

Final Remedial Investigation Report

Park-Euclid WQARF Site, Tucson, Arizona

Volume I – Text, Tables, and Figures

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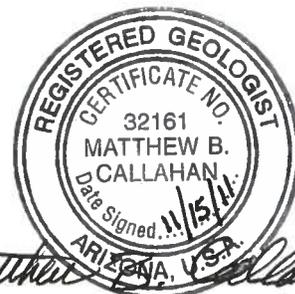
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ACRONYMS AND ABBREVIATIONS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
ASRAC	Arizona Superfund Response Action Contract
AST	aboveground storage tank
AWQS	Aquifer Water Quality Standard
bgs	below ground surface
cm/sec	centimeters per second
COCs	contaminants of concern
°C	degrees Celsius
cis-1,2-DCE	cis-1,2-dichloroethene
1,1-DCE	1,1-dichloroethene
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
ERA	early response action
ESA	environmental site assessment
°F	degrees Fahrenheit
FS	feasibility study
ft/day	feet per day
ft ² /day	square feet per day
ft/ft	foot per foot
GAC	granulated activated carbon
GPL	Groundwater Protection Level
gpm	gallons per minute
HRA	health risk assessment
lb	pound
LRL	laboratory reporting limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µS/cm	microsiemens per centimeter
µg/ft-min	micrograms per linear foot per minute
milliequivalents/L	milliequivalents per liter
MPE	multi-phase extraction
NR-SRL	non-residential soil remediation level
µg/L	micrograms per liter
µg/kg	micrograms per kilogram
ORP	oxidation reduction potential
PA/SI	preliminary site assessment/site inspection
PCE	tetrachloroethene/tetrachloroethylene
ppmv	parts per million by volume
RI	remedial investigation
RO	remedial objective
R-SRL	residential soil remediation level
SRL	soil remediation level
SVE	soil vapor extraction

TCA	1,1,1-trichlorethane
TCE	trichloroethene
TDS	total dissolved solids
TOC	total organic carbon
trans-1,2-DCE	trans-1,2-dichloroethene
UA	University of Arizona
USACE	United States Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound
WQARF	Water Quality Assurance Revolving Fund

EXECUTIVE SUMMARY

The Park-Euclid Water Quality Assurance Fund (WQARF) Site (Park-Euclid Site) is located south of 8th Street, north of 14th Street, west of Mountain Avenue, and east of Park Avenue in Tucson, Arizona. In 1990, as part of a larger area-wide investigation, an inactive industrial water-supply well at the Haskell/Mission Linen Facility at 301 South Park Avenue, known as New Well (or MP-1), was sampled by the Arizona Department of Environmental Quality (ADEQ). The water-supply well was discovered to be contaminated with dry cleaning-related contaminants and diesel fuel. In 1999, the Park-Euclid Site was placed on the WQARF Registry, with an eligibility and evaluation score of 51 out of a possible 120. In October 1999, ADEQ initiated a Remedial Investigation (RI). As part of this RI, 20 perched aquifer monitoring wells, 10 soil vapor monitoring wells, 4 soil vapor extraction (SVE) wells, 1 multi-phase extraction well, and 17 regional aquifer monitoring wells (including 4 regional aquifer sentinel wells) have been installed across the site by Mission Linen, the U.S. Environmental Protection Agency (EPA), ADEQ, and/or the City of Tucson.

Activities undertaken to achieve the RI goals included: evaluating historical site uses; identifying and assessing the integrity of sanitary sewer and wastewater lines; collection of soil, soil gas and groundwater samples; conducting aquifer tests to determine aquifer characteristics; and compiling and evaluating available environmental data for the Park-Euclid Site generated by ADEQ, Mission Linen, the City of Tucson, EPA, Pima County, the U.S. Army Corps of Engineers, and the Arizona Department of Transportation. This RI report has been prepared using data collected from the last full groundwater monitoring and sampling event in November 2008, a 2009 evaluation of a multi-phase extraction (MPE) system pilot operation, and any information collected prior to that time.

The Park-Euclid Site and surrounding area is located in an urbanized setting, which includes single-family and multi-family homes, shops, restaurants, schools, and light industry. The scope of the RI also includes the area to the north and northeast of the Park-Euclid Site extending to the University of Arizona (UA) campus. UA operates eight water-supply wells which provide drinking water to the Main Campus and the Arizona Health Sciences Center.

The contaminants of concern (COCs) at the Park-Euclid Site are the dry cleaning-related chemicals tetrachloroethene (PCE) and its biological breakdown products trichloroethene (TCE), dichloroethene (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE), and vinyl chloride. 1,1-DCE can also be an abiotic degradation product of 1,1,1-trichloroethane (1,1,1-TCA). However, 1,1,1-TCA has not been detected at the Park-Euclid Site. COCs are regulated chemicals that exist in the groundwater in concentrations above soil remediation levels, groundwater protection levels, and ADEQ AWQSSs, as appropriate.

Identification of potential sources for the diesel fuel-related contamination in the perched aquifer was not an objective of this RI. ADEQ's RI activities were focused on the dry cleaning-related contaminants in the soil and groundwater, since these contaminants presented the greatest potential risks to human health based on exposure pathways.

Groundwater beneath the Park-Euclid Site is present in a shallow perched aquifer, which exists from approximately 84 to 96 feet below ground surface (bgs), and the regional aquifer, which begins at approximately 200 feet bgs. The perched aquifer at the Park-Euclid Site is approximately zero to greater than 5 feet thick, responds seasonally to various weather/climate events, and does not appear to be present in the northern portion of the Park-Euclid Site near

the sentinel wells UAM-1, UAM-2, UAM-2B, and UAM-3. The perched aquifer is underlain by clayey sediments with low permeability (the upper aquitard), which helps restrict the migration of fluids downward.

The hydraulic gradient of the perched aquifer is to the north-northwest in the area north of the Haskell/Mission Linen Facility, and to the west-southwest in the area south of the Haskell/Mission Linen Facility. The perched aquifer COCs plume extends approximately 800 feet northwest from beneath the former dry-cleaning area, approximately 250 feet to the southwest, and approximately 400 feet to the southeast and northeast. The perched aquifer in the southern portion of the Park-Euclid Site is impacted with diesel free product and dissolved-phase fuel-related hydrocarbons. The diesel fuel has been trapped by the upper aquitard and is floating on top of the perched aquifer. Dry cleaning-related contaminants are found both in the diesel fuel and in the groundwater of the perched aquifer. Based on information collected during the site investigations, the perched aquifer is not a source of potable water.

The perched aquifer and aquitard are underlain by the lower vadose zone, which extends to the top of the regional aquifer at about 200 feet bgs. Dry cleaning-related contaminants are present in this zone as vapors and adsorbed to soil.

The regional aquifer, present at depths starting at approximately 200 feet bgs at the Park-Euclid Site, is the main source of water supply for the Tucson Basin. The COCs plume in the regional aquifer extends about 2,800 feet to the north-northeast from the Haskell/Mission Linen Facility towards UA. The extent of the regional aquifer plume is dependent on the pumpage of the regional aquifer. The nearest water-supply wells to the Park-Euclid Site are located approximately 0.5 miles to the north (downgradient) and are used by the UA. UA water-supply wells do not contain any Park-Euclid Site COCs. Diesel-fuel free product is currently not found in the regional aquifer monitoring wells, but it has been detected historically.

The primary sources of contamination may be attributed to spills and releases of PCE solvent from the wastewater pipes, sanitary sewer lines, storage tank spills, spills in the dry-cleaning area, and releases from dry-cleaning machines. These spills and releases reportedly occurred within and in the vicinity of the former dry-cleaning area at 301 South Park Avenue (the Haskell/Mission Linen Facility). These spills may have resulted in releases of liquid PCE to the subsurface through soil, joints, and cracks in the concrete slab of the building, and through discharges to the floor drains, sumps, and sewer lines.

The spilled/released PCE eventually migrated to the underlying shallow perched aquifer. Contamination observed in the regional aquifer is likely a mixture of PCE and water from the perched aquifer that primarily migrated into two former water-supply wells (Old Well and MP-1) located at the Haskell/Mission Linen Facility. Contaminants were most likely transported downward from the perched aquifer to the regional aquifer through these former water-supply wells that acted as primary conduits to the regional aquifer. Old Well was abandoned in 1992 and MP-1 in 1994. Downward migration of contamination from the perched aquifer by seepage/vapor transport through the upper aquitard may be a potential continuous pathway. Some groundwater monitoring wells that may have been drilled through the perched aquifer without implementation of measures to limit cross-contamination may have been a temporary conduit.

Wastewater pipes were examined at and adjacent to the Haskell/Mission Linen Facility as a potential route for PCE to enter the subsurface. Wastewater from the Haskell/Mission Linen Facility discharged into a sanitary sewer beneath the building that flowed north to a manhole in

13th Street, between Fremont Avenue and Park Avenue. The north-south wastewater line was installed in 1947 in an alley, and the building at 301 South Park Avenue was later extended over it.

ADEQ performed an investigation of the north-south sewer pipe. A hydrostatic test indicated a rate of leakage exceeding the standard for wastewater pipes. Video camera images also indicated that pipe corrosion and numerous cracks were observed along the north-south piping, as well as a complete pipe joint separation at one location. Hydrostatic testing of the sewer line indicated a definite failure of pipe. The sewer line was filled with concrete and abandoned in place in 2007.

In 1999, Mission Linen installed a SVE system at the former dry-cleaning area to remove volatile organic compounds (VOCs) from the upper vadose (unsaturated) zone. The system operated from June 2000 through July 2002 and from September 2004 through February 2006, and extracted a total of approximately 7,991 pounds (lbs) of VOCs from the upper vadose zone.

From April 16, 2008 through June 3, 2009 (for a combined total of approximately 6 months), Mission Linen performed pilot testing and pilot operation of a MPE system at 301 South Park Avenue to remove COCs from the perched aquifer, the capillary fringe above the perched aquifer, and the upper vadose zone beneath the Haskell/Mission Linen Facility. Collected data indicated that the MPE system removed a total of approximately 1,000 lbs of VOCs from the subsurface and that MPE was a viable remedial alternative.

ADEQ's screening assessment of health risk indicated that VOC vapors, including PCE, volatilizing from subsurface soil and groundwater beneath the Haskell/Mission Linen Facility do not pose a significant health risk to current or future off-site residential structures north and south of the facility, but may pose a health risk to current on-site workers. Subsequent air-quality sampling indicated vapor concentrations inside the building were significantly below applicable occupational health exposure limits.

The perched aquifer at and in the vicinity of the Park-Euclid Site does not serve as a source of potable water. The principal risk associated with contamination in the perched aquifer is the potential for contaminants to migrate from the perched aquifer into the overlying upper vadose zone or into the underlying lower vadose zone and regional aquifer.

There are no direct risks associated with contamination in the lower vadose zone. The principal risk associated with contamination in the lower vadose zone is the potential for contaminants to migrate from the lower vadose zone into the underlying regional aquifer.

The regional aquifer is an important source of potable water for the UA and the City of Tucson. No water-supply wells are currently affected by the Park-Euclid Site contaminant plume in the regional aquifer, but several water-supply wells operated by UA are downgradient of the plume and could be adversely affected by future contaminant migration.

This Final RI Report will provide the basis for the feasibility study (FS), which will evaluate various remedial alternatives to mitigate the soil and regional groundwater contamination beneath the Park-Euclid Site.

1.0 INTRODUCTION

This Final Remedial Investigation (RI) Report for the Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Site (Park-Euclid Site) was originally prepared by Miller Brooks Environmental, Inc. (Miller Brooks) on behalf of the Arizona Department of Environmental Quality (ADEQ). Miller Brooks performed RI activities and prepared a Draft RI report under the Arizona Superfund Response Action Contract (ASRAC), in accordance with the guidelines and requirements outlined in ASRAC No. 99-0017 and the Scope of Work for Procurement No. 00-0062. The Draft RI report was dated June 29, 2004 and made available for public review and comment on July 4, 2004.

Based upon comments received, ADEQ determined that additional site information was necessary and the Draft RI report would be updated to include the comments received and current information. Subsequent updates to this report have been prepared by Tetra Tech GEO (Tt-GEO, formerly GeoTrans, Inc.). The Final RI presents the findings of investigative activities performed from March 1991 through November 2009 by ADEQ, Haskell Linen Supply, Inc. (Haskell Linen), Mission Linen Supply (Mission Linen), the City of Tucson, the U.S. Environmental Protection Agency (EPA), and/or various other parties. Recent data collection by Tt-GEO was performed under ASRAC No. 03-0073 and the Scope of Work for Procurement No. 04-0052.

The Park-Euclid Site was added to the WQARF Registry in 1999. The boundary for the Park-Euclid Site encompasses the Haskell/Mission Linen Facility (301 South Park Avenue in Tucson, Arizona; currently owned by Mission Linen, and formerly owned by Haskell Linen), and plumes originating from the Facility (Figures 1-1 and 1-2). This report presents the rationale and results of the investigation of industrial discharges from dry-cleaning related activities at the Haskell/Mission Linen Facility, resulting in impacts to soil and groundwater.

The purpose of this RI report is to: identify the nature and extent of contamination and the sources thereof; identify current and potential impacts to public health, welfare, and the environment and identify current and reasonably foreseeable uses of land and waters of the state.

1.1 PARK-EUCLID SITE LOCATION

The Park-Euclid Site is located in Tucson, Arizona, and is bounded to the north by 7th Street, to the south by 14th Street, to the west by Tyndall Avenue, and to the east by Cherry Avenue (Figure 1-3). The Haskell/Mission Linen Facility at 301 South Park Avenue is located at the southern portion of the Park-Euclid Site. The Park-Euclid Site is generally located in the northwest quarter of Section 18, Township 14 South, Range 14 East of the Gila and Salt River Base and Meridian in Pima County, Arizona.

The Park-Euclid Site is located in an urban setting that includes a mixture of commercial businesses, light industry, warehouses, and residential neighborhoods. Schools and daycare centers have been identified both hydraulically upgradient and downgradient of the Park-Euclid Site. The University of Arizona (UA) Main Campus is located approximately 0.5 miles north of the Park-Euclid Site boundary (Figure 1-3).

1.2 SOURCE IDENTIFICATION

1.2.1 Source Area History

A Preliminary Assessment/Site Inspection (PA/SI) report prepared by the EPA in 1999 identified two properties which were investigated to determine the source of contamination at the Park-Euclid Site – 200 and 301 South Park Avenue (EPA, 1999), separated by 13th Street (Figure 1-4) (EPA, 1999). The facility at 299 South Park Avenue was originally established in 1948 on previously undeveloped property by Cascade Cleaners and operated as a laundry and dry-cleaning facility. The facility at 301 South Park Avenue was originally owned and operated by Haskell Linen. Haskell Linen began operations in 1938, when the Haskell family purchased the previously undeveloped property. At that time, Haskell Linen's business consisted of a small laundry service that washed clothes and towels. According to a summary of the operational history of the Park-Euclid Site prepared for ADEQ by HydroGeoLogic, Inc. (HGL), no dry cleaning was conducted at the 301 South Park Avenue facility during this timeframe (HGL, 2010).

In 1963 or 1964, Haskell Linen purchased the Cascade Cleaners facility located at 299 South Park Avenue, including dry-cleaning operations. Mission Linen purchased the facility in 1983 (HGL, 2010), operating as a linen supplier and industrial laundry. The company also continued dry cleaning at the site until June 1985, when the dry-cleaning machines were taken out of service (Dames & Moore, 2000a).

1.2.2 Dry-Cleaning Machines

When Haskell Linen purchased Cascade Cleaners in approximately 1964, they acquired two small dry-cleaning machines that may have used tetrachloroethene (PCE; HGL, 2010). In 1973, Haskell Linen purchased two 250-pound dry-cleaning machines manufactured by American Laundry Machinery Industries (American Laundry Machinery Industries, 1972). The new dry-cleaning machines, which used PCE, replaced the two Cascade Cleaners machines and were in use by Haskell Linen from 1973 until Mission Linen purchased the facility in 1983 (HGL, 2010).

Each dry-cleaning machine went through two washes during each cycle. Up to 150 gallons of PCE were pumped into the primary washing area, known as the wash wheel. The dirty PCE from these cycles was drained into a still feed tank and then pumped into a vertical still for reclamation. PCE was supplied from a 2,000-gallon aboveground storage tank (AST) and was manually pumped into a 350-gallon clean solvent tank. PCE was also stored in various components of the dry-cleaning machines. Overall, the total PCE storage capacity of one dry-cleaning machine was approximately 600 gallons.

Two components of the dry-cleaning machines produced a residue that required cleaning on a regular basis – the vertical still and the cooker. Up to 5 gallons of sludge was removed from the cooker on a daily basis. Sludge from the vertical still that was not pumped over to the cooker also needed to be removed. The dry-cleaning operator would remove “maybe a couple of gallons” of sludge from the vertical still once a week (HGL, 2010).

Mission Linen stated that it used approximately 100 to 300 gallons of PCE per week (Mission Linen, 1995; Quarles, Brady, Streich, Lang, 2000). Weekly performance sheets for the dry-cleaning operation indicated that PCE usage varied greatly. For example, a performance sheet for the week of April 25, 1985 shows that both machines cleaned a total of 16,000 pounds (lbs)

of clothing and used a total of 311 gallons of PCE, while a performance sheet for the week of May 9, 1985 shows that one machine cleaned a total of 8,250 lbs of clothing and used 231 gallons of PCE (HGL, 2010).

1.2.3 PCE Spill History

The following is a short description of various spills of PCE at the Haskell/Mission Linen Facility:

- From 1970 to 1975, there were minor weld bursts in the various PCE tanks located to the south of the dry-cleaning machines. The specific amounts of PCE released are unknown, but it is believed there were several of these bursts, increasing in frequency, which prompted Haskell Linen to file complaints with the manufacturer, American Dry Cleaning, who then replaced various equipment that served the dry-cleaning machines (Quarles, Brady, Streich, Lang, 2002).
- During the period 1970 to 1983, there were periodic, small PCE spills from a “button trap” located underneath each cleaning machine to capture buttons and other articles left in the pockets of items that were being cleaned (such as bills, coins, paper clips, etc.). These items would tumble in the dry-cleaning machine and ultimately drop into the button trap before PCE solvent ran into a hose underneath the machine to be returned to the tanks. After each load was completed, the operator would clean out the button trap. If properly executed, this would not result in spilling of any solvent on the floor. However, if the button trap was removed too soon, there could have been some minor spillage onto the floor (Mullen & Hanzell, 1998; Quarles, Brady, Streich, Lang, 2002).
- During the period from 1975 to 1983, PCE releases resulted from punctured seals on the doors of the dry-cleaning machines. This occurred about 10 to 12 times a year (Mullen & Hanzell, 1998; EMCON, 1994c; Mission Linen, 1995; Villarreal, 1995; Urbano, 1995; Quarles, Brady, Streich, Lang, 2002). These incidents occurred when sharp objects were emptied from pockets of clothing in the dry-cleaning machines. The amount of spilled PCE depended upon the cycle in which the machine was operating and the location of the operator at the time of the incident (Quarles, Brady, Streich, Lang, 2002).
- In 1976, there was a small weld burst in the seam of the chemical water separator tank, resulting in a spill of at least 25 gallons of PCE onto the concrete floor (Quarles, Brady, Streich, Lang, 2002).
- There were three positions for the machines: down, middle, and up; the machines would wash in the middle position. During the period from 1976 to 1978, when the air compressor would malfunction, the machines would tilt forward to the down position. This may have occurred as many as 20 times. PCE spilled on the floor in about half of these incidents, with perhaps as much as 100 gallons being spilled each time (Mullen & Hanzell, 1998).
- In 1979, a weld seam on the intermediate tank burst, and PCE was “all over the floor.” It was estimated that at least 75 gallons of PCE spilled, thus making it “a very big spill” (Quarles, Brady, Streich, Lang, 2002).

- In approximately 1979, a spill occurred during the PCE delivery at the 2,000-gallon PCE storage tank located north of the dry-cleaning operation (Figure 1-4).¹ This was the “first storage tank incident,” and it was caused by connecting improper fittings to the tank during delivery. Since “a good deal of perc spilled on the floor,” former employees recall it as a “big spill” (Quarles, Brady, Streich, Lang, 2002).
- In approximately 1979 or 1980, a seal on the main pump behind the dry-cleaning machines failed and at least 30 gallons of PCE spilled on the floor (Quarles, Brady, Streich, Lang, 2002).
- In summer 1980, a blockage occurred in the cleaning tube that came out of the bottom of one of the dry-cleaning machines; this tube allowed the operator to determine the level of PCE within the machine. During this incident, the entire cleaning machine completely filled with PCE, but PCE continued to be pumped into the machine. Because of the weight, PCE broke the tubes and at least 150 gallons of PCE spilled across the dry-cleaning machine and onto the floor (Mullen & Henzell, 1998; Quarles, Brady, Streich, Lang, 2002), making it a “very big spill” (Quarles, Brady, Streich, Lang, 2002).
- In 1981, during PCE delivery, the driver overfilled the large storage tank.² PCE traveled into a vent pipe extending up and out of the tank, up to the roof of the building, continuing down the drain underneath the loading dock, and out onto the area immediately adjacent to the loading dock on the east side of the building. From there, PCE traveled along the east side of the building in front of the loading dock, down into a drain in the asphalt. This was an “extremely large spill, but it was not cleaned up because it was outside of the building” (Quarles, Brady, Streich, Lang, 2002).
- From February 1983 through May or June 1985, several PCE spills occurred, with approximately 40 to 50 gallons of PCE spilled each time (Mission Linen, 1995).
- In April/early May 1985, a “fan became undone” in one of the dry-cleaning machines during the “high extract” cycle. This caused the machine to literally explode inside, followed by a pump leak that caused almost all the PCE inside the machine to spill. “This was a very large spill” (Quarles, Brady, Streich, Lang, 2002). It is estimated that about 50 gallons of PCE was spilled onto the plant floor (Mission Linen, 1995).
- Haskell Linen employees indicate there were typically spills of 25 to 40 gallons of PCE onto the concrete floor that occurred once or twice a month, and sometimes as often as once a week (Earth Technology, 1991).

¹ This tank was installed in 1976 north of the dry-cleaning machines, and later moved south of the dry-cleaning operation, behind the wall at the south end of the dry-cleaning area (Quarles, Brady, Streich, Lang, 2002).

² Because of the difficulty loading the large PCE storage tank by entering the 13th Street side of the plant, it was determined to move the large storage tank south of the wall behind the dry-cleaning operation. A “port” was installed on the outside wall on Manlove Street, where a pipe entered the plant, went up, ran north across the rafters, and then went down and entered the storage tank from the top (Quarles, Brady, Streich, Lang, 2002).

- There were spills as large as 500 or 1,000 gallons that would cover the entire dry-cleaning area, approximately 20 to 30 feet in diameter (Earth Technology, 1991).

The general practice for cleaning up PCE spills or releases inside the Haskell/Mission Linen Facility was to soak up as much as possible with clothes waiting to be dry-cleaned, which were subsequently run through the dry-cleaning machines (Mission Linen, 1995; Mullen & Henzell, 1998; Urbano, 1998; Villareal, 1998; Quarles, Brady, Streich, Lang, 2002; HGL, 2010), and then broom any remaining PCE into the floor drain behind the dry-cleaning machines (Earth Technology, 1991; Mission Linen, 1995; Urbano, 1998; Villareal, 1998).

1.2.4 Water-Supply Wells

Two water-supply wells, Old Well and New Well (or MP-1; hereafter called MP-1), were located on the property at 301 South Park Avenue (Figure 1-4). No written records were found documenting the drilling dates or construction details for Old Well or MP-1. Old Well is believed to have been drilled circa 1938, which is the year that Haskell Linen began operating at 301 South Park Avenue. According to the well abandonment report submitted to the Arizona Department of Water Resources (ADWR), Old Well was constructed of 10-inch diameter steel casing. Total depth of the well was 501 feet below ground surface (bgs) (EMCON, 1995a). Reportedly, Old Well was used by Haskell Linen until the early 1980's, when it was taken out of commission because of bad casing, and the Facility obtained a connection to City of Tucson water system (Pima County Health Department, 1980; Earth Technology, 1991). The water quality in Old Well was said to be good as late as 1982 (Anonymous, 1982a,b).

In 1973, Haskell Linen installed MP-1 (EPA, 1999) approximately 120 feet east of Old Well, south of 13th Street, and west of Fremont Avenue. MP-1 was constructed of 12-inch diameter steel casing, but the original depth, screened interval, drilling method, original water level, and other relevant construction details are unknown. According to video surveys, well casing perforations were first noted at depths of 332 feet bgs (Earth Technology, 1991) and 338 feet bgs (EMCON, 1995d). Based on the well abandonment report submitted to ADWR, MP-1 was 511 feet deep (EMCON, 1995d).

The initial pumping of MP-1 produced water containing diesel fuel. In March 1980, in an attempt to clean out the diesel fuel, Haskell Linen pumped MP-1 for three or four weeks (Pima County Health Department, 1980). The pumped water and diesel fuel mixture was discharged onto 13th Street, flowed east on 13th Street to Fremont Avenue, ran north on Fremont Avenue, ponded at the intersection of Fremont and Miles Street, and then flowed north and east to the Arroyo Chico. Pumping of MP-1 was halted following complaints to the Arizona Department of Health Services (ADHS) (ADHS, 1982a; Earth Technology, 1991). The extended pumping in 1980 reportedly cleared out the floating free product; however, clothes cleaned with the water still smelled of diesel, and diesel free product eventually reappeared in the well (Earth Technology, 1991).³

³ Deepening of the well in 1981 in an attempt to improve water quality was discussed in the Draft RI report (Miller Brooks, 2004d); no valid supporting references could be identified.

1.2.5 Sewer/Wastewater Lines

According to the Pima County Wastewater Management Department (Pima County), a sewer line, built in 1927, ran north and south beneath 301 South Park Avenue (Figure 1-4). Pima County records indicate that the Facility at 301 South Park Avenue was first connected to the sewer line on June 30, 1947. Investigation of the sewer line conducted by ADEQ revealed that it was made of cement (GTA, 2003).

On July 25, 1940, the City of Tucson conveyed an alley to the east of the facility to Haskell Linen in a deed; however, it did not convey to them the sanitary sewer line running north and south through the alley (HGL, 2010). When Haskell Linen began dry-cleaning operations in 1973, the sewer line was owned and operated by the City of Tucson (HGL, 2010). Aerial photographs taken in December 21, 1973 show that the building structure appears to have completely covered the area where the sewer line is located. In 1979, City of Tucson and Pima County entered into an intergovernmental agreement by which the City of Tucson transferred ownership of all sewer lines within the City's jurisdiction to Pima County; the sewer line beneath the facility at 301 South Park Avenue remained within the jurisdiction of Pima County, although constructing a privately owned facility over a public sewer line is not a common practice (HGL, 2010).

In addition to PCE entering the sewer system through miscellaneous spills that were broomed into the floor drain (as discussed in Section 1.2.3 above) during the use of the Facility by Haskell Linen, PCE also entered the sewer system from the floor drain in the dry-cleaning area by the following:

- **Chemical Water Separators:** The purpose of the chemical water separator on the two dry-cleaning machines was to allow the PCE and water used in the dry-cleaning process to settle out; water from the separators was discharged into the sewer (Earth Technology, 1991; HGL, 2010) and the PCE was then returned to the system for reuse (HGL, 2010).
- **Sludge from Still and Cooker:** The dry-cleaning machines produced a sludge that had to be removed from both the vertical still and the cooker. The cooker produced up to 5 gallons of sludge daily, and the vertical still produced "maybe several gallons" of sludge per week (HGL, 2010). Sludge was being disposed of down the floor drain in the dry-cleaning area from at least 1976 until either 1980 or 1981 (HGL, 2010). Afterwards, the sludge collected daily from the chemical separator was stored in 55-gallon barrels and sent off site, but it is uncertain if the chemical water separators were disconnected from the sewer (HGL, 2010). According to a 1999 PA/SI by the EPA, samples collected from still bottom drums at the site showed concentrations of PCE as high as 11 to 12 percent (Ecology and Environment, 1999).
- **Still Rinsate:** PCE also entered the sewer system through disposal of still rinsate down the floor drain in the dry-cleaning area (American Laundry Machinery Industries, 1972; Earth Technology, 1991; HGL, 2010), and subsequently into the sewer, as noted in a February 9, 1984 Pima County site inspection report (HGL, 2010). The inspection report also notes that the manhole on 13th Street, where the Facility's wastewater flowed, "had a heavy perc odor" (HGL, 2010). On June 21, 1984, Pima County ordered Mission Linen to cease discharging the rinse water (HGL, 2010). A follow-up inspection on July 12,

1984, noted that the floor drain behind the dry-cleaning machines had been sealed and that PCE was “now being collected at a rate of four 55-gallon barrels per day 5 days a week” (HGL, 2010).

1.2.6 Underground Storage Tank

In 1974, a 10,000-gallon gasoline underground storage tank (UST) was installed in the parking area of the Haskell Linen property, at the southwest corner of 13th Street and Fremont Avenue. The UST was removed in 1986 (Earth Technology, 1991). There was no evidence that the UST or associated filling operations released fuel hydrocarbons to the subsurface.

1.3 ARROYO CHICO PROJECT

The City of Tucson, Pima County, and the U.S. Army Corps of Engineers (USACE) have proposed construction of runoff detention basins along the Arroyo Chico for flood-control purposes (USACE, 2001a). The proposed detention basins include three separate basins situated generally along the axis of the Arroyo Chico Wash. Proposed Basin One, the northwestern and farthest downstream of the proposed basins would largely be situated within the Park-Euclid Site boundary (Figures 1-2 and 1-3). Proposed detention Basin One would be excavated at the southwest side of the present Arroyo Chico streambed. The sides of the basin would be sloped, and the bottom would no longer be lower than that of the Arroyo Chico streambed.

1.4 PARK-BROADWAY AREA

The Park-Broadway area is located approximately 500 feet northwest of the current Park-Euclid Site boundary. The Park-Broadway area is the location of documented former dry-cleaning and fuel-dispensing operations near the corner of Broadway Boulevard and Park Avenue (Miller Brooks/Golder, 2001c). Dry-cleaning was performed at the Park-Broadway area by Nu Way Dry Cleaners from at least 1958 to 1968 (ADEQ, 1998).

Site investigations began in May 1990 to determine if the Park-Broadway contamination contributed to the Park-Euclid Site. Site activities have continued into 2008 and have included the advancement of soil borings, collection of soil and soil vapor samples, and the installation of groundwater monitoring wells. A detailed discussion of Park-Broadway site activities is presented in Section 2.4.

2.0 PREVIOUS INVESTIGATIONS

2.1 PARK-EUCLID SITE INVESTIGATIONS

The Haskell/Mission Linen Facility is located within a broad area of study informally referred to as “The Downtown Tucson Study Area.” This area had been the subject of an ADEQ investigation of groundwater contamination since late 1989. The focus of this investigation was primarily on diesel contamination in a shallow perched groundwater zone which overlies the regional aquifer of the Tucson Basin. Eighteen (18) wells in the downtown Tucson area, including a well on Mission Linen’s property (MP-1), were sampled in 1989 and early 1990 as part of the ADEQ investigation. Old Well, located at the Haskell/Mission Linen Facility, was not sampled as part of the investigation due to possible casing damage.

In early 1990, a sample of a green liquid was collected by ADEQ from MP-1. This liquid (free product) appeared to float on top of the water table at approximately 172 feet bgs. Laboratory analyses indicated that the liquid was diesel fuel, with concentrations of PCE at 2,700 micrograms per liter ($\mu\text{g/L}$) and trichloroethene (TCE) in excess of 15 $\mu\text{g/L}$ (Earth Technology, 1991).

In late 1990, a groundwater sample collected immediately below the diesel layer in MP-1 was found to contain 11,000 $\mu\text{g/L}$ PCE (Earth Technology, 1991). Other volatile organic compounds (VOCs) present included TCE, 1,1,2-trichloroethane (TCA), trans-1,2-dichloroethene (DCE), benzene, and xylene. Due to the elevated PCE concentration, the Haskell/Mission Linen Facility was considered by ADEQ to be a potential contributor to the groundwater contamination since the solvent was used in former dry-cleaning operations at the facility.

Site characterization activities focused on chlorinated hydrocarbons, including PCE and its breakdown products TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. Diesel free product and dissolved fuel-related compounds are also present in shallow perched groundwater in the southern part of the Park-Euclid Site and extend south past the Park-Euclid Site boundary. Diesel free product was also observed in the regional groundwater in Old Well and MP-1. However, characterization and identification of the origin of the diesel and fuel-related compounds is not the subject of this RI.

Remedial investigations at the Park-Euclid Site have been performed primarily on behalf of ADEQ, Mission Linen, Haskell Linen, the City of Tucson, and EPA. Investigations have included drilling and installation of perched and regional groundwater monitoring wells, groundwater monitoring, and sampling of soil, soil gas, groundwater, and floating diesel free product.

2.1.1 Investigation of Waste Disposal on Vacant Lot – ADHS and Haskell Linen, 1982

The Pima County Health Department noted waste on the vacant lot east of the Haskell/Mission Linen Facility across Fremont Avenue in 1980 and instructed Haskell Linen to “Clean up and remove all industrial wastes from the lot east of Fremont, and refrain from disposing of further wastes there, or elsewhere, in the future” (Pima County Health Department, 1980). In March 1982, ADHS, in response to a complaint, instructed Haskell Linen to “... remove from the lot all perchloroethylene (PCE) contaminated material/soil to a concentration level of 20 mg/kg or lower ...” (ADHS, 1982a).

In March 1982, Haskell Linen collected samples from the source of the waste (not from the vacant lot). A drum of still bottom waste contained 11.8 percent PCE and a hot oil floor-cleaning machine sample contained 18.1 milligrams per kilogram (mg/kg) PCE (Ecology and Environment, 1999). Two samples collected from the waste on the vacant lot were found to contain 10.6 mg/kg and 200 mg/kg PCE. The approximate location of the waste area is shown on Figure 2-1.

In April 1982, Haskell Linen collected seven soil samples after removal of the waste and soil (21.06 tons) to a hazardous waste landfill (BKK in California) (Haskell Linen, 1982), and three samples from a pile of mixed soil and oily diatomaceous earth that was later removed to a local landfill in Tucson. Analysis reported that no sample contained PCE above the laboratory detection limit. Haskell Linen collected duplicate samples from the pile of soil and diatomaceous earth, which were reported to contain 0.112 mg/kg and 0.056 mg/kg PCE. A duplicate soil sample collected from dark-colored material remaining after removal of the waste contained 0.0047 mg/kg PCE (Figure 2-1). On April 26, 1982, ADHS notified Haskell Linen that "Haskell Linen has satisfactorily completed the perchloroethylene cleanup" (ADHS, 1982b).

The exact location of the waste disposal area is not known, but is assumed to be on and adjacent to the unpaved 13th Street right-of-way (Miller Brooks/Golder, 2001e). The soil samples collected by Haskell Linen indicate the waste was distributed over an area approximately 100 feet by 150 feet (the field sketch of sample locations was not drawn to scale, but it shows locations with respect to trees visible on aerial photographs). The entire area appears to be within or on the edge of the proposed area of excavation for Arroyo Chico Detention Basin One (Figure 2-1) (see Section 2.3 below).

2.1.2 Preliminary Site Characterization – ADEQ, 1991

From March through June 1991, ADEQ performed initial site characterization activities at the Mission Linen facility to determine the nature and extent of impact to the regional aquifer and to assess whether MP-1 was a possible source or conduit for contamination. The investigation included the installation of three on-site regional monitoring wells (MLR-1, MLR-2, and MLR-3), and conducting an on-site soil gas survey and an assessment of MP-1 and Old Well (Figure 1-3).

In March and April 1991, ADEQ conducted logging of Old Well and MP-1, which included temperature and spinner flowmeter logging, and video-surveying. In preparation for the Old Well assessment, 178 feet of piping was removed from the well. Pipe removed from a depth of 70 feet bgs was found to be heavily coated with a liquid similar to diesel fuel, and with a dark green liquid of unknown composition at greater depths (Earth Technology, 1991).

A video survey of Old Well was performed in March and April, 1991. The results of the video survey indicated a small cascade of water entering the casing through a corrosion hole at approximately 165 feet bgs; the water level in the well at the time was 176 feet bgs. During video-logging, obstructions were encountered at different depths, consisting of mop heads, frames, and handles. A total of about 20 mop heads, frames, and handles were removed from the well to a total depth of 491 feet bgs, where additional mop heads were encountered. Attempts to remove them were unsuccessful, and the survey terminated at that depth. A dark, orange-colored substance was observed at about 172 feet bgs (Earth Technology, 1991). Groundwater was encountered at 176 feet bgs, and from 176 to 230 feet bgs groundwater appeared to have a slight green tint, but no free floating product was observed (Earth

Technology, 1991). The casing appeared to have areas of heavy scale and encrustations, and no perforations were observed to the depth of 491 feet bgs (Earth Technology, 1991).

The temperature log of Old Well recorded a temperature of approximately 90 degrees Fahrenheit (°F) just below the water table. A 10°F temperature increase to approximately 100°F was recorded between the depths of 180 to 250 feet bgs. From 250 to 400 feet bgs, the temperature of the water remained constant at 100°F. From 400 to 445 feet bgs, the temperature decreased to 90°F and remained constant until logging was completed at 487 feet bgs (Earth Technology, 1991).

Information obtained from the spinner flowmeter log of Old Well did not detect vertical movement in the water column (Earth Technology, 1991).

Depth-specific groundwater samples were collected from Old Well at depths of 176, 210, 260, 460, and 489 feet bgs. Elevated PCE concentrations were detected in the 176-foot sample (2,700 µg/L) and 210-foot sample (630 µg/L), with concentrations decreasing with depth (Table 2-1) (Earth Technology, 1991).

MP-1 video-logging and borehole logging was conducted by ADEQ in April 1991. Based on the video log of MP-1, a floating layer of diesel free product was present on top of the water from 175 feet to 190 feet bgs. Slots in the casing were observed from 332 feet bgs to the bottom of video logging at 480 feet bgs. A second layer of dark, viscous liquid, approximately 3 feet thick, was observed at the bottom of MP-1, from 447 to 480 feet bgs (Earth Technology, 1991).

The temperature log of MP-1, located approximately 120 feet east of Old Well, recorded temperatures in the water column ranging from 83°F to 90°F (Earth Technology, 1991). The temperatures rose gradually with depth, and were comparable to groundwater temperatures observed in groundwater from similar depths in Park-Euclid Site monitoring wells.

A spinner flowmeter log of MP-1 did not detect vertical movement in the water column, and the gamma ray and neutron logs were inconclusive in delineating lithology (Earth Technology, 1991).

A sample of the floating free product, collected at a depth of 180 feet bgs, was found to contain 630,000 micrograms per kilogram (µg/kg) PCE, 40,000 µg/kg TCE, and 170,000 µg/kg total 1,2-DCE. Total concentration of C10-C22 fuel hydrocarbon (indicative of diesel fuel) was 800,000,000 µg/kg (Table 2-1) (Earth Technology, 1991).

Depth-specific groundwater samples were collected from MP-1 at depths of 200, 265, 390, 405, and 460 feet bgs. Elevated PCE concentrations were detected in all samples, showing a decline with depth: 6,100 µg/L at 200 feet bgs; 3,800 µg/L at 265 feet bgs; 765 µg/L at 390 feet bgs; and 565 µg/L at 405 feet bgs. Trans-1,2-DCE was detected in all samples, with concentrations decreasing with depth from 300 µg/L at 200 feet bgs to 100 µg/L at 405 feet bgs. The collected samples contained lower concentrations of TCE (21 to 55 µg/L) (Table 2-1) (Earth Technology, 1991).

A liquid portion of a sample of the dark, viscous layer encountered at 460 feet bgs was found to contain 1,560 µg/L PCE and 29 milligrams per liter (mg/L) C10-C22 fuel hydrocarbons (Table 2-1). An additional sample of this material was analyzed unaltered, centrifuged, and as individual components (supernate and precipitate). The PCE contents of these samples were as follows: 21 mg/kg PCE (unaltered sample), 280 mg/kg PCE (precipitate), and 4.8 mg/kg PCE

(supernate). It was concluded that the precipitate is probably a collection of scale and sediment in the well to which PCE has absorbed and accumulated at the well bottom (Earth Technology, 1991).

Analytical results of groundwater samples collected on May 6, 1991 from MLR-1 (located upgradient of the former dry-cleaning area), MLR-2 (located downgradient from the former dry-cleaning area, at the central portion of the facility), and MLR-3 (located cross-gradient of the former dry-cleaning area) indicated PCE and TCE were not present at or above the laboratory reporting limit (LRL) of 0.10 µg/L in the groundwater sample from MLR-2. PCE was reported in MLR-1 and MLR-3 at 0.15 µg/L and 8.3 µg/L, respectively. TCE was not reported above its LRL at 0.10 µg/L in MLR-1 or MLR-2. However, TCE was reported at 0.33 µg/L in MLR-3. Well MLR-3 also contained 0.21 µg/L cis-1,2-DCE on this date. Results of groundwater samples collected from MLR-1, MLR-2, and MLR-3 on June 10, 1991 indicated PCE at 10 µg/L and TCE at 0.45 µg/L in MLR-3. No PCE, TCE or cis-1,2-DCE was reported in samples from MLR-1 or MLR-2 on this date (Earth Technology, 1991).

Data collected during the May 4 and May 6, 1991 soil gas survey at the Haskell/Mission Linen Facility indicated the presence of CE beneath the concrete floor in the vicinity of the former dry-cleaning area. PCE concentrations in soil gas ranged from 3.38 µg/L at 299 South Park to 11,700 µg/L at 301 South Park Avenue, where documented spills from the dry-cleaning machines and equipment occurred (Earth Technology, 1991).

2.1.3 Phase 1 Remedial Investigation – Mission Linen, 1992

In September 1992, per ADEQ's request, Mission Linen conducted an on-site investigation of soil and groundwater contamination at properties located at 299 and 301 South Park Avenue. This investigation included the following: conducting a shallow soil gas survey; geophysical logging and abandonment of Old Well; free product removal and depth-specific sampling from MP-1; and groundwater monitoring and sampling of the three previously installed regional aquifer monitoring wells (EMCON, 1995a).

The Phase I Investigation indicated that approximately 54,000 to 82,000 µg/L or 7,837 to 11,900 parts per million [ppmv] of vapor phase PCE was present beneath the former dry-cleaning area.

On September 15, 1992, Mission Linen re-logged Old Well. The results of the temperature gradient log were similar to the 1991 log, in that an increase in water temperature of approximately 10°F (from 86 to 96°F) was observed through the 230- to 270-foot bgs depth interval. Below 270 feet bgs, however, the temperature remained constant at approximately 96°F to the total depth surveyed (approximately 483 feet). A decrease in water temperature was not observed at the base of the well, as was the case in 1991 (EMCON, 1995a).

In September 1992, Old Well was abandoned by cutting the casing at 44-foot depth intervals from the base of the well up to 21 feet bgs. The upper 21 feet were "continuously" perforated by cutting a series of four holes every foot from 21 feet bgs to the ground surface. The entire well casing was then filled with cement grout (EMCON, 1995a).

In 1992, approximately 13 feet of diesel free product was measured in MP-1, starting at a depth of approximately 178 feet bgs. In October 1992, approximately 85 gallons of diesel free product were bailed from MP-1. After bailing, the thickness of the product was approximately 2 feet. A sample of the free product was found to contain 930,000,000 µg/kg total petroleum

hydrocarbons (C10-C22 range) and 380,000 µg/kg PCE (Table 2-1). Depth-specific groundwater samples were collected from MP-1 in November 1992. PCE was detected in each sample: 12,000 µg/L at 210 feet bgs; 3,800 µg/L at 265 feet bgs; 7,400 µg/L at 273 feet bgs; 3,400 µg/L; and 2,600 µg/L at 441 feet bgs. TCE was only detected in the sample collected from 357 feet bgs (42 µg/L) (Table 2-1) (EMCON, 1995a).

2.1.4 Phase 2 Remedial Investigation – Mission Linen, 1993

Mission Linen installed three shallow aquifer monitoring wells, MLS-4 through MLS-6, and four soil vapor extraction (SVE) wells, SVE-101 through SVE-104. The four SVE wells were installed inside the building at 301 South Park Avenue and were completed in the shallow aquifer. Following installation, MLS-4, MLS-5, SVE-101, and SVE-103 were found to contain free product. A short-term pilot test was conducted to evaluate the suitability of the site for SVE (EMCON, 1995b).

2.1.5 Phase 3 Remedial Investigation – Mission Linen, 1993 and 1994

Mission Linen further evaluated MP-1 by conducting video- and geophysical logging and sampling. The video log identified potential intervals of “free pipe” casing without an annular seal beneath the fluid level.

In May 1994, approximately two feet of diesel free product was present in MP-1 (EMCON, 1995d). Because the thickness of the free product had not changed since 1992, EMCON concluded that a continuing source of diesel in the well did not exist and that the product inside the well appeared to have been introduced through some mechanism rather than through the casing (EMCON, 1995d). Prior to abandonment, approximately 250 gallons of diesel free product and water were bailed from MP-1. A sample of the floating diesel free product contained up to 6,300,000 µg/kg PCE, 270,000 µg/kg TCE, and 960,000,000 µg/kg Total Petroleum Hydrocarbons (TPH). This free product had a specific gravity of 0.9. A free product sample collected at the free product/water interface at 187.80 feet bgs contained 16,000,000 µg/kg TCE, 240,000 µg/kg TCE, and 6,000 µg/kg trans-1,20DCE. A groundwater sample collected at the same depth of 187.80 feet bgs, immediately below the free product/water interface, contained 1,700 µg/L of PCE, 440 µg/L TCE, and 13 µg/L 1,1-DCE (Table 2-1) (EMCON, 1995d).

A dark green, dense fluid with black, highly viscous globules was detected at depths of 457 to 477 feet bgs. A sample of this fluid, collected with a 15-foot bailer, was found to contain 3,900,000 µg/kg PCE, 180,000 µg/kg TCE, and 13,000,000 µg/kg TPH. This fluid had an odor and a specific gravity of 0.8915 (Table 2-1) (EMCON 1995d).

Sediments were encountered in the well from 457 feet bgs to the bottom of the casing at 511 feet bgs. Concentrations of PCE in the sediment decreased with depth, from 3,000,000 µg/kg at 457 to 477 feet bgs to 34,000 µg/kg at 511 feet bgs. A sediment sample collected at 457 to 477 feet bgs contained 92,000 µg/kg TCE. 1,1-DCE and cis-1,2-DCE were not detected in any product or sediment samples. Sediment samples also contained TPH, with concentrations decreasing with depth from 1,200,000 µg/kg at 457 to 477 feet bgs to 40,000 µg/kg at 511 feet bgs (Table 2-1). Samples from depths between 457 and 489 feet bgs had a strong odor and were black in color; sediment discoloration was observed to a depth of 511 feet bgs. In 1994, the top of the dense fluid and sediment was detected 10 feet lower than in 1991 (457 feet bgs in 1994 versus 447 feet bgs in 1991). Therefore, it was concluded that the level of product and sediment had declined or settled 10 feet during these three years (EMCON, 1995d).

In June 1994, MP-1 was abandoned by perforating the casing over the entire depth. The well was then filled with sand/cement slurry from the total depth to 240 feet bgs, and then with neat cement to the ground surface (EMCON, 1994d). A soil sample collected from native soil below the base of the well at a depth ranging from 511 to 515 feet bgs did not contain any COCs (EMCON, 1995d). This sample was collected after reaming to ensure that the knifing tools and tremie tube could be lowered to the total depth of the well for abandonment by grouting.

Regional aquifer monitoring well MLR-7 was installed to identify the top of the regional aquifer and to allow collection of groundwater samples from the uppermost part of the aquifer. During the drilling of MLR-7, a petroleum odor was noted in the drilling fluid at depths of approximately 170 feet to 190 feet bgs. The initial groundwater sample collected from MLR-7 contained 630 µg/L PCE. Following installation of MLR-7, an aquifer pumping test was performed in May 1994 to evaluate the regional aquifer characteristics and to assess the potential hydraulic connection between the regional and the shallow aquifers (EMCON, 1995e).

The initial groundwater sample collected from MLR-7 contained 630 µg/L PCE. A 0.02-foot layer of diesel free product was observed in the well during initial sampling on June 2, 1994, and 0.01 feet the next month (July 14, 1994). The free product layer was too thin to sample for laboratory analysis (EMCON, 1994e). The floating free product layer was observed at an elevation of 189.6 and 193.13 feet bgs, respectively (EMCON, 1994e). These elevations were more than 20 and 16 feet, respectively, above the top of the screened interval of MLR-1 (210 feet bgs).⁴ No free product has been observed in MLR-7 since 1994.

2.1.6 Preliminary Site Assessment/Site Inspection Mission Linen – EPA, 1998

EPA conducted field activities at and in the vicinity of the Mission Linen Facility to support the PA/SI for the site. Field activities included installation of two shallow groundwater monitoring wells and sampling of nearby monitoring wells. In October 1998, two shallow upgradient groundwater monitoring wells (MLS-12 and MLS-13) were installed (Figure 2-1); PCE was not reported at or above the LRL in these wells. Although diesel was detected in shallow groundwater samples, EPA did not evaluate it any further because diesel is not considered a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act and was not suspected to be associated with the Park-Euclid Site (EPA, 1999).

2.1.7 Phase 4 Remedial Investigation – Mission Linen, 1998 and 1999

As part of the Phase 4 investigation, Mission Linen conducted an investigation of the sanitary sewer, a vadose zone contaminant characterization, and a shallow aquifer investigation. Mission Linen also operated an interim SVE system with vapor treatment.

In August 1998, Mission Linen conducted a multilevel soil vapor sampling investigation of the upper vadose zone in and around the Mission Linen Facility. Soil gas samples were collected at 5, 30, 55, and 85 feet bgs. Elevated concentrations of PCE (greater than 10,000 µg/L) were detected at depths of 55 and 85 feet below the former dry-cleaning area (Dames & Moore, 2000a).

Shallow soil vapor samples were also collected from 25 locations at depths of 2 and 5 feet bgs. Samples were collected along the trace of the 301 South Park Avenue facility's sanitary sewer

⁴ The water level in MLR-7 at that time was still above the screened interval.

line, originating in the former dry-cleaning area and continuing to 13th Street. Analysis of soil gas samples indicated that concentrations of PCE were highest beneath the former dry-cleaning area, followed by the area along the sewer lines. Concentrations in the former dry-cleaning area were at least an order of magnitude higher than the highest concentrations along the sewer line. The concentrations of PCE in soil gas along the sewer line suggest that the sewer line was a source of PCE and that the fill around the sewer may also be a continuing source of PCE and its degradation products (Dames & Moore, 2000a).

Soil vapor samples were also collected at the vacant lot located across Freemont Avenue from the Haskell/Mission Linen Facility to evaluate whether this area was a source of shallow soil or vadose zone contamination resulting from disposal of PCE still bottoms and oily diatomaceous earth (see Section 2.1.1 above). Soil vapor samples were collected at nine sampling locations, at depths of 5 and 18 feet bgs, with the exception of one sample collected at 30 rather than 18 feet bgs. All 18 samples were found to contain PCE: up to 100 µg/L PCE at 5 feet bgs; up to 270 µg/L at 18 feet bgs and 780 µg/L at 30 feet bgs (Dames & Moore, 2000a).

In 1999, Mission Linen installed an SVE system to extract VOCs in the upper vadose zone soil beneath the Haskell/Mission Linen Facility. The SVE system utilized existing wells SVE-101 through SVE-104 as extraction wells (Figure 1-3), since they were screened across the upper vadose zone to a depth of 90 feet bgs. The wells were piped to a manifold attached to a vacuum pump. The vapors were removed from beneath the building with the vacuum pump, passed through four granular activated carbon (GAC) canisters, and vented to the atmosphere. Initial startup testing of the system began in February 2000. The SVE system operated intermittently through February 2006 (URS, 2009).

2.1.8 Installation of Sentinel Wells – ADEQ, 2000

In January 2000, ADEQ installed three "sentinel" regional aquifer monitoring wells (UAM-1, UAM-2, and UAM-3; see Figure 1-3) between the Park-Euclid Site and UA water-supply wells (Malcolm Pirnie, 2000). The three wells were installed to monitor possible contaminant migration toward the UA water-supply wells. The wells ranged in depth from 266 to 296 feet bgs. Due to their proximity to the UA supply wells, all three wells were sampled monthly from August 2000 through January 2009. If they were active during monthly sampling events, UA water-supply wells south of Speedway Boulevard have also been sampled from October 2000 through January 2009. Depending on the pumping schedule on the sampling dates, UA wells sampled have included the Agriculture (Aggie), Architecture, Huachuca, Martin Street, and Optical wells.

2.1.9 Site Investigation – ADEQ, 2000

During November and December 2000, ADEQ installed seven perched aquifer monitoring wells (PEP-8, PEP-9, PEP-10, PEP-11, PEP-16, PEP-17, and PEP-18) and two regional aquifer monitoring wells (PER-14 and PER-15; see Figure 1-3). PER-14 was screened deeper in the regional aquifer than previous monitoring wells, to the approximate depth of previously abandoned production well MP-1 and the active UA water-supply wells. During the installation of both the perched and regional aquifer monitor wells, soil samples were collected and analyzed for VOCs, total organic carbon (TOC), hydraulic conductivity, and gradational classification (Miller Brooks/Golder, 2001b).

2.1.10 Environmental Site Assessment – ADEQ, 2001

ADEQ performed a targeted Environmental Site Assessment (ESA) to identify historical land uses and potential users of PCE, chlorinated compounds, and diesel fuel in the vicinity of the Park-Euclid Site (Miller Brooks/Golder, 2001d). Information gathered for the ESA was also used to assist in locating additional groundwater monitor wells to determine the nature and extent of groundwater contamination.

Based on information collected for the ESA, a number of potential users of compounds known to impact the soil and groundwater were identified in the vicinity of the Park-Euclid Site. Given the location of these potential users of PCE downgradient of contamination identified at the Park-Euclid Site, additional investigations were not conducted by ADEQ as part of this RI report.

A pilot study was conducted to remove diesel-fuel free product from the perched aquifer. Two portable free product recovery units were designed and installed by Mission Linen in SVE-101 and SVE-103, and ADEQ conducted joint testing with Mission Linen for six weekends in September and November 2001. The units were moved to the wells during the weekend and stored away during the work week. After testing was completed, the units were turned over to Mission Linen.

2.1.11 Contaminant Characterization – ADEQ, 2002 and 2003

From May 2002 through May 2003, ADEQ investigated contaminant distribution in the perched aquifer, the underlying lower vadose zone, and the regional aquifer. Two perched aquifer monitoring wells (PEP-19 and PEP-24), six regional aquifer monitoring wells (PER-21, PER-22, PER-23, and PER-25 through PER-27), and two lower vadose zone vapor monitoring wells (VML-1 and VML-2) were installed (Miller Brooks, 2002a and 2003c). The vapor/vacuum monitoring wells were completed in the lower vadose zone with four separate probes set at depths of approximately 125 to 130, 145 to 150, 165 to 170, and 185 to 190 feet bgs (Miller Brooks, 2003b).

Following the installation of VML-1 and VML-2, ADEQ installed vapor extraction test well VEL-3, completed in the lower vadose zone, from 160 to 190 feet bgs. Soil vapor samples were collected from VML-1, VML-2, VEL-3, located near MP-1, and groundwater monitoring well WR-347B,⁵ located northeast of MP-1, across 13th Avenue. The samples were analyzed for VOCs and fixed gases (HydroGeoChem, 2003a).

In 2002 and 2003, depth-specific groundwater samples were collected at 20-foot intervals while installing new wells PER-21, PER-22, PER-23, PER-25, PER-26, and PER-27. These samples were collected to assess vertical migration of chlorinated VOCs in the regional aquifer (Miller Brooks, 2002b and 2003d).

2.1.12 Upper Vadose Zone and Perched Aquifer Assessment – Mission Linen and ADEQ, 2003 and 2004

In January and February 2003, Mission Linen drilled and sampled 17 borings in the upper vadose zone. Four of the borings were completed as multilevel vapor/vacuum monitoring wells to depths of 5 to 7, 29 to 31, 54 to 56, and 83 to 85 feet bgs (URS, 2002).

⁵ WR-347B contained a portion of screened interval above the regional aquifer and within the lower vadose zone.

In conjunction with the Mission Linen upper vadose soil vapor program, ADEQ installed three multilevel vapor monitoring wells (VMW-1, VMW-2 and VMW-3). Each multilevel vapor monitoring well was completed in the upper vadose zone in those locations where Mission Linen could not obtain access in the City of Tucson right-of-way. Soil vapor samples were collected during drilling and the wells were completed in the same manner as the Mission Linen borings to assure comparability of data (Miller Brooks, 2003a). After installation, soil vapor samples were collected from each interval at all three wells. The samples were analyzed for VOCs and fixed gases, the latter to assess the activity of anaerobic bacteria that may degrade chlorinated VOCs.

Mission Linen installed free product observation well MPM-1 in February 2003, and free product recovery well MPE-1 in August 2003 (Figure 1-3). These wells, located just east of the Mission Linen building, were completed in the perched aquifer (URS, 2002) and were used in a multiphase vacuum extraction test performed by Mission Linen during September 2003 (URS, 2009).

In February 2004, ADEQ performed limited soil gas sampling during installation of soil vapor monitoring wells VW-04, VW-05, VW-06, and VW-07. The purpose of the sampling was to assess the soil vapor concentrations of VOCs outside the building at the Haskell/Mission Linen Facility, and away from the facility, along Freemont Avenue south of Manlove Street. Soil vapor samples were collected at depths of 5, 30, 55, and 85 feet bgs at each location. The 55- and 85-foot soil vapor samples from each location were also analyzed for fixed gases. PCE was a predominant analyte in all but one sample, which had high concentrations of cis-1,2-DCE and vinyl chloride at a depth of 85 feet bgs. Oxygen concentrations decreased with depth, accompanied with increased nitrogen and dioxide concentrations (Miller Brooks, 2003a).

2.1.13 Vapor Flux Testing and Screening Risk Assessment – ADEQ, 2004

In 2004, ADEQ evaluated health risks to individuals living in adjacent residential structures and to on-site workers from soil vapors potentially volatilizing from subsurface soils through concrete floor slabs. Vapor flux testing was performed at five locations with concrete surfaces inside the Haskell/Mission Linen building and eight locations at ground surfaces near the property boundary.

A screening health risk assessment (HRA) was performed based on the results of the vapor flux testing. The results of the HRA screening indicated that VOCs and polycyclic aromatic hydrocarbons (PAHs) from the subsurface to indoor air did not pose a significant risk to current and future residential receptors located to the north and south of the facility, but may pose a significant risk to current on-site industrial workers (Copeland, T. and J. Van de Water, 2004).

2.1.14 Contaminant Plume Characterization – ADEQ, 2008

In 2008, ADEQ drilled and installed sentinel well UAM-2B (Figure 1-3) and regional monitoring well PER-14A (GeoTrans, 2008a, 2008b, and 2008d). Well UAM-2B was screened from 266 to 296 feet bgs to assess if groundwater beneath sentinel well UAM-2 (screened from 202 to 262 feet bgs) was impacted by COCs, and to further assess the downgradient lateral and vertical extent of contamination by COCs.

The deepest monitoring well installed at the Park-Euclid Site (PER-14, screened from 473 to 523 feet bgs) showed consistently higher water levels than the surrounding wells. Well PER-14A was drilled in the immediate vicinity of PER-14, to detect any groundwater mound present

at the top of the regional aquifer and to better characterize the lithology and water quality (GeoTrans, 2008c). Water-elevation measurements in well PER-14A, which is screened in the upper portion of the regional aquifer from 180 to 250 feet bgs, did not indicate a groundwater mound at the top of the regional aquifer (GeoTrans, 2008c). The PER-14 groundwater levels thus appear to trend upward which maybe the result of groundwater affected by upwelling along the nearby Santa Cruz Fault Zone. Groundwater samples collected immediately following PER-14A well installation were found to contain 1.2 µg/L of PCE only. A sample collected from PER-14A three weeks later during a regular groundwater sampling event was found to contain 12 µg/L PCE, 0.75 µg/L TCE, and 3.2 µg/L cis-1,2-DCE (GeoTrans, 2009).

2.1.15 Lower Vadose Zone Characterization – ADEQ, 2004 and 2008

In 2004 and 2008, ADEQ collected soil vapor samples from the existing lower vadose zone soil vapor wells VML-1 and VML-2, and VEL-1, and WR-347B (HydroGeoChem, 2003b; GeoTrans, 2008e). In 2004, COCs were detected in the lower vadose zone soils at depths between 165 and 190 feet bgs. The highest PCE concentrations of 170 mg/kg, 160 mg/kg and 140 mg/kg were detected at depths between 165 and 170 feet bgs; concentrations decreased steadily at greater depths. TCE and cis-1,2-DCE were detected in the same depth intervals, in concentrations up to 1.5 and 1.4 mg/kg, respectively (HydroGeoChem, 2003b).

Vapor concentrations of PCE, TCE, and cis-1,2-DCE in 2004 in the lower vadose zone are highest near MP-1 (VML-1 and VML-2), at depths ranging from approximately 125 feet bgs to the regional aquifer table at about 200 feet bgs (HydroGeoChem, 2003a). Based on the 2008 soil vapor sampling results, about 65 percent of the contaminant vapor mass in the lower vadose zone was PCE, 5 percent was TCE, and 15 percent was cis-1,2-DCE.⁶ Comparison of 2004 and 2008 soil vapor data shows an approximate 53 percent increase in total chlorinated hydrocarbons content in 2008 (GeoTrans, 2008e).

2.1.16 Multi-Phase Extraction – Park Euclid Group, 2008 through 2009

Construction of the MPE system began on December 12, 2007. The system consists of six multi-phase (commingled liquids and vapors) extraction wells (MPE-1 through MPE-6), a monitoring well (MPM-1), a vacuum pump, a vapor-liquid separation vessel, a vapor treatment train, and a liquid treatment. The location of these wells is shown on Figure 1-3. Initial system start-up was on April 16, 2008; system re-starting, troubleshooting and repair, pilot-testing, and pilot operations occurred through June 3, 2009 (URS, 2009). Monitoring after the system shut down showed that approximately 1,000 pounds (lbs) of VOCs had been removed.

2.2 INVESTIGATION OF SANITARY SEWER/WASTEWATER LINES

Sanitary sewer/wastewater lines at the Haskell/Mission Linen Facility were examined as a potential route for PCE to enter the subsurface. Wastewater generated from the Mission Linen Facility at 301 South Park Avenue discharged into an 8-inch diameter sanitary sewer beneath the building that runs north-south to a manhole located along the centerline of 13th Street, between Fremont Avenue and Park Avenue (Figure 1-4). The north-south sewer line was originally installed by Pima County in 1947 in a north-south alley that connected 13th Street and Manlove Street. The building at 301 South Park Avenue was later extended across the alley, overlying the wastewater line (Earth Technology, 1991).

⁶ By contrast, DCE concentrations are negligible in the upper vadose zone soil gas samples.

Under its sewer discharge permit with Pima County, the discharge from the Mission Linen Facility has been periodically sampled and analyzed. Analyses of wastewater discharges from Mission Linen show that PCE continued to be detected in the wastewater after dry-cleaning activities at the facility ceased on July 11, 1985 (Earth Technology, 1991; Table 2-2). According to Mission Linen personnel, the persistence of PCE in sewer discharge after the cessation of dry cleaning at the facility was due to laundering shop rags from print shops and other industrial facilities, a practice Mission Linen stopped in 1990. Pima County records show that, after 1990, detected PCE concentrations dropped by several orders of magnitude, and that the Mission Linen discharges had no PCE detected above discharge permit limitations from 1991 through 2001 (Table 2-1).

2.2.1 Soil Vapor Survey along Sewer/Wastewater Lines – Mission Linen, 1998

In 1998, Mission Linen performed a soil vapor survey at 301 South Park Avenue, which included collection of soil vapor samples from 25 locations at depths of 2 and 5 feet bgs along the trace of the sanitary sewer line, originating in the former dry-cleaning area and continuing to the north-south sewer line and along this sewer line to 13th Street (see Section 2.1.7 above).

2.2.2 Sewer Line Cleaning, Video-Logging, and Hydrostatic Testing – ADEQ, 2003

ADEQ performed cleaning, video-logging, and hydrostatic testing of the north-south sewer line in February 2003. The hydrostatic test indicated a rate of leakage exceeding the standard for wastewater pipes (GTA, 2003). A video camera was inserted into the lamp hole at the south end of the north-south pipe, so that a lateral distance of zero feet was measured at the lamp hole, and 251 feet at the manhole in 13th Street. The northern portion of the pipe had the poorest evident integrity. Pipe corrosion was observed at 185 feet. Numerous cracks were observed from 200 to 247 feet, and complete pipe joint separation was observed at approximately 78 feet (GTA, 2003).

2.2.3 Sewer Line Repair, Sampling, and Video-Logging – Pima County and ADEQ, 2003

On March 17, 2003, Pima County excavated and replaced approximately five feet of the north-south concrete sewer pipe between the south curb of 13th Street and the north wall of the building at 301 South Park Avenue. The removed concrete pipe was replaced with a polyvinyl chloride (PVC) pipe attached at each end with steel straps and rubber gaskets. The removed concrete pipe showed cracked surfaces covered with a black stain, similar to the staining on the inside surface of the pipe. The following day, after leakage was observed at the connection at the north end of the new section, the new section was removed, more original pipe was removed, and a slightly longer PVC replacement section was installed.

On March 17, 2003, after the section of old pipe had been removed and before the first repair section was added, ADEQ collected two soil samples from directly beneath the former sewer line to determine if the soil was impacted by potential releases from the pipe. Both samples were analyzed for VOCs and TPH; one soil sample contained no reported VOCs or TPH, and the other contained 0.33 mg/kg PCE and 8,900 mg/kg TPH (Miller Brooks, 2003c). Pima County also collected samples of soil and water from the excavation and of sludge lining the inside of the original pipe.

On March 18, 2003, Pima County observed a leak from a connection between the old pipe and the new replacement section at the north end of the new section, and subsequently removed an additional portion of the old pipe and installed a longer section of replacement pipe. A dye test

of the north-south sewer pipe observed that dyed water continued to leak from the existing pipe south of the repaired section, beneath the building.

On April 9, 2003, Pima County cleaned and video-logged the complete length of the sewer pipe from the manhole access on 13th Street to a final inlet service located approximately 250 feet to the south (Miller Brooks, 2003c). Significant breaks were observed at several locations by video-logging, ranging from marble to golf-ball diameter in size, thus allowing for exfiltration. Circular cracks or joints were observed throughout the pipe, with some being deep enough to allow exfiltration. Most of the observed active service conduits appeared to be in as poor shape as the primary conduit (Miller Brooks, 2003d).

2.3 INVESTIGATIONS ASSOCIATED WITH THE PROPOSED ARROYO CHICO DETENTION BASIN ONE

The City of Tucson, Pima County, and the U.S. Army Corps of Engineers have proposed excavation and construction of runoff detention basins along the Arroyo Chico for flood control purposes (Figures 1-3 and 2-1). Studies have been performed to characterize potential subsurface contamination in proposed Detention Basin One and the potential effects of the detention basin on the fate and transport of identified contamination are discussed below.

2.3.1 Phase I ESA – City of Tucson, 1997

In 1997, the City of Tucson performed a Phase I ESA of the area surrounding the portion of the Arroyo Chico between Kino Parkway and Park Avenue (AGRA, 1997). The purpose of the study was to identify potential sources that may have contributed subsurface contamination to the area of planned excavation.

2.3.2 Vacant Lot Soil Vapor Survey – Mission Linen, 1998

In 1998, as a part of a larger site investigation, Mission Linen performed a soil vapor survey at the vacant lot east of the Mission Linen across Freemont (see Section 2.1.7 above), where PCE-containing waste was disposed in 1982 (see Section 2.1.1 above). The disposal area is located within the proposed Basin One.

2.3.3 Shallow Soil Investigation – City of Tucson, 1998 to 2000

In January 1998, the City of Tucson performed a shallow soil investigation and installed two pairs of nested monitoring wells on property proposed for runoff detention basins along the Arroyo Chico (WR-345A and WR-347A into the perched aquifer, and WR-345B and WR-347B into the regional aquifer) (Figure 1-3). The northern basin, referred to as Basin One, would be located approximately 300 feet northeast of the Mission Linen property. As part of the shallow soil investigation, soil samples were collected from varying depths ranging from the surface to 40 feet bgs (Figure 2-1). No staining or odors in the soil were noted during drilling. All the soil samples were analyzed for VOCs, and all but three for semi-volatile organic compounds (SVOCs). No VOCs were detected in the collected soil samples (SCS Engineers, 1998).

The SVOC compounds pyrene and fluoranthene were reported in surface sample GS-1 at 0.460 µg/kg and 0.400 µg/kg, respectively. Bis (2-ethylhexyl) phthalate was reported at 1,200 µg/kg in a waste profile sample of soil.

Three of the soil borings were located approximately 40 feet within the proposed Basin One: boring B-9 was drilled and sampled to a depth of 40 feet at the location selected to coincide with the area from which PCE-bearing waste was removed in 1982, and WR-347A, B were drilled to a depth of 238 feet near the northern edge of the former waste area (Figure 2-1). Groundwater sampling of WR-345A,B and WR-347A,B identified the presence of PCE in WR-347A (34 µg/L) and WR-345B (2.9 µg/L) (SCS Engineers, 1998). The same wells were re-sampled in September 2000; WR-347A was found to contain 160 µg/L PCE, but PCE was not detected in WR-347B (SCS Engineers, 2000).

2.3.4 Infiltration Tests and Modeling – City of Tucson and Pima County, 1998 to 2002

In November, 1998, the City of Tucson and the Pima County Department of Transportation and Flood Control District excavated three infiltration test pits in the Arroyo Chico channel in proposed Basin One. Water infiltration tests were conducted in each of the test pits (Errol Montgomery, 1999).

In 2002, the City of Tucson and the Pima County Department of Transportation and Flood Control District used finite element models to evaluate the potential for proposed Basin One to increase infiltration from the surface to the perched aquifer (Stephens, 2001 and 2002).

2.3.5 Human Health Screening Risk Evaluation – ADEQ, 2002

In 2002, ADEQ performed a screening risk evaluation (SRE) to assess the potential risks associated with excavation of soil with possible concentrations of PCE and TCE at the proposed Arroyo Chico Detention Basin One. The results of the SRE indicated that the volatilization of chlorinated VOCs in soil during short-term excavation activities does not pose a significant risk to construction workers (Van de Water, J. and T. Copeland, 2002a).

2.3.6 Abandonment of PEP-16 and PEP-17 – City of Tucson, 2004

In June 2004, groundwater monitor wells PEP-16 and PEP-17 were abandoned by the City of Tucson in preparation for excavation work associated with the Arroyo Chico Development Project.

2.4 PARK-BROADWAY INVESTIGATIONS

The Park-Broadway area is centered on properties at the northwest corner of the intersection of Park Avenue and Broadway Boulevard, in Tucson, Arizona (Figure 1-2). The properties are reportedly owned by the Rollings Trust (Rollings) and the Arizona Department of Transportation (ADOT). The property was reportedly purchased by the Rollings Trust in 1983 (GEC, 2000). The southern portion of the Rollings property was purchased by ADOT for the purpose of widening East Broadway Boulevard in 1991 (ADEQ, 1998).

The Rollings property consists of vacant land, parts of which are used for parking, and a building on the northeast corner currently houses an administration office of the Tucson Unified School District. The northeast part of the property was the former location of the Nu Way Dry Cleaners, with a car dealership and a car wash adjoining the cleaners to the south. The southeast portion of the property was formerly operated as a Phillips 66 service station (Exceltech, 1990a).

Dry-cleaning operations were conducted at Nu Way Dry Cleaners from at least 1958 to 1968 (ADEQ, 1998). Several underground storage tanks (USTs) have been removed from the property since 1983 (Exceltech, 1990b). Reportedly, one 200-gallon UST was once used by Nu Way Dry Cleaners during its operations. The 200-gallon UST was removed in 1990 (Exceltech 1990b; GEC, 2000).

2.4.1 Monitor Well Installation – ADOT, 1986

As part of the City of Tucson Aviation Corridor Project, ADOT installed a perched aquifer groundwater monitor well (ADOT-1) in 1986, ADOT, 1990).

2.4.2 Phase II and III Environmental Site Investigation – ADOT, 1990

In May 1990, ADOT advanced eight soil borings to depths ranging from 15 to 99 feet bgs at 901 East Broadway Boulevard as part of their street widening Phase II and III Environmental Site Assessments. Only two samples were selected for analyses that included PCE. No PCE was detected in these samples (Exceltech, 1990a). In August 1990, during the removal of the 200-gallon UST at the Nu Way Dry Cleaners property, a sample of the UST contents and of sludge collected from the former car wash sump contained 800 and 200,000 µg/kg PCE, respectively. Two soil samples collected beneath the UST contained 32,000 and 47,000 µg/kg PCE (Exceltech, 1990b).

2.4.3 Soil and Soil Vapor Contamination Assessments – ADEQ, 1995 to 2000

In 1995, ADEQ conducted a preliminary assessment at the request of EPA. Soil and soil vapor samples were collected at depths ranging from 8.5 to 12 feet bgs from 12 locations at and north of the site. The results indicated the presence of PCE in soil vapor near the former UST location in concentrations ranging from 27 to 2,968 µg/L (ADEQ, 1998).

In 1997, ADEQ conducted an expanded preliminary assessment and collected soil and soil vapor samples at nine locations. Soil samples were collected at depths ranging from 15 to 17 feet bgs and 20 to 24 feet bgs. PCE concentrations in soil samples were detected at 840 µg/kg. Soil vapor samples were also collected at a depth of 13.5 feet bgs and 20 to 23.5 feet bgs. PCE concentrations in soil vapor samples ranged from 82 to 10,000 µg/L.

In May 2000, ADEQ advanced two soil borings to further investigate the PCE contamination detected in 1995 and 1997. The borings were advanced to the depth of perched groundwater (approximately 90 to 92 feet bgs). PCE concentrations in soil vapor samples collected during drilling ranged from 0.24 to 6.6 µg/L. PCE was not detected in soil samples. A groundwater grab sample collected during drilling of one of the borings contained 160 µg/L PCE and 93 µg/L TCE (GEC, 2000).

2.4.4 Groundwater Contamination Assessment – ADEQ, 2001 and 2002

In February 2001, ADEQ installed three groundwater monitoring wells in the immediate vicinity of the Rollins property (PBP-1, PBP-2, and PBP-3). During drilling, soil samples were collected in each boring within the perched aquifer at depths from 85 to 95 feet bgs; COCs were not detected in any of these samples. Perched aquifer groundwater grab samples from the three borings contained up to 550 µg/L PCE, 220 µg/L TCE, and 20 µg/L cis-1,2-DCE (Miller Brooks, 2002b).

In May and June 2002, ADEQ investigated potential groundwater contamination north of the Park-Euclid Site to determine if the Park-Broadway area contamination contributed to the Park-Euclid Site. Two groundwater monitoring wells were installed: PBP-7 (perched aquifer) and PBP-10 (regional aquifer). PBP-7 was constructed, although no groundwater was observed during drilling. Groundwater grab samples collected from PBP-10 contained 2.2 µg/L PCE and 0.75 µg/L TCE (Miller Brooks, 2002a). Boring logs and well completion diagrams for these two wells are provided in Appendix A. These wells were incorporated into the groundwater monitoring and sampling program associated with the Park-Euclid Site.⁷ The Park Broadway perched aquifer plume, based on the November 2008 groundwater sampling, is presented on Figure 2-2.

⁷ As discussed in Section 3, PBP-7 was dry prior to 2005.

3.0 PHYSICAL SITE CHARACTERISTICS

3.1 LOCATION AND PHYSIOGRAPHY

The Park-Euclid Site is located in the northwest quarter of Section 18, Township 14 South, Range 14 East of the Gila and Salt River Meridian, in Tucson, Pima County, Arizona. The land surface is essentially flat, except where incised by surface water drainages. The land surface elevation varies from approximately 2,400 to 2,420 feet above mean sea level and slopes to the northwest at approximately 50 feet per mile. The area is urban in character, with a mix of light industry, retail shops and restaurants, schools, single-family residences, and apartment buildings.

3.2 CLIMATE

The average annual temperature is 68 degrees Fahrenheit (°F). Monthly average high temperatures peak at 100°F in July. Monthly average low temperatures reach 39°F in January. Rainfall averages 12 inches per year, most of which falls during the months from July through September (Office of the Arizona State Climatologist, 2003).

3.3 SURFACE DRAINAGE

The Park-Euclid Site lies within the northeast-draining Santa Cruz River Basin. Most surface water in the Santa Cruz Basin is lost to infiltration or evapotranspiration before leaving the basin. Most surface runoff at the Park-Euclid Site is diverted into storm drains or arroyos.

An ephemeral stream, the Arroyo Chico, is located to the east of the Haskell/Mission Linen Facility and crosses the Park-Euclid Site north of the Haskell/Mission Linen Facility (Figure 1-3). The Arroyo Chico channel is incised up to approximately 20 feet below the surrounding land surface. It is unknown if the present channel course is natural or has been modified, although placement of earthen fill and construction debris appears to have steepened the banks of the arroyo in places. Channel modification and construction of several stormwater detention basins along the Arroyo Chico have been proposed for the northeast portion of the Park-Euclid Site (Aspen Environmental Group, 2000). The Arroyo Chico flows northwestward, enters a box culvert at Park Avenue, and ultimately drains into the Santa Cruz River, approximately 1.5 miles further west, on the west side of downtown Tucson.

A second ephemeral stream, High School Wash, flows from east to west near the northern end of the Park-Euclid Site, just south of the UA campus to the north (Figure 1-3). High School Wash is sharply incised in places below the surrounding land surface. The channel course may have been modified and generally follows the alleyway between 8th and 9th Streets. High School Wash enters a box culvert at Euclid Avenue and eventually drains into the Santa Cruz River on the west side of downtown Tucson.

3.4 REGIONAL GEOLOGY AND HYDROGEOLOGY

The Park-Euclid Site lies within the Tucson Basin, a topographic and groundwater basin approximately 1,000 square miles in area. The Tucson Basin is one of many such basins within the Basin and Range Physiographic Province which dominates the southern half of Arizona. The Tucson Basin is defined by mountains consisting of normal, fault-bounded and uplifted domes of Precambrian metamorphic core complexes regarded as Cretaceous to Tertiary and

Phanerozoic sedimentary and igneous rocks (Mayo, 1968). The Tucson Basin is bounded primarily by the Tucson Mountains to the west, the Santa Rita Mountains to the south, the Sierrita Mountains to the south-southwest, the Tortolita, Black Mountains and Santa Catalina Mountains to the north and northeast, the Rincon and Tanque Verde Mountains to the east, and the Empire Mountains to the southeast. These mountains provided the source for the sediments that were deposited in the basin. Deposition of Tucson Basin sediments were accompanied by faulting. Faults within the sediment may act as conduits for vertical flow causing local anomalies in water temperature, potentiometric surface, and chemical quality of water (Davidson, 1973). Locations of identified faults are shown on Figure 3-1.

The regional aquifer is divided into three main hydrogeologic units. The units, in descending order, are the Quaternary Fort Lowell Formation, the Tertiary Tinaja Beds, and the Tertiary Pantano Formation. The Fort Lowell Formation consists of interbedded silts, sands, and gravel. The thickness of the formation ranges from approximately 300 to 400 feet and rests unconformably on the Tinaja Beds (Davidson, 1973).

The Tinaja Beds are divided into three main units. The upper unit is composed of clayey silt, silt, sand, and gravel deposits. The middle unit consists of gypsiferous and anhydritic clayey silt and mudstone, and the lower unit is composed of silty gravel and conglomerate. The Tinaja Beds are estimated to be several thousand feet thick in the middle of the basin, and rest unconformably on the Tertiary Pantano Formation (Davidson, 1973).

The Pantano Formation consists of gray conglomeratic sandstone, reddish-brown siltstone and mudstone, volcanic conglomerate, tufts, and pebble conglomerate. The sediments are weakly to strongly cemented with calcium carbonate (Davidson, 1973). The Pantano Formation outcrops near the edge of the basin and is buried by more than 8,000 feet of younger sediment in the center of the basin (Anderson, 1987). The Pantano Formation rests unconformably on igneous, metamorphic, and sedimentary rocks of the basement complex. No monitoring wells in the Park-Euclid Site penetrate the Pantano Formation.

The Tucson Basin, as is characteristic of basins in the Basin and Range Province, was a closed basin throughout much of its history. During the time the basin was closed, a playa lake formed, accumulating evaporite and fine-grained deposits in the central part of the basin. As the basin filled with sediments, the drainage spilled over the former barrier and discharged to the Gila River system to the east. The uppermost few hundred feet of sediment in the basin, including the Fort Lowell Formation, accumulated during and following this transitional period from closed basin to inter-basin depositional environments, with Fort Lowell sedimentation ending in middle Pleistocene time (Miller Brooks/Golder, 2001e).

3.5 SITE GEOLOGY/HYDROGEOLOGY

3.5.1 Lithology

The subsurface at the Park-Euclid Site can be generally divided into the following hydrostratigraphic zones (from shallowest to deepest): upper vadose zone, perched aquifer, upper aquitard, lower vadose zone, and regional aquifer.

Geologic cross-sections A-A', B-B', C-C', D-D', E-E', F-F', and G-G' (Figures 3-2 through 3-9) present the subsurface lithology based on available boring logs (Appendix A). Coarse-grained sediments, illustrated in light yellow on the cross-sections, predominate in the upper part of the vadose zone and are generally porous, coarse-grained deposits with relatively low percentages

of fines. Fine-grained sediments, illustrated in tan and brown, predominate in the lower part of the upper vadose zone and make up the upper aquitard. Fine-grained intervals vary in sediment characteristics between borings.

In general, subsurface lithology was classified into three categories: 1) coarse-grained materials, including well- to poorly-graded sands, silty sands, and clayey sands; 2) fine-grained sediments, including silts, sandy silts, and clayey sands; and 3) clays. Due to the gradational variations historically observed in the aquitard, clayey sands encountered at depths ranging from 90 to 110 feet bgs are interpreted to be a gradational feature of the aquitard. Furthermore, lithologic correlations observed within the cross-sections were made between boreholes located within 400 feet of one another. If a specific borehole was located more than 400 feet away from another borehole, lithology between the boreholes was inferred based on interpretation and projection of boreholes within the vicinity.

3.5.1.1 Upper Vadose Zone

The upper vadose zone extends from ground surface to the top of the perched aquifer at depths of 85 to 96 feet bgs. The upper vadose zone has been most intensively investigated beneath and in the vicinity of the Haskell/Mission Linen Facility at 301 South Park Avenue due to the location of documented on-site PCE releases.

The upper vadose zone consists of unconsolidated to partially indurated sediments, including fine to coarse sands and gravel, clayey sands, silty sands, and sandy clays in a wide variety of admixtures and textures. These units vary in thickness from inches to tens of feet. The sediments are moist to dry and range in color from pale orange, light and moderate brown, to pale red. The fine-grained sediments generally have low plasticity, but are usually moderately to highly cohesive. The initial borings advanced at the Park-Euclid Site (MLR-1 through MLR-3) noted coarse sands are muscovite-rich, with common lithic fragments and gravel and cobble-sized clasts are composed chiefly of quartz, granite, gneiss, and quartzite.

The upper vadose zone is comprised of a series of fining-upward sequences typical of alluvial deposits. In some areas, north and northwest of the Haskell/Mission Linen Facility, near the base of the upper vadose zone, fine-grained sediments, including silts, sandy silts, and clayey sands, were observed. These sediments may potentially impede water moving downward to the perched aquifer, as well as laterally within the perched aquifer itself.

3.5.1.2 Perched Aquifer and Upper Aquitard

The perched aquifer underlies the vadose zone, but is not continuous through the Park-Euclid Site. The perched aquifer consists of interbedded sands, silty sands, and clayey sands. The top of the perched aquifer is generally encountered at depths of 85 to 96 feet bgs (Figures 3-2 through 3-9). Its presence is dependent on the presence of an underlying, relatively thick, fine-grained aquitard.

The upper aquitard is a sequence of clays and cohesive, clay-rich sands, the top of which is generally encountered between 88 and 100 feet bgs, and the bottom is between 105 and 135 feet bgs. The aquitard is observed across the Park-Euclid Site to be approximately 10 to 30 feet in thickness and was encountered at depths ranging from approximately 88 feet to 100 feet bgs, as illustrated on Figures 3-2 through 3-9. Based on the soil core from PER-14, a 10-foot coarse gradation of the aquitard (clayey sand) was present from approximately 90 feet to 100 feet bgs

and was followed by an approximate 18-foot thick clay layer. The boring log from PER-14A, drilled to a total depth of 255 feet bgs, confirmed an aquitard thickness of approximately 24 feet.

A smaller, but still notable, clay layer (including a coarser clayey sand gradation) was encountered at approximately 25 feet bgs, and was approximately 10 feet thick in borings located on the extreme western edge of the Park-Euclid Site (PEP-24 and MLS-5 in cross-section B-B'; PBP-10 in cross-section C-C'; and PBP-3, PER-27, and PER-25 in cross-section D-D'). As noted above, gradational variations of silts, clays, and clayey sands were included in the cross-section interpretations.

The lithology directly beneath the Haskell/Mission Linen building has not been characterized to determine the actual depth of the aquitard. Soil vapor wells SVE-101 through SVE-104 were installed to approximately 100 feet bgs and did not fully characterize the vertical extent of the clay layer beneath the facility (Figures 3-8 and 3-9). A clayey sand, a coarser-grained aquitard gradation feature, was encountered at depths of approximately 98 to 116 feet bgs in MLS-4 (215 feet southeast of former dry-cleaning area). Resistivity logs from well MLR-1, located approximately 142 feet southeast of former dry-cleaning area, shows a finer-grained layer from 104 to 114 feet. This layer is thought to be a part of the aquitard; however, this was not depicted on the lithologic boring log. The aquitard is documented between 98 and 104 feet bgs in boring MLS-5, which is approximately 258 feet southwest of the location of the former dry-cleaning area.

The depth to the top of the aquitard was noted in boring logs at approximately 88 feet bgs at WR-345A (on the east side of the Arroyo Chico Wash); 95 feet bgs at MLR-3 and MLR-7 (just north of the Haskell/Mission Linen Facility); 100 feet bgs at PER-14 (at the Haskell/Mission Linen Facility); at about 100 feet bgs at WR-347A (just northeast of the Haskell/Mission Linen Facility); and 105 feet bgs at SVE-102 (in the former PCE spill area at the Haskell/Mission Linen Facility) (Figure 3-3).

In general, the upper vadose zone and perched aquifer sediments are distinguished only by saturation. Hydrogeologic investigations of other contaminated sites to the south (former Unocal Bulk Terminal), southeast (Union Pacific Railroad 22nd Street Site), and northwest (Park-Broadway) of the Park-Euclid Site suggest that the perched aquifer may be laterally continuous (Miller Brooks, 2004). However, according to boring logs from the Park-Euclid Site, the upper aquitard was not observed during the drilling of UAM-1, UAM-2, and UAM-3. The boring logs from these three wells may have no indication of an aquitard, which may be due to the use of an air rotary drilling method. However, geophysical logs for UAM-2B (drilled using mud rotary drilling technology) indicate a fine-grained, possibly clayey interval from 98 feet to 102 feet bgs, but neutron and resistivity logs do not indicate the presence of saturated conditions (i.e., perched aquifer) above that interval (Figures 3-2 and 3-7).

It should be noted that well PBP-7, installed by ADEQ north of Broadway Boulevard and the Park-Euclid Site, also identified the upper aquitard and deposits equivalent to the perched aquifer; however, groundwater has not been observed in the perched aquifer zone at PBP-7. In addition, the boring for well PBR-10 penetrated a 10-foot section of clayey sands and sandy clays, which may be equivalent to the upper aquitard in a structurally high position. The sediments above this unit are equivalent to the perched aquifer, but were not saturated (Figure 3-3).

Saturated Thickness

The saturated thickness of the perched aquifer above the upper aquitard is highly variable across the Park-Euclid Site, with values historically ranging from zero to greater than 5 feet (Figures 3-10 and 3-11). In the area directly beneath the Haskell/Mission Linen Facility, there is a saturated thickness of between 1 and 2 feet (Figure 3-11).

The thickness of the perched aquifer is highly variable due to both the uneven surface contour of the aquitard (Figure 3-11) and the observed saturation of the aquitard at PBP-7. The low-lying areas of the aquitard will create a pooling effect, leading to preferential flow pathways, which would affect the lateral and vertical migration of contaminants through the perched aquifer and the underlying aquitard. Figure 3-11 illustrates the surface contours of the upper aquitard, indicating a low-lying area directly beneath the Haskell/Mission Linen Facility at MLS-4 and MLR-1. Additionally, the variable saturation in the aquitard and the presence of these pools makes it difficult to establish a uniform thickness of the perched aquifer. The observed saturation of the aquitard also indicates a more laterally extensive aquifer and infers that the vertical conductivity of the aquitard may be higher than originally assumed.

The static water level of the perched aquifer south of the Haskell/Mission Linen Facility is approximately 5 to 8 feet above the top of the aquitard (Figure 3-10). The static water level directly beneath the Haskell/Mission Linen Facility is at the same level as the aquitard, and north of the Haskell/Mission Linen Facility, near ADOT 1, the static water level of the perched aquifer is as much as 10 feet below the top of the aquitard. The thickness of the perched aquifer diminishes towards the north-northeast. Perched aquifer monitoring wells PBP-3, PBP-7, and PEP-17 are screened in the upper portion of the aquitard and have measured water levels lower than the top of the aquitard, indicating that the aquitard is saturated north of the Haskell/Mission Linen Facility, beyond where the saturation in the coarse-grained sediments ends. Perched aquifer monitoring well PBP-7 was dry prior to 2005, but began producing measurable water as water levels throughout the perched aquifer generally increased beginning around 2004 to 2005. Based on the most recent groundwater level data (2008), the static water level directly beneath the Haskell/Mission Linen Facility is at the top of the aquitard.

General Water Chemistry

Based upon the analysis of the stiff diagrams, perched aquifer groundwater is predominantly a calcium-bicarbonate type, with some calcium chloride and mixed-type water (Figure 3-12). Cation concentrations are plotted on the left side of the central axis and anions are plotted on the right side of the axis, both in milliequivalents per liter (milliequivalents/L). If one cation and one anion each constitute greater than half of all cations or anions in milliequivalents/L, the type of water is named after the predominant cation and anion; otherwise, the water is considered to be of mixed type.

Total dissolved solids (TDS) range from 390 to 2,400 mg/L. Groundwater in the vicinity of the Arroyo Chico, such as at PEP-18, had the lowest TDS. The highest TDS is found in groundwater sampled from wells further from the Arroyo Chico, such as SVE-102 and MLS-13 (Figure 3-13). Chloride ranges from 13 to 730 mg/L and is also lowest near the Arroyo Chico (Figure 3-14). The TDS and chloride concentration distributions suggest that fresh water is being recharged along the Arroyo Chico. Perched aquifer groundwater inorganic analytical results from June 2002 are presented in Table 3-1.

Total alkalinity in the perched aquifer ranges from 71 to 610 mg/L, with the area of highest alkalinity roughly coinciding with the area of floating diesel free product (Table 3-1; Figure 3-15). The correlation of high alkalinity with free product may be due to anaerobic processes typical of a reducing environment raising alkalinity by generating carbonate or bicarbonate.

Perched aquifer major ion and TDS analysis confirms that the differences in water quality and TDS concentration are a result of recharge from the Arroyo Chico. Wells nearest to the Arroyo Chico Wash indicate calcium bicarbonate-type water with a TDS concentration of approximately 400 mg/L. Chloride concentrations in the wells nearest the Arroyo Chico Wash are also the lowest encountered across the Park-Euclid Site, and are at or below 25 mg/L. Groundwater elevation, as well as chloride and TDS concentration contour plots (Table 3-1; Figures 3-12 through 3-14), indicate that a preferential east-west flow pathway may exist on or near the property, which carries newly recharged water from the Arroyo Chico Wash to monitoring wells PEP-16, MLS-4, PEP-8, and MLS-5. The stiff diagrams of these wells also indicate a similar calcium-bicarbonate water type to the samples encountered in the wells along the Arroyo Chico Wash. Wells further away from the recharge area along the Arroyo Chico Wash report calcium-chloride/sulfate type water, with increasing TDS and chloride concentrations. However, total alkalinity concentrations do not follow a similar distribution, but rather indicate that the highest total alkalinity is in the vicinity of MLS-4 and PEP-8. This divergent behavior may be indicative of the local microbial degradation of the overlying free-product diesel by which the alkalinity is increased as carbon dioxide is produced and subsequently converted into carbonate species.

Field conductivity measurements generally correlate well with TDS. For most wells in the perched aquifer, the groundwater conductivity in microsiemens per centimeter ($\mu\text{S}/\text{cm}$) is approximately 1.7 times the TDS in mg/L.

Aquifer Tests

Slug tests were performed in April 1999 in wells MLS-4, MLS-5, and MLS-6. As interpreted by the Bouwer-Rice Method, the data indicated that the hydraulic conductivity at the tested wells ranges from 4.6 to 8.6 feet/day (Dames & Moore, 2000a). A slug test was performed on well WR-347A in May 2000 that indicated a hydraulic conductivity of 0.074 feet/day using the Bouwer-Rice method (SCS, 2000).

Slug tests were also performed in the perched aquifer in May 2001. Analysis by the Bouwer-Rice Method indicated hydraulic conductivities (in those tests in which the data fit was judged to be of moderate to good reliability) ranging from 0.25 to 14 feet/day (Golder, 2001c, Table 6).

The slug test results from April 1999 and May 2001 appear to be consistent. A much lower value was reported by SCS in May 2000. The reason for this discrepancy cannot be evaluated, because the SCS report did not include the graph on which the interpretation was based.

3.5.1.3 Lower Vadose Zone

The lower vadose zone at the Park-Euclid Site is composed of coarse-grained sediments, including sands, silty sands, and clayey sands, often with significant fine-grained clay and silt layers between 115 and 200 feet bgs (Figures 3-3 through 3-9). Of the clay layers and/or lenses observed in the lower vadose zone, the most notable and substantial clay layer, approximately 25 to 50 feet thick, was encountered in several of the borings (MLR-1, MLR-3, and WR-345B) at depths of approximately 200 feet bgs. This significant clay layer was

predominant in most of the regional aquifer borings and can be observed on Figures 3-3 through 3-9.

Boring logs for WR-345B, WR-347B, PER-21, PER-22, PER-14, and PER-14A indicate that the lower vadose zone consists of a series of interbedded zones, with varying degree of saturation, the cause of which has not been determined. Previous investigations at the Park-Euclid Site have noted significant moisture in sediments located above the regional aquifer. In particular, moist sediments were noted in the boring log for well PER-14 from approximately 150 to 167 feet bgs, and very moist sediments from 167 to 177 feet bgs. In addition, during the installation of deep vapor monitoring well VMW-3, approximately 35 feet southeast of PER-14, light moisture was observed in the sediments from approximately 164 to 170 feet bgs. Saturated sediments were not encountered in PER-14 until approximately 200 feet bgs, the general depth of the regional aquifer at the Park-Euclid Site.

Other boring logs note the lower vadose zone as dry. However, the reported absence of moisture by visual observation may be due to the drilling method used (e.g., air-rotary drilling). The presence of moisture within the lower vadose zone is important to the analysis of the aquitard being a unit that would prevent migration of VOCs to the regional aquifer, since it may be an indication of communication between the perched and regional aquifers. No samples from the lower vadose zone or from just beneath the upper aquitard were collected for moisture analyses (see Section 3.5.2.4).

3.5.1.4 Regional Aquifer

The regional aquifer is considered hydraulically continuous throughout the Tucson Basin, and produces most of the potable drinking water for the City of Tucson, the UA, as well as other water providers throughout the Tucson Basin. The regional aquifer is composed of interbedded sands and clays (Figures 3-3 through 3-9). The saturated interval is estimated to be several thousands of feet thick, with an undetermined total thickness at many locations (Davidson, 1973).

Hydraulic Conductivity and Transmissivity

Published values for hydraulic conductivity and transmissivity for the upper alluvium part of the regional aquifer are typically from 30 to 40 feet/day (ft/day) and 1,500 to 40,000 square feet per day (ft²/day), respectively. The average specific yield in the upper part of the regional aquifer is about 0.15 (Hanson, et al., 1990).

Several aquifer tests were performed in the regional aquifer at the Park-Euclid Site; the results of these tests are summarized in Table 3-2. Mission Linen performed an aquifer test in May 1994, using MLR-7 as the pumping well. Transmissivities were interpreted to range from 18 ft²/day in MLR-7 to 1,400 ft²/day in MP-1, with average transmissivity of 1,600 ft²/day for MP-1 and MLR-3. Using an aquifer thickness of 300 feet, estimated horizontal hydraulic conductivities ranged from 0.059 to 5.5 ft/day (EMCON, 1994c). The hydraulic conductivities estimated for the observation wells were likely affected by differences in screened intervals between the pumping well MLR-7 (210 to 280 feet bgs) and observation wells MLR-3 (260 to 345 feet bgs) and MP-1 (330 to 511 feet bgs) (EMCON, 1994c). The measured transmissivity values are slightly lower than the reported values for the Fort Lowell Formation. This may be the result of more fine-grained lithology observed in the uppermost regional aquifer in on-site wells (Dames & Moore, 2000a). Storativity values for the regional aquifer were reported to range from 0.023 to 0.000592 (EMCON, 1994c). This range suggested that hydraulic

conditions in the regional aquifer at the Park-Euclid Site may range from confined to semi-confined and unconfined conditions (EMCON, 1994c).

Based on the data collected by ADEQ during an aquifer pumping test of PER-15 in May 2001, which had the advantage of pumping and observation wells completed within the same interval, a higher horizontal hydraulic conductivity value of approximately 30 ft/day was estimated for the upper 50 feet of the regional aquifer (Golder, 2001b).

A 56-day period of pumping the Martin Street well was initiated by ADEQ on May 2, 2001, and ended on June 27, 2001. The pump rate averaged 186 gallons per minute (gpm). The Agriculture well pumped for several days from May 29 to and June 1, 2001, at an average rate of 190 gpm. The resulting drawdowns measured by pressure transducers, primarily in UAM-3, were analyzed using the Well Hydraulics Interpretation Program for flow to a fully penetrating well in a homogeneous, isotropic, confined aquifer. Based on a Theis curve and late-time recovery using Jacob's Method, the regional aquifer transmissivity was estimated to be between 2,400 and 3,800 ft²/day, with a storage coefficient of 0.035. The storage coefficient indicates unconfined conditions. Using an aquifer thickness of 265 feet, a hydraulic conductivity was calculated to be approximately 9 to 14 ft/day. Because of the good comparison of the entire hydraulic response curve in UAM-3 to the Theis predicted drawdown, it was concluded that the hydraulic conductivity of the regional aquifer between the Martin Street well and UAM-3 was approximately 10 ft/day (HydroGeoChem, 2002a).

Temperature

The field parameters of temperature, conductivity, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP) were recorded during each sampling event for regional aquifer monitor wells. Table 3-3a lists the median values for these field parameters recorded from February 2000 through January 2003. Most of the wells have similar field parameters. Table 3-3b presents the most recent (November 2008) field parameters recorded from regional wells at the Park-Euclid Site. The only exception is the deepest monitor well, PER-14, which consistently has higher temperature, conductivity, and pH, and lower DO compared with the shallower regional wells.

The temperature log of Old Well recorded a temperature of approximately 90°F just below the water table. A 10°F temperature increase to approximately 100°F was recorded between the depths of 180 to 250 feet bgs. From 250 to 400 feet bgs, the temperature of the water remained constant at 100°F. From 400 to 445 feet bgs, the temperature decreased to 90°F and remained constant until logging was completed at 487 feet bgs (Earth Technology, 1991).

The temperature log of MP-1 shows a relatively uniform increase in temperature with depth, at a rate of 0.05°F per foot of depth, representative of a geothermal gradient (Earth Technology, 1991). The range of temperature was 83.5°F to 89.3°F. The temperature gradient decreased sharply at a depth just above 400 feet bgs, showing an increase of only 0.3°F for nearly 75 feet.

Temperatures are generally close to the line 24 degrees Centigrade (°C) + 1.7°C per 100 feet of depth, which is close to the Tucson Basin geothermal gradient found by Laney (1972).

General Water Chemistry

Concentrations of inorganic constituents in the upper 200 feet of the regional aquifer (all regional monitor wells except PER-14) tend to be lower and less variable than those in the perched aquifer. Chloride concentrations in the upper 200 feet of the regional aquifer range from 12 mg/L to 68 mg/L at the Park-Euclid Site, and tend to be lower to the southeast (Figure 3-16). As in the perched aquifer, TDS correlates well with electrical conductivity of regional aquifer groundwater (Figure 3-17).

Stiff diagrams from the upper 200 feet of the regional aquifer (Figure 3-18) are nearly identical in the southern portion of the Park-Euclid Site, indicating low TDS sodium/potassium-bicarbonate type water. Moving northward, the water increases slightly in TDS, but remains a sodium/potassium-bicarbonate type water in the area of PBR-10, UAM-1, and UAM-2 (UAM-2B was not installed at the time of this investigation). Moving further north-northeastward, the water again decreases in TDS, but increases in calcium content in UAM-3 and the UA production wells. The majority of the samples have measured TDS concentrations less than 400 mg/L, with slightly higher concentrations in PBR-10, UAM-1, and UAM-2, between 400 and 600 mg/L. The Martin Street water supply well at UA has calcium-bicarbonate water.

There is a notable exception in the sample collected from PER-14 (screened from 473 to 523 feet bgs), which is the only monitor well completed below the upper 415 feet of the regional aquifer. PER-14 has very different water chemistry than the other monitor wells completed in the regional aquifer. PER-14 has sodium/potassium-sulfate-type water, with minimal bicarbonate concentrations. Historically, PER-14 has much higher TDS concentrations (consisting of sodium/potassium, chloride, and sulfate) than the other regional monitor wells, and much lower alkalinity (Tables 3-4 and 3-5). This difference has been attributed to the chemical fingerprint of the deeper aquifer where PER-14 is screened, rather than a detection of leakage from the perched aquifer. It should be noted that well PER-14A, screened from 180 to 250 feet bgs, was installed in 2008, thus following this investigation. Laney (1972) found that Tucson Basin groundwater above 700 feet bgs was generally calcium-sodium bicarbonate type, except where it is affected by water upwelling along fault zones where it becomes sodium sulfate type. Laney also found that chloride concentrations greater than 50 mg/L (190 mg/L chloride in PER-14) and TDS concentrations greater than 500 mg/L (960 mg/L TDS in PER-14) were characteristic of groundwater affected by upwelling along fault zones. The nearest known fault is the Santa Cruz Fault Zone, mapped as being approximately 3,000 feet west of PER-14 (Figure 3-1).

3.5.2 Physical and Chemical Properties

Selected samples from the upper vadose zone, the perched aquifer, and the regional aquifer were submitted for laboratory testing for total organic carbon (TOC) analysis, hydraulic conductivity, moisture content, dry density, and specific gravity. A summary of the data reviewed is described in each respective section.

3.5.2.1 Total Organic Carbon

Thirty four (34) selected soil samples from the upper vadose zone, the perched aquifer, and the regional aquifer were evaluated by the Walkley-Black Method for TOC content. The TOC content ranged from 0.01 percent (PEP-8 and PEP-9) to 0.42 percent (PER-14 and TB-1). The results are summarized in Table 3-6.

3.5.2.2 Hydraulic Conductivity and Permeability

The permeabilities in centimeters per second (cm/sec) and hydraulic conductivities (in cm/sec), are summarized in Table 3-7:

- Eight soil samples from the upper vadose zone (collected from borings PEP-8, PEP-9, and PER-14) were analyzed for hydraulic conductivity (Miller Brooks/Golder, 2001b). The hydraulic conductivity ranged from 3.6×10^{-7} to 1.5×10^{-3} in PEP-8 and from 5.8×10^{-6} to 8.1×10^{-4} in PEP-9;
- Three soil samples from the perched aquifer (collected from borings PBP-1 and PBP-3) were analyzed for hydraulic conductivity (Miller Brooks/Golder, 2001b). The hydraulic conductivity ranged from 5.7×10^{-7} to 4.0×10^{-6} in PBP-1, and was 7.8×10^{-7} in PBP-3;
- Three soil samples from the regional aquifer (collected from boring PER-14) were analyzed for hydraulic conductivity (Miller Brooks/Golder, 2001b). The hydraulic conductivity ranged from 1.1×10^{-6} to 7.9×10^{-6} ;
- Four soil samples from the perched aquifer (collected from boring SVE-101) were analyzed for permeability. Average permeability in SVE-101 ranged from 1.38×10^{-6} to 1.71×10^{-5} (EMCON, 1995b);
- One soil sample from the upper vadose zone (collected from boring SVE-102) was analyzed for permeability. Average permeability in SVE-102 was 4.1×10^{-6} ; (EMCON, 1995b); and
- Four soil samples from the perched aquifer (collected from boring SVE-102) were analyzed for permeability. Average permeability in SVE-102 ranged from 8.0×10^{-7} to 1.2×10^{-5} (EMCON, 1995b).

Hydraulic conductivity analyses of the lower vadose zone have not been performed.

3.5.2.3 Sieve Analyses

Sieve analyses were conducted on samples from borings PEP-8, PEP-9, PEP-10, PEP-11, PER-14, PEP-16, PEP-17, and PEP-18 (Miller Brooks/Golder, 2001b). Sieve analyses from the 85 to 102 feet bgs intervals are summarized in Table 3-8. Of the samples analyzed from the upper vadose zone, samples from PER-14 and PEP-17 were classified as clayey sand and samples from PEP-8 and PEP-11 were classified as sand and clay or sand and silty clay. With exception to the sample collected from PEP-18, all of the other samples collected from the perched aquifer were classified as clayey sands. Only one sample was collected from the aquitard (PEP-14) and was classified as a sandy lean clay.

3.5.2.4 Moisture Content

Boring Logs

Boring logs were reviewed for moisture content information from boreholes drilled into the regional aquifer contaminant plume.

- **WR-345 and WR-347:** Monitoring wells WR-345 and WR-347 were drilled using air rotary drilling methods, and discrete soil samples were collected at selected intervals from 70 to 150 feet bgs. During drilling of WR-345, moisture was noted throughout the clay layer that comprises the aquitard, which was encountered between 86 feet and 104 feet bgs. The clay moisture decreased from 105 to 110 feet bgs, and became increasingly saturated from 110 to 113 feet bgs, where a caliche layer was observed. The moisture content varied in the lower vadose zone as follows: moist at 125 feet bgs; dry to moist at 132 feet bgs; dry at 195 feet bgs; and moist at 215 to 237 feet bgs. The boring log for WR-347 included a notation that the interbedded silty sand layer at 86 feet bgs was dry, while the sand layer at 95 feet bgs and the clay present at 110 feet bgs (at approximately the midpoint of the aquitard) were moist. Moisture was not noted from 115 to 137 feet bgs. No other notions of moisture level were recorded.
- **PER-21 and PER-22:** The boring logs for PER-21 and PER-22, drilled using air rotary methods, note various moist or damp intervals between 95 feet and 140 feet bgs. No other notations of moisture were recorded until the regional aquifer was encountered at approximately 215 feet bgs.
- **PER-14:** PER-14 was drilled using the sonic drilling technique to a depth of 200 feet bgs, where the drilling method was switched to mud rotary. The perched aquifer was encountered at a depth of 94 feet bgs. The clay layer constituting the aquitard, present from 101 feet to 118 feet bgs, was noted as slightly moist, with decreasing moisture with depth. Between the bottom of the aquitard and the top of the regional aquifer (118 feet and 200 feet bgs), various fine-grained layers within the lower vadose zone were noted as moist to very moist.

Moisture Content Laboratory Analysis

The Monitor Well Installation Report (Miller Brooks/Golder, 2001a) documents moisture content analyses from samples collected from borings PEP-8, PEP-9, PEP-10, PEP-11, PER-14, PEP-16, PEP-17, and PEP-18. The findings are summarized in Table 3-9. Moisture content analyses were conducted on soil samples collected from depths ranging from 5 feet to 102 feet bgs. From ground surface to 50 feet bgs, moisture content ranged from 2.3 percent at 5 feet in PEP-18 to 9.5 percent at 20 feet in SVE-101. From 51 feet to 102 feet bgs, moisture content ranged from 2.2 percent at 90 feet in PEP-11 to 9.5 percent at 18.2 feet in SVE-103. No samples were collected from the lower vadose zone.

3.6 CURRENT AND FUTURE LAND AND WATER USE

In accordance with Arizona Administrative Code (AAC) R18-16-406, Section D, the ADEQ has completed the attached Appendix B, Land and Water Use Report, Park-Euclid WQARF Site, Tucson, Arizona (dated May 18, 2004). This report outlines reasonably foreseeable uses of land and water for the Park-Euclid Site.

According to this report, about 70 percent of the land in the Park-Euclid Site Community Involvement Area is zoned for residential use, and 29 percent is zoned for commercial and industrial uses. At the time the report was issued, site-specific land uses were related to the Arroyo Chico Wash and commercial laundry operations. Future uses were identified for the

Arroyo Chico Floodwater Detention Basin Project (including a neighboring community center, public open space, trails, park space, and natural habitat restoration) and continued commercial laundry operations.

Groundwater uses in the area were identified by the UA for domestic irrigation, research/lab, commercial, steam, and cooling tower applications. The UA operates eight water-supply wells to meet the needs of the Main Campus and the Arizona Health Services Center and is expected to continue to withdraw groundwater from the regional aquifer through at least 2030 to meet expected demands.

Although there were no active City of Tucson production wells identified in the Park-Euclid Site Community Involvement Area, the City of Tucson indicated significant water-supply changes and population growth over the next 100 years in the vicinity of Tucson area WQARF sites, and thus a need to manage the regional aquifer to ensure groundwater availability to meet the community's future needs, which includes the remediation of the contaminated groundwater sites in the vicinity of the central well field.

The City of Tucson, Mission Linen, ADEQ, ADOT, and the EPA own groundwater monitoring wells used for the periodic monitoring and sampling of the perched and regional aquifers. Groundwater will continue to be monitored and sampled from these wells into the foreseeable future. Mission Linen identified the potential use of monitoring wells to assist in any potential groundwater remediation. Mission Linen has also indicated its willingness to use treated groundwater for laundry operations to the extent possible.

No surface water rights were identified in the Park-Euclid WQARF Site vicinity.

4.0 NATURE AND EXTENT OF CONTAMINATION AND FATE AND TRANSPORT

Based on review of the Park-Euclid Site historical data through November 2009, the COCs in soil, soil vapor, and groundwater at the Park-Euclid Site are PCE and its breakdown products TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. 1,1-DCE, an abiotic degradation product of 1,1,1-TCA, was also detected in groundwater at the Park-Euclid Site in concentrations above its Aquifer Water Quality Standard (AWQS). However, 1,1,1-TCA has not been detected at the Park-Euclid Site.⁸ 1,1-DCE is also formed by cometabolism of 1,1,1-TCA (WRHSRC, 2003) during the anaerobic biodegradation of TCE (EPA, 2009).

Diesel free product and dissolved fuel-related compounds are present in the shallow perched groundwater and have also been historically detected in the regional aquifer at the Park-Euclid Site. However, characterization of diesel fuel and fuel-related compounds is not the subject of this RI.

Based on the available information, the original sources of contamination were spills/discharges/disposal of PCE solvent at the Haskell/Mission Linen Facility and the vacant lot to the east. One or more of the above COCs have been detected in the following hydrogeologic zones:

- Upper vadose zone;
- Perched aquifer;
- Upper aquitard;
- Lower vadose zone; and
- Regional aquifer.

Correlation between elevated levels of COCs in the upper vadose zone in the immediate vicinity of the Haskell/Mission Linen Facility and high concentrations in perched and regional groundwater downgradient of this area are discussed in more detail in this section of the report.

4.1 SOURCE AREA – UPPER VADOSE ZONE

To define the extent of matrix contamination in the upper vadose zone, as compared with soil vapor contamination, the soil and soil vapor samples were evaluated separately. The detected soil concentrations have been lower and less aerially extensive than the soil vapor concentrations.

4.1.1 Soil Contamination

Only a small number of soil samples have been submitted for laboratory analyses across the source area. Table 4-1 summarizes concentrations of COCs in soil in the source area that are categorized by sample depth at each sampling location. Sampling locations are also shown on Figure 4-1. Based on the data, PCE was the primary contaminant detected in soil. TCE was detected in only one sample at a very low concentration, and cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride were not detected in any upper vadose zone soil samples down to the perched aquifer at depths of about 90 to 93 feet bgs.

⁸ Abiotic degradation of 1,1,1-TCA to 1,1-DCE in groundwater occurs rapidly, with a half-life of up to several years (EPA, 600/M-89/009; Gerkens, R.R. and J.A. Franklin, 1989; Wing, M.R., 1997).

Based on the data presented in Table 4-1 and on Figures 2-1 and 4-1, the lateral extent of PCE soil contamination at the Haskell/Mission Linen Facility and its immediate vicinity is defined by soil samples collected at SVE-101 to the west, PER-14 to the north, PEP-8 to the south, and HL-6 to the east.

Based on the available information, the vertical extent of soil contamination in the upper vadose zone within the source area is as follows:

- Contaminated soil immediately below the former dry-cleaning area extends through the upper vadose zone to the perched aquifer at a depth of 90 feet bgs, as shown by soil vapor surveys conducted at wells SVE-101 through SVE-104;
- Contaminated soil below former sumps, sanitary sewers, and other equipment, as indicated by soil vapor surveys at a depth of 5 to at least 55 feet bgs (see Section 4.1.2 below), high concentrations detected in sewer discharges from the Haskell/Mission Linen Facility, and a pipe joint separation and numerous cracks observed along the north-south sewer line; and
- Contaminated soil around Old Well and MP-1 extends through the upper vadose zone to the regional aquifer, as shown on PER-14.

Detected PCE concentrations in the upper vadose zone soils ranged from 0.0047 mg/kg to 3.1 mg/kg (Table 4-1). None of the upper vadose zone soil sample concentrations exceeded ADEQ's Non-Residential Soil Remediation Level (NR-SRL) of 13 mg/kg. However, PCE concentrations detected in two soil samples from SVE-102 (3.1 mg/kg and 1.4 mg/kg at 60 and 70 feet bgs, respectively) exceeded ADEQ's minimum Groundwater Protection Level (GPL) of 1.3 mg/kg.

PCE contamination detected in 9 out of 10 soil samples collected in the upper vadose zone soils at PER-14, located between the two former production wells, appears to be associated with the movement of contamination down the annulus of Old Well and/or MP-1.

TCE was detected at 0.02 mg/kg in only one soil sample, collected at SVE-103 a depth of 30 feet bgs; this concentration is much lower than the R-SRL and NR-SRL of 3.0 and 65 mg/kg, respectively, and the minimum GPL of 0.61 mg/kg.

The only soil sample collected at the vacant lot to the east of the Haskell/Mission Linen Facility, across Freemont Avenue, does not show PCE concentrations above the ADEQ Residential Soil Remediation Level (R-SRL). Residual soil contamination may exist at a depth of at least 20 feet bgs, as indicated by soil vapor concentrations detected during a soil vapor survey.

4.1.2 Soil Vapor Contamination

Several soil vapor surveys conducted at the Haskell/Mission Linen Facility from 1991 through 1998 showed the highest concentrations to exist underneath the former dry-cleaning area. According to the 1998 survey (the most comprehensive of the surveys), PCE, TCE, and total DCE were detected in soil vapors in concentrations up to 47,000 µg/L, 350 µg/L, and 14 µg/L, respectively (Figures 4-2 and 4-3A, B, C, D). At shallow depths of 5 bgs, the highest concentrations of PCE (up to 4,200 µg/L) were detected around the sewer/wastewater lines. Soil vapor concentrations of PCE were found to increase with depth and were detected at depths of 55 and 85 feet bgs (up to 47,000 µg/L at 85 feet bgs). Soil vapor samples collected

18 months later (in February 2000) from SVE-101, SVE-102, and SVE-104 from the unsaturated screened intervals from 30 to 90 feet bgs supported the findings of the 1998 multi-level soil gas concentrations. Well construction details for the soil vapor wells at the Haskell/Mission Linen Facility are presented in Table 4-2.⁹

The 1998 soil vapor survey was also conducted on the vacant lot located east of the Haskell/Mission Linen Facility, across Freemont Avenue, to evaluate whether soil at this lot was a source of contamination resulting from former disposal of PCE still bottoms and oily diatomaceous earth. Soil vapor samples were collected at nine sampling locations at approximate depths of 5 and 18 feet bgs, with the exception of one sample which was collected at 30 feet rather than 18 feet bgs. All 18 soil vapor samples were found to contain PCE: up to 100 µg/L PCE at 5 feet bgs; up to 270 µg/L at 18 feet bgs; and 780 µg/L at 30 feet bgs.

An SVE system was operated within the former dry-cleaning area at the Haskell/Mission Linen Facility from June 2000 to July 2002, and from September 2004 to February 2006. The purpose of the SVE system was to remove VOCs from the upper vadose zone underneath the source area. The results of a soil gas survey performed in January and February 2003, to evaluate the SVE performance, showed the presence of PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. PCE was detected at all sample locations and depths, except at two locations: in the northwest corner of the 299 South Park Avenue property and along Park Avenue, about half-a-block south-southwest of the 301 South Park Avenue property.

Similar to previous investigations, PCE vapor concentrations in 2003 and 2004 were higher at greater depths, near the depth of the perched aquifer at about 90 feet bgs. The highest PCE concentrations in 2003 were detected in samples collected below the former dry-cleaning area, with the exception of one sample collected in the northeast corner of the Haskell/Mission Linen Facility (about 65 feet east of MP-1) which had a PCE concentration of 59,000 µg/L at 85 feet bgs. According to the 2003 data, the operation of SVE system at the Haskell/Mission Linen Facility had reduced contaminant concentrations in soil gas by an order of magnitude. The greatest reductions occurred at the depths and locations that had the highest contaminant concentrations in 1998.

During the period September 2008 through June 2009, a MPE system was pilot-tested and pilot-operated at the Haskell/Mission Linen Facility for a combined total of about six months. However, soil vapor sampling to evaluate the lateral and vertical extent of the remaining soil vapor contamination following the MPE activities has not yet been performed.

4.1.3 Summary – Upper Vadose Zone Contamination

- Detected PCE concentrations in the upper vadose zone soils ranged from 0.0047 mg/kg to 3.1 mg/kg. None of the detected concentrations exceeded the PCE NR-SRL of 13 mg/kg. PCE concentrations detected in two samples at depths of 60 and 70 feet bgs exceeded the minimum GPL of 1.3 mg/kg;
- Detected soil contamination consists primarily of PCE, with only one detection of TCE;

⁹ Since these wells are also used as perched aquifer monitor wells, they are presented in both Tables 4-2 and 4-3.

- Below the former dry-cleaning area, soil contamination extends vertically through the entire depth of the upper vadose zone to the perched aquifer at a depth of about 90 feet bgs;
- Below former sumps, sanitary sewers, and other equipment, soil contamination may extend to at least 55 feet bgs zone;
- In the area of PER-14, soil contamination extends through the entire depth of the upper vadose zone to the regional aquifer;
- At the vacant lot to the east of the Haskell/Mission Linen Facility, across Freemont Avenue, there may be some residual soil contamination extending to unknown depths;
- Soil vapor contamination in the upper vadose zone is directly associated with the source areas and consists primarily of PCE and lower concentrations of TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride.
- The highest levels of PCE in shallow soil vapors were detected beneath the sewer/wastewater lines. The highest levels of PCE at greater depths were detected underneath the former dry-cleaning area and extended radially beyond the Haskell/Mission Linen Facility boundaries. Much lower concentrations of soil vapors were detected in soils on the vacant lot east of the Haskell/Mission Linen Facility;
- Evaluation of the vertical PCE distribution in soil vapors beneath the Haskell/Mission Linen Facility and the vacant lot showed increases in concentrations with depth; the highest concentrations were observed at depths of 85 feet bgs at the majority of the sampling locations. Groundwater in the perched aquifer was typically encountered between 85 and 90 feet bgs. The lower portions of the upper vadose zone appeared to have been impacted by PCE as follows: density-driven¹⁰ downward vapor migration from the source areas and spreading laterally when a barrier, such as groundwater, is encountered; vapor migration from groundwater; and volatilization from the smear zone; and
- Results of SVE activities suggest that PCE and its degradation products in soil vapor are mobile, with detectable concentrations migrating to the extraction points. Because baseline and post-MPE sampling was not performed, the extent of vapor contamination is difficult to define, since SVE operations and MPE pilot operations have influenced migration of vapor contamination and induced volatilization of dissolved, adsorbed, and free-product PCE (if present).

¹⁰ The vapor density of PCE is 5.7 times that of air.

4.2 PERCHED AQUIFER AND UPPER AQUITARD

4.2.1 Groundwater Movement

Observed water levels in the perched aquifer monitor wells have shown seasonal variations, typically rising during the winter and spring, and falling during the summer and fall (see hydrographs in Appendix C). Groundwater well construction details, including measured elevation and screened intervals, are presented in Table 4-3. November 2008 groundwater elevations and groundwater contours are presented on Figure 4-4. A summary of historical depth-to-water measurements and groundwater elevations is presented in Table 4-4.

Monitor wells in the immediate vicinity of the Arroyo Chico consistently show larger variations in water levels (approximately 4 to 6 feet), possibly due to recharge from the Arroyo Chico. Since 2002, water levels have risen in wells PEP-11 and WR-345A to the northeast of Arroyo Chico, and ADOT-1 and PEP-18 to the south of it. A similar pattern was observed in perched wells further south of the Arroyo Chico, specifically PEP-9, PEP-10, and MLS-6. In general, groundwater levels increased to a lesser degree (approximately 2 to 4 feet) with greater distance from the Arroyo Chico, in perched wells PBP-3, PBP-8, MLS-4 and MLS-5.

Based on the November 2008 depth-to-water measurements, the perched aquifer gradient across the Park-Euclid Site was calculated to be approximately 0.009 feet per foot (ft/ft) to the north-northwest in the area north of the Haskell/Mission Linen Facility, and 0.004 ft/ft to the west-southwest in the area south of the Mission Linen property (Figure 4-4).

4.2.2 Soil Contamination

Soil samples have been collected from the saturated zone at the water table and about 2 feet below the water table of the perched aquifer during drilling of several wells, and from the upper aquitard during drilling of PER-14. The corresponding data is presented in Table 4-1. The highest PCE concentrations are associated with the former dry-cleaning area: in borings SVE-102 (1,300 mg/kg) and SVE-103 (1,900 mg/kg) at depths of 90 feet bgs, just below the water table. These high concentrations may be a result of adsorption onto soil of PCE dense non-aqueous phase liquid (DNAPL) or PCE present in the floating diesel free product. At PEP-8, PCE soil contamination was detected at 93 feet bgs (18 mg/kg) and 94 feet bgs (14 mg/kg), exceeding the R-SRL of 0.51 mg/kg and the GPL of 1.3 mg/kg. At PEP-9, 39 mg/kg PCE and 11 mg/kg TCE detected at 93 feet bgs exceeded both R-SRLs and GPLs for these two contaminants.

PCE concentrations in soil decrease with depth within the perched aquifer below the floating diesel-fuel free product. Contamination within the aquitard is evidenced by soil samples collected during drilling of PER-14 and PEP-8. At PER-14, COCs were detected within the aquitard at depths of 90 to 100 feet bgs, and at PEP-8 at 94 feet bgs (see Table 4-1).

The lateral extent of the perched aquifer soil contamination is assumed to coincide with the lateral extent of the perched aquifer groundwater contamination (see Section 4.2.3 below). The vertical extent of the perched aquifer soil contamination is assumed to extend through the depth of the perched aquifer and into and possibly through the underlying aquitard within the perched aquifer plume footprint.

4.2.3 Perched Aquifer Groundwater Contamination

Based on the November 2008 data, the estimated lateral extent of the perched aquifer contamination by PCE, TCE, cis-1,2-DCE, vinyl chloride, and 1,1-DCE is presented on Figure 4-5. The plume extends approximately 800 feet northwest from beneath the former dry-cleaning operation at the Haskell/Mission Linen Facility, approximately 250 feet to the southwest, and approximately 400 feet to the southeast and northeast. Perched water groundwater quality data for the Park-Euclid Site is provided in Table 4-5.

In November 2008, PCE was detected in 4 of 15¹¹ perched aquifer monitoring wells sampled, with TCE in 4 wells, cis-1,2-DCE in 7 wells, and vinyl chloride in 2 wells. 1,1-DCE was not detected at or above LRLs. Concentrations of PCE, TCE, cis-1,2-DCE, and vinyl chloride are highest north and northeast of the former dry-cleaning area at the 301 South Park Avenue building (Figure 4-5.).

Historically, the highest level of perched aquifer groundwater contamination with PCE (62,000 µg/L) was detected in SVE-104, followed by up to 40,000 µg/L in SVE-102 and SVE-104 (see Table 4-5), and 31,000 µg/L in SVE-102. All of these wells are located in the former dry cleaning area. These high concentrations suggest the possible past presence of a DNAPL, based on the PCE solubility in water of 125,000 µg/L.¹²

Aqueous PCE concentrations have generally decreased since 2000 to November 2008 in a number of wells (MLS-4 through MLS-6, MPM-1, PEP-8 through PEP-10, PEP-16, PEP-17, and WR-347A, and to a lesser extent in wells SVE-101 and SVE-103).

This decrease in PCE concentrations coincides with increases in concentrations of PCE breakdown products, such as: TCE (observed in PEP-8, SVE-103, SVE-104, and WR-347A); cis-1,2-DCE (observed in PEP-9, PEP-10, SVE-101 through 104, and WR-347A); and vinyl chloride (observed in PEP-9, PEP-10, SVE-101 and SVE-103). These trends are illustrated on the hydrographs presented in Appendix C.

During the period May 2006 through July 2009, groundwater samples were collected as part of the MPE performance monitoring (see Section 5). In June 2009, perched aquifer water samples were collected the same day as the MPE system shutdown, and then a month later. These data, presented in Table 4-6, illustrate that PCE is no longer the predominant COC in groundwater; cis-1,2-DCE was the primary perched aquifer contaminant in most of samples beneath the Haskell/Mission Linen Facility.

4.2.4 Summary – Perched Aquifer and Upper Aquitard Contamination

- Water levels in the perched aquifer show seasonal variations and impacts of recharge from the Arroyo Chico, the latter decreasing with distance from the wash;

¹¹ A total of 19 perched groundwater wells were sampled in November 2008. However, 4 of the wells were from the Park-Broadway area and have not been included in this discussion. However, depth-to-water measurements and analytical results for these wells are included in Tables 4-4 and 4-5, respectively.

¹² Cohen and Mercer (1993) found that aqueous concentrations above 1 percent of the theoretical maximum indicate presence of a free- phase non-aqueous phase liquid.

- The perched aquifer gradient is to the north-northwest, north of the Haskell/Mission Linen Facility, and to the west-southwest south of the Facility;
- The lateral extent of soil contamination within the perched aquifer is assumed to coincide with the lateral extent of the perched aquifer groundwater contamination;
- The vertical extent of soil contamination within the perched aquifer decreases with depth as a result of lower contaminant concentrations below the floating diesel-fuel free product, but is assumed to extend within the perched aquifer plume footprint through the depth of the perched aquifer and into and possibly through the underlying aquitard;
- The lateral extent of perched aquifer contamination by PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCE, and vinyl chloride extends from beneath the former dry-cleaning area approximately 800 feet to the north-northwest, 250 feet to the southwest, and 400 feet to the southeast and northeast; and
- In July 2009, cis-1,2-DCE and vinyl chloride were the primary contaminants in the perched aquifer beneath the Haskell/Mission Linen Facility.

4.3 LOWER VADOSE ZONE

4.3.1 Soil Contamination

A very limited number of soil samples have been collected from lower vadose zone. Soil samples in the lower vadose zone were collected during drilling of wells PER-14, VML-1, and VML-2, all of which are located in the vicinity of MP-1. COCs were detected in soil at depths between 165 and 190 feet bgs. The highest PCE concentrations of 170, 160, and 140 mg/kg were detected at depths between 165 and 170 feet bgs; concentrations decreased steadily at greater depths. TCE and cis-1,2-DCE were detected at the same depth intervals, in concentrations up to 1.5 and 1.4 mg/kg, respectively. The results are summarized in Table 4-1.

In addition, during drilling of MLR-7, in response to detected odor, a core sample was collected from 180 to 195 feet bgs. The analysis detected 10 mg/kg C10-C22 TPH (i.e., diesel), but no PCE.

These findings indicate that contamination potentially flowed down the annulus of MP-1 into the regional aquifer, where it spread laterally and vertically. As the water table in the regional aquifer declined over time to the present levels due to production well pumping, residual contamination was left behind within the lower vadose zone.

4.3.2 Soil Vapor Contamination

Soil vapor samples were collected in the lower vadose zone from wells VEL-3, VML-1, VML-2, and WR-347B; the results are tabulated in Table 4-7. Vapor concentrations of PCE, TCE, and cis-1,2-DCE in the lower vadose zone are highest near MP-1 (VML-1 and VML-2), at depths ranging from approximately 125 feet bgs to the regional aquifer at about 200 feet bgs.¹³ Based

¹³ Soil vapor samples were collected in the middle of screened intervals.

on the 2008 soil vapor sampling results, about 65 percent of the contaminant vapor mass in the lower vadose zone was PCE, 5 percent was TCE, and 15 percent was cis-1,2-DCE.¹⁴ Comparison of 2004 and 2008 soil vapor data in Table 4-7 shows about 53 percent increase in total chlorinated hydrocarbons content in 2008 in VML-1 and VML-2.

As with soil samples, the detected soil vapor contamination appears to be directly associated with the movement of contamination down the annulus of MP-1.¹⁵ However, the soil vapor samples have a wider extent of detectable concentrations than soil samples, which is likely to be caused by a combination of vapor migration from the areas of higher concentrations and off-gassing from the contaminated regional aquifer.

4.3.3 Summary – Lower Vadose Zone Contamination

- Based on limited sampling of soil and soil vapors in the lower vadose zone, contamination is the highest near MP-1:
 - Soil contamination was found at depths of 165 to 190 feet bgs, consisting primarily of PCE and much lower concentrations of TCE and cis-1,2-DCE; and
 - Soil vapor contamination was detected at depths from approximately 125 feet bgs to the regional aquifer at about 200 feet bgs, consisting primarily of PCE and lower concentrations of cis-1,2-DCE and TCE.
- Contamination appears to be directly associated with the movement of contamination down the annulus of MP-1 and into the regional aquifer, where it spread laterally and vertically. As the water table in the regional aquifer declined over time to the present levels, residual contamination was left behind within the lower vadose zone.

4.4 REGIONAL AQUIFER

In addition to the regional aquifer characteristics presented below, other pertinent information is presented in Section 3.5.1.4.

4.4.1 Groundwater Movement

Hydrographs presenting groundwater elevation trends are included in Appendix C. Groundwater well construction details, including measured elevation and screened intervals, are presented in Table 4-3.

A significant decrease in water levels has been measured in wells MLR-1 through MLR-3, which have had declines of up to 30 feet since the early 1990's. Water levels in the most downgradient wells, UAM-1, UAM-2, and UAM-3, have declined less than those in upgradient wells at the Park-Euclid Site. The overall declines are sometimes interrupted or reversed during the winter months, presumably due to seasonal aquifer recharge or decreased pumping stresses.

¹⁴ By contrast, DCE concentrations are negligible in the upper vadose zone soil gas samples.

¹⁵ MP-1 was abandoned in 1994.

Since 2002, water levels in the regional aquifer monitor wells at the Park-Euclid Site have shown a consistent decline of two feet or more. A rise in water levels from 2005 to late 2007 (followed by a decrease in water levels in 2008) measured in wells PER-21 through PER-23 and PER-25 through PER-27 may be indicative of decreased pumping stress in the region. A similar rising trend since 2005 was observed in well PER-14; however, the PER-14 groundwater level appears to trend upward which maybe the result of groundwater affected by upwelling along the nearby Santa Cruz Fault Zone.

The overall decline in water levels observed at the Park-Euclid Site are similar to the longer term decline in potentiometric head in the regional aquifer since 1940. In the Tucson Basin, a decline in groundwater of up to 100 feet has been observed, with annual declines ranging from approximately 2 to 4 feet per year (EMCON, 1995e).

Based on the November 2008 depth-to-water data, the regional aquifer gradient across the site was calculated to be approximately 0.003 ft/ft to the north-northeast, with an estimated gradient of approximately 0.024 ft/ft to the east-northeast immediately northeast of the Haskell/Mission Linen Facility (Figure 4-6).¹⁶ The observed north-northeast gradient at the Park-Euclid Site maybe an artificial gradient induced by pumping of nearby production wells. The natural gradient would be to the west-northwest, towards the Santa Cruz River.

The nested wells PER-15, PER-21, and PER-22 show that potentiometric head declines with increasing depth in the regional aquifer between 200 and approximately 340 feet bgs, with an overall vertical gradient of approximately -0.8 feet of head per 100 feet of depth (Figure 4-7). However, the higher head observed in PER-14 compared with nearby wells shows that the potentiometric head increases with depth between approximately 340 feet and 523 feet bgs at an overall rate of approximately +5 feet of head per 100 feet of depth. Both increasing and decreasing heads with depth have been observed elsewhere in the Tucson Basin. Davidson (1973) noted that head generally decreases with depth where the regional aquifer is mainly sand or gravel, and generally increases with depth where the regional aquifer is mainly silt and clay.

4.4.2 Regional Aquifer Groundwater Contamination

The estimated aerial extent of the regional aquifer contamination in November 2008 is presented on Figure 4-8. Groundwater quality monitoring in the regional aquifer monitoring wells at the Park-Euclid Site is provided in Table 4-5. The plume extends over 2,800 feet (approximately 0.5 miles) to the north-northeast from the Haskell/Mission Linen Facility. The extent of the regional aquifer plume is dependent on the pumpage of the regional aquifer.

In November 2008, PCE was present at concentrations above the AWQS of 5 µg/L in 8 of the 19¹⁷ regional aquifer wells sampled, ranging from 7.3 µg/L at MLR-7 to 180 µg/L at PER-26. PBR-10, PER-23, and UAM-2 contained PCE at concentrations below the AWQS. TCE was detected in eight wells, with concentrations exceeding the AWQS of 5.0 µg/L in one well only (6.4 µg/L in PER-26). Cis-1,2-DCE was detected in four wells, but all concentrations were

¹⁶ Due to the anomalously high groundwater levels measured in monitoring well PER-14, resulting from confining conditions in the deeper regional aquifer where PER-14 is screened, the groundwater level from PER-14 has been omitted from the contour map and calculations of the hydraulic gradient.

¹⁷ A total of 20 regional groundwater wells were sampled in November 2008. However, one of the wells (PBR-10) was from the Park-Broadway area and has not been included in this discussion. Groundwater measurements and analytical results for the Park-Broadway wells are include in Tables 4-4 and 4-5, respectively.

below the AWQS of 70 µg/L. 1,1-DCE and vinyl chloride were not detected at or above their LRLs in the regional aquifer wells sampled in November 2008.

Detected contamination has extended from the source area at least as far north-northeast as UAM-2 (about 2,800 feet north-northeast of MP-1). PCE was detected at UAM-2 at a concentration of 1.3 µg/L when first sampled in August 2000, and had increased to 5.7 µg/L in August 2008, and decreased to 4.0 µg/L in November 2008. These data indicate the continued migration of the plume towards the UA production wells. A deeper sentinel well, UAM-2B (screened from 328 to 410.8 feet bgs), was installed in April/May 2008 adjacent to UAM-2. Monthly sampling of UAM-2B from May 2008 through November 2008 shows no detected concentrations of PCE, TCE, cis-1,2-DCE, 1,1-DCE, and/or vinyl chloride.

As of November 2008, the highest PCE concentrations have been detected in monitoring wells PER-15, PER-22, PER-25, and PER-26, which are all within approximately 200 feet (Figure 4-8) of the plume centerline (at varying distances from MP-1): PER-15 and PER-22 (the closest of these wells) are approximately 740 and 750 feet, respectively, downgradient from MP-1; PER-25 is approximately 1,185 feet downgradient from MP-1; and PER-26 (the furthest of these wells) is approximately 1,570 feet downgradient from MP-1. The PCE concentration at PER-15 was 170 µg/L in December 2000, when it was first sampled. The concentrations have fluctuated at PER-15, falling below 50 µg/L for some events, but reported at 86 µg/L in November 2008. The highest PCE concentration in PER-22 was 310 µg/L in 2004; the concentrations have been steadily decreasing since then, but reported at 63 µg/L in November 2008. The PCE concentrations in PER-25 and PER-26 have generally been increasing since 2003, and were 58 µg/L at PER-25 and 180 µg/L at PER-26 in November 2008. PCE concentrations in other Park Euclid Site monitoring wells crossgradient to these plume core wells are substantially lower, indicating that the plume is relatively long and very narrow.

Information concerning vertical distribution of contamination in the regional aquifer in November 2008 is based on data collected from the following wells:

- PER-14A, located in the source area, near MP-1, and screened from 180 to 250 feet bgs;
- PER-15, PER-22, and PER-21, co-located further downgradient from the source area, close to the plume centerline, but screened at different depths:
 - PER-15 screen: 200 to 250 feet bgs,
 - PER-22 screen: 271 to 321 feet bgs, approximately 20 to 70 feet deeper than PER-15; and
 - PER-21 screen: 339 to 389 feet bgs, approximately 18 to 68 feet below PER-22.
- PER-26, located further downgradient of the PER-15, PER-21, PER-22 well cluster, and screened from 240 to 290 feet bgs, 40 to 80 feet deeper than PER-15, but with the bottom of the screen shallower than PER-22.

Further downgradient of these wells, at PER-26, data indicates a ten-fold increase of PCE concentrations, from 18 µg/L in December 2003, to 180 µg/L in September 2008. These data suggest that wells approximately 740 to 1,570 feet downgradient from MP-1 along center line,

with screened intervals from approximately 200 to 320 feet bgs, have the highest PCE concentrations.

The only Park-Euclid Site monitor well screened in the regional aquifer deeper than 411 feet bgs is PER-14 (screened from 473 to 523 feet bgs). COCs have not been detected in groundwater samples collected from PER-14 since its installation. A groundwater grab sample collected during drilling of PER-14 from the top of the regional aquifer at approximately 200 feet bgs (270 feet above the completed screened interval) yielded a PCE concentration of 220 µg/L.

A review of historical PCE concentrations from the source area indicates that the highest levels of regional aquifer contamination from PCE (up to 630 µg/L) were historically detected in 1994 (in MLR-7, immediately downgradient of the source area). The groundwater sampling data indicates an overall decrease in PCE concentrations over time.

4.4.3 Summary – Regional Aquifer Contamination

- Consistent water levels declines of two feet or more have been registered at the Park-Euclid Site since 2002, and at some locations up to 30 feet since 1990; increased water levels in PER-14 maybe the result of groundwater affected by upwelling along the nearby fault;
- Groundwater plume of PCE, TCE, and cis-1,2-DCE is continuous and not detached from the Haskell/Mission Linen Facility, as indicated by the November 2008 data, and extends about 0.5 miles to the north-northeast from the Facility;
- The regional plume continues to migrate towards the UA production wells;
- Laterally, the highest concentrations of COCs were most recently detected about 740 to 1,570 feet downgradient from MP-1, along the centerline, and substantially lower concentrations crossgradient to the plume core wells, resulting in a long, narrow plume;
- Vertically, the highest concentrations of COCs were most recently detected from 740 to 1,570 feet, downgradient from MP-1 along centerline, at depths of 200 to 320 feet bgs; and
- There is an overall decrease in PCE concentrations over time.

4.5 FATE AND TRANSPORT OF CONTAMINANTS

Free-phase PCE DNAPL has not been detected from the subsurface drilling and sampling conducted to date. However, the following information/data suggest the past and possible current presence of free-phase PCE:

- Nature of the past PCE spills;
- High PCE concentrations in soil vapors and the mass of PCE soil vapors removed;

- High PCE concentrations in the perched aquifer soils underneath the former dry-cleaning area;
- High PCE concentrations in diesel free product floating on top of the perched aquifer;
- High concentrations of PCE found inside MP-1 casing: in diesel-fuel free product floating on top of the regional aquifer water table; in liquid product detected at the deeper portion of well; and in groundwater throughout the water column; and
- High concentration of PCE at the top of the water column inside Old Well casing.

4.5.1 Upper Vadose Zone

PCE in the form of free product, dissolved in water, and/or as vapors has been released into the underlying soil from the spill/disposal areas. Upon being introduced to the soil, the chlorinated solvent was driven downward towards the perched aquifer by gravity, infiltration, groundwater recharge from the Arroyo Chico and, horizontally as a result of capillary action. Some of the solvent likely remained in the soil as DNAPL or sorbed onto the finer-grained sediments, which impeded the downward progress. The solvent reached the perched aquifer and began dissolving in the groundwater. Ultimately, the solvent that was introduced to the soils at the spill/disposal area reached the higher clay content in the upper aquitard, from which it likely continued to dissolve, contributing to the groundwater plume in the perched aquifer. Fluctuations in perched aquifer water levels have resulted in residual contamination (smear zone) in the upper vadose zone.

The vapor density of PCE is 5.7 times that of air. PCE vapor concentrations, especially in the presence of PCE DNAPL can be sufficiently high to cause downward vapor migration by density, spreading laterally when a barrier, such as a clay-rich layer or groundwater surface, is encountered. Density-driven downward migration of PCE vapor is assumed to be one of the PCE transport mechanisms in the upper vadose zone.

The shallow portions of the upper vadose zone are aerobic, and data indicate either absence or very low concentrations of PCE breakdown products. However, the presence of PCE degradation products TCE, cis-1,2-DCE, and vinyl chloride indicate that the biological reductive dehalogenation is occurring at the lower portions of the upper vadose zone. The frequency of TCE detections indicates extensive degradation of PCE, due to anaerobic conditions just above the diesel free product on the perched aquifer. The highest concentrations of degradation products were observed beneath and adjacent to the 301 South Park Avenue facility.

After the SVE system operation, carbon dioxide, and nitrogen concentrations were found to increase with depth, and oxygen concentrations were found to decrease with depth. Oxygen and nitrogen concentrations were found to be lower than atmospheric concentrations (21 percent and 78 percent, respectively), while carbon dioxide concentrations were considerably greater than atmospheric levels (0.03 percent). The strong negative correlation of oxygen with carbon dioxide shows an ongoing reductive dehalogenation activity in subsurface soils. Since these fixed gases have not been previously analyzed, it is difficult to determine the extent to which their concentrations in the upper vadose zone have been impacted by the operation of the SVE system.

4.5.2 Perched Aquifer and Upper Aquitard

Once PCE reached the perched aquifer, it began dissolving in the groundwater and flowing downgradient as part of the overall perched aquifer groundwater flow (to the west-northwest north of the Haskell/Mission Linen Facility, to the west at the Haskell/Mission Linen Facility, and to the west-southwest in the area south of the Facility). The Park-Euclid Site is characterized by the presence of the diesel-fuel layer atop the groundwater in the perched aquifer. This diesel-fuel layer increases biological degradation of PCE because it facilitates anaerobic conditions necessary for the efficient transformation by reductive dechlorination from PCE to TCE to 1,2-DCE to vinyl chloride. In addition, some of the diesel components may also act as carbon sources for degradation by co-metabolic processes.

As a result, biological degradation of PCE is very pronounced in the perched aquifer. According to the data, PCE was originally the predominant species in the perched aquifer. However, by July 2009, in nearly all samples collected as part of the MPE performance evaluation, cis-1,2-DCE was the primary perched aquifer contaminants in nearly all samples. Detected concentrations of cis-1,2-DCE in the soil sample at 98 feet bgs indicate either biodegradation within the aquitard or vertical movement of cis-1,2-DCE from the perched aquifer into the aquitard.

Presently, groundwater contamination in the perched aquifer continues to move downgradient from the Haskell/Mission Linen Facility in the direction of the groundwater flow.

4.5.3 Lower Vadose Zone and Regional Aquifer

Based on limited sampling of soil and soil vapors in the lower vadose zone, contamination is the highest near MP-1, indicating that contamination potentially flowed downward from the perched aquifer via the annulus of MP-1 into the formations of the upper aquitard and the lower vadose zone, and ultimately into the regional aquifer, where it spread laterally and vertically. As the water table in the regional aquifer declined over time to the present levels due to production well pumping, residual contamination was left behind within the lower vadose zone.

Soil vapor samples collected in the lower vadose zone were analyzed for fixed gases (Table 4-8). The strong negative correlation of oxygen with carbon dioxide indicates anaerobic conditions, which are a requirement for reductive dechlorination in subsurface soils. Reductive dechlorination in both VML-1 and VML-2 yielded the highest carbon dioxide and lowest oxygen concentrations at 167 feet bgs. The depth corresponded to the highest concentrations of COCs and petroleum hydrocarbons detected in lower vadose zone soil. High concentrations of cis-1,2-DCE and carbon dioxide indicate that biodegradation has been taking place in the lower vadose zone near MP-1.

Free diesel product has been measured historically only in two regional aquifer wells: MP-1 and MLR-7. In addition, indications of the presence of diesel free product were also observed in Old Well. These observations strongly suggest presence of vertical conduits for transport of contamination from the perched aquifer into the lower vadose zone and the regional aquifer. The following is a discussion of several potential vertical conduits at the Haskell/Mission Linen Facility:

- Old Well

- Old Well was installed around 1938. The drilling methods and construction details (including annular seals) are not known, but geophysical logging indicated zones of casing without grout, filter pack, or native material filling the space between the casing and the borehole wall;
- Deteriorated casing was observed in Old Well. A small cascade of water entering Old Well casing through a hole at approximately 165 feet bgs¹⁸ is indicative of transport of contamination from the perched aquifer down the annulus of the well;
- Groundwater with a green tint was observed inside the casing to 230 feet bgs;
- A groundwater sample from Old Well shows up to 2,700 µg/L of PCE;
- Piping removed from Old Well prior to its logging and abandonment was found to be heavily coated at a depth of 70 feet bgs with a liquid similar to diesel fuel, and with a dark green liquid of unknown composition at greater depths;
- Old Well was plugged and abandoned in 1992, and is thus no longer considered a conduit; and
- The known regional aquifer plume is located directly downgradient of Old Well and MP-1.

- MP-1

- MP-1 was installed in the early 1970's. The drilling methods and construction details (including annular seals) are not known, but geophysical logging indicated zones of casing without grout, filter pack, or native material filling the space between the casing and the borehole wall;
- The initial pumping of MP-1 produced water containing diesel fuel. In March 1980, in an attempt to clean out the diesel fuel, Haskell Linen pumped MP-1 for three or four weeks; the pumped water and diesel fuel mixture was discharged onto 13th Street. This extended pumping reportedly cleared out the floating free product; however, clothes cleaned with the water still smelled of diesel. Diesel free product eventually reappeared in the well; from 1990 through 1992, a 13- to 15-foot layer of floating diesel free product was found inside the MP-1 casing;¹⁹
- A viscous liquid was detected in MP-1 at depths between 457 and 477 feet bgs. According to the MP-1 well abandonment documentation, physical characterization of this liquid product is incomplete and conflicting: (1) the liquid was reportedly sampled with a 15-foot bailer,

¹⁸ The water level in the well at the time was 176 feet bgs.

¹⁹ Only up to 0.02 feet of diesel free product was observed historically in one of the Park-Euclid Site regional groundwater monitoring wells (MLR-7) (EMCON, 1994b).

- but its consistency was noted as “pudding-like,” and (2) the specific gravity of this liquid was determined to be 0.8915 (thus in the range of diesel fuel), but it was observed at the bottom of the well.²⁰ This 20-foot layer liquid product in MP-1 was possibly a PCE DNAPL;
- MP-1 was found to contain up to 12,000 µg/L PCE²¹. The highest PCE concentration ever documented in the regional aquifer monitoring wells at the Park-Euclid Site is much lower, 630 µg/L in MLR-7 in 1994;
 - PCE was detected in 17 out of the 25 soil samples collected during drilling of PER-14, located near MP-1, from depths of 5 feet to just above the regional aquifer. This indicates that contamination flowed down the annulus of MP-1 and entered formations within the upper vadose zone, perched aquifer, upper aquitard, and the lower vadose zone, and reached the regional aquifer, where it spread laterally and vertically. As the water table in the regional aquifer declined over time to the present levels due to production well pumping, residual contamination was left behind within the lower vadose zone;
 - MP-1 was plugged and abandoned in 1994, and is thus no longer considered a conduit. It appears that contaminated groundwater and liquid product were not removed prior to the well abandonment and thus must have been released into the formation/aquifer during air-knifing and plugging of the well. This liquid product may still be located in the regional aquifer and continues to be a source of PCE; and
 - The known regional aquifer plume is located directly downgradient of Old Well and MP-1.
- Other Vertical Boreholes that Penetrate the Upper Aquitard
 - Some groundwater monitoring wells may have been drilled through the perched aquifer without implementation of measures to limit cross-contamination. This may have been a temporary conduit.
 - Seepage or Vapor Transport from the Perched Aquifer through Aquitard
 - Given enough time, contaminants in the perched aquifer could migrate vertically through the aquitard into the lower vadose zone and then to the regional aquifer, especially in the areas with a coarser aquitard gradation, such as clayey sand at MLS-4 at depths of approximately 98 to 118 feet bgs. This may be a continuous potential pathway.

In summary:

- Contamination potentially flowed downward from the perched aquifer via several potential conduits into the upper aquitard and the lower vadose zone, and

²⁰ A separate free diesel product layer was encountered floating on top of the water column inside the well (15 feet in 1991, and 13 feet in 1992) Starting in 1992, this floating free diesel product was bailed from the well until its thickness remained constant at 2 feet, awaiting the well abandonment.

²¹ This high concentration suggests the possible past presence of PCE DNAPL, based on the PCE solubility in water of 125,000 µg/L (Cohen and Mercer, 1993).

ultimately into the regional aquifer, where it spread laterally and vertically. As the water table in the regional aquifer declined over time to the present levels due to production well pumping, residual contamination was left behind within the lower vadose zone.

- Potential vertical conduits include: annulus and deteriorated casing of Old Well; annulus of MP-1; other vertical boreholes that penetrate the upper aquitard that may have been installed without implementation of measures to limit cross-contamination; and seepage or vapor transport through the upper aquitard.
- In the lower vadose zone, PCE has been undergoing biological degradation.
- At the present, groundwater contamination in the regional aquifer continues to move downgradient from the Haskell/Mission Linen Facility, in the direction of the groundwater flow (north-northeast), as part of the overall regional groundwater flow induced by pumping of production wells;
- The plume is narrow, thus indicating a small amount of lateral diffusion;
- Biological degradation does not appear to be occurring at a discernable rate in the regional aquifer. Based on measurements of dissolved oxygen and oxidation-reduction potential during well purging, the regional aquifer is aerobic. Consequently, biological (anaerobic) degradation of chlorinated compounds is not favored;
- Free-phase PCE DNAPL has not been detected in the regional aquifer, and the concentrations measured to date in the downgradient monitoring wells do not suggest that free-phase PCE is present. However, high concentrations of PCE in diesel-fuel free product detected floating inside the MP-1 casing; PCE-rich free liquid observed at the deepest portion of MP-1; very high PCE concentrations inside MP-1 and Old Well casing; and possibly historically highest PCE concentrations detected in the Park-Euclid Site regional aquifer monitoring wells (630 µg/L in MLR-7 in 1994 suggest that free-product PCE may have entered the regional aquifer below the water table via the former production well, MP-1. Similarly, a high concentration of PCE at the top of the water column inside the Old Well casing also suggests the possibility of PCE free product entering the regional aquifer via this well; and
- Decline in the regional aquifer groundwater concentrations of COCs suggest that there is a reduced contribution of COCs continuing to enter the regional aquifer.

4.6 RISK EVALUATION

4.6.1 Risk Associated with Upper Vadose Zone

In 2004, in preparation for performing a screening HRS for on-site workers and off-site residents, a vapor flux test was conducted at the Haskell/Mission Linen Facility. The outdoor open flux data were collected from open soil, generally near the property boundaries to assess potential exposure to occupants in off-site structures. A total of eight sampling locations were selected: five sampling points, SF-1 through SF-5, were located in the area east of the loading

dock, north of Manlove Avenue; and three sampling points, SF-6 through SF-8, were located along the northern boundary of the fenced storage area, north of 13th Street.

Measurable VOC flux, including PCE, was detected above quality-control qualifying limits in vapors emanating from subsurface soils and groundwater. The highest soil PCE flux measurement was 3.9 micrograms per square meter per minute at location SF-5 (Schmidt, 2004).

The indoor sample locations inside the Haskell/Mission Linen building were placed in an area of the building where dry-cleaning machines were historically located and with a higher-than-normal concentration of concrete cracks. The area was intended to represent a worst-case slab intrusion scenario. One uncracked slab and four cracked or seamed slab locations were sampled. The highest infiltration flux for PCE was 130 micrograms per linear foot per minute ($\mu\text{g}/\text{ft}\cdot\text{min}$) of seam or crack at location SFI-02, and the highest infiltration flux for TCE was 0.19 $\mu\text{g}/\text{ft}\cdot\text{min}$ at location SFI-03 (Schmidt, 2004).

In February 2004, a screening was performed of health risk to on-site workers and to off-site occupants of residential structures based on vapor flux chamber source testing. The results of the risk assessment indicated that VOC vapors, including PCE, volatilizing from subsurface soil and groundwater beneath the Haskell/Mission Linen Facility do not pose a significant health risk to current or future off-site residential structures north and south of the Site, but may pose a health risk to current on-site workers (Copeland, T. and J. Van de Water, 2004).

As recommended by this health risk screening assessment, an ambient air sampling event was conducted inside the Haskell/Mission Linen laundry building to further evaluate the potential risk to on-site workers. Results of this air-quality sampling indicated vapor concentrations inside the building were significantly below applicable occupational health exposure limits (URS, 2004).

4.6.2 Risk Associated with Perched Aquifer

The perched aquifer at and in the vicinity of the Park-Euclid Site does not serve as a source of potable water. The principal risk associated with contamination in the perched aquifer is the potential for contaminants to migrate from the perched aquifer into the overlying upper vadose zone or to the underlying lower vadose zone and regional aquifer.

4.6.3 Risk Associated with Lower Vadose Zone

There are no direct risks associated with contamination in the lower vadose zone. The principal risk associated with contamination in the lower vadose zone is the potential for contaminants to migrate from the lower vadose zone into the underlying regional aquifer.

4.6.4 Risk Associated with Regional Aquifer

The regional aquifer is an important source of potable water for the UA and the City of Tucson. No water-supply wells are currently affected by the Park-Euclid Site contaminant plume in the regional aquifer, but several water-supply wells operated by UA are downgradient of the plume could be adversely affected by future contaminant migration.

5.0 EARLY RESPONSE ACTIONS

5.1 WATER SUPPLY WELLS ABANDONMENT - MISSION LINEN, 1992 AND 1994

The annular spaces surrounding former water supply wells Old Well and MP-1 are suspected conduits that allowed contamination in the perched aquifer to reach the regional aquifer. Old Well was abandoned by Mission Linen in September 1992 by cutting the casing at 44-foot depth intervals from the base of the well up to 21 feet bgs. From 21 feet bgs to the ground surface, the casing was “continuously” perforated by cutting a series of four holes every foot. The entire well casing was then filled with cement grout (EMCON, 1995a).

MP-1 was abandoned by Mission Linen in June 1994. Prior to abandonment, approximately 250 gallons of free diesel product and water were bailed from MP-1. The well was abandoned by cutting the casing with a knife from 480 feet bgs to the ground surface, filling with sand/cement slurry from the total depth to 240 feet bgs, and then filling with neat cement to the ground surface (EMCON, 1994a and 1995c).

5.2 UPPER VADOSE ZONE SVE – MISSION LINEN, 2002 THROUGH 2006

Mission Linen installed a SVE system in the fall of 1999 within the former dry-cleaning area to remove VOCs from the upper vadose zone above the perched aquifer. The system consisted of four extraction wells located inside the building at 301 South Park Avenue (SVE 101 through SVE-104), screened approximately 70 feet across the upper vadose zone to depths ranging from 97 feet to 101.5 feet bgs. The vapors were removed from beneath the building with a vacuum pump, passed through four GAC canisters, and vented to the atmosphere. Due to neighborhood noise concerns, the SVE system was operated during daylight hours only.

The SVE system operated from June 2000 through July 2002 and from September 2004 to February 2006, and extracted a combined total of approximately 7,991 lbs of VOCs from the upper vadose zone (URS, 2009).

5.3 SEWER AND WASTEWATER LINE ABANDONMENT – MISSION LINEN, 2007

Previous investigations indicated that sewer lines beneath the Haskell/Mission Linen Facility were a source of contamination. The north-south sewer line located underneath the Haskell/Mission Linen Facility and lines conveying wastewater generated by former dry-cleaning operations to the main sewer line were abandoned in place and filled with grout (URS, 2006) on February 7, 2007 (URS, 2011).

5.4 PERCHED AQUIFER MPE PILOT TESTING AND PILOT OPERATION – HASKELL/MISSION LINEN, 2008 THROUGH 2009

The objective of the MPE pilot test was to determine if the removal of COCs from the perched aquifer, the capillary fringe above the perched aquifer, and the upper vadose zone beneath the Haskell/Mission Linen Facility at 301 South Park Avenue was a feasible technology. The MPE system consisted of six multi-phase (comingled liquids and vapors) extraction wells (MPE-1 through MPE-6), a monitoring well (MPM-1), a vacuum pump, a vapor-liquid separation vessel,

a vapor treatment train, and a liquid treatment train (URS, 2009). MPE system testing (start-ups, pilot testing, testing for trouble-shooting and repair, pilot operation) was conducted intermittently from April 16, 2008 through June 3, 2009, for a combined total of approximately six months. Due to neighborhood noise concerns, the pilot test/operation was conducted during daylight hours only.

Monitoring at the conclusion of the pilot operational phase showed the following results (URS, 2009):

- **Vapor VOC Mass Removal:** Approximately 1,396.1 lbs of total VOCs vapors, with approximately 585.6 lbs and 577.2 lbs of PCE and TCE, respectively;
- **Groundwater VOC Mass Removal:** Approximately 0.37 lbs of total VOCs, with approximately 0.081 lbs and 0.11 lbs of PCE and TCE, respectively. The concentration of VOCs in extracted groundwater was lower than the concentration of VOCs observed in groundwater for samples collected from the wells within the source area. Since VOCs tend to volatilize from the dissolved phase to the vapor phase during the high vacuum extraction process, they were primarily removed in vapor form;
- **Diesel-Fuel Free Product Removal:** Approximately 750 gallons; the total mass of VOCs extracted in the product was approximately 0.366 lbs, with PCE as the only detected chlorinated analyte; and
- **Total VOC Mass Removal:** Approximately 1,396.8 lbs, with approximately 585.7 lbs PCE and approximately 577.3 lbs TCE, respectively.

6.0 SUMMARY AND CONCLUSIONS

This Final RI Report summarizes the results of the remedial investigations conducted by ADEQ and other parties to identify and assess soil and groundwater contamination at the Park-Euclid WQARF Site. This RI report presents a current conceptual site model for the Park-Euclid Site, as it describes: 1) the site hydrogeology; 2) the contaminants; 3) the nature and extent of soil and groundwater contamination; 4) contaminant sources; 5) contaminant fate and transport; and 6) associated potential public health risks resulting from soil and groundwater contamination. This RI Report also provides a basis for further decision-making.

6.1 SOURCES AND PATHWAYS OF CONTAMINATION

The boundary for the Park-Euclid Site encompasses the Haskell/Mission Linen Facility at 301 South Park Avenue, and perched aquifer and regional aquifer plumes of PCE and its degradation products originating from the facility. The probable source of contamination has been identified as the former dry-cleaning operations conducted at 301 South Park Avenue from 1964 through 1985.

Former dry-cleaning operations resulted in releases of PCE solvent, primarily from numerous spills (from dry-cleaning machines, PCE storage tanks, wastewater pipes, and sanitary sewer lines) and some land disposal on a neighboring vacant lot. These spills and releases reportedly occurred primarily within the former dry-cleaning area and in its vicinity. Spilled liquid PCE was introduced to the subsurface through soil, joints, and cracks in the concrete slab of the building, and through discharges to the floor drains, sumps, and sewer lines.

Upon being introduced to the soil, liquid PCE began downward movement in the form of free liquid DNAPL, dissolved in water, and as a vapor. Its downward movement was driven by infiltration, gravity, precipitation, and recharge from the Arroyo Chico. Liquid PCE eventually migrated to the groundwater in the underlying shallow perched aquifer and began dissolving in the groundwater and flowing in the direction of groundwater flow. Some of the solvent likely remained in the soil as DNAPL, or sorbed to the finer-grained sediments underneath the Haskell/Mission Linen Facility, which may have impeded its downward progress.

Within the perched aquifer, contamination spread laterally with the groundwater movement and vertically to the upper aquitard, which impeded its downward movement. However, contamination continued moving downward into the lower vadose zone and ultimately into the regional aquifer by potential conduits. From there, contamination spread laterally and vertically in the regional aquifer. As the water table in the regional aquifer declined over time to the present levels due to production well pumping, residual contamination was left behind in a smear zone within the lower vadose zone.

Potential vertical conduits for transport of contamination from the perched aquifer downward include: the annulus and deteriorated casing of Old Well; the annulus of MP-1; and seepage or vapor transport through the upper aquitard.

As a result, PCE and its degradation products are present at the Park-Euclid Site in the following zones, in descending order from the ground surface:

- **Upper Vadose Zone:** Consists of unconsolidated to partially indurated sediments, including fine to coarse sands and gravel, clayey sands, silty sands,

and sandy clays in a wide variety of admixtures and textures. Extends from the ground surface to the top of the perched aquifer at approximately 85 to 96 feet bgs;

- **Perched Aquifer:** Consists of interbedded sands, silty sands, and clayey sands. The top of this shallow, water-yielding zone is present at depths of 85 to 96 feet bgs. The saturated thickness of the perched aquifer above the upper aquitard is highly variable across the Park-Euclid Site, with values historically ranging from zero to greater than 5 feet. In the area directly beneath the Haskell/Mission Linen Facility, there is a saturated thickness of between 1 and 2 feet. The hydraulic gradient is to the north-northwest north of the Haskell/Mission Linen Facility, and to the south-southwest south of the Facility. The perched aquifer is not continuous through the Park-Euclid Site; its presence is dependent on the presence of an underlying aquitard;
- **Upper Aquitard:** Consists of a significant layer of clay and/or gradational variations of silts, clays, and clayey sands beneath the perched aquifer. The top of the upper aquitard at the Park-Euclid Site ranges from 88 to 100 feet bgs, and the bottom between 105 and 135 feet bgs;
- **Lower Vadose Zone:** Consists of sands, silty sands, and clayey sands, often with significant fine-grained clay and silt layers bound above by the upper aquitard, and below by the regional aquifer at approximately 200 feet bgs. Of the clay layers and/or lenses observed in the lower vadose zone, the most notable and substantial clay layer, approximately 25 to 50 feet thick at depths of approximately 200 feet bgs, is in most of the regional aquifer borings at the Park-Euclid Site; and
- **Regional Aquifer:** Consists of interbedded sands and clays. The saturated interval is present from approximately 200 feet bgs and is estimated to be several thousand feet thick, with an undetermined total thickness at many locations. The hydraulic gradient at the Park-Euclid Site is to the north-northeast. The regional aquifer potentiometric surface has declined between 2 and 3 feet per year over the past decade in response to off-site groundwater extraction. The regional aquifer is a sole source aquifer and is used as a water supply for the Tucson Basin. Locally, the regional aquifer is used as a water supply for UA, located approximately 0.5 miles north of the Park-Euclid Site.

6.2 NATURE AND EXTENT OF CONTAMINATION

6.2.1 Nature of Contamination

The Park-Euclid Site is an area of documented impact to the subsurface soil, soil vapor, and groundwater from the dry-cleaning solvent PCE and its biological breakdown products TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. 1,1-DCE can also be an abiotic degradation product of 1,1,1-TCA. However, 1,1,1-TCA has not been detected at the Park-Euclid Site.

Diesel-fuel free product and dissolved fuel-related compounds from unknown source(s) are present in the shallow perched groundwater and have also been historically detected in the

regional aquifer at the Park-Euclid Site. Identification of the origin and the nature and extent of the diesel fuel and the fuel-related compounds is not the subject of this RI.

6.2.2 Extent of Contamination

Characterization data, groundwater sampling, and monitoring results confirm that chlorinated hydrocarbons are present in multiple physical states beneath the Park-Euclid Site, such as vapor, dissolved-phase, adsorbed on soil matrix, and possibly as a free-liquid PCE DNAPL:

- **Soil Gas:** Detected as vapor in the upper vadose and lower vadose zones beneath and in the immediate vicinity of 301 South Park Avenue;
- **Soil Matrix:** Detected as adsorbed to soil in soil borings in the upper vadose zone, perched aquifer, upper aquitard, and the lower vadose zone beneath and in the immediate vicinity of 301 South Park Avenue;
- **Perched Aquifer Groundwater:** Detected as dissolved-phase extending approximately 800 feet northwest from beneath the former dry-cleaning operation at the Haskell/Mission Linen Facility, approximately 250 feet to the southwest, and 400 feet to the southeast and northeast; and
- **Regional Aquifer Groundwater:** Detected as dissolved-phase in the upper 320 feet of the regional aquifer; the plume extends approximately 0.5 miles to the north-northeast from the Haskell/Linen Facility at 301 South Park Avenue.

6.3 FATE AND TRANSPORT

6.3.1 Fate and Transport in Upper Vadose Zone

PCE released to the ground surface from dry-cleaning machines, storage tank spills, and leaking wastewater and/or sewer pipes, migrated downward and laterally in the upper vadose zone as free product, dissolved in water, and vapor. The frequency of TCE detections indicates extensive degradation of PCE, which is likely enhanced by the presence of anthropogenic carbon (i.e., diesel fuel) beneath the Haskell/Mission Linen Facility and its vicinity.

6.3.2 Fate and Transport in Perched Aquifer

PCE reached the perched aquifer from the overlying vadose zone. The historical groundwater elevation data indicate that the PCE and associated breakdown product contaminant plumes are transported by advective groundwater flow at 0.009 feet per foot (ft/ft) to the north-northwest in the area north of the Haskell/Mission Linen Facility, and 0.004 ft/ft to the west-southwest in the area south of the Haskell/Mission Linen Facility. Increasing concentrations of TCE, cis-1,2-DCE, and vinyl chloride indicate that degradation of chlorinated hydrocarbons is an active process occurring in the perched aquifer, potentially enhanced by the presence of a diesel layer atop the perched aquifer groundwater.

6.3.3 Fate and Transport in Lower Vadose Zone

Contamination observed in the lower vadose zone is likely the result of PCE migrating from the perched aquifer into the annulus of former water-supply wells Old Well and/or MP-1 (both wells have since been plugged and abandoned), and downward into the regional aquifer, possibly at

historic water levels around 165 feet bgs. Contamination in the lower vadose zone has remained behind in soils as the water levels in the regional aquifer have declined to the present level. Some groundwater monitoring wells that may have been drilled through the perched aquifer without implementation of measures to limit cross-contamination may have been a temporary vertical conduit. Seepage/vapor transport through the upper aquitard may be another potential continuous pathway for downward movement of contaminants from the perched aquifer into the lower vadose zone. High concentrations of cis-1,2-DCE vapor indicate that degradation of chlorinated hydrocarbons is an active process occurring in the lower vadose zone.

6.3.4 Fate and Transport in Regional Aquifer

The elongation of the COCs plume in the downgradient direction (north-northeast) indicates that advective groundwater transport is the primary mode of contaminant transport in the regional aquifer.

Observed reduction of dissolved contaminant concentrations over time in the regional aquifer near the source area indicates that contaminants are not continuing to enter regional aquifer groundwater in significant amounts. However, a rise in the potentiometric surface would allow the regional aquifer to contact the contaminated soil of the overlying lower vadose zone.

The uniformity of PCE/TCE and TCE/DCE ratios over time and in lateral extent in regional aquifer groundwater indicate that significant degradation of chlorinated hydrocarbons is not occurring in the regional aquifer.

6.4 EARLY RESPONSE ACTIONS (ERAs)

The following ERAs were carried out at the Haskell/Mission Linen Facility:

- Abandonment of water supply wells Old Well (1992) and MP-1 (1994);
- Operation of an SVE system at the former dry-cleaning area to remove VOCs from the upper vadose zone; the system operated from June 2000 through July 2002, and from September 2004 through February 2006, and extracted a total of approximately 7,991 lbs of VOCs from the upper vadose zone;
- Abandonment of the north-south sewer line located underneath the Haskell/Mission Linen Facility and lines conveying wastewater generated by former dry-cleaning operations to the main sewer line in 2007; and
- Pilot testing/operation of a MPE system for a total of about six months in 2008 and 2009 to remove COCs from the perched aquifer, the capillary fringe above the perched aquifer, and the upper vadose zone. The system removed a total of approximately 1,000 lbs of VOCs, thus indicating that it is a viable remedial alternative.

6.5 RISK ASSESSMENT

6.5.1 Risk Associated with Upper Vadose Zone

In February 2004, ADEQ performed a screening assessment of health risk to on-site workers and to off-site occupants of residential structures based on vapor flux chamber testing. The results indicated that VOC vapors, including PCE, volatilizing from subsurface soil and groundwater beneath the Mission Linen Facility do not pose a significant health risk to current or future off-site residential structures north and south of the Facility, but may pose a health risk to current on-site workers. As recommended by this screening assessment, Mission Linen conducted ambient air sampling inside the Mission Linen laundry building to further evaluate the potential risk to on-site workers. Results of this air-quality sampling indicated vapor concentrations inside the building were significantly below applicable occupational health exposure limits.

6.5.2 Risk Associated with Perched Aquifer

The perched aquifer at and in the vicinity of the Park-Euclid Site does not serve as a source of potable water. The principal risk associated with contamination in the perched aquifer is the potential for contaminants to migrate from the perched aquifer into the overlying upper vadose zone or to the underlying lower vadose zone and regional aquifer.

6.5.3 Risk Associated with Lower Vadose Zone

There are no direct risks associated with contamination in the lower vadose zone. The principal risk associated with contamination in the lower vadose zone is the potential for contaminants to migrate from the lower vadose zone into the underlying regional aquifer.

6.5.4 Risk Associated with Regional Aquifer

The regional aquifer is an important source of potable water for the UA and the City of Tucson. No water-supply wells are currently affected by the Park-Euclid Site contaminant plume in the regional aquifer, but several water-supply wells operated by UA are downgradient of the plume and could be adversely affected by future contaminant migration.

