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1110 West Washington Street, Phoenix, Arizona

Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site
Phoenix, Arizona

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EXECUTIVE SUMMARY

Malcolm Pirnie, Inc. and the Arizona Department of Environmental Quality (ADEQ) have prepared this Remedial Investigation (RI) report for the 7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund (WQARF) site under ADEQ Contract EV03-0073 and Task Assignment 04-0100 to meet the requirements of the Arizona Revised Statutes (A.R.S.) §49-287.03 and Arizona Administrative Code (A.A.C.) R18-16-406.

Two properties have been identified as likely sources of the groundwater contamination in the 7th Avenue and Bethany Home WQARF site (the Site). The Bayless Investment and Trading Company property, (Bayless property) located at 540 West Bethany Home Road, and the SCI Arizona Funeral Services property, (SCI property) located at 710 West Bethany Home Road.

The Bayless Investment and Trading Company (Bayless) originally purchased the property located at 540 West Bethany Home Road in 1950. Bayless developed the property into a small shopping center in 1952, including a Bayless Market, a variety of commercial shops, and a dry cleaning facility. The dry cleaning business began operation in 1953 at the shopping center. Between 1952 and 1960, the shopping center was connected to an on-site septic system and wastewater from all the retail spaces was reportedly discharged to the septic system. In 1960, the shopping center was connected to the Phoenix sewer system and discharge of wastewater to the septic system is believed to have terminated. A fire destroyed a portion of the shopping center in 1987 and the remaining buildings were demolished in 1994. The septic system and cesspools remained in place until 2000. The property is approximately 2.6 acres in size and is currently vacant land.

On behalf of a prospective lessee and the property owner, site investigations were conducted at the Bayless property between 1995 and 2001. The results of these investigations confirmed the presence of tetrachloroethene (PCE), and other volatile organic compounds (VOCs), in the soil and groundwater beneath the property. Groundwater samples collected from the monitor wells on two separate occasions in November 1995 reportedly detected the presence of PCE in each of the three groundwater monitor wells at concentrations up to 15,000 micrograms per liter (µg/L).

During site investigation activities in 1999, two septic tanks, three cesspools, and associated piping were discovered. In 2000, the contents in and around the septic tanks and cesspools were characterized, followed by the excavation and removal of the tanks and piping. The soil beneath the tanks was sampled and laboratory test results indicated that VOCs were not detected above reporting limits. Subsequently, the cesspools were abandoned in accordance with procedures based on ADEQ Dry Well Decommissioning Guidelines.

Shallow and deep soil gas sampling was conducted at the property in 1999. The intent of drilling the deep borings, to a depth of 70 feet below ground surface (bgs), was to provide a vertical profile of PCE at the property down to the water table. The maximum PCE vapor concentration detected was 830 milligrams per cubic meter (mg/m^3), at a depth of 25 feet bgs at a location near the northern most septic tank. Detections of PCE vapor occurred at all depths down to 70 feet bgs.

ADEQ conducted a Preliminary Investigation at the Bayless property in 2004 and placed the property on the WQARF Registry with a score of 29 out of a possible 120. In 2005, ADEQ initiated an Early Response Action (ERA) to address soil and groundwater contamination associated with the Bayless property. Malcolm Pirnie, Inc. was contracted by ADEQ to initiate the ERA Investigation and to collect data to characterize the source area of PCE contamination below the property. The main focus of the ERA investigation was to assess the extent of the PCE contamination in the vadose zone and groundwater at the property and to determine if a source area remediation soil vapor extraction (SVE) system could be used to efficiently reduce vapor phase VOC contamination within the vadose zone.

ADEQ and the property owner of the Bayless property, entered into a consent decree in April 2005. ADEQ received a settlement in the amount of $225,000. The decree indicted the owner had already spent approximately $170,000 investigating and remediating the property.

During the ERA investigation, in general, the PCE soil gas concentrations increased with depth in each of the exploratory soil borings. The highest detections of PCE soil gas concentrations occurred in the lower half of the vadose zone from approximately 45 feet to 80 feet bgs with estimated concentrations in the soils likely exceeding regulatory standards. In the closest borings to the former septic tanks, analyses of the samples indicated that PCE concentrations increased with depth to a maximum measured PCE soil gas concentration of 6,100 mg/m^3 at 80 bgs. Analytical results of the groundwater samples collected during the ERA indicated that PCE concentrations ranged from 56 μg/L to 10,000 μg/L, well above the Aquifer Water Quality Standard (AWQS) of 5 μg/L.

Based on the results of the ERA investigation, there appeared to be significant concentrations of PCE gas vapors in the vadose zone below the location of the former septic system. Therefore, ADEQ directed Malcolm Pirnie, Inc. to design, install and operate a SVE system to reduce the VOC mass in the vadose zone. The goal of the interim SVE remediation system was to remove as much of the VOC mass, primarily PCE, as possible, from the source area below the property and reduce further impacts to groundwater quality.

The SVE system was installed during the second quarter of 2005 and was operational by the end of June 2005. The SVE system consisted of five SVE wells, with screened intervals from 40 to

75 feet bgs, located within the septic system source area. The VOCs were removed from the extracted air using two 5,000 pound granular activated carbon (GAC) vessels that were operated in series. Air emissions from the SVE system were regulated under an air permit issued by the Maricopa County Environmental Services Department.

By January 2006, field data and analytical soil gas samples indicated that relatively low mass removal rates were occurring and that the majority of the extractable VOC mass in the vadose zone had been removed.

A SVE rebound test was conducted on April 11, 2006 to determine whether a substantial amount of removable VOCs remained in the unsaturated soils of the vadose zone previously treated by the SVE system. The results of the rebound test indicated that there did not appear to be enough extractable VOCs remaining in the vadose zone to warrant the continuation of the operation of the SVE system. During operations from June 2005 to January 2006, the SVE system removed approximately 380 pounds of PCE.

After termination of the source area remediation activities, but prior to the decommissioning of the SVE system, two verification borings were drilled within the SVE system extraction area. The purpose of the verification borings was to collect soil and soil gas samples to assess the residual concentrations of PCE that may be remaining in the vadose zone after operating the SVE system. PCE was not detected in the soil samples at or above the laboratory reporting limit of 0.050 milligrams per kilogram (mg/kg), the Groundwater Protection Level (GPL) of 0.8 mg/kg or the residential soil remediation level (SRL) of 5.1 mg/kg in any of the soil samples from the verification borings.

Soil gas samples were also collected from the verification borings. In general, the PCE gas concentrations increased with depth in each of the soil borings. PCE soil gas concentrations at the shallowest depths, ranging from 10 to 30 feet bgs, were relatively low, ranging from non-detect, less than 0.003 mg/m^3, to 1.1 mg/m^3. PCE soil gas concentrations increased with depth to a maximum measured concentration of 142.6 mg/m^3 at 80 feet bgs. The PCE soil gas concentrations detected in the borings were up to three orders of magnitude less than the levels detected in the samples collected from comparable depths in the borings that were drilled during the ERA Investigation. Converting the soil gas concentrations collected from the verification borings to soil solid concentration indicates the remaining concentrations in the soil range from approximately 0.0005 to 0.06 mg/kg, well below the residential SRL and GPL for PCE.

Based upon a request from the property owner, ADEQ granted the property owner a No Further Action (NFA) determination for soil at the property in December 2008. The soil NFA is for VOCs in soil and does not address any other area of land, groundwater or any other contaminants.

Subsequent groundwater samples collected during additional monitor well installation and quarterly sampling activities indicated PCE concentrations ranged from less than 2 μg/L to 2,200 μg/L. Recent groundwater sampling indicates concentrations of PCE as high as 600 μg/L. The location with the highest PCE concentration is immediately downgradient of the suspected source area, the former septic tank locations.

The SCI property is located at 710 West Bethany Home Road, Phoenix, Arizona and consists of four separate parcels. Two of the parcels are of interest in this investigation. Based on the currently available information in ADEQ files, a dry cleaner operated on parcel 2 from the 1950's until the 1990's. A dry well was installed on parcel 2 in September 1982, approximately 20 feet west of the dry cleaning operations. The dry well is 120 feet deep with drainage fabric located at approximately 18 feet bgs with gravel pack beneath the fabric to total depth. Parcel 4 was occupied by a mortuary and parking lot and contained two surface drains; one that lead to a septic tank and one the lead to a brick-lined seepage pit.

On behalf of the property owner, Water Resources Associates, Inc (WRA) performed the initial environmental investigations at the SCI property in the early 1990s. WRA conducted the site investigations in the first half of 1990 on parcels 1 through 4, which included four soil borings, 21 soil gas sampling locations, abandonment of a septic tank in place and the evacuation of a seepage pit.

According to a report submitted to ADEQ from WRA, "detectable" concentrations of PCE were detected during the initial investigation in February 1990 with the highest concentrations detected near the dry well. A sediment sample was collected from the dry well at approximately 16.5 feet bgs and analyzed for chlorinated VOCs using United States Environmental Protection Agency (US EPA) Method 8010. The detected analytes from the sediment sample were PCE, TCE, and total 1,2-dichloroethene (1,2-DCE) at concentrations of 1,300 mg/kg, 19 mg/kg, and 11 mg/kg, respectively.

In June 1990, on behalf of the lessee, SCS Engineers (SCS) provided oversight of dry well cleaning activities on parcel 2. SCS collected samples of the material located at the base of the dry well settling chamber. A total of two samples were collected by SCS, but only one sample was analyzed for chlorinated VOCs using US EPA Method 8010. The results of the one analyzed sample, collected prior to the washing of the gravel located at the base of the dry well, reported detections of PCE and TCE at concentrations of 65.9 mg/kg and 2.4 mg/kg, respectively.

During March 1990, the seepage pit located on parcel 4 was evacuated by a vacuum service truck and soil samples were collected by WRA. A single soil boring was drilled inside the seepage pit to a total depth of 59.5 feet bgs. Two chlorinated solvent compounds were detected in the soil boring at a depth of 32 feet bgs. PCE and 1,2-DCE were detected at concentrations of 0.21 mg/kg and 0.06 mg/kg, respectively.

As a result of these and other samples, WRA conducted a soil excavation and soil sampling event on April 12, 1990. A total of eleven soil samples were collected, but only seven of the samples were analyzed. A single soil sample, collected beneath the septic tank, had a detection of PCE of 0.01 mg/kg. A sludge sample was collected from the bottom of the seepage pit on April 16, 1990 and had detections of PCE, TCE, and 1,2-DCE at concentrations of 43.5 mg/kg, 0.4 mg/kg, and 0.3 mg/kg, respectively.

The field investigations in the early 1990s indicated a release of PCE to the vadose zone but any impact to the groundwater beneath the SCI property was not evaluated at that time. Therefore, Malcolm Pirnie, Inc. was contracted by ADEQ to initiate the ERA investigation and to collect data to characterize the source area of PCE contamination below the SCI property. The purpose of the ERA investigation at the SCI property was to collect the data necessary to characterize the potential source areas of VOC contamination and determine if further remedial actions were necessary at the property.

Six exploratory soil borings, B1 through B6, were drilled and two groundwater monitoring wells, MW-11 and MW-12, were installed as part of the ERA investigation conducted in March and April of 2008. The exploratory boring locations were selected based on the known location of the former dry cleaner building, potential source areas including a dry well and former septic system and seepage pit, and known groundwater flow direction.

Analytical results indicated PCE, propene (propylene), and acetone to be the most prevalent compounds in the soil gas samples, occurring in each boring and generally increasing in concentration with depth. Soil gas samples collected from borings B1 and B4, at approximately 65 feet bgs, had the highest concentrations of PCE detecting 100 mg/m^3 and 120 mg/m^3, respectively. Boring B1 is located near the former septic tank and seepage pit and boring B4 is located near the former dry cleaning building. TCE, chloroform, hexane and toluene were also present in most of the boreholes in lower concentrations. Benzene, 2-butanone (MEK), 1,2,4-trimethylbenzene, and dichlorodifluoromethane (Freon 12) occurred in a few borings and at relatively low concentrations. Results indicated that detected analytes occurred at their highest concentration between the 55 feet bgs to 75 feet bgs. No concentrations were detected above regulatory standards and no further remediation of the vadose zone at the SCI property is planned.

On March 18, 2008, groundwater samples were collected from monitoring wells MW-11 and MW-12 immediately after well development and analyzed for VOCs using US EPA Method 8260B. PCE was detected in both wells at concentrations in excess of the AWQS of 5 μg/L. Monitoring wells MW-11 and MW-12 had PCE concentrations of 7.4 μg/L and 22 μg/L, respectively. MW-12 also had a TCE concentration of 23 μg/L, which is above the AWQS for TCE of 5 μg/L. Vinyl chloride was also detected in monitor wells MW-12 at concentration

above the AWQS. Concentrations of vinyl chloride ranging from 2.6 μg/L to 2.7 μg/L, just above the AWQS for vinyl chloride of 2 μg/L.

The downgradient extent of the contamination above the AWQS assessed to date is estimated to be approximately 125 feet downgradient of monitor well MW-10. Monitor well MW-10 is located approximately 400 feet north of the Bayless property. The fourth quarter 2008 sample collected from this monitor well detected PCE at a concentration of 140 μg/L. In addition, the forth quarter 2008 quarterly sample collected from monitor well MW-8, located approximately 1,350 feet north of the property, detected PCE at a concentration of 0.61 μg/L. Due to budget constraints, the PCE detection in monitor well MW-8 has not been confirmed by additional groundwater samples.

The Bayless and SCI properties are under the jurisdiction of the City of Phoenix for planning purposes. The zoning pattern in the area has been long established and there are no foreseeable changes for the future.

The land and water use study questionnaire response provided by the City of Phoenix did not indicate the City has plans to restore an inactive drinking water well in the area to active service. In their land and water use study questionnaire response, the Salt River Project Agricultural Improvement and Power District (SRP) indicates that many of the properties in the area of the 7th Avenue and Bethany Home WQARF site, and downstream of the Site, still irrigate with untreated surface water. SRP also indicates because of their reliance on groundwater to supplement its surface water supplies during periods of drought, SRP is very concerned with any water quality problems in the aquifer or with a threat of groundwater contamination.

ADEQ has identified PCE, TCE and vinyl chloride as the contaminants of concern in the groundwater at the Site. With the exception of the east side of the Bayless property, the horizontal extent of groundwater PCE contamination is defined by the current Site groundwater monitor well network and the extent of VOC contamination above the AWQS has been defined.

The surface water, air and soil contact pathways are complete at the Site. The concentrations of the contaminants known at the Site do not pose a substantial risk to human heath.

1. INTRODUCTION

1.1. Site History

The 7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund (WQARF) Site (the Site) consists of two properties: The Bayless Investment and Trading Company property, (Bayless property) located at 540 West Bethany Home Road, and the SCI Arizona Funeral Services property, (SCI property) located at 710 West Bethany Home Road.

On behalf of a prospective lessee and the property owner, site investigations were conducted at the property located at 540 West Bethany Home Road between 1995 and 2001. The results of these investigations confirmed the presence of tetrachloroethene (PCE), and other volatile organic compounds (VOCs), in the soil and groundwater beneath the property. In 2004, the Arizona Department of Environmental Quality (ADEQ) conducted a Preliminary Investigation at the Site and placed the Site on the WQARF Registry with a score of 29 out of a possible 120.

ADEQ and the property owner, Bayless Investment and Trading Company (Bayless), entered into a consent decree in April 2005. ADEQ received a settlement in the amount of $225,000. The decree indicted the owner had already spent approximately $170,000 investigating and remediating the property.

Malcolm Pirnie, Inc. conducted an early response action (ERA) at the Bayless property under ADEQ Contract EV03-0073 and Task Assignment 04-0100. The objective of the ERA was to collect sufficient information to determine the appropriate cleanup actions needed at the property to address sources of contamination.

On behalf of the property owner and lessee, site investigations conducted at the SCI property in the early 1990s indicated a release of PCE to the vadose zone but any impact to the groundwater beneath the property was not evaluated at that time. Therefore, Malcolm Pirnie, Inc., under contract to ADEQ, conducted an ERA investigation at the SCI property. The objective of the ERA evaluation was to collect the data necessary to characterize the potential source areas of VOC contamination below the property. This investigation was conducted as part of the ongoing investigation of the 7th Avenue and Bethany Home WQARF Site.

The Site is located at the intersection of Bethany Home Road and Seventh Avenue in Phoenix, Arizona (Figure 1). It lies within the southwest quarter of the southwest quarter of the southwest quarter of section 8, Township 2 North, Range 3 East of the Gila and Salt River Baseline and Meridian. The Site is bounded to the north by Rose Lane, to the south by Bethany Home Road, to the east by 5th Avenue and to the west by 8th Avenue. The groundwater contamination plume

boundary varies and may extend beyond the streets listed, and those locations are considered part of the WQARF Site.

1.2. Remedial Investigation Objectives

ADEQ and Malcolm Pirnie, Inc. prepared this Remedial Investigation (RI) report to meet the requirements of the Arizona Revised Statutes (A.R.S.) §49-287.03 and Arizona Administrative Code (A.A.C.) R18-16-406. The purpose of the RI is to collect enough information about the contaminants present to determine the appropriate remedial actions needed at the Site. This RI report summarizes the activities completed as part of the ERA, including drilling, soil and soil vapor sampling, well installation, groundwater elevation and water quality monitoring within the Site. The information presented in the RI report includes the physical characteristics of the Site; the nature, extent, and sources of the contamination; and the actual and potential impacts of contaminants to public health, welfare, and the environment. The RI report also identifies present and reasonably foreseeable land and waters uses that have been, or are threatened to be, impacted by the contamination.

1.3. Site Facility Descriptions

1.3.1 Bayless Investment and Trading Company Property

Bayless originally purchased the property located at 540 West Bethany Home in 1950. Bayless developed the property into a small shopping center in 1952, including an A. J. Bayless Market, a variety of commercial shops, and a dry cleaning facility. The dry cleaning business began operation in 1953. Between 1952 and 1960, the shopping center was connected to an on-site septic system and wastewater from all the retail spaces was reportedly discharged to the septic system. In 1960, the shopping center was connected to the City of Phoenix sewer system and discharge of wastewater to the septic system is believed to have terminated. A fire destroyed a portion of the shopping center in 1987 and the remaining buildings were demolished in 1994. The septic system and cesspools remained in place until 2000. Figure 2 shows an approximate outline of the former buildings and former septic system. The property is approximately 2.6 acres in size and is currently vacant land.

1.3.2 SCI Arizona Funeral Services Property

The SCI property is located at 710 West Bethany Home Road, Phoenix, Arizona and consists of four separate parcels (see Figure 3). Based on the currently available information in the ADEQ files, a dry cleaner operated on parcel 2 from the 1950's until the 1990's. A dry well was installed on parcel 2 in September 1982, approximately 20 feet west of the dry cleaning operations. The dry well is 120 feet deep with a settling chamber and drainage fabric located at approximately 18 feet bgs and gravel pack beneath the settling chamber to total depth. Parcel 4 was occupied by a mortuary and parking lot and contained two surface drains; one that lead to a septic tank and one the lead to a brick-lined seepage pit.

2. PHYSICAL SETTING

2.1 Climate

The Site is located in an area that has an arid climate with hot summers temperatures and mild winters. Average annual temperature range from 59.9 to 83.9 degrees Fahrenheit (WRCC, 2008). The average annual total precipitation is approximately 8.39 inches, with most of the precipitation occurring between July through September and December through March.

2.2 Topography

Arizona is primarily divided into two physiographic provinces (the Colorado Plateau, and the Basin and Range) (USGS, 1996). The Site is located within the Basin and Range physiographic province, which is characterized by north-northwest trending mountain ranges separated by low-lying sedimentary basins. The basins were later filled with weathered and eroded alluviums that originate from the mountains. Based on surveyed elevations of monitor wells at the Site, the topography of the Site is relatively flat with elevation ranging from approximately 1,157 feet above mean sea level (amsl) in the northern parts to approximately 1,152 feet amsl at the southern and eastern parts.

2.3 Geology

The oldest rocks in the vicinity of the Site are mostly metamorphic rocks of Proterozoic age (Figure 4). These include metavolcanic rocks, metasedimentary rocks, and foliated to gneissic plutonic rocks. The metavolcanic rocks are composed mainly of greenstone (metamorphosed basalts and andesite) and metarhyolite and occur in the Phoenix Mountains and near Papago Park. The metasedimentary rocks include slate, schist, phyllite, and quartzite and are mostly exposed near the Phoenix Mountains (Reynolds and Bartlett, 2002).

The metamorphic rocks are in turn intruded by several distinct plutons of granitic composition. These are present in the Camelback Mountain and in the southwestern parts of Papago Park. These include the Camelback Granite and Tovrea Granite which are exposed in the Camelback Mountain and in a small area southwest of Papago Park (Reynolds and Bartlett, 2002).

Unconformably overlying the Proterozoic rocks are middle Tertiary sedimentary and volcanic rocks. The sedimentary rocks are present in the Camelback Mountain and middle parts of Papago Park. The volcanic rocks occur in the northwestern parts of the Phoenix Mountains. In the eastern parts of the Phoenix basin, these sedimentary and volcanic rocks are composed of three units namely the Camels Head Formation; the Tempe Formation, and the Tertiary volcanic rocks. The Camels Head Formation is composed of mainly debris-flow coarse sedimentary breccia and conglomerate, with thin interbeds of sandstone which are composed of conglomerate. This formation is overlain by the Tempe Formation which is fine grained and

composed mainly of siltstone and sandstone. Overlying the Tempe Formation are mafic to intermediate volcanic rocks. During and following the emplacement of the mid-Tertiary rocks, periods of structuaral deformation occurred that include episodes of crustal extension, faulting and erosion (Reynolds and Bartlett, 2002).

Overlying the mid-Tertiary rocks are Quaternary deposits composed of material derived from the surrounding mountains. In the vicinity of the Site, these basin-fill deposits consists of three main hydrogeologic units: the Lower Alluvial Unit (LAU) consisting mainly of conglomerate and gravel, Middle Alluvial Unit (MAU) consisting mainly of silt and clay, and Upper Alluvial Unit (UAU) consisting mainly of gravel and sand (Corkhill et al, 1993). Based on drilling records, the Site is underlain by the UAU, which is reported to be approximately 200 feet thick in the surrounding area. A deep monitor well at the Site, drilled to a depth of 225 feet, may have encountered the MAU at a depth of approximately 215 feet.

Overlying the Basin-fill deposits are recent alluvial deposits which occur south of the Site along the Salt River and its main tributaries. The alluvial deposits are composed mainly of clasts of coarse gravel, cobbles, and boulders in a sandy matrix.

2.4 Hydrogeology

The Site is located within the West Salt River Valley (WSRV) Sub-basin of the Phoenix Active Management Area (Figure 1). The valley is drained by the Salt and Agua Fria Rivers, both tributaries of the Gila River. Principal aquifer material within the WSRV can be divided into two units, the crystalline rocks of Precambrian to mid-Tertiary age and material deposited in the alluvial basins. The deposits of the crystalline rocks form the bedrock unit. In most cases, the bedrock unit is composed of crystalline and extrusive rocks. Locally, the bedrock unit may contain groundwater where it is fractured but yield is usually poor. Due to its low yield, the bedrock unit is not generally considered an aquifer. On a regional scale, it is instead considered as a nearly impermeable boundary to groundwater flow (Corkhill et al, 1993). The bedrock unit has not been encountered in borings registered with the Arizona Department of Water Resources (ADWR) within approximately one mile radius of the Site.

The principal aquifer at the Site is composed of the basin-fill deposits of the LAU, MAU and UAU. The thickness of basin fill deposits range from 100 feet near the basin margins to approximately 10,000 feet near the center of the basins. Lithology consists of interbedded sequences of comglomerate, gravel, sand, silt, clay, and evaporate. Hydraulic conductivity values for the LAU, MAU, and UAU have been estimated at 5-60 feet/day; 5-50 feet/day; and 20-250 feet/day, respectively. Groundwater recharge of the alluvial units is from a variety of sources. These include precipitation falling on the mountains surrounding the basins, seepage from reservoirs, percolation of surface water, imported water from the Colorado River, recharge from canal, agriculture, urban and artificial recharge (Corkhill et al, 1993). Depth to

groundwater in the vicinity of the Site ranges from 68-280 feet below ground surface (bgs) (ADWR, 2007). Regional groundwater flow direction near the Site is presented in Figure 5.

2.4.1 Groundwater Occurrence

Based on the lithology of Site monitoring wells and nearby ADWR registered wells, the upper most water-bearing unit occurs between 75 and 100 bgs. The upper most water bearing unit is composed of clay, sandy clay, sandy silt, clayey silt, and some silty sand. The general locations of wells in ADWR's well registry, located within one mile of the Site, are shown on Figure 6 and a listing of information for each of these wells is provided in Appendix A.

2.4.2 Groundwater Use

Groundwater use within a one mile radius of the Site is mainly for monitoring/remediation purposes. Other uses include irrigation, dewatering with a few domestic wells and one inactive City of Phoenix municipal well (Figure 6).

2.4.3 Groundwater Quality

Groundwater production in the vicinity of the Site is predominantly from one or more units of the basin-fill deposits. Groundwater in the basin-fill aquifers generally is of suitable chemical quality for most uses; most groundwater has total dissolved-solids concentrations of less than 1,000 milligrams per liter (Corkhill et al, 1993).

2.5 Soils

Soils in the Site are composed of the Torrifluvents Association. The major Torrifluvents in this soil association include Estrella and Laveen-soil association. The parent material for the Estrella consists of recent medium textured alluvium over older mixed alluvium while the Laveen is derived from mixed alluvium. Both soils are classified as well drained with slopes ranging from zero to one percent. The pH value in the uppermost five feet of the soil associations ranges from 7.9 to 8.4 (NRCS, 2008). The soil types and soil hydraulic conductivity value ranges are presented in the Table 1.

2.6 Vegetation

The Site is located within the lowland Sonoran Desert ecoregion. The lowland Sonoran Desert ecoregion occurs at an elevation range of 100-3,300 feet above mean sea level. Vegetation is dominated by low open, stands of creosote bush, and bursage. Other vegetative types include saltbush, acacia, and mesquites which are found on low, undrained, and salt affected soils. Other species include desert broom, cholla, ironwood, palo verde, desert willow and canyon ragweed. More than 20 percent of the areas occupied by the Senoran Desert vegetative communities have been replaced by development and agriculture (AGFD, 2006).

3. REMEDIAL INVESTIGATION ACTIVITIES AT THE BAYLESS PROPERTY

3.1 Initial Site Investigations

On behalf of a prospective lessee, Groundwater Technology, Inc. (GTI), and Hargis & Associates (Hargis, 2000, 2001) performed the initial environmental investigations at the Bayless property. GTI conducted two site investigations in 1995 and 1996, respectively, because of a potential lease of the vacant property. The phase I and II Site Investigations included drilling of five soil borings and the installation of three groundwater monitor wells (MW-1, MW-2, and MW-3).

Each boring was drilled to a maximum depth of 100 feet bgs. Soil samples from two of the borings indicated detections of PCE with concentrations ranging from 0.022 to 0.065 mg/kg. Groundwater samples collected from the monitor wells on two separate occasions in November 1995 reportedly detected the presence of PCE in each of the three wells at concentrations up to 15,000 micrograms per liter (µg/L). These concentrations are well above the Aquifer Water Quality Standard (AWQS) for PCE of 5 µg/L.

Based on the previous investigations, Hargis performed a third investigation between 1999 and 2001 on behalf of the property owner. The purposes of the Hargis investigation were to further evaluate the lateral and vertical extent of soil contamination at the property; determine the location, if possible, of the source of the contamination; and evaluate the potential for soil contamination to have impacted groundwater at the property. This investigation included several phases including a supplemental site investigation (1999), a septic system discovery and investigation (1999), a septic system removal and sampling (2000), and preparation of a draft investigation report (2001).

Hargis conducted shallow gas sampling in 1999 with sample locations focused on the area surrounding the former septic system. The samples were collected at depths of five and 10 feet bgs at 20 locations. VOC analysis of the samples indicated the highest PCE concentrations were detected at depths of 10 feet bgs near the east (back) side of the dry cleaner, just south of the dry cleaner, and around the former septic system near the two septic tanks (Figure 7).

Also in 1999, Hargis drilled three deep soil gas borings, DSG-1, DSG-2, and DSG-3 to depths of 28.3, 29.5, and 70 feet bgs, respectively. All deep soil gas boring locations were near the east side of the former dry cleaner location. The intent of drilling the deep borings was to provide a vertical profile of PCE at the property down to the water table. Soil gas samples were collected at five, 10, 15, and 25 feet bgs in DSG-1, at five, 10, 15, 25, and 29.5 feet bgs in DSG-2, and at 12,

22, 32, 41.5, 51, 60.5, and 70.5 feet bgs in DSG-3. Deep soil gas borings, DSG-1 and DSG-2, were terminated at their respective shallow depths due to refusal of the sampling equipment. After different drilling equipment was brought to the property, boring DSG-3 was successfully drilled to a total depth 70.5 feet. Detections of PCE vapor occurred at all sampling depths. The maximum PCE soil gas concentration detected was 830 micrograms per cubic meter (mg/m^3), at a depth of 25 feet bgs in DSG-2, which was drilled closest to the northern-most septic tank.

Hargis inspected the three existing monitoring wells at the Site in 1999. Two of the wells, MW-1 and MW-2, had obstructions above the water table that prevented sampling. Several attempts to clear the obstructions were unsuccessful. An unsuccessful attempt was made to redevelop monitor well MW-3 which continued to produce silt even after Hargis' redevelopment efforts. The well driller's reports for monitor wells MW-1, MW-2, and MW-3 indicate that each well was constructed using two-inch diameter Schedule 40 poly vinyl chloride (PVC) casing to a total depth of 100 feet bgs. The screen in each well extends from 70 to 100 feet bgs and has 0.02-inch machined slot openings.

