/26/2018	550-96983-03	8015D	Motor Oil (C20-C38)	PHCC20C38		3700	mg/Kg	E for surrogate %R MB detect none, sample conc. >5X MB	S8	ORG	Compounds detected in MB: C10-C28 at 1.08 mg/Kg; JP-8 at 0.975 mg/Kg; C10-C36 at 1.64 mg/Kg; Surrogate %R outside criteria; See abbreviations
B-036	1/26/2018	550-96983-13	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-036	1/26/2018	550-96983-13	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-036	1/26/2018	550-96983-13	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.0085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-058	1/26/2018	550-96983-02	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-058	1/26/2018	550-96983-02	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.0084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	Nitrobenzene	98-95-3	<	0.079	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-059	1/26/2018	550-96983-01	8330B	PETN	78-11-5	<	0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-059	1/26/2018	550-96983-01	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	6010B	Lead	7439-92-1		12	mg/Kg	E	--	ORG	Associated MSD %R outside criteria; Associated MS/MSD RPD outside criteria; See abbreviations
B-177	1/26/2018	550-96983-10	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	2,4-Dinitrotoluene	121-14-2	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	2,6-Dinitrotoluene	606-20-2	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	3,5-Dinitroaniline	618-87-1	<	0.0082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.027	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	m-Nitrotoluene	99-08-1	<	0.058	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	Nitrobenzene	98-95-3	<	0.077	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-177	1/26/2018	550-96983-10	8330B	Picric acid	88-89-1	<	0.051	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	p-Nitrotoluene	99-99-0	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	RDX	121-82-4	<	0.039	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177	1/26/2018	550-96983-10	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	6010B	Lead	7439-92-1		14	mg/Kg	E	--	FD	Associated MSD %R outside criteria; Associated MS/MSD RPD outside criteria; See abbreviations
B-177-2	1/26/2018	550-96983-11	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	3,5-Dinitroaniline	618-87-1	<	0.0089	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	Nitrobenzene	98-95-3	<	0.084	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-177-2	1/26/2018	550-96983-11	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-2	1/26/2018	550-96983-11	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	6010B	Lead	7439-92-1		18	mg/Kg	E	M1 R4	FD	MSD %R outside criteria; MS/MSD RPD outside criteria; See abbreviations
B-177-3	1/26/2018	550-96983-12	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	2,4-Dinitrotoluene	121-14-2	<	0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	2,6-Dinitrotoluene	606-20-2	<	0.017	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	3,5-Dinitroaniline	618-87-1	<	0.0082	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.027	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	Nitrobenzene	98-95-3	<	0.078	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	p-Nitrotoluene	99-99-0	<	0.033	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-177-3	1/26/2018	550-96983-12	8330B	RDX	121-82-4	<	0.039	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177-3	1/26/2018	550-96983-12	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	3,5-Dinitroaniline	618-87-1	<	0.0087	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	m-Nitrotoluene	99-08-1	<	0.062	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-178	1/26/2018	550-96983-08	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-184	1/26/2018	550-96983-09	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-184	1/26/2018	550-96983-09	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	6010B	Lead	7439-92-1		9.7	mg/Kg	E	--	ORG	Associated MSD %R outside criteria; Associated MS/MSD RPD outside criteria; See abbreviations
B-199	1/26/2018	550-96983-04	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-199	1/26/2018	550-96983-04	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	3,5-Dinitroaniline	618-87-1	<	0.0089	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	Nitrobenzene	98-95-3	<	0.084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-199	1/26/2018	550-96983-04	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	6010B	Lead	7439-92-1		53	mg/Kg	E	--	ORG	Associated MSD %R outside criteria; Associated MS/MSD RPD outside criteria; See abbreviations
B-201	1/26/2018	550-96983-05	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-201	1/26/2018	550-96983-05	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-201	1/26/2018	550-96983-05	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-208	1/26/2018	550-96983-06	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-208	1/26/2018	550-96983-06	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	9056	Nitrate as N	14797-55-8		25	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-227	1/30/2018	550-97173-06	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-227	1/30/2018	550-97173-06	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-227	1/30/2018	550-97173-06	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	9056	Nitrate as N	14797-55-8		8.2	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-232	1/30/2018	550-97173-05	6010B	Arsenic	7440-38-2		4.8	mg/Kg	E	M2	ORG	MS/MSD %R below criteria; See abbreviations
B-232	1/30/2018	550-97173-05	6010B	Lead	7439-92-1		16	mg/Kg	E	M2	ORG	MS/MSD %R below criteria; See abbreviations
B-232	1/30/2018	550-97173-05	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	3,5-Dinitroaniline	618-87-1	<	0.0086	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-232	1/30/2018	550-97173-05	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	m-Nitrotoluene	99-08-1	<	0.061	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	Nitrobenzene	98-95-3	<	0.081	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-232	1/30/2018	550-97173-05	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-232	1/30/2018	550-97173-05	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	9056	Nitrate as N	14797-55-8		44	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-34	1/30/2018	550-97173-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	2,4-Dinitrotoluene	121-14-2		0.091	mg/Kg	E	E4	ORG	Result Between RL and MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-34	1/30/2018	550-97173-02	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-34	1/30/2018	550-97173-02	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	9056	Nitrate as N	14797-55-8		150	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-35	1/30/2018	550-97173-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-35	1/30/2018	550-97173-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.0084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-35	1/30/2018	550-97173-01	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	Nitrobenzene	98-95-3	<	0.079	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-35	1/30/2018	550-97173-01	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	PETN	78-11-5	<	0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-35	1/30/2018	550-97173-01	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	9056	Nitrate as N	14797-55-8		41	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-38	1/30/2018	550-97173-04	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.036	mg/Kg	E	E4 C8	ORG	Result Between RL and MDL; RPD between columns > 40%; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	3,5-Dinitroaniline	618-87-1	<	0.0085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	HMX	2691-41-0		0.059	mg/Kg	E	E4 C8	ORG	Result Between RL and MDL; RPD between columns > 40%; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	m-Nitrotoluene	99-08-1	<	0.061	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-38	1/30/2018	550-97173-04	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-38	1/30/2018	550-97173-04	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	9056	Nitrate as N	14797-55-8		170	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-39	1/30/2018	550-97173-03	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	3,5-Dinitroaniline	618-87-1	<	0.0087	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	m-Nitrotoluene	99-08-1	<	0.062	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	Nitrobenzene	98-95-3	<	0.082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-39	1/30/2018	550-97173-03	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-39	1/30/2018	550-97173-03	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	9056	Nitrate as N	14797-55-8		40	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-193	1/31/2018	550-97259-09	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-193	1/31/2018	550-97259-09	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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2018 ANPI DEMOLITION SAMPLE DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-233	1/31/2018	550-97259-07	9056	Nitrate as N	14797-55-8		16	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-233	1/31/2018	550-97259-07	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-233	1/31/2018	550-97259-07	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	9056	Nitrate as N	14797-55-8		80	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-237	1/31/2018	550-97259-04	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-237	1/31/2018	550-97259-04	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-237	1/31/2018	550-97259-04	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	9056	Nitrate as N	14797-55-8		52	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-245	1/31/2018	550-97259-06	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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2018 ANPI DEMOLITION SAMPLE DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-245	1/31/2018	550-97259-06	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-245	1/31/2018	550-97259-06	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	9056	Nitrate as N	14797-55-8		91	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-457	1/31/2018	550-97259-08	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-457	1/31/2018	550-97259-08	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	3,5-Dinitroaniline	618-87-1	<	0.0084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	PETN	78-11-5	<	0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-457	1/31/2018	550-97259-08	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	9056	Nitrate as N	14797-55-8		18	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-510-1	1/31/2018	550-97259-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-510-1	1/31/2018	550-97259-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-510-1	1/31/2018	550-97259-01	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-510-1	1/31/2018	550-97259-01	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-1	1/31/2018	550-97259-01	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-510-1	1/31/2018	550-97259-01	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	9056	Nitrate as N	14797-55-8		13	mg/Kg	None, result >5X concentration in MB	--	FD	Nitrate detected in MB at 0.353 mg/Kg
B-510-2	1/31/2018	550-103691-04	6010C	Lead	7439-92-1	<	0.0026	mg/L	E	E8	EB	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-510-2	1/31/2018	550-97259-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-2	1/31/2018	550-97259-02	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	9056	Nitrate as N	14797-55-8		23	mg/Kg	None, result >5X concentration in MB		FD	Nitrate detected in MB at 0.353 mg/Kg
B-510-3	1/31/2018	550-97259-03	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-510-3	1/31/2018	550-97259-03	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-510-3	1/31/2018	550-97259-03	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	9056	Nitrate as N	14797-55-8		190	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-52	1/31/2018	550-97259-10	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-52	1/31/2018	550-97259-10	8330B	Nitroglycerin	55-63-0		0.32	mg/Kg	E	E4	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-52	1/31/2018	550-97259-10	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	9056	Nitrate as N	14797-55-8		26	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-534	1/31/2018	550-97259-05	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	3,5-Dinitroaniline	618-87-1	<	0.0087	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	m-Nitrotoluene	99-08-1	<	0.062	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	Nitrobenzene	98-95-3	<	0.082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-534	1/31/2018	550-97259-05	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-534	1/31/2018	550-97259-05	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	9056	Nitrate as N	14797-55-8		6.5	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-55	1/31/2018	550-97259-16	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	3,5-Dinitroaniline	618-87-1	<	0.0086	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	m-Nitrotoluene	99-08-1	<	0.061	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	Nitrobenzene	98-95-3	<	0.081	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-55	1/31/2018	550-97259-16	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-55	1/31/2018	550-97259-16	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	9056	Nitrate as N	14797-55-8		44	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.353 mg/Kg
B-56	1/31/2018	550-97259-15	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-56	1/31/2018	550-97259-15	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-56	1/31/2018	550-97259-15	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	9056	Nitrate as N	14797-55-8		160	mg/Kg	E	M2	ORG	MS/MSD %R below criteria; See abbreviations
B-57-1	1/31/2018	550-97259-11	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E for E8 Qualifier No qualifier for M1	E8 M1	ORG	Result evaluated to MDL; MS/MSD %R above criteria; See abbreviations
B-57-1	1/31/2018	550-97259-11	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-57-1	1/31/2018	550-97259-11	8330B	3,5-Dinitroaniline	618-87-1	<	0.0086	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-57-1	1/31/2018	550-97259-11	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	m-Nitrotoluene	99-08-1	<	0.061	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	Nitrobenzene	98-95-3	<	0.081	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-57-1	1/31/2018	550-97259-11	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-57-2	1/31/2018	550-97259-12	9056	Nitrate as N	14797-55-8		170	mg/Kg	None, result >5X concentration in MB	--	FD	Nitrate detected in MB at 0.353 mg/Kg
B-57-2	1/31/2018	550-97259-12	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-2	1/31/2018	550-97259-12	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	9056	Nitrate as N	14797-55-8		130	mg/Kg	None, result >5X concentration in MB	--	FD	Nitrate detected in MB at 0.353 mg/Kg
B-57-3	1/31/2018	550-97259-13	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-57-3	1/31/2018	550-97259-13	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	Nitroglycerin	55-63-0		0.69	mg/Kg	E	E4	FD	Result Between RL and MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-57-3	1/31/2018	550-97259-13	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	9056	Nitrate as N	14797-55-8		38	mg/Kg	EB -None, result >5X concentration in MB	--	ORG	Nitrate detected in EB at 0.18 mg/L; See abbreviations
B-197	2/1/2018	550-97315-03	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-197	2/1/2018	550-97315-03	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	3,5-Dinitroaniline	618-87-1	<	0.0083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	Nitrobenzene	98-95-3	<	0.079	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	PETN	78-11-5	<	0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-197	2/1/2018	550-97315-03	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	9056	Nitrate as N	14797-55-8		150	mg/Kg	EB -None, result >5X concentration in MB	--	ORG	Nitrate detected in EB at 0.18 mg/L; See abbreviations
B-221	2/1/2018	550-97315-04	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-221	2/1/2018	550-97315-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	Nitroglycerin	55-63-0	<	0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	p-Nitrotoluene	99-99-0	<	0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-221	2/1/2018	550-97315-04	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	9056	Nitrate as N	14797-55-8		310	mg/Kg	EB -None, result >5X concentration in MB	M3	ORG	Nitrate detected in EB at 0.18 mg/L, Sample analyte concentration is disproportionate to spike concentration; See abbreviations
B-222	2/1/2018	550-97315-05	6010B	Arsenic	7440-38-2		4.5	mg/Kg	E	M2	ORG	MS/MSD %R outside of criteria; See abbreviations.
B-222	2/1/2018	550-97315-05	6010B	Lead	7439-92-1		31	mg/Kg	E	M1 R4	ORG	MS %R outside of criteria; MS/MSD RPD outside of criteria; See abbreviations
B-222	2/1/2018	550-97315-05	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8 M1	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-222	2/1/2018	550-97315-05	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-222	2/1/2018	550-97315-05	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-222	2/1/2018	550-97315-05	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	Nitrobenzene	98-95-3	<	0.083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222	2/1/2018	550-97315-05	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	9056	Nitrate as N	14797-55-8		420	mg/Kg	EB -None, result >5X concentration in MB MS %R - E	--	ORG	Nitrate detected in EB at 0.18 mg/L Associated MSD %R outside of criteria; See abbreviations
B-228	2/1/2018	550-97315-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-228	2/1/2018	550-97315-02	8330B	2,4-Dinitrotoluene	121-14-2		0.037	mg/Kg	E	E4 C8	ORG	Result Between RL and MDL; RPD between columns > 40%; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.071	mg/Kg	E	E4	ORG	Result Between RL and MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.065	mg/Kg	E	E4	ORG	Result Between RL and MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-228	2/1/2018	550-97315-02	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	9056	Nitrate as N	14797-55-8		30	mg/Kg	EB -None, result >5X concentration in MB	M3	ORG	Nitrate detected in EB at 0.18 mg/L, Sample analyte concentration is disproportionate to spike concentration; See abbreviations
B-60	2/1/2018	550-97315-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-60	2/1/2018	550-97315-01	8330B	2,4,6-Trinitrotoluene	118-96-7		5.2	mg/Kg	E	M3	ORG	Sample analyte concentration is disproportionate to spike concentration; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	2,4-Dinitrotoluene	121-14-2		0.093	mg/Kg	E	E4	ORG	Result Between RL and MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	3,5-Dinitroaniline	618-87-1		0.029	mg/Kg	E	E4	ORG	Result Between RL and MDL; RPD between columns > 40%; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-60	2/1/2018	550-97315-01	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations
B-60	2/1/2018	550-97315-01	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	2,4-Dinitrotoluene	121-14-2	<	0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-177B	2/2/2018	550-97324-06	8330B	3,5-Dinitroaniline	618-87-1	<	0.0083	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.027	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	Nitrobenzene	98-95-3	<	0.078	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	RDX	121-82-4	<	0.039	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177B	2/2/2018	550-97324-06	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	1,3-Dinitrobenzene	99-65-0	<	0.017	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.031	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	3,5-Dinitroaniline	618-87-1	<	0.009	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8 M2	FD	Result evaluated to MDL; MSD %R below criteria; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	HMX	2691-41-0	<	0.023	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-177C	2/2/2018	550-97324-07	8330B	m-Nitrotoluene	99-08-1	<	0.064	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	Nitrobenzene	98-95-3	<	0.085	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8 M2	FD	Result evaluated to MDL; MS/MSD %R below criteria; See abbreviations.
B-177C	2/2/2018	550-97324-07	8330B	Tetryl	479-45-8	<	0.044	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	3,5-Dinitroaniline	618-87-1	<	0.0084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-207	2/2/2018	550-97324-09	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	PETN	78-11-5	<	0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-207	2/2/2018	550-97324-09	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	9056	Nitrate as N	14797-55-8		150	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.441 mg/Kg
B-222B	2/2/2018	550-97324-10	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	3,5-Dinitroaniline	618-87-1	<	0.0088	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	Nitrobenzene	98-95-3	<	0.084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-222B	2/2/2018	550-97324-10	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	Picric acid	88-89-1	<	0.055	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-222B	2/2/2018	550-97324-10	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	9056	Nitrate as N	14797-55-8		100	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.441 mg/Kg
B-235	2/2/2018	550-97324-04	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	3,5-Dinitroaniline	618-87-1	<	0.0083	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	Nitrobenzene	98-95-3	<	0.078	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-235	2/2/2018	550-97324-04	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL; MS/MSD %R outside of criteria; See abbreviations.
B-235	2/2/2018	550-97324-04	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	2,4-Dinitrotoluene	121-14-2	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	3,5-Dinitroaniline	618-87-1	<	0.0082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.027	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	m-Nitrotoluene	99-08-1	<	0.059	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	Nitrobenzene	98-95-3	<	0.078	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	Picric acid	88-89-1	<	0.052	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	p-Nitrotoluene	99-99-0	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-238	2/2/2018	550-97324-05	8330B	RDX	121-82-4	<	0.039	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-238	2/2/2018	550-97324-05	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.0084	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	o-Nitrotoluene	88-72-2	<	0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	PETN	78-11-5	<	0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	RDX	121-82-4	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-1	2/2/2018	550-97324-01	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-240-2	2/2/2018	550-97324-02	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	3,5-Dinitroaniline	618-87-1	<	0.0085	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	m-Nitrotoluene	99-08-1	<	0.06	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	Nitrobenzene	98-95-3	<	0.08	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	Picric acid	88-89-1	<	0.053	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	p-Nitrotoluene	99-99-0	<	0.034	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-2	2/2/2018	550-97324-02	8330B	Tetryl	479-45-8	<	0.041	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	2,4-Dinitrotoluene	121-14-2	<	0.015	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	2,6-Dinitrotoluene	606-20-2	<	0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-240-3	2/2/2018	550-97324-03	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.033	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	3,5-Dinitroaniline	618-87-1	<	0.0089	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	m-Nitrotoluene	99-08-1	<	0.063	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	Nitrobenzene	98-95-3	<	0.084	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	o-Nitrotoluene	88-72-2	<	0.047	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	PETN	78-11-5	<	0.49	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	Picric acid	88-89-1	<	0.056	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	p-Nitrotoluene	99-99-0	<	0.036	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	RDX	121-82-4	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-240-3	2/2/2018	550-97324-03	8330B	Tetryl	479-45-8	<	0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	9056	Nitrate as N	14797-55-8		170	mg/Kg	None, result >5X concentration in MB	--	ORG	Nitrate detected in MB at 0.441 mg/Kg
B-29	2/2/2018	550-97324-08	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	1,3-Dinitrobenzene	99-65-0	<	0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	2,4-Dinitrotoluene	121-14-2	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	2,6-Dinitrotoluene	606-20-2	<	0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	3,5-Dinitroaniline	618-87-1	<	0.0082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-29	2/2/2018	550-97324-08	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.027	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	HMX	2691-41-0	<	0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	m-Nitrotoluene	99-08-1	<	0.058	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	Nitrobenzene	98-95-3	<	0.077	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	o-Nitrotoluene	88-72-2	<	0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	PETN	78-11-5	<	0.45	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	Picric acid	88-89-1	<	0.051	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	p-Nitrotoluene	99-99-0	<	0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	RDX	121-82-4	<	0.039	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29	2/2/2018	550-97324-08	8330B	Tetryl	479-45-8	<	0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	3,5-Dinitroaniline	618-87-1	<	0.0086	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.028	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL, MS/MSD %R below criteria; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	m-Nitrotoluene	99-08-1	<	0.061	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-501	2/2/2018	550-97324-11	8330B	Nitrobenzene	98-95-3	<	0.081	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	Nitroglycerin	55-63-0	<	0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	o-Nitrotoluene	88-72-2	<	0.045	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	PETN	78-11-5	<	0.47	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL, MS/MSD %R below criteria; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	RDX	121-82-4	<	0.041	mg/Kg	E	E8 M2	ORG	Result evaluated to MDL, MS/MSD %R below criteria; See abbreviations.
B-501	2/2/2018	550-97324-11	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	9056	Nitrate as N	14797-55-8		100	mg/Kg	E	H1, H3	ORG	Sample received and analyzed outside of method hold time; See abbreviations
B-212	3/23/2018	550-100052-01	6010B	Lead	7439-92-1		57	mg/Kg	E	M2	ORG	MSD %R below criteria; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	1,3,5-Trinitrobenzene	99-35-4	<	0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	1,3-Dinitrobenzene	99-65-0	<	0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	2,4,6-Trinitrotoluene	118-96-7	<	0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	2,4-Dinitrotoluene	121-14-2	<	0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	2,6-Dinitrotoluene	606-20-2	<	0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	<	0.032	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	3,5-Dinitroaniline	618-87-1	<	0.0087	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	<	0.029	mg/Kg	E	E8, M2	ORG	Result evaluated to MDL; MSD %R below criteria; See abbreviations.