6.6 LAND AND WATER USE

According to information supplied as part of the Land and Water Use Report, about 70 percent of the land within the Community Involvement Area is currently zoned for residential use, and about 29 percent is zoned for commercial and industrial use (Appendix B). Current site-specific land uses include commercial laundry operations by Mission Linen and uses associated with the existing Arroyo Chico Wash by the City of Tucson.

Future land uses were identified by the City of Tucson and Pima County for the Arroyo Chico Floodwater Detention Basin project (including a neighborhood community center, public open space, trails, park space, and natural habitat restoration) and by Mission Linen for continued commercial laundry operations.

UA, which is located about 0.5 miles downgradient to the north, has eight water supply wells currently used to meet the needs of the Main Campus and the Arizona Health Sciences Center. UA expects to continue to withdraw groundwater from the regional aquifer to meet potable

needs through at least 2030. Although there are no active City of Tucson water-supply wells in the vicinity of the Park-Euclid Site, the City of Tucson has indicated significant water supply and demand changes will occur over the next 100 years in the vicinity of the Tucson WQARF sites, and that the regional aquifer should be managed to ensure groundwater availability to meet the community's future needs.

Future use of the groundwater at the Mission Linen may include use of treated groundwater for laundry operations.

6.7 REMEDIAL OBJECTIVES

A Remedial Objectives (RO) Report was prepared by ADEQ in 2008 utilizing information from the Draft RI, the Land and Water Use Report, and input by stakeholders and interested parties (Appendix D). Comments received for the draft RO and RI reports, along with the responsiveness summary, are included in Appendix E. The ROs for land and groundwater use at the Park-Euclid WQARF Site are:

- “To restore soil conditions to the remediation standards for non-residential use specified in A.A.C. R18-7-203 (specifically background remediation standards prescribed in R18-7-204, predetermined remediation standards prescribed by R18-7-205, or site-specific remediation standards prescribed by R18-7-206 that are applicable to the hazardous substances identified (tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethen (cis-1,2-DCE) and trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride).”
- “To protect for the use of the groundwater supply by the University of Arizona near the Park-Euclid WQARF site from contamination from the site. This action is needed for the present time and for as long as the UA wells are used for potable purposes, the resource remains available, and their use is threatened as a result of contamination from the Park-Euclid WQARF site. This action is also needed to protect potential future use of the groundwater supply for the City of Tucson, which is not expected within the next five to ten years.”

6.8 AREAS OF UNCERTAINTY/DATA GAPS

Some uncertainties or data gaps exist in the current understanding of the Park-Euclid Site that could alter the nature and extent of contamination and contaminant transport mechanisms. These areas of uncertainty/data gaps include:

- **Upper Vadose Zone and Perched Aquifer:** The possible presence of phase-separated PCE DNAPL in upper vadose soil and perched aquifer groundwater; the extent of soil contamination at the adjacent vacant lot; and the nature and extent of the upper vadose zone soil vapor contamination following pilot MPE operations;
- **Upper Aquitard:** Confirmation that clay is the major soil component throughout the upper aquitard; the nature and extent of contamination within the upper aquitard; and whether the upper aquitard fully prevents the migration of contaminants downward to the upper vadose zone and regional aquifer;

- **Lower Vadose Zone:** Full characterization of contamination and moisture content in the lower vadose zone beneath the Haskell/Mission Linen Facility; and
- **Regional Aquifer:** Characterization of the regional aquifer contamination beneath the former dry-cleaning area at the Haskell/Mission Linen Facility and the possible presence of phase-separated PCE DNAPL.

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TABLES

TABLE 2-1
Summary of Depth-Specific Sampling of Old Well and MP-1
 (µg/L, unless indicated otherwise)
Park-Euclid WQARF Site
Tucson, Arizona

Date Sampled	Sample Depth (feet bgs)	PCE	TCE	1,1-DCE	1,2-DCE (Total)	cis-1,2-DCE	trans-1,2-DCE	1,1,1-TCA	Methylene Chloride	Benzene	Ethylbenzene	Toluene	Xylene	1,2-Dichloro-ethane	2,2-Dichloro-propane	Bromofom	Chlorofom	TPH	Specific Gravity	Reference
Old Well																				
Apr-91	176	2,700	2.5	<0.29	NA	NA	<0.08	<0.01	<0.13	NA	NA	NA	NA	<0.03	NA	<0.001	<0.01	NA	NA	Earth Technology, 1991
	210	630	3.4	<0.10	NA	1.9	NA	0.20	<0.10	<0.10	<0.10	<0.10	1.2	<0.10	1.8	3	<0.10	<0.10	NA	NA
	260	15	<0.10	<0.10	NA	<0.10	NA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	NA
	460	3.6	<0.10	<0.10	NA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	NA
489	4.2	<0.10	<0.10	<0.10	NA	<0.10	<0.10	<0.10	<0.10	<0.10	0.14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	NA	
MP-1																				
Mar-91	180 #	630,000	40,000	<10,000	170,000	NA	NA	<10,000	1,300,000	<25,000	<25,000	<25,000	180,000	<10,000	<10,000	<10,000	<10,000	800,000,000	NA	Earth Technology, 1991
	200	6,100	<200	<200	NA	<200	300	<200	NA	<500	<500	<500	<500	<200	<200	<200	<200	NA	NA	
	265	3,800	55	<50	NA	<50	170	<50	NA	<125	<125	<125	<125	<50	<50	<50	<50	NA	NA	
	390	765	30	<2.0	NA	<2.0	126	<2.0	NA	<5.0	<5.0	<5.0	46	<2.0	<2.0	<2.0	<2.0	NA	NA	
	405	565	21	<2.0	NA	<2.0	100	<2.0	NA	<5.0	<5.0	<5.0	35	<2.0	<2.0	<2.0	<2.0	NA	NA	
	460	1,560	<20	<20	30	NA	NA	<20	<200	<50	<50	<50	<50	<20	<20	<20	<20	24,000	NA	
	600	1.1	<0.2	<0.2	NA	<0.2	<0.2	<0.2	NA	<0.5	<0.5	1.2	<0.5	<0.5	<0.2	<0.2	<0.2	0.5	NA	NA
	700	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2	NA	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	NA	NA
	180 #	380,000	32,000	<2,500	NA	NA	<2,500	<2,500	<10,000	<2,500	35,000	8,000	83,000	<2,500	NA	<2,500	<2,500	<2,500	930,000,000	NA
	210	12,000	<125	<125	NA	NA	<125	<125	<500	<125	<250	<250	<250	<250	<125	<125	<125	<125	160,000	NA
273	7,400	<50	<50	NA	NA	<50	<50	<200	<50	<100	<100	103	<50	NA	<50	<50	<50	120,600	NA	
357	3,400	42	<25	NA	NA	<25	<25	<100	<25	<50	<50	<50	<25	NA	<25	<25	<25	370,000	NA	
441	2,600	<25	<25	NA	NA	<25	<25	<100	<25	<50	<50	<50	53	NA	<25	<25	<25	131,000	NA	
Oct-92	185.70 #	6,300,000	<400,000	<400,000	NA	420,000	<400,000	<400,000	<800,000	<400,000	<400,000	<400,000	<800,000	<400,000	NA	<400,000	<400,000	960,000,000	0.9	EMCON, 1995a
	185.70 #	4,200,000	270,000	<5,000	NA	NA	<5,000	<5,000	<5,000	<10,000	<10,000	<5,000	130,000	NA	NA	NA	<5,000	<5,000	NA	0.8934
	187.80 #	16,000,000	240,000	<1,000	NA	NA	6,000	<1,000	24,000	<1,000	<1,000	<1,000	220,000	NA	NA	NA	<1,000	<1,000	NA	NA
	187.80 *	1,700	440	13	NA	NA	<2	<2	<2	<2	<2	<2	<4	NA	NA	NA	<0.2	<0.2	NA	NA
	457 - 477 ##	3,900,000	180,000	<5,000	NA	NA	<5,000	<5,000	<5,000	<10,000	<10,000	<5,000	140,000	NA	NA	NA	<5,000	<5,000	NA	0.8915
	457 - 477 ##	3,000,000	92,000	<5,000	NA	NA	<5,000	<5,000	<5,000	<10,000	<10,000	39,000	120,000	NA	NA	NA	<5,000	<5,000	13,000,000	NA
	477 - 489 ##	19,000	<1,000	<200	NA	NA	<1,000	<1,000	<2,000	<2,000	<1,000	<1,000	<2,000	<2,000	NA	<1,000	<1,000	7,400,000	NA	
	477 - 489 ##	2,300	<200	<200	NA	NA	<200	<200	<400	<400	<200	<200	<200	<400	NA	<200	<200	1,400,000	NA	
	510 - 510.5 ##	16,000	<1,000	<1,000	NA	NA	<1,000	<1,000	<2,000	<2,000	<1,000	<1,000	<2,000	<2,000	NA	<1,000	<1,000	6,500,000	NA	
	510.5 - 511 ##	2,400	<200	<200	NA	NA	<200	<200	<400	<400	<200	<200	<200	<400	NA	<200	<200	500,000	NA	
511 ##	34	<20	<20	NA	NA	<20	<20	<40	<40	<20	<20	<20	<40	NA	<20	<20	26,000	NA		
511 - 515 ###	<5	<5	<5	NA	NA	<5	<5	<5	<10	<5.0	<5.0	<5.0	<10	NA	<5.0	<5.0	11,000	NA		

Notes:
 µg/L = Micrograms per Liter
 bgs = below ground surface
 PCE = Tetrachloroethene
 TCE = Trichloroethene
 1,1-DCE = 1,1-Dichloroethene
 1,2-DCE = 1,2-Dichloroethene
 cis-1,2-DCE = Cis-1,2-Dichloroethene

trans-1,2-DCE = Trans-1,2-Dichloroethene
 1,1,1-TCA = 1,1,1-Trichloroethane
 NA = Not Analyzed
 # = Concentrations in Floating free product (micrograms per kilogram [µg/kg])
 ## = Concentrations in sediment at the base of the well (µg/kg)
 ### = Concentrations in soil beneath the base of the well (µg/kg)
 * = Concentration in water at water/product interface

EMCON,
1995d

EMCON,
1995a

Earth
Technology,
1991

TABLE 2-2
PCE Detected in Wastewater Discharge from
Haskell/Mission Linen Facility
1984 to 2001
Park-Euclid WQARF Site
Tucson, Arizona

Date	PCE Detected by Mission Linen (µg/L)	PCE Detected by Pima County (µg/L)
March 1984	3,400	NR
July 1984	28	NR
September 1986	54	NR
February 1988	158	NR
November 1988	700	NR
January 1989	17	NR
February 1989	6.1	NR
March 1989	1.8/5.8	NR
June 1989	20	NR
March 1990	NR	33,000
April 1990	33	30,800
May 1990	31/45	109.4
June 1990	109	34
August 1990	34	1,300
September 1990	1.4	30,400
October 1990	30	45,700
November 1990	46	83,100
January 1991	83	6.4
February 1991	6.4	4.9
April 1991	NR	347
May 1991	NR	8.8
June 1991	NR	6.2
November 1991	NR	30.3
December 1991	NR	23.3
January 1992	NR	19.5
February 1992	NR	38.7
March 1992	NR	22.8
May 1992	NR	4.3
November 1992	NR	5.8
December 1992	NR	27.7
January 1993	NR	40.7
February 1993	NR	9.3
March 1993	NR	11.7
September 1993	NR	12
October 1993	NR	8.8
January 1994	NR	4.9
August 1994	NR	16.6
November 1994	NR	59.7
February 1995	NR	6.9
April 1995	NR	84.6
November 1995	NR	33.5
May 1996	NR	20
March 1997	NR	57
June 1997	NR	2
September 1997	NR	3
December 1998	NR	5
February 1999	NR	2.9
December 1999	NR	8.5
March 2000	NR	1.6
November 2000	NR	6.7
March 2001	NR	135

Notes:

PCE = Tetrachloroethene
µg/L = Micrograms per liter
NR = Not Recorded

Above permitted discharge limit of 530 µg/L

TABLE 3-1
 Perched Aquifer Groundwater Inorganic Analytical Results - June 2002
 Park-Euclid WQARF Site
 Tucson, Arizona

Well	Sample Date	Cations							Anions				Alkalinity	Total Dissolved Solids	
		Calcium	Iron	Magnesium	Manganese	Zinc	Potassium	Sodium	Chloride	Bromide	Fluoride	Nitrate+Nitrite			Sulfate
Perched Aquifer Monitor Wells															
ADOT-1	06/11/02	90	3.7	16	2.0	0.057	3.2	41	25	NA	0.13	<0.50	31	310	410
MLS-4	06/10/02	180	2.3	36	2.6	<0.050	3.5	75	150	0.89	0.15	<0.50	<5.0	600	860
MLS-5	06/10/02	170	1.7	34	2.4	<0.050	3.7	74	150	0.98	0.15	<0.50	<5.0	530	860
MLS-6	06/11/02	120	0.17	23	0.52	<0.050	3.7	61	130	NA	0.12	<0.50	26	420	620
MLS-12	06/10/02	220	0.26	41	3.8	<0.050	4.5	79	210	1.1	0.14	<0.50	220	410	1,100
MLS-13	06/10/02	380	0.21	79	1.3	<0.050	7.7	200	730	1.4	0.14	<0.50	440	390	2,400
PBP-1	06/11/02	220	0.44	45	2.0	<0.050	4.8	85	230	NA	0.16	7.1	270	380	980
PBP-2	06/11/02	220	3.9	50	4.3	<0.050	4.5	74	400	NA	0.12	<0.50	78	480	1,100
PBP-3	06/11/02	240	<0.10	46	<0.050	<0.050	5.9	74	270	NA	0.12	15	310	340	1,100
PEP-8	6/10/2002	190	4.9	37	3.6	<0.050	3.7	77	130	0.71	0.12	<0.50	16	610	920
PEP-9	6/10/2002	210	5.8	41	1.9	<0.050	4.9	85	310	1.4	<0.10	<0.50	88	440	1,100
PEP-10	06/11/02	210	2.1	44	3.1	<0.050	5.1	83	320	NA	0.15	<0.50	71	71	1,100
PEP-11	06/11/02	95	1.8	17	0.080	<0.050	3.4	47	21	NA	0.12	1.0	52	330	440
PEP-16	06/11/02	110	5.3	22	2.2	<0.050	3.5	59	81	NA	0.18	<0.50	93	390	660
PEP-17	06/11/02	71	0.86	14	<0.050	<0.050	3.2	34	17	NA	0.18	<0.50	59	260	400
PEP-18	06/11/02	77	1.5	14	1.1	<0.050	2.2	27	13	NA	0.17	<0.50	<5.0	340	390
PEP-19	06/11/02	110	<0.10	20	0.097	<0.050	5.1	56	79	NA	0.19	1.4	160	270	670
WR-345A	06/11/02	81	14	17	0.12	<0.050	3.5	50	21	NA	0.12	<0.50	43	320	460
WR-347A	06/11/02	130	2.6	24	0.92	0.061	3.8	63	110	NA	0.1	<0.50	90	380	730
SVE Wells															
SVE-101		not sampled													
SVE-102	06/10/02	320	39	70	4.1	0.45	13	250	620	0.95	0.44	<0.50	630	420	2,300
SVE-103		not sampled													
SVE-104	06/10/02	360	6.8	61	3.7	0.17	7.3	86	400	2.0	0.70	<0.50	140	560	1,500

Notes: All results are in milligrams per liter
 NA = not analyzed
 Alkalinity is reported as CaCO₃; the figures shown are all equal to both bicarbonate alkalinity and total alkalinity; and no carbonate or hydroxide alkalinity were detected

TABLE 3-2
Summary of Aquifer Pumping Test Analyses - Regional Aquifer
Park-Euclid WQARF Site
Tucson, Arizona

Beginning Date of Test	Pumped Well	Pumping Duration (days)	Average Pump Rate (gpm)	Observation Wells	Observation Well Distances (feet)	Transmissivity (feet ² /day)	Hydraulic Conductivity (feet/day)	Storage Coefficient	Reference
5/29/1994	MLR-7	1	13	MLR-3, MP-1	87 - 93	1,650	5.5	0.0077	EMCON Associates, 1994c
5/3/2001	PER-15	1	15	WR-345B, WR-347B, MLR-7	234 - 647	1,500	31	0.00035	Golder Associates, 2001b
5/2/2001	Martin Street	56	186	UAM-1, UAM-2, UAM-3	1,036 - 2,998	2,400 - 3,800	10	0.035	Hydro Geo Chem, 2002b

Notes: gpm = gallons per minute

TABLE 3-3a
Summary of Regional Aquifer Field Parameters
February 2000 thru January 2003
Park-Euclid WQARF Site
Tucson, Arizona

Well	Temperature Degrees C	Conductivity uS/cm	pH	Dissolved Oxygen mg/L	ORP mV
MLR-1	28.7	456	7.7	4.0	199
MLR-2	29.5	440	7.8	3.8	231
MLR-3	30.8	487	8.0	2.6	186
MLR-7	28.7	467	7.7	4.8	217
PBR-10	28.0	649	7.4	4.3	266
PER-14	32.4	1,443	8.8	0.4	149
PER-15	28.2	576	7.8	1.5	87
PER-21	30.0	436	8.2	5.0	262
PER-22	29.0	544	7.8	3.4	247
PER-23	28.6	308	8.0	7.1	280
PER-25	28.6	339	8.6	7.0	272
UAM-1	27.8	548	7.8	4.2	273
UAM-2	28.0	557	7.7	4.8	286
UAM-3	28.1	444	7.7	5.6	273
WR-345B	27.9	446	7.9	5.9	283
WR-347B	28.4	469	7.9	6.0	289

Notes: Values shown are the median values over the time period
mg/L = milligrams per liter
uS/cm = microsiemens per centimeter
ORP = oxidation-reduction potential (Eh)
mV = millivolts

TABLE 3-3b
Summary of Regional Aquifer Field Parameters
November 2008
Park-Euclid WQARF Site
Tucson, Arizona

Well	Temperature Degrees C	Conductivity uS/cm	pH	Dissolved Oxygen mg/L	ORP mV
MLR-1	28.92	523	7.55	2.85	141.5
MLR-2	28.60	521	7.31	3.41	137.2
MLR-3	29.03	559	7.62	0.26	133.2
MLR-7	29.24	561	7.50	3.71	132.4
PBR-10	27.96	878	6.99	4.52	166.0
PER-14	32.26	1,909	8.58	0.20	106.4
PER-14A	29.33	619	7.75	4.61	134.7
PER-15	27.87	651	7.52	4.15	138.6
PER-21	30.19	655	7.72	3.65	149.7
PER-22	28.81	602	7.46	4.31	128.3
PER-23	28.26	513	7.46	6.41	132.5
PER-25	28.13	619	7.53	4.74	138.9
PER-26	28.21	747	7.49	2.71	132.0
PER-27	28.23	515	7.48	5.45	132.2
UAM-1	27.48	594	7.37	4.42	96.2
UAM-2	27.77	603	7.28	4.83	95.8
UAM-2B	30.87	413	7.59	4.85	173.0
UAM-3	28.03	528	7.27	6.06	89.8
WR-345B	27.43	501	7.56	6.26	131.5
WR-347B	27.66	552	7.49	6.79	95.4

Notes: Values shown are the median values over the time period
mg/L = milligrams per liter
uS/cm = microsiemens per centimeter
ORP = oxidation-reduction potential (Eh)
mV = millivolts

TABLE 3-4
Summary of Inorganic Analyses, June 2002
Park-Euclid WQARF Site
Tucson, Arizona

Inorganic Analytes		Perched Aquifer		Shallow Regional Aquifer		PER-14
		Low	High	Low	High	
Cations	Calcium	71	380	24	66	39
	Iron	<0.10	5.8	<0.10	2.7	0.59
	Magnesium	14	79	<1.0	7.1	<1.0
	Manganese	<0.050	4.3	<0.050	0.10	<0.050
	Zinc	<0.050	0.061	<0.050	0.26	29
	Potassium	2.2	7.7	2.1	6.8	3.2
	Sodium	27	200	41	87	240
Anions	Chloride	13	400	12	68	190
	Fluoride	<0.10	0.19	0.19	0.48	0.28
	Nitrate+Nitrite	<0.50	15	<0.50	3.2	<0.50
	Sulfate	16	440	67	120	470
Alkalinity		71	610	110	160	46
Total Dissolve Solids		390	2,400	220	430	960

Notes: All concentrations in milligrams per liter (mg/L)
 Alkalinity is both bicarbonate and total; and no carbonate or hydroxide alkalinity were detected

TABLE 3-5
Regional Aquifer Groundwater Inorganic Analytical Results - June 2002
Park-Euclid WQARF Site
Tucson, Arizona

Well	Sample Date	Cations						Anions					Total Dissolved Solids		
		Calcium	Iron	Magnesium	Manganese	Zinc	Potassium	Sodium	Chloride	Bromide	Fluoride	Nitrate+ Nitrite		Sulfate	Alkalinity
Regional Aquifer Monitor Wells															
MLR-1	06/11/02	26	0.51	2.3	<0.050	<0.050	2.5	70	15	NA	0.46	<0.50	85	120	340
MLR-2	06/10/02	24	0.22	2.1	<0.050	0.14	2.2	65	15	<0.50	0.46	<0.50	76	120	300
MLR-3	06/11/02	25	2.7	2.4	<0.050	0.26	2.7	68	27	NA	0.34	<0.50	98	120	380
MLR-7	06/11/02	36	<0.10	4.6	<0.050	0.21	2.1	45	12	NA	0.80	0.59	77	140	330
PBR-10	06/12/02	66	1.5	7.1	0.10	<0.050	4.7	71	68	NA	0.24	2.0	95	160	430
PER-14	06/11/02	39	0.59	<1.0	<0.050	2.9	3.2	240	190	NA	0.28	<0.50	470	46	960
PER-15	06/13/02	47	1.5	6.1	<0.050	<0.050	3.3	70	39	NA	0.31	0.70	110	120	380
PER-21	06/13/02	18	0.55	<1.0	<0.050	<0.050	3.3	87	28	NA	0.48	<0.50	83	110	300
PER-22	06/13/02	40	<0.10	3.0	<0.050	<0.050	6.8	69	47	NA	0.29	<0.50	120	120	390
PER-23	06/12/02	29	0.29	2.7	<0.050	<0.050	3.0	56	16	NA	0.33	0.58	80	120	300
UAM-1	06/11/02	37	<0.10	3.0	<0.050	<0.050	2.8	70	28	NA	0.28	0.83	76	140	400
UAM-2	06/11/02	45	<0.10	3.9	<0.050	<0.050	2.8	58	31	NA	0.19	1.3	98	120	410
UAM-3	06/11/02	44	0.64	4.1	<0.050	<0.050	2.5	41	27	NA	0.22	3.2	67	120	220
WR-345B	06/12/02	35	0.84	3.9	<0.050	<0.050	2.6	57	12	NA	0.33	0.59	81	120	300
WR-347B	06/12/02	40	1.7	5.2	<0.050	<0.050	2.5	52	12	NA	0.24	0.77	100	130	320
UA Water-Supply Wells															
Agriculture	06/11/02	38	<0.10	1.8	<0.050	<0.050	2.4	48	24	NA	0.19	1.6	68	120	300
Architecture	06/11/02	50	<0.10	2.8	<0.050	<0.050	2.6	54	43	NA	0.19	2.4	89	110	340
Huachuca	06/11/02	47	<0.10	2.3	<0.050	<0.050	2.9	73	46	NA	0.28	1.8	100	120	390
Martin St.	06/11/02	48	2.4	4.8	<0.050	<0.050	2.3	39	28	NA	0.18	3.7	70	120	320

Notes: All results are in milligrams per liter mg/L - milligrams per liter (parts per million)

Alkalinity is reported as CaCO₃; the figures shown are all both bicarbonatic and total alkalinity; and no carbonate or hydroxide alkalinity were detected
UA = University of Arizona

TABLE 3-6
Total Organic Carbon Content
by Walkley-Black Method
Park-Euclid WQARF Site
Tucson, Arizona

Borehole	Depth (bgs)	Stratigraphic Zone	USCS Soil Type	Percent Total Organic Carbon	Reference	
PBP-1	87	upper vadose	SW	0.06%	Miller Brooks/ Golder, 2001(c)	
PEP-8	20		SC	0.03%	Miller Brooks/ Golder, 2001(a)	
	70		SW	0.01%		
	80		SC	0.03%		
PEP-9	30		SW	0.03%		
	60		SM	0.01%		
	75		SC	0.01%		
	90		SC	<0.01%		
PEP-11	91		SW	0.03%		
PEP-16	90		SW	<0.01%		
PER-14	70		SP	0.02%		
	80		SM	0.04%		
	90		SC	0.03%		
TB-1 (soil boring at Park-Broadway)	32		SP-SW	0.42%		GEC, 2000
	52	SP-SW	0.25%			
	62	SW-SM	0.34%			
	72	SW-SM	0.39%			
	85	SC	0.37%			
TB-2 (soil boring at Park-Broadway)	22	SP-SW	0.39%			
	42	SP-SW	0.35%			
	62	SW-SM	0.39%			
	72	SW-SM	0.22%			
	82	SC	0.35%			
PBP-2	93	perched aquifer	SW	0.14%	Miller Brooks/ Golder, 2001(c)	
PBP-3	92		SW	0.32%		
PEP-10	90		SC	0.03%	Miller Brooks/ Golder, 2001(a)	
PEP-17	93		SC	0.07%		
PEP-18	92		SC	0.07%		
PER-14	100		SC	0.42%		
PER-14	200	regional aquifer	SC	0.03%		
	240		SC	0.06%		
	281		ML	0.04%		
	320		SM	0.06%		
	340		SP	0.03%		

Note: bgs = below ground surface
SW = Well-graded sands, gravelly sands, little or no fines
SC = Clayey sands, sand-clay mixtures
SM = Silty-sands, sand-silt mixtures
SP = Poorly-graded sands, gravelly sands, little or no fines
ML = Inorganic salts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity

TABLE 3-7
Summary of Hydraulic Conductivity/Permeability Analyses
Park-Euclid WQARF Site
Tucson, Arizona

Borehole	Sample Depth (bgs)	Lithologic Interval	Hydraulic Conductivity (cm/sec)	Average Permeability (cm/sec)	Reference
SVE-101	90	perched aquifer		5.7E-06	EMCON, 1995b
	91.6			1.71E-05	
	93			1.12E-06	
	94.5			1.38E-06	
SVE-102	9	upper vadose		4.1E-06	
	91.5	perched aquifer		1.2E-05	
	93			1.1E-06	
	94.5			1.9E-06	
	99			8.0E-07	
PEP-8	10	upper vadose	1.5E-03		
	40		3.6E-07		
	90		1.4E-03		
PEP-9	40	upper vadose	5.8E-06		
	50		1.5E-04		
	70		8.1E-04		
PER-14	40	upper vadose	4.7E-04		
	60		1.7E-04		
PBP-1	90	perched aquifer	4.0E-06		
	93		5.7E-07		
PBP-2	100	upper aquitard	3.2E-07		
PBP-3	94	upper aquitard	1.7E-04		
PBP-3	90	perched aquifer	7.8E-07		
PER-14	240	regional aquifer	7.9E-06		
	320		5.0E-06		
	340		1.1E-06		
NS	NS	lower vadose zone		1E-08 #	Dames & Moore, 2000a

Notes: bgs = below ground surface
cm/sec = centimeters per second
NS = Not Specified
= based on tri-axial permeability tests conducted with diesel fuel
Tests for upper vadose zone, perched aquifer, and regional aquifer were done by flexible wall parameter, ASTM D5084

TABLE 3-8
Sieve Analysis
Park-Euclid WQARF Site
Tucson, Arizona

Zone	Boring Name	Sample Depth (ft bgs)	Classification	Boring Log Lithology
Upper Vadose	PEP-8	91	Sand and Silty Clay	Poorly graded sand
	PEP-11	90	Sand and Clay	Poorly graded sand
	PER-14	92	Clayey Sand	Clayey Sand
	PEP-17	85	Clayey Sand	Clayey Sand
Perched Aquifer	PEP-9	95	Clayey Sand	Poorly graded sand
	PEP-9	102	Clayey Sand	Clayey Sand
	PEP-10	91	Clayey Sand	Clayey Sand
	PEP-10	95	Clayey Sand	Clayey Sand
	PER-14	98	Clayey Sand	Clayey Sand
	PER-14	100	Clayey Sand	Clayey Sand
	PEP-16	101	Clayey Sand	Clayey Sand
	PEP-17	90	Clayey Sand	Clayey Sand
	PEP-18	90	Sand and Silt	Poorly graded sand
	PEP-18	94	Clayey Sand	Clayey sand, high plasticity
Aquitard	PER-14	102	Sandy Lean Clay	Clay

Note: ft bgs = feet below ground surface

**TABLE 3-9
Moisture Content
Park-Euclid WQARF Site
Tucson, Arizona**

Well	Depth (ft bgs)	% Moisture	Reference
SVE-101	5	10.3	EMCON, 1995b
	10	2.8	
	15	3.5	
	20	9.5	
	30	6.6	
	40	5.2	
	50	4.1	
	60	6.0	
70	14.7		
SVE-102	10	4.6	
	20	6.1	
	30	3.2	
	40	6.6	
	50	4.8	
	60	10.1	
	70	5.6	
80	14.4		
SVE-103	10	4.6	
	20	7.0	
	30	4.1	
	40	6.6	
	50	7.7	
	60	18.2	
	70	6.2	
80	10.9		
SVE-104	10	4.5	
	30	3.5	
	40	3.7	
	50	4.5	
	70	5.6	
80	7.9		
PEP-8	20	3.1	Miller Brooks/Golder, 2001a
	62	3.7	
	91	3.2	
PEP-9	50	4.2	
	95	7.4	
	102	14.3	
PEP-10	67	7.6	
	78	9.1	
	91	2.3	
	95	3.3	

TABLE 3-9
Moisture Content
Park-Euclid WQARF Site
Tucson, Arizona

Well	Depth (ft bgs)	% Moisture	Reference
PEP-11	33	3.7	Miller Brooks/Golder, 2001a
	58	6.2	
	67	5.9	
	90	2.2	
PER-14	92	3.8	
	98	3.6	
	100	3.3	
	102	7.4	
PEP-16	38	3.8	
	61	7.1	
	85	2.7	
	101	6.2	
PEP-17	61	6.8	
	85	5.5	
	90	5.6	
PEP-18	5	2.3	
	40	4.2	
	60	6.8	
	90	2.3	
	94	17.7	

Notes: ft bgs = feet below ground surface
All tests were done by flexible wall parameter, ASTM D5084

TABLE 4-1
Summary of COC Analyses of Source Area Soil Samples
Park-Euclid WQARF Site
Tucson, Arizona

Boring	Sample Depth (feet bgs)	PCE (mg/kg)	TCE (mg/kg)	cis-1,2-DCE (mg/kg)	Reference
HL-1	0	<0.001	NK	NK	ADHS, 1982b
HL-5	0	<0.001	NK	NK	
HL-6	0	0.0047	NK	NK	
HL-7	0	<0.001	NK	NK	
HL-8	0	<0.001	NK	NK	
HL-9	0	<0.001	NK	NK	
MLSB-1	5	0.031	<0.0050	NA	Earth Tech, 1991
	10	<0.0050	<0.0050	NA	
	15	<0.0050	<0.0050	NA	
	31	0.043	<0.0050	NA	
MLS-4	5.5	<0.05	<0.05	NA	EMCON, 1995b
	11	<0.05	<0.05	NA	
	16.5	<0.05	<0.05	NA	
	21.5	<0.05	<0.05	NA	
MLS-5	5	<0.05	<0.05	NA	
	10	<0.05	<0.05	NA	
	15	<0.05	<0.05	NA	
	21	<0.05	<0.05	NA	
MLS-6	5	<0.05	<0.05	NA	
	10	<0.05	<0.05	NA	
	15	<0.05	<0.05	NA	
	20	<0.05	<0.05	NA	
PEP-8	5	<0.054	<0.054	<0.054	Miller Brooks/Golder, 2001a
	20	<0.054	<0.054	<0.054	
	76	0.23	<0.049	<0.049	
	80	0.30	<0.045	<0.045	
	93 ^a	18	<0.044	<0.044	
	94	14	0.088	<0.046	
PEP-9	5	<0.053	<0.053	<0.053	
	40	<0.046	<0.046	<0.046	
	70	<0.050	<0.050	<0.050	
	90	<0.051	<0.051	<0.051	
	93 ^a	39	11	<0.095	
PER-14	5	0.12	<0.037	<0.037	
	10	0.1	<0.053	<0.053	
	30	<0.045	<0.045	<0.045	
	55	0.13	<0.044	<0.044	
	65	0.48	<0.044	<0.044	
	75	0.72	<0.043	<0.043	
	82	0.15	<0.043	<0.043	
	85	0.24	<0.047	<0.047	
	88	0.12	<0.045	<0.045	
	90	1.2	<0.045	<0.045	

TABLE 4-1
Summary of COC Analyses of Source Area Soil Samples
Park-Euclid WQARF Site
Tucson, Arizona

Boring	Sample Depth (feet bgs)	PCE (mg/kg)	TCE (mg/kg)	cis-1,2-DCE (mg/kg)	Reference
PER-14 (cont)	93 ^a	3.5	<0.042	<0.042	Miller Brooks/Golder, 2001a
	95	1.7	<0.045	<0.045	
	98	<0.043	<0.043	0.046	
	100	0.064	<0.039	<0.039	
	105	<0.039	<0.039	<0.039	
	110	<0.066	<0.066	<0.066	
	115	<0.056	<0.056	<0.056	
	135	<0.049	<0.049	<0.049	
	150	<0.049	<0.049	<0.049	
	160	<0.051	<0.051	<0.051	
	165	170	1.0	1.1	
	167	140	0.75	0.68	
	170	4.6	<0.047	0.081	
	179	0.13	<0.052	0.31	
	190	0.12	<0.053	<0.053	
	195 ^b	<0.054	<0.054	<0.054	
	220	<0.040	<0.040	<0.040	
	240	<0.041	<0.041	<0.041	
	280	<0.040	<0.040	<0.040	
	300	<0.043	<0.043	<0.043	
	320	<0.041	<0.041	<0.041	
	340	<0.042	<0.042	<0.042	
360	<0.038	<0.038	<0.038		
420	<0.036	<0.036	<0.036		
460	<0.039	<0.039	<0.039		
500	<0.041	<0.041	<0.041		
520	<0.045	<0.045	<0.045		
SVE-101	5	0.02	<0.01	NA	EMCON, 1995b
	10	<0.01	<0.01	NA	
	15	<0.01	<0.01	NA	
	20	0.02	<0.01	NA	
	30	0.03	<0.01	NA	
	40	0.05	<0.01	NA	
	50	0.05	<0.01	NA	
	60	0.09	<0.01	NA	
	70	0.37	<0.01	NA	
	80	0.09	<0.01	NA	
	90 ^c	110	<1.0	NA	
91.5	3.7	<0.01	NA		

TABLE 4-1
Summary of COC Analyses of Source Area Soil Samples
Park-Euclid WQARF Site
Tucson, Arizona

Boring	Sample Depth (feet bgs)	PCE (mg/kg)	TCE (mg/kg)	cis-1,2-DCE (mg/kg)	Reference
SVE-101 (cont)	93	<0.01	<0.01	NA	EMCON, 1995b
	94.5	<0.01	<0.01	NA	
SVE-102	10	0.82	<0.01	NA	
	20	0.3	<0.01	NA	
	30	0.97	<0.01	NA	
	40	0.73	<0.01	NA	
	50	0.75	<0.01	NA	
	60	3.1	<0.01	NA	
	70	1.4	<0.01	NA	
	80	0.38	<0.01	NA	
90 ^d	1,300	1.2	NA		
SVE-103	10	0.03	<0.01	NA	
	30	<0.01	0.02	NA	
	40	0.03	<0.01	NA	
	50	0.1	<0.01	NA	
	60	0.85	<0.01	NA	
	70	0.58	<0.01	NA	
	80	0.18	<0.01	NA	
	90 ^e	1,900	<5.0	NA	
SVE-104	10	0.02	<0.01	NA	
	20	0.04	<0.01	NA	
	30	0.02	<0.01	NA	
	40	0.06	<0.01	NA	
	50	0.06	<0.01	NA	
	60	0.02	<0.01	NA	
	70	0.09	<0.01	NA	
	80	0.05	<0.01	NA	
	90 ^e	6.0	<0.01	NA	
VML-1	150	<0.050	<0.050	<0.050	Miller Brooks/Golder, 2001a
	155	<0.050	<0.050	<0.050	
	160	<0.050	<0.050	<0.050	
	165	<0.050	<0.050	<0.050	
	170	<0.050	<0.050	<0.050	
	175	<0.050	<0.050	<0.050	
	180	0.56	<0.050	<0.050	
	185	<0.050	<0.050	<0.050	
	190	<0.050	<0.050	<0.050	
VML-2	165	<0.050	<0.050	<0.050	Miller Brooks/Golder, 2001a
	170	4.5	<0.050	<0.050	
	173	160	1.5	1.4	
	175	<0.050	<0.050	<0.050	

TABLE 4-3
Groundwater Monitoring Well Construction Details
Park Euclid WQARF Site
Tucson, Arizona

Current Well ID	Cadastral Location	ADWR Number	Surveyed Measuring Point (ft amsl)	Diameter (inches)	Total Depth of Borehole (feet bgs)	Completed Well Depth (feet bgs)	Screened Interval (feet bgs)	Pump Set (feet bgs)
Perched Aquifer Groundwater Monitoring Wells								
ADOT-1	(D-14-14)18bbc	55-514256	2405.86	2	100	98	75 - 95	NA
MLS-4	(D-14-14)18bac	55-538186	2418.83	4	160	105	75 - 105	NA
MLS-5	(D-14-14)18bac	55-538187	2413.93	4	200	103.5	73.5 - 103.5	NA
MLS-6	(D-14-14)18bac	55-538188	2418.35	4	109	105	75 - 105	NA
MLS-12	(D-14-14)18bcb	55-570994	2418.38	4	105	105	90 - 105	NA
MLS-13	(D-14-14)18bcb	55-570993	2416.69	4	108	105	90 - 105	NA
MPE-1	(D-14-14)18bdb	55-599706	2415.00	6	101	100	90 - 100	NA
MPM-1	(D-14-14)18bdb	55-595028	2415.40	4	101	101	91 - 101	NA
PBP-1	(D-14-14)7ccd	55-585540	2405.08	4	94	92.5	82.5 - 92.5	NA
PBP-2	(D-14-14)7ccd	55-584496	2407.55	4	100	97	87 - 97	NA
PBP-3	(D-14-14)7ccd	55-584595	2407.22	4	97	97	87 - 97	NA
PBP-7	(D-14-14)7cdb	55-591858	2403.88	4	119.5	89	79 - 89	NA
PEP-8	(D-14-14)18bdb	55-584310	2417.87	4	100	100	90 - 100	NA
PEP-9	(D-14-14)18bac	55-584205	2414.99	4	103	100	90 - 100	NA
PEP-10	(D-14-14)18bba	55-584204	2408.18	4	95	94	84 - 94	NA
PEP-11	(D-14-14)18bad	55-584494	2410.95	4	96	95	85 - 95	NA
PEP-16*	(D-14-14)18bad	55-584358	2421.77	4	104	102	92-102	NA
PEP-17*	(D-14-14)18bad	55-584493	2415.3	4	94	94	84-94	NA
PEP-18	(D-14-14)18bbb	55-584492	2410.45	4	97	96	86 - 96	NA
PEP-19	(D-14-14)18bda	55-591466	2416.2	4	98	97.5	87.5 - 97.5	NA
PEP-24	(D-14-14)18bca	55-594917	2409.46	4	94	93.5	83.5 - 93.5	NA
SVE-101**	(D-14-14)18bac	55-538200	2414.7	2	97	97	27 - 97	NA
SVE-102**	(D-14-14)18bac	55-538201	2414.73	3	102	102	31.5 - 101.5	NA
SVE-103**	(D-14-14)18bac	55-538202	2414.76	3	100	100	30 - 100	NA
SVE-104**	(D-14-14)18bac	55-538203	2414.82	3	100	100	30 - 100	NA
WR-345A	(D-14-14)18baa	55-566559	2412.28	2	238	99	69 - 99	NA
WR-347A	(D-14-14)18bad	55-566560	2419.46	2	235	110	80 - 110	NA
Regional Aquifer Groundwater Monitoring Wells								
MLR-1	(D-14-14)18bac	55-531297	2417.53	1.75, 4***	350	350	260 - 345	335
MLR-2	(D-14-14)18bac	55-531298	2416.41	1.75, 4***	350	350	260 - 345	335
MLR-3	(D-14-14)18bac	55-531299	2418.47	1.75, 4***	350	350	260 - 345	335
MLR-7	(D-14-14)18bac	55-543556	2421.71	5	303	285	210 - 280	274
PBR-10	(D-14-14)7cdb	55-591859	2403.79	4	250	250	200 - 250	230
PER-14	(D-14-14)18bac	55-584203	2418.18	5	523	523	473 - 523	500
PER-14A	(D-14-14)18bac	55-909799	2417.33	5	255	250	180 - 250	233
PER-15	(D-14-14)18baa	55-584491	2408.73	4	250	250	200 - 250	230
PER-21	(D-14-14)18baa	55-591467	2407.91	4	390	389	339 - 389	365
PER-22	(D-14-14)18baa	55-591468	2408.22	4	321	321	271 - 321	295
PER-23	(D-14-14)7cdd	55-591469	2416.15	4	330	288.5	238.5 - 288.5	265
PER-25	(D-14-14)7cdc	55-594916	2412.32	4	290	290	240 - 290	265
PER-26	(D-14-14)7cdd	55-597845	2413.04	4	303	290	240 - 290	265
PER-27	(D-14-14)7cdc	55-597846	2408	4	296	290	240 - 290	265
UAM-1	(D-14-14)7cab	55-578588	2407.75	5	284	271	207 - 266	265
UAM-2	(D-14-14)7dbc	55-578589	2412.04	5	267	266	202 - 261	258
UAM-2B	(D-14-14)7dbc	55-908768	2412.80	5	458	415.6	328 - 410.8	369
UAM-3	(D-14-14)7dba	55-578590	2432.12	5	298	296	232 - 296	290
WR-345B	(D-14-14)18baa	55-566559	2414.34	4	238	235	180 - 235	230
WR-347B	(D-14-14)18bad	55-566560	2419.47	4	235	235	180 - 235	230
UA Production Wells								
Aggie	(D-14-14)7bda	55-618687	NA	16, 12	480	480	122 - 480	Unknown
Architecture	(D-14-14)7bab	55-618691	NA	18, 16	601	601	190 - 290, 297 - 600	Unknown
Huachuca	(D-14-14)7bca	55-618692	NA	16	614	614	180 - 592	Unknown
Martin	(D-14-14)7add	55-618690	NA	18	600	600	170-225, 300-590	Unknown
Optical	(D-14-14)7adb	55-201737	NA	12	680	680	480 - 540, 600 - 680	650

Notes: *PEP-16 and PEP-17 were abandoned in preparation for excavation work associated with the Arroyo Chico Development Project

** SVE-101, SVE-102, SVE-103, and SVE-104 are also used as perched aquifer monitor wells

*** 1.75- inch diameter well from 0 to 260 feet bgs, and 4-inch diameter well from 260 to 350 feet bgs

ADWR = Arizona Department of Water Resources

ft amsl = feet above mean sea level

bgs = below ground surface

NA = Not Available

UA = University of Arizona

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
Perched Aquifer Groundwater Monitoring Wells					
ADOT-1	02/07/2000		84.85		2319.07
	03/07/2000		84.95		2318.97
	04/07/2000		85.14		2318.78
	05/15/2000		85.32		2318.60
	06/21/2000		86.01		2317.91
	07/14/2000		86.10		2317.82
	08/21/2000		86.29		2317.63
	09/22/2000		85.89		2318.03
	10/25/2000		85.40		2318.52
	11/20/2000		85.42		2318.50
	12/15/2000		85.14		2318.78
	01/16/2001		85.16		2318.76
	02/26/2001		85.12		2318.80
	03/16/2001		85.08		2318.84
	04/23/2001		85.23		2318.69
	05/14/2001		85.14		2318.78
	05/18/2001		85.32		2318.60
	06/14/2001		85.37		2318.55
	07/11/2001		85.48		2318.44
	08/10/2001		85.60		2318.32
	09/20/2001		85.36		2318.56
	10/18/2001		85.44		2318.48
	11/19/2001		85.63		2318.29
	12/13/2001		85.74		2318.18
	02/14/2002		85.98		2317.94
	06/06/2002		86.46		2317.46
	08/19/2002		86.65		2317.27
	12/11/2002		86.41		2317.51
	01/27/2003		85.83		2318.09
	05/19/2003		85.94		2317.98
	12/01/2003		86.16		2317.76
	02/09/2004		86.32		2317.60
05/03/2004		86.05		2317.87	
11/08/2004		86.51		2317.41	
05/09/2005		85.40		2318.52	
11/07/2005		85.26		2318.66	
05/08/2006		86.33		2317.59	
11/27/2006		85.22		2318.70	
04/30/2007		85.46		2318.46	
12/10/2007		83.57		2320.35	
05/05/2008		84.16		2319.76	
11/04/2008		84.03		2319.89	
MLS-12	10/20/1998	92.90	93.10	0.20	2325.25
	04/20/1999	92.90	93.21	0.31	2325.14
	08/12/1999	92.92	93.21	0.29	2325.14
	10/14/1999	92.73	92.94	0.21	2325.41
	02/07/2000	92.70	92.95	0.25	2325.40
	03/07/2000	92.87	93.06	0.19	2325.29
	04/07/2000	92.86	93.36	0.50	2324.99
	05/15/2000	92.86	94.05	1.19	2324.30
	06/21/2000	92.78	94.80	2.02	2323.55
	07/17/2000	92.89	95.10	2.21	2323.25
	08/21/2000	92.95	95.10	2.15	2323.25
	09/22/2000	92.98	95.25	2.27	2323.10
	10/25/2000	93.00	95.27	2.27	2323.08
	11/20/2000	92.96	95.10	2.14	2323.25
	12/15/2000	92.95	94.80	1.85	2323.55
	01/16/2001	92.91	94.58	1.67	2323.77
	02/26/2001	92.91	94.58	1.67	2323.77
	03/16/2001	92.88	94.56	1.68	2323.79

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLS-12 (cont)	04/23/2001	92.90	94.55	1.65	2323.80
	05/18/2001	92.92	94.59	1.67	2323.76
	06/14/2001	92.91	94.62	1.71	2323.73
	07/11/2001	92.92	94.73	1.81	2323.62
	08/10/2001	93.00	94.92	1.92	2323.43
	09/20/2001	92.95	94.80	1.85	2323.55
	10/18/2001	93.01	94.85	1.84	2323.50
	11/19/2001	93.02	94.96	1.94	2323.39
	12/13/2001	93.07	95.11	2.04	2323.24
	02/14/2002	93.02	95.26	2.24	2323.09
	06/06/2002	93.22	95.55	2.33	2322.80
	08/19/2002	93.33	95.65	2.32	2322.70
	12/11/2002	93.40	95.67	2.27	2322.68
	01/27/2003	93.29	95.49	2.20	2322.86
	05/19/2003	93.29	95.46	2.17	2322.89
	12/01/2003	93.47	95.69	2.22	2322.66
	02/09/2004	93.42	95.41	1.99	2322.94
	05/03/2004	93.19	93.65	0.46	2324.70
	11/08/2004	93.30	95.26	1.96	2323.09
	05/09/2005	93.32	95.00	1.68	2323.35
	11/07/2005	93.09	94.44	1.35	2323.91
	05/08/2006	93.30	95.37	2.07	2322.98
	11/27/2006	93.18	94.47	1.29	2323.88
	04/30/2007	93.19	95.07	1.88	2323.28
	12/10/2007	92.67	93.57	0.90	2324.78
	05/05/2008	92.93	94.60	1.67	2323.75
	11/04/2008	93.03	94.20	1.17	2324.15
	MLS-13	10/20/1998	91.24	92.70	1.46
04/20/1999		91.17	93.05	1.88	2323.67
08/12/1999		90.21	93.11	2.90	2323.61
10/14/1999		91.06	92.64	1.58	2324.08
02/07/2000		91.00	92.75	1.75	2323.97
03/07/2000		91.15	93.15	2.00	2323.57
04/07/2000		91.14	93.28	2.14	2323.44
05/15/2000		91.22	93.45	2.23	2323.27
06/21/2000		91.25	93.59	2.34	2323.13
07/14/2000		91.37	93.79	2.42	2322.93
08/21/2000		91.44	93.61	2.17	2323.11
09/22/2000		91.45	93.53	2.08	2323.19
10/25/2000		91.49	93.90	2.41	2322.82
11/20/2000		91.43	93.67	2.24	2323.05
12/15/2000		91.41	93.50	2.09	2323.22
01/16/2001		91.38	93.36	1.98	2323.36
02/27/2001		91.37	94.43	3.06	2322.29
03/16/2001		91.36	93.40	2.04	2323.32
04/23/2001		91.40	93.44	2.04	2323.28
05/18/2001		91.41	93.56	2.15	2323.16
06/14/2001		91.41	93.54	2.13	2323.18
07/11/2001		91.41	93.57	2.16	2323.15
08/10/2001		91.49	93.79	2.30	2322.93
09/20/2001		91.43	93.59	2.16	2323.13
10/18/2001		91.49	93.75	2.26	2322.97
11/19/2001		91.50	93.43	1.93	2323.29
12/13/2001		91.56	93.86	2.30	2322.86
02/14/2002		91.51	93.91	2.40	2322.81
06/06/2002		91.70	94.12	2.42	2322.60
08/19/2002		91.78	94.22	2.44	2322.50
12/11/2002		91.86	94.26	2.40	2322.46
01/27/2003		91.78	94.12	2.34	2322.60
05/19/2003	91.80	94.13	2.33	2322.59	
12/01/2003	91.98	94.25	2.27	2322.47	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLS-13 (cont)	02/09/2004	91.92	94.02	2.10	2322.70
	05/03/2004	91.65	93.25	1.60	2323.47
	11/10/2004	91.80	93.85	2.05	2322.87
	05/09/2005	91.83	93.95	2.12	2322.77
	11/07/2005	91.55	93.38	1.83	2323.34
	05/08/2006	91.76	93.98	2.22	2322.74
	11/27/2006	91.59	93.15	1.56	2323.57
	04/30/2007	91.68	93.81	2.13	2322.91
	12/10/2007	91.33	92.92	1.59	2323.80
	05/05/2008	91.52	93.68	2.16	2323.04
	11/04/2008	91.55	93.25	1.70	2323.47
MLS-4	04/13/1993		93.02		2325.85
	04/30/1993		93.19		2325.68
	06/09/1993	93.20	93.25	0.05	2325.62
	07/08/1993	93.26	93.32	0.06	2325.55
	08/24/1993	93.46	94.15	0.69	2324.72
	10/14/1993		93.75		2325.12
	12/01/1993	93.62	93.66	0.04	2325.21
	12/29/1993	93.64	93.66	0.02	2325.21
	01/11/1994	93.80	93.82	0.02	2325.05
	06/02/1994	94.00	94.05	0.05	2324.82
	07/14/1994	93.85	94.12	0.27	2324.75
	09/08/1994	94.00	94.27	0.27	2324.60
	10/05/1994	94.00	94.25	0.25	2324.62
	11/17/1994	93.98	94.24	0.26	2324.63
	12/08/1994	93.98	94.22	0.24	2324.65
	01/01/1995	93.95	94.18	0.23	2324.69
	02/01/1995	93.82	94.01	0.19	2324.86
	03/01/1995	93.53	93.69	0.16	2325.18
	04/01/1995	93.37	93.54	0.17	2325.33
	05/01/1995	93.12	93.33	0.21	2325.54
	06/01/1995	93.31	93.58	0.27	2325.29
	02/25/1998	94.99	94.60	-0.39	2324.27
	10/20/1998	93.32	93.75	0.43	2325.12
	04/20/1999	93.77	93.97	0.20	2324.90
	08/12/1999	93.98	94.11	0.13	2324.76
	10/14/1999	93.41	93.44	0.03	2325.43
	02/07/2000	93.57	93.69	0.12	2325.18
	03/07/2000	93.80	93.90	0.10	2324.97
	04/07/2000	93.91	94.05	0.14	2324.82
	05/15/2000	94.08	94.25	0.17	2324.62
	06/21/2000	94.18	94.30	0.12	2324.57
	07/17/2000	94.39	94.45	0.06	2324.42
	08/21/2000	94.43	94.48	0.05	2324.39
	09/22/2000	94.43	94.51	0.08	2324.36
	10/25/2000	94.33	94.43	0.10	2324.44
	11/20/2000	94.21	94.33	0.12	2324.54
	12/15/2000	93.94	94.08	0.14	2324.79
	01/17/2001	93.79	93.87	0.08	2325.00
	02/27/2001	93.79	93.90	0.11	2324.97
	03/16/2001	93.75	93.86	0.11	2325.01
04/23/2001	93.76	93.87	0.11	2325.00	
05/18/2001	93.75	93.87	0.12	2325.00	
06/14/2001	93.77	93.88	0.11	2324.99	
07/11/2001	93.87	94.00	0.13	2324.87	
08/10/2001	94.02	94.18	0.16	2324.69	
09/20/2001	93.95	94.10	0.15	2324.77	
10/18/2001	93.99	94.15	0.16	2324.72	
11/19/2001	94.08	94.25	0.17	2324.62	
12/13/2001	94.20	94.37	0.17	2324.50	
02/14/2002	94.36	94.54	0.18	2324.33	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLS-4 (cont)	06/06/2002	94.77	94.95	0.18	2323.92
	08/19/2002	94.92	95.34	0.42	2323.53
	12/11/2002	94.60	96.24	1.64	2322.63
	01/27/2003	94.37	95.14	0.77	2323.73
	05/19/2003	94.33	95.14	0.81	2323.73
	12/01/2003	94.44	96.91	2.47	2321.96
	02/09/2004	94.38	97.00	2.62	2321.87
	05/03/2004		96.55		2322.32
	11/08/2004		96.93		2321.94
	05/09/2005		96.30		2322.57
	11/07/2005		93.78		2325.09
	05/08/2006	94.39	96.47	2.08	2322.40
	11/27/2006		94.76		2324.11
	04/30/2007		95.26		2323.61
	12/10/2007		92.37		2326.50
	05/05/2008		93.48		2325.39
11/04/2008		92.41		2326.46	
MLS-5	04/13/1993		88.56		2325.45
	04/30/1993		88.52		2325.49
	06/09/1993	88.50	89.19	0.69	2324.82
	07/08/1993	88.52	88.55	0.03	2325.46
	08/24/1993	88.62	88.76	0.14	2325.25
	10/14/1993		89.02		2324.99
	12/01/1993	88.70	88.76	0.06	2325.25
	12/29/1993	88.71	88.76	0.05	2325.25
	01/11/1994	89.02	89.07	0.05	2324.94
	06/02/1994	88.88	89.01	0.13	2325.00
	07/14/1994	88.93	89.11	0.18	2324.90
	09/08/1994	89.04	89.23	0.19	2324.78
	10/05/1994	89.04	89.24	0.20	2324.77
	11/17/1994	89.08	89.25	0.17	2324.76
	12/08/1994	89.10	89.28	0.18	2324.73
	01/01/1995	89.07	89.29	0.22	2324.72
	01/01/1995	89.07	89.93	0.86	2324.08
	02/01/1995	88.89	89.17	0.28	2324.84
	03/01/1995	88.62	88.70	0.08	2325.31
	04/01/1995	88.50	88.57	0.07	2325.44
	05/01/1995	88.36	88.47	0.11	2325.54
	06/01/1995	88.57	88.78	0.21	2325.23
	02/25/1998		89.41		2324.60
	10/20/1998	88.89	89.45	0.56	2324.56
	04/20/1999	88.99	89.45	0.46	2324.56
	08/12/1999	89.10	89.27	0.17	2324.74
	10/14/1999	88.80	88.93	0.13	2325.08
	02/07/2000	88.76	89.32	0.56	2324.69
	03/07/2000	88.92	89.14	0.22	2324.87
	04/07/2000	88.96	89.07	0.11	2324.94
	05/15/2000	89.05	90.10	1.05	2323.91
	06/21/2000	89.10	90.05	0.95	2323.96
	07/17/2000	89.23	90.54	1.31	2323.47
	08/21/2000	89.30	90.55	1.25	2323.46
	09/22/2000	89.31	90.35	1.04	2323.66
	10/25/2000	89.32	90.49	1.17	2323.52
11/20/2000	89.30	90.42	1.12	2323.59	
12/15/2000	89.23	90.05	0.82	2323.96	
01/17/2001	89.16	89.89	0.73	2324.12	
02/27/2001	89.16	89.97	0.81	2324.04	
03/16/2001	89.11	89.91	0.80	2324.10	
04/23/2001	89.15	89.97	0.82	2324.04	
05/18/2001	89.17	90.05	0.88	2323.96	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLS-5 (cont)	06/14/2001	89.17	90.11	0.94	2323.90
	07/11/2001	89.17	90.12	0.95	2323.89
	08/10/2001	89.25	90.30	1.05	2323.71
	09/20/2001	89.20	90.12	0.92	2323.89
	10/18/2001	89.23	90.26	1.03	2323.75
	11/19/2001	89.28	90.40	1.12	2323.61
	12/13/2001	89.34	90.57	1.23	2323.44
	02/14/2002	89.31	90.76	1.45	2323.25
	06/06/2002	89.50	91.09	1.59	2322.92
	08/19/2002	89.58	91.28	1.70	2322.73
	12/11/2002	89.63	91.44	1.81	2322.57
	01/27/2003	89.56	91.36	1.80	2322.65
	05/19/2003	89.55	91.42	1.87	2322.59
	12/01/2003	89.70	91.59	1.89	2322.42
	02/09/2004	89.58	90.98	1.40	2323.03
	05/03/2004		89.37		2324.64
	11/08/2004		90.71		2323.30
	05/09/2005		90.83		2323.18
	11/07/2005		90.13		2323.88
	05/08/2006	89.36	90.77	1.41	2323.24
	11/27/2006		89.38		2324.63
04/30/2007		90.68		2323.33	
12/10/2007		89.34		2324.67	
05/05/2008	89.12	90.31	1.19	2323.70	
11/04/2008		89.13		2324.88	
MLS-6	04/13/1993		93.04		2325.29
	04/30/1993		92.93		2325.40
	06/09/1993		93.14		2325.19
	07/08/1993		93.40		2324.93
	08/24/1993		93.74		2324.59
	10/14/1993		94.00		2324.33
	12/29/1993		94.45		2323.88
	01/11/1994		94.18		2324.15
	06/02/1994		94.38		2323.95
	07/14/1994		94.43		2323.90
	09/08/1994		94.65		2323.68
	10/05/1994		94.55		2323.78
	11/17/1994		94.42		2323.91
	12/08/1994		94.40		2323.93
	01/11/1995		94.31		2324.02
	02/09/1995		94.11		2324.22
	03/15/1995		93.81		2324.52
	04/03/1995		93.69		2324.64
	05/18/1995		93.64		2324.69
	06/13/1995		93.83		2324.50
	02/25/1998		94.38		2323.95
	10/20/1998		92.90		2325.43
	04/20/1999		93.96		2324.37
	08/12/1999		94.38		2323.95
	10/14/1999		93.15		2325.18
	02/07/2000		93.81		2324.52
	03/07/2000		94.21		2324.12
	04/07/2000		94.40		2323.93
	05/15/2000		94.65		2323.68
	06/21/2000		94.80		2323.53
07/14/2000		94.95		2323.38	
08/21/2000		95.13		2323.20	
09/22/2000		95.03		2323.30	
10/25/2000		94.77		2323.56	
11/20/2000		94.40		2323.93	
12/15/2000		93.81		2324.52	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLS-6 (cont)	01/17/2001		93.67		2324.66
	02/27/2001		93.75		2324.58
	03/16/2001		93.62		2324.71
	04/23/2001		93.71		2324.62
	05/15/2001		93.56		2324.77
	05/18/2001		93.75		2324.58
	06/14/2001		93.81		2324.52
	07/11/2001		94.03		2324.30
	08/10/2001		94.21		2324.12
	09/20/2001		94.07		2324.26
	10/18/2001		94.13		2324.20
	11/19/2001		94.37		2323.96
	12/13/2001		94.46		2323.87
	02/14/2002		94.85		2323.48
	06/06/2002		95.43		2322.90
	08/19/2002		95.67		2322.66
	12/11/2002		95.27		2323.06
	01/27/2003		94.92		2323.41
	05/19/2003		94.73		2323.60
	12/01/2003		95.26		2323.07
	02/09/2004		95.26		2323.07
	05/03/2004		94.99		2323.34
	11/08/2004		95.36		2322.97
	05/09/2005		94.60		2323.73
	11/07/2005		94.16		2324.17
	05/08/2006		95.17		2323.16
11/27/2006		93.77		2324.56	
04/30/2007		94.30		2324.03	
12/10/2007		91.53		2326.80	
05/06/2008		93.06		2325.27	
11/04/2008		92.59		2325.74	
MPE-I	12/02/2003	93.25	96.42	3.17	2318.58
	02/09/2004	93.16	96.08	2.92	2318.92
	05/03/2004		92.88		2322.12
	11/08/2004	93.04	94.41	1.37	2320.59
	05/09/2005	92.97	93.85	0.88	2321.15
	11/07/2005	92.66	92.88	0.22	2322.12
	05/08/2006	92.97	94.20	1.23	2320.80
	11/27/2006	92.61	92.85	0.24	2322.15
	04/30/2007	92.73	93.52	0.79	2321.48
05/05/2008					
MPM-I	05/19/2003	93.02	95.05	2.03	2322.59
	12/01/2003	93.21	96.49	3.28	2321.15
	02/12/2004	93.13	96.40	3.27	2321.24
	05/03/2004		92.89		2324.75
	11/08/2004		95.45		2322.19
	05/09/2005		94.20		2323.44
	11/07/2005	92.66	93.02	0.36	2324.62
	05/08/2006	92.94	94.33	1.39	2323.31
	11/27/2006		92.94		2324.70
	04/30/2007	92.75	93.29	0.54	2324.35
12/10/2007		91.61		2326.03	
05/05/2008					
PBP-I	02/27/2001		87.65		2319.64
	03/16/2001		87.60		2319.69
	04/23/2001		87.63		2319.66
	05/16/2001		87.60		2319.69
	05/18/2001		87.72		2319.57
	06/14/2001		87.74		2319.55
	07/11/2001		87.86		2319.43
	08/10/2001		87.90		2319.39

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
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Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PBP-1 (cont)	09/20/2001		87.86		2319.43
	10/18/2001		88.84		2318.45
	11/19/2001		87.86		2319.43
	12/13/2001		87.83		2319.46
	02/14/2002		87.89		2319.40
	06/06/2002		88.26		2319.03
	08/19/2002		88.35		2318.94
	12/11/2002		88.44		2318.85
	01/27/2003		88.31		2318.98
	05/19/2003		88.33		2318.96
	12/01/2003		88.56		2318.73
	02/09/2004		88.57		2318.72
	05/03/2004		88.45		2318.84
	11/08/2004		88.64		2318.65
	05/09/2005		88.51		2318.78
	11/07/2005		88.13		2319.16
	05/08/2006		88.45		2318.84
11/27/2006		88.28		2319.01	
04/30/2007		88.11		2319.18	
12/10/2007		87.07		2320.22	
05/06/2008		87.50		2319.79	
11/04/2008		87.61		2319.68	
PBP-2	02/27/2001		92.05		2317.72
	03/16/2001		91.94		2317.83
	04/23/2001		91.78		2317.99
	05/16/2001		91.80		2317.97
	05/18/2001		91.94		2317.83
	06/14/2001		92.01		2317.76
	07/11/2001		92.10		2317.67
	08/10/2001		92.22		2317.55
	09/20/2001		92.26		2317.51
	10/18/2001		92.26		2317.51
	11/19/2001		92.32		2317.45
	12/13/2001		92.30		2317.47
	02/14/2002		92.36		2317.41
	06/06/2002		92.72		2317.05
	08/19/2002		92.95		2316.82
	12/11/2002		93.07		2316.70
	01/27/2003		92.95		2316.82
	05/19/2003		92.93		2316.84
	12/01/2003		92.94		2316.83
	02/09/2004		92.82		2316.95
05/03/2004		92.65		2317.12	
11/08/2004		93.07		2316.70	
11/07/2005		92.60		2317.17	
05/08/2006		93.03		2316.74	
11/27/2006		92.96		2316.81	
04/30/2007		92.65		2317.12	
12/10/2007		91.56		2318.21	
05/06/2008		91.77		2318.00	
11/04/2008		91.84		2317.93	
PBP-3	02/27/2001		91.97		2317.48
	03/16/2001		91.90		2317.55
	04/23/2001		91.86		2317.59
	05/16/2001		91.80		2317.65
	05/18/2001		91.99		2317.46
	06/14/2001		92.00		2317.45
	07/11/2001		92.06		2317.39
	08/10/2001		92.12		2317.33
	09/20/2001		92.11		2317.34
	10/18/2001		92.13		2317.32

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PBP-3 (cont)	11/19/2001		92.12		2317.33
	12/13/2001		92.11		2317.34
	02/14/2002		92.11		2317.34
	06/06/2002		92.39		2317.06
	08/19/2002		92.55		2316.90
	12/11/2002		92.67		2316.78
	01/27/2003		92.57		2316.88
	05/19/2003		92.60		2316.85
	12/01/2003		92.83		2316.62
	02/09/2004		92.96		2316.49
	05/03/2004		92.77		2316.68
	11/08/2004		92.23		2317.22
	11/07/2005		92.60		2316.85
	05/08/2006		92.80		2316.65
	11/27/2006		92.79		2316.66
	04/30/2007		92.49		2316.96
12/10/2007		91.85		2317.60	
05/05/2008		92.01		2317.44	
11/04/2008		92.06		2317.39	
PBP-7	5/3/2004		89.11		2316.95
	11/8/2004		Dry		Dry
	5/9/2005		89.11		2316.95
	11/7/2005		88.47		2317.59
	5/8/2006		88.7		2317.36
	11/27/2006		88.95		2317.11
	04/30/2007				
	12/11/2007		Dry		Dry
	05/05/2008		87.38		2316.5
11/04/2008		85.46		2318.42	
PEP-8	11/20/2000	93.10	93.21	0.11	2324.81
	12/14/2000	92.95	93.56	0.61	2324.46
	01/16/2001	92.88	92.89	0.01	2325.13
	02/26/2001	92.90	92.91	0.01	2325.11
	03/16/2001	92.86	92.88	0.02	2325.14
	04/23/2001	92.86	93.00	0.14	2325.02
	05/18/2001	92.86	93.20	0.34	2324.82
	06/14/2001	92.84	93.30	0.46	2324.72
	07/11/2001	92.87	93.68	0.81	2324.34
	08/10/2001	92.80	93.98	1.18	2324.04
	09/20/2001	92.89	93.78	0.89	2324.24
	10/18/2001	92.92	93.86	0.94	2324.16
	11/19/2001	92.96	94.15	1.19	2323.87
	12/13/2001	93.02	94.29	1.27	2323.73
	02/14/2002	93.05	94.41	1.36	2323.61
	06/10/2002	93.20	95.86	2.66	2322.16
	08/19/2002	93.29	96.25	2.96	2321.77
	12/11/2002	93.31	96.02	2.71	2322.00
	01/27/2003	93.19	95.44	2.25	2322.58
	05/19/2003	93.18	95.33	2.15	2322.69
	12/01/2003	93.80	96.15	2.35	2321.87
	02/09/2004	93.27	95.55	2.28	2322.47
	05/03/2004	93.10	94.31	1.21	2323.71
	11/08/2004	93.16	93.21	0.05	2324.81
	11/07/2005	92.92	93.67	0.75	2324.35
	05/08/2006	93.15	95.70	2.55	2322.32
11/27/2006	92.98	93.33	0.35	2324.69	
04/30/2007	93.00	94.70	1.70	2323.32	
12/10/2007		92.10		2325.92	
05/05/2008	92.74	93.04	0.30	2324.98	
11/04/2008		92.78		2325.24	

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PEP-9	11/20/2000		93.35		2323.75
	12/15/2000	92.85	92.89	0.04	2324.21
	01/16/2001		92.70		2324.40
	02/26/2001	92.74	92.76	0.02	2324.34
	03/16/2001	92.62	92.90	0.28	2324.20
	04/23/2001	92.66	93.32	0.66	2323.78
	05/18/2001	92.64	93.35	0.71	2323.75
	06/14/2001	92.68	93.30	0.62	2323.80
	07/11/2001	92.79	93.48	0.69	2323.62
	08/10/2001	93.00	93.68	0.68	2323.42
	09/20/2001	92.89	93.41	0.52	2323.69
	10/18/2001	92.97	93.49	0.52	2323.61
	11/19/2001	93.12	93.67	0.55	2323.43
	12/13/2001	93.24	93.84	0.60	2323.26
	02/14/2002	93.46	93.92	0.46	2323.18
	06/06/2002	93.92	94.20	0.28	2322.90
	08/19/2002	94.12	94.36	0.24	2322.74
	12/11/2002	93.96	94.01	0.05	2323.09
	01/27/2003	93.69	93.75	0.06	2323.35
	05/19/2003	93.57	93.64	0.07	2323.46
	12/01/2003	93.98	94.02	0.04	2323.08
	02/09/2004		93.90		2323.20
	05/03/2004		93.56		2323.54
	11/08/2004		93.87		2323.23
	05/09/2005		93.47		2323.63
	11/07/2005		93.03		2324.07
	05/08/2006		93.76		2323.34
	11/27/2006		92.72		2324.38
	04/30/2007		93.15		2323.95
	12/10/2007		91.03		2326.07
05/06/2008		91.71		2325.39	
11/05/2008		92.02		2325.08	
PEP-10	12/15/2000		88.19		2322.11
	01/16/2001		88.13		2322.17
	02/26/2001		88.17		2322.13
	03/16/2001		88.14		2322.16
	04/23/2001		88.22		2322.08
	05/14/2001		88.12		2322.18
	05/18/2001		88.32		2321.98
	06/14/2001		88.34		2321.96
	07/11/2001		88.43		2321.87
	08/10/2001		88.51		2321.79
	09/20/2001		88.41		2321.89
	10/18/2001		88.43		2321.87
	11/19/2001		88.54		2321.77
	12/13/2001		88.55		2321.75
	02/14/2002		88.69		2321.61
	06/06/2002		88.98		2321.32
	08/19/2002		89.12		2321.18
	12/11/2002		89.29		2321.01
	01/27/2003		88.89		2321.41
	05/19/2003		88.92		2321.38
	12/01/2003		89.19		2321.11
	02/09/2004		89.16		2321.14
	05/03/2004		88.93		2321.37
	11/08/2004		89.10		2321.20
	11/07/2005		88.55		2321.75
	05/08/2006		89.15		2321.15
11/27/2006		88.48		2321.82	
04/30/2007		88.63		2321.67	
12/10/2007		87.46		2322.84	
05/05/2008		88.07		2322.23	
11/07/2008		87.95		2322.35	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PEP-11	12/15/2000		90.48		2320.09
	01/16/2001		89.57		2321.00
	02/26/2001		89.46		2321.11
	03/16/2001		89.26		2321.31
	04/12/2001		89.19		2321.38
	04/23/2001		89.17		2321.40
	05/17/2001		88.99		2321.58
	05/18/2001		89.11		2321.46
	06/14/2001		89.11		2321.46
	07/11/2001		89.32		2321.25
	08/10/2001		89.53		2321.04
	09/20/2001		89.59		2320.98
	10/18/2001		89.64		2320.93
	11/19/2001		89.89		2320.68
	12/13/2001		90.23		2320.34
	02/14/2002		91.23		2319.34
	06/06/2002		92.59		2317.98
	08/19/2002		93.06		2317.51
	12/11/2002		92.54		2318.03
	01/27/2003		91.72		2318.85
	05/19/2003		90.91		2319.66
	12/01/2003		92.02		2318.55
	02/09/2004		92.07		2318.50
	05/03/2004		91.93		2318.64
	11/08/2004		92.59		2317.98
	11/07/2005		90.15		2320.42
	05/08/2006		92.38		2318.19
	11/27/2006		89.66		2320.91
04/30/2007		89.94		2320.63	
12/10/2007		83.68		2326.89	
05/05/2008		85.50		2325.07	
11/04/2008		85.17		2325.40	
PEP-16	12/14/2000		99.55		2322.22
	01/16/2001		96.47		2325.30
	02/26/2001		96.49		2325.28
	03/16/2001		96.42		2325.35
	04/23/2001		96.49		2325.28
	05/15/2001		96.36		2325.41
	05/18/2001		96.60		2325.17
	06/14/2001		96.63		2325.14
	07/11/2001		96.79		2324.98
	08/10/2001		96.90		2324.87
	09/20/2001		96.80		2324.97
	10/18/2001		96.89		2324.88
	11/19/2001		97.05		2324.72
	12/13/2001		97.17		2324.60
	02/14/2002		97.47		2324.30
	06/06/2002		97.97		2323.80
	08/19/2002		98.19		2323.58
	12/11/2002		97.68		2324.09
	01/27/2003		97.18		2324.59
	05/19/2003		97.14		2324.63
12/01/2003		97.54		2324.23	
02/09/2004		97.54		2324.23	
05/03/2004		97.29		2324.48	
PEP-17	12/15/2000		90.31		2324.99
	01/16/2001		90.15		2325.15
	02/26/2001		90.41		2324.89
	03/16/2001		90.21		2325.09

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PEP-17 (cont)	04/12/2001		90.24		2325.06
	04/23/2001		90.31		2324.99
	05/16/2001		90.08		2325.22
	05/18/2001		90.35		2324.95
	06/14/2001		90.42		2324.88
	07/11/2001		90.70		2324.60
	08/10/2001		90.99		2324.31
	09/20/2001		90.82		2324.48
	10/18/2001		90.85		2324.45
	11/19/2001		91.13		2324.17
	12/13/2001		91.30		2324.00
	02/14/2002		91.85		2323.45
	06/06/2002		92.74		2322.56
	08/19/2002		93.14		2322.16
	12/11/2002		92.59		2322.71
	01/27/2003		91.87		2323.43
	05/19/2003		91.42		2323.88
	12/01/2003		92.25		2323.05
	02/09/2004		92.27		2323.03
	05/03/2004		92.11		2323.19
PEP-18	12/14/2000		86.35		2325.16
	01/16/2001		87.01		2324.50
	02/26/2001		86.58		2324.93
	03/16/2001		86.74		2324.77
	04/23/2001		86.96		2324.55
	05/15/2001		86.67		2324.84
	05/18/2001		86.93		2324.58
	06/14/2001		87.25		2324.26
	07/11/2001		87.54		2323.97
	08/10/2001		87.45		2324.06
	09/20/2001		87.21		2324.30
	10/18/2001		87.57		2323.94
	11/19/2001		87.91		2323.61
	12/13/2001		88.08		2323.43
	02/14/2002		88.54		2322.97
	06/06/2002		89.23		2322.28
	08/19/2002		89.56		2321.95
	12/11/2002		88.58		2322.93
	01/27/2003		87.69		2323.82
	05/19/2003		88.10		2323.41
	12/01/2003		88.62		2322.89
	02/09/2004		88.86		2322.65
	05/03/2004		88.14		2323.37
	11/08/2004		88.95		2322.56
	11/07/2005		87.51		2324.00
	05/08/2006		88.96		2322.55
11/27/2006		86.82		2324.69	
04/30/2007		87.65		2323.86	
12/10/2007		85.16		2326.35	
05/05/2008		86.57		2324.94	
11/04/2008		85.86		2325.65	
PEP-19	05/14/2002		93.55		2324.70
	06/06/2002		93.74		2324.51
	08/19/2002		94.09		2324.16
	12/11/2002		93.29		2324.96
	01/27/2003		92.25		2326.00
	05/19/2003		92.20		2326.05
	12/01/2003		91.97		2326.28
	02/09/2004		92.00		2326.25
	05/03/2004		91.42		2326.83
11/08/2004		92.33		2325.92	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PEP-19 (cont)	11/07/2005		91.57		2326.68
	05/08/2006		93.21		2325.04
	11/27/2006		91.81		2326.44
	04/30/2007		92.43		2325.82
	12/10/2007		89.99		2328.26
	05/05/2008		91.16		2327.09
	11/04/2008		90.52		2327.73
PEP-24	12/11/2002		87.95		2323.94
	01/27/2003		87.90		2323.99
	05/19/2003		87.92		2323.97
	12/01/2003		87.99		2323.90
	02/09/2004		87.66		2324.23
	05/03/2004		86.93		2324.96
	11/10/2004	87.41	87.87	0.46	2324.02
	11/07/2005	87.19	88.53	1.34	2323.36
	05/08/2006	87.17	88.14	0.97	2323.75
	11/27/2006	86.71	87.10	0.39	2324.79
	04/30/2007	87.43	88.78	1.35	2323.11
	12/10/2007	87.00	87.83	0.83	2324.06
	05/05/2008	87.39	88.64	1.25	2323.25
	11/04/2008	87.13	87.88	0.75	2324.01
SVE-101	04/30/1993	89.55	89.58	0.03	2325.13
	06/09/1993		89.39		2325.32
	05/31/2000	89.94	94.03	4.09	2320.68
	07/14/2000	90.02	92.43	2.41	2322.28
	08/21/2000	90.20	94.78	4.58	2319.93
	09/22/2000	90.25	95.50	5.25	2319.21
	10/25/2000	90.19	94.60	4.41	2320.11
	11/21/2000	90.14	93.97	3.83	2320.74
	12/15/2000	90.07	91.47	1.40	2323.24
	01/17/2001	89.97	91.03	1.06	2323.68
	02/09/2001	89.99	90.84	0.85	2323.87
	02/27/2001	89.91	90.96	1.05	2323.75
	03/16/2001	89.91	90.92	1.01	2323.79
	04/23/2001	89.94	91.08	1.14	2323.63
	05/18/2001	89.76	91.00	1.24	2323.71
	06/14/2001	89.77	91.08	1.31	2323.63
	07/11/2001	89.96	91.41	1.45	2323.30
	08/10/2001	89.87	91.46	1.59	2323.25
	09/15/2001	89.98	91.43	1.45	2323.28
	10/18/2001	89.91	91.44	1.53	2323.27
	10/26/2001	89.89	91.48	1.59	2323.23
	11/02/2001	89.99	91.58	1.59	2323.13
	12/01/2003	90.52	94.79	4.27	2319.92
	02/09/2004	90.40	94.27	3.87	2320.44
	05/03/2004	89.94	91.02	1.08	2323.69
	11/08/2004	90.10	90.13	0.03	2324.58
	05/09/2005	90.23	91.71	1.48	2323.00
	11/07/2005		87.79		2326.92
	05/08/2006	90.08	91.18	1.10	2323.53
	11/27/2006	89.43	89.56	0.13	2325.15
04/30/2007	90.06	90.21	0.15	2324.50	
12/10/2007	90.06	90.21	0.15	2324.50	
05/05/2008					
SVE-102	04/30/1993		86.55		2328.25
	06/09/1993		89.47		2325.33
	05/31/2000	89.95	91.49	1.54	2323.31
	07/14/2000	90.26	91.82	1.56	2322.98
	08/21/2000	90.30	92.20	1.90	2322.60
	09/22/2000	90.33	93.53	3.20	2321.27
	10/25/2000	90.20	93.60	3.40	2321.20

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
SVE-102 (cont)	11/21/2000	90.12	93.76	3.64	2321.04
	12/15/2000	89.90	93.80	3.90	2321.00
	01/17/2001	89.99	91.80	1.81	2323.00
	02/09/2001	89.75	91.96	2.21	2322.84
	02/27/2001	90.04	92.46	2.42	2322.34
	03/16/2001	90.02	91.03	1.01	2323.77
	04/23/2001	89.87	92.97	3.10	2321.83
	05/18/2001	89.95	93.08	3.13	2321.72
	06/14/2001	89.99	92.87	2.88	2321.93
	07/11/2001	89.91	93.13	3.22	2321.67
	08/10/2001	89.96	93.29	3.33	2321.51
	09/20/2001	89.98	92.83	2.85	2321.97
	10/18/2001	90.03	92.87	2.84	2321.93
	10/26/2001	89.90	91.08	1.18	2323.72
	11/02/2001	90.07	92.94	2.87	2321.86
	11/19/2001	90.10	92.93	2.83	2321.87
	12/13/2001	90.18	93.03	2.85	2321.77
	02/14/2002	90.27	92.13	1.86	2322.67
	06/06/2002	90.57	93.31	2.74	2321.49
	08/19/2002	90.85	91.47	0.62	2323.33
	12/11/2002	90.85	91.18	0.33	2323.62
	01/27/2003	90.78	91.45	0.67	2323.35
	05/19/2003	90.40	94.62	4.22	2320.18
	12/01/2003	90.51	95.26	4.75	2319.54
	02/09/2004	90.39	95.00	4.61	2319.80
	05/03/2004	89.92	94.98	5.06	2319.82
	11/08/2004	90.40	94.94	4.54	2319.86
	05/09/2005	90.32	94.41	4.09	2320.39
	11/07/2005		90.01		2324.79
	05/08/2006	90.58	95.57	4.99	2319.23
11/27/2006	89.42	89.89	0.47	2324.91	
04/30/2007	90.22	92.47	2.25	2322.33	
12/10/2007	89.47	90.02	0.55	2324.78	
05/05/2008					
SVE-103	04/30/1993	89.35	89.40	0.05	2325.31
	06/09/1993	89.36	89.38	0.02	2325.33
	05/31/2000	89.89	97.06	7.17	2317.65
	07/14/2000	90.05	97.20	7.15	2317.51
	08/21/2000	90.20	95.98	5.78	2318.73
	09/22/2000	90.03	96.47	6.44	2318.24
	10/25/2000	89.96	96.96	7.00	2317.75
	11/21/2000	89.86	95.98	6.12	2318.73
	12/15/2000	89.68	93.65	3.97	2321.06
	01/17/2001	89.87	91.18	1.31	2323.53
	02/09/2001	89.78	90.98	1.20	2323.73
	02/27/2001	89.69	90.73	1.04	2323.98
	03/16/2001	89.59	90.61	1.02	2324.10
	04/23/2001	89.84	90.82	0.98	2323.89
	05/18/2001	89.70	90.55	0.85	2324.16
	06/14/2001	89.69	90.59	0.90	2324.12
	07/11/2001	89.87	90.91	1.04	2323.80
	08/10/2001	89.76	90.92	1.16	2323.79
	09/15/2001	89.93	91.00	1.07	2323.71
	09/20/2001	89.71	90.70	0.99	2324.01
	10/18/2001	89.93	90.98	1.05	2323.73
	11/02/2001	89.95	91.20	1.25	2323.51
	12/01/2003	90.81	90.93	0.12	2323.78
	02/12/2004	90.69	90.71	0.02	2324.00
	05/03/2004		90.71		2324.00
	11/08/2004		90.53		2324.18
	05/09/2005	89.75	89.82	0.07	2324.89

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
SVE-103 (cont)	11/07/2005		89.92		2324.79
	05/08/2006	90.49	93.62	3.13	2321.09
	11/27/2006	89.75	93.36	3.61	2321.35
	04/30/2007	90.23	90.69	0.46	2324.02
	12/10/2007				
	05/05/2008				
SVE-104	04/30/1993		89.40		2325.47
	06/09/1993		89.42		2325.45
	05/31/2000	90.15	94.55	4.40	2320.32
	07/14/2000	90.31	94.64	4.33	2320.23
	08/21/2000	90.38	94.49	4.11	2320.38
	09/22/2000	90.55	93.27	2.72	2321.60
	10/25/2000	90.42	93.51	3.09	2321.36
	11/21/2000	90.21	92.26	2.05	2322.61
	12/15/2000	90.01	92.25	2.24	2322.62
	01/17/2001	89.53	91.90	2.37	2322.97
	02/09/2001	89.88	92.80	2.92	2322.07
	02/27/2001	89.86	90.53	0.67	2324.34
	03/16/2001	89.59	91.05	1.46	2323.82
	04/23/2001	89.90	91.95	2.05	2322.92
	05/18/2001	89.72	91.57	1.85	2323.30
	06/14/2001	89.68	91.36	1.68	2323.51
	07/11/2001	89.93	92.10	2.17	2322.77
	08/10/2001	89.86	90.45	0.59	2324.42
	09/20/2001	89.80	91.37	1.57	2323.50
	10/18/2001	90.09	92.28	2.19	2322.59
	11/02/2001	90.10	92.50	2.40	2322.37
	11/19/2001	89.89	92.13	2.24	2322.74
	12/13/2001	90.20	93.03	2.83	2321.84
	02/14/2002	90.27	95.29	5.02	2319.58
	06/06/2002	90.42	95.41	4.99	2319.46
	08/19/2002	90.75	95.87	5.12	2319.00
	12/11/2002	90.65	95.91	5.26	2318.96
	01/27/2003	90.67	91.42	0.75	2323.45
	05/19/2003	90.64	91.28	0.64	2323.59
	12/01/2003	90.91	91.42	0.51	2323.45
	02/12/2004	90.97	91.35	0.38	2323.52
05/03/2004	90.23	93.29	3.06	2321.58	
11/08/2004	90.16	95.04	4.88	2319.83	
05/09/2005	90.34	94.80	4.46	2320.07	
11/07/2005	89.98	93.13	3.15	2321.74	
05/08/2006	90.50	90.91	0.41	2323.96	
11/27/2006	89.96	91.80	1.84	2323.07	
04/30/2007	90.08	93.83	3.75	2321.04	
12/10/2007		89.65		2325.22	
05/05/2008					
WR-345A	02/06/1998		95.55		2316.70
	02/23/1998		95.37		2316.88
	02/25/1998		95.29		2316.96
	04/20/1999		94.10		2318.15
	08/12/1999		95.03		2317.22
	09/20/1999		94.52		2317.73
	10/14/1999		93.92		2318.33
	12/10/1999		93.14		2319.11
	01/04/2000		93.56		2318.69
	01/28/2000		93.62		2318.63
	04/14/2000		94.38		2317.87
	04/21/2000		94.51		2317.74
	05/15/2000		94.80		2317.45
	06/21/2000		95.25		2317.00
	06/30/2000		95.43		2316.82

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
WR-345A (cont)	07/17/2000		95.59		2316.66
	07/28/2000		95.68		2316.57
	08/21/2000		96.00		2316.25
	09/22/2000		95.98		2316.27
	10/25/2000		95.71		2316.54
	11/20/2000		95.26		2316.99
	12/15/2000		94.72		2317.53
	01/16/2001		93.79		2318.46
	02/26/2001		93.60		2318.65
	03/16/2001		93.32		2318.93
	04/23/2001		93.35		2318.90
	05/16/2001		92.82		2319.43
	05/18/2001		93.10		2319.15
	06/14/2001		92.91		2319.34
	07/11/2001		92.99		2319.26
	08/10/2001		93.37		2318.88
	09/20/2001		93.54		2318.71
	10/18/2001		93.57		2318.68
	11/19/2001		93.84		2318.41
	12/13/2001		94.19		2318.06
	02/14/2002		94.69		2317.56
	06/06/2002		96.22		2316.03
	08/19/2002		96.75		2315.50
	12/11/2002		96.09		2316.16
	01/27/2003		95.50		2316.75
	05/19/2003		95.47		2316.78
	12/01/2003		96.04		2316.21
	02/09/2004		96.04		2316.21
	05/03/2004		95.94		2316.31
	11/08/2004		96.36		2315.89
11/07/2005		94.88		2317.37	
05/08/2006		96.12		2316.13	
11/27/2006		94.61		2317.64	
04/30/2007		94.44		2317.81	
12/10/2007		85.42		2326.83	
05/05/2008		89.54		2322.71	
11/04/2008		89.28		2322.97	
WR-347A	02/06/1998		96.10		2323.33
	02/23/1998		96.48		2322.95
	02/25/1998		96.51		2322.92
	10/20/1998		94.33		2325.10
	04/20/1999		95.95		2323.48
	08/12/1999		96.34		2323.09
	09/20/1999		95.43		2324.00
	10/14/1999		94.79		2324.64
	12/10/1999		95.01		2324.42
	01/28/2000		95.66		2323.77
	04/14/2000		96.31		2323.12
	04/21/2000		96.37		2323.06
	05/17/2000		96.57		2322.86
	06/21/2000		96.60		2322.83
	06/30/2000		96.75		2322.68
	07/05/2000		96.76		2322.67
	07/07/2000		96.75		2322.68
	07/14/2000		96.73		2322.70
	07/28/2000		96.85		2322.58
	08/21/2000		96.95		2322.48
	09/22/2000		96.84		2322.59
	10/25/2000		96.55		2322.88
	11/20/2000		96.13		2323.30
12/15/2000		95.34		2324.09	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
WR-347A (cont)	01/16/2001		95.10		2324.33
	02/26/2001		95.24		2324.19
	03/16/2001		95.10		2324.33
	04/23/2001		95.19		2324.24
	05/15/2001		94.97		2324.46
	05/18/2001		95.03		2324.40
	06/14/2001		95.14		2324.29
	07/11/2001		95.34		2324.09
	08/10/2001		95.58		2323.85
	09/20/2001		95.40		2324.03
	10/18/2001		95.49		2323.94
	11/19/2001		95.73		2323.70
	12/13/2001		95.85		2323.58
	02/14/2002		96.27		2323.16
	06/06/2002		96.88		2322.55
	08/19/2002		97.15		2322.28
	08/23/2002		97.04		2322.39
	12/11/2002		96.62		2322.81
	01/27/2003		96.97		2322.46
	05/19/2003		96.48		2322.95
	12/01/2003	96.92	97.88	0.96	2321.55
	02/09/2004	96.81	98.46	1.65	2320.97
	05/03/2004	96.38	98.99	2.61	2320.44
	11/08/2004	96.85	96.87	0.02	2322.56
	11/07/2005	95.10	97.68	2.58	2321.75
	05/08/2006	96.33	99.32	2.99	2320.11
11/27/2006	94.55	97.55	3.00	2321.88	
04/30/2007	95.23	98.42	3.19	2321.01	
12/10/2007	92.12	94.56	2.44	2324.87	
05/05/2008	93.85	96.13	2.28	2323.30	
11/04/2008	93.25	95.52	2.27	2323.91	
Regional Aquifer Groundwater Monitoring Wells					
MLR-1	04/22/1991		178.57		2238.94
	05/06/1991		181.72		2235.79
	06/10/1991		182.29		2235.22
	10/04/1991		180.01		2237.50
	11/20/1991		180.67		2236.84
	01/23/1992		181.02		2236.49
	03/11/1992		181.34		2236.17
	04/10/1992		181.46		2236.05
	05/13/1992		181.37		2236.14
	06/17/1992		181.79		2235.72
	07/09/1992		182.04		2235.47
	09/01/1992		182.29		2235.22
	09/23/1992		182.76		2234.75
	11/04/1992		183.88		2233.63
	01/06/1993		184.56		2232.95
	02/05/1993		184.52		2232.99
	03/08/1993		184.65		2232.86
	04/13/1993		184.99		2232.52
	04/30/1993		185.07		2232.44
	06/09/1993		185.58		2231.93
	07/13/1993		185.79		2231.72
	08/24/1993		185.88		2231.63
	10/14/1993		186.40		2231.11
	12/01/1993		186.78		2230.73
	12/29/1993		187.04		2230.47
	01/11/1994		186.95		2230.56
	06/02/1994		187.40		2230.11
	07/14/1994		187.85		2229.66
09/08/1994		188.14		2229.37	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLR-1 (cont)	10/05/1994		188.35		2229.16
	11/17/1994		188.46		2229.05
	12/08/1994		188.65		2228.86
	01/01/1995		188.46		2229.05
	02/01/1995		188.49		2229.02
	03/01/1995		188.59		2228.92
	04/01/1995		188.47		2229.04
	05/01/1995		189.20		2228.31
	06/01/1995		189.20		2228.31
	03/20/1998		195.25		2222.26
	10/20/1998		197.22		2220.29
	04/20/1999		197.00		2220.51
	08/12/1999		198.22		2219.29
	10/14/1999		198.51		2219.00
	02/07/2000		198.95		2218.56
	03/07/2000		198.89		2218.62
	04/07/2000		199.37		2218.14
	05/15/2000		199.40		2218.11
	06/21/2000		200.00		2217.51
	07/17/2000		199.54		2217.97
	08/21/2000		200.20		2217.31
	09/26/2000		200.30		2217.21
	10/25/2000		200.51		2217.00
	11/20/2000		200.57		2216.94
	12/15/2000		200.90		2216.61
	01/17/2001		200.77		2216.74
	02/27/2001		200.36		2217.15
	03/16/2001		200.62		2216.89
	03/16/2001		200.62		2216.89
	04/23/2001		200.84		2216.67
	05/18/2001		201.38		2216.13
	06/14/2001		201.68		2215.83
	07/11/2001		201.65		2215.86
08/10/2001		201.81		2215.70	
09/20/2001		201.99		2215.52	
10/18/2001		202.15		2215.36	
11/19/2001		202.00		2215.51	
12/13/2001		202.66		2214.85	
02/14/2002		202.49		2215.02	
06/06/2002		203.08		2214.43	
08/19/2002		203.48		2214.03	
12/11/2002		203.51		2214.00	
01/27/2003		203.75		2213.76	
05/27/2003		204.04		2213.47	
12/01/2003		204.63		2212.88	
02/09/2004		204.78		2212.73	
05/03/2004		205.16		2212.35	
11/08/2004		205.52		2211.99	
05/09/2005		205.68		2211.83	
11/07/2005		205.86		2211.65	
05/08/2006		204.70		2212.81	
11/27/2006		205.15		2212.36	
04/30/2007		205.89		2211.62	
12/10/2007		206.08		2211.43	
05/06/2008		206.04		2211.47	
11/03/2008		206.53		2210.98	
MLR-2	05/02/1991		178.60		2237.81
	05/06/1991		182.07		2234.34
	06/10/1991		182.07		2234.34
	10/04/1991		179.94		2236.47
	11/20/1991		180.60		2235.81

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLR-2 (cont)	01/23/1992		180.91		2235.50
	03/11/1992		181.21		2235.20
	04/10/1992		181.43		2234.98
	05/13/1992		181.34		2235.07
	06/17/1992		181.73		2234.68
	07/09/1992		181.83		2234.58
	09/01/1992		182.36		2234.05
	09/23/1992		182.73		2233.68
	11/04/1992		183.98		2232.43
	01/06/1993		184.34		2232.07
	02/05/1993		184.65		2231.76
	03/08/1993		184.75		2231.66
	04/13/1993		185.19		2231.22
	04/30/1993		185.14		2231.27
	06/09/1993		185.58		2230.83
	07/13/1993		185.90		2230.51
	08/24/1993		186.12		2230.29
	10/14/1993		186.21		2230.20
	12/01/1993		187.02		2229.39
	12/29/1993		187.19		2229.22
	01/11/1994		187.15		2229.26
	06/02/1994		187.58		2228.83
	07/14/1994		188.01		2228.40
	09/08/1994		188.37		2228.04
	10/05/1994		188.58		2227.83
	11/17/1994		188.78		2227.63
	12/08/1994		188.85		2227.56
	01/01/1995		188.66		2227.75
	02/01/1995		188.71		2227.70
	03/01/1995		188.78		2227.63
	04/01/1995		188.72		2227.69
	05/01/1995		189.43		2226.98
	06/01/1995		189.43		2226.98
	03/20/1998		195.67		2220.74
	10/20/1998		197.62		2218.79
	04/20/1999		197.60		2218.81
	08/12/1999		198.43		2217.98
	10/14/1999		198.76		2217.65
	02/07/2000		199.21		2217.20
	03/07/2000		199.22		2217.19
04/07/2000		199.58		2216.83	
05/15/2000		199.65		2216.76	
06/21/2000		199.84		2216.57	
07/14/2000		200.10		2216.31	
08/21/2000		200.44		2215.97	
09/22/2000		200.38		2216.03	
10/25/2000		200.71		2215.70	
11/20/2000		200.77		2215.64	
12/15/2000		201.10		2215.31	
01/17/2001		200.63		2215.78	
02/26/2001		200.36		2216.05	
03/16/2001		200.64		2215.77	
04/23/2001		201.02		2215.39	
05/18/2001		201.42		2214.99	
06/14/2001		201.67		2214.74	
07/11/2001		201.72		2214.69	
08/10/2001		201.80		2214.61	
09/20/2001		201.91		2214.50	
10/18/2001		202.10		2214.31	
11/19/2001		202.03		2214.38	
12/13/2001		202.62		2213.79	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLR-2 (cont)	02/14/2002		202.42		2213.99
	06/07/2002		202.86		2213.55
	08/19/2002		203.43		2212.98
	12/11/2002		203.49		2212.92
	01/27/2003		203.71		2212.70
	05/27/2003		204.11		2212.30
	12/01/2003		204.61		2211.80
	02/09/2004		204.83		2211.58
	05/03/2004		205.21		2211.20
	11/08/2004		205.43		2210.98
	05/09/2005		205.55		2210.86
	11/07/2005		205.76		2210.65
	05/08/2006		204.80		2211.61
	11/27/2006		204.98		2211.43
	04/30/2007		205.45		2210.96
	12/10/2007		205.87		2210.54
	05/06/2008		205.90		2210.51
11/03/2008		206.52		2209.89	
MLR-3	04/22/1991		181.95		2236.50
	05/06/1991		185.27		2233.18
	06/10/1991		185.27		2233.18
	10/04/1991		182.87		2235.58
	11/20/1991		183.68		2234.77
	01/23/1992		184.06		2234.39
	03/11/1992		184.35		2234.10
	04/10/1992		184.54		2233.91
	05/13/1992		184.41		2234.04
	06/17/1992		185.16		2233.29
	07/09/1992		185.13		2233.32
	09/01/1992		185.67		2232.78
	09/23/1992		185.81		2232.64
	11/04/1992		187.02		2231.43
	01/06/1993		187.60		2230.85
	02/05/1993		187.73		2230.72
	03/08/1993		187.85		2230.60
	04/13/1993		188.09		2230.36
	04/30/1993		188.21		2230.24
	06/09/1993		188.76		2229.69
	07/13/1993		188.95		2229.50
	08/24/1993		189.11		2229.34
	10/14/1993		189.92		2228.53
	12/01/1993		190.04		2228.41
	12/29/1993		190.65		2227.80
	01/11/1994		190.33		2228.12
	06/02/1994		190.60		2227.85
	07/14/1994		191.06		2227.39
	09/08/1994		191.39		2227.06
	10/05/1994		191.65		2226.80
	11/17/1994		191.76		2226.69
	12/08/1994		191.85		2226.60
	01/01/1995		191.67		2226.78
02/01/1995		191.68		2226.77	
03/01/1995		191.74		2226.71	
04/01/1995		191.71		2226.74	
05/01/1995		192.39		2226.06	
06/01/1995		192.39		2226.06	
03/20/1998		198.49		2219.96	
10/20/1998		200.56		2217.89	
04/20/1999		200.10		2218.35	
08/12/1999		201.25		2217.20	
10/14/1999		201.49		2216.96	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLR-3 (cont)	02/07/2000		201.95		2216.50
	03/07/2000		201.90		2216.55
	04/07/2000		202.33		2216.12
	05/15/2000		202.40		2216.05
	06/21/2000		202.78		2215.67
	07/14/2000		202.87		2215.58
	08/21/2000		203.10		2215.35
	09/22/2000		203.10		2215.35
	10/25/2000		203.39		2215.06
	11/20/2000		203.50		2214.95
	12/15/2000		203.76		2214.69
	01/17/2001		203.52		2214.93
	02/27/2001		203.16		2215.29
	03/16/2001		203.36		2215.09
	04/23/2001		203.63		2214.82
	05/18/2001		204.13		2214.32
	06/14/2001		204.41		2214.04
	07/11/2001		204.29		2214.16
	08/10/2001		204.47		2213.98
	09/20/2001		204.62		2213.83
	10/18/2001		204.80		2213.65
	11/19/2001		204.68		2213.77
	12/13/2001		205.26		2213.19
	02/14/2002		205.04		2213.41
	06/07/2002		205.51		2212.94
	08/19/2002		206.12		2212.33
	12/12/2002		206.62		2211.83
	01/27/2003		206.39		2212.06
	05/27/2003		206.67		2211.78
	12/01/2003		207.18		2211.27
	02/09/2004		207.40		2211.05
	05/03/2004		207.74		2210.71
	11/08/2004		208.05		2210.40
	05/09/2005		208.15		2210.30
11/08/2005		208.34		2210.11	
05/08/2006		207.21		2211.24	
11/27/2006		207.50		2210.95	
04/30/2007		207.91		2210.54	
12/10/2007		208.27		2210.18	
05/06/2008		208.30		2210.15	
11/03/2008		208.74		2209.71	
MLR-7	06/02/1994	189.60	189.62	0.02	2232.11
	07/14/1994	193.13	193.14	0.01	2228.59
	09/08/1994		193.34		2228.39
	10/05/1994		193.53		2228.20
	11/17/1994		193.59		2228.14
	12/08/1994		193.69		2228.04
	01/01/1995		193.43		2228.30
	01/01/1995		193.41		2228.32
	02/01/1995		193.45		2228.28
	03/01/1995		193.38		2228.35
	04/01/1995		193.33		2228.40
	05/01/1995		193.90		2227.83
	06/01/1995		193.92		2227.81
	03/20/1998		200.52		2221.21
	10/20/1998		202.51		2219.22
	04/20/1999		202.17		2219.56
	08/12/1999		203.28		2218.45
	10/14/1999		203.63		2218.10
	02/07/2000		204.09		2217.64
03/07/2000		204.08		2217.65	

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
MLR-7 (cont)	04/07/2000		204.48		2217.25
	05/15/2000		204.55		2217.18
	06/21/2000		204.94		2216.79
	07/14/2000		205.08		2216.65
	08/21/2000		205.28		2216.45
	09/22/2000		205.26		2216.47
	10/25/2000		205.62		2216.11
	11/20/2000		205.75		2215.98
	12/15/2000		205.64		2216.09
	01/17/2001		205.77		2215.96
	02/27/2001		205.47		2216.26
	03/16/2001		205.63		2216.10
	04/23/2001		205.98		2215.75
	05/18/2001		206.36		2215.37
	06/14/2001		206.66		2215.07
	07/11/2001		206.69		2215.04
	08/10/2001		206.79		2214.94
	09/20/2001		206.92		2214.81
	10/18/2001		207.16		2214.57
	11/19/2001		206.98		2214.75
	12/13/2001		207.68		2214.05
	02/14/2002		207.54		2214.19
	06/06/2002		208.05		2213.68
	08/19/2002		208.60		2213.13
	12/12/2002		209.04		2212.69
	01/27/2003		208.90		2212.83
	05/27/2003		209.21		2212.52
	12/01/2003		209.74		2211.99
	02/09/2004		209.97		2211.76
	05/03/2004		210.31		2211.42
	11/08/2004		210.69		2211.04
	05/09/2005		210.74		2210.99
11/08/2005		211.00		2210.73	
05/08/2006		209.78		2211.95	
11/27/2006		210.20		2211.53	
04/30/2007		210.61		2211.12	
12/10/2007		211.02		2210.71	
05/06/2008		210.99		2210.74	
11/03/2008		211.42		2210.31	
PBR-10	06/06/2002		199.50		2206.40
	08/19/2002		201.29		2204.61
	12/11/2002		201.59		2204.31
	01/27/2003		201.20		2204.70
	05/27/2003		201.58		2204.32
	12/01/2003		202.07		2203.83
	02/09/2004		202.28		2203.62
	11/08/2004		202.09		2203.81
	05/08/2005		201.91		2203.99
	11/07/2005		202.06		2203.84
	05/08/2006		201.39		2204.51
	11/27/2006		200.92		2204.98
	04/30/2007		200.70		2205.20
12/10/2007		201.52		2204.38	
05/06/2008		201.47		2204.43	
11/03/2008		202.00		2203.90	
PER-14	12/15/2000		194.35		2225.98
	01/16/2001		193.02		2227.31
	02/26/2001		193.51		2226.82
	03/16/2001		193.01		2227.32
	04/23/2001		193.03		2227.30
	05/18/2001		193.47		2226.86

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PER-14 (cont)	06/14/2001		193.81		2226.52
	07/11/2001		194.06		2226.27
	08/10/2001		193.99		2226.34
	09/20/2001		195.29		2225.04
	10/18/2001		195.52		2224.81
	11/19/2001		196.41		2223.92
	12/13/2001		196.48		2223.85
	02/14/2002		195.87		2224.46
	06/06/2002		197.14		2223.19
	08/19/2002		197.33		2223.00
	12/11/2002		197.68		2222.65
	01/27/2003		196.49		2223.84
	05/27/2003		197.86		2222.47
	12/01/2003		198.21		2222.12
	02/09/2004		197.91		2222.42
	05/03/2004		198.21		2222.12
	11/08/2004		198.94		2221.39
	05/09/2005		198.41		2221.92
	11/07/2005		196.95		2223.38
	05/08/2006		197.15		2223.18
11/27/2006		196.03		2224.30	
04/30/2007		196.53		2223.80	
12/10/2007		195.65		2224.68	
05/06/2008		195.61		2224.72	
11/03/2008		194.88		2225.45	
PER-14A	11/06/2008		206.90		2210.43
PER-15	12/15/2000		198.32		2212.77
	01/16/2001		197.73		2213.36
	02/26/2001		197.65		2213.44
	03/16/2001		197.60		2213.49
	04/23/2001		198.09		2213.00
	05/18/2001		198.78		2212.31
	06/14/2001		199.03		2212.06
	07/11/2001		199.05		2212.04
	08/10/2001		199.02		2212.07
	09/20/2001		199.23		2211.86
	10/18/2001		199.41		2211.68
	11/19/2001		199.24		2211.85
	12/13/2001		199.89		2211.20
	02/14/2002		199.71		2211.38
	05/24/2002		199.86		2211.23
	06/06/2002		200.20		2210.89
	08/19/2002		200.66		2210.43
	12/12/2002		201.01		2210.08
	01/27/2003		200.74		2210.35
	05/27/2003		201.17		2209.92
12/01/2003		201.62		2209.47	
02/09/2004		201.80		2209.29	
05/03/2004		202.13		2208.96	
11/08/2004		202.49		2208.60	
05/09/2005		202.36		2208.73	
11/07/2005		202.70		2208.39	
05/08/2006		201.55		2209.54	
11/27/2006		201.46		2209.63	
04/30/2007		201.70		2209.39	
12/10/2007		202.31		2208.78	
05/06/2008		202.21		2208.88	
11/03/2008		202.63		2208.46	
PER-21	05/24/2002		199.92		2210.18
	06/06/2002		200.33		2209.77
	08/19/2002		200.87		2209.23

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
PER-21 (cont)	12/12/2002		201.22		2208.88
	01/27/2003		200.96		2209.14
	05/27/2003		201.48		2208.62
	12/01/2003		201.93		2208.17
	02/09/2004		202.01		2208.09
	05/03/2004		202.34		2207.76
	11/08/2004		203.21		2206.89
	05/09/2005		202.49		2207.61
	11/07/2005		202.64		2207.46
	05/08/2006		201.51		2208.59
	11/27/2006		201.35		2208.75
	04/30/2007		201.53		2208.57
	12/10/2007		202.10		2208.00
	05/06/2008		202.00		2208.10
11/03/2008		202.40		2207.70	
PER-22	05/24/2002		199.42		2210.99
	06/06/2002		199.73		2210.68
	08/19/2002		200.24		2210.17
	12/12/2002		200.69		2209.72
	12/01/2003		201.43		2208.98
	02/09/2004		201.58		2208.83
	05/03/2004		201.91		2208.50
	11/08/2004		202.07		2208.34
	05/09/2005		202.10		2208.31
	11/07/2005		202.30		2208.11
	05/08/2006		201.22		2209.19
	11/27/2006		201.23		2209.18
	04/30/2007		201.44		2208.97
	12/11/2007		201.99		2208.42
	01/10/2008		202.19		2208.22
	05/06/2008		201.91		2208.50
11/03/2008		202.35		2208.06	
PER-23	06/06/2002		209.79		2208.37
	08/19/2002		210.34		2207.82
	12/11/2002		210.65		2207.51
	01/27/2003		210.38		2207.78
	05/27/2003		210.96		2207.20
	12/01/2003		211.42		2206.74
	02/09/2004		211.51		2206.65
	05/03/2004		211.79		2206.37
	11/08/2004		211.81		2206.35
	05/09/2005		211.80		2206.36
	11/07/2005		211.98		2206.18
	05/08/2006		211.00		2207.16
	11/27/2006		210.78		2207.38
	04/30/2007		210.83		2207.33
12/10/2007		211.51		2206.65	
05/06/2008		211.43		2206.73	
11/03/2008		211.91		2206.25	
PER-25	01/27/2003		206.63		2207.83
	05/27/2003		207.07		2207.39
	12/01/2003		207.23		2207.23
	02/09/2004		207.71		2206.75
	05/03/2004		208.01		2206.45
	11/08/2004		208.22		2206.24
	05/09/2005		207.92		2206.54
	11/08/2005		208.04		2206.42
	05/08/2006		207.22		2207.24
	11/27/2006		206.94		2207.52
	04/30/2007		207.03		2207.43
12/10/2007		206.94		2207.52	

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION	
		feet	feet	feet	feet above mean sea level	
PER-25 (cont)	05/06/2008		207.63		2206.83	
	11/03/2008		208.09		2206.37	
PER-26	05/27/2003		209.41		2205.83	
	12/01/2003		209.77		2205.47	
	02/09/2004		209.99		2205.25	
	05/03/2004		210.23		2205.01	
	08/20/2004					
	11/08/2004		210.44		2204.80	
	05/09/2005		210.07		2205.17	
	11/08/2005		210.26		2204.98	
	05/08/2006		209.36		2205.88	
	11/27/2006		208.93		2206.31	
	04/30/2007		208.93		2206.31	
	12/10/2007		209.07		2206.17	
	05/06/2008		209.57		2205.67	
	11/03/2008		210.10		2205.14	
PER-27	05/27/2003		203.97		2206.22	
	12/01/2003		204.49		2205.70	
	02/09/2004		204.71		2205.48	
	05/03/2004		205.04		2205.15	
	11/08/2004		204.62		2205.57	
	05/09/2005		204.58		2205.61	
	11/07/2005		204.69		2205.50	
	05/08/2006		204.11		2206.08	
	11/27/2006		203.66		2206.53	
	04/30/2007		203.63		2206.56	
	12/10/2007		204.35		2205.84	
	05/06/2008		204.38		2205.81	
	UAM-1	02/03/2000		204.14		2203.66
		02/28/2000		208.00		2199.80
04/06/2000			208.06		2199.74	
08/21/2000			208.40		2199.40	
09/22/2000			208.52		2199.28	
10/25/2000			208.72		2199.08	
11/20/2000			208.60		2199.20	
12/15/2000			208.65		2199.15	
01/16/2001			207.10		2200.70	
02/26/2001			206.43		2201.37	
03/16/2001			206.71		2201.09	
04/11/2001			207.18		2200.62	
04/23/2001			207.37		2200.43	
05/18/2001			207.45		2200.35	
06/14/2001			207.81		2199.99	
07/11/2001			207.91		2199.89	
08/10/2001			208.05		2199.75	
09/20/2001			208.09		2199.71	
10/18/2001			208.04		2199.76	
11/19/2001			207.83		2199.97	
12/13/2001			208.23		2199.57	
02/20/2002			208.44		2199.36	
06/06/2002			208.78		2199.02	
08/19/2002			210.14		2197.66	
12/11/2002			209.81		2197.99	
01/27/2003			209.30		2198.50	
05/27/2003			208.98		2198.82	
12/01/2003			210.03		2197.77	
02/09/2004			210.17		2197.63	
04/08/2004			210.69		2197.11	
05/03/2004			210.31		2197.49	
06/11/2004						
07/16/2004		209.04		2198.76		

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
UAM-1 (cont)	08/20/2004				
	09/24/2004		208.76		2199.04
	10/14/2004		208.80		2199.00
	11/08/2004		208.54		2199.26
	12/01/2004		210.10		2197.70
	01/11/2005		208.45		2199.35
	02/23/2005				
	03/08/2005		208.29		2199.51
	04/12/2005		208.80		2199.00
	05/09/2005		208.29		2199.51
	06/17/2005		208.43		2199.37
	07/13/2005		208.51		2199.29
	11/07/2005		208.22		2199.58
	01/17/2006		208.33		2199.47
	02/07/2006		208.04		2199.76
	03/22/2006		209.17		2198.63
	04/11/2006		208.93		2198.87
	05/08/2006		207.72		2200.08
	06/19/2006		208.43		2199.37
	07/26/2006		207.34		2200.46
	08/24/2006		207.12		2200.68
	09/21/2006		206.91		2200.89
	10/25/2006		207.07		2200.73
	11/27/2006		206.95		2200.85
	12/29/2006		207.15		2200.65
	01/29/2007		206.89		2200.91
	02/22/2007		206.76		2201.04
	03/28/2007		206.81		2200.99
	04/19/2007		206.72		2201.08
	04/30/2007		206.65		2201.15
	06/14/2007		206.55		2201.25
	12/10/2007		207.61		2200.19
	01/10/2008		207.77		2200.03
02/11/2008		207.61		2200.19	
03/10/2008		207.55		2200.25	
04/14/2008		207.53		2200.27	
05/06/2008		207.54		2200.26	
06/09/2008		208.05		2199.75	
07/10/2008		207.35		2200.45	
08/19/2008		207.95		2199.85	
09/10/2008		208.20		2199.60	
10/08/2008		208.20		2199.60	
11/03/2008		208.26		2199.54	
12/09/2008		208.96		2198.84	
01/12/2009		209.69		2198.11	
UAM-2	02/03/2000		209.57		2202.51
	02/28/2000		210.10		2201.98
	04/06/2000		210.00		2202.08
	08/21/2000		209.77		2202.31
	09/22/2000		210.00		2202.08
	10/25/2000		210.20		2201.88
	11/20/2000		210.21		2201.87
	12/15/2000		210.20		2201.88
	01/16/2001		209.46		2202.62
	02/26/2001		208.82		2203.26
	03/16/2001		208.72		2203.36
	04/11/2001		208.87		2203.21
	04/23/2001		208.17		2203.91
	05/18/2001		209.36		2202.72
	06/14/2001		210.82		2201.26
	07/11/2001		209.72		2202.36

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
UAM-2 (cont)	08/10/2001		209.70		2202.38
	09/20/2001		209.66		2202.42
	10/18/2001		209.61		2202.47
	11/19/2001		209.53		2202.55
	12/13/2001		209.74		2202.34
	02/20/2002		210.13		2201.95
	06/06/2002		210.44		2201.64
	08/19/2002		212.26		2199.82
	12/11/2002		212.39		2199.69
	01/27/2003		210.85		2201.23
	05/27/2003		211.02		2201.06
	12/01/2003		211.46		2200.62
	02/09/2004		211.63		2200.45
	04/08/2004		211.86		2200.22
	05/03/2004		211.91		2200.17
	06/11/2004				
	07/17/2004		211.49		2200.59
	08/20/2004				
	09/24/2004		211.42		2200.66
	10/14/2004		211.39		2200.69
	11/08/2004		211.30		2200.78
	12/01/2004		212.53		2199.55
	01/11/2005		211.24		2200.84
	02/23/2005				
	03/08/2005		211.15		2200.93
	04/12/2005		211.39		2200.69
	05/09/2005		211.19		2200.89
	06/17/2005		211.35		2200.73
	07/13/2005		211.41		2200.67
	11/07/2005		211.22		2200.86
	01/17/2006		211.12		2200.96
	02/07/2006		210.88		2201.20
	03/22/2006		211.77		2200.31
	04/11/2006		211.59		2200.49
	05/08/2006		210.63		2201.45
	06/19/2006		211.15		2200.93
	07/26/2006		211.20		2200.88
	08/24/2006		210.05		2202.03
	09/21/2006		209.93		2202.15
	10/25/2006		209.87		2202.21
	11/27/2006		209.92		2202.16
	12/29/2006		210.10		2201.98
	01/29/2007		209.82		2202.26
	02/22/2007		209.68		2202.40
	03/28/2007		209.78		2202.30
	04/19/2007		209.72		2202.36
	04/30/2007		209.58		2202.50
06/14/2007		209.54		2202.54	
12/10/2007		210.42		2201.66	
01/10/2008		210.50		2201.58	
02/11/2008		210.90		2201.18	
03/10/2008		211.35		2200.73	
04/14/2008		210.19		2201.89	
05/06/2008		210.31		2201.77	
06/09/2008		210.86		2201.22	
07/10/2008		210.34		2201.74	
08/19/2008		210.69		2201.39	
09/10/2008		210.80		2201.28	
10/08/2008		210.95		2201.13	
11/03/2008		210.98		2201.10	

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Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
UAM-2 (cont)	12/09/2008		211.64		2200.44
	01/12/2009		212.02		2200.06
UAM-2B	05/06/2008		210.83		2201.97
	06/09/2008		211.38		2201.42
	07/10/2008		211.04		2201.76
	08/19/2008		211.29		2201.51
	09/10/2008		211.37		2201.43
	10/08/2008		211.51		2201.29
	11/03/2008		211.57		2201.23
	12/09/2008		212.23		2200.57
	01/12/2009		212.94		2199.86
UAM-3	02/03/2000		234.84		2197.34
	02/28/2000		236.53		2195.65
	04/06/2000		236.60		2195.58
	05/15/2000		85.32		2346.86
	08/21/2000		239.57		2192.61
	09/22/2000		235.30		2196.88
	10/25/2000		235.87		2196.31
	11/20/2000		235.77		2196.41
	12/15/2000		235.24		2196.94
	01/16/2001		234.51		2197.67
	02/26/2001		233.80		2198.38
	03/16/2001		233.56		2198.62
	03/29/2001		233.41		2198.77
	04/23/2001		233.16		2199.02
	05/18/2001		234.57		2197.61
	06/14/2001		234.45		2197.73
	07/11/2001		234.79		2197.39
	08/10/2001		234.37		2197.81
	09/20/2001		234.03		2198.15
	10/18/2001		233.86		2198.32
	11/19/2001		233.77		2198.41
	12/13/2001		233.88		2198.30
	02/20/2002		234.28		2197.90
	06/06/2002		234.60		2197.58
	08/19/2002		235.44		2196.74
	12/11/2002		235.53		2196.65
	01/27/2003		235.03		2197.15
	05/27/2003		235.16		2197.02
	04/08/2004		235.86		2196.32
	05/03/2004		235.81		2196.37
	06/11/2004				
	07/16/2004		235.77		2196.41
	08/20/2004				
	09/24/2004		235.71		2196.47
	10/14/2004				
	11/08/2004		235.51		2196.67
	12/01/2004		235.96		2196.22
	01/11/2005		235.57		2196.61
	02/23/2005		235.38		2196.80
	03/08/2005		235.34		2196.84
04/12/2005					
05/09/2005		235.52		2196.66	
06/17/2005		235.75		2196.43	
07/13/2005		235.84		2196.34	
11/07/2005		235.67		2196.51	
01/17/2006		235.72		2196.46	
02/07/2006		235.43		2196.75	
03/22/2006		236.26		2195.92	
04/11/2006		236.10		2196.08	
05/08/2006		235.15		2197.03	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
UAM-3 (cont)	06/19/2006		234.72		2197.46
	07/26/2006		234.64		2197.54
	08/24/2006		234.54		2197.64
	09/21/2006		234.45		2197.73
	10/25/2006		234.45		2197.73
	11/27/2006		234.20		2197.98
	12/29/2006		234.45		2197.73
	01/29/2007		234.20		2197.98
	02/22/2007		234.00		2198.18
	03/28/2007		234.05		2198.13
	04/19/2007		233.98		2198.20
	04/30/2007		233.91		2198.27
	06/14/2007		233.82		2198.36
	12/10/2007		234.65		2197.53
	01/10/2008		234.69		2197.49
	02/11/2008		234.45		2197.73
	03/10/2008		234.58		2197.60
	04/14/2008		234.34		2197.84
	05/06/2008		234.37		2197.81
	06/09/2008		234.89		2197.29
	07/10/2008		234.42		2197.76
	08/19/2008		234.94		2197.24
	09/10/2008		235.04		2197.14
	10/08/2008		235.17		2197.01
11/03/2008		234.95		2197.23	
12/09/2008		235.84		2196.34	
01/12/2009		236.52		2195.66	
WR-345B	02/06/1998		197.35		2214.97
	02/23/1998		197.01		2215.31
	03/20/1998		196.66		2215.66
	04/20/1999		198.05		2214.27
	08/12/1999		199.20		2213.12
	09/20/1999		199.28		2213.04
	10/14/1999		199.45		2212.87
	12/10/1999		199.70		2212.62
	01/04/2000		199.85		2212.47
	01/28/2000		199.85		2212.47
	04/14/2000		200.07		2212.25
	04/21/2000		200.18		2212.14
	05/15/2000		200.15		2212.17
	06/21/2000		200.40		2211.92
	06/30/2000		200.57		2211.75
	07/17/2000		200.31		2212.01
	07/28/2000		200.51		2211.81
	08/21/2000		200.70		2211.62
	09/22/2000		200.69		2211.63
	10/25/2000		201.01		2211.31
	11/20/2000		201.05		2211.27
	12/15/2000		201.37		2210.95
	01/16/2001		200.85		2211.47
	02/26/2001		200.71		2211.61
	03/16/2001		200.77		2211.55
	04/23/2001		200.18		2212.14
	05/18/2001		201.47		2210.85
	06/14/2001		201.73		2210.59
	07/11/2001		201.75		2210.57
	08/10/2001		201.77		2210.55
	09/20/2001		201.95		2210.37
	10/18/2001		202.13		2210.19
11/19/2001		202.11		2210.22	
12/13/2001		202.64		2209.68	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
WR-345B (cont)	02/14/2002		202.36		2209.96
	06/06/2002		202.82		2209.50
	08/19/2002		203.29		2209.03
	12/11/2002		203.57		2208.75
	01/27/2003		203.51		2208.81
	05/27/2003		204.08		2208.24
	12/01/2003		204.58		2207.74
	02/09/2004		204.66		2207.66
	05/03/2004		205.07		2207.25
	11/08/2004		205.27		2207.05
	05/09/2005		205.25		2207.07
	11/08/2005		205.56		2206.76
	05/08/2006		204.42		2207.90
	11/27/2006		204.32		2208.00
	04/30/2007		204.59		2207.73
	12/10/2007		205.11		2207.21
05/06/2008		205.01		2207.31	
11/03/2008		205.40		2206.92	
WR-347B	02/06/1998		202.20		2217.42
	02/23/1998		202.00		2217.62
	03/20/1998		201.84		2217.78
	10/20/1998		203.72		2215.90
	04/20/1999		203.06		2216.56
	08/12/1999		204.30		2215.32
	09/20/1999		203.78		2215.84
	10/14/1999		204.63		2214.99
	01/28/2000		205.53		2214.09
	04/14/2000		205.80		2213.82
	04/21/2000		206.07		2213.55
	05/15/2000		206.00		2213.62
	05/17/2000		206.38		2213.24
	06/21/2000		206.45		2213.17
	06/30/2000		206.62		2213.00
	07/07/2000		206.72		2212.90
	07/14/2000		206.69		2212.93
	07/28/2000		206.72		2212.90
	08/21/2000		206.95		2212.67
	09/22/2000		206.98		2212.64
	10/25/2000		207.40		2212.22
	11/20/2000		207.50		2212.12
	12/15/2000		207.84		2211.78
	01/16/2001		207.29		2212.33
	02/26/2001		207.15		2212.47
	03/16/2001		207.39		2212.23
	04/23/2001		207.80		2211.82
	05/18/2001		208.20		2211.42
	06/14/2001		208.52		2211.10
	07/11/2001		208.51		2211.11
	08/10/2001		208.66		2210.96
	09/20/2001		208.79		2210.83
	10/18/2001		209.03		2210.59
	11/19/2001		208.95		2210.67
	12/13/2001		209.62		2210.00
	02/14/2002		209.38		2210.24
06/06/2002		209.97		2209.65	
08/19/2002		210.45		2209.17	
12/11/2002		210.46		2209.16	
01/27/2003		210.74		2208.88	
05/27/2003		211.29		2208.33	
12/01/2003		211.86		2207.76	
02/09/2004		212.07		2207.55	

TABLE 4-4
Historical Summary of Depth to Groundwater Measurements
and Groundwater Elevations
Park-Euclid WQARF Site
Tucson, Arizona

Well Name	Date	DTFP	DTW	FP THICKNESS	ELEVATION
		feet	feet	feet	feet above mean sea level
WR-347B (cont)	05/03/2004		212.46		2207.16
	11/08/2004		212.80		2206.82
	05/09/2005		212.86		2206.76
	11/07/2005		213.17		2206.45
	05/08/2006		211.85		2207.77
	11/27/2006		212.14		2207.48
	04/30/2007		212.56		2207.06
	12/10/2007		213.00		2206.62
	05/06/2008		212.94		2206.68
	11/03/2008		213.42		2206.20

Notes: DTFP = Depth to Free Product
DTW = Depth to Groundwater
FP = Free Product
Cells void of data were either not measured or not reported

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
Perched Aquifer Wells							
ADOT-1	01/04/1990		6.63	1.84			
	02/09/2000		<0.50	1.4	<0.50	<0.50	<0.50
	05/17/2000		<0.50	0.8	<0.50	<0.50	<0.50
	08/23/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2000		<0.50	0.6	<0.50	<0.50	<0.50
	03/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/14/2001		<0.50	0.53	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	05/20/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/02/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/10/2004						
	05/03/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/07/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
11/27/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
04/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
12/13/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/04/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
MLS-4	04/15/1993		310	<2.0	NA	<2.0	<2.0
	07/14/1997		1300	110	540	<20	<5
	10/23/1998		5000	86	510	<120	<120
	04/20/1999		1800	350	760		
	07/28/1999		1300	250	490		
	10/19/1999		3500	300	1700		
	02/08/2000		5000.0	600.0	2200	<250	<250
	05/18/2000		1300.0	230.0	840	<50	<50
	08/23/2000		1200.0	210.0	760.0	<50	<50
	12/20/2000		1400.0	360.0	4200.0	<50	<50
	03/19/2001		520	220	7200	<50	<50
	05/21/2001		480	220	7900	9.5	<2.5
	08/13/2001		400	240	6300	10	<10
	12/18/2001		310	72	1600	<5.0	<5.0
	02/19/2002		190	51	1700	<5.0	<5.0
	06/10/2002		160	80	1300	<5.0	<5.0
	08/20/2002		95	30	790	<5.0	<5.0
	01/29/2003		200	36	700	<2.5	<2.5
	05/21/2003		220	330	1100	<2.5	<2.5
	12/04/2003		22	78	1800	<5.0	<2.5
	02/11/2004		26	130	970		
	05/05/2004		27	130	990	<2.5	<2.5
	11/09/2004		12	82	680	<2.5	<2.5
	05/10/2005		4.6	42	1400	<2.5	<2.5
	11/09/2005		54	150	1400	<2.5	<2.5
05/10/2006		8.2	2.6	1700	0.85	<0.50	
11/29/2006		14	14	2200	<2.5	<2.5	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
MLS-4 (cont)	05/03/2007		7.9	19	2100 D2	1.2	<0.50
	12/14/2007	D1	20	16	490	<5.0	<2.5
	05/05/2008	D2	<2.5	<2.5	680	<5.0	<2.5
	11/04/2008	D2	21	<5.0	290	<10	<5.0
MLS-5	04/14/1993		<2.0	<2.0	NA	<2.0	<2.0
	06/05/1994		30	2	NA	<10	NA
	07/14/1997		25	<0.5	<0.5	<2	<0.5
	10/22/1998		3.9	<5	<5	<5	<5
	04/20/1999		4.4				
	07/28/1999						
	10/19/1999						
	02/09/2000		88.0	<250	120.0	<250	<250
	05/18/2000		6.8	<2.5	<2.5	<2.5	<2.5
	08/23/2000		8.0	<5.0	<5.0	<5.0	<5.0
	12/19/2000		16.0	<5.0	<5.0	<5.0	<5.0
	03/19/2001		6.4	0.57	16	<0.50	<0.50
	05/21/2001		1.8	<0.50	9.2	<0.50	<0.50
	08/13/2001		9.0	0.90	37	<0.50	<0.50
	12/19/2001		5.5	<0.50	12	<0.50	<0.50
	02/19/2002		8.1	1.7	26	<0.50	<0.50
	06/10/2002		5.7	<2.5	36	<2.5	<2.5
	08/20/2002		4.6	<2.0	100	<2.0	<2.0
	01/29/2003		2.3	<1.0	58	<1.0	<1.0
	05/21/2003		1.1	<1.0	180	<1.0	<1.0
	12/03/2003		39	<5.0	70	<10	<5.0
	02/11/2004		0.5		210		
	05/05/2004		2.7	<1.0	47	<1.0	<1.0
	11/10/2004		<5.0	<5.0	120	<5.0	<5.0
	05/10/2005		<0.50	<0.50	170	<0.50	<0.50
	11/08/2005		<0.50	<0.50	29	<0.50	<0.50
	05/10/2006		<0.50	<0.50	120	<0.50	<0.50
11/28/2006		<0.50	<0.50	120	<0.50	<0.50	
05/02/2007		<0.50	<0.50	190 D2	<0.50	<0.50	
12/13/2007	D2	<2.5	<2.5	160	<5.0	<2.5	
05/05/2008	D2	<2.5	<2.5	120	<5.0	<2.5	
11/04/2008	D2	<5.0	<5.0	92	<10	<5.0	
MLS-6	04/15/1993		16	<2.0	NA	<2.0	<2.0
	07/14/1997		140	6.1	<1	<4	<1
	10/22/1998		120	9.8	<5	<5	<5
	04/20/1999		110	8.8			
	07/28/1999		370	10	5.7		
	10/19/1999		200	13	10		
	02/08/2000		470.0	20.0	9.9	<0.50	<0.50
	05/17/2000		310.0	18.0	80.0	1.2	<0.50
	08/22/2000		470.0	18.0	260.0	2.1	<0.50
	12/18/2000		360.0	14.0	350.0	3.0	<0.50
	03/20/2001		230	15	480	3.5	<0.50
	05/22/2001		160	16	380	2.0	<0.50
	08/14/2001		150	6.2	480	3.3	<0.50
	12/19/2001		81	11	380	2.8	<0.50
	02/18/2002		110	19	420	3.3	<1.0
	06/11/2002		57	5.1	1,000	3.3	<2.5
	08/20/2002		67	7.4	1,300	6.6	<2.5

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PGE	TCE	cis-1,2-DGE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
MLS-6 (cont)	01/28/2003		350	16	1,600	7.8	<2.5
	05/20/2003		51	9.1	1,400	3.3	<2.5
	12/03/2003		50	18	170	4.8	<0.50
	02/11/2004		60	31	1800	6.2	
	05/04/2004		63	22	2,000	11	<0.50
	11/09/2004		52	10	3,700	16	<5.0
	05/09/2005		79	16	3,200	11	<5.0
	11/08/2005		29	13	2,100	6.8	<0.50
	05/08/2006		51	22	2,300	8.5	0.6
	11/27/2006		130	12	760	2.2	<0.50
	04/30/2007		15	4.8	2500 D2	5.1	<0.50
	12/14/2007	D2	36	5.5	380	<5.0	<2.5
	05/05/2008	D2	29	5.4	530	<5.0	<2.5
11/04/2008	D2	11	4.3	410	<5.0	<2.5	
MLS-12	10/22/1998		<5	<5	<5	<5	<5
	02/09/2000						
	05/18/2000						
	08/22/2000		<5.0	<5.0	<5.0	<5.0	<5.0
	12/18/2000		<5.0	<5.0	<5.0	<5.0	<5.0
	03/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/13/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/18/2001		<5.0	<5.0	<5.0	<5.0	<5.0
	02/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/10/2002		<5.0	<5.0	<5.0	<5.0	<5.0
	08/20/2002		<1.0	<1.0	<1.0	<1.0	<1.0
	01/29/2003		1.0	<1.0	<1.0	<1.0	<1.0
	02/26/2003		<1.0	<1.0	<1.0	<1.0	<1.0
	05/21/2003		<1.0	<1.0	<1.0	<1.0	<1.0
	12/03/2003		<5.0	<5.0	<5.0	<1.0	<5.0
	02/11/2004						
	05/05/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
11/08/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
12/13/2007	D1	<1.0	<1.0	<2.0	<2.0	<1.0	
05/05/2008	D2	<1.0	<1.0	<2.0	<2.0	<1.0	
11/04/2008	D2	<1.0	<1.0	<2.0	<2.0	<1.0	
MLS-13	10/23/1998		<5	<5	<5	<5	<5
	02/09/2000						
	05/18/2000						
	08/22/2000		<5.0	<5.0	<5.0	<5.0	<5.0
	12/18/2000		<25	<25	<25	<25	<25
	03/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/13/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/18/2001		<1.0	<1.0	<1.0	<1.0	<1.0
	02/19/2002		<1.0	<1.0	<1.0	<1.0	<1.0
	06/10/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<1.0	<1.0	<1.0	<1.0	<1.0

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
MLS-13 (cont)	01/29/2003		<1.0	<1.0	<1.0	<1.0	<1.0
	05/21/2003		<1.0	<1.0	<1.0	<1.0	<1.0
	12/03/2003		<15	<5.0	<5.0	<10	<5.0
	02/11/2004						
	05/05/2004		<1.0	<1.0	<1.0	<1.0	<1.0
	11/09/2004		<1.0	<1.0	<1.0	<1.0	<1.0
	05/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50
12/13/2007		<1.0	<1.0	<2.0	<2.0	<1.0	
05/05/2008	D2	<2.5	<2.5	<5.0	<5.0	<2.5	
11/04/2008	D2	<5.0	<5.0	<10	<10	<5.0	
MPE-1	05/02/2007		20	55	8700 D2	3.9	2.2
MPM-1	05/21/2003		1400	120	3100	<5.0	<5.0
	12/04/2003		2000	900	23000	<5.0	<2.5
	02/11/2004		1800	2000	3100		
	11/10/2004		390	1,700	7,400	<25	<25
	05/10/2005		230	890	11,000	<25	<25
	11/08/2005		34	180	9,200	<25	<25
	05/10/2006		230	270	15,000	8.1	<5.0
	11/29/2006		13	14	13,000	8.9	<5.0
	05/02/2007		1.5	3	12,000	8.3	3.2
12/13/2007	D2	47	59	1,100	<10	<5.0	
PBP-1	03/19/2001		98	16	51	<0.50	0.77
	05/23/2001		130	17	71	<0.50	1.6
	08/14/2001		190	18	34	<0.50	0.66
	12/19/2001		120	18	13	<0.50	<0.50
	02/18/2002		130	21	17	<0.50	<0.50
	06/12/2002		140	27	38	<1.0	9.3
	08/20/2002		110	23	66	<0.50	47
	01/28/2003		84	42	460	0.62	180
	05/20/2003		95	40	470	0.61	86
	12/02/2003		90	42	630	<1.0	220
	02/10/2004		110	44	680	0.76	330
	05/04/2004		74	36	470	<0.50	290
	11/08/2004		69	29	410	<1.0	280
	05/09/2005		53	26	350	<0.50	200
	11/09/2005		67	25	260	<0.50	200
	05/09/2006		54	14	120	<0.50	380
	11/28/2006		73	15	91	<0.50	480
	05/01/2007		51	16	63	<0.50	290 D2
12/12/2007	D1	100	53	270	<5.0	470	
05/05/2008		37	15	44	<1.0	86	
11/04/2008		41	15	32	<1.0	37	
PBP-2	03/19/2001		490	160	9.5	1.3	<1.0
	05/23/2001		890	250	11	1.6	<1.0
	08/14/2001		770	250	10	1.4	<0.50
	12/19/2001		470	190	9	<2.5	<2.5
	02/18/2002		480	220	13	1.3	<1.0
	06/11/2002		470	220	13	1.5	<0.50
	08/20/2002		410	210	15	1.4	<1.0

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TGE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PBP-2 (cont)	01/28/2003		320	180	15	1.4	1.1
	05/20/2003		410	200	15	1.4	2.6
	12/02/2003		690	230	18	<5.0	8.0
	02/10/2004		1400	200	12		5.2
	05/04/2004		980	190	8.3	0.63	2.2
	11/08/2004		760	260	24	<2.5	11
	05/09/2005		600	250	50	1.1	32
	11/09/2005		500	250	57	1.2	72
	05/09/2006		390	240	47	0.91	90
	11/28/2006		410	290	71	1.2	140
	05/02/2007		440 D2	310 D2	100 D2	1.2	130
	12/12/2007	D2	390	530	150	<5.0	240
	05/06/2008	D2	630	350	71	<5.0	120
11/04/2008	D2	340	550	140	<5.0	100	
PBP-3	03/19/2001		250	7.4	3.7	<0.50	<0.50
	05/23/2001		240	8.1	4.7	<0.50	<0.50
	08/14/2001		300	6.7	5.2	<0.50	<0.50
	12/19/2001		180	7.6	12	<0.50	<0.50
	02/18/2002		180	8.3	22	<0.50	<0.50
	06/11/2002		160	7.5	44	<0.50	<0.50
	08/20/2002		140	9.6	50	<0.50	<0.50
	01/28/2003		150	11	94	<0.50	<0.50
	05/20/2003		160	12	120	<0.50	<0.50
	12/02/2003		200.0	12.0	140.0	<1.0	<0.50
	02/10/2004		310.0	13.0	180.0		
	05/04/2004		190.0	13.0	120.0	<0.50	<0.50
	11/08/2004		220.0	11.0	120.0	<0.50	<0.50
	05/09/2005		240.0	15.0	130.0	<0.50	<0.50
	11/09/2005		210.0	13.0	120.0	<0.50	<0.50
	05/09/2006		140.0	9.5	130.0	<0.50	<0.50
	11/28/2006		160.0	9.7	110.0	<0.50	<0.50
	05/01/2007		130 D2	9	110	<0.50	<0.50
12/12/2007		170	8.8	120	<1.0	<0.50	
05/06/2008		180	6.6	82	<1.0	<0.50	
11/04/2008	D2	190	8.4	91	<2.0	<1.0	
PBP-7	11/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	11/04/2008		<0.50	<0.50	<1.0	<1.0	<0.50
PEP-10	12/20/2000		2.8	1.0	39.0	<0.50	<0.50
	03/21/2001		2.9	1.2	66	<0.50	<0.50
	05/21/2001		4.5	1.6	75	<0.50	<0.50
	08/14/2001		4.4	1.6	80	<0.50	0.65
	12/19/2001		4.0	1.7	56	<0.50	0.56
	02/18/2002		3.4	1.5	46	<0.50	<0.50
	06/11/2002		2.9	0.95	16	<0.50	<0.50
	08/20/2002		1.9	1.40	19	<0.50	<0.50
	01/28/2003		0.79	0.84	16	<0.50	<0.50
	05/20/2003		1.3	0.60	20	<0.50	<0.50
	12/02/2003		<0.50	1.2	17.0	<1.0	<0.50
	05/03/2004		<0.50	<0.50	7.9	<0.50	<0.50
	11/08/2004		<0.50	0.60	8.3	<0.50	<0.50
	12/10/2004		0.51	0.72	13.0		

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PEP-10 (cont)	05/09/2005		<0.50	<0.50	6.1	<0.50	<0.50
	11/07/2005		<0.50	<0.50	5.6	<0.50	<0.50
	05/09/2006		<0.50	<0.50	4.6	<0.50	<0.50
	11/27/2006		0.69	<0.50	1.6	<0.50	<0.50
	04/30/2007		<0.50	<0.50	1.5	<0.50	<0.50
	12/13/2007	D2	<1.0	1.20	41.0	<2.0	250
	05/05/2008	D2	<2.5	6.0	100	<5.0	400
11/04/2008	D2	<2.5	<2.5	350	<5.0	750	
PEP-11	12/20/2000		1.3	<0.50	<0.50	<0.50	<0.50
	03/21/2001		0.57	<0.50	<0.50	<0.50	<0.50
	05/22/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/14/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/17/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		1.2	<0.50	<0.50	<0.50	<0.50
	08/20/2002		0.88	<0.50	<0.50	<0.50	<0.50
	01/28/2003		0.73	<0.50	<0.50	<0.50	<0.50
	05/20/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/02/2003		0.8	<0.50	<0.50	<1.0	<0.50
	02/10/2004		0.8				
	05/04/2004		0.7	<0.50	<0.50	<0.50	<0.50
	11/09/2004		0.6	<0.50	<0.50	<0.50	<0.50
	05/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/07/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/27/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	04/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50
12/12/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/04/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
PEP-16	12/19/2000		110.0	1.3	<0.50	<0.50	<0.50
	03/21/2001		370	2.6	<0.50	<0.50	<0.50
	05/22/2001		130	1.9	<0.50	<0.50	<0.50
	08/14/2001		190	2.3	<0.50	<0.50	<0.50
	12/19/2001		63	1.2	<0.50	<0.50	<0.50
	02/18/2002		77	2.0	<0.50	<0.50	<0.50
	06/11/2002		36	0.88	<0.50	<0.50	<0.50
	08/20/2002		33	1.0	<0.50	<0.50	<0.50
	01/28/2003		66	2.0	<0.50	<0.50	<0.50
	05/20/2003		79	2.4	<0.50	<0.50	<0.50
	12/02/2003		20.0	1.7	<0.50	<1.0	<0.50
	02/10/2004		7.1	1.4			
	05/04/2004		20.0	1.6	<0.50	<0.50	<0.50
PEP-17	12/19/2000		6.1	<0.50	<0.50	<0.50	<0.50
	03/19/2001		3.6	<0.50	<0.50	<0.50	<0.50
	05/21/2001		2.4	<0.50	<0.50	<0.50	<0.50
	08/14/2001		1.8	<0.50	<0.50	<0.50	<0.50
	12/17/2001		1.1	<0.50	<0.50	<0.50	<0.50
	02/18/2002		1.5	<0.50	<0.50	<0.50	<0.50
	06/11/2002		2.2	<0.50	<0.50	<0.50	<0.50
	08/20/2002		2.0	<0.50	<0.50	<0.50	<0.50
	01/28/2003		1.2	<0.50	<0.50	<0.50	<0.50
05/20/2003		1.1	<0.50	<0.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PEP-17 (cont)	12/02/2003		0.6	<0.50	<0.50	<1.0	<0.50
	02/10/2004		0.6				
	05/04/2004		0.5	<0.50	<0.50	<0.50	<0.50
PEP-18	12/20/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	03/21/2001		0.65	<0.50	<0.50	<0.50	<0.50
	05/21/2001		0.93	<0.50	<0.50	<0.50	<0.50
	08/14/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2001		<5.0	<5.0	<5.0	<5.0	<5.0
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		4.3	<2.5	<2.5	<2.5	<2.5
	08/20/2002		<2.5	<2.5	<2.5	<2.5	<2.5
	01/28/2003		<0.50	0.50	<0.50	<0.50	<0.50
	05/20/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/02/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/10/2004						
	05/03/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/07/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/27/2006		<0.50	<0.50	<0.50	<0.50	<0.50
04/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
12/13/2007	D1	<1.0	<1.0	<2.0	<2.0	<1.0	
05/05/2008	D1	<1.0	<1.0	<2.0	<2.0	<1.0	
11/04/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
PEP-19	06/11/2002		0.87	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/28/2003		<0.50	0.50	<0.50	<0.50	<0.50
	05/20/2003		<0.50	0.50	<0.50	<0.50	<0.50
	12/02/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/10/2004						
	05/03/2004		<0.50	0.50	<0.50	<0.50	<0.50
	11/08/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/07/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/27/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	04/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50
12/13/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/04/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
PEP-24	01/28/2003		<2.5	2.7	<2.5	<2.5	<2.5
	02/26/2003		<1.0	<1.0	<1.0	<1.0	<1.0
	05/21/2003		<1.0	<1.0	<1.0	<1.0	<1.0
	12/02/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/10/2004						
	05/05/2004		<2.5	<2.5	4.1	<2.5	<2.5
	11/09/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50
05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TGE	cis-1,2-DCE	1,1-DGE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PEP-24 (cont)	12/13/2007	D1	<1.0	<1.0	<2.0	<2.0	<1.0
	05/05/2008	D2	<1.0	<1.0	<2.0	<2.0	<1.0
	11/04/2008	D2, E2	<1.0	<1.0	<2.0	<2.0	<1.0
PEP-8	12/19/2000		410.0	15.0	<5.0	<5.0	<5.0
	03/19/2001		130	420	1.1	<0.50	<0.50
	05/21/2001		330	460	1.3	<0.50	<0.50
	08/13/2001		300	630	3.9	<0.50	<0.50
	12/18/2001		180	620	5.1	<5.0	<5.0
	02/19/2002		100	720	3.7	<1.0	<1.0
	06/10/2002		58	820	8.7	<5.0	<5.0
	08/20/2002		50	860	24.0	<2.0	<2.0
	01/29/2003		56	1,300	36	<2.5	<2.5
	05/21/2003		65	820	750	<2.5	<2.5
	12/04/2003		23	95	2000	1.3	0.9
	02/11/2004		9.9	52	2100		
	05/05/2004		8.9	57	2000	3.2	<2.5
	11/09/2004		7.0	33	1500	<2.5	<2.5
	05/10/2005		4.5	6.2	800	<2.5	<2.5
	11/08/2005		10	5.1	800	<2.5	<2.5
	05/10/2006		5.0	3.0	840	<0.50	<0.50
	11/29/2006		3.3	1.7	2800	1.6	<0.50
05/02/2007		1.6	1.1	2500 D2	1.5	<0.50	
12/14/2007	D1	12	9.9	190	<2.0	<1.0	
05/05/2008	D2	1.9	4.2	330	<2.0	<1.0	
11/04/2008	D2	2.6	3.8	650	<2.5	<2.5	
PEP-9	12/19/2000		500.0	1,200.0	270.0	<2.5	<2.5
	03/20/2001		490	2,700	530	1.4	1.0
	05/21/2001		160	2,600	960	4.4	5.9
	08/14/2001		330	1,700	490	<5.0	12
	12/19/2001		150	1,000	790	<5.0	150
	02/19/2002		110	860	820	<2.5	170
	06/10/2002		320	1,400	460	<5.0	200
	08/20/2002		130	1,000	440	<5.0	300
	01/29/2003		130	950	1,200	<2.5	400
	05/21/2003		50	610	820	<5.0	350
	12/04/2003		150.0	950	830	2.3	250.0
	02/11/2004		41.0	980	680		540.0
	05/05/2004		130.0	880	820	<2.5	230.0
	11/10/2004		34.0	890	2800	6.4	130.0
	05/10/2005		61.0	570	3600	6.9	190.0
	11/09/2005		21.0	540	2800	5.8	500.0
	05/09/2006		35.0	1000	1900	2.9	270.0
	11/28/2006		7.5	59	290	0.56	120.0
	04/30/2007		6.3	36	150	<5.0	<5.0
12/14/2007	D2	84	140	350	<5.0	18	
05/06/2008	D2	39	130	230	<5.0	200	
11/05/2008	D2	<25	170	1800	<50	700	
SVE-101	08/23/2000		640.0	1,400.0	18,000	<250	1,400
	11/21/2000		560.0	9,000.0	13,000	<200	500
	12/20/2000		4,300.0	8,800.0	4,900	<200	<200
	03/20/2001		620	21,000	8,000	30	31
	05/21/2001		2,400	21,000	3,900	<25	<25
	08/13/2001		2,400	24,000	7,600	27	<25

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
SVE-101 (cont)	12/03/2003		450	10,000	19,000	33	5200
	02/11/2004		620	12,000	25,000		7100
	05/05/2004		410	15,000	37,000	110	130
	05/10/2005		48	16,000	58,000	110	<25
	11/08/2005		190	22,000	52,000	99	72
	05/09/2006		47	5,300	37,000	63	5.6
	11/28/2006		26	170	4,300	12	8.5
	05/01/2007		15	68 D2	6,900 D2	<2.5	4500 D2
	12/11/2007	D1	<100	<100	17,000 D2	<200	5900 D2
05/06/2008							
SVE-102	04/30/1993		40,000	4,900	NA	<20	<20
	06/09/1993		29,000	6,100	NA	<2,000	<2,000
	05/31/2000		24000	18,000	14,000	<500	<500
	08/23/2000		9,800	42,000	11,000	<250	<250
	03/20/2001		8,400	42,000	5,300	<25	<25
	08/13/2001		9,300	34,000	13,000	<50	<50
	12/18/2001		4,700	33,000	17,000	<100	<100
	02/18/2002		3,000	34,000	16,000	<50	<50
	06/10/2002		4,500	24,000	17,000	<50	<50
	08/19/2002		3,600	37,000	12,000	<100	<100
	01/29/2003		8,600	30,000	4,600		
	01/29/2003		8,600	30,000	4,600	<50	<50
	02/11/2004		27,000	41,000	5,600		
	11/08/2005		7,500	63,000	9,400	<100	<100
	05/09/2006		16,000	30,000	12,000	<50	<50
	11/28/2006		530	8,900	16,000	<50	30000
	05/01/2007		2,300 D2	42,000 D2	42,000 D2	22	<13
12/11/2007	D1	2,800 D2	2,700 D2	110,000 D2	<1000	<500	
05/06/2008							
SVE-103	12/19/2000		22,000.0	15,000.0	750.0	<100	<100
	03/20/2001		23,000	12,000	3,000	<25	<25
	05/21/2001		31,000	13,000	2,700	<50	<50
	08/13/2001		20,000	17,000	2,300	<25	<25
	12/03/2003		620	15,000	110000	63	12
	02/11/2004		630	6,800	99000		
	05/05/2004		2,400	3,100	83,000	<100	<100
	11/09/2004		300	1,500	24,000	<50	34,000
	11/08/2005		1,000	8,800	5,100	<100	20,000
	05/01/2007		100 D2	1,800 D2	39,000 D2	24	22,000 D2
	12/12/2007						
	05/05/2008						
SVE-104	04/30/1993		37,000	52	NA	<20	<20
	08/23/2000		40,000.0	420.0	<100	<100	<100
	12/19/2000		22,000.0	320.0	<100	<100	<100
	03/20/2001		21,000	1,800	99	<25	<25
	05/21/2001		16,000	2,500	86	<25	<25
	08/13/2001		21,000	4,000	160	<25	<25
	12/18/2001		6,200	6,200	1,200	<50	<50
	06/10/2002		17,000	4,400	1,400	<25	<25
	01/29/2003		37,000	12,000	2,600	<50	<50
	05/21/2003		13,000	28,000	6,600	<50	<50

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
SVE-104 (cont)	12/03/2003		20,000	220,000	23,000	30	<2.5
	02/11/2004		2,400	28,000	21,000		
	05/05/2004		62,000	77,000	36,000	<250	<250
	05/10/2005		<100	20,000	56,000	100	<100
	11/08/2005		12,000	71,000	8,000	<10	<10
	05/09/2006		4,200	14,000	36,000	11	<5.0
	11/28/2006		7,600	59,000	18,000	<50	<50
	05/01/2007		3,800 D2	58,000 D2	23,000 D2	32	<13
	12/11/2007	D1	13,000 D2	66,000 D2	19,000 D2	<500	<250
	05/06/2008						
WR-345A	02/02/1998						
	04/20/1999		0.54				
	08/12/1999		1.7				
	10/18/1999						
	05/17/2000		0.5	<0.50	<0.50	<0.50	<0.50
	08/22/2000		6	<0.50	<0.50	<0.50	<0.50
	12/19/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	01/23/2001		<1.0	<1.0	<1.0	<2.0	<10
	03/21/2001		1.2	0.57	<0.50	<0.50	<0.50
	05/22/2001		0.58	<0.50	<0.50	<0.50	<0.50
	08/14/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		0.92	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/28/2003		<0.50	0.50	<0.50	<0.50	<0.50
	05/20/2003		<0.50	0.50	<0.50	<0.50	<0.50
	12/02/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/10/2004						
	05/03/2004		<0.50	0.50	<0.50	<0.50	<0.50
	11/08/2004		<0.50	0.50	<0.50	<0.50	<0.50
	05/09/2005		<0.50	0.50	<0.50	<0.50	<0.50
	11/07/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/27/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	04/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50
12/12/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/04/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
WR-347A	02/23/1998		34				
	10/21/1998		120	8.5	0.62		
	04/20/1999		110				
	08/12/1999		120				
	09/20/1999		160				
	10/18/1999		65				
	05/17/2000		260	2.9	<0.50	<0.50	<0.50
	08/22/2000		19	1.1	13	<0.50	<0.50
	12/20/2000		150	6.0	16	<0.50	<0.50
	01/23/2001		45	3.4	2.6	<2.0	<10
	03/19/2001		33	2.5	2.1	<0.50	<0.50
	05/22/2001		79	3.6	3.3	<0.50	<0.50
	08/14/2001		45	3.5	8.4	<0.50	<0.50
	12/19/2001		34	3.0	15	<0.50	<0.50

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Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TGE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
WR-347A (cont)	02/18/2002		24	1.6	34	<0.50	<0.50
	06/11/2002		13	0.63	44	<0.50	<0.50
	08/20/2002		6.7	<1.0	74	<1.0	<1.0
	01/28/2003		12	0.88	540	<0.50	<0.50
	05/20/2003		10	1.4	220	<0.50	<0.50
	12/03/2003		29	2.2	22	<1.0	<0.50
	02/11/2004		6.6	2.3	580	0.63	
	05/05/2004		9.8	3.1	770	<1.0	<1.0
	11/09/2004		2.8	1.1	570	<0.50	<0.50
	05/09/2005		19.0	3.7	700	<1.0	<1.0
	11/07/2005		2.6	1.5	420	<1.0	<1.0
	05/08/2006		1.9	1.0	430	<0.50	4.4
	11/28/2006		110.0	32.0	570	0.65	<0.50
	05/01/2007		28.0	5.2	620 D2	<0.50	<0.50
	12/12/2007	D1	15	<12.5	500 D2	<25	<12.5
05/05/2008	D2	12	14	1200	<10	<5.0	
11/04/2008	D2	14	22	1100	<10	<5.0	
Regional Aquifer Wells							
MLR-1	05/06/1991		0.15	<0.10	<0.10	<0.10	<0.10
	06/10/1991		<0.10	<0.10	<0.10	<0.10	<0.10
	11/03/1992		<2.0	<2.0	NA	<2.0	<2.0
	04/14/1993		<2.0	<2.0	NA	<2.0	<2.0
	07/14/1997		<0.5	<0.5	<0.5	<2	<0.5
	10/22/1998		<0.5	<0.5	<0.5	<0.5	<0.5
	04/20/1999						
	07/27/1999						
	10/19/1999						
	02/08/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	05/16/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	08/21/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	12/18/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	03/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/13/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/17/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/27/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/02/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/10/2004						
	05/04/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50
05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
12/14/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/07/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/07/2008		<0.50	<0.50	<1.0	<1.0	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC	
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L	
MLR-2	05/06/1991		<0.10	<0.10	<0.10	<0.10	<0.10	
	06/10/1991		<0.10	<0.10	<0.10	<0.10	<0.10	
	11/03/1992		<0.5	<0.5	NA	<2.0	<0.5	
	04/14/1993		<2.0	<2.0	NA	<2.0	<2.0	
	07/14/1997		<0.5	<0.5	<0.5	<2	<0.5	
	10/22/1998		<0.5	<0.5	<0.5	<0.5	<0.5	
	04/20/1999							
	07/27/1999							
	10/19/1999							
	02/08/2000			<0.50	<0.50	<0.50	<0.50	<0.50
	05/16/2000			<0.50	<0.50	<0.50	<0.50	<0.50
	08/21/2000			1.1	<0.50	<0.50	<0.50	<0.50
	12/18/2000			<0.50	<0.50	<0.50	<0.50	<0.50
	03/20/2001			<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001			<0.50	<0.50	<0.50	<0.50	<0.50
	08/14/2001			<0.50	<0.50	<0.50	<0.50	<0.50
	12/18/2001			<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002			0.54	<0.50	<0.50	<0.50	<0.50
	06/11/2002			0.52	<0.50	<0.50	<0.50	<0.50
	08/19/2002			0.69	<0.50	<0.50	<0.50	<0.50
	01/27/2003			<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2003			<0.50	<0.50	<0.50	<0.50	<0.50
	12/03/2003			0.59	0.59	<0.50	<1.0	<0.50
	02/11/2004							
	05/04/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	11/10/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2005			<0.50	<0.50	<0.50	<0.50	<0.50
05/10/2006			<0.50	<0.50	<0.50	<0.50	<0.50	
11/29/2006			<0.50	<0.50	<0.50	<0.50	<0.50	
05/01/2007			<0.50	<0.50	<0.50	<0.50	<0.50	
12/14/2007			<0.50	<0.50	<1.0	<1.0	<0.50	
05/07/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
11/06/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
MLR-3	05/06/1991		8.33	0.33	0.21	<0.10	<0.10	
	06/10/1991		10	0.45	<0.10	<0.10	<0.10	
	11/03/1992		<0.5	<0.5	NA	<2.0	<0.5	
	04/14/1993		4.2	<2.0	NA	<2.0	<2.0	
	07/14/1997		290	2.8	1.4	<4	<1	
	10/22/1998		240	2.8	<5	<5	<5	
	04/20/1999		200					
	07/27/1999		170	1.9	1.4			
	10/19/1999		190	1.2				
	02/08/2000		220.0	2.5	1.6	<0.50	<0.50	
	05/16/2000		200.0	3.5	1.6	<0.50	<0.50	
	08/21/2000		210.0	2.7	1.6	<0.50	<0.50	
	12/18/2000		100.0	1.7	2.7	<0.50	<0.50	
	03/21/2001		130	1.6	0.94	<0.50	<0.50	
	05/23/2001		200	1.8	1.2	<0.50	<0.50	
	08/15/2001		170	1.2	0.72	<0.50	<0.50	
	12/18/2001		79	1.1	1.0	<0.50	<0.50	
	02/19/2002		84	1.4	1.2	<0.50	<0.50	
06/11/2002		94	1.8	1.5	<0.50	<0.50		

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WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DGE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
MLR-3 (cont)	08/20/2002		76	1.4	1.5	<0.50	<0.50
	01/28/2003		71	1.7	1.8	<0.50	<0.50
	05/29/2003		73	1.6	2.1	<0.50	<0.50
	12/04/2003		93	1.4	1.7	<1.0	<0.50
	02/12/2004		61	1.3	1.6		
	05/05/2004		66	1.1	1.4	<0.50	<0.50
	11/11/2004		78	1.3	1.4	<0.50	<0.50
	05/12/2005		77	1.3	1.7	<0.50	<0.50
	11/10/2005		76	1.2	1.8	<0.50	<0.50
	05/11/2006		56	0.94	2.1	<0.50	<0.50
	11/30/2006		77	1.1	2.4	<0.50	<0.50
	05/03/2007		56	1.2	4.0	<0.50	<0.50
	12/13/2007		57	1	3.4	<1.0	<0.50
	05/08/2008		59	0.93	2.4	<1.0	<0.50
11/07/2008		43	0.87	3.1	<1.0	<0.50	
MLR-7	05/28/1994		630	16	14	<13	<25
	07/14/1997		85	2	2.1	<2	<0.5
	10/22/1998		78	1.9	0.83	<1	<1
	04/20/1999		51	1.2	0.5		
	07/27/1999		42	1			
	10/19/1999		83	0.75			
	02/08/2000		110.0	2.4	0.8	<0.50	<0.50
	05/16/2000		79.0	2.6	0.8	<0.50	<0.50
	08/21/2000		75.0	2.2	0.8	<0.50	<0.50
	12/18/2000		50.0	1.3	0.6	<0.50	<0.50
	03/21/2001		75	1.5	0.60	<0.50	<0.50
	05/23/2001		65	1.3	0.81	<0.50	<0.50
	08/14/2001		79	1.5	0.67	<0.50	<0.50
	12/18/2001		46	1.6	1.0	<0.50	<0.50
	02/19/2002		48	1.8	1.1	<0.50	<0.50
	06/11/2002		57	1.9	1.1	<0.50	<0.50
	08/20/2002		44	1.7	1.1	<0.50	<0.50
	01/27/2003		27	1.1	0.70	<0.50	<0.50
	05/28/2003		23	0.93	0.65	<0.50	<0.50
	12/04/2003		13.0	<1.0	0.5	<1.0	<0.50
	02/12/2004		11.0				
	05/05/2004		11.0	<0.50	<0.50	<0.50	<0.50
	11/11/2004		5.7	<0.50	<0.50	<0.50	<0.50
	05/12/2005		5.0	<0.50	<0.50	<0.50	<0.50
	11/10/2005		6.0	<0.50	<0.50	<0.50	<0.50
	05/11/2006		8.6	0.5	0.73	<0.50	<0.50
	11/30/2006		15.0	1.2	8.10	<0.50	<0.50
05/03/2007		8.8	0.65	3.80	<0.50	<0.50	
12/11/2007		9.8	<0.50	<1.0	<1.0	<0.50	
05/08/2008		6.9	<0.50	<1.0	<1.0	<0.50	
11/07/2008		7.3	<0.50	<1.0	<1.0	<0.50	
PBR-10	06/12/2002		1.8	0.57	<0.50	<0.50	<0.50
	08/21/2002		2.1	0.78	<0.50	<0.50	<0.50
	09/06/2002		3.3	1	<0.50	<0.50	<0.50
	01/29/2003		1.1	0.62	<0.50	<0.50	<0.50
	05/21/2003		1.7	0.81	<0.50	<0.50	<0.50
	12/03/2003		1.9	1	<0.50	<1.0	<0.50
	02/11/2004		1.4	0.73			

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Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cls-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PBR-10 (cont)	05/05/2004		1.2	0.69	<0.50	<0.50	<0.50
	11/10/2004		1.4	0.6	<0.50	<0.50	<0.50
	05/11/2005		1.2	0.62	<0.50	<0.50	<0.50
	11/09/2005		1.5	0.75	<0.50	<0.50	<0.50
	05/09/2006		1.8	0.82	<0.50	<0.50	<0.50
	12/29/2006		1.5	0.86	<0.50	<0.50	<0.50
	05/02/2007		1.7	0.86	<0.50	<0.50	<0.50
	12/11/2007		1.7	<0.50	<1.0	<1.0	<0.5
	05/08/2008		1.4	0.73	<1.0	<1.0	<0.50
11/06/2008		1.2	0.75	<1.0	<1.0	<0.50	
PER-14	12/21/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	03/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/13/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/17/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/27/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/02/2003		<0.50	<1.5	<1.0	<1.0	<0.50
	02/10/2004						
	05/04/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50
12/14/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/07/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/07/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
PER-14A	10/17/2008		1.4	<0.50	<1.0	<1.0	<0.50
	11/07/2008		12	0.75	3.2	<1.0	<0.50
PER-15	12/20/2000		170.0	5.0	3.2		
	01/23/2001		210	6.3	4.2	<2.0	<10
	03/21/2001		130	4.2	2.1	<0.50	<0.50
	05/23/2001		49	1.1	0.91	<0.50	<0.50
	08/15/2001		110	1.7	0.83	<0.50	<0.50
	12/20/2001		46	1.4	0.94	<0.50	<0.50
	02/19/2002		50	1.8	1.1	<0.50	<0.50
	06/13/2002		59	1.5	<0.50	<0.50	<0.50
	08/22/2002		53	2.4	1.4	<0.50	<0.50
	01/31/2003		100	3.7	1.8	<0.50	<0.50
	05/29/2003		98	3.9	2.1	<0.50	<0.50
	12/04/2003		61	1.8	0.83	<1.0	<0.50
	02/12/2004		76	1.9	0.99		
	05/06/2004		74	2.5	1.30	<0.50	<0.50
	11/10/2004		130	3.6	1.80	<0.50	<0.50
	05/11/2005		110	3.9	2.00	<0.50	<0.50
	11/09/2005		130	4.1	2.00	<0.50	<0.50
	05/10/2006		93	2.4	1.10	<0.50	<0.50
11/29/2006		140	3.5	1.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PGE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PER-15 (cont)	05/03/2007		39	1.1	0.71	<0.50	<0.50
	12/12/2007		120	3	1.70	<0.50	<0.50
	05/09/2008		110	2.0	<1.0	<1.0	<0.50
	11/07/2008		86	2.1	1.2	<1.0	<0.50
PER-21	06/13/2002		7.8	<0.50	<0.50	<0.50	<0.50
	08/21/2002		9.2	<0.50	0.55	<0.50	<0.50
	01/30/2003		10	0.54	<0.50	<0.50	<0.50
	05/29/2003		10	0.61	0.81	<0.50	<0.50
	12/04/2003		12	<1.0	<0.50	<1.0	<0.50
	02/12/2004		11				
	05/06/2004		13	<0.50	<0.50	<0.50	<0.50
	11/11/2004		8.7	<0.50	<0.50	<0.50	<0.50
	05/11/2005		13	<0.50	<0.50	<0.50	<0.50
	11/09/2005		15	0.53	<0.50	<0.50	<0.50
	05/10/2006		17	0.54	<0.50	<0.50	<0.50
	11/30/2006		24	0.68	0.51	<0.50	<0.50
	05/03/2007		23	0.64	0.53	<0.50	<0.50
	12/12/2007		27	0.9	<1.0	<1.0	<0.50
	05/08/2008		32	0.53	<1.0	<1.0	<0.50
11/07/2008		36	0.77	<1.0	<1.0	<0.50	
PER-22	06/13/2002		120	12	4.2	<0.50	<0.50
	08/22/2002		220	14	5.6	<0.50	<0.50
	01/31/2003		230	12	4.7	<0.50	<0.50
	05/29/2003		200	11	5.0	<0.50	<0.50
	12/04/2003		230	11	5.3	<1.0	<0.50
	02/12/2004		310	13	5.6		
	05/06/2004		210	11	4.9	<0.50	<0.50
	11/10/2004		180	6.6	3.0	<0.50	<0.50
	05/11/2005		160	7.3	3.4	<0.50	<0.50
	11/10/2005		190	8.4	3.7	<0.50	<0.50
	05/10/2006		110	5.2	2.5	<0.50	<0.50
	11/30/2006		130	4.4	2.1	<0.50	<0.50
	05/03/2007		100	4	2.0	<0.50	<0.50
	05/08/2008		80	2.1	<1.0	<1.0	<0.50
11/07/2008		63	2.0	1.0	<1.0	<0.50	
PER-23	06/12/2002		1.0	<0.50	<0.50	<0.50	<0.50
	08/21/2002		2.6	<0.50	<0.50	<0.50	<0.50
	01/30/2003		2.1	<0.50	<0.50	<0.50	<0.50
	05/28/2003		1.9	<0.50	<0.50	<0.50	<0.50
	12/03/2003		2.1	<0.50	<0.50	<1.0	<0.50
	02/11/2004		2				
	05/04/2004		2.2	<0.50	<0.50	<0.50	<0.50
	11/10/2004		1.1	<0.50	<0.50	<0.50	<0.50
	05/11/2005		1.1	<0.50	<0.50	<0.50	<0.50
	11/09/2005		1.6	<0.50	<0.50	<0.50	<0.50
	05/10/2006		1.5	<0.50	<0.50	<0.50	<0.50
	11/29/2006		2.3	<0.50	<0.50	<0.50	<0.50
	05/02/2007		2.4	<0.50	<0.50	<0.50	<0.50
	12/12/2007		2.2	<0.50	<1.0	<1.0	<0.50
	05/08/2008		2.6	<0.50	<1.0	<1.0	<0.50
11/06/2008		2.7	<0.50	<1.0	<1.0	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
PER-25	01/29/2003		73	1.1	<0.50	<0.50	<0.50
	02/26/2003		5.6	<0.50	<0.50	<0.50	<0.50
	03/10/2003		39	<2.0	<2.0	<5.0	<5.0
	03/25/2003		34	0.58	<0.50	<0.50	<0.50
	04/17/2003		41	0.79	<0.50	<0.50	<0.50
	05/29/2003		44	0.86	0.60	<0.50	<0.50
	12/03/2003		72	0.88	<0.50	<1.0	<0.50
	02/11/2004		96	0.76			
	05/06/2004		63	0.92	<0.50	<0.50	<0.50
	11/10/2004		64	0.94	<0.50	<0.50	<0.50
	05/11/2005		110	1.6	<0.50	<0.50	<0.50
	11/09/2005		17	1.7	<0.50	<0.50	<0.50
	05/09/2006		80	1	<0.50	<0.50	<0.50
	11/29/2006		130	2	<0.50	<0.50	<0.50
	05/03/2007		81	1.2	<0.50	<0.50	<0.50
	12/12/2007		92	1.2	<1.0	<1.0	<0.5
05/09/2008		67	0.70	<1.0	<1.0	<0.50	
11/07/2008		58	0.63	<1.0	<1.0	<0.50	
PER-26	05/28/2003		19	0.66	0.58	<0.50	<0.50
	06/04/2003		19	0.64	0.54	<0.50	<0.50
	12/03/2003		18	0.64	0.61	<1.0	<0.50
	02/12/2004		32	1.1	0.8		
	05/06/2004		48	2	1.3	<0.50	<0.50
	08/20/2004		57	2.2	1.5	<0.50	<0.50
	11/11/2004		43	1.5	1.0	<0.50	<0.50
	05/11/2005		47	1.9	1.2	<0.50	<0.50
	11/10/2005		57	2.3	1.5	<0.50	<0.50
	05/09/2006		78	2.9	1.8	<0.50	<0.50
	11/30/2006		130	4.9	2.7	<0.50	<0.50
	05/02/2007		120 D2	5.9	3.2	<0.50	<0.50
	12/13/2007		170 D2	5.5	3.0	<1.0	<0.50
	05/09/2008	D2	230	6.3	2.3	<2.0	<1.0
11/07/2008	D2	180	6.4	<5.0	<5.0	<2.5	
PER-27	05/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	06/04/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/04/2003		<0.50	<1.0	<0.50	<1.0	<0.50
	02/11/2004						
	05/05/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/10/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/11/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/29/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/2007		<0.50	<0.50	<1.0	<1.0	<0.50
	05/07/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	11/06/2008		<0.50	<0.50	<1.0	<1.0	<0.50
UAM-1	01/18/2000						
	02/28/2000						
	04/06/2000						
	08/21/2000		1.3	<0.50	<0.50	<0.50	<0.50
	09/22/2000		<1.0	<1.0	<1.0	<2.0	<10
	10/26/2000		<0.50	<0.50	<0.50	<0.50	<0.50