During site investigation activities conducted by Hargis in 1999, two septic tanks, three cesspools, and associated piping were discovered. In 2000, the contents in and around the septic tanks and cesspools were characterized, followed by the excavation and removal of the tanks and piping. The soil beneath the tanks was sampled and laboratory test results indicated that VOCs were not detected above reporting limits. Subsequently, the cesspools were abandoned in accordance with procedures based on ADEQ Dry Well Decommissioning Guidelines.

The locations of previous soil borings and monitor wells MW-1, MW-2, and MW-3, former septic system, and the historical PCE concentrations at 10 feet bgs are shown on Figure 7. The historic PCE concentrations and the map of the former septic system provided the basis for locating the soil borings for the ERA investigation conducted by Malcolm Pirnie, Inc.

3.2 ERA Investigation

ADEQ initiated an ERA to address soil and groundwater contamination associated with the Site as described in Sections 1.0 and 2.0. Malcolm Pirnie, Inc. was contracted by ADEQ to initiate the ERA investigation and to collect data to characterize the source area of PCE contamination below the Bayless property. This section summarizes the findings of the investigation and introduces the interim source area remediation activity.

The main focus of the ERA investigation was to assess the extent of the PCE contamination in the vadose zone and groundwater at the Bayless property and to determine if an interim source area remediation soil vapor extraction (SVE) system could be used to efficiently reduce vapor phase VOC contamination within the vadose zone.

A detailed summary of the ERA investigation activities and the associated results were provided in a report submitted to ADEQ in June 2005 by Malcolm Pirnie, Inc. (Malcolm Pirnie, 2005a).

3.2.1 Boring Locations and Drilling Methods

Ten exploratory soil borings were drilled and five SVE wells (SVE-1, SVE-2, SVE-3, SVE-4, and SVE-5) and two groundwater monitoring wells (MW-4 and MW-5) were installed as part of the ERA investigation conducted in October and November of 2004 in accordance with the methods and procedures discussed in the Work Plan, dated October 2004 (Malcolm Pirnie, 2004). The exploratory boring locations were selected based on the current understanding of the vadose zone and groundwater contamination at the Site and the need for an appropriate number of SVE wells to operate and effective interim SVE remediation system. The location of the soil borings, SVE wells, and monitor wells in relation to the boundary of the property are shown on Figure 8.

The ten exploratory soil borings (SB-1 through SB-10) were drilled to depths of approximately 90 to 125 feet bgs in order to collect depth specific soil, soil gas, and groundwater samples. The five SVE wells were installed in the soil borings that had the highest PCE soil gas concentrations and covered the general area of the former drycleaner and former septic system.

The drilling method used to drill the 10 boreholes was hollow stem auger. The contracted driller used the hollow stem auger bit to drill each borehole approximately nine inches in diameter. The initial borehole, SB-1, was drilled using a core-barrel to collect a nearly continuous core from the boring. The continuous core from the first boring was used as a depiction of the lithologic conditions beneath the Site. For the remaining nine soil borings, a California Modified split-spoon and Mini-Probe™ samplers were used to collect soil and soil gas samples at five-foot intervals beginning at five feet bgs to the total depth of each boring. The presence of groundwater was observed between approximately 86 and 88 feet bgs in each of the borings (Malcolm Pirnie, 2005a).

Based on the split-spoon samples provided by the driller, Malcolm Pirnie, Inc. developed a lithologic log of each borehole in accordance with the Unified Soil Classification System (USCS) and American Society for Testing and Materials (ASTM) standards. Section 5 provides an interpretation of the lithology for the Site. The lithologic logs and drilling observations for the ten boreholes are included in Appendix B.

Prior to drilling the first boring, and in between each consecutive boring, the drilling equipment was decontaminated using a pressure sprayer and wash water containment system. In addition, the field sampling tools were decontaminated in a triple rinse, consisting of one bucket of non-phosphatic detergent and water and two buckets of distilled water.

3.2.1.1 Boring Sample Methods

Soil and soil gas samples were collected from SB-1 through SB-10 in five-foot intervals beginning at five feet bgs and ending at the total depth of the boring. The driller used a Simulprobe™ sampler, capable of collecting a soil sample while simultaneously collecting a discrete level soil gas sample. Each soil sample was collected in a decontaminated stainless steel sleeve that was loaded in to the Simulprobe™ sampler. The soil samples were collected from the stainless steel sleeve by United States Environmental Protection Agency (US EPA) Method 5035 using EnCore™ samplers.

The soil gas samples were collected from each boring after the drill rig had advanced the hollow stem auger to within about one foot of the desired soil/soil gas sample depth. The Simulprobe™ sampler was then advanced one to two feet below the bottom of the borehole. The probe rod was then retracted approximately one to two inches to open a screen to allow for soil gas collection. Flexible poly tubing was connected from the soil gas probe to a vacuum pump at the ground surface. The vacuum pump was operated at a low flow rate to purge stagnant air out of the soil gas sampling assembly. Approximately three purge volumes were withdrawn from the borehole prior to sample collection. A photo ionization detector (PID) was also used during purging to verify stabilization of the VOC levels in the soil gas, prior to sample collection. After the borehole was purged, the vacuum pump was shut off and a Tedlar® bag was attached to the tubing for soil gas sample collection. A flow control valve was attached to the vacuum pump to regulate the flow during sample collection to approximately one liter per minute. New tubing was used for each soil gas sample collected. At the completion of soil and soil gas sample collection, the Simulprobe™ sampler was brought back to the surface and decontaminated.

Groundwater samples were collected from each exploratory soil boring just below the water table in each boring. The contracted driller was responsible for collecting the discrete level groundwater samples by using a Hydropunch™ sampling tool in which a stainless steel probe is advanced to the desired sample depth. The probe is then retracted about two feet to open a screen to collect groundwater. Once the sampling tool was full, the driller retrieved the sampling tool to the surface; Malcolm Pirnie, Inc. transferred the groundwater samples into three, 40-ml vials preserved with hydrochloric acid (HCl). At the completion of groundwater sample collection, the Hydropunch™ tool was decontaminated and prepared for the next sampling location.

3.2.1.1.1 Depth Specific Soil Sampling

Soil samples were collected from SB-1 in five-foot intervals beginning at five feet bgs and ending at 125 feet bgs. Soil samples were collected from SB-2 through SB-10 in five-foot intervals beginning at five feet bgs and ending at 80 feet bgs, in each boring. The contracted laboratory analyzed the soil samples from the exploratory borings for VOCs using US EPA Method 8260B (Malcolm Pirnie, 2005a).

VOCs were not detected at, or above the laboratory reporting limit, in the soil samples except for naphthalene, methylene chloride, and PCE:

- Naphthalene was detected at a concentration 0.65 mg/kg in the sample collected at 65 feet bgs from SB-1. There is no residential soil remediation level (SRL), for naphthalene.
- Methylene chloride was detected at concentrations of 2.3 mg/kg, 2.2 mg/kg, and 2.1 mg/kg in the 55, 65, and 80 foot bgs samples, respectively, collected from SB-5. The residential SRL for methylene chloride is 93 mg/kg.
    - Methylene chloride was also detected in the laboratory's method blank for this analysis, therefore, the detection of methylene chloride in the soil samples is likely the result of laboratory contamination.
- PCE was detected in soil samples from each soil boring except SB-8.
    - The soil samples collected from 65 feet bgs at SB-1, and 80 feet bgs at SB-5 had the highest PCE detected concentrations, 0.65 mg/kg, of all the soil samples collected. The residential SRL for PCE is 5.1 mg/kg.

A summary of the analytical results for PCE detections in the soil samples collected from the exploratory soil borings is included in Table 2.

Soil samples that were collected from the depths of 90, 115, and 120 feet bgs from each exploratory boring were also analyzed by mechanical sieve analysis to estimate porosity and hydraulic conductivity and provide an estimation of the permeability of the formation at those specific depths. Analysis of the geotechnical samples indicated that the hydraulic conductivity ranged from 9.2×10^{-7} centimeters per second (cm/s) at 115 feet bgs in monitor well MW-6 to 1.6×10^{-5} cm/s at 90 feet bgs in boring SB-7 and at 110 feet in boring SB-10 (Malcolm Pirnie, 2005a, 2006b).

A summary of the measured hydraulic conductivity and other geotechnical results is provided in Table 3.

3.2.1.1.2 Depth Specific Soil Gas Sampling

Soil gas samples were collected from SB-1 through SB-10 in five-foot intervals beginning at five feet bgs and ending at 80 feet bgs. The contracted laboratory analyzed the soil gas samples from the exploratory borings for VOCs using US EPA Method 8260B and 8021B/8015B (Malcolm Pirnie, 2005a). A summary of the soil gas analytical PCE results are provided in Table 4.

In general, PCE soil gas concentrations increased with depth in each of the exploratory soil borings. PCE concentrations at the shallowest depth, five feet bgs, were relatively low ranging from 3.6 mg/m^3 in boring SB-1, to a high of 72 mg/m^3 detected at boring SB-7. Soil borings SB-1 through SB-7 were drilled within areas where PCE concentrations were reported to be the

highest based on previous investigations or next to major features of the former septic system. The highest detections of PCE soil gas concentrations occurred in the lower half of the vadose zone from approximately 45 feet to 80 feet bgs. In the borings closest to the former septic tanks, SB-2 and SB-3, samples indicated that PCE concentrations increased with depth to a maximum measured PCE soil gas concentration of 6,100 mg/m^3 at 80 feet bgs.

Soil borings SB-8 through SB-10 were drilled furthest from the former septic tank locations. PCE soil gas concentrations at these locations also increased with depth to maximum concentrations ranging from 160 to 290 mg/m^3.

3.2.1.1.3 Depth Specific Groundwater Sampling

Depth specific groundwater samples were to be collected from each exploratory boring from the water table to 125 feet bgs. At the initial boring it was determined that collecting depth specific groundwater samples was not feasible due to low permeability of the sediments encountered below the water table. Malcolm Pirnie, Inc. and ADEQ made the decision to collect a single groundwater sample from each boring once the water table was encountered. Groundwater samples were collected via a Hydropunch™ tool from SB-1 through SB-10 at the depth of approximately 90 feet bgs. The groundwater samples were analyzed for PCE using US EPA Method 8021B (Malcolm Pirnie, 2004, 2005a). A summary of the analytical results for the initial ERA investigation groundwater samples is provided in Table 5.

Analytical results of the groundwater samples indicated that PCE concentrations ranged from 56 µg/L in SB-6 to 10,000 µg/L in SB-3. These concentrations are well above the AWQS for PCE of 5 µg/L. Soil boring SB-6 was located approximately 56 feet upgradient (south) of the former south septic tank. Soil boring SB-3 was located closest to the location of the former north septic tank and is approximately 57 feet downgradient (north) of the former south septic tank.

An evaluation of the analytical data and historical groundwater gradients indicated that the PCE contamination appears to be moving to the north, away from the two former septic tank locations, as indicated by a measured groundwater PCE concentration of 9,600 µg/L from soil boring SB-9.

3.2.2 Depth to Groundwater

Depth to groundwater measurements have been measured on a monthly basis from November 2004 to December 2008. Depth to groundwater measurements were discontinued in January 2009 due to budget restrictions. The on-site shallow monitor wells, MW-3, MW-4, MW-5, have an average depth to water of 83.7 feet bgs. A summary of depth to water level measurements and calculated groundwater elevations for the on-site wells are provided in Tables 6 and 7. A recent groundwater elevation contour map for December 8, 2008 is provided in Figure 9. The groundwater flow direction is north-northeasterly and the gradient is 0.0037 feet/feet (ft/ft). The

groundwater flow direction and gradient has not changed significantly since regular monitoring began in November 2004.

3.3 Monitor Well Installation Activities

In total, Malcolm Pirnie, Inc. installed seven groundwater monitor wells during the course of the remedial investigation at the Bayless property. Two additional wells were installed on the Bayless property and four off-site wells were installed to assess the potential off-site migration of PCE in groundwater (Malcolm Pirnie, 2005a, 2006b, 2007a). One deep groundwater monitor well (MW-9), with a total depth of 225 feet, was installed to assess the vertical extent of the PCE contamination in the aquifer under the property (Malcolm Pirnie, 2007a).

3.3.1 Shallow Monitor Well Locations and Construction Details

3.3.1.1 MW-4 and MW-5

The locations of the monitor wells, MW-4 and MW-5, in relation to the boundary of the property, are shown on Figure 9. The locations for these two wells were selected based on the existing understanding of the vadose zone and groundwater contamination at the property at the time of their installation.

Groundwater monitor wells MW-4 and MW-5 were constructed in soil borings SB-9 and SB-10, respectively (Malcolm Pirnie, 2005a). The soil boring for each monitor well was over-drilled to a total depth of approximately 116 feet bgs with a larger diameter auger that produced a borehole with a diameter of approximately 10 inches. After reaming each boring, both monitor wells were constructed using four-inch inner diameter, flush threaded, Schedule 40 PVC blank casing and 0.02-inch slotted PVC screen. A five-foot long section of blank casing with an end cap was threaded to the bottom of a 40-foot length of well screen. The screened interval for each monitor well extends from approximately 70 to 110 feet bgs with blank casing from 70 feet bgs to approximately six inches bgs. A filter pack of #10-20 Colorado Silica Sand was placed around each monitor well screen extending from the bottom of the borehole (approximately 116 feet bgs) up to 65 feet bgs. A fine sand seal consisting of #60 Colorado Silica Sand was placed around the well casing from 65 to 63 feet bgs. A seal of bentonite pellets was then placed from 63 to 59 feet bgs and hydrated with potable water. Bentonite-cement grout slurry was used to seal off the annular space from 59 to 20 feet bgs followed by cement-grout slurry to seal the remaining annular space from 20 feet bgs to land surface. A well seal cap was placed at the top of the casing and a 12-inch diameter flush-mounted, traffic-rated steel vault installed at the top of each monitor well to provide wellhead protection. Each vault was finished approximately six inches above the surface grade and encased in concrete.

A summary of well construction specifications, including ADWR numbers, total well depth, screened interval and survey information is included in Table 8. Detailed construction diagrams for monitor wells MW-4 and MW-5 are provided in Appendix C.

3.3.1.2 MW-6, MW-7, and MW-8

The locations of the off-site monitor wells, MW-6, MW-7, and MW-8, in relation to the boundary of the property are, shown on Figure 9. The locations for these three wells were selected based on the existing understanding of the historical groundwater gradients and groundwater contamination at the property at the time of their installation. The off-site monitor wells, MW-6, MW-7 and MW-8, were installed during September 2005a (Malcolm Pirnie, 2006b).

Monitor well MW-6 is located on the north side of Berridge Lane, approximately 600 feet east of 7th Avenue adjacent to the residence at 352 West Berridge Lane. Monitor well MW-7 is located on the north side of Rose Lane, approximately 300 feet east of 7th Avenue adjacent to the residence at 520 West Rose Lane. Monitor well MW-8 is located on the north side of Rose Lane in the corner cul-de-sac, approximately 300 feet west of 7th Avenue adjacent to the residence at 712 West Rose Lane.

Each off-site monitoring well (MW-6, MW-7, and MW-8) consists of one well casing. After drilling each borehole to the total depth of approximately 125 feet bgs, the driller suspended the well casing in place during construction of the well. Each well casing consists of flush-threaded four-inch diameter Schedule 40 PVC blank casing and 0.02-inch slotted PVC screen. Each monitoring well consists of an interval of blank PVC casing from approximately 1.5 feet bgs to 78.5 feet bgs, followed by screen from 78.5 feet bgs to 118.5 feet bgs. A five-foot sump with a blank PVC end cap is attached to the bottom of the PVC well screen and extends from 118.5 to 124 feet bgs. A filter pack consisting of #10-20 Colorado Silica Sand was placed adjacent to the screen extending from the bottom of the borehole (approximately 125 feet bgs) up to five feet above the top of the screen interval. Prior to the completion of the filter pack, the driller surged the well screen causing the filter pack to settle in the annular space and minimize potential bridging of the filter pack material. After surging, more #10-20 sand was added to bring the top of the filter pack up to 74 feet bgs. Bentonite pellets were used to provide a five foot seal from 74 feet bgs up to 69 feet bgs on top of the filter pack. Approximately 30 gallons of potable water was added to the bentonite pellets and allowed to hydrate for approximately 30 minutes. Bentonite-cement grout was placed from the top of the bentonite seal to 20 feet bgs followed by cement grout from 20 feet bgs up to approximately two feet bgs.

Since the surface completion of the off-site monitoring wells will likely experience vehicle traffic, a more rigorous surface completion was installed. The surface completions included a flush-to-grade two feet by two feet steel rebar reinforced concrete pad and 12-inch diameter flush mount traffic rated well vault.

A summary of well construction specifications, including ADWR numbers, total well depth, screened interval and survey information is included in Table 8. Detailed construction diagrams for monitor wells MW-6, MW-7, and MW-8 are provided in Appendix C.

3.3.1.3 MW-10

The location of the off-site monitor well MW-10, in relation to the boundary of the property, is shown on Figure 9. The location of this well was selected based on the existing understanding of the historical groundwater gradients and groundwater contamination at the property at the time of installation. Monitor well MW-10 was installed during April 2007 (Malcolm Pirnie, 2007a). Monitor well MW-10 is located on the north side of Berridge Lane, approximately 200 feet east of 7th Avenue adjacent to the residence at 604 Berridge Lane.

The monitor well consists of one well casing. After drilling the borehole to the total depth of 123 feet bgs, the driller suspended the well casing in place during construction of the well. The well casing consists of flush-threaded four-inch diameter Schedule 40 PVC blank casing and 0.02-inch slotted PVC screen. The monitor well consists of an interval of blank PVC casing, followed by screen from 80 feet bgs to 120 feet bgs. A blank PVC end cap measuring 0.5 feet in length was attached to the bottom of each PVC well screen. A filter pack consisting of #10-20 Colorado Silica Sand was placed adjacent to the screen extending from the bottom of the borehole up to five feet above the top of the screen interval. Prior to the completion of the filter pack, the driller surged the well screen causing the filter pack to settle in the annular space and minimize potential bridging of the filter pack material. Bentonite pellets were used to provide a five foot seal on top of the filter pack. Approximately 30 gallons of potable water was added to the bentonite pellets and allowed to hydrate for approximately thirty minutes. Bentonite-cement grout was placed from the top of the bentonite seal to 20 feet bgs followed by cement grout from 20 feet bgs up to approximately two feet bgs.

Since the surface completion of the off-site monitor well MW-10 will likely experience vehicle traffic, a more rigorous surface completion was installed. The surface completion includes a flush-to-grade two feet by two feet rebar reinforced concrete pad and 12-inch diameter flush mount traffic rated well vault.

A summary of well construction specifications, including ADWR numbers, total well depth, screened interval, and survey information is provided in Table 8. A detailed construction diagram for monitor well MW-10 is provided in Appendix C.

3.3.2 Deep Monitor Well Locations and Construction Details

3.3.2.1 MW-9

The location of the on-site monitor well MW-9, in relation to the boundary of the property is, shown on Figure 9. The location for this monitor well was selected based on the existing

understanding of the aquifer and groundwater contamination at the property at the time of the installation. Monitor well MW-9 is located approximately 10 feet from monitor well MW-4. Monitor well MW-9 was installed next to monitor well MW-4 to form a shallow and deep well cluster. The well cluster is used to assess potential vertical migration of contaminants into deeper levels of the aquifer. Monitor well MW-9 was installed during October 2006 (Malcolm Pirnie, 2007a).

The monitor well consists of one well casing. After drilling the borehole to the total depth of approximately 225 feet bgs, the driller suspended the well casing in place during construction of each well. The well casing consists of flush-threaded four-inch diameter Schedule 40 PVC blank casing and 0.02-inch slotted PVC screen. The monitor well consists of an interval of blank PVC casing, followed by screen from 178 feet bgs to 218 feet bgs. A blank PVC end cap measuring 0.5 feet in length was attached to the bottom of each PVC well screen. A filter pack consisting of #10-20 Colorado Silica Sand was placed adjacent to the screen extending from the bottom of the borehole up to five feet above the top of the screen interval. Prior to the completion of the filter pack, the driller surged the well screen causing the filter pack to settle in the annular space and minimize potential bridging of the filter pack material. The sand filter pack was followed by a three foot filter pack consisting of number 60 Paragon sand. Bentonite pellets were used to provide a five foot seal on top of the filter pack. Approximately 30 gallons of potable water was added to the bentonite pellets and allowed to hydrate for approximately 30 minutes. Bentonite-cement grout was placed from the top of the bentonite seal to 20 feet bgs followed by cement grout from 20 feet bgs up to approximately two feet bgs.

Surface completion for monitor well MW-9 consisted of a six-inch thick concrete pad two feet by two feet placed around the base of the well opening and a water tight seal was placed on top of the well casing with a bolted metal plate placed over the well opening, flush with the top of the concrete pad.

A summary of well construction specifications, including ADWR numbers, total well depth, screened interval, and survey information is provided in Table 8. A detailed construction diagram for monitor well MW-9 is provided in Appendix C.

3.3.3 Drilling Methods

Monitor wells MW-4 and MW-5 were drilled using a hollow stem auger drill rig to drill the two boreholes approximately nine inches in diameter and to a total depth of 116 feet bgs each. Split-spoon samples were collected from each borehole approximately every five feet. Monitor wells MW-6, MW-7, MW-8, and MW-10 were also drilled using the hollow stem auger drilling method and each borehole was approximately ten inches in diameter. MW-6, MW-7, and MW-8 were each drilled to a total depth of 125 feet bgs, and split-spoon samples were collected from each borehole approximately every 10 feet in the vadose zone and every five feet in the saturated zone. MW-10 was drilled to a total depth of 123 feet bgs and split-spoon samples were collected

approximately every 10 feet in the vadose zone and every five feet in the saturated zone. Monitor well MW-9 was drilled using sonic drilling equipment. The sonic drilling method uses an outer drive casing that helps reduce the potential for vertical cross-contamination into deeper levels of the aquifer, in addition to minimizing the amount of water produced during drilling. Continuous core samples were collected from MW-9 from ground surface to the final boring depth of 225 feet bgs.

The driller steam cleaned the drill rig and drilling equipment and ensured that the equipment was in good operating condition prior to drilling each borehole. In addition, the field sampling tools were decontaminated in a triple rinse, consisting of one bucket of non-phosphatic detergent and water and two buckets of distilled water. The soil samples collected from both drilling methods were screened for VOCs using a PID to help determine the potential depth of PCE contamination.

Malcolm Pirnie, Inc. developed a lithologic log of each borehole in accordance with USCS and ASTM standards using the soil samples the driller provided. An interpretation of the lithology beneath the Site is provided in Section 5. The lithologic logs and drilling observations for the monitor well boreholes are included in Appendix B.

3.3.4 Lithology

In general, the lithology observed in MW-4, installed in soil boring SB-9, and MW-5, installed in soil boring SB-10, can be characterized as alluvial deposits consisting of interbedded layers of silt, clay, sand, and gravel. The gravels consist largely of sub-angular to sub-round granite rock with weathered and un-weathered quartz, feldspar and mica crystals. The sand ranged from fine to coarse in size distribution, with generally well-graded fine gravel. The percentage of fine-grained material, mostly silt, was between approximately 20 and 40 percent throughout the upper 75 feet of the formation. At a depth of approximately 78 feet bgs, the lithology is characterized by an increase in the percentage of fine grain material, clay and silt, with the percentage of fine grained material ranging from 40 to 90 percent and extends to the bottom of each boring at 116 feet bgs.

The lithology observed in MW-6, MW-7, MW-8 and MW-10 can be generally characterized as alluvial deposits consisting of interbedded layers of silt, clay, sand and gravel. The sand was typically well graded with grain sizes distributed from fine to coarse and occasionally included fine gravel. In each of the boreholes, a distinct layer of increased fine grain materials, clay and silt, begins between 60 and 65 feet bgs and extends down to the bottom of each borehole at 125 feet bgs. A sand/gravel layer ranging in thickness from seven to 20 feet was observed within this silt and clay layer. The top of this sand and gravel layer ranged from 88 feet bgs to 97 feet bgs and was below the water table in each of the borings.

The lithology observed in MW-9 can also be generally characterized as alluvial deposits consisting of interbedded layers of silt, clay, sand and gravel. The upper portion of the deep monitor well is similar in lithology to MW-4. The layer of predominately clay and silt observed beginning at approximately 78 feet bgs continues to a depth of 175 feet bgs. From a depth of 175 feet bgs to a depth of approximately 215 feet bgs, the lithology can be described as interbedded silts, clays, and fine sands with a trace of gravel. The finer grained MAU, described to be at a depth of approximately 200 feet bgs in the area of the Site, may have been encountered in the borehole at a depth of approximately 215 feet bgs as fine grained material, silt and clay dominates the lithology from a depth of 215 feet bgs to the total depth of the borehole at 225 feet bgs.

The lithologic logs and drilling observations for each of the monitor wells are included in Appendix B.

3.3.5 Well Development

The monitor wells, MW-4 through MW-10, were developed in stages, utilizing techniques that included a combination of bailing, surging, and pumping. In general, development began with the swabbing of the well screen in 10-foot sections with a four-inch diameter surge block. After each 10-foot section of screen was swabbed, the wells were bailed to remove sand and silt that had entered the casing. Swabbing was discontinued when only small amounts of fine-grained material were recovered in the bailer following each swabbing event. Following swabbing and bailing, an electric submersible pump was temporarily lowered near the bottom of each well and pumped at a rate varying from one to six gpm until the purge water was visibly free of sediment. Development purge waters were containerized and disposed of following investigation derived waste (IDW) management procedures described in Sections below.

In November 2004, monitor well MW-3 was re-developed because previous reports indicated that this well had a history of low purge rates and produced a high amount of silt. After approximately three hours of bailing, swabbing, and pumping MW-3, the water produced remained cloudy and brown to light brown in color. Due to low production rates, monitor well MW-3 could not be pumped continuously. During development, MW-3 was pumped dry and then allowed to recover for approximately 30 minutes prior to pumping again.

Following the development of MW-6 through MW-10, permanent groundwater sampling pump assemblies were installed in the monitor wells. Permanent sampling pump assemblies were installed in MW-4 and MW-5 after the development of the offsite wells, MW-6 through MW-8. The monitor wells, with the exception of MW-9, were equipped with pumps capable of producing approximately five gpm with 100 feet of hydraulic head. MW-9 was equipped with a pump capable of producing approximately 10 gpm with 100 feet of hydraulic head. Each of the wells had the pump intakes set in the bottom portion of the well screen and each well was equipped with a 1-inch diameter water level sounding tube that extended down to the top of the

pump. Each well was equipped with a water tight seal containing a capped one-inch diameter sounding tube port and a capped one-inch diameter discharge pipe port. In addition, dedicated sample piping assemblies were constructed for each of the monitoring wells to be used during groundwater sampling activities.

3.3.6 Monitor Well Abandonment

In February 2007, ADEQ acquired ownership of monitor wells MW-1 through MW-3. In April of 2007, two groundwater monitor wells, MW-1 and MW-2 were abandoned (see Figure 8). The two groundwater monitor wells, MW-1, and MW-2, had obstructions at 60 feet bgs and were not usable for collecting water levels or groundwater samples. Each monitor well was abandoned in accordance with the Standard Abandonment Method guidelines established by ADWR. Both wells were abandoned using cement-bentonite grout. The grout was emplaced from the bottom to the top of each well using a tremie pipe. The upper two to three feet of each casing and both well vaults were removed and then back filled with clean soil (Malcolm Pirnie, 2007a).

3.3.7 Groundwater Sampling

Groundwater sampling has been conducted by Malcolm Pirnie, Inc. on a quarterly basis from November 2004 until budget constraints in January 2009. Groundwater samples have been collected and submitted to a State certified laboratory to be analyzed for VOCs utilizing US EPA Method 8260B. Initial groundwater sample results from each monitor well are discussed below. Results from the quarterly sampling events are discussed in Section 6.

3.3.7.1 Monitor Well Sampling

Prior to sampling each monitor well, depth to groundwater levels were collected with an electric water level sounder and recorded to the nearest hundredth of a foot. This depth to water measurement was then used to calculate the required three casing purge volume. In general, groundwater sampling activities for each of the monitor wells included water level collection, purging, monitoring of groundwater parameters, sample collection, and equipment decontamination.

Initial groundwater sampling of monitor wells MW-3, MW-4 and MW-5 by Malcolm Pirnie, Inc. was conducted during the fourth quarter of 2004 on November 18, 2004. A split sample was also collected with Holguin, Fahan & Associates, Inc. (HFA) from groundwater monitor well MW-6 at the Chevron Leaking Underground Storage Tank site. Monitor well Chevron MW-6 is located immediately south of the Site, in the westbound traffic lane on West Bethany Home Road, approximately 50 feet east of 7th Avenue. Groundwater samples were collected from each monitor well using disposable bailers following the purging of each well. The PCE concentrations in the groundwater were less than 2 µg/L at Chevron MW-6, 1,600 µg/L at MW-3, 2,200 µg/L at MW-4, and 140 µg/L at MW-5. There were also detections of 1,2 dichloroethane, dichlorodifluoromethane (Freon 12), trichloroethene (TCE), and methyl-tert-butyl-ether (MTBE) but only PCE exceeded the AWQS (Malcolm Pirnie, 2005a).

Initial groundwater sampling of off-site monitor wells MW-6, MW-7, and MW-8 was conducted by Malcolm Pirnie, Inc. during the fourth quarter of 2005 on October 13, 2005. Groundwater samples were collected from each monitor well using a dedicated sampling tee following the purging of each well. The VOC concentrations in the groundwater samples collected from each of the off-site monitor wells were less than the laboratory reporting limit of 2 μg/L (Malcolm Pirnie, 2006b).

Initial groundwater sampling of monitor wells MW-9 and MW-10 was conducted by Malcolm Pirnie, Inc. during the second quarter of 2007 on May 16, 2007. Groundwater samples were collected from each monitor well using a dedicated sampling tee following the purging of each well. The PCE concentration in MW-9 was less than the laboratory reporting limit of 2 μg/L, while the concentration in MW-10 was reported to be at 94 μg/L. Table 9 summarizes the detected analytes from the initial groundwater sampling events.