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-212	3/23/2018	550-100052-01	8330B	HMX	2691-41-0	<	0.022	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	m-Nitrotoluene	99-08-1	<	0.062	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	Nitrobenzene	98-95-3	<	0.082	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	Nitroglycerin	55-63-0	<	0.21	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	o-Nitrotoluene	88-72-2	<	0.046	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	PETN	78-11-5	<	0.48	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	Picric acid	88-89-1	<	0.054	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	p-Nitrotoluene	99-99-0	<	0.035	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	RDX	121-82-4	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-212	3/23/2018	550-100052-01	8330B	Tetryl	479-45-8	<	0.042	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations.
B-29-2	5/31/2018	550-103691-03	6010B	Lead	7439-92-1		150	mg/Kg	--	M3	ORG	MS/MSD %R outside criteria; See abbreviations
SCP-1	7/2/2018	18G0089-01	6010B	Lead	7439-92-1		15	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
SCP-2	7/2/2018	18G0089-02	6010B	Lead	7439-92-1		9.5	mg/Kg	E	M7	ORG	6010B MS/MSD%R below criteria, See abbreviations
SCP-2	7/2/2018	18G0089-02	8015AZ	C22 – C32			760	mg/L	--	M3	ORG	MS/MSD %R not applicable; See abbreviations
SCP-3	7/2/2018	18G0089-03	6010B	Lead	7439-92-1		9.8	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
SCP-4	7/2/2018	18G0089-04	6010B	Lead	7439-92-1		39	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
SCP-4	7/2/2018	18G0089-04	8015AZ	o-Terphenyl			104	%	--	S8	ORG	Surrogate %R not applicable; See abbreviations
SCP-4	7/2/2018	18G0089-04	8015AZ	Trifluorotoluene			97	%	--	S8	ORG	Surrogate %R not applicable; See abbreviations
SCP-5	7/2/2018	18G0089-05	6010B	Lead	7439-92-1		11	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
SCP-6	7/2/2018	18G0089-06	6010B	Lead	7439-92-1		21	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
SCP-7	7/2/2018	18G0089-07	6010B	Lead	7439-92-1		12	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
SCP-8	7/2/2018	18G0089-08	6010B	Lead	7439-92-1		19	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
SCP-8	7/2/2018	18G0089-10	6010B	Lead	7439-92-1		19	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
Equipment Blank	7/3/2018	18G0089-11	8015AZ	C10-C22		<	3	mg/L	None, sample is ND	M1	EB	8015AZ MS/MSD %R above criteria; See abbreviations
Equipment Blank	7/3/2018	18G0089-11	8260B	Benzene	71-43-2	<	0.5	µg/L	None, sample is ND	L5	EB	8260B LCS/LCSD%R above criteria; See abbreviations
Equipment Blank	7/3/2018	18G0089-11	8260B	Toluene	108-88-3	<	0.5	µg/L	None, sample is ND	L5	EB	8260B LCS/LCSD%R above criteria; See abbreviations
SCP-9	7/3/2018	18G0089-09	6010B	Lead	7439-92-1		8.6	mg/Kg	E	M7	ORG	6010B MS/MSD%R below criteria, See abbreviations
SCP-9	7/3/2018	18G0089-09	8015AZ	C10 – C22			820	mg/L	--	M3	ORG	Surrogate %R not applicable; See abbreviations
SCP-9	7/3/2018	18G0089-09	8015AZ	C22 – C32			660	mg/L	--	M3	ORG	Surrogate %R not applicable; See abbreviations
B-027	11/13/2018	550-113432-04	6010B	Lead	7439-92-1		40	mg/Kg	E	M2	ORG	Associated MS/MSD %R below; See abbreviations
B-027	11/13/2018	550-113432-04	6010B	Arsenic	7440-38-2		3.8	mg/Kg	None, sample conc. >5X conc. in EB	M2	ORG	Arsenic detected in associated EB at a concentration of 0.010 mg/L
B-198	11/13/2018	550-113432-05	6010B	Arsenic	7440-38-2		5.4	mg/Kg	None, sample conc. >5X conc. in EB	M2	ORG	Arsenic detected in associated EB at a concentration of 0.010 mg/L
B-198	11/13/2018	550-113432-06	6010B	Arsenic	7440-38-2		5.5	mg/Kg	None, sample conc. >5X conc. in EB	M2	ORG	Arsenic detected in associated EB at a concentration of 0.010 mg/L
B-198-3	11/13/2018	550-113432-07	6010B	Arsenic	7440-38-2		5.6	mg/Kg	None, sample conc. >5X conc. in EB	M2	ORG	Arsenic detected in associated EB at a concentration of 0.010 mg/L
B-027	11/13/2018	550-113432-04	8330B	1,3-Dinitrobenzene	99-65-0		0.017	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	2,4,6-Trinitrotoluene	118-96-7		0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-027	11/13/2018	550-113432-04	8330B	2,4-Dinitrotoluene	121-14-2		0.015	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	2,6-Dinitrotoluene	606-20-2		0.019	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.033	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	3,5-Dinitroaniline	618-87-1		0.009	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.03	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	HMX	2691-41-0		0.023	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	m-Nitrotoluene	99-08-1		0.064	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	Nitrobenzene	98-95-3		0.085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	Nitroglycerin	55-63-0		0.22	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	o-Nitrotoluene	88-72-2		0.047	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	PETN	78-11-5		0.49	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	Picric acid	88-89-1		0.056	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	p-Nitrotoluene	99-99-0		0.037	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	RDX	121-82-4		0.043	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-027	11/13/2018	550-113432-04	8330B	Tetryl	479-45-8		0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	6010B	Lead	7439-92-1		23	mg/Kg	E	--	ORG	Associated MS/MSD %R below laboratory criteria; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	1,3,5-Trinitrobenzene	99-35-4		0.013	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	1,3-Dinitrobenzene	99-65-0		0.016	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	2,4,6-Trinitrotoluene	118-96-7		0.029	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	2,4-Dinitrotoluene	121-14-2		0.014	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	2,6-Dinitrotoluene	606-20-2		0.018	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-198	11/13/2018	550-113432-05	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.031	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	3,5-Dinitroaniline	618-87-1		0.0085	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.028	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	HMX	2691-41-0		0.021	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	m-Nitrotoluene	99-08-1		0.06	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	Nitrobenzene	98-95-3		0.08	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	Nitroglycerin	55-63-0		0.2	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	o-Nitrotoluene	88-72-2		0.044	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	PETN	78-11-5		0.46	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	Picric acid	88-89-1		0.053	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	p-Nitrotoluene	99-99-0		0.034	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	RDX	121-82-4		0.04	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198	11/13/2018	550-113432-05	8330B	Tetryl	479-45-8		0.041	mg/Kg	E	E8	ORG	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	6010B	Lead	7439-92-1		28	mg/Kg	E	M2	FD	MS/MSD %R below criteria; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	1,3,5-Trinitrobenzene	99-35-4		0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	1,3-Dinitrobenzene	99-65-0		0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	2,4,6-Trinitrotoluene	118-96-7		0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	2,4-Dinitrotoluene	121-14-2		0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	2,6-Dinitrotoluene	606-20-2		0.018	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.032	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	3,5-Dinitroaniline	618-87-1		0.0087	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-198-2	11/13/2018	550-113432-06	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.029	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	HMX	2691-41-0		0.022	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	m-Nitrotoluene	99-08-1		0.062	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	Nitrobenzene	98-95-3		0.082	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	Nitroglycerin	55-63-0		0.21	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	o-Nitrotoluene	88-72-2		0.046	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	PETN	78-11-5		0.48	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	Picric acid	88-89-1		0.054	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	p-Nitrotoluene	99-99-0		0.035	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	RDX	121-82-4		0.041	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-2	11/13/2018	550-113432-06	8330B	Tetryl	479-45-8		0.042	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	6010B	Lead	7439-92-1		27	mg/Kg	E	--	FD	Associated MS/MSD %R below laboratory criteria; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	1,3,5-Trinitrobenzene	99-35-4		0.013	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	1,3-Dinitrobenzene	99-65-0		0.016	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	2,4,6-Trinitrotoluene	118-96-7		0.03	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	2,4-Dinitrotoluene	121-14-2		0.014	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	2,6-Dinitrotoluene	606-20-2		0.019	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.032	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	3,5-Dinitroaniline	618-87-1		0.0088	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.029	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	HMX	2691-41-0		0.022	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
B-198-3	11/13/2018	550-113432-07	8330B	m-Nitrotoluene	99-08-1		0.062	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	Nitrobenzene	98-95-3		0.083	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	Nitroglycerin	55-63-0		0.21	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	o-Nitrotoluene	88-72-2		0.046	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	PETN	78-11-5		0.48	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	Picric acid	88-89-1		0.055	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	p-Nitrotoluene	99-99-0		0.036	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	RDX	121-82-4		0.042	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
B-198-3	11/13/2018	550-113432-07	8330B	Tetryl	479-45-8		0.043	mg/Kg	E	E8	FD	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	6010B	Arsenic	7440-38-2		0.01	mg/L	E	E4	B	Result between RL and MDL, Arsenic detected in EB at a concentration of 0.010 mg/L; See abbreviations
EB-20181113	11/13/2018	550-113432-08	6010B	Lead	7439-92-1		0.0026	mg/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	1,3,5-Trinitrobenzene	99-35-4		0.2	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	1,3-Dinitrobenzene	99-65-0		0.089	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	2,4,6-Trinitrotoluene	118-96-7		0.073	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	2,4-Dinitrotoluene	121-14-2		0.084	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	2,6-Dinitrotoluene	606-20-2		0.065	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.051	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	3,5-Dinitroaniline	618-87-1		0.13	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.058	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	HMX	2691-41-0		0.088	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations

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Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
EB-20181113	11/13/2018	550-113432-08	8330B	m-Nitrotoluene	99-08-1		0.084	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	Nitrate as N	14797-55-8		0.051	mg/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	Nitrobenzene	98-95-3		0.092	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	Nitroglycerin	55-63-0		0.93	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	o-Nitrotoluene	88-72-2		0.086	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	PETN	78-11-5		0.42	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	Picric acid	88-89-1		0.044	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	p-Nitrotoluene	99-99-0		0.2	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	RDX	121-82-4		0.053	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181113	11/13/2018	550-113432-08	8330B	Tetryl	479-45-8		0.08	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	6010B	Arsenic	7440-38-2		0.008	mg/L	E	E4	B	Arsenic detected in EB at Conc. of 0.0080 mg/L, Result between RL and MDL; See abbreviations
TEST STATION	11/15/2018	550-113598-01	6010B	Lead	7439-92-1		43	mg/L	--	--	ORG	Lead detected in EB at Conc. of 0.12 mg/L
EB-20181115	11/15/2018	550-113598-02	8330B	1,3,5-Trinitrobenzene	99-35-4		0.22	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	1,3-Dinitrobenzene	99-65-0		0.1	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	2,4,6-Trinitrotoluene	118-96-7		0.081	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	2,4-Dinitrotoluene	121-14-2		0.094	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	2,6-Dinitrotoluene	606-20-2		0.072	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.057	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	3,5-Dinitroaniline	618-87-1		0.15	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.065	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
EB-20181115	11/15/2018	550-113598-02	8330B	HMX	2691-41-0		0.098	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	m-Nitrotoluene	99-08-1		0.094	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	Nitrate as N	14797-55-8		0.051	mg/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	Nitrobenzene	98-95-3		0.1	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	Nitroglycerin	55-63-0		1	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	o-Nitrotoluene	88-72-2		0.096	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	PETN	78-11-5		0.47	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	Picric acid	88-89-1		0.049	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	p-Nitrotoluene	99-99-0		0.22	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	RDX	121-82-4		0.059	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
EB-20181115	11/15/2018	550-113598-02	8330B	Tetryl	479-45-8		0.089	ug/L	E	E8	B	Result evaluated to MDL; See abbreviations
TEST STATION	11/15/2018	550-113598-01	6010B	Arsenic	7440-38-2		10	mg/L	None, sample conc. >5X conc. in EB	--	ORG	Arsenic detected in associated EB at Conc. of 0.0080 mg/L
TEST STATION	11/15/2018	550-113598-01	6010B	Lead	7439-92-1		43	mg/L	None, sample conc. >5X conc. in EB	--	ORG	Lead detected in associated EB at Conc. of 0.12 mg/L
TEST STATION	11/15/2018	550-113598-01	8330B	1,2-Dinitrobenzene	528-29-0				--	S12	ORG	Surrogate recovery outside of criteria; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	1,3,5-Trinitrobenzene	99-35-4		0.013	mg/Kg	E	E8, S12, H4, L3	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time, LCS %R outside of criteria; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	1,3-Dinitrobenzene	99-65-0		0.015	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
TEST STATION	11/15/2018	550-113598-01	8330B	2,4,6-Trinitrotoluene	118-96-7		0.029	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	2,4-Dinitrotoluene	121-14-2		0.014	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	2,6-Dinitrotoluene	606-20-2		0.018	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	2-Amino-4,6-dinitrotoluene	35572-78-2		0.031	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	3,5-Dinitroaniline	618-87-1		0.0084	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	4-Amino-2,6-dinitrotoluene	19406-51-0		0.028	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	HMX	2691-41-0		0.021	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	m-Nitrotoluene	99-08-1		0.06	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
TEST STATION	11/15/2018	550-113598-01	8330B	Nitrobenzene	98-95-3		0.079	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	Nitroglycerin	55-63-0		0.2	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	o-Nitrotoluene	88-72-2		0.044	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	PETN	78-11-5		0.46	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	Picric acid	88-89-1		0.052	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	p-Nitrotoluene	99-99-0		0.034	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	RDX	121-82-4		0.04	mg/Kg	E	E8, S12, H4	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time; See abbreviations
TEST STATION	11/15/2018	550-113598-01	8330B	Tetryl	479-45-8		0.041	mg/Kg	E	E8, S12, H4, L3	ORG	Result evaluated to MDL, Surrogate %R outside of criteria, Sample re-extracted past hold time, LCS %R outside of criteria; See abbreviations
EB_20180926	9/1/2718	18I0643-08	8260B	o-Xylene	95-47-6	<	0.5	ug/L	None, recovery high, sample ND	V1	B	CCV %R outside criteria; See abbreviations