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TGE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
UAM-1 (cont)	11/21/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	01/23/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/23/2001		<1.0	<1.0	<1.0	<2.0	<10
	03/20/2001		0.54	<0.50	<0.50	<0.50	<0.50
	04/24/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	06/15/2001		0.52	<0.50	<0.50	<0.50	<0.50
	07/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/14/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	09/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	10/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	11/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/18/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	01/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	03/22/2002		1.0	<0.50	<0.50	<0.50	<0.50
	04/17/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	05/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		0.83	<0.50	<0.50	<0.50	<0.50
	07/22/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	09/25/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	10/18/2002		0.66	<0.50	<0.50	<0.50	<0.50
	11/15/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	12/20/2002		0.51	<0.50	<0.50	<0.50	<0.50
	01/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	02/26/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	03/25/2003		0.64	<0.50	<0.50	<0.50	<0.50
	04/17/2003		0.89	<0.50	<0.50	<0.50	<0.50
	05/28/2003		0.88	<0.50	<0.50	<0.50	<0.50
	06/20/2003		4.70	<0.50	<0.50	<0.50	<0.50
	08/08/2003		4.60	<0.50	<0.50	<0.50	<0.50
	09/26/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	10/17/2003		<0.50	<1.0	<0.50	<1.0	<0.50
	11/14/2003		<0.50	<1.0	<0.50	<1.0	<0.50
	12/02/2003		<4.0	<8.0	<1.0	<1.0	<0.50
	01/09/2004						
	02/10/2004						
	03/08/2004						
04/08/2004			0.58	<0.50	<0.50	<0.50	<0.50
05/04/2004			0.52	<0.50	<0.50	<0.50	<0.50
06/11/2004			<0.50	<0.50	<0.50	<0.50	<0.50
07/16/2004			<0.50	<0.50	<0.50	<0.50	<0.50
08/20/2004			<0.50	<0.50	<0.50	<0.50	<0.50
09/24/2004			<0.50	<0.50	<0.50	<0.50	<0.50
10/14/2004			<0.50	<0.50	<0.50	<0.50	<0.50
11/09/2004			<0.50	<0.50	<0.50	<0.50	<0.50
01/11/2005			<0.50	<0.50	<0.50	<0.50	<0.50
02/23/2005			<0.50	<0.50	<0.50	<0.50	<0.50
03/08/2005			<0.50	<0.50	<0.50	<0.50	<0.50
04/12/2005			<0.50	<0.50	<0.50	<0.50	<0.50
05/10/2005			<0.50	<0.50	<0.50	<0.50	<0.50

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Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PGE	TCE	cis-1,2-DCE	1,1-DCE	VC	
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L	
UAM-1 (cont)	06/17/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
	07/13/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/16/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
	10/10/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
	11/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
	12/15/2005		<2.00	<2.00	<2.00	<2.00	<0.500	
	12/23/2005		<0.50	<0.50	<0.50	<0.50	<0.50	
	01/17/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	02/07/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	03/22/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	04/11/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	05/09/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	06/19/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	07/26/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	08/24/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/21/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	10/25/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	12/29/2006		<0.50	<0.50	<0.50	<0.50	<0.50	
	01/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
	02/22/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
	03/28/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
	04/19/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
	05/02/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
	06/14/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
	12/11/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
	01/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
	02/11/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
	03/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
	04/14/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
05/07/2008		<0.50	<0.50	<1.0	<1.0	<0.50		
06/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50		
08/19/2008			0.58	<0.50	<1.0	<1.0	<0.50	
09/10/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
10/09/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
11/05/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
12/09/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
01/12/2009		S1	0.56	<0.50	<1.0	<1.0	<0.50	
UAM-2	01/18/2000							
	02/28/2000							
	04/06/2000							
	08/22/2000			1.3	<0.50	<0.50	<0.50	<0.50
	09/22/2000			1.5	<1.0	<1.0	<2.0	<10
	10/26/2000			1.9	<0.50	<0.50	<0.50	<0.50
	11/21/2000			1.9	<0.50	<0.50	<0.50	<0.50
	12/19/2000			1.8	<0.50	<0.50	<0.50	<0.50
	01/23/2001			2.5	<0.50	<0.50	<0.50	<0.50
	02/23/2001			1.9	<1.0	<1.0	<2.0	<10
	03/20/2001			2.2	<0.50	<0.50	<0.50	<0.50
	04/24/2001			1.7	<0.50	<0.50	<0.50	<0.50
	05/21/2001			1.7	<0.50	<0.50	<0.50	<0.50
06/20/2001			2.4	<0.50	<0.50	<0.50	<0.50	
07/20/2001			1.4	<0.50	<0.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PGE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
UAM-2 (cont)	08/14/2001		2.7	<0.50	0.51	<0.50	<0.50
	09/21/2001		2.3	<0.50	<0.50	<0.50	<0.50
	10/19/2001		2.2	<0.50	<0.50	<0.50	<0.50
	11/20/2001		2.3	<0.50	<0.50	<0.50	<0.50
	12/18/2001		2.6	<0.50	<0.50	<0.50	<0.50
	01/18/2002		3.3	<0.50	<0.50	<0.50	<0.50
	02/18/2002		3.4	<0.50	<0.50	<0.50	<0.50
	03/22/2002		3.5	<0.50	<0.50	<0.50	<0.50
	04/17/2002		4.1	<0.50	<0.50	<0.50	<0.50
	05/20/2002		3.3	<0.50	<0.50	<0.50	<0.50
	06/11/2002		4.5	<0.50	0.51	<0.50	<0.50
	07/19/2002		3.6	<0.50	<0.50	<0.50	<0.50
	08/21/2002		4.6	<0.50	<0.50	<0.50	<0.50
	09/25/2002		3.8	<0.50	<0.50	<0.50	<0.50
	10/18/2002		4.0	<0.50	<0.50	<0.50	<0.50
	11/15/2002		4.0	<0.50	<0.50	<0.50	<0.50
	12/20/2002		3.7	<0.50	<0.50	<0.50	<0.50
	01/28/2003		3.8	<0.50	<0.50	<0.50	<0.50
	02/26/2003		3.7	<0.50	<0.50	<0.50	<0.50
	03/25/2003		4.0	<0.50	<0.50	<0.50	<0.50
	04/17/2003		3.9	<0.50	<0.50	<0.50	<0.50
	05/28/2003		4.2	<0.50	<0.50	<0.50	<0.50
	06/20/2003		4.7	<0.50	<0.50	<0.50	<0.50
	08/08/2003		4.6	<0.50	<0.50	<0.50	<0.50
	09/26/2003		2.8	<0.50	<0.50	<1.0	<0.50
	10/17/2003		4.3	<0.50	<0.50	<0.50	<0.50
	11/14/2003		4.3	<1.0	<0.50	<1.0	<0.50
	12/02/2003		4.0	<0.50	<0.50	<1.0	<0.50
	01/09/2004		4.2				
	02/10/2004		4.1				
	03/08/2004		4.2				
	04/08/2004		4.5	<0.50	<0.50	<0.50	<0.50
	05/05/2004		3.5	<0.50	<0.50	<0.50	<0.50
	06/11/2004		4.0	<0.50	<0.50	<0.50	<0.50
	07/16/2004		4.4	<0.50	<0.50	<0.50	<0.50
	08/20/2004		3.7	<0.50	<0.50	<0.50	<0.50
	09/24/2004		3.8	<0.50	<0.50	<0.50	<0.50
	10/14/2004		3.7	<0.50	<0.50	<0.50	<0.50
	11/09/2004		4.4	<0.50	<0.50	<0.50	<0.50
	12/23/2004		4.2	<0.50	<0.50	<0.50	<0.50
01/11/2005		4.4	<0.50	<0.50	<0.50	<0.50	
02/23/2005		3.5	<0.50	<0.50	<0.50	<0.50	
03/08/2005		3.8	<0.50	<0.50	<0.50	<0.50	
04/12/2005		3.9	<0.50	<0.50	<0.50	<0.50	
05/10/2005		3.6	<0.50	<0.50	<0.50	<0.50	
06/17/2005		4.1	<0.50	<0.50	<0.50	<0.50	
07/13/2005		4.6	<0.50	<0.50	<0.50	<0.50	
09/16/2005		4.5	<0.50	<0.50	<0.50	<0.50	
10/10/2005		4	<0.50	<0.50	<0.50	<0.50	
11/09/2005		3.8	<0.50	<0.50	<0.50	<0.50	
12/15/2005		2.53	<2.00	<2.00	<2.00	<0.500	
01/17/2006		3.5	<0.50	<0.50	<0.50	<0.50	
03/22/2006		4	<0.50	<0.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
UAM-2 (cont)	04/11/2006		3.9	<0.50	<0.50	<0.50	<0.50
	05/09/2006		4.2	<0.50	<0.50	<0.50	<0.50
	06/19/2006		4.5	<0.50	<0.50	<0.50	<0.50
	07/26/2006		4.5	<0.50	<0.50	<0.50	<0.50
	08/24/2006		4.4	<0.50	<0.50	<0.50	<0.50
	09/21/2006		4.1	<0.50	<0.50	<0.50	<0.50
	10/25/2006		4.9	<0.50	<0.50	<0.50	<0.50
	11/28/2006		5.2	<0.50	<0.50	<0.50	<0.50
	12/29/2006		4.7	<0.50	<0.50	<0.50	<0.50
	01/30/2007		4.7	<0.50	<0.50	<0.50	<0.50
	02/22/2007		5.2	<0.50	<0.50	<0.50	<0.50
	03/28/2007		5.2	<0.50	<0.50	<0.50	<0.50
	04/19/2007		4.5	<0.50	<0.50	<0.50	<0.50
	05/02/2007		4.8	<0.50	<0.50	<0.50	<0.50
	06/14/2007		4.8	<0.50	<0.50	<0.50	<0.50
	12/11/2007		5.1	<0.50	<1.0	<1.0	<0.50
	01/10/2008		4.3	<0.50	<1.0	<1.0	<0.50
	02/11/2008		3.8	<0.50	<1.0	<1.0	<0.50
	03/10/2008		4.0	<0.5	<1.0	<1.0	<0.5
	04/14/2008		4.2	<0.50	<1.0	<1.0	<0.50
	05/06/2008		3.9	<0.50	<1.0	<1.0	<0.50
	06/09/2008		2.6	<0.50	<1.0	<1.0	<0.50
	07/10/2008		2.3	<0.50	<1.0	<1.0	<0.50
	08/19/2008		5.7	<0.50	<1.0	<1.0	<0.50
09/10/2008		3.7	<0.50	<1.0	<1.0	<0.50	
10/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/05/2008		4.0	<0.50	<1.0	<1.0	<0.50	
12/09/2008		4.2	<0.50	<1.0	<1.0	<0.50	
01/12/2009		3.0	<0.50	<1.0	<1.0	<0.50	
UAM-2B	05/06/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	06/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	07/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	08/19/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	09/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	10/08/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	11/06/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	12/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50
01/12/2009		<0.50	<0.50	<1.0	<1.0	<0.50	
UAM-3	01/18/2000						
	02/28/2000						
	04/06/2000						
	08/22/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/2000						
	10/26/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	11/21/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	01/23/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/23/2001		<1.0	<1.0	<1.0	<2.0	<10
	03/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	04/24/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50
06/15/2001		<0.50	<0.50	<0.50	<0.50	<0.50	
07/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC	
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L	
UAM-3 (cont)	08/14/2001		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/21/2001		<0.50	<0.50	<0.50	<0.50	<0.50	
	10/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50	
	11/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50	
	12/18/2001		<0.50	<0.50	<0.50	<0.50	<0.50	
	01/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	03/22/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	04/17/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	05/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	07/22/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/25/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	10/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	11/15/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	12/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	01/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	02/26/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	03/25/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	04/17/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	05/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	06/20/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	08/08/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/26/2003		<0.50	<0.50	<0.50	<1.0	<0.50	
	10/17/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
	11/14/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
	12/02/2003		<1.0	<2.5	<3.0	<1.0	<0.50	
	01/09/2004							
	02/10/2004							
	03/08/2004							
	04/08/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	05/04/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	07/16/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	09/24/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	10/14/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	12/23/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	01/11/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	02/23/2005			<0.50	<0.50	<0.50	<0.50	<0.50
03/08/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
04/12/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
05/10/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
06/17/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
07/13/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
09/16/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
10/10/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
11/08/2005			<0.50	<0.50	<0.50	<0.50	<0.50	
12/15/2005			<2.00	<2.00	<2.00	<2.00	<0.500	
01/17/2006			<0.50	<0.50	<0.50	<0.50	<0.50	
02/07/2006			<0.50	<0.50	<0.50	<0.50	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
UAM-3 (cont)	03/22/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	04/11/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/09/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	06/20/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	07/26/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	08/24/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	09/21/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	10/25/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/28/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	01/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	02/22/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	03/28/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	04/19/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	06/14/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/2007		<0.50	<0.50	<1.0	<1.0	<0.50
	01/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	02/11/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	03/10/2008		<0.5	<0.5	<1.0	<1.0	<0.5
	04/14/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	05/08/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	06/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	07/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	08/19/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	09/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50
10/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
12/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
01/12/2009		S1	<0.50	<0.50	<1.0	<1.0	<0.50
WR-345B	02/23/1998		2.9				
	04/20/1999		8.2	1.5	0.63		
	08/12/1999		5.5				
	10/18/1999		3.1				
	05/17/2000		7.5	<0.50	0.5	<0.50	<0.50
	08/22/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2000		5.1	<0.50	<0.50	<0.50	<0.50
	01/23/2001		5.3	<1.0	<1.0	<2.0	<10
	03/21/2001		5.0	0.55	0.70	<0.50	<0.50
	05/23/2001		4.1	<0.50	0.57	<0.50	<0.50
	08/15/2001		3.7	<0.50	<0.50	<0.50	<0.50
	12/19/2001		3.9	<0.50	0.59	<0.50	<0.50
	02/19/2002		3.4	<0.50	0.57	<0.50	<0.50
	06/12/2002		3.2	<0.50	<0.50	<0.50	<0.50
	08/21/2002		3.8	<0.50	<0.50	<0.50	<0.50
	01/30/2003		2.2	<0.50	<0.50	<0.50	<0.50
	05/28/2003		1.9	<0.50	<0.50	<0.50	<0.50
	12/04/2003		1.4	<1.0	<0.50	<1.0	<0.50
	02/11/2004		1.4				
	05/05/2004		1.3	<0.50	<0.50	<0.50	<0.50
	11/10/2004		0.6	<0.50	<0.50	<0.50	<0.50
	05/11/2005		0.5	<0.50	<0.50	<0.50	<0.50
	11/09/2005		0.9	<0.50	<0.50	<0.50	<0.50
05/10/2006		1.6	<0.50	<0.50	<0.50	<0.50	

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January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
WR-345B (cont)	11/29/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	12/12/2007		<0.50	<0.50	<1.0	<1.0	<0.50
	05/06/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	11/06/2008		<0.50	<0.50	<1.0	<1.0	<0.50
WR-347B	02/23/1998						
	10/21/1998		120	8	0.6	<0.5	<0.5
	04/20/1999						
	08/12/1999						
	09/20/1999						
	10/18/1999						
	05/17/2000		1.2	<0.50	<0.50	<0.50	<0.50
	08/22/2000		1.1	<0.50	<0.50	<0.50	<0.50
	12/20/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	01/23/2001		<1.0	<1.0	<1.0	<2.0	<10
	03/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/22/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/15/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/12/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/29/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	05/21/2003		<0.50	<0.50	<0.50	<0.50	<0.50
	12/03/2003		<0.50	<0.50	<0.50	<1.0	<0.50
	02/11/2004						
	05/04/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/29/2006		<0.50	<0.50	<0.50	<0.50	<0.50
05/01/2007		<0.50	<0.50	<0.50	<0.50	<0.50	
12/12/2007		<0.50	<0.50	<1.0	<1.0	<0.50	
05/06/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
11/05/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
UA Production Wells							
Aggie	12/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	01/12/2009	S6	<0.50	<0.50	<1.0	<1.0	<0.50
Architecture	03/26/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	04/25/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/22/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	06/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	07/23/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/10/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	10/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	11/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	03/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	04/16/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	07/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC	
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L	
Architecture (cont)	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/25/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	10/21/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	11/15/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	12/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50	
	01/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	02/27/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	03/25/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	04/17/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	05/22/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	06/19/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	08/08/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
	09/26/2003		<0.50	<0.50	<0.50	<1.0	<1.0	
	10/17/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
	11/14/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
	12/03/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
	02/10/2004							
	03/08/2004							
	04/08/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	05/05/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	07/16/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	09/24/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	10/14/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	12/23/2004			<0.50	<0.50	<0.50	<0.50	<0.50
	01/11/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	02/23/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	03/08/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	04/12/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	05/11/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	06/17/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	07/13/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	10/10/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2005			<0.50	<0.50	<0.50	<0.50	<0.50
	12/15/2005			<2.00	<2.00	<2.00	<2.00	<0.500
	01/17/2006			<0.50	<0.50	<0.50	<0.50	<0.50
	02/07/2006			<0.50	<0.50	<0.50	<0.50	<0.50
06/14/2007			<0.50	<0.50	<0.50	<0.50	<0.50	
12/11/2007		S6	<0.50	<0.50	<1.0	<1.0	<0.50	
03/10/2008		S6	<0.5	<0.5	<1.0	<1.0	<0.5	
04/14/2008		S6	<0.50	<0.50	<1.0	<1.0	<0.50	
07/10/2008		S6	<0.50	<0.50	<1.0	<1.0	<0.50	
08/19/2008		N1	<0.50	<0.50	<1.0	<1.0	<0.50	
09/10/2008		S6	<0.50	<0.50	<1.0	<1.0	<0.50	
10/08/2008		S6	<0.50	<0.50	<1.0	<1.0	<0.50	
11/04/2008		S6	<0.50	<0.50	<1.0	<1.0	<0.50	
12/09/2008			<0.50	<0.50	<1.0	<1.0	<0.50	
Huachuca	11/09/1999							
	02/28/2000							
	04/06/2000							

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
Huachuca (cont)	08/24/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	09/22/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	10/26/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	11/21/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	12/22/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	01/26/2001		<1.0	<1.0	<1.0	<2.0	<10
	02/26/2001		<1.0	<1.0	<1.0	<2.0	<10
	03/26/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	04/24/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	05/22/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	06/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	07/23/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	08/10/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	09/20/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	10/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	11/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	12/13/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	01/16/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	02/18/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	03/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	04/16/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	05/17/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	07/19/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	09/25/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	10/21/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	11/15/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	12/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	01/28/2003		<0.50	<0.50	<0.50	<0.50	<0.50
02/27/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
03/25/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
04/17/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
05/22/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
06/19/2003		<0.50	<0.50	<0.50	<0.50	<0.50	
09/26/2003		<0.50	<0.50	<0.50	<1.0	<1.0	
11/14/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
12/03/2003		<0.50	<1.0	<0.50	<1.0	<0.50	
03/08/2004							
04/08/2004			<0.50	<0.50	<0.50	<0.50	<0.50
Martin St	11/09/1999						
	02/28/2000						
	04/06/2000						
	09/22/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	10/26/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	11/21/2000		<0.50	<0.50	<0.50	<0.50	<0.50
	01/26/2001		<1.0	<1.0	<1.0	<2.0	<10
	02/26/2001		<1.0	<1.0	<1.0	<2.0	<10
	05/22/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	06/19/2001		<0.50	<0.50	<0.50	<0.50	<0.50
	06/11/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/20/2002		<0.50	<0.50	<0.50	<0.50	<0.50
	08/19/2008		<0.50	<0.50	<1.0	<1.0	<0.50

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
Martin St (cont)	09/10/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50
	10/08/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50
	12/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50
	01/12/2009	S6, S1	<0.50	<0.50	<1.0	<1.0	<0.50
Optical	08/20/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	09/24/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	10/14/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	11/08/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	12/23/2004		<0.50	<0.50	<0.50	<0.50	<0.50
	01/11/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	02/23/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	03/08/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	04/12/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	05/11/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	06/17/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	07/13/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	09/16/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	10/10/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	11/09/2005		<0.50	<0.50	<0.50	<0.50	<0.50
	12/15/2005		<2.00	<2.00	<2.00	<2.00	<0.500
	01/17/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	02/07/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	03/22/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	04/11/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	05/10/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	07/26/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	08/24/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	09/21/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	11/29/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	12/29/2006		<0.50	<0.50	<0.50	<0.50	<0.50
	01/30/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	02/22/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	03/28/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	04/19/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	05/03/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	06/14/2007		<0.50	<0.50	<0.50	<0.50	<0.50
	12/11/2007	S6	<0.50	<0.50	<1.0	<1.0	<0.50
01/10/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
02/11/2008		<0.50	<0.50	<1.0	<1.0	<0.50	
03/10/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
04/14/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
05/08/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
06/09/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
07/10/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
08/19/2008	N1	<0.50	<0.50	<1.0	<1.0	<0.50	
09/10/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
10/08/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	
11/04/2008	S6	<0.50	<0.50	<1.0	<1.0	<0.50	

TABLE 4-5
Historical Summary of Chemicals of Concern Detected in Groundwater (in ug/L)
January 1990 - November 2008
Park-Euclid WQARF Site
Tucson, Arizona

WELL	DATE	SAMPLE QUALIFIER	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
			AWQS: 5 µg/L	AWQS: 5 µg/L	AWQS: 70 µg/L	AWQS: 7 µg/L	AWQS: 2 µg/L
Optical	12/09/2008		<0.50	<0.50	<1.0	<1.0	<0.50
(cont)	01/12/2009	S6, S1	<0.50	<0.50	<1.0	<1.0	<0.50

- Notes:** PCE = Tetrachloroethene
TCE = Trichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
1,1-DCE = 1,1-Dichloroethene
VC = Vinyl chloride
AWQS = Aquifer Water Quality Standard
µg/L = micrograms per Liter
D1 = Sample required dilution due to matrix
D2 = Sample required dilution due to high concentration of target analyte
E2 = Concentration of analyte estimated; analyte exceeded calibration range; and reanalysis not performed due to sample matrix
N1 = Surrogate recovery was below laboratory acceptance limit and based on the historical information, the low recovery of the surrogate was caused by matrix interference
S1 = Surrogate recovery was above laboratory acceptance limits, but within method acceptance limits
S6 = Surrogate recovery was below laboratory and method acceptance limits and reextraction and/or reanalysis confirms low recovery caused by matrix effect
- 15** Concentrations detected at or above the AWQS
- 2.3 Concentrations detected above method detection limits
- Void cells indicate either that the concentration did not exceed reporting limits or that the analyte was not included in the analysis

TABLE 4-6
Summary of Perched Groundwater Monitoring Results for COCs (ug/L) During MPE
Park-Euclid WQARF Site
Tucson, Arizona

Well ID	Date Sampled	PCE	TCE	cis-1,2-DCE	VC
MLS-4	5/10/2006	8.2	2.6	1,700	<0.50
	5/3/2007	7.9	19	2,100	<0.50
	6/4/2009	30	17	379	<10
	7/7/2009	<10	<10	544	<10
MLS-5	5/10/2006	<0.50	<0.50	120	<0.50
	5/2/2007	<0.50	<0.50	190	<0.50
	6/4/2009	<5.0	<5.0	78	<5.0
	7/7/2009	<100	<100	202	<100
MPE-1	5/10/2006	71	340	9,800	<5.0
	5/2/2007	20	55	8,700	2.2
	6/4/2009	30	20	14,210	<10
	7/7/2009	<20	<20	14,315	<20
MPE-2	6/4/2009	34	84	11,480	<10
	7/7/2009	28	47	16,365	<10
MPE-3	6/4/2009	3,350	48,000	48,300	<10
	7/7/2009	3,740	35,260	35,090	<20
MPE-4	6/5/2009	123	654	73,070	<10
	7/7/2009	107	688	78,340	<10
MPE-5	6/5/2009	829	3,300	43,910	<10
	7/7/2009	721	5,810	61,080	<100
MPE-6	6/4/2009	285	2,860	31,700	<10
	7/7/2009	<100	2,344	34,780	<100
MPM-1	5/10/2006	230	270	15,000	<5.0
	5/2/2007	1.5	2.9	12,000	3.2
	6/4/2009	14	<10	31,280	<10
	7/7/2009	<100	<100	37,140	<100
SVE-101	5/9/2006	47	5,300	37,000	5.6
	5/1/2007	15	68	6,900	4,500
	6/5/2009	<10	<10	5,891	2,208
	7/7/2009	<20	74	7,717	1,370
SVE-102	5/9/2006	16,000	30,000	12,000	<50
	5/1/2007	2,300	42,000	42,000	<13
	6/5/2009	205	1,258	114,250	<10
	7/7/2009	64	878	87,350	<20
SVE-103	5/1/2007	100	1,800	39,000	22,000
	6/5/2009	<10	23	5,675	3,160
	7/7/2009	30	259	2,594	4,273

TABLE 4-6
Summary of Perched Groundwater Monitoring Results for COCs (ug/L) During MPE
Park-Euclid WQARF Site
Tucson, Arizona

Well ID	Date Sampled	PCE	TCE	cis-1,2-DCE	VC
SVE-104	5/9/2006	4,200	14,000	36,000	<5.0
	5/1/2007	3,800	58,000	23,000	<13
	6/4/2009	10,591	49,040	64,050	<100
	7/7/2009	1,449	14,255	132,380	292

Source: URS, 2009

Notes: ug/L = micrograms per liter
PCE = tetrachloroethene
TCE = trichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
VC = Vinyl chloride

TABLE 4-7
Summary of Compounds Detected in Lower Vadose Zone Soil Vapor Samples (µg/L)
Park-Euclid WQARF Site
Tucson, Arizona

Boring	Sample Depth (feet bgs)	Sample Date	PCE	TCE	1,1-DCE	cis-1,2-DCE	VC
VEL-3	175	01/23/03	340	26	2.5	120	0.057
		08/27/08	2100	150	<1.8	1000	<1.1
VML-1	127	01/24/03	2.20	0.06	<0.5	<0.5	<0.5
		05/04/04	51.82	3.00	<1.02	11.46	<0.66
		08/27/08	5.20	0.12	<0.021	1.20	<0.014
	147	01/24/03	12	1.10	<0.5	0.28	<0.5
		05/04/04	77.03	2.72	<1.02	5.32	<0.66
		08/27/08	90.00	2.10	<0.26	<0.26	<0.16
	167	01/24/03	75	3.4	<0.5	0.35	<0.5
		05/04/04	329.12	9.99	<2.05	2.21	<1.32
		08/27/08	180.00	9.00	<0.11	0.53	<0.069
	187	01/24/03	220	9.1	0.092	2.20	<0.5
		05/04/04	770.28	19.42	<10.23	<10.23	<6.60
08/27/08		43.00	2.10	<0.11	0.35	<0.072	
VML-2	127	01/24/03	24	1.2	0.16	4.6	<0.5
		05/04/04	112.04	1.61	<2.05	1.47	<0.66
		08/27/08	230.00	7.90	<0.26	19.00	<0.16
	147	01/24/03	1740	94	13	260	0.39
		05/04/04	1680.61	94.32	<20.47	450.22	<13.20
		08/27/08	2400.00	180.00	<2.6	890.00	<1.6
	167	01/24/03	5460	600	23	2380	1.1
		05/04/04	3221.17	249.67	<40.94	1268.8	<26.39
		08/27/08	5700.00	540.00	<5	2900.0	<3.2
	187	01/24/03	1040	77	8.7	490	3.7
		05/04/04	1820.66	99.87	<40.94	695.79	<26.39
08/27/08		1900.00	140.00	<2.4	1100.00	<1.5	
WR-347B	192	01/24/03	0.3	0.01	<0.5	0.02	<0.5

Reference: HydroGeoChem, 2003b

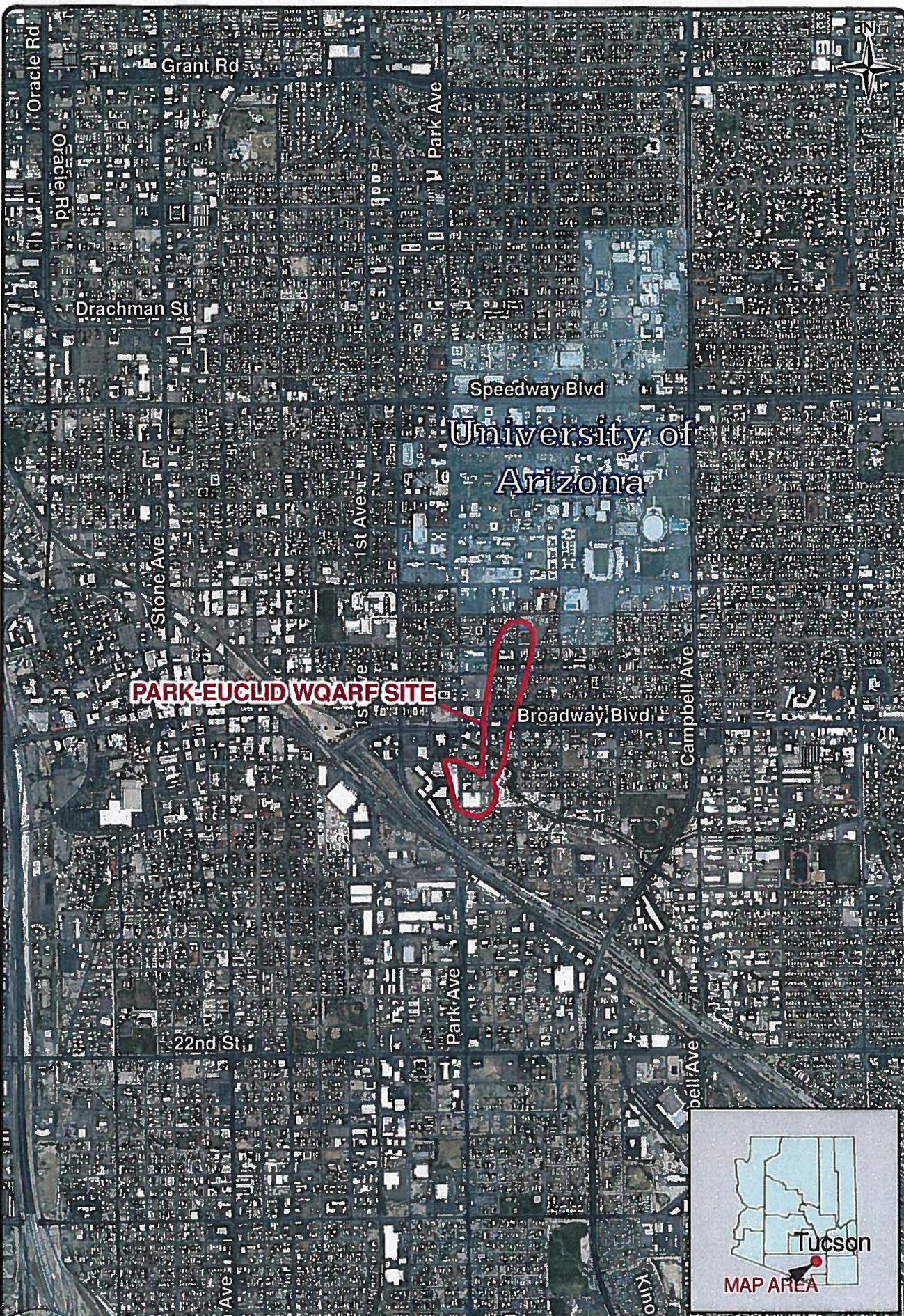
Note: µg/L = micrograms per liter
bgs = below ground surface
PCE = tetrachloroethene
TCE = trichloroethene
1,1-DCE = 1,1-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
Detected concentrations shown in **bold**

TABLE 4-8
Concentrations of Fixed Gases in the Lower Unsaturated Zone (percent)
Park-Euclid WQARF Site
Tucson, Arizona

Boring	Depth (feet bgs)	Carbon Dioxide	Oxygen	Nitrogen	Methane	Carbon Monoxide	Hydrogen	Total
VEL-3	175	2.2	13.5	84.2	ND	ND	ND	99.9
VML-1	127	0.5	19.0	80.5	ND	ND	ND	100.0
	147	1.8	16.7	81.6	ND	ND	ND	100.1
	167	4.0	10.3	85.7	ND	ND	ND	100.0
	187	3.1	12.1	84.8	ND	ND	ND	100.0
VML-2	127	0.6	20.9	78.6	ND	ND	ND	100.1
	147	3.2	17.7	79.1	ND	ND	ND	100.0
	167	7.6	2.8	89.6	ND	ND	ND	100.0
	187	3.7	12.2	84.1	ND	ND	ND	100.0
WR-374B	192	0.1	21.1	78.9	ND	ND	ND	100.1

Note: bgs = below ground surface
 ND = Non-detect

FIGURES



PARK-EUCLID WQARF SITE

University of
Arizona



Legend

-  Approximate Site Boundary
-  University of Arizona



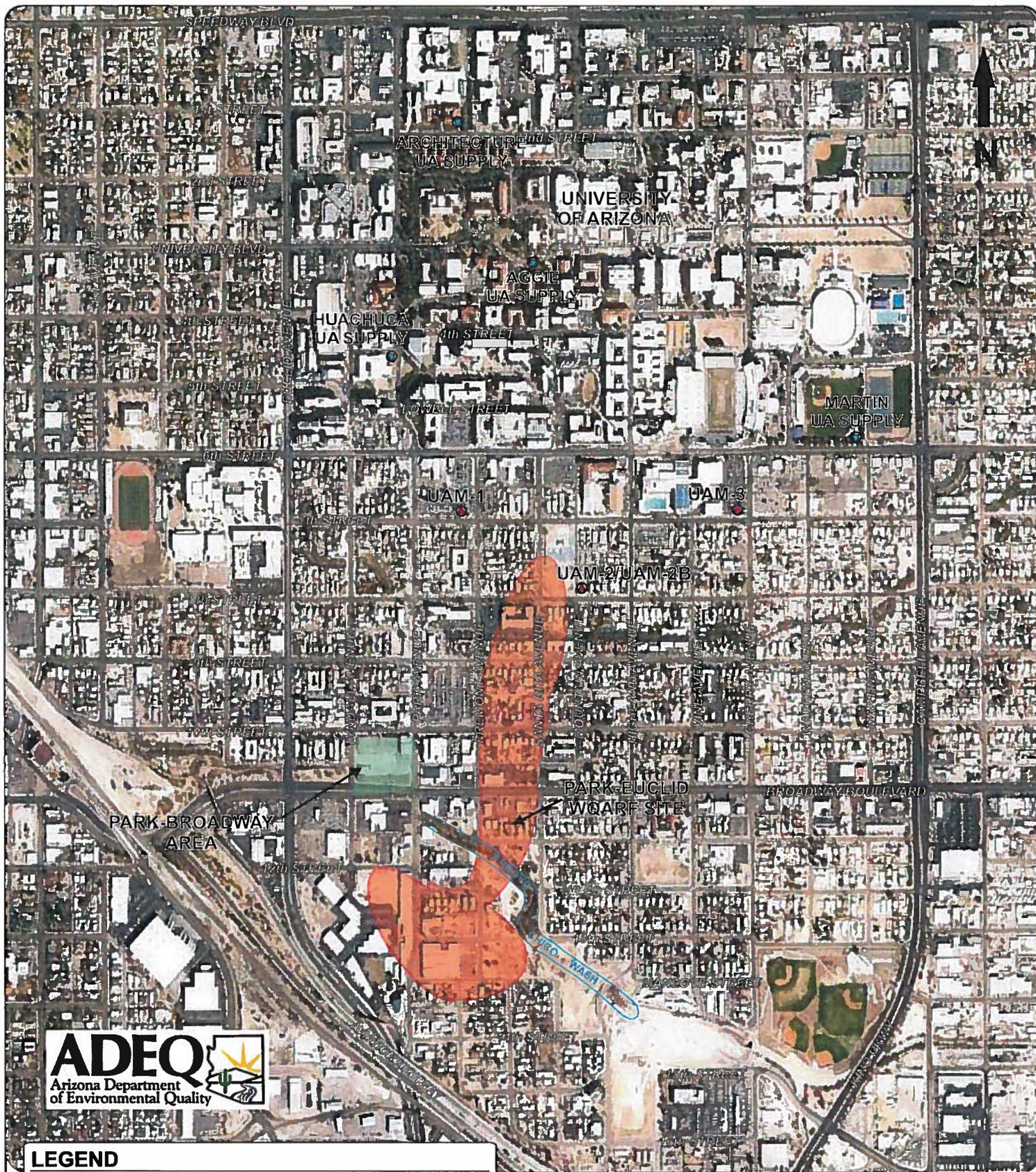
Site Location Map

LOCATION: PARK-EUCLID WQARF SITE, TUCSON, ARIZONA

CHECKED: JZ	FIGURE
DRAFTED: CJR	1-1
FILE: 1303 041	
DATE: 05/05/11	

 TETRA TECH GEO

P:\Database\Park Euclid\Fig 1 - Location Map.mxd



LEGEND

- UA SUPPLY University Of Arizona Water Supply Well Location
- UAM-1 ADEQ Monitor Wells (Installed by Malcolm Pirnie, Inc.)

0 500 1000

Approximate Scale:
1 inch = 1000 feet

NOTE: Locations and boundaries are approximate.

TITLE:

SITE VICINITY MAP

LOCATION:

Park-Euclid WQARF Site, Tucson, Arizona



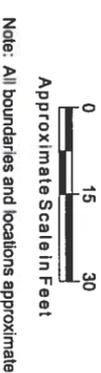
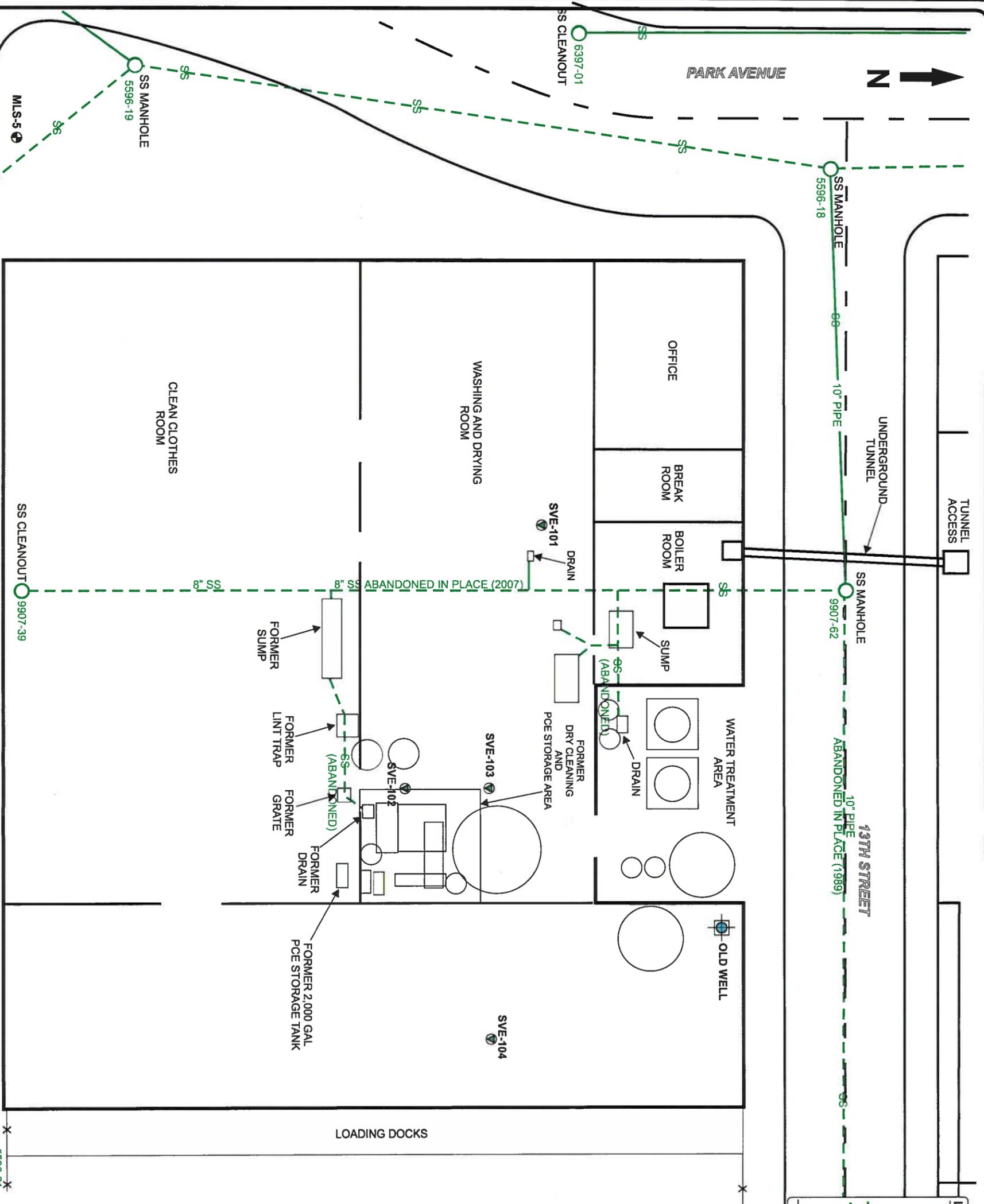
TETRA TECH GEO

APPROVED	JZ
DRAFTED	BB
PROJECT#	1303.041
DATE	5-24-11

FIGURE

1-2

LEGEND	
	Regional Aquifer Well Location.
	Perched Aquifer Well Location.
	Soil Vapor Extraction Well Location.
	Abandoned and Plugged Regional Aquifer Water Supply Well Location.
	Sanitary Sewer Location (Source - Pima County).
	Abandoned Sanitary Sewer Location (Source - Pima County).
	Sanitary Sewer Structure ID (Source - Pima County).
	Sanitary Sewer Manhole or Cleanout (Source - Pima County).
	Fence.



TITLE:
301 SOUTH PARK AVENUE FACILITY PLAN

LOCATION:
Park-Euclid WQARF Site, Tucson, Arizona

TF TETRA TECH GEO

APPROVED	JZ	FIGURE
DRAFTED	CJR	1-4
PROJECT#	1303.041	
DATE	5-6-11	



TWELFTH STREET

ARROYO CHICO

PEP-18	
DEPTH	PCE (mg/kg)
5'	<0.042
70'	<0.049
86'	<0.040
89'	<0.046
92'	<0.040

WR-345	
DEPTH	PCE (mg/kg)
70'	<0.05
90'	<0.05
100'	<0.05

S-2	
DEPTH	PCE (mg/kg)
2'	<0.05

B-7	
DEPTH	PCE (mg/kg)
2'	<0.05
15'	<0.05

S-3	
DEPTH	PCE (mg/kg)
2'	<0.05

PEP-17	
DEPTH	PCE (mg/kg)
5'	<0.060
30'	<0.069
46'	<0.054
60'	<0.054
90'	<0.047

MILES STREET

PEP-11

FREMONT AVENUE

SANTA RITA AVENUE

WR-347	
DEPTH	PCE (mg/kg)
80'	<0.05
90'	<0.05
100'	<0.05
110'	<0.05

G-4	
DEPTH	PCE (mg/kg)
0'	<0.05

HL-7	
DEPTH	PCE (mg/kg)
0'	<0.001

HL-9	
DEPTH	PCE (mg/kg)
0'	<0.001

HL-8	
DEPTH	PCE (mg/kg)
0'	<0.001

OLD WELL

PER-14

HL-2	
DEPTH	PCE (mg/kg)
0'	0.112

HL-3	
DEPTH	PCE (mg/kg)
0'	0.056

HL-4	
DEPTH	PCE (mg/kg)
0'	<0.001

HL-5	
DEPTH	PCE (mg/kg)
0'	<0.001

HL-1 (COMPOSITE SAMPLE)	
DEPTH	PCE (mg/kg)
0'	<0.001

HL-6	
DEPTH	PCE (mg/kg)
0'	0.0047

G-3	
DEPTH	PCE (mg/kg)
0'	<0.05

- SVE-101
- SVE-103
- SVE-104
- SVE-102
- SVE-105

MLR-1

PEP-8

MLS-4

PEP-16	
DEPTH	PCE (mg/kg)
5'	<0.051
40'	<0.053
59.5'	<0.075
85'	<0.045
93'	<0.054
95'	<0.052
97'	<0.055

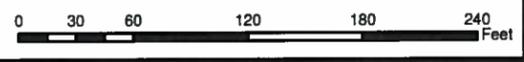
Manlove St

STAR AVENUE

Legend

- Perched Aquifer Wells
- Regional Aquifer Wells
- Vapor Extraction Wells
- Former Production Well
- Approximate Location of Dry Cleaning Waste Disposal Area
- Surface Sample, ADHS (1982), of Waste or Soil Which Was Later Removed From The Site.
- HL Surface Sample, A.D.H.S. (1982)
- B Soil Boring, C.O.T. (1998)
- S Hand Auger, C.O.T. (1998)
- G Surface Sample, C.O.T. (1998)
- PEP Soil Boring, A.D.E.Q. (2000)
- WR Soil Boring, C.O.T. (1998)
- PCE Tetrachloroethene Concentration mg/kg Milligrams per Kilogram

WELL-ID	
DEPTH	PCE (mg/kg)

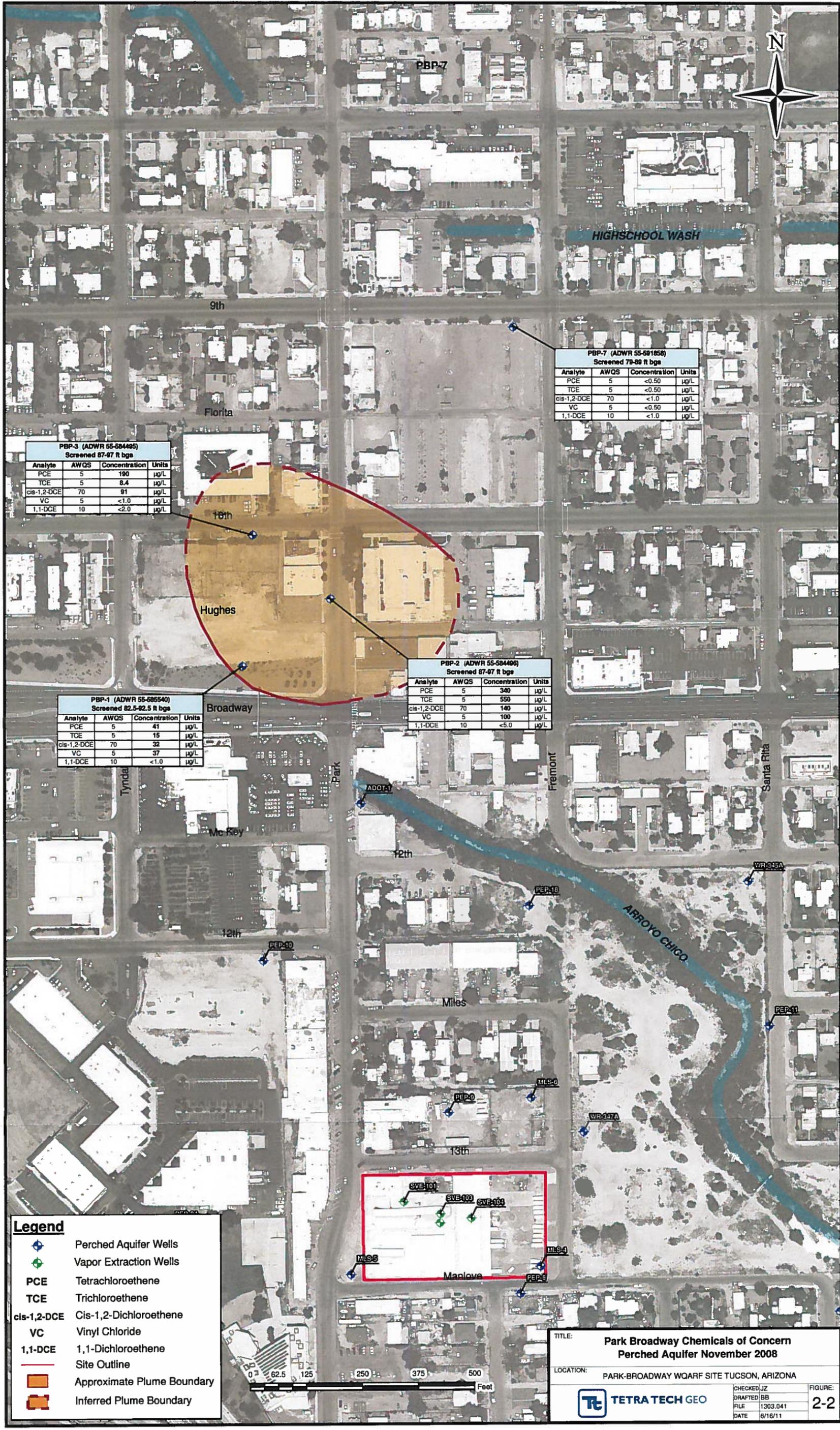


TITLE: SOIL CONTAMINATION CHARACTERIZATION IN THE PROPOSED ARROYO CHICO BASIN 1

LOCATION: PARK-EUCLID WQARF SITE TUCSON, ARIZONA

TETRA TECH GEO

CHECKED: JZ	FIGURE: 2-1
DRAFTED: BB	
FILE: 1303.041	
DATE: 5/26/2011	



PBP-3 (ADWR 55-584485)
Screened 87-97 R bgs

Analyte	AWQS	Concentration	Units
PCE	5	190	µg/L
TCE	5	8.4	µg/L
cis-1,2-DCE	70	91	µg/L
VC	5	<1.0	µg/L
1,1-DCE	10	<2.0	µg/L

PBP-7 (ADWR 55-581858)
Screened 79-89 R bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PBP-2 (ADWR 55-584486)
Screened 87-97 R bgs

Analyte	AWQS	Concentration	Units
PCE	5	340	µg/L
TCE	5	550	µg/L
cis-1,2-DCE	70	140	µg/L
VC	5	100	µg/L
1,1-DCE	10	<5.0	µg/L

PBP-1 (ADWR 55-585540)
Screened 82.5-82.5 R bgs

Analyte	AWQS	Concentration	Units
PCE	5	41	µg/L
TCE	5	15	µg/L
cis-1,2-DCE	70	32	µg/L
VC	5	37	µg/L
1,1-DCE	10	<1.0	µg/L

Legend

- Perched Aquifer Wells
- Vapor Extraction Wells
- PCE** Tetrachloroethene
- TCE** Trichloroethene
- cis-1,2-DCE** Cis-1,2-Dichloroethene
- VC** Vinyl Chloride
- 1,1-DCE** 1,1-Dichloroethene
- Site Outline
- Approximate Plume Boundary
- Inferred Plume Boundary

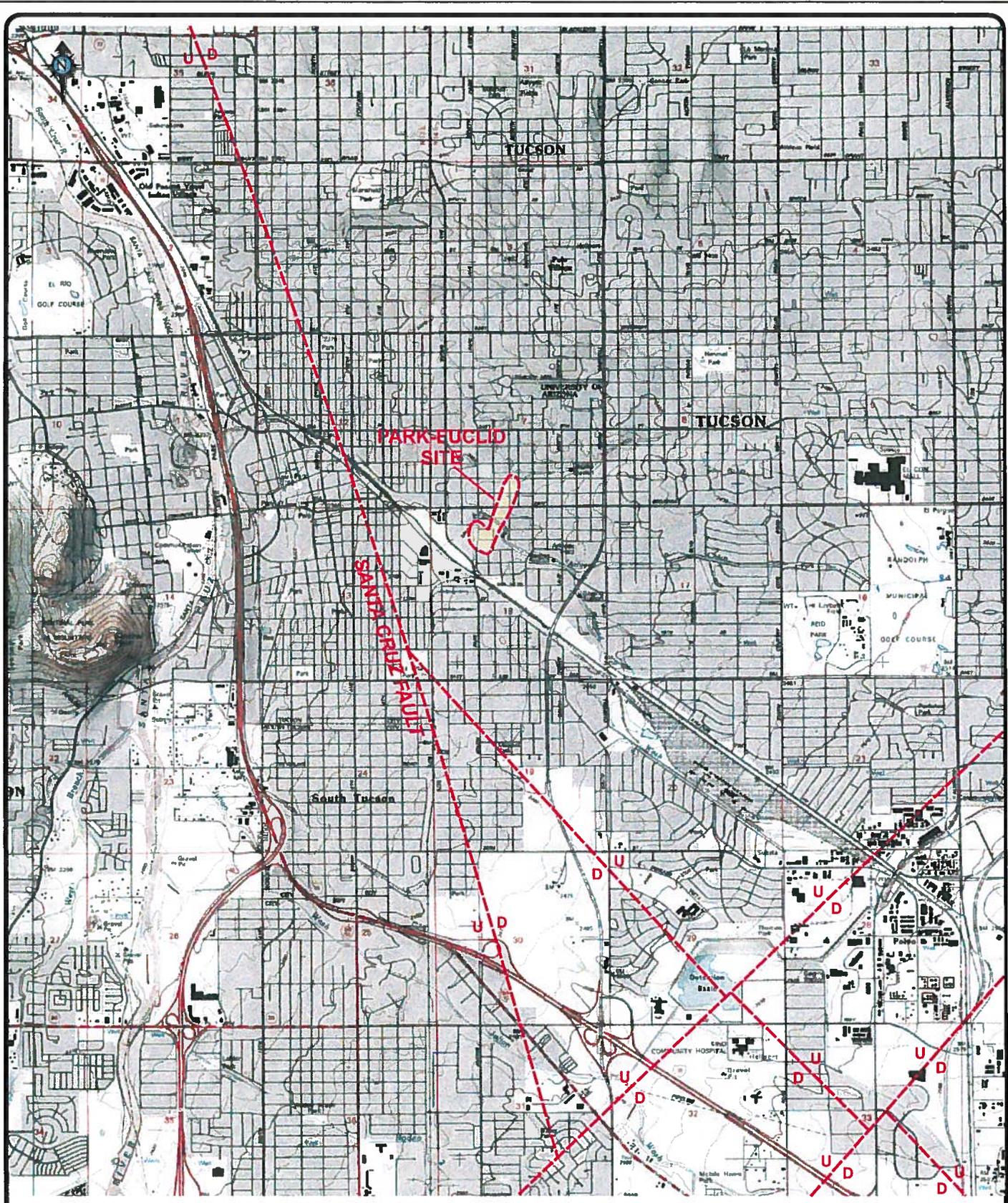


TITLE: **Park Broadway Chemicals of Concern**
Perched Aquifer November 2008

LOCATION: PARK-BROADWAY WQARF SITE TUCSON, ARIZONA

TETRA TECH GEO

CHECKED: JZ	FIGURE: 2-2
DRAFTED: BB	
FILE: 1303.041	
DATE: 6/16/11	



Faults from Davidson (1973).



Approximate Scale:
1 : 50,000
1 inch = 4,167 feet

Note: All boundaries and locations approximate.
Source: US Geological Survey 7.5 min topographic map, Arizona.

TITLE:

IDENTIFIED FAULTS IN TUCSON BASIN

LOCATION:

Park-Euclid WQARF Site, Tucson, Arizona



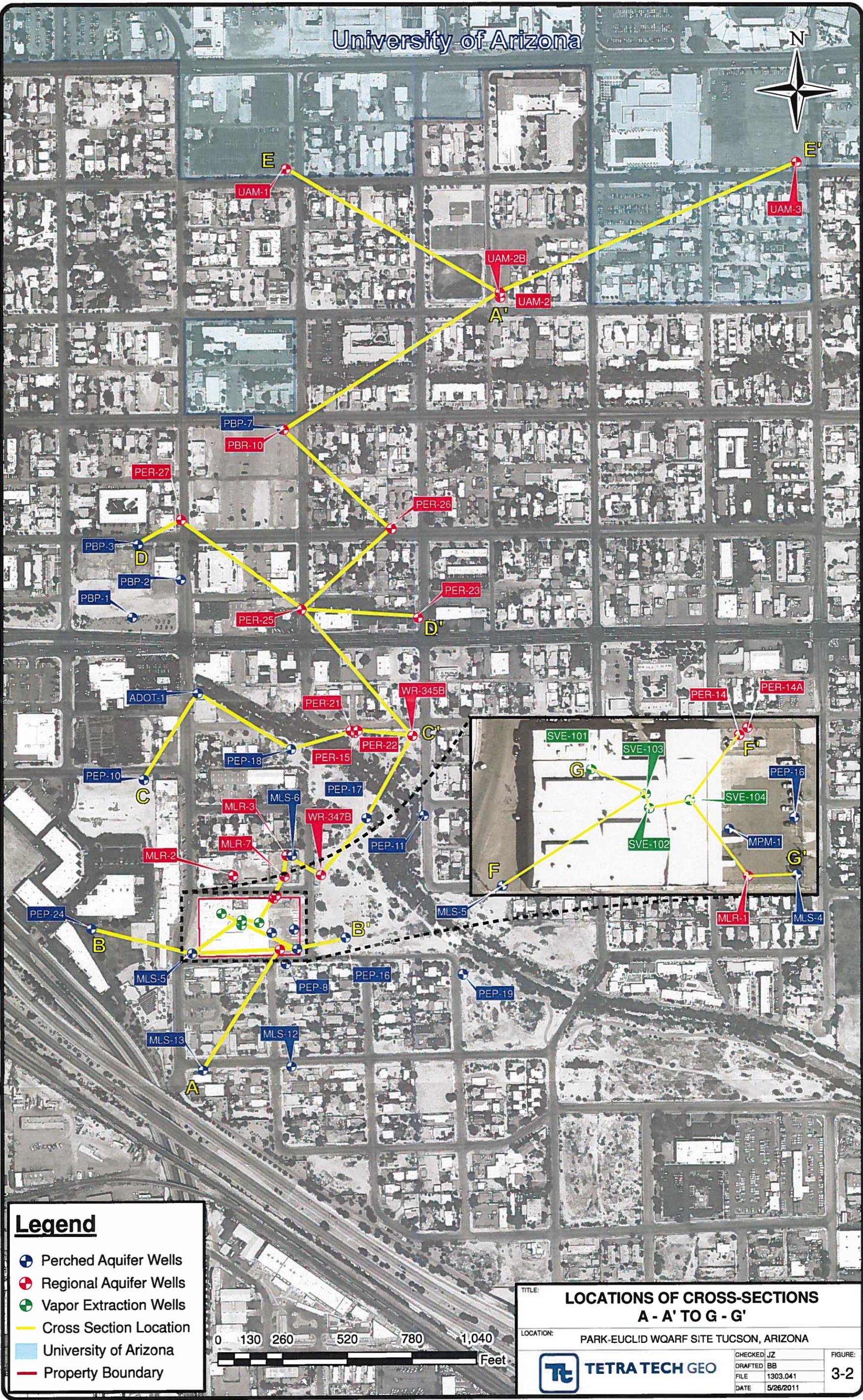
TETRA TECH GEO

APPROVED	JZ
DRAFTED	BB
PROJECT#	1303.041
DATE	5-6-11

FIGURE

3-1

University of Arizona



Legend

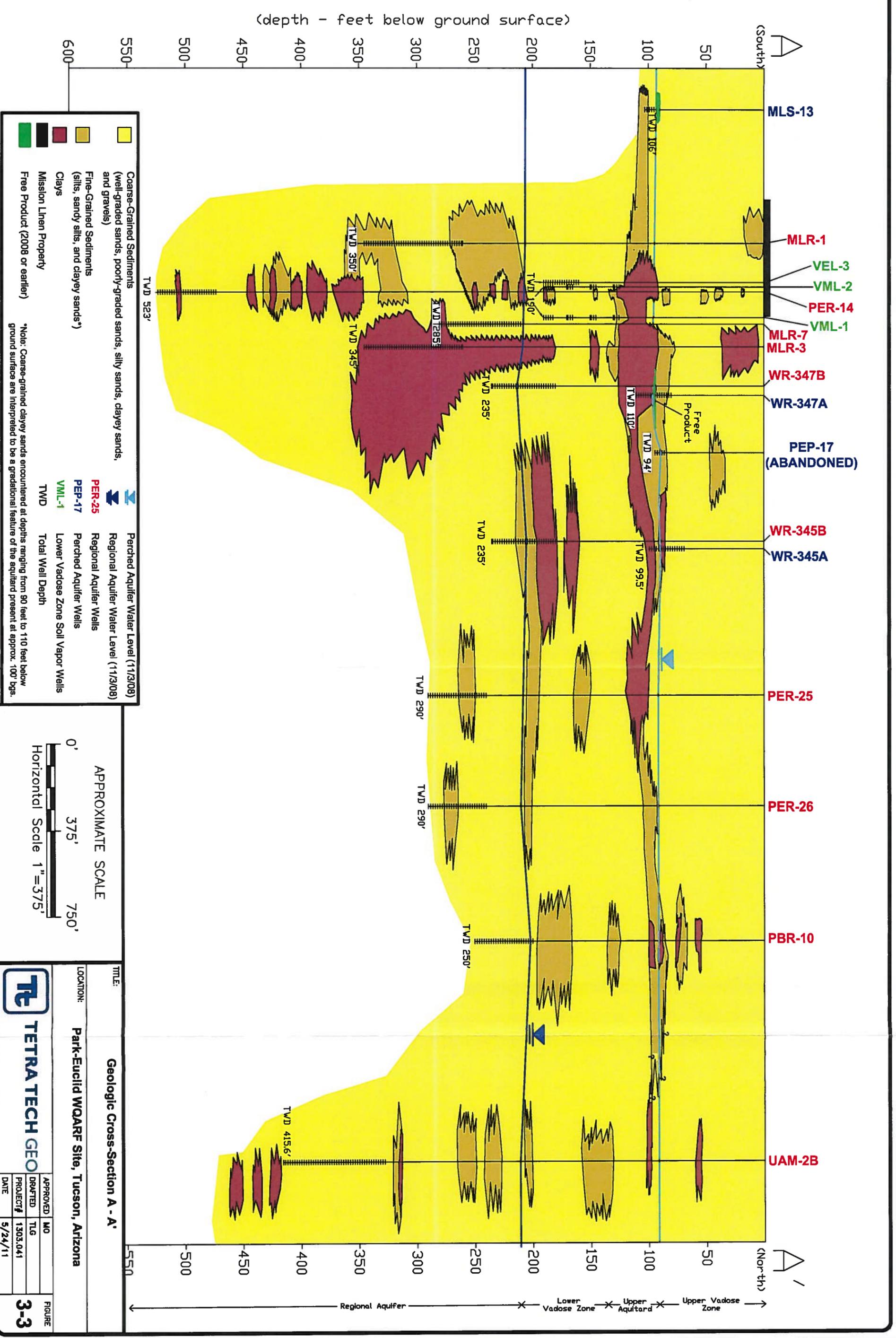
-  Perched Aquifer Wells
-  Regional Aquifer Wells
-  Vapor Extraction Wells
-  Cross Section Location
-  University of Arizona Property Boundary

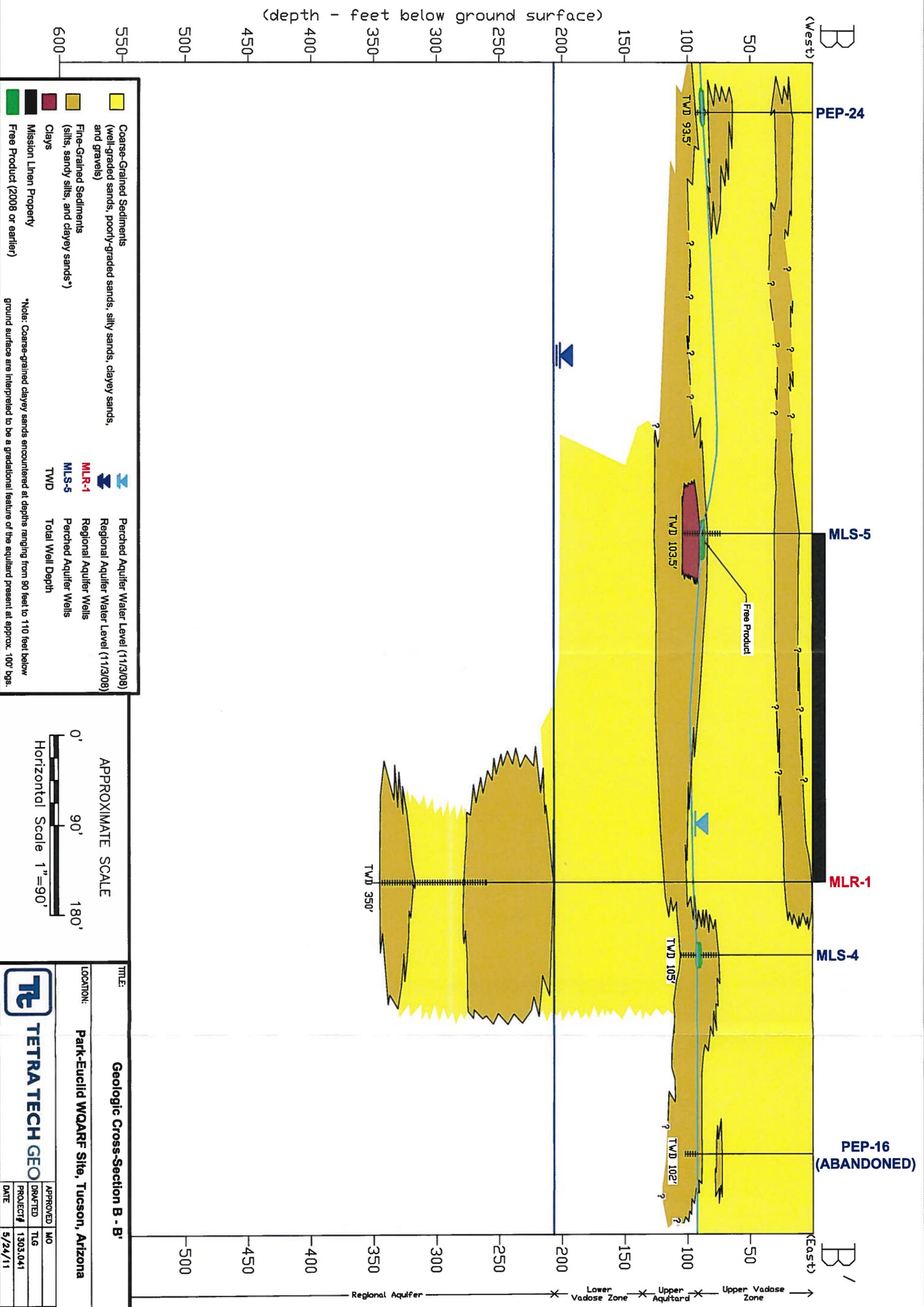


TITLE: **LOCATIONS OF CROSS-SECTIONS A - A' TO G - G'**

LOCATION: **PARK-EUCLID WQARF SITE TUCSON, ARIZONA**

	CHECKED	JZ	FIGURE: 3-2
	DRAFTED	BB	
	FILE	1303.041	
	DATE	5/26/2011	





	Coarse-Grained Sediments (well-graded sands, poorly-graded sands, silty sands, clayey sands, and gravels)		Perched Aquifer Water Level (11/3/08)
	Fine-Grained Sediments (silt, sandy silt, and clayey sands*)		Regional Aquifer Water Level (11/3/08)
	Clays		Regional Aquifer Wells
	Mission Lihen Property		Perched Aquifer Wells
	Free Product (2008 or earlier)		Total Well Depth

*Note: Coarse-grained clayey sands encountered at depths ranging from 90 feet to 110 feet below ground surface are interpreted to be a gradational feature of the aquitard present at approx. 100' bgs.

APPROXIMATE SCALE

0' 90' 180'

Horizontal Scale 1" = 90'

TITLE: **Geologic Cross-Section B - B'**

LOCATION: **Park-Euclid WQARF Site, Tucson, Arizona**

APPROVED: MO

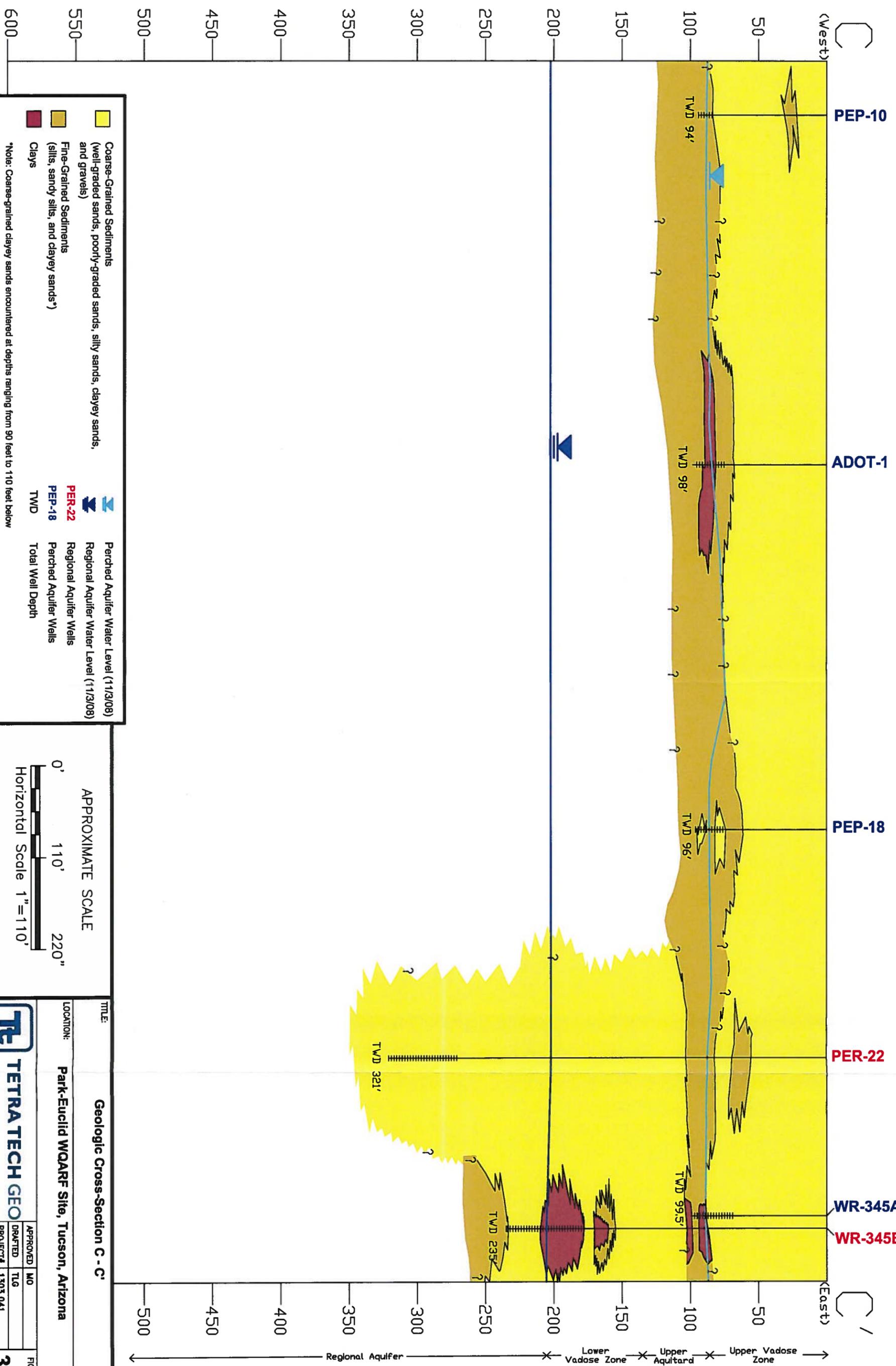
DRAWN: TLG

PROJECT#: 1303.041

DATE: 5/24/11

FIGURE: **3-4**

(depth - feet below ground surface)



Legend

- Coarse-Grained Sediments (well-graded sands, poorly-graded sands, silty sands, clayey sands, and gravels)
- Fine-Grained Sediments (silt, sandy silt, and clayey sands*)
- Clays
- Perched Aquifer Water Level (11/3/08)
- Regional Aquifer Water Level (11/3/08)
- Regional Aquifer Wells
- Perched Aquifer Wells
- TWD
- Total Well Depth

*Note: Coarse-grained clayey sands encountered at depths ranging from 90 feet to 110 feet below ground surface are interpreted to be a gradational feature of the aquitard present at approx. 100' bgs.



TITLE: Geologic Cross-Section C - C'

LOCATION: Park-Euclid WQARF Site, Tucson, Arizona

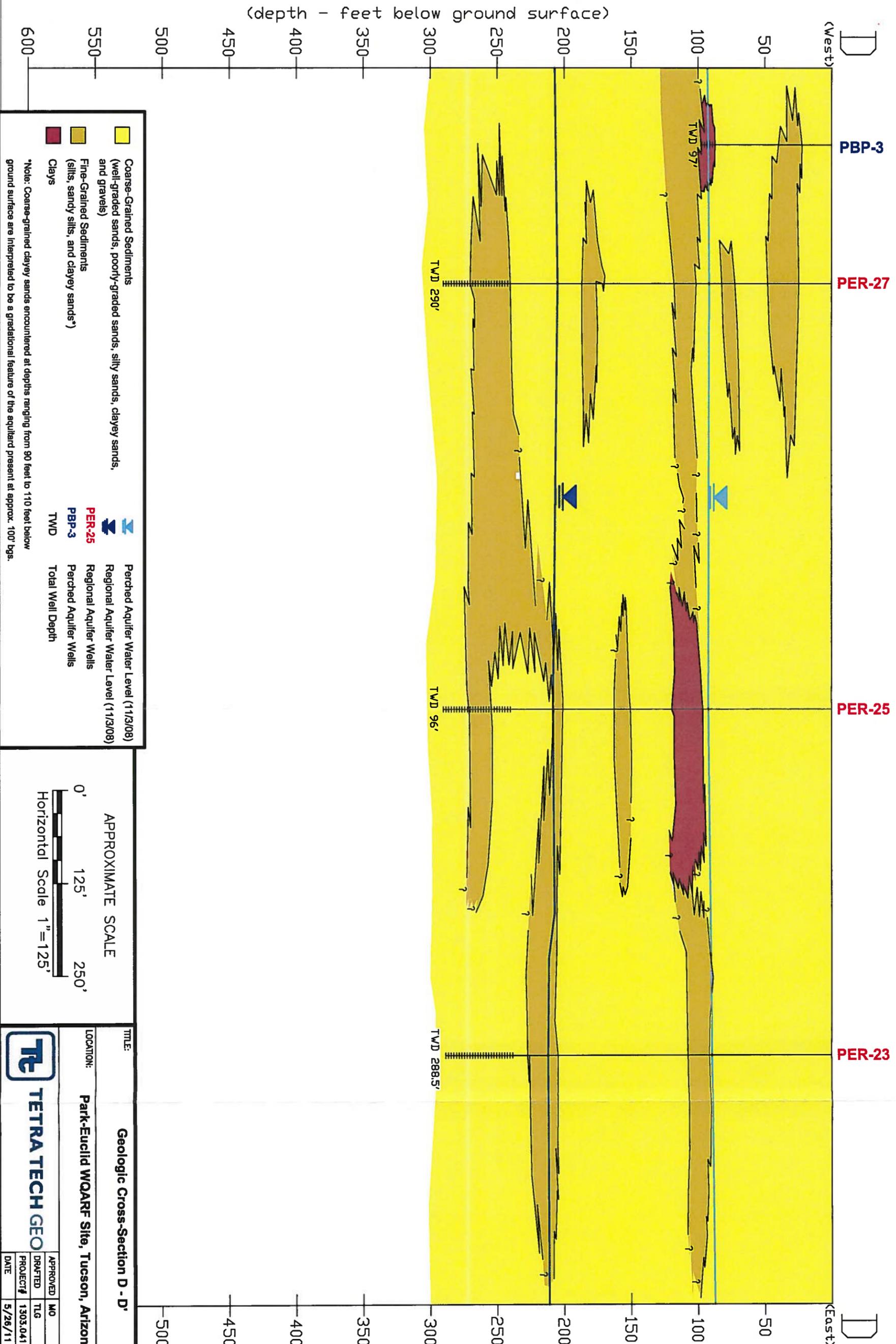
APPROVED: MO

DRAFTED: TLG

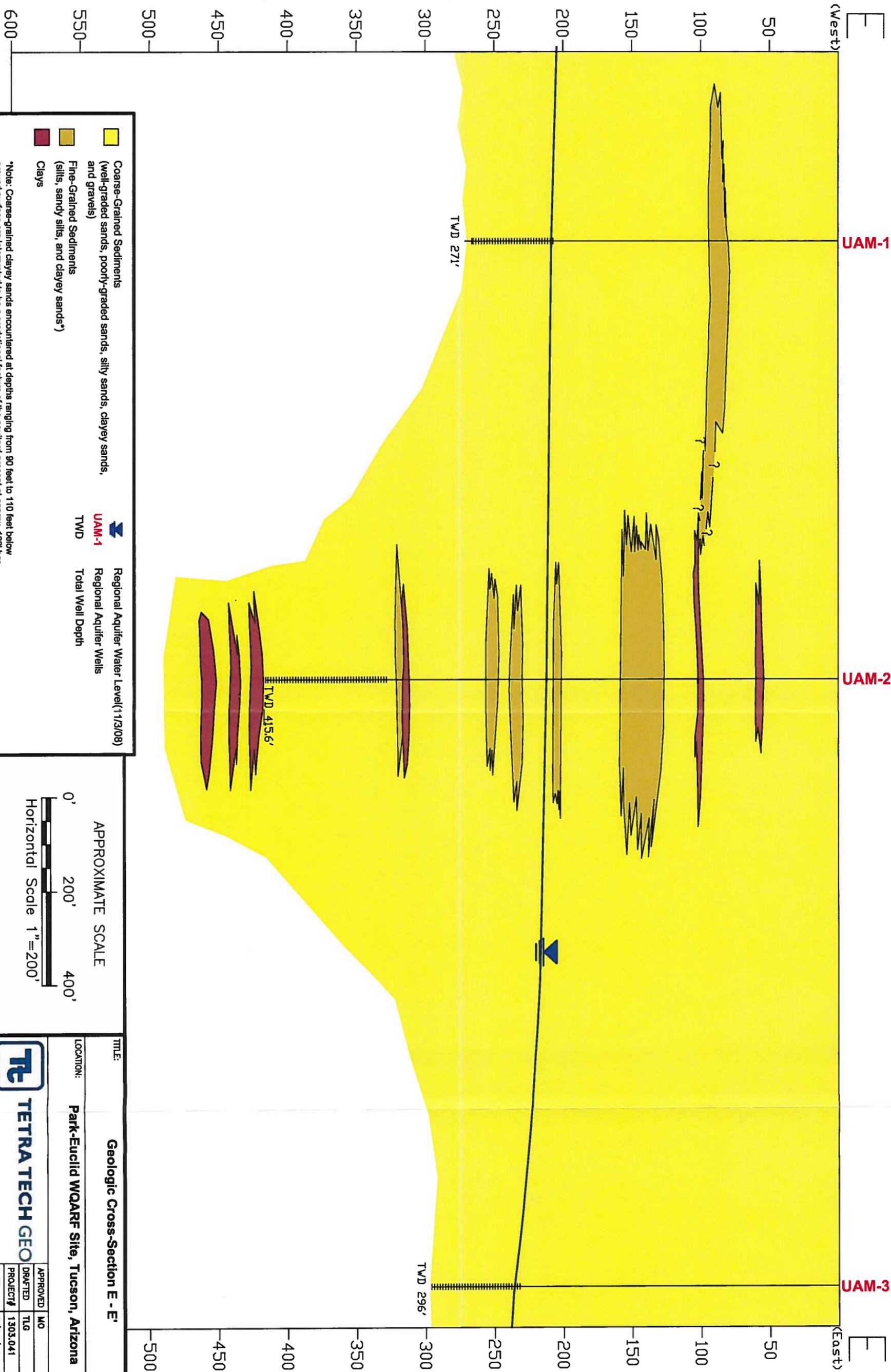
PROJECT#: 1303.041

DATE: 5/24/11

FIGURE: 3-5



(depth - feet below ground surface)



- Coarse-Grained Sediments (well-graded sands, poorly-graded sands, silty sands, clayey sands, and gravels)
 - Fine-Grained Sediments (silt, sandy silt, and clayey sands*)
 - Clays
- Regional Aquifer Water Level (1/13/09)
 UAM-1
 TWD
 Regional Aquifer Wells
 TWD
 Total Well Depth

*Note: Coarse-grained clayey sands encountered at depths ranging from 90 feet to 110 feet below ground surface are interpreted to be a gradational feature of the aquitard present at approx. 100' bgs.

APPROXIMATE SCALE



TITLE: **Geologic Cross-Section E - E'**

LOCATION: **Park-Euclid WQARF Site, Tucson, Arizona**

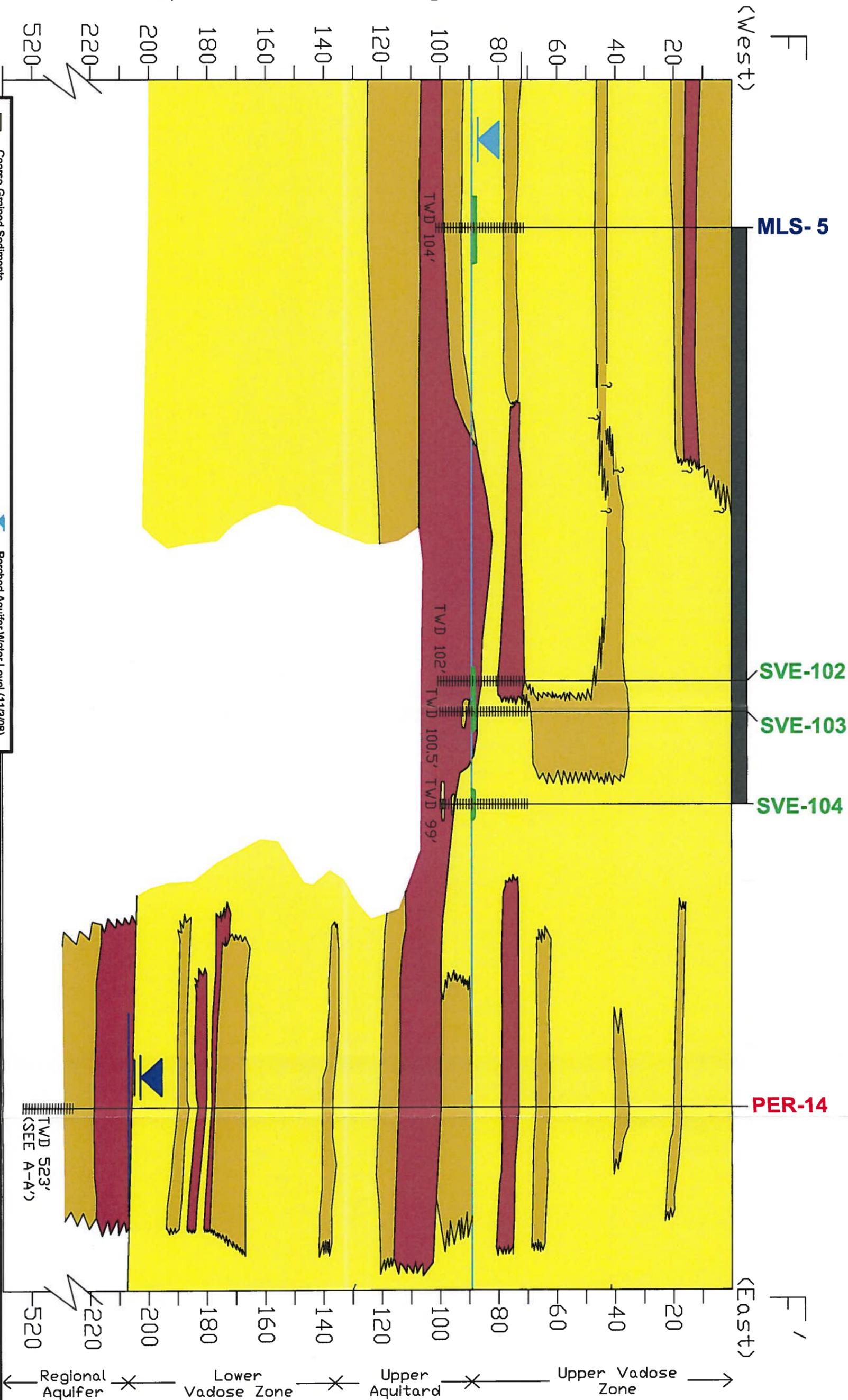


APPROVED	MO
DRAFTED	TLG
PROJECT#	1303.041
DATE	5/26/11

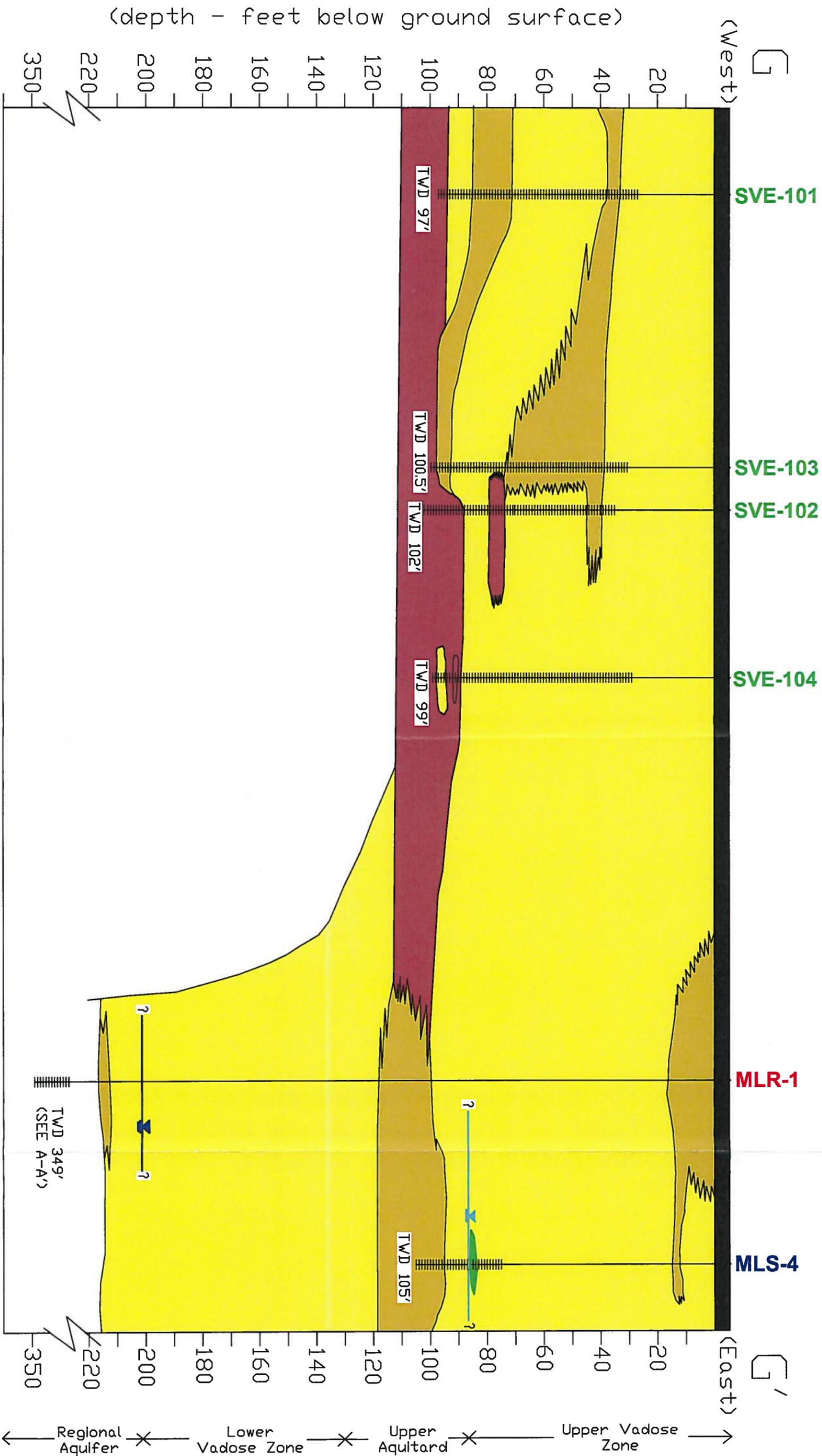
FIGURE **3-7**

←
Regional Aquifer
X
Lower Vadose Zone
X
Upper Aquitard
X
Upper Vadose Zone
→

(depth - feet below ground surface)



(depth - feet below ground surface)



- Coarse-Grained Sediments (well-graded sands, poorly-graded sands, silty sands, clayey sands, and gravels)
 - Fine-Grained Sediments (silt, sandy silt, and clayey sands*)
 - Clays
 - Mission Lichen Property
 - Free Product (2008 or earlier)
-
- Perched Aquifer Water Level (11/3/08)
 - Regional Aquifer Water Level (11/3/08)
 - MLR-1 Regional Aquifer Wells
 - MLS-4 Perched Aquifer Wells
 - SVE-101 Vadose Zone Soil Vapor Extraction Wells
 - TWD Total Well Depth

*Note: Coarse-grained clayey sands encountered at depths ranging from 90 feet to 110 feet below ground surface are interpreted to be a gradational feature of the aquitard present at approx. 100' bgs.

APPROXIMATE SCALE



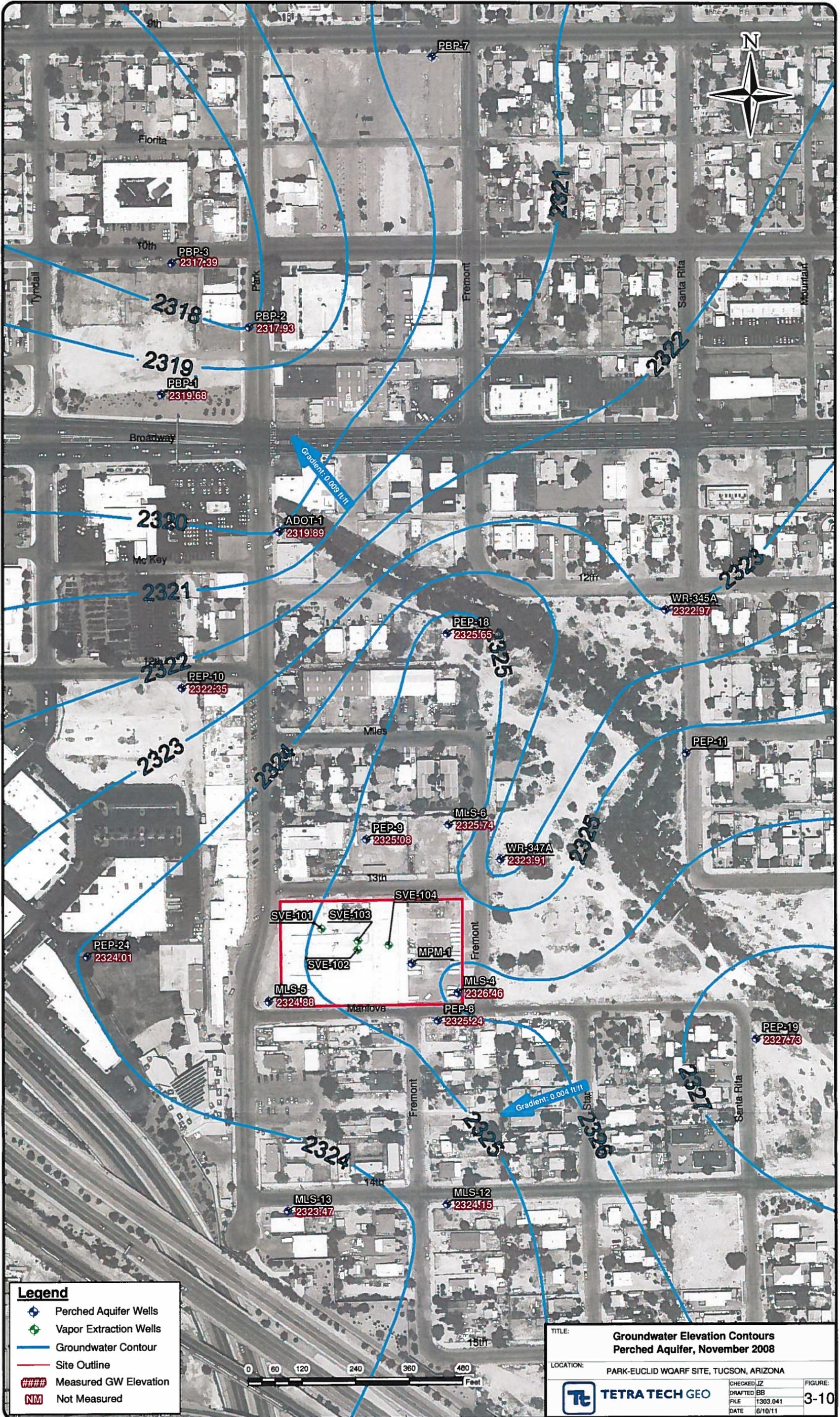
TITLE: **Geologic Cross-Section G - G'**

LOCATION: **Park-Euclid WQARF Site, Tucson, Arizona**



APPROVED	MO
DRAFTED	TLG
PROJECT#	1303.041
DATE	5/26/11

FIGURE **3-9**

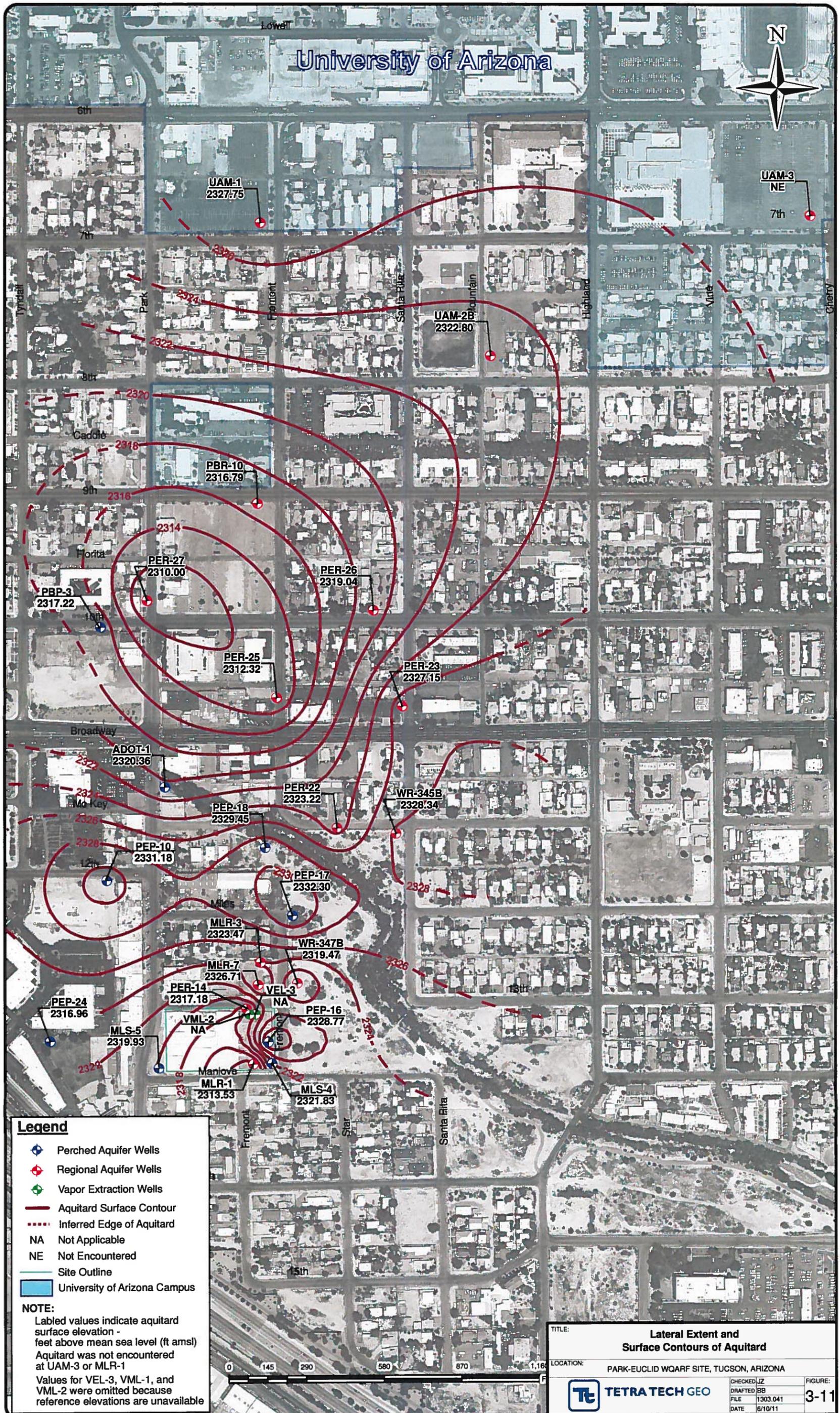


Legend

- ◆ Perched Aquifer Wells
- ◆ Vapor Extraction Wells
- Groundwater Contour
- Site Outline
- ### Measured GW Elevation
- NM Not Measured

TITLE: Groundwater Elevation Contours Perched Aquifer, November 2008		
LOCATION: PARK-EUCLID WQARF SITE, TUCSON, ARIZONA		
TETRA TECH GEO	CHECKED: JZ DRAFTED: BB FILE: 1303.041 DATE: 6/10/11	FIGURE: 3-10

University of Arizona

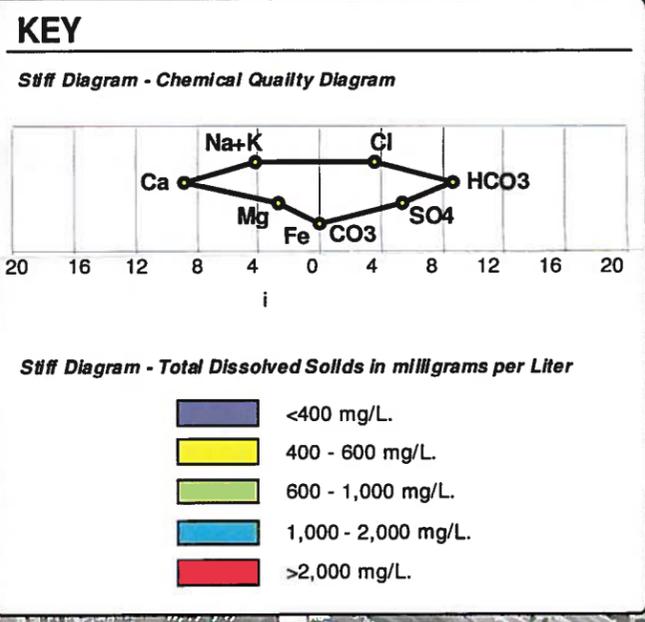
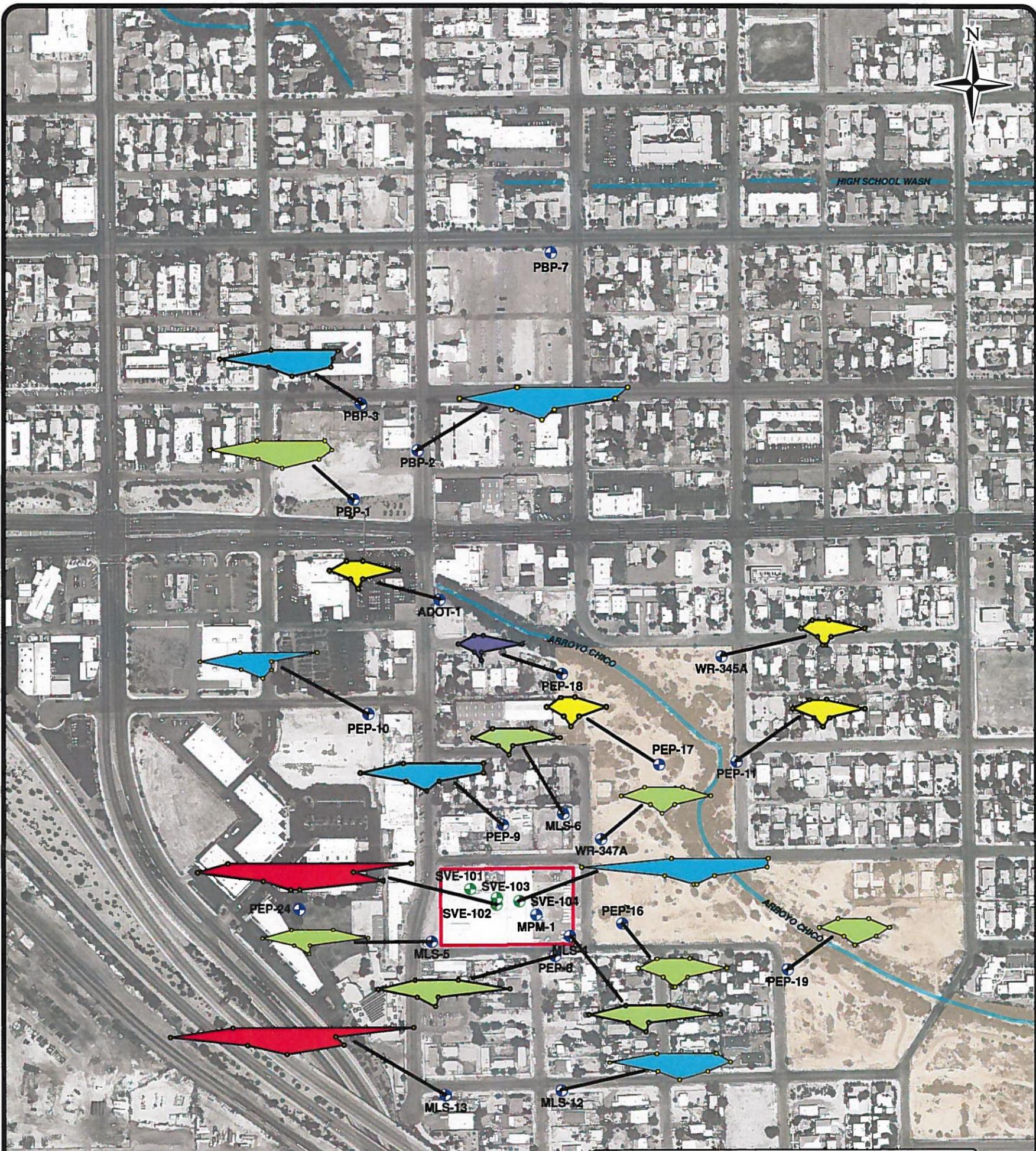


Legend

- Perched Aquifer Wells
- Regional Aquifer Wells
- Vapor Extraction Wells
- Aquitard Surface Contour
- Inferred Edge of Aquitard
- NA Not Applicable
- NE Not Encountered
- Site Outline
- University of Arizona Campus

NOTE:
 Labeled values indicate aquitard surface elevation - feet above mean sea level (ft amsl)
 Aquitard was not encountered at UAM-3 or MLR-1
 Values for VEL-3, VML-1, and VML-2 were omitted because reference elevations are unavailable

TITLE: Lateral Extent and Surface Contours of Aquitard	
LOCATION: PARK-EUCLID WQARF SITE, TUCSON, ARIZONA	
	CHECKED: JZ
	DRAFTED: BB
	FILE: 1303.041
DATE: 6/10/11	FIGURE: 3-11



Legend

- Perched Aquifer Wells
- Vapor Extraction Wells
- Site Outline
- Proposed Arroyo Chico Drainage Detention Basin

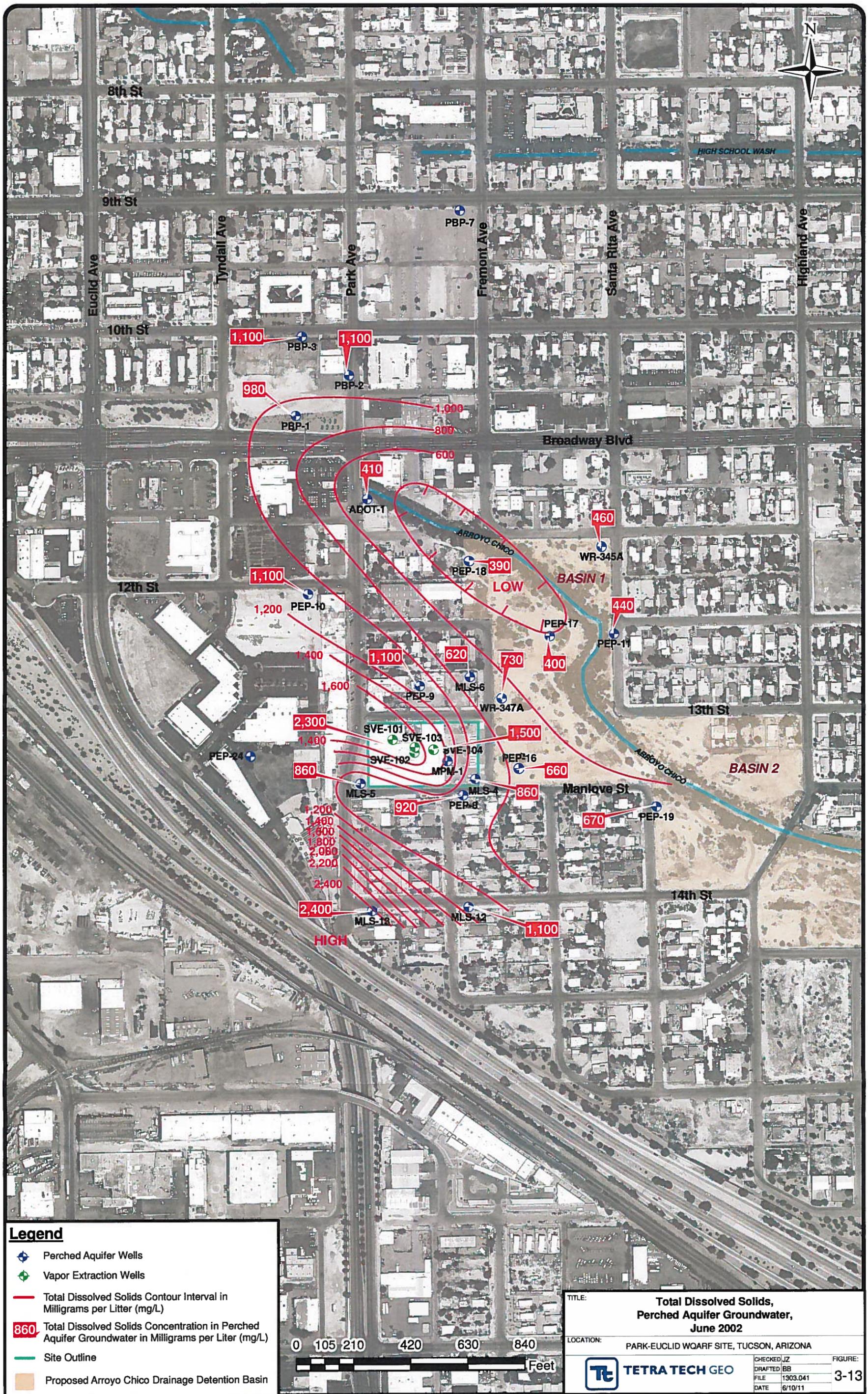


TITLE: Stiff Diagrams, Perched Aquifer Groundwater, June 2002

LOCATION: PARK-EUCLID WQARF SITE, TUCSON, ARIZONA

CHECKED: JZ	FIGURE:
DRAFTED: BB	3-12
FILE: 1303.041	
DATE: 6/10/11	

TETRA TECH GEO

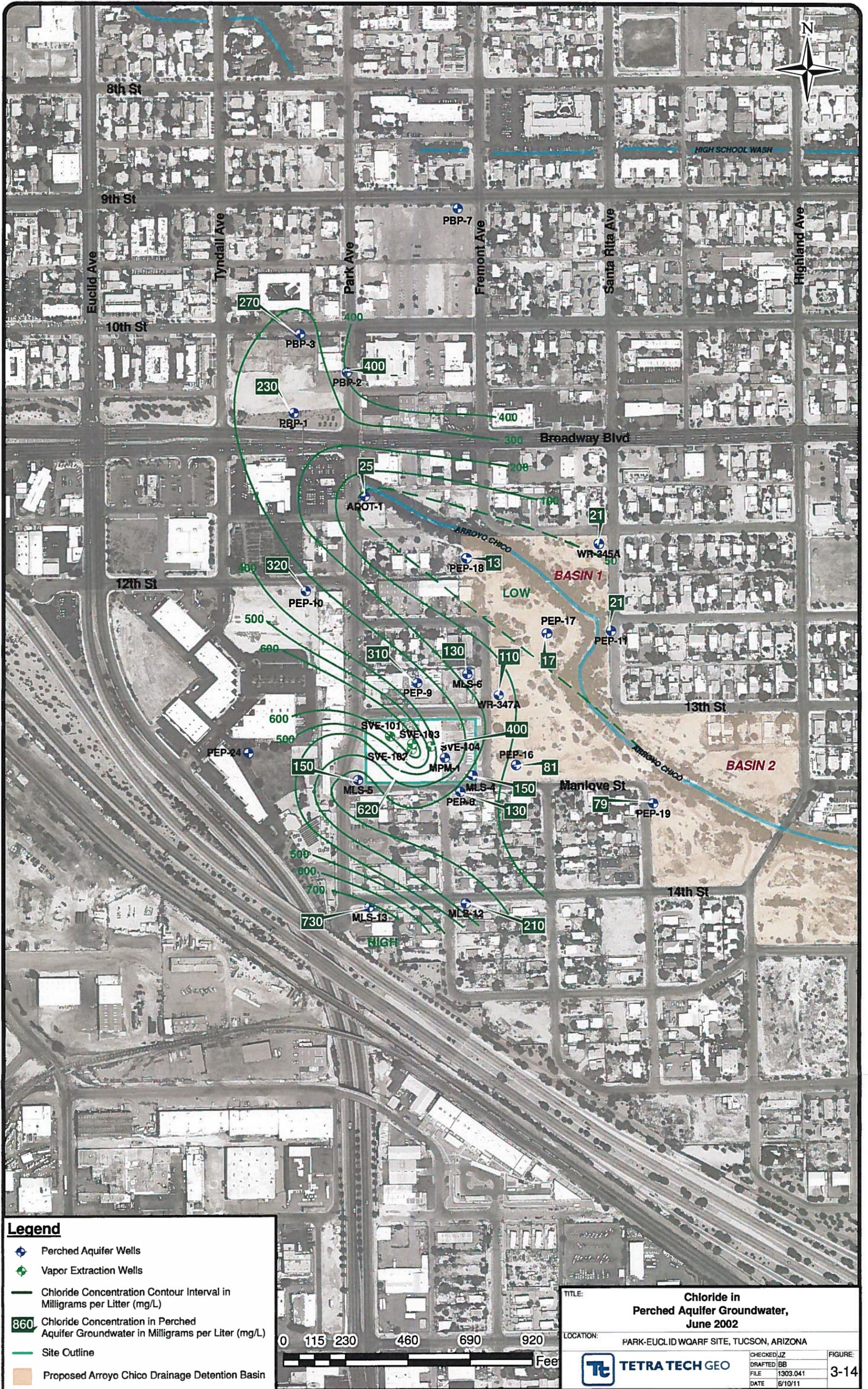


Legend

-  Perched Aquifer Wells
-  Vapor Extraction Wells
-  Total Dissolved Solids Contour Interval in Milligrams per Liter (mg/L)
-  Total Dissolved Solids Concentration in Perched Aquifer Groundwater in Milligrams per Liter (mg/L)
-  Site Outline
-  Proposed Arroyo Chico Drainage Detention Basin

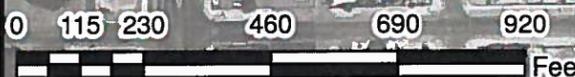


TITLE: Total Dissolved Solids, Perched Aquifer Groundwater, June 2002	
LOCATION: PARK-EUCLID WQARF SITE, TUCSON, ARIZONA	
	TETRA TECH GEO
CHECKED: JZ	FIGURE: 3-13
DRAFTED: BB	
FILE: 1303.041	
DATE: 6/10/11	

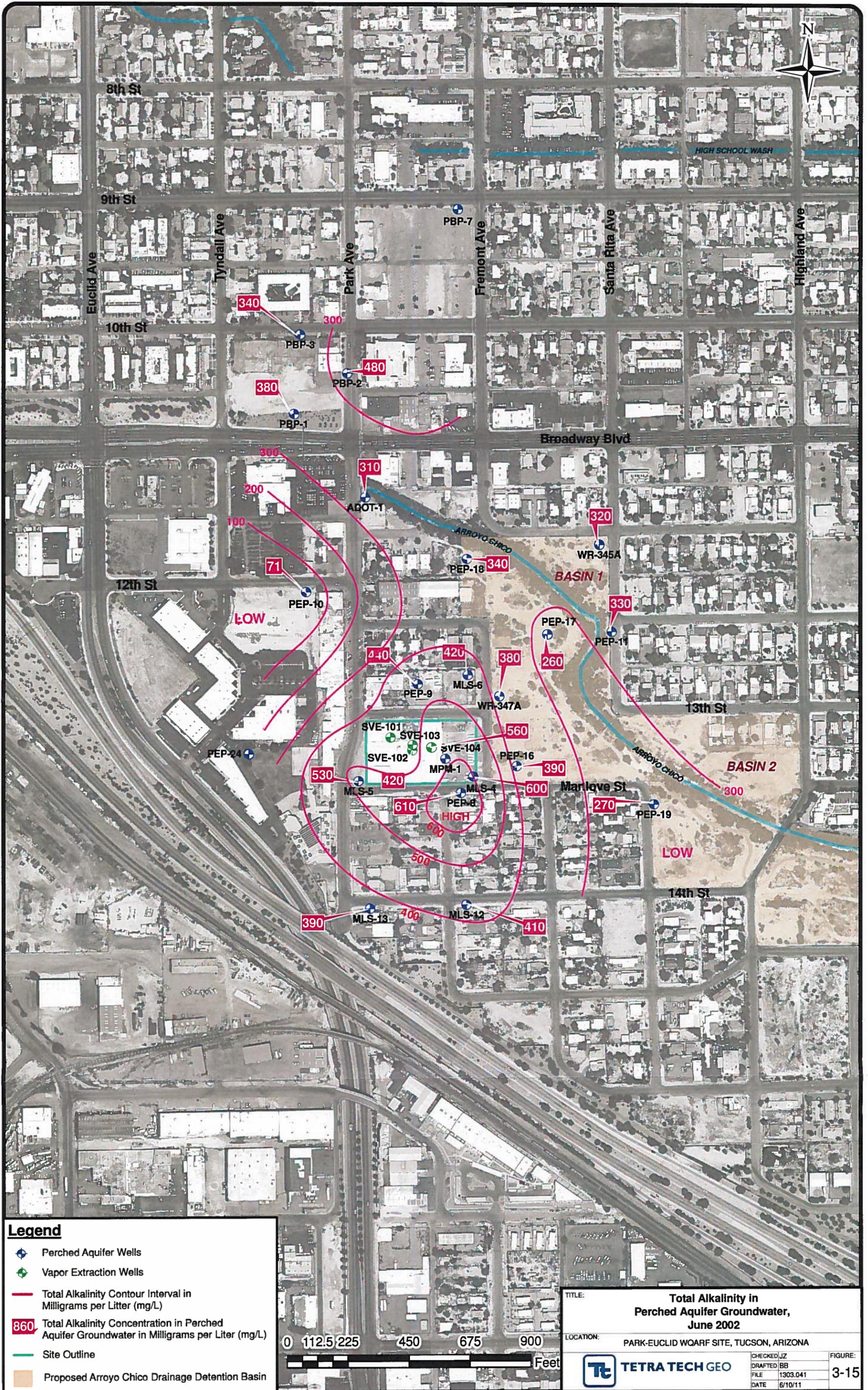


Legend

- Perched Aquifer Wells
- Vapor Extraction Wells
- Chloride Concentration Contour Interval in Milligrams per Litter (mg/L)
- 860 Chloride Concentration in Perched Aquifer Groundwater in Milligrams per Litter (mg/L)
- Site Outline
- Proposed Arroyo Chico Drainage Detention Basin

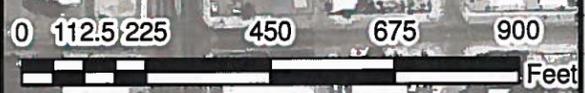


TITLE: Chloride in Perched Aquifer Groundwater, June 2002		FIGURE: 3-14
LOCATION: PARK-EUCLID WHARF SITE, TUCSON, ARIZONA		
		CHECKED: JZ
		DRAFTED: BB
		FILE: 1303.041
		DATE: 6/10/11

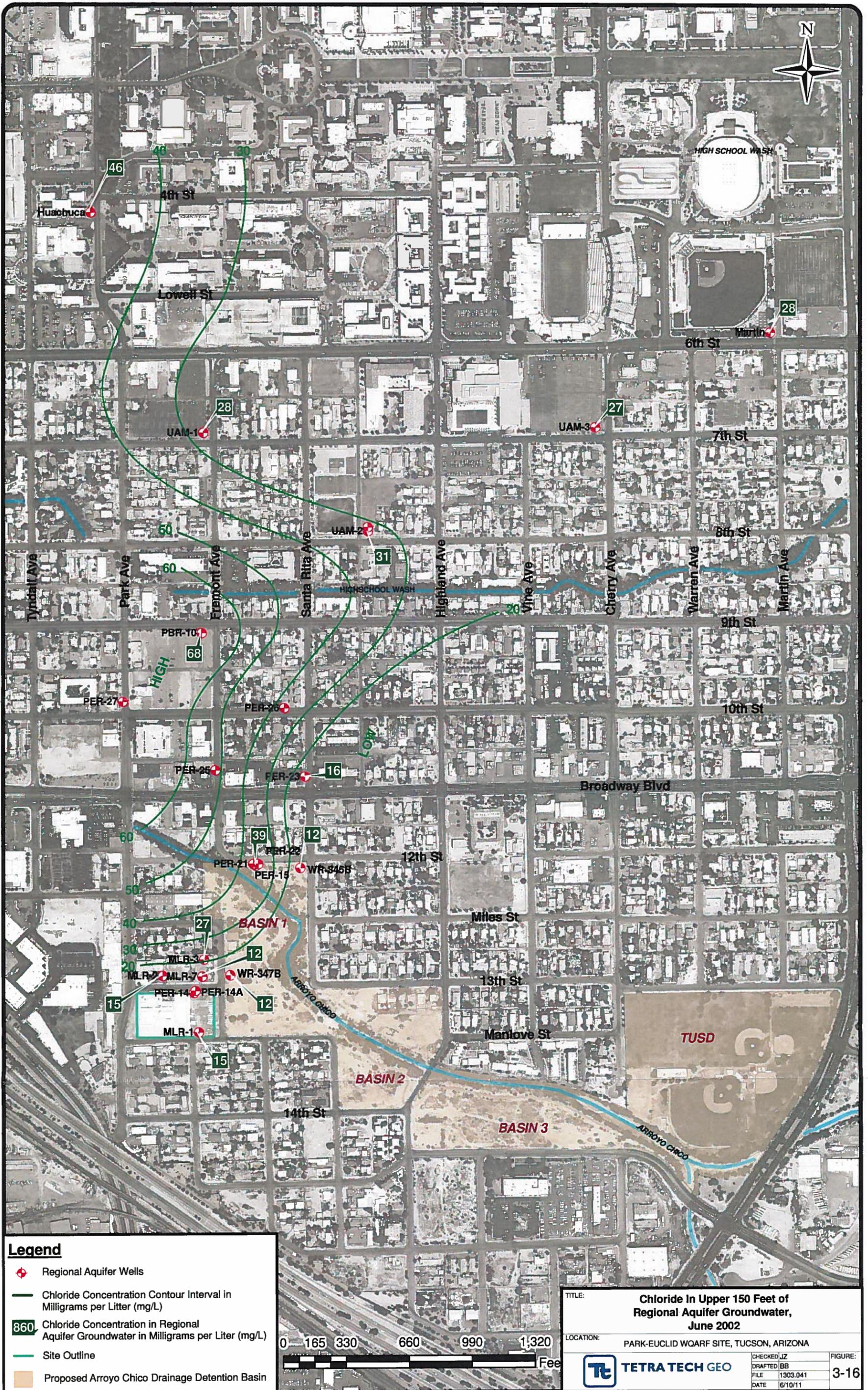


Legend

- Perched Aquifer Wells
- Vapor Extraction Wells
- Total Alkalinity Contour Interval in Milligrams per Liter (mg/L)
- 860 Total Alkalinity Concentration in Perched Aquifer Groundwater in Milligrams per Liter (mg/L)
- Site Outline
- Proposed Arroyo Chico Drainage Detention Basin



TITLE: Total Alkalinity in Perched Aquifer Groundwater, June 2002	
LOCATION: PARK-EUCLID WHARF SITE, TUCSON, ARIZONA	
	FIGURE: 3-15
CHECKED: JZ	DRAFTED: BB
FILE: 1303.041	DATE: 6/10/11



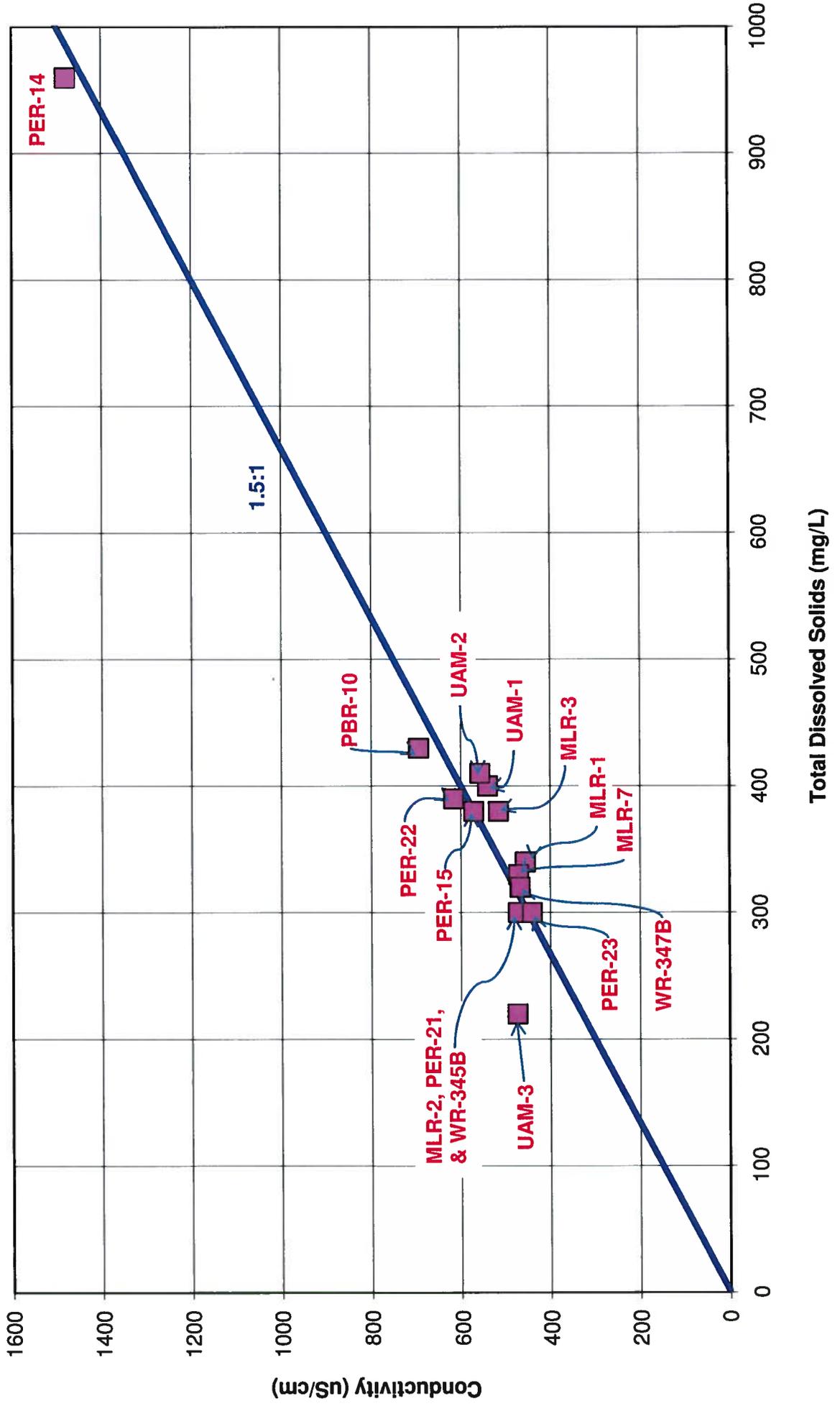
Legend

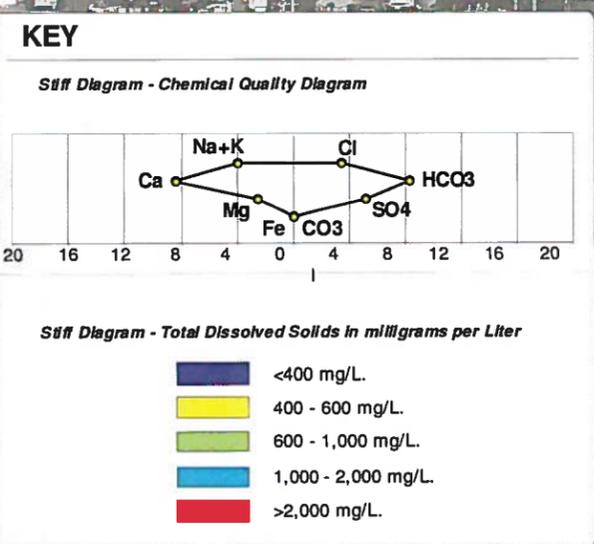
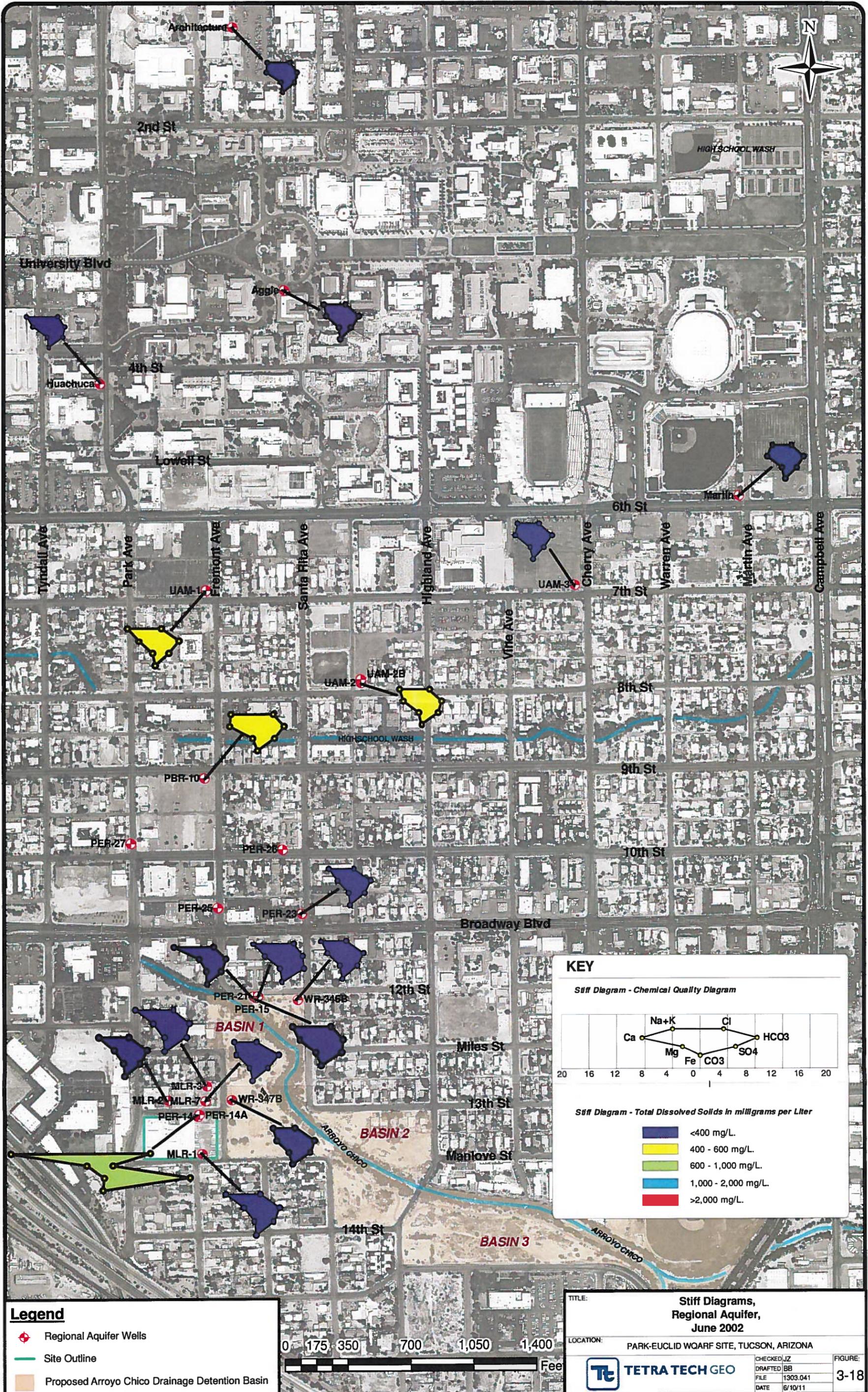
- ◆ Regional Aquifer Wells
- Chloride Concentration Contour Interval in Milligrams per Liter (mg/L)
- 860 Chloride Concentration in Regional Aquifer Groundwater in Milligrams per Liter (mg/L)
- Site Outline
- Proposed Arroyo Chico Drainage Detention Basin



TITLE: Chloride In Upper 150 Feet of Regional Aquifer Groundwater, June 2002	
LOCATION: PARK-EUCLID WQAR SITE, TUCSON, ARIZONA	
TETRA TECH GEO	CHECKED: JZ DRAFTED: BB FILE: 1303.041 DATE: 6/10/11
FIGURE: 3-16	

Figure 3-17
 Conductivity versus Total Dissolved Solids in Regional Aquifer, June 2002
 Park-Euclid WQARF Site, Tucson, Arizona





- Legend**
- ⊕ Regional Aquifer Wells
 - Site Outline
 - Proposed Arroyo Chico Drainage Detention Basin



TITLE: **Stiff Diagrams, Regional Aquifer, June 2002**

LOCATION: **PARK-EUCLID WQARF SITE, TUCSON, ARIZONA**

CHECKED: JZ

DRAFTED: BB

FILE: 1303.041

DATE: 6/10/11

FIGURE: **3-18**

TETRA TECH GEO



ARROYO CHICO

MILES ST

PARK AVE

13TH ST

MANLOVE ST

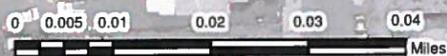
FREMONT AVE

STAR AVE

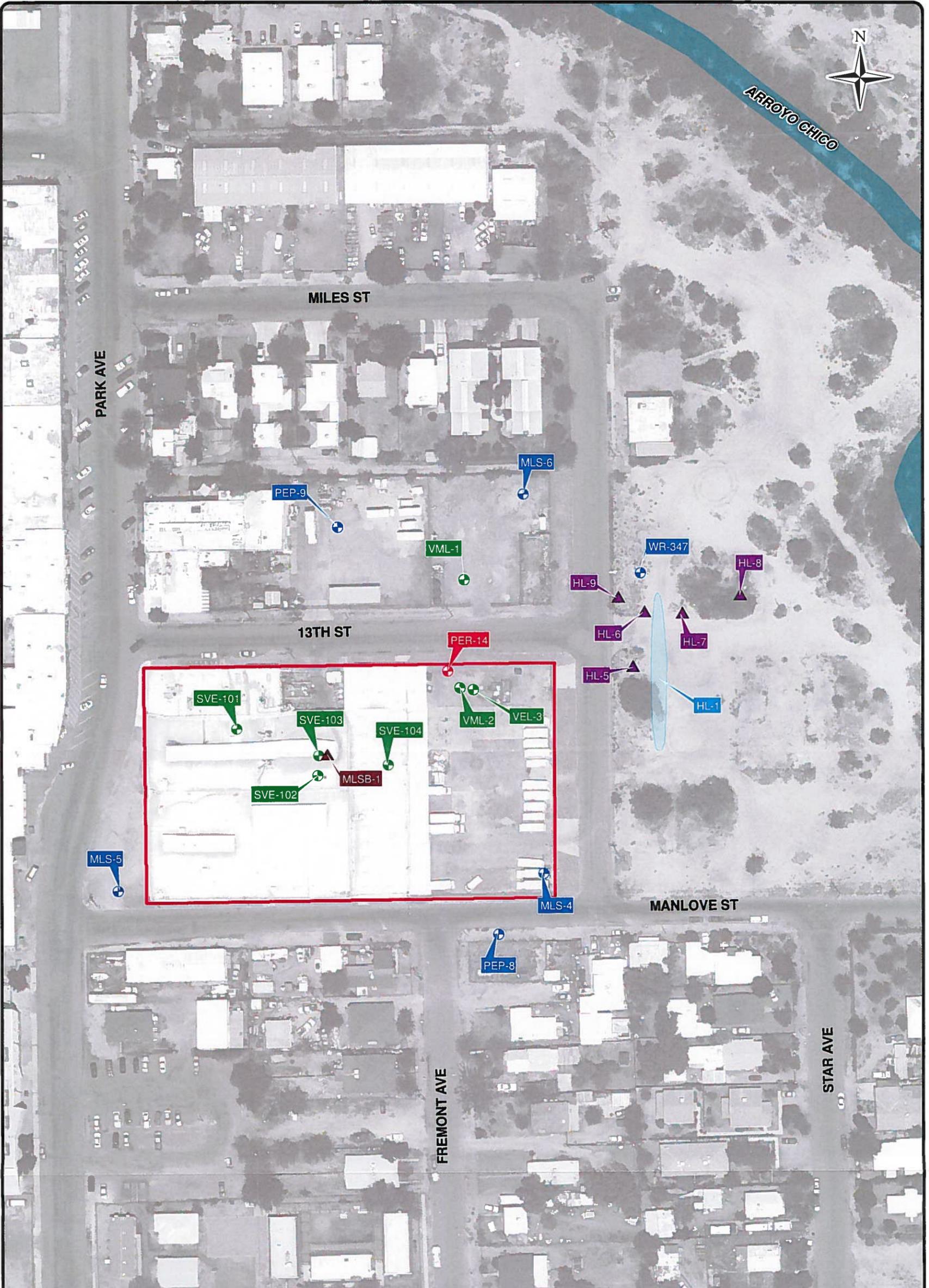
14TH ST

Legend

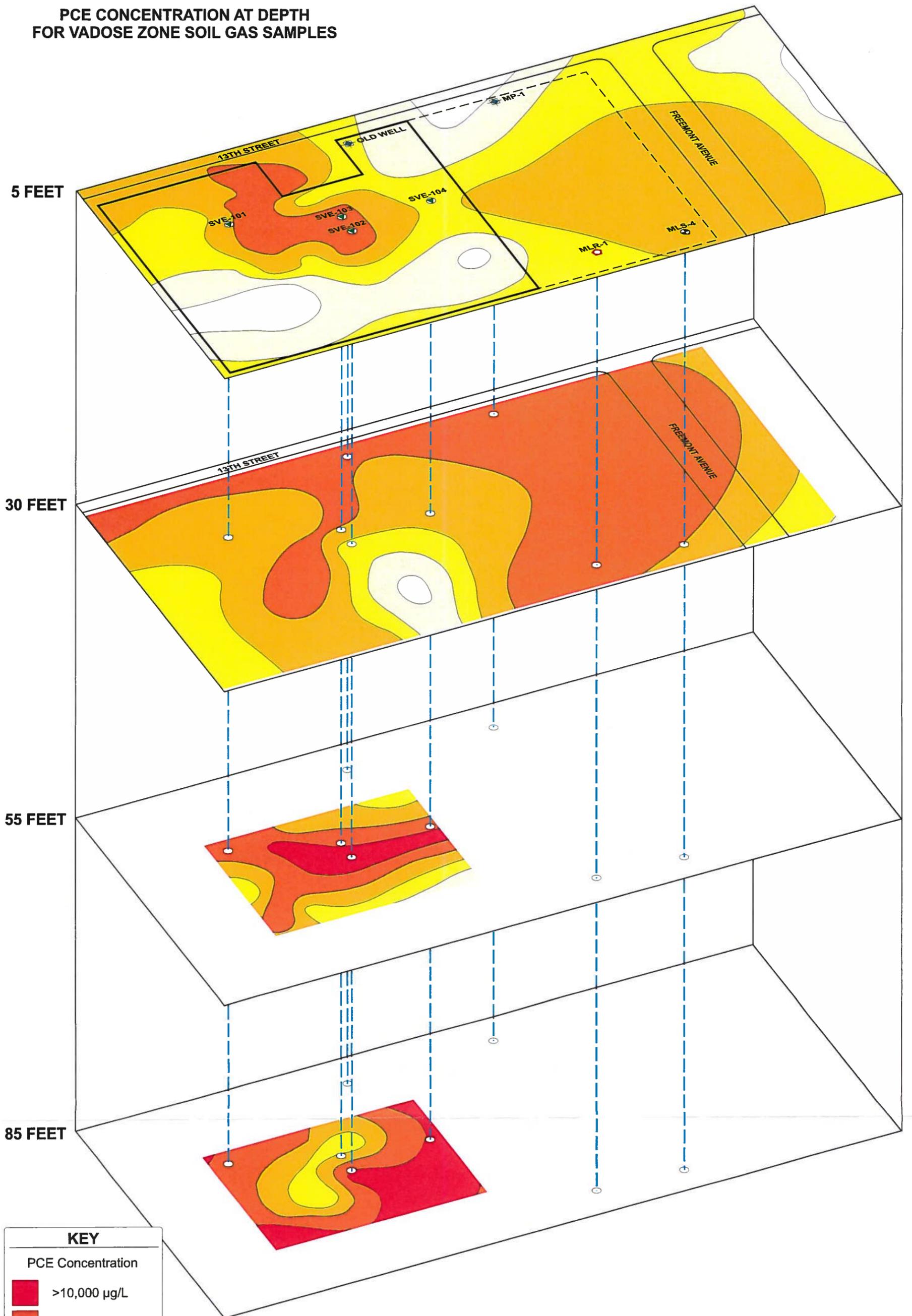
-  Perched Aquifer Wells
-  Regional Aquifer Wells
-  Vapor Extraction Wells
-  Surface Soil Sample
-  Soil Boring Sample
-  Soil Boring ID
-  Sample area for composite soil sample HL-1
-  Property Boundary



TITLE: SOIL SAMPLE LOCATIONS AT HASKELL/MISSION LINEN FACILITY		FIGURE: 4-1
LOCATION: PARK-EUCLID WQARF SITE TUCSON, ARIZONA		
	TETRA TECH GEO	
CHECKED: JZ	DRAFTED: BB	
FILE: 1303.041	DATE: 5/26/2011	



**PCE CONCENTRATION AT DEPTH
FOR VADOSE ZONE SOIL GAS SAMPLES**

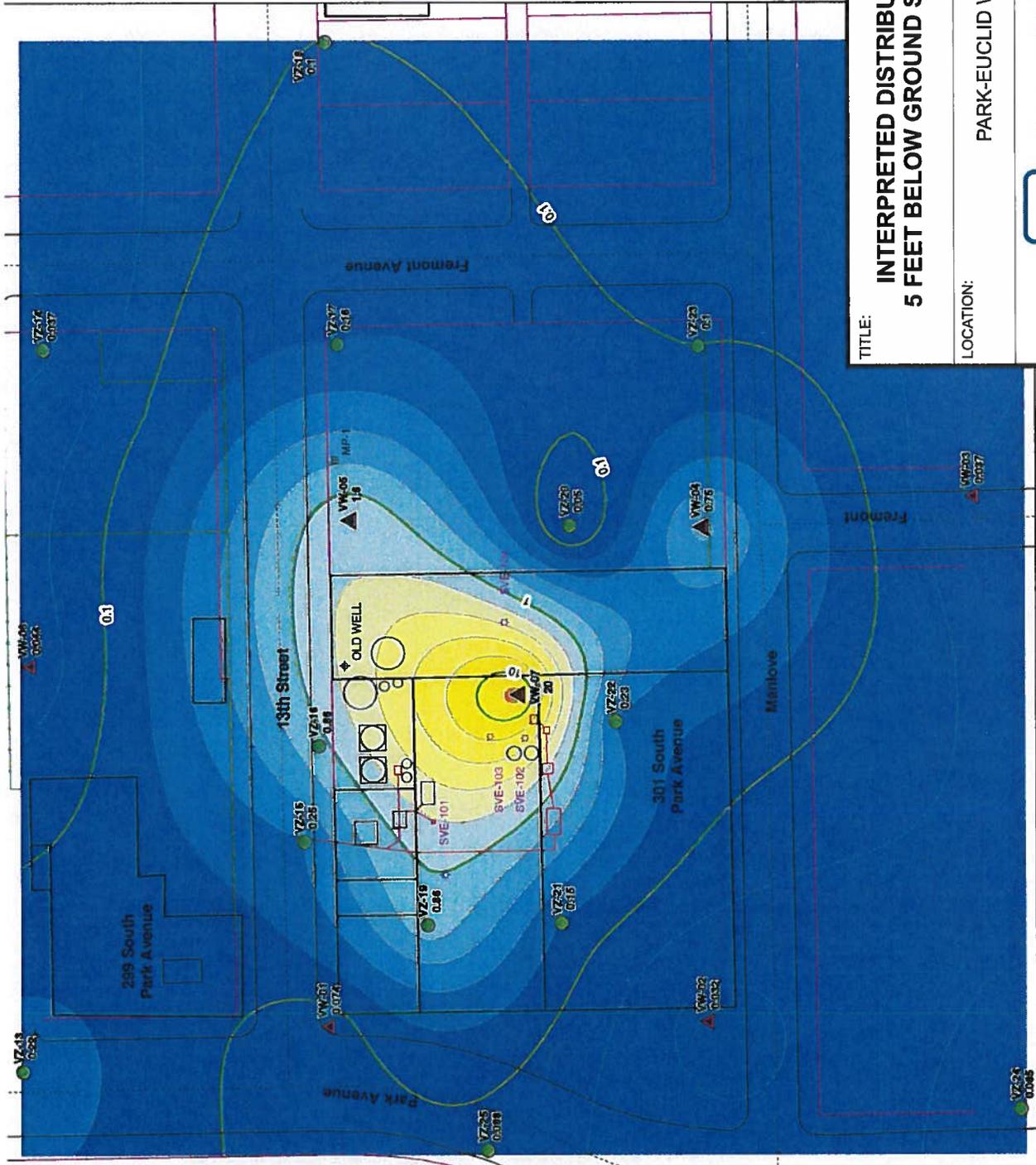


KEY

PCE Concentration

	>10,000 µg/L
	1,000-10,000 µg/L
	100-1,000 µg/L
	10-100 µg/L
	1-10 µg/L

TITLE: PCE VAPOR CONCENTRATIONS, 1998 AFTER DAMES & MOORE (2000)		
LOCATION: PARK-EUCLID WQARF SITE TUCSON, AZ		
	TETRA TECH GEO	FIGURE 4-2
CHECKED	JZ	DATE
DRAFTED	BB	
PROJECT	1303.041	
DATE	6/14/2011	



EXPLANATION

Soil Gas Sampling Locations (2003)

- ▲ Multi-depth Soil Gas Sampling/Monitoring Point
- PCE Concentration (PPMV)
- Multi-depth Soil Gas Sampling Point
- PCE Concentration (PPMV)
- Line of Equal Interpreted PCE Concentration (PPMV)

VW-07
28
VZ-20
0.84



TITLE:

**INTERPRETED DISTRIBUTION OF PCE IN SOIL GAS (PPMV)
5 FEET BELOW GROUND SURFACE JANUARY-FEBRUARY 2003**

LOCATION:

PARK-EUCLID WQARF SITE TUCSON, ARIZONA

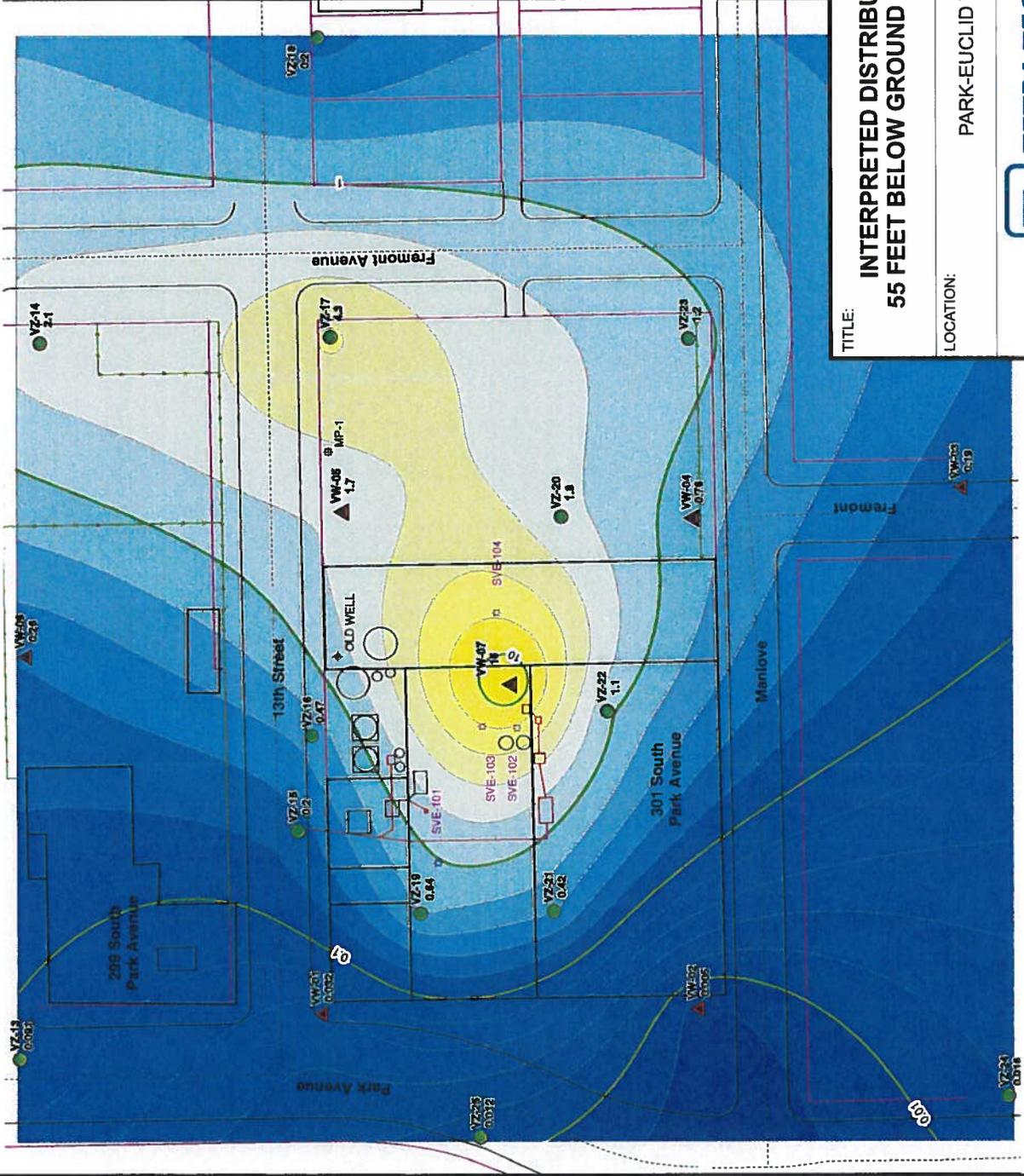


TETRA TECH GEO

FIGURE

4-3A

CHECKED	JZ
DRAFTED	BB
PROJECT	1303.041
DATE	6/14/2011



EXPLANATION

Soil Gas Sampling Locations (2003)

- ▲ Multi-depth Soil Gas Sampling/Monitoring Point
- PCE Concentration (PPMV)
- Multi-depth Soil Gas Sampling Point
- PCE Concentration (PPMV)
- Line of Equal Interpreted PCE Concentration (PPMV)

WW-07
28

VZ-20
0.84



TITLE: **INTERPRETED DISTRIBUTION OF PCE IN SOIL GAS (PPMV)
55 FEET BELOW GROUND SURFACE JANUARY-FEBRUARY 2003**

LOCATION: **PARK-EUCLID WQARF SITE TUCSON, ARIZONA**



TETRA TECH GEO

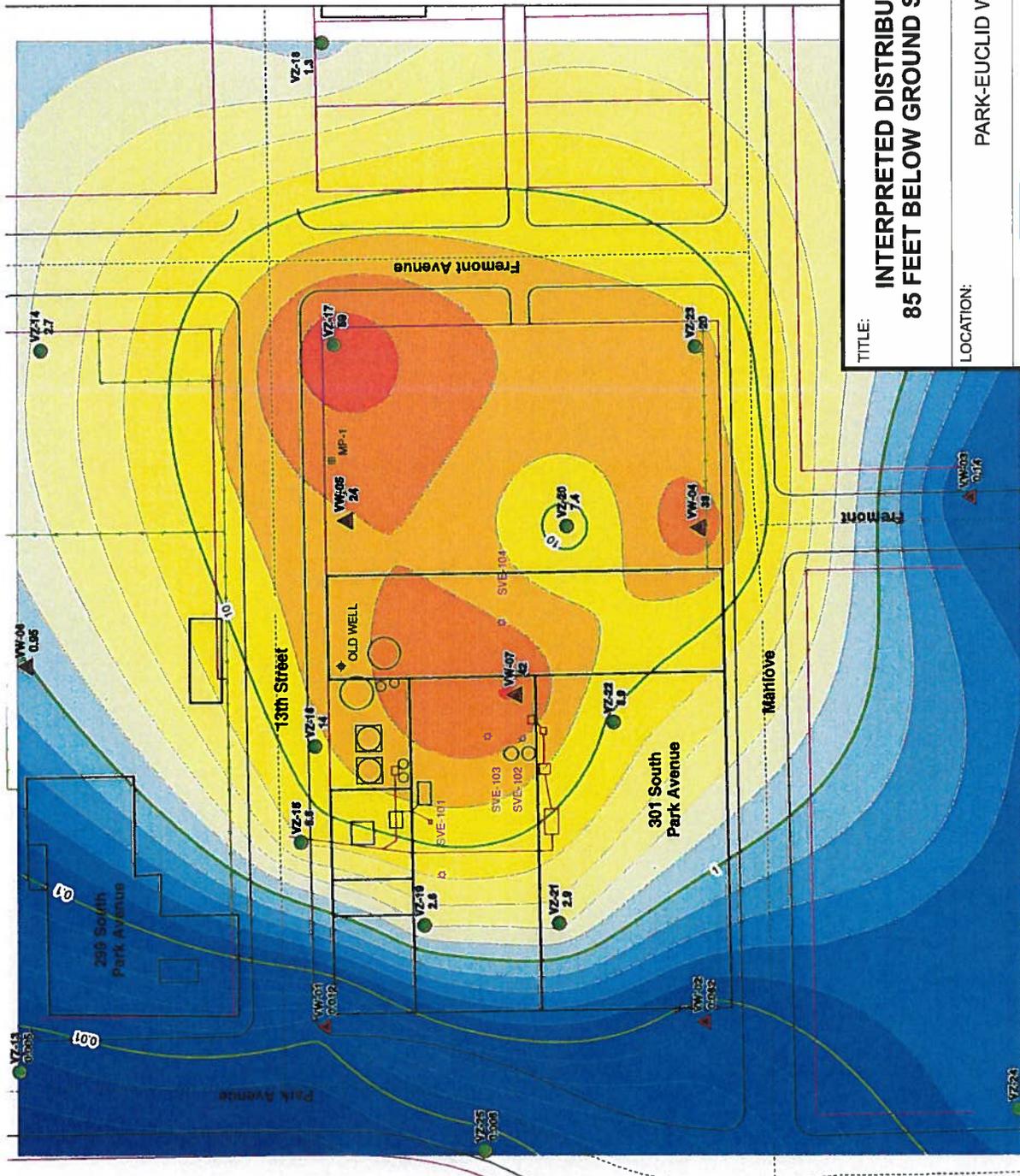
CHECKED JZ

DRAFTED BB

PROJECT 1303.041

DATE 6/14/2011

FIGURE
4-3C



EXPLANATION

- ▲ Soil Gas Sampling Locations (2003)
- ▲ Multi-depth Soil Gas Sampling/Monitoring Point
- PCE Concentration (PPMV)
- Multi-depth Soil Gas Sampling Point
- PCE Concentration (PPMV)
- Line of Equal Interpreted
- PCE Concentration (PPMV)



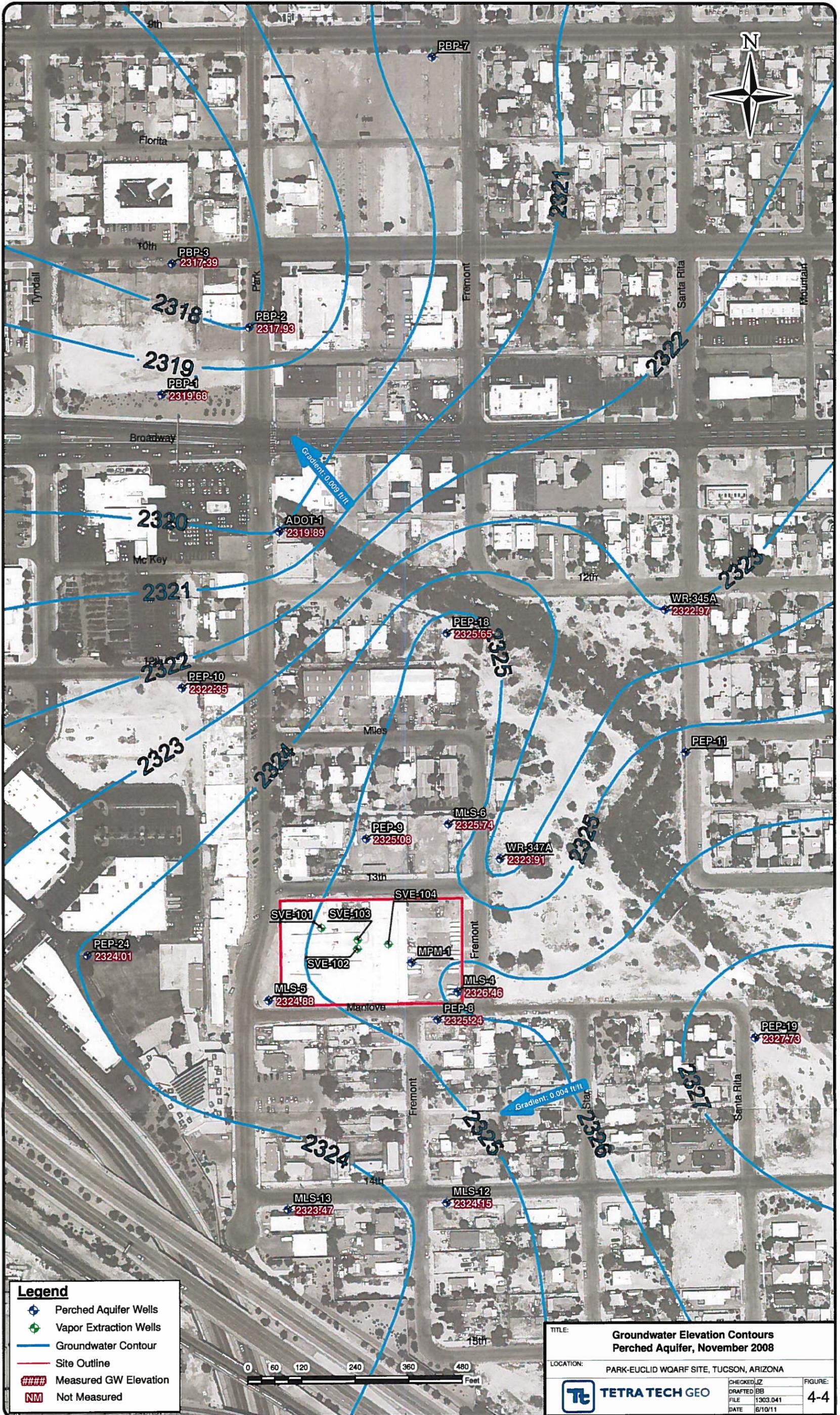
TITLE:
INTERPRETED DISTRIBUTION OF PCE IN SOIL GAS (PPMV)
85 FEET BELOW GROUND SURFACE JANUARY-FEBRUARY 2003

LOCATION:
 PARK-EUCLID WQARF SITE TUCSON, ARIZONA

TETRA TECH GEO

FIGURE
4-3D

CHECKED	JZ
DRAFTED	BB
PROJECT	1303.041
DATE	6/14/2011



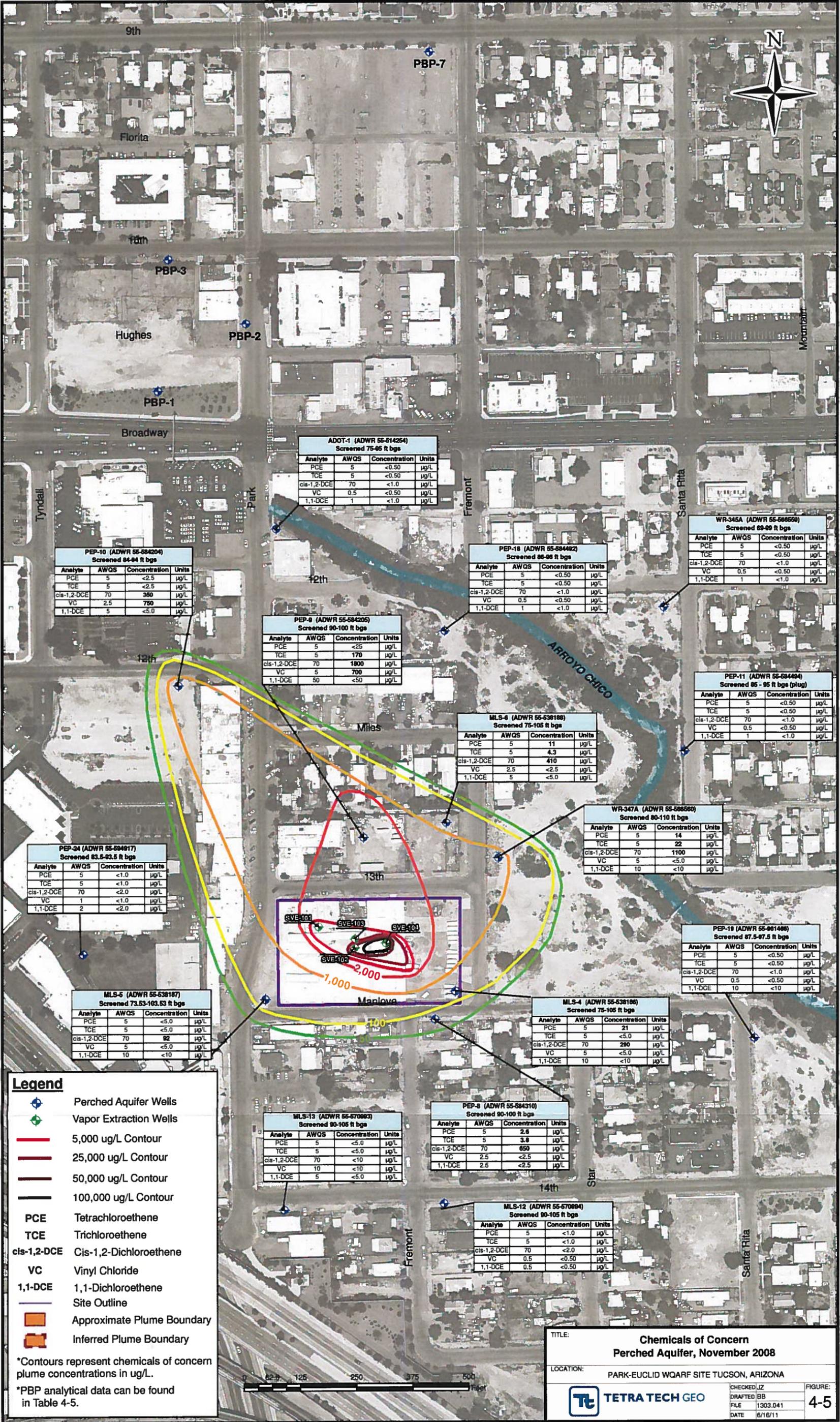
Legend

- Perched Aquifer Wells
- Vapor Extraction Wells
- Groundwater Contour
- Site Outline
- Measured GW Elevation
- Not Measured

TITLE: **Groundwater Elevation Contours
Perched Aquifer, November 2008**

LOCATION: **PARK-EUCLID WQARF SITE, TUCSON, ARIZONA**

TETRA TECH GEO	CHECKED: JZ	FIGURE: 4-4
	DRAFTED: BB	
	FILE: 1303.041	
	DATE: 6/10/11	



PEP-10 (ADWR 55-584204)
Screened 84-84 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<2.5	µg/L
TCE	5	<2.5	µg/L
cis-1,2-DCE	70	360	µg/L
VC	2.5	780	µg/L
1,1-DCE	5	<5.0	µg/L

ADOT-1 (ADWR 55-514254)
Screened 75-85 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	0.5	<0.50	µg/L
1,1-DCE	1	<1.0	µg/L

PEP-18 (ADWR 55-584482)
Screened 88-88 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	0.5	<0.50	µg/L
1,1-DCE	1	<1.0	µg/L

WR-345A (ADWR 55-586550)
Screened 89-89 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	0.5	<0.50	µg/L
1,1-DCE	1	<1.0	µg/L

PEP-9 (ADWR 55-584205)
Screened 90-100 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<25	µg/L
TCE	5	170	µg/L
cis-1,2-DCE	70	1800	µg/L
VC	5	700	µg/L
1,1-DCE	50	<50	µg/L

MLS-6 (ADWR 55-538188)
Screened 75-105 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	11	µg/L
TCE	5	4.3	µg/L
cis-1,2-DCE	70	410	µg/L
VC	2.5	<2.5	µg/L
1,1-DCE	5	<5.0	µg/L

PEP-11 (ADWR 55-584494)
Screened 85 - 85 ft bgs (plug)

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	0.5	<0.50	µg/L
1,1-DCE	1	<1.0	µg/L

PEP-34 (ADWR 55-584917)
Screened 83.5-83.5 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<1.0	µg/L
TCE	5	<1.0	µg/L
cis-1,2-DCE	70	<2.0	µg/L
VC	1	<1.0	µg/L
1,1-DCE	2	<2.0	µg/L

WR-347A (ADWR 55-586550)
Screened 80-110 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	14	µg/L
TCE	5	22	µg/L
cis-1,2-DCE	70	1100	µg/L
VC	5	<5.0	µg/L
1,1-DCE	10	<10	µg/L

MLS-5 (ADWR 55-538187)
Screened 73.53-103.63 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<5.0	µg/L
TCE	5	<5.0	µg/L
cis-1,2-DCE	70	82	µg/L
VC	5	<5.0	µg/L
1,1-DCE	10	<10	µg/L

PEP-19 (ADWR 55-581488)
Screened 87.5-87.5 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	0.5	<0.50	µg/L
1,1-DCE	10	<10	µg/L

MLS-4 (ADWR 55-538186)
Screened 75-105 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	21	µg/L
TCE	5	<5.0	µg/L
cis-1,2-DCE	70	280	µg/L
VC	5	<5.0	µg/L
1,1-DCE	10	<10	µg/L

MLS-13 (ADWR 55-570893)
Screened 90-105 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<5.0	µg/L
TCE	5	<5.0	µg/L
cis-1,2-DCE	70	<10	µg/L
VC	10	<10	µg/L
1,1-DCE	5	<5.0	µg/L

PEP-8 (ADWR 55-584310)
Screened 90-100 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	2.6	µg/L
TCE	5	3.8	µg/L
cis-1,2-DCE	70	650	µg/L
VC	2.5	<2.5	µg/L
1,1-DCE	2.5	<2.5	µg/L

MLS-12 (ADWR 55-570894)
Screened 90-105 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<1.0	µg/L
TCE	5	<1.0	µg/L
cis-1,2-DCE	70	<2.0	µg/L
VC	0.5	<0.50	µg/L
1,1-DCE	0.5	<0.50	µg/L

Legend

- Perched Aquifer Wells
- Vapor Extraction Wells
- 5,000 ug/L Contour
- 25,000 ug/L Contour
- 50,000 ug/L Contour
- 100,000 ug/L Contour
- PCE** Tetrachloroethene
- TCE** Trichloroethene
- cis-1,2-DCE** Cis-1,2-Dichloroethene
- VC** Vinyl Chloride
- 1,1-DCE** 1,1-Dichloroethene
- Site Outline
- Approximate Plume Boundary
- Inferred Plume Boundary

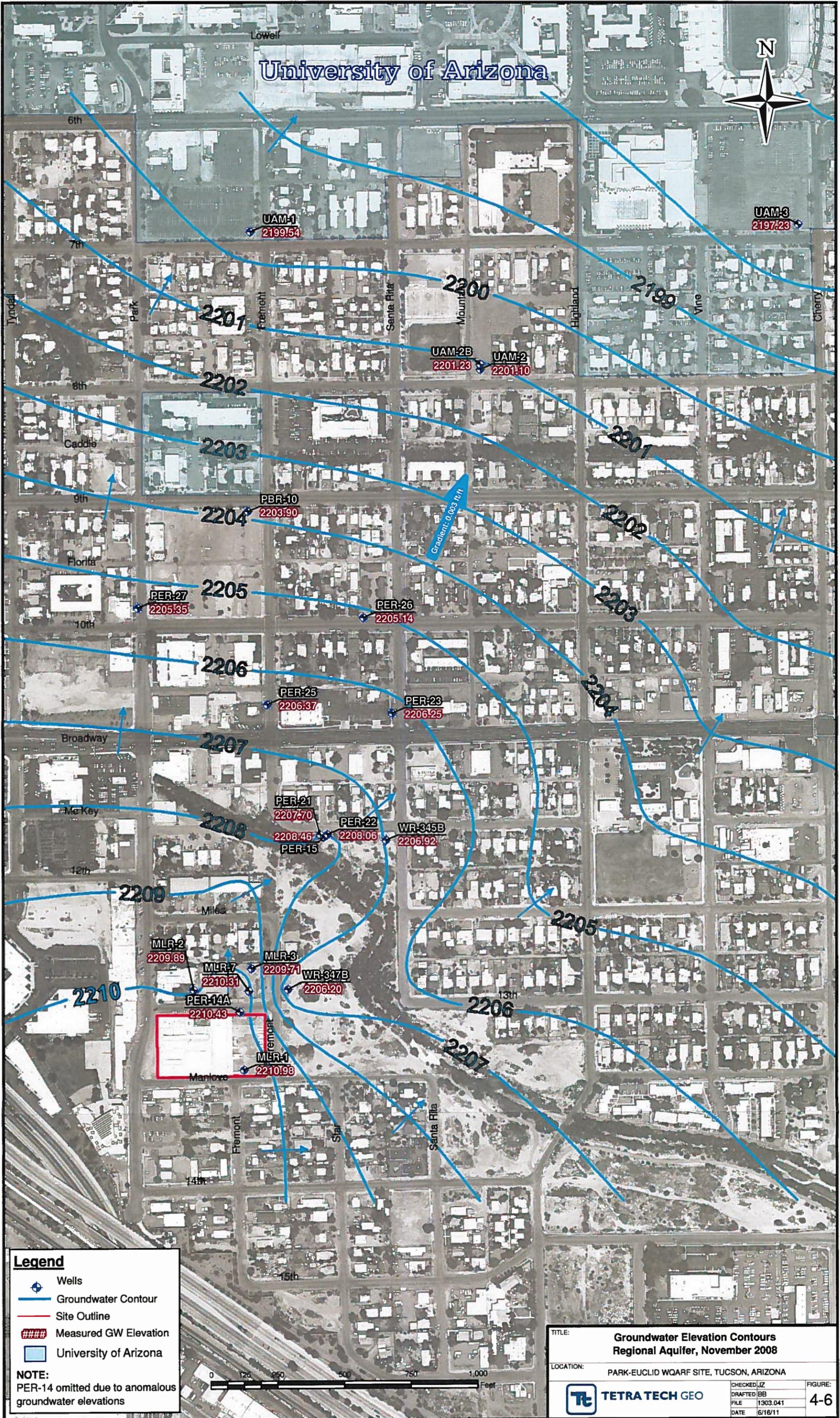
*Contours represent chemicals of concern plume concentrations in ug/L.
*PBP analytical data can be found in Table 4-5.