3.3.8 Investigation Derived Waste

3.3.8.1 Solid IDW

During the drilling and well construction activities related to monitor wells MW-4 and MW-5 in late 2004, soil cuttings were generated and contained in several lined 20-cubic yard roll-off bins. Approximately 15 tons of soil cuttings were generated during 2005 requiring two lined 12-cubic yard roll-off bins during the drilling of the off-site monitoring wells, MW-6, MW-7, and MW-8. During the drilling of monitor wells MW-9 and MW-10, an estimated total of 17 tons of soil cuttings were generated and containerized in roll-off bins. The soil cuttings generated during the drilling of monitor well MW-10 in early 2007 were disposed of using the same waste profile generated during the drilling of monitor well MW-9 in late 2006.

The roll-off bins for each drilling activity were staged on the northeast corner of the Bayless property at the corner of 7th Avenue and Bethany Home Road. The soil cuttings were transported from the drill site to the roll-off bin(s) during off-site drilling activities. The roll-off bins were labeled with non-hazardous stickers indicating contents and appropriate contact information. A four point composite sample was collected after each drilling activity from the roll-off bins to characterize the waste stream for disposal. The composite samples were composed of four grab samples. Each grab sample was collected from a different side of the roll-off bin and at different depths ranging from the surface to two feet. Each grab sample was collected with a clean disposable scoop and placed into a clean disposable cardboard bucket. For each grab sample, an eight-ounce sample jar was filled with the soil from the bucket. Based on the analytical results, Environmental Response Inc. (ERI), generated a profile for the soil cuttings for each drilling activity, each of which were classified as non-regulated solid waste. ERI transported the roll-off bins off site and disposed of the cuttings at a municipal landfill.

Solid IDW disposal documenting is included in the Malcolm Pirnie, Inc. reports documentation the drilling and installation of the monitor wells. (Malcolm Pirnie, 2005a, 2006b, 2007a).

3.3.8.2 Liquid IDW

Purge water produced during drilling, development, and sampling of MW-4 and MW-5 in late 2004 was contained in 55-gallon drums that were stored in a temporary fenced area on the northeast side of the property. The drums were labeled with non-hazardous stickers indicating contents and appropriate contact information. A total of twelve 55-gallon drums were generated during well development and sampling activities. During the decontamination of drilling equipment, development and sampling of the off-site monitoring wells MW-6, MW-7, and MW-8 in mid 2005, approximately 2,400 gallons of non-hazardous waste water was generated. The accumulated waste water was contained in sixteen 55-gallon drums and a rented 1,500 gallon poly tank. The drums and poly tank were labeled with non-hazardous stickers indicating contents and appropriate contact information. Purge water produced during the drilling, development, and sampling of MW-9 (late 2006) and MW-10 (early 2007) was contained in a rented 1,050 gallon poly tank. The poly tank was stored at the Bayless property. The poly tank was labeled with a non-hazardous sticker indicating contents and appropriate contact information.

ERI collected composite samples of the containerized water after each drilling activity and sent the samples to Resource Recovery Techniques of Arizona, Inc. (RRTA) for analysis and profile of the waste streams. RRTA is permitted by ADEQ, Maricopa County and City of Phoenix for treatment and disposal of non-hazardous liquid wastes. Based on the analytical results, RRTA was able to treat and dispose of all of the liquid IDW under their existing permit. Liquid IDW disposal documentation is included in the Malcolm Pirnie, Inc. reports documenting the drilling and installation of the monitor wells (Malcolm Pirnie, 2005a, 2006b, 2007a).

3.4 ERA Source Area Remediation

3.4.1 Interim SVE System Implementation

The purpose of this section is to summarize the ERA source area remediation activities. Based on the results of the ERA investigation, there appeared to be significant concentrations of PCE gas vapors in the vadose zone below the location of the former septic system. As a result of the elevated PCE levels, ADEQ directed Malcolm Pirnie, Inc. to design, install and operate an interim SVE system to reduce the VOC mass in the vadose zone. The goals of the interim SVE remediation system were to remove as much of the VOC mass, primarily PCE, as possible, from the source area and reduce further impacts to the groundwater quality before the Site was developed for a new business. Once new structures are built on the property, it would become difficult to access the vadose zone and shallow aquifer below the source area.

3.4.2 SVE System Performance History

3.4.2.1 SVE Operations

The SVE system was installed during the Second Quarter 2005 and was operational by the end of June 2005. The SVE system consisted of five SVE wells that were located within the source area (see Figure 8) with screened intervals from 40 to 75 feet bgs (see Table 8). The VOCs were removed from the extracted air using two 5,000 pound granular activated carbon (GAC) vessels that were operated in series. Air emissions from the SVE system were regulated under an air permit that was issued by the Maricopa County Environmental Services Department on March 7, 2005 (Malcolm Pirnie, 2005b). The SVE system operated from June 22, 2005 through January 6, 2006. During that time, approximately 378 pounds of VOCs, primarily PCE, were removed from the vadose zone within the source area. A schematic of the SVE system is included as Figure 10.

During the operational period of the SVE system, weekly site visits were conducted to assess the rate of VOC mass removal and check on how the system was functioning. Based on the data collected in the field and the analytical vapor samples submitted for analysis (US EPA Method TO-15), the highest VOC mass removal came from SVE well, SVE-4, which was located near the south side of the former dry cleaner, which is the suspected source of the PCE contamination. A summary of the total VOC mass removed and mass removed through each SVE well is provided in Figure 11. Initial daily VOC mass removal rates from SVE-4 were approximately 16 pounds per day. After five months of operation, the VOC mass removal rate at SVE-4 had declined to approximately 0.2 pounds per day.

By January 2006, field data and analytical vapor samples were showing that relatively low mass removal rates were occurring and that the majority of the extractable VOC mass in the vadose zone had been removed. Progress reports were submitted on a monthly basis to ADEQ on the SVE system to document the progress of the source remediation activities. (Malcolm Pirnie, 2006a).

On January 6, 2006, the SVE system was vandalized by thieves who removed the main copper power line that provided electricity to operate the SVE system blower resulting in a shut down of the SVE system operation.

3.4.2.2 SVE Rebound Test

Prior to the vandalism of the SVE system, the field data and analytical vapor samples were indicating that relatively low mass removal rates were occurring at the Site. To determine if the system should be repaired or operations permanently terminated, a SVE rebound test was conducted on April 11, 2006 to determine whether a substantial amount of removable VOCs remained in the area of the vadose zone previously treated by the SVE system.

In order to conduct the rebound test, system operational data was recorded two to six times per hour for approximately eight hours. In addition, four analytical vapor samples were collected during the rebound test and submitted to a certified laboratory for analysis using US EPA Method TO-15. Vapor samples were collected periodically to calibrate the field PID readings which were used for estimating the VOC mass removal rates. A portable generator was used to provide power for the blower during the rebound test.

The results of the rebound test indicated that there did not appear to be enough extractable VOCs remaining in the vadose zone to warrant the continuation of the operation of the SVE system. A detailed summary of the SVE rebound test and the associated results were provided in a letter report submitted to ADEQ on May 31, 2006 (Malcolm Pirnie, 2006c).

3.4.3 Verification Borings

After termination of the source area remediation activities, but prior to the decommissioning of the SVE system, two verification soil borings were drilled within the SVE system extraction area. The purpose of the verification borings was to collect soil and soil gas samples to assess the residual concentrations of PCE that may be remaining in the vadose zone after operating the SVE system (Malcolm Pirnie, 2007b).

3.4.3.1 Boring Locations and Drilling Methods

Verification soil borings VB-1 and VB-2 were drilled within areas where PCE soil gas concentrations were observed to be the highest during the initial ERA investigation and near the SVE wells that had the highest PCE mass removal rates. The locations of the verification borings are shown on Figure 12.

The method used to drill soil borings VB-1 and VB-2 was hollow stem auger. The contracted driller used the hollow stem auger bit to drill each verification borehole approximately eight inches in diameter. Split-spoon samples, for logging purposes, were collected approximately every five feet, or where there was a significant change in lithology, to 80 feet bgs.

Based on the split-spoon samples provided by the driller, Malcolm Pirnie, Inc. developed a lithologic log of each borehole in accordance with the USCS and ASTM standards. In general, the lithology observed in each of the boreholes can be characterized as alluvial deposits consisting of interbedded layers of silt, clay, sand and gravel. The lithologic logs and drilling observations for VB-1 and VB-2 are included in Appendix B.

Prior to drilling the first boring, and in between each consecutive boring, the drilling equipment was decontaminated using a pressure sprayer and wash water containment system. In addition, the field sampling tools were decontaminated in a triple rinse, consisting of one bucket of non-phosphatic detergent and water and two buckets of distilled water.

3.4.3.2 Boring Sample Methods

Soil and soil gas samples were collected from VB-1 and VB-2 in 10-foot intervals beginning at 10 feet bgs and ending at 80 feet bgs, in each boring. The driller used a Simulprobe™ sampler, capable of collecting a soil and soil gas sample at the same time. Each soil sample was collected in a decontaminated stainless steel sleeve that was loaded in to the Simulprobe™ sampler. The soil samples were collected from the stainless steel sleeve by US EPA Method 5035 using EnCore™ samplers.

The soil gas samples were collected at each boring after the drill rig had advanced the hollow stem auger to within about one foot of the desired soil/soil gas sample depth. The Simulprobe™ sampler was then advanced one to two feet below the bottom of the borehole. The probe rod was then retracted approximately one to two inches to open a screen to allow for soil gas collection. Flexible poly tubing was connected from the soil gas probe to a vacuum pump at the ground surface. The vacuum pump was operated at a low flow rate to purge stagnant air out of the soil gas sampling assembly. Approximately three purge volumes were withdrawn from the borehole prior to sample collection. A PID was also used during purging to verify stabilization of the VOC levels in the soil gas, prior to sample collection. After the borehole was purged, the vacuum pump was shut off and a Summa® canister was attached to the tubing for soil gas sample collection. The canister was prepared by the laboratory to be under a vacuum of approximately 30 inches of mercury (Hg) vacuum to facilitate sample collection. A flow control valve was attached to the canister to regulate the flow during sample collection to approximately one liter per minute. New tubing was used for each soil gas sample collected.

At the completion of soil and soil gas sample collection, the Simulprobe™ sampler was brought back to the surface, decontaminated and prepared for the next sampling location.

3.4.3.2.1 Depth Specific Soil Sampling

The soil samples collected from the verification borings were analyzed for PCE using US EPA Method 8260. PCE was not detected at or above the laboratory reporting limit, 0.049–0.051 mg/kg, the residential SRL, of 5.1 mg/kg, or the Groundwater Protection Level (GPL) of 0.8 mg/kg in any of the verification boring soil samples. A summary of the PCE analytical results for the verification boring soil samples is provided in Table 10.

3.4.3.2.2 Depth Specific Soil Gas Sampling

Soil gas samples were collected from VB-1 and VB-2 in 10-foot intervals beginning at 10 feet bgs and ending at 80 feet bgs, in each boring. The soil gas samples collected from the verification borings were analyzed for PCE using US EPA Method TO-15.

In general, the PCE soil gas concentrations increased with depth in each of the soil borings. PCE gas concentrations at the shallowest depths, ranging from 10 to 30 feet bgs, were relatively low,

ranging from non-detect, at less than 0.003 mg/m^3, to 1.1 mg/m^3. At VB-1, PCE soil gas concentrations generally increased with depth to a maximum measured concentration of 142.6 mg/m^3 at 80 feet bgs. In VB-2, PCE soil gas concentrations increased with depth to a maximum measured concentration of 88.3 mg/m^3 at 80 feet bgs. The increasing concentrations with depth indicated the source of the remaining soil vapor concentration in the soil may be due to off-gassing from the PCE contaminated groundwater beneath the Site. The PCE soil gas concentrations detected in VB-1 and VB-2 were up to three orders of magnitude less than the levels detected in the samples collected from comparable depths in the ten soil borings that were drilled during the ERA Investigation. Converting the soil gas concentrations collected from the verification borings to soil solid concentration indicates the remaining concentrations in the soil range from approximately 0.0005 to 0.06 mg/kg, below the residential SRL for PCE of 5.1 mg/kg and the GPL for PCE of 0.8 mg/kg. A summary of the PCE soil gas analytical results for the verification boring samples is provided in Table 11.

3.4.4 SVE Decommissioning

The main components of the SVE system were dismantled on April 11, 2007, by ERI, after the results of the SVE rebound test indicated that there were not enough extractable VOCs remaining in the vadose zone to continue operating the SVE system.

Prior to the dismantling of the SVE components, a representative of Hydro Geo Chem Inc. (HGC), acting on behalf of ADEQ, came on site to identify reusable components of the system that could be utilized at other remediation sites managed by ADEQ. The reusable components identified by HGC were dismantled and transported to ERI's facility in Tempe, Arizona for temporary storage. Other SVE components that were determined to be unusable were placed in a 20 cubic yard roll-off bin and were hauled to a municipal landfill for disposal by ERI. The SVE components that were stored at ERI's facility for future use by ADEQ included:

- two 5,000 pound GAC carbon canisters;
- SVE skid and components;
- 4-inch diameter PVC piping;
- SVE manifold;
- discharge silencer;
- 4-inch diameter carbon steel pipe; and
- all bolts and nuts.

As part of the decommissioning of the SVE system, SVE wells SVE-1 through SVE-5 (Figure 8) were abandoned using cement-bentonite grout during the week of April 19, 2007, Each SVE well was abandoned in accordance with the Standard Abandonment Method guidelines established by ADWR. The upper two to three feet of each casing and each well vault was removed and back

filled with clean soil. The well vault and upper casing material were subsequently disposed of at a municipal landfill by ERI.

Based upon a request from the property owner, ADEQ granted the property owner a No Further Action (NFA) determination for soil at the property in December 2008. The soil NFA is for VOCs in soil and does not address any other area of land, groundwater or any other contaminants (ADEQ, 2008).

4 REMEDIAL INVESTIGATION ACTIVITIES AT THE SCI FUNERAL SERVICES PROPERTY

4.1 Initial Site Investigation

Water Resources Associates, Inc. (WRA) performed the initial environmental investigations at the SCI property in the early 1990s. The property is located at 710 West Bethany Home Road, Phoenix, Arizona and consists of four separate parcels (Figure 13). A dry cleaner operated on parcel 2, 6022 North 7th Avenue, from the 1960s into the 1990s. On behalf of the property owner, WRA conducted the site investigations in 1990 and 1991 on parcels 1 through 4. The investigations included soil borings, soil gas (vapor points) sampling locations, excavation of contaminated soils and sludge, and abandonment of the septic tank and the seepage pit. (WRA, 1990, 1991)

Parcel 1 was vacant during the initial site investigation and contained a former 1,000 gallon underground storage tank (UST), which was closed in-place in November 1988. A dry well was installed on parcel 2 in September 1982 approximately 20 feet west of the dry cleaning operations. The dry well is 120 feet deep with a settling chamber and drainage fabric located at approximately 18 feet bgs and gravel pack beneath the settling chamber to total depth.

In February 1990, eight soil vapor points were sampled within parcel 1 and 2, with the majority of the points surrounding the footprint of the former UST. According to a report submitted to ADEQ from WRA, "detectable" concentrations of PCE were present with the highest concentration detected in the vapor point located near the drywell.

Also in February 1990, a sediment sample was collected from the dry well settling chamber approximately 16.5 feet bgs and analyzed for chlorinated VOCs using US EPA Method 8010. The detected analytes from the sediment sample were PCE, TCE, and total 1,2-dichloroethene (1,2-DCE) at concentrations of 1,300 mg/kg, 19 mg/kg, and 11 mg/kg, respectively. The residential SRL for PCE is 5.1 mg/kg. The residential SRL for TCE is 30 mg/kg. The residential SRL for the most common 1,2-DCE isomer, cis-1,2 DCE, is 43 mg/kg. The GPL for PCE is 0.8 mg/kg, 0.76 mg/kg for TCE and 5.3 mg/kg for cis-1,2 DCE.

In June 1990, on behalf of the property lessee, SCS Engineers (SCS) provided oversight of dry well cleaning activities on parcel 2 and collected samples of the material located at the base of the dry well settling chamber. A total of two samples were collected by SCS, but only one sample was analyzed for chlorinated VOCs using US EPA Method 8010. The results of the analyzed sample, collected prior to the washing of the gravel located at the base of the dry well

settling chamber, reported detections of PCE and TCE at concentrations of 65.9 mg/kg and 2.4 mg/kg, respectively.

Parcel 3 contained an office building and covered parking area during WRA's investigation. In February 1990, seven soil vapor points were sampled within parcel 3. The results of that sampling event are unknown. It is important to note that parcel 3 is not owned by the owners of the SCI property.

Parcel 4 was occupied by a mortuary and parking lot and contained two surface drains; one that lead to a septic tank and one the lead to a brick-lined seepage pit. In March 1990, two soil borings to a depth of 31.5 feet bgs on parcel 4 were drilled in the vicinity of the septic tank and seepage pits surface drains. Two chlorinated solvent compounds were detected in the soil boring located near the septic tank. PCE and trichlorofluoroethane (Freon) were detected at concentrations of 0.009 mg/kg at five feet bgs and 0.04 mg/kg at 20 feet bgs, respectively. The residential SRL for trichlorofluoroethane is 390 mg/kg.

A sludge sample was collected from the bottom of the seepage pit at a depth of 32 feet bgs on March 6, 1990. Analysis of this sample detected PCE, TCE, and total 1,2-DCE at concentrations of 43.5 mg/kg, 0.4 mg/kg, and 0.3 mg/kg, respectively. A sample of the liquid and suspended sediments in the septic tank was collected on July 27, 1990 and analysis detected PCE at a concentration of 0.7 μg/L.

In April 1990, three soil vapor samples were collected at a depth of five feet bgs in the vicinity of the septic tank and seepage pit surface drains. The analytical results reported PCE detections ranging from 14 mg/m^3 to 197 mg/m^3. As a result of these and previous samples, WRA conducted a soil excavation and soil sampling at the base of the excavation on April 12, 1990. A total of eleven soil samples were collected, but only seven of the samples were analyzed. A single soil sample, collected beneath the septic tank, had a detection of PCE of 0.01 mg/kg. The septic tank was abandoned by filling the tank with aggregate base coarse slurry.

During March 1991, the seepage pit on parcel 4 was evacuated by a vacuum service truck to a depth of 29 feet bgs where a firm clay material was encountered. A single soil boring was drilled inside the seepage pit to a total depth of 59.5 feet bgs. Two chlorinated solvent compounds were detected in the soil boring at a depth of 32 feet bgs. PCE and total 1,2-DCE were detected at concentrations of 0.21 mg/kg and 0.06 mg/kg, respectively. The seepage pit was also abandoned after the excavation by filling the pit with aggregate base coarse slurry.

The locations of previous soil borings and soil vapor sample locations, septic system, and the seepage pit are shown on Figure 14. The historic VOC detections and the locations of the former septic system, seepage pit, and drywell, provided the basis for locating the soil borings and groundwater monitor wells for the ERA Investigation conducted by Malcolm Pirnie, Inc.

4.2 ERA Investigation

The field investigations in the early 1990s indicated a release of PCE to the vadose zone but any impact to the groundwater beneath the property was not evaluated at that time. Therefore, the purpose of the ERA investigation at the SCI property was to collect the data necessary to characterize the potential source areas of VOC contamination below the property. This investigation was conducted as part of the ongoing investigation of the 7th Avenue and Bethany Home WQARF Site. Malcolm Pirnie, Inc. effort's were concentrated on parcels 2 and 4 of the SCI property. This section summarizes the findings of the ERA investigation. A detailed summary of the ERA Investigation activities and the associated results were provided in a report submitted to ADEQ in June 2008 (Malcolm Pirnie, 2008).

4.2.1 Boring Locations and Drilling Methods

Six exploratory soil borings, B1 through B6, were drilled and two groundwater monitoring wells (MW-11 and MW-12) were installed as part of the ERA investigation conducted in March and April of 2008 in accordance with the methods and procedures discussed in the work plan, dated February 2008 (Malcolm Pirnie, 2008). The exploratory boring locations were selected based on the existing understanding of the vadose zone, the known location of the former dry cleaner building, potential source areas including the dry well, former septic system and seepage pit, and known groundwater flow direction. The soil borings and monitor well locations in relation to the boundary of the SCI property are shown on Figure 15.

Two boreholes, B1 and B2, were drilled to a depth of 129 feet bgs using a 10-inch diameter hollow stem auger while the other four boreholes, B3 through B6, were advanced to 75 feet bgs using an 8-inch diameter hollow stem auger. A Simulprobe™ sampler was used to collect depth specific soil and soil gas samples at 10-foot intervals between five and 75 feet bgs in soil borings B1 and B2 and between 15 and 75 feet bgs in soil borings B3 through B6. The presence of groundwater was observed in boreholes B1 and B2 at approximately 80 feet bgs.

Based on the soil samples provided by the driller using the Simulprobe™ sampler, Malcolm Pirnie, Inc. developed a lithologic log of each borehole in accordance with the USCS and ASTM standards. Section 5 provides an interpretation of the lithology for the Site. The lithologic logs and drilling observations for the six boreholes are included in Appendix B.

Prior to drilling the first boring, and in between each consecutive boring, the drilling equipment was decontaminated using a pressure sprayer and wash water containment system. In addition, the field sampling tools were decontaminated in a triple rinse, consisting of one bucket of non-phosphatic detergent and water and two buckets of distilled water.

4.2.2 Boring Sample Methods

Soil and soil gas samples were collected from deep borings B1 and B2 at 10-foot intervals beginning at five feet bgs to a depth of 75 feet bgs, and at 10-foot interval in shallow exploratory borings B3, B4, B5 and B6 beginning at 15 feet bgs to a depth of 75 feet bgs.

Soil and soil gas samples were collected using a Simulprobe™ sampler, capable of collecting a soil sample while simultaneously collecting a discrete level soil gas sample. Each soil sample was collected in a decontaminated stainless steel sleeve that was loaded in to the Simulprobe™ sampler. The soil samples were collected from the stainless steel sleeve by US EPA Method 5035 using EnCore™ samplers. The contracted laboratory analyzed the soil gas samples from the exploratory borings for VOCs using US EPA method TO-15.

The soil gas samples were collected from each boring after the drill rig had advanced the hollow stem auger to within about one foot of the desired soil/soil gas sample depth. The Simulprobe™ sampler was then advanced one to two feet below the bottom of the borehole. The probe rod was then retracted approximately one to two inches to open a screen to allow for soil gas collection. Flexible poly tubing was connected from the soil gas probe to a vacuum pump at the ground surface. The vacuum pump was operated at a low flow rate to purge stagnant air out of the soil gas sampling assembly. Approximately three purge volumes were withdrawn from the tubing prior to sample collection. A PID was also used during purging to verify stabilization of the VOC levels in the soil gas, prior to sample collection. After the tubing was purged, the vacuum pump was shut off and a one-liter Summa® canister, with a one liter per minute flow regulator, was attached to the tubing for soil gas sample collection. New tubing was used for each soil gas sample collected. At the completion of soil and soil gas sample collection, the Simulprobe™ sampler was brought back to the surface, decontaminated and prepared for the next sampling location.

4.2.3 Depth Specific Soil Sampling

The soil samples collected from the exploratory borings were analyzed at a State certified laboratory for VOCs using US EPA Method 8260. No VOCs were detected at or above the laboratory reporting limit in the analyzed soil samples. Laboratory reporting limits for the VOCs ranged from 0.086 mg/kg to 0.220 mg/kg.

4.2.4 Depth Specific Soil Gas Sampling

The contracted laboratory analyzed the soil gas samples from the exploratory borings for VOCs using US EPA method TO-15. Analytical results indicated acetone, PCE, and propene (propylene), to be the most prevalent compounds in the soil gas samples, occurring in each boring and generally increasing in concentration with depth. Soil gas samples collected from borings B1 and B4, at approximately 65 feet bgs, had the highest concentrations of PCE with concentrations ranging from 100 mg/m^3 to 120 mg/m^3.

Chloroform, hexane, TCE and toluene were also present in most of the boreholes in lower concentrations. Benzene, 2-butanone (MEK), 1,2,4-trimethylbenzene and dichlorodifluoromethane occurred in a few borings and at relatively low concentrations. Results indicated that detected analytes occurred at their highest concentration between 55 feet bgs to 75 feet bgs.

A summary of the soil gas analytical results for PCE and TCE are provided in Table 12 and 13, respectively.

4.2.5 Site Groundwater Elevation

Depth to groundwater measurements were measured by Malcolm Pirnie, Inc. on a monthly basis from the monitor well installation in 2008 until funding was disrupted in January 2009. The SCI property wells, MW-11 and MW-12, had an initial measured depth to water of approximately 80 feet bgs. A summary of depth to water level measurements and calculated groundwater elevations above mean sea level for the SCI property wells are included in Tables 6 and 7. A groundwater elevation contour map for December 8, 2008 is also included as Figure 9.

4.2.6 Well Locations and Construction Details

The SCI property monitor well locations were discussed in the field with ADEQ's project manager. Final well locations were determined based on the dry well location on the west side of the former drycleaner building and the former septic system and seepage pit located on the northeast side of the mortuary building, and the apparent north-northeasterly groundwater flow direction. The location of the monitor wells, MW-11 and MW-12, in relation to the boundary of the SCI property is shown on Figure 15. The installation of MW-11 and MW-12 occurred at the deep exploratory borings, B1 and B2, respectively.

Monitor wells MW-11 and MW-12 each consist of one well casing. After drilling each borehole to the total depth of approximately 129 feet bgs, the driller suspended the well casing in place during construction of the well. Each well casing consists of flush-threaded four-inch diameter Schedule 40 PVC blank casing and 0.02-inch slotted PVC screen. Each monitoring well consists of an interval of blank PVC casing from approximately 1.5 feet bgs to 80 feet bgs, followed by screen from 80 feet bgs to 120 feet bgs. A four-foot sump with a blank PVC end cap is attached to the bottom of the PVC well screen and extends from 120 feet bgs to 125 feet bgs. A filter pack consisting of #10-20 Colorado Silica Sand was placed adjacent to the screen extending from the bottom of the borehole (approximately 129 feet bgs) up to five feet above the top of the screen interval. Prior to the completion of the filter pack, the driller surged the well screen causing the filter pack to settle in the annular space and minimize potential bridging of the filter pack material. After surging, more #10-20 sand was added to bring the top of the filter pack up to 75 feet bgs. Bentonite pellets were used to provide a five foot seal from 75 feet bgs up to 70 feet bgs on top of the filter pack. Potable water was added to the bentonite pellets and allowed to hydrate for approximately thirty minutes. Cement grout was placed from the top of the bentonite seal up to approximately two feet bgs.

The surface completions include a flush-to-grade two feet by two feet concrete pad and 12-inch diameter flush mount traffic rated well vault. Each well vault cover has the ADWR registration number stamped into the metal vault.

A summary of well construction specifications, including ADWR numbers, total well depth, screened interval, and survey information is included in Table 8. Detailed construction diagrams for MW-11 and MW-12 are included in Appendix C.

4.2.7 Drilling Methods

MW-11 and MW-12 were drilled using a hollow stem auger to a total depth of 129 feet bgs each and Simulprobe™ samples were collected approximately every 10 feet in the vadose zone and every five feet in the saturated zone.

Prior to drilling the first boring, and in between each consecutive boring, the drilling equipment was decontaminated using a pressure sprayer and wash water containment system. In addition, the field sampling tools were decontaminated in a triple rinse, consisting of one bucket of non-phosphatic detergent and water and two buckets of distilled water.

Based on the split-spoon samples provided by the driller using the Simulprobe™ sampler, Malcolm Pirnie, Inc. developed a lithologic log of each borehole in accordance with the USCS and ASTM standards using the soil samples the driller provided. Section 5 provides an interpretation of the lithology and hydrogeology for the Site. The lithologic logs and drilling observations for the monitor well boreholes are included in Appendix B.

4.2.8 Lithology

In general, the lithology observed in each of the boreholes can be characterized as alluvial deposits consisting of interbedded layers of silt, clay, sand, and gravel. The gravels consist largely of sub-angular to sub-round granite rock with weathered and un-weathered quartz, feldspar and mica crystals. The sand ranged from fine to coarse in size distribution, with generally well-graded fine gravel. The percentage of fine-grained material, mostly silt, ranged between 50 and 80 percent throughout the vadose zone with a clayey-silt observed from approximately 15 feet to 45 feet bgs and a silty-sand layer from approximately 50 feet to 65 feet bgs. Silt and clay predominant from 65 feet bgs to the total depth of the borings at 129 feet bgs. The lithologic logs and drilling observations for each of the monitor wells are included in Appendix B.

4.2.9 Well Development

The monitor wells, MW-11 and MW-12, were developed in stages, utilizing development techniques that included a combination of bailing, surging, and pumping. In general, development began with the swabbing of the well screen in 10-foot sections with a four-inch

diameter surge block. After each 10-foot section of screen was swabbed, the wells were bailed to remove sand and silt that had entered the casing. Swabbing was discontinued when only small amounts of fine-grained material were recovered in the bailer following each swabbing event. Following swabbing and bailing, an electric submersible pump was temporarily lowered near the bottom of each well and pumped at a rate of five gpm until the purge water was visibly free of sediment.

Immediately following the development of MW-11 and MW-12, permanent groundwater sampling pump assemblies were installed in the monitor wells. The monitor wells were equipped with pumps capable of producing approximately five gpm with 100 feet of hydraulic head. Each of the wells had the pump intakes set in the bottom portion of the well screen and each well was equipped with a one-inch diameter sounding tube that extended down to the top of the pump. Each well was equipped with a water tight seal containing a capped one-inch diameter sounding tube port and a capped one-inch diameter discharge pipe port. In addition, dedicated sample piping assemblies were constructed for each of the monitoring wells to be used during groundwater sampling activities.