TABLE J-6

2018 ANPI DEMOLITION SAMPLE
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Method	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Comments
EB_20180927	9/1/2718	18I0643-09	8260B	o-Xylene	95-47-6	<	0.5	ug/L	None, recovery high, sample ND	V1	B	CCV %R outside criteria; See abbreviations
SCP-11	9/1/2718	18I0643-01	8015AZ	Trifluorotoluene			134	%	None, surrogate recovery high, sample ND	S4	ORG	Surrogate %R outside criteria; See abbreviations
SCP-12	9/1/2718	18I0643-02	6010C	Selenium	7782-49-2		0.18	mg/L	E	L1	ORG	LCS/LCSD %R outside criteria; See abbreviations
SCP-13	9/1/2718	18I0643-03	6010C	Selenium	7782-49-2		0.16	mg/L	E	L1	ORG	LCS/LCSD %R outside criteria; See abbreviations
SCP-15	9/1/2718	18I0643-05	6010C	Selenium	7782-49-2		0.19	mg/L	E	L1	ORG	LCS/LCSD %R outside criteria; See abbreviations
SCP-16	9/1/2718	18I0643-06	8015AZ	C10-C22 (Diesel Range Organics)		<	30	mg/Kg	None, MS/MSD recovery high, sample ND	M1	ORG	MS/MSD %R outside criteria; See abbreviations
SCP-16	9/1/2718	18I0643-06	8015AZ	Trifluorotoluene			141	%	None, surrogate recovery high, sample ND	S4	ORG	Surrogate %R outside criteria; See abbreviations
SCP-16	9/1/2718	18I0643-06	8260B	Toluene	108-88-3	<	0.05	mg/Kg	None, MS/MSD recovery high, sample ND	M1	ORG	MS/MSD %R outside criteria; See abbreviations
Water Proof Tar	9/1/2718	18I0643-07	6010C	Lead	7439-92-1		250	mg/Kg	None, sample conc. > 5X Blank Conc	B7	ORG	Lead detected in MB at a concentration of 1.4 mg/Kg, See abbreviations
Water Proof Tar	9/1/2718	18I0643-07	8260B	Toluene-d8			68	%	None, surrogate diluted out	S8	ORG	Surrogate %R not applicable; See abbreviations

TABLE J-6

2018 ANPI DEMOLITION SAMPLES
DATA QUALIFIERS SUMMARY

Abbreviations/Acronyms:

<	=	Less Than
>	=	Greater Than
%R	=	% Recovery
µg/L	=	Micrograms per Liter
ADHS	=	Arizona Department of Health Services
B	=	Blank
B7	=	Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank.
C8	=	Sample RPD between the primary and confirmatory analysis exceeded 40% Per EPA Method 8000C, the lower value was reported as there was no evidence of chromatographic problems.
CAS	=	Chemical Abstracts Service
CCV	=	Continuing Calibration Verification Standard
Conc.	=	Concentration
E	=	Estimated
E4	=	Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL) but above MDL.
E8	=	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
EB	=	Equipment Blank
FD	=	Field Duplicate
H1	=	Sample analysis performed past holding time.
H3	=	Sample was received and/ or analysis requested past holding time.
H4	=	Sample was extracted past required extraction holding time, but analyzed within analysis HT.
HA	=	Hargis + Associates, Inc.
HU	=	Unusable
L1	=	The associated LCS/LCSD recovery was above laboratory acceptance limits.
L3	=	The associated blank spike recovery was above the laboratory/method acceptance limits. This analyte was not detected in the sample
L4	=	The associated blank spike recovery was below method acceptance limits.
L5	=	The associated blank spike recovery was above laboratory/method acceptance limits. This analyte was not detected in the sample.
LCS/LCSD	=	Laboratory Control Sample/Laboratory Control Sample Duplicate
M1	=	Matrix spike recovery was high, the associated blank spike recovery was acceptable.
M2	=	Matrix spike recovery was low, the associated blank spike recovery was acceptable.
M3	=	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.

TABLE J-6

2018 ANPI DEMOLITION SAMPLES
DATA QUALIFIERS SUMMARY

Abbreviations/Acronyms (con'd):

M7	=	Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed
MB	=	Method Blank
MDL	=	Method Detection Limit
mg/Kg	=	Milligrams per Kilogram
mg/L	=	Milligrams per Liter
MS/MSD	=	Matrix Spike/Matrix Spike Duplicate
ND	=	Non-detect
ORG	=	Original
QA	=	Quality Assurance
R1	=	RPD/RSD exceeded the method acceptance limit. See case narrative.
R4	=	MS/MSD RPD exceeded the method control limit. Recovery met acceptance criteria.
R6	=	LFB/LFBD RPD exceeded method control limit. Recovery met acceptance criteria.
RL	=	Reporting Limit
RPD	=	Relative Percent Difference
S4	=	Surrogate recovery was above laboratory and method acceptance limits. No target analytes were detected in the sample
S8	=	The analysis of the sample required a dilution such that the surrogate recovery does not provide useful information. The associated LCS/LCSD recovery was acceptable.
S12	=	Surrogate recovery was low. Data reported per ADEQ policy 0154.000.
V1	=	CCV recovery was above method acceptance limits. This target analyte was not detected in the sample.