TITLE: **Chemicals of Concern Perched Aquifer, November 2008**

LOCATION: **PARK-EUCLID WQARF SITE TUCSON, ARIZONA**

TETRA TECH GEO

CHECKED/JZ	FIGURE: 4-5
DRAFTED/BB	
FILE 1303.041	
DATE 6/16/11	



University of Arizona

N



UAM-1
2199.54

UAM-3
2197.23

2200

UAM-2B
2201.23

UAM-2
2201.10

2201

2202

2203

2204

2205

2206

2207

2208

2209

2210

PBR-10
2203.90

PER-26
2205.14

PER-25
2206.37

PER-23
2206.25

PER-21
2207.70

PER-22
2208.06

WR-345B
2206.92

2208.46

PER-15

MLR-2
2209.89

MLR-7
2210.31

MLR-3
2209.71

WR-347B
2206.20

PER-14A
2210.43

MLR-1
2210.98

2207

2206

2205

2204

2203

2202

2201

2199

Gradient 0.003 left

Legend

- Wells
- Groundwater Contour
- Site Outline
- Measured GW Elevation
- University of Arizona

NOTE:
PER-14 omitted due to anomalous groundwater elevations



TITLE: Groundwater Elevation Contours
Regional Aquifer, November 2008

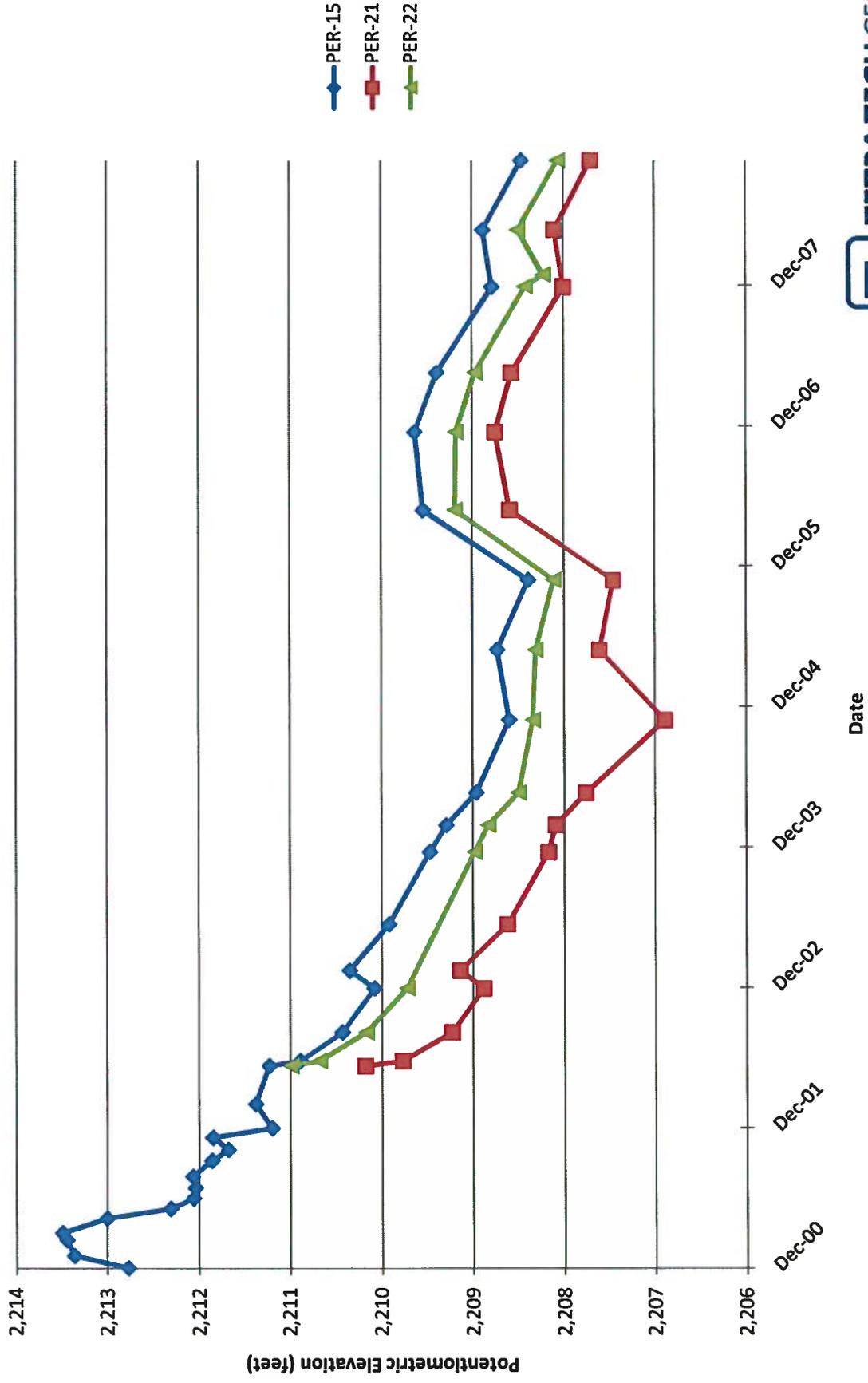
LOCATION: PARK-EUCLID WQARF SITE, TUCSON, ARIZONA

TETRA TECH GEO

CHECKED: JZ
DRAFTED: BB
FILE: 1303.041
DATE: 6/16/11

FIGURE:
4-6

Figure 4-7
Potentiometric Surface in Regional Aquifer
Monitor Well Cluster



University of Arizona



UAM-1 (ADWR 55-57858)
Screened 297-298 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

UAM-3 (ADWR 55-57890)
Screened 232-236 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

UAM-2B (ADWR 55-59575)
Screened 329-410.8 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

UAM-2 (ADWR 55-57858)
Screened 202-261 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	4.0	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-27 (ADWR 55-59784)
Screened 240-290 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-26 (ADWR 55-59784)
Screened 240-290 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	180	µg/L
TCE	5	6.4	µg/L
cis-1,2-DCE	70	<5.0	µg/L
VC	5	<2.5	µg/L
1,1-DCE	10	<5.0	µg/L

PER-25 (ADWR 55-59481)
Screened 240-290 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	58	µg/L
TCE	5	0.83	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-23 (ADWR 55-59149)
Screened 238.5-288.5 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	2.7	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-21 (ADWR 55-59147)
Screened 339-389 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	36	µg/L
TCE	5	0.77	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-22 (ADWR 55-59148)
Screened 271-321 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	83	µg/L
TCE	5	2.8	µg/L
cis-1,2-DCE	70	1.8	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-16 (ADWR 55-59491)
Screened 290-290 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	88	µg/L
TCE	5	2.1	µg/L
cis-1,2-DCE	70	1.2	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

WR-345B (ADWR 55-59559)
Screened 180-235 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

MLR-7 (ADWR 55-54356)
Screened 210-280 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	7.3	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

MLR-3 (ADWR 55-53129)
Screened 260-345 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	43	µg/L
TCE	5	0.87	µg/L
cis-1,2-DCE	70	3.1	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

MLR-2 (ADWR 55-53126)
Screened 280-345 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

WR-347B (ADWR 55-59558)
Screened 180-235 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-14 (ADWR 55-59488)
Screened 473-523 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

PER-14A (ADWR 55-59579)
Screened 180-250 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	12	µg/L
TCE	5	0.75	µg/L
cis-1,2-DCE	70	3.2	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

MLR-1 (ADWR 55-53129)
Screened 260-345 ft bgs

Analyte	AWQS	Concentration	Units
PCE	5	<0.50	µg/L
TCE	5	<0.50	µg/L
cis-1,2-DCE	70	<1.0	µg/L
VC	5	<0.50	µg/L
1,1-DCE	10	<1.0	µg/L

Legend

- Regional Aquifer Wells
- PCE** Tetrachloroethene
- TCE** Trichloroethene
- cis-1,2-DCE** Cis-1,2-Dichloroethene
- VC** Vinyl Chloride
- 1,1-DCE** 1,1-Dichloroethene
- Approximate Plume Boundary
- Inferred Plume Boundary
- Site Outline
- University of Arizona

*PBP analytical data can be found in Table 4-5.



TITLE: Chemicals of Concern
Regional Aquifer November 2008

LOCATION: PARK-EUCLID WQARF SITE TUCSON, ARIZONA

FIGURE: 4-8

CHECKED: JZ	FILE: 1303.041
DRAFTED: BB	DATE: 6/16/11

TETRA TECH GEO

Final Remedial Investigation Report

Park-Euclid WQARF Site, Tucson, Arizona

Volume II – Appendices A through E

Prepared for:

Arizona Department of Environmental Quality

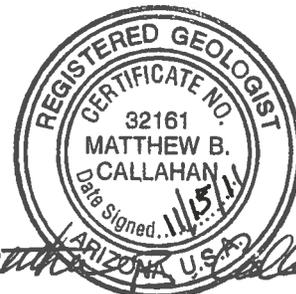
400 W. Congress, Suite 433
Tucson, Arizona 85701
(520) 628-6663
Fax (520) 628-6745

Prepared by:

Tetra Tech GEO

4801 E. Washington St., Suite 260
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(602) 682-3320
Fax (602) 682-3318
Tetra Tech Project No. 1303.041

November 15, 2011



Matthew B. Callahan

Expires 12/31/12

APPENDIX A
BORING LOGS AND WELL COMPLETION DIAGRAMS

AGRICULTURE BUILDING

NAME University of Arizona

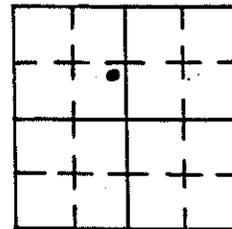
B.M. ELEVATION 2424.25

DRILLED BY F.O. Mackey DATE 1915

CASING 283' of 16" Deepened and Relined 12" to 480'

PERFORATIONS _____ BY Forsyth (1965)

WELL USE
 Domestic
 Industrial
 Irrigation
 Municipal
 Recreation
 Stock
 Unused



T 14S, R 14E, S 7

WELL LOG

From Feet	To Feet	Material
0	9	Dug Pit to 81 Feet
9	24	Cemented Boulders
24	28	Cemented Sand
28	34	Sand
34	54	Cemented Sand and Gravel
54	57.3	Caliche
57.3	62.3	Cemented Sand
62.3	65	Cemented Sand
65	82	Cemented Sand
82	96	Loose Sand
96	98	Soft Cemented Sand and Gravel
98	111	Cemented sand Silt
111	112	Sand and Clay Packed
112	127	Loose sand, Gravel and Boulders
127	141	Cemented Sand and clay
141	143	Packed Sand and clay
143	168	Hard Cemented sand + clay
168	170	Soft Clay, Sand + Gravel
170	176	Clay, Sand and Gravel
176	182	Cemented Sand
182	183	Loose, Coarse Sand
183	284	Sand Clay Seams 3"-4"
1965		
284	360	Sandy Clay Conglomerate
360	365	Sandy Conglomerate
365	390	Sandy Clay Conglomerate
390	396	Sandy Conglomerate - H ₂ O
396	450	Sandy Clay Conglomerate
450	480	Clay Conglomerate
Total Depth	480	

WATER ANALYSIS

Date			
Lab. No.			
Total Salts (PPM)			
EC x 10 ³			
Calcium			
Magnesium			
Sodium			
Chloride			
Sulfate			
Carbonate			
Bicarbonate			
Nitrate			
pH			
Hardness Gr/Gal			
Flouride			

WELL PUMP TEST

Date	11/14/53	7/16/60
Static W.L.	123.1	132.5
Running W.L.	139.8	153.8
Drawdown	16.7	21
Cox Meter Discharge/Method	185.6 G.P.M.	256 G.P.M.
Specific Capacity	11.1	10.7
Transmissivity		
Duration		
Type of Test		
Agency		

SIGNED: *W. Rempus Helms*



LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rises in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	9	Dug pit to 81 feet
9	24	Cemented Boulders
24	28	Cemented Sand
28	34	Sand
34	54	Cemented Sand and Gravel
54	57.3	Caliche
57.3	62.3	Cemented Sand
62.3	65	Cemented Sand
65	82	Cemented Sand
82	96	Loose Sand
96	98	Soft Cemented Sand and Gravel
98	111	Cemented Sand Silt
111	112	Sand and Clay Packed
112	127	Loose Sand, Gravel and Boulders
127	141	Cemented Sand and Clay
141	143	Packed Sand and Clay
143	168	Hard Cemented Sand and Clay
168	170	Soft Clay, Sand and Gravel
170	176	Clay, Sand and Gravel
176	182	Cemented Sand
182	183	Loose, Coarse Sand
183	284	Sand Clay Seams 3" - 4"
		1965
284	360	Sandy Clay Conglomerate
360	365	Sandy Conglomerate
365	390	Sandy Clay Conglomerate
390	396	Sandy Conglomerate -H ₂ O
396	450	Sandy Clay Conglomerate
450	480	Clay Conglomerate
TOTAL DEPTH 480		

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller..... Name

Address

Date.....

TELEPHONE
OFFICE: MAIN 2-7212

TELEPHONE
RESIDENCE: MAIN 3-2036

CARL W. PISTOR

MAIL ADDRESS: 337 E. SPEEDWAY
TUCSON, ARIZONA - 85705

DRILLING
CONTRACTOR

DISTRIBUTOR
PEERLESS PUMPS
SHOP: 335 EAST 25TH STREET

UNIVERSITY OF ARIZONA - SPEEDWAY AND OLIVE RD.

Well #6 - (For Clinical Science Bldg. and
Teaching Hospital.)

18" Well - Drilled August, September 1968

0 - 2 Caliche
2 - 18 " and loose gravel
18 - 73 Caliche, hard
73 - 90 Boulders and gravel
90 - 120 Red clay and gravel
120 - 170 Sand, Clay and gravel - Struck water 168'
170 - 195 Cemented sand, hard
195 - 250 Red clay, sand and gravel
250 - 262 Fine sandy clay
262 - 315 Cemented gravel, hard
315 - 325 Fine sand, some clay
325 - 475 Cemented sand
475 - 580 Red sticky clay
580 - 601 Cemented gravel, hard

342' - 18" .312 wall casing
307' - 16" .312 wall preperforated casing

To top of 16" casing 294'

18" casing perforated with Millis knife, 190-290' 166'
8 cuts per ft.

16" casing perforated, machine cut - 48 cuts per
ft. 5/16x2 1/2x3"

Aug.	23	-	Surging and bailing	50'	sand
	24	-	" " "	80'	"
	26	-	" " "	95'	"
	27	-	" " "	95'	"
	28	-	" " "	85'	"
	29	-	" " "	60'	"
	30	-	" " "	55'	"
	31	-	" " "	55'	"
Sept.	3	-	" " "	50'	"
	4	-	" " "	35'	"
	5	-	" " "	35'	"
	6	-	" " "	35'	"
	7	-	" " "	25'	"
	9	-	" " "	15'	"

Total time surging and bailing - 112 Hrs.

Carl Pistor

CARL W. PISTOR

MAIL ADDRESS: 337 E. SPEEDWAY
SHOP: 50 4TH AVE. AND 25TH ST.
TUCSON, ARIZONA

DRILLING
CONTRACTOR

PEERLESS PUMPS
SALES AND SERVICE

~~Oct. 5, 1962~~

"HUACHUCA WELL"

UNIVERSITY OF ARIZONA-PARK AVE. BETWEEN 4-5TH STS.

Well #4 - drilled July-Aug. 1962 - 16" well
16" OD 1/2" wall casing with Baker steel shoe

Water level top of casing 131'8"

- 0 - 5 Top soil
- 5 - 17 Red caliche
- 17 - 28 Sand and boulders
- 28 - 35 Hard white caliche
- 35 - 99 Red sandy clay
- 99 - 117 White caliche
- 117 - 139 White sand
- 139 - 207 Red sandy clay - struck water 143'
- 207 - 430 Fine sand - cemented
- 430 - 473 Red sticky clay
- 473 - 572 Cemented sand
- 572 - 614 Cemented boulders

Perforated Mills knife 180-592' - 7-8 cuts per ft.

14' open hole.

Washed and surged well:

- Aug. 14 - 120' sand - 8 hrs.
- 15 - 120' " - "
- 16 - 120' " - "
- 17 - 100' " - "
- 18 - 53' " - "
- 20 - 50' " - "
- 21 - 40' " - "
- 22 - 20' " - "
- 23 - 20' " - "
- 24 - Bailed well 1/2 day. Fine sand settled overnight

Carl W. Pistor



NAME UNIVERSITY OF ARIZONA

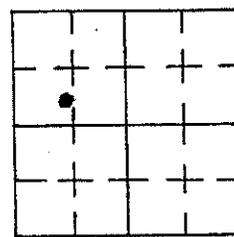
B.M. ELEVATION 2417.90

DRILLED BY C.W. PISTOR DATE 8/24/62

CASING 16" ID x 5/16" 600 feet of casing
14' open hole

PERFORATIONS Mills Knife 180'-592' 7-8 cuts/ft.

WELL USE
 Domestic
 Industrial
 Irrigation
 Municipal
 Recreation
 Stock
 Unused



T 14S, R 14E, S 7

WELL LOG

From Feet	To Feet	Material
0	5	Top Soil
5	17	Red Caliche
17	28	Sand and Boulders
28	35	Hard White Caliche
35	99	Red Sandy Clay
99	117	White Caliche
117	139	White Sand
139	207	Red sandy clay - struck water at 143'
207	430	Fine Sand - Cemented
430	473	Red sticky clay
473	572	Cemented sand
572	614	Cemented boulders
Total Depth		614

WATER ANALYSIS

Date	8-62		
Lab. No.	80937		
Total Salts (PPM)	312		
EC x 10 ³			
Calcium	15		
Magnesium	2		
Sodium	75		
Chloride	18		
Sulfate	73		
Carbonate	0		
Bicarbonate	129		
Nitrate	-		
pH			
Hardness Gr/Gal	2.7		
Flouride	0		

WELL PUMP TEST

Date	10/14/65		
Static W.L.	141.35		
Running W.L.	163.6		
Drawdown	22.2		
In line sparging Discharge/Method	300 GPM		
Specific Capacity	13.62		
Transmissivity			
Duration			
Type of Test			
Agency			

SIGNED: *W. Dempsey Helms*

TELEPHONE
OFFICE: MAIN 2-7212

TELEPHONE
RESIDENCE: MAIN 3-2036

CARL W. PISTOR
MAIL ADDRESS: 337 E. SPEEDWAY
TUCSON, ARIZONA - 85705

MARTIN

DRILLING
CONTRACTOR

DISTRIBUTOR
PEERLESS PUMPS
SHOP: 335 EAST 25TH STREET

UNIVERSITY OF ARIZONA-ATHLETIC FIELD

Martin and 6th St. - Drilled Aug.-Sept. 1966

0 - 2 Soil
2 - 12 Caliche and gravel
12 - 33 Boulders and gravel
33 - 55 Caliche, gravel, hard
55 - 70 Sand and gravel, loose
70 -160 Sand and gravel, cemented, hard
Struck water at 155'
160-205 Cemented sand
205-220 Red clay, sand and gravel
220-325 Cemented sand, very hard
325-330 Fine sandy clay, yellow
330-348 Cemented sand, hard
348-440 Cemented sand, cavey. Apparently dry
in natural state, but started to cave
in after water got to it.
440-495 Hard cemented gravel
495-578 Red clay - very sticky
578-600 Red clay - some sand

Perforated with Mills knife 590'-170', 5 and 7
cuts per rings 18" apart. No perforations between 225'
and 300'.

Casing used 18" OD, 5/16" wall and alloy steelshoe.

Surged:

10-1-66	-	6 hrs.	30'	sand
10-3		8 "	75'	"
10-4		8 "	80'	"
10-5		8 "	65'	"
10-6		8 "	25'	"
10-7		8 "	20'	"

Carl W. Pistor

WELL COMPLETION LOG

MLR-1

PROJECT NAME: ADEQ - Mission Linen

PROJECT NUMBER: 91-5409

WELL LOCATION: Mission Linen, Tucson, Arizona 301 S. Park

WELL REGISTRATION NUMBER: 55-531297

DEPTH TO WATER (FEET FTWC): 178.57

DRILLING CO.: BJ Drilling Co., Inc.

DRILLER: Bob Jackson

RIG TYPE: Ingersoll T4

DRILLING METHOD: Rotary

DRILLING FLUID: Mud

BOREHOLE DIAMETER (INCHES): 14 3/4, 9 7/8, 5 5/8

TOTAL DEPTH DRILLED (FEET): 350

CASING TYPE: Steel

CASING DIAMETER (INCHES O.D.): 10 3/4, 6 5/8, 4 1/2

SCREEN TYPE: Machine Slotted

SLOT SIZE (INCHES): 0.060 x 3 20 slots/ft.

SCREENED INTERVAL (FEET): 260 TO 344

CASING INTERVAL (FEET): 0 TO 260

FILTER PACK: Natural Pack

FILTER INTERVAL (FEET): 260 TO 340

TYPE OF SEAL: Cement Pressure Grout

SEALED INTERVAL (FEET): 0 TO 260

GROUT TYPE: Portland Cement

PERCENT BENTONITE IN GROUT: 0

GROUT INTERVAL (FEET): -- TO --

GROUND ELEVATION: _____

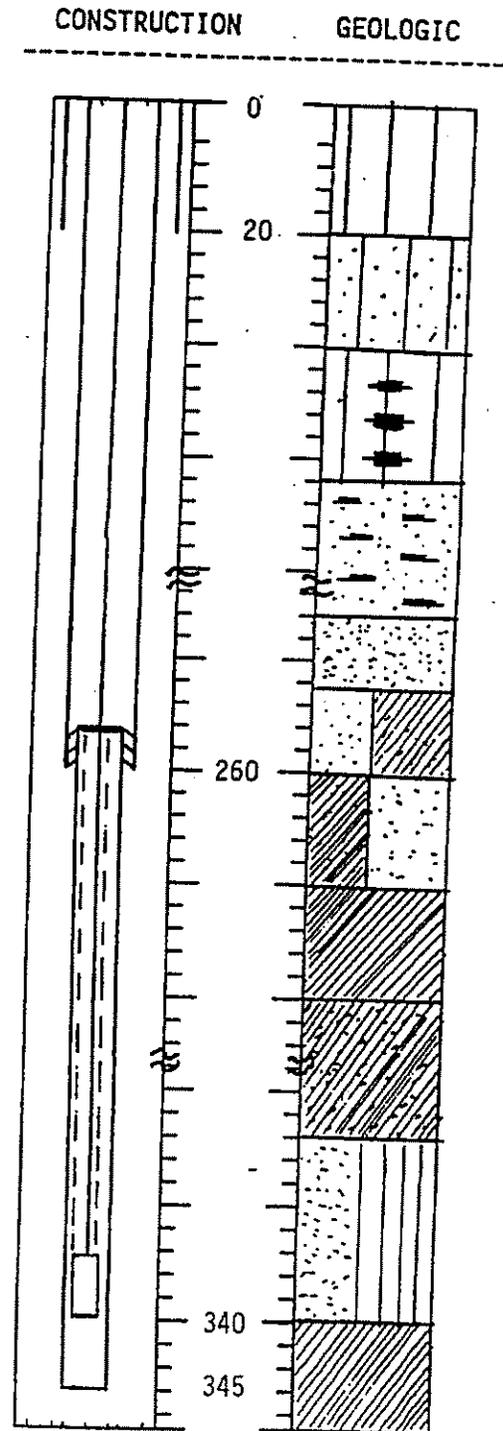
TOP OF CASING ELEVATION: 2413.810 (ft)

COMMENTS: Sediment trap (blank 4" steel) 344
to 349 bls.

WELL NUMBER: ML-1

DRILLING AND COMPLETION PROGRESS		
DATE	START	FINISH
4/17/91	-->	4/22/91

WELL SKETCH*
(DEPTH IN FEET)



Sketch not to scale

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN			
Project Number: 91-5409-01	Borehole Number: ML-1 MLR-1	Sheet 1 of 9	
Borehole Location: LOADING BAGS - PARKING AREA		Elevation and Datum: 2413.81 FT AMSL	
Drilling Company: BJ DRILLING CO., INC.	Driller: BOB JACKSON	Date Started: 4-17-91	Date Finished: 4-22-91
Drilling Equipment: INGERSOLL T4		Total Depth (feet): 352	Depth to Bedrock (feet): —
Drilling Method: ROTARY		Borehole Diameter: 14 IN 21 1/2 FT, 9 3/4 IN 26 FT, 6 IN	
Drilling Fluid: AIR & WATER		Depth to Water (feet): First: —	Compl.: 1 B.S.F. 24 hrs.
Completion Information: Borehole completed as monitor well. See Well Completion Log for ML-1.		Logged By: Paul Dunster	Checked by: S. Lagas

Depth (feet)	Description	Lithology	OVA (ppm)	Samples				Remarks
				Number	Type	Blow Count	Drilling Rate/Time	
0	BASE COARSE AND BLACKTOP						1610	Drilling initiated with a 14 inch hole Due to drilling method samples were sieved from the drilling fluid
5	Silt (ML); silt, trace of FINE-COARSE GRAINED SAND, SUBANGULAR TO SUBROUNDED SAND, light brown, low plasticity.	ML		B1 (10-10)			1620	
10			2					
15				B2 (10-20)			1630	Driller reports possible caliche
20	SAND (SM); MODERATE RANGE PINK, FINE-COARSE GRAINED SAND AND SILT (SM), TRACE FINE GRAIN GRAVEL ANGULAR - SUBROUNDED	SM	2				1635	Drilling completed for day surface casing placed.
25	Cobbles? - drill chatter 2' thick, angular coarse gravel chips	GW/GP		B3 (20-30')				Drill chatter cobble at 25 feet
30		SM					1005	Drilling begins with 9 7/8 inch bit.

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN							
Project Number: 91-5409-01			Borehole Number: ML-1			Sheet 2 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
35	Silty SAND (SM); MODERATE ORANGE-PINK, FINE-COARSE GRAINED SAND and silt, SAND IS ANGULAR - SUB ROUNDED	SM	>1	B4			1012
35-40	PALE YELLOW BROWN TO PALE BROWN, TRACE FINE GRAVEL, ROUNDED TO ANGULAR GRANITICS, schists, MICAS						
40	TRACE FINE-COARSE GRAVEL						1015
45				B5			
45-50				(40-50')			
50	SAND/silty SAND (SM/SW) PALE YELLOW BROWN TO PALE BROWN 10-20% silt, subangular to subrounded GRANITIC, schist, micaeous clasts.	SM/SW	>1				1020
55				B6			
55-60				(50-60')			
65				B7			1031
65-70				(60-70')			1041
70							1045

Let borehole stand to see if perched water zone could be identified.

BOREHOLE LOG

Project Name: ADEQ - MISSION LINE							
Project Number: 91-5409			Borehole Number: ML-1			Sheet 3 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
75	SAND/silty SAND (SW/SM) pale yellow brown - pale brown 10/20% silt.	SM/ SW	>1	B8 (70-80')			
	COARSE GRAVEL, angular, FINE gravel cuttings	GW/ GP	>1			1050	DRILLER REPORTS CHATTER
80	SAND (SW); pale yellow brown pale brown, FINE - COARSE GRAIN SAND, TRACE FINE GRAVEL, SOME silt, sub angular to rounded	SW					
85	SOME FINE TO COARSE GRAVEL COMPOSED OF black MINERALS WELL ROUNDED - subangular		>1	B9 (80-90')		1107	CONCLUDE SEARCHING for POSSIBLE PERCHED WATER ZONE. Switch to mud as drilling fluid -
90							
95							
100	SAND; BROWN color 10yr 6/8, COARSE pebbly SAND, WELL ROUNDED CLASTS - QUARTZ, FELDSPAR, MICA POORLY SORTED.	SP	>1	B10 (90-100')		1350	cedar SHAVINGS added to circulating mud AS a THICKENER.
105							
110			>1	B11 (100-110')		1400	

BOREHOLE LOG

Project Name: **ADEQ - MISSION LINEN**

Project Number: **91-5409**

Borehole Number: **ML-1**

Sheet **6** of **9**

Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Drilling Rate/Time	Remarks
				Number	Type	Blow Count		
195	SAND (SW); FINE-COARSE SAND TRACE-SOME SILT, TRACE FINE GRAIN GRAVEL, SAND and gravel, sub angular sub rounded white quartz PREDOMINANT 1" thick c	SW		B-20 (190-200)			1545	COBBLE layer at 191 ft 6.5.
205				B-21 (200-205)				
215	SAND (SC/SM); light brown FINE-MEDIUM SAND clayey/silty, plastic clay.	SC/SM					1555	
220	CLAY (CL/CH), light brown, low plasticity with FINE to MEDIUM gravelly SAND.	CL/CH		B-22 (210-220)				
225							1610	
230				B-23 (220-230)				

BOREHOLE LOG

Project Name: ADEC - MISSION LINEN
 Project Number: 91-5409-01 Borehole Number: ML-1 Sheet 7 of 9

Depth (feet)	Description	Lithology	OVA (ppm)	Samples				Remarks
				Number	Type	Blow Count	Drilling Rate/Time	
235	Clay: (CH/CL): light brown low plasticity clay with FINE to MED GRAINED SAND.	CH/CL		B-24 (230-240)				
240	SANDY clay (CL); light brown low plasticity clay, FINE to medium GRAIN SAND.	CL						
245				B-25 (240-250)				
250								
255				B-26 (250-260)				
260								
265				B-27 (260-270)			1635	TOTAL DEPTH 4-18-91
270							0915	4-20-91 PROCEEDED DRILLING WITH 6 IN DIAMETER

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN							
Project Number: 91-5409-01			Borehole Number: ML-1			Sheet 9 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
315	Silty SAND/SANDY SILT (SM/ML) light brown and white, FINE-MED GRAIN ANGULAR-subangular SAND and silt.	SM/ ML	<1	B-32 (310-320)		0950	
320	Clayey/silty SAND () light brown and white FINE-MEDIUM GRAINED SAND light brown clay/silt ANGULAR-sub rounded.	SM/ SM				0955	
325	?						
330	Clay (CL/CH), lt. brown clay with FINE to MEDIUM GRAINED ANGULAR-subrounded QUARTZ SAND					1000	
335							
340						1000 ^{PK} 1010	
345	TD 345 feet			B-35 (345)			
350						1015	OVER DRILLED BOREHOLE to 352 feet

WELL COMPLETION LOG

MLR-2

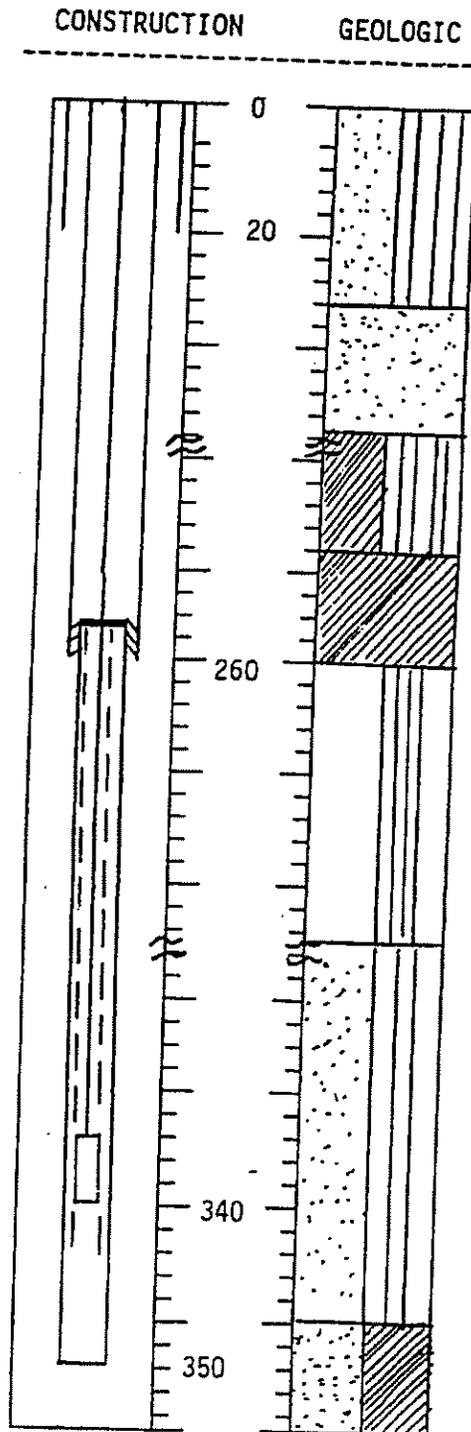
PROJECT NAME: ADEO - Mission Linen
 PROJECT NUMBER: 91-5409
 WELL LOCATION: 301 S. Park Mission Linen, Tucson, Arizona
 WELL REGISTRATION NUMBER: 55-531298
 DEPTH TO WATER (FEET FTOC): 178.6
 DRILLING CO.: B-J Drilling Company, Inc.
 DRILLER: Bob Jackson
 RIG TYPE: Ingersoll T4
 DRILLING METHOD: Rotary
 DRILLING FLUID: Mud
 BOREHOLE DIAMETER (INCHES): 14 3/4, 9 7/8, 5 5/8
 TOTAL DEPTH DRILLED (FEET): 350
 CASING TYPE: Steel
 CASING DIAMETER (INCHES O.D.): 10 3/4, 6 5/8, 4 1/2
 SCREEN TYPE: Machine Slotted
 SLOT SIZE (INCHES): 0.060 x 3 20 slots/ft
 SCREENED INTERVAL (FEET): 260 TO 345
 CASING INTERVAL (FEET): 0 TO 260
 FILTER PACK: Natural Pack
 FILTER INTERVAL (FEET): 260 TO 345
 TYPE OF SEAL: Cement Pressure Grout
 SEALED INTERVAL (FEET): 0 TO 260
 GROUT TYPE: Portland Cement
 PERCENT BENTONITE IN GROUT: 0
 GROUT INTERVAL (FEET): -- TO --
 GROUND ELEVATION: _____
 TOP OF CASING ELEVATION: 2412.690 (ft.)
 COMMENTS: Sediment Trap (blank 4" steel)
345 - 350 bls.

WELL NUMBER: ML-2

DRILLING AND COMPLETION PROGRESS:

DATE	START	FINISH
4/29/91	---	5/2/91

WELL SKETCH*
(DEPTH IN FEET)



*Sketch not to scale wcl.form/3-f

BOREHOLE LOG

Project Name: **ADEQ - MISSION LINEN**
 Project Number: **91-5409** Borehole Number: **.ML-2** Sheet **2** of **9**

Depth (feet)	Description	Lithology	OVA (ppm)	Samples				Remarks
				Number	Type	Blow Count	Drilling Rate/Time	
35	SAND (SP); light brown - reddish brown, medium to coarse grain, well rounded with pebbly gravel subangular to subrounded trace of clay.	SP	B.G. 0.5 1	B-4 (30-40)				DRILLER COMMENTS WENT THROUGH APPROXIMATELY SIX INCHES OF ONE INCH GRAVELS BASED ON PRESSURE AND RATE OF DRILLING. WENT TO MUD CIRCULATION FROM AIR ADDED ONE BAG CEDAR SHAVINGS TO INC. THICKNESS.
40	SAND (SM); light grey, coarse angular - sub angular with light brown silt.	SM	B.G. 1.5 6.0	B-5 (40-50)		1605		
55	SAND (SM); light grey and pink, medium grained, subangular to sub rounded, with occasional small gravel, trace light brown silt.	SM	B.G. 1.5 4.0	B-6 (50-60)		1855		
65	SAND (SP); light grey, medium grain, subangular to subrounded quartz and feldspar trace pea gravel.	SP	B.G. 1.5 2.9			1900		

BOREHOLE LOG

Project Name: ADEQ MISSION LINE							
Project Number: 91-5409				Borehole Number: ML-2		Sheet 3 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
75	SAND (SC); light brown, MEDIUM GRAINED SAND, subrounded to subangular with low plasticity clay	SC	B.G. 1.5 3.9	B-7 (70-80)		1910	
80	SAND (SM); light grey, COARSE SAND, angular-subangular, silt light brown with TRACE of clay semi plastic.	SM	B.G. 1.5 4.2	B-8 (80-90)			
90	SAND; MEDIUM to FINE GRAIN SAND mica, quartz, grey, subrounded to subangular TRACE silt.		B.G. 1.5 10.0	B-9 (90-100)		1920 0820	TERMINATED Drilling for Day 4-29-91 BEGAN drilling 4-30-91
100	CLAYEY SILT (MH); light brown ^{pink} low plasticity with FINE SAND, OCC pea-gravel light grey	MH	B.G. 1.5 4.2	B-10 (100-110)		0830	
105							
110							

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN

Project Number: 91-5409

Borehole Number: ML-2

Sheet 4 of 9

Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
115	Clayey silt (MH); grey low plasticity with FINE GRAIN SAND, rounded	MH	B.G. 1.5 38	B-11 (110-120)			0845
120	Silt/clay (ML/MH); light grey 50% silt 50% clay, low plasticity with FINE SAND, well rounded	ML/MH	B.G. 1.5 60	B-12 (120-130)			0900
130	SAND (SM); light grey, MEDIUM SAND with silt, some angular clasts trace clay lt-brown, very low plasticity	SM	B.G. 1.5 4.4	B-13 (130-140)			0910
140	SAND (SC); light brown, FINE to very fine sand, well rounded with clay low plasticity trace light brown silt.	SC	B.G. 1.5 3.4	B-14 (140-150)			0940

BOREHOLE LOG

Project Name: **ADEQ - MISSION LINEN**

Project Number: **91-5409**

Borehole Number: **ML-2**

Sheet **6** of **9**

Depth (feet)	Description	Lithology	OVA (ppm)	Samples				Remarks
				Number	Type	Blow Count	Drilling Rate/Time	
195	SAND (SC); light grey, medium GRAINED SAND well rounded with clay low plasticity	SC	B.G. 1.5	B-20	19	1050		
			4.5	(19-20)				
200			B.G. 1.5	B-20				
			3.9	(20-21)				
205						1115		
210	Clay (CL); light brown, medium plasticity with FINE to medium SAND well rounded	CL	B.G. 1.5	B-21		1250		
			4.3	(21-22)				
215								
220			B.G. 0.4	B-22				
			1.2	(22-23)				
225						1300		
230								

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEA							
Project Number: 91-5409			Borehole Number: ML-2			Sheet 7 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
235	SANDY Clay (CL); light brown, MEDIUM plasticity well graded	CL	B.G. 0.4 2.0	B-23 (230-240)			1310
240		CL	B.G. 0.4 1.4	B-24 (240-250)			1317
250		CL	B.G. 0.4 1.1	B-25 (250-260)			
260		CL	B.G. 0.8 3.5	B-26 (260-270)			1330
265							Drilling with 9 7/8" bit TERMINATED go to 6" bit for REMAINDER of the hole. stopped drilling for 5-1-91
270							1030 Began drilling 5-2-91

BOREHOLE LOG

Project Name: **ADEQ - MISSION LINEN**
 Project Number: **91-5409** Borehole Number: **ML-2** Sheet **8** of **9**

Depth (feet)	Description	Lithology	SVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
275		CL	B.G. 0.8 3.5	B-27 (270-280)		1031	
280	SAND AND CLAY (SC/ML); light brown COARSE ANGULAR SAND, low plasticity CLAY	SC/ML	B.G. 0.8 3.0	B-28 (280-290)		1035	
290	Sandy Clay (CL); Light brown, MEDIUM GRAINED, ANGULAR, mica-quartz Clay low plasticity	CL	B.G. 0.8 4.9	B-29 (290-300)		1040	
295			B.G. 0.8 2.0	B-30 (300-310)		1050	
300							
305							
310							

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN.

Project Number: 91-5409

Borehole Number: ML-2

Sheet 9 of 9

Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
315	Silty SAND; (SM) light grey, medium grain sand angular to sub angular with occasional clay ball.	SM	B.G. 0.8 3.5	B-31	(310-320)	1055	
320			B.G. 0.8 3.2	B-32	(320-330)		
325			B.G. 0.8 2.2	B-33	(330-340)		
330	Sandy Clay (MH); light brown low plasticity clay, FINE to medium grain sand sub rounded	MH	B.G. 0.8 2.8	B-34	(340-350)	1100	
335							
340	Hole terminated in Sandy Clay		B.G. 0.8 2.6	B-35	(350-355)	1105	
345							
350						TERMINAL depth 355 ft bis.	

WELL COMPLETION LOG

MLR-3

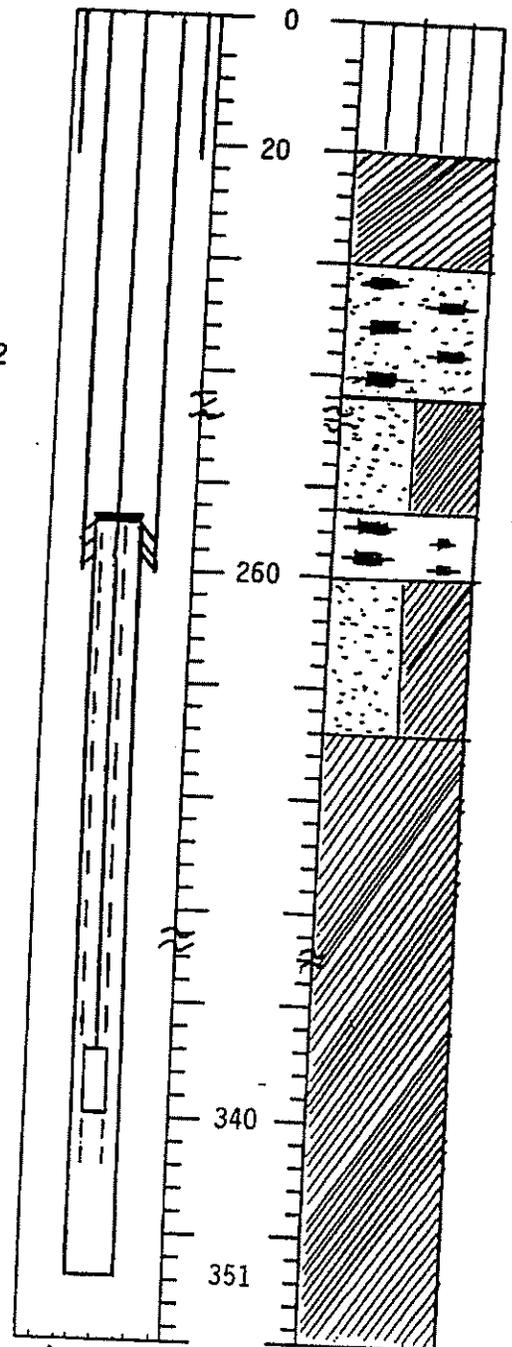
PROJECT NAME: ADEQ Mission Linen
 PROJECT NUMBER: 91-5409
 WELL LOCATION: Mission Linen, 301 S. Park Tucson, Arizona
 WELL REGISTRATION NUMBER: 55-531299
 DEPTH TO WATER (FEET FTOC): 181.95
 DRILLING CO.: B-J Drilling Company, Inc.
 DRILLER: Bob Jackson
 RIG TYPE: Ingersoll T4
 DRILLING METHOD: Rotary
 DRILLING FLUID: Mud
 BOREHOLE DIAMETER (INCHES): 14 3/4, 9 7/8, 5 5/8
 TOTAL DEPTH DRILLED (FEET): 350
 CASING TYPE: Steel
 CASING DIAMETER (INCHES O.D.): 10 3/4, 6 5/8, 4 1/2
 SCREEN TYPE: Machine Slotted
 SLOT SIZE (INCHES): 0.060 x 3 20 slot/ft.
 SCREENED INTERVAL (FEET): 261 TO 346
 CASING INTERVAL (FEET): 0 TO 261
 FILTER PACK: Natural Pack
 FILTER INTERVAL (FEET): 261 TO 346
 TYPE OF SEAL: Cement Pressure Grout
 SEALED INTERVAL (FEET): 0 TO 261
 GROUT TYPE: Portland Cement
 PERCENT BENTONITE IN GROUT: 0
 GROUT INTERVAL (FEET): -- TO --
 GROUND ELEVATION: --
 TOP OF CASING ELEVATION: 2414.735 (ft.)
 COMMENTS: Sediment Trap (blank 4" steel) 346 to 351 bls.

WELL NUMBER: ML-3

DRILLING AND COMPLETION DATE	PROGRESS START	FINISH
4/22/91	-->	4/29/91

WELL SKETCH*
(DEPTH IN FEET)

CONSTRUCTION ' GEOLOGIC



*sketch not to scale

BOREHOLE LOG

Project Name: ADEQ MISSION LINEN			
Project Number: 91-5409		Borehole Number: ML-3 MLR-3	Sheet 1 of 9
Borehole Location: NORTH EAST CORNER		Elevation and Datum: 2414.7354 AMSL	
Drilling Company: B-J DRILLING CO, INC.	Driller: BOB JACKSON	Date Started: 4-23-91	Date Finished: 4-25-91
Drilling Equipment: INGERSOLL T4		Total Depth (feet): 355	Depth to Bedrock (feet): —
Drilling Method: ROTARY		Borehole Diameter: 14" to 21", 9 7/8" to 260, 6" to 355'	
Drilling Fluid: AIR and MUD		Depth to Water (feet): First: —	Compl.: 18.5 24 hrs.
Completion Information:		Logged By: PAUL DUNSTER	Checked by:

Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
5	Silt (ML); light brown, low plasticity silt, with medium to fine grain sand angular-subrounded, TRACE ANGULAR COARSE SAND and FINE GRAIN GRAVEL	ML	B.G. 0 5.5	B-1 (0-0)		0910	MILD REACTION WITH 10% HCL SOLUTION
10			B.G. 0 0	B-2 (0-20)		0915	MILD ACID REACTION
20	CLAY (CL/CH); GRAYISH ORANGE PINK to PALE YELLOW BROWN CLAY SOME FINE GRAINED SAND	CL/CH	B.G. 0.8 0.8	B-3 (20-30)		0924 220	INSTALLED SURFACE CASING TO 21 FEET.
25	SANDY CLAY (CL); Light brown, clay and FINE to COARSE GRAIN SAND angular, TRACE GRAVEL QUARTZ and CALICHE.		0.8				NO ACID REACTION
30							

BOREHOLE LOG

Project Name: MISSION LINEN							
Project Number: 91-5409			Borehole Number: ML-3			Sheet 2 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
35	SANDY CLAY (CL); Light brown clay and fine to coarse grain sand angular, trace fine grain gravel quartz and calcite	CL	B.G. 0.5 0.5	B-4 (3-4')			
40	Cobble/Boulders, cuttings are angular, fine-coarse grain gravel composed of calcite + metamorphics.					1230 1253	DRILLER REPORTS INTO BOULDER AND COBBLES.
45	Silty SAND (SM); Light brown FINE-COARSE GRAIN SAND rounded angular trace FINE GRAIN angular gravel; SAND and gravel quartz calcite + METAMORPHICS.	SM	B.G. 0.5 0.5	B-5 (40-50')			
50	Cobbles/Boulders i.e. 36"-40.5"					1259	CHATTER
55	Silty SAND (SM); Light brown FINE TO COARSE SAND, rounded-ANGULAR, TRACE FINE GRAIN GRAVEL (ANGULAR) QUARTZ, CALCITE, and METAMORPHICS.	SM	B.G. 0.6 0.6	B-6 (50-60')			
60							NO ACID REACTION
65			B.G. 0.7 0.7	B-7 (60-70')		1305	
70						1307 1311	
						1315	TERMINATE AIR CIRCULATION

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN							
Project Number: 91-5409			Borehole Number: ML-3			Sheet 3 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
75	SAND (SP); white, FINE to MEDIUM GRAIN rounded quartz SAND, some silt, TRACE ANGULAR GRAVEL	SP	B.G. 0.7	B-8 (70-80')			INITIATED MUD CIRCULATION.
			1.0				
80			B.G. 0.7				
			1.0				
95	SANDY CLAY; light brown clay, COARSE ANGULAR QUARTZ SAND		B.G. 0.7	B-10 (90-100')			
			1.1				
105			B.G. 0.7	B-11 (100-110')			
			1.0				
110	CLAY (CL/CH); light brown clay with MEDIUM to COARSE ANGULAR SAND QUARTZ and calcite.						

1624

1608

BOREHOLE LOG

Project Name: ADEQ - MISSION LINEN							
Project Number: 91-5409		Borehole Number: ML-3			Sheet 7 of 9		
Depth (feet)	Description	Lithology	Samples				Remarks
			OVA (ppm)	Number	Type	Blow Count	
235	CLAY (CH); Light brown, high plastic, some angular to sub rounded FINE to medium GRAIN SAND, QUARTZ.	CH	B.G.	B-24	(230-240)		1012
			0.2				
			9.2				
240			B.G.	B-25	(240-250)		1030 1028
		0.2					
		6.0					
245			B.G.	B-26	(250-260)		1040
		0.2					
		6.0					
250			B.G.	B-27	(260-270)		1055
		1.0					
		3.0					
255	~90% of sample is CEMENT but PAN sieve and filtered clay balls similar to above.		B.G.				Total depth for 4-24-91 began setting casing
			1.0				
260							
265							
270							Drilling on 4-25-91

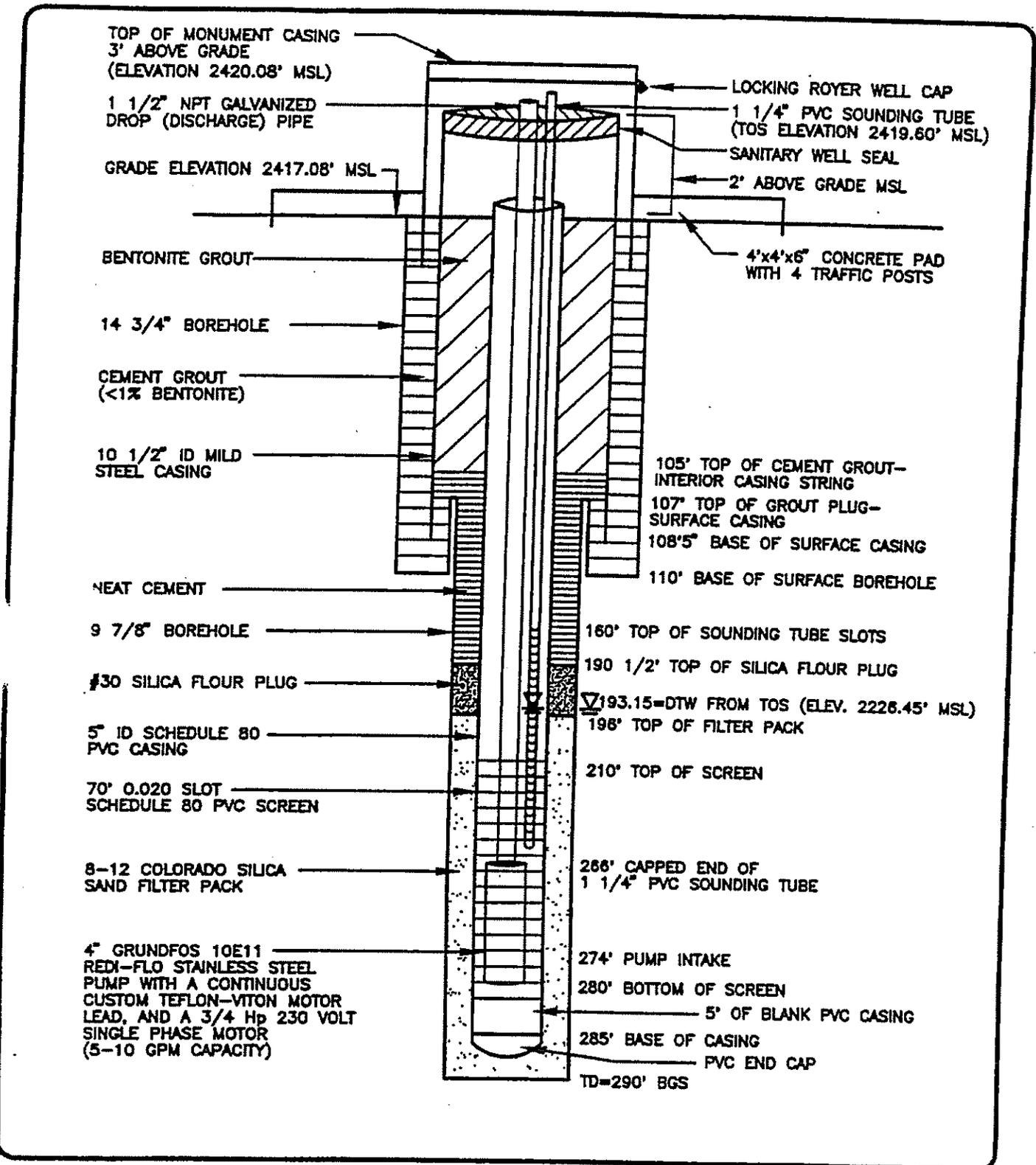
BOREHOLE LOG

Project Name: ADEQ - MISSION LINE							
Project Number: 91-5409			Borehole Number: ML-3			Sheet 8 of 9	
Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
275	Clay (CL-CH); Light brown, some angular to sub round fine to medium grain sand	CH	B.G.	B-28		1152	90% sample is cement still inside 6 inch casing
			1.0	(270-280)			
			1.7				
280			B.G.	B-29			
			1.0	(280-290)			
			1.6				
285							
290			B.G.	B-30			
			1.0	(290-300)			
			1.7				
295							
300			B.G.	B-31		1159	
			2.1	(300-310)		1215	
			1.7				
305							
310							

BOREHOLE LOG

Project Name: **ADEQ - MISSION LINEN**
 Project Number: **91-5409** Borehole Number: **ML-3** Sheet **9** of **9**

Depth (feet)	Description	Lithology	OVA (ppm)	Samples			Remarks
				Number	Type	Blow Count	
315	CLAY (CL-CH); LIGHT BROWN TRACE FINE TO COARSE ANGULAR SUB-ROUNDED QUARTZ AND CaCO ₃	CL/ KH	B.G. 1-0 3.5	B-32	(30-32)		CUTTINGS STILL PREDOMINANTLY CEMENT.
320			B.G. 1-0 3.5	B-33	(30-33)	1220	
325						1223	
330			B.G. 1-0 3.0	B-34	(30-34)		
340			B.G. 1-0 3.0				
345							
350							OVER DRILLED BOREHOLE TO ≈ 355 FT 1232 TOTAL DEPTH 355 CEASED DRILLING 4-25-91



Emcon
Associates

DATE 6-28-94
 DWN. BAL
 APPR. _____
 REVIS. _____

MISSION INDUSTRIES
 REMEDIAL INVESTIGATION STATUS REPORT
 301 SOUTH PARK AVENUE,
 TUCSON, ARIZONA

MLR-7 AS BUILT

FIGURE

2-3

PROJECT NO.

0H31-001.01

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BORING/WELL No. MLR-7

SHEET 2 of 7

PROJECT: MISSION LINEN

PROJECT No: OH31-001.01

GS ELEV: 2417.08

CLIENT: MISSION INDUSTRIES

CONTRACTOR: H-F DRILLING INC.

RIG: RT-1800

TOP OF SOUNDER: 2416.90

WELL CONSTRUCT	DEPTH (feet)	SAMPLE NUMBER	SAMPLE & TYPE	RECOVERY (Inches)	BLOWS / 6 In.	LOG	UNIFIED	FIELD DESCRIPTION	REMARKS
CEMENT GROUT W/CENTRALIZERS AND WALL SCRUBBERS 5" SCH. 80 PVC IN BLANK 10.5" MILD STEEL CASING W/CENTRALIZERS AND SCRUBBERS	45		G				SP	SAND - LIGHT BROWN (7.5 YR, 6/4); COARSE SAND 100%, WELL ROUNDED, VERY POORLY GRADED. NO ODOR.	
			G					SAND - LIGHT BROWN (7.5 YR, 6/4) (MEDIUM SAND 10%, COARSE SAND 90%). WELL ROUNDED AND POORLY GRADED. NO ODOR.	
	50		G				SP		
	55		G					SAND - LIGHT BROWN (7.5 YR, 6/4), COARSE SAND 100%, WELL ROUNDED VERY WELL SORTED, POORLY GRADED. NO ODOR.	
	60		G				SP		MILD-SWEET ODOR (UNKNOWN)
	65		G				SP	SAND - LIGHT BROWN (7.5 YR, 6/4); (MEDIUM SAND 40%; COARSE SAND 60%) WELL ROUNDED, POORLY GRADED, MODERATE ODOR (SWEET-UNKNOWN).	
	70		G					AS ABOVE	MILD TO MODERATE SWEET ODOR (UNKNOWN)
	75		G					AS ABOVE	MILD TO MODERATE ODOR.
	80		G				SP		
	85							SC	CLAYEY SAND - LIGHT BROWN (7.5 YR, 6/4); FINE TO COARSE SAND. (FINE 20%, COARSE 40%) SUBROUNDED, MODERATELY GRADED, MEDIUM DRY STRENGTH, DILATANCY - NONE, MEDIUM TOUGHNESS; MODERATE ODOR.

Tue Jun 15 10:09:06 1995



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BORING/WELL No. MLR-7

SHEET 4 of 7

PROJECT: MISSION LINEN

PROJECT No: OH31-001.01

GS ELEV: 2417.08

CLIENT: MISSION INDUSTRIES

TOP OF SOUNDER: 2416.90

CONTRACTOR: H-F DRILLING INC.

RIG: RT-1800

WELL CONSTRUCT	DEPTH (feet)	SAMPLE NUMBER	SAMPLE & TYPE	RECOVERY (Inches)	BLOWS / 6 In.	LOG	UNIFIED	FIELD DESCRIPTION	REMARKS
CEMENT GROUT 5" ID BLANK SCH 80 PVC CASING								AS ABOVE	
	135						CL		
	137'-139'	C	18/24				SC	CLAYEY SAND- PALE BROWN (10 YR, 6/3); MEDIUM TO FINE SAND, (FINE 80%, MEDIUM 20%, SUBROUNDED) AT 138', LITHOLOGY CHANGES TO MEDIUM TO COARSE SAND WITH CLAY, (MEDIUM 20%, COARSE 30%, VERY COARSE 50%) DRY. NO ODOR (COARSE-GRAINED MATERIAL PROBABLY SLOUGH) STRONG HCL REACTION.	POOR RETURNS SWITCH TO FOAM AT 139'
	139'-140'	C	14/36						
	140'-142'	C							
	142'-147'	C	11/60				SP	SAND- BROWN (7.5 YR, 5/4) MEDIUM TO FINE (FINE 20%, MEDIUM 80%, TRACE COARSE), HARD; SUBROUNDED; DRY; NO ODOR; COLOR CHANGE TO REDDISH BROWN @ 142' (5 YR, 5/4), INCREASE IN MEDIUM GRAINED FRACTION COARSE SAND, CLEAN, (COARSE 25%, VERY COARSE 75%) HARD, SUBROUNDED; NO ODOR; STRONG HCL REACTION.	
	145								
	150								
	155								
	160		G					SP	SAND- LIGHT GREY (7.5 YR, 7/1); MEDIUM TO COARSE, (MEDIUM 20%, COARSE 80%) WELL ROUNDED, POORLY GRADED, NO ODOR.
165								165'-170' POOR RETURNS	
170		G					SP	SAND- PINKISH GRAY (7.5 YR, 7/2); COARSE SAND 100%, WELL ROUNDED, POORLY GRADED, MODERATE ODOR.	
175								DRILLER NOTES HARD DRILLING CONDITIONS AT 177'. HEAVY CEMENTATION OR COBBLES.	



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BORING/WELL No. MLR-7

SHEET 5 of 7

PROJECT: MISSION LINEN
CLIENT: MISSION INDUSTRIES
CONTRACTOR: H-F DRILLING INC.

PROJECT No: 0H31-001.01

GS ELEV: 2417.08

RIG: RT-1800

TOP OF SOUNDER: 2416.90

WELL CONSTRUCT	DEPTH (feet)	SAMPLE NUMBER	SAMPLE & TYPE	RECOVERY (Inches)	BLOWS / 6 In.	LOG	UNIFIED	FIELD DESCRIPTION	REMARKS		
CEMENT GROUT	180	180'-184'	C	22/48			SP	CLAYEY SAND - LIGHT BROWN (7.5 YR, 6/5); MEDIUM TO VERY COARSE SAND (MEDIUM 70%, COARSE 20%, VERY COARSE 10%). SUB-ROUNDED, POORLY GRADED. STRONG HCL REACTION. VERY WELL-CEMENTED, HARD.	NO DIESEL DETECTED IN DRILLING FOAM OR CORE.		
	185	184'-185'	C	3/12			SC/SP				
		185'-186.5'	C	8/18							
		186.5'-190'	C	22/42							
		190'-191.5'	C	21/18			SC				
		195	G							SAND - PINKISH GRAY (7.5 YR, 7/2) MEDIUM TO COARSE SAND (MEDIUM 40%, COARSE 60%), WELL ROUNDED, POORLY GRADED. SLIGHTLY MOIST, NO ODOR.	DRILLER NOTE: HARD DRILLING, WELL CEMENTED
		200								AS ABOVE NO ODOR.	
		205									
		210	G				SP			SAND - PINKISH GRAY (7.5 YR 7/2); COARSE, ROUNDED, VERY POORLY GRADED. NO ODOR, POSSIBLY GAINING FLUID, DRILLING BECOMING "STICKIER".	FOAM TURNED TO TAN COLOR
		215	G							AS ABOVE. 215'-220' GROUNDWATER POSSIBLY ENCOUNTERED	
	220							POOR RETURNS CLEANED OUT HOLE - FOAM TURNS FROM TAN TO WHITE			

JUN 16 12:55 1995



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BORING/WELL No. MLR-7

SHEET 6 of 7

PROJECT: MISSION LINEN
CLIENT: MISSION INDUSTRIES
CONTRACTOR: H-F DRILLING INC

PROJECT No: OH31-001.01

GS ELEV: 2417.08

RIG: RT-1800

TOP OF SOUNDER: 2416.90

WELL CONSTRUCT	DEPTH (feet)	SAMPLE NUMBER	SAMPLE TYPE & TYPE	RECOVERY (Inches)	BLOWS / 6 In.	LOG	UNIFIED	FIELD DESCRIPTION	REMARKS
5" 0.020 SLOT PVC SCREEN IN 8 - 12 COLORADO SILICA FILTER PACK	225			NR				<p>⊙ 225' ATTEMPTED TO MEASURE DTW HOLE COLLAPSED TO 222'</p>	
	230		G				SP	<p>SAND - PINKISH GREY (7.5 YR, 7/2); COARSE SAND 100%, WELL ROUNDED. NO ODOR.</p> <p>POOR RETURNS FROM 225' TO 233'</p>	
	235								
	240	240'-242.5'	C		5/30			<p>CORE GRADES FROM MEDIUM TO COARSE SAND, NO ODOR, MOIST. POSSIBLE SLOUGH. NO HCL REACTION BUT WEAK CEMENTATION. NOSE OF CORE APPROX. 1" OF CLAYEY SAND.</p>	SWITCHED FROM AIR TO MUD AT 242'
	245	242.5'-245.5'	C		6/36			<p>CLAYEY SAND - PINKISH GREY (7.5 YR, 7/3); FINE TO MEDIUM SAND, (FINE 20%, MEDIUM 80%) WELL-CEMENTED; STRONG REACTION WITH HCL; DRY; NO ODOR; HIGH DRY STRENGTH; MEDIUM PLASTICITY.</p>	
	250						SC	<p>POOR RETURNS FROM 245.5 - 250' MEDIUM TO COARSE SAND</p>	250 - 255' DRILLER NOTES HARD WELL-CEMENTED ZONE
	255							<p>POOR RETURNS FROM 250 - 255' MEDIUM TO COARSE SAND</p>	
	260		G					AS ABOVE	
	265							<p>INCREASING FINES/CLAY ⊙ 264' POOR RETURNS.</p>	DRILLER NOTES: FINER - GRAINED MATERIAL, BUT DOES NOT FEEL LIKE CLAY



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BORING/WELL No. MLR-7

SHEET 7 of 7

PROJECT: MISSION LINEN

PROJECT No: OH31-001.01

GS ELEV: 2417.08

CLIENT: MISSION INDUSTRIES

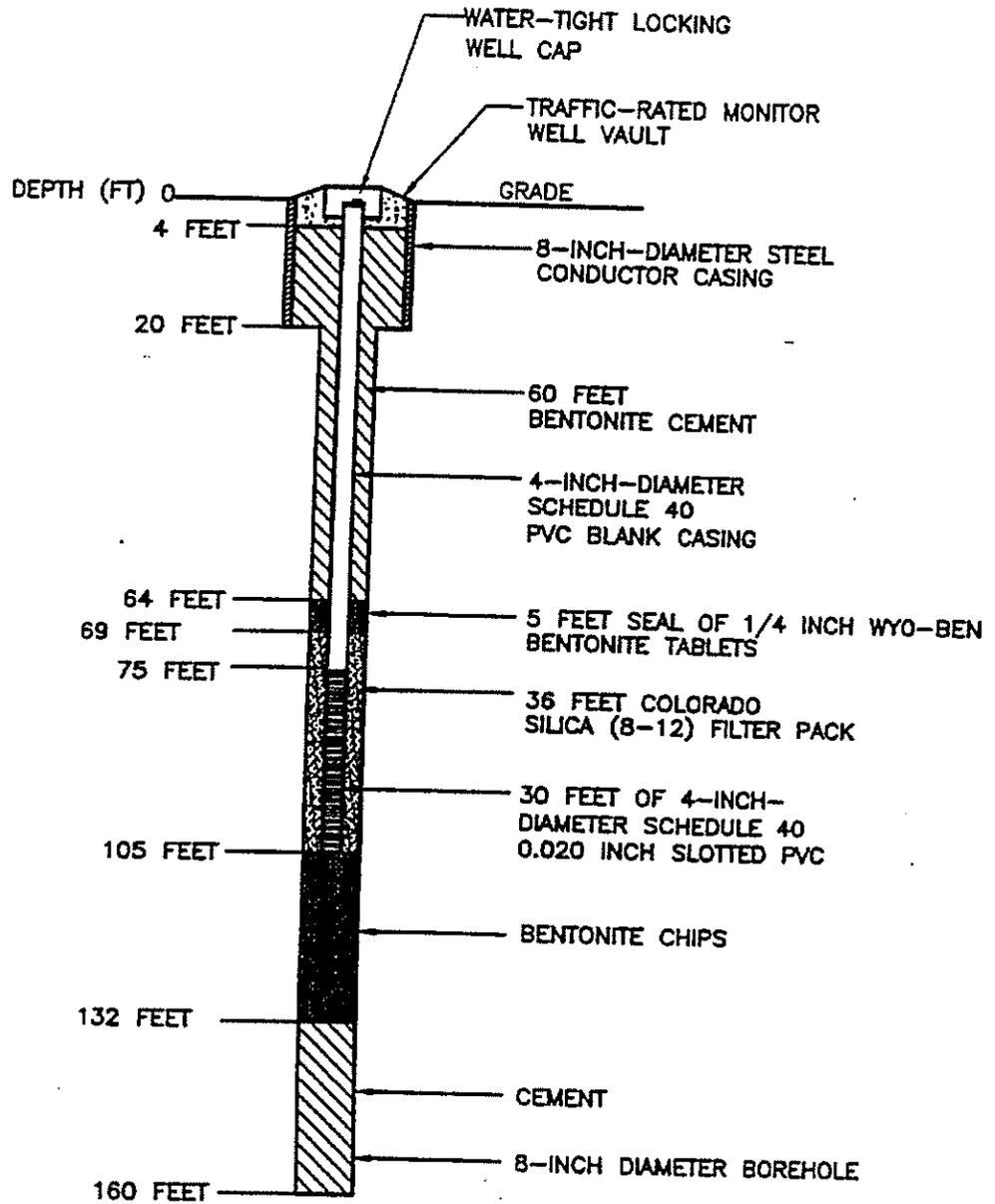
TOP OF SOUNDER: 2416.90

CONTRACTOR: H-F DRILLING INC.

RIG: RT-1800

WELL CONSTRUCT	DEPTH (feet)	SAMPLE NUMBER	SAMPLE & TYPE	RECOVERY (Inches)	BLOWS / 6 In.	LOG	UNIFIED	FIELD DESCRIPTION	REMARKS
5" 0.020 SLOT PVC IN 8-12 COLORADO SILICA FILTER PACK	270		G				SP	SAND - MEDIUM TO COARSE SAND, POOR RETURNS, NO ODOR.	DRILLER NOTES SAND @ 267'
	275							INCREASE IN FINER-GRAINED MATRIX, NO ODOR. POOR RETURNS DURING REAMING - CUTTINGS APPROX. 40-50% SOFT, MEDIUM PLASTICITY, CLAY	(VISCOSITY MUD = 31)
BLANK 5" SCH 80 PVC CASING IN 8-12 COLORADO SILICA FILTER PACK	280		G					SANDY CLAY - LIGHT BROWN (7.5 YR, 6/3); MEDIUM TO COARSE-GRAINED, (MEDIUM 10%, COARSE 90%), POORLY GRADED, WELL ROUNDED, SAND IN CLAY. HARD, MEDIUM PLASTICITY, HIGH DRY STRENGTH. NO ODOR.	
	285	286'-290	C	10/48			CL		
	290	290'-295'	C	10/60				SAME AS ABOVE, NO ODOR. CORE CONTAINS APPROX. 1" WELL-CEMENTED LENSE.	REAMED BORING @ 290' TOTAL DEPTH (TD)
	295		G					POOR RETURNS. COARSE SAND WITH CLAY. NO ODOR.	
	300								
	305								
	310							TOTAL DEPTH (PILOT BORING) AT 303' BG	

MLS-4
ADWR NO. 55-538186



NOT TO SCALE



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MISSION INDUSTRIES
301 SOUTH PARK AVENUE
PHASE 2 FIELD ACTIVITIES
TUCSON, ARIZONA
SHALLOW MONITOR WELL
CONSTRUCTION DETAILS MLS-4

FIGURE

3.1

PROJECT NO.

0H31-001.07

DRAWN BY: GAL

DATE LAST REVISED: 7/18/95

CADD FILE: J:\H3100107\FIG3-1

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. *MLS-4*
~~ML-4~~

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 1 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
NA	0.5/1.5	50/6"		5		ASPHALT	<p>ASPHALT (2 1/2"-thick) high weathering, poor integrity, abundant surface cracks.</p> <p>FILL: SILTY SAND (SM) reddish brown (5YR, 4/3); little/some fines (low plasticity); mostly sand (trace fine, mostly medium/coarse); trace gravel; moist.</p> <p>@3.5', SILTY SAND (SM) very pale brown (10YR, 7/3); little/some fines (low plasticity); mostly sand (little/some fine, mostly medium/coarse); trace gravel; moderate cementation; dry.</p> <p>@ 5', moderate to high cementation (only 6" sample recovery).</p>	
0.0	1.0/1.5	13 26 9		10		SANDY GRAVEL	<p>SANDY GRAVEL (GP) multicolored gravel with a light brown matrix (7.5YR, 6/4); trace fines; little/some sand (trace fine, mostly medium/coarse); mostly gravel (1/8 to 1/4 inch o.d., subangular to subrounded); moist (drier than at 2.5').</p> <p>@ 10.5', CLAYEY SAND (SC) brown (7.5YR, 5/4); little/some fines (moderate plasticity); mostly sand (mostly fine, little/some medium/coarse); trace gravel; low/moderate cementation; moist (wetter than above).</p> <p>@ 13', Driller notices a decrease in drilling rate - cuttings show:</p> <p>SANDY GRAVEL (GP) (lithology similar to that at 9 feet with moderate cementation).</p>	
0.0	1.5/1.5	19 36 50		15		SANDY GRAVEL		
				20		SANDY GRAVEL		

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-4

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	1.5/1.5	9 36 50		25		30	<p>SANDY GRAVEL (GP) continued.</p> <p>SAND (SP) reddish yellow (7.5YR, 6/6); trace fines, mostly micaceous sand (trace fine, mostly medium, some coarse); trace gravel; moist (wetter than above).</p> <p style="text-align: center;">35</p> <p>SANDY GRAVEL (GP) multicolored gravel with a light brown matrix (7.5YR, 6/4); trace fines; little/some sand (trace fine, mostly medium/coarse); mostly gravel (1/8 to 1/4 inch o.d., subangular to subrounded).</p> <p>SAND (SP)</p> <p style="text-align: center;">40</p> <p>SANDY GRAVEL (GP) multicolored gravel with a</p>	

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-4

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				45	50	55	60	
						45	<p>light brown matrix (7.5YR, 6/4); trace fines; little/some sand (trace fine, mostly medium/coarse); mostly gravel (1/8 to 1/4 inch o.d., subangular to subrounded).</p> <p>SAND (SP)</p>	
						50	<p>SANDY GRAVEL (GP) multicolored gravel with a light brown matrix (7.5YR, 6/4); trace fines; little/some sand (trace fine, mostly medium/coarse); mostly gravel (1/8 to 1/4 inch o.d., subangular to subrounded).</p>	
						55	<p>SANDY GRAVEL/GRAVELLY SAND (GP/SP) Multicolored gravel in a brown matrix (7.5YR, 5/3); trace fines; little/some sand (some fine/medium, mostly coarse); mostly gravel (1/8 to 1/2 inch o.d., subrounded to subangular); because of mist added to air rotary, soil moisture cannot be assessed.</p>	

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-4

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65	70	75	80	
							<p>SANDY GRAVEL/GRAVELLY SAND (GP/SP) continued</p>	

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-4

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				85		SANDY GRAVEL/GRAVELLY SAND (GP/SP) continued	<p>@ 80', 5 1/2 inch o.d. tricone bit is plugged with a 1 inch o.d. gravel.</p> <p>@ 90', Product-like odor.</p> <p>@ 96', Driller notices an increase in moisture and drilling rate - cuttings show decrease in gravel.</p> <p>@ 97', Decrease in drilling rate - cuttings show increase in gravel.</p>	100

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-4

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 7 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				125		130	<p>SANDY GRAVEL/GRAVELLY SAND (GP/SP) Multicolored gravel in a brown matrix (7.5YR, 5/3); trace fines; little/some sand (some fine/medium, mostly coarse); mostly gravel (1/8 to 1/2 inch o.d., subrounded to subangular); because of mist added to air rotary, soil moisture cannot be assessed.</p>	
				135		140	<p>GRAVELLY SAND(SP) trace fines; mostly sand (little fine/medium, mostly coarse); little/some gravel (1/4 to 1/2 inch o.d., subrounded to subangular).</p>	

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-4

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 8 OF 8

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2416.94 ft.

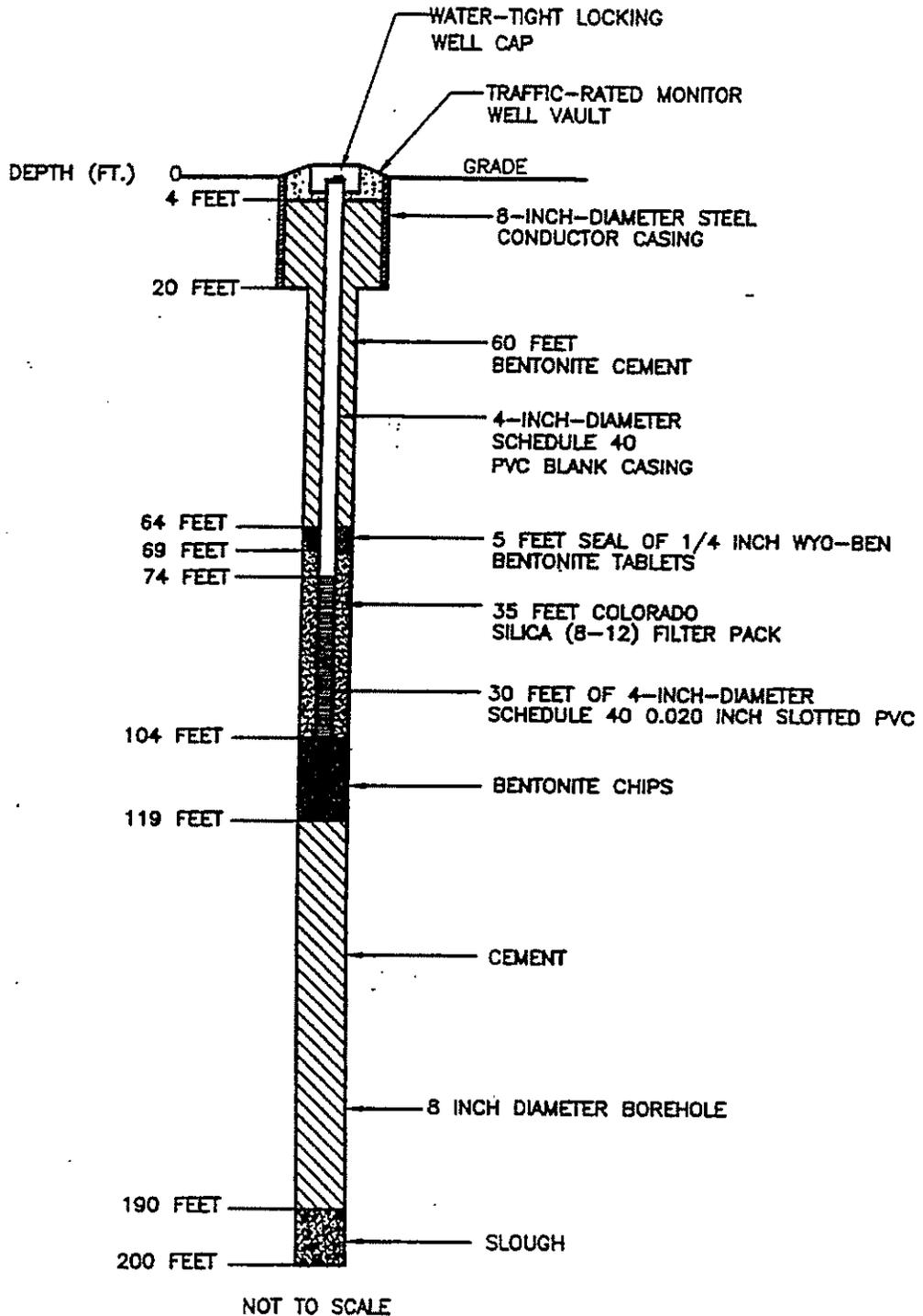
PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				145	GRAVELLY SAND (SP) continued.		
				150		@ 145', Slight increase in gravel (2-3 foot thick layer).	
				155		@ 155', increase in gravel (3-4 foot thick layer, 1/2 to 1 inch o.d., subrounded).	
				160		BOTTOM OF BORING AT 160 FEET BORING TERMINATED	

REMARKS

The boring was drilled to 160 feet by Boyles Brothers using a Schramm 850 rig with air rotary and completed as a monitor well on 3/20/93. The casing was then pulled, the boring redrilled and the borehole was sealed to 105 feet. The casing was reinstalled on 3/26/93 to a total depth of 105 feet.



MLS-5
ADWR NO. 55-538187



EMCON
Associates

MISSION INDUSTRIES
301 SOUTH PARK AVENUE
PHASE 2 FIELD ACTIVITIES
TUCSON, ARIZONA
SHALLOW MONITOR WELL
CONSTRUCTION DETAILS MLS-5

FIGURE
3.2
PROJECT NO.
0H31-001.07

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

MLS-5
BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 1 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5		ASPHALT	
NA	1.5/1.5	6 3 6		5		WELL GRADED SAND WITH CLAY (SC); light brown; 10-15% fines (medium plasticity); 80% fine - very coarse sand, 5% fine gravel; dry.	
NA	1.5/1.5	4 4 6		10		@ 10', decrease fines to 5%; increase fine gravel to 10%; dry.	
NA	.75/1.5	45 50/2"		15		SANDY CLAY (CL), light grey; 80% fines (medium plasticity); 20% fine-medium sand; trace gravel.	
				20		CLAYEY SAND (SC), light brown; 35% fines (medium plasticity); 65% fine to coarse sand; trace gravel; dry.	

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
NA	1.5/1.5	19 30 50		25		30	<p>SANDY GRAVEL (GP) multicolored gravel with a light brown matrix (7.5YR, 6/4); trace fines; little/some sand (trace fine, mostly medium/coarse); mostly gravel (1/8 to 1/2 inch o.d., subangular to subrounded); moderate cementation; moist (wetter than above).</p> <p>SAND (SP) reddish yellow (7.5YR, 6/6); trace fines; mostly sand (trace fine, mostly medium (micaceous), some coarse); trace gravels; moist.</p> <p>SANDY GRAVEL (GP); similar to lithology at 21 feet.</p>	
				35				
				40				

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				45			<p>SAND (SP) reddish yellow (7.5YR, 6/6); trace fines; mostly sand (trace fine, mostly medium (micaceous), some coarse); trace gravels; moist.</p> <p>SANDY SILT (ML) light brown (7.5YR, 6/2), mostly fines (low plasticity); little/some fine (micaceous) sand; moist (wetter than above).</p> <p>SAND (SP) reddish yellow (7.5YR, 6/6); trace fines; mostly sand (trace fine, mostly medium (micaceous), some coarse); trace gravels; moist.</p>	
				50			<p>SANDY GRAVEL (GP) multicolored gravel with a brown matrix (7.5YR, 5/3), trace fines; little/some sand (little/some fine, mostly medium/coarse); mostly gravel (subangular to subrounded, 1/8 to 1/2 inch o.d.)</p>	
				55				
				60				

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65	70	75	<p>SANDY GRAVEL (GP); continued.</p> <p>@ 71', Driller notices a 4-5 foot area of hardness - cuttings show a coarsening of sand grain size, increase in o.d. of gravel.</p> <p>CLAYEY SAND(SC) brown (7.5YR, 5/3), little/some fines (moderate/high plasticity); mostly sand (mostly fine/medium, little/some coarse); trace gravel.</p>	80

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				85			<p>SANDY GRAVEL (GP) multicolored gravel with a brown matrix (7.5YR, 5/3), trace fines; little/some sand (little/some fine, mostly medium/coarse); mostly gravel (subangular to subrounded, 1/8 to 1/2 inch o.d.)</p> <p>@ 85-90', Decrease in drilling rate - cuttings show a gravelly sand with an increase in gravel.</p>	
				90			<p>@ 91-93', Cuttings show gravelly sand</p>	
				95			<p>@ 94', Driller notices an increase in water - diesel odor.</p> <p>CLAYEY SAND (SC), strong brown 40% fines (medium plasticity); 50% fine to very coarse sand; 10% fine gravel.</p>	
				100			<p>SANDY CLAY (CL), brown (7.5YR, 5/4); 75% fines (medium plasticity); 20% fine to coarse sand; 5% fine gravel; (increase in moisture).</p>	

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 7 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				125			<p>CLAYEY SAND (SC); continued.</p>	
				130			<p>GRAVELLY SAND (SP), white to light gray (5YR, 8/1-7/1); trace fines; mostly sand (little fine/medium, mostly coarse); little/some gravel (subrounded to subangular, 1/8 to 1/4 inch o.d.).</p> <p>@ 130', Cuttings show 1 1/2 to 2 foot-thick slight increase in gravel layer (decrease in drilling rate).</p>	
				135				
				140				

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 8 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				145			<p>GRAVELLY SAND (SP); continued.</p> <p>@ 148, Cuttings show 2-3 foot-thick increase in gravel layer (decrease in drilling rate).</p>	
				150				
				155				
				160				

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 9 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				165		<p>@ 163', Driller notices an increase in drilling rate - cuttings show an decrease in sand coarseness.</p> <p>SAND(SP), white to light gray (5YR, 8/1-7/1); trace fines; mostly sand (mostly fine/medium, little/some coarse); trace gravel.</p>	
				170		<p>GRAVELLY SAND (SP), white to light gray (5YR, 8/1-7/1); trace fines; mostly sand (little fine/medium, mostly coarse); little/some gravel (subrounded to subangular, 1/8 to 1/4 inch o.d.).</p>	
				175		<p>@ 175-200', Cuttings show alternating Gravelly Sand (as at 163 feet) and Sandy Gravel (as at 125 feet).</p>	
				180			

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-5

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 10 OF 10

BY C.Estes/M.Minter DATE 3/26/93

SURFACE ELEV. 2412.16 ft.

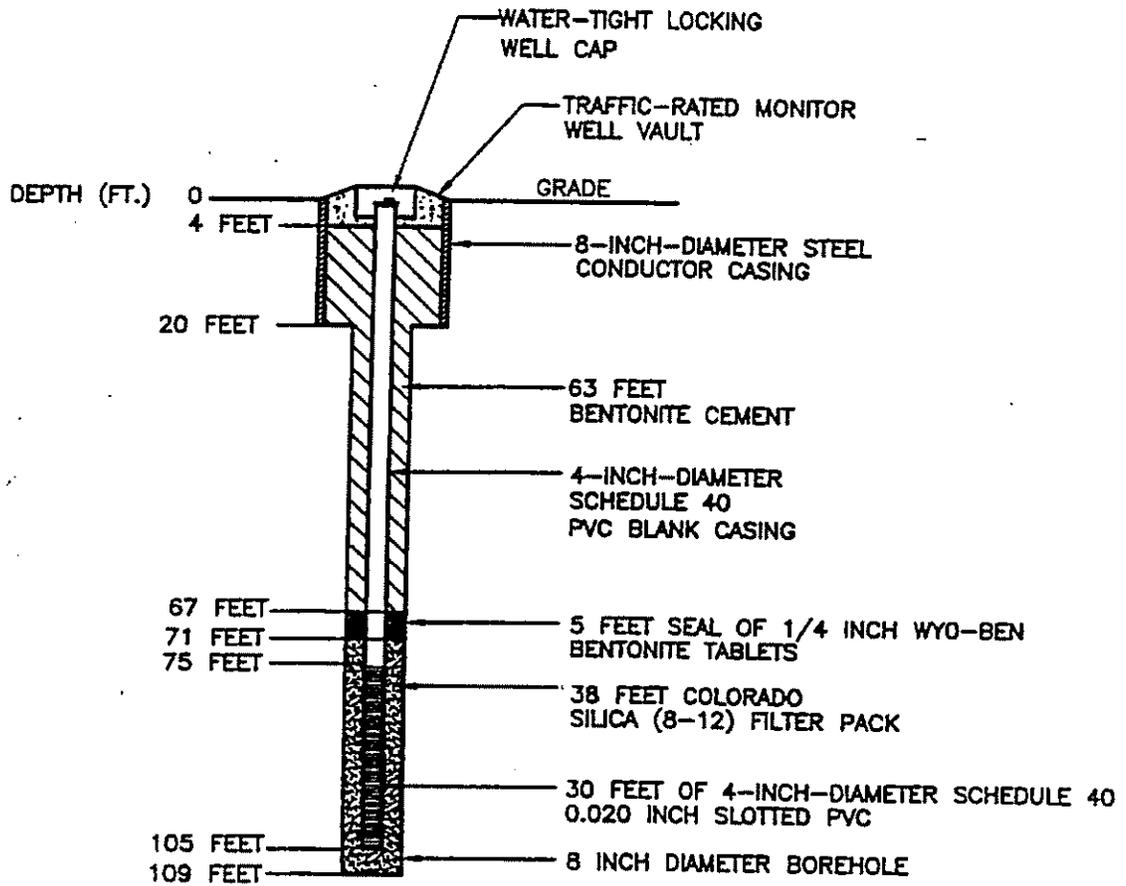
PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				185			Alternating Gravelly Sand and Sandy Gravel; continued.	
				190			@ 190-200', Strong product-like odor.	
				195				
				200			BOTTOM OF BORING AT 200 FEET. BORING TERMINATED.	

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and was completed as a monitor well to a depth of 104 feet. The remainder of the boring was sealed with cement and bentonite.



MLS-6
ADWR NO. 55-538188



NOT TO SCALE



EMCON
Associates

MISSION INDUSTRIES
301 SOUTH PARK AVENUE
PHASE 2 FIELD ACTIVITIES
TUCSON, ARIZONA
SHALLOW MONITOR WELL
CONSTRUCTION DETAILS MLS-6

FIGURE
3.3
PROJECT NO.
OH31-001.07

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01
 PROJECT NAME Mission Industries - Phase 2 Activities
 BY C.Estes DATE 3/30/93

BORING NO. ^{MLS-6}
~~ML-6~~
 PAGE 1 OF 6
 SURFACE ELEV. 2416.49 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
NA	.75/1.5	55/6"		5	ASPHALT		
				5	CLAYEY SAND (SC)	CLAYEY SAND (SC); light brown; 30% fines (medium plasticity); 70% medium to coarse grained sand; trace gravel; dry.	
NA	1.25/1.5	10 18 22		10	SANDY CLAY (CL)	SANDY CLAY (CL); very light brown; 70% fines (medium plasticity); 30% fine to medium grained sand; moderately well cemented; dry.	
				10	WELL GRADED SAND (SW)	WELL GRADED SAND (SW); 5-10% fines; 90% well graded subangular sand; 5% fine gravel; little cementation; dry.	
NA	1.3/1.5	10 12 18		15		@ 15', Trace fines; light orange brown in color.	
				15	WELL GRADED SAND (SW)	WELL GRADED SAND (SW) ; trace fines; 80% very fine to very coarse, well graded sand; 20% fine gravel; one large clast 1.5" diameter; lightly	
NA	1.5/1.5	40 50		20			

REMARKS
 The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and completed as a monitor well to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-6

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 6

BY C.Estes DATE 3/30/93

SURFACE ELEV. 2416.49 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		50		25		30	cemented; dry. WELL GRADED SAND (SW); continued.	
				35			POORLY GRADED SAND (SP); 20% fines; 60% very fine grained sand; 10% fine-coarse sand; 10% fine gravel.	
				40			@ 40', 100% very fine grained sand, trace fines	

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and completed as a monitor well to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-6

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 6

BY C.Estes

DATE 3/30/93

SURFACE ELEV. 2416.49 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				45	50	55	
					60		

(almost like beach sand).

WELL GRADED SAND (SW); trace fines; 90% well graded sand (fine to coarse); 10% gravel.

@ 50', Increase in gravel.

WELL GRADED GRAVEL WITH SAND (GW); trace fines; 40% fine to coarse sand; 50% well graded gravel (fine up to 1/2" diameter).

@ 60', Decrease in gravel.

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and completed as a monitor well to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-6

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 6

BY C.Estes DATE 3/30/93

SURFACE ELEV. 2416.49 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				65	70	75	80
					80	<p>WELL GRADED SAND WITH GRAVEL (SW); 70% well graded sand; 30% fine gravel.</p> <p>POORLY GRADED SAND (SP); 20% fines; 75% poorly graded sand (coarse grained); 5% fine gravel.</p> <p>@ 76', Increase in fines.</p> <p>CLAYEY SAND (SC); 35% fines (medium plasticity); 60% fine to coarse sand; 5% fine gravel.</p>	

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and completed as a monitor well to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. ML-6

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 6

BY C.Estes

DATE 3/30/93

SURFACE ELEV. 2416.49 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				85			<p>@ 83', Decrease in fines to approximately 15%.</p> <p>WELL GRADED SAND (SW); some fines (medium plasticity); mostly well graded sand (very fine to coarse); trace gravel.</p>	
				90				
				95				
				100			<p>@ 98', Boring starts producing water.</p>	

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and completed as a monitor well to a total depth of 105 feet.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

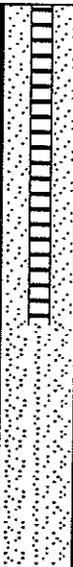
BORING NO. ML-6

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 6 OF 6

BY C.Estes DATE 3/30/93

SURFACE ELEV. 2416.49 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				105			<p>SANDY CLAY (CL); 60% fines (medium plasticity); 40% fine to medium grained sand; trace gravel.</p> <p style="text-align: center;">BOTTOM OF BORING AT 109 FEET. BORING TERMINATED.</p>	
				110				
				115				
				120				

REMARKS

The boring was drilled by Boyles Brothers using a Schramm 850 rig with air rotary, and completed as a monitor well to a total depth of 105 feet.



EMCON
ASSOCIATES

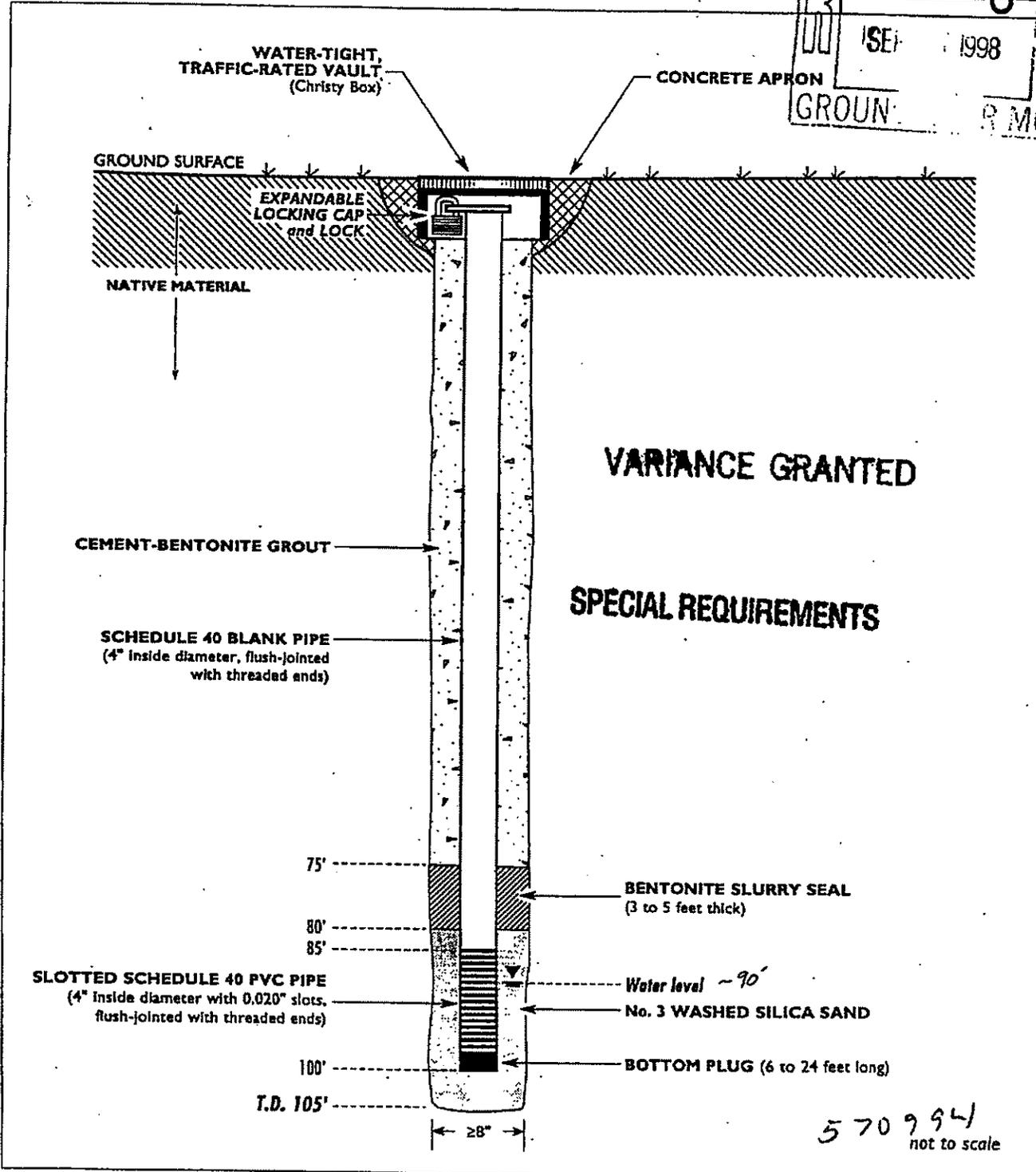
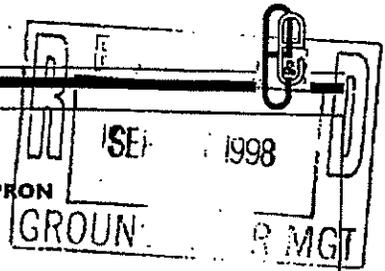


Figure 5-2

Shallow Monitoring Well Construction Diagram
 Mission Linen Supply
 Tucson, Arizona

Ecology & Environment, Inc.

WELL NUMBER **MLS-12 (EPA-2)**

Page 1 of 3

LITHOLOGIC LOG: MLS-12 Mission Linen, Tucson

elevation: (ground level 2416.18 , PVC casing 2416.07 ft.)

drilling contractor, method: THE Tubex reverse air

completion date: 10/13/98, ADWR Registration No. 55-570994

logger: REL

location: northing 443,873 , easting 997,394

diameter: (borehole 7 1/2 , PVC 4' inches)

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content structure...)	USCS	SAMPLE NUMBERS AND COMMENTS	COMPLETION DETAIL	
	0			sand to silty sand, hard, brown (7.5 YR 7/4), silt or very fine sand to coarse sand, 15% gravel to 1/3" dry grains are subangular to subrounded	SM/SP	9:05		
	5							
	10					9:10		
	15				caliche, some silty sand	SM		
	20				silt, (7.5 YR 8/1)--grey	ML		
	25				sand, brown, even distribution of very fine to very coarse sand, some silt and fine gravel, grades coarser	SW		start injecting water to suppress dust
	30				sand, brown, mostly medium to coarse grained, some very coarse.	SP		9:35 centralizer
35				gravely sand, brown, gravel to 3/4", subrounded	SP			
40				more gravel to 1" mainly very coarse sand with brown to light brown coating.	SW	9:45 0.0 ppm on ovm		

LITHOLOGIC LOG: MLS-12 Mission Linen, Tucson

elevation: (ground level 2416.18, PVC casing 2416.07 ft.)

drilling contractor, method: THF

completion date: 10/13/98

logger: REL

location: northing 443.873, easting 997.394

diameter: (borehole 7 1/2, PVC 4 inches)

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content structure...)	USCS	SAMPLE NUMBERS AND COMMENTS	COMPLETION DETAIL
				rocks are mostly quartz and feldspars			
	45			less gravel		poor returns plugged	
	50			very coarse sand and fine ~1/4" gravel	GP	9:55	
	55			more gravel, various colors sand, fine-very coarse with some fine gravel	SW		
	60			grades coarser		10:22 0.0ppm	centralizer
	65			sandy gravel, very coarse sand-gravel fine to 1/2"	GP		
	70			sandy gravel as above	GP/ SP	0.0 ppm	
	75			sand, light brown (7.5 YR 6/4), moist, very coarse		10:40	
				sand to silty sand, brown, fine to coarse sand	SP/ SM	0.0 ppm	
	80			sand, brown, ~50% fine, 10% medium, 25% coarse, trace very coarse, some silt		0.0 ppm 11:07	

Ecology & Environment, Inc.

WELL NUMBER **MLS-12 (EPA-2)**

Page 3 of 3

LITHOLOGIC LOG: MLS-12 Mission Linen, Tucson

elevation: (ground level 2416.18 , PVC casing 2416.07 ft.)

drilling contractor, method: THF

completion date: 10/13/98

logger: REL

location: northing 443,873 , easting 997,394

diameter: (borehole 7 1/2 , PVC 4 inches)

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content structure...)	USCS	SAMPLE NUMBERS AND COMMENTS	COMPLETION DETAIL
	85					0.0 ppm	
	90			sand, light brown, fine-very coarse, grading to coarse-very coarse sand	SP	0.0 ppm 11:19 0.3 ppm	
	95			sand, light brown, hydrocarbon odors starting at 91', silty fine-coarse sand	SM		
	100			sand, brown, fine-very coarse grained, some silt, sandy silt, light brown no odors	SM ML SP	11:34	
	105			TD 105'		11:45	
	110						
	115						
	120						

MLS-13



RECEIVED
SEP 21 1998

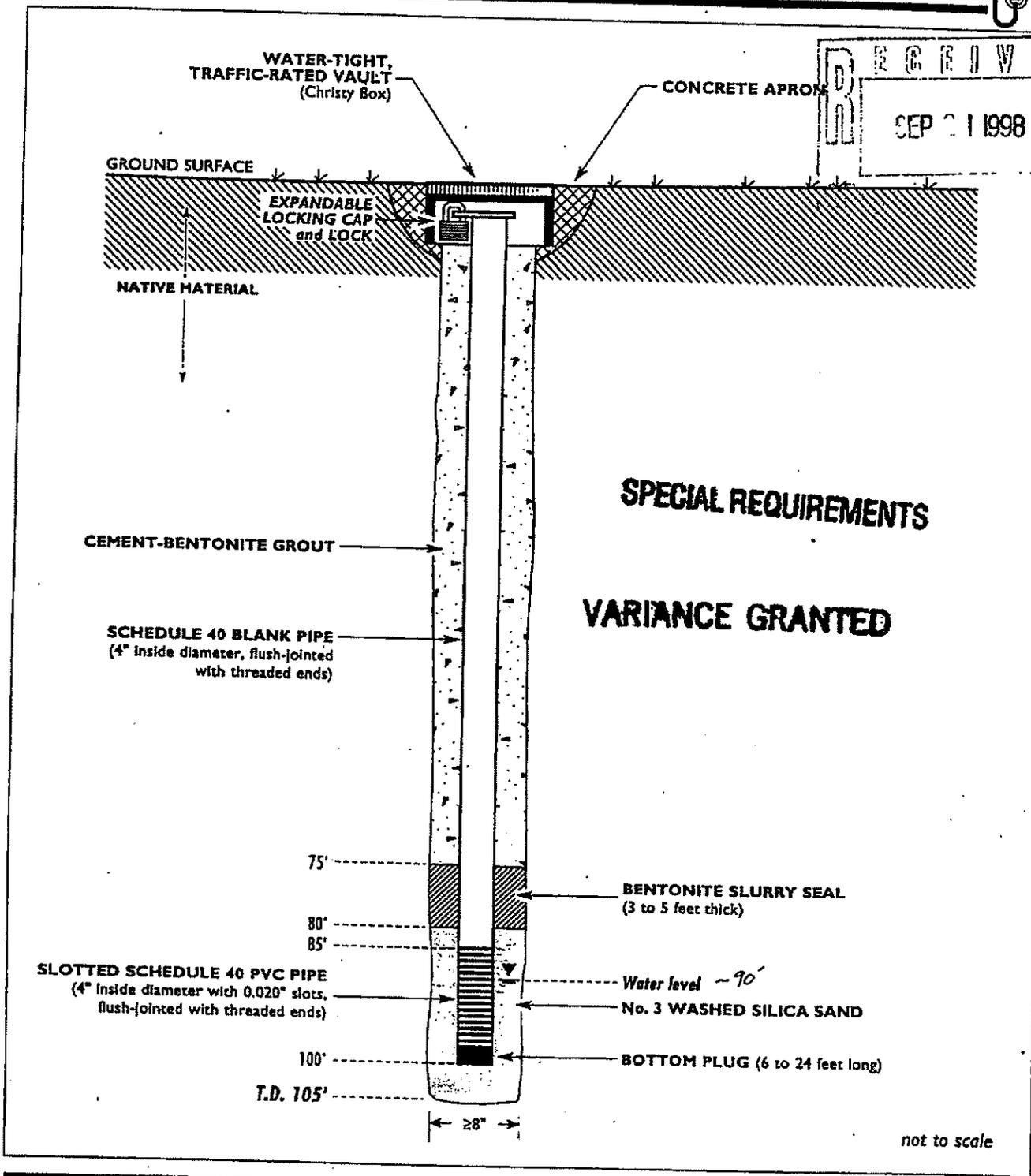


Figure 5-2
Shallow Monitoring Well Construction Diagram
Mission Linen Supply
Tucson, Arizona

Ecology & Environment, Inc.

WELL NUMBER **MLS-13 (EPA-1)**

Page 1 of 3

LITHOLOGIC LOG: MLS-13 Mission Linen, Tucson

elevation: (ground level 2414.53 , PVC casing 2414.37 ft.)

drilling contractor, method: THE air rotary

completion date: 10/12/98, ADWR Registration No. 55-570993

logger: B. Lambert

location: northing 443.864 , easting 997.039

diameter: (borehole 7 7/8 , PVC 4' inches)

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content structure...)	USCS	SAMPLE NUMBERS AND COMMENTS	COMPLETION DETAIL
	0-5			sand (sw) light brown, with 35% gravel and caliche pieces to 3/4", fairly even distribution of fine to coarse sand, 5% silt and clay	SW		cement grout 4" schedual 40-PVC casing
	5-10					11:07	
	10-20			less gravel		0.0 ppm w/ovm	
	20-25						
	25-30						
	30-35			sand (sw), light brown, fine-coarse sand, slightly moist, ~10% fine gravel	SW		
	35-40			sand, greenish brown (10 YR 7/4), coarse to very coarse, minor fines	SP	11:12 0.0 ppm clean out hole, start injecting water	

Ecology & Environment, Inc.

WELL NUMBER **MLS-13 (EPA-1)**

Page 2 of 3

LITHOLOGIC LOG: MLS-13 Mission Linen, Tucson

elevation: (ground level 2414.53, PVC casing 2414.37 ft.)

drilling contractor, method: THE, air rotary

completion date: 10/12/98

logger: B. Lambert

location: northing 443.864, easting 997.039

diameter: (borehole 7 7/8, PVC 4 inches)

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content structure...)	USCS	SAMPLE NUMBERS AND COMMENTS	COMPLETION DETAIL
	45			rare-subangular to sub rounded gravel to 1 1/3"			
	50						
	55			sand- ~30% very coarse sand (2-4 mm) ~50% coarse sand, remainder is finer	SP	11:32 0.0 ppm	
	60						
	65			caliche layer, gravelly sand, 10-20% gravel to 1" consisting of mixed rocks 20% fine-medium sand, ~50% coarse sand, ~10% fines	SW	rig chatter	
	70						
	75			sand brown (7.5 YR 5/4), very coarse sand with lenses of silt or clay	SP/SM		
	80						
				caliche or sandy gravel	SW	0.0 ppm 11:49 lunch + 13:06 resume drilling	79'

Ecology & Environment, Inc.

WELL NUMBER **MLS-13 (EPA-1)**

Page 3 of 3

LITHOLOGIC LOG: MLS-13 Mission Linen, Tucson

elevation: (ground level 2414.53, PVC casing 2414.37 ft.)

drilling contractor, method: THF, air rotary

completion date: 10/12/98

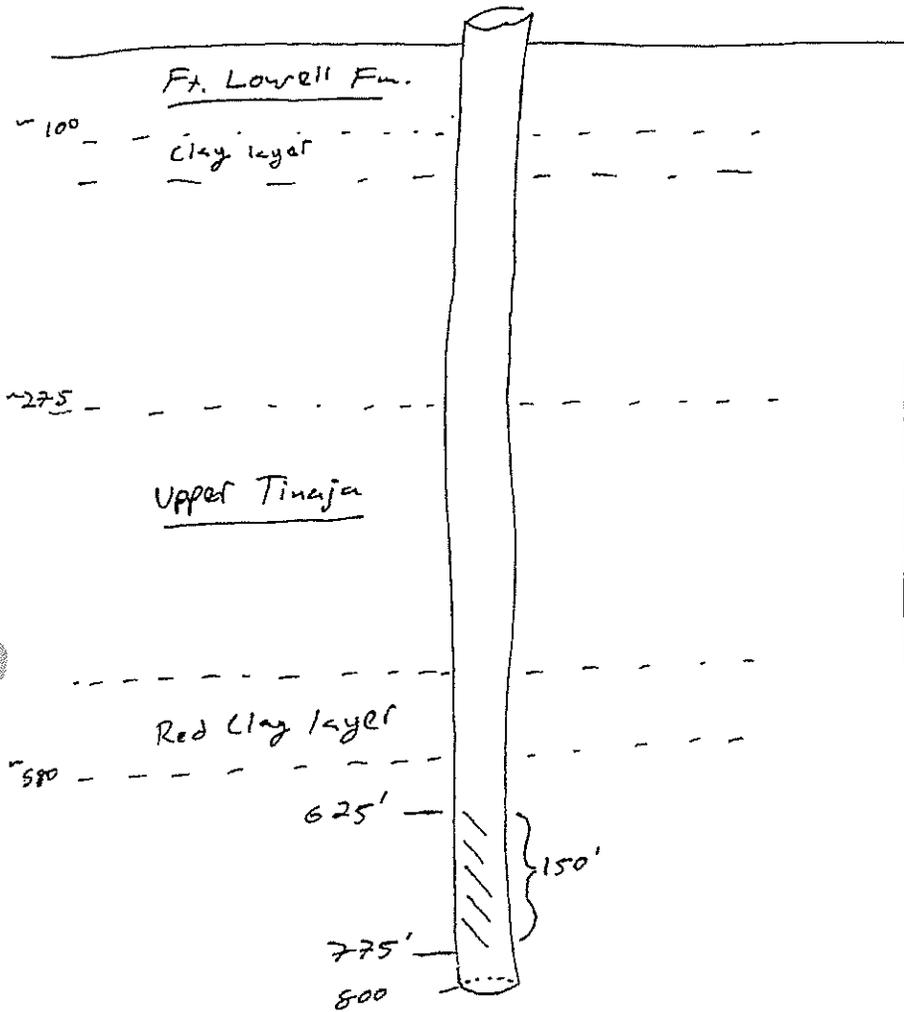
logger: REL

location: northing 443.864, easting 997.039

diameter: (borehole 7 1/2, PVC 4 inches)

GRAPHIC LOG	DEPTH BELOW SURFACE (feet)	SAMPLE INTERVAL	BLOW COUNT	SOIL DESCRIPTION (name, color, particle size distribution, consistency (soft, hard, etc.), moisture content structure...)	USCS	SAMPLE NUMBERS AND COMMENTS	COMPLETION DETAIL
	85			sand, brown, about=amounts of fine, medium, and coarse sand, some silt	SP/SM	drilling speeds up	bentonite
	90			sand with silt, brown, diesel odors		0-3 ppm diesel odors	8 X 12 sand
	95			wet		13.20	
	100					ML slower drilling few returns less odors few cuttings	
	105			silt, brown (7.5 YR 5/4), no odor, moist but crumbles	ML		
	110					3:37 TD 108	
	115						
	120						

Well schematic



Calculations

T from N. Hospital well study
 $2500 \frac{\text{ft}^2}{\text{day}}$

S from N. Hospital well study
 0.00031

WL (N. Hospital Well, 1984) = 208

Screened interval of N. Hospital
 150 to 438 feet b/s

Thus $b = 438 - 208 = 230'$

$K = \frac{T}{b} = \frac{2500 \frac{\text{ft}^2}{\text{day}}}{230 \text{ft}} = 10.87 \frac{\text{ft}}{\text{day}}$

$b = 150 \text{ft}$ $k = 10.87 \frac{\text{ft}}{\text{day}}$

$T = bk = 1630.5 \frac{\text{ft}^2}{\text{day}}$

$= 12167.9 \frac{\text{gpd}}{\text{ft}}$

$Q = 238.7 \frac{\text{ac-ft}}{\text{yr}}$

$\approx 148 \text{ gpm}$

* UofA Dept. of Hydrology, 198
 Analysis of well Interference
 and water Quality, 26p.

Information Record

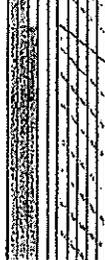
Name		OPTICAL SCI WEEL LOG	
Organization		Phone - Bus.	
Address		Home	
START 3-29-04		FINISH: 4-1-04 @ 1:00AM	
11:45AM		Delegated/Routed To	
From		Due/Response Date BIT SIZE 14 3/4	
Sequence Follow Up & Dates	Needed	Subject/As Said	Response/They Said
40	90	Sandy gravel	
90	110	very sandy	
110	134	Sandy gravel	
134	215	Sandy clay med grit	
215	240	Sandy clay finer grit	
240	330	Sand - cemented	SUL?
330	350	Sand - soft	
350	411	Sandy clay - fine grit	
411	511	Sandy clay - larger grit	
511	540	Sandy clay - more clay - tight	*
540	555	Sandy clay - Tight - tan	
555	610	Sandy clay - soft, holding back, Tr. of reddish clay = fluid temp 94°F @ disch.	
610	655	Sandy clay - streaks of red clay	
655	675	Sticky clay w/ sand (tan w/red streaks)	
675	680	Brown clay & coarse sand	
680	690	Coarse sand	
690	703	Sandy clay w/ tiny gravel	
703	749	Sandy clay	
749	800	Sandy clay, (broken w/ tighter spots)	

Project/Client Name <u>University of Arizona</u>		Location (Cadastral) <u>T14S R14E FDCB</u>		Elevation (ft amsl)	Project No. <u>190005</u>
Drilling Co. <u>Stewart Brothers</u>		Location (NAD 83 GPS Latitude Longitude)		Date Started <u>12/12/07</u>	Date Finished <u>1/2/08</u>
Lithology Described By <u>KZ</u>		Drilling Equipment	Drilling Method <u>Reverse Flood</u>	ADWR Well Registration No. <u>55-217003</u>	
Total Depth <u>1202</u>		Drilling Fluid <u>Bentonite Gel</u>		* Indicates (based on visual estimates of volume): <div style="display: flex; justify-content: space-between;"> <div style="width: 20px; height: 10px; background-color: black; border: 1px solid black;"></div> Relative % fines (F < 0.074mm) </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 20px; height: 10px; background-color: white; border: 1px solid black;"></div> Relative % sand (S>.074<4.8mm) </div> <div style="display: flex; justify-content: space-between;"> <div style="width: 20px; height: 10px; background: repeating-linear-gradient(45deg, transparent, transparent 2px, black 2px, black 4px); border: 1px solid black;"></div> Relative % gravel (G > 4.8mm) </div>	
Bit Diameter <u>S.C. 20" / P.H. 17 1/2" / B.H. 20"</u>		Conductor Casing (type; diameter; depth) <u>24" LCS</u>			
Comments					
* Classification System: Unified Soil Classification System (ASTM)					

Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
BASIN FILL / Clayey sand with some gravels. Reddish brown in color. Medium plasticity to Low plasticity. Gravel range is 1/4" - 1". (40, 50, 10)	0 10	220		12/12/07 Drilled 20" borehole to 20ft. for 24" LCS conductor casing
Still in Basin Fill. Sandy gravels with silt. Dominated by Macroscopic material - quartz, feldspar. Gravel range is 1/4" - 1/2". Sand looks sugary. Gravels are white, pink, green, tan, yellow colors. (20, 30, 50)	20 30 40 50 60 70 80 90	215		12/11/07 Began drilling 17 1/2" pilot hole with mill tooth bit.
Silty gravels with sand. More silt present. Fine grained sands. Clay like. Silt and gravel balls present. Gravel range is 1/4" - 1/2". (30, 20, 50)	100 110 120			Deviation survey completed - everything is right on almost 5/16" eye



Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Back to above zone. More sands than silt present. Gravel range is 7/4" - 1/2". Sub rounded - rounded. (20, 30, 50)	-120	216		
	-130			
	-140			
	-150			
	-160			
Same as previous zone but increase in gravel range to 1/4" - 2". Quartz and Feldspars still present. Sand is still sugary looking. Rounded to Sub-rounded (20, 30, 50)	-170			
	-180			
	-190			
	-200			Deviation survey done - almost bullseye
	-210			
	-220			7000lbs on bit
	-230			
	-240			
	-250			
	-260			mud viscosity is 34 seconds
	-270			
	-280			120ft of airline in hole

Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Gravel range is much larger than before. 1/4"-4". Granite materials present and are angular to sub angular. Mafic gravels still present 1/4"-1/2" (10, 20, 70)	-280 -290 -300 -310 -320	~15		Mud viscosity is 31 seconds Deviation survey done - within 1/8"
Gravel range is much smaller again 7/16"-1/2". Larger pieces are speckled throughout. Very little granite materials present. (10, 30, 60)	-330 -340 -350			
No granite materials present. Silty gravel with sand. Silt and gravel balls present. Gravel range is 7/16"-1/4". Less sands more clay. (40, 10, 50)	-360 -370 -380 -390 -400			
Back to small gravel range 7/16"-1/4". Less silts. Some large quartz rocks present 1/2"-1". (20, 20, 60)	-410 -420	~20		10,000/lbs on bit Deviation survey complete - 1/8" within
Back to silty gravels with sand. Silt and gravel balls present. Clayey. Gravel range is 7/16"-1/4". Rounded to sub-rounded. (30, 20, 50)	-430 -440			Mud viscosity is 30 seconds

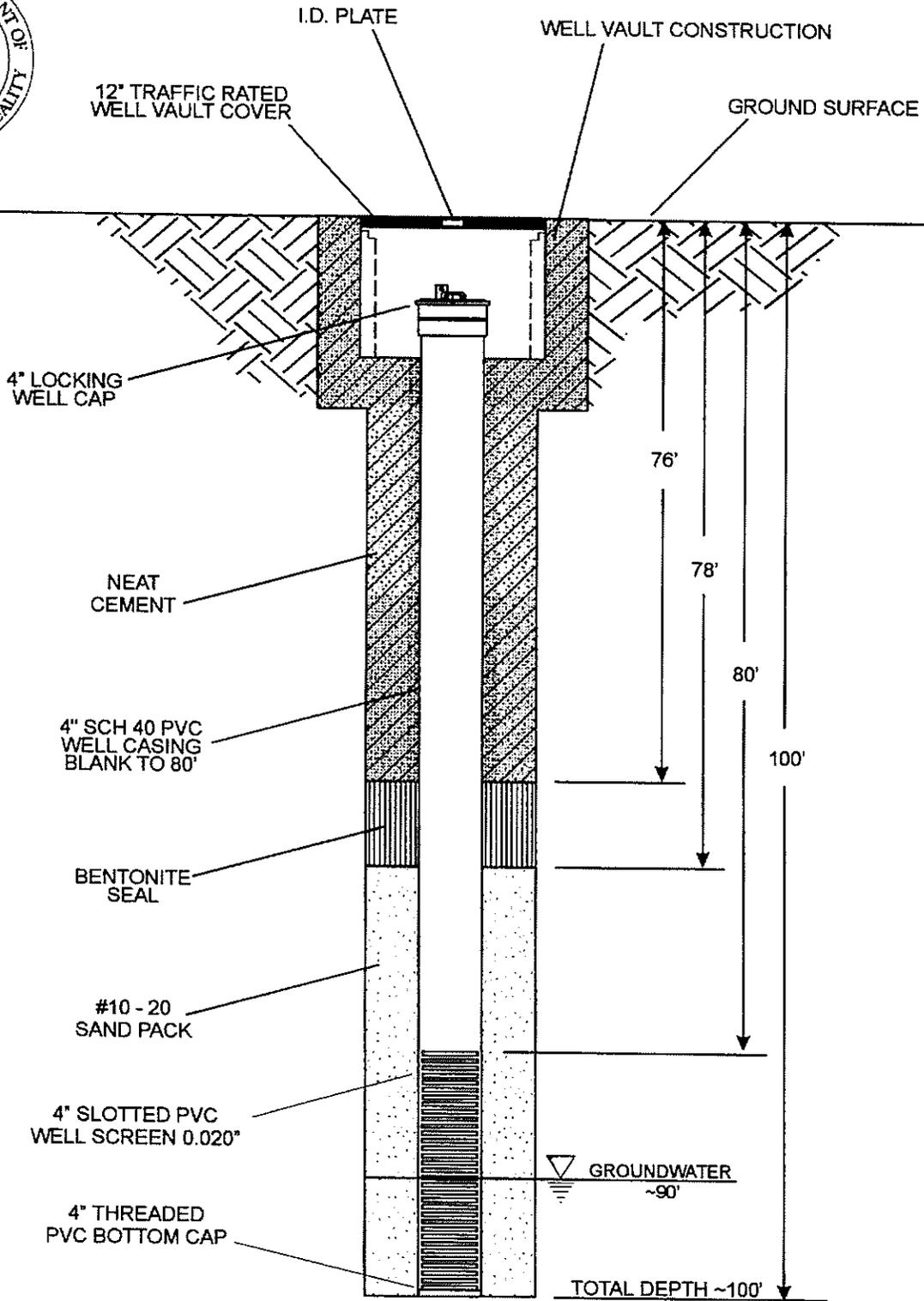
Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Same as previous page. (30,20,50)	-440 -450 -460 -470 -480 -490 -500 -510 -520	~20 ft		10,000 lbs on bit
Silty gravel with sands but darker in color. Balls of silt and gravel still dominate but volcanics now present ~5%. (30,20,50)	-530 -540 -550 -560 -570 -580			Mud viscosity 330 seconds
Silty gravel. Balls of silt and gravel present but now a lot of various volcanic pieces present. Large is 1/4" - 1/2". Rounded to sub-rounded. (30,10,60)	-590 -600	~10		Hard drilling - drop weight can bit at 500 lbs

Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Same as previous page (30,10,60)	600 610 620	210		Deviation survey complete - within 1/8"
Basin Fill All volcanics. Some silty gravelly balls present. Mostly coarse gravels with little sand. Volcanics are brown, green, yellow and tan in color. Aphanitic volcanics present. (30,10,60)	630 640 650			Mud viscosity is 29 seconds 10,000 lbs on bit
All small pieces of volcanics. Silty gravels. Rounded to sub-rounded. Gravel range is 1/4" - 1/4" (30,10,60)	660 670 680 690 700 710 720			Switched to button tooth bit - 5000 lbs on bit Mud viscosity is 33 seconds Deviation survey complete - within 1/8"
Increase in volcanic gravel range 1/4" - 1/2" (30,10,60)	730 740 750 760			

Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Same as previous page (30,10,60)	-760	210		700lbs on bit
Back to smaller gravel range >1/4" - 1/2" still all volcanic - rounded to subrounded. silty gravels.	-770			
(20,10,70)	-780			
	-790			
Larger volcanic gravel range - still silty gravels. Range is 1/4" - 2".	-800			Deviation survey complete - within 1/8"
(20,10,70)	-810			Mud viscosity is 30 seconds
	-820			Mud weight is 9.1 lbs
	-830			
	-840			Mud viscosity is 29 seconds
	-850			
	-860			
Back to smaller volcanic gravel range >1/4" - 1/2". Darker M color overall - maybe more clits present.	-870			
(20,10,60)	-880			
	-890			
Very fine grained gravels >1/4" - 1/2". Sub-angular to sub rounded.	-900			Deviation survey complete - still within 1/8"
(30,10,60)	-910			
	-920			

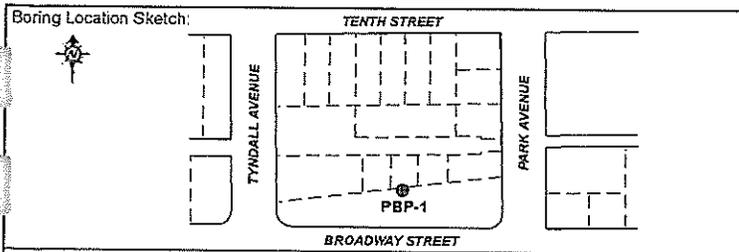
Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Larger gravel range 1/4"-1". Silty gravels. Little more silt present. Few silt and gravel balls present. Still all volcanics. (40,10,50)	920 930 940	2/0		Mud viscosity is 31 seconds
Silty gravels, more gravels present, less silt. Gravel range is 1/4"-1/2". All volcanics. Sub-rounded - rounded. Green, yellow, brown, red, grey colors. (20,10,70)	950 960 970 980 990 1000 1010 1020 1030 1040			9000lbs on bit Deviation survey complete - within 1/8"
Back to silt and gravel balls. More clays present. All material is volcanics. (40,10,50)	1050 1060 1070 1080			Mud viscosity is 31 seconds

Description	Depth (feet)	Drill Rate (feet/hour)	* F S G (%)	Remarks
Back to small gravels ~3/4" - 1/4". Volcanics still dominate. Silty gravels. (30,10,60)	1080	~10		
Very flaky volcanic material. Colting is angular, very little silts and sands present. (10,10,80)	1090			
Back to multiple volcanic gravels. Silty gravels. red, brown, tan, green, yellow colors. Gravel range is 3/4" - 1/4" (30,10,60)	1100 1110			Deviation survey complete - within 1/8" still
	1120 1130			Mud viscosity is 30 seconds
Silty gravels but more slummy like. No clays present. Gravel range is 1/4" - 1/2". More silts present. (40,10,50)	1140 1150			
	1160 1170			
Silt and gravel balls present. Volcanics still dominate. Some clay like material present (30,10,60)	1180 1190			
	1200			TDD at 1200ft.



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
SCHEMATIC OF PERCHED WATER-BEARING INTERVAL MONITOR WELL PBP-1				FIGURE PBP-1
PROJECT#: 365-0001-01	FILE#: wcdpbb1	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN	



Project No:	365-0006-05	Date Drilled:	02-21-01	Boring No. PBP-1 #55-585540 Sheet No. 1 of 3
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			
City:	TUCSON, ARIZONA			
Logged By:	J. MEYER	Driller:	W.D.C.	

Drilling Method: HOLLOW-STEM AUGER
 Boring Diameter: 6 AND 10 INCHES

Casing installation data:
 0.5' to 82.5' 4" DIAMETER SCHEDULE 40 PVC BLANK
 82.5' to 92.5' 4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN
 Top of casing elevation: 2407.26'
 Ground Level Elevation: 2408.25'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level B.G.S.	Time	Date
0								87.71'	09:10	02-23-01
5	PBP1-5		11:45	0.0	3,3,4					
10	PBP1-10		11:52	0.0	6,6,10					
15	PBP1-15		12:00	0.0	8,10,12					
20	PBP1-20		12:06	0.0	16,18,18					
25	PBP1-25		12:12	0.0	6,9,13					
30	PBP1-30		12:22	0.0	7,14,18					
35										

0'-1' GRAVEL FILL COVER

1'-4.5' SANDY SILT (ML), PALE YELLOWISH ORANGE (10YR 8/6), 30%-40% FINE GRAINED SAND, SLIGHTLY MOIST.

SIMILAR TO ABOVE, PIECES OF RED BRICK.

4.5'-22' WELL GRADED SAND (SW), DARK YELLOWISH ORANGE (10YR 6/6), 20%-25% COARSE SAND, 50%-60% MEDIUM SAND, 30%-35% FINE SAND, SLIGHTLY MOIST.

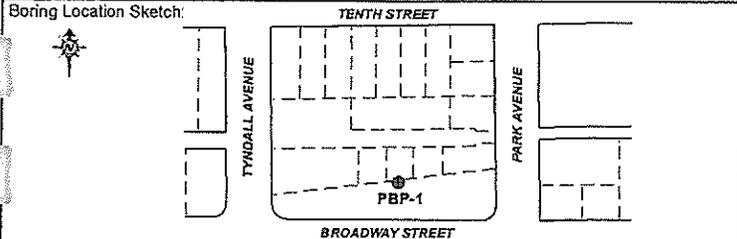
SIMILAR TO ABOVE, TRACE CLAY, LIGHT BROWN (5YR 6/4), 15%-20% COARSE SAND, 60%-70% MEDIUM SAND, 20%-25% FINE SAND, 5%-10% CLAY, VERY LOOSE, SLIGHTLY MOIST.

SIMILAR TO ABOVE, MEDIUM DENSE.

22'-30' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), 5%-10% COARSE SAND, 40%-50% MEDIUM SAND, 20%-25% FINE SAND, 25%-30% CLAY, WELL GRADED, MEDIUM DENSE, SLIGHTLY MOIST.

30'-59' WELL GRADED SAND (SW), WITH GRAVEL, LIGHT BROWN (5YR 6/4), 5%-10% GRAVEL, 5%-10% COARSE SAND, 40%-50% MEDIUM SAND, 20%-25% FINE SAND, 5%-10% CLAY, MEDIUM DENSE, SLIGHTLY MOIST.

SIMILAR TO ABOVE, MEDIUM BROWN (5YR 4/4), 15%-20% GRAVEL.



Project No: 365-0006-05	Date Drilled: 02-21-01	Boring No. PBP-1 #55-585540
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		Sheet No. 2 of 3
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: W.D.C.	

Drilling Method: HOLLOW-STEM AUGER
Boring Diameter: 6 AND 10 INCHES

Casing installation data:	
0.5' to 82.5'	4" DIAMETER SCHEDULE 40 PVC BLANK
82.5' to 92.5'	4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN
Top of casing elevation: 2407.26'	Ground Level Elevation: 2408.25'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level B.G.S.	Time	Date
35	PBP1-35	■	12:31	0.0	6,8,15			87.71'	09:10	02-23-01
40	PBP1-40	■	12:40	0.0	6,13,18					
45	PBP1-45	■	12:49	0.0	7,15,19					
50	PBP1-50	■	12:57	-	9,17,19					
55	PBP1-55	■	13:42	-	8,14,20					
60	PBP1-60	■	13:57	-	19,50,2'					
65	PBP1-65	■	14:04	-	8,14,20					
70										

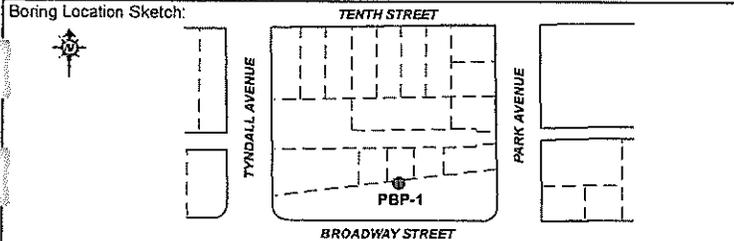
30'-59' WELL GRADED SAND (SW), WITH GRAVEL, LIGHT BROWN (5YR 4/4), 15%-20% GRAVEL, 5%-10% COARSE SAND, 40%-50% MEDIUM SAND, 20%-25% FINE SAND, 5%-10% CLAY, MEDIUM DENSE, SLIGHTLY MOIST.

SIMILAR TO ABOVE, <5% GRAVEL, 10%-15% CLAY.

SIMILAR TO ABOVE, 15%-20% COARSE SAND, 40%-50% MEDIUM SAND, 10%-20% FINE SAND, 10%-15% CLAY.

59'-67' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), 5%-10% GRAVEL, 5%-10% COARSE SAND, 40%-50% MEDIUM SAND, 20%-25% FINE SAND, 15%-20% CLAY, WELL GRADED, SLIGHTLY MOIST.

67'-91.5' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 25%-30% COARSE SAND, 40%-50% MEDIUM SAND, 20%-25% FINE SAND, <5% GRAVEL, MEDIUM DENSE, SLIGHTLY MOIST.



Project No:	365-0006-05	Date Drilled:	02-21-01	Boring No. PBP-1
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			#55-585540
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			Sheet No.
City:	TUCSON, ARIZONA			3 of 3
Logged By:	J. MEYER	Driller:	W.D.C.	

Drilling Method: HOLLOW-STEM AUGER
 Boring Diameter: 6 AND 10 INCHES

Casing installation data:
 0.5' to 82.5' 4" DIAMETER SCHEDULE 40 PVC BLANK
 82.5' to 92.5' 4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN

Top of casing elevation: 2407.26'
 Ground Level Elevation: 2408.25'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol
70	PBP1-70	■	14:15	0.0	11,23,24		
75	PBP1-75	■	14:23	0.0	6,15,17		
80	PBP1-80	■	14:35	0.0	8,14,21		
85	PBP1-85	■	14:48	10.0	6,16,26		
	PBP1-87	■	14:54	65.0	15,24,28		
	PBP1-88	■	14:59	0.0	10,17,21		
90	PBP1-90	■	15:08	-	15,18,20		
	PBP1-91	■	15:14	-	8,22,40		
	PBP1-92	■	15:25	-	7,18,20		
95							
100							
105							

Water Level B.G.S.	87.71'		
Time	09:10		
Date	02-23-01		

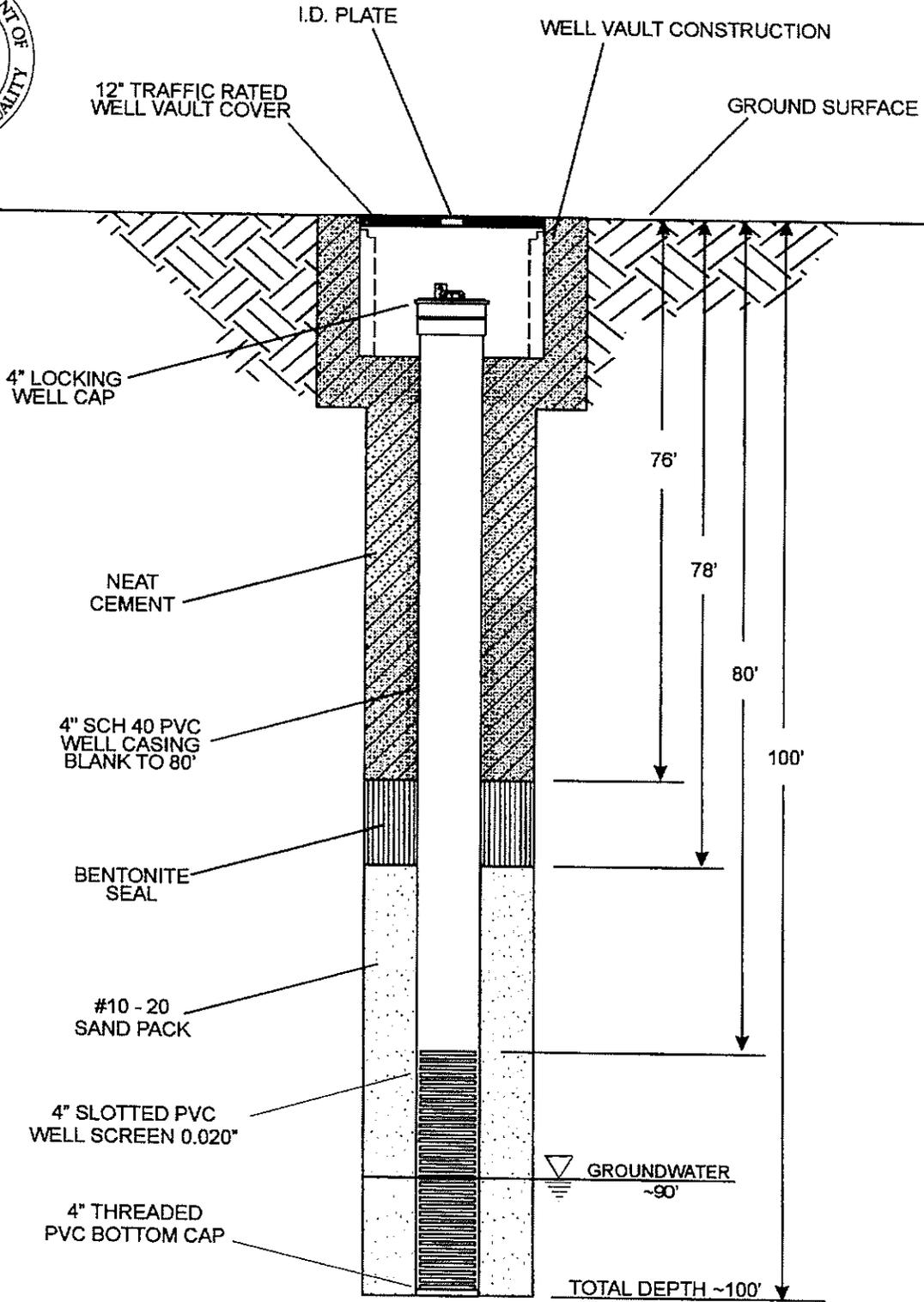
67'-91.5' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 25%-30% COARSE SAND, 40%-50% MEDIUM SAND, 20%-25% FINE SAND, <5% GRAVEL, MEDIUM DENSE, SLIGHTLY MOIST.

SIMILAR TO ABOVE, VERY PALE ORANGE (10YR 8/2).

▼ GROUNDWATER @ 87.5', 02/23/01

91.5'-93.5' CLAYEY SAND (SC), DARK YELLOWISH ORANGE (10YR 6/6), 5%-10% COARSE SAND, 45%-55% MEDIUM SAND, 20%-25% FINE SAND, 20%-25% CLAY, MEDIUM DENSE, SLIGHTLY MOIST.

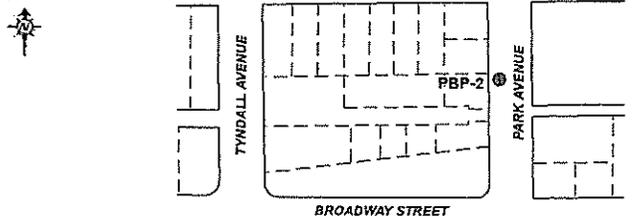
93.5' END OF BORING.



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
SCHEMATIC OF PERCHED WATER-BEARING INTERVAL MONITOR WELL PBP-2				FIGURE PBP-2
PROJECT#: 365-0001-01	FILE#: wcdpbb2	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN	

Boring Location Sketch:



Project No:	385-0008-05	Date Drilled:	02-17-01	Boring No. PBP-2 #55-584496
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			Sheet No. 1 of 3
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			
City:	TUCSON, ARIZONA			
Logged By:	J. MEYER	Driller:	W.D.C.	

Drilling Method: HOLLOW-STEM AUGER

Boring Diameter: 10 AND 14 INCHES

Casing installation data:

0.5' to 87'	4" DIAMETER SCHEDULE 40 PVC BLANK
87' to 97'	4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN

Top of casing elevation: 2409.73' Ground Level Elevation: 2410.36'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol
0							
5	PBP2-5	■	10:40	0.0	12,13,13		
10	PBP2-10	■	10:50	0.0	6,9,14		
15	PBP2-15	■	10:58	0.0	7,19,22		
20	PBP2-20	■	11:07	0.0	22,30,34		
25	PBP2-25	■	11:16	-	10,28,28		
30	PBP2-30	■	11:27	-	11,30,38		
35							

Water Level B.G.S.	92.04'		
Time	08:52		
Date	02-23-01		

0'-1.5' ASPHALT COVER, COURSE SANDY GRAVEL BACKFILL.

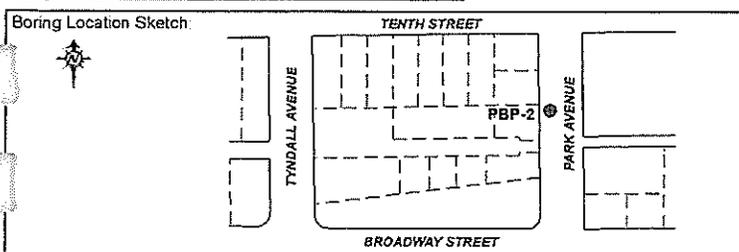
1.5'-10' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), 30%-35% CLAY, POORLY GRADED FINE SAND, MODERATELY INDURATED, MEDIUM DENSE, VERY LITTLE MOISTURE.

10'-33' GRAVELLY SAND; WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 15%-20% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

SIMILAR TO ABOVE, GRAVEL TO 1 1/2" DIAMETER.

SIMILAR TO ABOVE, POSSIBLE CALICHE DEPOSITS, MODERATE INDURATION, VERY LITTLE MOISTURE.

33'-36' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 30%-35% CLAY, POORLY GRADED FINE SAND, MODERATELY INDURATED, SLIGHTLY MOIST.



Project No: 365-0006-05	Date Drilled: 02-17-01	Boring No. PBP-2
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		Boring No. #55-584496
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		2 of 3
Logged By: J. MEYER	Driller: W.D.C.	

Drilling Method: HOLLOW-STEM AUGER

Boring Diameter: 10 AND 14 INCHES

Casing installation data:

0.5' to 87'	4" DIAMETER SCHEDULE 40 PVC BLANK
87' to 97'	4" DIAMETER SCHEDULE 40 PVC 0.010' SLOTTED SCREEN

Top of casing elevation: 2409.73'

Ground Level Elevation: 2410.36'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol
35	PBP2-35	■	11:40	0.0	6,15,24		
40	PBP2-40	■	11:52	0.0	7,18,19		
45	PBP2-45	■	12:04	0.0	10,30,37		
50	PBP2-50	■	12:18	0.5	10,27,31		
55	PBP2-55	■	12:33	0.5	17,10,12		
60	PBP2-60	■	12:42	0.0	7,22,29		
65	PBP2-65	■	12:55	0.0	12,20,28		
70							

Water Level B.G.S.	92.04'		
Time	08:52		
Date	02-23-01		

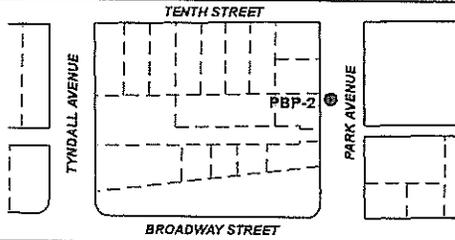
33'-36' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 30%-35% CLAY, POORLY GRADED FINE SAND, MODERATELY INDURATED, SLIGHTLY MOIST.

36'-67' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 30%-35% COARSE SAND, 35%-40% MEDIUM SAND, 25%-30% FINE SAND, SOME MICA AND PLAGIOCLASE MINERALS, MEDIUM DENSE, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 20%-25% COARSE SAND, 25%-30% MEDIUM SAND, 30%-35% FINE SAND.

67'-71' SILTY SAND (SM), WITH CLAY, LIGHT BROWN (5YR 5/6), 30%-35% SILT, 5%-10% CLAY, MODERATE INDURATION, MEDIUM DENSE, SLIGHTLY MOIST.

Boring Location Sketch.



Project No. 365-0006-05	Date Drilled: 02-17-01	Boring No. PBP-2
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		Sheet No. 3 of 3
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: W.D.C.	

Drilling Method: HOLLOW-STEM AUGER

Boring Diameter: 10 AND 14 INCHES

Casing Installation data:	
0.5' to 87'	4" DIAMETER SCHEDULE 40 PVC BLANK
87' to 97'	4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN
Top of casing elevation: 2409.73'	Ground Level Elevation: 2410.36'
Water Level B.G.S. 92.04'	
Time 08:52	
Date 02-23-01	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol
70	PBP2-70		13:08	1.1	11,17,19		
75	PBP2-75		13:18	0.0	20,21,23		
80	PBP2-80		13:28	0.0	10,12,13		
85	PBP2-85		13:40	4.7	9,24,26		
	PBP2-87		13:51	26	13,18,19		
90	PBP2-90		14:08	4.6	50/6"		
	PBP2-93		15:09	27	8,10,20		
95	PBP2-95		15:20	0.0	3,4,7		
	PBP2-98		15:29	0.0	2,8,9		
100							
105							

67'-71' SILTY SAND (SM), WITH CLAY, LIGHT BROWN (5YR 5/6), 30%-35% SILT, 5%-10% CLAY, MODERATE INDURATION, MEDIUM DENSE, SLIGHTLY MOIST.
71'-75' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 30%-35% COARSE SAND, 35%-40% MEDIUM SAND, 25%-30% FINE SAND, MEDIUM DENSE, SLIGHTLY MOIST.

75'-85' CLAYEY SAND (SC), MODERATE BROWN (5YR 5/6), 25%-30% CLAY, WELL GRADED SAND, MEDIUM DENSE, MODERATELY INDURATED, SLIGHTLY MOIST.

85'-91' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 30%-35% COARSE SAND, 35%-40% MEDIUM SAND, 25%-30% FINE SAND, MEDIUM DENSE, SLIGHTLY MOIST, PETROLEUM ODOR.

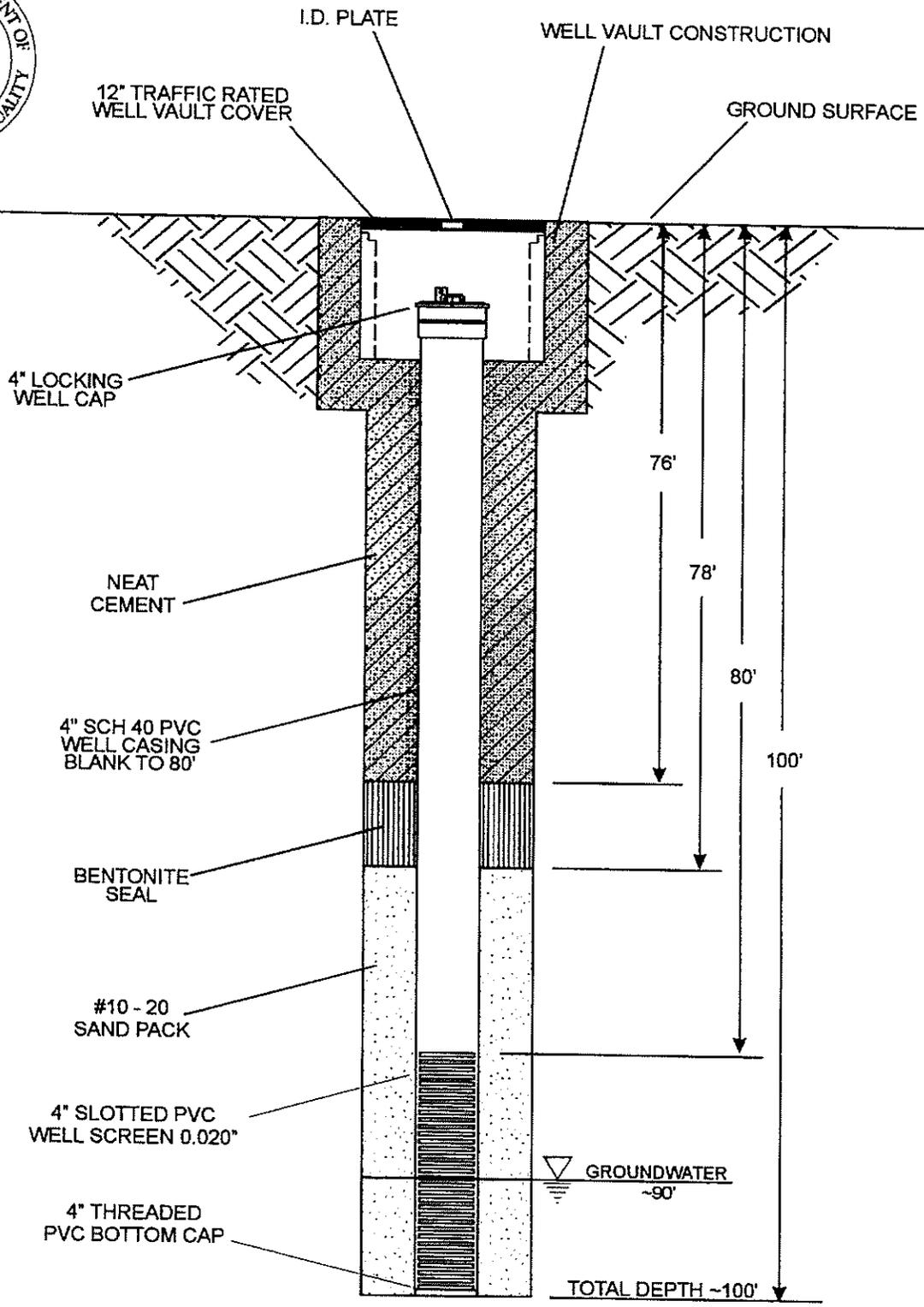
91'-93' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 30%-35% MEDIUM SAND, 30%-35% FINE SAND, 40%-45% CLAY, DENSE TO VERY DENSE, SLIGHTLY MOIST.

▼ GROUNDWATER @ 92', 02/23/01

93'-96' WELL GRADED SAND (SW), 35%-40% COARSE SAND, 30%-35% MEDIUM SAND, 20%-25% FINE SAND, MEDIUM DENSE, MOIST TO WET.

96'-100' SILTY CLAY (CL), VERY PALE ORANGE (10YR 8/2), 25%-30% SILT, MEDIUM STIFF, MOIST.

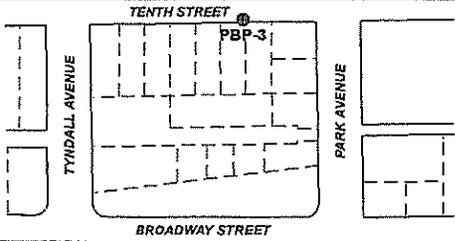
100' END OF BORING.



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
SCHEMATIC OF PERCHED WATER-BEARING INTERVAL MONITOR WELL PBP-3				FIGURE PBP-3
PROJECT#: 365-0001-01	FILE#: wcdpbb3	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN	

Boring Location Sketch:



Project No: 385-0008-05	Date Drilled: 02-19-01	Boring No. PBP-3
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		#55-584495
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		1 of 3
Logged By: J. MEYER	Driller: W.D.C.	

Drilling Method: HOLLOW-STEM AUGER

Boring Diameter: 10 AND 14 INCHES

Casing installation data.	
0.5' to 87'	4" DIAMETER SCHEDULE 40 PVC BLANK
87' to 97'	4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN
Top of casing elevation: 2409.40'	Ground Level Elevation: 2410.02'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol
0							
5	PBP3-5	■	10:23	0.0	22,23,33		
10	PBP3-10	■	10:30	0.0	9,17,21		
15	PBP3-15	■	10:37	0.0	8,10,14		
20	PBP3-20	■	10:45	0.0	9,15,28		
25	PBP3-25	■	10:52	0.0	6,12,16		
30	PBP3-30	■	11:03	0.0	12,13,17		
35							

Water Level B.G.S.	91.97'		
Time	08:45		
Date	02-23-01		

0'-5' ASPHALT COVER.
.5'-15' SANDY SILT (ML), WITH GRAVEL, PALE YELLOWISH ORANGE (10YR 8/6), 10%-15% GRAVEL, 25%-30% MEDIUM SAND, VERY STIFF, VERY LITTLE MOISTURE.

SIMILAR TO ABOVE, <5% GRAVEL.

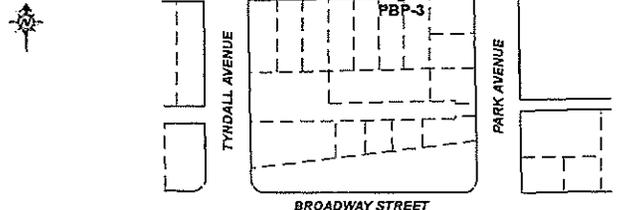
15'-25' WELL GRADED SAND (SW), 5%-10% COARSE SAND, 35%-40% MEDIUM SAND, 40%-50% FINE SAND, MEDIUM DENSE, VERY LITTLE MOISTURE.

SIMILAR TO ABOVE, GRAVEL CLASTS >3".

25'-35.5' CLAYEY SAND (SC), 5%-10% COARSE SAND, 35%-40% MEDIUM SAND, 40%-50% FINE SAND, 15%-20% CLAY, MEDIUM DENSE, VERY LITTLE MOISTURE.

SIMILAR TO ABOVE, LARGE CLASTS.

Boring Location Sketch:



Project No:	365-0006-05	Date Drilled:	02-19-01	Boring No.	
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			Boring No.	PBP-3
Facility:	PARK-EUCLID WQARF SITE			Boring No.	#55-584495
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			Sheet No.	
City:	TUCSON, ARIZONA			Sheet No.	3 of 3
Logged By:	J. MEYER	Driller:	W.D.C.		

Drilling Method: HOLLOW-STEM AUGER

Casing installation data:
 0.5' to 87' 4" DIAMETER SCHEDULE 40 PVC BLANK
 87' to 97' 4" DIAMETER SCHEDULE 40 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 10 AND 14 INCHES

Top of casing elevation: 2409.40' Ground Level Elevation: 2410.02'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level B.G.S.	91.97'	Time	08:45	Date	02-23-01
70	PBP3-70		12:34	0.0	7,11,15								
75	PBP3-75		13:14	0.0	9,11,15								
80	PBP3-80		13:25	0.0	10,13,14								
85	PBP3-85		13:36	0.0	7,14,30								
90	PBP3-90		13:47	0.0	5,9,21								
	PBP3-92		13:58	0.0	8,16,28								
	PBP3-93		15:36	0.0	4,8,10								
95													
100													
105													

61'-74' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), WELL GRADED SAND, <5% GRAVEL, 20%-25% COARSE SAND, 20%-25% MEDIUM SAND, 25%-30% FINE SAND, 15%-20% CLAY, MEDIUM DENSE, VERY LITTLE MOISTURE.

74'-81' SAND (SW), MODERATE BROWN (5YR 4/4), WELL GRADED, 5%-10% GRAVEL, 15%-20% COARSE SAND, 40%-50% MEDIUM SAND, 25%-30% FINE SAND, MEDIUM DENSE, SLIGHTLY MOIST.

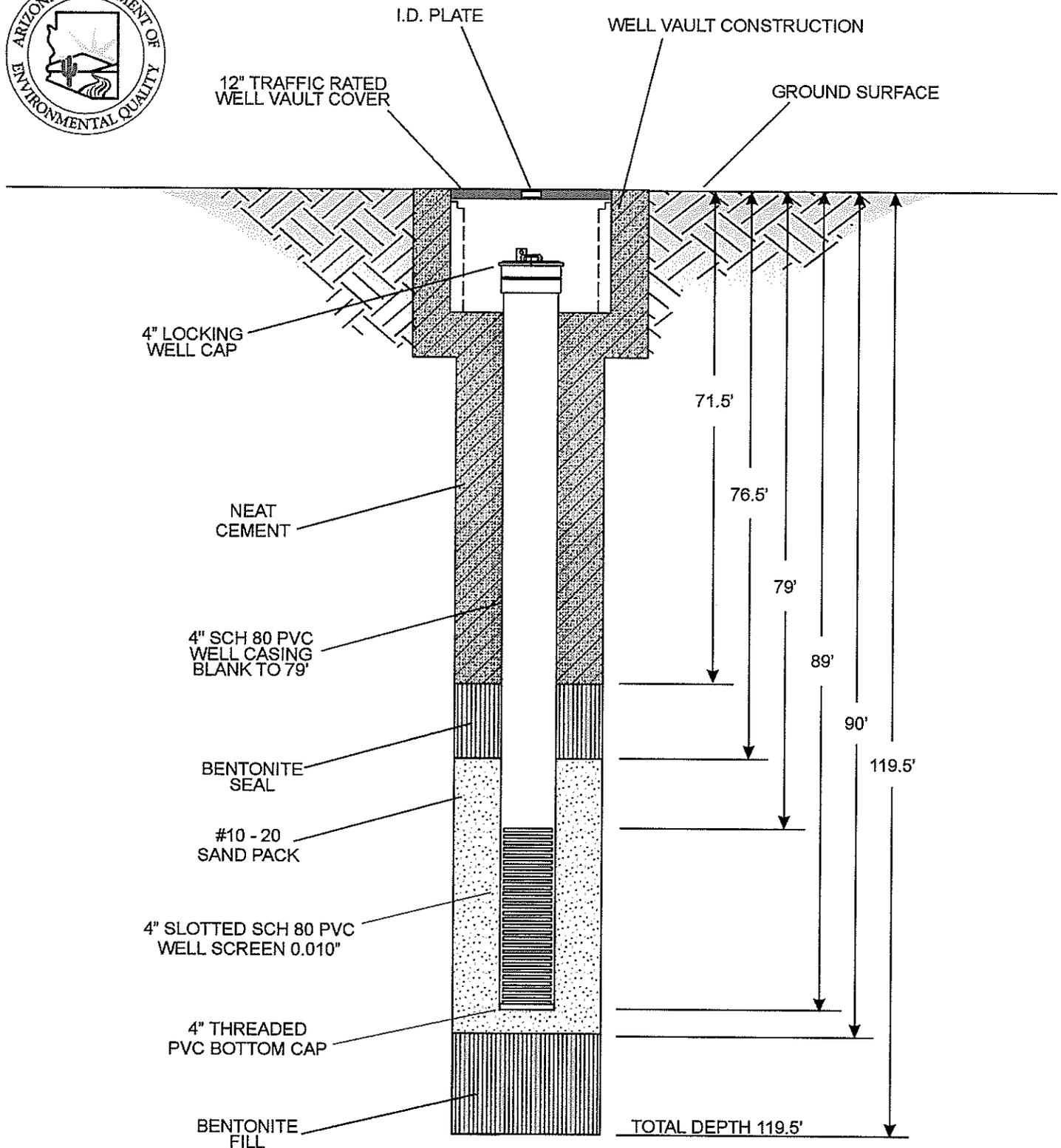
81'-82' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), WELL GRADED SAND, <5% GRAVEL, 20%-25% COARSE SAND, 20%-25% MEDIUM SAND, 25%-30% FINE SAND, 15%-20% CLAY, MEDIUM DENSE, VERY LITTLE MOISTURE.
 82'-90' SAND (SW), VERY PALE ORANGE (10YR 8/2), WELL GRADED, 20%-25% COARSE SAND, 50%-60% MEDIUM SAND, 15%-20% FINE SAND, MEDIUM DENSE, VERY LITTLE MOISTURE.

90'-91' SANDY CLAY (CL), MODERATE BROWN (5YR 4/4), 20%-25% MEDIUM TO COARSE SAND, STIFF, LOW PLASTICITY, SLIGHTLY MOIST.
 91'-93' SAND (SW), VERY PALE ORANGE (10YR 8/2), WELL GRADED, 20%-25% COARSE SAND, 50%-60% MEDIUM SAND, 15%-20% FINE SAND, MEDIUM DENSE, MOIST TO VERY MOIST.

▽ GROUNDWATER
 @ 92', 02/23/01

93'-97' SILTY CLAY (CL), VERY PALE ORANGE (10YR 8/2), 25%-30% SILT, MEDIUM STIFF, MOIST.

97' END OF BORING.



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA	
CONSTRUCTION DETAIL OF PERCHED AQUIFER MONITOR WELL PBP-7			FIGURE
PROJECT#: 365-0005-05	FILE#: pbp7wcd	DATE DRAWN: 07/26/02	DRAWN BY: B. McCLELLAN



SEE WELLHEAD COMPLETION DETAIL

GROUND SURFACE

18" BOREHOLE
10" CONDUCTOR CASING
9 5/8" BOREHOLE
4" CASING

TREMIED PORTLAND CEMENT
GROUTED CASING SEAL

10" ID WELDED STEEL BLANK
PERCHED ZONE CONDUCTOR
CASING FROM 101' TO SURFACE

TREMIED PORTLAND CEMENT
GROUTED CASING SEAL

4" I.D. SCH. 80 PVC
FLUSH-THREADED
BLANK CASING

BENTONITE SEAL
FROM 188' TO 194'

101'

188'

194'

200'

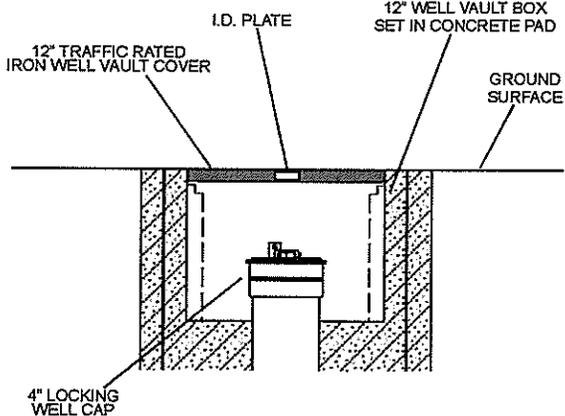
250'

#10-20 COLORADO SILICA SAND
FROM 194' TO 250'

4" I.D. SCH. 80 PVC
0.010" WELL SCREEN
FROM 200' TO 250'

TOTAL DEPTH 250'

WELLHEAD COMPLETION DETAIL



NOTE: NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF REGIONAL AQUIFER MONITOR WELL PBR-10

FIGURE

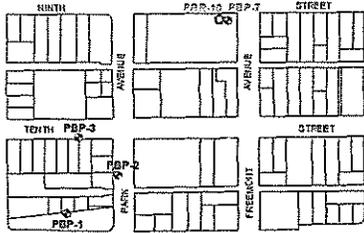
PROJECT#: 365-0001-01

FILE#: pbr10wcd

DATE DRAWN: 06/17/02

DRAWN BY: B. McCLELLAN

Boring Location Sketch:



Project No:	365-0003-04	Date Drilled:	05-20-02	Boring No. PBR-10 #55-591859 Sheet No. 1 of 8
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			
City:	TUCSON, ARIZONA			
Logged By:	J. MEYER / P. McALPINE	Driller:	WDC	

Drilling Method: AIR ROTARY

Boring Diameter: 16 INCHES

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Top of casing elevation: 2405.82' Ground Level Elevation:

Water Depth	199.50'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
0							
5	PEP7-5		08:25	0.0	50/6"		
10							
15							
20							
25							
30							
35							

0'-1' GRAVEL COVER.

1'-8' SILTY SAND TO SANDY GRAVEL (SM/GM), PALE YELLOWISH ORANGE (10YR 6/2), 35-45% SILT, 25-30% FINE SAND, 25-30% GRAVEL 3/4"-2", SOME CALICHE, DRY.

8'-23' GRAVELLY SAND (SW), LIGHT BROWN (5YR 6/4), 25-30% FINE SAND, 15-20% MEDIUM SAND, 30-35% COARSE SAND, 20-25% GRAVEL 1/4" - 1/2", WELL GRADED, SOME CALICHE, DRY.

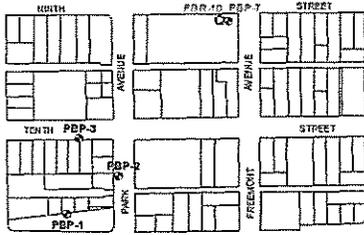
SIMILAR TO ABOVE, NO CALICHE, 20-25% MEDIUM SAND, 10-15% GRAVEL.

SIMILAR TO ABOVE, COBBLE ROCK CLASTS.

SIMILAR TO ABOVE, 20-25% SILT.

30'-37' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 35-40% CLAY, 15-20% FINE SAND, 25-30% MEDIUM SAND, 10-15% COARSE SAND, LOW PLASTICITY, SLIGHTLY MOIST.

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:


Project No:	365-0003-04	Date Drilled:	05-20-02	Boring No.	PBR-10 #55-591859
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW¼ SECTION 18, T. 14 S., R. 14 E.				5 of 8
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER / P. McALPINE	Driller:	WDC		

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Drilling Method:

AIR ROTARY

Boring Diameter:

16 INCHES

Top of casing elevation: 2405.82' Ground Level Elevation:

Water Depth	199.50'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
140			09:29				
145							
150			09:33				
155			09:39				
160							
165							
170			09:51				
175							

130'-160' SAND (SW), 10% SILT, 50-60% FINE SAND, 20-30% MEDIUM SAND, 10-15% COARSE SAND.

SIMILAR TO ABOVE, <5% SMALL GRAVEL.

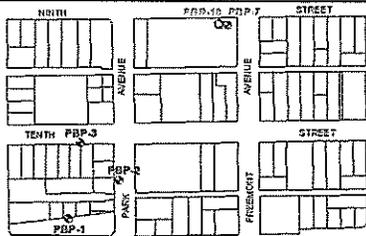
SIMILAR TO ABOVE, 5-10% SILT, 40-50% FINE SAND, 30% MEDIUM SAND, 20-30% COARSE SAND.

160'-168' CLAYEY SAND (SC), LIGHT BROWN, 10-15% CLAY, 10-15% SILT, 10-20% FINE SAND, 40-50% MEDIUM SAND, 10-20% COARSE SAND, 5-10% SMALL GRAVEL, SEMI-MOIST.

168'-175' SILTY SAND (SM), 40-50% SILT, 20-30% FINE SAND, 10-20% MEDIUM SAND, 10% COARSE SAND, DRY.

SIMILAR TO ABOVE, LIGHT BROWN, 20-30% SILT, 40-50% FINE SAND, 10-20% MEDIUM SAND, 10% COARSE SAND, MOIST.

Boring Location Sketch:



Project No:	385-0003-04	Date Drilled:	05-20-02	Boring No.	PBR-10
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591859
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				6 of 8
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER / P. McALPINE	Driller:	WDC		

Drilling Method: AIR ROTARY

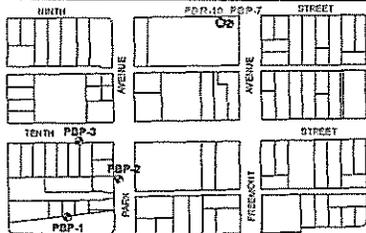
Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES

Top of casing elevation: 2405.82' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	199.50'		
								Time			
								Date	06-06-02		
175											175-185' SAND (SW), 5-10% SILT, 60-70% FINE SAND, 10-15% MEDIUM SAND, 5-10% COARSE SAND.
180											
185											185-197' SILTY SAND (SM) MEDIUM BROWN, 30-40% SILT, 30-40% FINE SAND, 10-15% MEDIUM SAND, 5-10% COARSE SAND.
190											
195											SIMILAR TO ABOVE, VERY MOIST.
200											197-250' SAND (SW), 10% SILT, 10-20% FINE SAND, 50-60% MEDIUM SAND, 10-15% COARSE SAND, WET.
205											
210											SIMILAR TO ABOVE, INCREASED SILT AND CLAY.

Boring Location Sketch:



Project No:	365-0003-04	Date Drilled:	05-20-02	Boring No. PBR-10
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			Sheet No. 7 of 8
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			
City:	TUCSON, ARIZONA			
Logged By:	J. MEYER / P. McALPINE	Driller:	WDC	

Drilling Method: AIR ROTARY

SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES

Top of casing elevation: 2405.82' Ground Level Elevation:

Water Depth	199.50'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
210							
215							
220							
225							
230							
235							
240							
245							

SIMILAR TO ABOVE, <5% SILT, 10-15% FINE SAND, 20-30% MEDIUM SAND, 50-60% COARSE SAND.

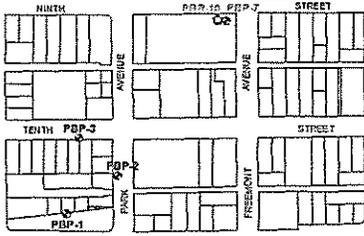
SIMILAR TO ABOVE, MEDIUM BROWN, 10-15% CLAY, 10-15% SILT, 50-60% FINE SAND, 10-20% MEDIUM SAND, WET.

SIMILAR TO ABOVE, LITTLE TO NO CLAY OR SILT.

SIMILAR TO ABOVE, <5% SILT, 60-70% FINE SAND, 10-20% MEDIUM SAND, 10-15% COARSE SAND.

SIMILAR TO ABOVE, 10-15% FINE SAND, 10-15% MEDIUM SAND, 60-70% COARSE SAND, 5% SMALL GRAVEL.

Boring Location Sketch:



Project No:	385-0003-04	Date Drilled:	05-20-02	Boring No.	PBR-10
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			#55-591859	
Facility:	PARK-EUCLID WQARF SITE			Sheet No.	8 of 8
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER / P. McALPINE	Driller:	WDC		

Drilling Method: AIR ROTARY

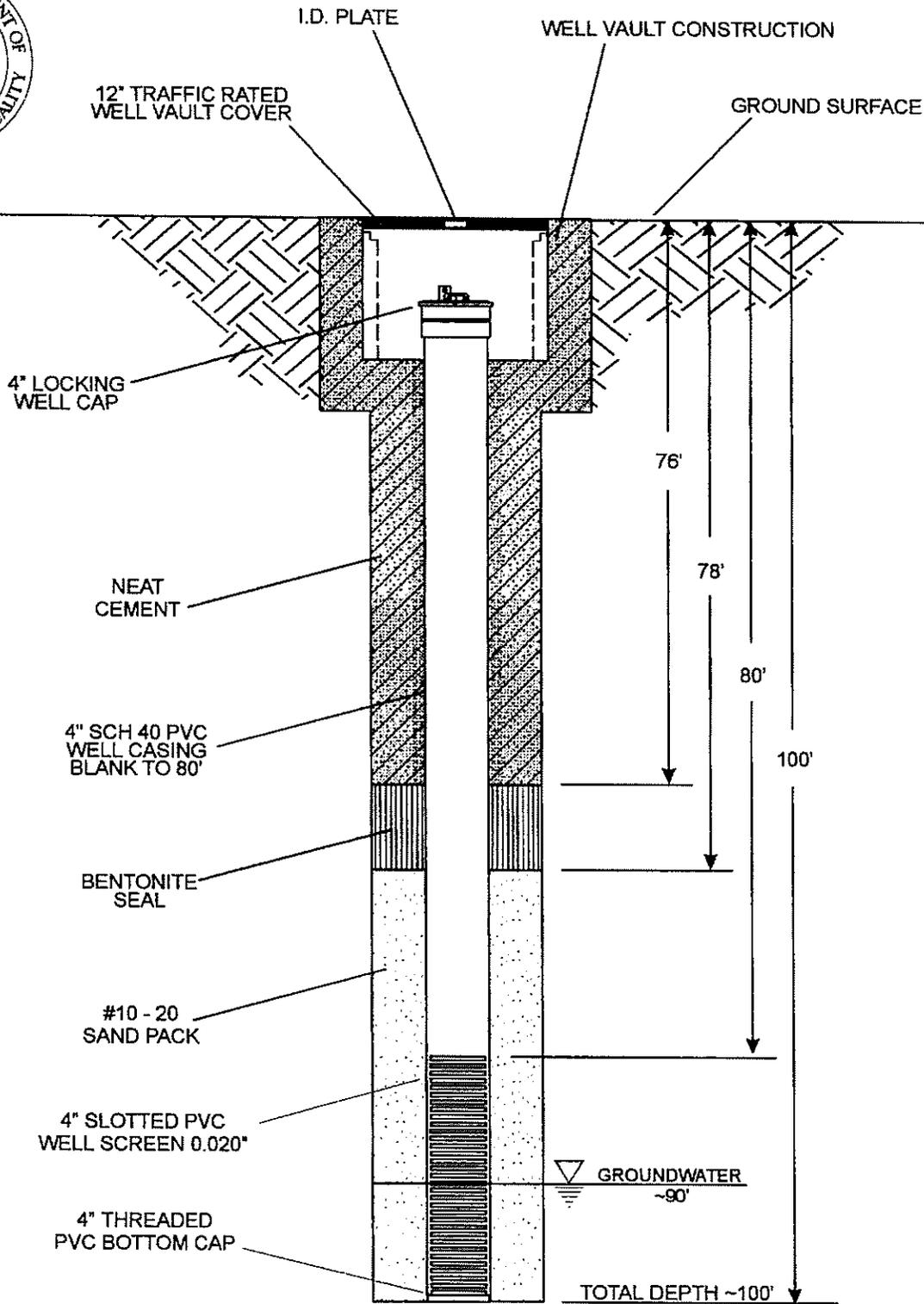
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES

Top of casing elevation:	2405.82'	Ground Level Elevation:	
Water Depth:	199.50'		
Time:			
Date:	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
245							
250							
255							
260							
265							
270							
275							
280							

250' END OF BORING.



NOT TO SCALE

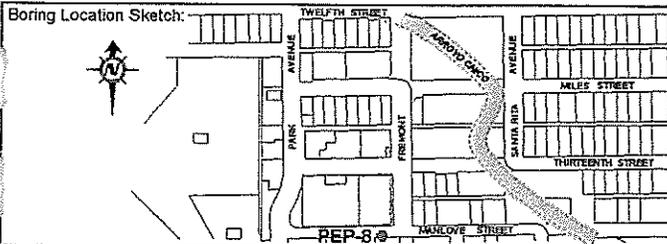


PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

SCHMATIC OF
PERCHED WATER-BEARING INTERVAL MONITOR WELL
PEP-8

FIGURE
PEP-8

PROJECT#: 365-0001-01	FILE#: wcdpep8	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN
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Project No:	365-0006-05	Date Drilled:	11-17-00 TO 11-18-00	Boring No.	
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				PEP-8
Facility:	PARK-EUCLID WQARF SITE				#55-584310
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				Sheet No.
City:	TUCSON, ARIZONA				1 of 3
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:
 0' to 90' 4" DIAMETER SCHEDULE 80 PVC BLANK
 90' to 100' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2418.06' Ground Level Elevation: 2417.87'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Time			
								Date			
0				-							
				-							
				-							
				5							
5	PEP08-5		10:39	14							
				0							
				0							
				-							
10	PEP08-10		10:48	0							
				0							
				0							
				-							
15	PEP08-15		11:01	1							
				1							
				0							
				-							
20	PEP08-20		11:32	0							
				0							
				0							
				-							
25	PEP08-25		11:38	0							
				0							
				-							
30	PEP08-30		13:37	1							
				0							
				1							
				0							
35				0							

0'-13' SILTY SAND (SM), MODERATE ORANGE (5YR 8/4), 40% FINE SAND, 15% MEDIUM SAND, 15% COARSE SAND, 20% SILT, 10% GRAVEL, POORLY TO MODERATELY INDURATED, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 25% - 30% MEDIUM SAND, 40% - 50% SILT, POORLY INDURATED.

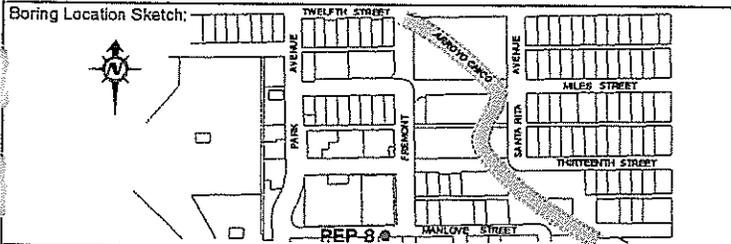
13'-14.5' WELL GRADED SAND (SW), DARK YELLOW ORANGE (10YR 8/6), 20% - 30% FINE SAND, 40% - 50% MEDIUM SAND, 5% - 20% COARSE SAND, 10% - 15% GRAVEL, SLIGHTLY MOIST.

14.5'-17.5' POORLY GRADED SAND (SP), PALE ORANGE (10YR 8/6), 60% - 70% MEDIUM SAND, 15% - 20% COARSE SAND, 10% - 15% GRAVEL, SLIGHTLY MOIST.

17.5'-22' CLAYEY SAND (SC), PALE ORANGE (10YR 8/2), 26% GRAVEL, 6% COARSE SAND, 24% - MEDIUM SAND, 10% FINE SAND, 34% SILT AND CLAY, POORLY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

22'-36' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 20% - 30% FINE SAND, 30% - 40% MEDIUM SAND, 5% - 10% COARSE SAND, POORLY INDURATED, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 40% - 50% FINE SAND, <5% GRAVEL.



Project No: 365-0006-05	Date Drilled: 11-17-00 TO 11-18-00	Boring No. PEP-8 #55-584310
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 2 of 3
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: **ROTONSONIC CONTINUOUS CORE**

Casing installation data:
 0' to 90' 4" DIAMETER SCHEDULE 80 PVC BLANK
 90' to 100' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: **8 INCHES**

Top of box elevation: **2418.06'**
 Ground Level Elevation: **2417.87'**

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level
35				2				
				2				
				2				
				2				
				18				
40	PEP08-40		14:50	2				
				0				
				3				
				0				
				2				
45	PEP08-45		14:55	0				
				0				
				1				
				-				
				0				
50	PEP08-50		15:04	1				
				0				
				0				
				0				
				0				
55	PEP08-55		15:13	0				
				0				
				1				
				0				
				1				
60	PEP08-60		16:12	0				
				2				
				2				
				1				
65	PEP08-65		16:37	1				
				0				
				0				
				1				
				-				
70				0				

22'-36' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 40% - 50% FINE SAND, 30% - 40% MEDIUM SAND, 5% - 10% COARSE SAND, <5% GRAVEL, SLIGHTLY MOIST.
 36'-40' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), LOW PLASTICITY, SLIGHTLY MOIST.