4.2.10 Groundwater Sampling

On March 18, 2008, groundwater samples were collected from monitoring wells MW-11 and MW-12 immediately after well development and analyzed for VOCs using US EPA Method 8260B. PCE was detected in both wells at concentrations in excess of the AWQS value of 5 μg/L. Monitoring wells MW-11 and MW-12 had PCE concentrations of 7.4 μg/L and 22 μg/L, respectively. MW-12 also had a TCE concentration of 23 μg/L, which is above the AWQS for TCE of 5 μg/L. Monitoring well MW-12 also detected vinyl chloride at a concentration of 1.9 μg/L, very near the AWQS for vinyl chloride of 2.0 μg/L. The detected analytes from the initial groundwater sampling event for monitor wells MW-11 and MW-12 are summarized in Table 14.

Until budget constraints in January 2009, groundwater samples were collected on a quarterly basis since the monitor well installation in 2008. Groundwater samples were submitted to a certified laboratory to be analyzed for VOCs utilizing US EPA Method 8260B. Analytical results of quarterly groundwater samples collected from monitor wells MW-11 and MW-12 are discussed in Section 6.

4.2.11 Investigation Derived Waste

4.2.11.1 Solid IDW

During the drilling and well construction activities, soil cuttings were generated and contained in two lined 20-cubic yard roll-off bins. The roll-off bins for each drilling activity were staged on the northeast corner of the Bayless property. The soil cuttings were transported from the drill site to the roll-off bin(s) during off site drilling activities. The roll-off bins were labeled with non-hazardous stickers indicating contents and appropriate contact information. A four-point

composite soil sample was collected from each roll-off bin. The composite sample was composed of four grab samples. Each grab sample was collected from a different corner of the roll-off bin and at different depths ranging from the surface to two feet. Each grab sample was attained with a decontaminated stainless steel trowel. The grab samples were immediately placed into a ziplock bag and mixed. An eight-ounce sample jar was collected from the soil in the ziplock bag. These samples were submitted to a State certified laboratory for VOC analysis using US EPA method 8260. Based on the analytical results, ERI generated a profile for the soil cuttings which were classified as non-regulated solid waste. ERI transported the roll-off bins off site and disposed of the cuttings at a municipal landfill. Solid IDW disposal documentation is included in the Malcolm Pirnie, Inc. report documenting the investigation of the SCI property (Malcolm Pirnie, 2008).

4.2.11.2 Liquid IDW

Purge water produced during drilling, development, and sampling, was contained in one 1100-gallon poly tank and two 250-gallon poly tanks. The tanks were stored on the north side of the Bayless property. The drums and poly tank were labeled with non-hazardous stickers indicating contents and appropriate contact information. ERI arranged to have Liquid Environmental Solutions (LES) collect a composite sample of the containerized well drilling and development water from MW-11 and MW-12 on April 4, 2008. Lab results from the LES composite sample confirmed that the existing non-hazardous waste profile for the 7th Avenue and Bethany Home Road WQARF Site could be used for the liquid waste generated from MW-11 and MW-12. The well drilling and development purge water was removed from the property by Overley's Transportation Services and delivered to LES for disposal. Liquid IDW disposal documentation is included in the Malcolm Pirnie, Inc. report documenting the investigation of the SCI property (Malcolm Pirnie, 2008).

5 HYDROGEOLOGY

5.1 Site Stratigraphy

As discused in Section 2, stratigraphy in the vicinity of the Site is composed of thick basin fill sediments of unconsolidated to semi-consolidated clastic sediments deposited from Late Tertiary to Quaternary. Stratigraphy beneath the Site was determined from soil borings drilled during various site investigations. Lithologic descriptions from these borings indicate that the Site is predominantly underlain by fine-grained sediments composed of very fine sand, silts, silty sands and clays with a few sand and gravel lenses that are generally less than 10 feet in thickness. The upper most sand and gravel lenses are typically encountered at approximately 30 to 50 feet bgs and ranged from fine to coarse in size distribution. The gravels consist largely of sub-angular to sub-round granite rock with weathered and un-weathered quartz, feldspar and mica crystals. Sieve analysis and hydrometer tests of selected soil samples indicate the fine grained components (silts and clays) make up significant components of soil samples retrieved. Hydrometer test of silts and clays indicate that silts dominate by weight of the fines. The total depths of most of the on-site borings seldom exceed 130 feet bgs, therefore, most borings only encounter the UAU at the Site. As previously mentioned, the UAU, is reported to be approximately 200 feet thick in the surrounding area. A deep monitor well at the Site, drilled to a depth of 225 feet, may have encountered the MAU at a depth of approximately 215 feet.

A summary of the measured physical parameters and pertinent geotechnical results is provided in Table 3. Boring logs with detailed lithologic descriptions and drilling observations are included in this report as Appendix B. West to east and north to south geologic cross-sections are presented as Figures 16 and 17, respectively.

5.2 Aquifer Hydraulic Properties

Soil samples collected from soil borings SB-1, SB-3, SB-7, SB-10 (Malcolm Pirnie 2005a) and monitoring wells MW-6, MW-7, MW-8 (Malcolm Pirnie, 2006b) below the water table were analyzed by mechanical sieve analysis to estimate porosity and hydraulic conductivity and provide an estimation of the permeability of the formation at those specific depths. Analysis of the geotechnical samples indicates vertical hydraulic conductivity values that range from 9.22 x 10^{-7} cm/s to 1.6 x 10^{-5} cm/s (0.0026 feet/day to 0.054 feet/day). In the absence of site specific aquifer testing, hydraulic properties of the aquifer beneath the Site was supplemented with specific capacity data obtained by monitoring pumping rate and drawdown during groundwater sampling of monitor wells MW-4, MW-5, MW-6, MW-7, and MW-8 during the second quarter of 2006. Table 15 summarizes the data obtained from this analysis. Average horizontal hydraulic conductivity was estimated from 25-76 feet per day. This range of values compares favorably with literature values of wells screened in the UAU of 20-250 feet/day. Using these

data and hydraulic gradient calculated for the fourth quarter 2008 sampling event, groundwater velocity in the aquifer beneath the Site is estimated to range from 113-342 feet per year. The geotechnical analytical results for hydraulic conductivity are summarized in Table 3.

5.3 Depth to Groundwater

Groundwater levels were monitored regularly at the Site beginning in 2004 and continued until budget constraints in January 2009. Depth to groundwater and calculated groundwater elevations from November 2004 to December 2008 are summarized in Tables 6 and 7, and presented on Figure 18. Over this period, depth to groundwater has fluctuated over a range of 4 to 8 feet. Depth to groundwater at the Site currently ranges from 76 to 88 feet bgs.

5.4 Groundwater Flow and Gradients

Water levels were measured at each of the monitor wells at the Site on a monthly basis until budgets constraints in January 2009. The groundwater elevations calculated using these measurements are plotted, contoured and presented in the quarterly groundwater monitoring reports. The groundwater elevation measurements for December 8, 2008 (Figure 9) indicate that groundwater flow direction beneath the Site is generally north-northeast. The groundwater flow directions depicted with the contours shown on the figure are consistent with flow directions observed since November 2004. Based on water levels observed on the date mentioned above, local groundwater flow beneath the Site is toward the north-northeast at a gradient of approximately 0.0037 ft/ft.

6 CONTAMINANT TRANSPORT AND DATA EVALUATION

6.1 Fate and Transport in Soils

This section describes the mechanisms involved in the fate and transport of soil and groundwater contaminants at the Site. The contaminants of concern at the Site are halogenated VOCs or more specifically dense, chlorinated solvents. Transport of dense, chlorinated solvents is controlled by several different mechanisms, including the type of subsurface medium and geochemical conditions in the material through which the compounds are migrating. Physical and chemical transformations of the contaminants can also affect their fate and transport.

The exact nature of a dense, chlorinated solvent release is not always known. Dense, chlorinated solvents can be released to the environment as a free-phase immiscible liquid or dense non-aqueous phase liquid (DNAPL), as a dissolved-phase component of a liquid waste stream, or as vapor phase. The nature of the release will have broad implications with respect to the type and duration of remedial activities. Where a DNAPL release has occurred, migration in the subsurface is density driven and occurs within zones of interconnected DNAPL within the soil pore spaces. In such zones, the DNAPL in different pore openings forms an immiscible-phase continuum through the intervening pore throats. Experiments have shown that even relatively small differences in hydraulic conductivity can inhibit downward migration and cause lateral spreading of DNAPLs. Once the release ceases, the forces driving DNAPL movement dissipate and the DNAPL in the pore openings become disconnected to form a zone of residual DNAPL (Pankow and Cherry, 1996).

Within the overall zone of DNAPL contamination, it is often impractical to define specific locations of residual zones. As such, remedial technologies must be directed over a larger area of interest. Residual DNAPL in the vadose zone can produce a vapor plume that, after many years, can move downward or can come in contact with infiltrating water and reach the water table. In field experiments, such vapor plumes have been shown to migrate vertically over large distances and result in groundwater contamination with maximum concentrations in the thousands of micrograms per liter (Pankow and Cherry, 1996).

VOCs released to the subsurface as a dissolved-phase component of a liquid waste stream can occur as either a point source release (such as a wastewater infiltration pond) or non-point source release (such as leaking sewer pipes). In those cases, the distribution of VOCs in subsurface soils will generally be broader and occur at lower concentrations than is typically observed with a DNAPL release. Nevertheless, waste stream releases often occur over a longer period of time and allow for rapid vertical migration to the water table by infiltration.

VOCs will pass through unsaturated soils at different rates depending on physical properties of the soils. Soil physical properties such as permeability, moisture content, and organic carbon content affect the rate of migration of VOCs in soil. Physical properties of the compound itself such as specific gravity, Henry's Law constant (KH), water solubility, octanol-water partition coefficient (Kow), and organic carbon partition coefficient (Koc) also affect its fate and transport.

Organic carbon is present in all soils and causes certain chemicals to adsorb to soil. The adsorptive properties of soil depend largely on the total amount of organic carbon available and the nature of the contaminant contacting it. The Koc value is a measure of the capacity for an organic chemical to adsorb to soil. The higher the Koc value, the more readily the compound adsorbs to the soils. Based on it's Koc value, PCE is expected to have moderate mobility in soil.

Another physical property that affects the mobility of liquids is the porosity of the soil. The size and interconnectedness of the pore spaces in the soil affects the retention of liquids in soil. Small pore spaces retain liquids by capillary forces. Larger pore spaces, such as those found with coarse gravels and cobbles, allow liquids to move through them more freely. Extremely fine particles, such as silt and clay, retain liquids by the capillary forces produced by their small pore sizes and reduced interconnectedness of the pores. Thus, VOC contamination would be expected to dissipate (i.e., drain and volatilize) most rapidly in coarse-grained soils, such as gravel and sand, and least rapidly in silts and clays.

Volatilization of PCE from moist soil surfaces is an important fate process and is related to their respective Henry's Law constants. Contact of VOCs in liquid or vapor phases with moisture in soils results in VOC contamination of the soil moisture, which is also known as pore water. Release of VOCs dissolved in pore water is typically much slower than volatilization from a free-phase VOC liquid. Therefore, moist soils retain evidence of VOCs that have passed through the soil column longer than soils with low moisture content (Cohen and Mercer, 1993).

The moisture content of a soil is also a significant factor in migration and retention of VOCs both in liquid and vapor phases. Penetration of DNAPL through the vadose zone is enhanced by dry soil conditions (Cohen and Mercer, 1993), whereas moisture filling the pores of a soil can act as a barrier to migration of DNAPL and result in lateral spreading. Similarly, the downward migration of a VOC vapor plume will be hindered by elevated moisture content in soils. Conversely, increased moisture content (as pore water) will generally increase the vertical conductivity of soil, thus enhancing infiltration and migration of dissolved-phase VOCs through the vadose zone.

Applying these VOC soil migration principles to the site-specific conditions at the properties at the Site provides a framework for analysis of the Site soil data discussed later in this section.

6.2 Fate and Transport in Groundwater

Beneath source areas, contaminants may also enter the saturated zone as DNAPL, dissolved phase infiltration/leachate, or through mass transfer from vapor-phase contamination in the vadose zone. If present as DNAPL, the contaminants of concern in the Site are denser than water and are capable of moving vertically in the saturated zone. The extent of vertical migration is dependent on several factors, including chemical properties of the contaminant (e.g., specific gravity, viscosity, interfacial tension), and the degree of heterogeneity within the vadose zone and underlying aquifer. Vertical migration is expected to be greater in coarser sediments than in fine grained sediments. Fine-grained sediments characteristically have smaller pores and pore-throat dimensions, resulting in greater capillary resistance to infiltrating DNAPL in saturated sediments. If the DNAPL encounters a finer-grained unit, differences in hydraulic conductivity can inhibit downward migration and cause lateral spreading of DNAPLs.

Contaminant plumes in groundwater generally originate through mass transfer at the water table interface beneath the immediate vicinity of the source and usually consist of dissolved-phase mass in groundwater that migrates advectively in the direction of groundwater flow. In addition to advection, other natural processes can affect the transport of contaminant mass in groundwater. These processes include hydrodynamic dispersion (defined as the combined effects of mechanical dispersion and chemical diffusion), retardation, and attenuation.

Advection

Advective transport is the process that results in the movement of contaminants in the same direction and at the same rate as the average linear velocity of groundwater. The average groundwater velocity may be estimated according to the following equation derived from Darcy's law:

$$V = \frac{K\,i}{ne}$$

where:

V = Average Groundwater Velocity (feet per day [ft/day])
K = Hydraulic Conductivity (ft/d)
i = Gradient (foot per foot [ft/ft])
n_e = Effective Porosity

Hydrodynamic Dispersion

Hydrodynamic dispersion causes dilution of contaminants both longitudinally and laterally to groundwater flow lines. Dispersion and diffusion have the same impact on chemical transport, but through very different methods. Mechanical dispersion is the process by which contaminants are spread laterally due to heterogeneities in the porous media and variations in groundwater velocity. As groundwater moves through porous media it encounters obstacles to flow (such as dead-end pore spaces or reduced pore throat size), forcing the water to change velocity and alter

its course. Alternatively, chemical diffusion is controlled by the laws of thermodynamics and results in mass moving from areas of high concentration to areas of low concentration. As such, chemical diffusion may cause mass to travel both faster (ahead of the plume) and slower (behind the center of mass) than predicted by simple advection, and will add to laterally spreading.

In general, contaminant transport in coarse-grained media is dominated by advection and, to a lesser degree, mechanical dispersion. Chemical diffusion plays a more important role in finer-grained media where groundwater velocities are much slower. In addition, the nature of the flow field within the aquifer will affect impacts of hydrodynamic dispersion on contaminant transport. In natural flow fields with the aquifer at equilibrium, hydrodynamic dispersion may play a more significant role than in areas of aquifer discharge, such as remedial pumping centers, where flow lines are converging.

Away from the source, contaminant transport usually occurs within the more porous coarse-grained materials where impacts of hydrodynamic dispersion are less significant. Where diffusion into adjacent fine-grained materials occurs, the rate at which mass can be captured or attenuated by remedial actions may be substantially decreased.

Retardation

Another primary process affecting contaminant transport in groundwater is retardation, which deals with the process of adsorption-desorption. Adsorption-desorption is the process by which chemicals are sorbed onto the surface of sediments. This process results because the surfaces of solids, especially clays and organic soil material, have an electrical charge due to isomorphous replacement, broken bonds, or lattice imperfections. The electrical charge is imbalanced and may be satisfied by adsorbing a charged ion. Halogenated VOCs have a high affinity to organic material and can be adsorbed to the surface of organic material in an effort to achieve ionic balance.

The affinity of a VOC for soil is defined by the solid-water partition coefficient (also known as distribution coefficient), Kd. The distribution coefficient relates to the mass of contaminant dissolved in groundwater to the mass sorbed to the soil and is calculated using the following equation:

$$Kd = Koc * foc$$

where:

Kd = Distribution Coefficient (milliliters water per grams soil [mlwater/gsoil])

Koc = Organic Carbon Partition Coefficient (milliliters water per grams organic carbon [mlwater/goc])

foc = Fraction of Organic Carbon (grams organic carbon per grams soil [goc/gsoil])

The retardation factor of a VOC can then be calculated using the following equation:

$$R = 1 + \frac{\rho b \, Kd}{n_e}$$

where:

R = Retardation Factor (no units)
ρb = Bulk Density (grams per cubic centimeter [g/cm^3])
n_e = Effective porosity
Kd = Distribution Coefficient (mlwater/gsoil)

PCE is in a class of compounds with moderate mobility and will moderately adsorb to suspended solids or sediment in saturated sediments (Fetter, 1988).

Attenuation

Attenuation accounts for the multitude of chemical and biochemical reactions that can alter contaminant concentrations in groundwater flow systems. The rate of attenuation is highly variable and complex, and depends on many factors, which include: groundwater geochemistry, type and density of micro-biological agents in the soil, availability of oxygen (aerobic or anaerobic conditions), and chemical stability within those environments.

Most alluvial aquifers in the Salt River Valley occur naturally in an aerobic (oxidized) state. PCE is very stable under aerobic conditions and therefore would be expected to attenuate very slowly. Other compounds, such as petroleum hydrocarbons, degrade more easily in aerobic environments and are therefore not as persistent as PCE. In an anaerobic (reducing) environment, dechlorination of PCE occurs more readily, and results in the formation of several daughter products, including TCE, cis-1,2-DCE, and vinyl chloride.

6.3 Distribution of Contaminants at the Bayless Property

The temporal and spatial distribution of the contaminants, PCE and other detected analytes, observed on the Bayless property is summarized in the sections below. Detailed results of the investigations at the Bayless property can be found in the following reports: Malcolm Pirnie, 2005a, Malcolm Pirnie, 2006b, Malcolm Pirnie, 2007a, Malcolm Pirnie, 2007b. As discussed in Section 3, results of these site investigations also form the basis for installation of groundwater monitoring wells, which have been incorporated into a groundwater monitoring program. Results of the quarterly groundwater monitoring events are presented in a series of quarterly reports submitted to ADEQ. These reports have been submitted since the fourth quarter of 2004 until budget constraints in January 2009.

6.3.1 Vadose Zone Contamination

6.3.1.1 Distribution of PCE

Soil: The major contaminant of concern identified at the Site is PCE, which was first detected in two soil samples collected from borings associated with the installation of monitoring wells MW-1 through MW-3 (Hargis & Associates, 2000, 2001). To delineate the extent of the initial detections, the ERA investigation was initiated by ADEQ (Malcolm Pirnie, 2005a). Ten borings centered around the suspected source areas were drilled to depths ranging from 90 to 125 bgs. During the initial ERA investigation, PCE was detected in all but one of the borings, SB-8, with the highest concentrations observed in soil samples collected at depths greater than 65 bgs. From the samples collected, the highest concentrations detected was, 0.65 mg/kg, in soil samples collected from at SB-1 at a depth of 65 feet bls and SB-5 at a depth of 80 feet bls. These boring locations were near the former dry cleaner and drug store, respectively. Other locations with notably high detections were SB-4 and SB-9 at a depth of 80 feet bls, These located were near the former beauty shop and downgradient of the source area, respectively.

Soil Gas: Initial shallow soil gas sampling was conducted in 1999 with sample locations focused on the area surrounding the former septic system. The maximum PCE vapor concentration, 830 $\mu g/m^3$ was detected in DSG-2, at a depth of 25 feet bgs. This boring was drilled adjacent to the northern most septic tank.

Soil gas samples collected during the ERA site investigation were analyzed for VOCs by US EPA Method 8260B and 8021B/8015B. PCE vapor was detected in each of the soil borings with the highest concentrations observed at depths greater than 45 feet bgs. A summary of the soil gas analytical PCE results is provided in Table 4.

In general, PCE soil gas concentrations increased with depth in each of the exploratory soil borings. PCE concentrations at the shallowest depth, five feet bgs, were relatively low ranging from 3.6 mg/m^3 in boring SB-1, to a high of 72 mg/m^3 detected at boring SB-7. Soil borings SB-1 through SB-7 were drilled within areas where PCE concentrations were reported to be the highest based on previous investigations or next to major features of the former septic system. The highest detections of PCE gas concentrations occurred in the lower half of the vadose zone from approximately 45 feet to 80 feet bgs. In the borings closest to the former septic tanks, SB-2 and SB-3, samples indicated that PCE concentrations increased with depth to a maximum measured PCE gas concentration of 6,100 mg/m^3 at 80 feet bgs.

Soil borings SB-8 through SB-10 were drilled furthest from the former septic tank locations. PCE soil gas concentrations at these locations also increased with depth to maximum concentrations ranging from 160 to 290 mg/m^3.

The soil and soil gas results from the recent investigative soil borings along with the historical soil gas results were used to formulate the current understanding of the source area of PCE. Based on the spatial distribution and concentrations, VOCs were released to the subsurface as a dissolved-phase component of a liquid waste stream. Wastewater contaminated with PCE appears to have entered the vadose zone through the former septic system where the contaminated pore water then percolated down to the water table. The highest concentrations of PCE exist directly beneath the locations of the former septic tanks. The majority of PCE mass, present as soil gas, appears to occur between 40 feet bgs and the water table in the area around the former septic system.

6.3.1.2 Distribution of Other Analytes in the Vadose Zone

Soil: Other analytes detected in the vadose zone include naphthalene and methylene chloride. During the ERA investigations, naphthalene was detected at a concentration of 0.65 mg/kg in the sample collected at 65 feet bgs from SB-1. Methylene chloride was detected at concentrations of 2.3 mg/kg, 2.2 mg/kg, and 2.1 mg/kg in the 55, 65, and 80 feet bgs samples collected from SB-5.

Methylene chloride was also detected in the laboratory's method blank for this analysis, therefore, the detection of methylene chloride in the soil samples is likely the result of laboratory contamination.

Soil Gas: Toluene was detected at a low concentration of 4.9 mg/m^3 at soil boring SB-1 at a depth of 15 feet bgs.

6.3.2 Groundwater Contamination

6.3.2.1 Distribution of PCE

Groundwater samples collected during these investigations were submitted to a State certified laboratory (Test America) and analyzed for VOCs by US EPA Method 8260B. In addition, quarterly groundwater samples have been collected and analyzed for VOCs since 2004 until budget constraints in January 2009.

With the exception of the east side of the Bayless property, the horizontal extent of groundwater PCE contamination is defined by the current Site groundwater monitor wells. Currently, PCE is detected in groundwater at the following locations: Monitor wells MW-3, MW-4, MW-5, MW-10, MW-11, and MW-12 (Monitor wells MW-11 and MW-12 are located on the SCI property).

The downgradient extent of the contamination above the AWQS assessed to date is estimated to be approximately 125 feet downgradient of monitor well MW-10 where a recent groundwater sample detected PCE at a concentration of 140 µg/L. Monitor well MW-10 is located approximately 400 feet north of the Bayless property. Groundwater sampling conducted in November 2008 indicated the presence of PCE in monitor well MW-8 at a concentration of 0.61

μg/L. Monitor well MW-8, is located approximately 1,350 feet north of the property. Previously, PCE has not been detected in this well. Due to budget constraints, the PCE detection in monitor well MW-8 has not been confirmed by additional groundwater samples. Figure 19 presents the distribution of PCE contamination in groundwater at the Site, and the estimated extent of groundwater with PCE exceeding the AWQS of 5 μg/L.

The vertical extent of contamination is defined by one deep monitor well, monitor well MW-9, located on the Bayless property near MW-4. Monitor well MW-9 is screened from 178 to 218 feet bgs where as the other monitor wells are generally screened from 70 to 120 feet bgs. PCE has not been detected above laboratory reporting limits in MW-9 since it was initially sampled in November 2006.

Initial groundwater samples collected from monitor wells (MW-1, MW-2, and MW-3) during the early 1990's reportedly detected the presence of PCE at concentrations of up to 15,000 μg/L. The AWQS for PCE is 5μg/L.

Analytical results of the groundwater samples collected during the initial ERA investigations indicated that PCE concentrations ranged from 56 μg/L in SB-6 to 10,000 μg/L in SB-3. Subsequent groundwater samples collected during additional monitor well installation and quarterly sampling activities indicated PCE concentrations ranged from less than 2 μg/L to 2,200 μg/L. Current Site conditions indicate the PCE plume is centered around monitor well MW-3, MW-4, MW-5, and MW-10, with concentrations as high as 600 μg/L. The location with the highest PCE concentration is immediately downgradient of the suspected source area, the former septic tank locations.

Guidance provided by the US EPA (EPA, 1993) suggests that the presence of DNAPL should be suspected when concentrations in groundwater approach 10 percent of the solubility of a compound. Based on the above guidance, the concentrations of PCE detected at the property and the solubility limit of 200,000 μg/L for PCE, DNAPL is not suspected in the source area.

Organic carbon fractions in basin-fill deposits are very small and typically are in the range of 0.0005 to 0.005. Perhaps due to the fine grained nature of the sediments at the Site, the sediments are relatively high in organic material. Total organic carbon content for samples collected from beneath the water table at the Bayless property ranged from 0.1 percent to 2.1 percent (foc = 0.001 to 0.021). Therefore, some retardation is likely taking place at the Site.

Analyses of groundwater samples collected from wells downgradient of the source area at the Bayless property do not contain significant amounts of TCE indicating attenuation is not a significant factor at this property.

6.3.2.2 Distribution of Other Analytes in Groundwater

Other VOCs that have been detected in groundwater at the property include chloroform, dichlorodifluoromethane, 1,2-dichloroethane, methyl-tert-butyl-ether (MTBE) and TCE. Chloroform was initially detected in monitor well MW-8, at the laboratory reporting limit of 1.0 μg/L during the first quarter of 2008. A lowering of the laboratory reporting limit in 2008, has allowed lower level VOC monitoring of groundwater samples. To date, detected chloroform concentrations in these wells have ranged from 0.66 μg/L to 1.1 μg/L. The AWQS for total trihalomethanes, which includes chloroform, is 100 μg/L.

Dichlorodifluoromethane has been detected in monitor wells MW-3 and MW-4, and MW-5 since 2004. Detected dichlorodifluoromethane concentrations in these three wells have ranged from 0.5 μg/L to 4.9 μg/L. An AWQS for dichlorodifluoromethane has not been established at this time.

1,2-dichloroethane has only been detected twice since monitoring began in 2004; once in monitor well MW-4 at a concentration of 2.3 μg/L in 2004 and once in monitor well MW-5 at a concentration of 0.61 μg/L in 2008. The AWQS 1,2-dichloroethane is 5 μg/L.

MTBE has been detected periodically in monitor wells MW-3 and MW-4 since 2004. Detected MTBE concentrations in these two wells ranged from 1.2 μg/L to 25 μg/L, respectively. The AWQS for MTBE has not been established. Guidance from ADEQ's Underground Storage Tank program indicates that a remediation level of 94 μg/L should be used when an existing drinking water receptor is not affected or is not potentially affected by MTBE (ADEQ, 2002).

TCE has been detected in monitor wells MW-3 and MW-4 since 2004 and more recently in monitor well MW-10. Detected TCE concentrations in these three wells have range from 0.5 μg/L to 4.9 μg/L. The AWQS for TCE is 5 μg/L.

6.3.2.3 Concentration Trends

Groundwater PCE concentration trends in monitor wells MW-3, MW-4, MW-5, MW-10, are shown on Figure 20. The graph shows that the overall trend indicates PCE concentrations have remained relatively stable, with a slight long-term decrease in concentrations from initial concentrations. Historic PCE concentrations detected during quarterly sampling events at the Bayless property are included in Table 16.

6.3.3 Potential Offsite Transport Mechanism

At the Bayless property, the contaminant plume is generally oriented in the direction of the groundwater gradient. Concentrations are generally higher in the vicinity of source areas and decline both longitudinally (downgradient) and laterally away from the source area. The width of a contaminant plume is likely controlled by hydrodynamic dispersion.

6.4 Distribution of Contaminants at the SCI Funeral Service Property

The temporal and spatial distribution of the major contaminants of concern and other detected analytes observed on the SCI property is summarized below.

6.4.1 Vadose Zone Contamination

6.4.1.1 Distribution of PCE

Soil: Initial samples collected in the 1990s near the dry well (Figure 14) were analyzed for chlorinated VOCs using US EPA Method 8010. The detected analytes from the samples collected from the settling chamber of the drywell during these initial investigations include PCE at concentrations of 1,300 mg/kg at a depth of 16.5 feet bgs and at a concentration of 65.9 mg/kg detected in an additional sample collected from the sediments in the settling chamber of the dry well. During this period, PCE was also detected in soil samples collected from parcel 4 at concentrations ranging from 0.009 mg/kg near the former septic tank to 43.5 mg/kg at the bottom of the former seepage pit. In addition, a sample of the liquid and suspended sediments in the septic tank detected PCE at a concentration of 0.7 μg/L.

During the 2008 ERA investigation, soil samples collected from soil borings B1-B6 (Figure 15) indicated there were no VOCs detected at or above the laboratory reporting limit.

Soil Gas: Reported initial soil gas samples collected in the 1990s were from parcel 4, collected at a depth of five feet bgs in the vicinity of the septic tank and seepage pit surface drains. The analytical results reported PCE detections ranging from 14 mg/m^3 to 197 mg/m^3.

During the ERA investigation, PCE was detected at borings B1 through B6 at concentrations ranging from 0.3 mg/m^3 to 120 mg/m^3. The highest PCE concentrations were observed in boring B1 near the septic tank and seepage pit as well as borings B4 through B6 located near the former dry cleaning building. The highest concentrations occur between 55-75 feet bgs. Table 13 summarizes the analytical results and show the depth intervals with their respective detected PCE concentrations.

The soil gas results from the recent ERA investigation soil borings along with the historical soil and soil gas results were used to formulate the current understanding of the source areas of PCE. Based on the spatial distribution and concentrations, VOCs were released to the subsurface as a dissolved-phase component of a liquid waste stream. Wastewater contaminated with PCE appears to have entered the vadose zone through the former septic system, seepage pit and dry well where the contaminated water then percolated down to the water table. The majority of PCE mass, present as soil gas, appears to occur between 45 feet bgs and the water table in the area of the property surrounding the former dry cleaning building, the dry well, the septic system and seepage pit on the property.