TABLE J-7

2018 NORTHERN AREA REMEDIATION ACCELERATION
TOTAL NUMBER OF ANALYSES PERFORMED

LABORATORY		
No. of Analyses	Analyte	
34	Ca	Calcium
34	Cl	Chloride
34	CO3	Carbonate, Alkalinity
34	F	Fluoride
34	HCO3	Bicarbonate, Alkalinity
33	Mg	Magnesium
34	Na	Sodium
34	NO3-N	Nitrate – Nitrogen
34	OH	Hydroxide, Alkalinity
25	PALK	Phenolphthalein, Alkalinity
34	K	Potassium
33	SO4	Sulfate
34	TALK	Total Alkalinity
431	Total Laboratory Analyses	

TABLE J-8

2018 NORTHERN AREA REMEDIATION ACCELERATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
MW-34-B	7/5/2018	18G0157-08	Bicarb/ Total Alk			9	mg/L	--	--	B	SM	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
NAP-1	7/5/2018	18G0157-01	Bicarb/ Total Alk			1100	mg/L	None, sample conc. >5X in FB	--	ORG	--	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
NAP-2	7/5/2018	18G0157-02	Bicarb/ Total Alk			1000	mg/L	None, sample conc. >5X in FB	--	ORG	--	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
NAP-3	7/5/2018	18G0157-03	Bicarb/ Total Alk			520	mg/L	None, sample conc. >5X in FB	--	ORG	--	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
NAP-5	7/5/2018	18G0157-04	Bicarb/ Total Alk			460	mg/L	None, sample conc. >5X in FB	--	ORG	--	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
NAP-4	7/5/2018	18G0157-05	Bicarb/ Total Alk			820	mg/L	None, sample conc. >5X in FB	--	ORG	--	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
MW-45	7/5/2018	18G0157-06	Bicarb/ Total Alk			240	mg/L	None, sample conc. >5X in FB	--	ORG	SM	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
MW-34	7/5/2018	18G0157-07	Bicarb/ Total Alk			290	mg/L	None, sample conc. >5X in FB	--	FD	SM	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
MW-35	7/5/2018	18G0157-09	Bicarb/ Total Alk			320	mg/L	None, sample conc. >5X in FB	--	ORG	SM	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
MW-36	7/5/2018	18G0157-10	Bicarb/ Total Alk			250	mg/L	None, sample conc. >5X in FB	--	ORG	SM	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L
MW-36-D	7/5/2018	18G0157-11	Bicarb/ Total Alk			260	mg/L	None, sample conc. >5X in FB	--	FD	SM	Bicarbonate and Total Alk detected in FB at conc. of 9 mg/L

TABLE J-8

2018 NORTHERN AREA REMEDIATION ACCELERATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
MW-35	7/5/2018	18G0157-09	Ca	7440-70-2		150	mg/L	--	M3	ORG	SM	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
MW-35	7/5/2018	18G0157-09	Na	7440-23-5		130	mg/L	--	M3	ORG	SM	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
MW-45	7/5/2018	18G0157-06	NO3-N	14797-55-8		200	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-36	7/5/2018	18G0157-10	NO3-N	14797-55-8		160	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-36-D	7/5/2018	18G0157-11	NO3-N	14797-55-8		160	mg/L	E	H2	ORG	SM	Required dilution of sample analyzed after holding time expiration, See Abbreviations
MW-46	7/11/2018	18G0325-01	Ca	7440-70-2		400	mg/L	--	M3	ORG	SM	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
MW-46	7/11/2018	18G0325-01	Na	7440-23-5		530	mg/L	--	M3	ORG	SM	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	7/13/2018	18G0427-01	NO3-N	14797-55-8		240	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	7/16/2018	18G0462-01	Ca	7440-70-2		370	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations

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TABLE J-8

2018 NORTHERN AREA REMEDIATION ACCELERATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
SEW-2	7/16/2018	18G0462-01	NO3-N	14797-55-8		290	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	7/17/2018	18G0501-01	Ca	7440-70-2		380	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	7/17/2018	18G0501-01	Na	7440-23-5		110	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	7/19/2018	18G0573-01	NO3-N	14797-55-8		240	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	7/23/2018	18G0625-01	NO3-N	14797-55-8		240	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	8/14/2018	18H0472-01	Ca	7440-70-2		260	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	8/23/2018	18H0703-01	Ca	7440-70-2		270	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	8/23/2018	18H0703-01	Na	7440-23-5		100	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	8/27/2018	18H0732-01	NO3-N	14797-55-8		210	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	9/8/2018	18H0377-01	NO3-N	14797-55-8		220	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations

TABLE J-8

2018 NORTHERN AREA REMEDIATION ACCELERATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
SEW-2	10/10/2018	18J0393-1	Ca	7440-70-2		250	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	10/10/2018	18J0393-1	NO3-N	14797-55-8		160	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	10/16/2018	18J0487-1	Ca	7440-70-2		310	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	11/7/2018	18K0262-01	Ca	7440-70-2		270	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	11/7/2018	18K0262-01	NO3-N	14797-55-8		160	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	11/14/2018	18K0427-01	Ca	7440-70-2		290	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	11/14/2018	18K0427-01	Na	7440-23-5		100	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	12/4/2018	18L0160-01	Ca	7440-70-2		280	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	12/4/2018	18L0160-01	Na	7440-23-5		96	mg/L	--	M3	ORG	EW	Sample analyte concentration is disproportionate to spike concentration; See Abbreviations
SEW-2	12/5/2018	18L0213-01	Ca	7440-70-2		310	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations

TABLE J-8

2018 NORTHERN AREA REMEDIATION ACCELERATION MONITORING PLAN
DATA QUALIFIERS SUMMARY

Sample ID	Date Collected	Lab ID	Analyte	CAS Number	Value Flag	Lab Result	Units	HA Qualifier	ADHS Code	QA Code	Group	Comments
SEW-2	12/5/2018	18L0213-01	NO3-N	14797-55-8		230	mg/L	E	C4	ORG	EW	Confirmatory analysis was past holding time; See Abbreviations
SEW-2	12/11/2018	18L0375-01	Ca	7440-23-5		310	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	12/11/2018	18L0375-01	Na	7440-23-5		110	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	12/11/2018	18L0375-01	NO3-N	7440-23-5		210	mg/L	E	H2	ORG	EW	Required dilution of sample analyzed after holding time expiration, See Abbreviations
SEW-2	12/13/2018	18L0468-01	Ca	7440-70-2		300	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	12/27/2018	18L0661-01	Ca	7440-70-2		290	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations
SEW-2	12/27/2018	18L0661-01	Na	7440-23-5		87	mg/L	--	M3	ORG	EW	Sample analyte conc. is disproportionate to spike conc.; See Abbreviations

TABLE J-8

2018 NORTHERN AREA REMEDIATION ACCELERATION
DATA QUALIFIERS SUMMARY

ABBREVIATIONS/ACRONYMS:

>	=	Greater Than
ADHS	=	Arizona Department of Health Services
ALK	=	Alkalinity
B	=	Field Blank
Bicarb	=	Bicarbonate Alkalinity
C4	=	Confirmatory analysis was past holding time
Ca	=	Calcium
CAS	=	Chemical Abstracts Service
Conc.	=	Concentration
E	=	Estimated
EW	=	Extraction Well
FB	=	Field Blank
FD	=	Field Duplicate
H2	=	Initial analysis was performed within holding time. Reanalysis for the required dilution was past holding time.
HA	=	Hargis + Associates, Inc.
M3	=	Matrix Spike: The spike recovery value is unusable, the analyte concentration in the sample is disproportionate to the spike level; the associated blank spike recovery was acceptable.
mg/L	=	Milligrams per Liter
Na	=	Sodium
NO3-N	=	Nitrate-Nitrogen
ORG	=	Original
QA	=	Quality Assurance
SM	=	Shallow Monitor Well
SPT	=	Split

TABLE J-9

2018 QUALITY CONTROL FINDINGS AND CORRECTIVE ACTIONS SUMMARY

DATE	SITE PROGRAM	ISSUE TYPE	FINDINGS	CORRECTIVE ACTIONS
1/30/2018	NARS	Laboratory	18A0685 - MS/MSD Not Analyzed as Marked on COC; Sample SEW-1 marked on COC, Sample PDA-SB used for NH_3 MS/MSD	Reminded laboratory to use QC samples as indicated on COC.
1/30/2018	NARS	Field	18A0685 - Sample Temperature on Laboratory Receipt >6°C.	Lab notified of error, revised report issued.
1/31/2018	Building Demolition	Field	550-97259-9 COC listed sample B-193, sample containers listed sample B-197.	Field personnel contacted and sample ID on COC determined to be correct.
1/31/2018	Building Demolition	Field	550-97259 - Sample matrix was not listed on COC	Revised COC with matrix listed submitted to laboratory. Field personnel reminded to complete COC
1/31/2018	Building Demolition	Laboratory	550-97259 - EB-2018-0131 analyzed for As and Pb. These analyses were not requested on COC	Notified lab that these analytes were not requested. Revised report, deleting results, was received
2/22/2018	NARS	Laboratory	550-98468- Sample ID listed on COC PDA-C-S, Sample ID in laboratory report PDA-C-5	Lab notified of error, revised report issued.
3/27/2018	NARS	Field	18C0647 - Sample Temperature on Laboratory Receipt: > 6.0° C.	Sample Temperature on Laboratory Receipt >6°C. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
4/24/2018	NARS	Field	18D0613 - Sample Temperature on Laboratory Receipt: > 6.0° C.	Sample Temperature on Laboratory Receipt 10.4°C. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
4/24/2018	NARS	Field	550-98468-1 Sample ID was incorrect. Sample EFF-L was missing "S" to indicate split sample	Field personnel contacted to notify of required change. Laboratory contacted and ID was revised and reported correctly.
5/16/2018	PMP	Laboratory	18E0461 - Ammonia RPD for MW-43 / MW-43-D 98.4%. Result for MW-43 does not match historical data	Contacted laboratory to confirm results. Both samples were reanalyzed. The result for MW-43 did not confirm. Reanalysis result matched historical data. MW-43-D result confirmed.
5/21/2018	NARS	Field	550-103292 - Total Organic Carbon Trip Blank was missing from COC	Revised COC sent to laboratory, field personnel reminded to include all samples on COC
5/21/2018	NARS	Field	18E0544 - Sample Temperature on Laboratory Receipt: >6oC.	Sample Temperature on Laboratory Receipt 9.1°C. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
7/3/2018	Building Demolition	Field	18G0089 - Sample Temperature on Laboratory Receipt >6°C.	18G0089 sample temperature 15.8°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
7/11/2018	NARA	Field	18G0325 - Sample Temperature on Laboratory Receipt >6°C.	Sample temperature 14.8°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
7/11/2018	NARA	Laboratory	18G0325 - Project number in report does not match COC	Report revised to change project number from 130.106 to 130.165