40'-60.5' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 40% - 50% FINE SAND, 10% - 20% MEDIUM SAND, <5% COARSE SAND, 10% - 15% SILT, SLIGHTLY MOIST.

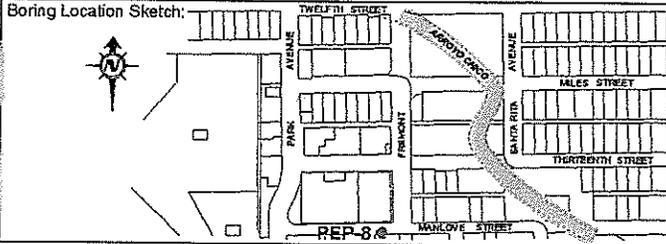
SIMILAR TO ABOVE, 30% - 40% FINE SAND, 30% - 35% MEDIUM SAND, 15% - 20% COARSE SAND.

SIMILAR TO ABOVE, 10% - 15% FINE SAND, 30% - 40% COARSE SAND, 15% - 25% GRAVEL.

FIST SIZED COBBLES.

60.5'-64' WELL GRADED SAND (SW), MODERATE BROWN (5YR 4/4), 9% GRAVEL, 16% COARSE SAND, 45% MEDIUM SAND, 17% FINE SAND, 13% SILT AND CLAY, LOW PLASTICITY, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE

64'-75' WELL GRADED SAND (SW), LIGHT BROWN (5YR 4/4), 30% - 45% FINE SAND, 45% - 65% MEDIUM SAND, 10% - 20% COARSE SAND.



Project No:	365-0006-05	Date Drilled:	11-17-00 TO 11-18-00	Boring No.	
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				PEP-8
Facility:	PARK-EUCLID WQARF SITE				#55-584310
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				Sheet No.
City:	TUCSON, ARIZONA				3 of 3
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:
 0' to 90' 4" DIAMETER SCHEDULE 80 PVC BLANK
 90' to 100' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2418.06'
 Ground Level Elevation: 2417.87'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level
70	PEP08-70		17:11	0				
				-				
				1				
				2				
75				-				
				1				
	PEP08-76		17:25	6				
	PEP08-77		17:45	27				
	PEP08-78		17:46	82				
80				26				
	PEP08-80		07:41	32				
				4				
				-				
	PEP08-83		07:55	6				
	PEP08-84		07:52	1				
85				2				
	PEP08-85		07:53	2				
	PEP08-86		08:46	17				
	PEP08-87		08:48	22				
	PEP08-88		08:50	12				
90								
	PEP08-90		08:51	12				
	PEP08-91		09:00	9				
	PEP08-92		09:01	208				
				-				
95								
	PEP08-94		09:03	250				
	PEP08-95		09:06	122				
				4				
	PEP08-97		09:53	5				
				-				
				4				
100								
	PEP08-100		10:51	6				
	PEP08-101		11:15					
105								

64'-75' SAND (SW), LIGHT BROWN (5YR 4/4), 25% - 35% FINE SAND, 45% - 65% MEDIUM SAND, 10% - 20% COARSE SAND, 25% - 30% GRAVEL.

SIMILAR TO ABOVE, COBBLE.

75'-83' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), MODERATE PLASTICITY, SLIGHTLY MOIST, COHESIVE.

SIMILAR TO ABOVE, 35% - 40% FINE SAND, <5% MEDIUM SAND, 35% - 40% CLAY.

83'-92' POORLY GRADED SAND (SP), PALE ORANGE (10YR 8/2), 9% GRAVEL, 36% COARSE SAND, 42% MEDIUM SAND, 8% FINE SAND, 5% SILT AND CLAY, MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

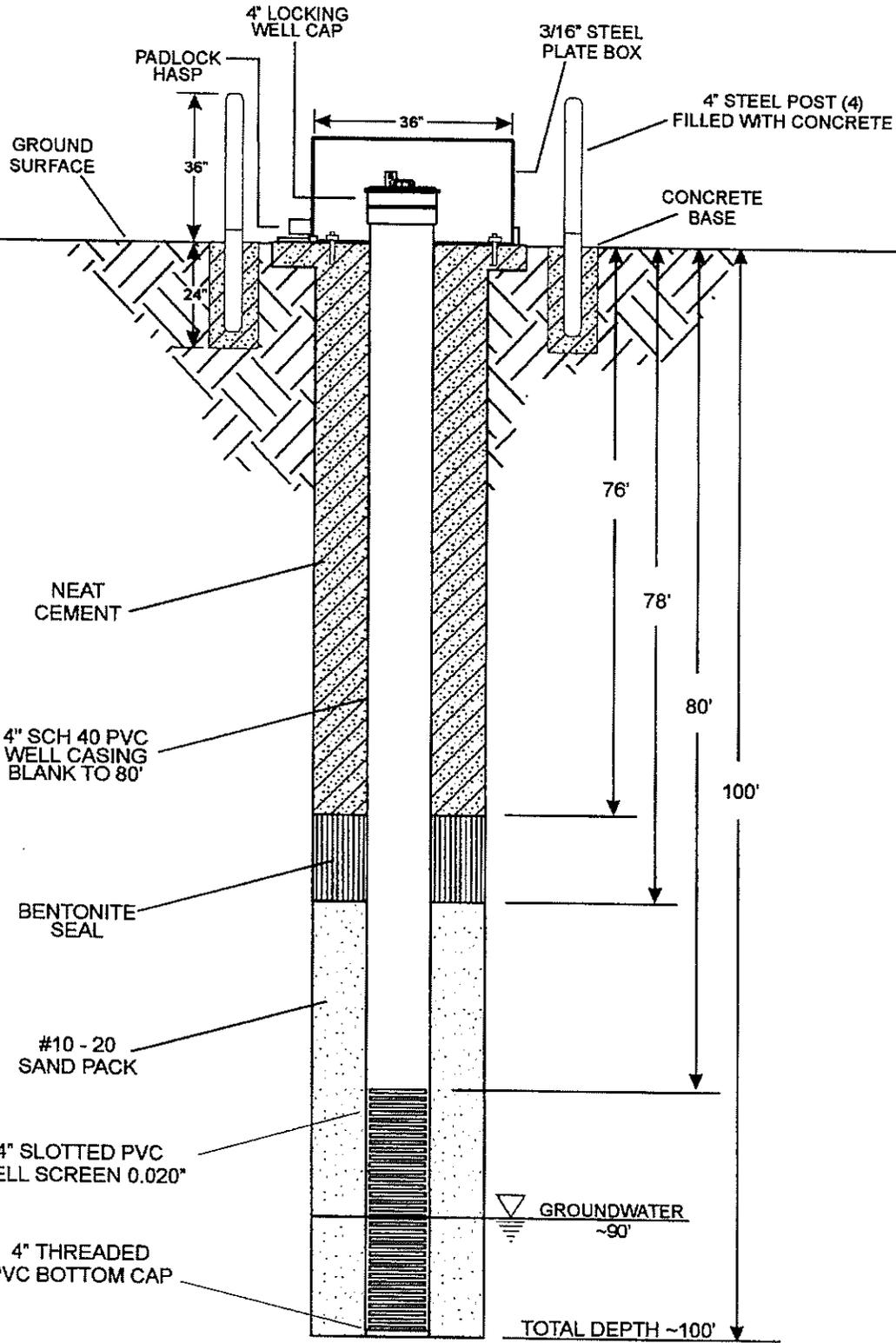
SIMILAR TO ABOVE, COBBLE.

STRONG ODOR OF DIESEL FUEL.
 92'-97' LOW PLASTICITY CLAY (CL), MODERATE BROWN (5YR 4/4), 15% - 20% FINE SAND, 15% - 20% SILT, 40% - 55% CLAY, MODERATELY INDURATED, SLIGHTLY MOIST.

▽ GROUNDWATER
 @ 93', 11/18/00

97'-101' CLAY (CL), MODERATELY BROWN (5YR 4/4), 15% - 20% FINE SAND, 20% - 25% SILT, 60% - 70% CLAY, WELL INDURATED, SLIGHTLY MOIST.

101' END OF BORING.



NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

SCHMATIC OF
PERCHED WATER-BEARING INTERVAL MONITOR WELL
PEP-9

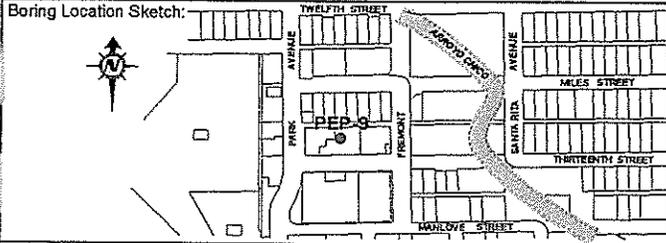
FIGURE
PEP-9

PROJECT#: 365-0001-01

FILE#: wcdpep9a

DATE DRAWN: 10/26/00

DRAWN BY: B. McCLELLAN



Project No:	365-0006-05	Date Drilled:	11-15-00 TO 11-16-00	Boring No.	PEP-9
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584205
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				1 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:
 0' to 90' 4" DIAMETER SCHEDULE 80 PVC BLANK
 90' to 100' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2417.17' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
0				-						
5	PEP09-5		10:03	0						
				0						
				0						
10	PEP09-10		10:10	0						
				0,1						
				0						
				0						
15	PEP09-15		10:22	2						
				0						
				1						
				1						
20	PEP09-20		10:47	1						
				3						
				4						
				2,2						
				3						
25	PEP09-25		11:00	1						
				0						
				0						
				-						
				4						
30	PEP09-30		11:11	0						
				2						
				5						
				2						
35				2						

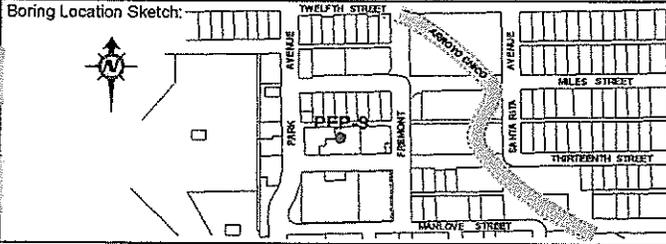
0'-33' WELL GRADED SAND (SW), PALE ORANGE (10YR 7/4), 15% - 20% FINE SAND, 30% - 40% MEDIUM SAND, 0% - 15% COARSE SAND, 30% SILT, 5% - 7% GRAVEL, SLIGHTLY MOIST.

SIMILAR TO ABOVE, <5% COARSE SAND, NO GRAVEL.

SIMILAR TO ABOVE, 10% - 15% COARSE SAND, 7% - 10% GRAVEL.

SIMILAR TO ABOVE, 5% - 10% GRAVEL.

33'-39' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 60% - 70% FINE SAND, 5% - 10% SILT, 30% - 40% CLAY, SLIGHTLY MOIST.



Project No:	365-0006-05	Date Drilled:	11-15-00 TO 11-16-00	Boring No.	PEP-9
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584205
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				2 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:
 0' to 90' 4" DIAMETER SCHEDULE 80 PVC BLANK
 90' to 100' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2417.17' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	
								Time	Date
								35	PEP09-40
			2						
			0						
			-						
			10						
40	PEP09-40	14:00	8	1					
			0						
			5,2						
			1						
45	PEP09-45	14:24	2	1					
			1						
			2						
			1						
50	PEP09-50	15:16	5	0					
			1						
			1						
			-						
55	PEP09-55	16:02	1	1					
			1						
			2						
			1						
60	PEP09-60	16:14	4	0					
			1						
			-						
			2						
65	PEP09-65	17:08	3	0					
			1						
			1						
			0						
70			0						

33'-39' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 60% - 70% FINE SAND, 5% - 10% SILT, 30% - 40% CLAY, SLIGHTLY MOIST.

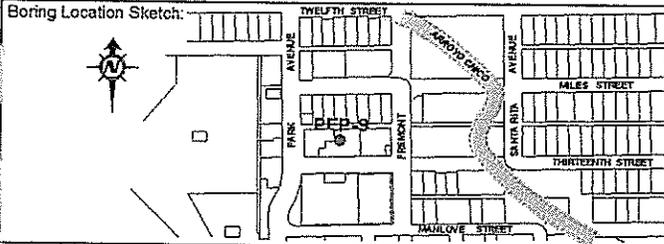
39'-48' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/8), 40% - 50% FINE SAND, 20% - 30% MEDIUM SAND, 20% - 30% COARSE SAND, 5% - 10% SILT, 5% - 10% GRAVEL, SLIGHTLY MOIST.

48'-52' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 11% GRAVEL, 15% COARSE SAND, 34% MEDIUM SAND, 4% FINE SAND, 36% SILT AND CLAY, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

52'-59' WELL GRADED SAND (SW), MODERATE BROWN (5YR 4/4), 40% - 50% FINE SAND, 25% - 35% MEDIUM SAND, 5% - 10% COARSE SAND, 10% - 15% SILT, SLIGHTLY MOIST.

59'-62' SILTY SAND (SM), MODERATE BROWN (5YR 4/4), 40% - 50% FINE SAND, 10% - 15% MEDIUM SAND, 30% - 40% SILT, 0% - 5% CLAY, SLIGHTLY MOIST.

62'-72' POORLY GRADED SAND (SP), PALE ORANGE (10YR 8/2), 40% - 50% FINE SAND, 10% - 15% MEDIUM SAND, 35% - 40% COARSE SAND, 10% - 15% GRAVEL, SLIGHTLY MOIST.



Project No: 365-0008-05	Date Drilled: 11-15-00 TO 11-16-00	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PEP-9
Facility: PARK-EUCLID WQARF SITE		#55-584205
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		3 of 3
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: ROTOSONIC CONTINUOUS CORE
 Boring Diameter: 8 INCHES

Casing installation data:
 0' to 90' 4" DIAMETER SCHEDULE 80 PVC BLANK
 90' to 100' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN
 Top of box elevation: 2417.17' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
70				-						
				3						
				0						
				0						
75	PEP09-75		07:45	3						
				17.5						
				10						
				-						
				2						
80	PEP09-80		09:13	0						
				0						
				-						
				0						
85	PEP09-85		09:23	2						
				0						
	PEP09-87		09:25	0						
				-						
	PEP09-89		10:09	0						
90	PEP09-90		10:10	0						
				0						
	PEP09-92		10:11	0						
	PEP09-93		10:45	18						
	PEP09-94		10:46	13						
95	PEP09-95		11:10	0						
				0						
	PEP09-97		11:11	-						
	PEP09-98		11:12	0						
				0						
100	PEP09-100		11:55	0						
				0						
	PEP09-102		12:00	0						
	PEP09-103		12:01	0						
105	PEP09-104		13:20							

62'-72' POORLY GRADED SAND (SP), PALE ORANGE (10YR 8/2), 40% - 50% FINE SAND, 10% - 15% MEDIUM SAND, 35% - 40% COARSE SAND, 10% - 15% GRAVEL, SLIGHTLY MOIST.

72'-74' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), LOW TO MEDIUM PLASTICITY, SLIGHTLY MOIST, COHESIVE.

74'-80' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), LOW PLASTICITY, SLIGHTLY MOIST.

80'-82' POORLY INDURATED SAND (SW), LIGHT BROWN (5YR 8/4), 20% - 30% FINE SAND, 20% - 30% MEDIUM SAND, 10% - 15% COARSE SAND, 15% - 25% GRAVEL, FIST SIZED COBBLES, SLIGHTLY MOIST.

82'-84' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), LOW PLASTICITY, MOIST, COHESIVE.

84'-93' CLAYEY SAND (SC), LIGHT BROWN (5YR 8/4), 6% GRAVEL, 7% COARSE SAND, 16% - MEDIUM SAND, 34% FINE SAND, 37% SILT AND CLAY, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

93'-97' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), <50% FINE SAND, LOW PLASTICITY, WELL INDURATED, MOIST.

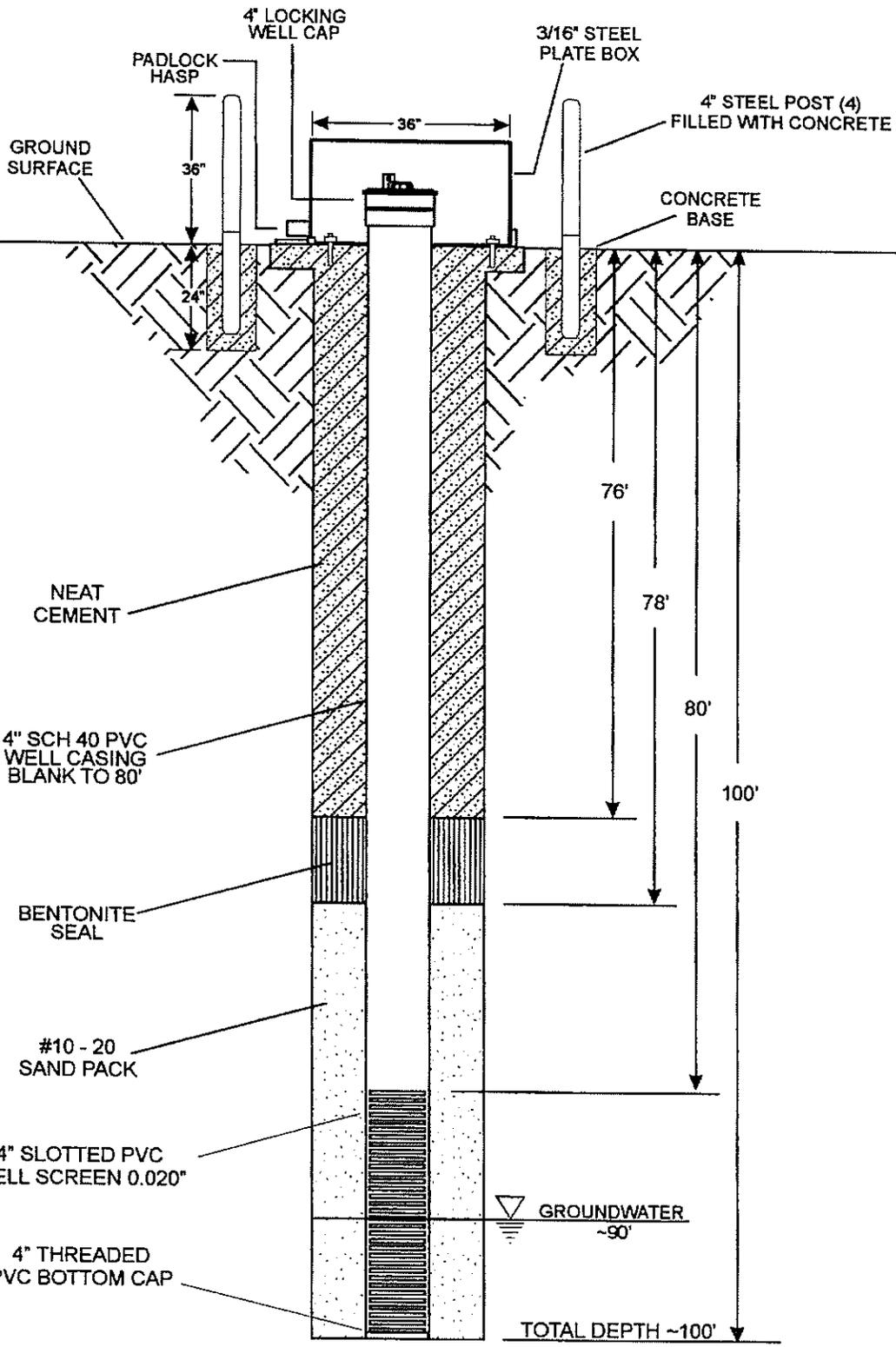
97'-98' POORLY GRADED SAND (SP), 50% - 60% MEDIUM TO COARSE SAND, 35% - 40% GRAVEL.

98'-100' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), <50% FINE SAND, LOW PLASTICITY, MOIST.

100'-104' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 3% GRAVEL, 3% COARSE SAND, 17% MEDIUM SAND, 25% FINE SAND, 51% CLAY, MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

104' END OF BORING.

STRONG PETROLEUM ODOR, PROBE COATED WITH FREE PRODUCT.
 ▼ GROUNDWATER
 @ 93', 11/16/00



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA	
SCHEMATIC OF PERCHED WATER-BEARING INTERVAL MONITOR WELL PEP-10			FIGURE PEP-10
PROJECT#: 365-0001-01	FILE#: wcdpep10	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN



Project No: 365-0006-05	Date Drilled: 11-29-00 TO 12-01-00	Boring No. PEP-10
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		#55-584204
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		1 of 3
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: ROTOSONIC CONTINUOUS CORE
 Boring Diameter: 8 INCHES

Casing installation data:
 0' to 84' 4" DIAMETER SCHEDULE 80 PVC BLANK
 84' to 94' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Top of box elevation: 2410.36'
 Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Time			
								Date			
0				-				0'-2' WELL GRADED GRAVEL (GW), FILL.			
				-				2'-6.5' SILTY SAND (SM), LIGHT BROWN (5YR 5/6), 60% - 70% FINE SAND, 30% - 40% SILT, POORLY INDURATED, SLIGHTLY MOIST.			
5	PEP10-5		16:11	0				6.5'-33.5' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/8), 35% - 45% FINE SAND, 25% - 35% MEDIUM SAND, 10% - 15% COARSE SAND, 10% - 15% SILT, POORLY INDURATED, SLIGHTLY MOIST.			
				0				SIMILAR TO ABOVE, 25% - 35% FINE SAND, 25% - 35% COARSE SAND, <5% GRAVEL.			
10	PEP10-10		16:18	0							
				0							
15	PEP10-15		16:24	-							
				0							
20	PEP10-20		16:37	0							
				0							
25	PEP10-25		16:56	0							
				0							
30	PEP10-30		17:20	0							
				0,0							
				0							
35				-				33.5'-41' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 20% - 25% FINE SAND, 15% - 20% MEDIUM SAND, 30% - 40% CLAY, 5% - 15% SILT, MODERATELY INDURATED, SLIGHTLY MOIST.			



Project No: 365-0006-05	Date Drilled: 11-29-00 TO 12-01-00	Boring No. PEP-10
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		Sheet No. 2 of 3
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: **ROTOSONIC CONTINUOUS CORE**

Boring Diameter: **8 INCHES**

Casing installation data:
 0' to 84' 4" DIAMETER SCHEDULE 80 PVC BLANK
 84' to 94' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Top of box elevation: 2410.36' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level					
35				3									
				1									
				1									
				-									
40	PEP10-40		07:28	0									
				1									
				1									
				0									
45	PEP10-45		08:23	2									
				2									
				1									
				0									
50	PEP10-50		08:45	0									
				0									
				0									
				0									
55	PEP10-55		09:10	1									
				1									
				-									
				23									
60	PEP10-59		09:12	26									
	PEP10-60		09:30	2									
				2									
				4									
	PEP10-63		09:52	10									
65	PEP10-65		10:15	49									
				178									
				8									
				16									
70				1									

33.5'-41' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 20% - 25% FINE SAND, 15% - 20% MEDIUM SAND, 30% - 40% CLAY, 5% - 15% SILT, MODERATELY INDURATED, SLIGHTLY MOIST.

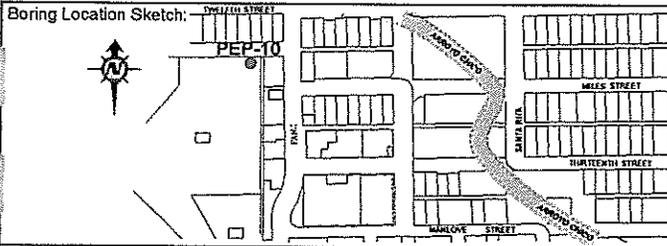
41'-49' SILTY SAND (SM), LIGHT BROWN (5YR 5/6), 35% - 40% FINE SAND, 10% - 15% MEDIUM SAND, 25% - 35% SILT, 5% - 10% CLAY, POORLY INDURATED, SLIGHTLY MOIST.

49'-59' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 35% - 45% FINE SAND, 25% - 30% MEDIUM SAND, 20% - 25% COARSE SAND, 10% - 15% SILT, POORLY INDURATED, SLIGHTLY MOIST.

59'-66' SILTY SAND (SM), 15% - 20% SILT, <5% CLAY.

66'-68' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 4% GRAVEL, 19% COARSE SAND, 35% MEDIUM SAND, 17% FINE SAND, 25% SILT AND CLAY, MODERATELY INDURATED, MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

68'-73' SILTY SAND (SM), LIGHT BROWN (5YR 6/4), 20% - 25% FINE SAND, 30% - 35% MEDIUM SAND, 20% - 25% SILT, 15% - 20% CLAY, POORLY INDURATED, SLIGHTLY MOIST.



Project No:	365-0006-05	Date Drilled:	11-29-00 TO 12-01-00	Boring No.	PEP-10
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584204
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				3 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE
 Boring Diameter: 8 INCHES

Casing installation data:
 0' to 84' 4" DIAMETER SCHEDULE 80 PVC BLANK
 84' to 94' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol
70				2			
				3			
				3			
				1			
				1			
75	PEP10-75		10:58	-			
				1			
				3			
				0			
80	PEP10-80		11:32	0			
				0			
				1			
				0			
85	PEP10-85		13:28	0			
				0			
				2			
				-			
				0			
90	PEP10-90		13:54	0			
				1			
	PEP10-92		13:55	0			
				0			
95	PEP10-95		13:57	0			
				-			
100							
105							

Top of box elevation: 2410.36' Ground Level Elevation:

Water Level

Time

Date

68'-73' SILTY SAND (SM), LIGHT BROWN (5YR 6/4), 20% - 25% FINE SAND, 30% - 35% MEDIUM SAND, 20% - 25% SILT, 15% - 20% CLAY, POORLY INDURATED, SLIGHTLY MOIST.

73'-77' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 25% - 30% FINE SAND, 30% - 35% MEDIUM SAND, 25% - 30.5% COARSE SAND, POORLY INDURATED, SLIGHTLY MOIST.

77'-83' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 2% GRAVEL, 11% COARSE SAND, 31% MEDIUM SAND, 20% FINE SAND, 36% SILT AND CLAY, LOW PLASTICITY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

83'-85' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), 40% - 50% FINE SAND, 30% - 35% MEDIUM SAND, 20% - 25% COARSE SAND, 15% - 20% CLAY, MODERATELY INDURATED, SLIGHTLY MOIST.

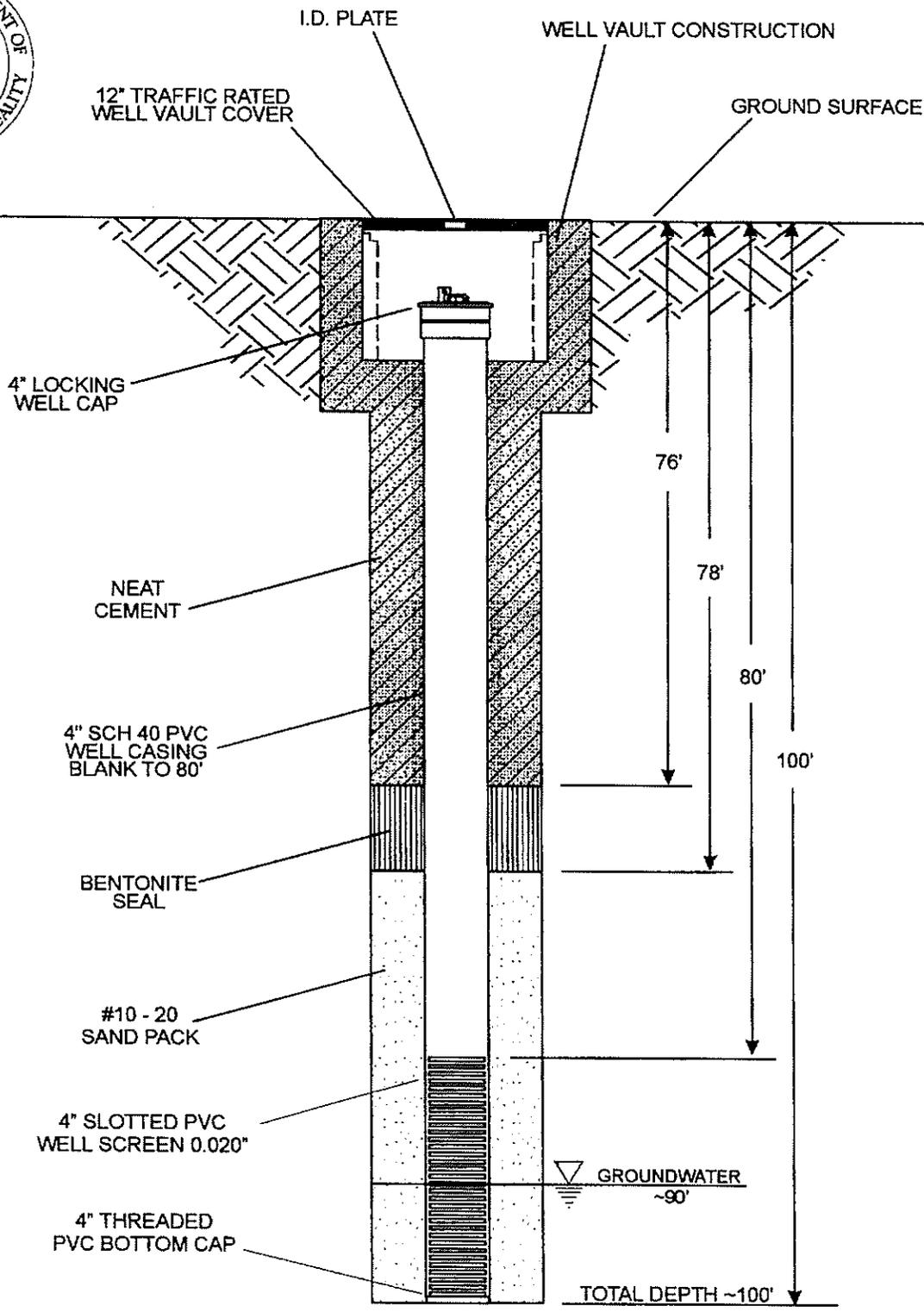
85'-87' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), POORLY INDURATED, MOIST, COHESIVE.

▽ GROUNDWATER
 @ 87', 11/30/00

87'-93' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10Y4 5/4), 16% GRAVEL, 15% COARSE SAND, 38% MEDIUM SAND, 12% FINE SAND, 19% SILT AND CLAY, WELL INDURATED, VERY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

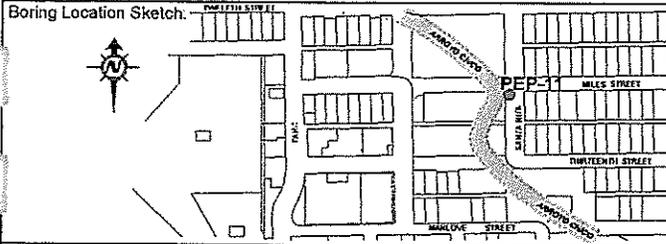
93'-95' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 28% GRAVEL, 8% - COARSE SAND, 17% MEDIUM SAND, 19% FINE SAND, 30% SILT AND CLAY, WELL INDURATED, MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

95' END OF BORING.



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
SCHEMATIC OF PERCHED WATER-BEARING INTERVAL MONITOR WELL PEP-11				FIGURE PEP-11
PROJECT#: 365-0001-01	FILE#: wcdpep11	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN	



Project No:	385-0005-05	Date Drilled:	12-01-00 TO 12-02-00	Boring No.	PEP-11
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584494
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				2 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE

Boring Diameter: 8 INCHES

Casing installation data:
 0' to 85' 4" DIAMETER SCHEDULE 80 PVC BLANK
 85' to 95' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Top of box elevation: 2410.60'
 Ground Level Elevation: 2410.95'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level
								Time
								Date
35				0				
				24				
				11				
				-				
				14				
40	PEP11-40		16:26	5				
				7				
				1				
				-				
				1				
45				13				
				0				
				0				
				-				
				0				
50	PEP11-50		17:12	0				
				1				
				2				
				0				
55				0				
				3				
				0				
				2				
				6				
60	PEP11-60		08:59	0				
				0				
				0				
				0				
65				0				
				0				
				0				
				0,0				
70				0				

33'-36" POORLY GRADED SAND (SP), LIGHT BROWN (5YR 5/6), 37% GRAVEL, 17% COARSE SAND, 30% MEDIUM SAND, 9% FINE SAND, 7% SILT AND CLAY, LOW PLASTICITY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

36'-49.5" CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 35% - 45% FINE SAND, 15% - 20% MEDIUM SAND, 15% - 20% SILT, 30% - 35% CLAY, POORLY TO MODERATELY INDURATED, SLIGHTLY MOIST.

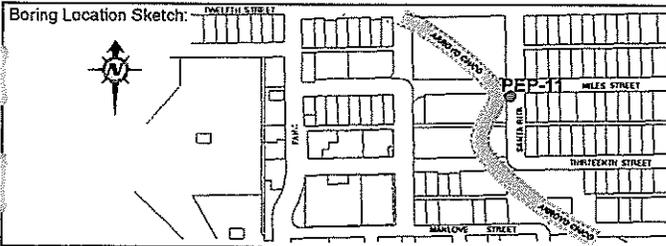
49.5'-57" WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 25% - 30% FINE SAND, 25% - 30% MEDIUM SAND, 20% - 25% COARSE SAND, 5% - 10% SILT, 5% - 10% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

57'-63.5" CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 75% COARSE SAND, 43% MEDIUM SAND, 19% FINE SAND, 31% SILT AND CLAY, LOW PLASTICITY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

63.5'-66" SILTY SAND (SM), LIGHT BROWN (5YR 5/6), 35% - 40% FINE SAND, 20% - 25% MEDIUM SAND, 10% - 15% SILT, 10% - 15% CLAY, POORLY INDURATED, SLIGHTLY MOIST.

66'-68" CLAYEY SAND (SC), MODERATE BROWN (5YR 5/6), 1% GRAVEL, 1% COARSE SAND, 37% MEDIUM SAND, 24% FINE SAND, 37% SILT AND CLAY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

68'-74" SILTY SAND (SM), LIGHT BROWN (5YR 5/6), 35% - 40% FINE SAND, 20% - 25% MEDIUM SAND, 10% - 15% SILT, 10% - 15% CLAY, POORLY INDURATED, SLIGHTLY MOIST.



Project No:	365-0008-05	Date Drilled:	12-01-00 TO 12-02-00	Boring No.	PEP-11
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584494
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				3 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE
Boring Diameter: 8 INCHES

Casing installation data:
0' to 85' 4" DIAMETER SCHEDULE 80 PVC BLANK
85' to 95' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN
Top of box elevation: 2410.60'
Ground Level Elevation: 2410.95'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
70	PEP11-70		10:10	0						
				0						
				0						
				0						
75				0						
				0						
				0,0						
				0						
80	PEP11-80		11:20	0						
				0						
				0						
				0						
85				0						
				0						
				0						
				0						
90	PEP11-89		13:51	0						
	PEP11-90		14:13	0						
				0						
	PEP11-92		14:15	0						
				0						
				0						
95	PEP11-95		14:17	0						
100										
105										

68'-74' SILTY SAND (SM), LIGHT BROWN (5YR 5/6), 35% - 40% FINE SAND, 20% - 25% MEDIUM SAND, 10% - 15% SILT, 10% - 15% CLAY, POORLY INDURATED, SLIGHTLY MOIST.

74'-78.5' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), WELL INDURATED, MOIST, COHESIVE.

78.5'-80.5' SILTY SAND (SM), VERY PALE ORANGE (10YR 8/2), 35% - 40% FINE SAND, 30% - 35% MEDIUM SAND, 15% - 20% SILT, POORLY INDURATED, VERY MOIST.

80.5'-83.5' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 40% - 50% FINE SAND, 15% - 20% MEDIUM SAND, 30% - 35% CLAY, MODERATELY INDURATED, SLIGHTLY MOIST.

83.5'-88.5' WELL GRADED SAND (SW), VERY PALE ORANGE (10YR 8/2), 30% - 35% FINE SAND, 35% - 40% MEDIUM SAND, 25% - 30% COARSE SAND, 5% - 10% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

88.5'-90' POORLY GRADED SAND (SP), LIGHT BROWN (5YR 5/6), 18% GRAVEL, 23% COARSE SAND, 43% MEDIUM SAND, 10% FINE SAND, 8% SILT AND CLAY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

90'-91' WELL GRADED SAND (SW), LIGHT BROWN (5YR 5/6), 20% - 30% FINE SAND, 40% - 50% MEDIUM SAND, 10% - 15% COARSE SAND, POORLY INDURATED, WET.

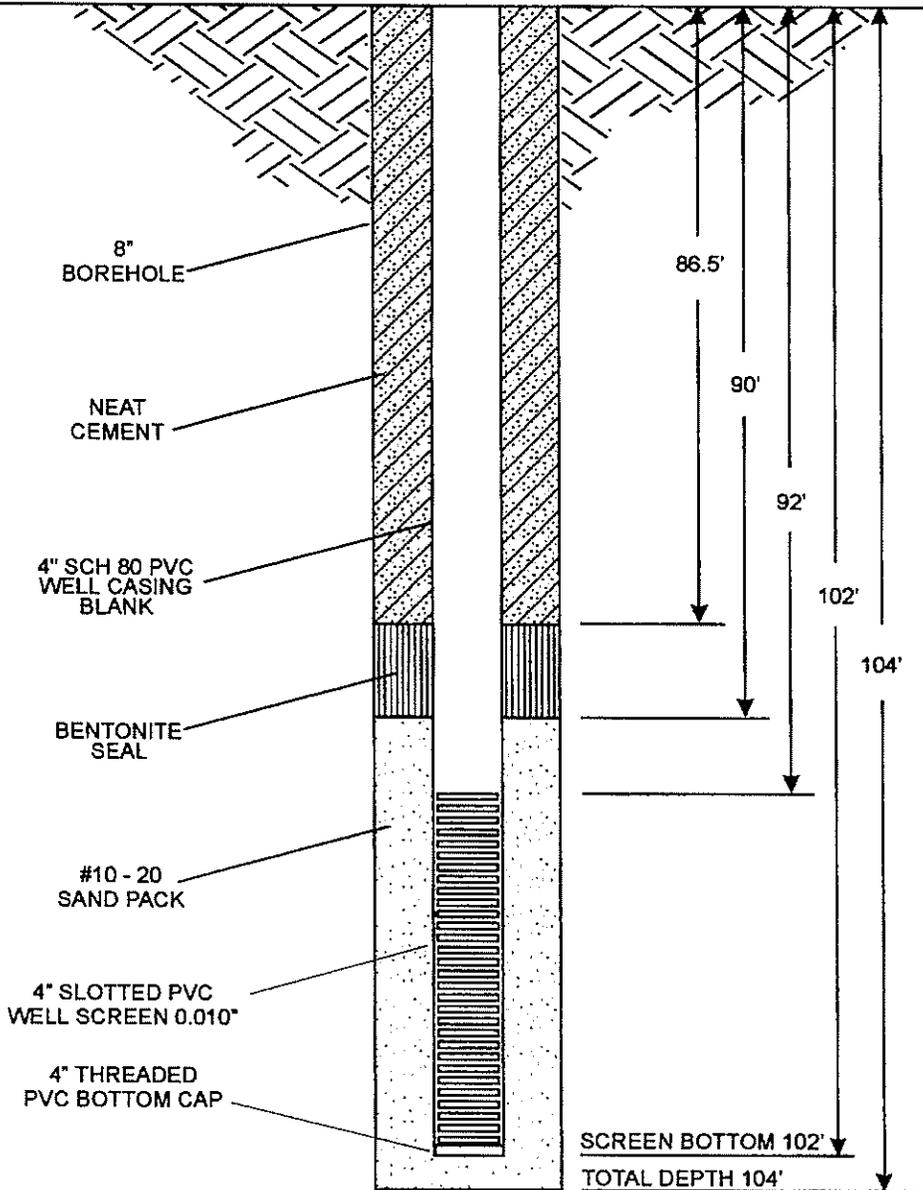
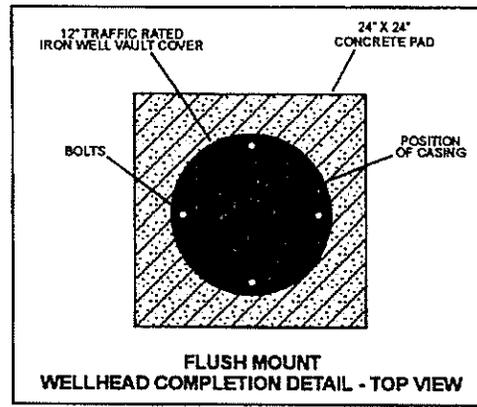
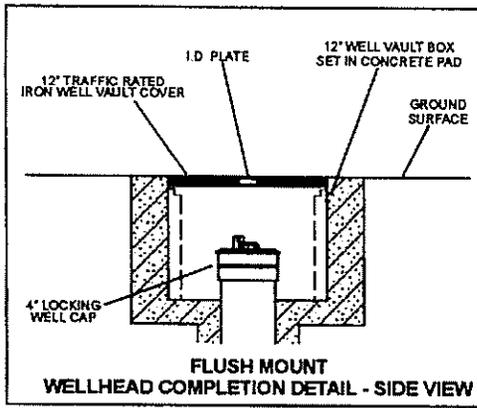
91'-92.5' CLAY (CL), MODERATE BROWN (10YR 4/4), 20% - 25% MEDIUM SAND, 15% - 20% SILT, 50% - 60% CLAY, MODERATELY INDURATED, MOIST.

▽ GROUNDWATER
@ 92', 12/02/00

92.5'-93' WELL GRADED SAND (SW), SIMILAR TO 90'-91'.

93'-96' CLAY (CL), VERY PALE ORANGE (10YR 8/2), 10% - 20% FINE SAND, 20% - 30% SILT, 50% - 60% CLAY, WELL INDURATED, MOIST.

96' END OF BORING.



ADWR WELL REGISTRATION No. 55-584358

NOT TO SCALE



MILLER BROOKS
Environmental, Inc.

PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

AS-BUILT CONSTRUCTION DETAIL OF
PERCHED AQUIFER MONITOR WELL PEP-16

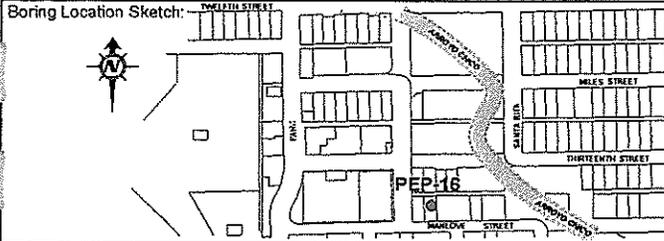
FIGURE
PEP-16A

PROJECT#: 365-0003-03

FILE#: pep16wcd

DATE DRAWN: 04/05/04

DRAWN BY: B. McCLELLAN



Project No: 365-0006-05	Date Drilled: 11-27-00 TO 11-29-00	Boring No. PEP-16 #55-584358
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE	Sheet No. 1 of 3	
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: **ROTONSONIC CONTINUOUS CORE**

Boring Diameter: **8 INCHES**

Casing installation data:	
0' to 92' 4" DIAMETER SCHEDULE 80 PVC BLANK	
92' to 102' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN	
Top of box elevation: 2421.77'	Ground Level Elevation: 2420.61'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
0				-						
				-						
				-						
				0						
				-						
5	PEP16-5		08:50	0						
				0						
				0						
				0						
				1						
10	PEP16-10		09:13	0						
				0						
				0						
				0						
				0						
15	PEP16-15			0						
				0,0						
				0						
				0						
				0						
20	PEP16-20		10:40	0						
				0						
				0						
				0						
				0						
25	PEP16-25		10:50	0						
				0						
				0						
				1						
				0						
30	PEP16-30		11:05	0						
				0						
				-						
				0						
				-						
35				1						

0'-23.5' SILTY SAND (SM), MODERATE BROWN (5YR 4/4), 50% - 70% FINE SAND, 30% - 40% SILT, POORLY INDURATED, MOIST.

SIMILAR TO ABOVE, 5% - 10% GRAVEL.

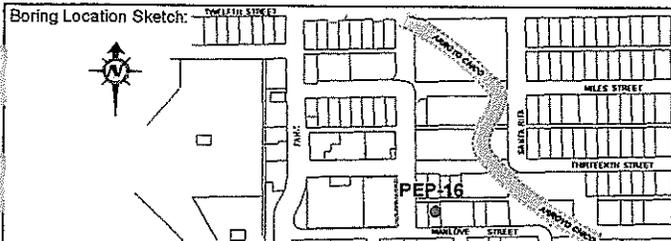
SIMILAR TO ABOVE, 10% - 15% MEDIUM SAND, 10% - 15% COARSE SAND, 40% - 50% SILT.

SIMILAR TO ABOVE, GREYISH PINK (5R 8/2), 50% - 70% FINE SAND, 25% - 35% SILT, 5% - 10% CLAY, POORLY INDURATED, SLIGHTLY MOIST.

23.5'-26.5' WELL GRADED SAND (SW), PALE REDDISH BROWN (10R 5/4), 40% - 50% FINE SAND, 20% - 30% MEDIUM SAND, 10% - 15% COARSE SAND, 5% - 10% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

26.5'-30' CLAY (CL), 5% - 10% MEDIUM SAND, <5% COARSE SAND, 15% - 20% SILT, 30% - 40% CLAY, SLIGHTLY MOIST.

30'-37' WELL GRADED SAND (SW), PALE REDDISH BROWN (10R 5/4), 40% - 50% FINE SAND, 20% - 30% MEDIUM SAND, 10% - 15% COARSE SAND, 5% - 10% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.



Project No: 365-0006-05	Date Drilled: 11-27-00 TO 11-29-00	Boring No. PEP-16 #55-584358
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 2 of 3
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: **ROTOSONIC CONTINUOUS CORE**

Casing installation data:
 0' to 92' 4" DIAMETER SCHEDULE 80 PVC BLANK
 92' to 102' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: **8 INCHES**

Top of box elevation: 2421.77' Ground Level Elevation: 2420.61'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level		
								Time		
								Date		
35	PEP16-35		11:35	0						
				0						
				0						
				0						
40	PEP16-40		13:20	0						
				0						
				0						
				0						
45	PEP16-45		13:22	0						
				0						
				1						
				1						
50	PEP16-50		13:55	-						
				1						
				0						
				0						
				0						
55	PEP16-55		14:10	2						
				-						
				1						
				4						
				7						
60	PEP16-60		14:52	0						
				0						
				3						
				2						
				0						
65	PEP16-65		15:20	1						
				1						
				0						
				-						
70				2						

SIMILAR TO ABOVE, MODERATE ORANGE PINK (5YR 8/4), 35% - 45% FINE SAND, 15% - 20% MEDIUM SAND, 5% - 10% COARSE SAND, 15% - 20% SILT, POORLY INDURATED, SLIGHTLY MOIST.

37'-39' CLAYEY SAND (SC), MODERATE REDDISH ORANGE (10R 6/6), 13% GRAVEL, 8% COARSE SAND, 27% MEDIUM SAND, 16% FINE SAND, 38% SILT AND CLAY, POORLY TO MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

39'-60' SILTY SAND (SM), MODERATE YELLOW BROWN (10YR 5/4), 30% - 40% FINE SAND, 25% - 35% MEDIUM SAND, 25% - 35% SILT, POORLY INDURATED, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 30% - 40% MEDIUM SAND, 15% - 20% COARSE SAND, 15% - 20% SILT.

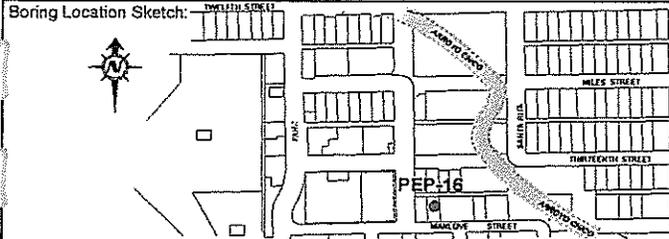
SIMILAR TO ABOVE, GRAVEL CLASTS >3".

SIMILAR TO ABOVE, VERY PALE ORANGE (10 YR 8/2), SOME SILT AND GRAVEL.

60'-62' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 2% GRAVEL, 20% COARSE SAND, 34% MEDIUM SAND, 20% FINE SAND, 24% SILT AND CLAY, LOW PLASTICITY, MODERATELY INDURATED, MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

62'-66' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 20% - 30% FINE SAND, 40% - 60% MEDIUM SAND, POORLY TO MODERATELY INDURATED, SLIGHTLY MOIST.

66'-75' SILTY SAND (SM), 15% - 20% MEDIUM SAND, 30% - 40% SILT, WELL INDURATED.



Project No: 385-0006-05	Date Drilled: 11-27-00 TO 11-29-00	Boring No. PEP-16 #55-584358
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 3 of 3
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: ROTOSONIC CONTINUOUS CORE

Boring Diameter: 8 INCHES

Casing installation data:
 0' to 92' 4" DIAMETER SCHEDULE 80 PVC BLANK
 92' to 102' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Top of box elevation: 2421.77'
 Ground Level Elevation: 2420.61'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	
								Time	Date
70				1					
				0					
				1,2					
				1					
				0					
75	PEP16-75		16:47	1					
				1					
				1					
				2					
				2					
80	PEP16-80		17:05	1					
				2					
				0					
				-					
				0					
85	PEP16-85		08:05	1					
				1					
				1					
				1					
				0					
90	PEP16-90		08:10	0					
				0					
	PEP16-92		08:19	0					
	PEP16-93		08:53	0					
	PEP16-94		08:55	0					
95	PEP16-95		09:18	0					
				1,1					
	PEP16-97		09:20	3					
	PEP16-98		12:40	0					
100	PEP16-100		14:05	0					
				0					
				0					
				0					
105									

62'-75' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 20% - 30% FINE SAND, 15% - 20% MEDIUM SAND, 30% - 40% SILT, WELL INDURATED, SLIGHTLY MOIST.

75'-79' CLAYEY SAND (SC), MODERATE REDDISH BROWN (10R 6/6), 40% - 50% FINE SAND, 10% - 15% MEDIUM SAND, 35% - 40% CLAY, MODERATELY INDURATED, MOIST.

79'-83' POORLY GRADED SAND (SP), MODERATE REDDISH BROWN (10R 6/6), 7% GRAVEL, 24% COARSE SAND, 43% MEDIUM SAND, 13% FINE SAND, 13% CLAY, MODERATE PLASTICITY, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

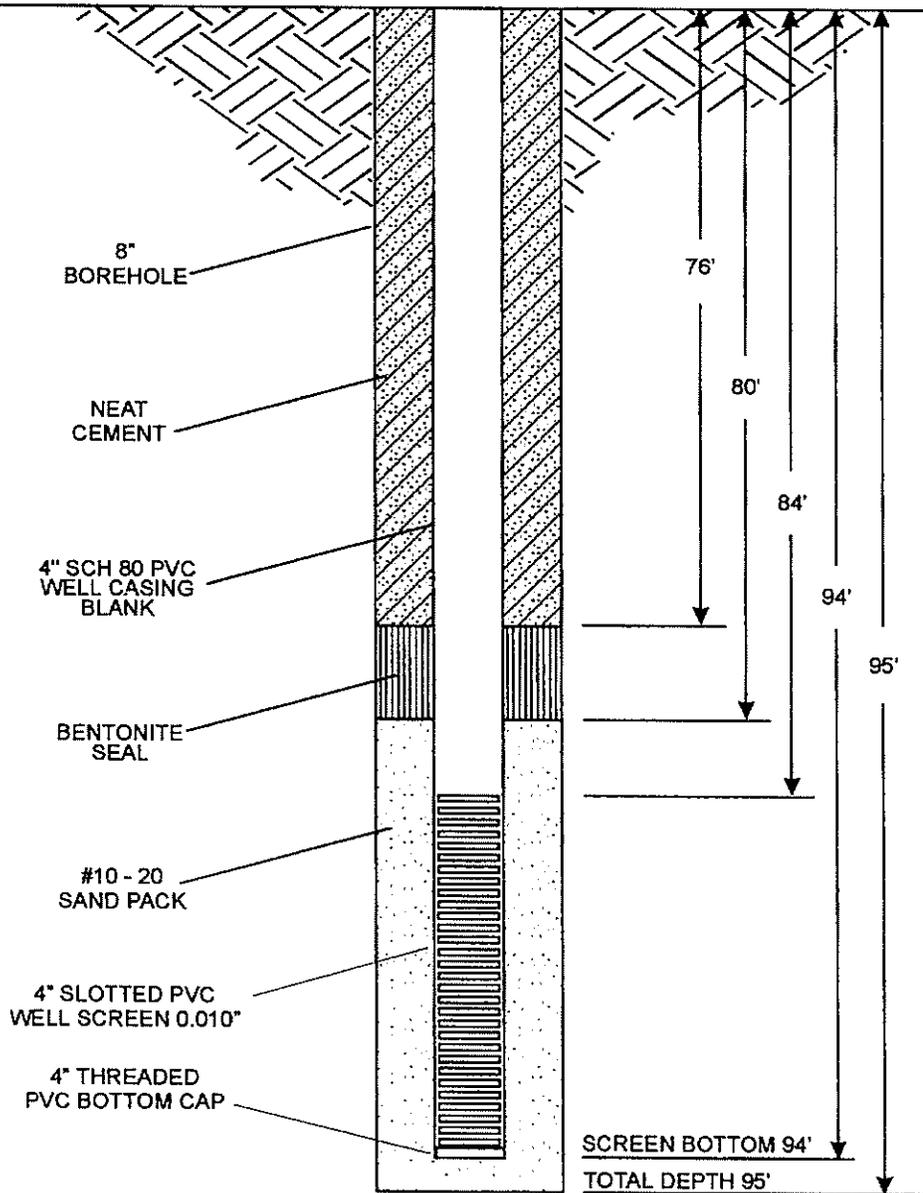
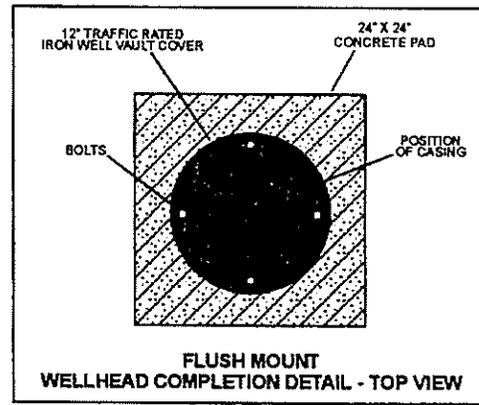
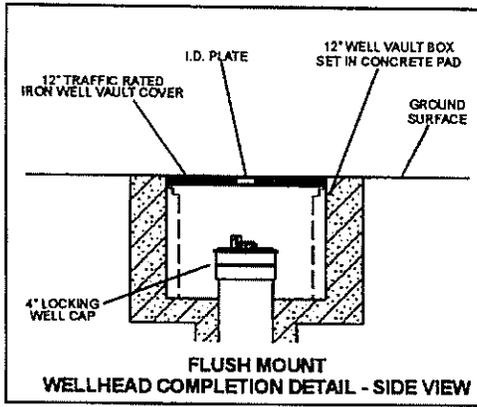
83'-93' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 40% - 50% FINE SAND, 30% - 40% MEDIUM SAND, 5% - 10% COARSE SAND, 5% - 10% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 15% - 20% COARSE SAND, 10% - 15% GRAVEL.

93'-97' CLAYEY SAND (SC) MODERATE BROWN (5YR 4/4), LOW PLASTICITY, SLIGHTLY MOIST, COHESIVE.

▽ GROUNDWATER
 @ 97', 11/28/00
 97'-98' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 50% - 60% FINE SAND, 10% - 15% SILT, 20% - 30% CLAY, POORLY INDURATED, MOIST.
 98'-100' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 1% GRAVEL, 4% COARSE SAND, 11% - MEDIUM SAND, 35% FINE SAND, 49% SILT AND CLAY, MODERATE PLASTICITY, WELL INDURATED, MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE
 SIMILAR TO ABOVE, 10% - 15% FINE SAND, HIGH PLASTICITY.

104' END OF BORING.



ADWR WELL REGISTRATION No. 55-584493

NOT TO SCALE



MILLER BROOKS
Environmental, Inc.

PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

AS-BUILT CONSTRUCTION DETAIL OF
PERCHED AQUIFER MONITOR WELL PEP-17

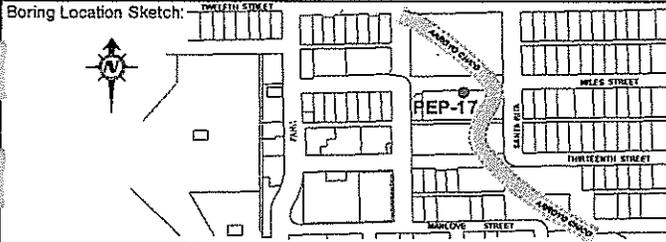
FIGURE
PEP-17A

PROJECT#: 365-0003-03

FILE#: pep17wcd

DATE DRAWN: 04/05/04

DRAWN BY: B. McCLELLAN



Project No: 365-0006-05	Date Drilled: 12-05-00 TO 12-06-00	Boring No. PEP-17
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		#55-584493
Facility: PARK-EUCLID WQARF SITE		Sheet No. 1 of 3
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: BOART LONGYEAR	

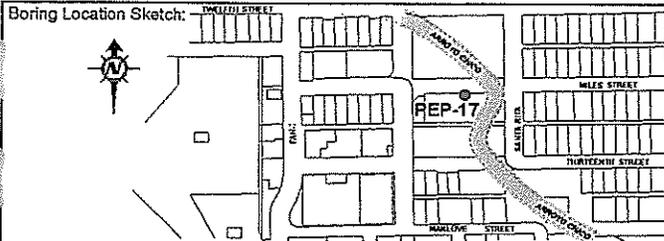
Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:
 0' to 84' 4" DIAMETER SCHEDULE 80 PVC BLANK
 84' to 94' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2415.30'
 Ground Level Elevation: 2414.38'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Water Level			
								Time			
								Date			
0				-				0'-4' WELL GRADED GRAVEL (GW), FILL.			
5	PEP17-5		14:55	0				4'-7' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), POORLY INDURATED, SLIGHTLY MOIST.			
10	PEP17-10		14:57	2				7'-38' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 40% - 50% FINE SAND, 20% - 30% MEDIUM SAND, 5% - 10% COARSE SAND, 5% - 10% SILT, POORLY INDURATED, SLIGHTLY MOIST.			
15	PEP17-15		15:37	0				SIMILAR TO ABOVE, 10% - 15% MEDIUM SAND, 10% - 20% SILT, 15% - 20% GRAVEL.			
20	PEP17-20		15:32	1							
25				1							
30	PEP17-30		18:12	0							
35				2							



Project No: 365-0006-05	Date Drilled: 12-05-00 TO 12-06-00	Boring No. PEP-17 #55-584493
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		Sheet No. 2 of 3
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:	
0' to 84'	4" DIAMETER SCHEDULE 80 PVC BLANK
84' to 94'	4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2415.30'	Ground Level Elevation: 2414.38'
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Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
35				1						
				0,0						
				1						
				0						
40	PEP17-40		18:57	0						
				1						
				1						
				-						
45	PEP17-45		08:10	1						
				2						
				1						
				1						
50				0						
				0						
	PEP17-51		08:45	2						
				0						
				6						
55				0						
				0						
				0						
				0						
				0						
60	PEP17-60		09:17	0						
				0						
				0						
				0						
				0						
65				0						
				0						
				0						
				0						
				0						
70				0						

35'-38' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4, 40% - 50% FINE SAND, 10% - 15% MEDIUM SAND, 5% - 10% COARSE SAND, 10% - 20% SILT, 15% - 20% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

38'-46' CLAY (CL), MODERATE YELLOWISH BROWN (10YR 5/4), 5% - 10% FINE SAND, 5% - 10% SILT, 80% - 90% CLAY, WELL INDURATED, SLIGHTLY MOIST.

46'-49' SILTY SAND (SM), MODERATELY ORANGE PINK (5YR 8/4), 60% - 70% FINE SAND, 10% - 15% MEDIUM SAND, 5% - 10% COARSE SAND, 15% - 20% SILT, 5% - 10% GRAVEL, SLIGHTLY MOIST.

49'-53.5' CLAYEY SAND (SC), MODERATELY YELLOWISH BROWN (10YR 5/4), LOW PLASTICITY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE.

53.5'-57.5' WELL GRADED SAND (SW), MODERATELY ORANGE PINK (5YR 8/4), 30% - 40% FINE SAND, 30% - 40% COARSE SAND, 0% - 5% SILT, 10% - 20% GRAVEL, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 30% - 40% MEDIUM SAND.

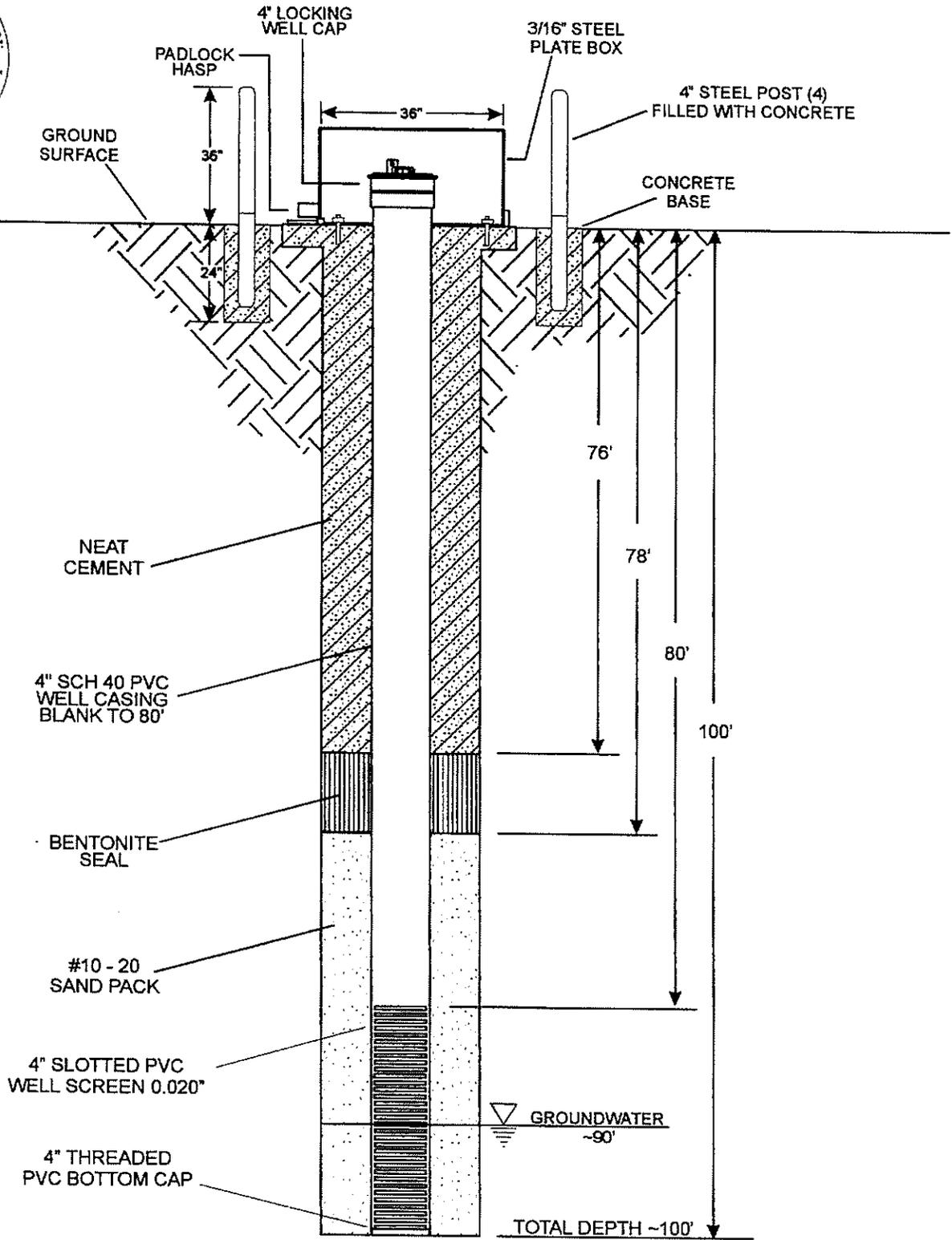
57.5'-59' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 60% - 70% FINE SAND, 20% - 30% COARSE SAND, 10% - 20% CLAY.

59'-60' WELL GRADED SAND (SW), MODERATELY ORANGE PINK (5YR 8/4), 20% - 30% FINE SAND, 40% - 50% MEDIUM SAND, 10% - 20% COARSE SAND, 0% - 5% SILT.

60'-63' SILTY CLAY (ML), MODERATE YELLOWISH BROWN (10YR 5/4), 40% - 50% FINE SAND, 0% - 10% MEDIUM SAND, 40% - 50% CLAY.

63'-70' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 6% GRAVEL, 7% COARSE SAND, 43% - MEDIUM SAND, 11% FINE SAND, 33% SILT AND CLAY, MODERATELY WELL INDURATED, SLIGHTLY MOIST TO MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

SIMILAR TO ABOVE, 10% - 15% FINE SAND, 10% - 15% MEDIUM SAND, 70% - 80% CLAY.



NOT TO SCALE

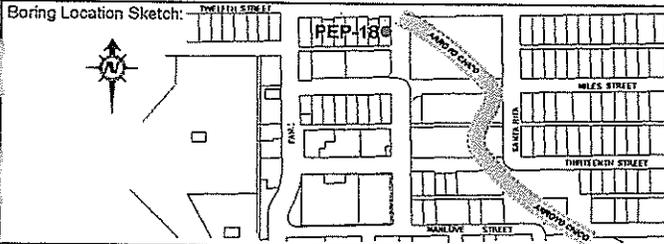


PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

SCHMATIC OF
PERCHED WATER-BEARING INTERVAL MONITOR WELL
PEP-18

FIGURE
PEP-18

PROJECT#: 365-0001-01	FILE#: wcdpep18	DATE DRAWN: 10/26/00	DRAWN BY: B. McCLELLAN
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Project No:	365-0006-05	Date Drilled:	12-07-00 TO 12-07-00	Boring No.	PEP-18
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584492
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				1 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

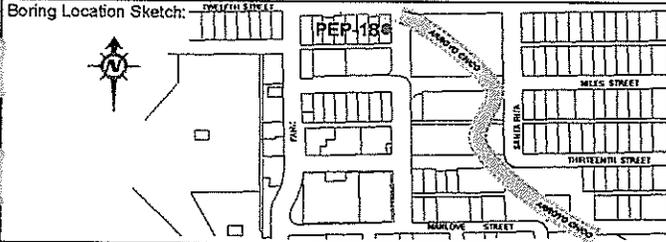
Drilling Method: ROTOSONIC CONTINUOUS CORE

Casing installation data:
 0' to 85.7' 4" DIAMETER SCHEDULE 80 PVC BLANK
 85.7' to 95.7' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Boring Diameter: 8 INCHES

Top of box elevation: 2411.49' Ground Level Elevation: 2410.45'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Time			
			Date								
0				-				0'-3' WELL GRADED GRAVEL (GW), FILL.			
5	PEP18-5		10:02	0				3'-10' POORLY GRADED SAND (SP), LIGHT BROWN (5YR 6/4), 40% GRAVEL, 19% COARSE SAND, 21% MEDIUM SAND, 8% FINE SAND, 12% SILT AND CLAY, POORLY INDURATED, SLIGHTLY MOIST; SIEVE ANALYTICAL REPORT AVAILABLE.			
10	PEP18-10		10:12	0				10'-15' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 25% - 30% FINE SAND, 20% - 25% MEDIUM SAND, 20% - 25% COARSE SAND, 30% - 35% SILT, POORLY INDURATED, SLIGHTLY MOIST.			
15				0				15'-25' SILTY SAND (SM), LIGHT BROWN (5YR 6/4), 60% - 70% FINE SAND, 30% - 40% SILT, 10% - 15% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.			
20	PEP18-20		10:43	0				SIMILAR TO ABOVE, 5% - 10% MEDIUM SAND, 15% - 20% SILT, 15% - 20% GRAVEL.			
25				0,0				25'-26.5' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 35% - 45% FINE SAND, 15% - 20% MEDIUM SAND, 5% - 10% GRAVEL, 20% - 25% CLAY, MODERATELY WELL INDURATED, SLIGHTLY MOIST.			
30	PEP18-30		11:44	0				26.5'-33.5' SILTY SAND (SM), LIGHT BROWN (5YR 5/6), 35% - 45% FINE SAND, 15% - 20% MEDIUM SAND, 5% - 10% GRAVEL, 20% - 25% CLAY, MODERATELY WELL INDURATED, SLIGHTLY MOIST.			
35				0				SIMILAR TO ABOVE, 5% - 10% SILT, <5% CLAY.			
				0				33.5'-39' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 40% - 45% FINE SAND, 30% - 35% MEDIUM SAND, 15% - 20% COARSE SAND, 5% - 10% SILT, 5% - 10% GRAVEL, SLIGHTLY MOIST.			



Project No:	365-0006-05	Date Drilled:	12-07-00 TO 12-07-00	Boring No.	PEP-18
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584492
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				2 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE

Boring Diameter: 8 INCHES

Casing installation data:
 0' to 85.7' 4" DIAMETER SCHEDULE 80 PVC BLANK
 85.7' to 95.7' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Top of box elevation: 2411.49' Ground Level Elevation: 2410.45'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Time			
								Date			
35				0							
				-							
				0							
				0							
40	PEP18-40		12:19	0							
				0							
				0							
				0							
45				0							
				0							
				0							
				10							
50	PEP18-50		14:09	0							
				0							
				0							
				0							
55				-							
				0							
				0							
				3							
				1							
60	PEP18-60		15:06	0							
				3							
				0							
				0							
65				0							
				0							
				0							
				-							
70				0							

33.5'-39' WELL GRADED SAND (SW), LIGHT BROWN (5YR 6/4), 40% - 45% FINE SAND, 30% - 35% MEDIUM SAND, 15% - 20% COARSE SAND, 5% - 10% SILT, 5% - 10% GRAVEL, SLIGHTLY MOIST.

39'-40.5' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 18% GRAVEL, 10% COARSE SAND, 27% MEDIUM SAND, 16% FINE SAND, 29% SILT AND CLAY, LOW PLASTICITY, MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

40.5'-50' POORLY GRADED SAND (SP), LIGHT BROWN (5YR 5/6), 60% - 70% MEDIUM SAND, 20% - 25% COARSE SAND, 15% - 20% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST TO MOIST.

SIMILAR TO ABOVE, 20% - 25% FINE SAND, 30% - 40% MEDIUM SAND, SLIGHTLY MOIST.

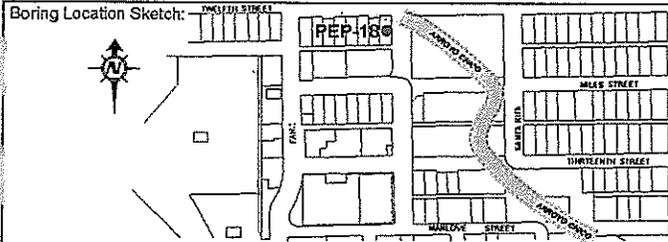
SIMILAR TO ABOVE, <5% CLAY, POORLY TO MODERATELY INDURATED.

50'-52' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE.

52'-59.5' WELL GRADED SAND (SW), VERY PALE ORANGE (10YR 8/2), 25% - 30% FINE SAND, 40% - 50% MEDIUM SAND, 15% - 20% COARSE SAND, 5% - 10% GRAVEL, POORLY INDURATED, SLIGHTLY MOIST.

59.5'-65' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 4% GRAVEL, 24% COARSE SAND, 29% MEDIUM SAND, 14% FINE SAND, 29% SILT AND CLAY, POORLY TO MODERATELY INDURATED, SLIGHTLY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

65'-75.5' CLAY SAND (SC), LIGHT BROWN (5YR 5/6), 30% - 40% FINE SAND, 25% - 35% MEDIUM SAND, 5% - 10% SILT, 15% - 20% CLAY, POORLY INDURATED, SLIGHTLY MOIST.



Project No: 365-0006-05	Date Drilled: 12-07-00 TO 12-07-00	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PEP-18
Facility: PARK-EUCLID WQARF SITE		#55-584492
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		3 of 3
Logged By: J. MEYER	Driller: BOART LONGYEAR	

Drilling Method: ROTOSONIC CONTINUOUS CORE

Boring Diameter: 8 INCHES

Casing installation data:
 0' to 85.7' 4" DIAMETER SCHEDULE 80 PVC BLANK
 85.7' to 95.7' 4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN

Top of box elevation: 2411.49'
 Ground Level Elevation: 2410.45'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
70	PEP18-70		15:56	0						
				0						
				0						
				0						
75				0						
				0						
				0						
				0						
80	PEP18-80		17:08	0						
				0						
				0						
				0						
				0						
85	PEP18-85		17:25	6						
				42						
				-						
	PEP18-88		17:27	42						
				9						
90				57						
				62						
				71						
				18						
95				12						
				9						
100										
105										

65'-75.5' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 30% - 40% FINE SAND, 25% - 35% MEDIUM SAND, 5% - 10% SILT, 15% - 20% CLAY, POORLY INDURATED, SLIGHTLY MOIST.

75.5'-78' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), MODERATE PLASTICITY, MODERATELY TO WELL INDURATED, MOIST, COHESIVE.

78'-81.5' WELL GRADED SAND (SW), MODERATE YELLOWISH BROWN (10YR 5/4), 40% - 50% FINE SAND, 30% - 40% MEDIUM SAND, 20% - 25% COARSE SAND, POORLY INDURATED, VERY MOIST.

81.5'-85' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), MODERATE PLASTICITY, WELL INDURATED, SLIGHTLY MOIST, COHESIVE.

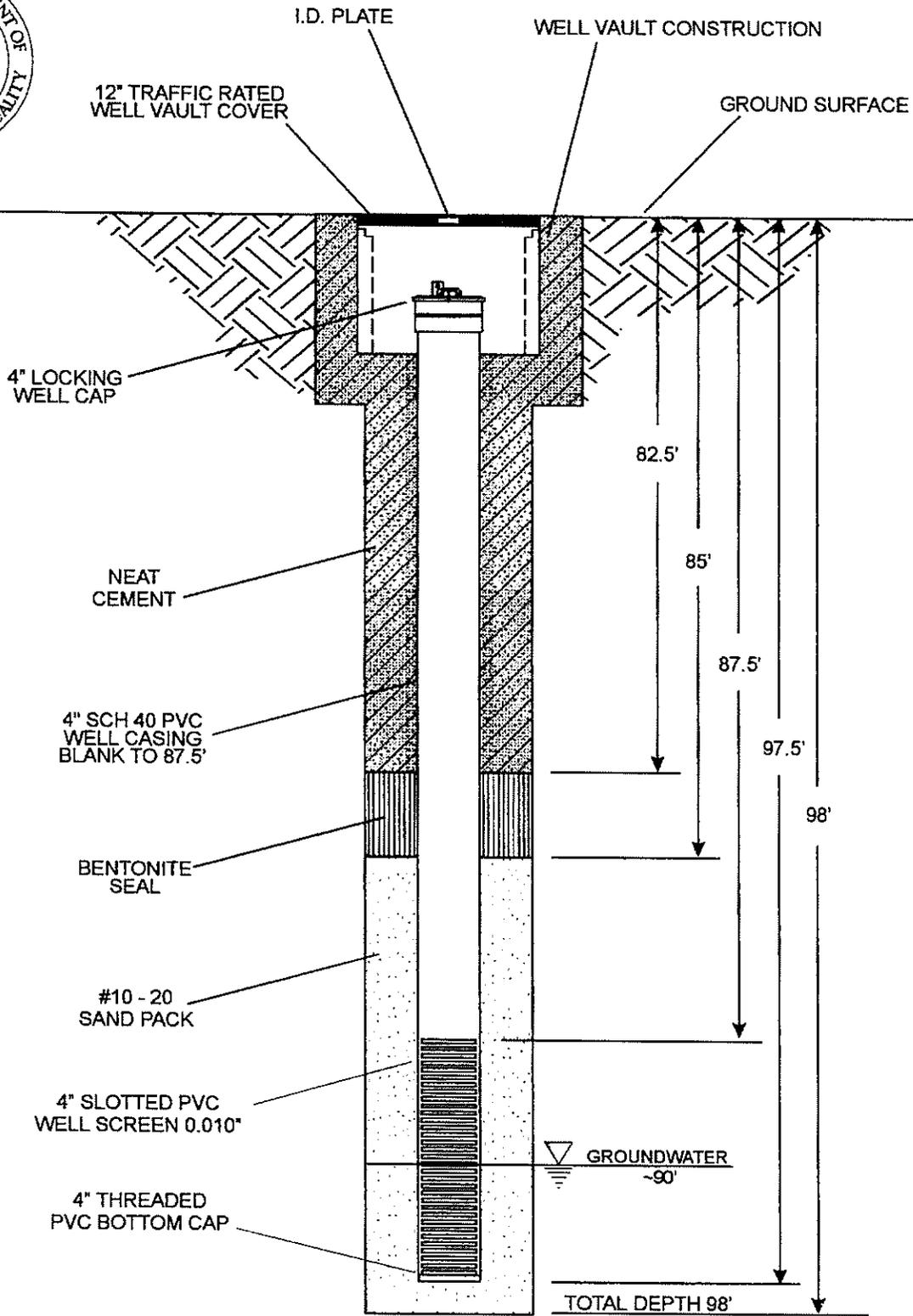
85'-88.5' CLAYEY SAND (SC), GREYISH BROWN (5YR 3/2), PETROLEUM STAINING, 30% - 35% FINE SAND, 30% - 35% MEDIUM SAND, 10% - 15% SILT, 20% - 25% CLAY, POORLY INDURATED, MOIST, VERY STRONG GASOLINE FUEL ODOR.

▽ GROUNDWATER
 @ 89', 12/08/00

88.5'-91.5' POORLY GRADED SAND (SP), GREYISH BROWN (5YR 3/2), 6% GRAVEL, 20% COARSE SAND, 53% MEDIUM SAND, 13% FINE SAND, 8% SILT AND CLAY, PETROLEUM STAINING, POORLY INDURATED, WET, STRONG ODOR OF DIESEL FUEL, COHESIVE, SIEVE ANALYTICAL REPORT AVAILABLE.

91.5'-96' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 3% GRAVEL, 19% MEDIUM SAND, 35% FINE SAND, 43% SILT AND CLAY, HIGH PLASTICITY, WELL INDURATED, MOIST TO VERY MOIST, COHESIVE; SIEVE ANALYTICAL REPORT AVAILABLE.

96' END OF BORING.



NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF
PERCHED AQUIFER MONITOR WELL PEP-19

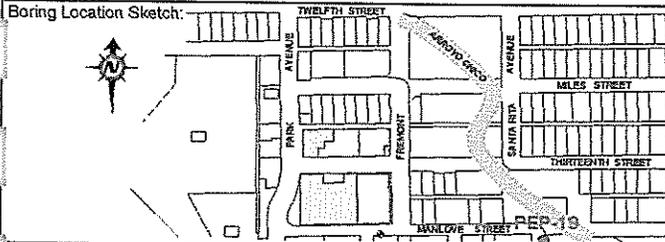
FIGURE
PEP-19

PROJECT#: 365-0005-05

FILE#: pep19wcd

DATE DRAWN: 07/28/02

DRAWN BY: B. McCLELLAN



Project No:	365-0003-04	Date Drilled:	05-06-02 TO 05-07-02	Boring No.	PEP-19
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591466
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				3 of 3
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER / D. GEORGE	Driller:	YELLOW JACKET DRILLING		

Drilling Method: HOLLOW STEM AUGER, BK-81
Boring Diameter: 12 INCHES

Casing installation data:	
0' to 87.5'	4" DIAMETER SCHEDULE 80 PVC BLANK
87.5' to 97.5'	4" DIAMETER SCHEDULE 80 PVC 0.010" SLOTTED SCREEN
Top of casing elevation:	2418.38'
Ground Level Elevation:	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
70	PEP19-70		13:30	0.0	15,25,32		
75	PEP19-75		13:55	0.0	23,24,36		
80	PEP19-80		14:27	0.0	27,36,28		
85	PEP19-85		15:11	0.0	40,50/6"		
	PEP19-87		15:21	0.0	26,27,39		
	PEP19-88		15:53	0.0	10,27,36		
90	PEP19-89		16:14	0.0	15,22,50		
	PEP19-91		07:45	0.0	28,35,38		
	PEP19-93		08:06	0.0	27,38,50		
95	PEP19-94		08:19	0.0	38,50/6"		
	PEP19-95		08:33	0.0	28,40,50/3"		
	PEP19-96		08:47	0.0	15,15,50/3"		
100							
105							

Water Depth	93.55'	93.74'
Time		
Date	05-14-02	06-08-02

65'-71' SANDY CLAY (CL), MODERATE BROWN (5YR 4/4), 50-60% CLAY, 25-30% FINE SAND, 15-25% MEDIUM SAND, LOW PLASTICITY, SLIGHTLY MOIST.
71'-82' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 4/2), 20-25% CLAY, 45-50% FINE SAND, 25-30% MEDIUM SAND, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 10-15% CLAY, 5-10% SILT, 5-10% COARSE SAND, WELL GRADED, SOME 1/2" GRAVEL ROCK CLASTS.

SIMILAR TO ABOVE, MODERATE BROWN (5YR 4/4), 40-45% CLAY, 30-35% FINE SAND, 10-15% MEDIUM SAND, LOW PLASTICITY.

82'-84' SAND (SP), DARK YELLOWISH BROWN (10YR 4/2), 10-15% SILT, 50-60% FINE SAND, 15-20% MEDIUM SAND, POORLY GRADED, MEDIUM DENSE, SLIGHTLY MOIST.

84'-85' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 40-45% CLAY, 30-35% FINE SAND, 10-15% MEDIUM SAND, LOW PLASTICITY.
85'-87' SAND (SW), LIGHT BROWN (5YR 5/6), 25-30% FINE SAND, 30-35% MEDIUM SAND, 35-40% COARSE SAND, WELL GRADED, DRY.

87'-90' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (5YR 5/4), 30-35% CLAY, 30-35% FINE SAND, 25-30% MEDIUM SAND, SLIGHTLY MOIST.

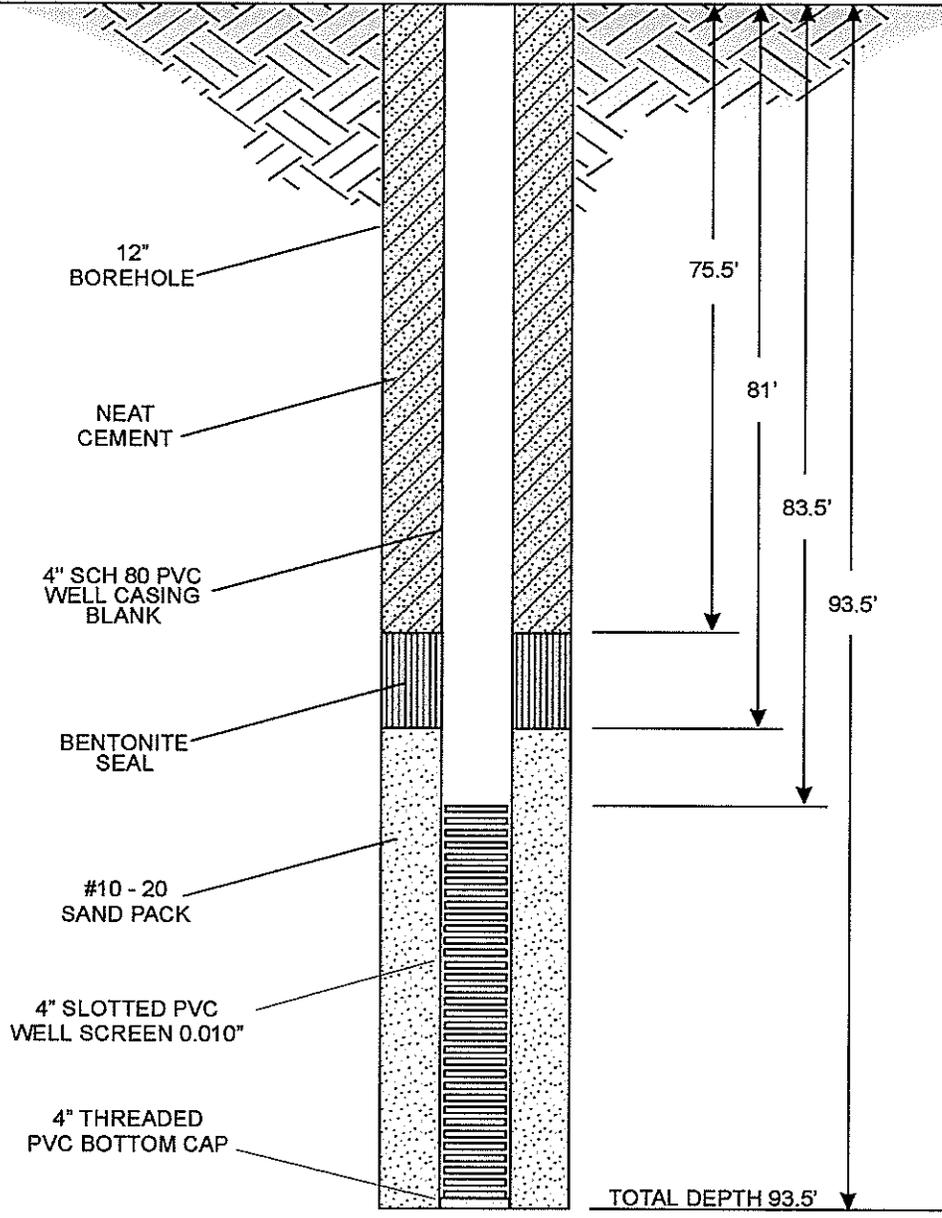
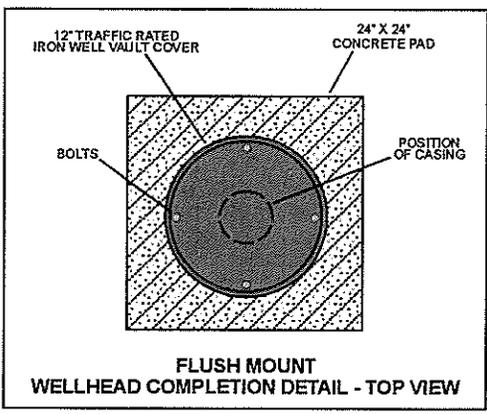
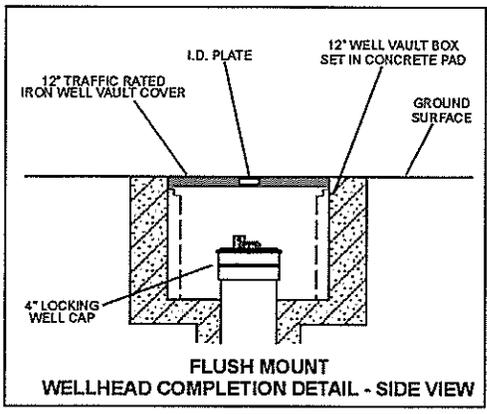
90'-92' SAND (SW), GREYISH ORANGE PINK (5YR 7/2), 30-35% FINE SAND, 45-50% MEDIUM SAND, 10-15% COARSE SAND, DENSE, SLIGHTLY MOIST.

92'-94' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 20-25% CLAY, 35-40% FINE SAND, 30-35% MEDIUM SAND, WELL INDURATED, SLIGHTLY MOIST.

94'-96' SAND (SW), GREYISH ORANGE (10YR 7/4), 20-25% FINE SAND, 30-35% MEDIUM SAND, 35-40% COARSE SAND, POORLY INDURATED, WET.

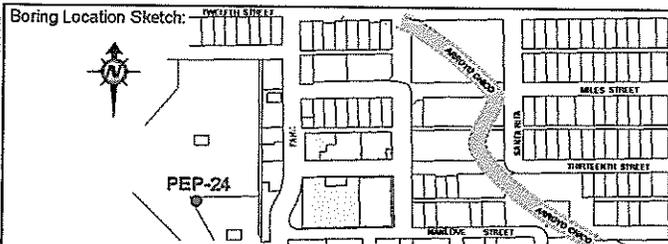
96'-98' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 20-25% CLAY, 20-25% FINE SAND, 30-35% MEDIUM SAND, 20-25% COARSE SAND, WELL INDURATED, SLIGHTLY MOIST.

98' END OF BORING.



NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
AS-BUILT CONSTRUCTION DETAIL OF PERCHED AQUIFER MONITOR WELL PEP-24				FIGURE PEP-24
PROJECT#: 365-0003-03	FILE#: pep24wod	DATE DRAWN: 09/30/02	DRAWN BY: B. McCLELLAN	



Project No: 365-003-09	Date Drilled: 11/29/02	Boring No. PEP-24
Client: Arizona Department of Environmental Quality	Facility: Project Moore	
Location: 440 South Park	City: Tucson	Sheet No. 1 of 3
Logged By: John Meyer	Driller: Yellow Jacket Drilling	

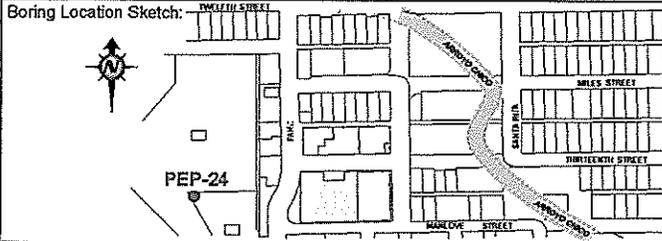
Drilling Method: **HOLLOW STEM AUGER**

Casing installation data:
 0-83.5' 4" DIAMETER SCHEDULE 80 PVC, BLANK
 83.5-93.5' 4" DIAMETER SCHEDULE 80 PVC, 0.010" SLOTTED SCREEN

Boring Diameters: 12'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level	
								Time	
								Date	
0								Grass Cover Asphalt Layer 2' at 1'.	
5				0.0	27-50/5"			SM Fill Material; Silty Sand; Grayish orange pink (5YR 8/4)	
10				0.0	10-11-11			CL Fill Material; Silty Clay; 1 inch x 1 inch chunk of Basalt	
15				0.0	10-50/5"			Gradational contact SW Sand; Greyish orange (10YR 7/4); Medium Sand (45-50%); Coarse Sand (35-40%); Fine Sand (20-25%); Dry; Subangular	
20				0.0	35-50/2"			CL Silty Clay; Very pale orange (10YR 8/2)	
25				0.0	47-50/5"			Increasing in sand. Fine sand (25-30%); Light Brown (5YR 6/4).	
30				0.1	42-22/33"			Gradational contact SW Sand with gravel; Pale yellowish brown (10YR 6/2); Fine Sand (25-30%); Medium Sand (25-30%); Coarse Sand (25-30%); Gravel 1/4-1/3" diameter (15-20%); Silt (5-10%)	
35				0.1	20-25/35"			No silt; increase gravel 1/4-1" (20-25%)	



Project No: 365-003-09	Date Drilled: 11/29/02	Boring No. PEP-24
Client: ADEQ	Facility: Project Moore	
Location: 440 South Park	City: Tucson	Sheet No. 2 of 3
Logged By: John Meyer	Driller: Yellow Jacket Drilling	

Drilling Method: **HOLLOW STEM AUGER**

Casing installation data:
 0'-83.5' 4" DIAMETER SCHEDULE 80 PVC, BLANK
 83.5'-93.5' 4" DIAMETER SCHEDULE 80 PVC, 0.010" SLOTTED SCREEN

Boring Diameters: 12"

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level						
								Time						
								Date						
35														
40				0.1	15-20-20									
45				0.5	40-45-37									
50				0.3	20-35-37									
55				0.2	20-25-37									
60				0.2	26-25-30									
65				0.0	28-32-30									
70				0.2	30-35-40									

SC Clayey Sand; Light Brown (5YR 5/6); Fine Sand (45-50%); Medium Sand (20-25%); Clay (20-25%); Some 1/4-1/2" gravel rock clast (5-10%).

Gradational contact
 SW Sand; Pale yellowish brown (10YR 6/2); Fine Sand (35-40%); Medium Sand (30-35%); Coarse Sand (15-20%); Silt (5-10%); Light Moist; Very Dense; Micaceous.

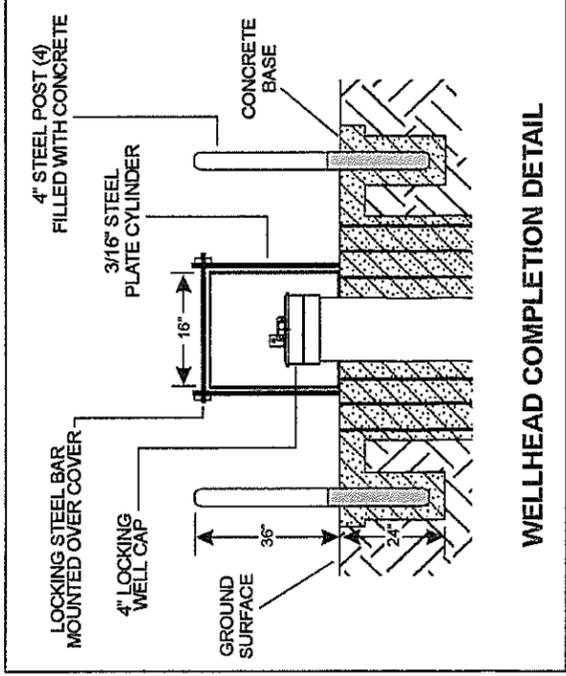
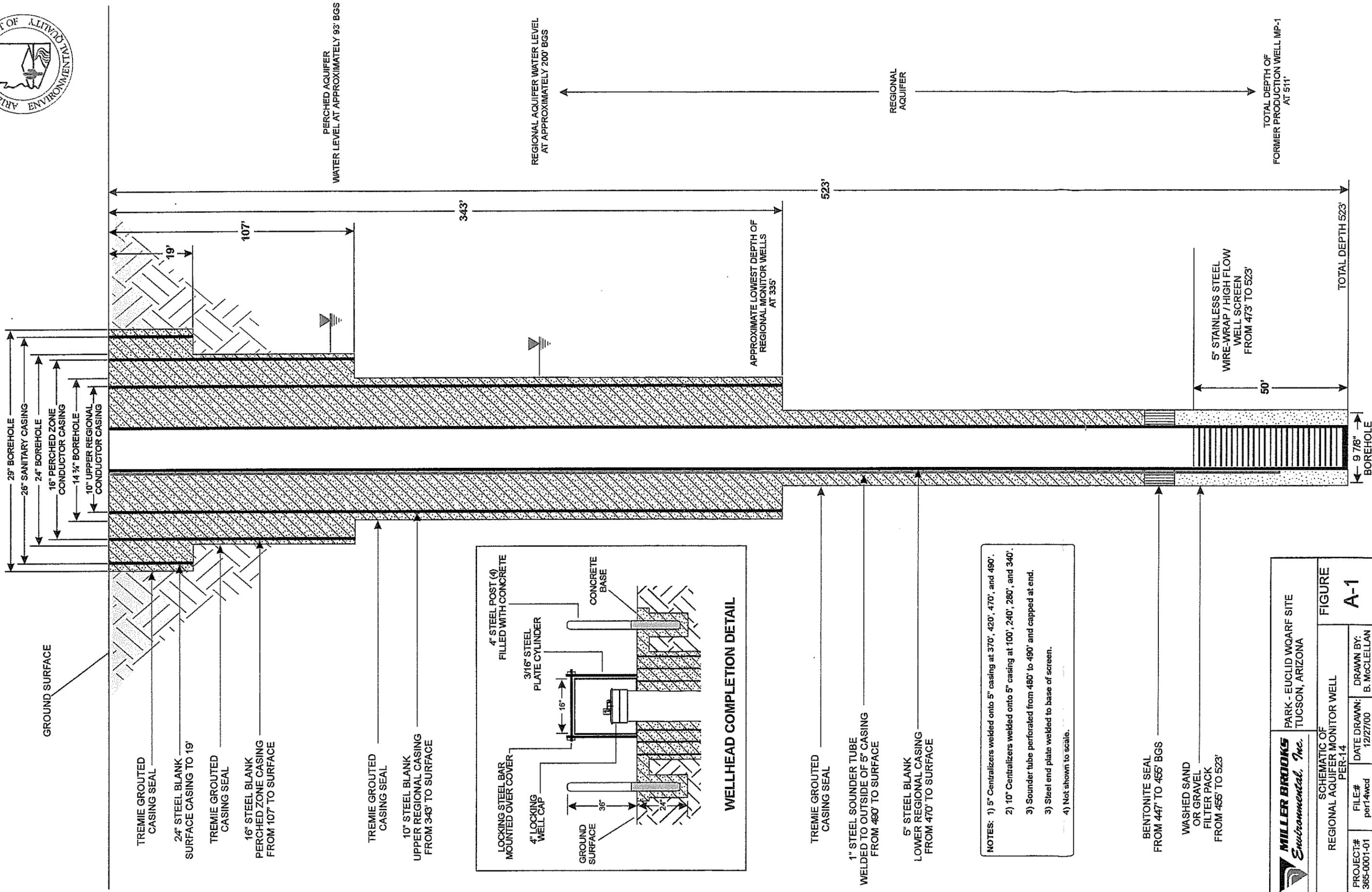
Light Brown (5YR 6/4)

SC Clayey Sand; Moderate Yellowish Brown (10YR 6/2); Fine Sand (40-50%); Moderate Sand (10-15%)
 Gradational contact.

SW Gravelly Sand; Light brown (5YR 6/4); Fine sand (35-40%); Medium Sand (25-30%); Coarse Sand (20-25%); Gravel (15-20%)

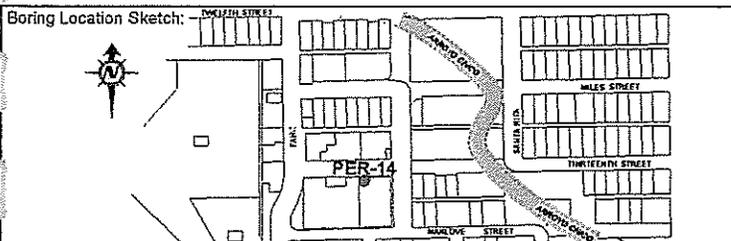


SEE WELL HEAD COMPLETION DETAIL



- NOTES:**
- 1) 5" Centralizers welded onto 5" casing at 370', 420', 470', and 490'.
 - 2) 10" Centralizers welded onto 5" casing at 100', 240', 280', and 340'.
 - 3) Sounder tube perforated from 480' to 490' and capped at end.
 - 3) Steel end plate welded to base of screen.
 - 4) Not shown to scale.

		PARK - EUCLID WQARF SITE TUCSON, ARIZONA	
PROJECT# 365-0001-01		FILE# per14wcd	
DATE DRAWN: 12/27/00		DRAWN BY: B. McCLELLAN	
REGIONAL AQUIFER MONITOR WELL PER-14		SCHEMATIC OF REGIONAL AQUIFER MONITOR WELL	
PER-14		FIGURE A-1	



Project No:	365-0006-05	Date Drilled:	11-13-00 TO 12-04-00	Boring No.	PER-14
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584496
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				1 of 15
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

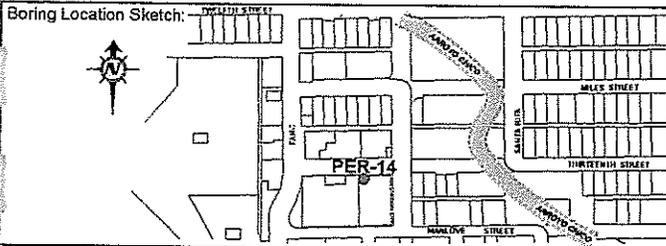
Drilling Method: ROTOSONIC CONTINUOUS CORE / MUD ROTARY

Casing installation data:
SEE WELL COMPLETION DETAIL

Boring Diameters: 10", 14 3/4", 16", 24", 26", AND 29"

Top of box elevation: 2420.36'
Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level
								Time
								Date
0				-				0'-6" CLAYEY SAND (SC), FILL, RED/BLACK (10YR 4/4), <5% ORGANICS, MOIST.
5	PER14-5		13:05	0				SIMILAR TO ABOVE, ASPHALT AND GLASS PARTICLES.
10	PER14-10		13:12	0				6'-11.5' CLAYEY SAND (SC), RED-BROWN (10YR 4/4), 40% - 50% FINE SAND, 10% - 15% MEDIUM SAND, 15% - 20% SILT, 25% - 35% CLAY, SLIGHTLY MOIST.
15	PER14-15		13:25	0				11.5'-14.5' SILTY SAND (SM), RED-BROWN (10YR 4/4), 40% - 50% FINE SAND, 30% - 40% SILT, 15% - 20% CLAY, SLIGHTLY MOIST.
20	PER14-20		14:17	0				14.5'-18' POORLY GRADED SAND (SP), RED-BROWN (10YR 4/4), 20% - 30% MEDIUM SAND, 35% - 45% COARSE SAND, SLIGHTLY MOIST.
25	PER14-25		14:26	0				18'-20' CLAYEY SAND (SC), PINK-WHITE (10R 8/2), SOME CALICHE, SLIGHTLY MOIST, COHESIVE.
30	PER14-30		14:56	0				BASE OF 26" STEEL SANITARY OUTER CASING AT 19'. THE 16" AND 10" STEEL CONDUCTOR CASINGS CONTINUE DOWN. 20'-34' POORLY GRADED SAND (SP), RED-BROWN (10YR 4/4), 20% - 30% MEDIUM SAND, 35% - 45% COARSE SAND, 25% - 35% GRAVEL, SLIGHTLY MOIST.
35				0				SIMILAR TO ABOVE, DECREASED COARSE SAND (10% - 15%) AND GRAVEL (5% - 10%), INCREASED MEDIUM GRAINED SAND (55% - 65%), SILT (10% - 15%).
				0				SIMILAR TO ABOVE, INCREASED COARSE SAND (25% - 35%), DECREASED MEDIUM GRAINED SAND (40% - 50%).
				0				SIMILAR TO ABOVE, DECREASED COARSE SAND (15% - 20%), INCREASED SILT (20% - 30%).
				0				34'-40' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), MODERATELY INDURATED, SLIGHTLY MOIST.



Project No:	365-0006-05	Date Drilled:	11-13-00 TO 12-04-00	Boring No.	
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			Boring No.	PER-14
Facility:	PARK-EUCLID WQARF SITE			Boring No.	#55-584496
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			Sheet No.	
City:	TUCSON, ARIZONA			Sheet No.	2 of 15
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE / MUD ROTARY

Casing installation data: SEE WELL COMPLETION DETAIL

Boring Diameter: 10", 14 3/4", 16", 24", 26", AND 29"

Top of box elevation: 2420.36'

Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Time			
			Date								
35				0				34'-40' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), MODERATELY INDURATED, SLIGHTLY MOIST.			
				0							
				0							
				-							
40	PER14-40		15:35	3				SIMILAR TO ABOVE, SLIGHT INCREASE IN FINE SAND (25% - 35%), DECREASE IN CLAY (10% - 15%), SOME MEDIUM GRAINED SAND (<5%).			
				0				40'-46' POORLY GRADED SAND (SP), PALE BROWN (10R 5/4), 20% - 25% FINE SAND, 50% - 60% MEDIUM SAND, 10% - 15% SILT, MOIST.			
				0				SIMILAR TO ABOVE, 4" GRAVEL ROCK CLASTS, PLAGIOCLASE, QUARTZ, AND MICA MINERALS.			
				-							
45	PER14-45		15:52	2				45'-46' SILTY SAND (SM), 30% - 40% SILT, 25% - 35% FINE SAND, 30% - 40% MEDIUM SAND.			
				4				46'-58' WELL GRADED SAND (SW), PALE BROWN (10R 5/4), 20% - 30% FINE SAND, 30% - 40% MEDIUM SAND, 25% - 35% COARSE SAND, 5% - 10% SILT, MOIST.			
				2							
				-							
50	PER14-50		16:15	0							
				1							
				3							
				-							
				4							
55	PER14-55		16:45	6				SIMILAR TO ABOVE, 10% - 15% GRAVEL ROCK CLASTS.			
				0							
				2							
				-							
60	PER14-60		17:05	4				58'-61' SILTY SAND (SM), 10% - 15% COARSE SAND, 20% - 25% SILT, <5% CLAY.			
				10				61'-66' CLAYEY SAND (SC), PALE RED (10R 5/4), 35% - 40% FINE SAND, 20% - 25% MEDIUM, 5% - 10% SILT, 25% - 35% CLAY, SLIGHTLY MOIST.			
				-							
				10							
				-							
65	PER14-65		08:11	31				SIMILAR TO ABOVE, INCREASED MEDIUM GRAINED SAND (15% - 20%).			
				0				66'-72.5' POORLY GRADED SAND (SP), 30% - 35% FINE SAND, 45% - 55% MEDIUM SAND, 10% - 15% COARSE SAND, SLIGHTLY MOIST.			
				6				SIMILAR TO ABOVE, GRAVEL (5% - 10%).			
				-							
70				3				SIMILAR TO ABOVE, FEW GRAVEL (<5%).			

FIELD EXPLORATORY BORING LOG



Project No:	365-0006-05	Date Drilled:	11-13-00 TO 12-04-00	Boring No.	PER-14
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584496
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				3 of 15
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	BOART LONGYEAR		

Drilling Method: ROTOSONIC CONTINUOUS CORE / MUD ROTARY

Boring Diameter: 10", 14 3/4", 16", 24", 26", AND 29"

Casing installation data:
SEE WELL COMPLETION DETAIL

Top of box elevation: 2420.36'

Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
70				1						
				19						
				10						
				-						
				10						
75	PER14-75		09:02	13						
				7						
				17						
				-						
				30						
80	PER14-80		10:03	12						
	PER14-81		11:23	24						
	PER14-82		11:23	7						
				-						
	PER14-84		11:23	6						
85	PER14-85		11:23	3						
	PER14-86		11:42	4						
	PER14-87		11:42	2						
				-						
	PER14-89		11:42	9						
90	PER14-90		11:42	5						
	PER14-91		11:47	18						
	PER14-92		11:47	2						
				-						
	PER14-94		11:47	8						
95	PER14-95		11:47	8						
	PER14-96		12:35	12						
	PER14-97		12:35	9						
				-						
	PER14-99		12:35	5						
100	PER14-100		12:35	3						
	PER14-101		15:18	0						
	PER14-102		15:18	0						
				-						
105	PER14-104		15:18	1						

SIMILAR TO ABOVE, INCREASED FINE SAND.

72.5'-79' LOW PLASTICITY CLAY (CL), RED-BROWN (10R 3/4), 10% - 15% FINE SAND, 20% - 30% SILT, MODERATELY WELL INDURATED, SLIGHTLY MOIST.

SIMILAR TO ABOVE, INCREASED SAND (25% - 35%), DECREASED CLAY (45% - 55%).

79'-89' SILTY SAND (SM), PALE BROWN (10R 3/4), 35% - 45% FINE SAND, 45% - 55% MEDIUM SAND, 15% - 20% SILT, SLIGHTLY MOIST.

SIMILAR TO ABOVE, 4" GRAVEL CLASTS, INCREASED FINE GRAINED SAND.

SIMILAR TO ABOVE, INCREASED GRAVEL (20% - 30%).

89'-97' CLAYEY SAND (SC), RED BROWN (10 YR 4/4), 11% GRAVEL, 5% COARSE SAND, 45% - MEDIUM SAND, 15% FINE SAND, 24% SILT AND CLAY, MEDIUM PLASTICITY, MODERATELY INDURATED, MOIST; SIEVE ANALYTICAL REPORT AVAILABLE.

▽ GROUNDWATER @ 94', 11/14/00

FREE PRODUCT 0.01' THICK, SOIL HAS BLACK PETROLEUM STAINS AND ODOR FROM 94' TO 100'.

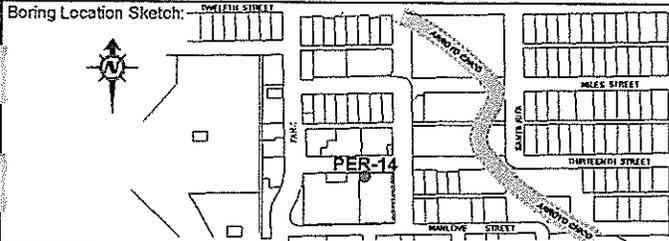
SIMILAR TO ABOVE, INCREASED CLAY (20% - 30%).

97'-98' CLAYEY SAND (SC), RED BROWN (10 YR 4/4), 24% GRAVEL, 6% COARSE SAND, 11% - MEDIUM SAND, 23% FINE SAND, 36% SILT AND CLAY, POORLY INDURATED, MOIST; SIEVE ANALYTICAL REPORT AVAILABLE.

98'-101' CLAYEY SAND (SC), RED-PINK (5 YR 7/2), 6% GRAVEL, 9% COARSE SAND, 20% MEDIUM SAND, 21% FINE SAND, 44% SILT AND CLAY, WELL INDURATED, SLIGHTLY MOIST; SIEVE ANALYTICAL REPORT AVAILABLE.

SIMILAR TO ABOVE, DECREASED MEDIUM SAND (5% - 10%), INCREASED CLAY AND SILT.

101'-118' CLAY (CL), MODERATE BROWN (5 YR 4/4), 9% GRAVEL, 3% COARSE SAND, 10% - MEDIUM SAND, 19% FINE SAND, 59% SILT AND CLAY, HIGH PLASTICITY, WELL INDURATED, SLIGHTLY MOIST, COHESIVE, SIEVE ANALYTICAL REPORT AVAILABLE.



Project No: 365-0006-05	Date Drilled: 11-13-00 TO 12-04-00	Boring No. PER-14 #55-584496
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 9 of 15
Logged By: R. TAYLOR	Driller: BOART LONGYEAR	

Drilling Method: ROTOSONIC CONTINUOUS CORE / MUD ROTARY

Casing installation data:
SEE WELL COMPLETION DETAIL

Boring Diameter: 10", 14 1/4", 16", 24", 28", AND 29"

Top of box elevation: 2420.36'
Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	
								Time	Date
280									
	PER14-281		13:49 11-28-00	0.0					
285									
290									
295									
300									
	PER14-300		16:51 11-28-00						
305									
310				0.0					
315									

275'-281' SILTY SAND (SM), (5 YR 6/4), 50% SAND, 30% SILT, 15% GRAVEL, 5% CLAY.
 281'-282' CLAYEY SANDY SILT (ML), (5 YR 5/4), 60% SILT, 20% CLAY, 10% SAND, 10% GRAVEL.
 282'-290' POORLY GRADED SAND (SP), (10 YR 8/2), 95% SAND, 5% SILT, WELL INDURATED.

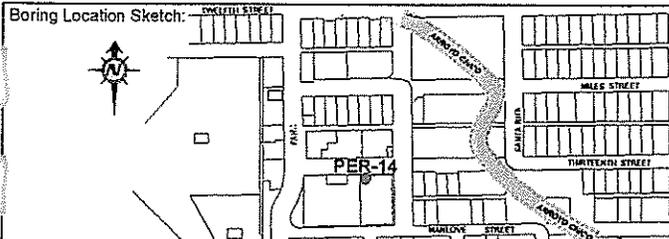
290'-291' SILTY SAND (SM), (5 YR 6/6), 60% MEDIUM TO COARSE SAND, 35% FINE SAND AND SILT, 5% GRAVEL.
 291'-293' SILT (ML), (5 YR 6/6), 85% FINES, 15% SAND.

293'-299' POORLY GRADED SAND (SP), (5 YR 7/2), ANGULAR, MUSCOVITE.

SIMILAR TO ABOVE, VERY FINE GRAINED SAND.

299'-326' SILTY SAND (SM), (5 YR 7/4), POORLY GRADED, SUBANGULAR, 70% MEDIUM TO COARSE SAND, 30% FINE SAND AND SILT.

SIMILAR TO ABOVE, (5 YR 6/2), 80% MEDIUM SAND, SUBANGULAR, POORLY SORTED.



Project No: 365-0006-05	Date Drilled: 11-13-00 TO 12-04-00	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PER-14
Facility: PARK-EUCLID WQARF SITE		#55-584496
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		13 of 15
Logged By: R. TAYLOR	Driller: BOART LONGYEAR	

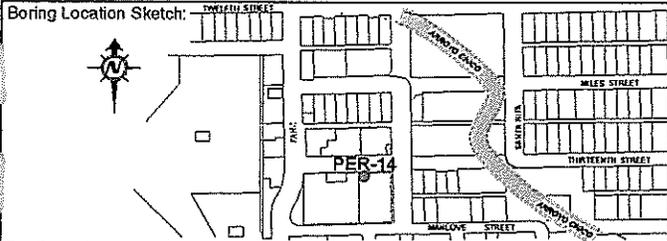
Drilling Method: ROTOSONIC CONTINUOUS CORE / MUD ROTARY

Casing installation data:
SEE WELL COMPLETION DETAIL

Boring Diameter: 10", 14 3/4", 16", 24", 28", AND 29"

Top of box elevation: 2420.36'
Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	
								Time	Date
420	PER14-420		16:45 11-30-00	0.0					418'-423' POORLY GRADED SAND AND CLAY (SP/CL), (5 YR 4/4), WITH GRAVEL AND MICA.
425									423'-428' CLAY (CL), (5 YR 4/4), WITH SILT AND LITTLE GRAVEL, PLASTIC, STIFF, INDURATED.
430									428'-441' POORLY GRADED SAND AND CLAY (SP/CL), (5 YR 4/4), PLASTIC.
435									SIMILAR TO ABOVE, WELL INDURATED CALICHE SAND.
440				0.0					441'-447' CLAY (CL), (5 YR 4/4), WITH SILT, HARD.
445									SIMILAR TO ABOVE, SOFT. SIMILAR TO ABOVE, HARD.
450				0.0					447'-452' POORLY GRADED SAND AND CLAY (SP/CL), (5 YR 5/6).
455									452'-455' POORLY GRADED SAND (SP), (5 YR 5/6), MEDIUM TO COARSE GRAINED, SUBANGULAR, VERY MAFIC.



Project No: 365-0006-05	Date Drilled: 11-13-00 TO 12-04-00	Boring No. PER-14 #55-584496
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 15 of 15
Logged By: R. TAYLOR	Driller: BOART LONGYEAR	

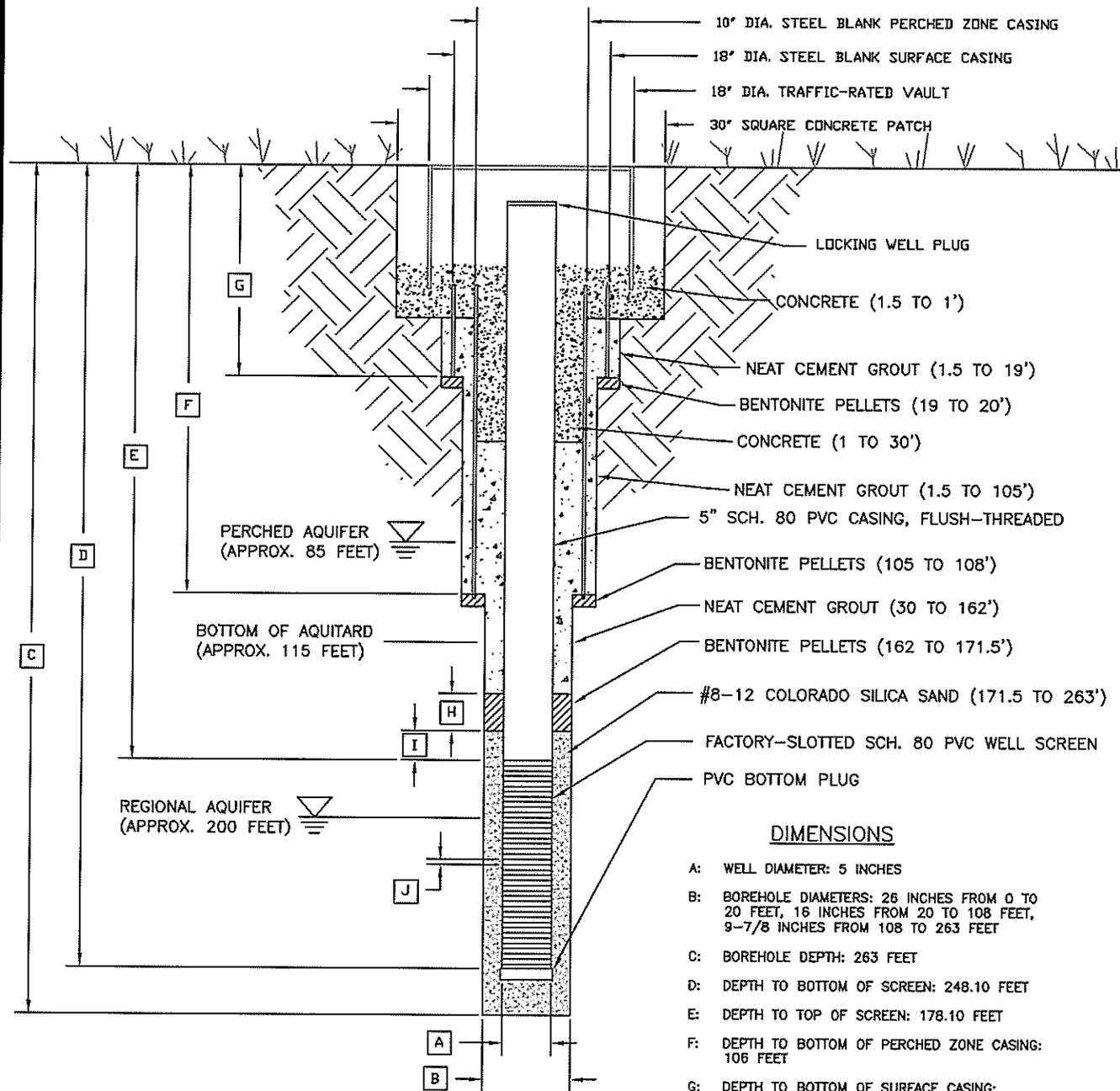
Drilling Method: ROTOSONIC CONTINUOUS CORE / MUD ROTARY

Casing installation data:
SEE WELL COMPLETION DETAIL

Boring Diameter: 10", 14 3/4", 16", 24", 26", AND 29"

Top of box elevation: 2420.36'
Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	
								Time	
								Date	
490				0.0					488'-493' POORLY GRADED GRAVEL AND CLAYEY SAND (GP/SC), (5 YR 6/2).
495									493'-503' POORLY GRADED GRAVEL (GP), (5 YR 6/2), FINE TO COARSE MAFIC SAND, SUBANGULAR.
500	PER14-500		12:50 12-01-00	0.0					SIMILAR TO ABOVE, SOME GRAVEL.
505									503'-503.5' POORLY GRADED SAND (SP), (5 YR 5/2), SOME LARGE GRAVEL. 503.5'-505' CLAYEY SAND (SC), (5 YR 5/2).
510				0.0					505'-507' CLAY (CL), (5 YR 6/4), HARD.
515									507'-521.5' POORLY GRADED SAND (SP), (5 YR 5/2).
520	PER14-520		15:20 12-01-00	0.0					SIMILAR TO ABOVE, CALICHE
525									521.5'-523' CLAYEY SAND (SC), (5 YR 5/2). 523' END OF BORING.



DIMENSIONS

- A: WELL DIAMETER: 5 INCHES
- B: BOREHOLE DIAMETERS: 26 INCHES FROM 0 TO 20 FEET, 16 INCHES FROM 20 TO 108 FEET, 9-7/8 INCHES FROM 108 TO 263 FEET
- C: BOREHOLE DEPTH: 263 FEET
- D: DEPTH TO BOTTOM OF SCREEN: 248.10 FEET
- E: DEPTH TO TOP OF SCREEN: 178.10 FEET
- F: DEPTH TO BOTTOM OF PERCHED ZONE CASING: 106 FEET
- G: DEPTH TO BOTTOM OF SURFACE CASING: 19 FEET
- H: THICKNESS OF BENTONITE SEAL: 9.5 FEET
- I: TOP OF SCREEN TO BOTTOM OF BENTONITE SEAL: 6.6 FEET
- J: SLOT APERTURE: 0.020 INCHES

* NOT TO SCALE

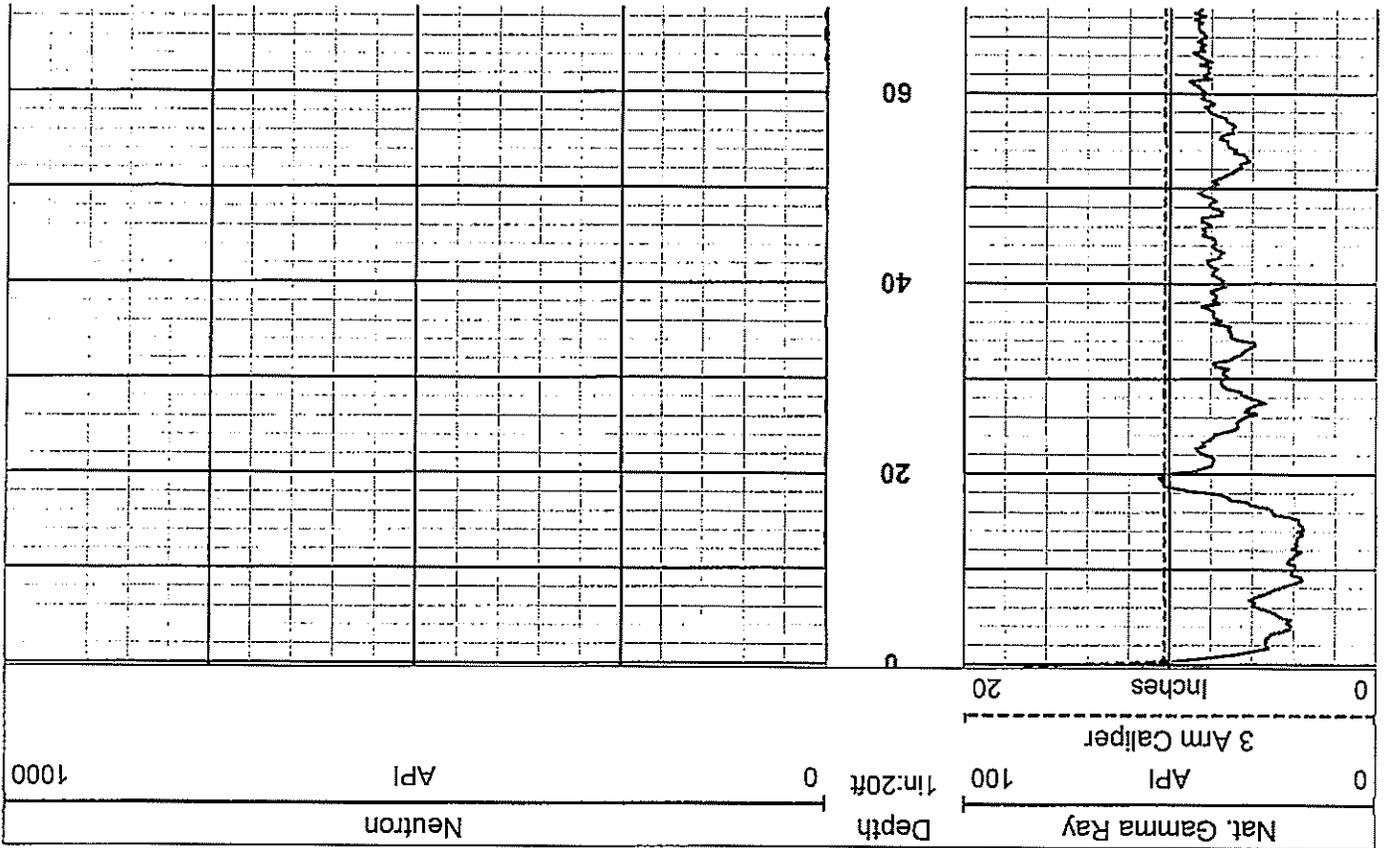
TITLE: PER-14A WELL CONSTRUCTION DIAGRAM PARK-EUCLID WQARF SITE												
LOCATION: TUCSON, ARIZONA												
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CHECKED	TD/JZ											
DRAFTED	ERZ											
PROJECT	1303.031											
DATE	9/25/08											
FIGURE	3											

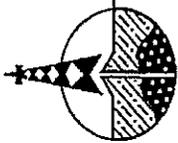


Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY		GEOTRANS	
WELL ID	PER-14A		
FIELD	PARK EUCLID		
COUNTY	PIMA	STATE	ARIZONA
TYPE OF LOGS: GAMMA RAY NEUTRON		OTHER SERVICES	
MORE: CALIPER		E-LOGS	
LOCATION			
SEC	TWP	RGE	
PERMANENT DATUM		ELEVATION	
3 MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	K.B.
ILLING MEAS. FROM		D.F.	
		G.L.	
DATE	10-8-08	TYPE FLUID IN HOLE	FRESH MUD
LOG No	1	SALINITY	
DEPTH-DRILLER	GAMMA-NEUTRON-CALIPER	DENSITY	
DEPTH-LOGGER	261 FT	LEVEL	FULL
DEPTH-LOGGED INTERVAL	263 FT	MAX. REC. TEMP.	N/A
DEPTH-LOGGED INTERVAL	263 FT	IMAGE ORIENTED TO:	N/A
DEPTH-LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.2 FT
DEPTH-LOGGED INTERVAL	YELLOW JACKET	LOGGING TRUCK	TRUCK #107
DEPTH-LOGGED INTERVAL	D.JACOVITCH	TOOL STRING/SN	COMPROBE COMBO.2 1/8"
DEPTH-LOGGED INTERVAL	GEOTRANS- THERESA	LOG TIME: ON SITE/OFF SITE	1300 1530
BOREHOLE RECORD			
BIT	FROM	TO	FROM
?	SURFACE	20 FT	SURFACE
9 7/8"	106 FT	TOTAL DEPTH	106 FT
REMARKS:			

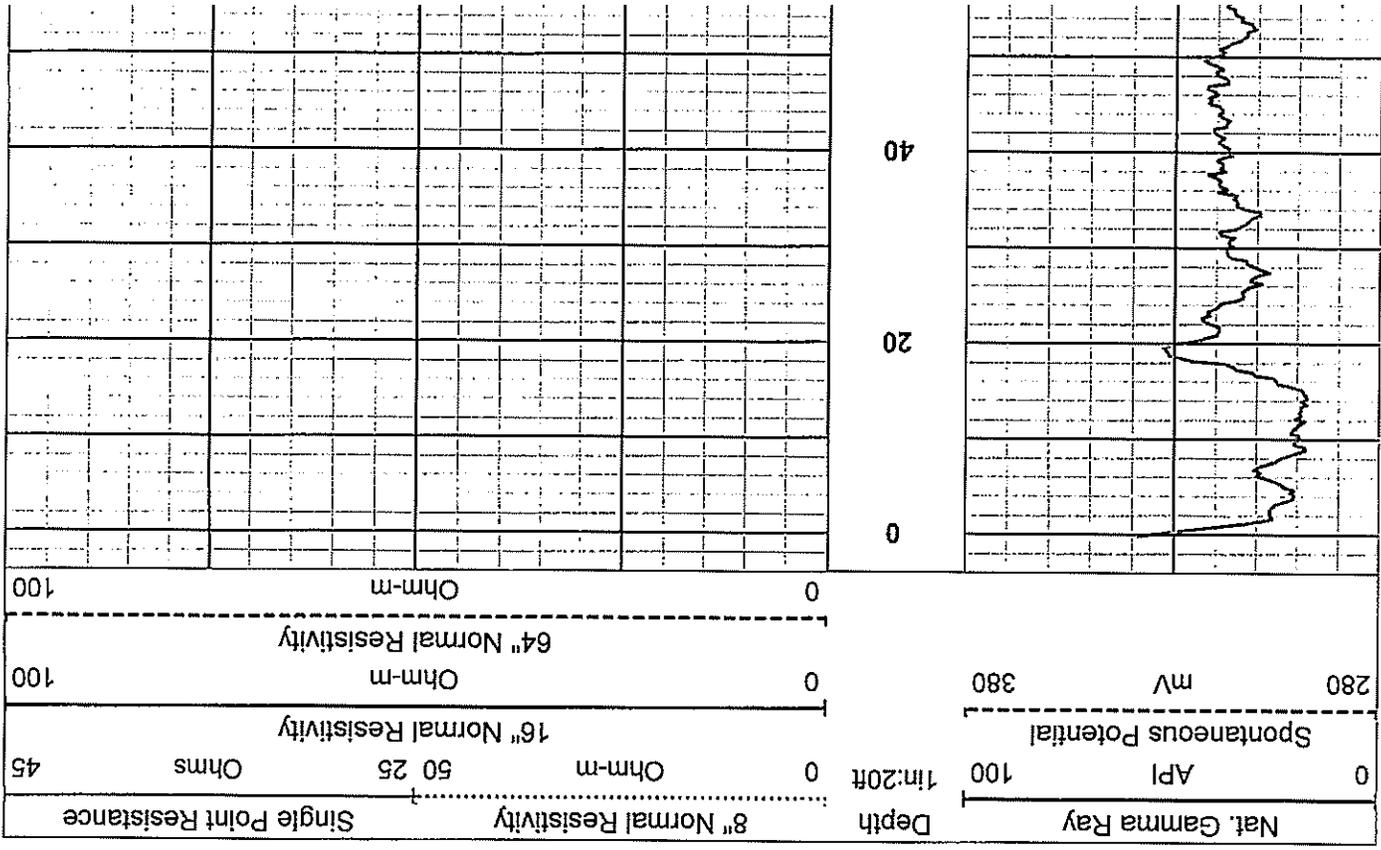




Southwest Exploration Services, LLC

borehole geophysics & video services

COMPANY GEOTRANS		STATE ARIZONA	
WELL ID	PER-14A	OTHER SERVICES	
FIELD	PARK EUCLID	CALIPER	
COUNTY	PIMA	NEUTRON	
TYPE OF LOGS: E-LOGS-GAMMA RAY			
MORE:			
LOCATION			
SEC	TWP	RGE	
PERMANENT DATUM		ELEVATION	
OG MEAS. FROM	GROUND LEVEL	ABOVE PERM. DATUM	
RILLING MEAS. FROM			
DATE	10-8--08	TYPE FLUID IN HOLE	FRESH MUD
UN No	1	SALINITY	
TYPE LOG	E-LOGS-GAMMA RAY	DENSITY	
EPH-DRILLER	261 FT	LEVEL	FULL
EPH-LOGGER	263 FT	MAX. REC. TEMP.	N/A
TM LOGGED INTERVAL	263 FT	IMAGE ORIENTED TO:	N/A
OP LOGGED INTERVAL	SURFACE	SAMPLE INTERVAL	0.2 FT
RILLER / RIG#	YELLOW JACKET	LOGGING TRUCK	TRUCK #107
RECORDED BY / Logging Eng.	D.JACOVITCH	TOOL STRING/SN	2 PEA-F
WITNESSED BY	GEOTRANS - THERESA	LOG TIME-ON SITE/OFF SITE	1300 1530
UN BOREHOLE RECORD			
Q.	BIT	FROM	TO
	?	SURFACE	20 FT
	9 7/8"	106 FT	TOTAL DEPTH
			10 3/4"
			SURFACE
			20 FT
			SURFACE
			106 FT
COMMENTS:			



Spontaneous Potential

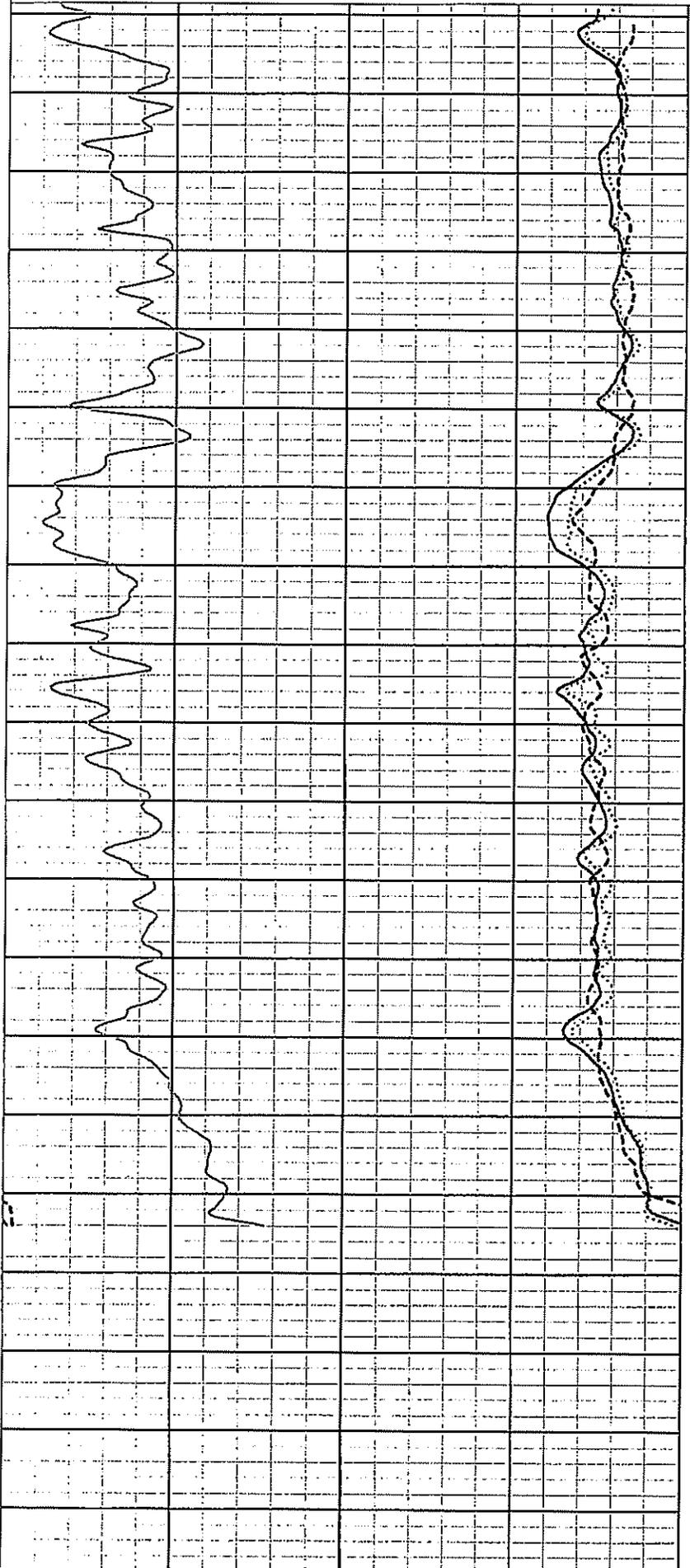
260
240
220
200
180
160
140
120
100
80

16" Normal Resistivity

64" Normal Resistivity

Ohm-m

100

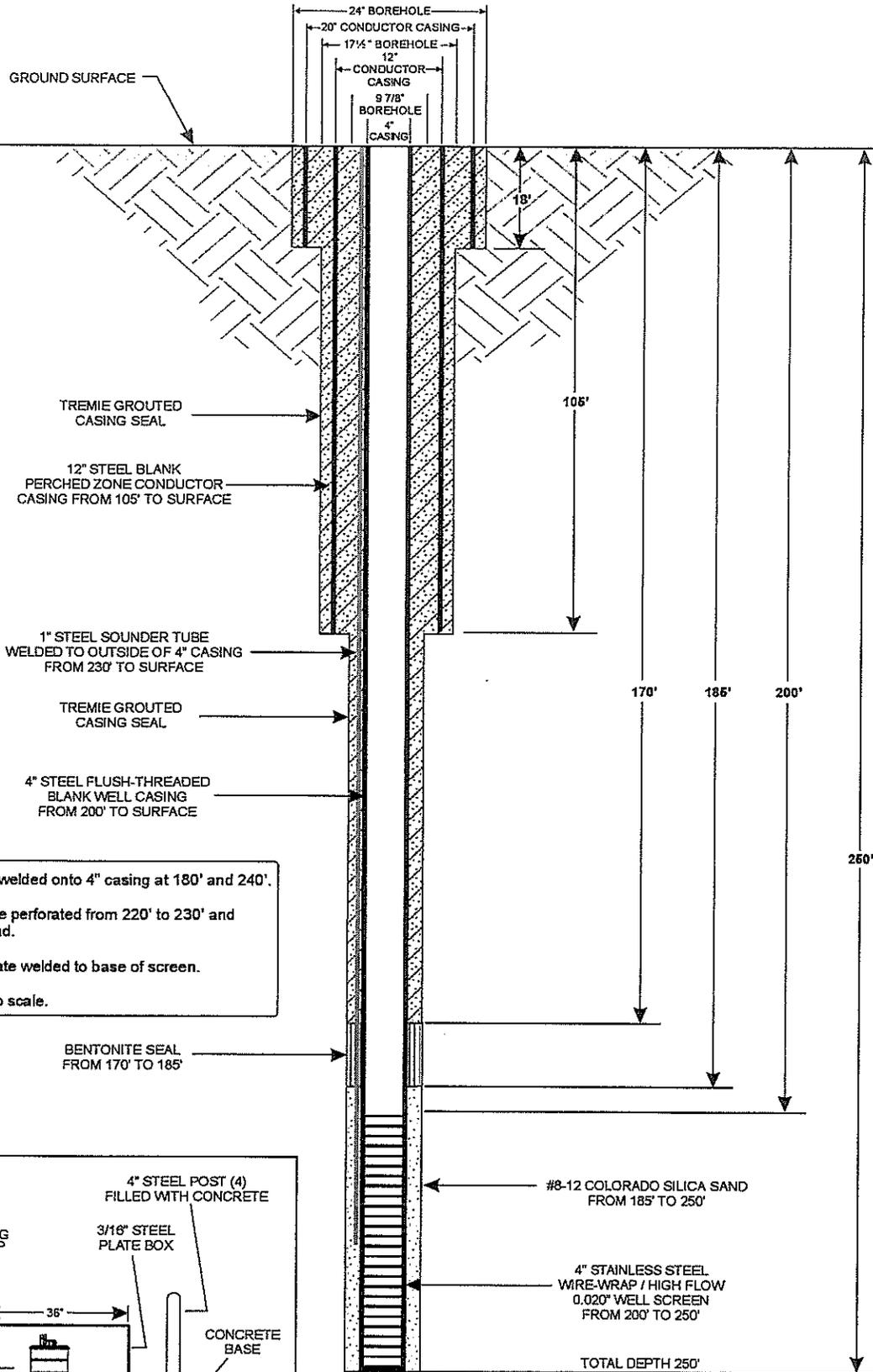


Nat. Gamma Ray		Depth	Normal Resistivity		Single Point Resistance			
0	API	100	1in:20ft	0	Ohm-m	50 25	Ohms	45

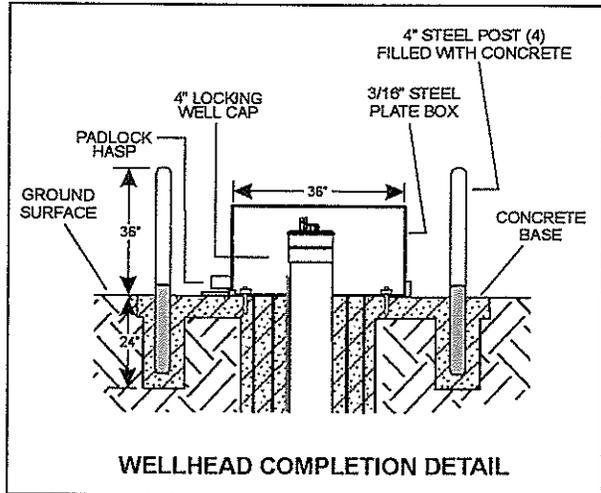


SEE WELLHEAD COMPLETION DETAIL

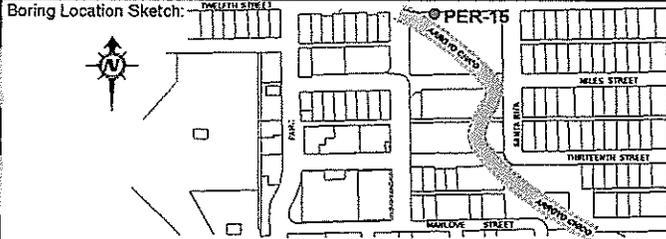
GROUND SURFACE



- NOTES:**
- 1) Centralizers welded onto 4" casing at 180' and 240'.
 - 2) Sounder tube perforated from 220' to 230' and capped at end.
 - 3) Steel end plate welded to base of screen.
 - 4) Not shown to scale.



		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
CONSTRUCTION DETAIL OF REGIONAL AQUIFER MONITOR WELL PER-15				FIGURE A-2
PROJECT#: 365-0001-01	FILE#: per15wcd	DATE DRAWN: 12/28/00	DRAWN BY: B. McCLELLAN	



Project No:	365-0006-05	Date Drilled:	12-08-00 TO 12-12-00	Boring No.	PER-15
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-584491
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				1 of 8
City:	TUCSON, ARIZONA				
Logged By:	D. PLAZAK	Driller:	BOART LONGYEAR		

Drilling Method: MUD ROTARY (NO SAMPLES TAKEN, PID FROM TOP OF BOREHOLE).

Boring Diameter: 9 7/8 INCHES

Casing Installation data:
 SEE WELL COMPLETION DETAIL
 0' to 200' 4" DIAMETER STEEL BLANK
 200' to 250' 4" DIAMETER STEEL WIRE WRAPPED 0.020" SLOTTED SCREEN

Top of box elevation: 2410.90'
 Ground Level Elevation: 2409.73'

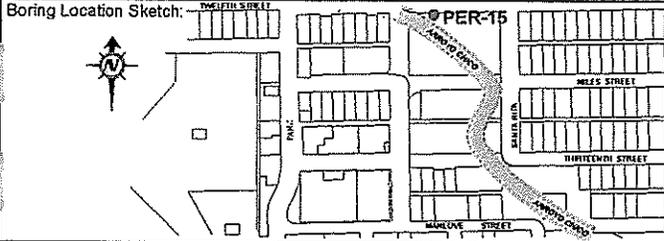
Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol
0							
5							
10							
15							
20							
25							
30							
35							

Water Level			
Time			
Date			

0'-20' WELL GRADED SAND (SW), 60% MEDIUM TO COARSE GRAINED SAND, 40% GRAVEL, ANGULAR TO SUBANGULAR CLASTS UP TO 1", MOSTLY QUARTZ WITH SOME GRANITIC CLASTS, PROBABLY FILL.

20'-25' SILTY SAND (SM), 10 YR 5/4, MEDIUM TO COARSE GRAINED, SUB-ROUNDED TO ANGULAR SAND WITH SOME FINE SAND AND SILT.

30'-45' WELL GRADED SAND / SILTY SAND (SW/SM), MEDIUM TO COARSE GRAINED SAND WITH LITTLE FINE SAND, TRACE SILT.



Project No: 365-0006-05	Date Drilled: 12-08-00 TO 12-12-00	Boring No. PER-15 #55-584491
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 3 of 8
Logged By: D. PLAZAK	Driller: BOART LONGYEAR	

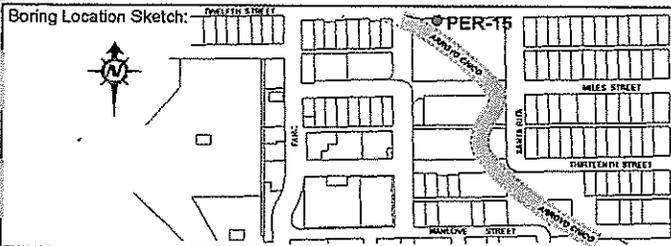
Drilling Method: MUD ROTARY (NO SAMPLES TAKEN, PID FROM TOP OF BOREHOLE).

Casing installation data:
SEE WELL COMPLETION DETAIL
0' to 200' 4" DIAMETER STEEL BLANK
200' to 250' 4" DIAMETER STEEL WIRE WRAPPED 0.020" SLOTTED SCREEN

Boring Diameter: 9 7/8 INCHES

Top of box elevation: 2410.90'
Ground Level Elevation: 2409.73'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level			
								Time	Date		
70							70'-71' HIGH PLASTICITY CLAY (CH).				
							71'-72' POORLY GRADED GRAVEL (GP).				
							72'-73' HIGH PLASTICITY CLAY (CH).				
							73'-75' POORLY GRADED GRAVEL (GP).				
75							75'-81' CLAY (CL).				
80							81'-88' WELL GRADED GRAVEL (GW), FINE.				
85							88'-102' CLAYEY SAND (SC), WITH GRAVEL.				
90											
95											
100											
105							102'-103' SILTY SAND (SM), WELL CEMENTED SAND CHIPS. SIMILAR TO ABOVE, LARGE CLASTS OF INDURATED SILT AND SAND.				



Project No: 365-0006-05	Date Drilled: 12-08-00 TO 12-12-00	Boring No. PER-15
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 5 of 8
Logged By: D. PLAZAK	Driller: BOART LONGYEAR	

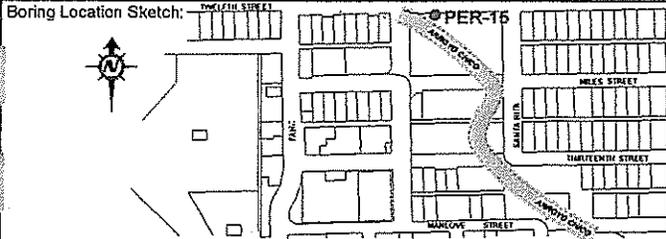
Drilling Method: MUD ROTARY (NO SAMPLES TAKEN, PID FROM TOP OF BOREHOLE).

Casing installation data:
 SEE WELL COMPLETION DETAIL
 0' to 200' 4" DIAMETER STEEL BLANK
 200' to 250' 4" DIAMETER STEEL WIRE WRAPPED 0.020" SLOTTED SCREEN

Boring Diameter: 9 7/8 INCHES

Top of box elevation: 2410.90'
 Ground Level Elevation: 2409.73'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol	Water Level	Time	Date
140							140'-144' WELL GRADED SAND (SW), 10% INTERBEDS OF SANDY CLAY, QUARTZ MILKY, ANGULAR TO SUBANGULAR, COARSE TO MEDIUM GRAINED, CLASTS TO 1/2".			
							SIMILAR TO ABOVE, 20% INTERBEDS OF SANDY CLAY.			
							SIMILAR TO ABOVE, 50% INTERBEDS OF SANDY CLAY.			
145							144'-146' SANDY CLAY (CL), WITH GRAVEL CLASTS TO 1".			
							146'-150' INTERBEDS OF SAND AND CLAY (SW/CL), 50% WELL GRADED SAND, 50% SANDY CLAY.			
150				0.0			150'-156' WELL GRADED SAND (SW), WITH FINE GRAINED GRAVEL, (5 YR 6/4), COARSE SUBANGULAR SAND.			
							SIMILAR TO ABOVE, MEDIUM TO FINE GRAINED SAND.			
155				0.0			156'-160' CLAYEY SILTY SAND (SM/SC), SOME FINE TO MEDIUM GRAINED GRAVEL, (5 YR 6/2), STICKY.			
160				0.0			160'-165' POORLY GRADED SAND (SP), (10 YR 6/2), COARSE SAND, MEDIUM TO FINE GRAINED GRAVEL.			
165							165'-172' CLAYEY SILTY SAND (SM/SC), (5 YR 7/2).			
170				0.0			172'-174.5' SILT (ML), (5 YR 8/4), INCREASE IN FINES.			
175							174.5'-175.5' CLAYEY SILTY SAND (SM/SC), (5 YR 6/4).			



Project No: 365-0008-05	Date Drilled: 12-08-00 TO 12-12-00	Boring No. PER-15 #55-584491
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 6 of 8
Logged By: D. PLAZAK	Driller: BOART LONGYEAR	

Drilling Method: MUD ROTARY (NO SAMPLES TAKEN, PID FROM TOP OF BOREHOLE).

Boring Diameter: 9 7/8 INCHES

Casing installation data:
SEE WELL COMPLETION DETAIL
0' to 200' 4" DIAMETER STEEL BLANK
200' to 250' 4" DIAMETER STEEL WIRE WRAPPED 0.020" SLOTTED SCREEN

Top of box elevation: 2410.90'
Ground Level Elevation: 2409.73'

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Recovery (%)	Well Detail	Soil Group Symbol
175				0.0			174.5'-175.5' CLAYEY SILTY SAND (SM/SC), (5 YR 6/4). 175.5'-177' POORLY GRADED SAND (SP), SOME GRAVEL, (10 YR 7/2).
							177'-179' POORLY GRADED SAND AND CLAY (SP/CL), WITH GRAVEL, (5 YR 6/4), GRAVEL TO ½"
180				0.0			179'-181' CLAYEY SILTY SAND (SM/SC), SOME FINE GRAINED GRAVEL, PURE QUARTZ MINERALS, (5 YR 6/4).
							181'-184.5' CLAYEY SAND (SC), (5 YR 8/4), COARSE SAND.
							SIMILAR TO ABOVE, INCREASED CLAY.
185				0.0			184.5'-189' POORLY GRADED SAND (SP), (10 YR 7/2), MEDIUM TO COARSE GRAINED. SIMILAR TO ABOVE, WITH ANGULAR GRAVEL TO ½", DECREASED GRAVEL SIZE AFTER 186'.
							189'-193' POORLY GRADED SAND AND SILT (SP/ML), (10 YR 5/4).
190							193'-195' POORLY GRADED SAND AND SILT (SP/ML), (10 YR 5/4), SLIGHTLY INDURATED.
							195'-197' SILT (ML), WITH CLAY AND FINE GRAINED SAND, (10 YR 5/4).
							197'-198' POORLY GRADED SAND (SP).
							198'-203' SILTY SAND (SM).
200				0.0			203'-206' SILT (ML), (10 YR 5/4).
							206'-214' CLAY (CL).
205				0.0			
210							



SEE WELLHEAD COMPLETION DETAIL

GROUND SURFACE

16" BOREHOLE
10"
CONDUCTOR
CASING
9 5/8"
BOREHOLE
4"
CASING

TREMIED PORTLAND CEMENT
GROUTED CASING SEAL

10" ID WELDED STEEL BLANK
PERCHED ZONE CONDUCTOR
CASING FROM 107.5 TO SURFACE

TREMIED PORTLAND CEMENT
GROUTED CASING SEAL

4" I.D. SCH. 80 PVC
FLUSH-THREADED
BLANK CASING

BENTONITE SEAL
FROM 324' TO 331'

107.5'

324'

331'

339'

389'

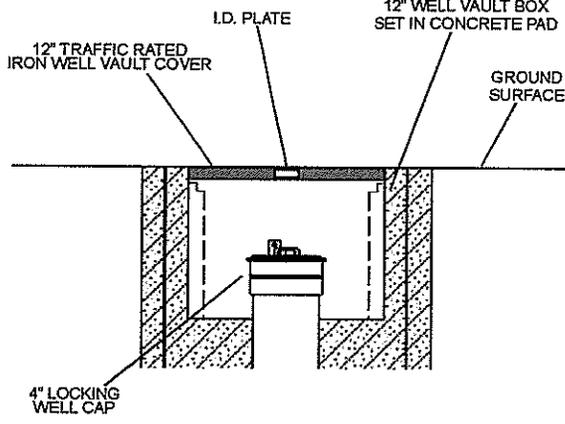
390'

#10-20 COLORADO SILICA SAND
FROM 331' TO 390'

4" I.D. SCH. 80 PVC
0.010" WELL SCREEN
FROM 339' TO 389'

TOTAL DEPTH 390'

WELLHEAD COMPLETION DETAIL



NOTE: NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF
REGIONAL AQUIFER MONITOR WELL PER-21

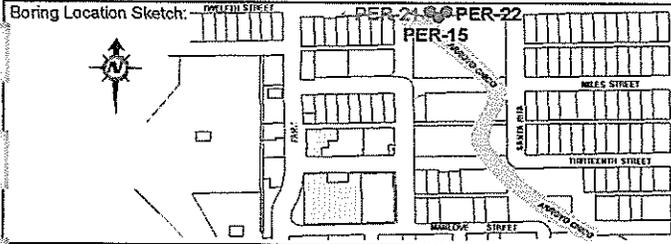
FIGURE

PROJECT#: 365-0001-01

FILE#: per21wcd

DATE DRAWN: 06/17/02

DRAWN BY: B. McCLELLAN



Project No:	365-0003-04	Date Drilled:	05-12-02	Boring No. PER-21
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			#55-591467
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.			Sheet No.
City:	TUCSON, ARIZONA			1 of 12
Logged By:	J. MEYER	Driller:	WDC	

Drilling Method: AIR ROTARY

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

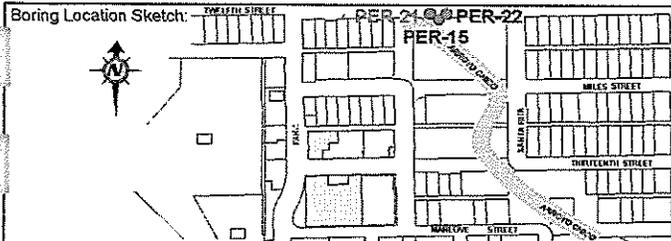
Boring Diameter: 16 INCHES (0-107.5') 9 5/8 INCHES (107.5'-390')

Top of casing elevation: 2409.91' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	199.92'	200.33'	
								Time			
								Date	05-24-02	06-06-02	
0			09:40					0'-31' GRAVELLY SAND (SW), DARK YELLOWISH ORANGE (10YR 8/6), 30-35% FINE SAND, 15-20% MEDIUM SAND, 25-30% COARSE SAND, 15-20% GRAVEL 1/4"-1/2", WELL GRADED.			
5											
10											
15											
20											
25			09:50								
30											
35			10:10								

SIMILAR TO ABOVE, 5-10% SILT, 15-20% FINE SAND, 30-35% GRAVEL.

31'-35' SAND (SW), MODERATE YELLOWISH BROWN (10YR 5/4), 10-15% SILT, 40-45% FINE SAND, 20-25% MEDIUM SAND, 10-15% COARSE SAND, 15-20% GRAVEL, WELL GRADED.



Project No:	365-0003-04	Date Drilled:	05-12-02	Boring No. PER-21
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK-EUCLID WQARF SITE			#55-591467
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.			Sheet No.
City:	TUCSON, ARIZONA			2 of 12
Logged By:	J. MEYER	Driller:	WDC	

Drilling Method: AIR ROTARY

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES (0-107.5') 9 5/8 INCHES (107.5-390')

Top of casing elevation: 2409.91' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	199.92'	200.33'	
								Time			
								Date	05-24-02	06-06-02	
35			10:31								
			10:36								
40											
			10:41								
			10:47								
45											
			11:08								
50											
			11:12								
			11:19								
55											
			11:40								
60											
			11:44								
65											
70											

35'-39' SAND (SW), MODERATE YELLOWISH BROWN (10YR 5/4), 10-15% SILT, 40-45% FINE SAND, 20-25% MEDIUM SAND, 10-15% COARSE SAND, 5-10% GRAVEL 1/4", WELL GRADED.

39'-47' SILTY SAND (SM), MODERATE YELLOWISH BROWN (10YR 5/4), 30-35% SILT, 40-45% FINE SAND, 15-20% MEDIUM SAND.

SIMILAR TO ABOVE, 15-20% SILT, 25-30% FINE SAND, 25-30% MEDIUM SAND, 15-20% COARSE SAND.

SIMILAR TO ABOVE, 25-30% SILT, 25-30% FINE SAND, 20-25% MEDIUM GRAVEL, 5-10% COARSE SAND.

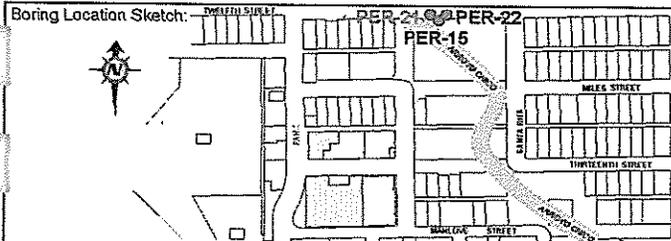
47'-51' SAND (SW), GREYISH ORANGE (10YR 7/4), 50-60% FINE SAND, 20-25% MEDIUM SAND, 15-20% COARSE SAND.

51'-54' SANDY GRAVEL (GW), LIGHT BROWN (5YR 5/6), 10-15% FINE SAND, 15-20% COARSE SAND, 60-70% GRAVEL 1/4" TO 1/2", WELL GRADED.

54'-57' CLAYEY SAND (SC), DARK YELLOWISH BROWN (10YR 4/2), 20-25% CLAY, 25-30% FINE SAND, 30-35% MEDIUM SAND, 5-10% COARSE SAND.

57'-61' SAND (SW), DARK YELLOWISH ORANGE (10YR 6/6), 40-45% FINE SAND, 30-35% MEDIUM SAND, 20-25% COARSE SAND.

61'-70' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 20-25% CLAY, 30-35% FINE SAND, 25-30% MEDIUM SAND, 10-15% COARSE SAND.



Project No:	365-0003-04	Date Drilled:	05-12-02	Boring No.	PER-21
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591467
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				4 of 12
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	WDC		

Drilling Method: AIR ROTARY

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES (0-107.5') 9 5/8 INCHES (107.5'-390')

Top of casing elevation: 2409.91' Ground Level Elevation:

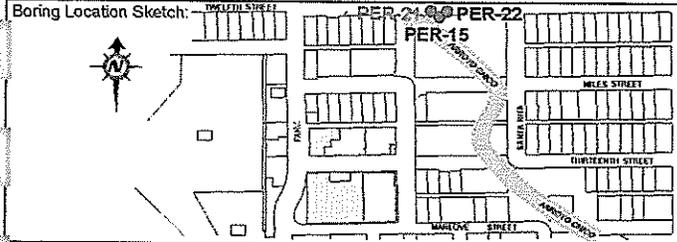
Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
105							
110							
115							
120							
125							
130							
135							
140							

Water Depth	199.92'	200.33'		
Time				
Date	05-24-02	06-06-02		

93'-110' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 15-20% CLAY, 20-25% FINE SAND, 30-35% MEDIUM SAND, 25-30% COARSE SAND.

107.5' BASE OF 10" STEEL SANITARY OUTER CASING THE 4" SCH 80 PVC CASING CONTINUE DOWN

110'-140' CLAYEY SAND (SC), MEDIUM BROWN, 20% CLAY, 20% SILT, 60% FINE TO COARSE SAND, SUBANGULAR TO SUBROUNDED, COMMON MUSCOVITE, SLIGHTLY DAMP.



Project No: 365-0003-04	Date Drilled: 05-12-02	Boring No. PER-21 #55-591467
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 6 of 12
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

Boring Diameter: 16 INCHES (0-107.5') 9 5/8 INCHES (107.5'-390')

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Top of casing elevation: 2409.91'

Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
175							
180							
185							
190							
195							
200							
205							
210							

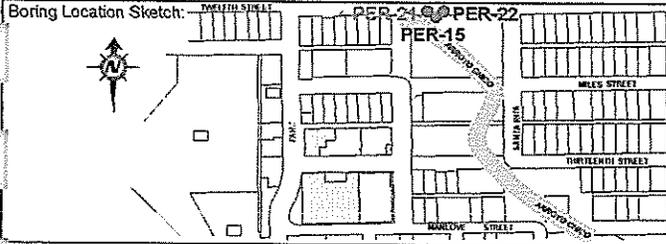
Water Depth	199.92'	200.33'	
Time			
Date	05-24-02	06-06-02	

172'-191' SAND (SW), MEDIUM BROWN, 5-10% CLAY, 90-95% FINE TO COARSE SAND, MINOR 1" PEBBLES AT 183'-196'.

191'-194' CLAYEY SAND (SC), MEDIUM BROWN, 20-30% CLAY, 70-80% FINE TO COARSE SAND.

194'-201' SAND (SW), MEDIUM BROWN, FINE TO COARSE SAND.

201'-210' CLAYEY SAND (SC), MEDIUM BROWN, 20-40% CLAY, 60-80% FINE SAND.



Project No: 385-0003-04	Date Drilled: 05-12-02	Boring No. PER-21 #55-591467
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 8 of 12
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

Boring Diameter: 16 INCHES (0-107.5') 9 5/8 INCHES (107.5'-390')

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

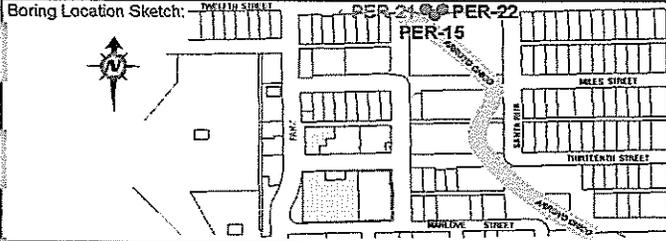
Top of casing elevation: 2409.91' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
245							
250							
255							
260							
265							
270							
275							
280							

Water Depth	199.92'	200.33'		
Time				
Date	05-24-02	06-06-02		

211'-270' CLAYEY SAND (SC), MEDIUM BROWN, 20% CLAY, 80% FINE SAND.

270'-310' SAND (SW), WELL GRADED.



Project No: 365-0003-04	Date Drilled: 05-12-02	Boring No. PER-21 #55-591467
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	Sheet No. 9 of 12
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES (0-107.5') 9 5/8 INCHES (107.5'-390')

Top of casing elevation: 2409.91' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	200.33'		
								199.92'			
								Time	Date		
								05-24-02	06-06-02		

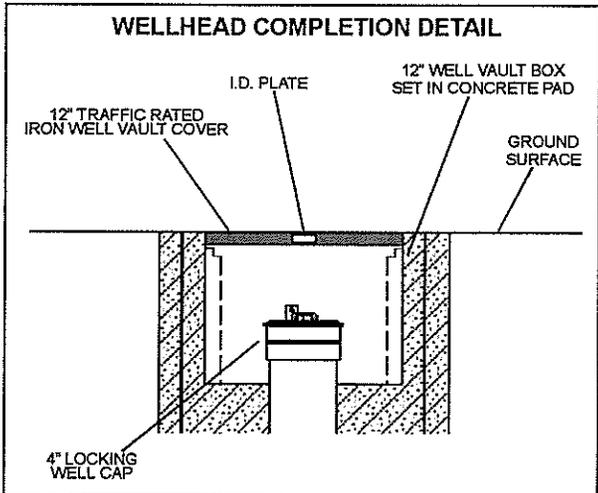
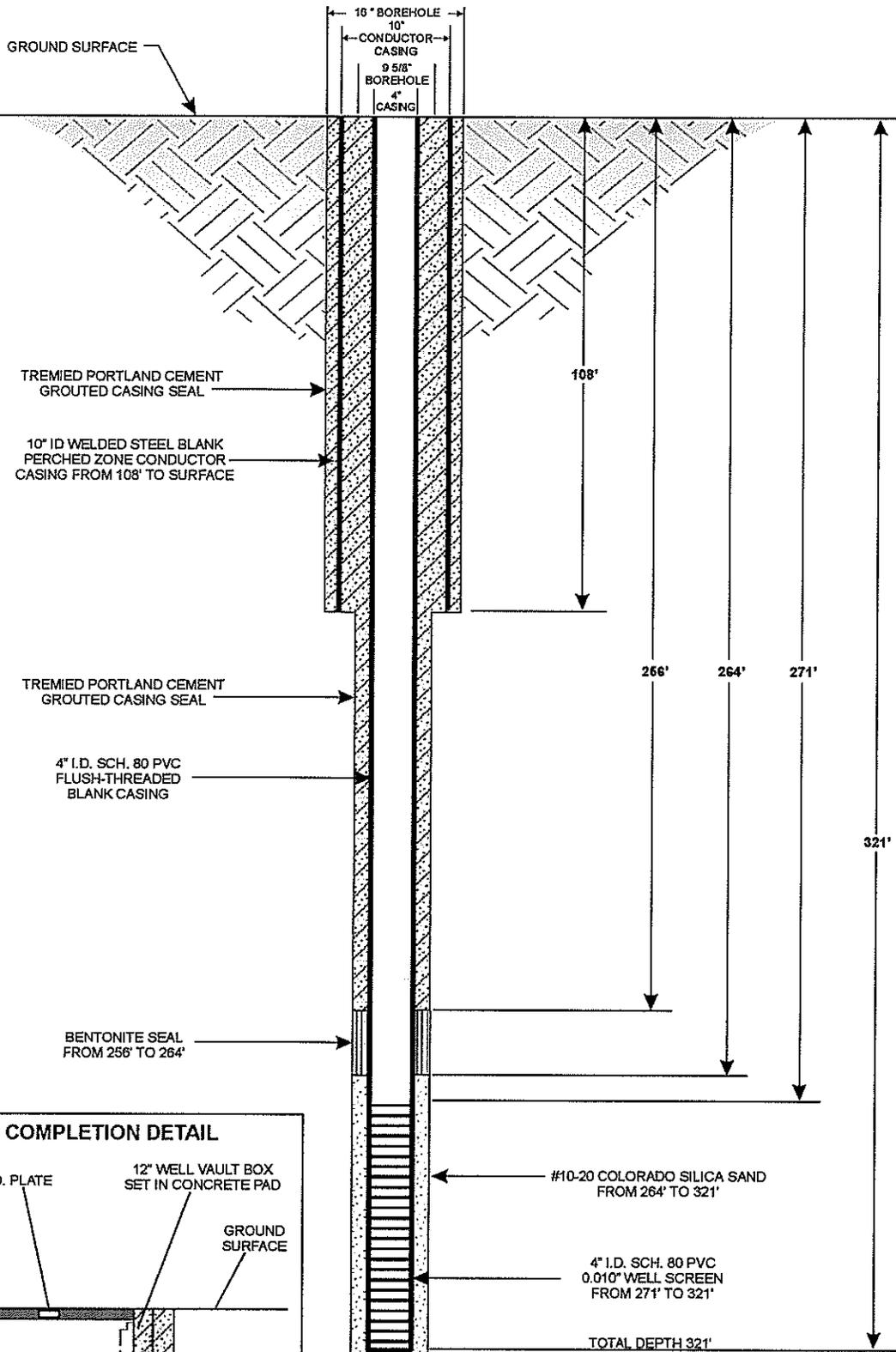
Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
280							
285							
290							
295							
300							
305							
310							
315							

270'-310' SAND (SW), WELL GRADED.

310'-390' SAND (SP), MEDIUM BROWN, FINE TO MEDIUM SAND, POORLY GRADED.



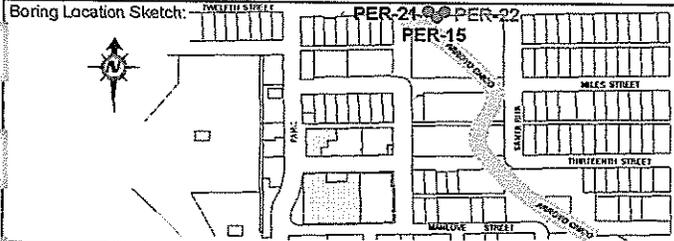
SEE WELLHEAD COMPLETION DETAIL



NOTE: NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA	
CONSTRUCTION DETAIL OF REGIONAL AQUIFER MONITOR WELL PER-22			FIGURE
PROJECT#: 365-0001-01	FILE#: per22wcd	DATE DRAWN: 06/17/02	DRAWN BY: B. McCLELLAN

FIELD EXPLORATORY BORING LOG



Project No: 365-0003-04	Date Drilled: 05-07-02	Boring No. PER-22
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK-EUCLID WQARF SITE	
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.	City: TUCSON, ARIZONA	1 of 10
Logged By: D. GEORGE	Driller: WDC	
Casing installation data: SEE WELL CONSTRUCTION DETAIL		

Drilling Method: AIR ROTARY

Boring Diameter: 16 INCHES (0-108") 9 5/8 INCHES (108'-321")

Top of casing elevation: 2410.19' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
0							
5							
10							
15							
20							
25							
30							
35							

Water Depth	199.42'	199.73'		
Time				
Date	05-24-02	06-06-02		

0'-10' SILTY SAND (SM), TAN, 30% SILT, 70% FINE TO COARSE SAND, 10% GRAVEL, SUBANGULAR CLASTS TO 2".

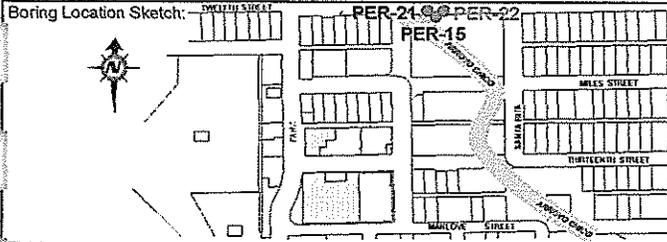
SIMILAR TO ABOVE, COMMON MUSCOVITE.

10'-15' SAND (SW), TAN, 10% SILT, 70% FINE TO COARSE WELL GRADED SAND, 20% GRAVEL TO 1", SUBANGULAR CLASTS.

15'-25' SILTY SAND (SM), TAN, 20% SILT, 70% FINE TO COARSE SAND, 10% GRAVEL.

25'-45' SAND (SP-SC), LIGHT BROWN (5YR 5/6), FINE TO MEDIUM SAND, TRACE GRAVEL TO 1", POORLY GRADED, SLIGHTLY DAMP.

FIELD EXPLORATORY BORING LOG



Project No:	365-0009-04	Date Drilled:	05-07-02	Boring No.	PER-22
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591468
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				2 of 10
City:	TUCSON, ARIZONA				
Logged By:	D. GEORGE	Driller:	WDC		

Drilling Method: AIR ROTARY

Boring Diameter: 16 INCHES (0-108") 9 5/8 INCHES (108'-321')

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Top of casing elevation:	2410.19'	Ground Level Elevation:	
Water Depth	199.42'	199.73'	
Time			
Date	05-24-02	06-06-02	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
35							
40							
45			08:40				
50							
55				3.0			
60				3.9			
65				6.0			
70							

25'-45' SAND (SP-SC), LIGHT BROWN (5YR 5/6), 90-95% FINE TO MEDIUM SAND, 5-10% COARSE SAND, TRACE FINE GRAVEL, POORLY GRADED, SLIGHTLY DAMP.

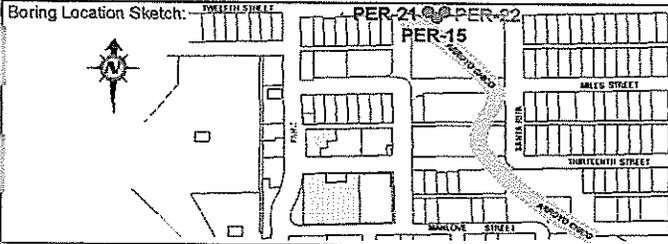
45'-50' CLAYEY SAND (SC), LIGHT BROWN (5YR 5/6), 80% FINE TO MEDIUM SAND, SLIGHTLY DAMP.