No information is available from the City of Phoenix about the wastewater disposal history at this property or the date the property was connected to the City of Phoenix sewer system. If the Bayless property was connected to the City of Phoenix sewer system during 1960 it may be assumed that the SCI property would be connected in approximately the same time frame. If this is the case, a dry cleaner also operated at this property prior to connection to the City of Phoenix sewer. It is possible that the septic tank and seepage pit received wastewater from the previous dry cleaner building.

6.4.1.2 Distribution of Other Analytes

Soil: The detected analytes from the sediment samples collected during the initial investigations in the 1990's include TCE and total 1,2-DCE at concentrations ranging from 19 mg/kg to 2.4 mg/kg detected in sample collected at the base of the drywell. During this period, total 1,2-DCE was also detected at a concentration of 11 mg/kg in parcel 2. In parcel 4, total 1,2-DCE was detected at concentrations that ranged from 0.3 mg/kg near the former septic system to 0.06 mg/kg at a depth of 32 feet bgs in the former seepage pit.

Other analytes detected include trichlorofluoroethane, which was detected at concentrations of 0.04 mg/kg at 20 feet bgs, in sample collected near the former septic system.

Soil Gas: During the ERA investigation, TCE was detected in soil gas samples collected from borings B1, B2, B4, and B5. A summary of TCE concentrations of soil gas samples is provided in Table 14. Other analytes detected in soil gas at the property include, acetone, benzene, 2-butanone (MEK), chloroform, dichlorodifluoromethane, hexane, propene, toluene, and 1,2,4-trimethylbenzene at relatively low concentrations.

6.4.2 Groundwater Contamination

6.4.2.1 Distribution of PCE

Initial groundwater samples were collected from monitor wells MW-11 and MW-12 in March, 2008, and submitted to a State certified laboratory and analyzed for VOCs by US EPA Method 8260B. To date, groundwater samples have been collected in monitor wells MW-11 and MW-12 during three previous quarterly sampling events.

Analytical results of the groundwater samples collected after the ERA investigations indicated that PCE concentrations ranged from 4.9 µg/L in monitor well MW-11 to 24 µg/L in monitor well MW-12. Monitor well MW-12 is located near the former drywell while monitor well MW-11 is located approximately 25 feet downgradient of the former septic tank and seepage pit. The summary of the initial laboratory analytical results are presented in Table 14. The distribution of PCE contamination at the Site is presented in Figure 19.

Wells at the SCI property do contain significant amounts of TCE, 1,2-DCE and vinyl chloride indicating a significant amount of attenuation is taking place at this property.

6.4.2.2 Distribution of Other Analytes

Other VOCs that have been detected at the Site include chloroform, cis-1,2-DCE, trans-1,2-DCE, TCE and vinyl chloride. Chloroform was detected in monitor wells MW-11 and MW-12 at concentration ranging from 3.1 μg/L to 4.4 μg/L and <0.5 μg/L to 0.76 μg/L, respectively. The AWQS for total trihalomethanes, which includes chloroform, is 100 μg/L.

Cis-1,2-DCE was detected in monitor wells MW-12 at concentration ranging from 23 μg/L to 33 μg/L, the AWQS for cis-1,2-DCE is 70 μg/L. Trans-1,2-DCE was detected in monitor wells MW-12 at concentration ranging from 2.9 μg/L to 3.2 μg/L, the AWQS for trans-1,2-DCE is 100 μg/L.

TCE was detected in monitor wells MW-12 at concentration ranging from 26 μg/L to 27 μg/L, the AWQS for TCE is 5 μg/L. Vinyl chloride was detected in monitor wells MW-12 at concentration ranging from 2.6 μg/L to 2.7 μg/L, the AWQS for vinyl chloride is 2 μg/L. The summary of the initial laboratory analytical results for other constituents detected in groundwater is presented in Table 14.

6.4.2.3 Concentration Trends

Groundwater PCE concentration trends in monitor wells MW-11 and MW-12 are shown on Figure 20. Only three quarters of data have been collected from these monitor wells and concentrations are relatively stable. Historic PCE concentrations detected during quarterly sampling events at the SCI property are included in Table 17.

6.4.3 Potential Offsite Transport Mechanism

With the limited number of monitor wells downgradient from the source area at the SCI property, it is difficult to determine the downgradient extent of contamination. As with the Bayless property, the contaminant plume is suspected to be generally oriented in the direction of the groundwater gradient. Concentrations are expected to be generally higher in the vicinity of the source area and decline both longitudinally (downgradient) and laterally away from the source. The width of a contaminant plume is likely controlled by hydrodynamic dispersion.

7 LAND AND WATER USE EVALUATION

7.1 Reasonably Foreseeable Land Use

7.1.1 Land Use Planning and Zoning

Beginning in 1952, the Bayless property contained a small shopping center. The buildings were demolished in 1994 after a fire destroyed part of the buildings. The Bayless property occupies a total area of 2.6 acres and is composed of three undeveloped parcels. All three parcels are currently unoccupied and are designated for commercial uses. The property is bordered to the south and west by Bethany Home Road and 7th Avenue, respectively. The parcels immediately to the north and east of the Bayless property are developed and zoned as single family residents. The land use classification and related zoning for the Bayless property is shown in Figure 21.

The SCI property contains four parcels and occupies a total area of approximately 2 acres. It is important to note that the northern most parcel, parcel 3, while part of earlier investigations, is not owned by SCI Arizona Funeral Services. All four parcels are currently occupied and are designated for commercial uses except the eastern one-third of the largest parcel, parcel 4, which contains the mortuary building. This one-third of the parcel contains a parking lot and is designated for single family residential use.

The SCI property is bordered to the south and east by Bethany Home Road and 7th Avenue, respectively. Parcels that border both roads are developed and designated for commercial uses as shown in Figure 21. The parcels immediately to the north and west of the SCI property are developed and zoned as single family residential and commercial respectively.

The Bayless and SCI properties are under the jurisdiction of the City of Phoenix for planning purposes. Within the area of the 7th Avenue and Bethany Home Road Site there is little acreage available to be developed in the future, and the area near the Site is not expected to experience significant increases in either employment or residential growth. The zoning pattern in the area has been long established and there are no foreseeable changes for the future.

7.1.2 Current and Projected Land Use

The Bayless property is currently an undeveloped vacant lot. The proposed projected land use is for commercial purposes and is consistent with the City of Phoenix zoning classification for the area.

The SCI property parcels are currently developed and occupied. The current land use is consistent with the City of Phoenix zoning classification for the area. The existing zoning and land use designation for both properties and surrounding parcels are shown in Figure 21.

7.2 Reasonably Foreseeable Water Use

7.2.1 Available Water Resources

Land and water use study questionnaires were sent to Salt River Project Agricultural Improvement and Power District (SRP) and the City of Phoenix in May 2009. Both surveys were returned. Available water resources in the vicinity of the Site include groundwater and surface water. Surface water is transported in the SRP Grand Canal, located approximately 1.5 miles south of the Site. SRP also owns and operates a piped lateral that conveys irrigation water from north to south along 7th Avenue. Local residential properties are irrigated with untreated water provided by SRP.

A review of ADWR registered wells within a one mile radius of the Site indicate that the upper most water-bearing unit occurs between 75 and 100 feet bgs. The general locations of these wells are shown on Figure 6 and a listing of information for each of these wells is provided in Appendix A.

SRP has two wells in the vicinity of the 7th Avenue and Bethany Home Road Site which are used to pump groundwater for agricultural purposes but neither of the wells are located within the 7th Avenue and Bethany Home Road Site boundary.

SRP well 13.1E -10.5N (55-608426) is located in the SW/4 of the SW/4 of the NW/4 of Section 8, Range 2N, Township 3E. The well is located near the intersection of 7th Avenue and Maryland, approximately one-quarter mile north of the 7th Avenue and Bethany Home Road Site boundary. The ADWR database indicates well 13.1E-10.5N is cased from land surface to a depth of 600 feet and the interval open to the aquifer for water production is from 240 to 600 feet. SRP provided groundwater sample results from this well for the period from 1986 to 2009. Over this time period, concentrations of PCE ranged from not detected at 0.5 μg/l until 2000 to 4.6 μg/l in 2006. The most recent sample collected in 2009 detected PCE at a concentration of 2.4 μg/l.

SRP well 12.5E-10N (55-608429) is located in the SW/4 of the SW/4 of the SE/4 of Section 7, Range 2N, Township 3E. The well is located near the intersection of 15th Avenue and Bethany Home Road, approximately one-half mile west of the 7th Avenue and Bethany Home Road Site boundary. The ADWR database indicates well 12.5E-10N is cased from land surface to a depth of 600 feet and the interval open to the aquifer for water production is from 250 to 600 feet. SRP provided groundwater sample results from this well for the period from 1986 to 2008. Over this time period, concentrations of PCE ranged from 3.4 μg/l in 1986 to not detected beginning in 2006. The most recent sample, collected in 2008, did not detect PCE above a concentration of 0.5 μg/l.

SRP also owns well 13E-10N (55-617696), located in the NE/4 of the NW/4 of the NW/4 of Section 17, Range 2N, Township 3E. The well is located near the intersection of 5th Avenue and Rancho Drive, approximately one-eight of a mile southeast of the 7th Avenue and Bethany Home Road Site. This well is currently out of service but SRP anticipates it will be returned to service in the future. Well 13E-10N is cased from land surface to a depth of 242 feet and the ADWR database indicates the interval open to the aquifer for water production is from 0 to 242 feet. This would be an unusual open interval and may not be accurate. ADEQ has no groundwater sample results from this well.

The COP maintains one inactive well in the vicinity of the 7th Avenue and Bethany Home Road Site, well number 58, (55-626549) is located in the NW/4 of the NE/4 of the SE/4 of Section 7, Range 2N, Township 3E. This well is located near 10th Avenue and Maryland, approximately one-quarter mile northwest of the 7th Avenue and Bethany Home Road Site boundary. Well number 58 is cased from land surface to a depth of 606 feet and the interval open to the aquifer for water production is from 300 to 686 feet. The COP currently lists this well as disconnected and ADEQ is aware of no groundwater sample results from this well.

7.2.2 Current and Projected Water Use

Beneficial uses of water in the vicinity of the Site include domestic use and landscape irrigation. Within a one mile radius of the Site, well use is dominated by monitoring, remediation, and irrigation wells. The groundwater use by wells within a one mile radius of the Site is shown in Figure 6.

The land and water use study questionnaire response provided by the City of Phoenix did not indicate the City has plans to restore their drinking water well to active service.

According to the annual water withdrawal and use reports filed by the COP with ADWR, the COP has 34 active wells currently in production and from 1997 to 2008 these wells produced and average of 11,859 acre-feet per year (AFY) of groundwater. None of these active wells are located in the vicinity of the 7th Avenue and Bethany Home Road Site.

Due to water quality degradation (and the establishment of more stringent maximum contaminant levels [MCLs]), other wells were placed on inactive status. The total loss of COP well production for normal use from 1981 to 2000 due to elevated contaminant concentrations exceeds 90,000 AFY from the closure of over 60 wells. This represents 60 percent of the total production capacity of COP wells.

Degraded groundwater constitutes a vast reserve of water for use in meeting the COP's future water needs. The COP maintains wells for emergency use and future use in meeting service area water needs. These wells could be placed back in service with the addition of wellhead treatment systems or approved blending programs. Also, the COP holds "Special Pump Rights" with SRP,

which are rights to groundwater well capacity developed by SRP. In order for the COP to maintain and use these rights in the future, it may be necessary to connect SRP wells directly to the COP water distribution system; this may require the addition of wellhead treatment systems.

According to COP's 50 year plan, the use of potentially degraded groundwater is likely to be somewhat limited within the next decade, but the COP will depend more heavily on this groundwater to provide for service area water demands later in the 50-year planning horizon. Specifically, new groundwater production capacity is needed starting in the year 2030 at 30,000 AFY, increasing to 55,000 AFY in 2050. Assuming average production of two million gallons per day and a 75 percent utilization factor, 18 new wells will be required beginning in 2030, with an additional 15 wells added by 2050.

In their land and water use questionnaire response, SRP indicates many of the properties in the area of the Site, and downstream of the Site, still irrigate with untreated canal water. SRP anticipates a drinking water plant will be built on the Grand Canal within the next 100 years.

In addition, SRP also indicates because of their reliance on groundwater to supplement their surface water supplies during periods of drought, SRP is very concerned with any water quality problems in the aquifer or with a threat of groundwater contamination. It is important to SRP to safeguard the ability to utilize their wells and SRP indicates it is conceivable that during periods of severe drought, SRP wells in the area may be utilized at their full annual registered volumes.

In their land and water use questionnaire response, SRP anticipates all of its properties in the vicinity of the Site will remain in use in the future. Therefore, SRP believes any plan to remediate groundwater needs to recognize the highly variable pumping scenarios that may occur in and around the Site. Appendix D contains the land and water use study questionnaires from SRP and the City of Phoenix.

The annual use of groundwater by SRP will fluctuate depending upon the availability of surface water. Based on specific well information, the most reliable method of projecting future aquifer use by SRP may be through evaluation of their past aquifer use. Well 13.1-10.5E has pumped an average of 624 AFY from 1996 to 2009. Well 12.5-10N has pumped an average of 98 AFY from 1996 to 2009. This may represent the future average annual pumpage by SRP near the 7th Avenue and Bethany Home Road Site.

In July 2008, ADWR completed a comprehensive well inventory for private wells within one mile of the 7th Avenue and Bethany Home Road Site. The ADWR well database included seven wells with private ownership within one mile of the 7th Avenue and Bethany Home Road Site. None of the wells are located within the 7th Avenue and Bethany Home Road Site boundary. ADWR made several attempts to contact the well owners. Of the seven wells in the database,

two were confirmed to exist, one was confirmed as abandoned and four were not located. A well not located during the field verification is not conclusive evidence that the well does not exist.

The Young well (55-702874), is located in the NE/4 of the NE/4 of the SE/4 of Section 7, Range 2N, Township 3E. The well is located near the intersection of 15th Avenue and Maryland, approximately one-quarter mile northwest of the 7th Avenue and Bethany Home Road Site and its use is listed as domestic. The ADWR database indicates the Young well cased from the surface to 192 feet and the interval open to the aquifer for water production is from 50 to 192 feet. ADEQ has no groundwater sample VOC results from this well.

The Wolf well (55-806789) is located in the NW/4 of the SW/4 of the SE/4 of Section 8, Range 2N, Township 3E. The well is located near the intersection of 2nd Street and Rose Lane, approximately one-half mile east of the 7th Avenue and Bethany Home Road Site and its use is listed as irrigation. The ADWR database indicates the Wolf well is 300 feet deep but no other construction information is available. ADEQ has no groundwater sample VOC results from this well.

8 BASELINE RISK ASSESSMENT

8.1 Human Health Evaluation

8.1.1 Migration Pathways

An exposure pathway is the route over which a chemical or physical agent migrates from a source to an exposed population or individual (receptor) and also describes a unique mechanism by which the receptor may be potentially exposed to chemicals or physical agents at or originating from the Site. For an exposure pathway to be complete,
the following four elements must be present:

- a source or release from a source (e.g., vapor emissions released from soils to air)
- a likely environmental migration route (e.g., volatilization of a site-related chemical or physical agent)
- an exposure point where receptors may come in contact with site-related chemical or physical agents (e.g., local soils)
- a route by which potential receptors may be exposed to a site-related chemical or physical agent (e.g., inhalation of vapors)

If any one of these components is not present, the exposure pathway is considered incomplete and is not expected to contribute to the total exposure from the Site.

Groundwater Pathway

Domestic consumption of groundwater is a pathway of concern when private wells that produce water from the underlying aquifer are used to provide a source of drinking water. Exposure will occur as a result of ingestion, inhalation, and direct dermal contact with chemicals during domestic activities. This pathway is considered to be incomplete at the Site since the only private well with a listed use as domestic known in the area of the Site, the Young well, is located approximately one-quarter mile northwest of the 7th Avenue and Bethany Home Road Site boundary and is not believed to be impacted from the groundwater contamination from the Site.

Municipal water wells may also produce water from the aquifer in or near the Site. This pathway is considered to be incomplete for the Site since the municipal well near the Site is approximately one-quarter mile northwest of the 7th Avenue and Bethany Home Road Site boundary and is not believed to be impacted from the groundwater contamination from the Site.

Surface water Pathway

SRP indicates many of the properties in the area of the Site, are still irrigated with untreated surface water. Appendix B, of Arizona Administrative Code R18-11-1, List of Surface Waters and Designated Uses, indicates the designated uses of canals below water treatment plants are agricultural irrigation and agricultural livestock. There are no numeric standards for PCE for

these designated uses. Assuming partial or full body contact is a possibility with irrigation waters at the Site, the numeric water quality standard would be 9,333 μg/L. Concentrations of PCE in the groundwater at the Site are well below this concentration.

Air Pathway

The air pathway is a pathway of concern when inhalation can occur from exposure to contaminated air due to volatilization of the contaminants of concern from surficial soils, the underlying unsaturated soils or the aquifer.

Exposure by the inhalation pathway would be negligible outdoors, but can be significant indoors where vapors cannot readily disperse (e.g., in on-site residences and buildings.) On-site human receptors are children and adults living in the residential properties at the Site. On-site human receptors would also include adults working in commercial properties at the Site.

Health concerns have been raised about the potential for subsurface contamination in either soil or groundwater adversely impacting indoor air quality. In September 1998, the U.S. EPA developed a series of models for estimating indoor air concentrations and associated health risks from subsurface vapor intrusion into buildings. These models were based on the analytical solutions of Johnson and Ettinger, 1991 for contaminant partitioning and subsurface vapor transport into buildings. A user's guide for these models was published by the U.S. EPA in 2004.

To assist in evaluating the air pathway and indoor air quality, ADEQ collected a shallow soil gas sample at a depth of 10 feet bgs while drilling monitor well MW-10, located on Berridge Avenue in the residential area north of the Bayless property. Analysis of this sample indicated PCE was present at a concentration of 0.004 mg/m^3. Entering this value into the Johnson and Ettinger model spreadsheet indicates the incremental risk due to vapor intrusion of PCE into a residential dwelling would be 3.7×10^{-9}. This incremental risk is well below ADEQ's acceptable cumulative excess cancer risk from 1×10^{-6} to 1×10^{-4} as stated in the soil remediation rule, R18-7-206(D).

Soil gas concentrations at SCI property were also evaluated in a non-residential setting to assist in evaluating the risk to adults working in commercial buildings at the property. Soil gas samples were collected from a depth of 15 feet all across the property. Boring B3 detected the highest concentration at 6.2 mg/m^3. Entering this value in the Johnson and Ettinger spreadsheet indicates the incremental risk due to vapor intrusion of PCE into a non-residential setting would be 2.1×10^{-6}. This incremental risk would also be within ADEQ's acceptable cumulative excess cancer risk from 1×10^{-6} to 1×10^{-4}. Appendix E contains the soil gas screen spreadsheets from the Johnson and Ettinger model.

Soil Contact Pathway

Direct soil contact is a pathway of concern in areas where humans may come in contact with contaminated soils. At the Bayless property, there is a possibility of direct human exposure to contaminated soils, but these soils do not contain contaminant concentrations above soil remediation standards. Soil samples collected from a depth of five feet at the Bayless property did not detect PCE above a concentration of 0.05 mg/kg well below the residential SRL of 0.51 mg/kg. Due to volatilization, concentrations in the soils at depths less than five feet should be less than concentrations present at five feet. As previously mentioned, ADEQ issued a NFA for the soils at the Balyess property in December 2008.

At the SCI property, contaminated soils occur under asphalt parking lots, asphalt-surface storage areas, or under the concrete floors of buildings at the property. In addition, during the 2008 ERA investigation of this property, analyses of soil samples collected from soil borings B1-B6 at a depth of five feet indicated there were no VOCs detected at or above the laboratory reporting limit.

8.2 Environmental Receptor Evaluation

There are no ecological receptors at the Site. Vegetation is limited to decorative grass, bushes, and trees surrounding buildings and residences. No evidence of distressed vegetation has been observed at the Site.

8.3 Baseline Risk Assessment Conclusions

The surface water, air and soil contact pathways are complete at the Site. The concentrations of the contaminants known at the Site do not pose a substantial risk to human heath.

9. SUMMARY AND CONCLUSIONS

The soil and groundwater investigation at the Site has included the drilling and sampling of soil borings and the installation of SVE wells and groundwater monitoring wells. Results of these activities were used to characterize the extent of contamination in subsurface soils and identify the vertical and horizontal distribution of VOCs in the groundwater.

Based on the results of the ERA investigation at the Bayless property, there appeared to be significant concentrations of PCE soil gas in the vadose zone below the location of the former septic system. As a result of the elevated PCE levels, ADEQ directed Malcolm Pirnie, Inc. to design, install and operate an interim SVE system to reduce the VOC mass in the vadose zone. The goals of the interim SVE remediation system were to remove as much of the VOC mass, primarily PCE, as possible, from the source area and reduce further impacts to the groundwater quality before the property was developed. The SVE system operated from June 22, 2005 through January 6, 2006. During that time, approximately 378 pounds of VOCs, primarily PCE, were removed from the unsaturated zone within the source area. Concentrations of VOCs remaining in the unsaturated zone at the Bayless property are below SRLs and GPLs. In December 2008, ADEQ granted Bayless Investment and Trading Company a NFA determination for soil at the property.

The ERA investigation of the SCI property indicated concentrations of VOCs remaining in the unsaturated zone at the property are below SRLs and GPLs. At this time, ADEQ believes no further remedial actions are required for the unsaturated soils at the property.

ADEQ has identified PCE, TCE and vinyl chloride as the contaminants of concern in the groundwater at the Site. The quarterly sampling event in November 2008 detected PCE at concentration ranging from 0.61 to 600 μg/L. TCE was detected in the SCI property monitor well MW-12 at a concentration of 32 μg/L. The AWQS for PCE and TCE is 5 μg/L. Vinyl chloride was also detected in monitor well MW-12 at a concentration of 2.7 μg/L, slightly above the AWQS for vinyl chloride of 2 μg/L.

The deep monitor well at the Site, monitor well MW-9, does not detect any VOCs at the depth of the screened interval from 178 to 218 feet bgs indicating the majority of the groundwater contamination at the Site occurs at the depth of the shallow monitor wells, which are screened at the interval from 70 to 120 feet bgs. With the exception of the east side of the Bayless property, the horizontal extent of groundwater PCE contamination is defined by the current Site groundwater monitor well network and the extent of VOC contamination above the AWQS has been defined.

The Bayless and SCI properties are under the jurisdiction of the City of Phoenix for planning purposes. The zoning pattern in the area has been long established and there are no foreseeable changes for the future.

An inactive City of Phoenix well is located in the vicinity of the groundwater contamination plume. The well is 686 feet deep and is located in the NW/4 NE/4 SW/4 of Section 7, Township 2N, Range 3E. The well is identified with the ADWR registration number 55-626549. ADEQ is aware of no groundwater sample results from this well. The land and water use questionnaire response provided by the City of Phoenix did not indicate the City has plans to restore their drinking water well to active service.

Degraded groundwater constitutes a vast reserve of water for use in meeting the COP's future water needs. The COP maintains wells for emergency use and future use in meeting service area water needs. These wells could be placed back in service with the addition of wellhead treatment systems or approved blending programs. Also, the COP holds "Special Pump Rights" with SRP, which are rights to groundwater well capacity developed by SRP. In order for the COP to maintain and use these rights in the future, it may be necessary to connect SRP wells directly to the COP water distribution system; this may require the addition of wellhead treatment systems.

According to COP's 50 year plan, the use of potentially degraded groundwater is likely to be somewhat limited within the next decade, but the COP will depend more heavily on this groundwater to provide for service area water demands later in the 50-year planning horizon. Specifically, new groundwater production capacity is needed starting in the year 2030 at 30,000 AFY, increasing to 55,000 AFY in 2050. Assuming average production of two million gallons per day and a 75 percent utilization factor, 18 new wells will be required beginning in 2030, with an additional 15 wells added by 2050.

Two SRP wells that provide water for irrigation are located in the vicinity of the plume. Sampling conducted by SRP has detected low levels of VOCs in these wells in the past. To date, no samples have exceeded the AWQS for PCE of 5 μg/L and the wells are still in service.

In their land and water use study questionnaire response, SRP indicates many of the properties in the area of the Site, and downstream of the Site, still irrigate with untreated surface water. SRP anticipates a drinking water plant will be built on the Grand Canal within the next 100 years.
In addition, SRP also indicates because of their reliance on groundwater to supplement their surface water supplies during periods of drought, SRP is very concerned with any water quality problems in the aquifer or with a threat of groundwater contamination. It is important to SRP to safeguard the ability to utilize their wells and SRP indicates it is conceivable that during periods of severe drought, SRP wells in the area may be utilized at their full annual registered volumes.

In their land and water use study questionnaire response, SRP anticipates all of its properties in the vicinity of the Site will remain in use in the future. Therefore, SRP believes any plan to remediate groundwater needs to recognize the highly variable pumping scenarios that may occur in and around the Site.

There are no ecological receptors at the Site. Vegetation is limited to decorative grass, bushes, and trees surrounding buildings and residences. No evidence of distressed vegetation has been observed at the Site.

The surface water, air and soil contact pathways are complete at the Site. The concentrations of the contaminants known at the Site do not pose a substantial risk to human heath.

10. REFERENCES

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TABLES

Table 1
Soil Types and Soil Hydraulic Conductivity Ranges
Remedial Investigation Report
7th Avenue and Bethany Home Road
WQARF Site

Map symbol and soil name	Depth (inches)	USDA texture	USCS Classification	Saturated hydraulic conductivity (µm/sec)	Location
Es: Estrella	0-11	Loam	ML	4.0-14.0	MW-6, MW-7, MW-8, MW-10
	11-24	Loam	ML	4.0-14.0	
	24-48	Clay loam	CL	1.4-4.0	
	48-60	Gravelly clay loam	CL	1.4-4.0	
LcA: Laveen	0-15	Loam	ML	4.0-14.0	MW-1, MW-2, MW-3, MW-4, MW-5, MW-9
	15-50	Loam, Silt loam, Very fine sandy loam	ML	4.0-14.0	
	50-72	Gravelly loam, Gravelly very fine sandy loam	ML	4.0-14.0	

Source : NRCS, 2008

Note:
USCS = United States Conservation Services
USDA = United States Department of Agriculture
µm/sec = micrometer per second

Table 2
Summary of Depth Specific Soil Analytical Results for PCE, October 2004 Bayless Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Boring Depth (ft bgs)	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10
	Soil PCE (mg/kg)									
5	< 0.05	NA	NA	NA	NA	NA	< 0.05	NA	NA	< 0.05
15	NA	< 0.05	NA	< 0.05	NA	NA	NA	NA	NA	NA
25	NA	NA	< 0.05	NA	NA	NA	NA	NA	NA	NA
35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
45	< 0.05	< 0.05	NA	NA	0.13	NA	NA	NA	NA	NA
55	< 0.05	NA	0.083	NA	< 0.05	0.069	< 0.05	NA	NA	NA
65	0.65	NA	0.15	0.075	0.19	0.18	0.11	NA	NA	NA
75	< 0.05	0.079	0.27	0.16	NA	0.13	NA	NA	NA	NA
80	NA	0.21	0.29	0.55	0.65	NA	0.31	< 0.05	0.52	0.36
125	< 0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

NA = Not Analyzed

PCE = tetrachloroethene

PCE Residential Soil Remediation Level (SRL) = 5.1 mg/kg

PCE Non-Residential SRL = 13 mg/kg

PCE ADEQ Groundwater Protection Level (GPL) = 0.8 mg/kg

Table 3
Summary of Geotechnical Analysis Results
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Soil Boring	Sample Date	Depth of Sample (ft bgs)	Moisture Content (%)	Wet Density (pcf)	Dry Density (pcf)	Specific Gravity	Total Porosity (%)	Water Filled Porosity (%)	Organic Carbon Content (%)	Hydraulic Conductivity (cm/sec)	Percent Fines (<#200 sieve)	Percent Sand (>#200 sieve)
SB-1	10/18/04	120	14.7	128.0	118.6	2.51	31.0	30.0	0.100	2.2×10^{-6}	67.0	33.0
SB-3	10/21/04	50	4.3	--	--	--	--	--	0.018	--	13.6	86.4
SB-3	10/21/04	70	18.5	114.9	96.7	--	65.0	34.0	0.200	--	31.8	68.2
SB-3	10/21/04	90	24.5	128.9	103.5	--	37.0	--	--	9.3×10^{-6}	46.0	54.0
SB-4	10/22/04	41	3.4	--	--	--	--	--	0.045	--	10.2	89.8
SB-4	10/22/04	51	10.3	143.5	129.8	--	22.0	21.0	0.054	--	29.0	71.0
SB-5	10/23/04	50	9.5	99.8	91.1	--	40.8	14.7	0.073	--	52.5	47.5
SB-5	10/23/04	70	25.7	114.2	90.5	--	85.5	47.2	0.230	--	63.6	36.4
SB-7	10/26/04	90	19.8	108.4	90.5	--	45.3	--	--	1.6×10^{-5}	39.4	60.6
SB-10	10/28/04	115	27.8	99.8	78.1	--	52.8	--	--	1.6×10^{-5}	56.0	44.0
MW-8	9/13/05	115	23.4	116.5	100.8	2.52	54.0	36.0	1.600	4.64×10^{-6}	61.0	39.0
MW-7	9/15/05	115	29.9	109.9	84.6	2.48	58.0	45.0	1.600	3.04×10^{-6}	83.0	17.0
MW-6	9/20/05	115	23.9	123.5	99.7	2.65	50.0	40.0	2.100	9.22×10^{-7}	35.0	65.0

Notes:
ft bgs = feet below ground surface
pcf = pounds per cubic foot
cm/sec = centimeters per second
(--) = Not Analyzed

Table 4
Summary of Depth Specific Soil Gas Analytical Results for PCE, October 2004 Bayless Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Boring Depth (ft bgs)	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10
	Soil Gas PCE (mg/m^3)									
5	3.6J*	35	62J	7.2	11	38	72*	1.2	4.5	5.1*
15	94/67[1]	120*	260	22*	160	67	200	NS	NS	NS
25	210	110	100*	110	140	130	110	NS	NS	NS
35	500	330	41	100	310	290	1300	NS	NS	NS
45	1000*	1900*	290	22	330	180	650	11	130	50
55	NR*	1000	1500*	590	1900*	840*	1700*	20	27	67
65	2800*	1900	2100*	1300*	2600*/1300[1]	620*	1700*	25	46	93
75	670*	4900*	3200*	920*	630	2100*/1300[1]	780	97	230	57
80	25J	6100*	2500*	1800*	2400*	2400	2700*/1700[1]	290*/250[1]	260*/260[1]	160/100[1]

Notes:

ft bgs = feet below ground surface

mg/m^3 = miligrams per cubic meter

NR = No Result

NS = Not sampled

PCE = tetrachloroethene

* Indicates corresponding soil samples selected for US EPA Method 8260 analysis.