TABLE J-9

2018 QUALITY CONTROL FINDINGS AND CORRECTIVE ACTIONS SUMMARY

DATE	SITE PROGRAM	ISSUE TYPE	FINDINGS	CORRECTIVE ACTIONS
7/23/2018	NARS	Field	18A0645 - Sample Temperature on Laboratory Receipt >6°C.	18G0624 sample temperature 9.8°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
7/23/2018	NARS	Laboratory	550-106565-01 sample ID on COC PDA-NS, sample ID in lab report PDA-N5	Lab contacted to revise report.
8/6/2018	PMP	Laboratory	18H0201 - Ammonia result for MW-21 much lower than historical concentrations	Contacted laboratory to confirm results. Review of data indicated dilution factor not incorporated into result calculation. When recalculated the result was within historical concentration range.
9/6/2018	NARA	Field	18I0151 - Sample Temperature on Laboratory Receipt >6°C.	Sample temperature 12.5°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
9/16/2018	NARA	Field	18I0405 - Sample Temperature on Laboratory Receipt >6°C.	Sample temperature 6.3°C at receipt. Field personnel reminded to use sufficient ice to cooler.
9/18/2018	NARS	Field	18I0510- Sample Temperature on Laboratory Receipt >6°C.	18I0510 sample temperature 7.4°C at receipt. Field personnel contacted, reminded to add sufficient ice to cooler.
9/26/2018	Building Demolition	Field	18I0643 – Project number listed incorrectly on COC	Laboratory contacted for report revision with correct project number
9/26/2018	Building Demolition	Laboratory	18I0643 – Sample IDs for EB-20180926 and EB-20180927 listed incorrectly in report	Laboratory contacted for report revision with correct sample IDs
10/10/2018	NARA	Field	18J0393 - Sample Temperature on laboratory receipt >6°C.	Sample temperature 6.9°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
10/16/2018	NARA	Field	18J0487 - Sample Temperature on laboratory receipt >6°C.	Sample temperature 6.8°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
11/7/2018	NARA	Laboratory	18K0262 - NO3-N result missing from report	Lab contacted. Nitrate analyzed at dilution past hold time expiration and report revised
11/13/2018	Building Demolition	Field	Equipment blank metals bottle preserved with H_2SO_4	Laboratory split off portion of unpreserved bottle and preserved with HNO_3
11/14/2018	NARA	Field	18K0427 - Sample Temperature on Laboratory Receipt >6°C.	Sample temperature 9.7°C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
11/16/2018	Building Demolition	Laboratory	550-113741 - Lab report lists project number as 130.151, COC lists project number as 130.161	Laboratory notified of error, revised report issued with correct project number.
11/16/2018	Building Demolition	Laboratory	550-113741 - Lab report lists project number as 130.151, COC lists project number as 130.161	Laboratory notified of error, revised report issued with correct project number.
12/4/2018	NARA	Field	18L0160 - Unpreserved bottle submitted for metals analysis	Metals sample require preservation to pH <2 with nitric acid. Aliquot of unpreserved bottle preserved with HNO3 upon receipt by lab. Subsample added as sample -02 (SEW-02) TW-1 per ANPI instruction. No action required.

TABLE J-9

2018 QUALITY CONTROL FINDINGS AND CORRECTIVE ACTIONS SUMMARY

DATE	SITE PROGRAM	ISSUE TYPE	FINDINGS	CORRECTIVE ACTIONS
12/4/2018	NARA	Field	18L0160 - Sample Temperature on Laboratory Receipt >6oC.	Sample temperature 7.0^{o}C at receipt. Samples delivered via short transit time to lab, not allowing enough time to cool samples. No action required.
12/5/2018	NARS	Field	550-114504-1 Sample ID listed incorrectly as MW-10-S on chain of custody	Revised COC sent to laboratory, correct ID DCP-12 -S used for analysis and reporting

Note: All qualified laboratory data are listed in Tables I-2, I-4, I-7, I-8, and I-10

Abbreviations/Acronyms:

^{o}C	=	Degrees Celsius
COC	=	Chain-of-Custody
H2SO4	=	Sulfuric Acid
HNO3	=	Nitric Acid
MS/MSD	=	Matrix Spike/Matrix Spike Duplicate
NARS	=	Northern Area Remediation System
NARA	=	Northern Area Remediation Acceleration
NO3-N	=	Nitrate as Nitrogen
PMP	=	Performance Monitoring Plan
QC	=	Quality Control
RPD	=	Relative Percent Difference

HARGIS + ASSOCIATES, INC.

APPENDIX J-1

2018 ON-SITE LABORATORY AUDIT FOR THE APACHE POWDER SUPERFUND PROJECT

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760/827-1100 Fax: 760/827-1099

December 19, 2018

Turner Laboratories, Inc.
2445 N. Coyote Drive
Tuscon, AZ 85745
Attn: Ms. Elizabeth Kasik

Subject: 2018 Apache Powder Assessment Report of Turner Laboratories, Inc. in Tuscon, AZ

Dear Ms. Kasik,

The attached report provides results of the laboratory assessment of Turner Laboratories, Inc. located in Tuscon, Arizona. Laboratory Data Consultants, Inc. (LDC) conducted the assessment on behalf of Hargis + Associates, Inc.. The report includes information pertaining to the review of laboratory preliminary documentation, proficiency testing (PT) information and an on-site assessment performed on November 29, 2018.

Turner Laboratories has until January 15, 2019 (approximately 15 business days excluding holidays) to submit a corrective action plan (CAP) addressing the deficiencies identified in this report. For each finding, your response should include a discussion of the scope and approach for planned corrective actions along with scheduled completion dates for each item not completed at the time the CAP is submitted. The plan of action must provide sufficient detail to determine if the approach is technically reasonable.

Your CAP should be directed to my attention at the letterhead address. I would like to express my appreciation to you and other members of the staff who were helpful and candid during the on-site visit. Should you have any questions or wish to discuss assessment deficiencies or proposed corrective action, please contact me at (760) 827-1100.

Sincerely,

Scott Denzer
Principal Chemist

Report for:

Apache Powder Superfund Project
2018 Laboratory Audit

Prepared for:

Hargis + Associates, Inc.
7400 N. Oracle Road, Suite 202
Tucson, AZ 85705
Attn: Ms. Mary Tyer

Laboratory:

Turner Laboratories, Inc.
2445 North Canyon Drive
Tucson, AZ 85745

Prepared by:

Laboratory Data Consultants, Inc.
2701 Loker Ave. West, Suite 220
Carlsbad, CA 92010

December 19, 2018

1.0 Introduction

As requested by Hargis + Associates, Inc. (Hargis), Laboratory Data Consultants, Inc. (LDC) conducted an assessment of Turner Laboratories, Inc. (Turner Laboratories) located in Tuscon, AZ. The assessment process includes four primary phases: 1) Review of laboratory preliminary documentation; 2) Proficiency Testing (PT) review; 3) On-site assessment; and 4) Corrective action.

2.0 General Information

The assessment was initiated by Hargis and executed by Mr. Scott Denzer of LDC as part of the overall Quality Assurance program for the Apache Powder Superfund project. The on-site assessment was structured as a general evaluation of the laboratory's quality systems and capacity to support the project.

Turner Laboratories has been providing residential, commercial and government clients with routine environmental analytical services since it was founded in 1984. The laboratory has the capacity, capabilities and support systems to deliver analytical data for small and mid-size projects.

Turner Laboratories maintains licensing through Arizona Department of Health Services. The laboratory occupies approximately 8,400 square feet. The laboratory currently operates with approximately 14 full-time personnel. Normal business hours are 8:00am to 5:00pm Monday through Friday however extended hours occur on an add-needed basis for sample receiving and operations.

3.0 Laboratory Preliminary Documentation Review

A review of laboratory supplied documentation was conducted prior to the onsite assessment and as part of the on-site assessment. Documentation included the laboratory's Quality Assurance Plan (QAP), selected standard operating procedures (SOPs) and proficiency test (PT) sample results. A master list of SOPs and a master list of major analytical instrumentation were included in the QAM and reviewed during the document review process.

4.0 Licensing and Proficiency Test (PT) Review

Turner Laboratories has been licensed by the State of Arizona Department of Health Services (AZ DHS) environmental laboratory licensing program. The laboratory is currently licensed by AZ DHS through March 24, 2019 (License #AZ0066). In addition, Turner Laboratories participates in externally administered proficiency testing programs.

All results of the most recent PT samples were within acceptance limits.

5.0 On-Site Assessment

The following information is presented in association with the on-site assessment performed by LDC of Turner Laboratories on November 29, 2018.

5.1 On-Site Assessment

The assessment was initiated by Hargis and executed by Mr. Scott Denzer of LDC. The on-site assessment was structured as a general evaluation of the laboratory's quality systems and capacity to support the Apache Powder Superfund project however particular focus was placed on selected areas of the laboratory based on data observations over the past year. The objective of the on-site assessment of Turner Laboratories was to determine whether the laboratory's quality assurance (QA) program and Quality Control (QC) practices meet the method requirements and are consistent with the QAP, applicable SOPs, State licensing requirements, and are consistent with good laboratory practices.