50'-60' SAND (SW-SC), LIGHT BROWN (5YR 5/6), 80% FINE TO MEDIUM SAND, WELL GRADED, SLIGHTLY DAMP.

SIMILAR TO ABOVE, INCREASED COARSE SAND, TRACE FINE GRAVEL.

60'-75' CLAYEY SAND (SC), MODERATE BROWN (5YR 4/4), 70% WELL GRADED SAND, DAMP.

FIELD EXPLORATORY BORING LOG



Project No:	365-0003-04	Date Drilled:	05-07-02	Boring No.	PER-22
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591468
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				4 of 10
City:	TUCSON, ARIZONA				
Logged By:	D. GEORGE	Driller:	WDC		

Casing installation data:
 SEE WELL CONSTRUCTION DETAIL

AIR ROTARY
 Boring Diameter: 16 INCHES (0-108") 9 5/8 INCHES (108"-321")

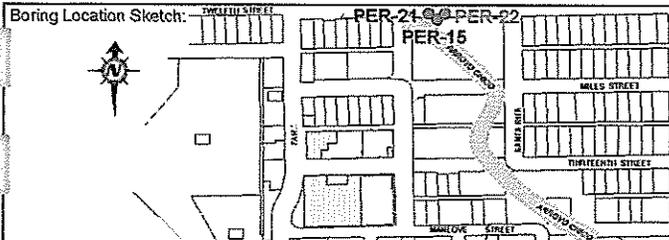
Top of casing elevation:	2410.19'	Ground Level Elevation:	
Water Depth	199.42'	199.73'	
Time			
Date	05-24-02	06-06-02	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
105							
110							
115							
120							
125							
130							
135							
140							

85'-110' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), 85% WELL GRADED SAND, DAMP.

105' BASE OF 10" STEEL SANITARY OUTER CASING. THE 4" SCH. 80 PVC CASING CONTINUES DOWN

110'-166' SAND (SP), BROWN-TAN, 10% CLAY, 90% MEDIUM SAND, POORLY GRADED, SUBROUNDED TO SUBANGULAR, COMMON MUSCOVITE



Project No: 365-0003-04	Date Drilled: 05-07-02	Boring No. PER-22
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		#55-591468
Facility: PARK-EUCLID WQARF SITE		Sheet No. 9 of 10
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: D. GEORGE	Driller: WDC	

Drilling Method: AIR ROTARY

Boring Diameter: 16 INCHES (0-108') 9 5/8 INCHES (108'-321')

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Top of casing elevation: 2410.19'	Ground Level Elevation:
-----------------------------------	-------------------------

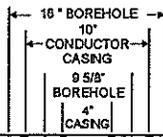
Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
280							
285							
290							
295							
300							
305							
310							
315							

Water Depth	199.42'	199.73'	
Time			
Date	05-24-02	06-06-02	

202'-321' CLAYEY SAND (SC), LIGHT BROWN, 5% CLAY, 95% FINE SAND, COMMON MUSCOVITE.

SEE WELLHEAD COMPLETION DETAIL

GROUND SURFACE



TREMIED PORTLAND CEMENT GROUTED CASING SEAL

10" ID WELDED STEEL BLANK PERCHED ZONE CONDUCTOR CASING FROM 105' TO SURFACE

TREMIED PORTLAND CEMENT GROUTED CASING SEAL

4" I.D. SCH. 80 PVC FLUSH-THREADED BLANK CASING

BENTONITE SEAL FROM 230' TO 235'

105'

230'

236'

238.5'

288.5'

293'

330'

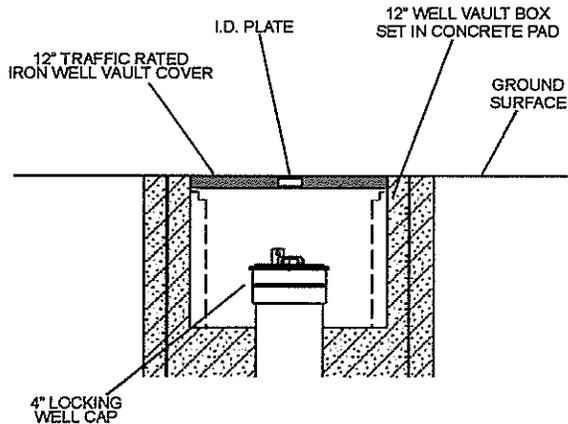
TOTAL DEPTH 330'

#10-20 COLORADO SILICA SAND FROM 235' TO 293'

4" I.D. SCH. 80 PVC 0.010" WELL SCREEN FROM 238.5' TO 288.5'

BENTONITE SEAL FROM 293' TO 330'

WELLHEAD COMPLETION DETAIL



NOTE: NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF
REGIONAL AQUIFER MONITOR WELL PER-23

FIGURE

PROJECT#: 365-0001-01

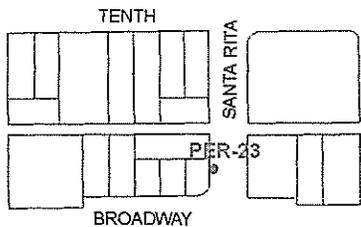
FILE#: per23wcd

DATE DRAWN: 06/17/02

DRAWN BY: B. McCLELLAN

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No: 365-0003-04	Date Drilled: 05-29-02	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PER-23
Facility: PARK-EUCLID WQARF SITE		#55-591469
Location: NW ¼ SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		1 of 10
Logged By: J. MEYER	Driller: WDC	

Drilling Method:

AIR ROTARY

 Casing installation data:
 SEE WELL CONSTRUCTION DETAIL.

Boring Diameter:

16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation: 2418.09' Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	209.78'		
								Time			
								Date	06-06-02		
0			09:30								
5											
10											
15											
20											
25											
30											
35											

0'-12' SANDY SILT (ML/SM), GREYISH ORANGE (10YR 7/4), 45-50% SILT, 10-15% FINE SAND, 20-25% MEDIUM SAND, 25-30% COARSE SAND, DRY.

12'-26' SAND (SW), LIGHT BROWN (5YR 5/6), 15-20% FINE SAND, 25-30% MEDIUM SAND, 25-30% COARSE SAND, 25-30% GRAVEL 1/4" TO 1 1/2".

SIMILAR TO ABOVE, 15-20% FINE SAND, 20-25% MEDIUM SAND, 20-25% COARSE SAND, 35-40% GRAVEL.

SIMILAR TO ABOVE, 30-35% FINE SAND, 25-30% MEDIUM SAND, 20-25% COARSE SAND, 15-20% GRAVEL.

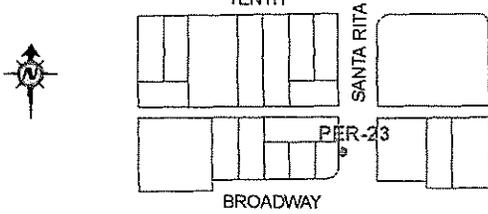
26'-32' CLAYEY SAND (SC), DARK YELLOWISH ORANGE (10YR 6/6), WITH GRAVEL.

32'-41' SAND (SW), MODERATE YELLOWISH BROWN (10YR 5/4), 40-50% FINE SAND, 25-30% MEDIUM SAND, 20-25% COARSE SAND, SLIGHTLY MOIST.

SIMILAR TO ABOVE, WITH 15-20% GRAVEL.

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No: 365-0003-04	Date Drilled: 05-29-02	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PER-23
Facility: PARK-EUCLID WQARF SITE		#55-591469
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		2 of 10
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

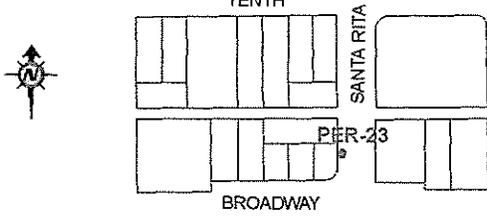
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation:	2418.09'	Ground Level Elevation:	
Water Depth	209.79'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	
35								SIMILAR TO ABOVE, 35-40% FINE SAND, 25-30% MEDIUM SAND, 30-35% COARSE SAND, 15-20% GRAVEL.
40								41'-46' SAND (SP), LIGHT BROWN (5YR 5/6), 10-15% SILT, >60% FINE SAND, POORLY GRADED.
45								46'-52' SAND (SW), 35-40% FINE SAND, 20-25% MEDIUM SAND, 15-20% COARSE SAND, 15-20% GRAVEL 1/4" TO 1/2", WELL GRADED.
50								
55								
60								62'-68' SAND (SP), 10-15% SILT, 50-60% FINE SAND, 25-30% MEDIUM SAND, POORLY GRADED.
65								
70								68'-71' SAND (SW), LIGHT BROWN (5YR 6/4), 35-40% FINE SAND, 15-20% MEDIUM SAND, 10-15% COARSE SAND, 20-25% GRAVEL 1/4" TO 1/2".

Boring Location Sketch:



Project No:	385-0003-04	Date Drilled:	05-29-02	Boring No.	PER-23
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591469
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				3 of 10
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	WDC		

Drilling Method:

AIR ROTARY

SEE WELL CONSTRUCTION DETAIL

Boring Diameter:

16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation:	2418.09'	Ground Level Elevation:	
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Water Depth	209.79'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
70							
75							
80							
85							
90							
95							
100							
105							

71'-76' SILTY SAND (SM), VERY PALE ORANGE (10YR 8/2), 30-35% SILT, 40-45% FINE SAND, 15-20% MEDIUM SAND.

76'-84' SAND (SW), GREYISH ORANGE (10YR 2/4), 10-15% SILT, 30-35% FINE SAND, 25-30% MEDIUM SAND, 20-25% COARSE SAND, WELL GRADED.

84'-86' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 6/4), 20-25% CLAY, 30-35% FINE SAND, 25-30% MEDIUM SAND, 15-20% COARSE SAND.

86'-89' SAND (SP), VERY PALE ORANGE (10YR 8/2), 10-15% SILT, 60-70% FINE SAND, 20-25% MEDIUM SAND.

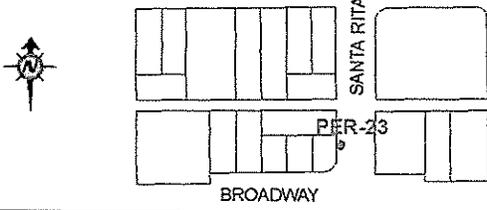
89'-110' CLAYEY GRAVEL (GC), 30-35% CLAY, 15-20% COARSE SAND, 40-45% GRAVEL 1/4" TO 1/2".

SIMILAR TO ABOVE, 50-60% CLAY, 20-25% FINE SAND, 10-15% GRAVEL TO 105'.

105' BASE OF 10" STEEL SANITARY OUTER CASING. THE 4" SCH. 80 PVC CASING CONTINUES DOWN.

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No:	365-0003-04	Date Drilled:	05-29-02	Boring No.	PER-23
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591469
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				5 of 10
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	WDC		

Drilling Method: AIR ROTARY

Casing installation data:
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation: 2418.09' Ground Level Elevation:

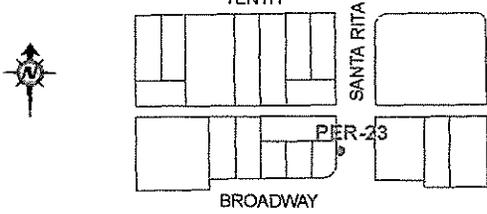
Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
140							
145							
150							
155							
160							
165							
170							
175							

Water Depth	209.79'		
Time			
Date	06-06-02		

110'-215' SAND (SP), LIGHT BROWN (5YR 5/6), 25-30% FINE SAND, 35-40% MEDIUM SAND, 30-35% COARSE SAND, POORLY GRADED, SLIGHTLY MOIST.

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No:	365-0003-04	Date Drilled:	05-29-02	Boring No.	PER-23
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			Sheet No.	#55-591469
Facility:	PARK-EUCLID WQARF SITE				
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.				
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	WDC		

Drilling Method:

AIR ROTARY

 Casing installation data:
 SEE WELL CONSTRUCTION DETAIL

Boring Diameter:

16 INCHES (0-105') 9 5/8 INCHES (108'-330')

 Top of casing elevation: 2418.09'
 Ground Level Elevation:

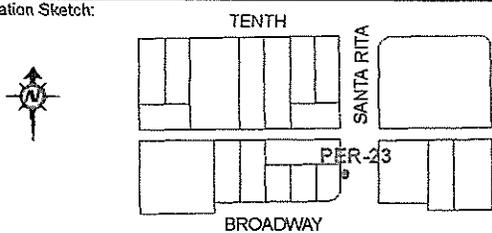
Water Depth	209.79'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
175							
180							
185							
190							
195							
200							
205							
210							

110'-215' SAND (SP), LIGHT BROWN (5YR 5/6), 25-30% FINE SAND, 35-40% MEDIUM SAND, 30-35% COARSE SAND, POORLY GRADED, SLIGHTLY MOIST.

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No:	365-0003-04	Date Drilled:	05-29-02	Boring No.	PER-23
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY				#55-591469
Facility:	PARK-EUCLID WQARF SITE				Sheet No.
Location:	NW ¼ SECTION 18, T. 14 S., R. 14 E.				7 of 10
City:	TUCSON, ARIZONA				
Logged By:	J. MEYER	Driller:	WDC		

Drilling Method:

AIR ROTARY

 Casing installation data:
 SEE WELL CONSTRUCTION DETAIL

Boring Diameter:

16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation: 2418.09' Ground Level Elevation:

Water Depth	209.79'		
Time			
Date	08-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
210			10:30				
215							
220							
225							
230							
235							
240							
245							

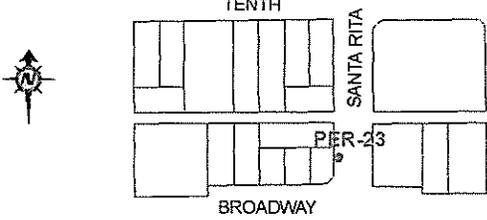
110'-215' SAND (SP), LIGHT BROWN (5YR 5/6), 25-30% FINE SAND, 35-40% MEDIUM SAND, 30-35% COARSE SAND, POORLY GRADED, SLIGHTLY MOIST.

215'-225' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 30-35% CLAY, 35-40% FINE SAND, 15-20% MEDIUM SAND, SLIGHTLY MOIST.

225'-305' SAND (SW), LIGHT BROWN (5YR 5/6).

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No: 365-0003-04	Date Drilled: 05-29-02	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PER-23
Facility: PARK-EUCLID WQARF SITE		#55-591469
Location: NW 1/4 SECTION 18, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		9 of 10
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

SEE WELL CONSTRUCTION DETAIL

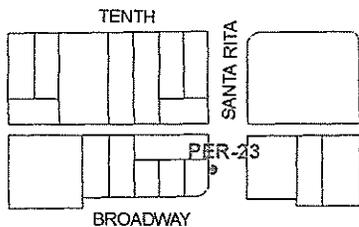
Boring Diameter: 16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation:	2418.09'	Ground Level Elevation:
Water Depth	209.79'	
Time		
Date	06-06-02	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Description
280						[Vertical Hatching]		225'-305' SAND (SW), LIGHT BROWN (5YR 5/6).
285						[Vertical Hatching]		
290			12:41			[Vertical Hatching]		SIMILAR TO ABOVE, PALE YELLOWISH BROWN (10YR 6/2), 40-50% FINE SAND, 25-30% MEDIUM SAND, 15-25% COARSE SAND.
295						[Vertical Hatching]		
300						[Vertical Hatching]		
305						[Vertical Hatching]		305'-320' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 30-40% CLAY, 40-50% FINE SAND, 15-25% MEDIUM SAND.
310						[Vertical Hatching]		
315						[Vertical Hatching]		

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No:	365-0003-04	Date Drilled:	05-29-02	Boring No.
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			PER-23
Facility:	PARK-EUCLID WQARF SITE			#55-591469
Location:	NW 1/4 SECTION 18, T. 14 S., R. 14 E.			Sheet No.
City:	TUCSON, ARIZONA			10 of 10
Logged By:	J. MEYER	Driller:	WDC	
Casing installation data:				

Drilling Method:

AIR ROTARY

SEE WELL CONSTRUCTION DETAIL

Boring Diameter:

16 INCHES (0-105') 9 5/8 INCHES (108'-330')

Top of casing elevation:	2418.09'	Ground Level Elevation:	
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Water Depth	209.79'		
Time			
Date	06-06-02		

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
315							
320							
325							
330							
335							
340							
345							
350							

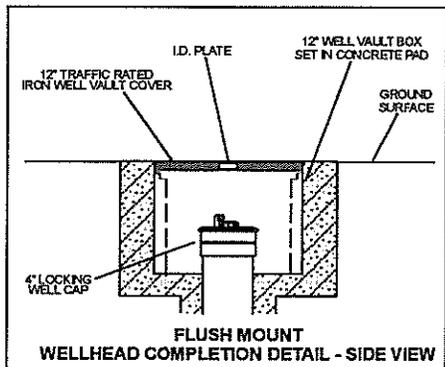
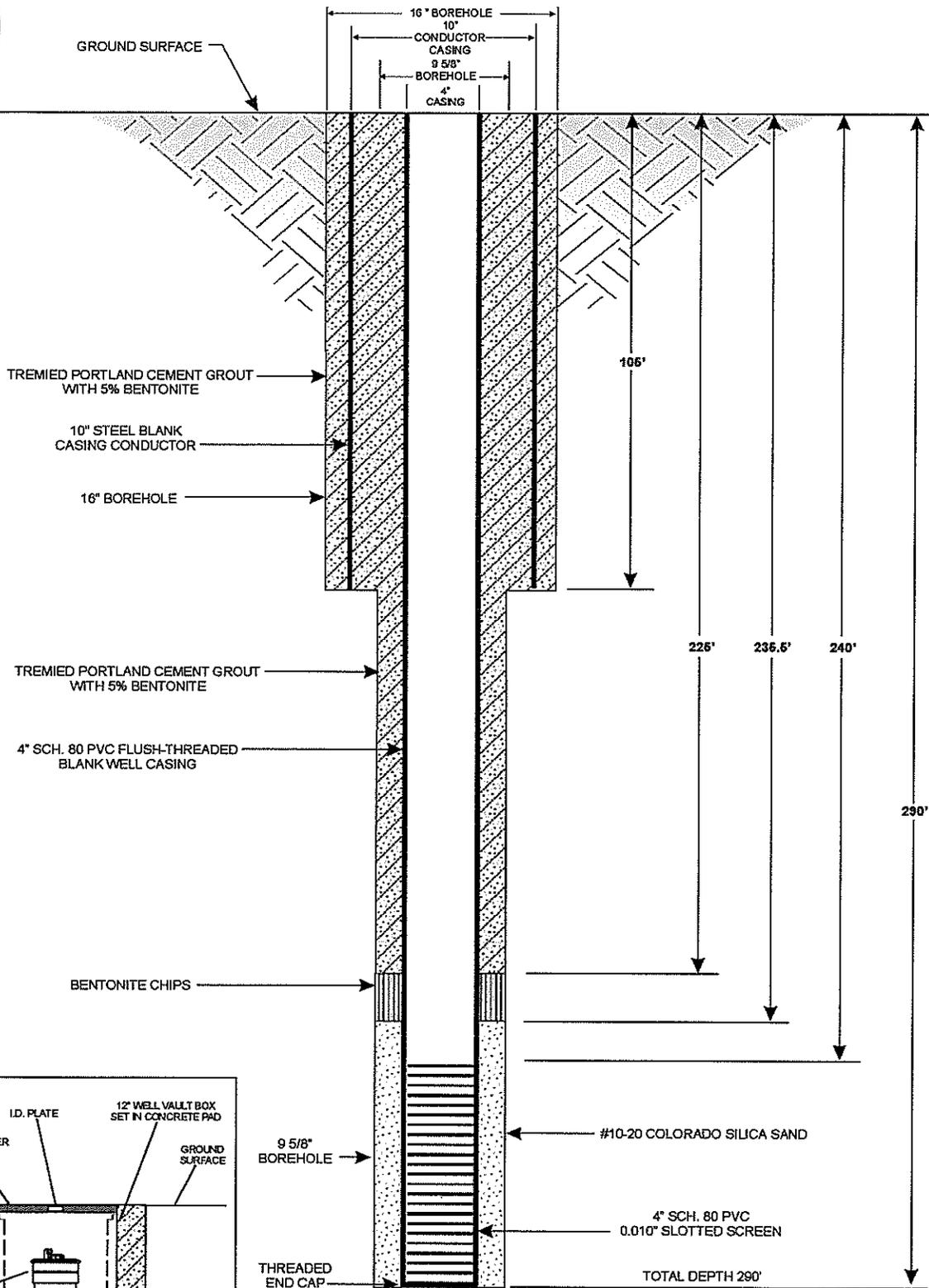
305'-320' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/4), 30-40% CLAY, 40-50% FINE SAND, 15-25% MEDIUM SAND.

320'-330' SAND (SW), PALE YELLOWISH BROWN (10YR 6/2), 35-45% FINE SAND, 25-35% MEDIUM SAND, 20-30% COARSE SAND.

330' END OF BORING.



SEE WELLHEAD COMPLETION DETAIL.



NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

AS-BUILT CONSTRUCTION DETAIL OF
REGIONAL AQUIFER MONITOR WELL PER-25

FIGURE
PER-25

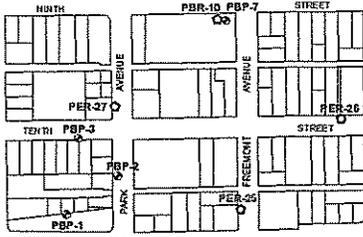
PROJECT#: 365-0003-01

FILE#: per25wcd

DATE DRAWN: 09/30/02

DRAWN BY: B. McCLELLAN

Boring Location Sketch:



Project No: 365-0003-04	Date Drilled: 01-07-03	Boring No. PER-25
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		Sheet No. 8 of 9
Location: SW ¼ SECTION 7, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 AND 9 5/8 INCHES

Top of casing elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth		
								Time		
								Date		
245										
250										
255										
260										
265										
270										
275										
280										

252'-266' CLAYEY SAND (SC), MODERATE YELLOWISH BROWN (10YR 5/5), 20-25% CLAY AND SILT, 55-60% FINE SAND, 20-25% MEDIUM SAND.

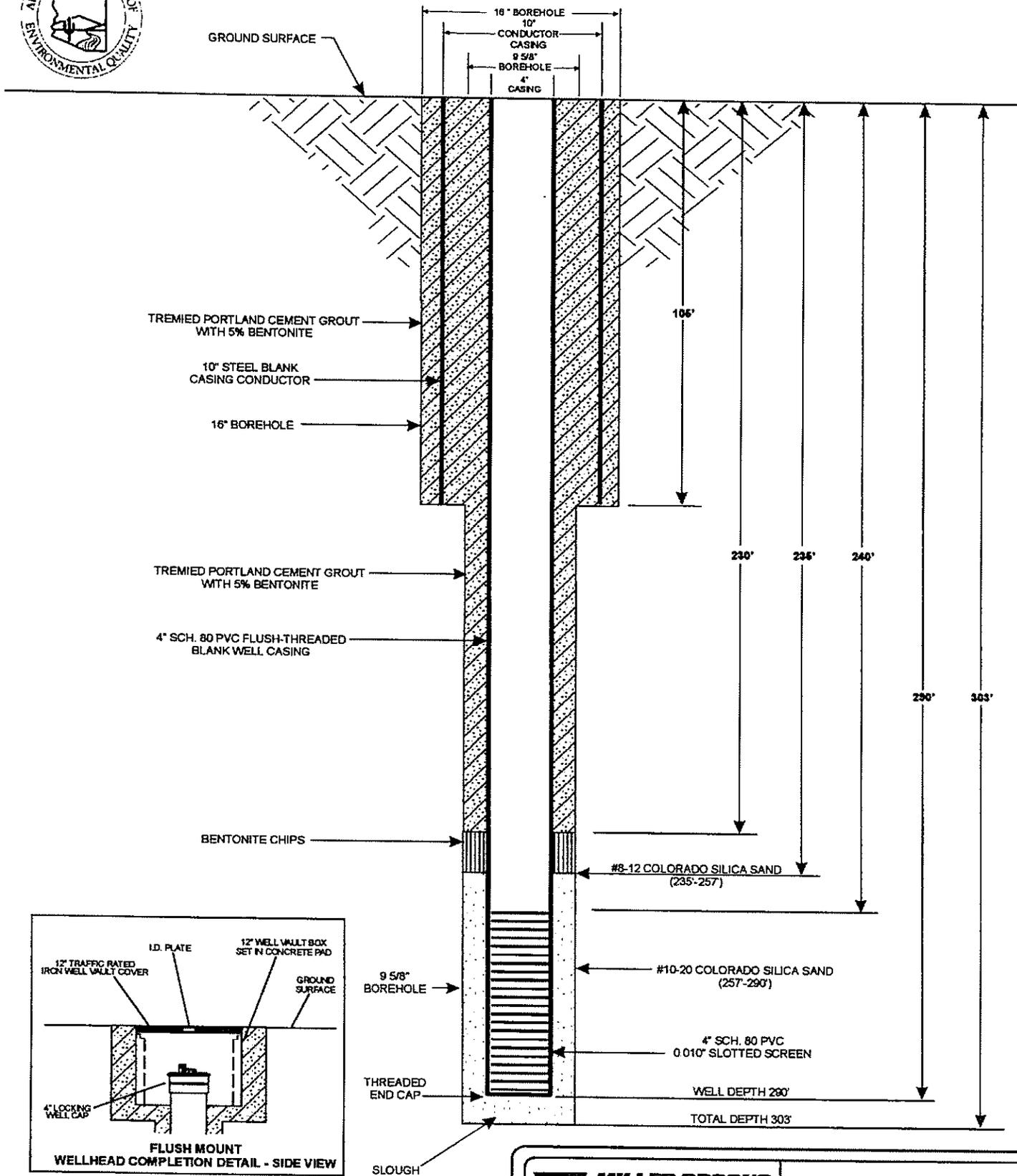
266'-274' CLAYEY GRAVEL (GC), MODERATE YELLOWISH BROWN (10YR 5/5), 25-30% CLAY, 50-55% GRAVEL 1/4" TO 1/2", 15-20% SAND.

274'-278' SAND (SW), MODERATE YELLOWISH BROWN (10YR 5/5), WELL GRADED, 40-45% FINE SAND, 25-30% MEDIUM SAND, 20-25% COARSE SAND.

278'-290' SAND (SP), POORLY GRADED, 65-70% FINE SAND, NO COARSE SAND.



SEE WELLHEAD COMPLETION DETAIL.



NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

AS-BUILT CONSTRUCTION DETAIL OF
REGIONAL AQUIFER MONITOR WELL PER-26

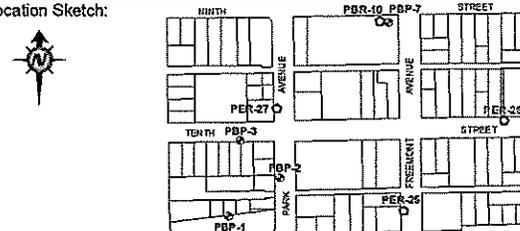
FIGURE
PER-26

PROJECT#: 365-0003-01

FILE#: per26wcd

DATE DRAWN: 06/29/03

DRAWN BY: B. McCLELLAN

Boring Location Sketch: 	Project No: 385-0003-04	Date Drilled: 05-12-03 TO 05-15-03	Boring No.	
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			PER-26
	Facility: PARK-EUCLID WQARF SITE			
	Location: SW 1/4 SECTION 7, T. 14 S., R. 14 E.			Sheet No.
	City: TUCSON, ARIZONA			2 of 9
Logged By: J. MEYER		Driller: WDC		

Drilling Method: AIR ROTARY	SEE WELL CONSTRUCTION DETAIL
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Boring Diameter: 16 AND 9 5/8 INCHES	Top of casing elevation:	Ground Level Elevation:
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Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	Time	Date
35										
40										
45										
50			10:50	0.1						
55										
60										
65										
70										

SIMILAR TO ABOVE, MODERATE BROWN (5YR 4/4), 45-55% FINE SAND, 30-35% MEDIUM SAND, 20-25% COARSE SAND.

SIMILAR TO ABOVE, 15-20% GRAVEL 1/4"-1".

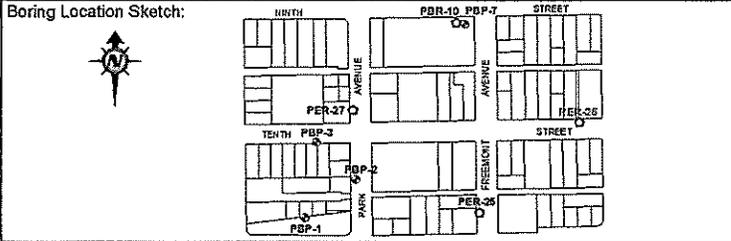
SIMILAR TO ABOVE, 15-20% COARSE SAND, 5-10% GRAVEL 1/4".

SIMILAR TO ABOVE, MODERATE BROWN (5YR 4/4), 20-25% FINE SAND, 30-35% MEDIUM SAND, 20-25% COARSE SAND, 25-30% GRAVEL 1/4"-1".

SIMILAR TO ABOVE, 35-40% GRAVEL 3/4"-2", ANGULAR GRAVEL AND ROCK CLASTS.

SIMILAR TO ABOVE, 25-30% GRAVEL 1/4"-1", SUB-ROUNDED.

SIMILAR TO ABOVE, 15-20% FINE SAND, 25-30% MEDIUM SAND, 25-30% COARSE SAND, 30-35% GRAVEL 1/4"-1/2", SUB-ROUNDED.



Project No: 365-0003-04	Date Drilled: 05-12-03 TO 05-15-03	Boring No. PER-26
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		
Location: SW 1/4 SECTION 7, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC	
Casing installation data: SEE WELL CONSTRUCTION DETAIL		

Drilling Method: AIR ROTARY

Boring Diameter: 16 AND 9 5/8 INCHES

Top of casing elevation: _____

Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth		Ground Level Elevation	
								Time			
175											
180											
185											
190											
195											
200			16:28	0.2							
205											
210											

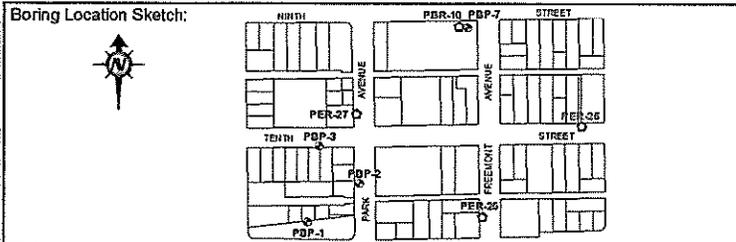
SIMILAR TO ABOVE, GRAVELLY SAND, LIGHT BROWN (5YR 6/4), 15-20% FINE SAND, 35-40% MEDIUM SAND, 20-25% COARSE SAND, 25-30% GRAVEL 1/4"-1".

SIMILAR TO ABOVE, SAND, LIGHT BROWN (5YR 6/4), 45-50% FINE SAND, 30-35% MEDIUM SAND, 20-25% COARSE SAND.

201'-206' SILTY SAND (SM), LIGHT BROWN (5YR 6/4), 20-30% SILT, 60-70% FINE SAND, 10-15% MEDIUM SAND.

206'-209' SAND (SP), POORLY GRADED, 5-10% SILT, 70-75% FINE SAND, 20-25% MEDIUM SAND, SLIGHTLY MOIST.

209'-270' GRAVELLY SAND (SW), LIGHT BROWN, 35-40% FINE SAND, 20-25% MEDIUM SAND, 15-20% COARSE SAND, 25-30% GRAVEL 1/4"-3/4".



Project No: 365-0003-04	Date Drilled: 05-12-03 TO 05-15-03	Boring No. PER-26
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		
Location: SW 1/4 SECTION 7, T. 14 S., R. 14 E.		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC	
Casing installation data: SEE WELL CONSTRUCTION DETAIL		

Drilling Method: AIR ROTARY

Boring Diameter: 16 AND 9 5/8 INCHES

Top of casing elevation:	Ground Level Elevation:
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Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol
245						[Well Detail Diagram]	[Soil Group Symbol]
250			10:45	0.0		[Well Detail Diagram]	[Soil Group Symbol]
255						[Well Detail Diagram]	[Soil Group Symbol]
260						[Well Detail Diagram]	[Soil Group Symbol]
265						[Well Detail Diagram]	[Soil Group Symbol]
270			11:37	0.0		[Well Detail Diagram]	[Soil Group Symbol]
275						[Well Detail Diagram]	[Soil Group Symbol]
280						[Well Detail Diagram]	[Soil Group Symbol]

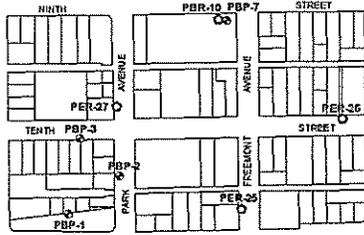
Water Depth	Time	Date

SIMILAR TO ABOVE, 30-35% FINE SAND, 25-30% COARSE SAND, 20-25% GRAVEL.

SIMILAR TO ABOVE, 40-45% FINE SAND, 30-35% MEDIUM SAND, 20-25% COARSE SAND, POSSIBLE CALICHE.

270'-280' CLAYEY SAND (SC), 10-20% CLAY, 65-70% FINE SAND, 15-20% MEDIUM SAND.

SIMILAR TO ABOVE, SATURATED.

Boring Location Sketch:


Project No: 365-0003-04	Date Drilled: 05-12-03 TO 05-15-03	Boring No. PER-26
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		
Location: SW ¼ SECTION 7, T. 14 S., R. 14 E		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC	Sheet No. 9 of 9

Drilling Method: AIR ROTARY

SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 AND 9 5/8 INCHES

Top of casing elevation:	Ground Level Elevation:
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Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	
								Time	Date
								280	
285			12:22	0.0					
290									
295									
300									
305									
310									
315									
320									
325									
330									
335									
340									
345									

280'-303' SAND WITH GRAVEL (SW), WELL GRADED, 35-40% FINE SAND, 35-40% MEDIUM SAND, 15-20% COARSE SAND, 5-10% GRAVEL 1/4", SATURATED.

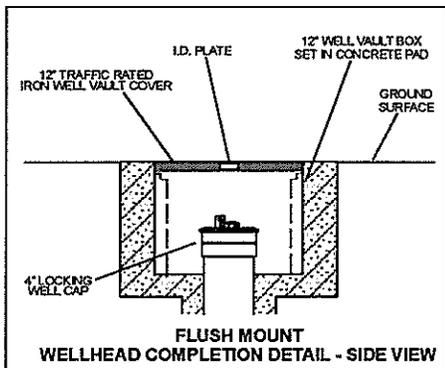
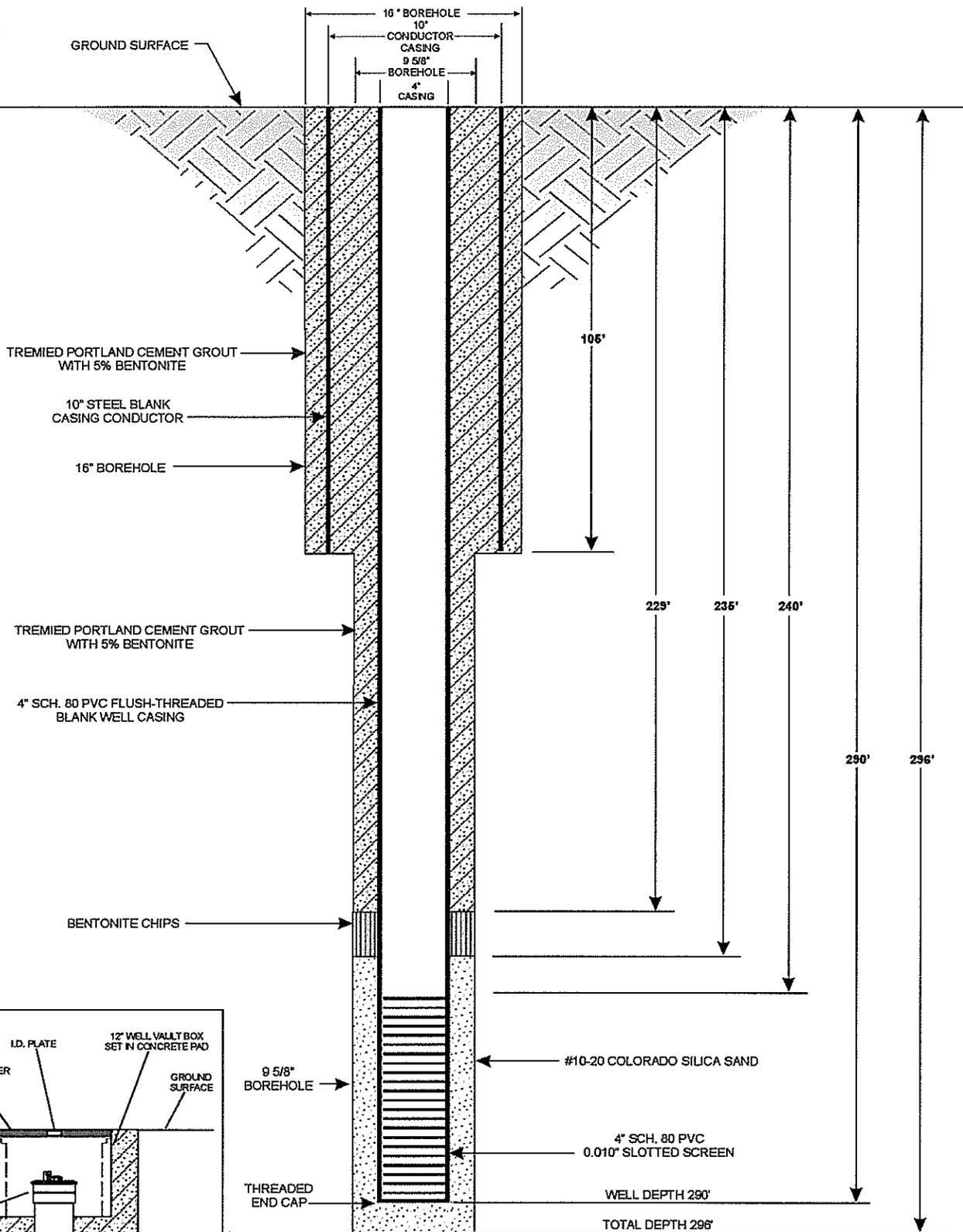
290' END OF CASING, BOREHOLE 290'-303' FILLED WITH SLOUGH AND SAND PACK.

SIMILAR TO ABOVE, VERY COARSE GRAVEL ROCK CLASTS, POSSIBLE CEMENTATION.

303' END OF BORING.



SEE WELLHEAD COMPLETION DETAIL



NOT TO SCALE

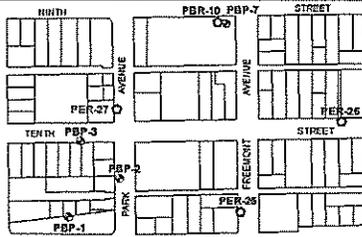


PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

AS-BUILT CONSTRUCTION DETAIL OF
REGIONAL AQUIFER MONITOR WELL PER-27

FIGURE
PER-27

PROJECT#: 365-0003-01	FILE#: per27wcd	DATE DRAWN: 06/29/03	DRAWN BY: B. McCLELLAN
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Boring Location Sketch:


Project No: 365-0003-04	Date Drilled: 05-17-03 TO 05-20-03	Boring No. PER-27
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		
Location: SW ¼ SECTION 7, T. 14 S., R. 14 E		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC	Sheet No. 2 of 9

Drilling Method: AIR ROTARY

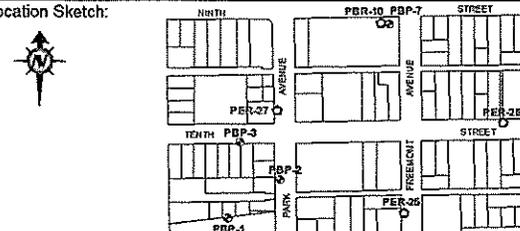
SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 AND 9 5/8 INCHES

Top of casing elevation:	Ground Level Elevation:
--------------------------	-------------------------

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Description
35								36'-44' GRAVEL WITH CLAY (GP-GC), ANGULAR GRAVEL 1/4"-1/2".
40								
45								44'-50' CLAYEY GRAVEL (GC), POORLY GRADED, 15-20% CLAY, 20-25% MEDIUM SAND, 15-20% COARSE SAND, 45-50% GRAVEL 1/4".
50								50'-52' SAND (SW), LIGHT BROWN (5YR 6/4), WELL GRADED, 5-10% CLAY, 30-35% FINE SAND, 35-40% MEDIUM SAND, 20-25% COARSE SAND.
55			09:27	0.1				52'-69' GRAVEL (GW), WELL GRADED, 20-25% COARSE SAND, 70-75% GRAVEL 1/4"-1", FEW FINES.
60								SIMILAR TO ABOVE, 1/4" ANGULAR GRAVEL, COARSE SAND, AND CLAY.
65								
70			09:58	0.0				69'-72' CLAYEY SAND (SC).

FIELD EXPLORATORY BORING LOG

Boring Location Sketch: 	Project No: 365-0003-04	Date Drilled: 05-17-03 TO 05-20-03	Boring No.
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		PER-27
	Facility: PARK-EUCLID WQARF SITE		
	Location: SW 1/4 SECTION 7, T. 14 S., R. 14 E.		Sheet No.
City: TUCSON, ARIZONA		5 of 9	
Logged By: J. MEYER			
Driller: WDC		Casing installation data:	
SEE WELL CONSTRUCTION DETAIL			

Drilling Method: AIR ROTARY	SEE WELL CONSTRUCTION DETAIL
Boring Diameter: 16 AND 9 5/8 INCHES	Top of casing elevation: _____
	Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth	Time	Date
140										
145										
150										
155										
160										
165										
170										
175										

SIMILAR TO ABOVE, GRAVELLY SAND, 20-25% FINE SAND, 30-35% MEDIUM SAND, 10-15% COARSE SAND, 35-40% ANGULAR GRAVEL 3/4"-2".

SIMILAR TO ABOVE, LIGHT BROWN (5YR 6/4), 30-35% FINE SAND, 40-45% MEDIUM SAND, 25-30% COARSE SAND.

SIMILAR TO ABOVE, 230% FINE SAND, 30-35% COARSE SAND.

SIMILAR TO ABOVE, GRAVEL 2"-3".

Boring Location Sketch: 	Project No: 365-0003-04	Date Drilled: 05-17-03 TO 05-20-03	Boring No. PER-27
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
	Facility: PARK-EUCLID WQARF SITE		
	Location: SW 1/4 SECTION 7, T. 14 S., R. 14 E.		
	City: TUCSON, ARIZONA		
Logged By: J. MEYER		Driller: WDC	
Casing installation data:			

Drilling Method: AIR ROTARY	SEE WELL CONSTRUCTION DETAIL
-----------------------------	------------------------------

Boring Diameter: 16 AND 9 5/8 INCHES	Top of casing elevation:	Ground Level Elevation:
--------------------------------------	--------------------------	-------------------------

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth			
								Time			
								Date			
175											
180											
185											
190											
195											
200											
205											
210											

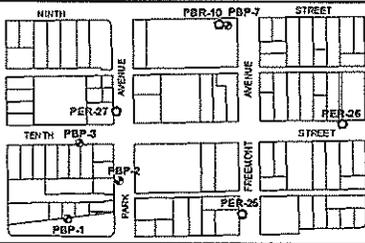
179'-187' CLAYEY SAND (SC), LIGHT BROWN (5YR 6/4), 15-20% CLAY, 60-70% FINE SAND, 15-20% MEDIUM SAND.

187'-195' SAND (SW), LIGHT BROWN 5YR 6/4), 45-50% FINE SAND, 20-25% MEDIUM SAND, 15-30% COARSE SAND.

195'-200' SAND (SP), POORLY GRADED, 70-75% FINE SAND, 15-20% MEDIUM SAND, 5-10% COARSE SAND.

200'-202' SILTY SAND (SM), PALE YELLOWISH ORANGE (10YR 8/2), 10-15% SILT, 85-90% SAND.

202'-222' SAND (SW), LIGHT BROWN (5YR 6/4), WELL GRADED, 45-50% FINE SAND, 35-40% MEDIUM SAND, 10-15% COARSE SAND.

Boring Location Sketch:


Project No: 365-0003-04	Date Drilled: 05-17-03 TO 05-20-03	Boring No. PER-27
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK-EUCLID WQARF SITE		
Location: SW ¼ SECTION 7, T. 14 S., R. 14 E.		Sheet No. 7 of 9
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC	

Drilling Method: AIR ROTARY

Casing installation data: SEE WELL CONSTRUCTION DETAIL

Boring Diameter: 16 AND 9 5/8 INCHES

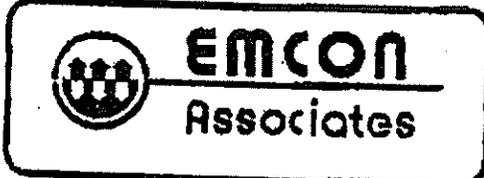
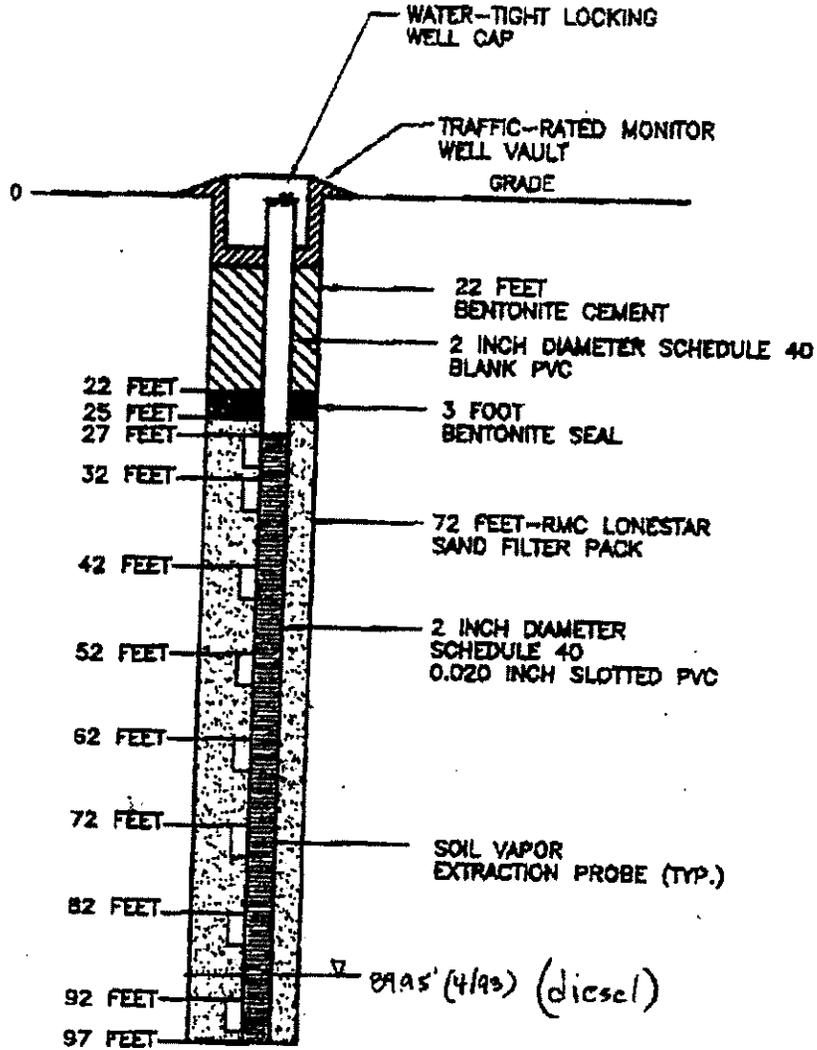
Top of casing elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blows Per 6"	Well Detail	Soil Group Symbol	Water Depth		
210										
215										
220										
225										
230										
235										
240										
245										

SIMILAR TO ABOVE, <5% COARSE SAND.

222'-230' SANDY SILT (ML), PALE YELLOWISH BROWN (10YR 8/2), 65-70% SILT, 25-30% FINE SAND.

230'-245' SANDY SILT (SM), 70-75% SILT, 15-20% MEDIUM SAND, 5-10% COARSE SAND.



DRAWN BY: GAL

DATE LAST REVISED: 6-8-95

MISSION INDUSTRIES
301 SOUTH PARK AVENUE
SVE WELL INSTALLATION REPORT
TUCSON, ARIZONA

SOIL VAPOR EXTRACTION
WELL CONSTRUCTION DETAIL SVE 101

FIGURE
3
PROJECT NO.
DH31-001.01

CADD FILE J:\4310101\PHASE3\F03

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE101

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 1 OF 5

BY K. Kilgore DATE 4/4/93

SURFACE ELEV. 2412.98 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5	5		<p>CONCRETE, 4" thick, good condition, no cracks, low/moderate weathering, no reinforcement</p> <p>GRAVELLY SAND (SP) Brown (7.5YR, 5/4). Trace fines, mostly sand (trace fine, mostly medium/coarse), little/some gravels (subangular, 1/8" to 1/2"). Exhibits moderate cementation. Moist. At 3/4' bls moderate/high cementation in zones (reacts highly with 10% HCl).</p>	
12.7ppm	75%	9 9 9		10	10		<p>GRAVELLY SAND (SP) Brown. Slightly clayey (trace). 30% fine gravel (<1/2"). 40% medium to coarse sand. 20% fine sand. Caliche cementation. Loose. No odor. Dry.</p>	
0.0ppm	75%	13 18 18		15	15		<p>GRAVELLY SAND (SP) Red (2.5YR, 4/8). 40-50% coarse sand. 30% fine gravel. 20% medium sand. Slightly moist. No fines. No odor.</p> <p>Color change - Reddish yellow to pink. 20% gravel (1/2" to 3/4", sub-rounded). Heavy cementation. Dry.</p>	
0.0ppm	75%	8 17 17		20	20			

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



EMCON
ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE101

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 5

BY K. Kilgore DATE 4/4/93

SURFACE ELEV. 2412.98 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0ppm	100%	70 102/6"					<p>SANDY GRAVEL (GM) Pale red to pinkish white/pink. 10% 1/2" and 50% 1/4" sub-angular gravel. 20% coarse to medium sub-angular sand. 10-20% silt/clay and very fine sand. Heavy cementation. Dry, compacted and cemented tightly. No odor.</p>	
0.0ppm	100%	24 30 30		25			<p>SANDY GRAVEL (GM) Light reddish brown (5YR, 6/3). 60% fine, angular gravel (1/4" to 1/2"). 30-20% medium to coarse subangular sand. 10-20% fine sand. Dry, loose, no cementation. No odor.</p>	
0.0ppm	100%	20 34 55		30			<p>SANDY GRAVEL (GM) Pinkish white (5YR, 8/2) cementation, reddish brown sediment (5YR, 5/3). 50-60% 1/2" subangular gravel. 20% coarse sub-angular sand. 10% medium sand. 10-20% fine to very fine sand. Matrix slightly moist. Tightly cemented with partial vertical loose zones. No odor.</p>	
0.0ppm	100%	20 20 30		35			<p>GRAVELLY SAND/ CLAYEY SAND (SC) Light reddish brown. Slightly moist at 36.5'. No odor. Clay slightly stiff, low to medium plasticity. Sand, well-graded, (20% coarse, 20% medium, and 20% fine). 20-30% fine (<0.5") angular gravel. No cementation. Increasing clay at 37'. Color change to dark reddish brown.</p>	
				40			<p>SILTY SAND (SM) Yellowish red (5YR, 5/6). Dry. Loose. No cementation. 15-20% fine subangular</p>	

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



EMCON
ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE101

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 5

BY K. Kilgore

DATE 4/4/93

SURFACE ELEV. 2412.98 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0ppm	100%	29 50 40					gravel, 20% coarse subangular sand, 20% medium subangular sand, 40% very fine sand and silt. No odor. Increasing clay content at 41.5' CLAYEY SAND (SC) Stiff clay layer 0.5"	
0.8ppm	100%	22 50 50		45			GRAVELLY SAND (SP) Reddish brown (5YR, 5/4). Loose. Dry. 15% fine (0.125-0.5") subangular gravel, 60% medium sand, 5% subangular coarse sand, 20% very fine sand and silt. No odor.	
0.0ppm	100%	19 40 40		50			GRAVELLY SAND (SP) Yellowish red (5YR, 5/6). 10% fine (0.125-0.25") gravel, 60% medium sand, 20% fine sand, 10% clay (soft to very soft, low plasticity). Slightly moist @51'. no odor. 0.5" basalt piece.	
0.0ppm	100%	22 48 68		55			GRAVELLY SAND (SP) Dark reddish brown. Clay lense 0.5' thick @56'. Slightly moist. 10% fine subangular gravel, 50-60% medium to coarse sand, 10% fine sand. Clayey matrix. Slightly loose between 55-56' and consolidated 56-56.5'. No cementation.	
				60				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

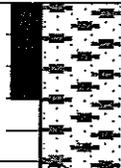
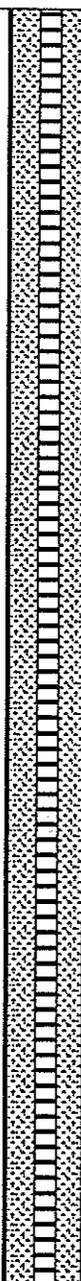
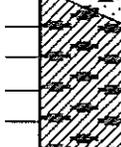
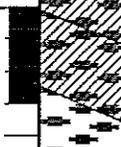
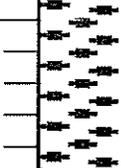
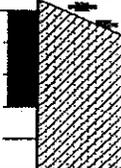
BORING NO. SVE101

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 5

BY K. Kilgore DATE 4/4/93

SURFACE ELEV. 2412.98 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0ppm	100%	28 34 40					<p>SANDY GRAVEL (GW) Light reddish brown. No caliche. 10% 1" angular gravel (quartz). 40-50% fine angular to subangular gravel. 20% coarse to very fine sand. Dry. No odor.</p>	
6.1ppm	100%	20 38 38		65			<p>CLAYEY GRAVEL (GC) Reddish brown (2.5YR, 4/3). 40% 1" subrounded gravel. 30% fine subrounded gravel in a clay matrix. Soft, low to medium plasticity clay in 0.5" to 1" lenses from 63-64'. Slightly moist.</p>	
							<p>CLAYEY GRAVEL to SANDY GRAVEL (GC-GP) Reddish brown. Dry to slightly moist. Clay matrix soft, medium plasticity. No clay @66.5'. @66-66.5' sandy gravel with ~ 10% fines.</p>	
25.3ppm	100%	24 34 40		70			<p>SANDY CLAY TO CLAYEY SAND (SC-CL) Yellowish red (5YR, 4/6). Dry to slightly moist. 10% medium sand, 20-40% fine to very fine sand. Clay ranges from soft to stiff. Micaceous. < 5% fine (0.25") gravel.</p>	
23.8ppm	100%	28 44 50		75			<p>Same as above.</p> <p>slight sweet odor in cuttings.</p> <p>Rig chatter - overheated. In stiffer clay; clay balling up on auger.</p>	
				80				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE101

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 5

BY K. Kilgore DATE 4/4/93

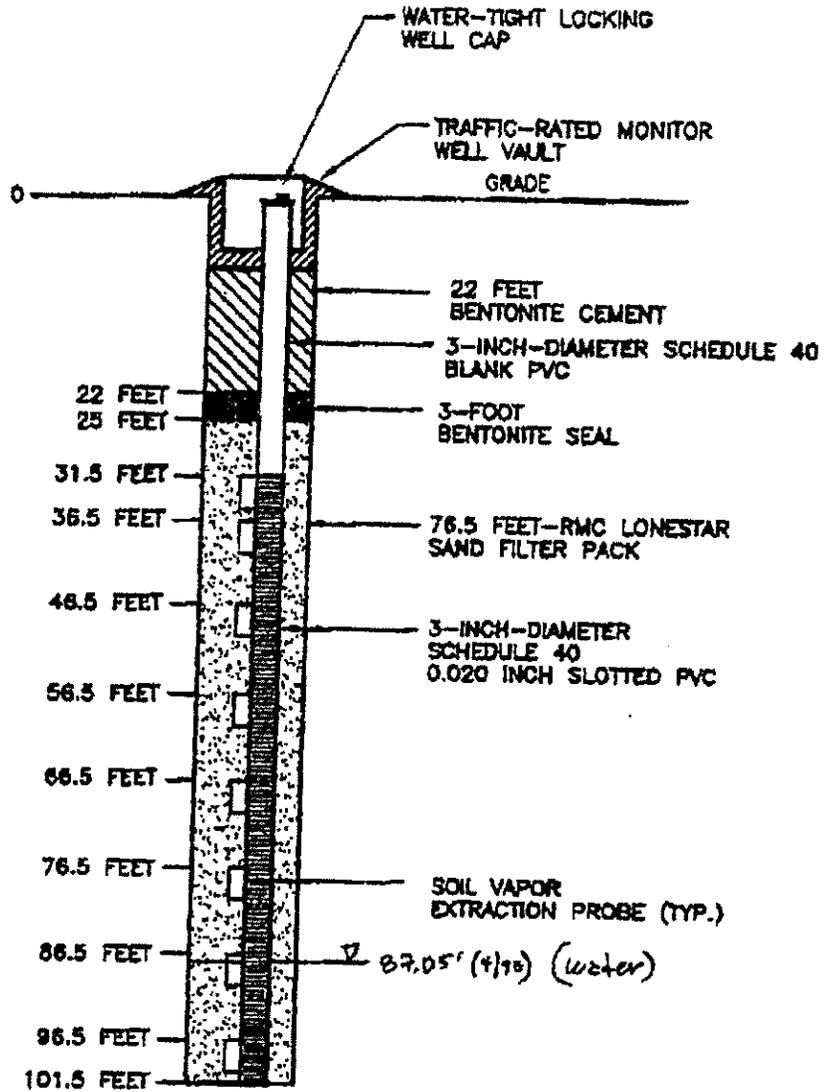
SURFACE ELEV. 2412.98 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0ppm	100%	23 34 26				80-81'	<p>CLAYEY SAND to SANDY CLAY (SC-CL) Reddish brown (5YR, 5/4). Dry. Slightly loose from 80-81'. Increasing clay at 81'. 50% medium subangular sand, 10% fine to very fine sand. Less than 10% very fine gravel in clay matrix. Clay medium plasticity. Decreasing sand and increasing clay at 81'. No odor. (Soil moisture sample not sealed.)</p>	
	50%	67 170/3"				85'	<p>CLAYEY GRAVEL (GC) Clay: dark grayish brown; 2-3' granitic gravel: light gray. Matrix 30-40% coarse to medium sand. No moisture sample collected. (Incomplete recovery- tube blocked with clay and granite gravel/ cobble). Clay slightly moist, medium plasticity, soft. Slight odor.</p>	
0.0ppm	75%	20 35 40				90'	<p>GRAVELLY SAND (SW) Light reddish brown (2.5YR, 6/3). Dry to slightly moist (moist @ 90.5'). Well-graded. 30-40% fine gravel. 60% coarse to fine sand. Strong diesel odor.</p>	
258ppm	100%	27 40 50				90.5'	<p>GRAVELLY SAND Green free product inside split spoon; same as above.</p>	
330ppm	100%	27 27 27				95'	<p>SANDY CLAY (CL) Reddish brown. Moist. Tight stiff clay. 40% medium to coarse sand. Free product.</p>	
55.49	100%	25 35 35				95'	<p>SANDY CLAY (CL) Reddish brown. Increasing medium sand. Free product. Moist, but drier than above.</p>	
BORING TERMINATED AT 100 FEET (TARGET DEPTH)								

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .





NOT TO SCALE



MISSION INDUSTRIES
301 SOUTH PARK AVENUE
SVE WELL INSTALLATION REPORT
TUCSON, ARIZONA

SOIL VAPOR EXTRACTION
WELL CONSTRUCTION DETAIL SVE 102

FIGURE
4
PROJECT NO.
OH31-001.01

DRAWN BY: GAL DATE LAST REVISED: 6-8-95

CADD FILE: \\VST0101\PHASER\F04

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE102

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 6

BY K. Kilgore

DATE 4/6/93

SURFACE ELEV. 2413.09 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
	100%	23 55 55		25			<p>GRAVELLY SAND (SW) Reddish brown (5/4). Dry. Loose. 30% fine subrounded to subangular gravel (0.25-0.5"). 40% coarse sand. 30% medium to fine sand. Slight unknown odor.</p>	
				30			<p>GRAVELLY SAND (SW) Reddish brown (5/4). Loose. Dry. 30% fine subangular gravel. 10% coarse sand. 40% medium sand. 10-20% fine sand with some clay in matrix.</p>	
	100%	23 40 90		35			<p>GRAVELLY SAND (SW) Light reddish brown. Loose. Dry. 10% fine, subangular gravel. 40% coarse sand. 30% medium sand. 20% fine sand.</p>	
				40			<p>GRAVELLY SAND (SP) Reddish brown (4/3). Dry, loose. 20% fine, subrounded gravel (<0.25"). 40% coarse sand, subrounded. 30% medium sand. 10% fine sand.</p> <p>Rig chatter @ 39'.</p>	

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

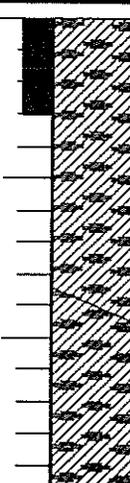
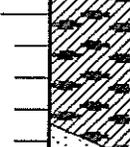
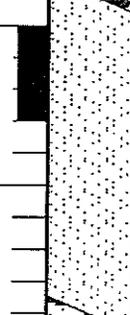
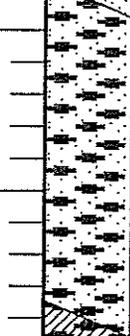
BORING NO. SVE102

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 6

BY K. Kilgore DATE 4/6/93

SURFACE ELEV. 2413.09 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
	100%	27 33 50					<p>CLAYEY SAND (SC) Reddish brown (5/4). Dry, but outside of sleeves slightly moist. 10% fine, rounded gravel (<0.25"). 40% coarse sand. 10% medium sand. 10-20% fine sand. Clay matrix. Loose, soft.</p>	
				45			<p>SANDY GRAVEL (GC) Dark reddish grey (4/2). Clay matrix. Slightly moist. No odor. 30% (0.75-1") coarse subrounded gravel. 30% fine subrounded gravel. 20% very coarse sand. 10-15% fine to very fine sand.</p>	
	100%	15 21 27					<p>SAND (SW) Yellowish red. Dry, loose. 15% fine subangular gravel (0.25"). 50% very coarse subangular sand. 15% medium sand. 15% fine to very fine sand. No odor.</p>	
				50			<p>SANDY GRAVEL (GW) Dark reddish brown. Dry to slightly moist. Loose. <10% coarse subrounded gravel. 40% fine gravel. 20-10% very coarse sand. 10% medium to coarse sand. 10% fine sand. 10% very fine sand.</p>	
				55			<p>POORLY-GRADED GRAVEL (GP) 40% coarse gravel (0.75"-1"), 40% fine gravel (<0.5"), 20% very coarse sand at 57'.</p>	
				60				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE102

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 6

BY K. Kilgore

DATE 4/6/93

SURFACE ELEV. 2413.09 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
19.2	100%	20					<p>CLAYEY SANDY GRAVEL (GC) Reddish brown (4/4). Loose, slightly moist. 10% coarse subrounded gravel; 30% fine subrounded to subangular gravel. 10% very coarse sand. 10-15% medium sand. 10% fine sand; clay matrix.</p> <p>SANDY GRAVEL (GW) Dark reddish grey. Loose, dry. 10% coarse gravel. 20% fine subangular gravel. 30% very coarse sand. 20% medium sand. 20% fine to very fine sand.</p>	
		40						
		50						
				65				
							<p>SANDY CLAY (CL) Reddish brown.</p> <p>Water added to hole - samples collected, 2 40ml VOA vials.</p>	
290	100%	20					<p>GRAVELLY SAND (SW) Red (2.5YR 5/6). 10% fine subangular gravel and quartz. 10% fine gravel. 30% very coarse sand. 20% medium sand. 20% fine sand. Dry, loose.</p> <p>SANDY CLAY (CL) Reddish brown (2.5YR 4/3). Soft, low plasticity. 30% fine sand. 10% 0.25" subrounded gravel.</p>	
		30						
		50					<p>No gravel.</p>	
				70				
				75				
				80				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE102

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 6

BY K. Kilgore

DATE 4/6/93

SURFACE ELEV. 2413.09 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		40 50					<p>(4/4). Loose, slightly moist. 10% coarse subrounded gravel; 30% fine subrounded to subangular gravel. 10% very coarse sand. 10-15% medium sand. 10% fine sand; clay matrix.</p> <p>SANDY GRAVEL (GW) Dark reddish grey. Loose, dry. 10% coarse gravel. 20% fine subangular gravel. 30% very coarse sand. 20% medium sand. 20% fine to very fine sand.</p>	
				85			<p>SANDY CLAY (CL) Reddish brown.</p> <p>Water added to hole - samples collected, 2 40ml VOA vials.</p>	
290	100%	20 30 50		90			<p>GRAVELLY SAND (SW) Red (2.5YR 5/6). 10% fine subangular gravel and quartz. 10% fine gravel. 30% very coarse sand. 20% medium sand. 20% fine sand. Dry, loose.</p> <p>SANDY CLAY (CL) Reddish brown (2.5YR 4/3). Soft, low plasticity. 30% fine sand. 10% 0.25" subrounded gravel.</p>	
				95			No gravel.	
29.5	100%	30		100				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE102

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 6 OF 6

BY K. Kilgore DATE 4/6/93

SURFACE ELEV. 2413.09 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		41 70					<p>GRAVELLY SAND (SW) Reddish brown (5YR, 5/3). Trace fines, mostly sand (little/some fine (micaceous), mostly medium/coarse); little/some gravel (subangular to subrounded, 1/8 to 1/2 inch). 25% low to moderately cemented nodules (1/4 to 1/2 inch), no reaction with HCl). Moist.</p>	
	100%	20 63 36		105			<p>@ 85', Gravelly sand (loose).</p>	
28.8	100%	20 35		110			<p>SANDY CLAY (CL) Reddish brown (2.5YR, 5/4). Dry, soft, medium to low plasticity. 40% fine to very coarse sand. Slight odor, slight cementation (no reaction with HCl). 5-10% granite gravel (1/4 to 1/2 inch pieces, angular). @ 87-88 feet bls, odor detected - slightly sweet, diesel.</p>	
440	100%	42 50 50					<p>CLAYEY SAND (SC) Greenish gray (product) to yellowish red. Moist/saturated. 40% very coarse sand. 30% medium to fine sand. 5-10% fine gravel (1/4"). Strong odor. Greenish fluid in tube - slimy.</p>	
95	100%	18 22 35					<p>@ 91.5', Saturated. @ 93', Dry in last 2 rings; predominantly fine sand to very fine sand; strong odor.</p>	
	100%	25 33		115			<p>SANDY CLAY (CL) Reddish brown. Slightly moist. Clay - stiff, compacted tight. 30% very fine to fine sand. Odor - weathered product. No discoloration.</p>	
18.5	75%	13 13 15					<p>@ 96' Free product in tube. @ 96.5' Dry, no product, no discoloration.</p>	
47.5	100%	27 75					<p>CLAYEY SAND (SC) Reddish brown. Slightly moist. 30% coarse, 20% medium, 10-20% fine sand. Product odor, no discoloration.</p>	
378	100%	50 28 25 35					<p>CLAY (CL) Dark reddish brow. Very fine sand.</p>	

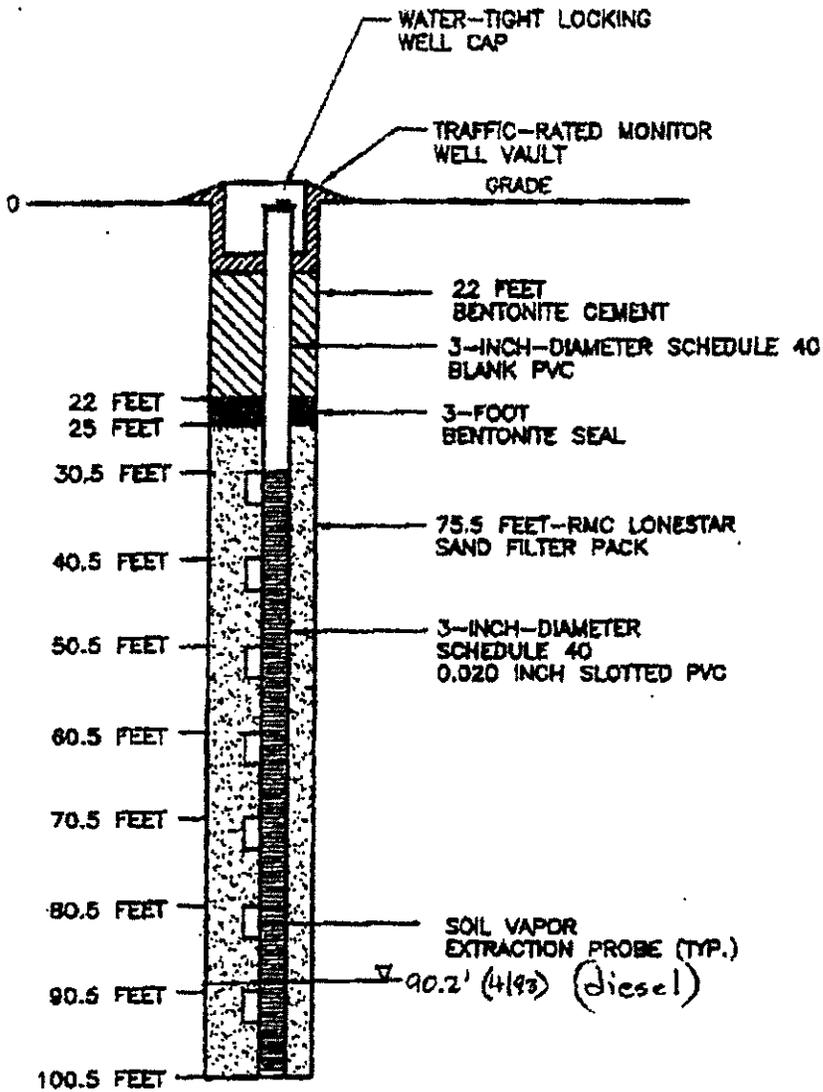
REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



SVE-103

P. 05



NOT TO SCALE



EMCON
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MISSION INDUSTRIES
301 SOUTH PARK AVENUE
SVE WELL INSTALLATION REPORT
TUCSON, ARIZONA

SOIL VAPOR EXTRACTION
WELL CONSTRUCTION DETAIL SVE 103

FIGURE

5

PROJECT NO.

CH31-001.01

DRAWN BY: GAL

DATE LAST REVISED: 6-6-88

CADD FILE J:\H310101\PHASE1\FIG5

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE103

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 1 OF 6

BY M. Minter DATE 4/7/93

SURFACE ELEV. 2413.08 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
20.5	100%	5 7 7		5 10 15 20	X X X		<p>CONCRETE (4 inches thick). Good integrity with moderate weathering. Few surface cracks; no reinforcement.</p> <p>GRAVELLY SAND (SP) Light brown (7.5YR, 6/3). Trace fines. Mostly sand (little/some fine, mostly medium/coarse). Little/some gravel (subangular to subrounded, 1/8 to 1/4 inch). Moist.</p> <p>SANDY GRAVEL (GP) Multicolored gravel with a brown matrix (7.5YR, 5/4). Trace fines. Little/some sand (little/some fine, some/mostly medium to coarse). Some/mostly gravel (subrounded, 1/4 to 1 inch). Reacts violently with 10% HCl. Moist.</p> <p>@ 8.5', Decrease in diameter of gravel (1/8 to 1/4 inch). Reacts violently with 10% HCl. Overall decrease in sand (GC/GW).</p> <p>@ 15', Change in color to dark brown (7.5YR, 4/4).</p> <p>@ 18.5', 25-30% 1 to 1.5 inch nodules of low/moderate cemented sand.</p>	

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE103

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 6

BY M. Minter DATE 4/7/93

SURFACE ELEV. 2413.08 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
NT	100%	50 45 45/3"					<p>@ 20.5', Encounter 1-2 inch granitic, subrounded gravel. Does not react with 10% HCl.</p> <p>@ 25', Color change - brown (7.5YR, 5/4). Approximately 50% of gravels react mildly with 10% HCl - remaining volume granitic, does not react with HCl.</p> <p>@28' Color change to greyish brown (10YR 5/2)</p> <p>GRAVELLY SAND (SP) Grayish brown (10YR, 5/2). Trace fines. Some/mostly sand (little/some fine to medium, some/mostly coarse). Little/some gravel (subangular to subrounded, 1/8 to 1/4 inch). Moist (wetter than above).</p> <p>@ 36', Driller notices a decrease in drilling rate (approximately 1 inch of penetration for 30 seconds of drilling).</p> <p>GRAVELLY CLAYEY SAND (SC) Dark brown (7.5YR, 4/4). Some fines (moderate plasticity). Mostly sand (mostly fine/medium, little/some coarse). Trace gravels. Moist (wetter than above).</p>	
19.5	83%	12 44 40		25 30 35 40				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE103

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 6

BY M. Minter DATE 4/7/93

SURFACE ELEV. 2413.08 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
40	100%	32 40 40					<p>Clay reacts mildly with acid. @39' color change to reddish brown (5YR, 4/4).</p> <p>@40.5' 30-40% of volume exhibits low/moderate cementation (does not react with HCl). Moist (wetter than above).</p> <p>@43' decrease in drill rate - moderate rig chatter. Increase in clay.</p> <p>SANDY CLAY to CLAYEY SAND (SC/CL) Dark reddish brown (5YR 3/4). Some fines (moderate/high plasticity). Mostly sand (mostly fine/medium, little/some coarse). Trace gravel. Moist (wetter than above).</p> <p>@45' water is added to borehole to aid in the removal of cuttings/cool augers.</p>	
11.7	100%	23 27 27		50			Same as above.	
				55			Clay balls generated during drilling react mildly with 10% HCl.	
				60			@58.5' increase in fine material (high plasticity)	

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE103

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 6

BY M. Minter DATE 4/7/93

SURFACE ELEV. 2413.08 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
19.2	100%	25 25 30		65			<p>SANDY CLAY/CLAYEY SAND (CONT) @60.5' increase in fine (micaceous) sand. ~30% of volume exhibits low/moderate ferruginous cementation (does not react with acid). Staining along apparent pathways of cementation. Slight increase in gravel. Moist (drier than above).</p>	
290	78%	40 100 NC		70			<p>GRAVELLY SAND (SW) Reddish yellow (7.5YR, 7/6). Trace fines. Mostly sand (little/some fines, mostly medium to coarse/ very coarse). Little to some multicolored gravels (subangular to subrounded). Moist (wetter than above). Low cementation (does not react with HCl). Gravels ~0.125 to 0.25 inch diameter.</p> <p>@76' decrease in gravel</p>	
				75				
				80				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE103

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 6

BY M. Minter DATE 4/7/93

SURFACE ELEV. 2413.08 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
29.5	100%	19					GRAVELLY SAND (CONT.) @80' increase in gravels. Slight increase in moisture.	
		20						
		20						
				85			@87' increase in fines.	
							@90' diesel appears on sample barrel, strong diesel odor.	
28.8	78%	20						
		35						
		28						
440	66%	17						
		25						
		33						
95	83%	20					SANDY CLAY/ CLAYEY SAND (CL/SC) Brown (7.5YR, 5/4). Some fines (moderate to high plasticity). Mostly sand (mostly fine/medium, little/some coarse). Trace gravel. Wet.	
		30						
		45						
10.5	83%	20						
		50						
		45						
18.5	83%	10					@96' (wetter than above), increase in coarse sand.	
		30						
		30						
47.5	83%	14					SANDY CLAY (CL) Dark yellowish brown (10YR, 4/4). Mostly fines (high plasticity). Little/some sand (mostly very fine micaceous, trace/little medium/coarse). Trace gravel. Stiff (test with	
		31						
		35						
378	100%	20						
		20						
				100				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



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LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE103

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 6 OF 6

BY M. Minter DATE 4/7/93

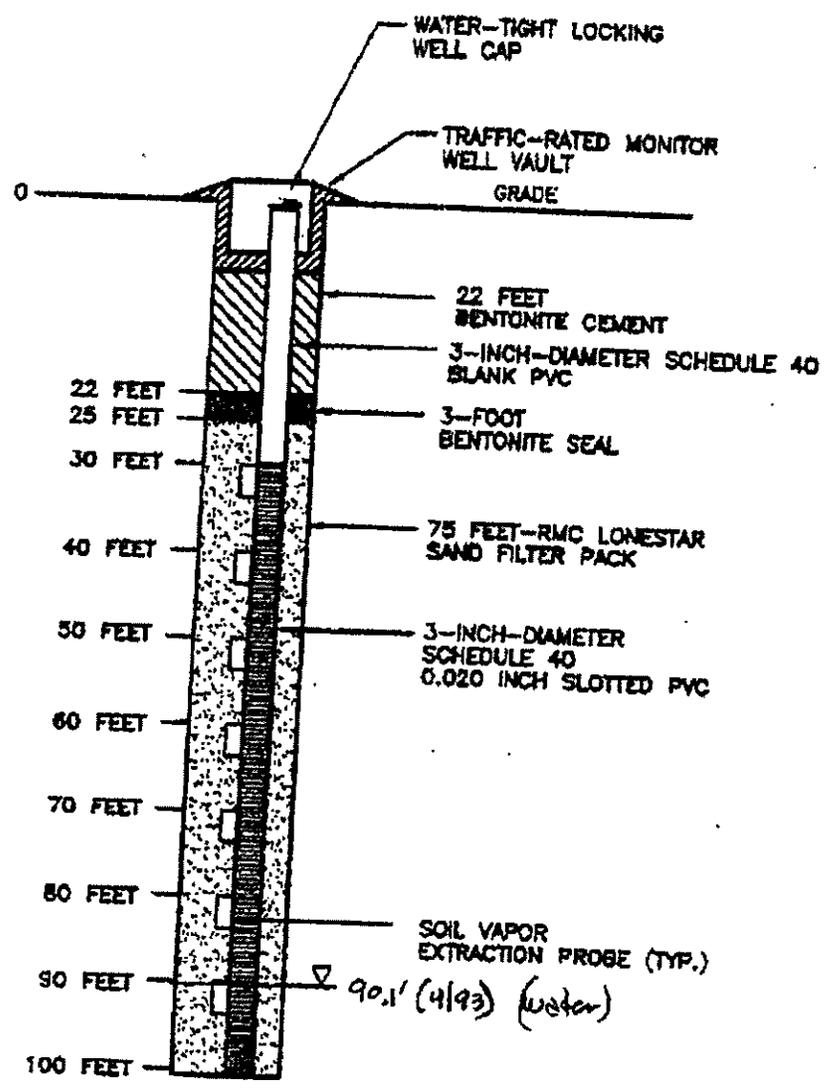
SURFACE ELEV. 2413.08 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
		25		105			pocket penetrometer). Wet. BORING TERMINATED AT 100.5 FEET (TARGET DEPTH)	
				110				
				115				
				120				



REMARKS
 BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .

SVE-104



NOT TO SCALE



EMCON
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MISSION INDUSTRIES
301 SOUTH PARK AVENUE
SVE WELL INSTALLATION REPORT
TUCSON, ARIZONA

SOIL VAPOR EXTRACTION
WELL CONSTRUCTION DETAIL SVE 104

FIGURE

6

PROJECT NO.
0431-001.01

DRAWN BY: GAL

DATE LAST REVISED: 8-8-88

CADD FILE: J:\310101\PHASE1\FOE

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE104

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 1 OF 5

BY M. Minter DATE 4/10/93

SURFACE ELEV. 2413.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5			<p>CONCRETE (4" thick) Good condition, moderate weathering, few surface cracks, no reinforcement.</p> <p>GRAVELLY SILTY SAND (SM) Light brown (7.5YR, 6/3). Little/some non-plastic fines. Mostly sand (little/some fine, mostly medium to coarse). Trace gravel. Loose. Reacts violently with 10% HCl. Dry.</p>	
14.8	100%	15 15 15		10			<p>GRAVELLY SAND to SANDY GRAVEL (GP/SP) Reddish yellow (7.5YR, 6/6) matrix with multicolored gravel. Trace fines. Some/mostly sand (trace fine, mostly medium to coarse). Little/some gravel (subangular to subrounded, 0.25 to 1 inch). Moist.</p>	
				15			@15' decrease in drilling rate	
				20				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE104

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 2 OF 5

BY M. Minter

DATE 4/10/93

SURFACE ELEV. 2413.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
10.2	83%	20 125		25			<p>GRAVELLY SAND/SANDY GRAVEL (CONT) @20' high cementation, reacts violently with 10% HCl, dry, change in color to pinkish gray (5YR, 7/2).</p> <p>@28' decrease in gravels, increase in coarse sand. Loose, dry.</p> <p>@30.5" (As above) low/moderate cementation, does not react with 10% HCl.</p>	
8.7	100%	17 57 57		30 35 40				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE104

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 3 OF 5

BY M. Minter DATE 4/10/93

SURFACE ELEV. 2413.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
12.8	100%	22 30 30					<p>GRAVELLY SAND /SANDY GRAVEL (CONT) @40' change in soil color to light reddish brown (5YR, 6/3). Loose, moist (wetter than @ 7').</p> <p>@47' trace non plastic fines.</p> <p>@50' slight increase in moisture.</p> <p>@53' trace moderately plastic fines, slight increase in moisture.</p> <p>@55' increase in gravel diameter to 1 to 2 inches (~50% of total volume).</p> <p>@59' increase in fine/medium sand, increase in moisture, slight decrease in drilling rate.</p>	
10.2	100%	13 17 19		45 50 55 60				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

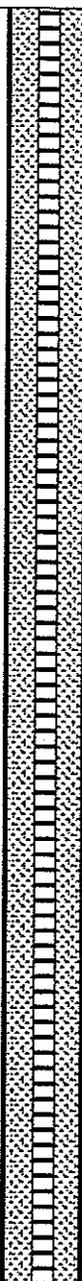
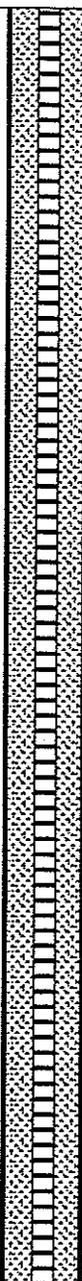
BORING NO. SVE104

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 4 OF 5

BY M. Minter DATE 4/10/93

SURFACE ELEV. 2413.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
11.3	66%	12					GRAVELLY SAND to SANDY GRAVEL (CONT) @60' moderate/high cementation, does not react with 10% HCl. Water is added to borehole to aid in cutting removal and to cool augers.	
		32 50						
12.3	100%	50		65			@70' increase in gravels (fragments of gravels (cobbles?) > 2 inches), low/moderate cementation - does not react with 10% HCl.	
		95 NC		70				
				75				
				80				

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0H31-001.01

BORING NO. SVE104

PROJECT NAME Mission Industries - Phase 2 Activities

PAGE 5 OF 5

BY M. Minter DATE 4/10/93

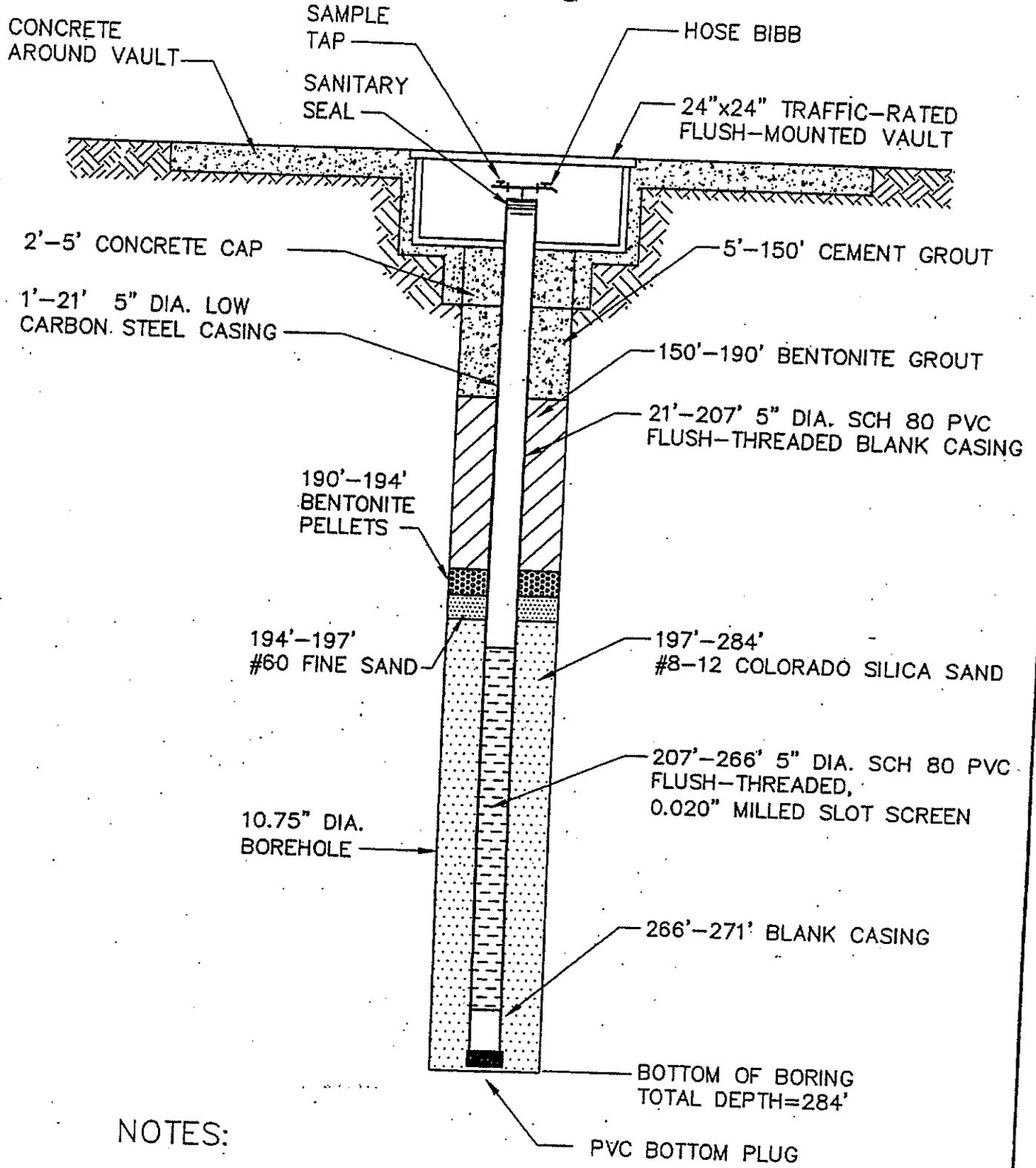
SURFACE ELEV. 2413.16 ft.

PID Reading	Recovery (ft/ft)	Blows Per 6 inches	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
31.9	100%	30 75 NC					<p>GRAVELLY SAND/SANDY GRAVEL (CONT.) @80' infrequent layers of clay (~3 inches thick), dark brown (7.5YR, 3/4). Mostly high plasticity fines. Trace very fine grained sand. No gravel. Wet.</p>	
40.1	66%	7 10 15		85			<p>@87' water is encountered.</p>	
247	33%	8 18 20		90			<p>SAND (SP) with interbeds of CLAY (CL). Sand is pinkish gray (5YR, 7/2). Trace fines. Mostly sand (little/some fine micaceous, mostly medium/coarse). Trace gravels. Clay in 3" layers, mostly highly plastic.</p>	
	66%	8 18 20						
83.1	66%	15 20					<p>@93' ~0.5' thick layer of high cementation - reacts violently with 10% HCl.</p>	
58.3	100%	100 40 55		95				
69.7	100%	60 25 69 80					<p>@96' increase in gravels (fragments of gravels (cobbles?) >2" O.D.) - reacts violently with 10% HCl.</p>	
BORING TERMINATED AT 100 FEET TARGET DEPTH								

REMARKS

BORING DRILLED WITH MODIFIED MOBIL B-61 HOLLOW STEM AUGER RIG. PLASTICITY ESTIMATED IN FIELD. PRODUCT OBSERVED DURING DRILLING. SVE PROBES WERE ATTACHED TO THE EXTERIOR OF CASING DURING WELL INSTALLATION .





- NOTES:
1. NOT DRAWN TO SCALE
 2. DEPTH MEASUREMENTS ARE FROM GROUND SURFACE.

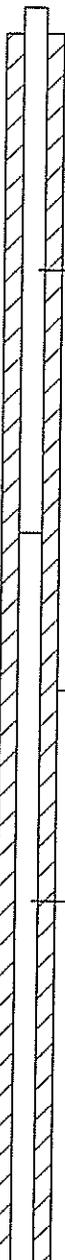
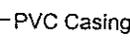
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Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 6, 2000
Finish Date : January 8, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447504.62
Easting : 997377.72

Project #1761-103

Depth in Feet	Surf. Elev. 2408	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-1 Elev.: 2407.56	Well Construction Information	
0	2408	SW		SAND, well graded, medium, clean, light brown (5 YR 6/4), dry.			<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-207 feet 5-inch diameter schedule 80 PVC blank casing 207-266 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 266-271 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-190 feet Bentonite Grout 190-194 feet 1/4 Minus Bentonite Pellets 194-197 feet #60 Fine Sand 197-284 8-12 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 265 feet.</p> <p>Surface Completion:</p> <p>24-inch by 24-inch Traffic Rated Steel Vault with Bolt Down Diamond Plate Cover Encased in Concrete.</p> <p>Reference elevation for depth to water measurements is 2407.56 feet above mean sea level.</p>	
2	2406							
4	2404							
6	2402							
8	2400	GW		GRAVELLY SAND, well graded, 30-40% fine sub-rounded gravels, little to no fines, light brown, dry.				
10	2398							
12	2396	SW		SANDY GRAVEL, well graded, 60-70% sub-rounded to sub-angular gravel, cemented, dry.				
14	2394							
16	2392							
18	2390							
20	2388	SM		GRAVELLY SAND, well graded, 30-40% fine sub rounded gravels, little to no fines, light brown, dry.				
22	2386							
24	2384	SW		SILTY GRAVELLY SAND, well graded, 60-70% medium to coarse sand, 10-20% fine gravels, 10-20% plastic fines, light brown, moist (driller adding water, hard drilling).				
26	2382							
28	2380							
30	2378							
32	2376	SW		fines				
34	2374							
36	2372	SW		SAND, well graded, 80-90% medium to coarse sand, angular to sub-angular, light brown, dry.				
38	2370							
40	2368							
42	2366							
44	2364	SW						
46	2362							
48	2360							
50								

MALCOLM PIRNIE

LOG OF BORING UAM-1

(Page 2 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 6, 2000
Finish Date : January 8, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447504.62
Easting : 997377.72

Project #1761-103

Depth in Feet	Surf. Elev. 2408	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-1 Elev.: 2407.56	Well Construction Information
50	2358	SW					<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing</p> <p>21-207 feet 5-inch diameter schedule 80 PVC blank casing</p> <p>207-266 feet 5-inch diameter schedule 80 PVC 0.020-inch screen</p> <p>266-271 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap</p> <p>5-150 feet Cement Grout</p> <p>150-190 feet Bentonite Grout</p> <p>190-194 feet 1/4 Minus Bentonite Pellets</p> <p>194-197 feet #60 Fine Sand</p> <p>197-284 8-12 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib</p> <p>Sounding Tube</p> <p>1.5 HP Pump with Intake Set at Approximately 265 feet.</p> <p>Surface Completion:</p> <p>24-inch by 24-inch Traffic Rated Steel Vault with Bolt Down Diamond Plate Cover Encased in Concrete.</p> <p>Reference elevation for depth to water measurements is 2407.56 feet above mean sea level.</p>
52	2356						
54	2354						
56	2352						
58	2350						
60	2348						
62	2346	SM		SILTY SAND, well graded medium to coarse sand, 30-40% plastic fines, light brown, moist.			
64	2344						
66	2342	SW		GRAVELLY SAND, well graded, 90-95% coarse sand, 5-10% fine gravels, light brown, dry.			
68	2340						
70	2338	SM-ML		SANDY SILT, 55-60% plastic silt, 40-45% fine to medium sand, orange brown, slightly moist.			
72	2336						
74	2334						
76	2332						
78	2330	CS		Thin layer of highly cemented sands, quartz and mica clasts, very hard, white.			
80	2328						
82	2326	SW		SAND, clean, fine to medium, angular, quartz, feldspar, and mica minerals visible, dry, white.			
84	2324						
86	2322						
88	2320						
90	2318						
92	2316						
94	2314						
96	2312						
98	2310						
100							

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Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 6, 2000
Finish Date : January 8, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447504.62
Easting : 997377.72

Project #1761-103

Depth in Feet	Surf. Elev. 2408	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-1 Elev.: 2407.56	Well Construction Information
100	2308						<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-207 feet 5-inch diameter schedule 80 PVC blank casing 207-266 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 266-271 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-190 feet Bentonite Grout 190-194 feet 1/4 Minus Bentonite Pellets 194-197 feet #60 Fine Sand 197-284 8-12 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 265 feet.</p> <p>Surface Completion:</p> <p>24-inch by 24-inch Traffic Rated Steel Vault with Bolt Down Diamond Plate Cover Encased in Concrete.</p> <p>Reference elevation for depth to water measurements is 2407.56 feet above mean sea level.</p>
102	2306						
104	2304						
106	2302						
108	2300						
110	2298			Granite cobbles from cyclone			
112	2296						
114	2294						
116	2292						
118	2290						
120	2288						
122	2286			Decomposed granite cobbles from cyclone. Quartz, feldspar, and mica with garnet crystals			
124	2284	SW					
126	2282						
128	2280						
130	2278						
132	2276						
134	2274						
136	2272						
138	2270						
140	2268			No cobbles			
142	2266						
144	2264						
146	2262						
148	2260						
150							

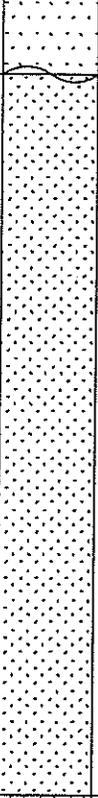
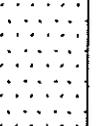
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Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 6, 2000
Finish Date : January 8, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447504.62
Easting : 997377.72

Project #1761-103

Depth in Feet	Surf. Elev. 2408	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-1 Elev.: 2407.56	Well Construction Information
150	2258	SW		SAND, 90-95% poorly graded clean sub-angular sand, dry, light brown			<p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-207 feet 5-inch diameter schedule 80 PVC blank casing 207-266 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 266-271 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-190 feet Bentonite Grout 190-194 feet 1/4 Minus Bentonite Pellets 194-197 feet #60 Fine Sand 197-284 8-12 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 265 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 24-inch by 24-inch Traffic Rated Steel Vault with Bolt Down Diamond Plate Cover Encased in Concrete. <p>Reference elevation for depth to water measurements is 2407.56 feet above mean sea level.</p>
152	2256						
154	2254						
156	2252						
158	2250						
160	2248						
162	2246						
164	2244						
166	2242						
168	2240						
170	2238						
172	2236						
174	2234						
176	2232						
178	2230						
180	2228						
182	2226						
184	2224						
186	2222	GR		SILTY SAND, well graded, 80-90% fine to medium, sub-angular to sub-rounded sand. 10-20 % fines, cohesive, slightly moist, light brown.			
188	2220						
190	2218						
192	2216						
194	2214	SW					
196	2212						
198	2210						
200	2208						

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Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 6, 2000
Finish Date : January 8, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447504.62
Easting : 997377.72

Project #1761-103

Depth in Feet	Surf. Elev. 2408	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-1 Elev.: 2407.56	Well Construction Information
200	2208	SW		<p>Depth to Water: 205.45 feet on 2/3/00 (2,202.11 feet above MSL)</p> <p>GRAVELLY SAND, medium to coarse sand, 5-10% fine gravels, slightly moist, light brown.</p> <p>Cuttings very moist</p>		<p>PVC Casing</p> <p>Filter</p> <p>Screen</p>	<p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-207 feet 5-inch diameter schedule 80 PVC blank casing 207-266 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 266-271 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-190 feet Bentonite Grout 190-194 feet 1/4 Minus Bentonite Pellets 194-197 feet #60 Fine Sand 197-284 8-12 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 265 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 24-inch by 24-inch Traffic Rated Steel Vault with Bolt Down Diamond Plate Cover Encased in Concrete. <p>Reference elevation for depth to water measurements is 2407.56 feet above mean sea level.</p>
202	2206						
204	2204						
206	2202						
208	2200						
210	2198						
212	2196						
214	2194						
216	2192						
218	2190						
220	2188						
222	2186						
224	2184						
226	2182						
228	2180						
230	2178						
232	2176						
234	2174						
236	2172						
238	2170						
240	2168						
242	2166						
244	2164						
246	2162						
248	2160						
250							

MALCOLM PIRNIE

LOG OF BORING UAM-1

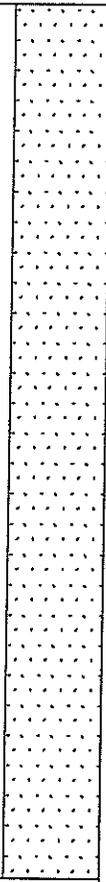
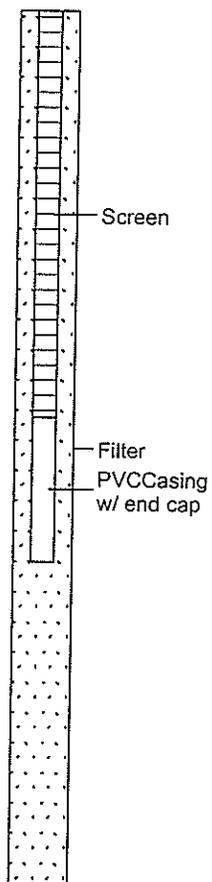
(Page 6 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 6, 2000
Finish Date : January 8, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

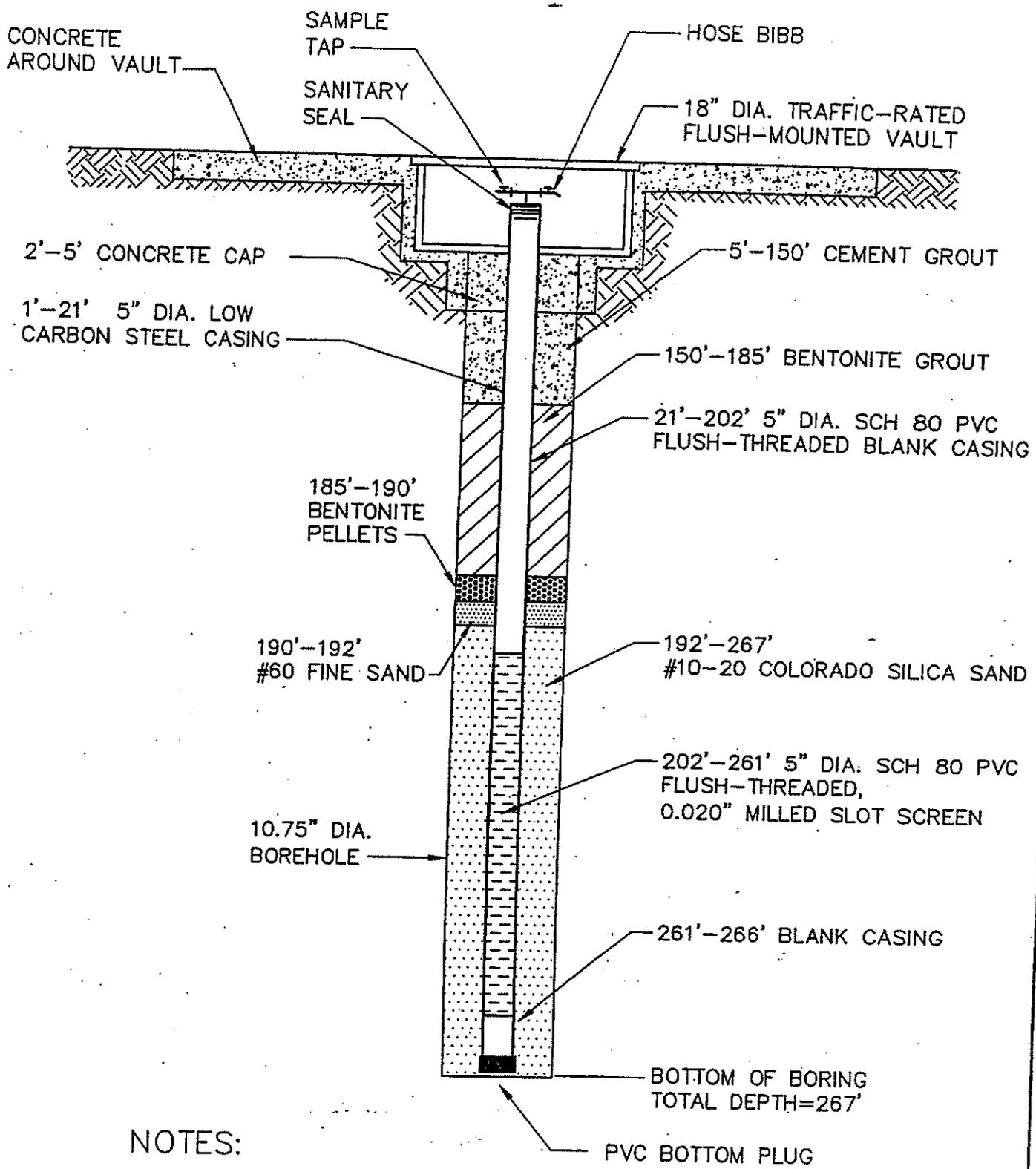
Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447504.62
Easting : 997377.72

Project #1761-103

Depth in Feet	Surf. Elev. 2408	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-1 Elev.: 2407.56	Well Construction Information					
250	2158	SW		Cuttings wet			<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-207 feet 5-inch diameter schedule 80 PVC blank casing 207-266 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 266-271 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-190 feet Bentonite Grout 190-194 feet 1/4 Minus Bentonite Pellets 194-197 feet #60 Fine Sand 197-284 8-12 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 265 feet.</p> <p>Surface Completion:</p> <p>24-inch by 24-inch Traffic Rated Steel Vault with Bolt Down Diamond Plate Cover Encased in Concrete.</p> <p>Reference elevation for depth to water measurements is 2407.56 feet above mean sea level.</p>					
252	2156											
254	2154											
256	2152											
258	2150											
260	2148											
262	2146											
264	2144											
266	2142											
268	2140											
270	2138											
272	2136											
274	2134											
276	2132											
278	2130											
280	2128											
282	2126											
284	2124							Heaving sands entering casing. Drilled to 284 for solid bottom.				
286	2122											
288	2120											
290	2118											
292	2116											
294	2114											
296	2112											
298	2110											
300												

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File: P:\1761103\ACAD\UAM-2.DWG Scale: 1:1 Date: 02/27/2000
User: 7011 Job: ADMIN



- NOTES:
1. NOT DRAWN TO SCALE
 2. DEPTH MEASUREMENTS ARE FROM GROUND SURFACE.

MALCOLM PIRNIE

LOG OF BORING UAM-2

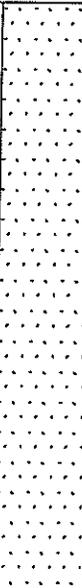
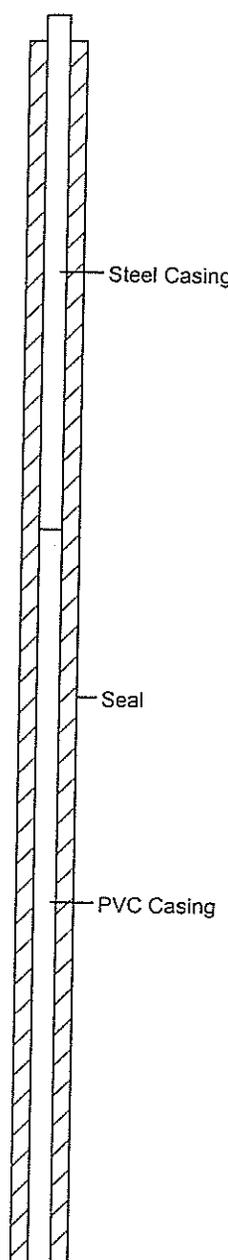
(Page 1 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 9, 2000
Finish Date : January 11, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 446983.10
Easting : 998240.13

Project #1761-103

Depth in Feet	Surf. Elev. 2412	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-2 Elev.: 2411.86	Well Construction Information		
0	2412	SW		SAND, well graded, 90-95% fine to coarse sand, dry, light brown (5 YR 6/4).			<p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-202 feet 5-inch diameter schedule 80 PVC blank casing 202-261 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 261-266 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-185 feet Bentonite Grout 185-190 feet 1/4 Minus Bentonite Pellets 190-192 feet #60 Fine Sand 192-267 10-20 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 258 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete <p>Reference elevation for depth to water measurements is 2411.86 feet above mean sea level.</p>		
2	2410								
4	2408								
6	2406								
8	2404								
10	2402								
12	2400								
14	2398								
16	2396			Fining with depth, fine to medium sand.					
18	2394			GRAVELLY SAND, 85-90% well graded sand, fine to medium sand, dry, light brown.					
20	2392			Very slow casing advance. Adding water.					
22	2390								
24	2388			GW					SANDY GRAVEL, 70-80% fine, sub-rounded to sub-angular gravels, 20-30% fine to coarse, well graded sand, dry, light brown.
26	2386			SW					
28	2384							GRAVELLY SAND, 85-90% well graded sand, fine to medium sand, dry, light brown.	
30	2382							increasing fines	
32	2380							decreasing fines	
34	2378								
36	2376								
38	2374								
40	2372	GRAVELLY SAND, 80-90% well graded, medium to coarse sand, 10-20% angular to sub-angular fine gravels.							
42	2370								
44	2368								
46	2366								
48	2364								
50									

03-13-2000 C:\MTECH51P-EA\DEQIB2.BOR

MALCOLM PIRNIE

LOG OF BORING UAM-2

(Page 2 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 9, 2000
Finish Date : January 11, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 446983.10
Easting : 998240.13

Project #1761-103

Depth in Feet	Surf. Elev. 2412	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-2 Elev.: 2411.86	Well Construction Information	
50	2362	SW		Easy Casing Advance GRAVELLY SAND, 85-90% well graded sand, fine to medium sand, dry, light brown.		PVC Casing Seal	<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-202 feet 5-inch diameter schedule 80 PVC blank casing 202-261 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 261-266 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-185 feet Bentonite Grout 185-190 feet 1/4 Minus Bentonite Pellets 190-192 feet #60 Fine Sand 192-267 10-20 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 258 feet.</p> <p>Surface Completion:</p> <p>18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete</p> <p>Reference elevation for depth to water measurements is 2411.86 feet above mean sea level.</p>	
52	2360							
54	2358							
56	2356							
58	2354							
60	2352							
62	2350							
64	2348							
66	2346							
68	2344							
70	2342							
72	2340							
74	2338							
76	2336							
78	2334							
80	2332							
82	2330							
84	2328							
86	2326							Slow casing advance Fine white dust from cyclone. Very hard cuttings. Matrix supported fine grained conglomerate or caliche.
88	2324							
90	2322		SILTY SAND, well graded, fine to medium sand, 5-10% fines, slightly moist, light brown.					
92	2320							
94	2318		CLEAN SAND Fast casing advance					
96	2316							
98	2314							
100								

03-13-2000 CIMTECHSP-EADEQB2.BOR

MALCOLM PIRNIE

LOG OF BORING UAM-2

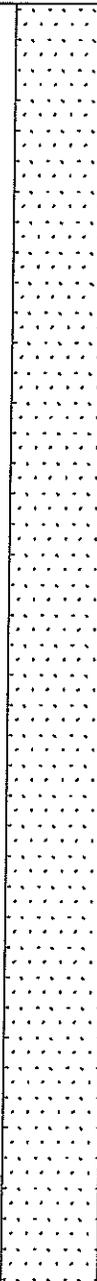
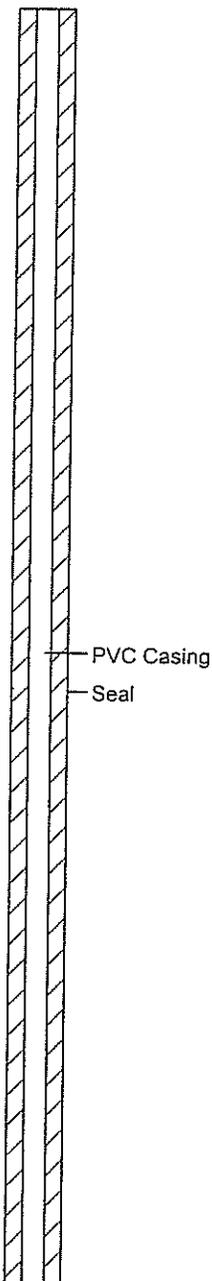
(Page 3 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 9, 2000
Finish Date : January 11, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwright Peterson
Sampling Method : Grab
Northing : 446983.10
Easting : 998240.13

Project #1761-103

Depth in Feet	Surf. Elev. 2412	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-2 Elev.: 2411.86	Well Construction Information				
100	2312	SW		Easy Casing Advance GRAVELLY SAND, 85-90% well graded sand, fine to medium sand, dry, light brown.			<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-202 feet 5-inch diameter schedule 80 PVC blank casing 202-261 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 261-266 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-185 feet Bentonite Grout 185-190 feet 1/4 Minus Bentonite Pellets 190-192 feet #60 Fine Sand 192-267 10-20 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 258 feet.</p> <p>Surface Completion:</p> <p>18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete</p> <p>Reference elevation for depth to water measurements is 2411.86 feet above mean sea level.</p>				
102	2310										
104	2308										
106	2306										
108	2304										
110	2302										
112	2300										
114	2298										
116	2296										
118	2294										
120	2292								CLEAN SAND		
122	2290										
124	2288										
126	2286										
128	2284										
130	2282			CLEAN SAND							
132	2280										
134	2278										
136	2276										
138	2274										
140	2272			CLEAN SAND							
142	2270										
144	2268			GRAVELLY SAND, 80-90% medium to coarse, well graded, dry, light brown sand, 10-20% angular to sub-angular fine gravels.							
146	2266										
148	2264										
150											

03-13-2000 C:\MTECH\5IP-EA\DEQIB2.BOR

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 9, 2000
Finish Date : January 11, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 446983.10
Easting : 998240.13

Project #1761-103

Depth in Feet	Surf. Elev. 2412	USCS	GRAPHIC	DESCRIPTION	Samples	Well Construction Information
150	2262	SW		GRAVELLY SAND		<p>Well: UAM-2 Elev.: 2411.86</p> <p>Well Construction Information</p>
152	2260					
154	2258					
156	2256					
158	2254					
160	2252					
162	2250					
164	2248					
166	2246					
168	2244					
170	2242	SP		SAND, clean, poorly graded, medium, light brown, dry.		<p>Grout</p> <p>PVC Casing</p> <p>Bentonite Pellets</p> <p>#60 Fine Sand</p> <p>Filter</p>
172	2240					
174	2238					
176	2236					
178	2234					
180	2232					
182	2230					
184	2228					
186	2226					
188	2224					
190	2222			Increasing gravels, sand fining. GRAVELLY SAND, 85-90% poorly graded, fine sand, dry, light brown.		<p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-185 feet Bentonite Grout 185-190 feet 1/4 Minus Bentonite Pellets 190-192 feet #60 Fine Sand 192-267 10-20 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 258 feet.</p> <p>Surface Completion:</p> <p>18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete</p> <p>Reference elevation for depth to water measurements is 2411.86 feet above mean sea level.</p>
192	2220					
194	2218					
196	2216					
198	2214					
200						

03-13-2000 C:\MTECH\SP-EA\DEQIB2.BOR

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 9, 2000
Finish Date : January 11, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 446983.10
Easting : 998240.13

Project #1761-103

Depth in Feet	Surf. Elev. 2412	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-2 Elev.: 2411.86	Well Construction Information
200	2212	SP		Increasing gravels, 15-20% gravels.		<p>PVC Casing</p> <p>Filter Screen</p>	<p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-202 feet 5-inch diameter schedule 80 PVC blank casing 202-261 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 261-266 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-185 feet Bentonite Grout 185-190 feet 1/4 Minus Bentonite Pellets 190-192 feet #60 Fine Sand 192-267 10-20 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 258 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete <p>Reference elevation for depth to water measurements is 2411.86 feet above mean sea level.</p>
202	2210			SAND, clean, well graded, fine to medium, very moist, light brown.			
204	2208			Depth to water 209.57 feet on 2/3/2000 (2,202.29 feet above MSL)			
206	2206						
208	2204						
210	2202						
212	2200						
214	2198						
216	2196						
218	2194						
220	2192	SW		GRAVELLY SAND, 60-70% well graded, fine to medium, clean sand, 30-40% sub-rounded coarse gravels up to 2.5-inches in diameter.			
222	2190						
224	2188						
226	2186						
228	2184						
230	2182						
232	2180						
234	2178						
236	2176						
238	2174						
240	2172		Wet cuttings				
242	2170						
244	2168						
246	2166						
248	2164						
250							

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MALCOLM PIRNIE

LOG OF BORING UAM-2

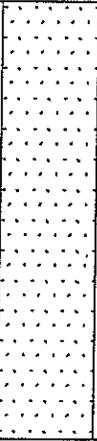
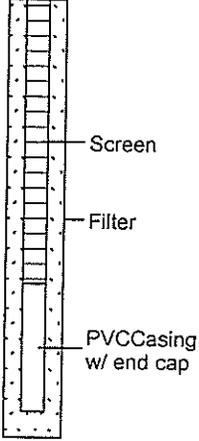
(Page 6 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 9, 2000
Finish Date : January 11, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 446983.10
Easting : 998240.13

Project #1761-103

Depth in Feet	Surf. Elev. 2412	USCS	GRAPHIC	DESCRIPTION	Samples	Well Construction Information
250	2162	SW		GRAVELLY SAND Total boring depth 267 feet.		<p>Well: UAM-2 Elev.: 2411.86</p>  <p>Screen Filter PVCCasing w/ end cap</p>
252	2160					
254	2158					
256	2156					
258	2154					
260	2152					
262	2150					
264	2148					
266	2146					
268	2144					
270	2142					
272	2140					
274	2138					
276	2136					
278	2134					
280	2132					
282	2130					
284	2128					
286	2126					
288	2124					
290	2122					
292	2120					
294	2118					
296	2116					
298	2114					
300						

NOTES

Well Casing and Screen:

- 1- 21 feet below ground surface
- 5-inch diameter low carbon schedule 40 steel casing
- 21-202 feet
- 5-inch diameter schedule 80 PVC blank casing
- 202-261 feet
- 5-inch diameter schedule 80 PVC 0.020-inch screen
- 261-266 feet
- 5-inch diameter schedule 80 PVC blank casing with end cap

Annular Space Materials:

- 2-5 feet below ground surface
- Concrete Cap
- 5-150 feet
- Cement Grout
- 150-185 feet
- Bentonite Grout
- 185-190 feet
- 1/4 Minus Bentonite Pellets
- 190-192 feet
- #60 Fine Sand
- 192-267
- 10-20 Colorado Silica Sand

Well Equipment:

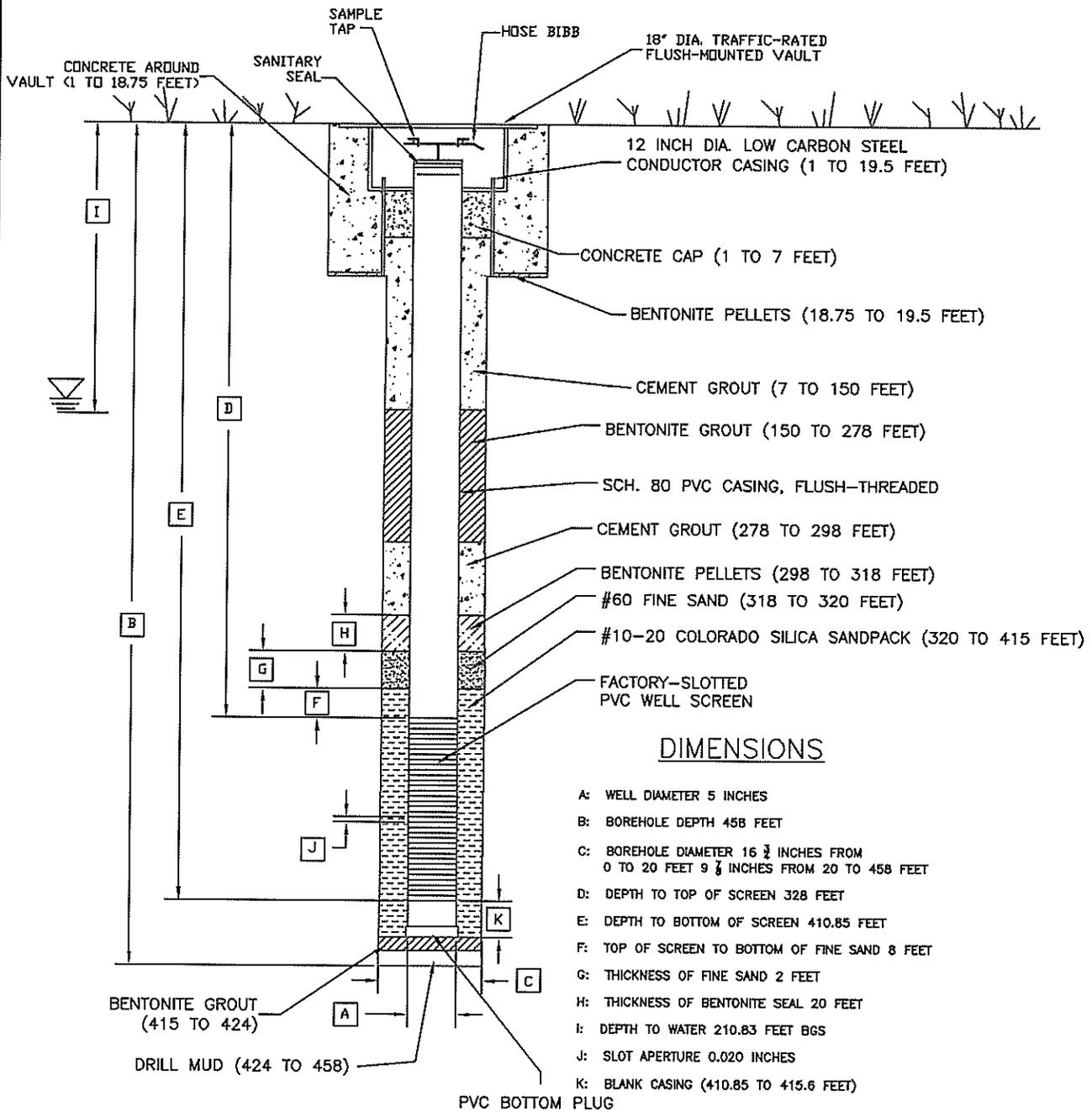
- Sanitary Seal with Sampling Tap and Hose Bib
- Sounding Tube
- 1.5 HP Pump with Intake Set at Approximately 258 feet.

Surface Completion:

- 18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete

Reference elevation for depth to water measurements is 2411.86 feet above mean sea level.

03-13-2000 C:\MTECH\5P-EADEC\B2.BOR



* NOT TO SCALE

TITLE:		UAM-2B WELL COMPLETION DIAGRAM PARK-EUCLID WQARF SITE	
LOCATION:		TUCSON, ARIZONA	
 GeoTrans, Inc. <small>A TETRA TECH COMPANY</small>	CHECKED	TD/JZ	FIGURE 3
	DRAFTED	TLG	
	PROJECT	1303.029	
	DATE	5/15/08	



Project No: 1303.029.11.00

Borehole No: UAM-2B
ADWR ID:

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
0					Ground Surface
1					SW/SM Fine to silty sand
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					SC/CL Clayey sand to clay
34					
35					SM Silty sand
36					
37					
38					SW Sand to gravelly sand
39					
40					SM Silty sand
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					

Drilling Contractor: Yellow Jacket

Checked By:

Date Checked:

Sheet: 1 of 10

GeoTrans, Inc
 4801 East Washington Street, Suite 260
 Phoenix, Arizona 85034
 Voice: 602-682-3320 Fax: 602-682-3318



Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
51					
52					
53					
54					
55					
56					
57					SC/CL Clayey sand to clay
58					
59					
60					SW/SM Sand to silty sand
61					
62					
63					
64					
65					
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
79					
80					
81					
82					SW Sand to gravelly sand
83					
84					
85					
86					
87					SC Clayey sand
88					
89					
90					
91					SW/SM Sand to silty sand
92					
93					
94					
95					
96					
97					
98					
99					
100					

Drilling Contractor: Yellow Jacket

Checked By:

Date Checked:

Sheet: 2 of 10

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Phoenix, Arizona 85034
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GeoTrans, Inc.

Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
101					
102					
103					
104					
105					
106					
107					
108					
109					
110					
111					
112					
113					
114					
115					
116					
117					
118					
119					
120					
121					
122					
123					
124					
125					
126					
127					
128					
129					
130					
131					
132					
133					
134					
135					
136					
137					
138					
139					
140					
141					
142					
143					
144					
145					
146					
147					
148					
149					
150					

Drilling Contractor: Yellow Jacket

Checked By:

Date Checked:

Sheet: 3 of 10

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4801 East Washington Street, Suite 260
Phoenix, Arizona 85034
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Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
151					
152					
153					
154					
155					
156					
157					
158					
159					
160					SW Gravelly sand
161					
162					
163					
164					SW/SM Sand to silty sand
165					
166					
167					
168					
169					
170					
171					
172					
173					
174					
175					
176					
177					
178					
179					
180					SP/SM Sand to silty sand
181					
182					
183					
184					
185					
186					
187					
188					
189					
190					
191					
192					
193					
194					
195					
196					
197					
198					
199					
200					

Drilling Contractor: Yellow Jacket

Checked By:

Date Checked:

Sheet: 4 of 10

GeoTrans, Inc
 4801 East Washington Street, Suite 260
 Phoenix, Arizona 85034
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Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
201					
202					
203					
204					SM Silty sand
205					
206					
207					SW Sand
208					
209					
210					
211					
212					
213					
214					
215					
216					
217					
218					
219					
220					
221					
222					
223					
224					
225					SM Silty sand
226					
227					
228					
229					
230					
231					
232					
233					
234					
235					SW Gravelly sand
236					
237					
238					
239					
240					SM Silty sand
241					
242					SP Sand
243					
244					
245					
246					SM Silty sand
247					
248					
249					
250					

Drilling Contractor: Yellow Jacket

Checked By:

Date Checked:

Sheet: 5 of 10

GeoTrans, Inc
4801 East Washington Street, Suite 260
Phoenix, Arizona 85034
Voice: 602-682-3320 Fax: 602-682-3318



Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
251				[Stippled Lithology Pattern]	
252					
253					
254					
255					
256					
257					
258					
259					
260					
261				[Dotted Lithology Pattern]	SW/SM Sand to silty sand
262					
263					
264					
265					
266					
267					
268					
269					
270					
271					
272					
273					
274					
275					
276					
277					
278					
279					
280				[Dotted Lithology Pattern]	SW Sand
281					
282					
283					
284					
285					
286					
287					
288					
289					
290				[Dotted Lithology Pattern]	
291					
292					
293					
294					
295					
296					
297					
298					
299					
300					

Drilling Contractor: Yellow Jacket

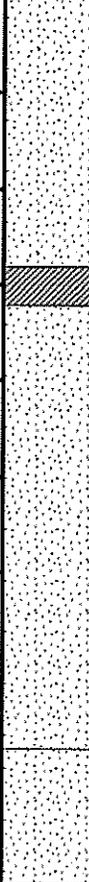
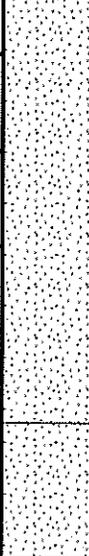
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Date Checked:

Sheet: 6 of 10

GeoTrans, Inc
 4801 East Washington Street, Suite 260
 Phoenix, Arizona 85034
 Voice: 602-682-3320 Fax: 602-682-3318

Site Map	Project No: 1303.029.11.00	Borehole No: UAM-2B
	Client: ADEQ	Start Date/Time: 4/8/08
	Site: Park Euclid	End Date/Time: 5/8/08
		Logged By: LG
Drilling Method: Mud Rotary		Angle from Vertical: 0
Borehole Diameter: UAM-2B		
Surface Material: Asphalt		Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
301					SW/SM Sand grading downward to silty sand
302					
303					
304					
305					
306					
307					
308					
309					
310					
311					
312					
313					
314					
315					
316					
317					SW/SM Sand with silty sand
318					
319					
320					
321					
322					
323					
324					
325					
326					
327					
328					
329					
330					
331					
332					
333					
334					
335					
336					
337					
338					
339					
340					SW Gravelly sand
341					
342					
343					
344					
345					
346					SC Clayey sand
347					
348					
349					
350					

Drilling Contractor: Yellow Jacket	Sheet: 7 of 10
Checked By:	
Date Checked:	

GeoTrans, Inc
 4801 East Washington Street, Suite 260
 Phoenix, Arizona 85034
 Voice: 602-682-3320 Fax: 602-682-3318

Site Map	Project No: 1303.029.11.00	Borehole No: UAM-2B
	Client: ADEQ	Start Date/Time: 4/8/08
	Site: Park Euclid	End Date/Time: 5/8/08
		Logged By: LG
Drilling Method: Mud Rotary		Angle from Vertical: 0
Borehole Diameter: UAM-2B		
Surface Material: Asphalt		Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
351					SM
352					Silty sand
353					SW
354					Gravelly sand
355					SW/SM
356					Sand to silty sand, fining downward
357					
358					
359					
360					
361					
362					
363					
364					
365					
366					
367					
368					
369					
370					
371					
372					
373					
374					
375					
376					
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399					
400					

Drilling Contractor: Yellow Jacket
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Date Checked:
Sheet: 8 of 10

GeoTrans, Inc
4801 East Washington Street, Suite 260
Phoenix, Arizona 85034
Voice: 602-682-3320 Fax: 602-682-3318



Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
401					
402					
403					
404					
405					
406					
407					
408					
409					
410					
411					
412					
413					
414					
415					SW Gravelly sand to sand
416					
417					
418					CL/SC Clay to clayey sand
419					
420					
421					
422					
423					
424					
425					
426					SW Sand
427					
428					
429					
430					
431					
432					
433					
434					
435					CL/SC Clay to clayey sand
436					
437					
438					
439					
440					
441					
442					
443					
444					
445					SM Silty sand
446					
447					
448					
449					
450					

Drilling Contractor: Yellow Jacket

Checked By:

Date Checked:

Sheet: 9 of 10

GeoTrans, Inc
4801 East Washington Street, Suite 260
Phoenix, Arizona 85034
Voice: 602-682-3320 Fax: 602-682-3318



Project No: 1303.029.11.00

Borehole No: UAM-2B

Site Map

Client: ADEQ

Start Date/Time: 4/8/08

Site: Park Euclid

End Date/Time: 5/8/08

Logged By: LG

Drilling Method: Mud Rotary

Angle from Vertical: 0

Borehole Diameter: UAM-2B

Surface Material: Asphalt

Sampling Method: None

Depth	Sample Characteristics			Lithologic Characteristics	
	DEPTH (FEET)	TIME	PID (ppm)	Lithology	Description and Comments
451					
452					
453					
454					
455					
456					
457					
458					
459					
460					
461					
462					
463					
464					
465					
466					
467					
468					
469					
470					
471					
472					
473					
474					
475					
476					
477					
478					
479					
480					
481					
482					
483					
484					
485					
486					
487					
488					
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492					
493					
494					
495					
496					
497					
498					
499					
500					

Drilling Contractor: Yellow Jacket

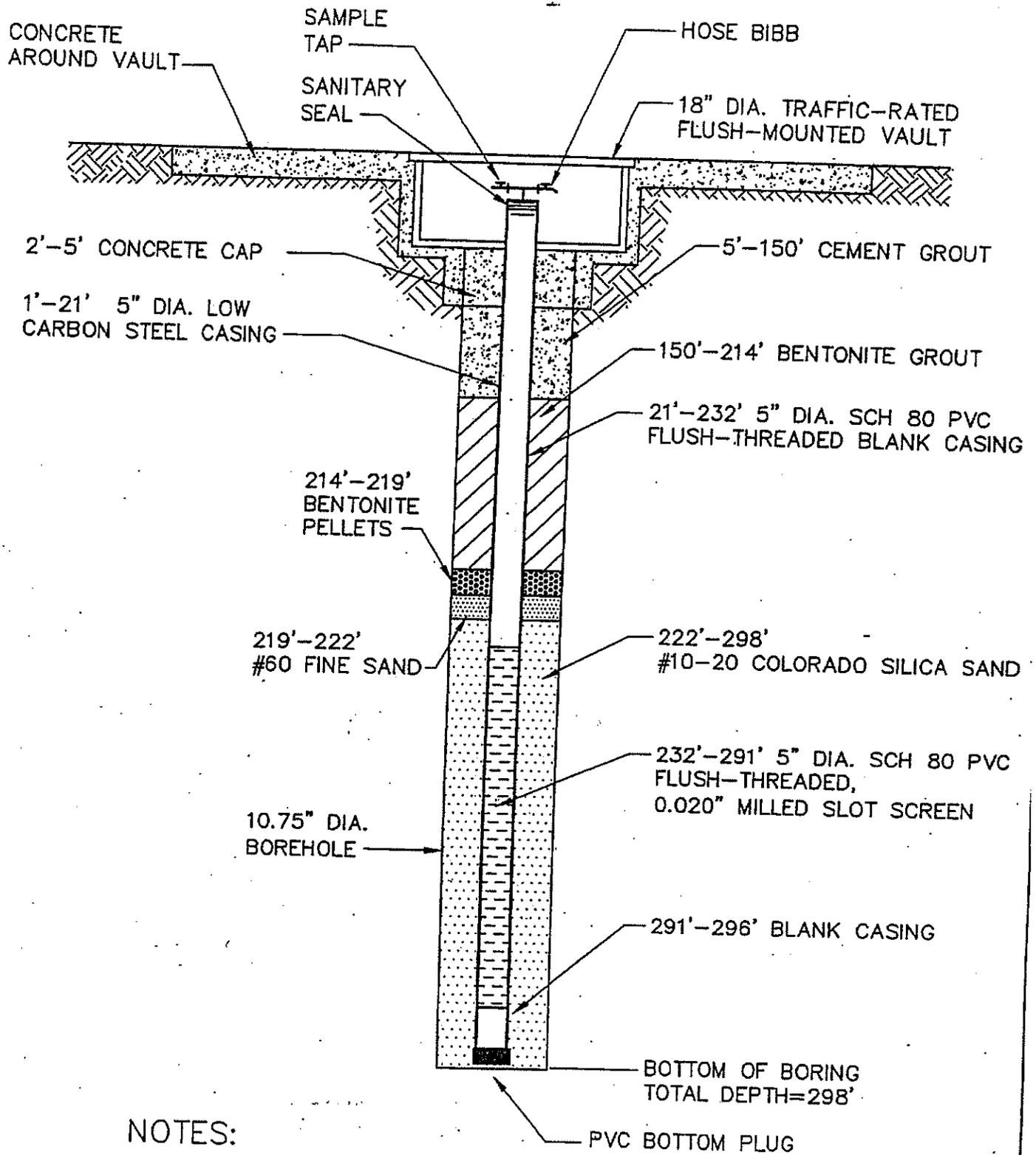
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Date Checked:

Sheet: 10 of 10

GeoTrans, Inc
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 Phoenix, Arizona 85034
 Voice: 602-682-3320 Fax: 602-682-3318

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NOTES:

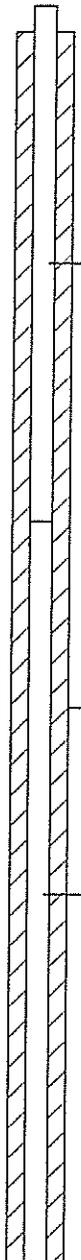
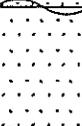
1. NOT DRAWN TO SCALE
2. DEPTH MEASUREMENTS ARE FROM GROUND SURFACE.

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 12, 2000
Finish Date : January 14, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447532.01
Easting : 999434.21

Project #1761-103

Depth in Feet	Surf. Elev. 2433	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-3 Elev.: 2432.02	Well Construction Information		
0	2433	SP		SAND, poorly graded, fine, dry, light brown (5 YR 6/4).			<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-232 feet 5-inch diameter schedule 80 PVC blank casing 232-291 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 291-296 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-214 feet Bentonite Grout 214-219 feet 1/4 Minus Bentonite Pellets 219-222 feet #60 Fine Sand 222-298 10-20 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 290 feet.</p> <p>Surface Completion:</p> <p>18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete</p> <p>Reference elevation for depth to water measurements is 2432.02 feet above mean sea level.</p>		
2	2431								
4	2429								
6	2427								
8	2425								
10	2423								
12	2421								
14	2419								
16	2417			SW					GRAVELLY SAND, well graded, 80-90% fine to coarse sand, 10-20% fine gravels, dry, light brown.
18	2415								
20	2413			SM					SILTY SAND, well graded, 75-80% fine to coarse sands, 15-25% plastic fines, dry, light brown to yellow orange.
22	2411								
24	2409								
26	2407								
28	2405			SW					Decreasing Fines GRAVELLY SAND, 85-95% well graded, medium to coarse sand, 5-15% fine to medium gravels, dry, light brown.
30	2403								
32	2401								
34	2399								
36	2397								
38	2395								
40	2393								
42	2391								
44	2389								
46	2387								
48	2385								
50				Increasing gravel fraction (30-40%) with some small cobbles to 3-inches in diameter.					

04-28-2000 C:\MTECH5\IP-LEADEC\B3.BOR

MALCOLM PIRNIE

LOG OF BORING UAM-3

(Page 2 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 12, 2000
Finish Date : January 14, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447532.01
Easting : 999434.21

Project #1761-103

Depth in Feet	Surf. Elev. 2433	USCS	GRAPHIC	DESCRIPTION	Samples	Well Construction Information
50	2383	SW		Decreasing gravel fraction (15-25%).		<p>Well: UAM-3 Elev.: 2432.02</p> <p>Well Construction Information</p> <p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-232 feet 5-inch diameter schedule 80 PVC blank casing 232-291 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 291-296 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-214 feet Bentonite Grout 214-219 feet 1/4 Minus Bentonite Pellets 219-222 feet #60 Fine Sand 222-298 10-20 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 290 feet.</p> <p>Surface Completion:</p> <p>18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete</p> <p>Reference elevation for depth to water measurements is 2432.02 feet above mean sea level.</p>
52	2381					
54	2379					
56	2377					
58	2375	SP		SAND, fine, clean, dry, light brown.		
60	2373					
62	2371	GW		SANDY GRAVEL, 60-70% well graded, fine to coarse, sub-angular to sub-rounded gravels. Some cobbles 3-4 inches in diameter. 30-40% fine to medium sand, dry, light brown.		
64	2369					
66	2367					
68	2365					
70	2363	SW		SAND, well graded, fine to medium, clean, dry, light brown.		
72	2361					
74	2359					
76	2357					
78	2355	SW		Thin layer of granite chips. Pink in color with visible quartz, feldspar, and mica clasts.		
80	2353					
82	2351					
84	2349					
86	2347	SW		SAND, well graded, fine to coarse, dry, pinkish color.		
88	2345					
90	2343					
92	2341					
94	2339	SW		SAND, well graded, fine to coarse, dry, pinkish color.		
96	2337					
98	2335					
100						

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MALCOLM PIRNIE

LOG OF BORING UAM-3

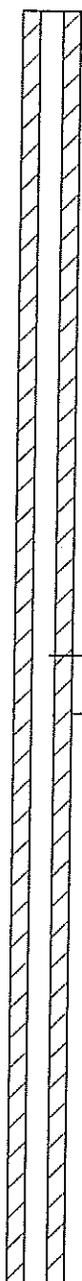
(Page 3 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 12, 2000
Finish Date : January 14, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447532.01
Easting : 999434.21

Project #1761-103

Depth in Feet	Surf. Elev. 2433	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-3 Elev.: 2432.02	Well Construction Information		
100	2333	SW		SAND, well graded, fine to medium, clean, dry, light brown.			<p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-232 feet 5-inch diameter schedule 80 PVC blank casing 232-291 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 291-296 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-214 feet Bentonite Grout 214-219 feet 1/4 Minus Bentonite Pellets 219-222 feet #60 Fine Sand 222-298 10-20 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 290 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete <p>Reference elevation for depth to water measurements is 2432.02 feet above mean sea level.</p>		
102	2331								
104	2329								
106	2327								
108	2325								
110	2323								
112	2321								
114	2319								
116	2317								
118	2315								
120	2313								Slight increase in moisture.
122	2311								
124	2309								
126	2307								
128	2305								
130	2303								Cuttings very dry.
132	2301								
134	2299								
136	2297								
138	2295								
140	2293								
142	2291								
144	2289			5-10% fine granite chips in cuttings.					
146	2287								
148	2285								
150									

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MALCOLM PIRNIE

LOG OF BORING UAM-3

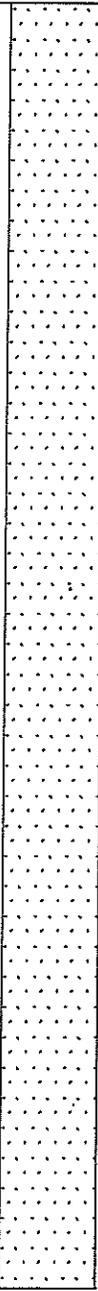
(Page 4 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

Start Date : January 12, 2000
Finish Date : January 14, 2000
Location : Tucson, AZ
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Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447532.01
Easting : 999434.21

Project #1761-103

Depth in Feet	Surf. Elev. 2433	USCS	GRAPHIC	DESCRIPTION	Samples	Well: UAM-3 Elev.: 2432.02	Well Construction Information
150	2283	SW		SAND, well graded, fine to medium, clean, dry, light brown.			<p>NOTES</p> <p>Well Casing and Screen:</p> <p>1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-232 feet 5-inch diameter schedule 80 PVC blank casing 232-291 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 291-296 feet 5-inch diameter schedule 80 PVC blank casing with end cap</p> <p>Annular Space Materials:</p> <p>2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-214 feet Bentonite Grout 214-219 feet 1/4 Minus Bentonite Pellets 219-222 feet #60 Fine Sand 222-298 10-20 Colorado Silica Sand</p> <p>Well Equipment:</p> <p>Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 290 feet.</p> <p>Surface Completion:</p> <p>18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete</p> <p>Reference elevation for depth to water measurements is 2432.02 feet above mean sea level.</p>
152	2281						
154	2279						
156	2277						
158	2275						
160	2273						
162	2271						
164	2269						
166	2267						
168	2265						
170	2263						
172	2261						
174	2259						
176	2257						
178	2255						
180	2253						
182	2251						
184	2249						
186	2247						
188	2245						
190	2243						
192	2241						
194	2239						
196	2237						
198	2235						
200							

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MALCOLM PIRNIE

LOG OF BORING UAM-3

(Page 5 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

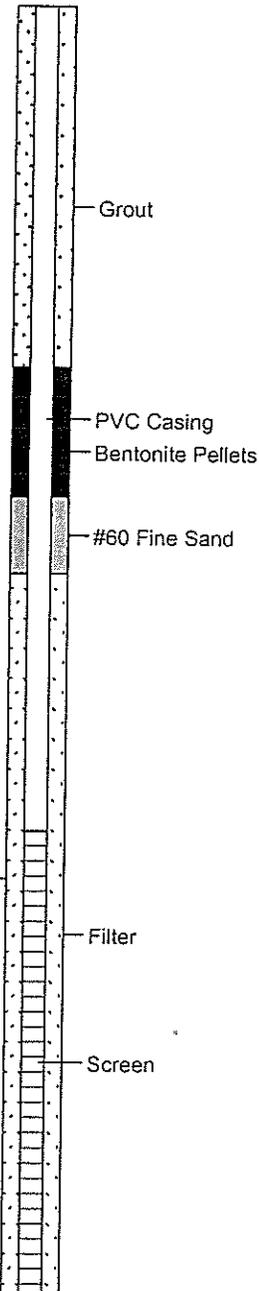
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Finish Date : January 14, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447532.01
Easting : 999434.21

Project #1761-103

Depth in Feet	Surf. Elev. 2433	USCS	GRAPHIC	DESCRIPTION	Samples	Well Construction Information
200	2233					<p>Well: UAM-3 Elev.: 2432.02</p> <p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-232 feet 5-inch diameter schedule 80 PVC blank casing 232-291 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 291-296 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-214 feet Bentonite Grout 214-219 feet 1/4 Minus Bentonite Pellets 219-222 feet #60 Fine Sand 222-298 10-20 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 290 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete <p>Reference elevation for depth to water measurements is 2432.02 feet above mean sea level.</p>
202	2231	SW		Thin layer of cemented sand and larger decomposed granitic crystals. Slow casing advance.		
204	2229			SILTY SAND, 80-90% fine sand, 10-20% fines, slightly moist, cohesive, light brown.		
206	2227					
208	2225	SM		Very slow casing advance. CEMENTED SAND, very fine grained crystalline matrix, very fine dust from cyclone. Casing advance rate 2 ft/hr.		
210	2223					
212	2221	CS		Fast casing advance. SILTY SAND, 80-90% fine to medium sand, 10-20% fines, dry, light brown.		
214	2219					
216	2217					
218	2215					
220	2213					
222	2211					
224	2209					
226	2207					
228	2205	SM		SAND, well graded, fine to medium, slightly moist, light brown.		
230	2203					
232	2201					
234	2199					
236	2197					
238	2195					
240	2193					
242	2191					
244	2189					
246	2187	SW		SAND, well graded, fine to medium, slightly moist, light brown.		
248	2185					
250						

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MALCOLM PIRNIE

LOG OF BORING UAM-3

(Page 6 of 6)

Arizona Department of Environmental Quality
Park-Euclid WQARF Site
Sentinel Well Installation
Tucson, Arizona

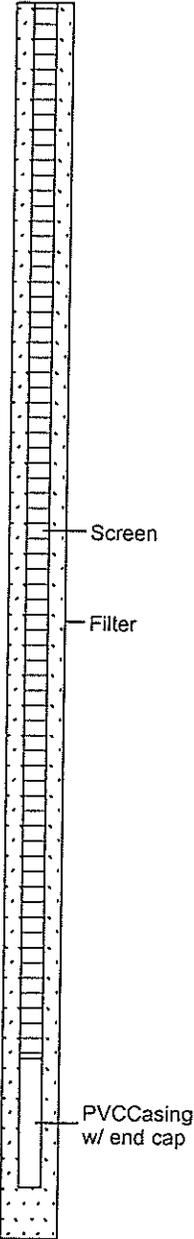
Start Date : January 12, 2000
Finish Date : January 14, 2000
Location : Tucson, AZ
Logged By : Mark Groseclose
Drilling Subcontractor : Layne Christensen Inc.

Drill Rig : AP-1000
Driller : Dwight Peterson
Sampling Method : Grab
Northing : 447532.01
Easting : 999434.21

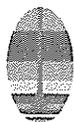
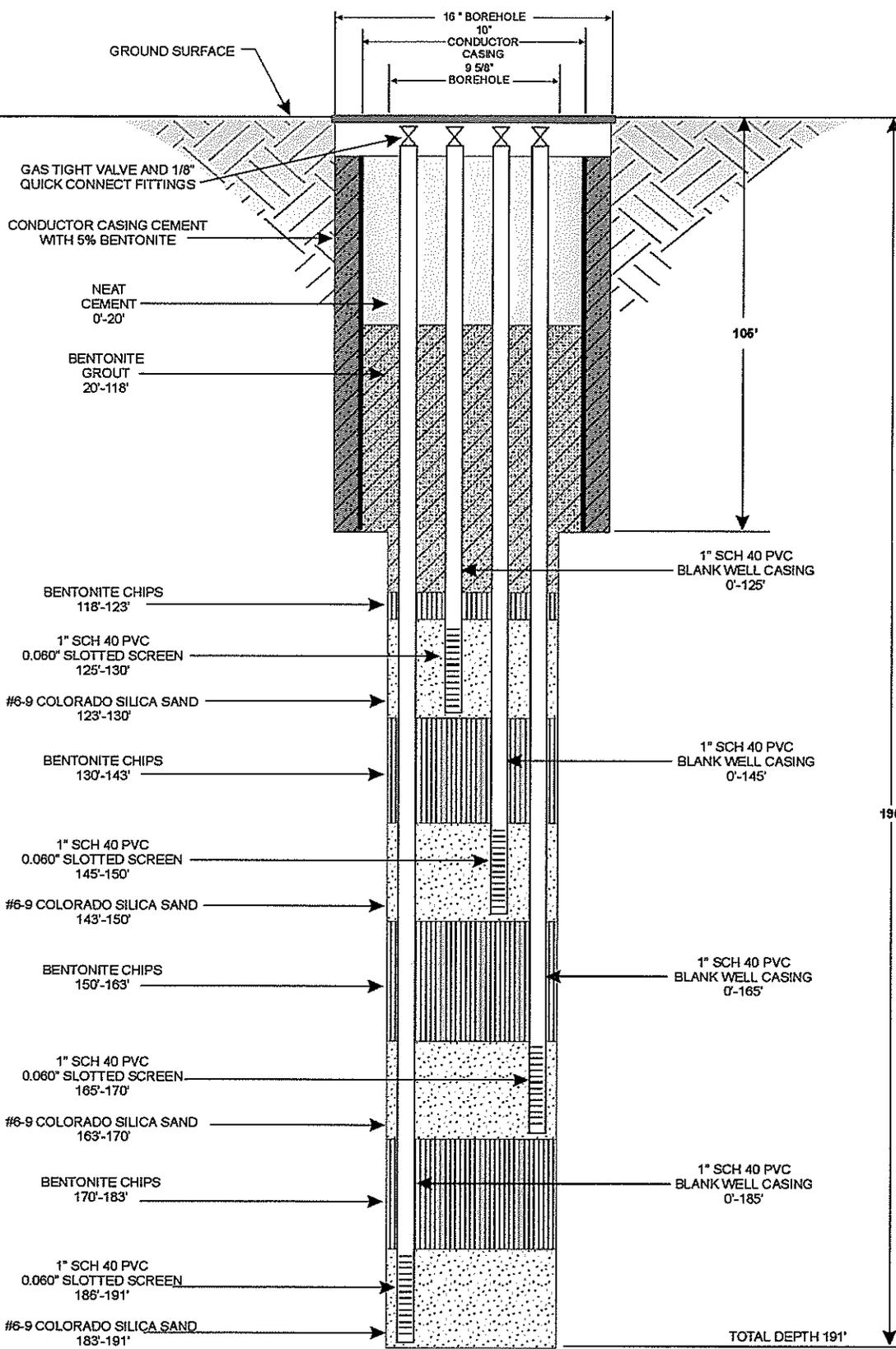
Project #1761-103

Depth in Feet	Surf. Elev. 2433	USCS	GRAPHIC	DESCRIPTION	Samples	Well Construction Information
250	2183	SW		SILTY SAND, 80-90% well graded, fine to medium sand, 10-20% fines, moist, cohesive, light brown. Cuttings very moist.		<p>NOTES</p> <p>Well Casing and Screen:</p> <ul style="list-style-type: none"> 1- 21 feet below ground surface 5-inch diameter low carbon schedule 40 steel casing 21-232 feet 5-inch diameter schedule 80 PVC blank casing 232-291 feet 5-inch diameter schedule 80 PVC 0.020-inch screen 291-296 feet 5-inch diameter schedule 80 PVC blank casing with end cap <p>Annular Space Materials:</p> <ul style="list-style-type: none"> 2-5 feet below ground surface Concrete Cap 5-150 feet Cement Grout 150-214 feet Bentonite Grout 214-219 feet 1/4 Minus Bentonite Pellets 219-222 feet #60 Fine Sand 222-298 10-20 Colorado Silica Sand <p>Well Equipment:</p> <ul style="list-style-type: none"> Sanitary Seal with Sampling Tap and Hose Bib Sounding Tube 1.5 HP Pump with Intake Set at Approximately 290 feet. <p>Surface Completion:</p> <ul style="list-style-type: none"> 18-inch Diameter Traffic Rated Christy Box with Bolt Down Lid Encased in Concrete <p>Reference elevation for depth to water measurements is 2432.02 feet above mean sea level.</p>
252	2181					
254	2179					
256	2177					
258	2175					
260	2173					
262	2171	SM				
264	2169					
266	2167					
268	2165					
270	2163					
272	2161					
274	2159					
276	2157	GW		SANDY GRAVEL, 70-80% well graded, fine to coarse, sub-angular to sub-rounded gravels, 20-30% very coarse sand, wet, light brown.		
278	2155					
280	2153					
282	2151					
284	2149					
286	2147					
288	2145	SM		SILTY SAND, 80-90% poorly graded, fine sand, 10-20% fines, cohesive, wet, light brown.		
290	2143					
292	2141					
294	2139					
296	2137					
298	2135			Total boring depth 298 feet.		
300						

Well: UAM-3
Elev.: 2432.02



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HYDRO GEO CHEM, INC.
Environmental Science & Technology

NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF
VAPOR MONITOR WELL VML-1

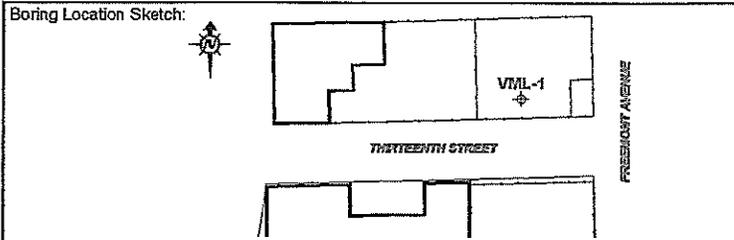
FIGURE
VML-1

PROJECT#: 365-0003-03

FILE#: vml1wcd

DATE DRAWN: 09/30/02

DRAWN BY: B. McCLELLAN



Project No: 365-0004-09	Date Drilled: 12/10/02 - 12/12/02	Boring No. VML-1
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK EUCLID		Sheet No. 1 of 6
Location:		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC EXPLORATION	
Casing installation data:		

Drilling Method: AIR ROTARY CASING HAMMER

SEE WELLBORE DIAGRAM

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level		
								Time		
								Date		
0										POORLY GRADED GRAVEL COVER (GP).
5										5'-12' SILTY SAND (SM), PALE YELLOWISH BROWN (10YR6/2), FINE SAND (40-45%), MEDIUM SAND (25-30%), SILT (25-30%), DRY TO LIGHT MOIST.
10										12'-33' WELL GRADED SAND (SW), GREYISH ORANGE (10YR7/4), MEDIUM SAND (40-45%), COARSE SAND (25-30%), FINE SAND (20-25%), SILT/CLAY (5-10%), DRY.
15										
20				0.0						
25										
30										
35										33'-40' SANDY CLAY (CL), LIGHT BROWN (5YR5/6), FINE SAND (35-40%), MEDIUM SAND (15-20%), CLAY (45-55%), LIGHT MOIST.

Boring Location Sketch: 	Project No: 365-0004-09	Date Drilled: 12/10/02 - 12/12/02	Boring No.
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	VML-1	
	Facility: PARK EUCLID	Sheet No.	
	Location:	2 of 6	
City: TUCSON, ARIZONA	Logged By: J. MEYER	Driller: WDC EXPLORATION	
Casing installation data:			
SEE WELLBORE DIAGRAM			

Drilling Method: AIR ROTARY CASING HAMMER

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level		
								Time		
								Date		
35										
40				0.0						
45										
50										
55				0.0						
60										
65										
70										

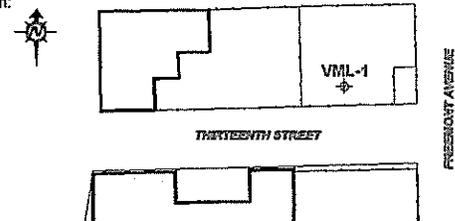
40'-44' CLAYEY SAND (SC), PALE BROWN (5YR5/2), FINE SAND (40-45%), MEDIUM SAND (25-30%), COARSE SAND (5-10%), CLAY (25-35%), DRY.

44'-55' GRAVELLY WELL GRADED SAND (SW), PALE BROWN (5YR5/2), 1/4-2" GRAVELS (30-35%), COARSE SAND (25-30%), MEDIUM SAND (20-25%), FINE SAND (20-25%), DRY.

55'-60' POORLY GRADED SAND (SP), FINE SAND (60-70%), MEDIUM SAND (20-25%), SILT/CLAY (5-10%), DRY.

60'-72' WELL GRADED SAND (SW), INCREASED MEDIUM SAND (35-40%), SOME COARSE SAND (20-25%), DECREASED FINE SAND (30-35%).

-1/4-1/2" GRAVELS (25-30%), DECREASED FINE SAND (15-20%), AND MEDIUM SAND (30-35%).

Boring Location Sketch: 	Project No: 365-0004-09	Date Drilled: 12/10/02 - 12/12/02	Boring No. VML-1
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
	Facility: PARK EUCLID		
	Location:		
City: TUCSON, ARIZONA		Sheet No. 3 of 6	
Logged By: J. MEYER		Driller: WDC EXPLORATION	
Casing installation data: SEE WELLBORE DIAGRAM			

Drilling Method: AIR ROTARY CASING HAMMER	SEE WELLBORE DIAGRAM
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Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'	Top of box elevation:	Ground Level Elevation:
---	-----------------------	-------------------------

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level						
70														
				0.0										
75														
80														
85				0.0										
				0.0										
				0.0										
				0.0										
				0.0										
90				0.9										
				2.9										
				8.4										
				11.5										
				12.3										
95				9.8										
				7.5										
				1.8										
				1.0										
				0.9										
100				0.6										
				0.2										
				0.5										
				0.4										
				0.0										
105				0.0										

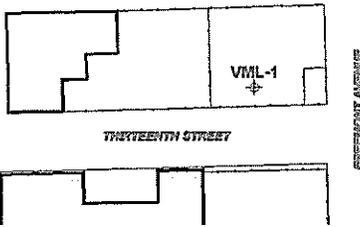
72-77' SILTY SAND (SM), LIGHT BROWN (5YR5/6), FINE SAND (40-50%), MEDIUM SAND (25-30%), SILT (30-35%), DRY.

77-89' CLAYEY SAND (SC), MODERATE BROWN (5YR4/4), FINE SAND (35-40%), MEDIUM SAND (30-35%), CLAY (25-30%), 1/4-1/2" GRAVELS (5-10%).

89-105' GRAVELLY WELL GRADED SAND (SW), COARSE SAND (35-40%), MEDIUM SAND (25-30%), FINE SAND (15-20%), 1/4-3/4" GRAVELS (20-25%).

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No:	385-0004-09	Date Drilled:	12/10/02 - 12/12/02	Boring No. VML-1
Client:	ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			
Facility:	PARK EUCLID			Sheet No. 4 of 6
Location:				
City:	TUCSON, ARIZONA			
Logged By:	J. MEYER	Driller:	WDC EXPLORATION	

Drilling Method: AIR ROTARY CASING HAMMER

Casing installation data:
SEE WELLBORE DIAGRAM

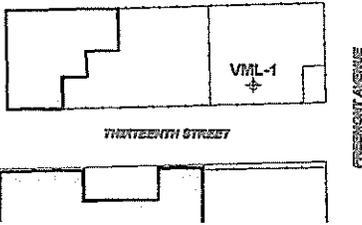
Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level		
								Time	Date	
								105		
110				0.1					- INCREASED SILT, VERY PALE ORANGE (10YR8/2), SILT (30-35%), SOME FINE SAND, DRY.	
				0.0					6" STRINGER SILTY CLAY, VERY PALE ORANGE (10YR8/2), DRY, STIFF.	
115				0.5					115'-122" CLAYEY SAND (SC), LIGHT BROWN (5YR5/6), FINE SAND (40-50%), MEDIUM SAND (20-25%), CLAY (25-30%), LIGHT MOIST.	
				0.4						
120				0.4						122'-127' WELL GRADED SAND (SW), VERY PALE ORANGE (10YR8/2), FINE SAND (45-50%), MEDIUM SAND (30-35%), SILT (10-15%), DRY, DENSE
				0.5						
125				0.5						127'-131' SILTY SAND (SM), LIGHT BROWN (5YR5/6), FINE SAND (45-50%), MEDIUM SAND (30-35%), SILT (15-20%), DRY.
				0.1						
130				0.2						131'-150' WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), FINE SAND (50-55%), MEDIUM SAND (30-35%), COARSE SAND (10-15%), DRY, SOME CEMENTATION, CALICHE.
				0.0						
135				0.1						
				0.0						
140				0.0						

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No: 365-0004-09	Date Drilled: 12/10/02 - 12/12/02	Boring No.
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		VML-1
Facility: PARK EUCLID		
Location:		Sheet No.
City: TUCSON, ARIZONA		5 of 6
Logged By: J. MEYER	Driller: WDC EXPLORATION	
Casing installation data:		

Drilling Method: AIR ROTARY CASING HAMMER

SEE WELLBORE DIAGRAM

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation:	Ground Level Elevation:
-----------------------	-------------------------

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level				
								Time				
								Date				
140												
145				0.1								
	VML-1-150		14:37	0.5								
150				0.4								
	VML-1-155		14:50									
155				0.3								
				0.8								
	VML-1-160		15:05	0.6								
160												
				1.0								
	VML-1-165		15:24	1.1								
165												
				0.8								
				0.4								
170	VML-1-170		15:46	0.4								
				0.0								
	VML-1-175		16:00	0.2								
175	VML-1-175B		16:14	2.0								

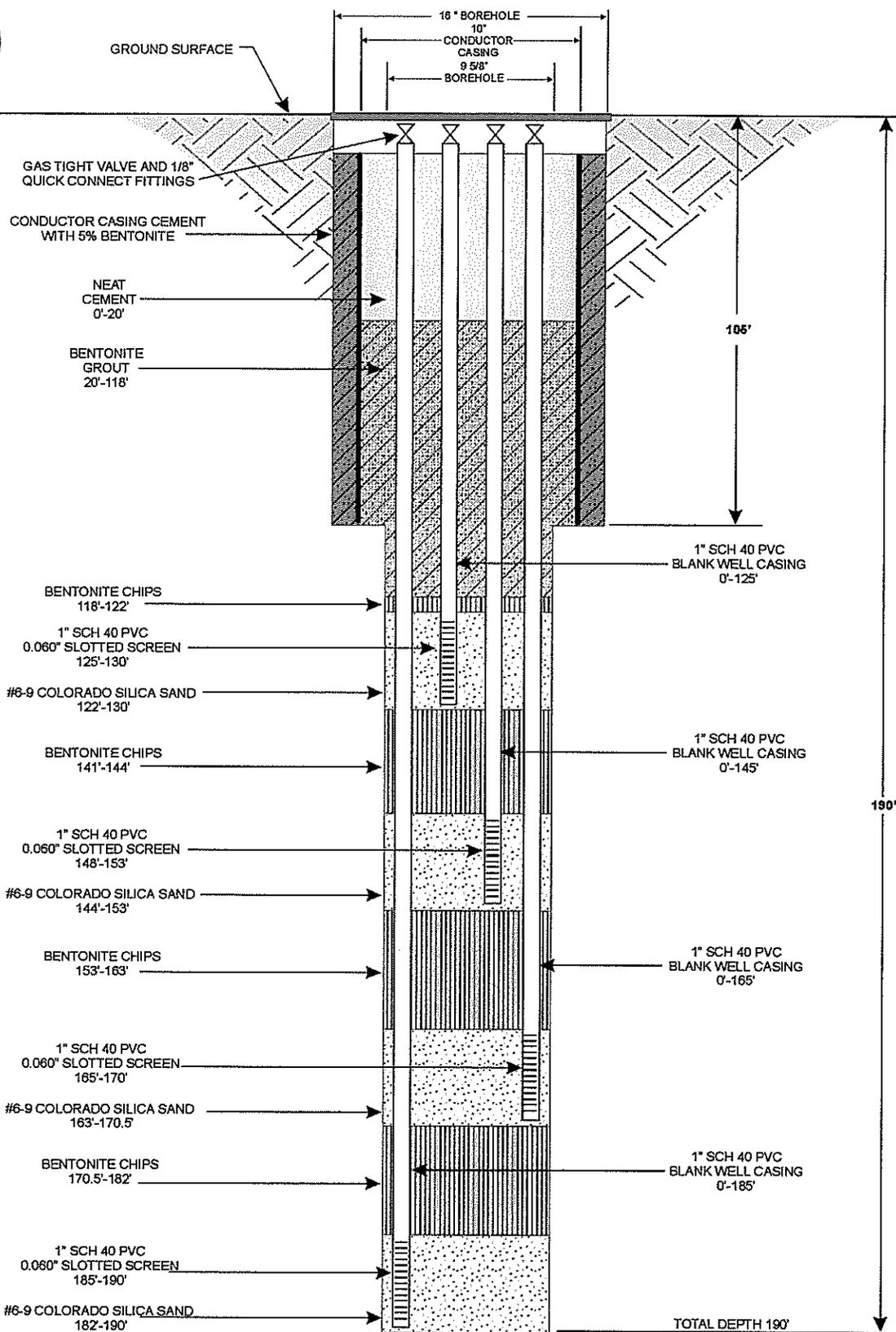
- INCREASED COARSE SAND (25-30%), DECREASED FINE SAND (35-40%), VERY PALE ORANGE, VERY DENSE.

- CEMENTATION.

150'-170' WELL GRADED GRAVELLY SAND (SW) WITH CLAY, PALE BROWN (5YR5/2), 1/4" 3/4" GRAVEL (10-15%), COARSE SAND (25-30%), MEDIUM SAND (30-35%), FINE SAND (25-30%), CLAY (5-10%), VERY DENSE, DRY.

- DECREASE COARSE SAND (15-20%), INCREASED FINE SAND (35-40%), GRAVEL ROCK CLASTS >3".

170'-175' SILTY SAND (SM), LIGHT BROWN (5YR5/6), FINE SAND (50-60%), MEDIUM SAND (20-25%), SILT (20-25%), VERY DENSE.



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Environmental Science & Technology

NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF
VAPOR MONITOR WELL VML-2

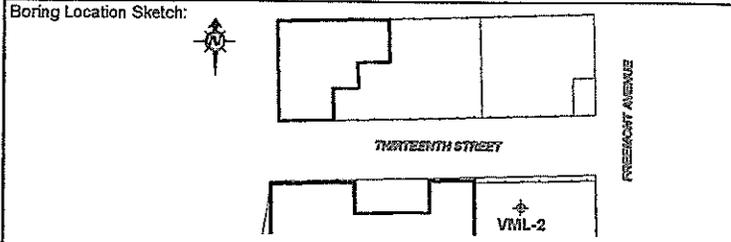
FIGURE
VML-2

PROJECT#: 365-0003-03

FILE#: vml2wod

DATE DRAWN: 09/30/02

DRAWN BY: B. McCLELLAN



Project No: 365-0004-09	Date Drilled: 12/13/2003	Boring No. VML-2
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK EUCLID	
Location:	City: TUCSON, ARIZONA	Sheet No. 1 of 6
Logged By: R. BRAND / J. MILLER	Driller: WDC EXPLORATION	

Drilling Method: AIR ROTARY CASING HAMMER

Casing installation data:
SEE WELLBORE DIAGRAM

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

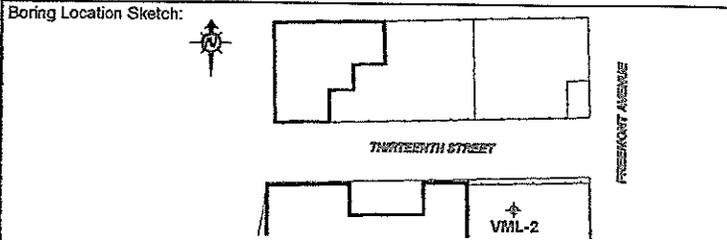
Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level	
								Time	Date
								0	
5									
10									
15									
20				0.0					
25									
30									
35									

ASPHALT COVER.

1'-10' SILTY SAND (SM), LIGHT BROWN (5YR5/6), FINE SAND (40%), MEDIUM SAND (35%), SILT (20%), CLAY (5%), SLIGHTLY MOIST.

10'-45' POORLY GRADED SAND (SP), FINE SAND (30%), MEDIUM SAND (20%), COARSE SAND (40%), GRAVEL (5%), SILT/CLAY (5%), SLIGHTLY MOIST.



Project No: 365-0004-09	Date Drilled: 12/13/2003	Boring No. VML-2
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK EUCLID	
Location:	City: TUCSON, ARIZONA	Sheet No. 2 of 6
Logged By: R. BRAND / J. MILLER	Driller: WDC EXPLORATION	

Drilling Method: AIR ROTARY CASING HAMMER

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Casing installation data:
SEE WELLBORE DIAGRAM

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level	Ground Level Elevation:	
								Time		
35										
40										
45										
50										
55										
60										
65										
70										

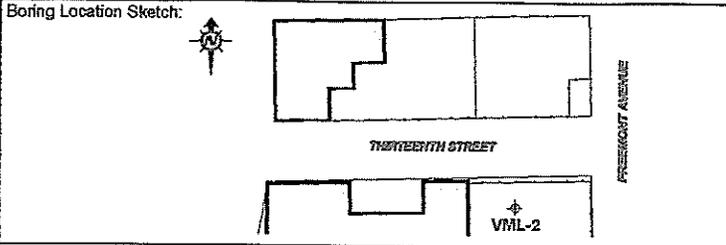
LIGHT BROWN (5YR5/6), FINE SAND (45%), MEDIUM SAND (30%), COARSE SAND (15%) GRAVEL (5%), SILT/CLAY (5%), SLIGHTLY MOIST.

45'-53' CLAYEY SAND (SC), LIGHT BROWN (5YR5/6), FINE SAND (25%), MEDIUM SAND (60%), COARSE SAND (2%), CLAY (8%), SILT (4%), GRAVEL (1%), MICA FLAKES, SLIGHTLY MOIST.

53'-58' POORLY GRADED SAND (SP), LIGHT BROWN (5YR5/6), FINE SAND (60%), MEDIUM SAND (30%), CLAY (9%), SILT (1%), MICA FLAKES, SLIGHTLY MOIST.

58'-64' WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), INCREASED MEDIUM SAND (40%), COARSE SAND (25%), FINE SAND (25%), GRAVEL (10%), MOIST.

64'-77' POORLY GRADED SAND (SP), LIGHT BROWN (5YR5/6), FINE SAND (60%), MEDIUM SAND (30%), CLAY (9%), SILT (1%), MICA FLAKES, MOIST.



Project No: 365-0004-09	Date Drilled: 12/13/2003	Boring No. VML-2
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK EUCLID		Sheet No. 3 of 6
Location:		
City: TUCSON, ARIZONA		
Logged By: R. BRAND / J. MILLER	Driller: WDC EXPLORATION	
Casing installation data:		

Drilling Method: AIR ROTARY CASING HAMMER

SEE WELLBORE DIAGRAM

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

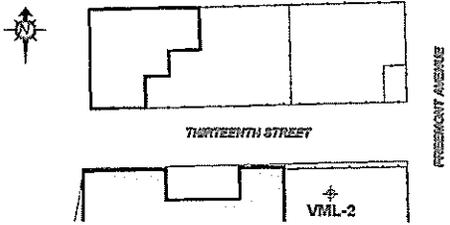
Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level	
								Time	Date
								70	
75									
80									
85				0.0					
90									
95									
100				4.8					
				4.8					
105									

77'-95' CLAYEY SAND (SC), LIGHT BROWN (5YR5/6), FINE SAND (40%), MEDIUM SAND (30%) CLAY (25%), GRAVEL (5%).

95'-105' GRAVELLY WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), COARSE SAND (35%), MEDIUM SAND (30%), FINE SAND (15%), GRAVEL (20%), SOLVENT ODOR, DIESEL ODOR.