[1] Indicates verification result from fixed base lab soil gas analysis using US EPA Method 8260.

J = The analyte was positively identified; however, the result should be considered an estimated value.

Table 5
Summary of Depth Specific Groundwater Analytical Results for PCE, October 2004 Bayless Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Boring Depth (ft bgs)	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10
	GW PCE (µg/L)									
90	1600	1400	10000	1300	2200	56	4800	1600	9600	1600

Notes:
GW = groundwater sample results
PCE = tetrachloroethene
µg/L = micrograms per liter
ft bgs = feet below ground surface

Table 6
Depth to Water Measurements
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Survey Measuring Point Elevation	1151.46	1151.73	1151.18
Date	**Well ID**		
	MW-3	**MW-4**	**MW-5**
	Depth to Water (ft bmp)		
11/8/2004	85.88	86.81	85.81
11/18/2004	85.95	86.88	85.9
12/2/2004	85.97	86.89	85.88
1/5/2005	86.04	86.93	85.96
2/17/2005	86.22	87.1	86.12
3/8/2005	86.42	87.28	86.31
4/4/2005	86.58	87.49	86.47
5/19/2005	83.58*	86.95	85.92
6/22/2005	85.11	85.91	84.96
7/22/2005	84.43	85.28	84.38
8/5/2005	83.89	84.72	83.80

Survey Measuring Point Elevation**	1151.46	1151.64	1151.16	1153.59	1156.28	1155.33	1152.32	1153.11	1151.00	1149.94
	MW-3	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-10**	**MW-11**	**MW-12**
9/27/2005	82.14	83.07	82.23	86.73	93.12	92.74	DNE	DNE	DNE	DNE
10/13/2005	81.72	82.83	81.90	86.38	92.75	92.4	DNE	DNE	DNE	DNE
11/30/2005	81.23	82.29	81.44	86.19	92.05	91.44	DNE	DNE	DNE	DNE
12/20/2005	81.40	82.42	81.48	86.21	91.90	91.32	DNE	DNE	DNE	DNE
1/31/2006	81.99	82.96	82.09	86.8	92.24	91.36	DNE	DNE	DNE	DNE
2/28/2006	82.65	83.58	82.73	87.33	92.62	91.65	DNE	DNE	DNE	DNE
3/22/2006	83.2	84.14	83.29	87.85	93.06	92.06	DNE	DNE	DNE	DNE
4/21/2006	83.55	84.50	83.61	88.19	93.30	92.28	DNE	DNE	DNE	DNE
May 2006	NM	NM	NM	NM	NM	NM	DNE	DNE	DNE	DNE
6/15/2006	82.69	83.57	82.73	87.23	92.50	93.22*	DNE	DNE	DNE	DNE
7/18/2006	82.16	83.05	82.20	86.65	92.08	91.42	DNE	DNE	DNE	DNE
8/24/2006	81.48	82.32	81.50	85.94	91.49	90.90	DNE	DNE	DNE	DNE
9/14/2006	80.71	81.52	80.75	85.14	90.86	90.42	DNE	DNE	DNE	DNE
10/16/2006	79.76	80.57	79.81	84.11	89.97	89.66	DNE	DNE	DNE	DNE
11/20/2006	79.49	80.32	79.53	83.94	89.59	89.14	82.94	DNE	DNE	DNE
12/13/2006	79.52	80.38	79.56	83.99	89.50	88.95	83.21	DNE	DNE	DNE
1/11/2007	79.70	80.56	79.74	84.14	89.51	88.80	83.25	DNE	DNE	DNE
2/21/2007	80.66	81.59	80.74	85.13	90.21	89.35	84.11	DNE	DNE	DNE
3/20/2007	81.44	82.35	81.51	85.97	91.10	90.07	86.11	DNE	DNE	DNE
4/19/2007	82.72	83.64	82.80	87.25	92.42	91.50	87.38	DNE	DNE	DNE
5/16/2007	83.35	84.21	83.51	87.77	93.21	92.32	88.02	86.83	DNE	DNE
6/7/2007	83.64	84.58	83.80	88.13	93.55	92.91	87.55	87.20	DNE	DNE
7/10/2007	82.73	83.65	82.82	87.35	92.98	92.35	86.48	86.34	DNE	DNE
8/14/2007	81.71	82.65	81.76	86.44	92.10	91.49	85.54	85.33	DNE	DNE
9/25/2007	80.77	81.68	80.82	85.39	91.14	90.55	84.79	84.31	DNE	DNE
10/11/2007	80.37	81.23	80.41	84.85	90.73	90.23	84.45	83.83	DNE	DNE
11/15/2007	80.09	80.97	80.19	84.75	90.39	89.84	84.20	83.68	DNE	DNE
12/7/2007	80.13	81.09	80.22	84.88	90.38	89.67	84.32	83.73	DNE	DNE
1/9/2008	80.41	81.34	80.49	85.14	90.58	89.74	84.55	84.00	DNE	DNE
1/31/2008	80.88	81.81	80.93	85.57	90.92	90.06	84.92	84.45	DNE	DNE
3/28/2008	82.00	82.94	82.04	86.63	91.62	90.61	86.14	85.45	DNE	DNE
4/15/2008	82.21	83.13	82.23	86.91	91.85	90.83	86.34	85.68	81.20	80.46
5/7/2008	81.96	82.86	82.02	86.68	91.88	90.95	86.28	85.60	80.99	80.27
6/27/2008	80.96	81.85	NM	85.71	91.10	90.38	85.43	84.62	79.97	79.28
8/20/2008	79.52	80.30	79.55	84.05	89.84	89.35	84.29	82.89	78.65	77.90
8/27/2008	79.29	80.05	79.29	83.75	89.56	89.09	84.10	82.64	78.41	77.62
9/24/2008	78.84	79.61	78.87	83.09	88.92	88.69	83.83	82.16	78.01	77.24
10/22/2008	78.18	78.93	78.20	82.37	88.25	88.18	83.26	81.48	77.37	76.65
11/10/2008	78.04	78.84	78.10	82.34	88.09	87.89	83.14	81.48	77.25	76.51
12/08/2008	78.04	78.85	78.10	82.33	87.97	87.63	83.50	81.50	77.26	76.50

NOTES:

Survey Measuring Point Elevation is referenced from the north side of the well casing.

ft amsl = feet above mean sea level

ft bmp = feet below measuring point

* = anomalous data point, not used in generation of hydrograph or contour map.

** = Survey Measuring Point Elevation is referenced from the north side of the sounding tube.

NM = Not Measured

DNE = Did Not Exist

Measuring Point Elevation reflects the October 2005 survey conducted by Malcolm Pirnie/A-Team.

Measuring Point Elevation for MW-9 and MW-10 reflects the May 2007 survey conducted by Malcolm Pirnie / A-Team

Table 7
Groundwater Elevations
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Survey Measuring Point Elevation	1151.46	1151.73	1151.18
Date	**Well ID**		
	MW-3	**MW-4**	**MW-5**
	Groundwater Elevation (ft amsl)		
11/8/2004	1065.58	1064.92	1065.37
11/18/2004	1065.51	1064.85	1065.28
12/2/2004	1065.49	1064.84	1065.30
1/5/2005	1065.42	1064.80	1065.22
2/17/2005	1065.24	1064.63	1065.06
3/8/2005	1065.04	1064.45	1064.87
4/4/2005	1064.88	1064.24	1064.71
5/19/2005	1067.88*	1064.78	1065.26
6/22/2005	1066.35	1065.82	1066.22
7/22/2005	1067.03	1066.45	1066.80
8/5/2005	1067.57	1067.01	1067.38

Survey Measuring Point Elevation**	1151.46	1151.64	1151.16	1153.59	1156.28	1155.33	1152.32	1153.11	1151.00	1149.94
	MW-3	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-10**	**MW-11**	**MW-12**
9/27/2005	1069.32	1068.57	1068.93	1066.86	1063.16	1062.59	DNE	DNE	DNE	DNE
10/13/2005	1069.74	1068.81	1069.26	1067.21	1063.53	1062.93	DNE	DNE	DNE	DNE
11/30/2005	1070.23	1069.35	1069.72	1067.40	1064.23	1063.89	DNE	DNE	DNE	DNE
12/20/2005	1070.06	1069.22	1069.68	1067.38	1064.38	1064.01	DNE	DNE	DNE	DNE
1/31/2006	1069.47	1068.68	1069.07	1066.79	1064.04	1063.97	DNE	DNE	DNE	DNE
2/28/2006	1068.81	1068.06	1068.43	1066.26	1063.66	1063.68	DNE	DNE	DNE	DNE
3/22/2006	1068.26	1067.50	1067.87	1065.74	1063.22	1063.27	DNE	DNE	DNE	DNE
4/21/2006	1067.91	1067.14	1067.55	1065.40	1062.98	1063.05	DNE	DNE	DNE	DNE
May 2006	NM	NM	NM	NM	NM	NM	DNE	DNE	DNE	DNE
6/15/2006	1068.77	1068.07	1068.43	1066.36	1063.78	1062.11*	DNE	DNE	DNE	DNE
7/18/2006	1069.30	1068.59	1068.96	1066.94	1064.20	1063.91	DNE	DNE	DNE	DNE
8/24/2006	1069.98	1069.32	1069.66	1067.65	1064.79	1064.43	DNE	DNE	DNE	DNE
9/14/2006	1070.75	1070.12	1070.41	1068.45	1065.42	1064.91	DNE	DNE	DNE	DNE
10/16/2006	1071.70	1071.07	1071.35	1069.48	1066.31	1065.67	DNE	DNE	DNE	DNE
11/20/2006	1071.97	1071.32	1071.63	1069.65	1066.69	1066.19	1069.38	DNE	DNE	DNE
12/13/2006	1071.94	1071.26	1071.6	1069.6	1066.78	1066.38	1069.11	DNE	DNE	DNE
1/11/2007	1071.76	1071.08	1071.42	1069.45	1066.77	1066.53	1069.07	DNE	DNE	DNE
2/21/2007	1070.80	1070.05	1070.42	1068.46	1066.07	1065.98	1068.21	DNE	DNE	DNE
3/20/2007	1070.02	1069.29	1069.65	1067.62	1065.18	1065.26	1066.21	DNE	DNE	DNE
4/19/2007	1068.74	1068.00	1068.36	1066.34	1063.86	1063.83	1064.94	DNE	DNE	DNE
5/16/2007	1068.11	1067.43	1067.65	1065.82	1063.07	1063.01	1064.30	1066.28	DNE	DNE
6/7/2007	1067.82	1067.06	1067.36	1065.46	1062.73	1062.42	1064.77	1065.91	DNE	DNE
7/10/2007	1068.73	1067.99	1068.34	1066.24	1063.30	1062.98	1065.84	1066.77	DNE	DNE
8/14/2007	1069.75	1068.99	1069.40	1067.15	1064.18	1063.84	1066.78	1067.78	DNE	DNE
9/25/2007	1070.69	1069.96	1070.34	1068.20	1065.14	1064.78	1067.53	1068.80	DNE	DNE
10/11/2007	1071.09	1070.41	1070.75	1068.74	1065.55	1065.10	1067.87	1069.28	DNE	DNE
11/15/2007	1071.37	1070.67	1070.97	1068.84	1065.89	1065.49	1068.12	1069.43	DNE	DNE
12/7/2007	1071.33	1070.55	1070.94	1068.71	1065.90	1065.66	1068.00	1069.38	DNE	DNE
1/9/2008	1071.05	1070.30	1070.67	1068.45	1065.70	1065.59	1067.77	1069.11	DNE	DNE
1/31/2008	1070.58	1069.83	1070.23	1068.02	1065.36	1065.27	1067.40	1068.66	DNE	DNE
3/28/2008	1069.46	1068.70	1069.12	1066.96	1064.66	1064.72	1066.18	1067.66	DNE	DNE
4/15/2008	1069.25	1068.51	1068.93	1066.68	1064.43	1064.50	1065.98	1067.43	1069.80	1069.48
5/7/2008	1069.50	1068.78	1069.14	1066.91	1064.40	1064.38	1066.04	1067.51	1070.01	1069.67
6/27/2008	1070.50	1069.79	NM	1067.88	1065.18	1064.95	1066.89	1068.49	1071.03	1070.66
8/20/2008	1071.94	1071.34	1071.61	1069.54	1066.44	1065.98	1068.03	1070.22	1072.35	1072.04
8/27/2008	1072.17	1071.59	1071.87	1069.84	1066.72	1066.24	1068.22	1070.47	1072.59	1072.32
9/24/2008	1072.62	1072.03	1072.29	1070.50	1067.36	1066.64	1068.49	1070.95	1072.99	1072.70
10/22/2008	1073.28	1072.71	1072.96	1071.22	1068.03	1067.15	1069.06	1071.63	1073.63	1073.29
11/10/2008	1073.42	1072.80	1073.06	1071.25	1068.19	1067.44	1069.18	1071.63	1073.75	1073.43
12/8/2008	1073.42	1072.79	1073.06	1071.26	1068.31	1067.70	1068.82	1071.61	1073.74	1073.44

NOTES:

Survey Measuring Point Elevation is referenced from the north side of the well casing

ft amsl = feet above mean sea level

* = anomalous data point, not used in generation of hydrograph or contour map.

** = Survey Measuring Point Elevation is referenced from the north side of the sounding tube.

NM = Not Measured

DNE = Did Not Exist

Measuring Point Elevation reflects the October 2005 survey conducted by Malcolm Pirnie/A-Team

Measuring Point Elevation for MW-9 and MW-10 reflects the May 2007 survey conducted by Malcolm Pirnie / A-Team

Measuring Point Elevation for MW-11 and MW-12 reflects the April 2008 survey conducted by Malcolm Pirnie / A-Team

Table 8
Summary of Well Construction Information
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Well Name	ADWR Registration Number	Date Surveyed	Surveyor	Survey Coordinates (AZ NAD 83)		Measuring Point Elevation (ft amsl)	Boring Depth (ft bgs)	Well Depth (ft bgs)	Screened Interval (ft bgs)
				Latitude[1]	Longitude[2]				
SVE-1	55-205272	12/2/2004	A-Team	33°31'28.64049"N	112°04'53.31560"W	NS	77	75	40 - 75
SVE-2	55-205299	12/2/2004	A-Team	33°31'28.86108"N	112°04'53.75295"W	NS	77	75	40 - 75
SVE-3	55-205300	12/2/2004	A-Team	33°31'28.33699"N	112°04'53.59469"W	NS	77	75	40 - 75
SVE-4	55-205301	12/2/2004	A-Team	33°31'28.32846"N	112°04'54.34640"W	NS	76	75	40 - 75
SVE-5	55-205302	12/2/2004	A-Team	33°31'28.77222"N	112°04'54.23503"W	NS	76	75	40 - 75
MW-3	55-551332	12/2/2004	A-Team	33°31'28.00902"N	112°04'54.27916"W	1151.46	100	100	70 -100
MW-4	55-205271	10/5/2005	A-Team	33°31'29.24138"N	112°04'53.65749"W	1151.64	116	115	70 - 110
MW-5	55-205273	10/5/2005	A-Team	33°31'28.89132"N	112°04'55.08659"W	1151.16	116	115	70 - 110
MW-6	55-208275	10/5/2005	A-Team	33°31'32.71395"N	112°04'49.36758"W	1153.59	125	124	78.5 - 118.5
MW-7	55-208276	10/5/2005	A-Team	33°31'39.16793"N	112°04'52.56912"W	1156.28	125	124	78.5 - 118.5
MW-8	55-208274	10/5/2005	A-Team	33°31'40.78461"N	112°04'00.39392"W	1155.33	125	124	78.5 - 118.5
MW-9	55-213660	5/16/2007	A-Team	33°31'29.34871"N	112°04'53.66183"W	1152.32	230	218	178 - 218
MW-10	55-214357	5/16/2007	A-Team	33°31'32.73553"N	112°04'53.49782"W	1153.11	123	120	80 - 120
MW-11	55-908604	4/8/2008	A-Team	33°31'28.05336"N	112°04'58.61246"W	1151.00	129	125	80 - 120
MW-12	55-908605	4/8/2008	A-Team	33°31'28.63735"N	112°04'58.32486"W	1149.94	129	125	80 - 120

Notes:

[1] Survey made on north side of sounding tube; accuracy of Latitude measurements are +/- 0.0004 seconds.

[2] Survey made on north side of sounding tube; accuracy of Longitude measurements are +/- 0.0005 seconds.

ft amsl = feet above mean sea level

ft bgs = feet below ground surface

NS = Not Surveyed

TOC = Top of Casing

Vertical datum: NGVD'29

Horizontal datum: AZ NAD 83 = Arizona State Plane Central Zone, North American Datum 1983, units of feet

Table 9
Summary of Initial Monitor Well Groundwater Analytical Results
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Sample ID	Date Collected	CFC-12	1,2-DCA	MTBE	TCE	PCE
		Groundwater (µg/L)				
MW-3	11/18/2004	10	< 2.0	6.0	4.9	**1600**
MW-4	11/18/2004	7.1	2.3	25	4.9	**2200**
MW-5	11/18/2004	< 5.0	< 2.0	< 5.0	< 2.0	**140**
Chevron MW-6	11/18/2004	< 5.0	< 2.0	150.0	< 2.0	< 2.0
MW-6	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0
MW-7	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0
MW-8	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0
MW-9	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0
MW-10	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**94**
	AWQS:	NE	5	NE	5	5

Notes:

µg/L = micrograms per liter

1,2-DCA = 1,2- Dichloroethane

AWQS = Aquifer Water Quality Standard

CFC-12 = Dichlorodifluoromethane

MTBE = Methyl-Tert-Butyl-Ether

NE = Not Established

PCE = Tetrachloroethene

TCE = Trichloroethene

Bold = concentration exceeds AWQS

Table 10
Summary of Depth Specific Soil Analytical Results for PCE, October 2006 Bayless Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Boring Depth (ft bgs)	VB-1	VB-2
	Soil PCE (mg/kg)	
10	NS	< 0.051
15	< 0.049	NS
20	< 0.050	< 0.050
30	< 0.049	<0.050
40	< 0.050	< 0.050
50	< 0.049	< 0.050
60	< 0.051	< 0.049
70	< 0.049	< 0.051
80	< 0.049	< 0.049

Notes:

ft bgs = feet below ground surface

mg/kg = milligram per kilogram

NS = No Sample Collected

PCE = tetrachloroethene

PCE Residential Soil Remediation Level (SRL) = 5.1 mg/kg

PCE Non-Residential SRL = 13 mg/kg

PCE ADEQ Groundwater Protection Level (GPL) = 0.8 mg/kg

Table 11
Summary of Depth Specific Soil Gas Analytical Results for PCE, October 2006 Bayless Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Boring Depth (ft bgs)	VB-1	VB-2
	Soil Gas PCE (mg/m^3)	
10	NS	0.1
15	< 0.003	NS
20	NS	0.3
30	0.004	1.1
40	< 0.003	2.5
50	< 0.003	0.4
60	37.3	38.7
70	0.5	45.5
80	142.6	88.3

Boring Depth (ft bgs)	VB-1	VB-2
	Soil Gas PCE (ppbv)	
10	NS	14
15	< 0.50	NS
20	NS	44
30	0.56	160
40	< 0.50	370
50	< 0.50	57
60	5500	5700
70	66	6700
80	21000	13000

Notes:
ft bgs = feet below ground surface
ppbv = parts per billion volume
mg/m^3 = milligrams per cubic meter
NS = No Sample Collected
PCE = tetrachloroethene
Note: The laboratory reported PCE gas concentrations in ppbv.
PCE detections have been converted to mg/m^3 for consistency

Table 12
Summary of Depth Specific Soil Gas Analytical Results for PCE, March 2008 SCI Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Boring	B1	B2	B3	B4	B5	B6
Depth (ft bgs)	Soil Gas PCE (mg/m^3)					
5	0.64	0.30	NS	NS	NS	NS
15	5.2	1.8	6.3	0.90	4.5	3.4
25	1.3	4.0	17	6.5	1.2	12
35	4.7	5.5	18	NS	11	12
45	6.0	31*	14	10	2.6	0.58
55	44	2.4	28	69	66	17
65	100	2.6	30	120	2.8	28
75	27	1.1	76	35	14	69J

Boring	B1	B2	B3	B4	B5	B6
Depth (ft bgs)	Soil Gas PCE (ppbv)					
5	93	43.00	NS	NS	NS	NS
15	760	260	910	130.00	650	500
25	190	580.0	2500	940	170	1800
35	680	790	2600	NS	1600	1800
45	870.0	4500*	2100	1500	370	84
55	6400	350	4100	10000	9600	2500
65	15000	380	4300	17000	400	4000
75	3900	160	11000	5100	2000	10000J

Notes:

* Sample collected at 48 ft bgs

ft bgs = feet below ground surface

ppbv = parts per billion volume

mg/m^3 = milligrams per cubic meter

NS = Not sampled

J = The analyte was positively identified; however, the result should be considered an estimated value.

PCE = tetrachloroethene

Table 13
Summary of Depth Specific Soil Gas Analytical Results for TCE, March 2008 SCI Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF site

Boring Depth (ft bgs)	B1	B2	B3	B4	B5	B6
	Soil Gas TCE (mg/m^3)					
5	< 0.014	0.083	NS	NS	NS	NS
15	< 0.055	< 0.055	< 0.055	0.30	< 0.055	< 0.055
25	< 0.055	< 0.055	< 0.28	< 0.055	< 0.055	< 0.055
35	< 0.055	< 0.055	< 0.28	NS	< 0.055	< 0.055
45	< 0.055	0.088*	< 0.28	0.055	< 0.055	< 0.055
55	0.18	< 0.055	< 1.1	0.36	0.17	< 0.055
65	0.30	< 0.055	< 0.55	0.38	< 0.055	0.30
75	0.13	0.088	< 1.1	0.19	< 0.055	< 1.4

Boring Depth (ft bgs)	B1	B2	B3	B4	B5	B6
	Soil Gas TCE (ppbv)					
5	< 2.5	15	NS	NS	NS	NS
15	< 10	< 10	< 10	54	< 10	< 10
25	< 10	< 10	< 50	< 10	< 10	< 10
35	< 10	< 10	< 50	NS	< 10	< 10
45	< 10	16*	< 50	10	< 10	< 10
55	32	< 10	< 200	65	31	< 10
65	54	< 10	< 100	68	< 10	54
75	23	16	< 200	35	< 10	< 250

Notes:

* Sample collected at 48 ft bgs

ft bgs = feet below ground surface

ppbv = parts per billion volume

mg/m^3 = milligrams per cubic meter

NS = Not sampled

TCE = tricholoroethene

Table 14
Summary of Initial Monitor Well Groundwater Analytical Results, March 2008 SCI Property
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF site

Sample ID	Date Collected	Chloroform	cis 1,2-DCE	trans 1,2-DCE	TCE	PCE	Vinyl Chloride
		Groundwater (µg/L)					
MW-11	3/18/2008	5.4	1.9	< 1.0	< 1.0	**7.4**	< 1.0
MW-12	3/18/2008	1.1	24	2.8	**23**	**22**	1.9
	AWQS:	100	70	100	5	5	2

Notes:

µg/L = micrograms per liter

AWQS = Arizona Aquifer Water Quality Standard

cis 1,2-DCE = cis-1,2-Dichloroethene

PCE = Tetrachloroethene

trans 1,2-DCE = trans-1,2-Dichloroethene

TCE = Trichloroethene

Bold = concentration exceeds AWQS

Table 15
Estimate Transmissivity Based on Specific Capacity Determined During Groundwater Sampling
Remedial Investigation Report
7th Avenue and Bethany Home Road WQARF Site

Well	Static WL (ft)	Pumping WL (ft)	Drawdown (ft)	Q (gpm)	SC (gpm/ft dd)	T= SC*2000 (gpd/ft)[1]	Well total depth (ft)	Saturated Thickness (ft)	Saturated Sand thickness (ft)	Est. K (ft/day) - total sat. thickness	Est. K (ft/day) Sand thickness
MW-4	82.83	83.72	0.89	2.78	3	6247	115	32	7	26	119
MW-5	81.9	83.02	1.12	2.7	2.4	4821	115	33	15	19	43
MW-6	86.38	87.4	1.02	4.5	4.4	8824	124	38	20	31	59
MW-7	92.75	93.8	1.05	4.2	4.0	8000	124	31	12	34	89
MW-8	92.4	95.3	2.9	4.5	1.6	3103	124	32	6	13	69
Average K										**25**	**76**
Range of Ave K									25-76 feet/day		

Notes:

WL = Water Level (Water level and pumping data collected during 4th quarterly sampling event conducted in November 2008)

Q = pumping rate during sampling

SC = Specific Capacity

T = Transmissivity

T = Kb (K = Hydraulic Conductivity; b = thickness)

FLOW VELOCITY CALCS					
			Notes:		
K (feet/day)		25 to 76	*See Calcs above*		
Hydraulic gradient (I)		0.0037	*4th Quarter 2008*		
Porosity (n)		0.3	*Estimated*		
V = K*I/n	Low V	0.3	ft/day	113	ft/year
	High V	0.9	ft/day	342	ft/year

Notes:

V = velocity

(1) = Driscoll, 1986

Table 16
Summary of Detected Constituents
Bayless Property
7th Avenue and Bethany Home Road WQARF Site

Sample ID	Date Collected	CFC-12 (µg/L)	1,2-DCA (µg/L)	MTBE (µg/L)	TCE (µg/L)	**PCE (µg/L)**	Chloroform (µg/L)
MW-3	11/11/2008	1.5	< 0.5	1.0	0.7	**81**	< 0.5
	8/28/2008	2.7	< 0.5	1.2	1.3	**200**	< 0.5
	4/15/2008	< 0.5	< 0.5	< 0.5	< 0.5	**410**	< 0.5
	1/31/2008	< 4.0	< 1.0	< 5.0	1.4	**260**	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**300**	< 0.5
	8/14/2007	< 5.0	< 2.0	< 5.0	< 2.0	**350**	< 0.5
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**400**	< 0.5
	2/21/2007	< 5.0	< 2.0	< 5.0	< 2.0	**380**	< 0.5
	11/20/2006	< 5.0	< 2.0	< 5.0	< 2.0	**270**	< 0.5
	8/24/2006	< 5.0	< 2.0	< 5.0	2.4	**770**	< 0.5
	6/15/2006	5.4	< 2.0	< 5.0	3.2	**1000**	< 0.5
	1/31/2006	< 5.0	< 2.0	< 5.0	2.0	**650**	< 0.5
	10/13/2005	< 5.0	< 2.0	< 5.0	2.4	**730**	< 0.5
	8/5/2005	< 5.0	< 2.0	< 5.0	2.6	**950**	< 0.5
	5/19/2005	< 5.0	< 2.0	< 5.0	2.8	**970**	< 0.5
	2/17/2005	5.5	< 2.0	5.0	3.5	**990**	< 0.5
	11/18/2004	10	< 2.0	6.0	4.9	**1600**	< 0.5
MW-4	11/11/2008	2.7	< 0.5	2.5	1.6	**600**	< 0.5
	8/28/2008	2.2	< 0.5	2.5	1.7	**720**	< 0.5
	4/16/2008	< 0.5	< 0.5	< 0.5	< 0.5	**820**	< 0.5
	1/31/2008	< 4.0	< 1.0	< 5.0	2.3	**1000**	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	2.3	**920**	< 0.5
	8/14/2007	< 5.0	< 2.0	5.5	2.3	**810**	< 0.5
	5/16/2007	< 5.0	< 2.0	5.2	2.0	**970**	< 0.5
	2/21/2007	< 5.0	< 2.0	5.5	2.5	**1000**	< 0.5
	11/20/2006	< 5.0	< 2.0	7	2.2	**1000**	< 0.5
	8/24/2006	< 5.0	< 2.0	7.3	2.0	**1100**	< 0.5
	6/15/2006	< 5.0	< 2.0	13	2.2	**750**	< 0.5
	1/31/2006	< 5.0	< 2.0	14	2.6	**1200**	< 0.5
	10/13/2005	< 5.0	< 2.0	15	2.2	**1200**	< 0.5
	8/5/2005	< 5.0	< 2.0	13	2.7	**1600**	< 0.5
	5/19/2005	< 5.0	< 2.0	19	2.9	**1400**	< 0.5
	2/17/2005	< 5.0	< 2.0	17	< 2.0	**830**	< 0.5
	11/18/2004	7.1	2.3	25	4.9	**2200**	< 0.5
MW-5	11/11/2008	0.53	< 0.5	< 0.5	< 0.5	**42**	< 0.5
	8/28/2008	0.52	< 0.5	< 0.5	< 0.5	**53**	< 0.5
	4/16/2008	0.80	0.61	< 0.5	< 0.5	**70**	< 0.5
	1/31/2008	< 4.0	< 1.0	< 5.0	< 1.0	**62**	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**57**	< 0.5
	8/14/2007	< 5.0	< 2.0	< 5.0	< 2.0	**60**	< 0.5
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**54**	< 0.5
	2/21/2007	< 5.0	< 2.0	< 5.0	< 2.0	**77**	< 0.5
	11/20/2006	< 5.0	< 2.0	< 5.0	< 2.0	**86**	< 0.5
	8/24/2006	< 5.0	< 2.0	< 5.0	< 2.0	**60**	< 0.5
	6/15/2006	< 5.0	< 2.0	< 5.0	< 2.0	**90**	< 0.5
	1/31/2006	< 5.0	< 2.0	< 5.0	< 2.0	**51**	< 0.5
	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	**72**	< 0.5
	8/5/2005	< 5.0	< 2.0	< 5.0	< 2.0	**110**	< 0.5
	5/19/2005	< 5.0	< 2.0	< 5.0	< 2.0	**180**	< 0.5
	2/17/2005	< 5.0	< 2.0	< 5.0	< 2.0	**140**	< 0.5
	11/18/2004	< 5.0	< 2.0	< 5.0	< 2.0	**140**	< 0.5
MW-6	11/11/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.63
	8/28/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.56
	4/16/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.78
	1/31/2008	< 4.0	< 1.0	< 5.0	< 1.0	< 1.0	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/14/2007	NS	NS	NS	NS	NS	NS
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	2/21/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	11/20/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/24/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	6/15/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	1/31/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5