The following analytical methods (along with appropriate sample preparation procedures) were evaluated during the assessment process:

<table>
<tr><th>Matrix</th><th colspan="2">Analytical Method</th><th colspan="2">Analyte</th></tr>
<tr><td rowspan="16">Water</td><td rowspan="2">EPA 200.7</td><td>Total</td><td colspan="2">Be, Ca, K, Mg, Na, Sr</td></tr>
<tr><td>Dissolved</td><td colspan="2">Ag, Al, Ba, Cd, Cr, Cu, Fe, Mn</td></tr>
<tr><td>EPA 200.8</td><td>Dissolved</td><td colspan="2">As, Pb, Sb, Se</td></tr>
<tr><td>EPA 245.1</td><td>Total</td><td colspan="2">Hg</td></tr>
<tr><td colspan="2">EPA 300.0</td><td colspan="2">Chloride
Fluoride
Orthophosphate
Sulfate
Nitrate</td></tr>
<tr><td colspan="2">EPA 314.0</td><td colspan="2">Perchlorate</td></tr>
<tr><td colspan="2">Hach 8000</td><td colspan="2">COD</td></tr>
<tr><td colspan="2">SM 4500-NH3</td><td colspan="2">Nitrogen, Ammonia as N</td></tr>
<tr><td colspan="2">SM 4500-P E</td><td colspan="2">Phosphorus as P (total)</td></tr>
<tr><td colspan="2" rowspan="5">SM2320B</td><td rowspan="5">Alkalinity</td><td>Total</td></tr>
<tr><td>Hydroxide</td></tr>
<tr><td>Carbonate</td></tr>
<tr><td>Bicarbonate</td></tr>
<tr><td>Phenolphthalein</td></tr>
<tr><td colspan="2">SM2540 C</td><td colspan="2">TDS</td></tr>
<tr><td colspan="2">SM2540 D</td><td colspan="2">TSS</td></tr>
</table>

5.2 Evaluation Criteria

The on-site assessment was performed in accordance with the protocols presented in the analytical methods and in accordance with applicable AZ DHS quality control requirements. The EPA's Test Methods for Evaluating Solid Waste SW846, Turner Laboratories' QAP and laboratory SOPs were also used as performance standards.

5.3 Description

Upon arrival at the laboratory, the assessor held an orientation meeting with the Technical Director, the Project Manager and the President of the company during which the elements of the laboratory assessment program were described.

Following a description of the scope and schedule for the assessment, the assessor adjourned the opening meeting and initiated their review of laboratory operations. The on-site assessment of Turner Laboratories focused on items related to quality systems and aspects of routine laboratory operations, including:

- Organization and Personnel
- Safety and Facilities
- Sample Management
- Quality Control (QC) Practices
- Record Keeping and Traceability

- Ethics and Technical Training
- Laboratory Licensing
- Sample and Standard Preparation
- Report Generation
- Specific Analytical Methods
- Data Management and Storage
- Laboratory Information Management System
- Waste Management

The adequacy of the laboratory's QA program was assessed. The facility, instrumentation, documentation, and support practices were reviewed. The assessor interviewed the Technical Director, the Project Manager, supervisors, analysts, technicians, and support personnel.

At the conclusion of the assessment, the assessor conducted an exit brief with the Technical Director and the Project Manager. During the briefing the assessor presented a verbal review of the overall deficiencies and observations identified during the course of the on-site assessment. The deficiencies and observations are presented in Sections 6.0 and 7.0 of this report.

Laboratory personnel asked questions as needed throughout the assessment.

6.0 Deficiencies

During the course of the assessment the assessor noted policies, practices, documents, or records that did not comply with evaluation criteria identified in Section 5.2. In addition, the assessor paid special attention to items previously identified as deficiencies to ensure laboratory corrective actions had remained in place.

Table 1 presents a cumulative summary of deficiencies. It is requested that the laboratory provide their response in the "Laboratory Corrective Action Plan (CAP)" column of Table 1 as a means of facilitating a more expedient corrective action process. A copy of Table 1 has been provided to the Technical Director as a Microsoft Word file in order to expedite the process.

7.0 Observations

This section presents general observations, which reflect on the capabilities and capacity of the laboratory. Response from the laboratory is not required.

The laboratory's facility provides ample space for production analytical work and support activities, with appropriate segregation of functional areas.

Based on interviews and a review of available training documents, the laboratory's staff is qualified to perform the analyses requested by Hargis.

A laboratory information management system (LIMS) is used in all sections of the laboratory. The LIMS is within the laboratory and has a user authentication system that limits access for each user to privileges specific to their role in the laboratory. The laboratory has contracted staff to maintain the LIMS and ensure routine backup and offsite storage of files.

8.0 Conclusions

Turner Laboratories has the staff, facilities, and equipment necessary to provide Hargis with environmental analytical services on the Apache Powder Superfund project. In general, the laboratory quality control samples, sample identification and batch records are adequate to meet project requirements, and staff members are qualified for their positions. The laboratory will need to adequately address the findings of this report for complete approval.

Table 1
Hargis + Associates, Inc.: Apache Powder Superfund Project
Laboratory Audit, November 29, 2018
Turner Laboratories, Inc.

Ref #	Department	Finding	Response	Documentation	Status	Follow-up Date
1	QA	Responsibilities of the Quality Assurance Officer have not been defined in Section 2.2 of the QAP and the position has not been included in the Organization Chart in Appendix A. The Quality Assurance Officer should be independent from laboratory management if possible.				
2	QA	Max DiSante is referenced as the Laboratory Director on the signature page of the QAP however the auditor was informed Max DiSante is no longer with Turner Laboratories.				
3	QA	Appendix E of the QAP indicates SOP INORG-4 is available as a procedure for the analysis of Ammonia however the auditor was informed the SOP is no longer in use. Appendix E should be updated to indicate the SOP is no longer in use.				
4	QA	The auditor was shown the results from PT samples analyzed by Marissa Huff however the training form for Ms. Huff did not indicate she had performed PT samples.				
5	QA	It was indicated Ron DiCenzo performs metals prep for EPA 220.7 however Mr. DiCenzo was not identified on the Organization Chart.				
6	QA	Section 6.2 of the QAP indicates infrared temperature devices are checked each day of use however the Sample Control Officer indicated the infrared thermometer is checked every one to two days.				
7	QA	Item 2, including Item 2b, in the laboratory's Policy No. 6 indicates internal laboratory audits are to be conducted at the time of each major on-study performance evaluation (WP, WS, HW) however an internal audit had not been conducted when WP18-2 and WS18-3 were performed.				
8	QA	The laboratory does not have a policy regarding the archival of raw data acquired through instrument data acquisition systems including the frequency of archival and deletion of data from the data acquisition system.				
9	Sample Control	The temperature correction factor of -0.2°C was not being applied to the Fisher Sample Control refrigerator.				

Table 1
Hargis + Associates, Inc.: Apache Powder Superfund Project
Laboratory Audit, November 29, 2018
Turner Laboratories, Inc.

Ref #	Department	Finding	Response	Documentation	Status	Follow-up Date
10	Sample Control	Temperature of the Fisher Sample Control refrigerator was not consistently being recorded to one decimal place.				
11	Wet Chem (TDS)	Section 7.1.3 in the SOP for total dissolved solids (INORG-32) indicates "….a dried residue weight of 2.5 mg……" The sentence should indicate "…. a dried residue of at least 2.5 mg…."				
12	Wet Chem (TSS)	Section 7.2.10 in the SOP for total suspended solids (INORG-33) indicates "….a dried residue weight of 2.5 mg……" The sentence should indicate "…. a dried residue of at least 2.5 mg…."				
13	Wet Chem (Ammonia)	The analyst indicated the mixed indicator solution prepared for ammonia analysis is used until it runs out rather than monthly as indicated in Section 6.1.3 of SOP INORG-51.				
14	Wet Chem (Ammonia)	Although maintenance was performed on the ammonia distillation unit in July 2018, maintenance was not documented since there's no maintenance log as indicated in Section 12 of the QAP.				
15	Wet Chem (Ammonia)	Sections 9.2.3 and 9.2.4 indicate the precision criteria for the LCSD and MSD is calculated as RSD rather than RPD.				
16	Wet Chem (Phosphorus as P [total])	Section 7.1.7 of the SOP states to proceed with the orthophosphate analysis "in Section 6.2" rather than "in Section 7.2".				
17	Wet Chem (COD)	The following COD standards were logged into the LIMS however they did not have the manufacturer's certificate of analysis attached to the LIMS identifiers: LIMS ID: 1801489 LIMS ID: 1801490				
18	Wet Chem (COD)	The sections numbers corresponding to reagents in the COD SOP (INORG-6) are misidentified. The correct section numbers should be 6.2, 6.2.1 and 6.2.2, respectively.				
19	Wet Chem (COD)	The outside of the vial was not being cleaned with a dry lint-free cloth prior to placing it in the spectrophotometer as indicated in Section 7.4.3 of the SOP (INORG-6).				

Table 1
Hargis + Associates, Inc.: Apache Powder Superfund Project
Laboratory Audit, November 29, 2018
Turner Laboratories, Inc.

Ref #	Department	Finding	Response	Documentation	Status	Follow-up Date
20	Wet Chem (Alkalinity)	An indicator blank was not being prepared and titrated as indicated in Section 1d of SM2320B.				
21	Wet Chem (Anions)	Retention time windows had not been established for anion analyses (INORG-3) and the analyst was not familiar with how to establish retention time windows. In addition, the SOP does not include criteria to evaluate retention time drift as indicated in Section 10.4 of EPA Method 300.0.				
22	Wet Chem (Perchlorate)	Raw data for perchlorate analysis was not being pushed (for back up purposes) from the local data acquisition system to the lab's server on a routine basis.				
23	Wet Chem (Mercury)	Air flow in the fume hood used for mercury digestion had not been checked since 9/18/15.				
24	Metals (ICP, ICP/MS)	The metals receipt form for work order 18G0157-01 was incomplete. There was no indication digestion had been performed on the metals preparation bench sheet.				
25	Metals (ICP, ICP/MS)	The metals preparation bench sheet does not have a place to designate when filtration is performed.				
26	Metals (ICP, ICP/MS)	Raw data for metals analyses were not being pushed (for back up purposes) from the local data acquisition system to the lab's server on a routine basis.				
27	Wet Chem (General)	Various reagents did not have expiration dates indicated on the bottles. For example: phenolphthalein (used for alkalinity analyses), sodium perchlorate (used for perchlorate analyses), potassium permanganate (used for mercury analyses), and potassium persulfate (used for mercury analyses)				
28	Wet Chem (General)	"Monthly" calibration of the analytical balance was performed on 9/4/18 and subsequently on 10/20/18 instead of monthly.				
29	Wet Chem (General)	Calibration acceptance criteria was not readily available, such as on the monthly calibration form, for the analytical balance.				