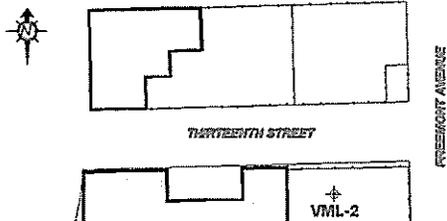
FIELD EXPLORATORY BORING LOG

Boring Location Sketch: 	Project No: 365-0004-09	Date Drilled: 12/13/2003	Boring No.
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		VML-2
	Facility: PARK EUCLID		
	Location:		Sheet No.
	City: TUCSON, ARIZONA		4 of 6
Logged By: R. BRAND / J. MILLER		Driller: WDC EXPLORATION	
Casing installation data:			

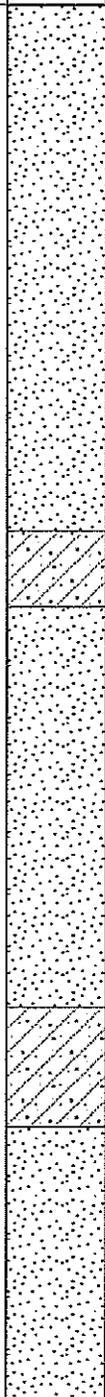
Drilling Method: AIR ROTARY CASING HAMMER	SEE WELLBORE DIAGRAM
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Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'	Top of box elevation:	Ground Level Elevation:
---	-----------------------	-------------------------

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level			
								Time			
								Date			
105				1.3			/	105'-112' SANDY CLAY (CL), MODERATE BROWN (5YR4/4), FINE SAND (35-45%), CLAY (55-65%), LIGHT MOIST.			
110				0.2			/	112'-115' SILTY CLAY (CL), GREYISH ORANGE (10YR7/4), SOME SAND (5-15%), SILTY CLAY (75-95%), MOIST.			
115				0.0			/	115'-117' CLAYEY SAND (SC), GREYISH ORANGE (10YR7/4), FINE SAND (35-40%), MEDIUM SAND (15-20%), COARSE SAND (20-25%), CLAY (25-30%), LIGHT MOIST.			
				1.6			/	117'-125' CLAYEY SAND (SC), LIGHT BROWN (5YR5/6), FINE SAND (45-50%), MEDIUM SAND (10-15%), CLAY (35-40%), LIGHT MOIST.			
120				0.5			/	DECREASED CLAY (20-25%), INCREASED FINE SAND (50-55%), MEDIUM SAND (25-30%), DRY.			
				0.0			/				
				0.8			/	125'-130' GRAVELLY WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), FINE SAND (30-35%), MEDIUM SAND (15-20%), COARSE SAND (25-30%), 1/4" GRAVEL (20-25%).			
				0.0			/				
130	VML-2 - 130		9:30	1.6			/	130'-135' CLAYEY SAND (SC), LIGHT BROWN (5YR5/6), COARSE SAND (30-35%), MEDIUM SAND (20-25%), FINE SAND (25-30%), CLAY (15-20%).			
				1.3			/				
				0.9			/				
135							/	135'-153' WELL GRADED SAND (SW) WITH SILT, LIGHT BROWN (5YR6/4), FINE SAND (45-50%), MEDIUM SAND (30-35%), COARSE SAND (5-10%), SILT (5-10%), DRY, DENSE TO VERY DENSE.			
				0.3			/				
140	VML-2 - 140		9:55	0.1			/				

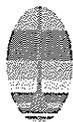
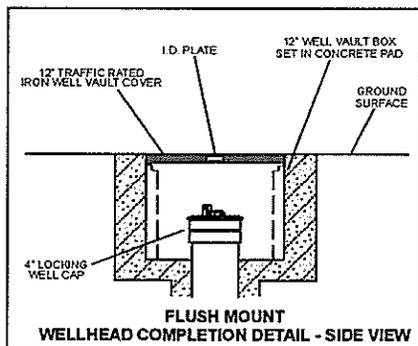
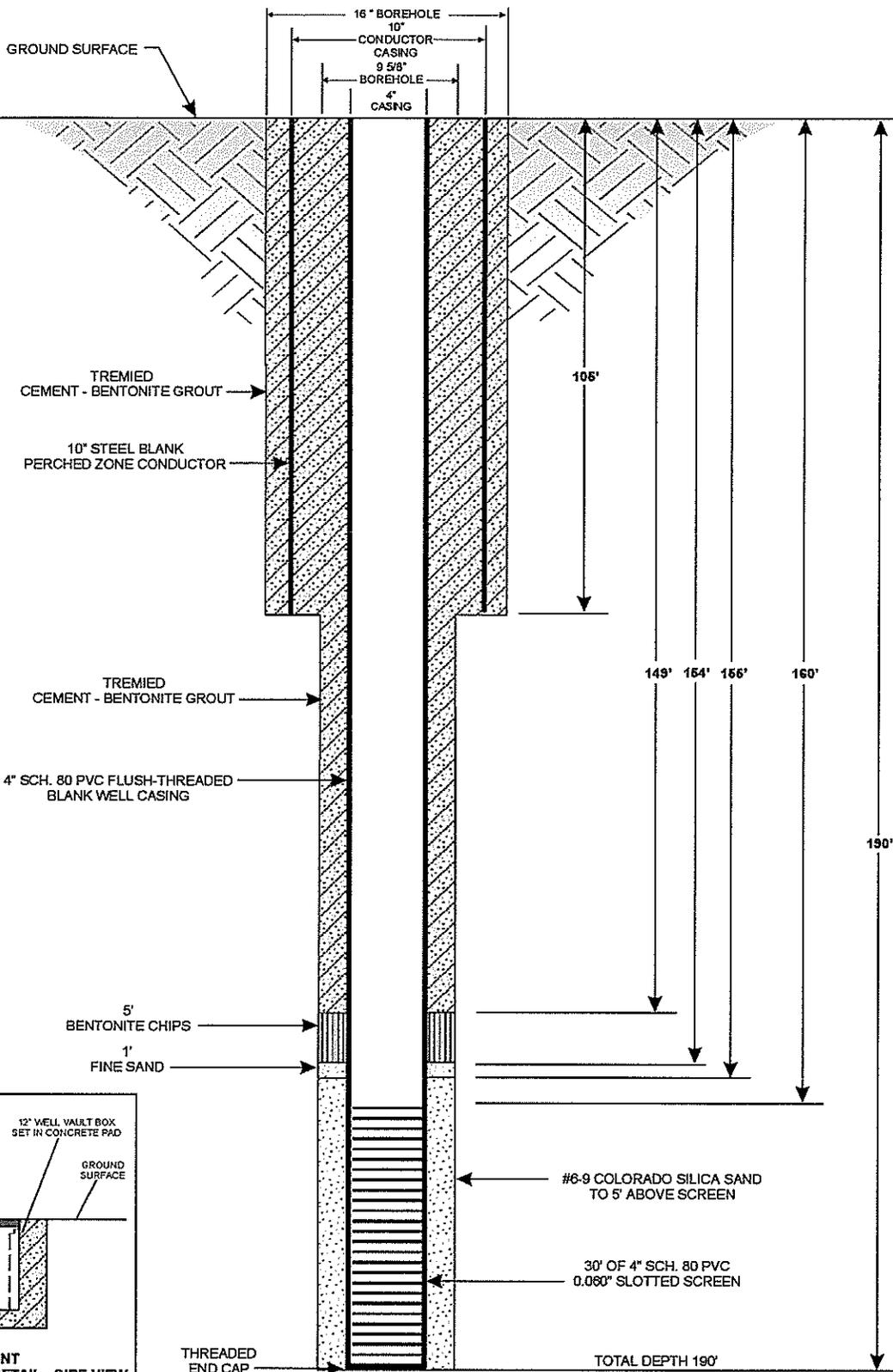
Boring Location Sketch: 	Project No: 365-0004-09	Date Drilled: 12/13/2003	Boring No.
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		VML-2
	Facility: PARK EUCLID		Sheet No.
	Location:		
City: TUCSON, ARIZONA		5 of 6	
Logged By: R. BRAND / J. MILLER		Driller: WDC EXPLORATION	
Casing installation data:			

Drilling Method: AIR ROTARY CASING HAMMER	SEE WELLBORE DIAGRAM
Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'	Top of box elevation: _____
	Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level			
								Time			
			Date								
140								VERY PALE ORANGE (10YR5/2), INCREASED MEDIUM SAND (35-40%) AND COARSE SAND (20-25%), DECREASED FINE SAND (25-30%). GRAVELLY SAND, 1/4-1/2" GRAVEL (20-25%), COARSE SAND (30-35%), MEDIUM SAND (20-25%), FINE SAND (25-30%). 153-155' CLAYEY SAND (SC), DARK YELLOWISH BROWN (10YR6/6), FINE SAND (45-50%), MEDIUM SAND (20-25%), CLAY (25-30%). 155-165' WELL GRADED SAND (SW), GREYISH ORANGE (10YR5/4), FINE SAND (35-45%), MEDIUM SAND (30-35%), COARSE SAND (25-30%). SOME CLAY (10-15%). INCREASE FINE SAND (45-50%), DECREASE COARSE SAND (15-20%). 165-168' CLAYEY SAND (SC), DARK YELLOWISH ORANGE (10YR6/6), FINE SAND (35-40%), MEDIUM SAND (30-35%), COARSE SAND (15-20%), CLAY (15-20%). 168'-176' WELL GRADED SAND (SW), MODERATE YELLOWISH BROWN (10YR5/4), FINE SAND (40-45%), MEDIUM SAND (30-35%), COARSE SAND (15-20%).			
145	VML-2 - 145		10:10	1.4							
150	VML-2 - 150		10:35	0.0							
155	VML-2 - 155		13:35	1.1							
160	VML-2 - 180		14:15	4.2							
165	VML-2 - 165		14:30	11.2							
170	VML-2 - 170		14:45	123							
	VML-2 - 173		15:00	156							
175	VML-2 - 175		15:04	5.3							



SEE WELLHEAD COMPLETION DETAIL



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PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

CONSTRUCTION DETAIL OF
LOWER VAPOR EXTRACTION WELL 3

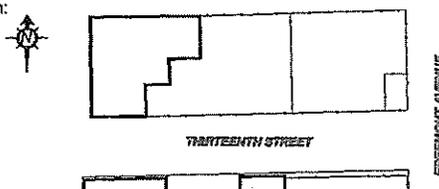
FIGURE
VEL-3

PROJECT#: 365-0003-02

FILE#: vel3wcd

DATE DRAWN: 09/13/02

DRAWN BY: B. McCLELLAN

Boring Location Sketch: 	Project No: 365-0004-09	Date Drilled: 12-19-02	Boring No.
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		VEL-3
	Facility: PARK EUCLID		
	Location:		Sheet No.
City: TUCSON, ARIZONA		3 of 6	
Logged By: J. MEYER	Driller: WDC EXPLORATION		
Casing installation data: 10" Steel 0-105' 4" Sch. 80 PVC blank 0-160' 4" Sch. 80 PVC slotted 160-190'0.0			

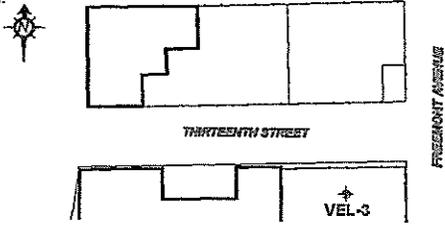
Drilling Method: AIR ROTARY CASING HAMMER

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level			
70				0.0		SEE SEPARATE SHEET		INCREASED GRAVEL CONTENT (20-25%), MEDIUM SAND (30-35%), DECREASED FINE SAND (25-30%).			
75							SILTY SAND (SM), MODERATE BROWN (5YR4/4), FINE SAND (45-50%), MEDIUM SAND (20-25%), SILT (30-35%), LIGHT MOISTURE.				
80							INCREASED MEDIUM SAND (30-35%), SOME COARSE SAND (15-20%), DECREASED SILT (15-20%).				
85				2.7			WELL GRADED SAND (SW), LIGHT BROWN (5YR6/5), FINE SAND (50-55%), MEDIUM SAND (30-35%), COARSE SAND (10-15%).				
				5.6			SOLVENT ODOR.				
				7.4							
90				9.3							
				8.7							
				10.2							
				4.5							
95				0.0			SANDY CLAY (CL), GREYISH ORANGE (10YR7/4), FINE SAND (30-40%), CLAY (60-70%).				
				1.2							
				0.6							
100											

Boring Location Sketch:



Project No: 365-0004-09	Date Drilled: 12-19-02	Boring No. VEL-3
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: PARK EUCLID	
Location:	City: TUCSON, ARIZONA	Sheet No. 4 of 6
Logged By: J. MEYER	Driller: WDC EXPLORATION	

Drilling Method: AIR ROTARY CASING HAMMER

Casing installation data:
 10" Steel 0-105'
 4" Sch. 80 PVC blank 0-160'
 4" Sch. 80 PVC slotted 160-190'

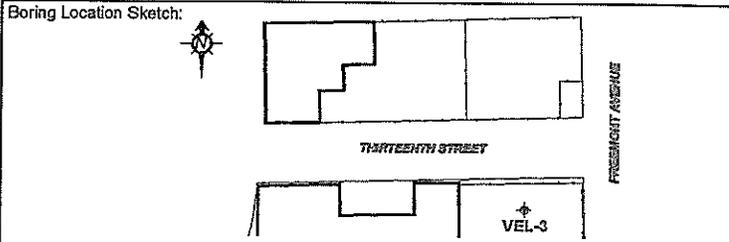
Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level				
								Time				
								Date				
105						SEE SEPARATE SHEET						
110												
115												
120												
125												
130												
135												

UNDETERMINED FROM 110-130', NO CUTTINGS WERE RECOVERED.

WELL GRADED SAND (SW), 1/4 - 1/2" GRAVEL, FINE SAND, SOME CLAY (10-15%).



Project No: 365-0004-09	Date Drilled: 12-19-02	Boring No. VEL-3
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: PARK EUCLID		Sheet No. 5 of 6
Location:		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: WDC EXPLORATION	

Drilling Method: AIR ROTARY CASING HAMMER

Casing installation data:
 10" Steel 0-105'
 4" Sch. 80 PVC blank 0-160'
 4" Sch. 80 PVC slotted 160-190'2.9

Boring Diameters: 16" 0'-105'; 9 5/8" 105'-190'

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level	Ground Level Elevation	
								Time		
								Date		
140						SEE SEPARATE SHEET				
145										
150				2.9						
155				3.3						
160				3.2						
165				12.3						
170				38.0						
				19.0						

WELL GRADED SAND (SW), LIGHT BROWN (5YR6/4), FINE SAND (35-40%), MEDIUM SAND (30-40%), COARSE SAND (20-25%), SUB ANGULAR.

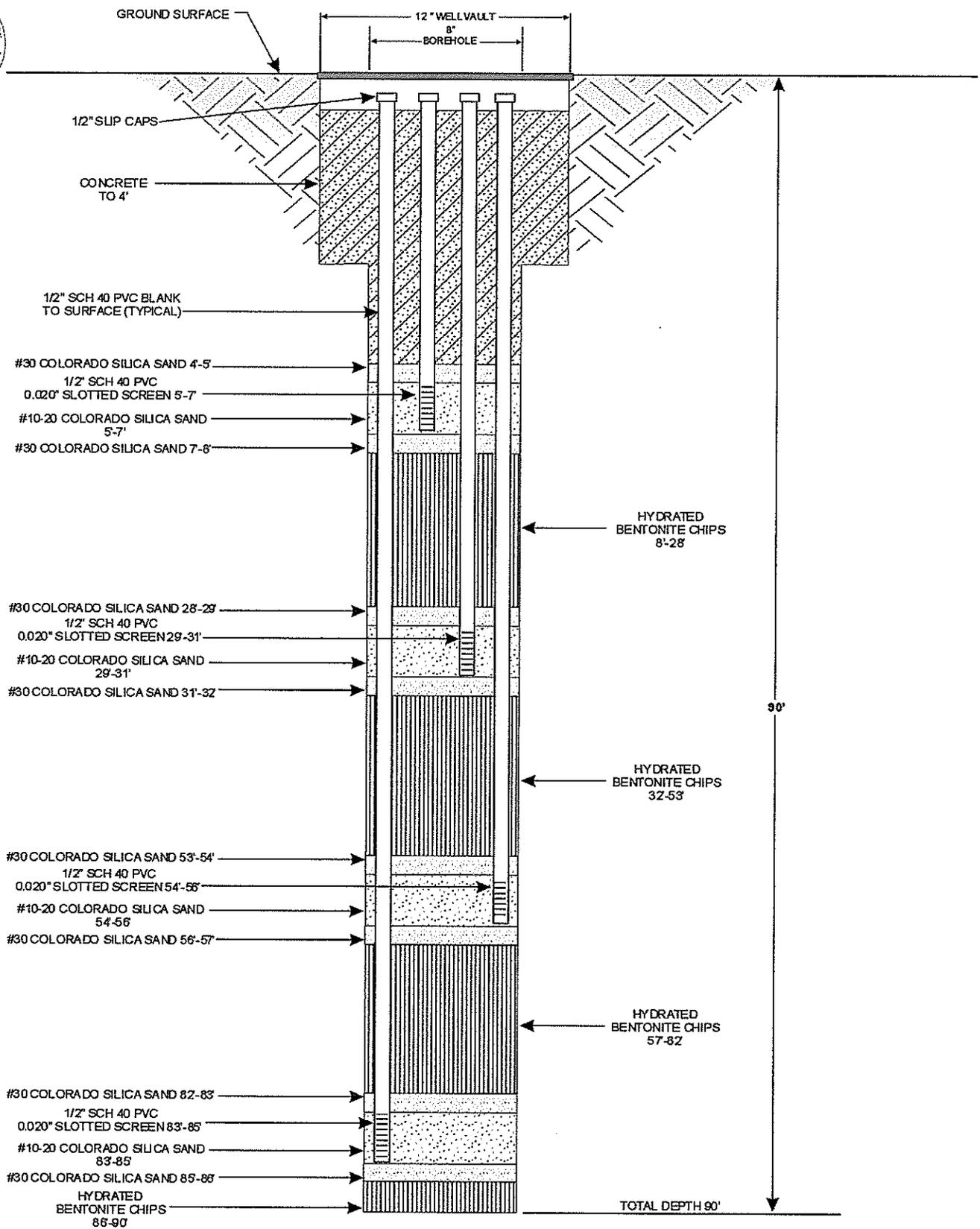
DECREASED COARSE SAND (10-15%), INCREASED MEDIUM SAND (35-45%), FINE (45-55%).

INCREASED COARSE SAND (30-35%), DECREASED FINE SAND (30-35%).

SILTY SAND (SM), SILT (15-20%), DECREASED COARSE SAND (15-20%), MEDIUM SAND (25-30%).

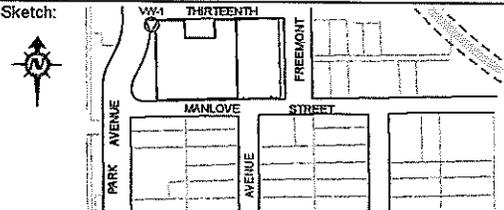
CLAYEY SAND (SC), DARK YELLOWISH BROWN (10YR6/6), CLAY (15-20%), FINE SAND (35-40%), MEDIUM SAND (25-30%), COARSE SAND (10-15%), LIGHT MOISTURE.

WELL GRADED SAND (SW), LIGHT BROWN (5YR6/2), FINE SAND (40-45%), COARSE SAND (30-35%), MEDIUM SAND (25-30%).



NOT TO SCALE

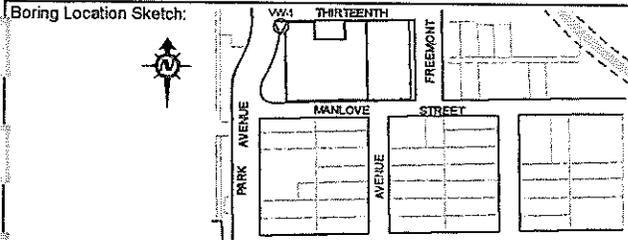
		PARK - EUCLID WQARF SITE TUSCON, ARIZONA	
AS-BUILT SOIL VAPOR MONITOR WELL SCHEMATIC			FIGURE VW-1
PROJECT#: 365-0003-03	FILE#: vw1wcd	DATE DRAWN: 02/26/02	DRAWN BY: B. McCLELLAN

Boring Location Sketch: 	Project No: 365-0007-03	Date Drilled: 02-15-03	Boring No.	
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY			VW-1
	Facility: MISSION LINEN FACILITY			
	Location:			Sheet No.
	City: TUCSON, ARIZONA			1 of 3
Logged By: J. MEYER		Driller: YELLOW JACKET DRILLING		
Casing installation data:				

Drilling Method: HOLLOW STEM AUGER, BK-81	Top of box elevation:
Boring Diameters: 8"	Ground Level Elevation:

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level	
0								0'-8" CONCRETE COVER	
5	VW1-5'		08:30	4.9	60/6"		[Soil Symbol]		SILTY SAND (SM), LIGHT BROWN (5YR6/4), FINE SAND (45-55%), MEDIUM SAND (20-25%), SILT (30-35%), LIGHT MOIST.
10			08:45	10.2	7,6,12		[Soil Symbol]		POORLY GRADED SAND (SP), LIGHT BROWN (5YR5/6), FINE SAND (65%), MEDIUM SAND (20-35%), COARSE SAND (5-10%), LIGHT TO MEDIUM DENSE.
15			08:51	12.7	16,40,50/2"		[Soil Symbol]		WELL GRADED SAND (SW), INCREASED MEDIUM SAND (25-30%), COARSE SAND (15-20%), DECREASED FINE SAND (50-55%), LIGHT MOIST.
20			09:00	6.7	50/5"		[Soil Symbol]		INCREASED COARSE SAND (20-25%), 1/4" GRAVEL (25%).
25			09:06	6.9	19,50/4"		[Soil Symbol]		CLAYEY SAND (SC), WITH GRAVEL, MODERATE YELLOWISH BROWN (10YR5/4), CLAY (15-20%), FINE SAND (40-45%), MEDIUM SAND (20-25%), COARSE SAND (10-15%), 1/4" GRAVEL (5-10%).
30	VW1-30'		09:23	5.0	40/6"		[Soil Symbol]		WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), FINE SAND (30-35%), MEDIUM SAND (35-40%), COARSE SAND (15-20%), 1/4-1/2" BROKEN GRAVELS (20-25%), LITTLE MOISTURE.

FIELD EXPLORATORY BORING LOG



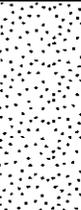
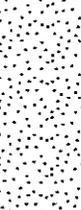
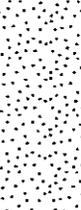
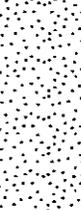
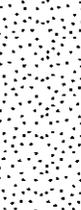
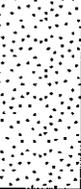
Project No: 385-0007-03	Date Drilled: 02-15-03	Boring No. VW-1
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY	Facility: MISSION LINEN FACILITY	
Location:	City: TUCSON, ARIZONA	Sheet No. 2 of 3
Logged By: J. MEYER	Driller: YELLOW JACKET DRILLING	
Casing installation data:		

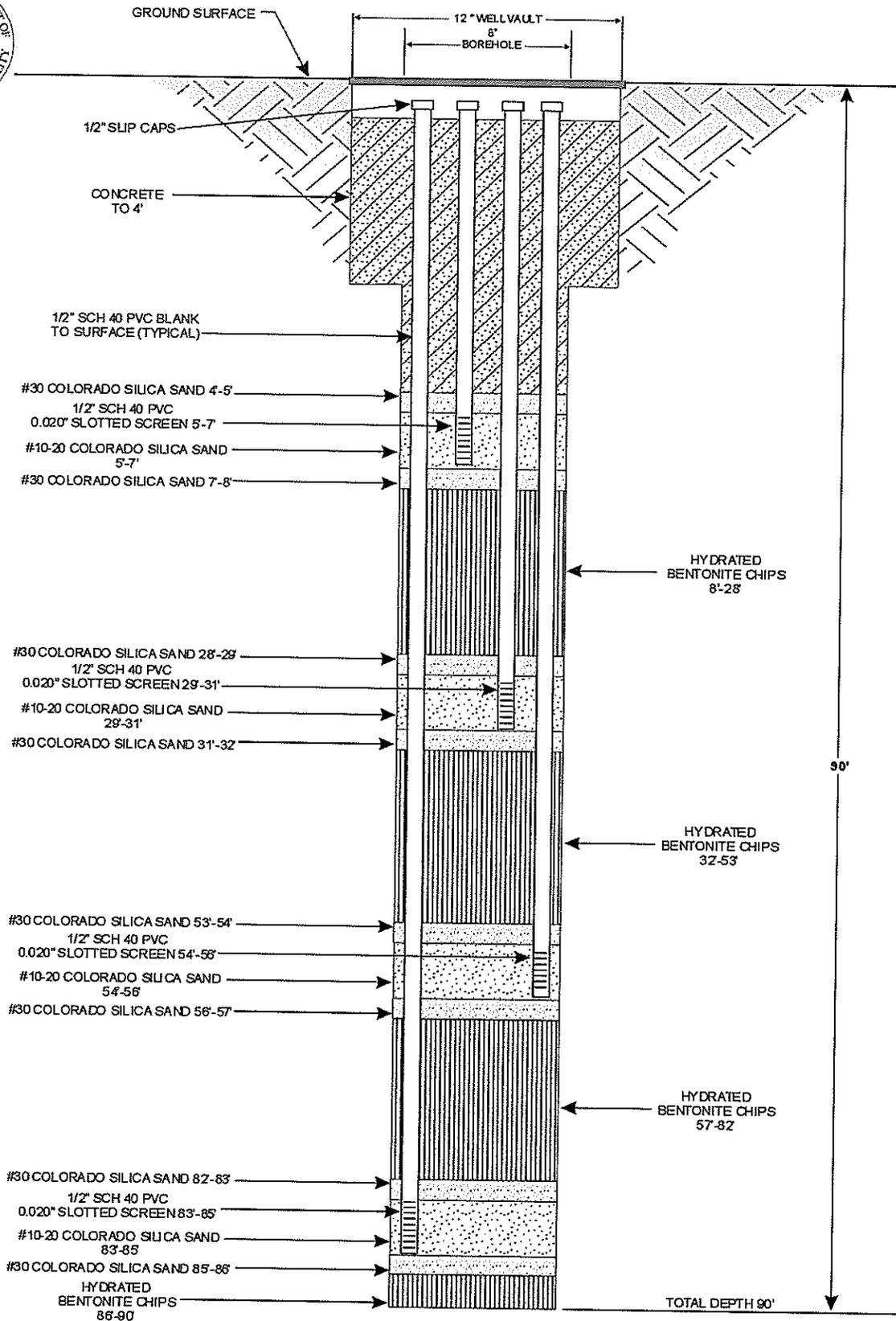
Drilling Method: HOLLOW STEM AUGER, BK-81

Boring Diameters: 8"

Top of box elevation: _____

Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level			
								Time			
			Date								
35			09:35	7.8	12,24,30			CLAYEY SAND (SC), MODERATE BROWN (5YR6/4), CLAY (25-30%), FINE SAND (45-50%), MEDIUM SAND (20-25%), MOIST.			
40			09:43	6.2	18,30,30			WELL GRADED SAND (SW), LIGHT BROWN (5YR6/4), FINE SAND (35-40%), MEDIUM SAND (35-40%), COARSE SAND 20-25%, LIGHT MOIST.			
45			09:51	8.5	22,50/6"			INCREASED COARSE SAND (25-30%), SOME 1/4" GRAVELS (5-10%), DECREASED FINE SAND (25-30%).			
50			09:59	9.2	45,50/6"			INCREASED GRAVEL 1/4-1/2" (10-15%), COARSE SAND (30-35%), DECREASED FINE SAND (20-25%), MEDIUM SAND (30-35%).			
55	VW1-55'		10:12	10.4	80/6"			INCREASED GRAVEL 1/4" (15-20%), GRAVELLY SAND..			
60			10:29	10.2	50/6"			SAND WITH CLAY, MODERATE REDDISH BROWN (10YR4/6), CLAY (10-15%), FINE SAND (50-55%), MEDIUM SAND (25-30%), COARSE SAND (5-10%), LIGHT MOIST.			
65			10:37	10.0	14,50/4"			WELL GRADED SAND (SW), MODERATE REDDISH BROWN (10YR4/6), FINE SAND (25-30%), MEDIUM SAND (35-40%), COARSE SAND (30-35%), LIGHT MOIST.			



NOT TO SCALE



PARK - EUCLID WQARF SITE
TUSCON, ARIZONA

AS-BUILT SOIL VAPOR
MONITOR WELL SCHEMATIC

FIGURE

PROJECT#: 365-0003-03

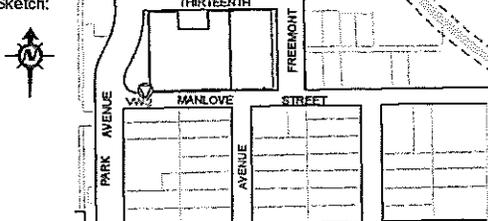
FILE#: vw2wcd

DATE DRAWN: 02/26/02

DRAWN BY: B. McCLELLAN

VW-2

FIELD EXPLORATORY BORING LOG

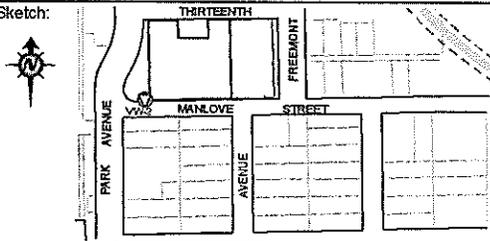
Boring Location Sketch: 	Project No: 385-0007-03	Date Drilled: 02-13-03	Boring No.
	Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		VW-2
	Facility: MISSION LINEN FACILITY		
	Location:		Sheet No.
City: TUCSON, ARIZONA		1 of 3	
Logged By: D. PLAZAK	Driller: YELLOW JACKET DRILLING		
Casing installation data:			

Drilling Method: HOLLOW STEM AUGER, BK-RIG

Boring Diameters: 8"	Top of box elevation:	Ground Level Elevation:
----------------------	-----------------------	-------------------------

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level			
0								SILTY SAND (SM) ~20% SILT, GRAYISH ORANGE (10YR7/4), 80% FINE SAND.			
5	VW2-5'		10:15	3.7	50/6"			SAA.			
10			10:20	4.1	8,14,15			WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), FG TO CG, SUB ANGULAR, MOSTLY QUARTZ.			
15			10:25	3.4	27,50/2"			MIXED CLAY/CALICHE, MOTTLED (10YR8/2), VERY PALE ORANGE AND (5YR5/6), LIGHT BROWN FRIABLE TO VERY HARD.			
20			10:35	3.3	50/6"			CLAYEY SAND (SC) ~ 30% CLAY, 70% FG TO CG SAND, LIGHT BROWN (5YR8/4).			
25			10:40	4.2	30,50/5"			WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), FG TO CG GRANITIC CLASTS UP TO 1/2", 5% CLAY.			
30	VW2-30'		10:50	4.2	65/6"			SAA SUBANGULAR TO ROUNDED QUARTZ GRAINS, GRANITE CLASTS UP TO 1".			

Boring Location Sketch:



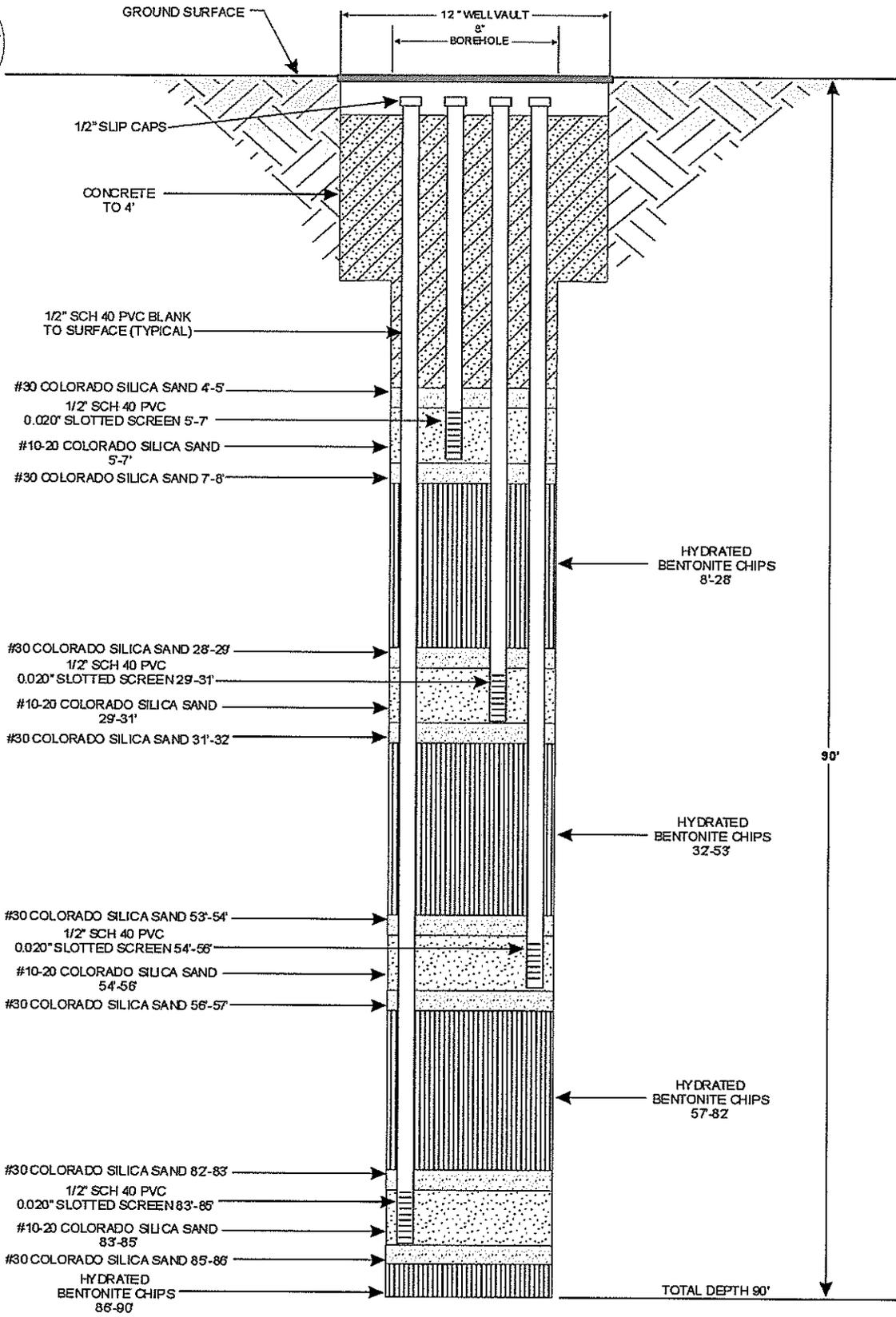
Project No: 365-0007-03	Date Drilled: 02-13-03	Boring No. VW-2
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: MISSION LINEN FACILITY		Sheet No. 2 of 3
Location:		
City: TUCSON, ARIZONA		
Logged By: D. PLAZAK	Driller: YELLOW JACKET DRILLING	
Casing installation data:		

Drilling Method: HOLLOW STEM AUGER, BK-RIG

Boring Diameters: 8"

Top of box elevation:	Ground Level Elevation:
Water Level	
Time	
Date	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	
35			11:15	3.7	28,50/2"			WELL GRADED SAND (SW), LIGHT BROWN (5YR6/4), FG TO CG, ANGULAR TO SUB ROUNDED, MOSTLY QUARTZ, SOME MICA & FELDSPAR, GRANITE CLASTS UP TO 1/2".
40			11:25	4.3	12,20,30			CLAYEY SAND (SC), LIGHT BROWN (5YR5/6), 20% CLAY, FG TO MG, SOME MICA.
45			11:29	4.2	21,50/5"			POORLY GRADED SAND (SP), LIGHT BROWN (5YR5/6), FG TO MG, QUARTZ, MINOR MICA, ANGULAR TO SUB ROUNDED.
50			11:36	4.0	50/6"			WELL GRADED SAND (SW), MODERATE YELLOWISH BROWN (10YR5/4), FG TO CG, CLASTS UP TO 1/4", MINOR MICA.
55	VW2-55'		11:52	4.0	60/6"			WELL GRADED SAND (SW), MODERATE BROWN (5YR4/4), FG TO CG SUB ANGULAR QUARTZ AND FELDSPAR, MINOR MICA.
60			12:14	3.7	25,50/5"			WELL GRADED SAND (SW), MODERATE REDDISH BROWN (10R4/6), 5% CLAY, FG TO CG SUB ANGULAR QUARTZ AND FELDSPAR, MINOR MICA, GRANITE CLASTS TO 1".
65			12:25	5.3	25,50/5"			SAA

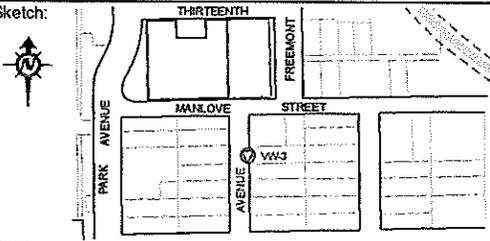


NOT TO SCALE

		PARK - EUCLID WQARF SITE TUSCON, ARIZONA		
AS-BUILT SOIL VAPOR MONITOR WELL SCHEMATIC				FIGURE VW-3
PROJECT#: 365-0003-03	FILE#: vw3wcd	DATE DRAWN: 02/26/02	DRAWN BY: B. McCLELLAN	

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



Project No: 365-0007-03	Date Drilled: 02-14-03	Boring No. VW-3
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: MISSION LINEN FACILITY		Sheet No. 1 of 3
Location:		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: YELLOW JACKET DRILLING	
Casing installation data:		

Drilling Method: HOLLOW STEM AUGER, BK-81

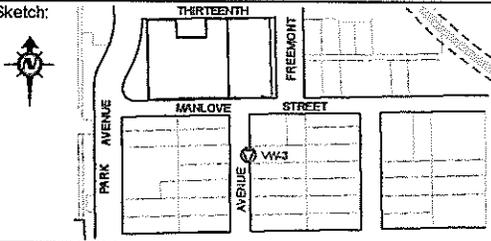
Boring Diameters: 8"

Top of box elevation:	Ground Level Elevation:
Water Level	
Time	
Date	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	
0								ASPHALT COVER
5	VW3-5'		08:40	4.7	30/6"			SILTY SAND (SM), WITH GRAVEL, GREYISH ORANGE PINK (5YR7/2), SILT (30-40%), FINE SAND (40-45%), 1/4" GRAVEL (10-15%), DRY.
10			09:01	6.8	9,14,19			GRAVELLY WELL GRADED SAND (SW), LIGHT BROWN (5YR5/6), 1/4" GRAVEL (15-20%), FINE SAND (30-35%), MEDIUM SAND (35-40%), COARSE SAND (25-30%), LITTLE MOISTURE.
15			09:07	11.3	50/6"			INCREASED GRAVEL CONTENT (20-25%), SOME 1/2", INCREASED COARSE SAND (30-35%).
20			09:16	7.6	50/2"			GRAVEL CLASTS > 2".
25			09:24	7.1	50/6"			SIMILAR TO ABOVE, 1/4-3/4" GRAVELS (25-30%).
30	VW3-30'		09:35	8.1	50/6"			CLAYEY SAND (SC), MODERATE BROWN (5YR4/9) CLAY (25-30%), FINE SAND (35-40%), MEDIUM SAND (20-25%), LIGHT MOIST.

FIELD EXPLORATORY BORING LOG

Boring Location Sketch:



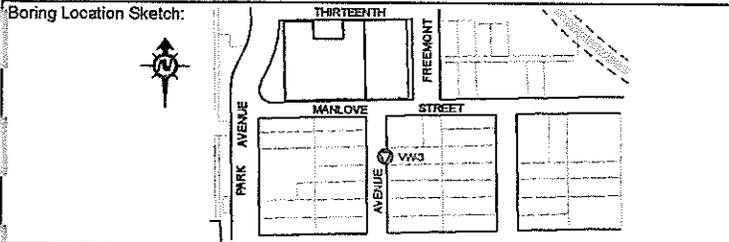
Project No: 385-0007-03	Date Drilled: 02-14-03	Boring No. VW-3
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: MISSION LINEN FACILITY		Sheet No. 2 of 3
Location:		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: YELLOW JACKET DRILLING	

Drilling Method: HOLLOW STEM AUGER, BK-81

Boring Diameters: 8"

Top of box elevation:	Ground Level Elevation:
Water Level	
Time	
Date	

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	
35			09:59	6.7	50/5"			GRAVELLY WELL GRADED SAND (SW), LIGHT BROWN (5YR5/4), FINE SAND (50-50%), MEDIUM SAND (25-30%), GRAVEL ROCK CLAST > 2" (20-25%), LITTLE MOISTURE.
40			10:03	7.1	50/6"			SOME SILT AND CLAY (10-15%), DECREASED GRAVEL CONTENT (15-20%).
45			10:07	3.9	35,50/2"			GRAVEL 1/4" (15-20%), SOME COARSE SAND (15-20%), FEW FINES (<3%) TO NONE
50			10:14	4.8	50/6"			
55	VW3-55'		10:25	6.2	80/6"			INCREASED COARSE SAND (20-25%), MEDIUM SAND (30-35%), DECREASED FINE SAND (30-35%), 1/4-1/2" GRAVELS (20-25%), LIGHT MOISTURE.
60			10:48	-	50/5"			NO RECOVERY, GRANITE ROCK CLAST >3" IN CUTTINGS.
65			11:40	4.2	30,50/5"			SAND, MODERATE REDDISH BROWN (10R4/6), FINE SAND (35-40%), MEDIUM SAND (30-35%), COARSE SAND (25-30%), GRAVEL ROCK CLAST >2" (5-10%).



Project No: 385-0007-03	Date Drilled: 02-14-03	Boring No. VW-3
Client: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY		
Facility: MISSION LINEN FACILITY		Sheet No. 3 of 3
Location:		
City: TUCSON, ARIZONA		
Logged By: J. MEYER	Driller: YELLOW JACKET DRILLING	
Casing installation data:		

Drilling Method: HOLLOW STEM AUGER, BK-81

Boring Diameters: 8"

Top of box elevation: _____ Ground Level Elevation: _____

Depth (Feet)	Sample Number	Sample Int.	Time	PID (ppm)	Blow Counts per 6"	Well Detail	Soil Group Symbol	Water Level			
								Time			
								Date			
70			11:50	3.8	14,50/5"		<p>SANDY CLAY (CL), MODERATE YELLOWISH BROWN (10YR5/4), FINE SAND (30-35%), CLAY (60-70%), LITTLE MOISTURE.</p>				
75			12:00	5.7	11,30,50/3"						
80			12:08	7.8	21,50/6"			<p>CLAYEY SAND (SC), LIGHT BROWN (5YR5/4), CLAY (20-25%), FINE SAND (30-35%), MEDIUM SAND (30-35%), COARSE SAND (5-10%).</p>			
85	VW3-85'		12:25	8.4	60/6"		<p>WELL GRADED SAND (SW), LIGHT BROWN (5YR5/4), FINE SAND (35-40%), MEDIUM SAND (30-35%), COARSE SAND (25-30%), LIGHT MOISTURE.</p>				
90											
95											
100											

Boring Number: VW-4

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: D. Carlson

Total Drilled Depth: 88.3'

Drill Date/Time: 1/21/03 15:20

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
0					Ground Surface			
0-5	70/7		(diagonal lines)	SC	Clayey sand with silt, light brown, medium dense, slightly moist, angular to sub angular 0 Cementation, Low Plasticity F-M Sand 60%, 40% Silt, 0% Clay			
5-10	15 16 18		(dotted pattern)	SP	Sand, trace silt, light brown, medium-strong dense, slightly moist, angular to sub 0 0 Cementation, No Plasticity M-C Sand 95%, 5% Silt, 0% Clay	0		Inches Driven/Inches Recovered 18/8
10-15	25 50/6		(diagonal lines)	SP		0		12/9
15-20	50/5		(diagonal lines)	CL		0		5/4

Boring Number: VW-4

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: D. Carlson

Total Drilled Depth: 88.3'

Drill Date/Time: 1/21/03 15:20

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
21					Sandy clay, mottled pinkish-white/lt brown, very stiff, slightly moist W Cementation, med Plasticity Sand 35%, 15% Gravel, 65% Clay			
22								
23				SC	Gravels 22' to 26'			
24					Clayey sand, few gravels, dense to very dense, slightly moist, angular to sub 0 0 Cementation, med Plasticity Sand 60%, 0% Silt, 25% Clay, 15% Gravel			
25	40					0		9/9
26	50/3							
27								
28								
29								
30	100/4			SM	Silty sand, with gravels, very dense, light brown 0 Cementation, No Plasticity, angular to sub 0 Sand 65%, 15% Silt, 0% Clay, 20% Gravel	0		4/4
31								
32								
33								
34								
35	50/4			SC	Inter-bedded gravels 35' to 40', Clayey sand with gravels, light brown, med dense, angular to sub angular 0 Cementation, Low Plasticity M-C Sand 55%, 0% Silt, 20% Clay, 25% Gravel	0		4/3
36								
37								
38								
39								
40	24					0		16/16
	26							Added water
41	50/4							

Boring Number: VW-5

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: D. Carlson

Total Drilled Depth: 89'

Drill Date/Time: 1/23/03 08:44

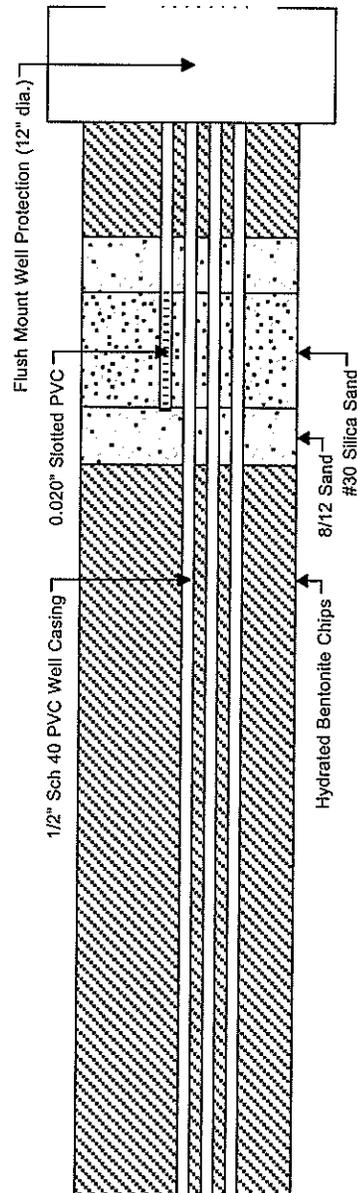
Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
0					Ground Surface			
0-2'				SC	Probable fill 0-2', dense, moist, low Plasticity, F-C Sand 80%, 20% Clay			
2-30'					Clayey sand, light brown, very dense, slightly moist, angular to sub angular Weak Cementation, low to medium Plasticity, mottled pinkish-white F-M Sand 60%, 40% Clay			
5	80/8					0		8/5
10	20 50/4					0.2		10/8
15	20 23 60/6					0		18/18
18					Gravel Layer at 18', inter-bedded			
20	50/3					0		3/3



Inches Driven/Inches Recovered

Boring Number: VW-5

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: D. Carlson

Total Drilled Depth: 89'

Drill Date/Time: 1/23/03 08:44

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
21								
22								
23								
24								
25	24					0		18/16
26	30							
27	35							
28								
29								
30	50			SP	Sand, trace silt, trace gravels, very dense, light brown, slightly moist	0.2		10/6
31	50/4				0 Cementation, No Plasticity, sub angular to sub 0 M-C Sand 100%, trace Silt, trace Gravel			
32								
33								
34								
35	30					0.2		12/6
36	80/6				Increase in silt, gravel @ 35-36'			
37								
38								
39								
40	22			SC		0.6		8/8
41	50/2							Added ~5 gallons of water in auger

Boring Number: VW-5

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: D. Carlson

Total Drilled Depth: 89'

Drill Date/Time: 1/23/03 08:44

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments	
42					Clayey sand, light brown-mottled, very dense, pinkish white, slightly moist, sub angular to sub 0 to Weak Cementation, No Plasticity F-C Sand 75%, 25% Clay			Additional water added as needed, but not near SP samples	
43									
44									
45	50/6					0			6/5
46									
47									
48									
49									
50	22 50/6			SP	Silty sand, trace gravels, very dense, light brown, slightly moist, angular to sub angular Sand 85%, 15% Silt, trace Gravel	0.2		12/10	
51									
52									
53									
54									
55	90/7				Becomes brown @ 55', 15% Gravel, 15% Silt, 70% Sand	0.2		7/	
56									
57									
58									
59									
60	50/6				Gravel Layer @ 60'	0		6/6 Rock in Sample	
61									

Boring Number: VW-5

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: D. Carlson

Total Drilled Depth: 89'

Drill Date/Time: 1/23/03 08:44

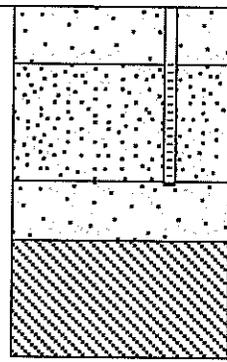
Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
83								
84								
85	20				Increase in clay, dark brown @ 85' (35% Clay, F-C Sand 65%)	3.2		
86	25							
87	30				Decrease in clay, brown @ 86' (20% Clay, F-C Sand 80%)			
88								
89								
90								
91								
92								
93								
94								
95								
96								
97								
98								
99								
100								
101								
102								



18/10, stopped at 89'

Boring Number: VW-6

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: AJ

Total Drilled Depth: 89'

Drill Date/Time: 2/4/03 08:25 - 12:00

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
0					Ground Surface			
0 - 5	100/5			SC	Clayey sand, brown, angular to sub angular F-C Sand 80%, 20% Clay		<p>Flush Mount Well Protection (12" dia.)</p> <p>0.020" Slotted PVC</p> <p>1/2" Sch 40 PVC Well Casing</p> <p>#30 Sand</p> <p>8/12 Sand</p> <p>Hydrated Bentonite Chips</p>	Inches Driven/Inches Recovered
5 - 10	50/5				Gravel layer @ 7'			5/4
10 - 15	50/5				Silty sand, clay, light brown W Cementation, low plasticity, sub round angularity F-M Sand 70%, 30% Clay			5/3
15 - 17	50/6				Gravel layer @ 17'			6/2
17 - 20	50/5							5/4
20						0.7		

Boring Number: VW-6

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: BK-81 with HSA

Geologist: AJ

Total Drilled Depth: 89'

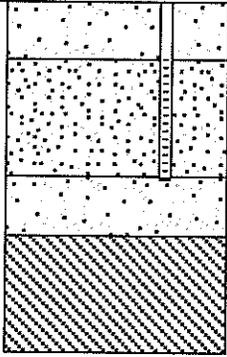
Drill Date/Time: 2/4/03 08:25 - 12:00

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
83							 <p style="text-align: right;">Bottom Seal</p>	5/10
84								
85	45 50/5				1.9			
86								
87								
88								
89								
90								
91								
92								
93								
94								
95								
96								
97								
98								
99								
100								
101								
102								

Total depth drilled @ 89'

Boring Number: VW-7

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: L-10-W (low clearance) with HSA

Geologist: D. Carlson

Total Drilled Depth: 88'

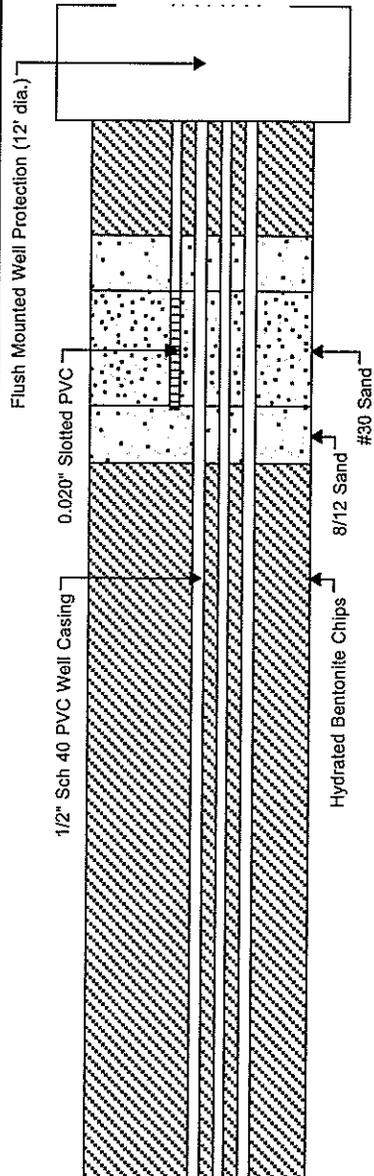
Drill Date/Time: 1/25/03 07:20

Depth to Water: NA

Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
0					Ground Surface			
0-5	40			CL	Clay with sand, light brown to brown, very stiff, slightly moist Weak Cementation, low Plasticity F-M Sand 25%, 75% Clay	0.8	 <p>Flush Mounted Well Protection (12' dia.)</p> <p>0.020" Slotted PVC</p> <p>1/2" Sch 40 PVC Well Casing</p> <p>Hydrated Bentonite Chips</p> <p>#30 Sand</p> <p>8/12 Sand</p>	<p>Inches Driven/Inches Recovered</p> <p>10/5</p>
5-8	50/4			SC	Clayey sand, few gravels, light brown, low plasticity			
18					Gravel layer @ 18'			

Boring Number: VW-7

Drilled By: Yellow Jacket Drilling

Project: Park Euclid WQARF

Bore Hole Diameter: 8"

Project No.: 2223709

Drill Method: L-10-W (low clearance) with HSA

Geologist: D. Carlson

Total Drilled Depth: 88'

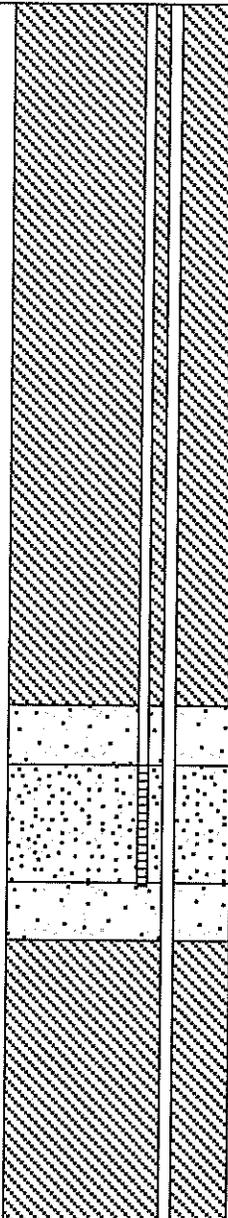
Drill Date/Time: 1/25/03 07:20

Depth to Water: NA

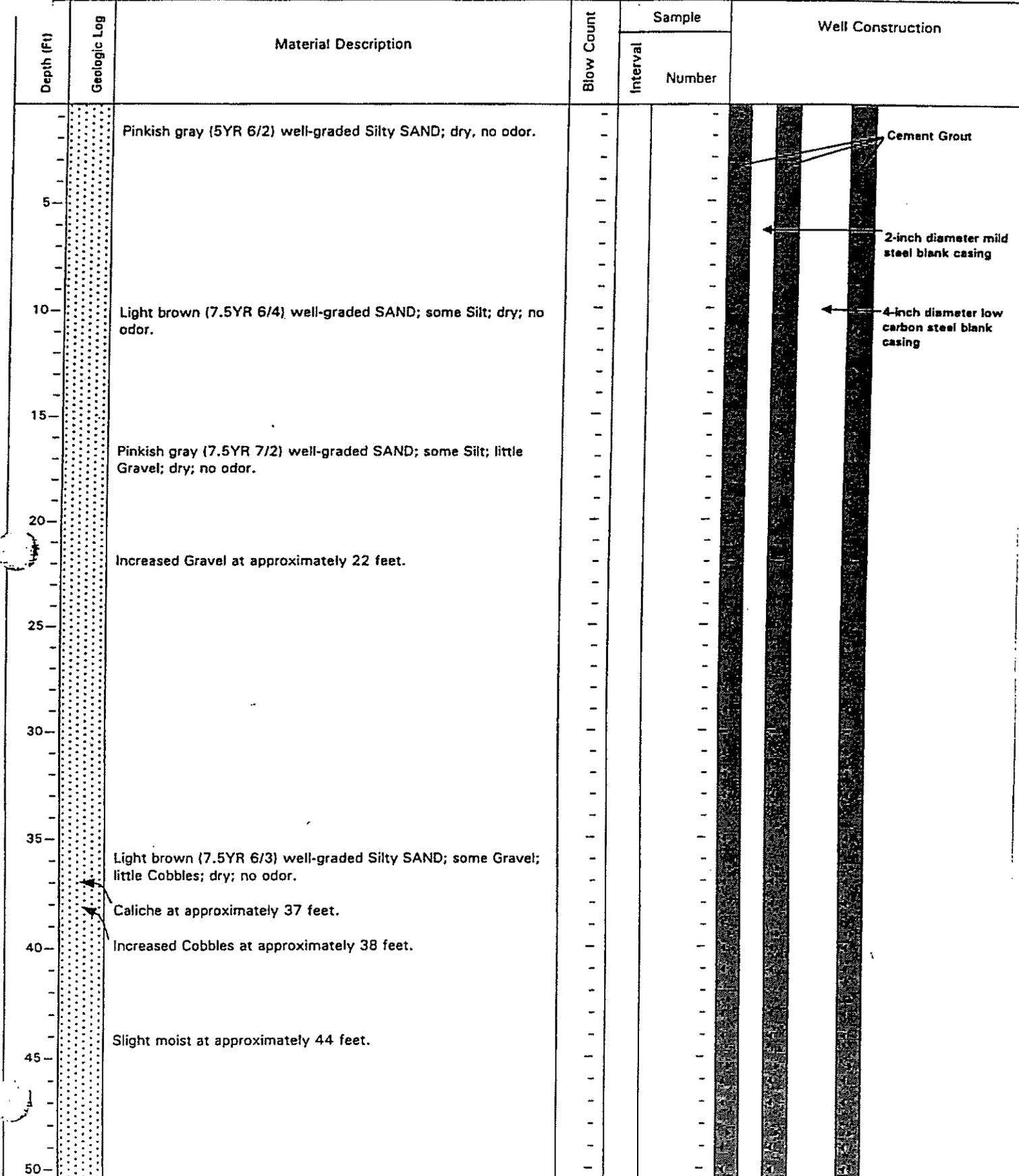
Water Level Date/Time: NA

Sample Method: SimulProbe, Split Spoon every 5'

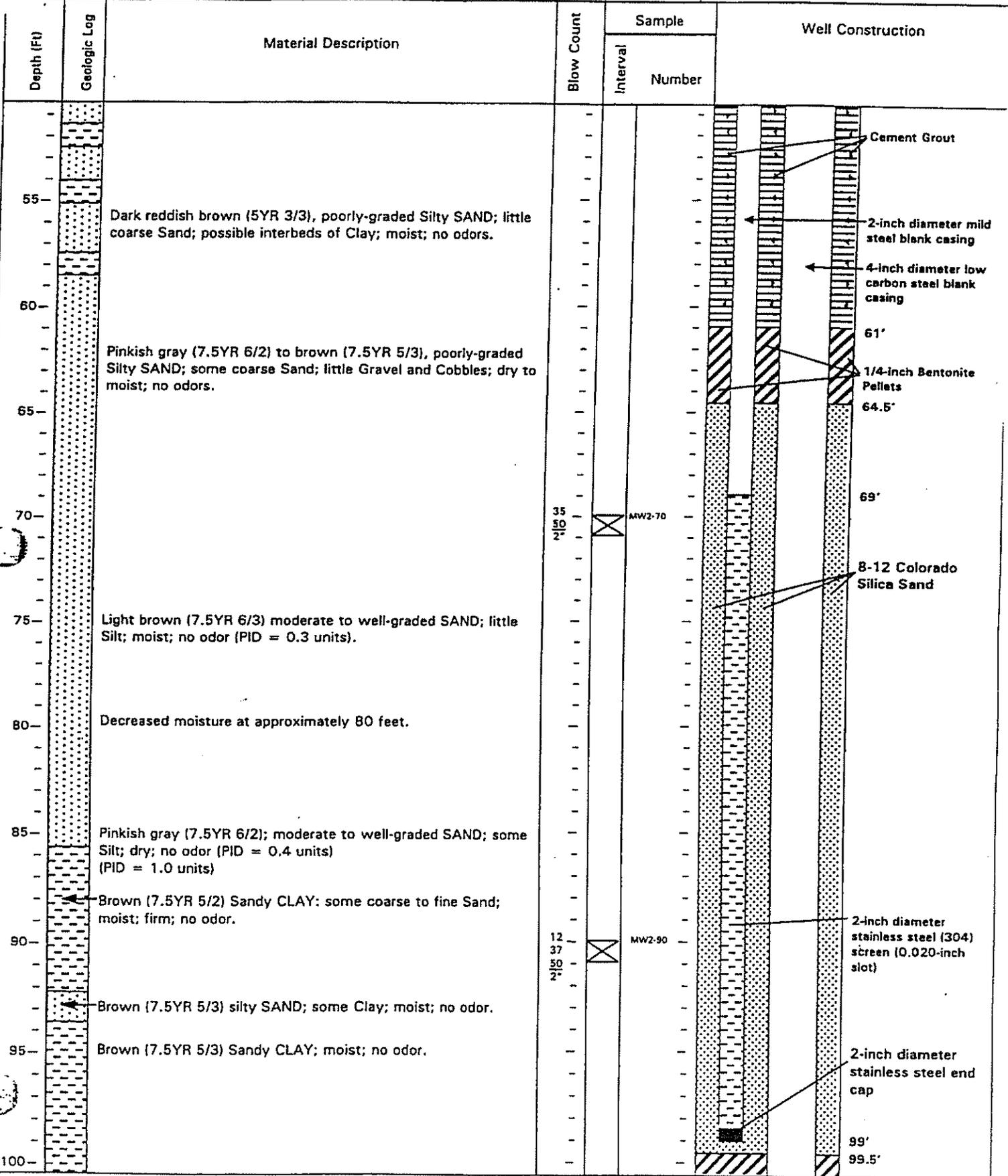
SUBSURFACE PROFILE

Depth	Blow Count	Sample Interval	Lithologic Symbol	Soil Class	Lithologic Description	PID (ppm)	Well Completion Details	Comments
42					Clayey sand, trace gravels, light brown-brown, dense, slightly moist 0Cementation, Low Plasticity Sand 70%, Trace Gravel, 30% Clay			
43								
44								
45								
46								
47								
48								
49								
50								
51								
52								
53								
54								
55	70/6							
56								
57								
58								
59								
60								
61								

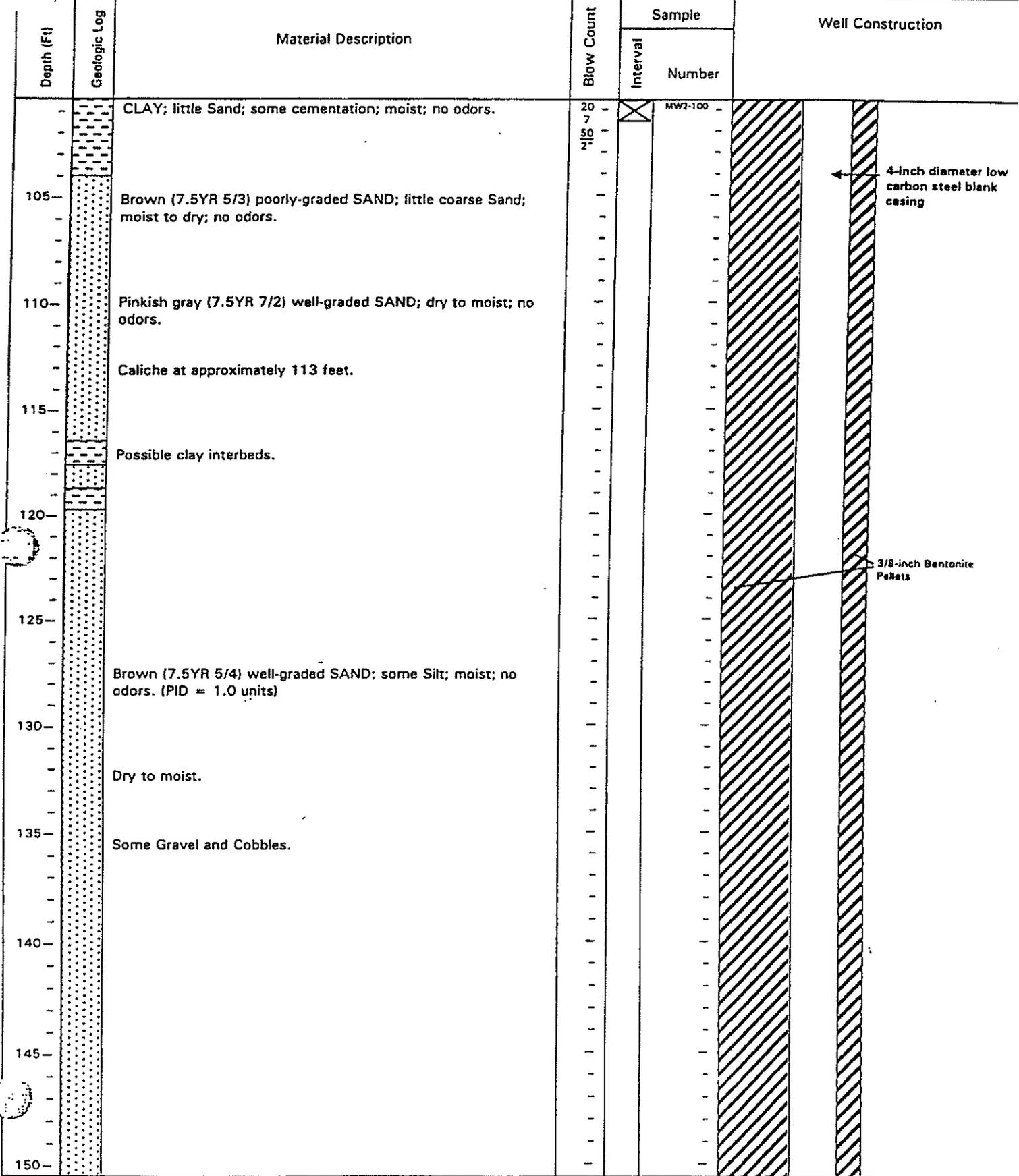
Project Name: Arroyo Chico		ADWR Registration No: 55-566559	Log of Well No.: MW-2	Page 1 of 5
Well Location: SW Corner 12th St. & Santa Rita Ave.		Depth of Wellbore Below LS: 238 Feet	Well Screen: 2 3/4" Diameter Stainless Steel	
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand
Date Started: 1/26/98	Date Completed: 1/30/98	WL Below Datum		Well Seal: Cement Grout/Bentonite
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:
Logging Equipment: AP-1000		Well Casing: 2 3/4" Diameter Mild Steel		Well Cover:



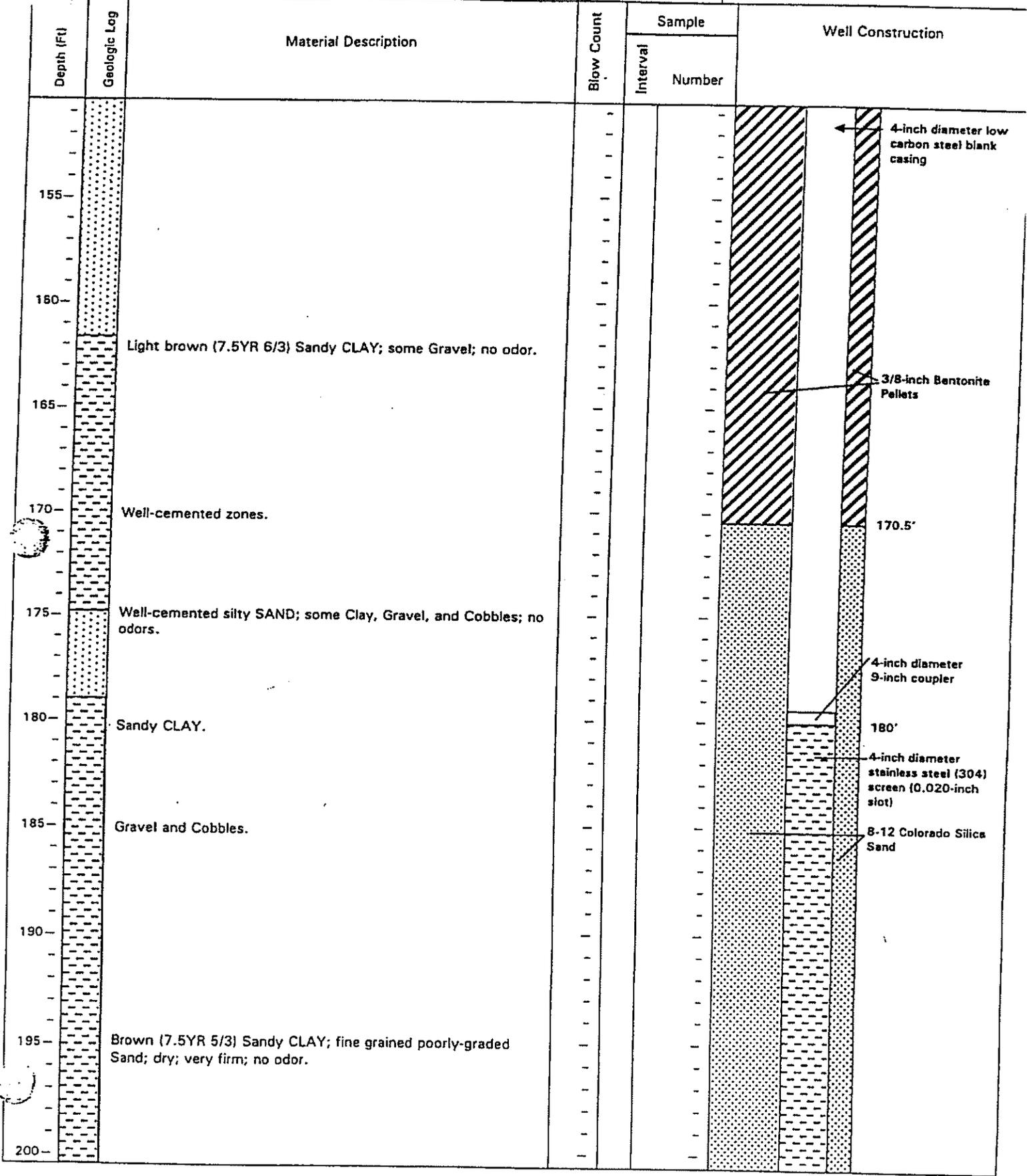
Project Name: Arroyo Chico		ADWR Registration No: 55-566559		Log of Well No.: MW-2	Page 2 of 5
Well Location: SW Corner 12th St. & Santa Rita Ave.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2" / 4" Diameter Stainless Steel	
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand	
Date Started: 1/26/98	Date Completed: 1/30/98	WL Below Datum		Well Seal: Cement Grout/Bentonite	
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:	
Logging Equipment: AP-1000		Well Casing: 2" / 4" Diameter Mild Steel		Well Cover:	



Project Name: Arroyo Chico		ADWR Registration No: 55-566559	Log of Well No.: MW-2	Page 3 of 5
Well Location: SW Corner 12th St. & Santa Rita Ave.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand
Date Started: 1/26/98	Date Completed: 1/30/98	WL Below Datum		Well Seal: Cement Grout/Bentonite
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:
Logging Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel		Well Cover:



Project Name: Arroyo Chico		ADWR Registration No: 55-566559		Log of Well No.: MW-2		Page 4 of 5	
Well Location: SW Corner 12th St. & Santa Rita Ave.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel			
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:		Datum Elev:		Filter Pack: 8-12 Colorado Silica Sand	
Date Started: 1/26/98		Date Completed: 1/30/98		WL Below Datum		Well Seal: Cement Grout/Bentonite	
Contractor: Layne		ATD/Time		Static/Date:		Cond Casing:	
Pumping Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel				Well Cover:	



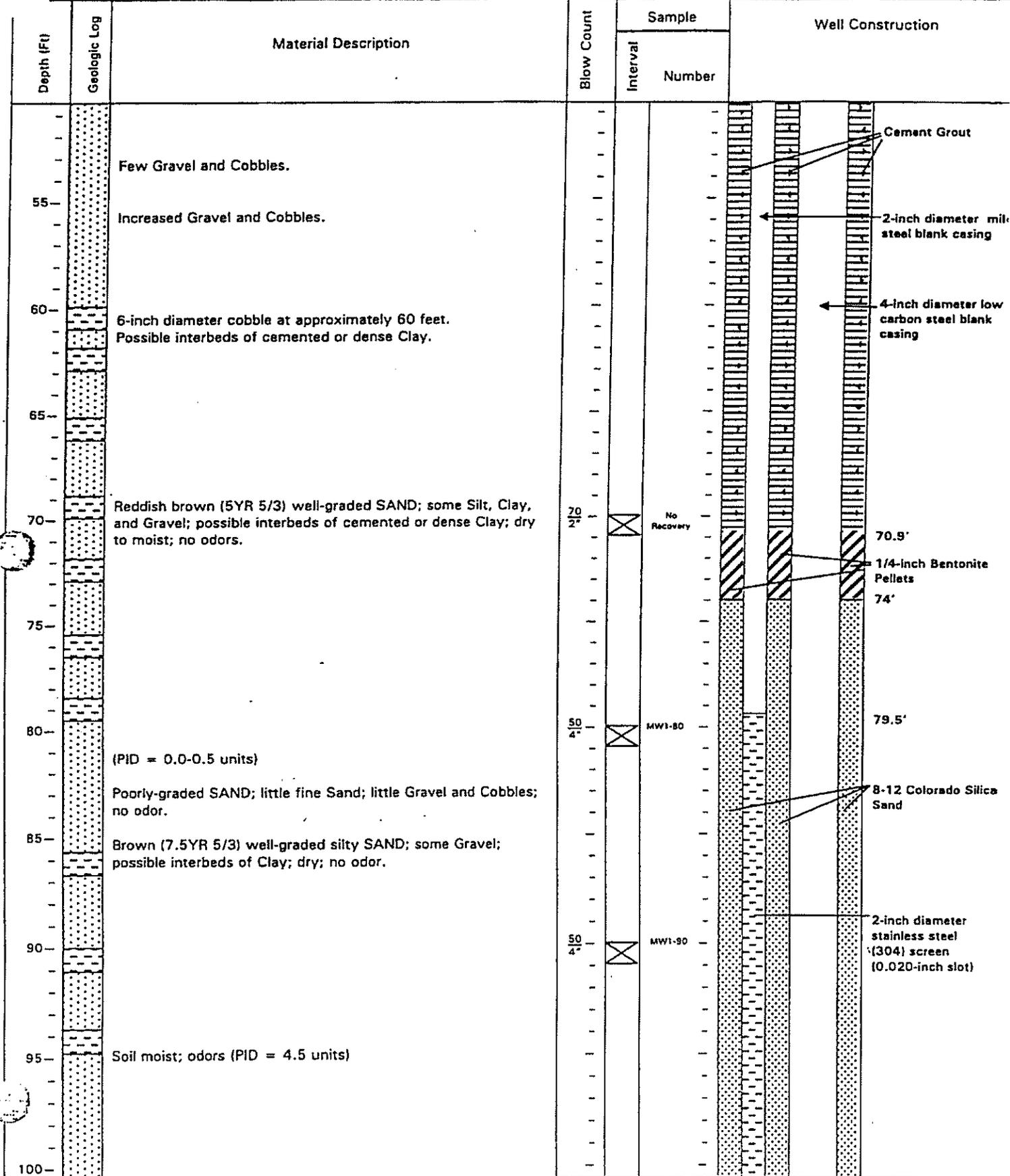
Project Name: Arroyo Chico		ADWR Registration No: 55-566559		Log of Well No.: MW-2	Page 5 of 5
Well Location: SW Corner 12th St. & Santa Rita Ave.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel	
Logged/Checked by: Patricia Hartshome, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand	
Date Started: 1/26/98	Date Completed: 1/30/98	WL Below Datum		Well Seal: Cement Grout/Bentonite	
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:	
Pumping Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel		Well Cover:	

Depth (ft)	Geologic Log	Material Description	Blow Count	Sample		Well Construction
				Interval	Number	
205		Well-cemented zones (to 235 feet).				
210						
215		Brown (7.5YR 5/3) well-cemented poorly graded SAND; little coarse Sand; moist; no odors.				<p>10.75-inch diameter borehole</p> <p>4-inch diameter stainless steel end cap</p> <p>235'</p> <p>TD = 238 feet</p>
220		Brown (7.5YR 5/3) well-cemented well-graded SAND; some Clay and Gravel; moist; no odors.				
225						
230		Brown (7.5YR 5/3) well-cemented poorly-graded Clayey SAND; little coarse Sand; moist; no odors.				
235		Brown (7.5YR 5/3) well-cemented Sandy CLAY; fine Sand; moist; no odors.				
240						
245						
250						

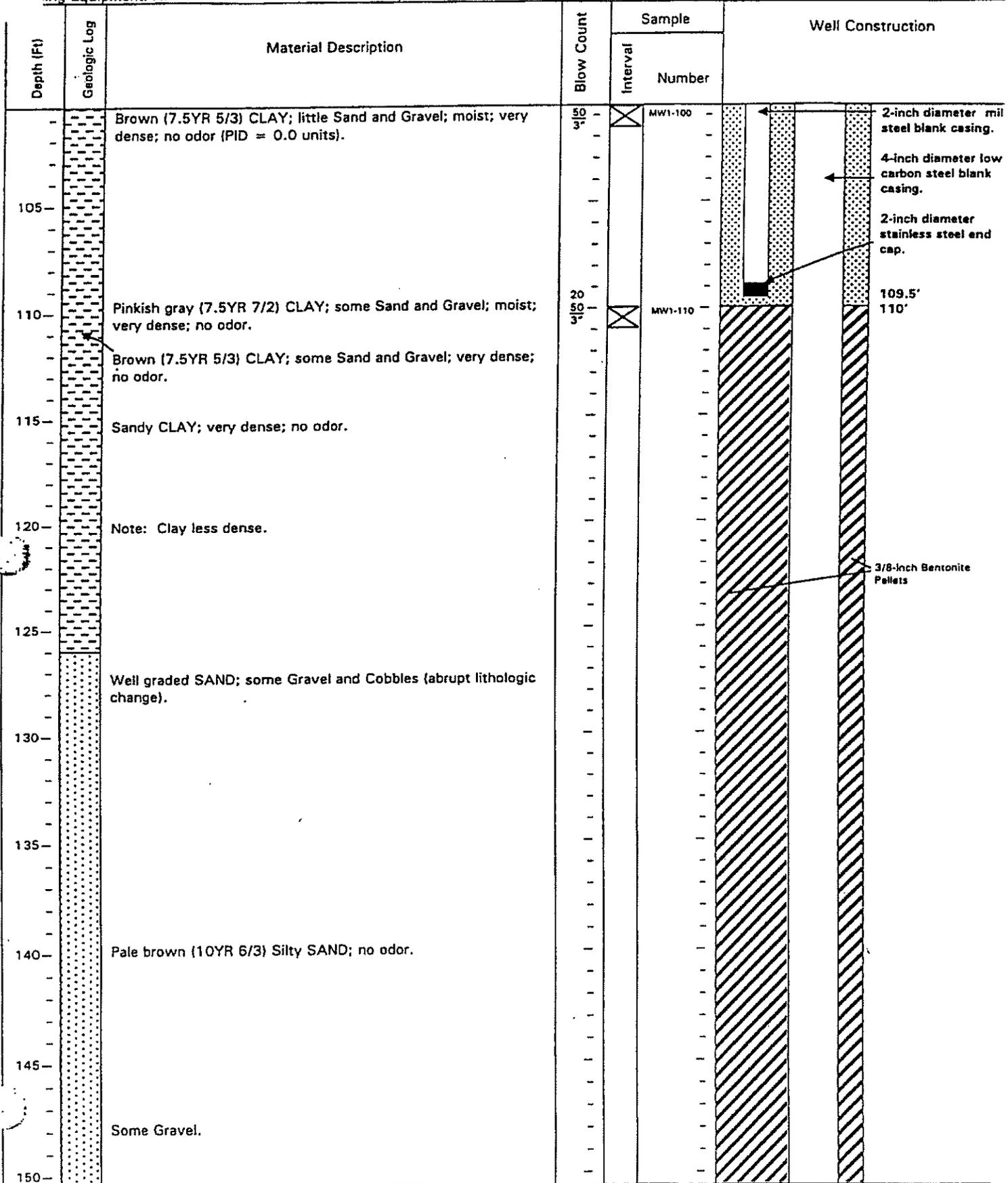
Project Name: Arroyo Chico		ADWR Registration No: 55-566560		Log of Well No.: MW-1		Page 1 of 5	
Well Location: NE Corner Fremont Ave. & 13th St.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel			
Logged/Checked by: Patricia Hartshome, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand			
Date Started: 1/30/98	Date Completed: 2/6/98	WL Below Datum		Well Seal: Cement Grout/Bentonite			
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:			
Drilling Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel		Well Cover:			

Depth (Ft)	Geologic Log	Material Description	Blow Count	Sample		Well Construction
				Interval	Number	
5		Light brown (7.5YR 6/3) silty SAND; little coarse Sand and Gravel; dry; no odors. (Note: Added water through most of boring to aid drilling)				Cement Grout 2-inch diameter mild steel blank casing
10		Caliche at approximately 7 feet.				4-inch diameter low carbon steel blank casing
15						
20						
25						
30						
35						
40		Brown (7.5YR 5/3) silty SAND; some Gravel, Cobbles, and Clay; no odors. (Note: Hard drilling)				
45						
50						

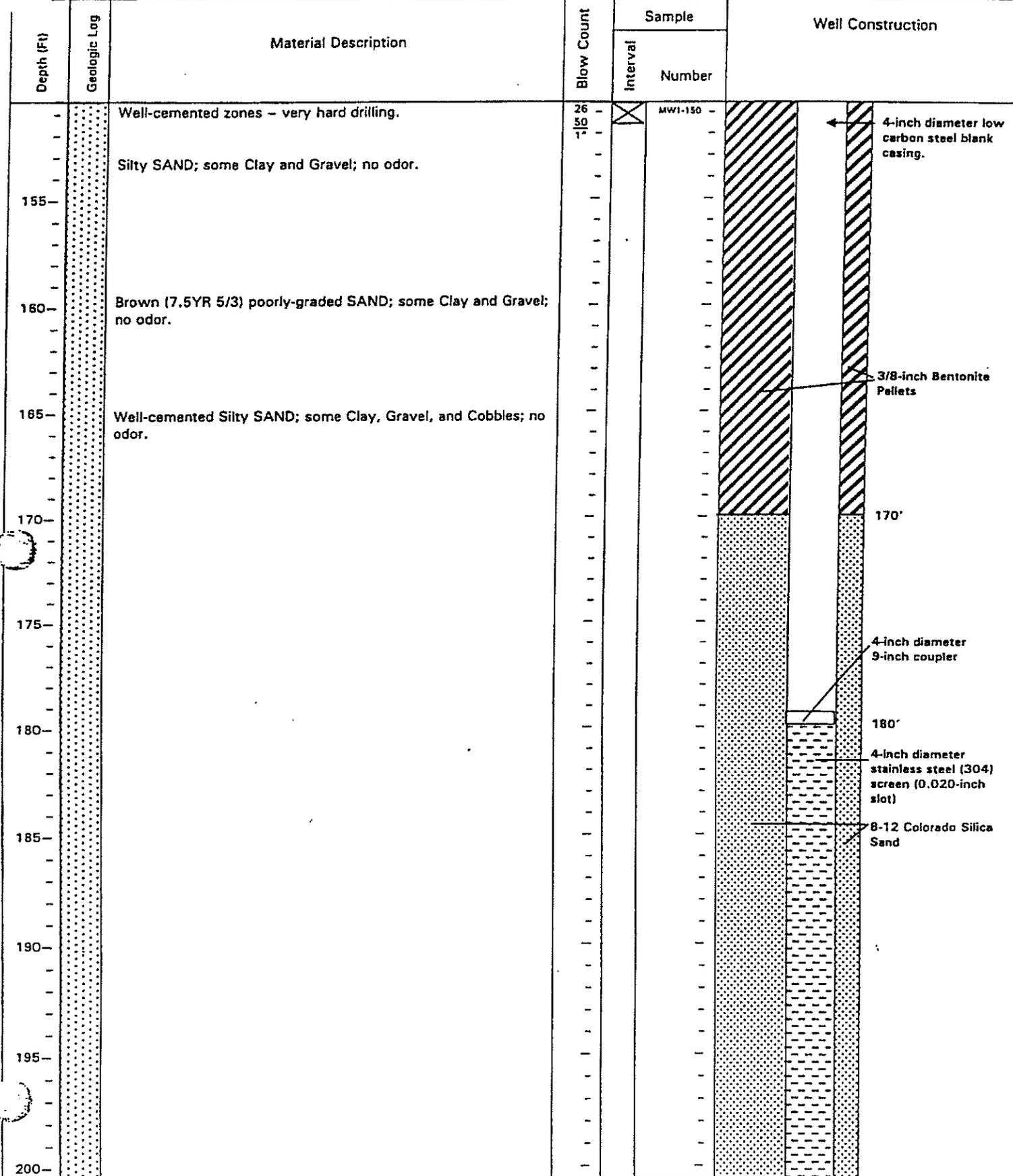
Project Name: Arroyo Chico		ADWR Registration No: 55-566560	Log of Well No.: MW-1	Page 2 of 5
Well Location: NE Corner Fremont Ave. & 13th St.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand
Date Started: 1/30/98	Date Completed: 2/6/98	WL Below Datum		Well Seal: Cement Grout/Bentonite
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:
Logging Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel		Well Cover:



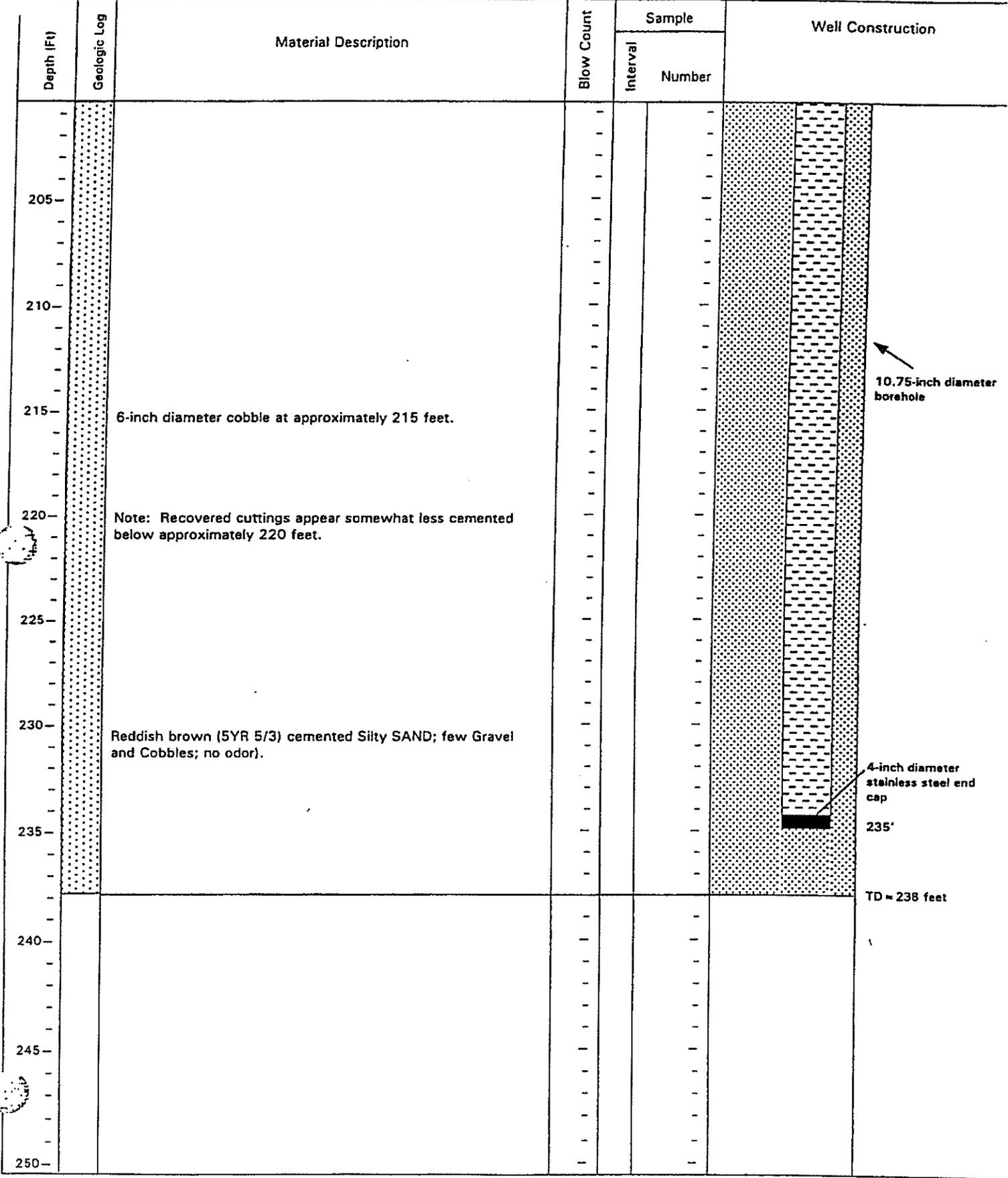
Project Name: Arroyo Chico		ADWR Registration No: 55-566560	Log of Well No.: MW-1	Page 3 of 5
Well Location: NE Corner Fremont Ave. & 13th St.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand
Date Started: 1/30/98	Date Completed: 2/6/98	WL Below Datum		Well Seal: Cement Grout/Bentonite
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:
Pumping Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel		Well Cover:



Project Name: Arroyo Chico		ADWR Registration No: 55-566560	Log of Well No.: MW-1	Page 4 of 5
Well Location: NE Corner Fremont Ave. & 13th St.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 1/4" Diameter Stainless Steel
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:	Datum Elev:	Filter Pack: 8-12 Colorado Silica Sand
Date Started: 1/30/98	Date Completed: 2/6/98	WL Below Datum		Well Seal: Cement Grout/Bentonite
Contractor: Layne		ATD/Time	Static/Date:	Cond Casing:
Drilling Equipment: AP-1000		Well Casing: 2 1/4" Diameter Mild Steel		Well Cover:



Project Name: Arroyo Chico		ADWR Registration No: 55-566560		Log of Well No.: MW-1		Page 5 of 5	
Well Location: NE Corner Framont Ave. & 13th St.		Depth of Wellbore Below LS: 238 Feet		Well Screen: 2 3/4" Diameter Stainless Steel			
Logged/Checked by: Patricia Hartshorne, R.G.		WL Datum:		Datum Elev:		Filter Pack: 8-12 Colorado Silica Sand	
Date Started: 1/30/98		Date Completed: 2/6/98		WL Below Datum		Well Seal: Cement Grout/Bentonite	
Contractor: Layne		ATD/Time		Static/Date:		Cond Casing:	
Logging Equipment: AP-1000		Well Casing: 2 3/4" Diameter Mild Steel		Well Cover:			



APPENDIX B
LAND AND WATER USE REPORT

Land and Water Use Report

Park-Euclid WQARF Site Tucson, Arizona



May 18, 2004

Prepared by
Arizona Department of Environmental Quality
Southern Regional Office/Superfund Programs Unit
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Tucson, AZ 85701
(520) 628-6888 • www.adeq.state.az.us

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APPENDICES

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ACRONYMS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AMA	Active Management Area
AWQS	Arizona Aquifer Water Quality Standard
bgs	below ground surface (in feet)
COE	U.S. Army Corps of Engineers
COT	City of Tucson
DCA	dichloroethane
DCE	dichloroethene
EPA	Environmental Protection Agency
FS	feasibility study
LWU	Land and Water Use
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
µg/L	micrograms per liter (also parts per billion)
mg/L	milligrams per liter (also parts per million)
ML	Mission Linen
PC	Pima County
PCE	tetrachloroethene or tetrachloroethylene
P-E	Park-Euclid
RI	remedial investigation
RO	remedial objective
UA	University of Arizona
TCE	trichloroethene or trichloroethylene
TDS	total dissolved solids
VOC	volatile organic compound
WQARF	Water Quality Assurance Revolving Fund

EXECUTIVE SUMMARY

The Arizona Department of Environmental Quality (ADEQ) has prepared this Land and Water Use report for the Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Registry site to meet the requirements established under Arizona Administrative Code (A.A.C.) R18-16-406 (D). The purpose of the report is to gather information regarding current and foreseeable uses of land or waters that have been or are threatened to be impacted by a contaminant release.

ADEQ requested information from local property and well owners to identify current and future land and water use at the P-E site and surrounding area to help identify Remedial Objectives prior to conducting the Feasibility Study.

About 70% of the land within the P-E Community Involvement Area is zoned for residential use; 29% is zoned for commercial and industrial uses. Information provided by the City of Tucson, Pima County, and Mission Linen indicates current site-specific land uses are related to the Arroyo Chico wash and commercial laundry operations. Future uses were identified for the Arroyo Chico Floodwater Detention Basin Project (including a neighborhood community center, public open space, trails, park space, and natural habitat restoration) and continued commercial laundry operations.

Groundwater uses in the area were identified by the University of Arizona for domestic, irrigation, research/lab, commercial, steam, and cooling tower applications. The University of Arizona currently operates eight water supply wells to meet the needs of the Main Campus and the Arizona Health Sciences Center and expects to continue to withdraw groundwater from the regional aquifer through at least 2030 to meet expected demands of increasing campus population and continued campus build-out.

Although there are no active City of Tucson production wells in the P-E Community Involvement Area, significant water supply changes and population growth over the next 100 years support the need to manage the regional aquifer to ensure groundwater availability to meet Tucson's current and future needs, which includes the remediation of contaminated groundwater sites in the vicinity of the Central Well Field.

The City of Tucson, Mission Linen, ADEQ, the Arizona Department of Transportation, and the Environmental Protection Agency own groundwater monitor wells used for the periodic monitoring and sampling of the perched and regional aquifers; groundwater will continued to be monitored and sampled from monitoring wells into the foreseeable future. Mission Linen identified the potential to use monitoring wells to assist in any potential groundwater remediation. Mission Linen has also indicated their willingness to use treated groundwater for laundry operations to the extent possible.

No surface water rights were identified in the P-E site vicinity.

1.0 INTRODUCTION

The Arizona Department of Environmental Quality (ADEQ) has prepared this Land and Water Use report for the Park-Euclid (P-E) Water Quality Assurance Revolving Fund (WQARF) Registry site to meet the requirements established under Arizona Administrative Code (A.A.C.) R18-16-406 (D). The purpose of the report is to gather information regarding current and foreseeable uses of land or waters that have been or are threatened to be impacted by a contaminant release.

1.1 Process Overview

The process to complete the remedial investigation (RI) and select remedial objectives (ROs) begins with the completion of the draft RI report, which includes the Land and Water Use (LWU) report. A public meeting is held to solicit input for the selection of ROs within 45 to 90 days after the draft RI has been available for public comment. Following the RO public meeting and the draft RI comment period, ADEQ issues the proposed ROs report. The ROs chosen for a site may be based on none, some, or all of the uses identified in the LWU report. If there is significant public interest or additional information has been discovered, an additional public meeting to discuss the ROs may be held. The final ROs report is then prepared and included in the final RI report.

1.2 Land and Water Use Report

The purpose of the LWU report is to gather information regarding current and “foreseeable” uses of land or waters that have been or are threatened to be impacted by a contaminant release, and to project time frames for future changes in those uses. Information gathered from property owners, water providers, municipalities, and well owners are to be included in the report.

In general, this report identifies various current and potential future uses of land and water in the vicinity of the P-E site. However, the report does not evaluate the uses, nor does it classify the use as “reasonably foreseeable”. The evaluation of uses will take place during public comment periods and public meetings and will be presented in the proposed ROs report.

1.3 Site Background

Diesel fuel and chlorinated hydrocarbon contamination were discovered in 1990 by ADEQ in two inactive former industrial water-supply wells located at Mission Linen and Uniform Service (currently known as Mission Linen Supply) at 301 South Park Avenue. ADEQ subsequently installed three groundwater monitor wells the following year to further characterize the groundwater contamination. The P-E site was placed on the WQARF Site Registry in April 1999. Figure 1 presents the P-E WQARF Registry Site Boundary as of June 2004.

Historic dry cleaning activities, conducted until 1985 at laundry facilities located at 301 S. Park, have been identified as the sources of the chlorinated hydrocarbons contaminating the soil and groundwater at the P-E site.

ADEQ and Mission Linen (ML) have conducted soil and groundwater investigations to characterize the extent of contamination as part of the RI, including the installation and sampling of ten soil vapor monitor wells, four soil vapor extraction wells, one multi-phase extraction well,

and 14 perched aquifer groundwater monitor wells, and 15 regional aquifer groundwater monitor wells. These wells were installed from 1991 through 2003.

The City of Tucson (COT), during investigations related to design of the Arroyo Chico flood control detention basins, conducted soil investigations and installed two perched aquifer and two regional aquifer groundwater monitor wells in 1998.

The U.S. Environmental Protection Agency (EPA) installed two perched aquifer groundwater monitor wells as part of the Preliminary Assessment/Site Assessment conducted in 1998.

Adjacent to the P-E site, the U.S. Army Corps of Engineers (COE), COT, and PC, have designed and are planning construction of a flood control project, the Arroyo Chico Project (also known as the Tucson Drainage Area Project – Park Avenue Detention Basins). This flood control project, which consists of a series of four detention basins extending from Kino Parkway to Fremont Avenue (Figure 2), will reduce the 100-year flood peak to the capacity of the existing box culvert extending from Park Avenue to the Santa Cruz River (COE, 2001). Basin 1 will be located between Fremont and Santa Rita Avenues and between Manlove and 12th Streets. Construction of the detention basins is tentatively scheduled to begin October 2004.

The contaminants known to be present at levels above regulatory limits in the groundwater at P-E site are: tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride, 1,2-dichloroethane (1,2-DCA), and benzene; other chlorinated hydrocarbons occur in the groundwater at levels below regulatory standards. A floating layer of diesel fuel free product, which also contains chlorinated solvents, is found in the shallow, perched aquifer.

Soils at the P-E site have also been contaminated by chlorinated solvents, primarily PCE.

Based on data collected during the RI, contamination occurs in soil and groundwater within four vertically-segregated zones:

- **Upper Vadose Zone** – The upper vadose zone extends from the ground surface to the top of the perched aquifer located approximately 85 to 90 feet below ground surface (bgs).
- **Perched Aquifer** – The shallowest water-yielding zone located between approximately 85 and 100 feet bgs, with saturated thickness ranging from less than 1 foot to greater than 5 feet. The hydraulic gradient in the perched aquifer is generally down toward the north. The aquifer potentiometric surface fluctuates in response to seasonal recharge. The perched aquifer is underlain by the upper aquitard, a layer of clay or cohesive, highly-clayey sand occurring at about 100 feet bgs. Both the perched aquifer and the underlying upper aquitard may be absent in areas north of the P-E site.
- **Lower Vadose Zone** – The lower vadose zone is bound above by the perched aquifer at approximately 100 feet bgs, and below by the regional aquifer at approximately 200 feet bgs. The lower vadose zone includes the upper aquitard unit.
- **Regional Aquifer** – The regional aquifer is present from approximately 200 feet bgs to depths greater than 500 feet bgs. The hydraulic gradient in the regional aquifer is to the north-northeast. The regional aquifer supplies water for the

University of Arizona (UA), located approximately one-half mile north of the P-E site.

1.4 Soil Conditions

1.4.1 Upper Vadose Zone

Historically, PCE has been detected in soil samples collected from the upper vadose zone (extending from about the ground surface to about 85 – 90 feet bgs) at concentrations as high as 3.1 milligrams/kilogram (mg/kg). PCE soil vapors currently occur in the upper vadose zone at a maximum concentration of 59,000 $\mu\text{g}/\text{m}^3$ at a depth of 85 feet bgs during sampling conducted by ML during 2003; TCE, cis-1,2-DCE, trans-1,2-DCE and vinyl chloride were also detected in soil gas collected from soils at a depth 85 feet bgs (URS, 2003).

During operation of a pilot soil vapor extraction system operated by ML from June 2000 to August 2002, approximately 6,000 pounds of PCE were removed from the upper vadose zone. ML has concluded additional soil treatment may be required to effectively remediate these soils based on a soil characterization study conducted in January and February 2003.

Figures 3 and 4 show the distribution of PCE in soil gas at sampling depths of 5 feet and 30 feet (URS, 2003). The maximum concentrations of PCE in the soil gas are located under the ML building, with concentrations decreasing radially towards the ML property boundaries.

1.4.2 Lower Vadose Zone

PCE has been detected in soil matrix samples collected from the lower vadose zone (extending from 100 feet to 200 feet bgs) at concentrations as high as 170 mg/kg at a depth of 165 feet bgs (Miller Brooks, 2001). Soil vapors also occur in the lower vadose zone with a maximum PCE concentration of 5.46 $\mu\text{g}/\text{m}^3$ in samples collected from 165-170 feet bgs by ADEQ in 2003; other VOC compounds were also present (Hydro Geo Chem, 2003).

1.5 Groundwater Flow Direction

1.5.1 Perched Aquifer

Groundwater in the perched aquifer is flowing toward the north-northeast at an average gradient of 0.011 foot/foot (Figure 5). The water levels in the perched aquifer exhibit variability likely related to storm water recharge as a result from precipitation and flow events in the Arroyo Chico. Figure 5 also indicates the extent of the diesel free-product overlying the perched aquifer.

1.5.2 Regional Aquifer

Groundwater in the regional aquifer is flowing to the north-northeast at an average gradient of 0.005 foot/foot (Figure 6).

1.6 General Groundwater Quality

1.6.1 Perched Aquifer

1.6.1.1 Inorganic Chemistry

Groundwater occurring in the perched aquifer contain concentrations of total dissolved solids (TDS) ranging from 390 milligrams per liter (mg/L) to 2,400 mg/L (Miller Brooks, 2002).

Groundwater sampled from wells in the vicinity of the Arroyo Chico typically has the lowest TDS; wells further from Arroyo Chico have the highest levels of TDS. The groundwater is predominately a calcium bicarbonate type, with some calcium chloride and mixed water type.

1.6.1.2 Organic Chemistry

The diesel free-product overlying the groundwater of the perched aquifer contains PCE at a maximum concentration of 10,000 mg/kg, along with TCE, cis-1,2-DCE, and additional VOCs from samples collected in February 2004.

As of February 2004, the maximum concentration of PCE in groundwater occurring in the perched aquifer was 27,000 micrograms per liter ($\mu\text{g/L}$); the maximum concentrations of TCE, cis-1,2-DCE, vinyl chloride, 1,2-DCA, and benzene were 41,000 $\mu\text{g/L}$, 99,000 $\mu\text{g/L}$, 7,100 $\mu\text{g/L}$, 34 $\mu\text{g/L}$, and 410 $\mu\text{g/L}$, respectively – all are exceedances of each compound's AWQS (Miller Brooks, 2004).

Other contaminants detected at concentrations in February 2004 below their respective AWQSs were 1,1-dichloroethane (1,1-DCA) and 1,1,1-trichloroethane, toluene, ethylbenzene, xylene, and various other VOCs (Miller Brooks, 2004).

Figure 7 indicates the extent of the PCE contamination in the perched aquifer as of February 2004.

1.6.2 Regional Aquifer

1.6.2.1 Inorganic Chemistry

Groundwater occurring in the upper portion (i.e. the uppermost 200 feet) of the regional aquifer contain concentrations of total dissolved solids (TDS) ranging from 220 milligrams per liter (mg/L) to about 430 mg/L (Miller Brooks, 2002). Inorganic constituents in the upper portion of the regional aquifer tend to occur at lower concentrations and are less variable in concentrations than groundwater in the perched aquifer. The groundwater is predominately a calcium bicarbonate type.

Based on sampling of monitor well PER-14 (screened from 473 to 523 feet bgs), groundwater occurring in the lower portion of the regional aquifer has higher concentrations of sodium, chloride, sulfate, and TDS relative to the upper portion of the regional aquifer.

1.6.2.2 Organic Chemistry

As of February 2004, the maximum concentration of PCE in groundwater occurring in the regional aquifer was 310 $\mu\text{g/L}$; the maximum concentration of TCE was 13 $\mu\text{g/L}$ – both are exceedances of each compound's AWQS (Miller Brooks, 2004).

Other contaminants detected in February 2004 at concentrations below their respective AWQSs were cis-1,2-DCE and 1,2-DCA (Miller Brooks, 2004).

Figure 8 indicates the extent of the PCE contamination in the regional aquifer as of February 2004.

2.0 USE EVALUATION

The following sections outline current and foreseeable land and water uses for the P-E site and the surrounding area. Reasonably foreseeable uses for land are those uses of land likely to occur at the site within a reasonable time period. Reasonably foreseeable uses of water are those likely to occur within 100 years unless a longer time period is shown to be reasonable based on site-specific circumstances [A.A.C. R18-16-406 (D)].

2.1 Land Uses

2.1.1 Current Regional Land Use

Development in the area occurs consistent with COT zoning laws. Current regional zoning in the site Community Involvement Area (CIA) is indicated by Figure 9. At the current time, approximately 69.1% of the property within in the CIA is zoned for residential use; 15.7% for commercial use, 13.3% for industrial use, the remaining 1.9% is zoned for miscellaneous uses.

2.1.2 Current Site-Specific Land Use

As mentioned above, the LWU report gathers information regarding current and “foreseeable” uses of land or waters that have been or are threatened to be impacted by a contaminant release, and to project time frames for future changes in those uses. Property owners in areas potentially impacted by future soil remediation efforts, if determined to be necessary, were also asked to provide information regarding current and future land uses. Figure 10 indicates the locations of these parcels and current ownership.

The sections below summarize the information provided to ADEQ by the property owners; the complete responses are contained in Appendix A.

2.1.2.1 Mission Linen

ML owns six parcels in the area of contaminant releases which overlie the central portion of the soil vapor plume that exists in the upper unsaturated zone, as well as the PCE contaminant plume in the perched aquifer (see Figures 3, 4, and 7). ML’s current uses of these properties are related to commercial laundry operations.

2.1.2.2 City of Tucson

COT owns ten parcels that overlie a portion of the PCE contaminant plume that exists in the perched aquifer (see Figure 7). COT has currently designated these parcels for uses associated with the existing Arroyo Chico wash.

2.1.2.3 Pima County

PC owns six parcels that overlie a portion of the soil vapor plume that exists in the upper unsaturated zone (see Figure 7). One of the parcels owned by PC is currently used for storage. The remaining five parcels owned by PC are currently vacant.

2.1.3 Future Site-Specific Land Use

2.1.3.1 Mission Linen

ML’s future use for its properties will be in connection with its commercial laundry operations.

2.1.3.2 City of Tucson

COT's future plans for its properties are for uses associated with the Arroyo Chico Floodwater Detention Basin Project, which includes uses within the basin project for public open space, passive recreation trails, park space, and natural habitat restoration maintained by COT's Parks Department. COT also indicated the current and future uses of these parcels could be compatible with potential WQARF remediation projects, given proper coordination and planning.

2.1.3.3 Pima County

PC's future plans for five of its properties are for the detention basins for the Arroyo Chico Project; the remaining parcel will be used for a neighborhood community center.

2.2 Groundwater Uses

The P-E site lies within the Tucson Active Management Area (AMA) created by the Arizona Groundwater Management Code passed in 1980. All groundwater legally withdrawn from any AMA must occur under a groundwater right or permit, unless groundwater is being withdrawn from an exempt well. An exempt well is defined as having a maximum discharge capacity of 35 gallons per minute or less. All exempt wells must be registered with the Arizona Department of Water Resources (ADWR). Non-exempt wells have a discharge capacity greater than 35 gallons per minute and are associated with one of the following types of rights or permits (ADWR, 2004):

- Grandfathered rights – Grandfathered rights are derived from past individual water use. There are three types of grandfathered rights 1) Irrigation grandfathered rights, 2) Type 1 non-irrigation grandfathered rights, and 3) Type 2 non-irrigation grandfathered rights;
- Service area right – Service area rights allow cities, towns, private water companies and irrigation districts to withdraw groundwater to serve their customers; or
- Withdrawal permits – Withdrawal permits allow new withdrawals of groundwater for non-irrigation uses within AMAs. There are eight types of withdrawal permits covering various groundwater uses that are subject to different requirements. Examples of withdrawal permits include general industrial use permits, dewatering permits, and poor-quality groundwater-withdrawal permits.

Tables 1 through 3 summarize information concerning groundwater rights and permits related to non-exempt wells in the P-E area.

Based on an ADWR well inventory and field verification conducted in 2003, 58 registered wells were identified within this area as indicated on Figure 11: forty-six of these wells are registered for monitoring use, five for domestic use, two for industrial use, and three for other unspecified uses. Table 4 provides information on the well owners, well names, ADWR well numbers, water use, and well type for these field-verified wells.

The following sections summarize the information received by ADEQ from well owners regarding specific current and future uses of groundwater wells in or near the P-E site that "have been or are threatened to be impacted by a contaminant release." This information was solicited

by ADEQ based on the groundwater flow directions in the perched and regional aquifers, as well as the current and potential future locations of contaminant plumes in these aquifers.

The complete responses from the well owners are contained in Appendix B.

2.2.1 University of Arizona

The University of Arizona (UA) currently owns eight production wells which are operated to meet the needs of the Main Campus and the Arizona Health Sciences Center. Water uses include domestic, irrigation, research/lab, commercial, steam, and cooling tower applications. The infrastructure exists for UA to supplement groundwater delivered by UA production wells with COT water, although UA prefers to maximize use of its production wells for financial reasons.

At the Main Campus, three wells are currently active (Huachuca, Architecture, and CRB wells) and three wells are inactive (Aggie, Martin Street, and Library wells).¹ The Huachuca and Architecture wells are expected to be replaced in the next 10 – 20 years. There are no identified plans for the inactive Martin Street well. The Aggie well will probably be abandoned and replaced within the next five years. The CRB well is expected to remain in service for another 20 – 30 years.

At the Arizona Health Sciences Center, two wells are currently active (North and South wells). The North well may be replaced in the next 10 years; the South well will probably be replaced within the next five years.

The average annual water use for UA during 2001 and 2002 was about 875 acre-feet – potable usage was about 685 acre-feet, with the remainder supplied by reclaimed effluent purchased from COT. With increased use of reclaimed effluent, the estimated annual potable water use is expected to be about 500 acre-feet.

Based on the expected campus population growth rate and the ultimate campus build-out population of 72,000 (probably reached by about 2030), UA estimates annual water use would be about 808 acre-feet. After 2030, the growth rate is expected to decrease from 2.2% per year to 1 – 1.5% per year.

2.2.2 City of Tucson

According to COT, there are no active COT production wells in the P-E CIA partially due to the presence of VOCs and/or diesel in groundwater. Well B-003B was converted from an active production well to a monitor well given its location near the P-E site; well A-033A, was abandoned due to the occurrence of diesel fuel.

COT indicates significant water supply changes will occur over the next 100 years in the vicinity of the Tucson WQARF sites and that it is imperative that the regional aquifer be managed to ensure groundwater availability to meet the community's future needs. COT states that it is certain that the community will rely on the regional aquifer in the vicinity of the Tucson

¹ Since the UA response dated February 6, 2004 to ADEQ's request for information concerning water use, the Library well has been abandoned and a replacement well (Optical Science well) for the Martin Street well has been drilled.

WQARF sites to satisfy current and projected water demands and believes it is imperative to remediate contaminated groundwater sites in the vicinity of COT's Central Well Field.

According to COT, remedial actions for all Tucson WQARF sites should achieve the specified remedial objectives and should preserve Tucson Water's flexibility in responding to a range of potential near- and long-term water supply scenarios.

COT owns four groundwater monitor wells located at the P-E site; two are completed in the perched aquifer, two are completed in the regional aquifer. These wells were installed as part of the groundwater investigations for the Arroyo Chico project. ADEQ currently samples and monitors these wells as part of the WQARF investigations.

COT does not currently have any plans for the installation of additional groundwater monitor wells in the P-E area.

2.2.3 Mission Linen

ML currently owns five groundwater monitor wells which are used for groundwater sampling and monitoring; four wells are completed in the perched aquifer; one well is completed in the regional aquifer. ML's only plan for its groundwater wells is to assist in any potential groundwater remediation. ML would also, to the extent possible, use treated groundwater in laundry operations. ML did not identify any other future uses for groundwater produced by ML's groundwater wells.

2.2.4 Arizona Department of Environmental Quality

ADEQ owns 28 groundwater monitor wells in the P-E vicinity. Thirteen wells are completed in the perched aquifer; 15 wells are completed in the regional aquifer. ADEQ currently samples and monitors these wells as part of the WQARF investigations. ADEQ has no plans at this time to use these wells for any other purpose than for groundwater sampling and monitoring.

2.2.5 Arizona Department of Transportation

The Arizona Department of Transportation (ADOT) owns one groundwater monitor well in the P-E vicinity. ADEQ currently samples and monitors this well as part of the WQARF investigations.

ADOT was contacted by ADEQ to provide information for the LWU report; no response was received.

2.2.6 Environmental Protection Agency

EPA owns two groundwater monitor well in the P-E vicinity. ADEQ currently samples and monitors these wells as part of the WQARF investigations.

EPA was contacted by ADEQ to provide information for the LWU report; no response was received.

2.3 Surface Water Uses

No surface water rights were identified in the P-E site vicinity.

3.0 SUMMARY OF USES

The land and water uses described in Section 2.0 most likely relevant to discussion of remedial objectives are presented below.

3.1 Land Uses

Current and future land uses within the P-E site area include the following:

- Mission Linen – Current uses are related to commercial laundry operations. Future uses will be in connection with commercial laundry operations.
- City of Tucson – Current uses are associated with the existing Arroyo Chico wash. Future uses are associated with the Arroyo Chico Floodwater Detention Basin Project; future uses could be compatible with potential WQARF remediation projects, given proper coordination and planning.
- Pima County – Five of six parcels are currently vacant, the remaining parcel is currently used for storage. Future plans for five of the parcels are for detention basins for the Arroyo Chico Project; the remaining parcel will be used for a neighborhood community center.

3.2 Groundwater Uses

Current and future groundwater uses within the P-E site area include the following:

- University of Arizona – UA owns eight production wells completed in the regional aquifer which are used to meet the needs of the Main Campus and the Arizona Health Sciences Center. Current uses are related to domestic, irrigation, research/lab, commercial, steam, and cooling water uses. Current average annual water use has been 875 acre-feet, with 685 acre-feet for potable uses, with the remaining volume provided by reclaimed effluent. Reclaimed effluent will be used to a greater extent in the future, which will decrease the annual potable water use to about 500 acre-feet. UA has plans for the continued operation of existing wells for the next 10 to 30 years, with the drilling of replacement wells when necessary. By 2030, UA estimates the annual water demand will be about 808 acre-feet based on the expected campus population growth rate and the ultimate campus build-out population.
- City of Tucson – There are no active COT production wells in the P-E CIA due to the presence of VOCs and/or diesel. Significant water supply changes will occur over the next 100 years and it is imperative that the regional aquifer be managed to ensure availability to meet future needs. COT believes it is imperative to remediate contaminated groundwater sites in the vicinity of COT's Central Well Field. According to COT, remedial actions for all Tucson WQARF sites should achieve the specified remedial objectives and should preserve Tucson Water's flexibility in responding to a range of potential near- and long-term water supply scenarios.

COT owns four groundwater monitor wells at the P-E site that were installed during the Arroyo Chico Flood Control Project investigations; two wells are completed in the perched aquifer, two wells in the regional aquifer. COT does not currently have plans for additional groundwater monitor well installation.

- Mission Linen – ML currently owns five groundwater monitor wells currently used for groundwater sampling and monitoring; four wells are completed in the perched aquifer, one well in the regional aquifer. ML's only future plan for these monitor wells is to assist in any potential groundwater remediation. ML would also use treated groundwater in laundry operations to the extent possible. No future uses were identified for groundwater produced by ML's groundwater monitoring wells.
- ADEQ – The existing 28 groundwater monitor wells completed in the perched and regional aquifers are currently used for groundwater sampling and monitoring; there are no plans for future uses other than for groundwater sampling and monitoring.
- ADOT – ADOT owns one groundwater monitor well completed in the perched aquifer currently used by ADEQ for groundwater sampling and monitoring. ADOT did not provide a response to ADEQ's request concerning future use.
- EPA – EPA owns two groundwater monitor wells completed in the perched aquifer currently used by ADEQ for groundwater sampling and monitoring. EPA did not provide a response to ADEQ's request concerning future use.

3.3 Surface Water Uses

Currently, there are no surface water uses within the P-E site area.

4.0 REFERENCES

- Arizona Department of Water Resources, 2004. Overview of Arizona's Groundwater Management Code. <http://www.water.az.gov/adwr/Content/Publications/files/gwmgtovw.pdf>.
- Hydro Geo Chem, 2003, Results of Soil Gas Sampling From the Lower Unsaturated Zone – Park-Euclid WQARF Site. June 20, 2003.
- Miller Brooks, 2001, Monitor Well Installation Report - Park-Euclid WQARF Site. February 7, 2001.
- Miller Brooks, 2002, Second Quarter 2002 Groundwater Monitoring and Sampling Report - Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona. November 5, 2002.
- Miller Brooks, 2004, First Quarter 2004 Groundwater Monitoring and Sampling Report - Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona. June 25, 2004.
- U.S. Army Corps of Engineers, 2001, Design Documentation report – Basis for Design - Tucson Drainage Area – Park Avenue Basins, Arroyo Chico/Tucson Arroyo Channel, High School Wash – Approved Report. December, 2001.
- URS, 2003, Vadose Zone Confirmation Study – Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona. August 7, 2003.

TABLES

TABLE 1
PARK-EUCLID WQARF SITE – GRANDFATHERED RIGHTS¹

Water Right Number	Owner Name	Well Name and ADWR Registration Number	Cadastral Location
58-104393.0004 58-106482.0006 58-115145.0006 58-115546.0004 58-117340.0002 58-117345.0004	Kalil Bottling Co.	Unnamed well (55-509753)	D-14-14 18 dcb

¹These rights are comprised of 1) Irrigation grandfathered rights 2) type 1 non-irrigation grandfathered rights, and 3) type 2 non-irrigation grandfathered rights.

TABLE 2
PARK-EUCLID WQARF SITE – SERVICE AREA RIGHTS²

Water Right Number	Owner Name	Well Names and ADWR Registration Numbers	Cadastral Location
56-000001.00	City of Tucson	B-008B (55-620180) B-001A (55-620172) B-003B (55-620174)	D-14-13 multiple sections
56-000268.0000	University of Arizona (Board of Regents)	Library (55-618693) Martin Ave (55-618690) Architecture (55-618691) Huachuca (55-618692) Agriculture (55-618687) C.R.B. (55-528535) N. Hospital Well (55-618688) S. Hospital Well (55-618689)	Main Campus: D-14-14 7 D-14-14 6 UMC: D-14-14 6 dab/dac

² Most Arizonans receive domestic water through service area rights. Service area rights allow cities, towns, private water companies and irrigation districts to withdraw groundwater to serve their customers.

TABLE 3
PARK-EUCLID WQARF SITE – STORAGE AND RECOVERY PERMITS³

Permit Number	Owner Name/Contact Person	Well Name and ADWR Registration Number	Cadastral Location
74-560621.0000	City of Tucson	B-003B (55-620174)	D-14-15 7 dda

³In 1986, the Arizona Legislature passed House Bill 22009 which regulates the underground storage of water and establishes a permit system for wells used to retrieve the stored water. This bill also amends the Groundwater Code to allow projects intended to recharge Arizona’s groundwater aquifers.

FIGURES

PARK-EUCLID WQARF SITE SITE BOUNDARIES

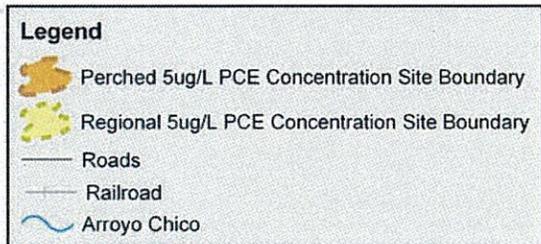
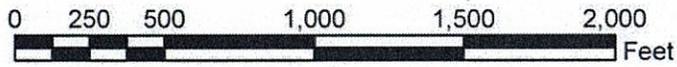


FIGURE 1

PARK-EUCLID WQARF SITE
ARROYO CHICO DETENTION BASINS

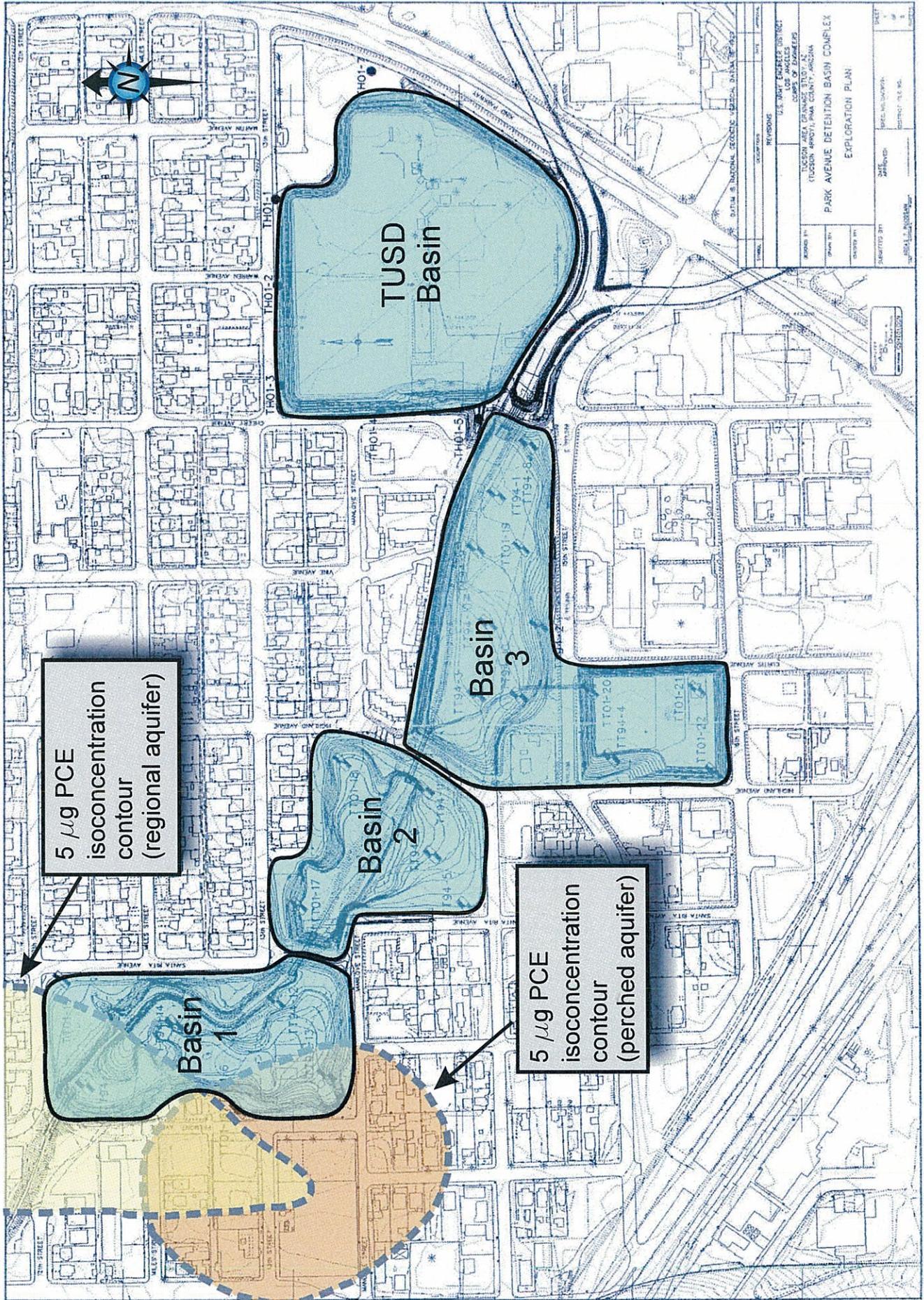
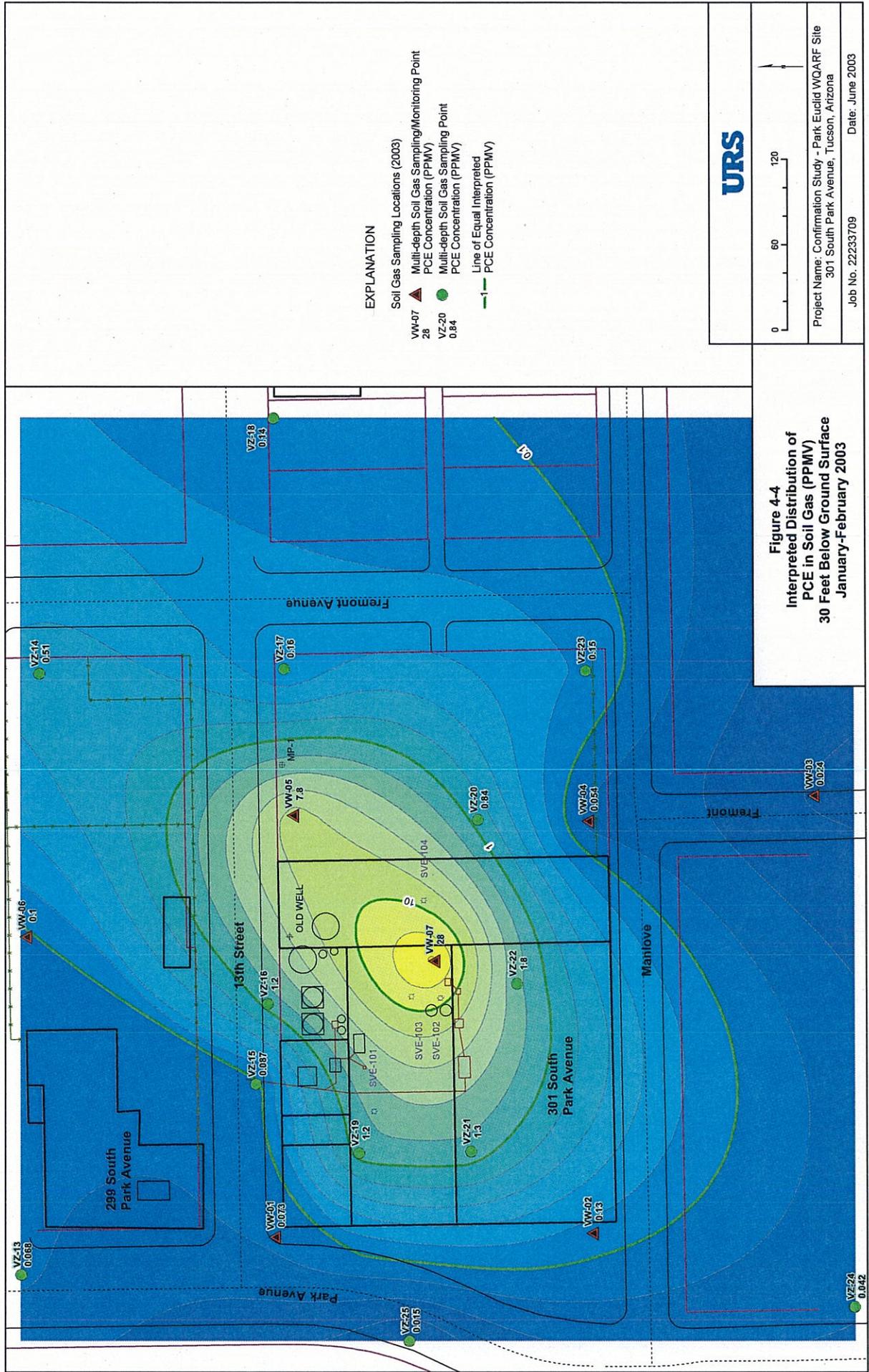


FIGURE 2



EXPLANATION

Soil Gas Sampling Locations (2003)

VW-07 Multi-depth Soil Gas Sampling/Monitoring Point
28 PCE Concentration (PPMV)

VZ-20 Multi-depth Soil Gas Sampling Point
0.84 PCE Concentration (PPMV)

— Line of Equal Interpreted PCE Concentration (PPMV)

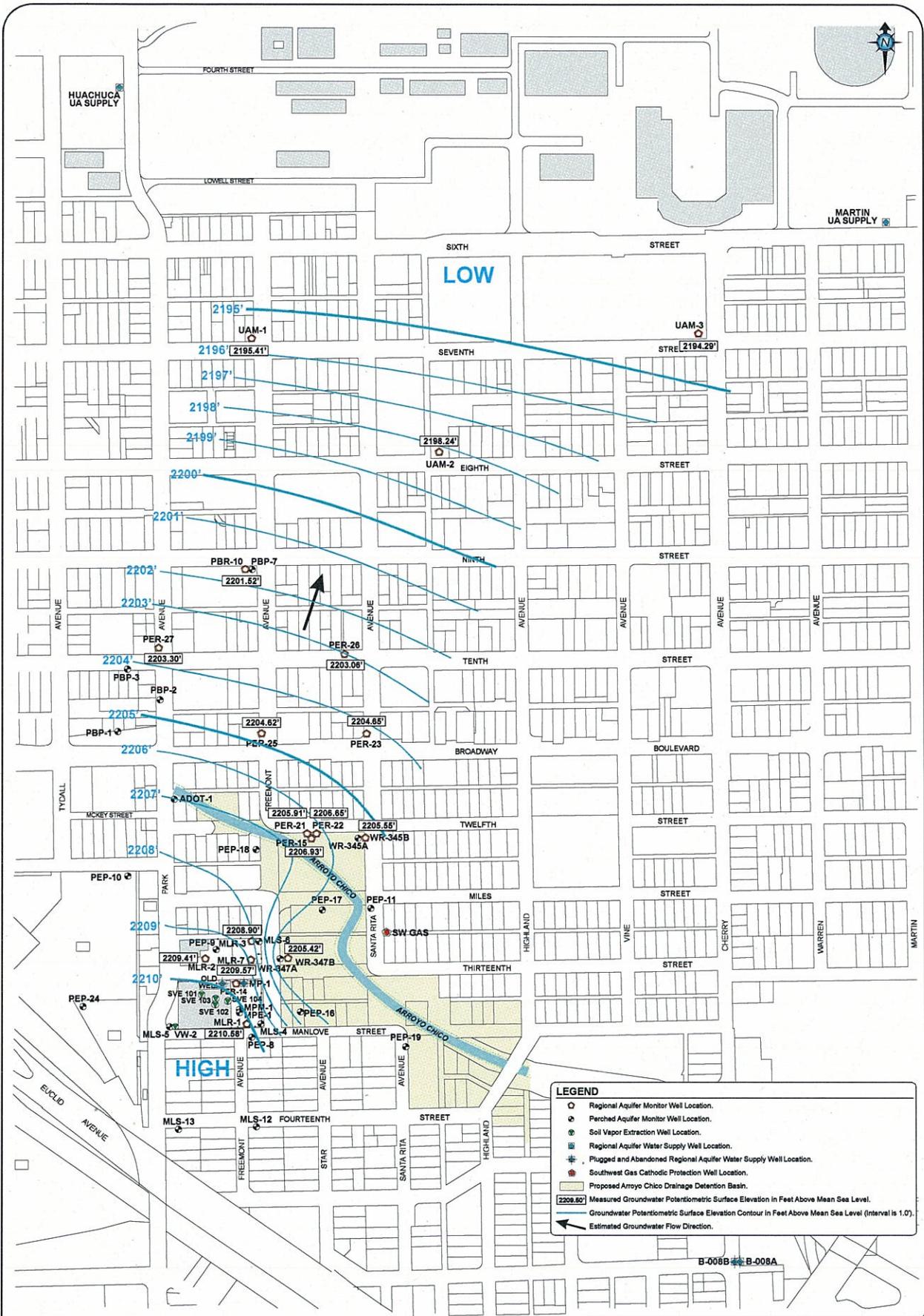


Figure 4-4
Interpreted Distribution of
PCE in Soil Gas (PPMV)
30 Feet Below Ground Surface
January-February 2003

Project Name: Confirmation Study - Park Euclid WQARF Site
 301 South Park Avenue, Tucson, Arizona

Job No. 22233709 Date: June 2003

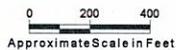
FIGURE 4



LEGEND

- Regional Aquifer Monitor Well Location.
- ◐ Perched Aquifer Monitor Well Location.
- ⊙ Soil Vapor Extraction Well Location.
- ⊕ Regional Aquifer Water Supply Well Location.
- ⊖ Plugged and Abandoned Regional Aquifer Water Supply Well Location.
- ⊗ Southwest Gas Cathodic Protection Well Location.
- ⊘ Proposed Arroyo Chico Drainage Detention Basin.
- 2208.82' Measured Groundwater Potentiometric Surface Elevation in Feet Above Mean Sea Level.
- Groundwater Potentiometric Surface Elevation Contour in Feet Above Mean Sea Level (Interval is 1.0').
- Estimated Groundwater Flow Direction.

NOTE: 1) Figure modified from Pima County property boundary map.
 2) PER-15, PER-21, and PER-22 are completed at different depths. The uppermost well (PER-15) is used in contouring.
 3) Elevations are in feet with respect to NAVD 1929.

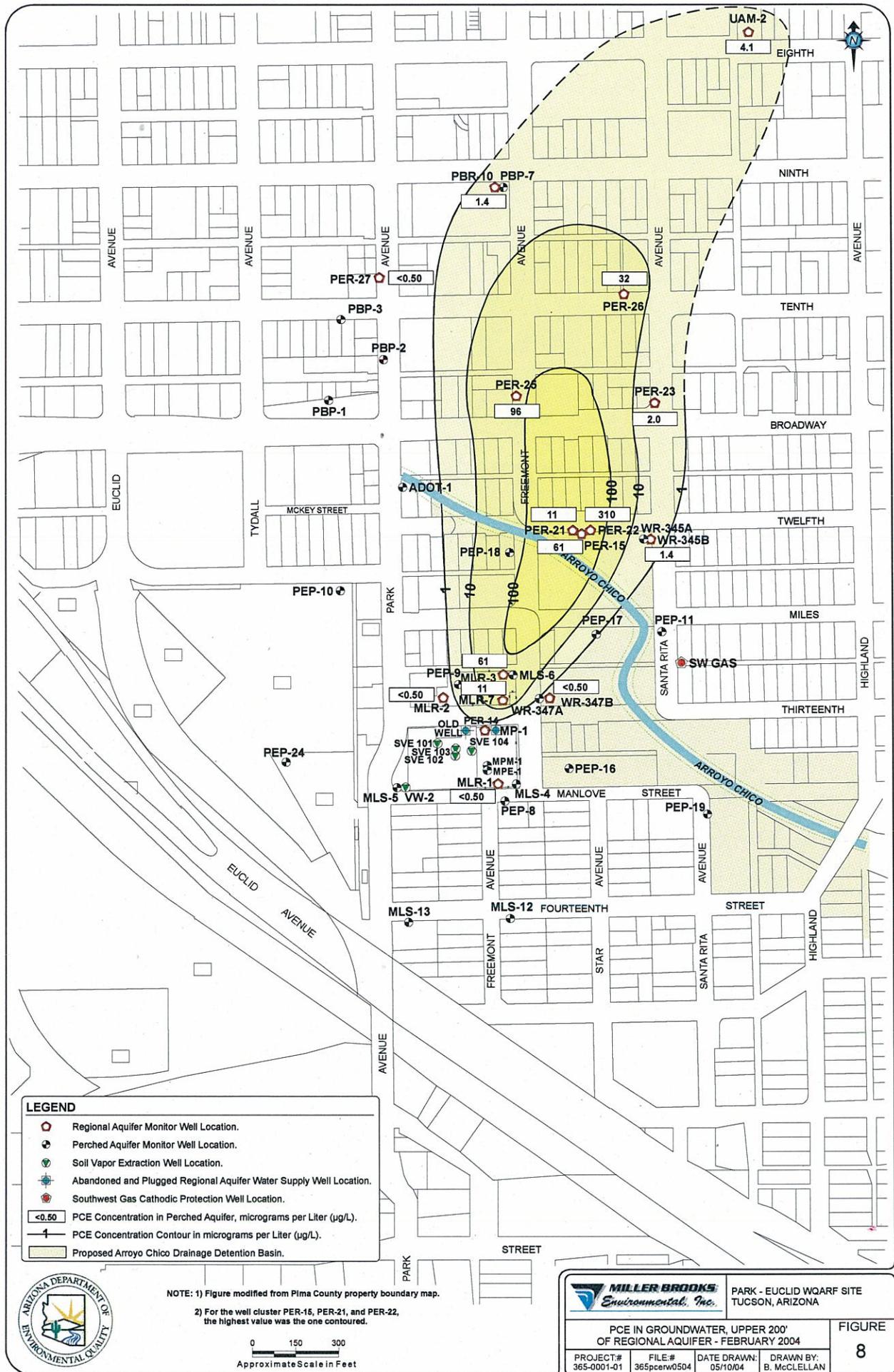


PARK - EUCLID WQARF SITE
 TUCSON, ARIZONA

UPPER 150' OF REGIONAL AQUIFER
 POTENTIOMETRIC SURFACE, FEBRUARY 2004

PROJECT.# 365-0005-05 FILE.# 365gwer0504 DATE DRAWN: 05/11/04 DRAWN BY: B. McCLELLAN

FIGURE
 6



LEGEND

- Regional Aquifer Monitor Well Location.
- Perched Aquifer Monitor Well Location.
- Soil Vapor Extraction Well Location.
- Abandoned and Plugged Regional Aquifer Water Supply Well Location.
- Southwest Gas Cathodic Protection Well Location.
- PCE Concentration in Perched Aquifer, micrograms per Liter ($\mu\text{g/L}$).
- PCE Concentration Contour in micrograms per Liter ($\mu\text{g/L}$).
- Proposed Arroyo Chico Drainage Detention Basin.

NOTE: 1) Figure modified from Pima County property boundary map.
 2) For the well cluster PER-15, PER-21, and PER-22, the highest value was the one contoured.

0 150 300
 Approximate Scale in Feet



		PARK - EUCLID WQARF SITE TUCSON, ARIZONA	
PCE IN GROUNDWATER, UPPER 200' OF REGIONAL AQUIFER - FEBRUARY 2004			
PROJECT:#	FILE.#	DATE DRAWN:	DRAWN BY:
365-0001-01	365pcerw0504	05/10/04	B. McCLELLAN
			FIGURE 8

PARK-EUCLID WQARF SITE CITY OF TUCSON - ZONING CATEGORIES

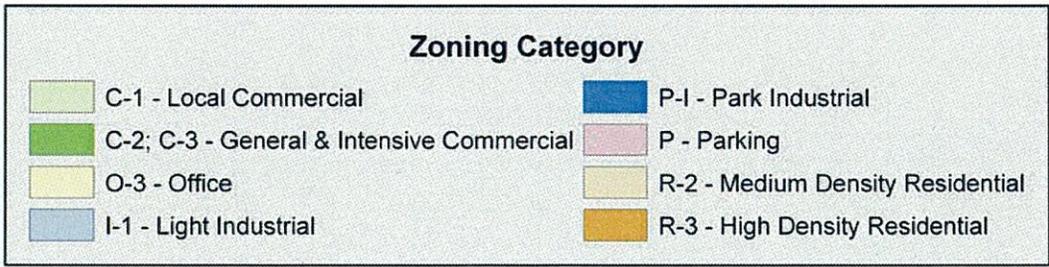
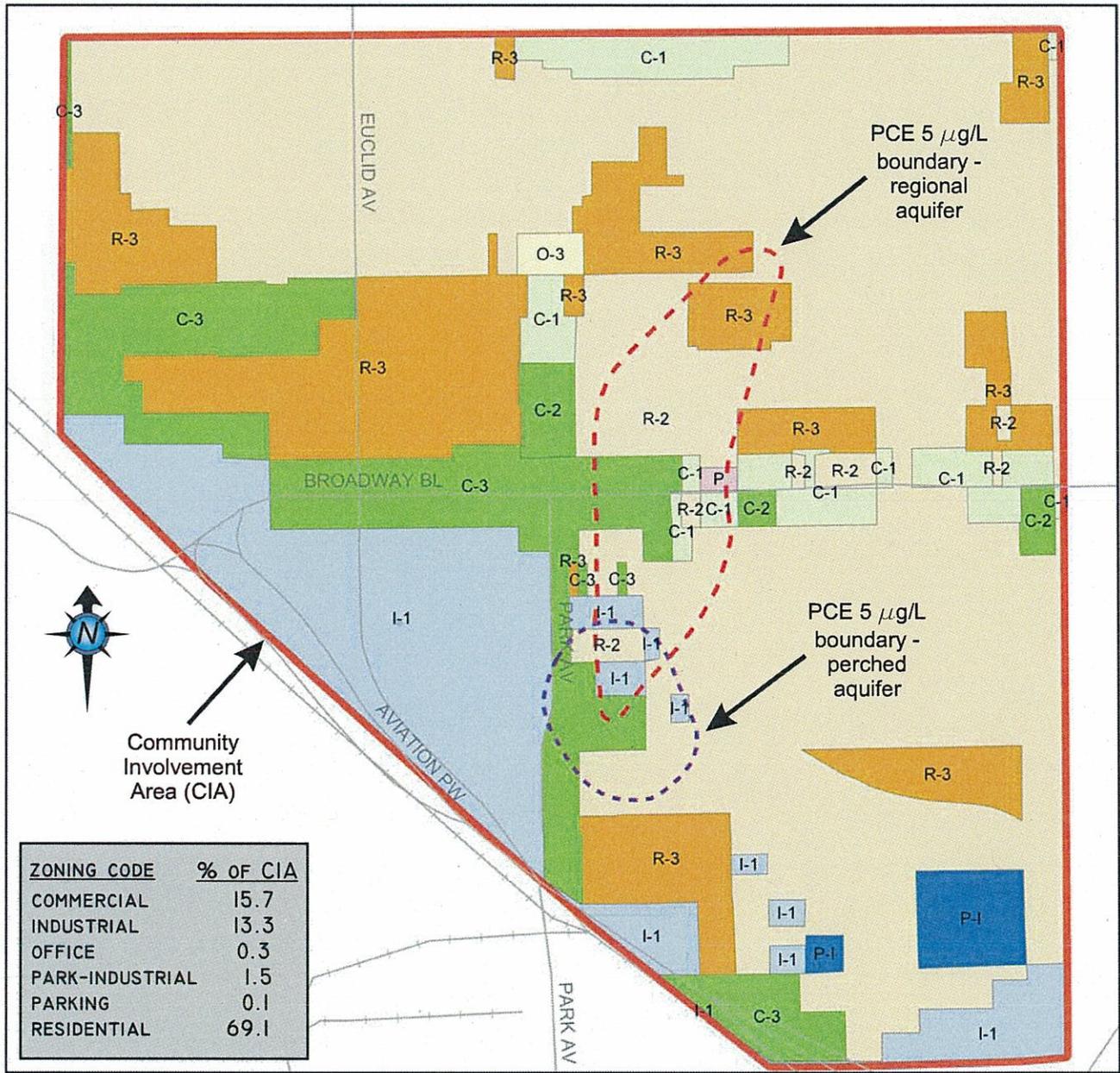
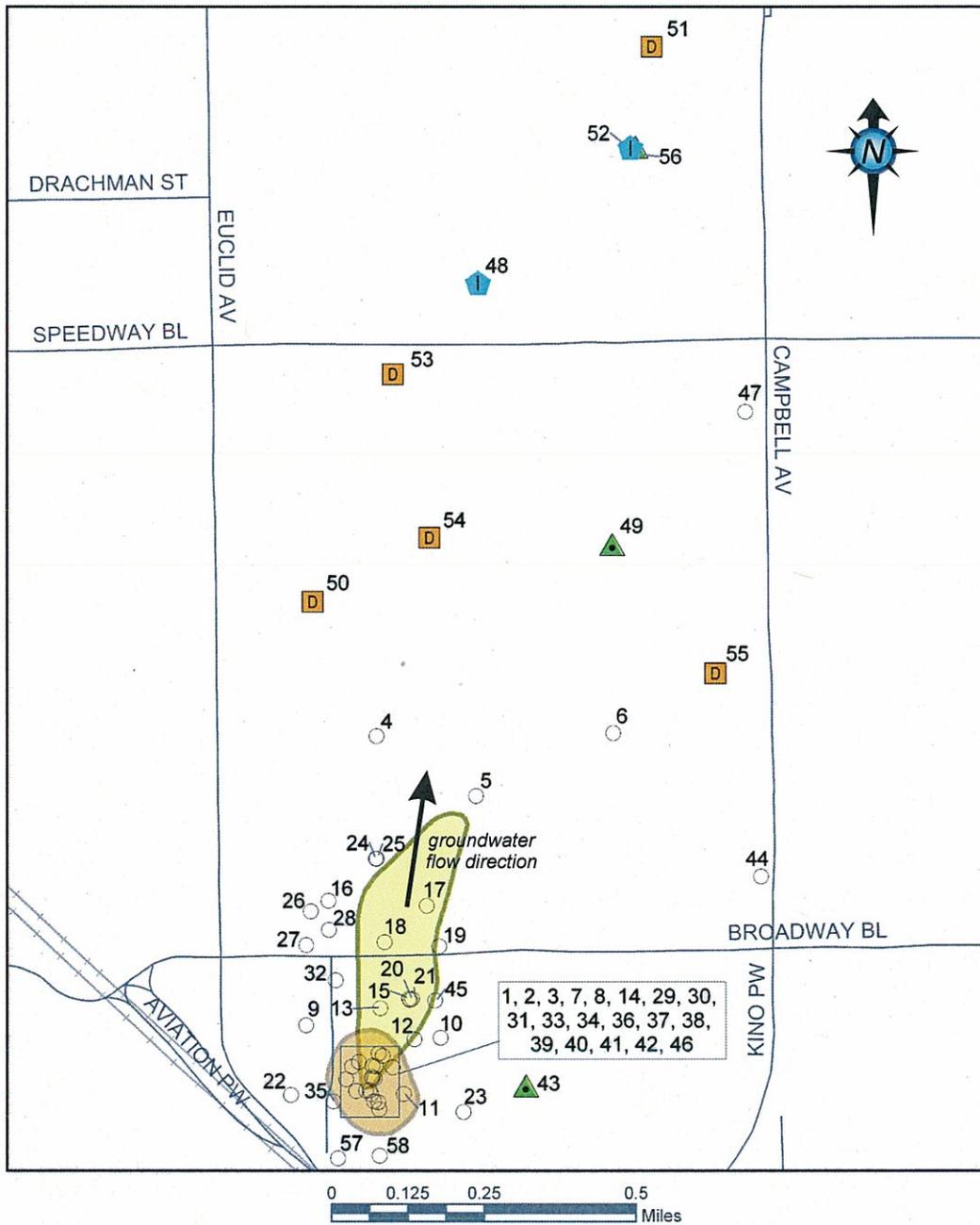


FIGURE 9

PARK-EUCLID WQARF SITE WELL LOCATIONS - ADWR FIELD-VERIFIED WELLS



Water Use	
	Domestic
	Industrial (cooling)
	Monitoring
	Other
	Perched 5ug/L PCE Concentration Site Boundary
	Regional 5ug/L PCE Concentration Site Boundary

well ownership	
<u>well number</u>	<u>well owner</u>
1 - 31	ADEQ
32	ADOT
33 - 42	Mission Linen
43	SW Gas
44 - 47	City of Tucson
48 - 56	Univ. of Arizona
57 - 58	EPA Region IX

FIGURE 11

APPENDIX A



FEB 2004
Environmental
Quality
SRO

MEMORANDUM

Date: February 9, 2004

To: *MDF*
Matt Doolen
Project Manager
Superfund Programs Unit
Southern Regional Office,
Arizona Department of Environmental Quality

From: *Karen Masbruch*
Karen Masbruch,
Deputy Director
Environmental Services
City of Tucson

Subject: **Arizona Department of Environmental Quality (ADEQ) Inquiry Regarding Land Use Studies Relating to the Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Registry Site.**

Environmental Services staff contacted the City of Tucson's Transportation Department in order to verify the location of the parcels outlined of the ADEQ map, and to determine their respective current and future uses. The map presented by ADEQ was in error. The tax parcel codes had the second "dash" placed between the wrong digits. The number sequence should have three digits, two digits, and three or four digits. The attached map was marked by three digits, three digits, and three digits.

The following ten (10) properties (identified by tax parcel numbers) do belong to the City of Tucson: 124-12-1150, 124-12-148A, 124-12-156A, 124-12-260A, 124-12-265A, 124-12-285D, 124-12-283D, 124-12-287A, 124-12-291A, & 124-12-277A.

The City's Real Estate department has indicated that these parcels are currently designated for use associated with the existing Arroyo Chico wash channel. The future intended use for the properties is for the Arroyo Chico Floodwater Detention Basin Project.

The City's Project Manager for the Arroyo Chico Floodwater Detention Basin Project has indicated that the future use within the basin project will be for public open space, passive recreation trails, park space, and natural habitat restoration. The City's Parks Department will maintain all of these land use projects.

With proper coordination and planning, the current and future use of these parcels could be compatible with remedial efforts at the adjacent WQARF site.

Please contact me with any additional questions or concerns at (520) 791-5414.

cc: Brooks Keenan, COT Transportation
MJ Dillard, COT Transportation
Tim Murphy, COT Real Estate
Nancy Petersen, COT Environmental Services
File



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Milwaukee and Madison, Wisconsin

Writer's Direct Dial: 602.229.5335
Writer's Fax: 602.420.5135
E-Mail: jdrazek@quarles.com

February 13, 2004



Matthew L. Doolen
Superfund Program Unit Project Manager
Arizona Department of Environmental Quality
400 W. Congress
Suite 433
Tucson, Arizona 85701

RE: Response to ADEQ Information Request regarding Land and Water Use Studies

Dear Matt:

On behalf of our client, Mission Linen Supply, I am hereby responding to your Information Requests dated January 9 and 13, 2004 in connection with the Land and Water Use Study relating to the Park-Euclid WQARF Site.

Regarding the Land Use Study, Mission's plans for the property located 299 and 301 South Park Avenue, Tucson, Arizona are to continue to use those properties in connection with its commercial laundry operations.

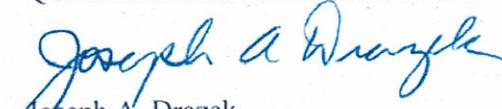
Regarding the Water Use Study, Mission's only plans for the groundwater wells on its property is to assist in any potential groundwater remediation, to the extent it is feasible to do so, by using treated groundwater in its laundry operations. Mission has no other planned future uses of groundwater from its groundwater wells.

Matthew L. Doolen
February 13, 2004
Page 2

Mission appreciates the opportunity to participate in this Study. If we can be of further assistance, please do not hesitate to give me a call.

Sincerely,

QUARLES & BRADY STREICH LANG LLP



Joseph A. Drazek

JAD:es
enclosures

cc: Mario Villarreal



PIMA COUNTY
DEPARTMENT OF TRANSPORTATION AND FLOOD CONTROL DISTRICT
201 NORTH STONE AVENUE, FOURTH FLOOR
TUCSON, ARIZONA 85701-1207

KURT WEINRICH, P. E.
DIRECTOR

(520) 740-6410
FAX (520) 620-1933

January 30, 2004

Mr. Mathew Doolen
Arizona Department of Environmental Quality
400 West Congress Street, Suite 433
Tucson, AZ 85701

Re: Land use Studies Relating to Park-Euclid Water
Quality Assurance Revolving Fund (WQARF)
Registry Site - Information Request

Dear Mr. Doolen:

In response to your letter dated January 9, 2004 on the above subject, we provide the following information regarding the lands owned by Pima County near the Park - Euclid WQARF registry site.

Out of the six parcels identified in Figure 2 of your letter, the Parcel 124-121-55A is currently used for storage and will be used in future as a neighborhood community center. The remaining five parcels (124-122-840, 124-122-860, 124-122-900, 124-122-82A and 124-122-81A) are currently vacant and will be part of detention basins for the Park Avenue Basin (Arroyo Chico) Project (construction expected to start in Summer of 2004).

Please contact Larry Robison or Fazle Karim (740-6371) if you need further information in this regard.

Sincerely,

A handwritten signature in blue ink that reads "Suzanne Shields".

Suzanne Shields
Deputy Director

xc: Leo Smith
Larry Robison
Fazle Karim

APPENDIX B



CITY OF
TUCSON
TUCSON WATER
DEPARTMENT

October 27, 2003



Mr. Mike Fulton
Southern Regional Office
Arizona Department of Environmental Quality
400 West Congress Street; Suite 433
Tucson, Arizona 85701

SUBJECT: Present and 'Reasonably Foreseeable Uses' of Ground Water in the Vicinity of Specified WQARF Sites in the Tucson Water Service Area

Dear ^{MIKE}Mr. Fulton:

In your letter dated 25 August 2003, you requested information regarding current and anticipated uses of ground water in the vicinity of the following WQARF sites: Broadway-Pantano, El Camino del Cerro, Miracle Mile, Park-Euclid, and Shannon Road-Rillito Creek. I understand that this information is needed to complete remedial investigation reports and that it should conform to specifications in ADEQ's Remedy Selection Rules [R18-16-406 (D)].

The Remedy Selection Rules specify that the information provided should address both present and "reasonably foreseeable uses" of water which are likely to occur within a "reasonable time period." This time period is recognized to be the next 100 years unless a longer period can be shown to be reasonable. Because of the inherent uncertainties associated with long-term water resources planning, any comments or discussion regarding the future use of ground water in the vicinity of the above noted WQARF sites is subject to change. Nonetheless, it is critical that the regional aquifer be managed to ensure that it will be available to satisfy the community's current and future needs. Our community will rely on the regional aquifer in the vicinity of these WQARF sites to satisfy projected water demands. Contaminated ground-water sites in the vicinity of the Central Well Field must be remediated as soon as possible to ensure that both potable and non-potable water supply operations will not be unduly hampered.

Current Use of Ground Water

The City of Tucson Water Department (Tucson Water) and other water providers/users in the Tucson basin primarily rely on ground water or groundwater-derived effluent to meet their respective demands. Because the overall area relies on ground water for more than 50 percent of its drinking water supply, the regional aquifer has been designated by the Environmental Protection Agency as a "sole source" aquifer.



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Tucson Water currently relies on the productive capacity of five well fields to meet current municipal demand. Of the five, the Central Well Field is the largest and encompasses most of the developed parts of the City of Tucson as well as some outlying areas. Until recently, this well field annually supplied about 60 percent of the water required by Tucson Water to meet municipal potable demand. However, a major shift was initiated in 2001 when the Central Avra Valley Storage and Recovery Project (CAVSARP) began delivering Central Arizona Project water, a renewable water source, to Tucson Water customers. As a result, ground-water withdrawals in the Central Well Field have been reduced since CAVSARP will annually provide about 60,000 acre-feet (54 million gallons per day) of base load supply. Although the total volume of aquifer withdrawals in the Central Well Field area will decrease over time, it will remain a significant source of supply and will continue to be an essential element within the City of Tucson's water-supply infrastructure. Hence, the five WQARF sites referenced in your letter continue to be causes of concern since they are all located within or immediately adjacent to the Central Well Field and to some degree constrain the use of ground water for potable supply.

In addition to potable concerns in and around the Central Well Field, one or more of the listed WQARF sites are located in the vicinity of Tucson Water's effluent underground storage and recovery facilities. The presence of these WQARF sites has impacted the development and potential future expansion of these facilities which in turn constrains the community's ability to reuse effluent—the only other renewable water resource available for supply. The impacts associated with these WQARF sites on both the Central Well Field and Tucson Water's effluent recharge and recovery facilities will be discussed more fully below.

Tucson Water has a number of water supply wells in the immediate vicinity of the **Broadway-Pantano WQARF Site**. Since the late 1980s, four Tucson Water supply wells have been taken off line because of the occurrence of VOCs in well water samples. These wells include C-021A, D-021A, D-022A and most recently C-026B. The City currently has a policy to take out of service wells which have VOC concentrations which exceed half of the potable drinking water standards for such substances. The City also has four production wells with restricted-use ("Last-On/First Off") status because of their proximity to the Broadway-Pantano VOC plume. These four wells located north and west of the Broadway North Landfill are C-020B, C-056B, C-058B, and C-114A. These wells have been needed to help meet peak demand between May and October. Because of their restricted use status, they have been among the last wells brought into service and among the first taken off line. Results of modeling studies have indicated that unrestricted use of well C-056B would have little if any effect on the VOC plume. Because of the critical need for additional pumping capacity in the Central Well Field, Tucson Water may recommend to City management that this well be dropped from the "Last-On/First-Off" list. Two other active wells, C-025B and D-018A, lie south of the VOC plume. Because these two wells have not been needed to meet peak- and off-peak demand since August 1999, they have for the time being been taken off line but this could change. Modeling analysis has indicated that if these wells were used

continuously, they could have an impact on the existing western containment of the plume and hence could necessitate additional remedial action. All six of these wells are considered available to meet municipal demand should they be required. Many other active wells are also in the general area but they are located farther away from the Broadway-Pantano WQARF Site.

The **El Camino del Cerro**, the **Shannon Road-Rillito Creek**, and the **Miracle Mile WQARF Sites** are all in close proximity to one another; hence, the water resource impacts associated with each are collectively addressed. To date, Z-006A is the only Tucson Water water-supply well that has been taken off line because of the presence of contaminants associated with one or more of these WQARF sites. Expansion of the Sweetwater Recharge Facilities and the planning and siting of recovery facilities associated with the Santa Cruz Managed Underground Storage Facility have been constrained by the existence of the ground-water contamination associated with the El Camino del Cerro WQARF Site. In addition, many of the existing wells in the vicinity of El Camino del Cerro and the Shannon Road-Rillito Creek WQARF Sites could be used as effluent recovery wells if it were not for issues associated with the VOC contamination of ground water. Also, the siting of constructed in-channel recharge facilities has been similarly constrained by ground-water contamination at the El Camino del Cerro WQARF Site. As points of correction, well Z-001A is not an active production well and should instead be shown on the provided map as a "partially equipped, not operational" well. Also, the map does not show EW-007A (55-582679), an "active production, but not connected" (to the potable system) well located on the west bank of the Santa Cruz River between WR-200A and PK-001A.

There are currently no active Tucson Water production wells in the WQARF Community Involvement Area associated with the **Park-Euclid WQARF Site**. The absence of currently active production wells is partially due to the reported presence of VOCs and/or diesel in ground water. For instance, well B-003B was converted from an active production well to a "monitor" well partially due to its proximity to the VOC ground-water contamination associated with the Park-Euclid WQARF Site. On the map provided, wells B-003A and B-003B are shown as "unknown" when in fact the location and status of both are known. Well B-003B is located at 127 North Campbell Avenue (parcel 124-09-067A) while B-003A, formerly located on the same parcel, was abandoned and should be shown as such. Well A-033A, located adjacent to railroad tracks, was abandoned due to the detection of diesel fuel in the well. Ground water in this area has been significantly impacted by local land uses.

Future Use of Ground Water

Tucson Water is currently ramping up its full-scale implementation of the Central Avra Valley Storage & Recovery Project and as noted previously, will soon be annually delivering up to 60,000 acre-feet of renewable supply. The utility goal is to utilize its full annual CAP allotment in the next 15 to 20 years. One of the key goals of Tucson Water will be to continue

reducing the amount of ground water that will be needed for municipal supply from its Central Well Field as well as from the other well fields. When reducing ground-water pumping in the Central Well Field and surrounding areas, the goal is to keep off line those wells located in that part of the Central Well Field where the largest historical water level declines have occurred. This area includes wells located near the Broadway-Pantano WQARF Site. In addition, other wells with a history of operational problems will also be among the first taken off line and this will apply throughout the Central Well Field as well as surrounding areas. By taking a large number of wells off line much of the year, water levels are generally expected to rise in the Central Well Field area. During times when peak demand will exceed the base supply provided by CAVSARP and other envisioned facilities, some Central Well Field wells will be brought back on line. The wells to be pumped to meet peak demand are selected based on operational need. It is anticipated that wells in the immediate vicinity of WQARF sites will be given a lower priority and hence kept off line as much as possible.

It is critical to recognize, however, that all available wells may be needed in both the near and long terms in order to respond to scheduled/unplanned CAP outages or supply shortfalls. Similarly, if potable drinking water standards become more stringent with regard to radon for instance or some other constituent, it may be necessary to rely on wells in the vicinity of WQARF sites for supply. Whatever remedial action approaches ADEQ elects to pursue, be it for interim plume containment or final remedy for all WQARF sites, they should be developed and implemented with two purposes in mind: 1) to achieve the specified remedial objectives, and 2) to preserve Tucson Water's flexibility in being able to operationally respond to a range of potential near- and long-term water-supply scenarios.

In the longer term, the community's water demand will at some point exceed the City of Tucson's current annual CAP allotment. The City may elect to obtain additional CAP water if it is available and/or treat wastewater effluent to a potable standard. Within the next fifty years or so, Tucson Water will probably find it necessary to resume the year-around pumping of ground water in the Central Well Field. This pumping will likely have an impact on ground-water conditions in the vicinity of the five WQARF sites.

In general, significant water supply changes will occur in the vicinity of the five WQARF sites over the next 100 years. It is imperative that the regional aquifer be managed to ensure that it will be available to satisfy the community's future needs. Anticipated operational changes in the Central Well Field and the increasing importance of aquifer management in the vicinity of existing and future effluent recharge and recovery projects during this period have been summarized. Water-resources planning has to respond to constantly changing circumstances; however, it is certain that the community will rely on the regional aquifer in the vicinity of these WQARF sites to satisfy current and projected water demands. It is imperative that contaminated ground-water sites in the vicinity of the Central Well Field be

remediated to ensure that both potable and non-potable supply operations will not be unduly hampered. If you have any questions regarding the information provided, please feel free to give me a call at (520) 791-2689.

Sincerely,



Ralph P. Marra
Chief Hydrologist

RM:cwf_current&futureuses_wqarf_oct2003.doc

cc: Marie Pearthree
Bruce Johnson
Joe Babcock
Jeff Biggs
Ted Sroka
Larry Mulhern,
Sandy Elder
Marie Light
Tim Thomure
Karen Masbruch (Environmental Services)
Ray Murray (Environmental Services)
Blake Ashley (City Attorney's Office)
Chris Avery (City Attorney's Office)
Hydrology File



CITY OF
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SERVICES

February 19, 2004

Mr. Matthew Doolen, RG
Project Manager
Superfund Programs Unit
Arizona Department of Environmental Quality
400 West Congress, Suite 433
Tucson, AZ 85701

4
FEB 2004
Environmental
Quality
SRO

**Subject: Park Euclid WQARF Site – Water Use Studies
Response to ADEQ’s January 14, 2004 Information Request**

Dear Mr. Doolen:

Thank you for your letter regarding City of Tucson locations and uses of existing wells and planned wells in the area of the Park Euclid WQARF site. We understand this inquiry is limited to City of Tucson groundwater monitor wells and that ADEQ has already solicited information from the City of Tucson Water Department regarding future uses of water from existing or planned production wells in the area.

The attachment to your January 14, 2004 letter identifies the locations and registrations of the four City of Tucson monitor wells at the site. These wells were installed in January and February 1998 as part of the investigation of groundwater beneath the Arroyo Chico project site due to its proximity to the Park-Euclid WQARF site. There are two nested well pairs constructed to intercept the perched and regional aquifers. Detailed information on the well installation and well use can be found in “Final Report, Phase II Environmental Site Assessment, Arroyo Chico Multi-use Project, Tucson, Arizona” (SCS Engineers, April 2002).

The groundwater monitor wells are currently used by ADEQ for water level and water quality monitoring at the Park Euclid WQARF site. In May 2000, the City of Tucson and ADEQ signed a well access agreement providing for ADEQ use of the wells through December 31, 2004. This may be extended by ADEQ for an additional five years (to December 31, 2009). The City of Tucson is not currently performing any monitoring at these wells.

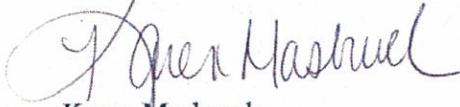
The City of Tucson does not currently have any plans to install additional monitor wells in this area. However, maintaining flexibility for the potable water supply is a prime concern of the City of Tucson. This was stated in Tucson Water’s letter dated October 27, 2003 regarding Present and Reasonably Foreseeable Uses’ of Groundwater in the Vicinity of Specified WQARF Sites in the Tucson Water Service Area: “Our community will rely on the regional aquifer in the vicinity of these WQARF sites to



satisfy projected water demands.” Therefore, it is critical that the regional aquifer be managed to ensure it will be available for the community’s current and future needs.

The City of Tucson appreciates ADEQ’s efforts to develop a remediation strategy at the Park Euclid site, which will not negatively impact existing well uses or future planned wells by the City of Tucson in the area. Please contact me, if we can provide additional information.

Respectfully submitted,



Karen Masbruch
Deputy Director, Environmental Services
City of Tucson

cc: Ralph Marra, Tucson Water
Richard Byrd, Environmental Services
Nancy Petersen, Environmental Services
Park Euclid WQARF File



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February 13, 2004



Matthew L. Doolen
Superfund Program Unit Project Manager
Arizona Department of Environmental Quality
400 W. Congress
Suite 433
Tucson, Arizona 85701

RE: Response to ADEQ Information Request regarding Land and Water Use Studies

Dear Matt:

On behalf of our client, Mission Linen Supply, I am hereby responding to your Information Requests dated January 9 and 13, 2004 in connection with the Land and Water Use Study relating to the Park-Euclid WQARF Site.

Regarding the Land Use Study, Mission's plans for the property located 299 and 301 South Park Avenue, Tucson, Arizona are to continue to use those properties in connection with its commercial laundry operations.

Regarding the Water Use Study, Mission's only plans for the groundwater wells on its property is to assist in any potential groundwater remediation, to the extent it is feasible to do so, by using treated groundwater in its laundry operations. Mission has no other planned future uses of groundwater from its groundwater wells.

Matthew L. Doolen
February 13, 2004
Page 2

Mission appreciates the opportunity to participate in this Study. If we can be of further assistance, please do not hesitate to give me a call.

Sincerely,

QUARLES & BRADY STREICH LANG LLP



Joseph A. Drazek

JAD:es
enclosures

cc: Mario Villarreal

February 6, 2004

Mr. Matt Doolen - Project Manager
Superfund Programs Unit
Arizona Dept. of Environmental Quality
400 West Congress Street, Suite 433
Tucson, AZ 85701

**Re: Present and Reasonably Foreseeable Groundwater Use in the Vicinity of the
Park-Euclid WQARF Site**

Dear Matt:

The following information is in response to your letter dated January 13, 2004, requesting information for incorporation into the draft Remedial Investigation report on the Park-Euclid WQARF site. Reasonably foreseeable water uses are defined as those likely to occur within 100 years, unless specific site conditions require a longer period. As you are aware, the accuracy of any prediction concerning groundwater use over such a long period is suspect, but it is still important to at least establish a baseline to allow planning for the most appropriate remediation of the site.

The University of Arizona has depended upon groundwater below its campus for almost a century. Until the last few decades, groundwater was the only source of water supply. We now supplement with City of Tucson water, but the cost differential between pumping our groundwater and using city water is significant. It is, therefore, a fiscal priority to maximize use of our wells over use of city water.

Infrastructure

Two independent water systems currently serve the needs of the Main Campus and the Arizona Health Sciences Center (AHSC) campus respectively. In the next five years, the two systems will be connected and merged into one.

The University has three active wells (Huachuca, Architecture, CRB) on its main campus and three inactive wells (Aggie, Martin Street, Library).

- Two of the active wells (Architecture, Huachuca) are south of Speedway, and are being monitored monthly for VOCs. Both of these wells will probably be replaced in the next 10-20 years.
- The Library Well will be abandoned this year and replaced by a new well on the east end of campus (Optical Science Well).
- The Martin Street well is currently inactive due to its proximity to the plume and silting issues. There are no current plans to abandon, rehab, or replace it. Its future will depend largely on remediation of the plume.



- The Aggie Well has been inactivated due to structural problems, and will probably be abandoned and replaced sometime in the next five years.
- The CRB well is north of Speedway, and probably has another 20-30 years of life before it is replaced.

There are two wells on the AHSC campus (North, South). The south well will probably be replaced within the next five years due to decreasing yields and sand issues. The north well may be relocated in the next 10 years to make space for a new building.

Over the past several years, the portion of the potable water supplied by our own wells has been about 50-60%. With the new well, and centralized management of the pumps, we hope to increase that share to 95%, or better, in the next two years.

Water Use

Water use on campus includes the following categories:

- Domestic uses in dormitory, classroom, laboratory, and office buildings
- Landscape irrigation with minor water feature use
- Research and laboratory use
- Commercial uses – including food preparation, light manufacturing
- Steam for building heat
- Cooling towers and chilled water loop make-up

The University uses reclaimed effluent (purchased from the City of Tucson) for a portion of the cooling tower use and irrigation. It is a priority to connect the remainder of the irrigation network to the reclaimed water system. Reclaim is available at all three cooling plants on campus, but only one is currently using it due to difficulties encountered in treatment. Once those challenges are overcome, the remaining two plants will also use reclaimed water in their towers.

According to the Comprehensive Campus Plan, Fall 2000 Student enrollment was 30,690 and staff was 9,278 FTEs. Projections for Fall 2010 are 37,230 students and 10,609 Staff FTEs. The University is currently growing with respect to building space. Net assignable square footage (NASF) in Fall 2000 was 5,362,357 square feet. Projected NASF for 2010 is 6,057,144 square feet. Eventual build-out will come close to doubling the Fall 2000 NASF. Much of the growth will concentrate on research facilities, so will not impact the total student enrollment as much as the staff FTE number.

The attached map shows the eventual build-out density envisioned in the University of Arizona Comprehensive Campus Plan, a copy of which is available on the University website. At that time, the NASF will be in excess of 9,000,00 square feet. The Fall 2000 and Fall 2010 figure represent a ratio of about 8 FTEs per 1000 square feet of NASF. Using the same ratio, the eventual total campus population (student plus staff) could grow to 72,000, or about 1.5 times the Fall 2000 population.

Average water use for 2001 and 2002 is broken out by categories below:

- Domestic = 438.25 acre ft.
- Commercial = 23.44 acre ft.
- Industrial = 368.48 acre ft.
- Landscape irrigation = 45.00 acre ft.

for a total water use of 875.17 acre-feet. Of that total, 192.57 acre feet was reclaimed effluent use, leaving a potable water use of 682.60 acre feet. Eventually about 90% of the industrial and 95% of the irrigation will be supplied by reclaimed effluent, which would reduce the annual potable water use to about 500 acre feet (162,925,500 gallons), based upon conditions in 2001 and 2002. We will use this figure as a base for projecting future ground water use on campus.

The only growth component that will have a significant effect on increased groundwater use is the change in campus population. Building growth will have a minor effect in increased steam production, but the cooling load should, by that time, only affect the reclaimed effluent use. Likewise, any increase in irrigated acreage should not have a substantial effect on groundwater use, as that new acreage will be irrigated with reclaimed effluent.

The average campus population for 2001 and 2002 was 44,563. That equates to a per capita annual potable water use of 3,656 gallons. Projecting that to ultimate campus build-out population (72,000) would equate to an annual water use of 263,237,125 gallons or about 808 acre feet.

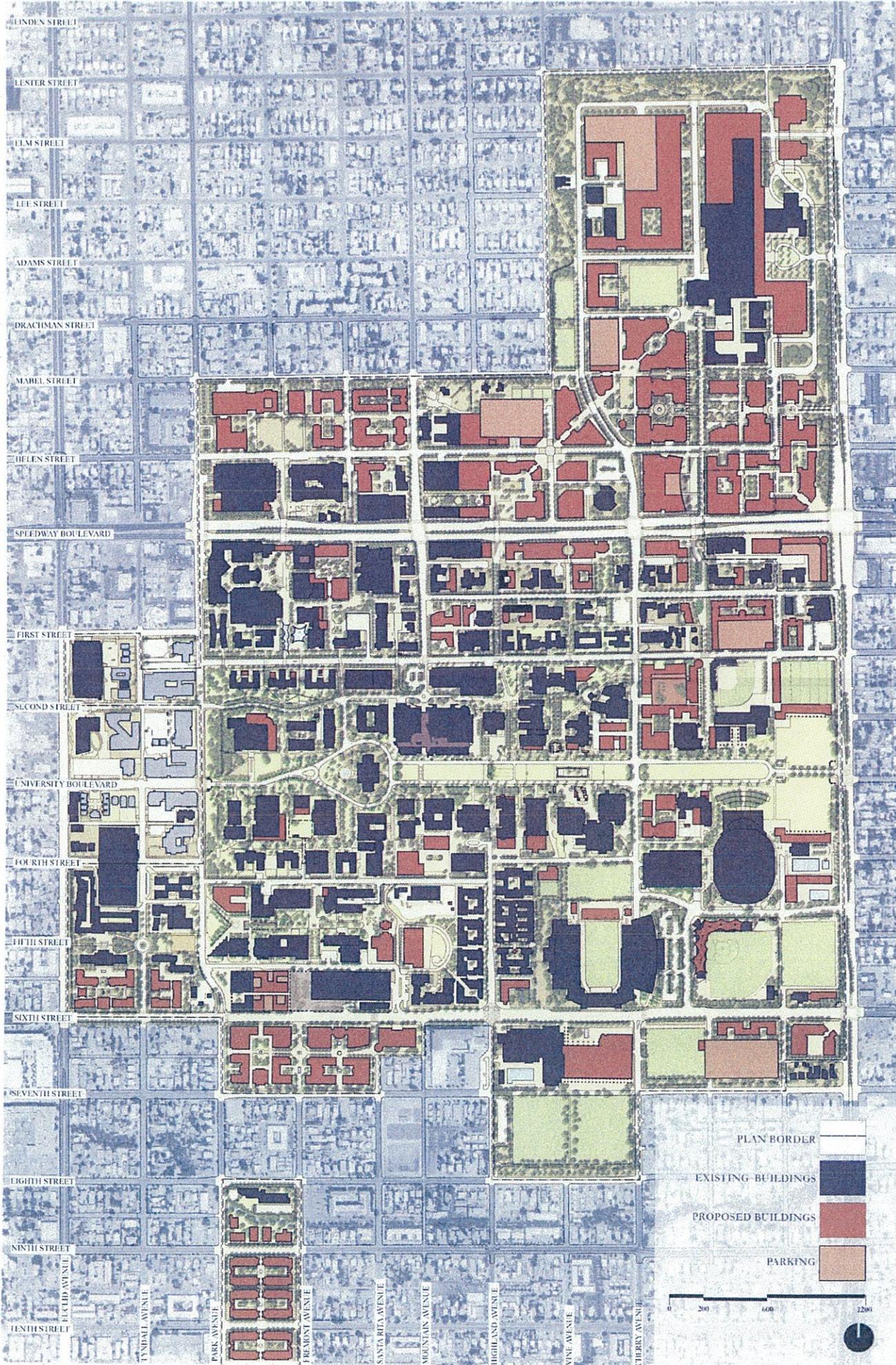
Campus build-out will probably be reached by about 2030, and unless the planning boundaries, and the area served by the campus water system are increased, growth will probably plateau after that. After that, the campus will probably grow vertically, making room for students and staff, but that growth rate would probably be smaller than for the first 25 years.