Table 16
Summary of Detected Constituents
Bayless Property
7th Avenue and Bethany Home Road WQARF Site

Sample ID	Date Collected	CFC-12 (µg/L)	1,2-DCA (µg/L)	MTBE (µg/L)	TCE (µg/L)	PCE (µg/L)	Chloroform (µg/L)
MW-7	11/11/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	8/28/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	4/16/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	1/31/2008	< 4.0	< 1.0	< 5.0	< 1.0	< 1.0	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/14/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	2/21/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	11/20/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/24/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	6/15/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	1/31/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
MW-8	11/11/2008	< 0.5	< 0.5	< 0.5	< 0.5	0.61	1.1
	8/28/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.1
	4/16/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.2
	1/31/2008	< 4.0	< 1.0	< 5.0	< 1.0	< 1.0	1.0
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/14/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	2/21/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	11/20/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/24/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	6/15/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	1/31/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	10/13/2005	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
MW-9	11/11/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	8/28/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	4/16/2008	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	1/31/2008	< 4.0	< 1.0	< 5.0	< 1.0	< 1.0	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	8/14/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	2/21/2007	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
	11/20/2006	< 5.0	< 2.0	< 5.0	< 2.0	< 2.0	< 0.5
MW-10	11/11/2008	< 0.5	< 0.5	< 0.5	0.64	**140**	0.84
	8/28/2008	< 0.5	< 0.5	< 0.5	0.50	**170**	0.76
	4/16/2008	< 0.5	< 0.5	< 0.5	< 0.5	**110**	0.66
	1/31/2008	< 4.0	< 1.0	< 5.0	< 1.0	**130**	< 0.5
	11/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**150**	< 0.5
	8/14/2007	< 5.0	< 2.0	< 5.0	< 2.0	**150**	< 0.5
	5/16/2007	< 5.0	< 2.0	< 5.0	< 2.0	**94**	< 0.5
	AWQS	NE	5	NE	5	5	100

Notes:

CFC 12 = Dichlorodifluoromethane
1,2-DCA = 1,2- Dichloroethane
MTBE = Methyl-Tert-Butyl-Ether
NS = Not Sampled, due to pump malfunction
TCE = Trichloroethene
PCE = Tetrachloroethene
µg/L = micrograms per liter
AWQS = Aquifer Water Quality Standard
NE = Not Established
Bold = Concentration exceeds AWQS

Table 17
Summary of Detected Constituents SCI Property
7th Avenue and Bethany Home Road WQARF Site

Sample ID	Date Collected	CFC-12 (µg/L)	1,2-DCA (µg/L)	MTBE (µg/L)	TCE (µg/L)	PCE (µg/L)	tDCE (µg/L)	VC (µg/L)	cDCE (µg/L)	Chloroform (µg/L)
MW-11	11/11/2008	< 0.5	< 0.5	< 0.5	< 0.5	**5.2**	< 0.5	< 0.5	< 0.5	3.2
	8/28/2008	< 0.5	< 0.5	< 0.5	< 0.5	**4.9**	< 0.5	< 0.5	< 0.5	3.1
	4/17/2008	< 0.5	< 0.5	< 0.5	< 0.5	**8.5**	< 0.5	< 0.5	< 0.5	4.4
MW-12	11/11/2008	< 0.5	< 0.5	< 0.5	**32**	**25**	4.5	**2.7**	44	0.65
	8/28/2008	< 0.5	< 0.5	< 0.5	**26**	**14**	3.2	**2.7**	23	< 0.5
	4/17/2008	< 0.5	< 0.5	< 0.5	**27**	**24**	2.9	**2.6**	33	0.76
	AWQS	NE	5	NE	5	5	100	2	70	100

Notes:

CFC 12 = Dichlorodifluoromethane
1,2-DCA = 1,2- Dichloroethane
MTBE = Methyl-Tert-Butyl-Ether
tDCE = trans-1,2-Dichloroethene
cDCE = cis-1,2-Dichloroethene
TCE = Trichloroethene
PCE = Tetrachloroethene
VC = Vinyl chloride
µg/L = micrograms per liter
AWQS = Aquifer Water Quality Standard
NE = Not Established
Bold = Concentration exceeds AWQS

FIGURES

Legend

- Major Highway
- River
- Section
- West Salt River Basin
- Phoenix AMA

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Location Map
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7th Ave & Bethany Home Rd
WQARF Site

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Figure 1

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Legend

- Septic Piping
- Former Buildings
- Site Boundary

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Former Buildings and Septic Piping
At Bayless Property
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011	Figure 2

Legend

- Monitor Well
- Former Seepage Pit
- Former Septic Tank
- Dry Well
- Former Septic System Area
- Limits of Excavation
- Parcel
- Former Tank Pit
- Property Boundary

0 25 50 100
Feet

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Site Map with Monitoring Locations
at SCI Property
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

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Figure 3

Legend

Quaternary

- Surficial Deposits (Q)
- Young Alluvium (Qy)

mid-Tertiary

- Basaltic Rock (Tb)
- Sedimentary Rock (Tsm)

Proterozoic

- Granitoid Rock (Xg)
- Metamorphic Rock (Xm)
- Metavolcanic Rock (Xmv)

Data Sources: ADWR;USGS

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Geologic Map
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

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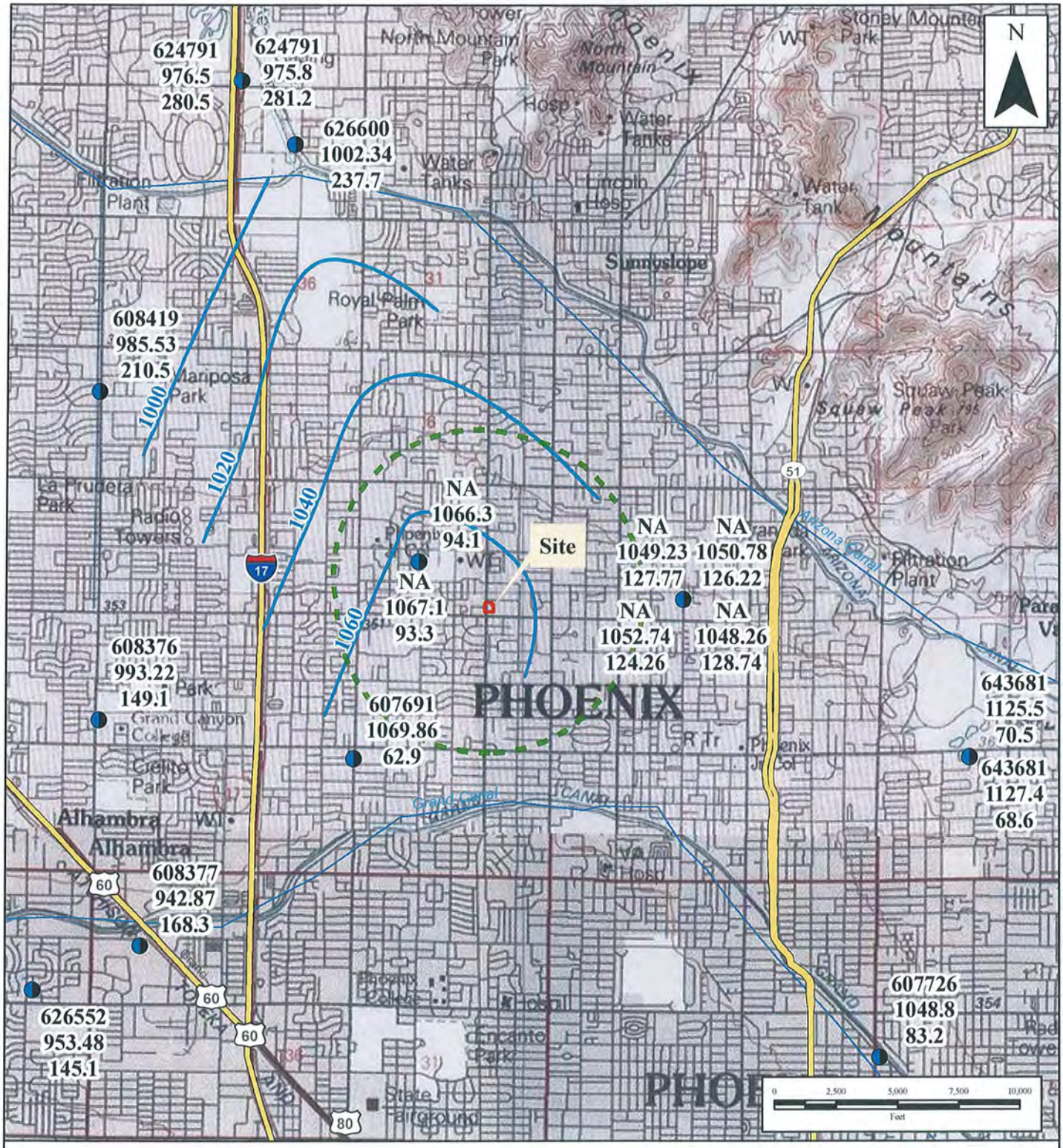
Figure 4



Legend

- Ground Water Elevation (ft amsl)
- ADWR Registered Well
- One mile boundary

626600 ADWR Registry #
1067.1 Grounwater Elevation
93.6 Depth to Water

Data Sources: ADWR's GWSI, 2007; USGS; NGS, 2008

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Regional Groundwater Elevation
Remedial Investigation Report
7th Ave and Bethany Home Rd
WQARF Site

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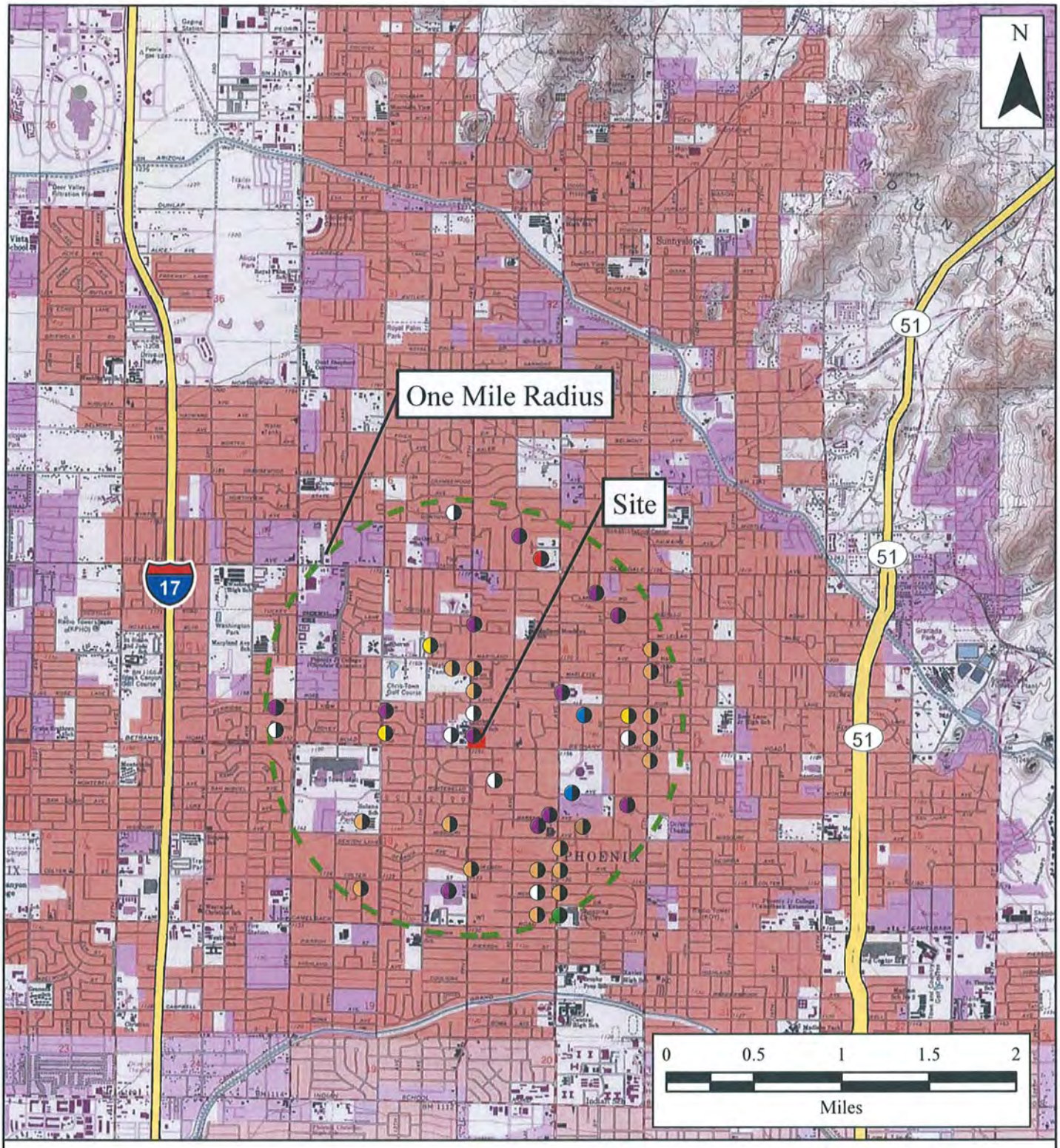
Figure 5



Legend

ADWR Registry Well

Water Use

- DEWATERING
- DOMESTIC
- IRRIGATION
- MONITORING
- MUNICIPAL
- OTHER - PRODUCTION
- REMEDIATION
- STOCK
- TEST

Data Sources: ADWR, 2007; USGS; Copyright:© 2008 National Geographic Society

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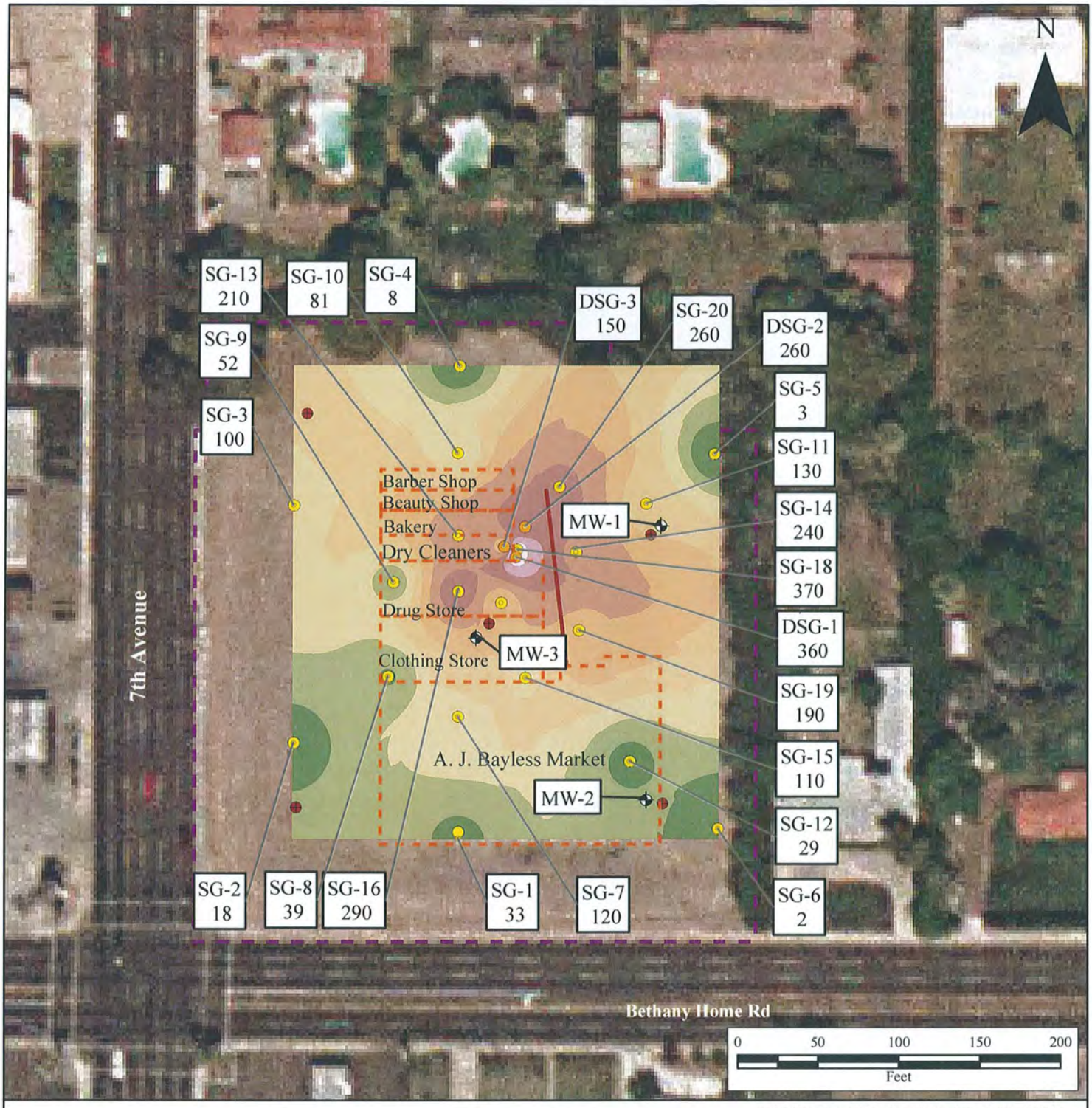
ADWR Registered Wells
Within One Mile
Remedial Investigation Report
7th Ave and Bethany Home Rd
WQARF Site

April 2011

Figure 6



Aerial Photo Copyright of Landiscor, flown in March 2004.

Legend

- Former Buildings
- Site Boundary
- Previous Deep Soil & Gas
- Previous Soil Gas Samples
- Previous Soil Borings
- Existing Monitor Well
- Septic Piping

PCE Soil Vapor Concentrations (in mg/L)

- 2 - <=43
- > 43 - <= 84
- > 84 - <= 124
- > 124 - <= 165
- > 165 - <= 206
- > 206 - <= 247
- > 247 - <= 287
- > 287 - <= 328
- > 328 - <= 369

Data Source:
Hargis and Associates, Inc., 2000

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Soil Borings, Monitor Wells and PCE Soil Vapor from Previous Investigations at Bayless Property
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

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Figure 7

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Legend

- Soil Boring (abandoned)
- New SVE Well
- Existing Monitor Well
- Former Buildings
- Site Boundary
- Septic Piping

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Soil Boring, SVE and Monitor Well Locations At Bayless Property
Remedial Investigation Report
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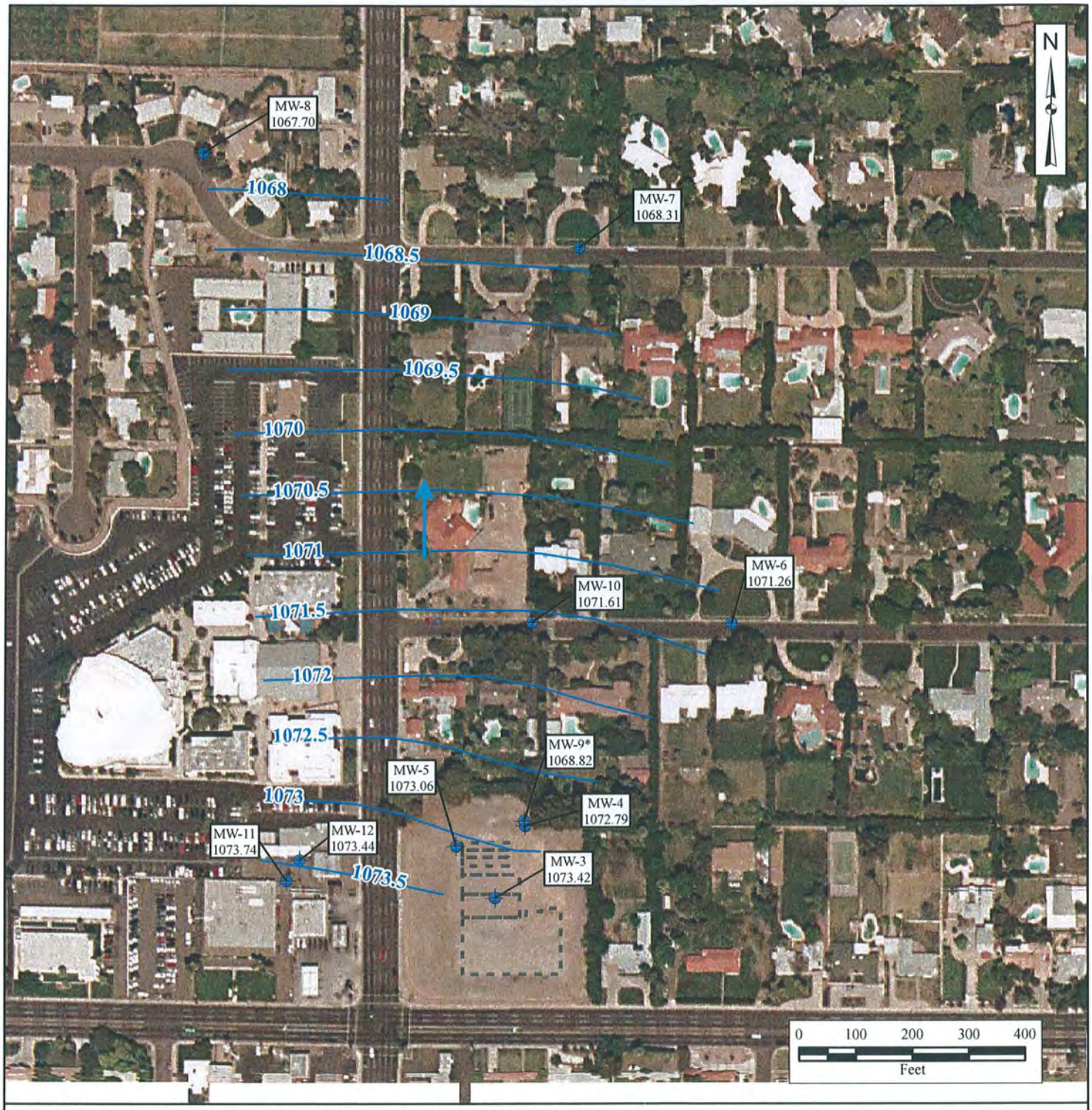
WQARF Site

April 2011 | Figure 8



* MW-9 GW elevation not used for contouring. MW-9 is approximately 10 feet north of MW-4

Legend

- Monitor Well
- Former Buildings
- December 2008 Groundwater Elevation Contours (ft amsl)
- MW-3 / 1073.42 — Monitor Well Name / December 8, 2008 Groundwater Elevation (ft amsl)
- General Groundwater Flow Direction

Note: ft amsl - feet above mean sea level
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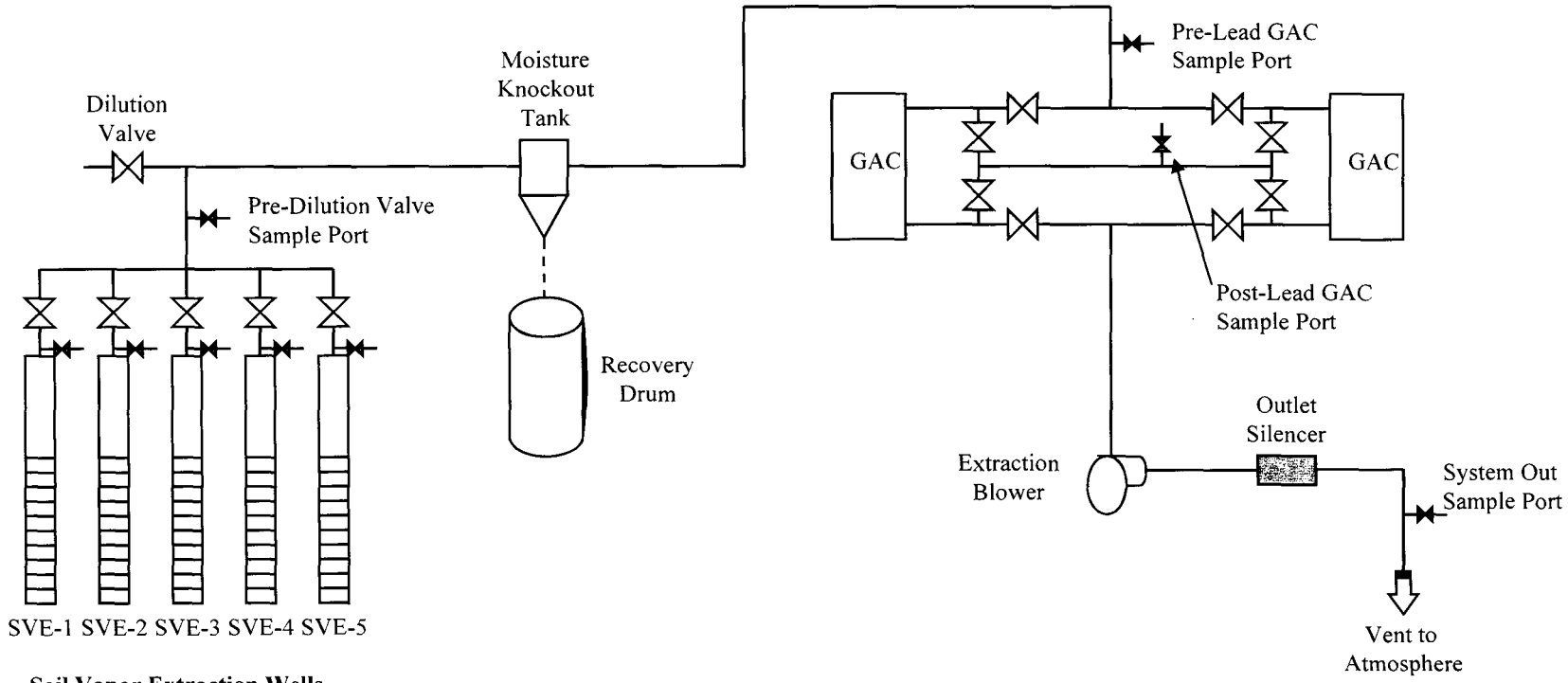
Groundwater Elevations
December 8, 2008
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011 | **Figure 9**



Legend	
	Sample Port
	Butterfly valve

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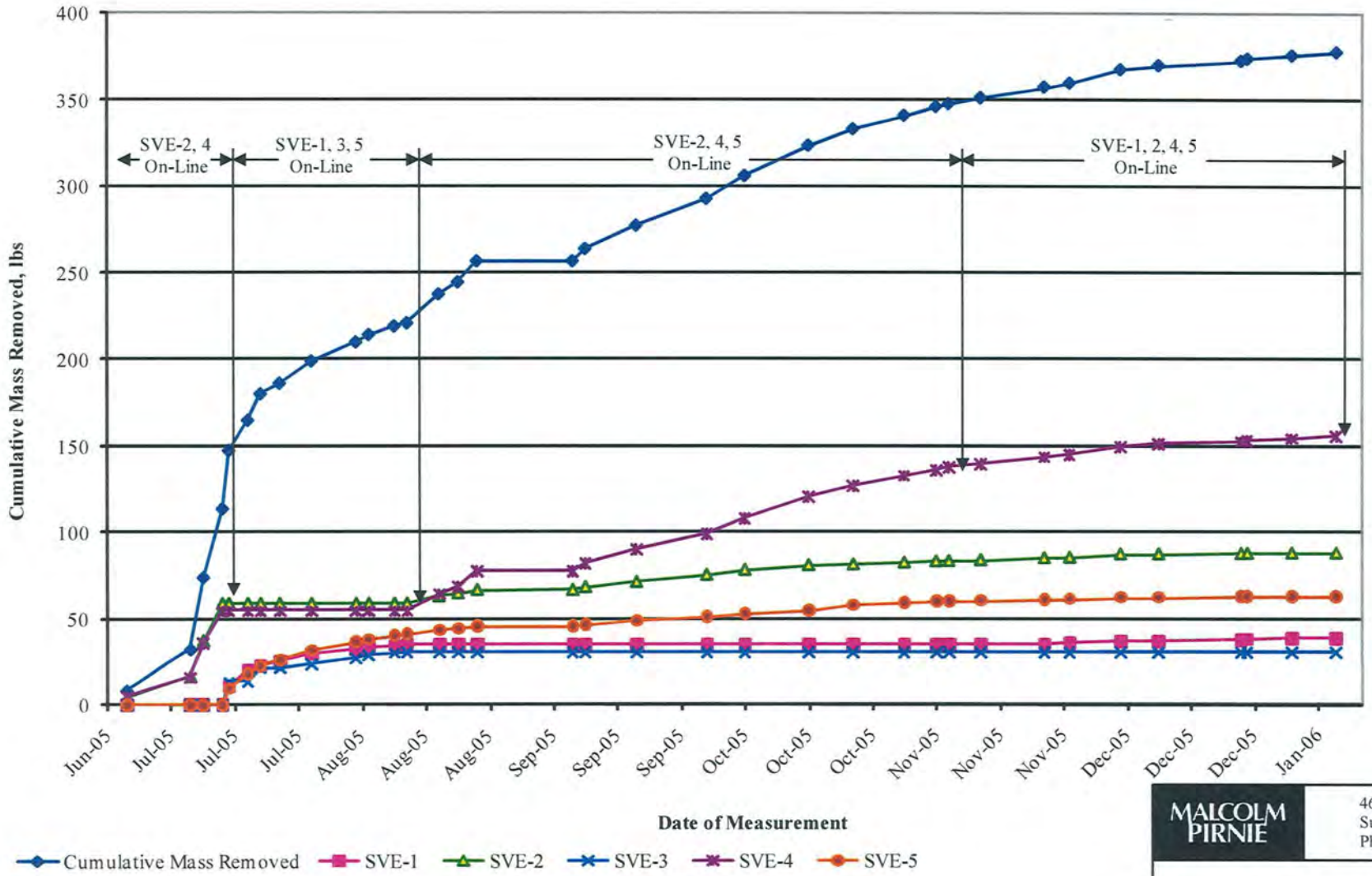
Soil Vapor Extraction System
Process Schematic
At Bayless Property
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011 | **Figure 10**