Table 1
Hargis + Associates, Inc.: Apache Powder Superfund Project
Laboratory Audit, November 29, 2018
Turner Laboratories, Inc.

Ref #	Department	Finding	Response	Documentation	Status (LDC)	Follow-up Date
1	QA	Responsibilities of the Quality Assurance Officer have not been defined in Section 2.2 of the QAP and the position has not been included in the Organization Chart in Appendix A. The Quality Assurance Officer should be independent from laboratory management if possible.	The QA Plan and the Organizational chart have been updated to include the QA Officer.	Revised QA Plan (Dated 1/14/19) and Organizational chart	Acceptable	
2	QA	Max DiSante is referenced as the Laboratory Director on the signature page of the QAP however the auditor was informed Max DiSante is no longer with Turner Laboratories.	The Quality Assurance Plan has been updated with Elizabeth Kasik as the Laboratory Director	Revised QA Plan (Dated 1/14/19)	Acceptable	
3	QA	Appendix E of the QAP indicates SOP INORG-4 is available as a procedure for the analysis of Ammonia however the auditor was informed the SOP is no longer in use. Appendix E should be updated to indicate the SOP is no longer in use.	Appendix E has been revised to reflect current SOPs and those that are no longer in use.	Revised Appendix E	Acceptable	
4	QA	The auditor was shown the results from PT samples analyzed by Marissa Huff however the training form for Ms. Huff did not indicate she had performed PT samples.	Marissa Huff's training file has been updated to reflect her metals training.	Marissa Huff training record	Acceptable	
5	QA	It was indicated Ron DiCenzo performs metals prep for EPA 220.7 however Mr. DiCenzo was not identified on the Organization Chart.	The Organizational Chart has been updated to reflect all current employees	Revised Organizational Chart	Acceptable	
6	QA	Section 6.2 of the QAP indicates infrared temperature devices are checked each day of use however the Sample Control Officer indicated the infrared thermometer is checked every one to two days.	All staff was retrained as to that temperatures must be recorded each day of use.	Training record from 1/10/19	Acceptable	
7	QA	Item 2, including Item 2b, in the laboratory's Policy No. 6 indicates internal laboratory audits are to be conducted at the time of each major on-study performance evaluation (WP, WS, HW) however an internal audit had not been conducted when WP18-2 and WS18-3 were performed.	An audit will be performed on WP18-2 and WS18-3 by March 31, 2019. The review was not completed by the previous Laboratory Director.		Acceptable	
8	QA	The laboratory does not have a policy regarding the archival of raw data acquired through instrument data acquisition systems including the frequency of archival and deletion of data from the data acquisition system.	The Quality Assurance Plan has been revised to include a policy for backing up data from local acquisition computers.	Revised QA Plan section 4.5.	Acceptable	
9	Sample Control	The temperature correction factor of -0.2°C was not being applied to the Fisher Sample Control refrigerator.	All staff was retrained as to that the correction factor must be accounted for prior to recording any temperature.	Training record from 1/10/19	Acceptable	

Table 1
Hargis + Associates, Inc.: Apache Powder Superfund Project
Laboratory Audit, November 29, 2018
Turner Laboratories, Inc.

Ref #	Department	Finding	Response	Documentation	Status (LDC)	Follow-up Date
10	Sample Control	Temperature of the Fisher Sample Control refrigerator was not consistently being recorded to one decimal place.	All staff was retrained as to that temperatures must be consistently recorded to the capability of the thermometer, including decimal places.	Training record from 1/10/19	Acceptable	
11	Wet Chem (TDS)	Section 7.1.3 in the SOP for total dissolved solids (INORG-32) indicates "….a dried residue weight of 2.5 mg……" The sentence should indicate "…. a dried residue of at least 2.5 mg…."	The TDS SOP will be updated no later than 3/31/19.		Acceptable pending documentation.	3/31/19
12	Wet Chem (TSS)	Section 7.2.10 in the SOP for total suspended solids (INORG-33) indicates "….a dried residue weight of 2.5 mg……" The sentence should indicate "…. a dried residue of at least 2.5 mg…."	The TSS SOP will be updated no later than 3/31/19.		Acceptable pending documentation.	3/31/19
13	Wet Chem (Ammonia)	The analyst indicated the mixed indicator solution prepared for ammonia analysis is used until it runs out rather than monthly as indicated in Section 6.1.3 of SOP INORG-51.	The indicator solution will be prepared prior to the next ammonia batch being analyzed. An expiration time of one month will be assigned to the standard.		Acceptable	
14	Wet Chem (Ammonia)	Although maintenance was performed on the ammonia distillation unit in July 2018, maintenance was not documented since there's no maintenance log as indicated in Section 12 of the QAP.	A maintenance log was put in to place on 1/10/19.	Pictures of the cover and inside of the new maintenance log.	Acceptable	
15	Wet Chem (Ammonia)	Sections 9.2.3 and 9.2.4 indicate the precision criteria for the LCSD and MSD is calculated as RSD rather than RPD.	The ammonia SOP will be updated no later than 2/28/19.		Acceptable pending documentation.	2/28/19
16	Wet Chem (Phosphorus as P [total])	Section 7.1.7 of the SOP states to proceed with the orthophosphate analysis "in Section 6.2" rather than "in Section 7.2".	The Phosphorous SOP will be updated no later than 2/28/19.		Acceptable pending documentation.	2/28/19
17	Wet Chem (COD)	The following COD standards were logged into the LIMS however they did not have the manufacturer's certificate of analysis attached to the LIMS identifiers: LIMS ID: 1801489 LIMS ID: 1801490	All staff was retrained as to that certificates of analysis must be attached to the standard information in the LIMs System.	Training record from 1/10/19	Acceptable	
18	Wet Chem (COD)	The sections numbers corresponding to reagents in the COD SOP (INORG-6) are misidentified. The correct section numbers should be 6.2, 6.2.1 and 6.2.2, respectively.	The COD SOP will be updated no later than 2/28/19.		Acceptable pending documentation.	2/28/19

Table 1
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Laboratory Audit, November 29, 2018
Turner Laboratories, Inc.

Ref #	Department	Finding	Response	Documentation	Status (LDC)	Follow-up Date
19	Wet Chem (COD)	The outside of the vial was not being cleaned with a dry lint-free cloth prior to placing it in the spectrophotometer as indicated in Section 7.4.3 of the SOP (INORG-6).	This procedure was put in to place as of 1/10/19.		Acceptable	
20	Wet Chem (Alkalinity)	An indicator blank was not being prepared and titrated as indicated in Section 1d of SM2320B.	We will begin running an indicator blank (Method Blank) with the next batch of Alkalinity samples that are run. The SOP will be updated no later 1/31/19.	Please see new Alkalinity bench sheet.	Acceptable pending documentation.	1/31/19
21	Wet Chem (Anions)	Retention time windows had not been established for anion analyses (INORG-3) and the analyst was not familiar with how to establish retention time windows. In addition, the SOP does not include criteria to evaluate retention time drift as indicated in Section 10.4 of EPA Method 300.0.	Retention time study was performed on 1/11/19 and will be completed per method specifications. The SOP will be revised to include retention time criteria no later than 3/15/19.	Retention Time window study from 1/11/19.	Acceptable pending documentation.	3/15/19
22	Wet Chem (Perchlorate)	Raw data for perchlorate analysis was not being pushed (for back up purposes) from the local data acquisition system to the lab's server on a routine basis.	All staff were trained that it is necessary to push all data to the servers at least weekly as per the new QAP on 1/10/19.	Training form from 1/10/19.	Acceptable	
23	Wet Chem (Mercury)	Air flow in the fume hood used for mercury digestion had not been checked since 9/18/15.	All air flows were checked on 1/10/19.	Copy of the air flow logbook showing that they were checked 1/10/19.	Acceptable	
24	Metals (ICP, ICP/MS)	The metals receipt form for work order 18G0157-01 was incomplete. There was no indication digestion had been performed on the metals preparation bench sheet.	All staff was retrained on the appropriate manner in which to fill out logbooks. The employee in question is no longer with the laboratory.	Please see the training form from 1/10/19.	Acceptable	
25	Metals (ICP, ICP/MS)	The metals preparation bench sheet does not have a place to designate when filtration is performed.	Filtration of the sample in the lab or in the field is indicated in the turbidity field of the logbook. The pages that were reviewed had not been filled out properly. Staff was retrained and an appropriately filled out form has been attached.	Example Metals prep bench sheet.	Acceptable	
26	Metals (ICP, ICP/MS)	Raw data for metals analyses were not being pushed (for back up purposes) from the local data acquisition system to the lab's server on a routine basis.	All staff were trained that it is necessary to push all data to the servers at least weekly as per the new QAP on 1/10/19.	Training form from 1/10/19.	Acceptable	
27	Wet Chem	Various reagents did not have expiration dates indicated on the bottles. For example: phenolphthalein (used for	All staff has been instructed to review all standards for the necessary information.	Please see the memorandum from	Acceptable	

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	(General)	alkalinity analyses), sodium perchlorate (used for perchlorate analyses), potassium permanganate (used for mercury analyses), and potassium persulfate (used for mercury analyses)		1/10/19.		
28	Wet Chem (General)	"Monthly" calibration of the analytical balance was performed on 9/4/18 and subsequently on 10/20/18 instead of monthly.	All staff was retrained on the necessity for regular scheduling when it comes to performing routine checks such as the monthly calibration of the balances. The employee in question is no longer with the laboratory.	Please see the training form from 1/10/19.	Acceptable	
29	Wet Chem (General)	Calibration acceptance criteria was not readily available, such as on the monthly calibration form, for the analytical balance.	New log sheets were put in to use on 1/10/19.	Please see copies of the new log sheets.	Acceptable	