The above projections reflect an average water use growth rate of about 2.2% per year through 2030. If past experience is any indicator, that growth will not be evenly distributed across those years, but probably occur in spurts. Beyond 2030, the growth rate will probably slow down to an average of 1-1.5% per year. As stated earlier, these projections are based upon current plans and priorities, and are subject to change. However, I believe they represent a realistic projection of future water use for the foreseeable future, given the limited foresight available.

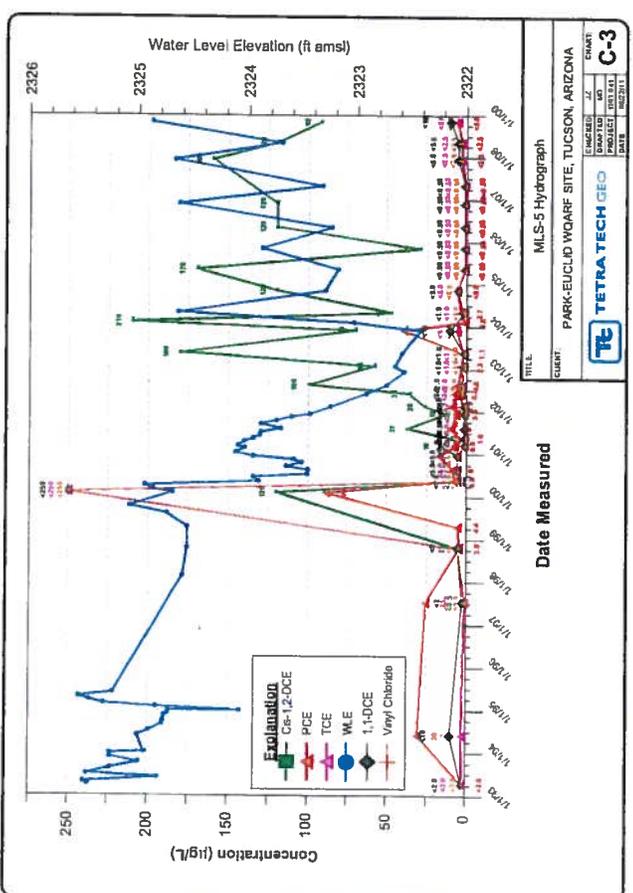
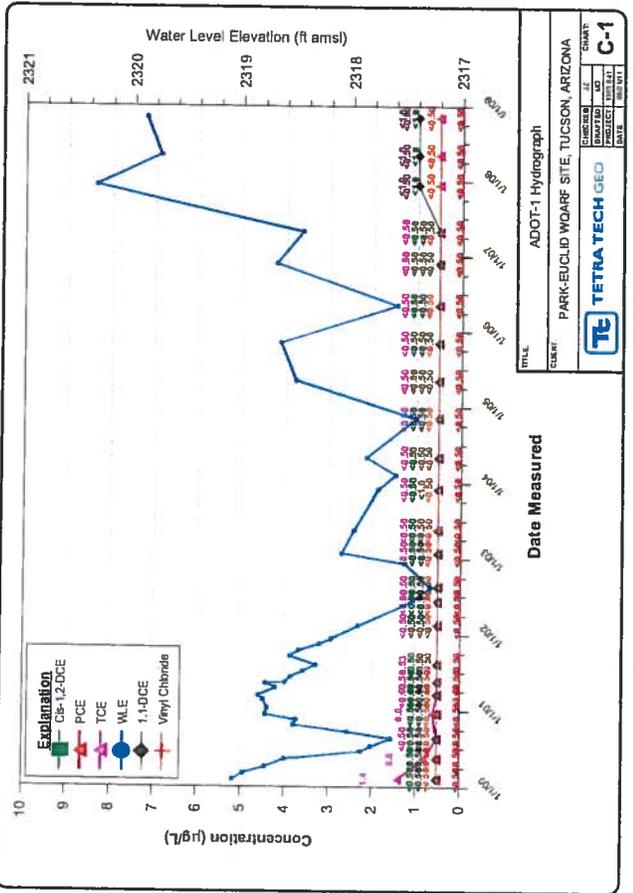
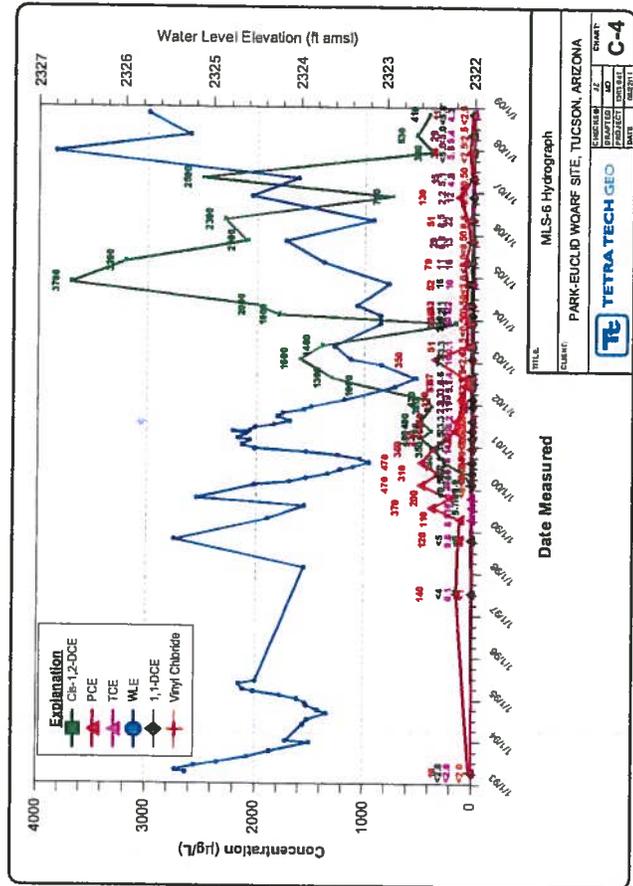
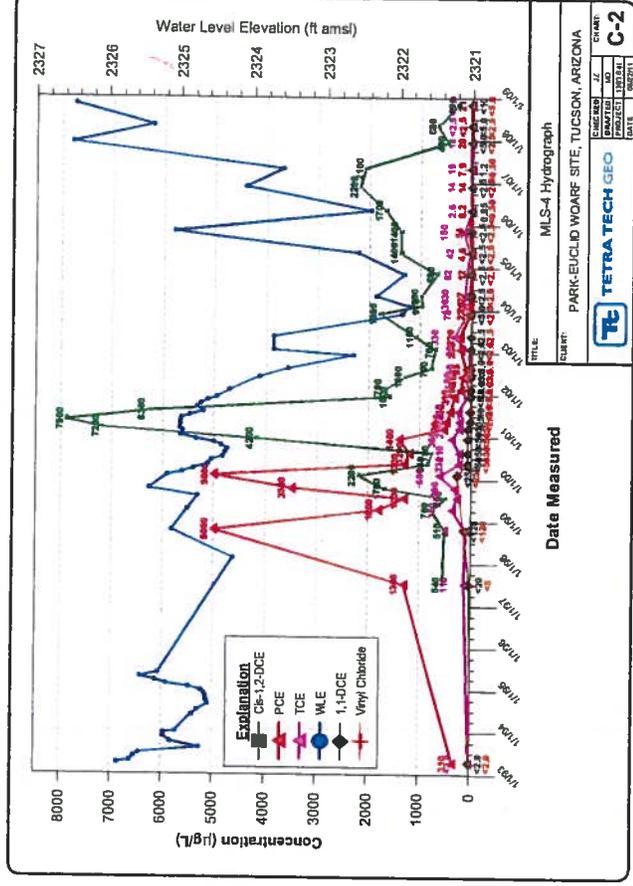
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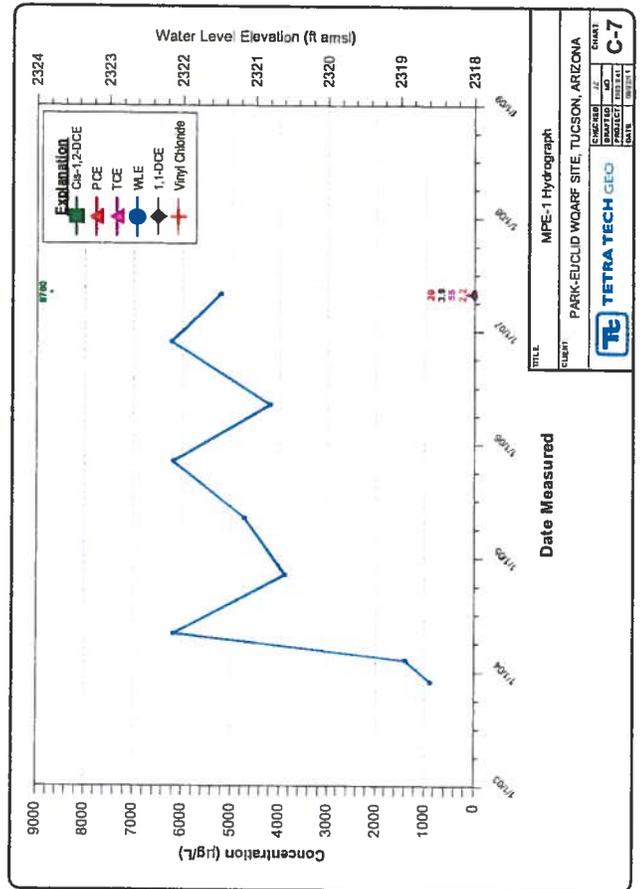
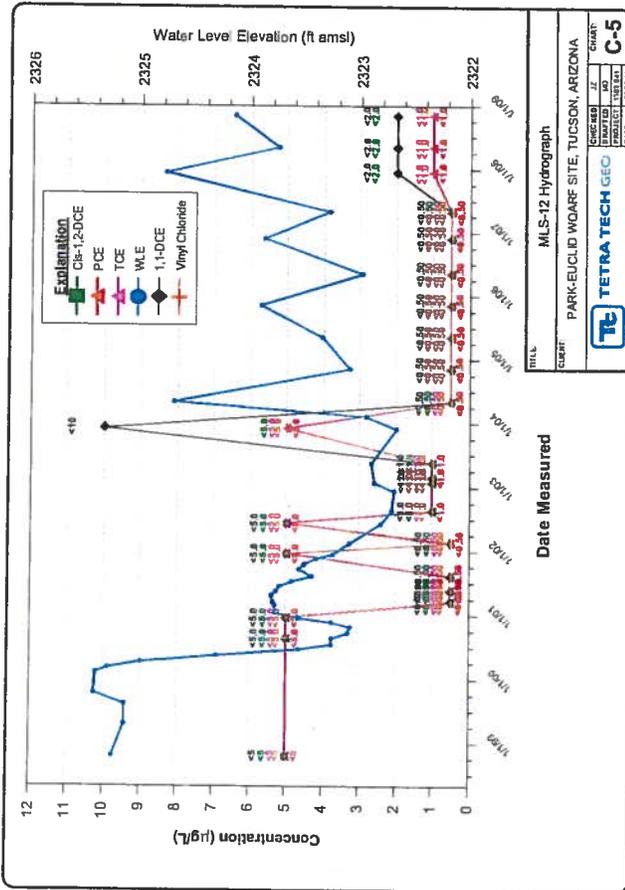
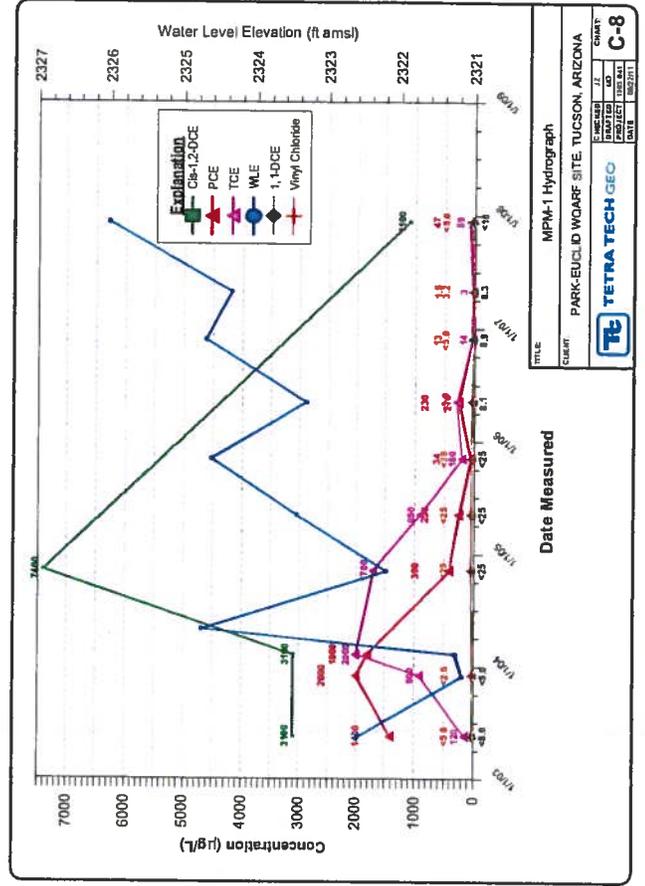
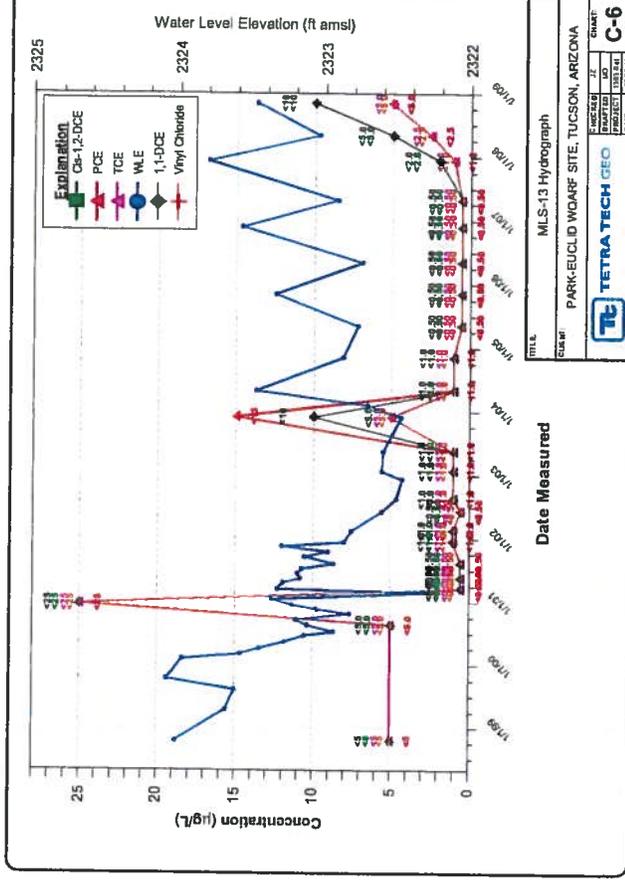


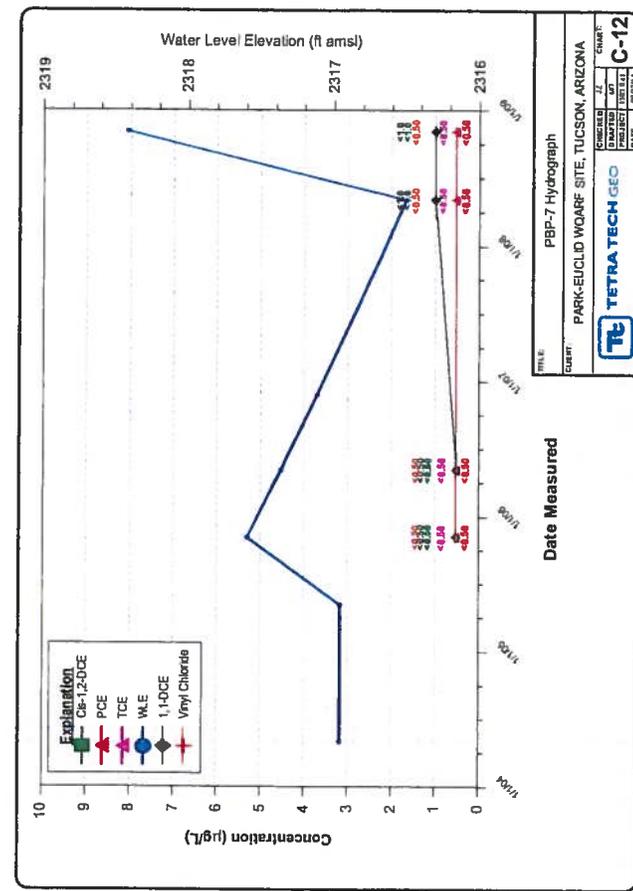
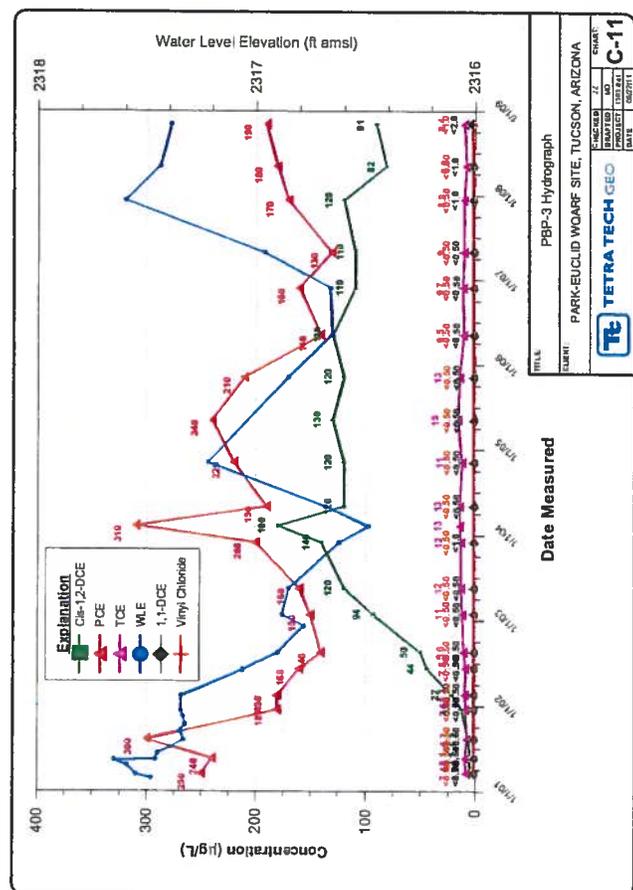
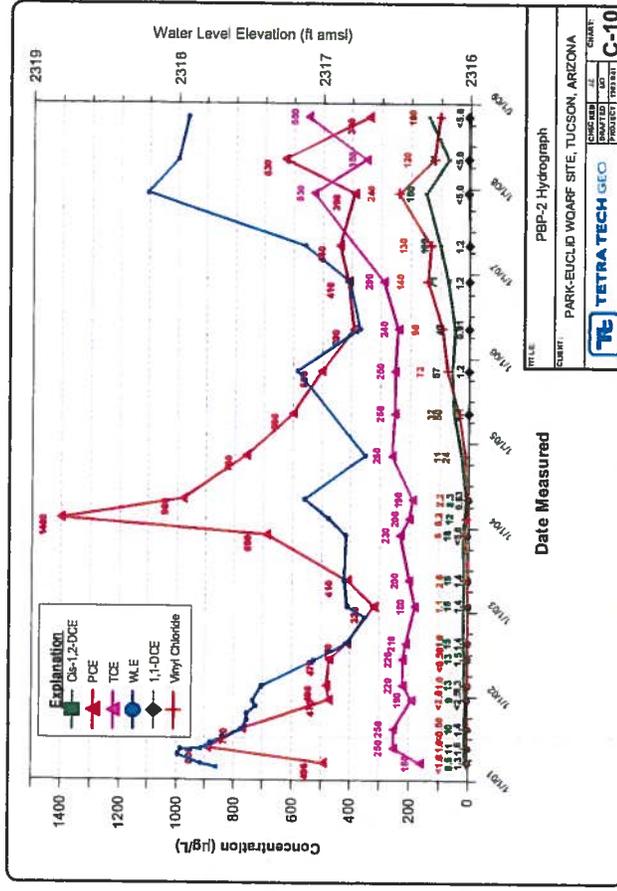
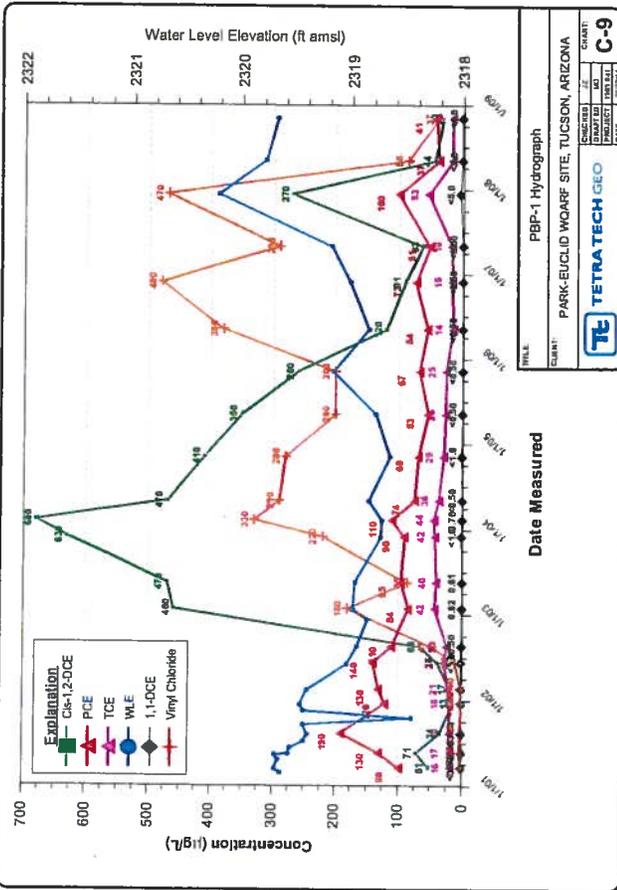
Mark Alan Marikos
Water Facilities Coordinator



APPENDIX C HYDROGRAPHS





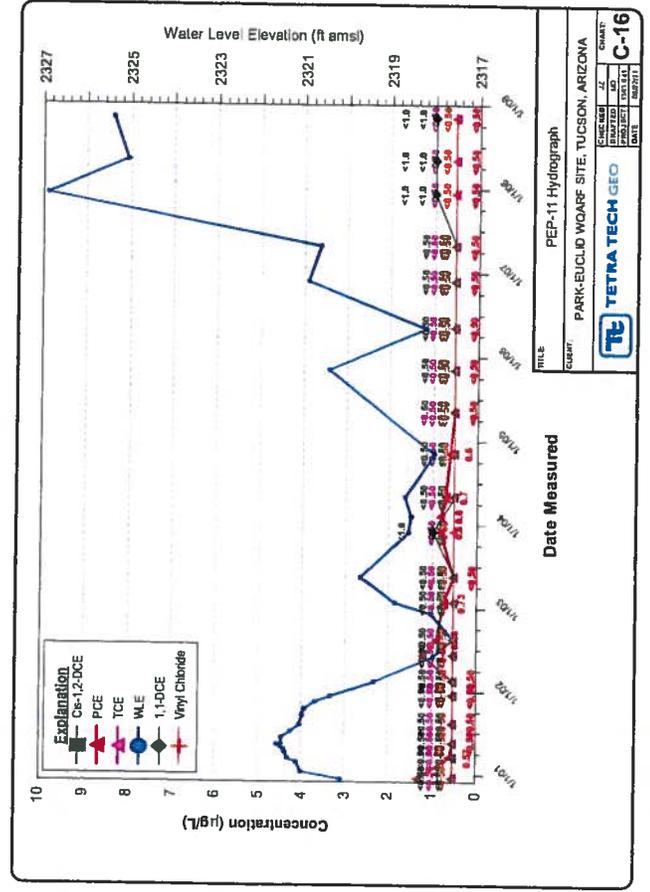
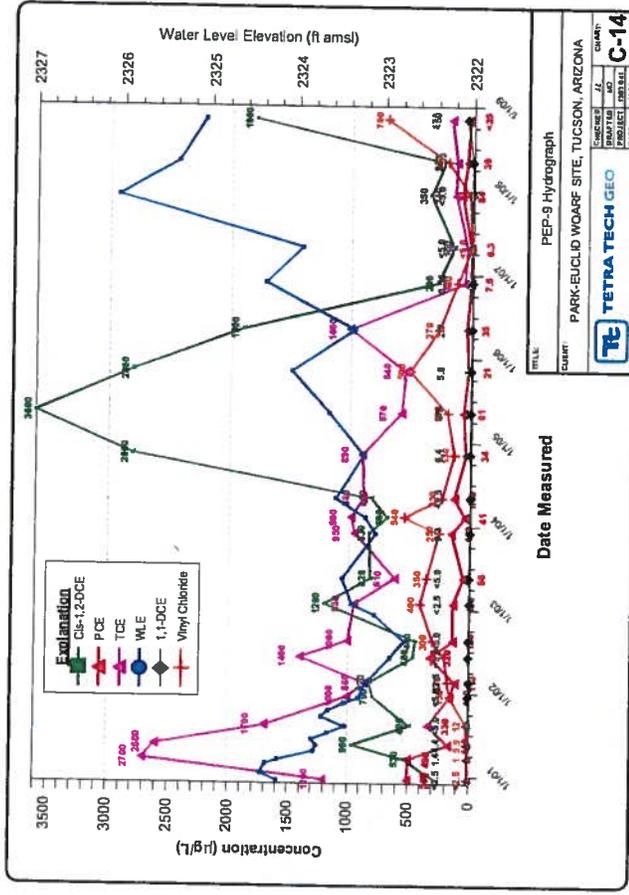
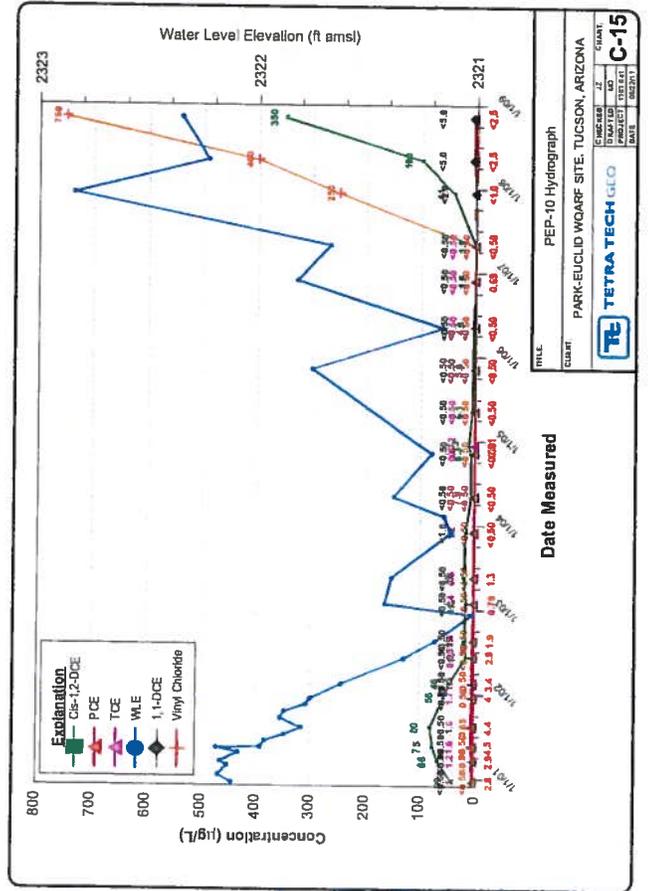
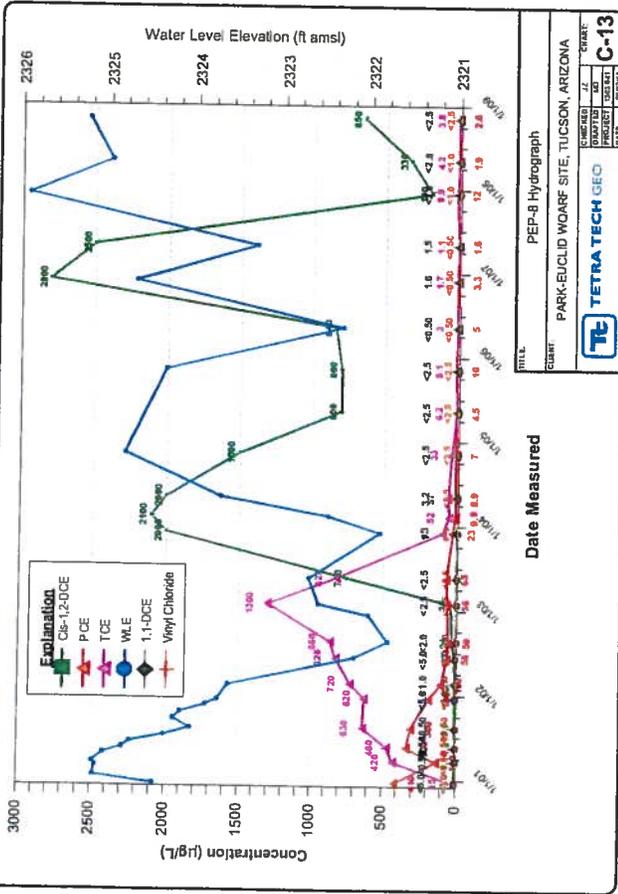


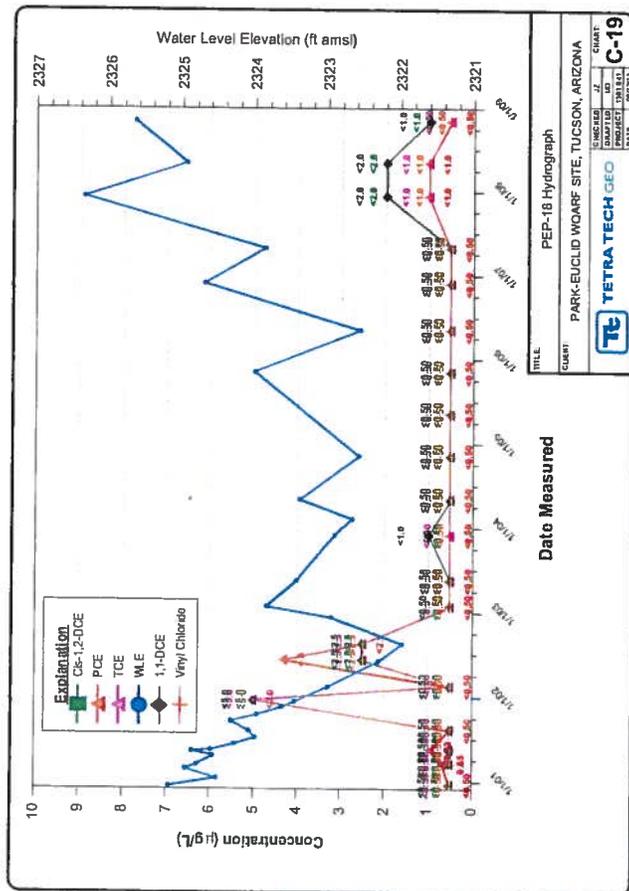
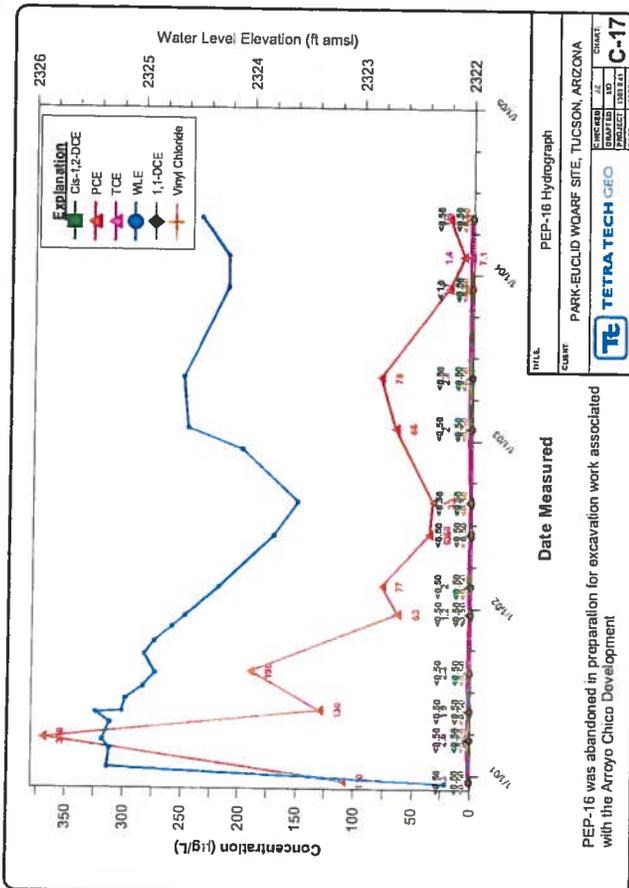
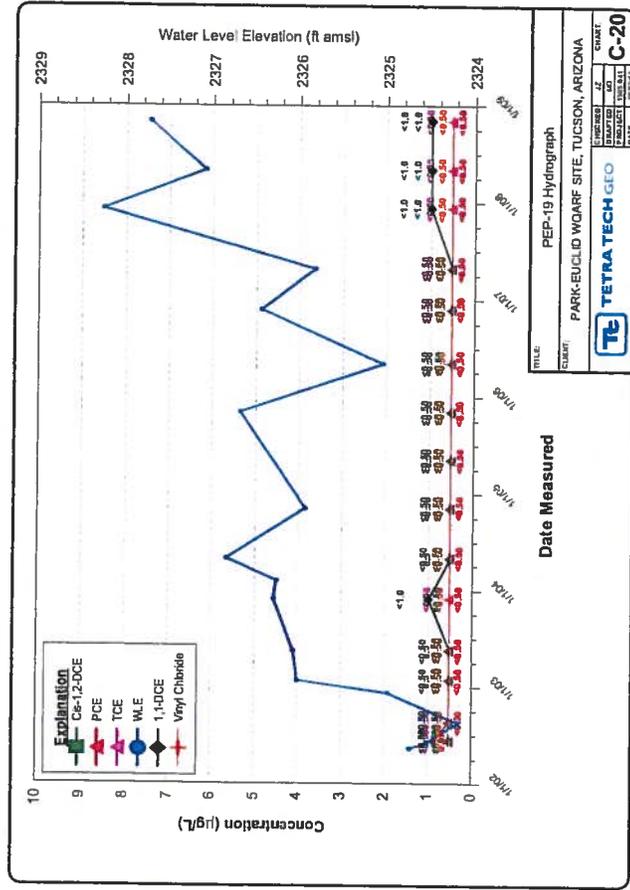
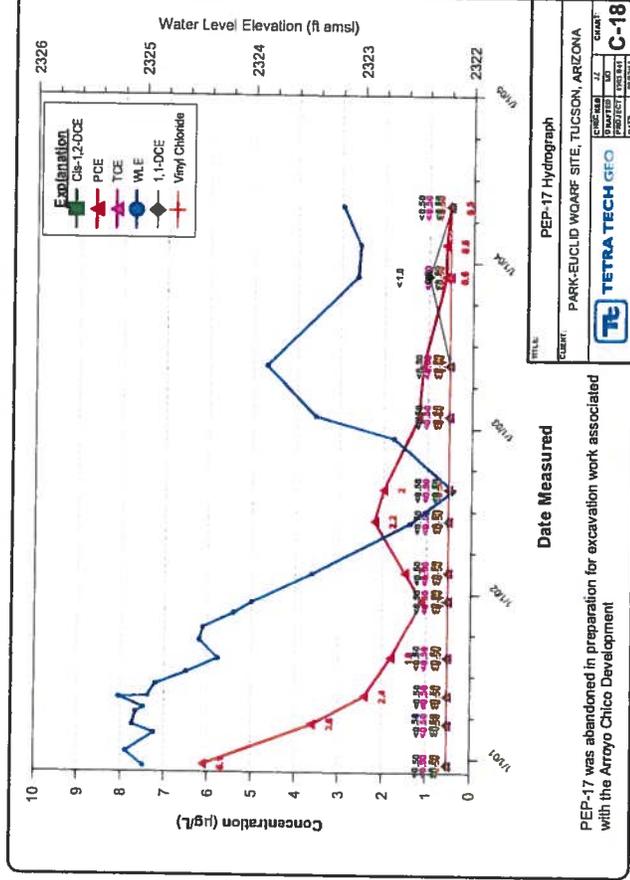
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 CHART: C-9
 PREPARED BY: [Redacted]
 DATE: 11/21/11

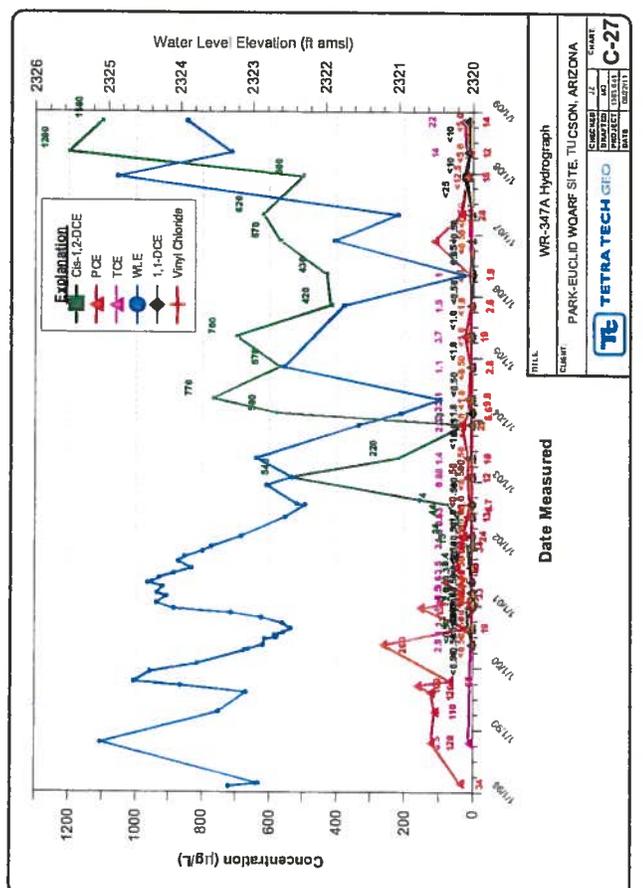
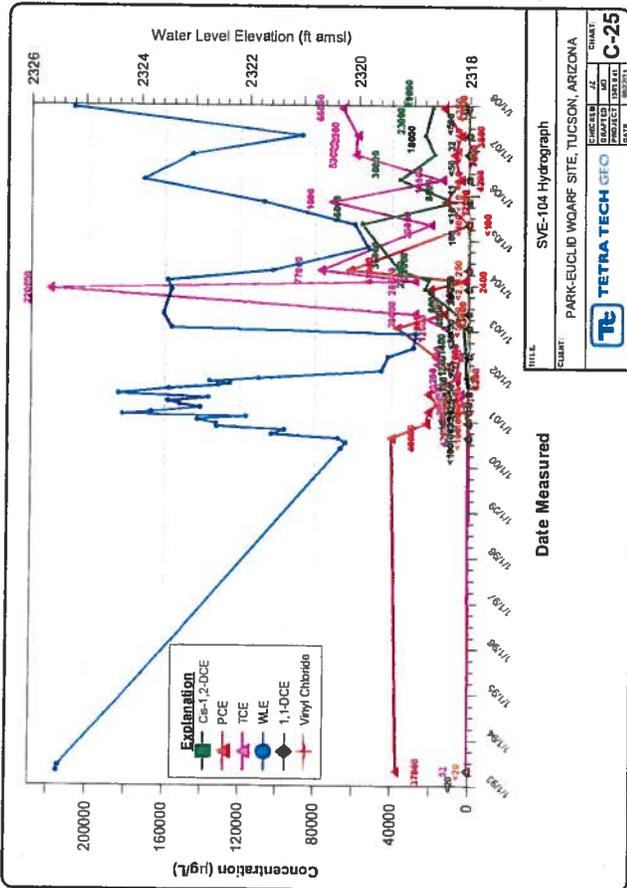
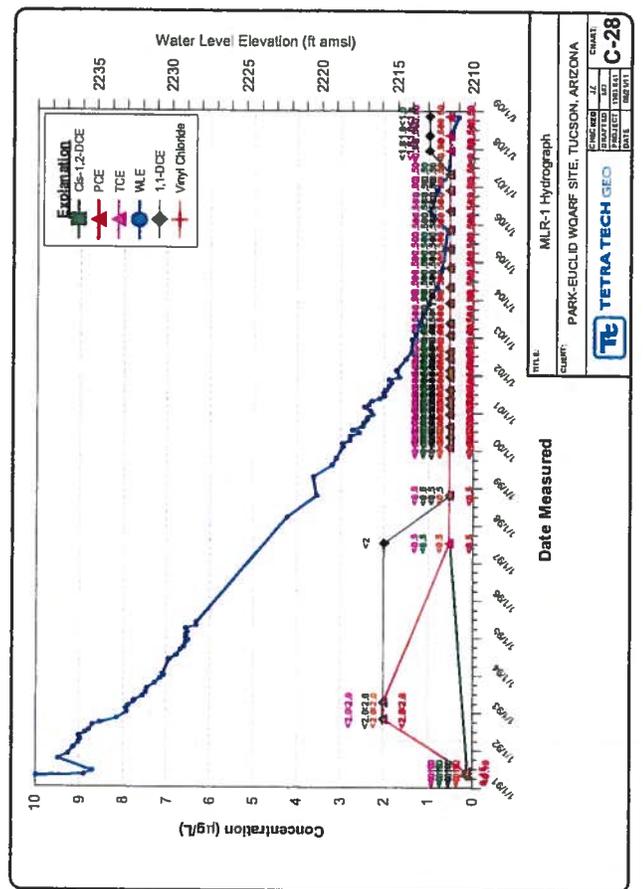
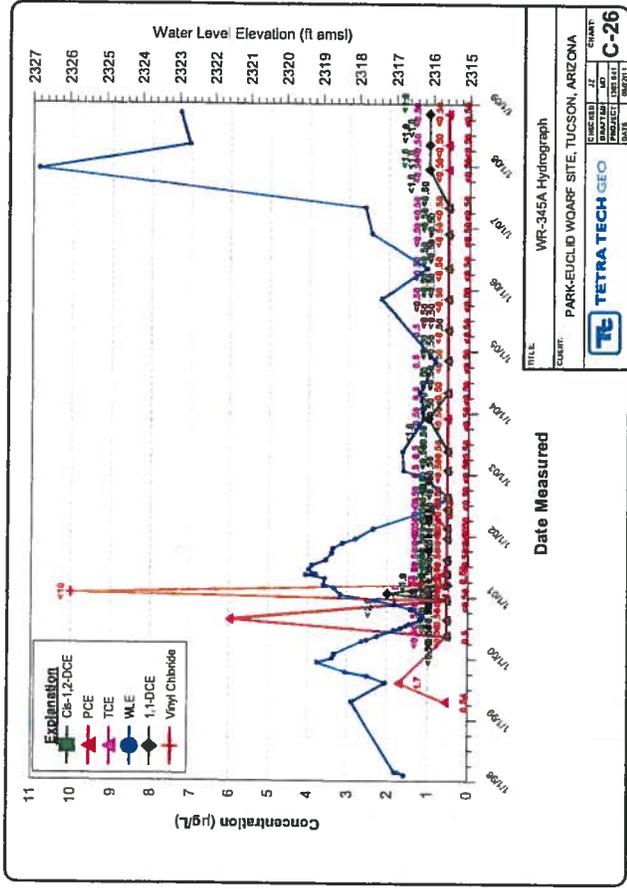
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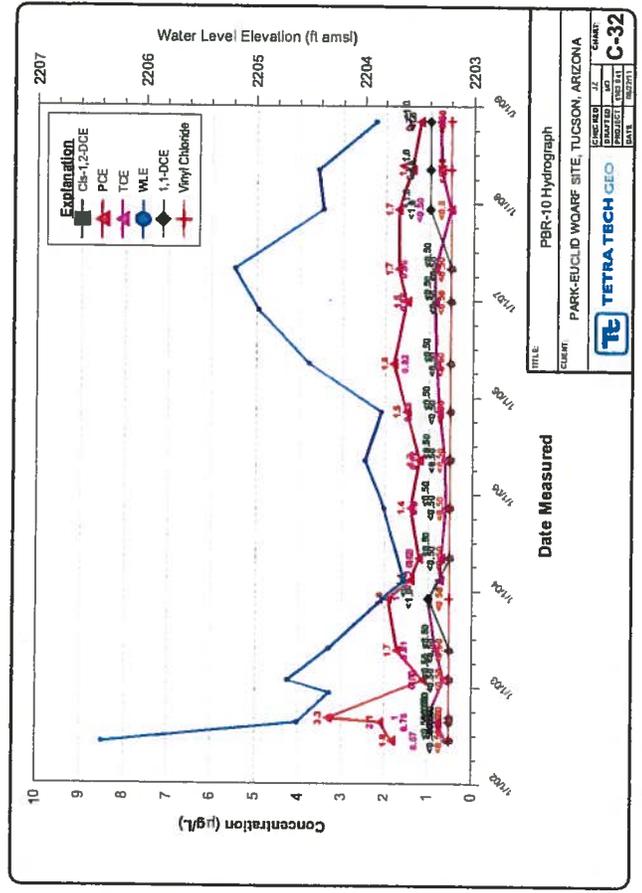
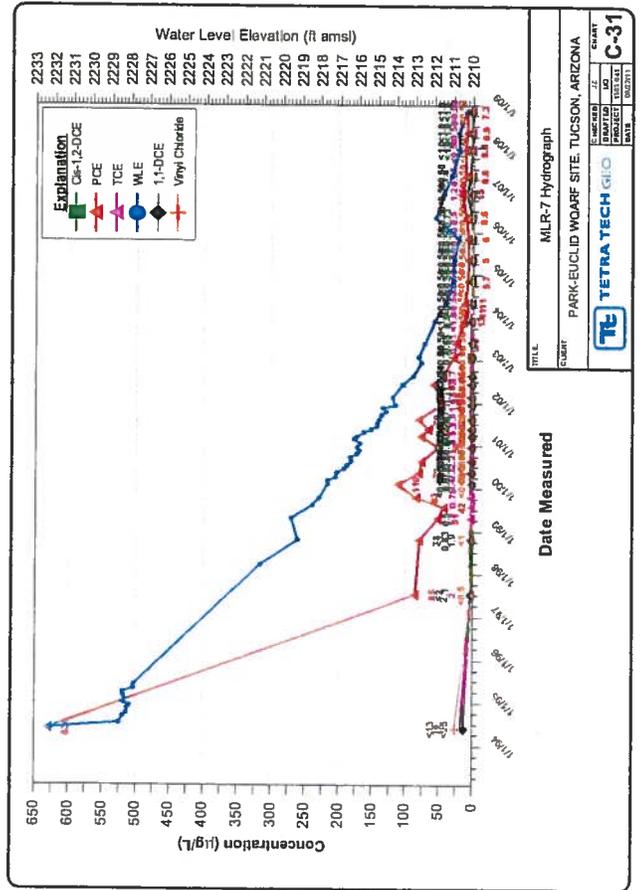
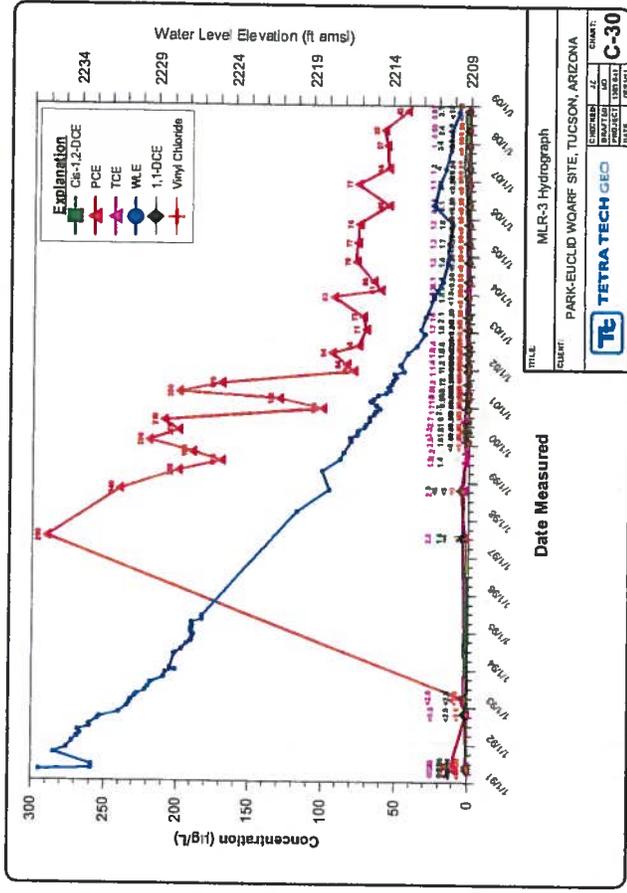
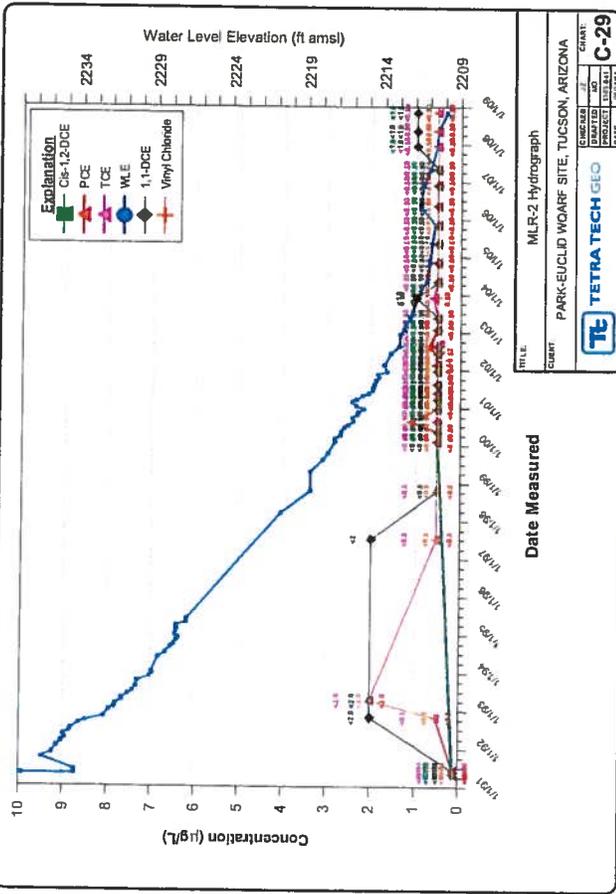
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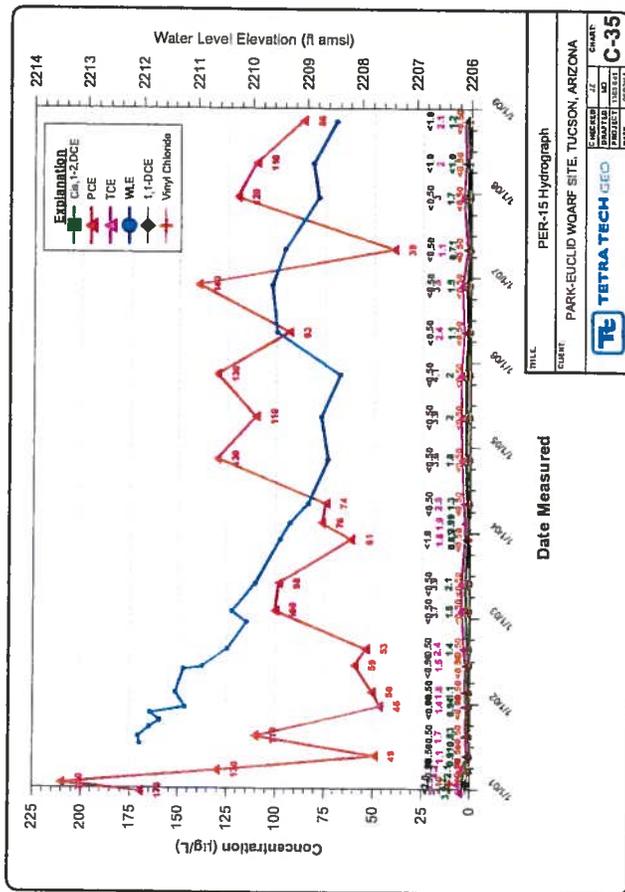
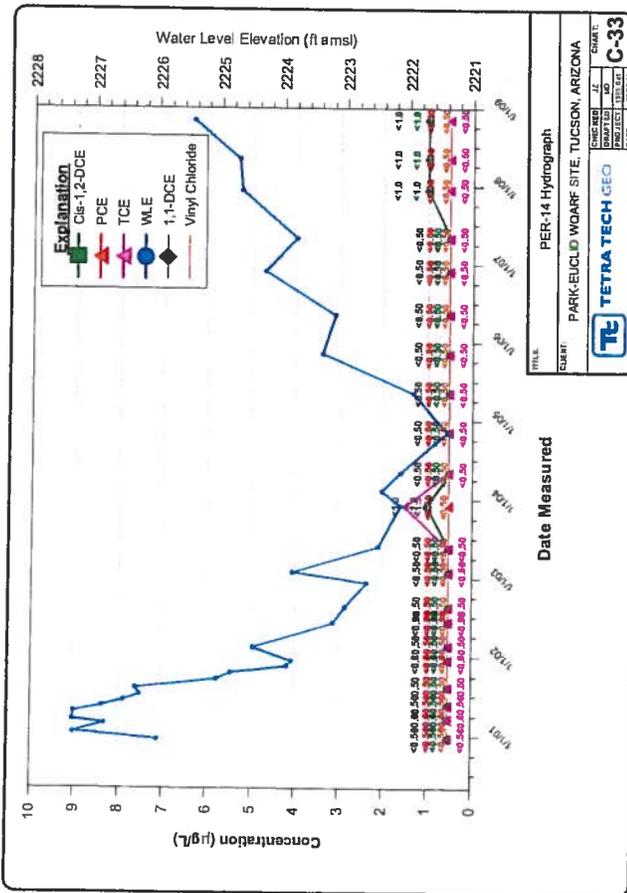
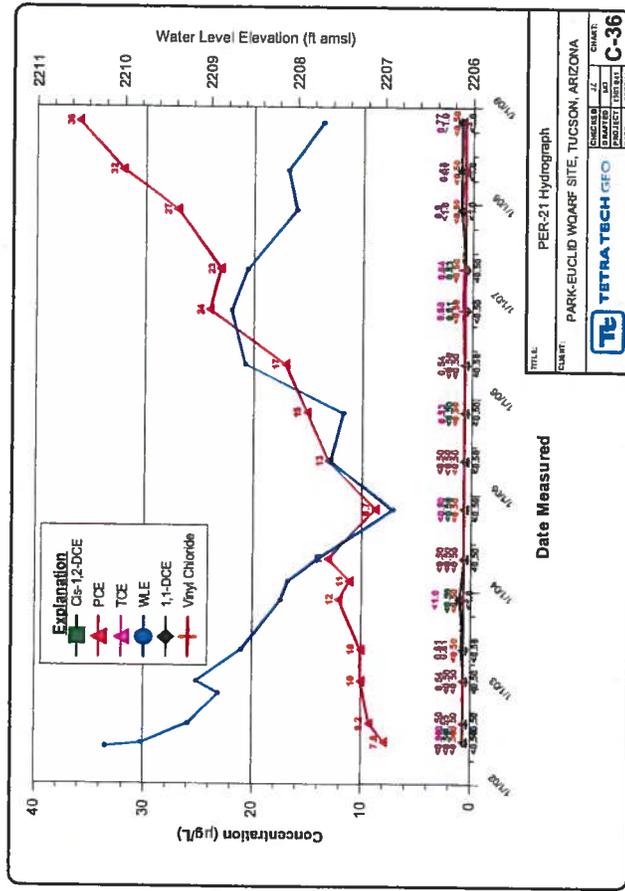
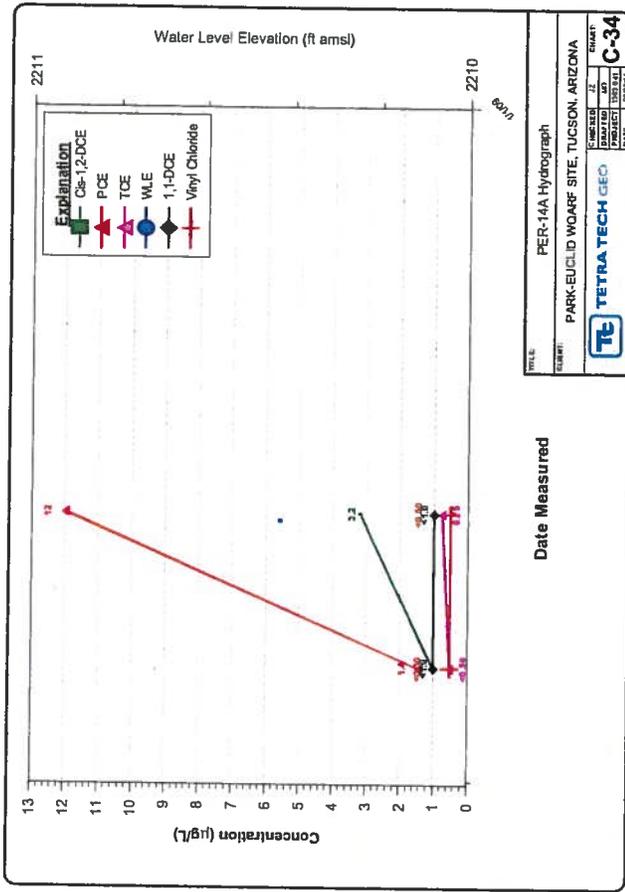
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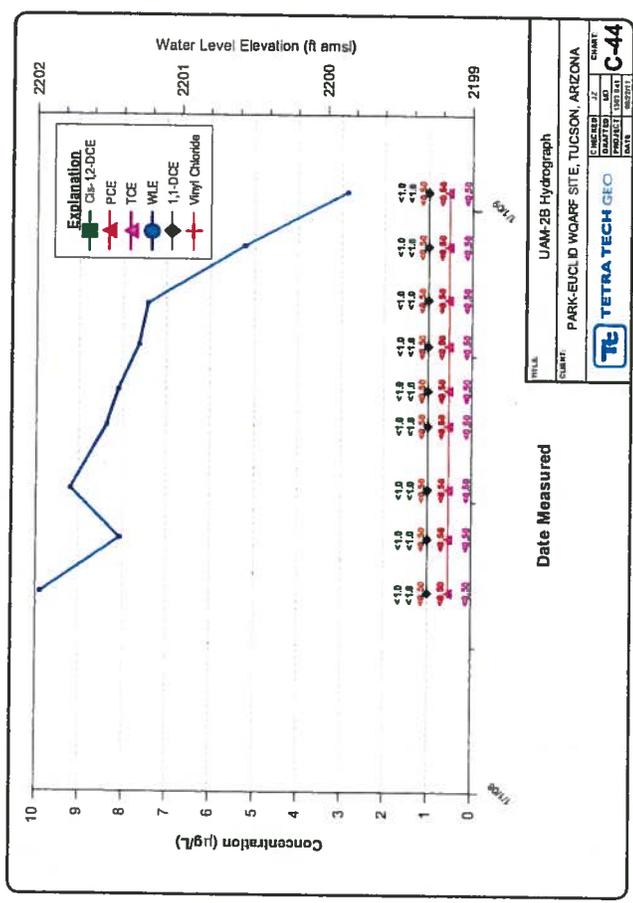
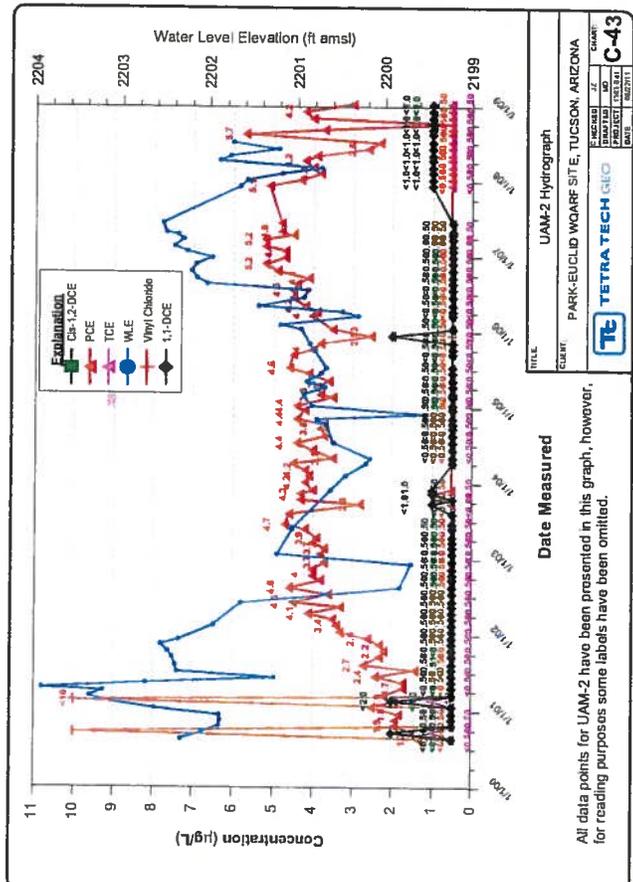
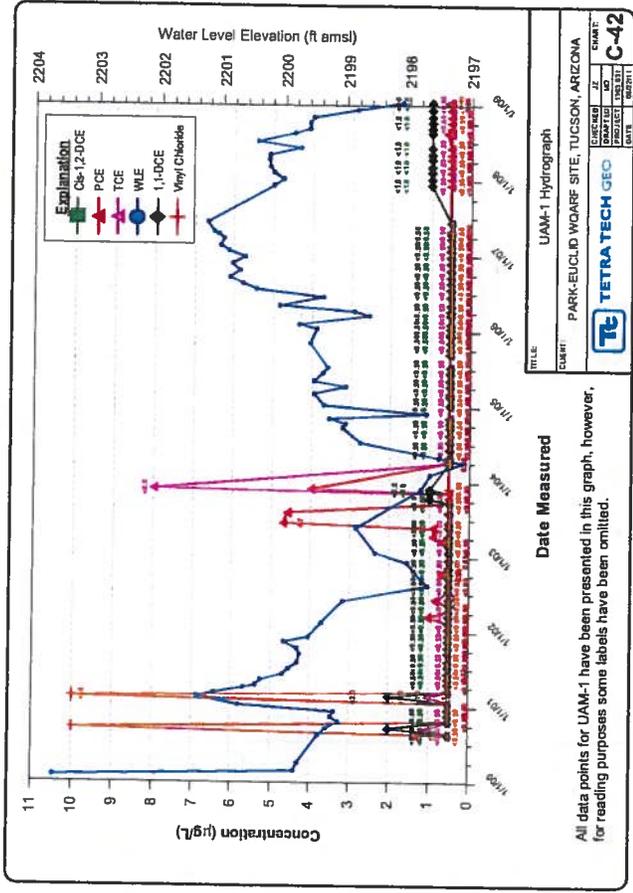
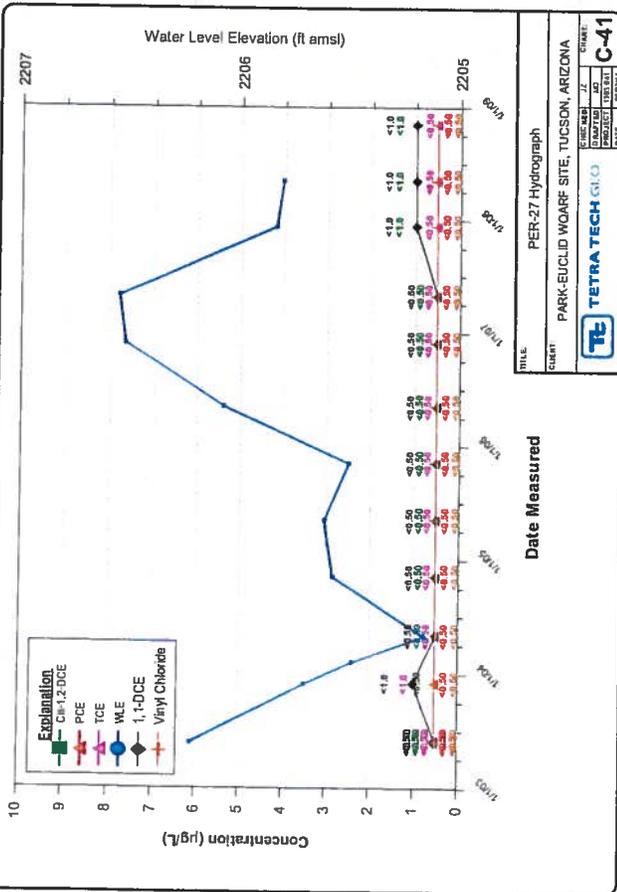






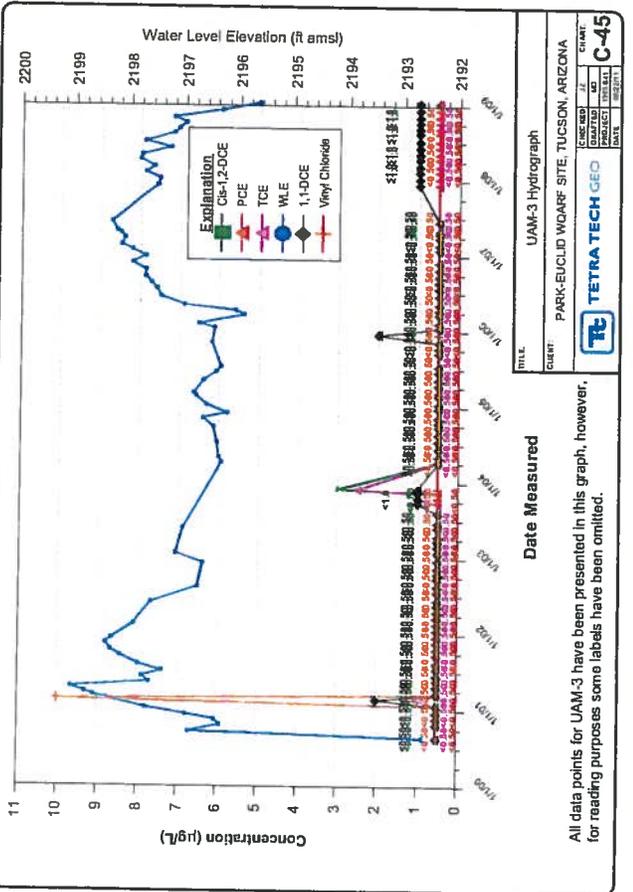
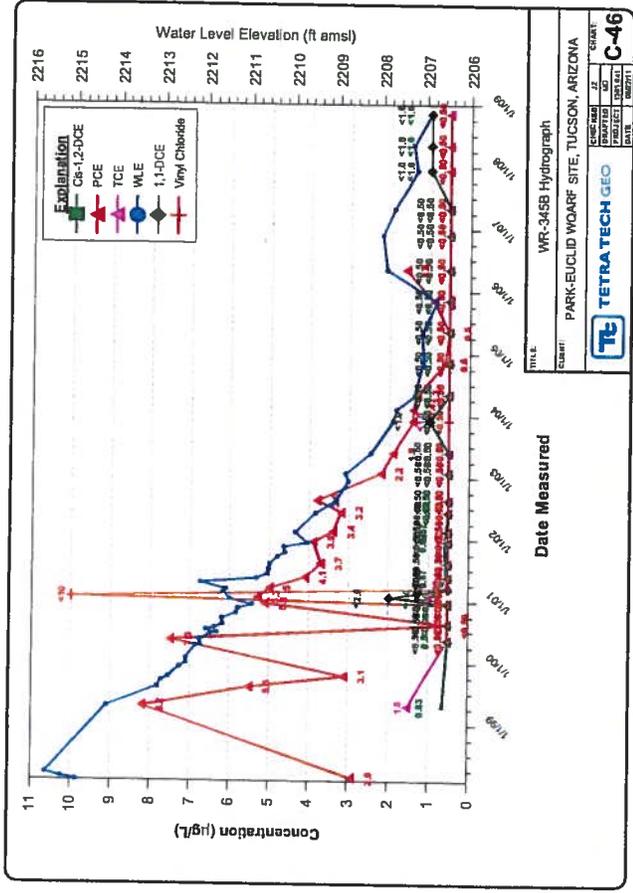




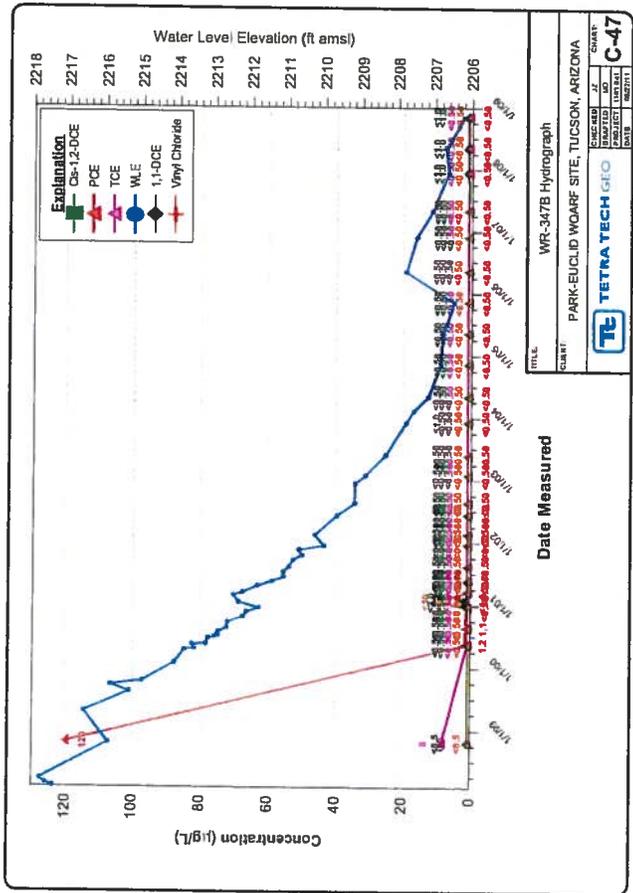


All data points for UAM-1 have been presented in this graph, however, for reading purposes some labels have been omitted.

All data points for UAM-2 have been presented in this graph, however, for reading purposes some labels have been omitted.



All data points for UAM-3 have been presented in this graph, however, for reading purposes some labels have been omitted.



**APPENDIX D
REMEDIAL OBJECTIVES REPORT**

REMEDIAL OBJECTIVES REPORT

**Park-Euclid Water Quality Assurance Revolving Fund Site
Tucson, Arizona**



April 15, 2008

**Prepared by:
Arizona Department of Environmental Quality
Southern Regional Office/Superfund Programs Unit
400 West Congress, Suite 433
Tucson, Arizona 85701**

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FIGURES

Figure 1. University of Arizona and City of Tucson Water Supply Wells

ACRONYMS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
bgs	below ground surface
cis-1,2-DCE	cis-1,2-dichloroethene
CAB	Community Advisory Board
CAP	Central Arizona Project
COT	City of Tucson
FS	Feasibility Study
g/m ³	grams per cubic meter
mg/kg	milligrams per kilogram
PCE	tetrachloroethene (or tetrachloroethylene)
RI	Remedial Investigation
RO(s)	Remedial Objective(s)
SVE	soil vapor extraction
TCE	trichloroethene, trichloroethylene
trans-1,2-DCE	trans-1,2-dichloroethene
UA	University of Arizona
VOC(s)	volatile organic compound(s)
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

The Arizona Department of Environmental Quality (ADEQ) has prepared this Remedial Objectives (RO) report for the Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Registry site to meet the requirements established under Arizona Administrative Code (A.A.C.) R18-16-406. This report relies upon the Land and Water Use Report (Use Report) prepared by ADEQ for the site dated May 18, 2004 and the comments received on the Proposed Remedial Objectives Report dated June 9, 2006.

Remedial Objectives (ROs) are established for the current and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be affected by a release of a hazardous substance. The rule specifies that the reasonably foreseeable uses of land are those likely to occur at the site, and the reasonably foreseeable uses of water are those likely to occur within one hundred years unless site-specific information suggests a longer time period is more appropriate [R18-16-406(D)]. Reasonably foreseeable uses are those likely to occur, based on information provided by water providers, well owners, land owners, governmental agencies and others. Not every use identified in the Use Report will have a corresponding RO. Uses identified in the Use Report may or may not be addressed based on information gathered during the public involvement process, statutory authority of WQARF, and whether the use is reasonably foreseeable.

Remedial Objectives were established for the current and reasonably foreseeable uses of land and water at the Park-Euclid WQARF site based on uses identified in the Land and Water Use Report dated May 18, 2004. The Use Report was available for public comment for a period of 90 days, from July 4 to October 1, 2004. A public meeting to obtain community and stakeholder input on the Use Report and Proposed ROs was held by ADEQ on September 14, 2004. The final RO report is the result of the efforts and participation of stakeholders and interested parties. This report also includes a response to comments for written comments received on the Remedial Objectives report. The final RO report will be combined with the Remedial Investigation (RI) report and a Final RI report will be released.

The ROs chosen for the Park-Euclid Site will be evaluated in the Feasibility Study (FS). The FS will evaluate specific remedial measures and strategies required to meet the ROs and propose a reference remedy and at least two alternative remedies, all capable of meeting the ROs. The proposed remedies will also be generally compatible with the future land use specified by the land owner. Possible mechanisms to achieve the ROs will be evaluated in the FS and presented in the FS report.

DEFINITIONS

Remedial Strategy: One or a combination of the six general strategies identified in Paragraph B.4 of A.R.S. §49-282.06 and further defined in rules promulgated in accordance with this statute. In general, these strategies are as follows: plume remediation, physical containment, controlled migration, source control, monitoring, and no action.

Remedial Measure: A specific action taken in conjunction with remedial strategies as part of the remedy to achieve one or more of the remedial objectives. For example, remedial measures may include well replacement, well modification, water treatment, provision of replacement water supplies, and engineering controls.

Reference Remedy: A combination of remedial strategies and remedial measures which, as a whole, is capable of achieving remedial objectives. The reference remedy is compared with the alternative remedies for purposes of selecting a proposed remedy at the conclusion of the Feasibility Study.

Alternative Remedy: A combination of remedial strategies and remedial measures different from the reference remedy that is capable of achieving remedial objectives. The alternative remedies are compared with the reference remedy for purposes of selecting a proposed remedy at the conclusion of the feasibility study.

The ROs must be stated in the following terms: 1) protecting against the loss or impairment of each use; 2) restoring, replacing, or otherwise providing for each use; 3) when action is needed to protect against or provide for the use; and 4) how long action is needed to protect or provide for the use.

2.0 REMEDIAL OBJECTIVES FOR LAND USE

Remedial Objectives have been established for land use likely to occur within 100 years for soils underlying the Park-Euclid Site. Information provided to ADEQ by the City of Tucson (COT), Pima County, and Mission Linen and Uniform Service (Mission Linen) for the Land and Water Use Report indicates current site-specific land uses are related to the Arroyo Chico and commercial laundry operations. Future uses were identified for the Arroyo Chico Floodwater Detention Basin Project (including a neighborhood community center, public open space, trails, park space, and natural habitat restoration) and continued commercial laundry operations.

2.1 *Upper Vadose Zone*

Typically, ROs for land use are established for those properties known to be contaminated with hazardous substances. For the Park-Euclid Site, those properties known to be contaminated are owned by Mission Linen and are the locations of former dry cleaning operations.

Historically at the Park-Euclid Site, PCE has been detected in soil samples collected from the upper vadose zone (extending from the ground surface to about 85 – 90 feet below ground surface (bgs)) at concentrations as high as 3.1 milligrams per kilogram (mg/kg).

Mission Linen conducted extensive soil sampling in 2003 to determine the effectiveness of a pilot soil vapor extraction system (SVE) that operated from June 2000 to August 2002; approximately 6,000 pounds of PCE were removed from the upper vadose zone by this SVE system. Based on Mission Linen's sampling, PCE soil vapors currently occur in the upper vadose zone at a maximum concentration of 59,000 micrograms/cubic meter ($\mu\text{g}/\text{m}^3$) at a depth of 85 feet bgs. During sampling conducted by Mission Linen during 2003, TCE, cis-1,2-DCE, trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride were also detected in soil gas collected from soils at a depth of 85 feet bgs (URS, 2003). The maximum concentrations of PCE in the soil gas are located under the existing Mission Linen building, with concentrations decreasing rapidly towards the Mission Linen property boundaries.

Shallow soils contaminated with PCE and its degradation products are restricted to an area underlying the current Mission Linen facility. Mission Linen owns six parcels in the area of contaminant releases, which overlie the central portion of the soil vapor plume that exists in the upper vadose zone.

Mission Linen's current and future uses of these properties are related to commercial laundry operations.

These current and future land uses are reasonably foreseeable.

The RO for land use by Mission Linen is:

To restore soil conditions to the remediation standards for non-residential use specified in A.A.C. R18-7-203 (specifically background remediation standards prescribed in R18-7-204, pre-determined remediation standards prescribed in R18-7-205, or site-specific remediation standards prescribed in R18-7-206) that are applicable to the hazardous substances identified (tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride).

2.2 Lower Vadose Zone

PCE has also been detected in soil matrix samples collected from the lower vadose zone (extending from 100 feet to 200 feet bgs) at concentrations as high as 170 mg/kg at a depth of 165 feet bgs (Miller Brooks, 2001). Soil vapors also occur in the lower vadose zone with a maximum PCE concentration of 5.46 grams per cubic meter (g/m^3) in samples collected from 165 to 170 feet bgs by ADEQ in 2003; other VOCs were also present (Hydro Geo Chem, 2003).

Since the presence of PCE in the lower vadose zone occurs at a depth of 165 feet bgs, thus below the shallow perched aquifer and underlying clay aquitard and directly above the regional aquifer, contamination in the lower vadose zone does not present a threat to the current or future uses of the land overlying this area. The lower vadose zone will be addressed by the Remedial Objectives which have been developed to address the contamination that occurs in the underlying regional aquifer.

3.0 REMEDIAL OBJECTIVES FOR GROUNDWATER USE

Based on an Arizona Department of Water Resources (ADWR) well inventory and field verification conducted in 2003, 58 registered wells were identified within the Park-Euclid Site; 46 of these wells are registered for monitoring use, 5 for domestic use, 2 for industrial use, and 3 for unspecified uses.

Of these 58 registered wells, ADEQ requested and received information from well owners regarding specific current and future uses of groundwater wells in or near the Park-Euclid Site based on the groundwater flow direction, as well as the current and potential future locations of contaminant plumes.

ADEQ received information from two parties that either currently operate potable water supply wells or could potentially install and operate potable water supply wells in the foreseeable future: the University of Arizona (UA) and COT (Figure 1).

Responses received from the remaining well owners indicate these groundwater wells are only used for groundwater monitoring and sampling purposes. Groundwater monitoring and sampling uses will not be addressed by the ROs for groundwater use, since remediation of the groundwater will not interfere with the current and future uses of groundwater monitor wells.

The following ROs for groundwater address the use of the regional aquifer and do not include ROs for groundwater that occurs in the shallow, perched aquifer. The shallow, perched aquifer is not currently being used as a source for drinking water. As discussed in the Final RI report (ADEQ, 2008), site characterization conducted to date has focused on PCE and its degradation products in the regional aquifer due to the potential impact to downgradient production wells.

Although PCE and its degradation products have been characterized as to origin and lateral extent in the shallow perched aquifer, diesel free-product and fuel-related compounds were not subject to any specific characterization efforts during previous RI work conducted by ADEQ.

3.1 University of Arizona

Based on information provided by the UA, the following consists of a summary of reasonable foreseeable uses of water. UA currently owns nine production wells which are operated to meet the needs of the Main Campus and the Arizona Health Sciences Center. Water uses include domestic, irrigation, research/lab, commercial, steam, and cooling tower applications. The infrastructure exists for UA to supplement groundwater delivered by UA production wells with COT water, although UA prefers to maximize use of its own production wells for financial reasons.

At the Main Campus, three wells are currently active (Architecture, CRB and Optical Science wells) and four wells are inactive (Huachuca, Aggie, Martin Street, and Library wells).¹ A Notice of Intent to Abandon the Huachuca well was submitted by UA to ADWR on September 1, 2004; the well abandonment was approved by ADWR on September 23, 2004. The Architecture well is expected to be replaced in the next 10 – 20 years. The Aggie well will probably be abandoned and replaced within the next five years. The CRB well is expected to remain in service for another 20 – 30 years. The Optical Science well was completed in April 2004 and is currently an active well.

At the Arizona Health Sciences Center, two wells are currently active (North and South Wells). The North Well may be replaced in the next 10 years; the South Well will probably be replaced within the next five years.

The average annual water use for UA during 2001 and 2002 was about 875 acre-feet; potable usage was about 685 acre-feet, and the remainder was supplied by reclaimed effluent purchased from the COT. With increased use of reclaimed effluent, the estimated annual potable water use is expected to be about 500 acre-feet. Based on the expected campus population growth rate and the ultimate campus build-out population of 72,000 (probably reached by about 2030), UA

¹ Since the UA response dated February 6, 2004 to ADEQ's request for information concerning water use, the Library well has been abandoned and a replacement well (Optical Science well) for the Martin Street well has been drilled. There are no identified plans for the inactive Martin Street well. The Optical Sciences well is currently an active production well.

estimates annual water use would be about 808 acre-feet. After 2030, the growth rate is expected to decrease from 2.2 percent per year to 1 – 1.5 percent per year.

These current and future regional aquifer groundwater uses are reasonably foreseeable.

3.2 City of Tucson

According to the COT, there are no active COT production wells in the Park-Euclid area partially due to the presence of VOCs and/or diesel in groundwater. Well B-003B was converted from an active production well to a monitor well given its location near the Park-Euclid Site; well A-033A, was abandoned due to the presence of diesel fuel. In additional correspondence from COT dated January 26, 2006, COT believes there is a low probability that these wells would be utilized in the near term, although replacement wells may be installed near A-033A, B-003B, and B-008B wellsites if the need arises.

COT has also indicated that future uses of groundwater in the vicinity of the Park-Euclid Site will remain low until its Central Arizona Project (CAP) allocation is fully utilized, which is not expected within the next five to ten years based on projected demands. COT also states that use of existing wells in the immediate vicinity of the Park-Euclid Site will be given a lower priority for potential use and would be kept off-line as much as possible.

COT indicates significant water supply changes will occur over the next 100 years in the vicinity of the Tucson WQARF sites and that it is imperative that the regional aquifer be managed to ensure groundwater availability to meet the community's future needs. COT states that it is certain that the community will rely on the regional aquifer in the vicinity of the Tucson WQARF sites to satisfy current and projected water demands and believes it is imperative to remediate contaminated groundwater sites in the vicinity of COT's Central Well Field.

According to COT, remedial actions for all Tucson WQARF sites should achieve the specified remedial objectives and should preserve Tucson Water's flexibility in responding to a range of potential near- and long-term water supply scenarios.

These future regional aquifer groundwater uses are reasonable foreseeable.

It is considered reasonably foreseeable that groundwater use from the regional aquifer might occur at or near the Park-Euclid Site sometime during the next 100 years. The RO for potable use of groundwater from the regional aquifer is:

To protect for the use of the groundwater supply by the University of Arizona near the Park-Euclid WQARF site from contamination from the site. This action is needed for the present time and for as long as the UA wells are used for potable purposes, the resource remains available, and their use is threatened as a result of contamination from the Park-Euclid WQARF site. This action is also needed to protect potential future use of the groundwater supply for the City of Tucson, which is not expected within the next five to ten years.

The remediation of the regional aquifer to fulfill this RO addressing the current and reasonably foreseeable uses of groundwater by the existing UA water supply wells will also address any future uses by COT based on the current low priority given groundwater withdrawals by COT in this area.

4.0 REFERENCES

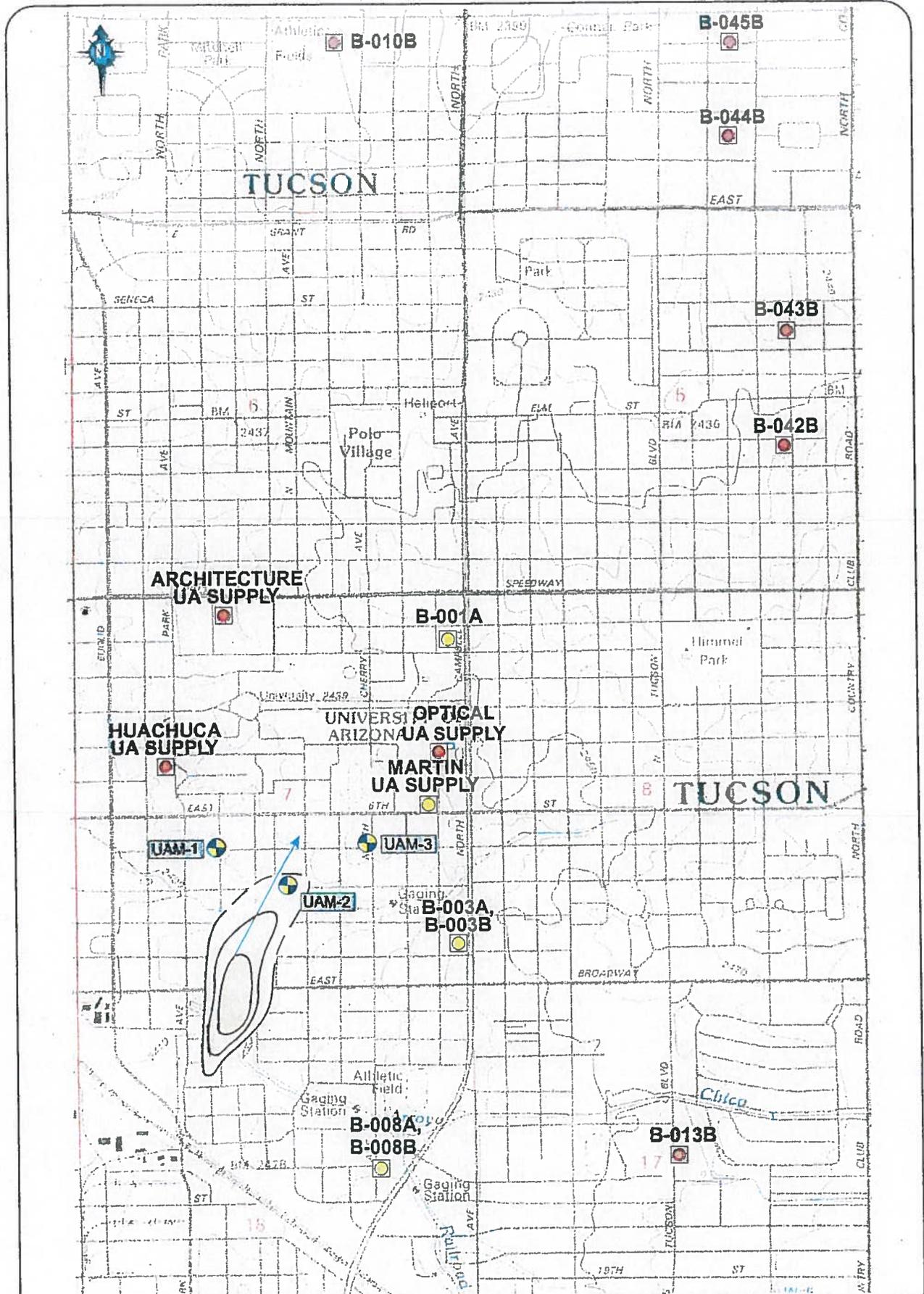
Arizona Department of Environmental Quality (ADEQ), 2008, *Final Draft Park-Euclid Remedial Investigation Report prepared for the Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona*. April 30.

Hydro Geo Chem, 2003, *Results of Soil Gas Sampling From the Lower Unsaturated Zone – Park-Euclid WQARF Site*. June 20.

Miller Brooks Environmental, Inc., 2001, *Monitor Well Installation Report – Park-Euclid WQARF Site*. February 7.

URS Corporation, 2003, *Vadose Zone Confirmation Study, Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona*. August 7.

FIGURE



LEGEND

- B-013B Active Regional Aquifer Water Supply Well Location.
- B-001A Inactive Regional Aquifer Water Supply Well Location.
- PCE in Regional Aquifer. ADEQ Monitor Wells
- Groundwater Flow Direction.



MILLER BROOKS Environmental, Inc.		PARK - EUCLID WQARF SITE TUCSON, ARIZONA1	
UA and COT WATER SUPPLY WELLS			FIGURE 1
PROJECT# 365-0001-04	FILE# 365tpob0301	DATE DRAWN: 03/29/01	DRAWN BY: B. McLELLAN

APPENDIX E
COMMENTS RECEIVED AND RESPONSIVENESS
SUMMARY

Arizona Department of Environmental Quality (ADEQ) has prepared this response to comments received from various parties on the ADEQ Proposed Remedial Objectives for the Park-Euclid WQARF Site in Tucson, Arizona. The Final Draft Remedial Investigation (RI) Report was made available for public comment on July 4, 2004. As specified in the Arizona Administrative Code (A.A.C.) R18-16-406(I)(1), a public meeting was held 45 to 90 days after the release of the RI to solicit and consider comments on the Proposed Remedial Objectives for the site. This meeting was held on September 14, 2004. ADEQ received written comments on the Proposed Remedial Objectives from the following: 1) The Park-Euclid Community Advisor Board (CAB), 2) Mission Linen Supply (Mission Linen) and 3) The City of Tucson. No other comments were received in the period allotted.

The Proposed Remedial Objectives (RO) Report was then prepared and made available for public review and comment from June 9 to August 7, 2006. This responsiveness summary addresses comments received by ADEQ on the proposed remedial objectives.

SPECIFIC COMMENTS FROM THE PARK-EUCLID COMMUNITY ADVISORY BOARD

Comments regarding the RO report were received in a letter from Co-Chairs Don Davis and Freya Eddy to Matt Doolen, the ADEQ Project Manager, dated September 29, 2004. The following section includes the text of comments along with a response to address each comment.

Comment 1. Our first priority for remediation efforts is to address the contamination plume in the regional aquifer, which threatens drinking water downgradient. Efforts should be directed at slowing, then stopping the plume's movement as quickly as possible. Steps must also be taken to assure that future water use outside the area of the current plume does not negatively impact the plume's movements. The level of contamination in this aquifer should be lowered as far as reasonable achievable, at least to potable water standards.

Response 1: ADEQ agrees that the first priority is to address the contamination in the regional aquifer. Remediation of the regional aquifer is necessary to protect the groundwater supply for the University of Arizona and for the potential future uses for the City of Tucson. To help evaluate, predict and manage the movement of contaminants as they move with groundwater through the subsurface a contaminant fate and transport numerical model is currently being prepared. This information will be used to develop a remedial strategy and will be an integral part of the Feasibility Study.

Comment 2. While regional aquifer contamination mentioned above is of greater concern, swift action also is needed to address water contamination in the perched aquifer. First, any spread should be prevented. Early actions, to the extent not taken already, also should be directed at eliminating the possibilities of perched aquifer contamination migrating down to affect the

regional drinking-water aquifer, such as through abandoned or poorly constructed older wells, or natural geologic connection. Studies to date have not found a specific natural connection between the perched and regional drinking-water aquifers, but such connections may exist. Geological changes over time could also cause connections. Removal of contaminants from the perched aquifer would be the desired method of eliminating this hazard.

Response 2: Based on information obtained for the Land and Water Use Report, no production or irrigation wells are being utilized for groundwater withdrawal from the shallow, perched aquifer. Therefore, ADEQ has determined that remediation of the regional aquifer is the highest priority. Mission Linen's Old Well and MP-1 were abandoned because they were possible vertical conduits to the regional aquifer. Based on information obtained during the remedial investigation and from the Arizona Department of Water Resources (ADWR), ADEQ is not aware of additional wells that may act as conduits.

Comment 3. Contaminated water which cannot be treated to drinking-water standards, should be dealt with in an environmentally safe manner: transported off site or used for industrial or other purposes for which it is suited.

Response 3: Groundwater generated during remedial activities will be appropriately handled to ensure protection of human health and the environment.

Comment 4. Sampling and testing of water for contaminant levels, under the ground and after treatment, must continue on a regular and relatively frequent basis until it can be assured that people, and other living things, in the community will never be exposed to contamination from the site.

Response 4: Groundwater monitoring and sampling across the site was previously conducted on a quarterly basis for several years. Based on current conditions, groundwater monitoring and sampling is conducted on a semi-annual basis. The sentinel and University of Arizona wells are monitored and sampled monthly. Groundwater monitoring and sampling across the site will be conducted as long as necessary to ensure that remedial efforts are being or have been achieved.

Comment 5. All future activities in the contamination area, but particularly those directly or indirectly affecting the polluted aquifers, or involving exposure to contaminated soil, should be restricted and monitored closely to ensure they do no impact negatively, in any way, the cleanup effort.

Response 5: Within its jurisdiction, ADEQ WQARF Program will monitor activities that have the potential to impact the soil and groundwater of the Park-Euclid Site.

Comment 6. Measures to clean contaminated soil, at all levels, must continue and, to the extent possible, be intensified. Areas where contaminated soil is not yet cleaned to human contact standards must be identified clearly as off-limits

to incidental human contact. Contamination in soils must be reduced below regulatory limits to a depth at which no foreseeable intrusion or human activity would take place. Sampling and testing for contaminant levels in treated and untreated soil must continue on a regular and relatively frequent basis.

Response 6: Based on information collected at the Park-Euclid WQARF site, elevated concentrations of contaminants in soil are primarily located beneath the Mission Linen facility and 13th Street, an asphalt paved street. Incidental human contact with contaminated soil is minimized due to the presence of the building, the concrete loading area and the presence of the pavement. Based on information provided by Mission Linen for the Land and Water Use Report, the Mission Linen property is to remain as a non-residential property. The upper vadose zone beneath Mission Linen may be remediated to residential or non-residential soil remediation levels (SRLs) (R18-7-205) or to a site-specific remediation level derived from a site-specific human health risk assessment (R18-7-206).

Comment 7. Emissions of contaminants to the air, inherent in cleanup technologies now being employed and contemplated, must be kept below regulatory limits, preferably below current limits for emissions from the soil vapor extraction at Mission Linen. Air emissions must be sampled and tested regularly and relatively frequently to ensure nearby residents and workers are not impacted either by routine or by “upset” conditions.

Response 7: Pima County Department of Environmental Quality (PDEQ) has incorporated into Mission Linen’s permit adequate monitoring, recordkeeping and testing requirements to ensure compliance with the emission limits in the operational limitations of the permit. According to Mission Linen’s Air Quality Operating Permit, grab samples will be collected from the influent and effluent vapor streams following four different schedules to ensure compliance with permit conditions. The four schedules change from daily, to twice weekly, to weekly, to monthly grab samples as long as there is no exceedance. If an exceedance occurs, Mission Linen shall take corrective actions to reduce the concentration of VOCs and revert back to the daily sampling schedule.

Comment 8. If the U.S. Army Corps of Engineers’ Arroyo Chico project is developed as envisioned, we want to reiterate that Basin One is not to be lined. People living in the vicinity have been clear on this issue and the CAB supports them fully. Nonetheless, neither basin One nor any other aspect of the Arroyo Chico project can be allowed to interfere in any way with the Park-Euclid site cleanup efforts aimed at reaching remedial objectives: Basin One should not alter the majority of infiltration events and should preserve the desired hydrological characteristics of the aquifer under the basin.

Response 8: ADEQ agrees that Basin One should be unlined and that the grading should not change the rate of infiltration from stormwater runoff.

Comment 9. Protections from water, soil, and air contamination, and all efforts to clean the site must err on the side of safety over the long term and be included in all aspects of the Park-Euclid remedial activity and of the Arroyo Chico Project.

Response 9: Remedial actions that will be conducted at the Park-Euclid site will be conducted in a safe manner to ensure protection of human health and the environment. The U.S. Army Corps of Engineers are responsible for safety concerns emanating from the Arroyo Chico Project.

SPECIFIC COMMENTS FROM MISSION LINEN SUPPLY

The following comments have been prepared by URS Corporation on behalf of Mission Linen in correspondence dated September 29, 2004, to Matthew Doolen, ADEQ Project Manager. The following section includes the text of comments along with a response to address each comment.

Specific Comments

Perform source removal of chlorinated volatile organic compounds (VOCs) in the perched aquifer and upper vadose zone, to the extent practicable, to protect the regional aquifer from further contamination resulting from releases at the Park-Euclid site.

Comment 1. As ADEQ is aware, source removal in the perched aquifer is complicated by the presence of petroleum hydrocarbon contamination, in the form of diesel fuel free product and associated VOCs, that have migrated from off-site sources not associated with the Park-Euclid Site. Such petroleum hydrocarbon contamination may affect the practicability, cost-effectiveness, and technical feasibility of remedial activities associated with source removal in the perched aquifer.

Response 1: Based on information obtained for the Land and Water Use Report, no production or irrigation wells are being utilized for groundwater withdrawal from the shallow, perched aquifer. Therefore, ADEQ has determined that remediation of the regional aquifer is the highest priority.

Protect the current beneficial use of the regional aquifer (groundwater production at the University of Arizona) from releases at the Park-Euclid Site by meeting water quality standards at the point of use.

Comment 2. No comment made.

Response 2. No response made.

Protect the potential future beneficial uses of the regional aquifer consistent with the Tucson Active Management Area (AMA) plan.

Comment 3. A necessary component of this Remedial Objective is the establishment of time-frames when action is needed to protect the use consistent with R18-406.I.4.b of the Arizona Administrative Code. Further, the Groundwater Quality Management Program (Chapter 7) of the Arizona Department of Water Resources Third Management Plan (2000 through 2010) for the Tucson AMA emphasizes the need to balance the need for aquifer cleanup with their stated objective to “ensure that remediation of contaminated groundwater uses the least amount of groundwater necessary to facilitate the objectives of each remedial action project.” In light of these provisions, we believe an appropriate analysis should be performed, that includes

numerical groundwater flow and contaminant transport modeling, to better understand the groundwater flow regime and associated contaminant transport patterns and attenuation rates within the regional aquifer. Such analysis will be useful: (a) to establish potential time-frames when action is needed to protect the future beneficial uses of the regional aquifer, and (b) to determine whether withdrawals are necessary to prevent exposure to point-of-use receptors and if so, to identify the minimum groundwater withdrawal volumes necessary to protect the potential future beneficial uses of the regional aquifer.

Response 3: ADEQ agrees that remediation of contaminated groundwater should use the least amount of groundwater to optimize the contaminant capture zone and to facilitate the objectives of each remedial action project. Also, a contaminant fate and transport numerical model is currently being prepared and will be included in the Feasibility Study.

SPECIFIC COMMENTS FROM THE CITY OF TUCSON ENVIRONMENTAL SERVICES

The City of Tucson (COT) Environmental Services provided comments to both the Final Draft RI and Proposed ROs in correspondence dated October 4, 2004, to ADEQ. The following section includes the text of comments along with a response to address each comment.

GENERAL COMMENT

With regards to the perched aquifer, the diesel plume should be an integral part of this project. While the City understands that ADEQ at the on-set of this RI investigation excluded the diesel plume from its scope of work based on funding, the City believed that the diesel contamination must be addressed to complete the RI. The diesel plume prevents future use of this water. This is particularly important at ADEQ moves into finalizing the [ROs] for the site. The City's position is that the RO must be to clean up both the perched and regional aquifers to drinking water standards. This RO cannot be achieved with the diesel being ignored.

Response: Based on information obtained for the Land and Water Use Report, no production or irrigation wells are being utilized for groundwater withdrawal from the shallow, perched aquifer. Therefore, ADEQ has determined that remediation of the regional aquifer is the highest priority.

As the main water supplier in the Tucson Basin the City of Tucson would like to continue to work with ADEQ through the RO and feasibility process. The City is concerned that ADEQ has sometimes expressed the opinion in general that wellhead treatment by water suppliers is a feasible option for site clean-up. The City's maintains the ground water supply should be cleaned up to drinking water standards and the Tucson Community as a whole should not knowingly allow future degradation by plume migration. Delaying cleanup by waiting until an end user needs the water or placing the responsibility on the end user/water supplier for clean-up is not an acceptable remedial strategy.

Response. On a site-specific basis, wellhead treatment is a feasible option for ensuring clean water for end use.

WRITTEN COMMENTS RECEIVED

The Park-Euclid Community Advisory Board
for the State of Arizona
Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Site
Tucson, Arizona

September 29, 2004

Matt Doolen, R.G.
Project Manager
Arizona Department of Environmental Quality (ADEQ)
400 W. Congress, Suite 433
Tucson, AZ 85701

RE: CAB Comments on the Draft Remedial Investigation Report

Dear Mr. Doolen:

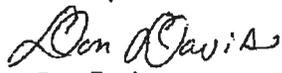
The Community Advisory Board (CAB) for the Arizona Department of Environmental Quality (ADEQ) Park-Euclid WQARF Site has reviewed the draft Remedial Investigation report (RI) for the site and submits the following comments to be addressed in the final RI.

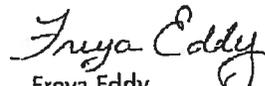
Overall, we, the CAB members, find the report is comprehensive and thorough and the CAB was kept well informed of most of the important findings presented in this report at our meetings. However, we do have one important correction and several suggestions as a result of our review of the draft RI. Our comments do not include specific concerns of Mission Linen, City of Tucson, or the University of Arizona, as they have indicated they will submit their own comments.

The statement on page 7 that – Basin One will be lined to minimize infiltration -- is incorrect. We have been informed by ADEQ, Pima County, and the U.S. Army Corps of Engineers, that the basin will not be lined and that the current plan for Basin One does not alter the majority of infiltration events and better preserves the desired hydrologic characteristics of the aquifer under the basin. Further, the community around the basin, Barrio San Antonio and Miles, does not want it lined. All subsequent parts of the report that are based on the assumption of a lined basin or reflect any basins being lined should be reworked and corrected to reflect an unlined Basin One.

The conclusion to the report states that the "report summarizes field Investigations." To the CAB, the conclusion is too often a list rather than a summary. The motivation for the work is often not given and the location in the report of the results of the work not stated. We suggest a historic document and summary table which would include brief descriptions of important results. A condensation of the table might be included in the Executive Summary. In the body of the report, and especially in the Executive Summary, the CAB would like an estimate of the total amount of contamination associated with the WQARF site in the soil, and in the upper and lower water-bearing units, and of the amount of contamination removed to date.

Thank you,


Don Davis *ejd*
Park-Euclid CAB Co-Chair


Freya Eddy *FE*
Park-Euclid CAB Co-Chair

Address Correspondence to: ADEQ Park-Euclid Community Advisory Board
c/o Arizona Department of Environmental Quality 400 W. Congress, Suite 433 Tucson, AZ 85701



September 29, 2004



Mr. Matthew L. Doolen
Superfund Program Unit Project Manager
Arizona Department of Environmental Quality
400 West Congress
Suite 433
Tucson, Arizona 85701

Subject: Recommended Remedial Objectives and Comments on the Final Draft Remedial Investigation Report, Park-Euclid WQARF Site, Tucson, Arizona

Dear Mr. Doolen:

Pursuant to Section R18-16-404.c.1.b of the Arizona Administrative Code, URS Corporation, on behalf of Mission Linen Supply, is submitting the enclosed recommended Remedial Objectives and comments on the Draft Remedial Investigation Report dated June 29, 2004 for the Park Euclid WQARF Site in Tucson, Arizona.

Please feel free to contact Joseph A. Drazek of Quarles & Brady Streich Lang ((602) 229-5335) or me at your convenience if you have questions or need additional information.

Sincerely,

Robert A. Boudra
Principal Hydrogeologist
Project Manager

cc: Ms. Janice Caesar, Mission Linen Supply
Mr. Donald W. Moore, ERS, Inc.
Charles S. Bargiel, Esq.
Joseph A. Drazek, Esq.
James M. Sakrison, Esq.

URS Corporation
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**Park - Euclid WQARF Site
Recommended Remedial Objectives
Prepared by URS Corporation on behalf of Mission Linen Supply
September 29, 2004**

The following recommended Remedial Objectives have been prepared by URS Corporation for the Park – Euclid WQARF Site in Tucson, Arizona and are being submitted to the Arizona Department of Environmental Quality on behalf of Mission Linen Supply.

- 1. Perform source removal of chlorinated volatile organic compounds (VOCs) in the perched aquifer and upper vadose zone, to the extent practicable, to protect the regional aquifer from further contamination resulting from releases at the Park-Euclid site.**

As ADEQ is aware, source removal in the perched aquifer is complicated by the presence of petroleum hydrocarbon contamination, in the form of diesel fuel free product and associated VOCs, that have migrated from off-site sources not associated with the Park - Euclid Site. Such petroleum hydrocarbon contamination may affect the practicability, cost-effectiveness, and technical feasibility of remedial activities associated with source removal in the perched aquifer.

- 2. Protect the current beneficial use of the regional aquifer (groundwater production at the University of Arizona) from releases at the Park – Euclid Site by meeting water quality standards at the point of use.**
- 3. Protect the potential future beneficial uses of the regional aquifer consistent with the Tucson Active Management Area (AMA) plan.**

A necessary component of this Remedial Objective is the establishment of time-frames when action is needed to protect the use consistent with R18-406.I.4.b. of the Arizona Administrative Code. Further, the Groundwater Quality Management Program (Chapter 7) of the Arizona Department of Water Resources Third Management Plan (2000 through 2010) for the Tucson AMA emphasizes the need to balance the need for aquifer cleanup with their stated objective to “ensure that remediation of contaminated groundwater uses the least amount of groundwater necessary to facilitate the objectives of each remedial action project.” In light of these provisions, we believe an appropriate analysis should be performed, that includes numerical groundwater flow and contaminant transport modeling, to better understand the groundwater flow regime and associated contaminant transport patterns and attenuation rates within the regional aquifer. Such analysis will be useful: (a) to establish potential time-frames when action is needed to protect the future beneficial uses of the regional aquifer, and (b) to determine whether withdrawals are necessary to prevent exposure to point-of-use receptors and, if so, to identify the minimum groundwater withdrawal volumes necessary to protect the potential future beneficial uses of the regional aquifer.

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**Park - Euclid WQARF Site
Draft Remedial Investigation Report Comments
Prepared by URS Corporation on behalf of Mission Linen Supply
September 29, 2004**

The following comments have been prepared by URS Corporation with respect to the report entitled "Final Draft, Park – Euclid Remedial Investigation Report" dated June 29, 2004 which was prepared by Miller Brooks Environmental, Inc. on behalf of the Arizona Department of Environmental Quality (ADEQ).

A. GENERAL COMMENT

Based on our review, we believe that ADEQ's Draft Remedial Investigation Report for the Park – Euclid WQARF site generally provides a thorough discussion of work performed to date and the associated data interpretation and conclusions. However, we believe that additional analysis and/or data presentation should be included in the report, especially with respect to contaminant mass calculations and characterization of groundwater flow and contaminant transport. Further, we recommend that ADEQ avoid speculation regarding possible sources of contamination which lack evidentiary support. Additional details regarding these issues are presented in the specific comments below.

B. SPECIFIC COMMENTS

1. ES-5. Last Paragraph, 1st Line. "UA, which is located about one-half mile downgradient to the north,..."

Comment. The University of Arizona is approximately 1 mile north of the Park – Euclid site, as stated in Section 1.3.2 of the document.

2. Page 7. 4th Paragraph. 3rd Line. "At the request of ADEQ, Basin 1 will be lined to minimize infiltration of detained water."

Comment. It is our understanding that the Corps of Engineers now plans to construct the basin in an unlined manner at ADEQ's request.

3. Page 8. 1st Paragraph. 1st Line. References Figure 5 which shows "sites with known subsurface contamination."

Comment. Figure 5 appears to indicate that the Former Unocal Bulk Terminal south of the Park – Euclid site is the sole source of petroleum hydrocarbon contamination beneath Park – Euclid. Based on our review of the available data, it does not appear that sufficient information is available to come to this conclusion. We recommend that any interpretation of free product extent displayed on this Figure that is not based on actual data points be removed.

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4. Page 11, 2nd Full Paragraph. 3rd Line. "Floating free product was observed..."

Comment. Type of free product not specified (e.g. gasoline, diesel, mixture?)

5. Page 18. 1st Full Paragraph. 4th Line. "Groundwater in the regional aquifer in the vicinity of the site is flowing to the northeast at an average gradient of 0.005 foot/foot."

Comment. Although gradient provides the potential for groundwater flow to occur, any specific gradient does not necessarily mean that significant flow is occurring. This statement should be reworded to indicate an average flow velocity which includes the other terms (hydraulic conductivity and porosity), or the reference to "flowing" should be removed.

6. Page 19, 4th Paragraph, 3rd Line. "The line was put into service in 1947..."

Comment. The reference to the sewer line beneath the building being put into service in 1947 is incorrect. We now know from the Pima County records that it was there as early as 1940. The actual date of installation is not known.

7. Page 21. 4th Paragraph. 1st Line. "In 1993, Mission Linen drilled and installed four SVE wells, SVE-101, SVE-102, SVE-103, and SVE-104, inside the building at 301 South Park Avenue. The wells were connected by buried PVC pipe to a location off the loading dock just east of the building."

Comment. SVE piping was not installed until 1999. Also, wells are connected via both buried and above-ground piping.

8. Page 26. 1st Paragraph. 1st Line. "ADEQ recorded a video log of the MP-1 borehole in March 1991, and again in May 1994 (Earth Technology, 1991)."

Comment. This statement appears to reference a report prepared in 1991 for work performed in 1994.

9. Page 38. 3rd Paragraph, 3rd Line "The north-south wastewater line was installed in 1947 in an alley, and the building at 301 South Park Avenue was later extend over it."

Comment. The reference to the sewer line beneath the building being put into service in 1947 is incorrect. We now know from the Pima County records that it was there as early as 1940. The actual date of installation is not known.

10. Page 38. 4th Paragraph, 5th Line. "According to Mission Linen personnel, the persistence of PCE in sewer discharge after the cessation of dry cleaning at the facility was due to laundering shop rags from print shops and other industrial facilities, a practice they stopped in 1990."

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Comment. Change this sentence to read: "According to Mission Linen personnel, the persistence of PCE in sewer discharge after the cessation of dry cleaning at the facility was due to laundering shop rags from print shops and other industrial facilities that used chlorinated solvents, a practice they stopped in 1990."

11. Page 41. 4th Full Paragraph. 8th Line. "The boring for well PBR-7 penetrated a ten-foot section of clayey sands...(Figure 14)."

Comment. Figure 14 does not show a well "PBR-7". Possibly, this reference should be to PBR-10.

12. Page 42. 1st Full Paragraph. 3rd Line. "Based on the top-of-aquitard elevations, and the January 2003 groundwater elevations, the saturated section of the perched aquifer ranges in thickness from zero to more than five feet (Figure 16)."

Comment. The referenced figure (Figure 16) does not appear to agree with this sentence. The maximum saturated thickness displayed on this figure is 2.4 feet at PEP-24 which contradicts "more than five feet" presented in the text. This may result from the fact that the text references water levels from January 2003 and the Figure apparently used data from February 2004. Further, Figure 16 appears to indicate negative saturated thickness values at several locations (PEP-17, PEP-11, WR-345) which is not possible. Finally, for the purposes of contaminant mass calculations on page 77, a third value (7 feet) was used for the perched aquifer saturated thickness.

13. page 45, 1st Full Paragraph. "the exact location of the waste is not known,..."

Comment. This sentence should be clarified that the exact location of the waste disposal area is not known.

14. Page 46. 4th Full Paragraph. 1st Line. "In December 2002, VML-1 and VML-2 were drilled to delineate...."

Comment. Since this is the first time that these two sampling points are referenced in the report, this sentence should include a reference to a Figure where the location of these points can be found. Currently, the first figure that they can be found on is Figure 17. Possibly, these sampling points should be included on Figure 3.

15. Page 48. 3rd Paragraph. 4th Line. "Although soil vapor concentrations collected by SimulProbe during the 2003 multilevel survey were lower than those from the 1998 multilevel soil gas survey, PCE concentrations reported in subsequent soil gas samples collected from three of the permanent vapor monitoring points did not correlate well with samples collected while drilling. Pending further sampling of the permanent vapor monitoring points, the 2003 SimulProbe soil gas sample results should not be regarded as quantitative."

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Comment. Soil vapor samples collected with direct push methods (used during both the 1998 and 2003 soil gas surveys performed by URS) are considered screening level tools and are not directly comparable with results collected using fixed monitoring wells. However, since both the 1998 and 2003 investigations were performed using similar sampling methods, the relative change in concentration between these two events presented in URS, 2003, when considered on a site-wide basis, is a valid comparison. Although this comparison may not be entirely “quantitative” in nature, it does present an excellent representation of the overall percent contaminant mass reduction in the vadose zone.

16. Page 49, second full paragraph. “($\mu\text{g}/\text{m}^2, \text{min}^{-1}$)”

Comment. Text indicates wrong units - should be micrograms per square meter per minute.

17. Page 49, 5th Full Paragraph. 3rd Line. “The soil vapor samples were analyzed for VOCs by EPA Method TO 14 and the analytical results were reported in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) = $\mu\text{g}/\text{L}$.”

Comment. The unit comparison in the above statement is incorrect ($1 \mu\text{g}/\text{L} = 1000 \mu\text{g}/\text{m}^3$).

18. Page 50. 1st Paragraph.

Comment. Units of $\mu\text{g}/\text{m}^3$ are non-standard units for reporting of soil vapor concentrations. We suggest that all PCE vapor concentrations reported in this document be converted to ppmv for consistency with data presented elsewhere in this document as well as historical data from the Vadose Zone Confirmation Study (URS, 2003).

19. Page 51. 2nd Full Paragraph. 2nd Line. “Results of free product analyses are summarized in Appendix D.”

Comment. This statement is incorrect. Appendix D contains “Historical Groundwater Laboratory Analyses”. Appendix C contains the “Historical Free Product Laboratory Analyses”.

20. Page 51. 5th Full Paragraph. 4th Line. “Since the SVE system has been shut off, the PCE concentration in free product samples from SVE-102 and SVE-104 have shown some increase, to 69,000 and 77,000 mg/kg respectively, in May 2003, but have declined to 10,000 mg/kg each in February 2004.”

Comment. The table in Appendix C indicates that the PCE concentration in free product at Well SVE-104 during February 2004 was 1,000 mg/kg rather than 10,000 mg/kg as presented in the above statement.

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21. Page 53. 4th Full Paragraph. 3rd Line. "There is no evidence of preferential migration of PCE, TCE, DCE, or vinyl chloride in the downgradient direction...".

Comment. As this is a major anomaly with respect to what would normally be expected, the text should contain some possible interpretation as to the cause of this anomaly. On a number of occasions, ADEQ representatives have verbally indicated that infiltration from the Arroyo Chico Wash may be responsible for groundwater mounding in the perched aquifer which is preventing the northward migration of groundwater and dissolved contaminants beyond the Wash. Further, it is our understanding that the primary reason that ADEQ has requested that the Flood Control Basin being constructed in the Wash not be lined is so that this balance will not be disturbed. If this is indeed ADEQ's interpretation of the hydrogeology of the area, then the text of the RI should state this interpretation.

22. Page 54. 1st Full Paragraph. 4th Line. "Breakdown products are now the predominant dry – cleaning chlorinated hydrocarbon species in groundwater of most perched aquifer monitor wells...".

Comment. Since the breakdown products are not "dry-cleaning" species, this sentence should be edited to read: "Breakdown products of PCE are now the predominant chlorinated hydrocarbons species in groundwater of most of the perched aquifer monitor wells...".

23. Page 57. 1st Paragraph, 1st Line. "Regional aquifer groundwater containing greater than 1 µg/L PCEdoes not extend upgradient, event to the southern boundary of the property."

Comment. Data is insufficient to support conclusion that there is no PCE upgradient in the regional aquifer

24. Page 58, 1st paragraph, 8th Line. "The reported concentrations have been comparable to those found in other chlorinated tap water, including that supplied by the City of Tucson (Figure 36)."

Comment. Figure 36 does not display disinfection byproduct concentrations.

25. Page 64. Second bullet list, 3rd bullet. "DCE, in the form of cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCE; all of which are degradation products of TCE;..."

Comment. Although it is possible for 1,1-DCE to be a breakdown product of PCE and TCE, this is rarely observed in most hydrogeologic settings.

26. Beginning with Page 71. Sections 5.2, 5.3, 5.4, and 5.5.

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General Comment with respect to mass calculations. The mass calculations cannot be verified based on the data presented in the report. Numeric terms used to calculate mass for each medium should be included. For example:

a) Appendix E includes equations, but no specific data. ADEQ should include area/volume estimates for plume distribution. (See chap. 6 / Draft 6-03)

b) Contaminant distribution data used to estimate mass differs from distribution data presented in the RI report (different dates). ADEQ should, as a minimum, provide average concentrations associated with each area.

27. Page 71. 1st Full Paragraph, 1st Line. "Most available data on contamination in the upper vadose zone was collected before or during operation of an SVE system at the Park - Euclid Site."

Comment. Although significant data were collected prior to operation of the SVE system, the 2003 Vadose Zone Confirmation Study performed by URS on behalf of Mission provides extensive soil vapor concentration data from the post-SVE period.

28. Page 73. 1st Line. "A calculation of the soil vapor mass based on the 1998 data indicated approximately 780 pounds of PCE... The results of the 2003 soil vapor survey have not yet been confirmed by sampling the permanent soil gas monitor points and so were not used to calculate remaining vapor mass."

Comment. This statement appears to indicate that the 1998 soil vapor sampling results are valid, but the 2003 Vadose Zone Confirmation Study results are not. Since both of these investigations were performed using direct push methods, they are both valid for screening of VOC concentrations and related mass in the vadose zone.

29. Page 73, Section 5.2.4.2.

Comment. Use of term "residual free phase" and "free phase PCE residual" is confusing. Free phase implies that the contaminant is present as a liquid that can move through the subsurface. Residual is typically what remains adsorbed to the soil or as a liquid in pore spaces that will not move as a liquid. It is not clear from ADEQ's terminology in this paragraph that this is the intended meaning.

30. Page 73, Section 5.2.4.3.

Comment. Phrasing suggests that the current SVE system is not adequate to remove vapor from the subsurface - i.e., "not recoverable by the present SVE system." Although it is true that the other phases of contamination may continue to generate vapor (PCE volatilizing from its dissolved form in the LNAPL, or diffusing from a zone of low permeability), the current SVE system configuration is expected to recover those vapors as they are generated. It may be more accurate to state that

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PCE existing in other phases (if not removed) is expected to continue to contribute to vapor mass in the vadose zone, and that recovery from low permeability zones may be diffusion limited.

31. Page 74. 2nd Full Paragraph, 7th Line. "Observations indicate that the free product layer is spreading at a rate of less than 10 feet per year."

Comment. ADEQ should provide specific details on how and which "observations" were used to calculate product movement velocities.

32. Page 75, 1st Bullet.

Comment. ADEQ speculates that SVE wells are a source of additional PCE to the perched zone, resulting in increased PCE concentrations in product accumulating in the SVE wells, with the free product with increased concentrations being removed through bailing activities. This speculation fails to take into account the concurrent decreases in PCE in product accumulating in perched wells outside of the immediate source area (as noted on Page 76).

33. Page 79. 2nd paragraph, 8th Line. "Dissolved PCE concentrations in the sentinel well UAM-2 have generally increased since August 2000 (Appendix D, Chart D-10)."

Comment. Statement that PCE concentrations in UAM-2 have "generally increased" is an overstatement and gives the false impression that an increasing trend continues. Although a straight line fit to the data over this entire period does show an increasing trend in PCE concentrations, more recently, the PCE concentration at this well has begun to level off, and since mid-2003, a slight decreasing trend has been observed.

34. Page 81. 1st Full Paragraph, 4th Line. "The contaminant masses in vapor and adsorbed to soil in the upper and lower vadose zones are inadequately defined."

Comment. During the Vadose Zone Confirmation Study performed by URS on behalf of Mission in 2003, soil vapor samples were collected and analyzed for VOCs at 4 different depths within the upper vadose zone at 20 locations for a total of 80 samples. These locations, upon which ADEQ provided oversight and concurrence, were selected to provide adequate coverage of the site and surrounding area. The results of the investigation show that the vast majority of the remaining contaminant mass in the upper vadose zone was adequately defined during this investigation. Continued monitoring of the permanent vapor monitoring wells installed during the Vadose Zone Confirmation Study will provide more detail on vapor concentrations and how they react to renewed SVE currently underway.

35. Page 82, 3rd paragraph.

Comment. Figure 59 and Figure 60 appear to be switched.

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36. Page 83, 1st Line. "...adjustments are applied to arrive at pre-dilution concentrations."

Comment. Additional detail is needed. What method was used to make adjustments to arrive at pre-dilution concentrations?

37. Page 84, 3rd Full Paragraph, Line 2. "Prior to startup, one additional SVE well will be installed in the upper vadose zone in the source area inside the building and connected to the existing SVE system."

Comment. The new SVE well will be connected to the system after SVE startup.

38. Page 87, 1st Paragraph, 3rd Line. "It is recommended that an independent study of the results of the SVE operation be performed following confirmation testing."

Comment. The meaning of this statement is not clear. If ADEQ suggests that additional testing be performed following completion of the SVE operational period to confirm the conclusions obtained at the completion of SVE operation, we concur. Conversely, if ADEQ is suggesting that a separate contractor should be retained to evaluate the SVE results, we do not agree that such an evaluation is necessary.

39. Page 89, 3rd Paragraph, 3rd Line. "Free-phase PCE may still exist in residual pockets in the upper vadose zone."

Comment. There is currently no evidence to support this statement. Based on the relatively small amount of vapor phase rebound that has been observed during lengthy SVE shut-down periods and the significant reductions in contaminant mass that were observed during the Vadose Zone Confirmation Study, it appears highly unlikely that significant "pockets" of DNAPL remain in the upper vadose zone.

40. Page 90, 3rd Paragraph, 2nd Line. "Influent concentrations from the extraction wells decreased over the period of operation of the system, but it is unclear how much of the upper vadose zone was being remediated."

Comment. This paragraph ignores the results of the Vadose Zone Confirmation Study conducted by Mission Linen in 2003. In addition, while operating the SVE system on a single SVE well, vapor concentrations at other SVE wells decreased concurrently, indicating that a large radius of influence for the SVE wells. If ADEQ is making a statement regarding diffusion-limited recovery from zones of low permeability, that should be stated specifically rather than making a general statement about vadose zone remediation being unclear. It is clear based both on the results of the SVE operation and on the Vadose Zone Confirmation Study that the initial SVE operational period was very successful in removing the vast majority of VOC mass from the vadose zone.

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41. Page 102. Bullet List. 1st Bullet. Discussion of potential remaining conduits for vertical transport of contaminants from the perched to the regional aquifer. "Possible incomplete sealing of the annulus during plugging and abandonment of water supply wells Old Well and MP-1"

Comment. There is currently no evidence to support this "conduit". Based on current plume configuration maps prepared by ADEQ, the dissolved phase PCE plume in the regional aquifer appears to be detaching from the original source area as the highest concentrations have moved downgradient from the site. This would strongly support the conclusion that the source area in the perched aquifer has been adequately sealed from the Regional Aquifer. Further, testing of a deep regional well installed by ADEQ adjacent to MP-1 (PER-14) has not detected significant contamination suggesting that well abandonment successfully sealed this potential conduit.

42. Page 102. Bullet List. 2nd, 3rd, 4th, and 5th bullets. Discussion of potential remaining conduits for vertical transport of contaminants from the perched to the regional aquifer.

Comment. There is currently no evidence to support that these "conduits" exist. Based on current plume configuration maps prepared by ADEQ, the dissolved phase PCE plume in the regional aquifer appears to be detaching from the original source area as the highest concentrations have moved downgradient from the site. This would strongly support the conclusion that the source area in the perched aquifer has been adequately sealed from the regional aquifer.

43. Page 106. Last Paragraph. 2nd Line. "Based on the highly stratified nature of the regional aquifer material and its low overall vertical hydraulic conductivity, higher concentrations of PCE at depth would not be expected if PCE were present only in the aqueous phase, or as a constituent of floating free product."

Comment. The likely explanation for higher PCE contaminant concentrations at depth in the regional aquifer has to do with the method of delivery of this contaminant. Both of the likely past sources, production wells Old Well and MP-1, were screened well below the water table in the regional aquifer. It is likely that pumping at these wells resulted in downward movement of contaminants into these deeper zones where they could begin acting as a source to the regional aquifer plume. This scenario does not require that PCE DNAPL be present in significant quantities in the regional aquifer.

44. Page 107. 3rd Full Paragraph, 6th Line. "This could have occurred through disposal of PCE product directly into MP-1,..."

Comment. There is absolutely no evidence that this ever occurred.

45. Page 111. Last Paragraph.

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Comment. This paragraph goes to great lengths to suggest that MLS-5, a well installed by EMCON for Mission Linen, could have contributed to contamination of the regional aquifer during drilling. However, no mention is made of the fact that Wells MLR-1, MLR-2, and MLR-3 installed by Earth Technology for ADEQ in 1990 did not even recognize the presence of a perched aquifer at the site, and therefore, drilling through this zone directly into the lower vadose zone and the regional aquifer occurred while no precautions whatsoever were taken to limit cross contamination of the regional aquifer with contaminants from the perched aquifer during drilling.

46. Page 112. Section 7.4.3. Contaminant Transport in the Regional Aquifer

Comment. Although this section provides some simplistic calculations regarding groundwater flow and contaminant transport, noticeably absent from this section are calibrated numerical groundwater flow and contaminant transport models. Numerical modeling, especially at a site as large and complex as this one, is an essential tool in understanding the groundwater flow regime and associated contaminant transport patterns of the aquifer. It is especially critical when evaluating potential remedial alternatives and the timing with which alternatives should be implemented.

Section R18-16-408.A.4 of the Arizona Administrative Code (AAC) states that the remedial investigation for a site shall "Obtain and evaluate any other information necessary for identification and comparison of alternative remedial actions." Clearly, groundwater modeling is essential to comparison of potential remedial alternatives. Further, with respect to remedial objectives, the AAC states in Section R18-16-406.I.4.b that the remedial objectives with respect to each listed use should be stated in terms of "Time-frames when action is needed to protect against or provide for the impairment or loss of the use." Groundwater modeling is invaluable in determining if and when contaminants may reach point-of-use receptors, and therefore, is critical to the development of remedial objectives.

Finally, the Groundwater Quality Management Program (Chapter 7) of the Arizona Department of Water Resources Third Management Plan (2000 through 2010) for the Tucson Active Management Area emphasizes the need to balance the need for aquifer cleanup with their stated objective to "ensure that remediation of contaminated groundwater uses the least amount of groundwater necessary to facilitate the objectives of each remedial action project." In light of this objective, we believe that groundwater modeling is necessary to evaluate whether withdrawals are necessary to prevent exposure to point-of-use receptors and, if so, to identify the minimum groundwater withdrawal volumes necessary to accomplish remedial objectives.

Therefore, for the reasons cited above, it is recommended that numerical groundwater flow and contaminant transport models of the regional aquifer be developed, calibrated, and implemented to establish Remedial Objectives and to

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evaluate potential remedial alternatives and the timing of implementation, if required.

47. Page 133, 1st Paragraph, 1st Line. "____, August 7, 2004, Vadose Zone Confirmation Study..."

Comment. This reference contains the incorrect date. The actual date should be August 7, 2003.

48. Table 1A.

Comment. Entry for 1960s in the "chlorinated hydrocarbons" column that "PCE spilled on plant floor when storage tanks overfilled" is incorrect. We believe this occurred in approximately 1979.

49. Appendix D - Summary Table, Chart D-9.

Comment. Time series graph of PCE for PER-26 indicates that PCE was non-detect in February 2004 while the table in Appendix D displays a concentration of 32 µg/L in February 2004.

URS



CITY OF
TUCSON
ENVIRONMENTAL
SERVICES

October 4, 2004

VIA FACSIMILE

Matt Doolen, R.G.
Project Manager
Arizona Dept. of Environmental Quality
400 W. Congress, Suite 433
Tucson, Arizona 85701



**Subject: Park Euclid Remedial Investigation (RI) Report -Final Draft
(June 29, 2004) & Remedial Objectives Comments**

Dear Mr. Doolen:

The City of Tucson submits the following comments, compiled from various city departments, with regards to the above referenced report.

The City of Tucson appreciates ADEQ's efforts as witnessed by the draft RI. The report shows the contamination of the regional aquifer has been well characterized. In addition, the City's previous comments regarding water supply needs into the future are well captured in this report.

With regards to the perched aquifer, the diesel plume should be an integral part of this project. While the City understands that ADEQ at the on-set of this RI investigation excluded the diesel plume from its scope of work based on funding, the City believes that the diesel contamination must be addressed to complete the RI. The diesel plume prevents future use of this water. This is particularly important as ADEQ moves into finalizing the Remedial Objectives (RO) for the site. The City's position is that the RO must be to clean up both the perched and regional aquifers to drinking water standards. This RO cannot be achieved with the diesel being ignored.

As the main water supplier in the Tucson Basin the City of Tucson would like to continue to work with ADEQ through the RO and Feasibility Study process. The City is concerned that ADEQ has sometimes expressed the opinion in general that wellhead treatment by water suppliers is a feasible option for site clean-up. The City's maintains the ground water supply should be cleaned up to drinking water standards and the Tucson Community as a whole should not knowingly allow future degradation by plume migration. Delaying cleanup by waiting until an end user needs the water or placing the responsibility on the end user/water supplier for clean-up is not an acceptable remedial strategy.

Additional specific comments are as follows:

Page 1 of 2

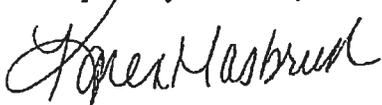


1. The City has reviewed the Park-Euclid Community Advisory Board's comments on the draft RI dated September 29, 2004 (attached) and concurs with these.
2. Page 5, 1.3.4. Arroyo Chico Project, last sentence: Please change this to "Excavation of the detention basins is currently scheduled to begin in 2005".
3. Page 7, 1.3.5.3 Worked Performed by the City of Tucson, third paragraph, third sentence: Please change this to read "At the request of ADEQ, the U.S. Army Corps of Engineers has revised the grading of Basin 1 such that the Arroyo Chico project will not change the rate of infiltration from the surface stormwater runoff."

As co-chair on the WQARF Advisory Board, I have had the opportunity to learn in detail the status of this site and other WQARF sites in the state. ADEQ's effort at this site has to date been well considered and your work with the Park Euclid CAB is appreciated also.

Thank you for considering these comments. If you have any questions, please contact me at 791-5414.

Respectfully submitted,



Karen Masbruch
Deputy Director, Environmental Services
City of Tucson

Attachment:

Park Euclid Community Advisory Board Comments (September 29, 2004)

cc: Benny Young, Assistant City Manager
David Modeer, Director, Utility Services
Ralph Marra, Chief Hydrologist, COT Water Department
Bruce Prior, COT Water Department
Brooks Kennan, Transportation, Engineering Division
MJ Dillard, Transportation, Engineering Division
Catesby Willis, Stormwater
Richard Byrd, COT-ES
Park Euclid File

The Park-Euclid Community Advisory Board
for the State of Arizona
Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Site
Tucson, Arizona

September 29, 2004

Matt Doolen, R.G.
Project Manager
Arizona Department of Environmental Quality (ADEQ)
400 W. Congress, Suite 433
Tucson, AZ 85701

RE: CAB Comments on the Draft Remedial Investigation Report

Dear Mr. Doolen:

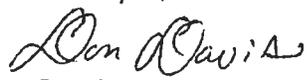
The Community Advisory Board (CAB) for the Arizona Department of Environmental Quality (ADEQ) Park-Euclid WQARF Site has reviewed the draft Remedial Investigation report (RI) for the site and submits the following comments to be addressed in the final RI.

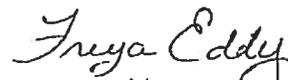
Overall, we, the CAB members, find the report is comprehensive and thorough and the CAB was kept well informed of most of the important findings presented in this report at our meetings. However, we do have one important correction and several suggestions as a result of our review of the draft RI. Our comments do not include specific concerns of Mission Linen, City of Tucson, or the University of Arizona, as they have indicated they will submit their own comments.

The statement on page 7 that -- Basin One will be lined to minimize infiltration -- is incorrect. We have been informed by ADEQ, Pima County, and the U.S. Army Corps of Engineers, that the basin will not be lined and that the current plan for Basin One does not alter the majority of infiltration events and better preserves the desired hydrologic characteristics of the aquifer under the basin. Further, the community around the basin, Barrio San Antonio and Miles, does not want it lined. All subsequent parts of the report that are based on the assumption of a lined basin or reflect any basins being lined should be reworked and corrected to reflect an unlined Basin One.

The conclusion to the report states that the "report summarizes field Investigations." To the CAB, the conclusion is too often a list rather than a summary. The motivation for the work is often not given and the location in the report of the results of the work not stated. We suggest a historic document and summary table which would include brief descriptions of important results. A condensation of the table might be included in the Executive Summary. In the body of the report, and especially in the Executive Summary, the CAB would like an estimate of the total amount of contamination associated with the WQARF site in the soil, and in the upper and lower water-bearing units, and of the amount of contamination removed to date.

Thank you,


Don Davis *ejp*
Park-Euclid CAB Co-Chair


Freya Eddy *je*
Park-Euclid CAB Co-Chair

Address Correspondence to: ADEQ Park-Euclid Community Advisory Board
c/o Arizona Department of Environmental Quality 400 W. Congress, Suite 433 Tucson, AZ 85701

The Park-Euclid Community Advisory Board
for the State of Arizona
Park-Euclid Water Quality Assurance Revolving Fund (WQARF) Site
Tucson, Arizona

September 29, 2004

Matt Doolen, R.G.
Project Manager
Arizona Department of Environmental Quality
400 W. Congress, Suite 433
Tucson, Ariz. 85701

RE: CAB Comments on Remedial Objectives

Dear Mr. Doolen:

The Community Advisory Board (CAB) for the Arizona Department of Environmental Quality (ADEQ) Park-Euclid WQARF Site submits the following comments with regard to the department's Remedial Objectives for the Park-Euclid contamination site.

Our first priority for remediation efforts is to address the contamination plume in the regional aquifer, which threatens drinking water downgradient. Efforts should be directed at slowing, then stopping the plume's movement as quickly as possible. Steps must also be taken to assure that future water use outside the area of the current plume does not negatively impact the plume's movements. The level of contamination in this aquifer should be lowered as far as reasonably achievable, at least to potable water standards.

While regional aquifer contamination mentioned above is of greater concern, swift action also is needed to address water contamination in the perched aquifer. First, any spread should be prevented. Early actions, to the extent not taken already, also should be directed at eliminating the possibilities of perched aquifer contamination migrating down to affect the regional drinking-water aquifer, such as through abandoned or poorly constructed older wells, or natural geologic connections. Studies to date have not found a specific natural connection between the perched and regional drinking-water aquifers, but such connections may exist. Geological changes over time could also cause connections. Removal of contaminants from the perched aquifer would be the desired method of eliminating this hazard.

Contaminated water which cannot be treated to drinking-water standards, should be dealt with in an environmentally safe manner: transported off site or used for industrial or other purposes for which it is suited.

Sampling and testing of water for contaminant levels, under the ground and after treatment, must continue on a regular and relatively frequent basis until it can be assured that people, and other living things, in the community will never be exposed to contamination from this site.

All future activities in the contamination area, but particularly those directly or indirectly affecting the polluted aquifers, or involving exposure to contaminated soil, should be restricted and monitored closely to ensure they do not impact negatively, in any way, the cleanup effort.

RESPONSE TO COMMENTS

**PARK-EUCLID REMEDIAL INVESTIGATION REPORT
WATER QUALITY ASSURANCE REVOLVING FUND SITE
TUCSON, ARIZONA**



**ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
400 West Congress, Suite 433
Tucson Arizona 85701
Southern Regional Office**

November 1, 2011

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APPENDICES

APPENDIX A.	WRITTEN COMMENTS RECEIVED
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Arizona Department of Environmental Quality (ADEQ) is presenting a responsiveness summary to comments received from various parties on the *Final Draft Remedial Investigation Report, Park-Euclid Water Quality Assurance Revolving Fund Site, Tucson, Arizona* dated June 29, 2004 (Final Draft RI Report). The Final Draft RI Report was made available for public review and comment on July 4, 2004. The ADEQ received written comments from the following: 1) The Park-Euclid Community Advisor Board (CAB), 2) Mission Linen Supply (Mission Linen) and 3) The City of Tucson. ADEQ has prepared this Responsiveness Summary for all comments received regarding the RI Report. The following sections include the text of comments along with a response to address each comment.

SPECIFIC COMMENTS FROM THE PARK-EUCLID COMMUNITY ADVISORY BOARD

Comments regarding the RI report were received in a letter from Co-Chairs Don Davis and Freya Eddy to ADEQ, dated September 29, 2004.

Comment 1. The Statement on page 7 that – Basin One will be lined to minimize infiltration – is incorrect. We have been informed by ADEQ, Pima County, and the U.S. Army Corps of Engineers, that the basin will not be lined and that the current plan for Basin One does not alter the majority of infiltration events and better preserves the desired hydrologic characteristics of the aquifer under the basin. Further, the community around the basin, Barrio San Antonio and Miles, does not want it lined. All subsequent parts of the report that are based on the assumption of a lined basin or reflect any basins being lined should be reworked and corrected to reflect an unlined Basin One.

Response 1: ADEQ agrees that Basin One should not be lined. The text has been corrected to state that Basin One will be unlined so as to not change the rate of infiltration of detained stormwater.

Comment 2. The conclusion to the report states that the “report summarizes field investigations.” To the CAB, the conclusion is too often a list rather than a summary. The motivation for the work is often not given and the location in the report of the results of the work not stated. We suggest a historic document and summary table which would include brief descriptions of important results. A condensation of the table might be included in the Executive Summary.

Response 2: Section 6.0 Summary and Conclusions has been reworded to accurately reflect the entire Remedial Investigation report and the findings to date.

Comment 3. In the body of the report, and especially in the Executive Summary, the CAB would like an estimate of the total amount of contamination associated with the WQARF site in the soil, and in the upper and lower water-bearing units, and of the amount of contamination removed to date.

Response 3: The total amount of contaminants will be provided in the Feasibility Study. The amount of contamination removed from the site to date is discussed in Section 5.4 Perched Aquifer MPE Pilot Testing and Pilot Operation – Haskell/Mission Linen, 2008 through 2009 of the main body of the report.

SPECIFIC COMMENTS FROM MISSION LINEN SUPPLY

The following comments have been prepared by URS Corporation on behalf of Mission Linen in correspondence dated September 29, 2004, to ADEQ.

General Comment

Based on our review, we believe that ADEQ's Draft Remedial Investigation Report for the Park – Euclid WQARF site generally provides a thorough discussion of work performed to date and the associated data interpretation and conclusions. However, we believe that additional analysis and/or data presentation should be included in the report, especially with respect to contaminant mass calculations and characterization of groundwater flow and contaminant transport. Further, we recommend that ADEQ avoid speculation regarding possible sources of contamination which lack evidentiary support. Additional details regarding these issues are presented in the specific comments below.

SPECIFIC COMMENTS

1. *ES-5. Last Paragraph, 1st Line. "UA, which is located about one-half mile downgradient to the north....,"*

Comment 1. The University of Arizona is approximately 1 mile north of the Park – Euclid site, as stated in Section 1.3.2 of the document.

Response 1: The Park-Euclid Site boundary, as indicated in Figures 1-1 and 1-2, is within 0.5 miles of the University of Arizona. Section 1.1 have been amended to reflect the distance from the Park-Euclid Site boundary.

2. *Page 7. 4th Paragraph. 3rd Line. "At the request of ADEQ, Basin 1 will be lined to minimize infiltration of detained water."*

Comment 2. It is our understanding that the Corps of Engineers now plans to construct the basin in an unlined manner at ADEQ's request.

Response 2: ADEQ agrees that Basin One should not be lined and the text of the report has been changed to reflect this.

3. *Page 8. 1st Paragraph. 1st Line. References Figure 5 which shows "sites with known subsurface contamination."*

Comment 3. Figure 5 appears to indicate that the Former Unocal Bulk Terminal south of the Park – Euclid site is the sole source of petroleum hydrocarbon contamination beneath Park – Euclid. Based on our review of the available

data, it does not appear that sufficient information is available to come to this conclusion. We recommend that any interpretation of free product extent displayed on this Figure that is not based on actual data points be removed.

Response 3: Locations of free product in the perched aquifer are no longer included in any figures, because characterization of diesel free product and fuel-related compounds is not the subject of this RI.

4. *Page 11, 2nd Full Paragraph. 3rd Line. "Floating free product was observed..."*

Comment 4. Type of free product not specified (e.g. gasoline, diesel, mixture?)

Response 4: This section has been removed to avoid speculation regarding the possible source(s) of the diesel free product.

5. *Page 18, 1st Full Paragraph. 4th Line. "Groundwater in the regional aquifer in the vicinity of the site is flowing to the northeast at an average gradient of 0.005 foot/foot."*

Comment 5. Although gradient provides the potential for groundwater flow to occur, any specific gradient does not necessarily mean that significant flow is occurring. This statement should be reworded to indicate an average flow velocity, which includes the other terms (hydraulic conductivity and porosity), or the reference to "flowing" should be removed.

Response 5: ADEQ agrees and references to groundwater "flowing" has been removed.

6. *Page 19, 4th Paragraph, 3rd Line. "The line was put into service in 1947..."*

Comment 6. The reference to the sewer line beneath the building being put into service in 1947 is incorrect. We now know from the Pima County records that it was there as early as 1940. The actual date of installation is not known.

Response 6: In the report titled "Preliminary Site Characterization Mission Linen and Uniform service 301 South Park Avenue" dated November 1991 by Earth Technology Corporation, the sewer main hookup for 301 South Park Avenue was reported to have occurred on June 30, 1947. The information was obtained from Mr. Gerry Koziol of the mapping and planning section of the Pima County Waste Water Department.

7. *Page 21, 4th Paragraph. 1st Line. "In 1993, Mission Linen drilled and installed four SVE wells, SVE-101, SVE-102, SVE-103, and SVE-104, inside the building at 301 South Park*

Avenue. The wells were connected by buried PVC pipe to a location off the loading dock just east of the building."

Comment 7. SVE piping was not installed until 1999. Also, wells are connected via both buried and above-ground piping.

Response 7: This sentence has been removed.

8. *Page 26. 1st Paragraph. 1st Line. "ADEQ recorded a video log of the MP-1 borehole in March 1991, and again in May 1994 (Earth Technology, 1991)."*

Comment 8. This statement appears to reference a report prepared in 1991 for work performed in 1994.

Response 8: The text has been modified to detail work activities in a chronological order. This sentence has been changed to reflect work conducted during the Preliminary Site Characterization in 1991.

9. *Page 38. 3rd Paragraph, 3rd Line "The north-south wastewater line was installed in 1947 in an alley, and the building at 301 South Park Avenue was later extend over it."*

Comment 9. The reference to the sewer line beneath the building being put into service in 1947 is incorrect. We now know from the Pima County records that it was there as early as 1940. The actual date of installation is not known.

Response 9: In the report titled "Preliminary Site Characterization Mission Linen and Uniform service 301 South Park Avenue" dated November 1991 by Earth Technology Corporation, the sewer main hookup for 301 South Park Avenue was reported to have occurred on June 30, 1947. The information was obtained from Mr. Gerry Koziol of the mapping and planning section of the Pima County Waste Water Department.

10. *Page 38. 4th Paragraph, 5th Line. "According to Mission Linen personnel, the persistence of PCE in sewer discharge after the cessation of dry cleaning at the facility was due to laundering shop rags from print shops and other industrial facilities, a practice they stopped in 1990."*

Comment 10. Change this sentence to read: "According to Mission Linen personnel, the persistence of PCE in sewer discharge after the cessation of dry cleaning at the facility was due to laundering shop rags from print shops and other industrial facilities that used chlorinated solvents, a practice they stopped in 1990."

Response 10: Because this statement was unclear, it has been removed from the text.

11. Page 41. 4th Full Paragraph. 8th Line. *“The boring for well PBR-7 penetrated a ten-foot section of clayey sands...(Figure 14).”*

Comment 11. Figure 14 does not show a well “PBR-7”. Possibly, this reference should be to PBR-10.

Response 11: The text has been modified to Figures 3-2 through 3-9.

12. Page 42. 1st Full Paragraph. 3rd Line. *“Based on the top-of-aquitard elevations, and the January 2003 groundwater elevations, the saturated section of the perched aquifer ranges in thickness from zero to more than five feet (Figure 16).”*

Comment 12. The referenced figure (Figure 16) does not appear to agree with this sentence. The maximum saturated thickness displayed on this figure is 2.4 feet at PEP-24 which contradicts “more than five feet” presented in the text. This may result from the fact that the text references water levels from January 2003 and the Figure apparently used data from February 2004. Further, Figure 16 appears to indicate negative saturated thickness values at several locations (PEP-17, PEP-11, WR-345) which is not possible. Finally, for the purposes of contaminant mass calculations on page 77, a third value (7 feet) was used for the perched aquifer saturated thickness.

Response 12: The text and Figures 3-2 through 3-9 have been modified to indicate that the top of the perched aquifer is generally encountered at depths of approximately 85 to 96 feet below ground surface. Its presence is dependent on the presence of an underlying relatively thick, fine-grained aquitard.

13. Page 45, 1st Full Paragraph. *“the exact location of the waste is not known, ...”*

Comment 13. This sentence should be clarified that the exact location of the waste disposal area is not known.

Response 13: The text has been modified to clarify that the location of the waste disposal area is not known.

14. Page 46. 4th Full Paragraph. 1st Line. *“In December 2002, VML-1 and VML-2 were drilled to delineate...”.*

Comment 14. Since this is the first time that these two sampling points are referenced in the report, this sentence should include a reference to a Figure where the location of these points can be found. Currently, the first figure that they can be found on is Figure 17. Possibly, these sampling points should be included on Figure 3.

Response 14: The locations of these wells are shown in Figure 4-1.

15. Page 48. 3rd Paragraph. 4th Line. *“Although soil vapor concentrations collected by SimulProbe during the 2003 multilevel survey were lower than those from the 1998 multilevel soil gas survey, PCE concentrations reported in subsequent soil gas samples collected from three of the permanent vapor monitoring points did not correlate well with samples collected while drilling. Pending further sampling of the permanent vapor monitoring points, the 2003 SimulProbe soil gas sample results should not be regarded as quantitative.”*

Comment 15. Soil vapor samples collected with direct push methods (used during both the 1998 and 2003 soil gas surveys performed by URS) are considered screening level tools and are not directly comparable with results collected using fixed monitoring wells. However, since both the 1998 and 2003 investigations were performed using similar sampling methods, the relative change in concentration between these two events presented in URS, 2003, when considered on a site-wide basis, is a valid comparison. Although this comparison may not be entirely “quantitative” in nature, it does present an excellent representation of the overall percent contaminant mass reduction in the vadose zone.

Response 15: This paragraph has been removed from the text.

16. Page 49, second full paragraph. *“(μg/m², min-1)”*

Comment 16. Text indicates wrong units - should be micrograms per square meter per minute.

Response 16: Both units are correct: ug/m².min is used for reporting vapors emanating from subsurface soils and groundwater, and ug/ft.min is used for slab intrusion (seams or cracks).

17. Page 49. 5th Full Paragraph. 3rd Line. *“The soil vapor samples were analyzed for VOCs by EPA Method TO 14 and the analytical results were reported in micrograms per cubic meter ((μg/m³) = μg/L).”*

Comment 17. The unit comparison in the above statement is incorrect ($1 \mu\text{g/L} = 1000 \mu\text{g/m}^3$).

Response 17: The text has been modified to reflect this comment.

18. Page 50. 1st Paragraph.

Comment 18. Units of $\mu\text{g/m}^3$ are non-standard units for reporting of soil vapor concentrations. We suggest that all PCE vapor concentrations reported in this document be converted to ppmv for consistency with data presented elsewhere in this document as well as historical data from the Vadose Zone Confirmation Study (URS, 2003).

Response 18: The document has been modified for consistency (ug/L).

19. Page 51. 2nd Full Paragraph. 2nd Line. *“Results of free product analyses are summarized in Appendix D.”*

Comment 19. This statement is incorrect. Appendix D contains “Historical Groundwater Laboratory Analyses”. Appendix C contains the “Historical Free Product Laboratory Analyses”.

Response 19: The text has been modified to reflect this change.

20. Page 51. 5th Full Paragraph. 4th Line. *“Since the SVE system has been shut off, the PCE concentration in free product samples from SVE-102 and SVE-104 have shown some increase, to 69,000 and 77,000 mg/kg respectively, in May 2003, but have declined to 10,000 mg/kg each in February 2004.”*

Comment 20. The table in Appendix C indicates that the PCE concentration in free product at Well SVE-104 during February 2004 was 1,000 mg/kg rather than 10,000 mg/kg as presented in the above statement.

Response 20: Appendix C is no longer included.

21. Page 53. 4th Full Paragraph. 3rd Line. *“There is no evidence of preferential migration of PCE, TCE, DCE, or vinyl chloride in the downgradient direction...”*

Comment 21. As this is a major anomaly with respect to what would normally be expected, the text should contain some possible interpretation as to the cause of this anomaly. On a number of occasions, ADEQ representatives have verbally

indicated that infiltration from the Arroyo Chico Wash may be responsible for groundwater mounding in the perched aquifer which is preventing the northward migration of groundwater and dissolved contaminants beyond the Wash. Further, it is our understanding that the primary reason that ADEQ has requested that the Flood Control Basin being constructed in the Wash not be lined is so that this balance will not be disturbed. If this is indeed ADEQ's interpretation of the hydrogeology of the area, then the text of the RI should state this interpretation.

Response 21: This sentence containing the statement "There is no evidence of preferential migration of PCE, TCE, DCE, or vinyl chloride in the downgradient direction..." has been removed.

22. *Page 54. 1st Full Paragraph. 4th Line. "Breakdown products are now the predominant dry – cleaning chlorinated hydrocarbon species in groundwater of most perched aquifer monitor wells..."*

Comment 22. Since the breakdown products are not "dry-cleaning" species, this sentence should be edited to read: "Breakdown products of PCE are now the predominant chlorinated hydrocarbons species in groundwater of most of the perched aquifer monitor wells..."

Response 22: The text has been modified to state that the contaminants of concern (COCs) at the Park-Euclid Site are the dry cleaning-related chemicals tetrachloroethene (PCE) and its biological breakdown products trichloroethene (TCE), dichloroethene (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE), and vinyl chloride.

23. *Page 57. 1st Paragraph, 1st Line. "Regional aquifer groundwater containing greater than 1 µg/L PCE ...does not extend upgradient, event to the southern boundary of the property."*

Comment 23. Data is insufficient to support conclusion that there is no PCE upgradient in the regional aquifer.

Response 23: RI no longer has any references to 1 ug/L PCE concentrations in groundwater, because the AWQS for PCE is 5 ug/L.

24. *Page 58, 1st paragraph, 8th Line. "The reported concentrations have been comparable to those found in other chlorinated tap water, including that supplied by the City of Tucson (Figure 36)."*

Comment 24. Figure 36 does not display disinfection byproduct concentrations.

Response 24: This figure has been removed from the document.

25. *Page 64. Second bullet list, 3rd bullet. “DCE, in the form of cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCE; all of which are degradation products of TCE;...”*

Comment 25. Although it is possible for 1,1-DCE to be a breakdown product of PCE and TCE, this is rarely observed in most hydrogeologic settings.

Response 25: This sentence has been removed.

26. *Beginning with Page 71. Sections 5.2, 5.3, 5.4, and 5.5.*

Comment 26. General Comment with respect to mass calculations. The mass calculations cannot be verified based on the data presented in the report. Numeric terms used to calculate mass for each medium should be included. For example:

a) Appendix E includes equations, but no specific data. ADEQ should include area/volume estimates for plume distribution.

b) Contaminant distribution data used to estimate mass differs from distribution data presented in the RI report (different dates). ADEQ should, as a minimum, provide average concentrations associated with each area.

Response 26: The data presented in the RI report will be used to determine the contaminant mass calculations in the Feasibility Study.

27. *Page 71. 1st Full Paragraph, 1st Line. “Most available data on contamination in the upper vadose zone was collected before or during operation of an SVE system at the Park-Euclid Site.”*

Comment 27. Although significant data were collected prior to operation of the SVE system, the 2003 Vadose Zone Confirmation Study performed by URS on behalf of Mission provides extensive soil vapor concentration data from the post-SVE period.

Response 27: The text of the report has been modified to include data from post- MPE operation as well.

28. *Page 73. 1st Line. “A calculation of the soil vapor mass based on the 1998 data indicated approximately 780 pounds of PCE... The results of the 2003 soil vapor survey have not yet been confirmed by sampling the permanent soil gas monitor points and so were not used to calculate remaining vapor mass.”*

Comment 28. This statement appears to indicate that the 1998 soil vapor sampling results are valid, but the 2003 Vadose Zone Confirmation Study results are not. Since both of these investigations were performed using direct push methods, they are both valid for screening of VOC concentrations and related mass in the vadose zone.

Response 28: The statement regarding the 2003 data has been removed.

29. Page 73, Section 5.2.4.2.

Comment 29. Use of term "residual free phase" and "free phase PCE residual" is confusing. Free phase implies that the contaminant is present as a liquid that can move through the subsurface. Residual is typically what remains adsorbed to the soil or as a liquid in pore spaces that will not move as a liquid. It is not clear from ADEQ's terminology in this paragraph that this is the intended meaning.

Response 29: The statements regarding "residual free phase PCE" have been removed.

30. Page 73, Section 5.2.4.3.

Comment 30. Phrasing suggests that the current SVE system is not adequate to remove vapor from the subsurface - i.e., "not recoverable by the present SVE system." Although it is true that the other phases of contamination may continue to generate vapor (PCE volatilizing from its dissolved form in the LNAPL, or diffusing from a zone of low permeability), the current SVE system configuration is expected to recover those vapors as they are generated. It may be more accurate to state that PCE existing in other phases (if not removed) is expected to continue to contribute to vapor mass in the vadose zone, and that recovery from low permeability zones may be diffusion limited.

Response 30: That paragraph has been removed.

31. Page 74. 2nd Full Paragraph, 7th Line. "Observations indicate that the free product layer is spreading at a rate of less than 10 feet per year."

Comment 31. ADEQ should provide specific details on how and which "observations" were used to calculate product movement velocities.

Response 31: That sentence has been removed from the text.

32. *Page 75, 1st Bullet.*

Comment 32. ADEQ speculates that SVE wells are a source of additional PCE to the perched zone, resulting in increased PCE concentrations in product accumulating in the SVE wells, with the free product with increased concentrations being removed through bailing activities. This speculation fails to take into account the concurrent decreases in PCE in product accumulating in perched wells outside of the immediate source area (as noted on Page 76).

Response 32: This discussion regarding fluctuations in chlorinated hydrocarbon content of the diesel free-product has been removed from the text.

33. *Page 79. 2nd paragraph, 8th Line. "Dissolved PCE concentrations in the sentinel well UAM-2 have generally increased since August 2000 (Appendix D, Chart D-10)."*

Comment 33. Statement that PCE concentrations in UAM-2 have "generally increased" is an overstatement and gives the false impression that an increasing trend continues. Although a straight line fit to the data over this entire period does show an increasing trend in PCE concentrations, more recently, the PCE concentration at this well has begun to level off, and since mid-2003, a slight decreasing trend has been observed.

Response 33: The text has been modified to say "PCE was detected at UAM-2 at a concentration of 1.3 µg/L when first sampled in August 2000, and had increased to 5.7 µg/L in August 2008, and decreased to 4.0 µg/L in November 2008. These data indicate the continued migration of the plume towards the UA production wells. A deeper sentinel well, UAM-2B (screened from 328 to 410.8 feet bgs), was installed in April/May 2008 adjacent to UAM-2. Monthly sampling of UAM-2B from May 2008 through November 2008 shows no detected concentrations of PCE, TCE, cis-1,2-DCE, 1,1-DCE, and/or vinyl chloride."

34. *Page 81. 1st Full Paragraph, 4th Line. "The contaminant masses in vapor and adsorbed to soil in the upper and lower vadose zones are inadequately defined."*

Comment 34. During the Vadose Zone Confirmation Study performed by URS on behalf of Mission in 2003, soil vapor samples were collected and analyzed for VOCs at 4 different depths within the upper vadose zone at 20 locations for a total of 80 samples. These locations, upon which ADEQ provided oversight and concurrence, were selected to provide adequate coverage of the site and surrounding area. The results of the investigation show that the vast majority of the remaining contaminant mass in the upper vadose zone was adequately defined during this investigation. Continued monitoring of the permanent

vapor monitoring wells installed during the Vadose Zone Confirmation Study will provide more detail on vapor concentrations and how they react to renewed SVE currently underway.

Response 34: The reference to the upper vadose zone has been removed.

35. *Page 82, 3rd paragraph.*

Comment 35. Figure 59 and Figure 60 appear to be switched.

Response 35: These figures have been removed from the document.

36. *Page 83, 1st Line. "...adjustments are applied to arrive at pre-dilution concentrations."*

Comment 36. Additional detail is needed. What method was used to make adjustments to arrive at pre-dilution concentrations?

Response 36: This sentence has been removed from the text.

37. *Page 84. 3rd Full Paragraph, Line 2. "Prior to startup, one additional SVE well will be installed in the upper vadose zone in the source area inside the building and connected to the existing SVE system."*

Comment 37. The new SVE well will be connected to the system after SVE startup.

Response 37: No new SVE well was installed and this sentence has been removed from the text.

38. *Page 87. 1st Paragraph, 3rd Line. "It is recommended that an independent study of the results of the SVE operation be performed following confirmation testing."*

Comment 38. The meaning of this statement is not clear. If ADEQ suggests that additional testing be performed following completion of the SVE operational period to confirm the conclusions obtained at the completion of SVE operation, we concur. Conversely, if ADEQ is suggesting that a separate contractor should be retained to evaluate the SVE results, we do not agree that such an evaluation is necessary.

Response 38: ADEQ is not suggesting that a separate contractor be retained to evaluate SVE results. ADEQ is only suggesting that additional testing be performed following completion of the SVE operational period to confirm cleanup. This sentence has been removed from the text.

39. *Page 89, 3rd Paragraph, 3rd Line. "Free-phase PCE may still exist in residual pockets in the upper vadose zone."*

Comment 39. There is currently no evidence to support this statement. Based on the relatively small amount of vapor phase rebound that has been observed during lengthy SVE shut-down periods and the significant reductions in contaminant mass that were observed during the Vadose Zone Confirmation Study, it appears highly unlikely that significant "pockets" of DNAPL remain in the upper vadose zone.

Response 39: This sentence has been removed from the text.

40. *Page 90, 3rd Paragraph, 2nd Line. "Influent concentrations from the extraction wells decreased over the period of operation of the system, but it is unclear how much of the upper vadose zone was being remediated."*

Comment 40. This paragraph ignores the results of the Vadose Zone Confirmation Study conducted by Mission Linen in 2003. In addition, while operating the SVE system on a single SVE well, vapor concentrations at other SVE wells decreased concurrently, indicating that a large radius of influence for the SVE wells. If ADEQ is making a statement regarding diffusion-limited recovery from zones of low permeability, that should be stated specifically rather than making a general statement about vadose zone remediation being unclear. It is clear based both on the results of the SVE operation and on the Vadose Zone Confirmation Study that the initial SVE operational period was very successful in removing the vast majority of VOC mass from the vadose zone.

Response 40: This sentence has been removed from the text.

41. *Page 102. Bullet List. 1st Bullet. Discussion of potential remaining conduits for vertical transport of contaminants from the perched to the regional aquifer. "Possible incomplete sealing of the annulus during plugging and abandonment of water supply wells Old Well and MP-1"*

Comment 41. There is currently no evidence to support this "conduit". Based on current plume configuration maps prepared by ADEQ, the dissolved phase PCE plume in the regional aquifer appears to be detaching from the original source area as the highest concentrations have moved downgradient from the site. This would strongly support the conclusion that the source area in the perched aquifer has been adequately sealed from the Regional Aquifer. Further, testing of a deep regional well installed by ADEQ adjacent to MP-1

(PER-14) has not detected significant contamination suggesting that well abandonment successfully sealed this potential conduit.

Response 41: Previous plume configurations were determined from groundwater samples collected from wells PER-14 and MLR-7. ADEQ installed regional monitor well PER-14A in 2008. PER-14A is screened in the upper portion of the regional aquifer from 180 to 250 feet below ground surface. Groundwater samples collected immediately following PER-14A well installation were found to contain low concentrations of PCE. A sample collected from PER-14A three weeks later during a regular groundwater sampling event was found to contain 12 µg/L PCE. Additional regional groundwater samples are needed to adequately characterize contaminants within the regional aquifer.

42. *Page 102. Bullet List. 2nd, 3rd, 4th, and 5th bullets. Discussion of potential remaining conduits for vertical transport of contaminants from the perched to the regional aquifer.*

Comment 42. There is currently no evidence to support that these “conduits” exist. Based on current plume configuration maps prepared by ADEQ, the dissolved phase PCE plume in the regional aquifer appears to be detaching from the original source area as the highest concentrations have moved downgradient from the site. This would strongly support the conclusion that the source area in the perched aquifer has been adequately sealed from the regional aquifer.

Response 42: As discussed in the previous response, the representation of the plume configuration was previously determined by two regional wells (PER-14 and MLR-7) that are not constructed to detect any persistent contamination at the top of the regional aquifer. However, ADEQ has since installed regional monitor well PER-14A. Limited groundwater samples collected from this well indicate that the contaminant plumes is not detached.

43. *Page 106. Last Paragraph. 2nd Line. “Based on the highly stratified nature of the regional aquifer material and its low overall vertical hydraulic conductivity, higher concentrations of PCE at depth would not be expected if PCE were present only in the aqueous phase, or as a constituent of floating free product.”*

Comment 43. The likely explanation for higher PCE contaminant concentrations at depth in the regional aquifer has to do with the method of delivery of this contaminant. Both of the likely past sources, production wells Old Well and MP-1, were screened well below the water table in the regional aquifer. It is likely that pumping at these wells resulted in downward movement of contaminants into these deeper zones where they could begin acting as a source to the regional aquifer plume. This scenario does not require that PCE DNAPL be present in significant quantities in the regional aquifer.

Response 43: Because the condition of the annulus at Old Well and MP-1 prior to abandonment is unknown, it is impossible to determine at what depth contaminants diffused into the regional aquifer. The discussion of PCE DNAPL has been removed.

44. *Page 107. 3rd Full Paragraph, 6th Line. "This could have occurred through disposal of PCE product directly into MP-1,..."*

Comment 44. There is absolutely no evidence that this ever occurred.

Response 44: It is highly unlikely that PCE could have been introduced into MP-1 from any surface sources due to the presence of a dedicated pump, an elevated well casing, and any other wellhead equipment. The statement: "This could have occurred through disposal of PCE product directly into MP-1,..." has been removed.

45. *Page 111. Last Paragraph.*

Comment 45. This paragraph goes to great lengths to suggest that MLS-5, a well installed by EMCON for Mission Linen, could have contributed to contamination of the regional aquifer during drilling. However, no mention is made of the fact that Wells MLR-1, MLR-2, and MLR-3 installed by Earth Technology for ADEQ in 1990 did not even recognize the presence of a perched aquifer at the site, and therefore, drilling through this zone directly into the lower vadose zone and the regional aquifer occurred while no precautions whatsoever were taken to limit cross contamination of the regional aquifer with contaminants from the perched aquifer during drilling.

Response 45: This paragraph continues to say that "since the PCE concentration in MLS-5 perched groundwater has never been very high, it is doubtful that this contributed significant contamination to the regional aquifer." Based on descriptions in Section 4.3.2 and 4.3.4 of the Earth Technology Corporation (Earth Tech) Preliminary Site Characterization Report dated November 1991, Earth Tech took adequate precautions in preventing cross-contamination of the regional aquifer. Each well was drilled with air from surface to 90 feet below ground surface. Saturated conditions were not identified within the first 90 feet of drilling. Water-based drilling mud was then added to the borehole and drilled from 90 feet to 260 feet bgs using mud rotary techniques. Drilling mud provides an effective borehole seal, which can prevent perched groundwater from impacting lower regional aquifer groundwater. Surface casing was then placed to 260 feet and sealed in place with cement grout. If perched groundwater was present in the upper 90 feet of each borehole, the length of time contaminated groundwater could have impacted the regional aquifer would likely have been less than 24 hours. Therefore, impact to the regional aquifer from drilling MLR-1, MLR-2, and MLR-3 is assumed to be insignificant.

Comment 46. Although this section provides some simplistic calculations regarding groundwater flow and contaminant transport, noticeably absent from this section are calibrated numerical groundwater flow and contaminant transport models. Numerical modeling, especially at a sites as large and complex as this one, is an essential tool in understanding the groundwater flow regime and associated contaminant transport patterns of the aquifer. It is especially critical when evaluating potential remedial alternatives and the timing with which alternatives should be implemented.

Section R18-16-408.A.4 of the Arizona Administrative Code (AAC) states that the remedial investigation for a site shall “Obtain and evaluate any other information necessary for identification and comparison of alternative remedial actions.” Clearly, groundwater modeling is essential to comparison of potential remedial alternatives. Further, with respect to remedial objectives, the AAC states in Section R18-16-406.I.4.b that the remedial objectives with respect to each listed use should be stated in terms of “Time-frames when action is needed to protect against or provide for the impairment or loss of the use.” Groundwater modeling is invaluable in determining if and when contaminants may reach point-of-use receptors, and therefore, is critical to the development of remedial objectives.

Finally, the Groundwater Quality Management Program (Chapter 7) of the Arizona Department of Water Resources Third Management Plan (2000 through 2010) for the Tucson Active Management Area emphasizes the need to balance the need for aquifer cleanup with their stated objective to “ensure that remediation of contaminated groundwater uses the least amount of groundwater necessary to facilitate the objectives of each remedial action project.” In light of this objective, we believe that groundwater modeling is necessary to evaluate whether withdrawals are necessary to prevent exposure to point-of-use receptors and, if so, to identify the minimum groundwater withdrawal volumes necessary to accomplish remedial objectives.

Therefore, for the reasons cited above, it is recommended that numerical groundwater flow and contaminant transport models of the regional aquifer be developed, calibrated, and implemented to establish Remedial Objectives and to evaluate potential remedial alternatives and the timing of implementation, if required.

Response 46: ADEQ agrees that remediation of contaminated groundwater should use the least amount of groundwater necessary to facilitate the objectives of each remedial action project. Also, a contaminant fate and transport numerical model will be prepared as part of the Feasibility Study.

47. *Page 133, 1st Paragraph, 1st Line. “____, August 7, 2004, Vadose Zone Confirmation Study...”*

Comment 47. This reference contains the incorrect date. The actual date should be August 7, 2003.

Response 47: The date has been corrected.

48. *Table 1A.*

Comment 48. Entry for 1960s in the "chlorinated hydrocarbons" column that "PCE spilled on plant floor when storage tanks overfilled" is incorrect. We believe this occurred in approximately 1979.

Response 48: ADEQ has no verification of any specific dates of spills. This table has been omitted from the document.

49. *Appendix D - Summary Table, Chart D-9.*

Comment 49. Time series graph of PCE for PER-26 indicates that PCE was non-detect in February 2004 while the table in Appendix D displays a concentration of 32 µg/L in February 2004.

Response 49: The text has been modified to reflect this information.

SPECIFIC COMMENTS FROM THE CITY OF TUCSON ENVIRONMENTAL SERVICES

The City of Tucson (COT) Environmental Services provided comments, dated October 4, 2004, to the RI report. The following section includes the text of comments along with a response to address each comment.

General Comment

With regard to the perched aquifer, the diesel plume should be an integral part of this project. While the City understands that ADEQ at the on-set of this RI investigation excluded the diesel plume from its scope of work based on funding, the City believes that the diesel contamination must be addressed to complete the RI. The diesel plume prevents future use of this water. This is particularly important as ADEQ moves into finalizing the remedial Objectives (RO) for the site. The City's position is that the RO must be to clean up both the perched and regional aquifers to drinking water standards. This RO cannot be achieved with the diesel being ignored.

Response. ADEQ acknowledges the City's position on the diesel plume, however, the diesel plume within the perched aquifer was not included in the current ROs. No City of Tucson wells are located within the perched aquifer. In addition, according to the Land and Water Use Study and based on inputs from the City, the perched aquifer has no beneficial uses.

Specific Comments

Comment 1. The City has reviewed the Park-Euclid Community Advisory Board's comments on the draft RI dated September 19, 2004 and concurs with these.

Response 1: The Community Advisory Board's (CAB) comments have been addressed.

Comment 2. Page 5, 1.3.4. Arroyo Chico Project, last Sentence. Please change this to "Excavation of the detention basin is currently scheduled to begin in 2005."

Response 2: The last sentence of Section 1.3.4 on page 5 has been removed.

Comment 3. Page 7 1.3.5.3. Work performed by the City of Tucson, third paragraph, third sentence: Please change this to read "At the request of ADEQ, the U.S. Army Corps of Engineers has revised the grading of Basin 1 such that the Arroyo Chico project will not change the rate of infiltration from the surface stormwater runoff."

Response 3: The CAB also requested this sentence be changed to say the infiltration rates will not be changed but in different words. ADEQ will request to the U.S. Army Corps of Engineers, that Basin One will be unlined so as not to alter the infiltration rate of detained stormwater."