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Cummulative Mass Removal via SVE System at Bayless Property Remedial Investigation Report 7th Ave & Bethany Home Rd WQARF Site

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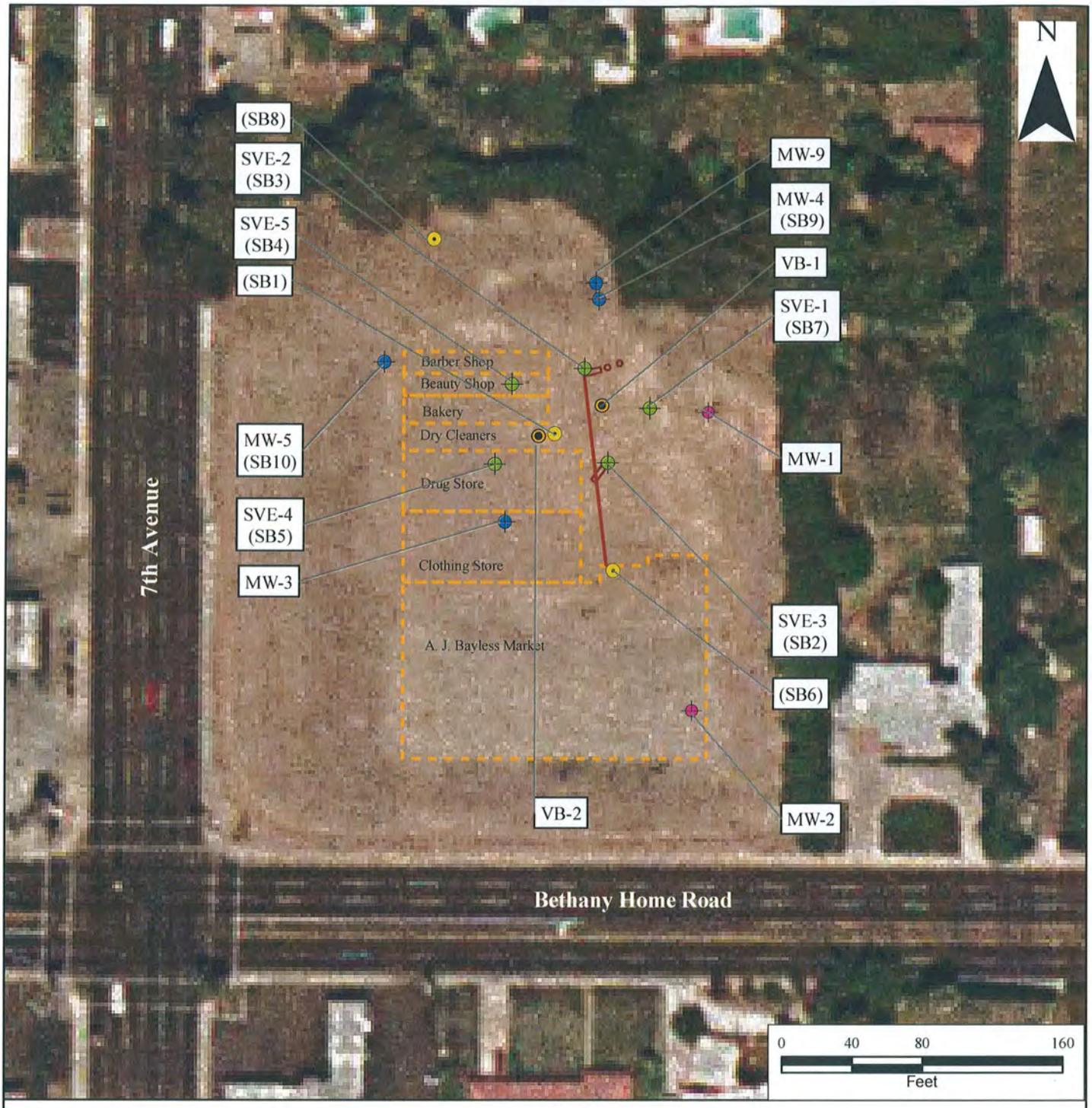
Figure 11



Legend

- Monitoring Well
- Monitor Well (Abandoned)
- SVE Well (Abandoned)
- Verification Boring (Abandoned)
- Soil Boring (Abandoned)
- Former Buildings
- Former Septic System

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Verification Boring, SVE Well, and Site Well Locations at Bayless Property
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WQARF Site

April 2011 | **Figure 12**

Legend

- Monitor Well
- Former Seepage Pit
- Former Septic Tank
- Dry Well
- Former Septic System Area
- Limits of Excavation
- Parcel
- Former Tank Pit
- Property Boundary

0 25 50 100
Feet

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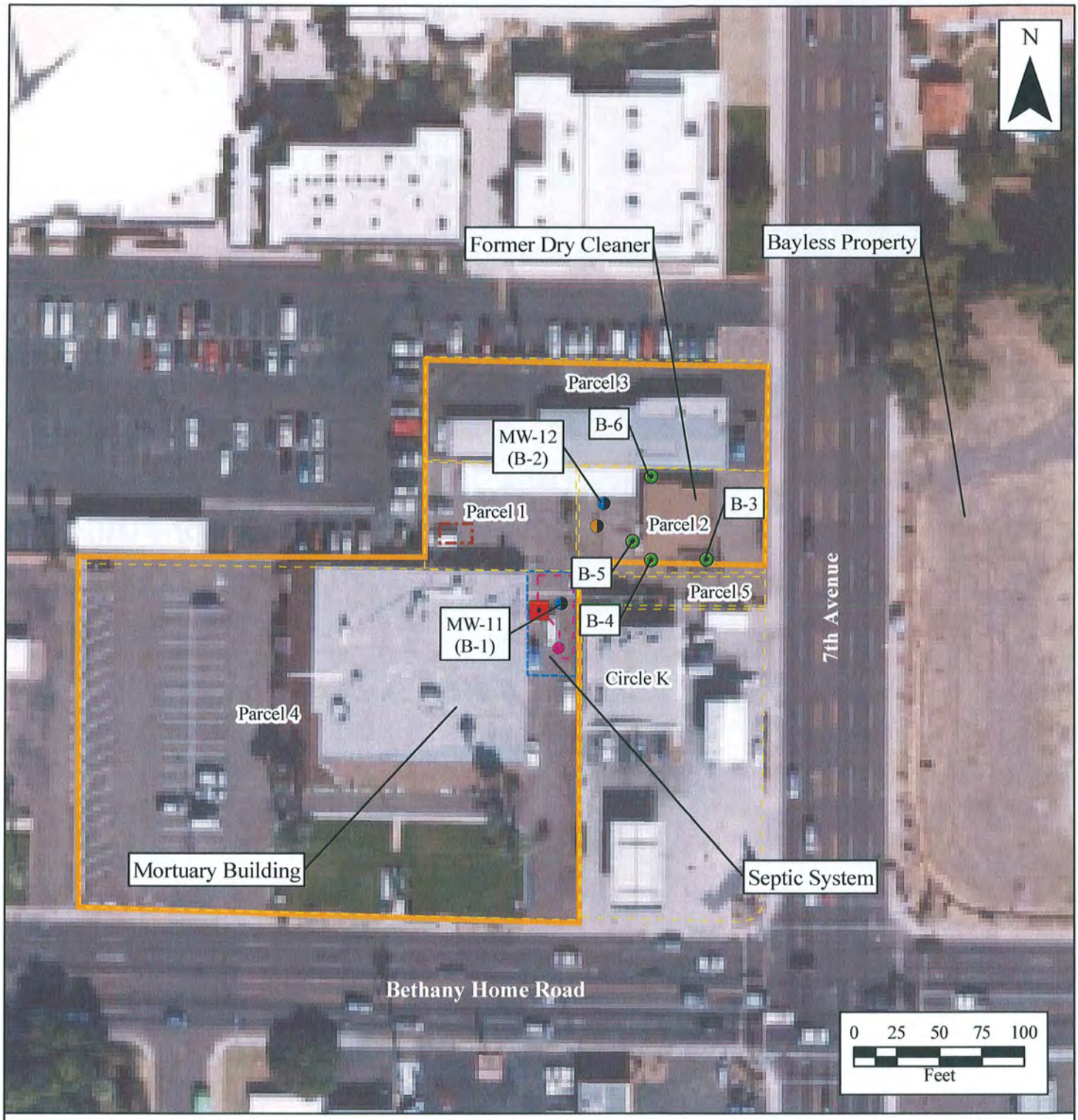
Site Map with Monitoring Locations at SCI Property
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011 | **Figure 13**



Legend

- Former Seepage Pit
- Former Septic Tank
- Monitor Well
- Soil Boring
- Dry Well
- Limits of Excavation
- Parcel
- Former Tank Pit
- Former Septic System Area
- Property Boundary

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Monitoring Well and Soil Boring Locations at SCI Property
Remedial Investigation Report
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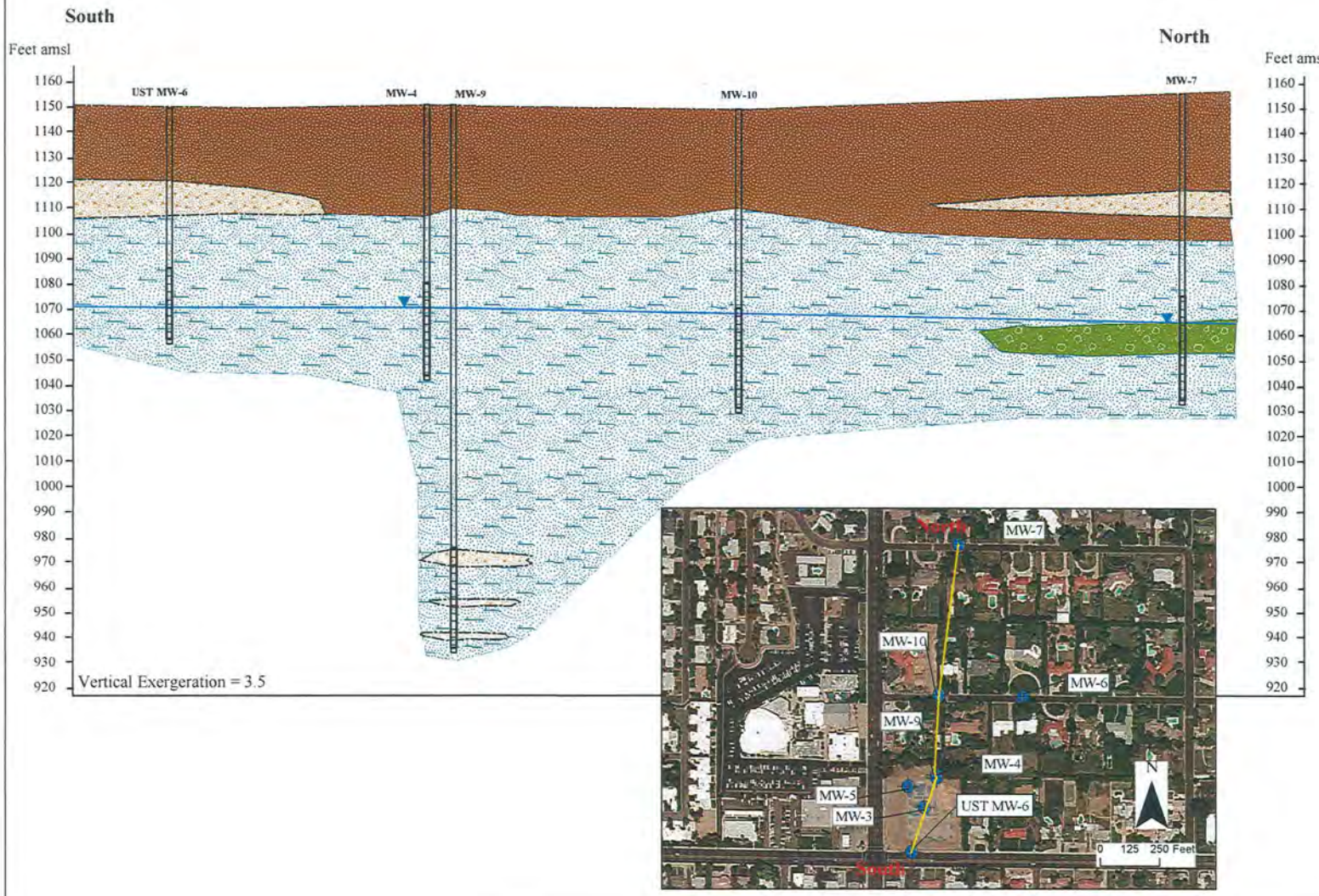
WQARF Site

April 2011 | **Figure 15**



Legend

- Sandy Gravel
- Fine Sand/Silt
- Sandy Clay/Clay/Silt
- Fine-Coarse Sand
- Groundwater Elevation
- Former Buildings
- Existing Monitoring Well
- Well Screen

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Hydrogeologic
North-South Cross-Section
Remedial Investigation Report
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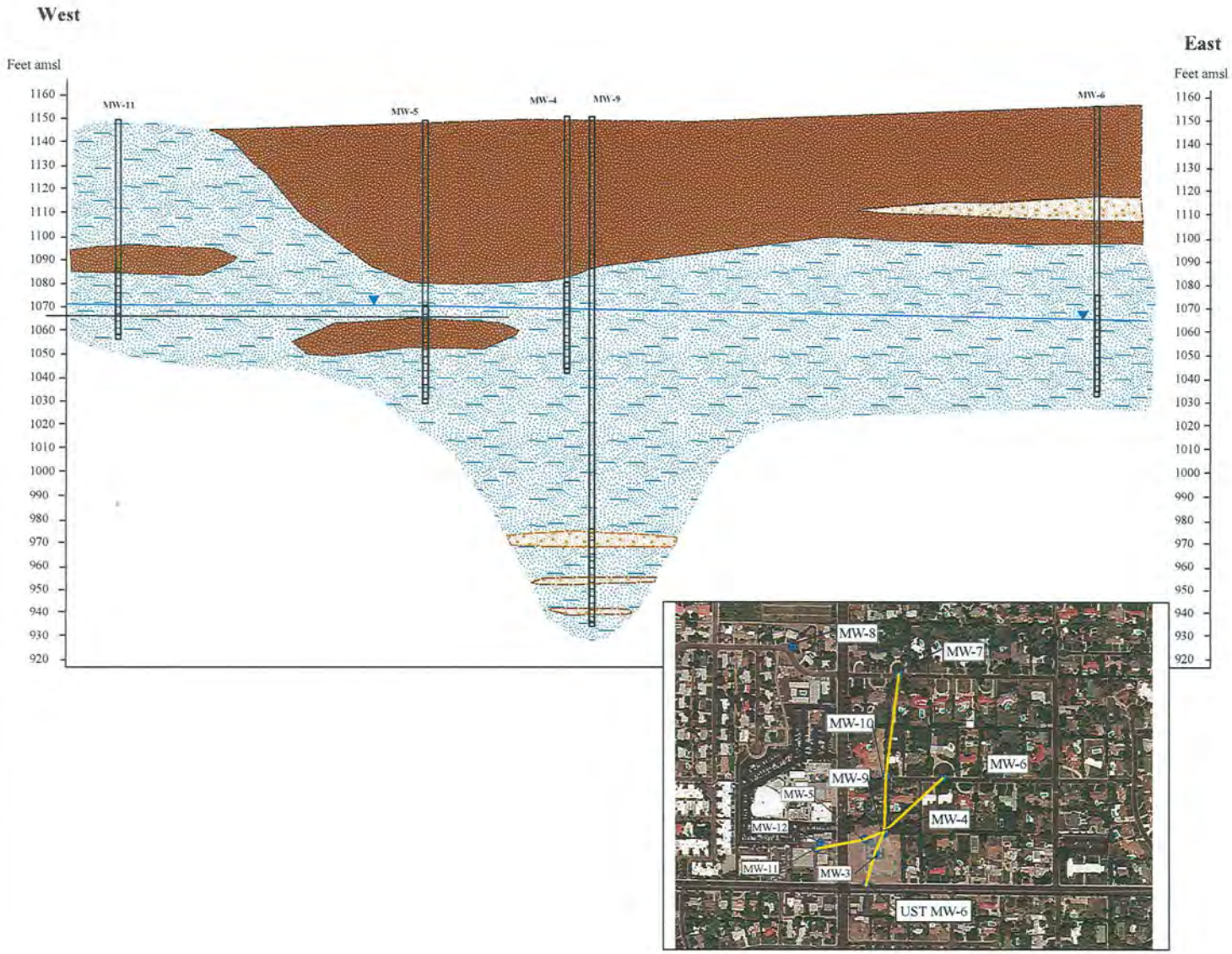
WQARF Site

April 2011 | **Figure 16**



Legend

- Fine Sand/Silt
- Fine -Coarse Sand
- Sandy Clay/Clay/Silt
- Water Elevation
- Former Buildings
- Monitor Well
- Well Screen

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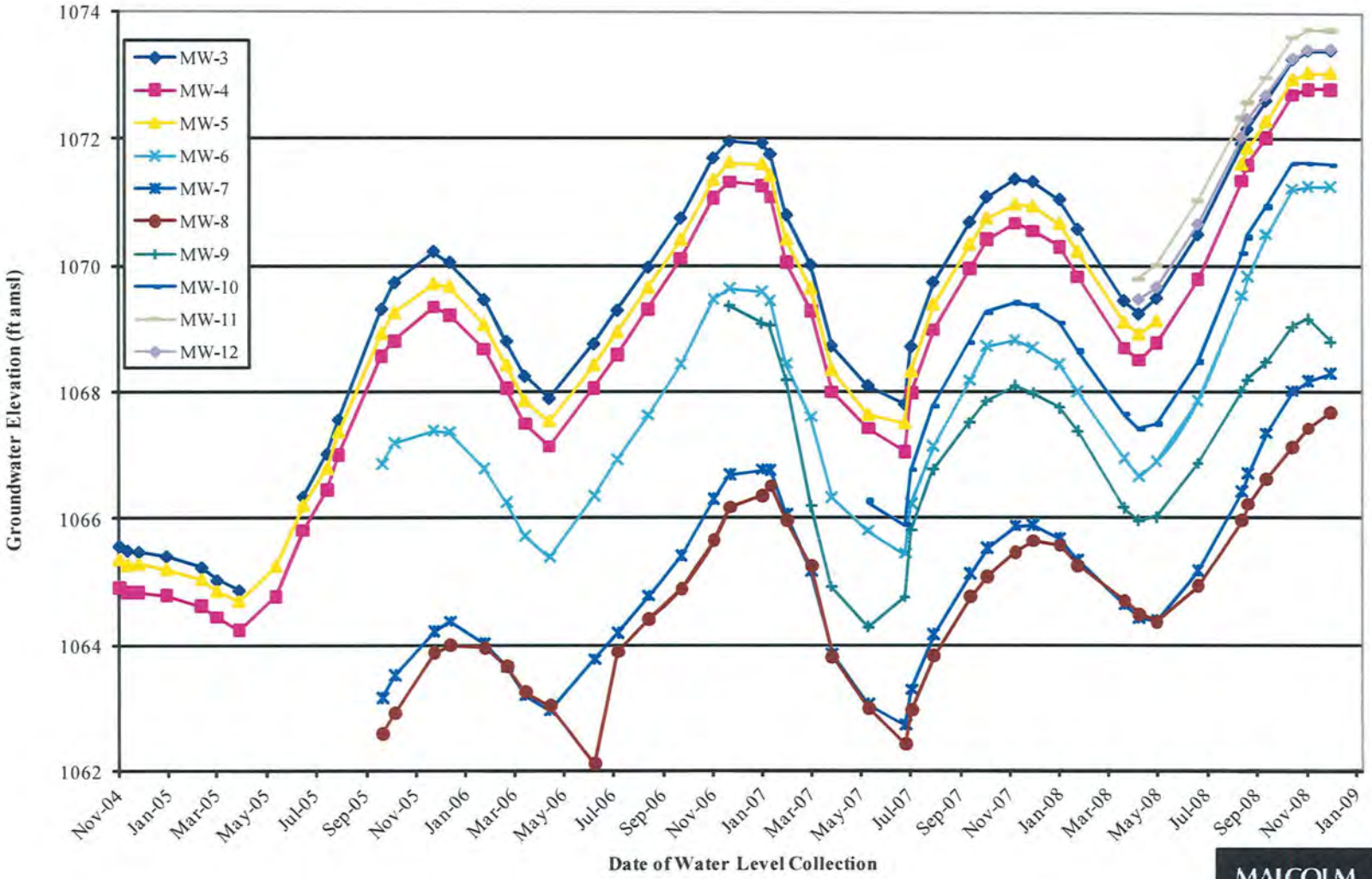
Hydrogeologic
West-East Cross-Section
Remedial Investigation Report
7th Avenue & Bethany Home Road
WQARF Site

April 2011 | **Figure 17**



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Hydrographs of Site Wells
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

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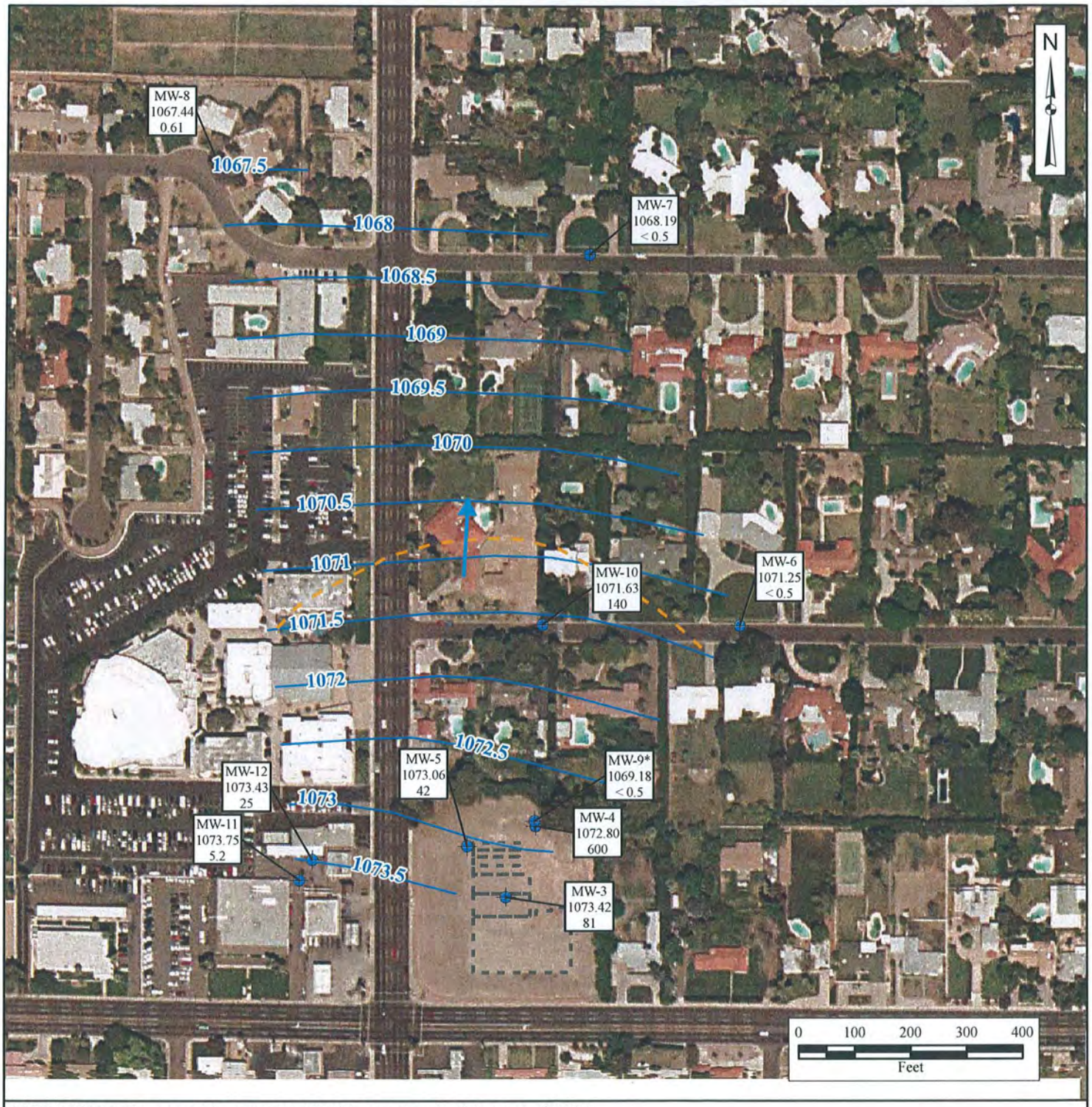
Figure 18



* MW-9 GW elevation not used for contouring. MW-9 is approximately 10 feet north of MW-4

Legend

- Monitor Well
- Former Buildings
- November 2008 Groundwater Elevation Contours (ft amsl)
- Estimated Extent of 5ug/L PCE Contour
- MW-3 / 1073.42 / 81 — Monitor Well Name / November 11, 2008 Groundwater Elevation (ft amsl) / PCE Concentration (ug/L)
- General Groundwater Flow Direction

Note: ft amsl - feet above mean sea level
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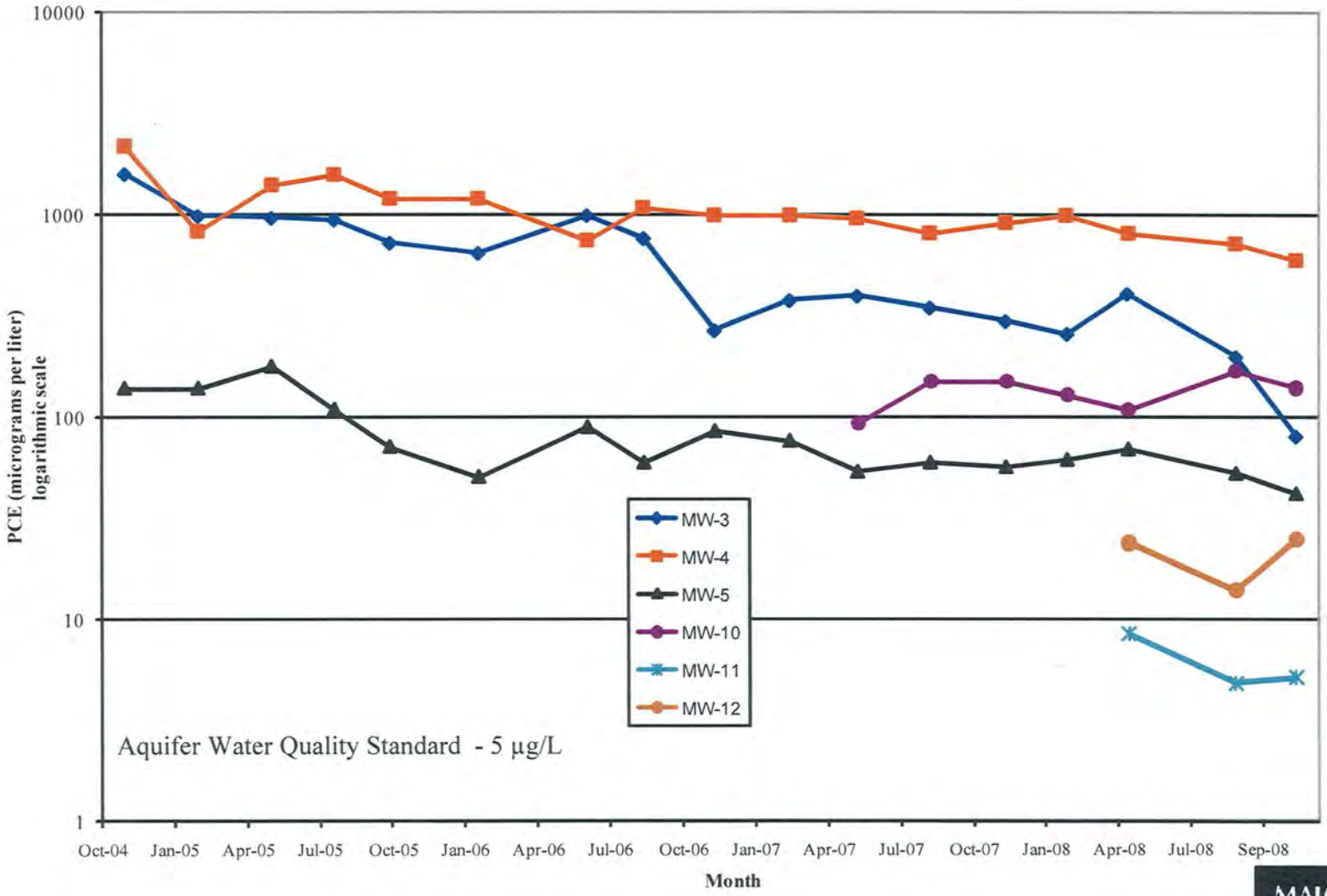
PCE Concentration in Groundwater
November 11, 2008
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011 | **Figure 19**



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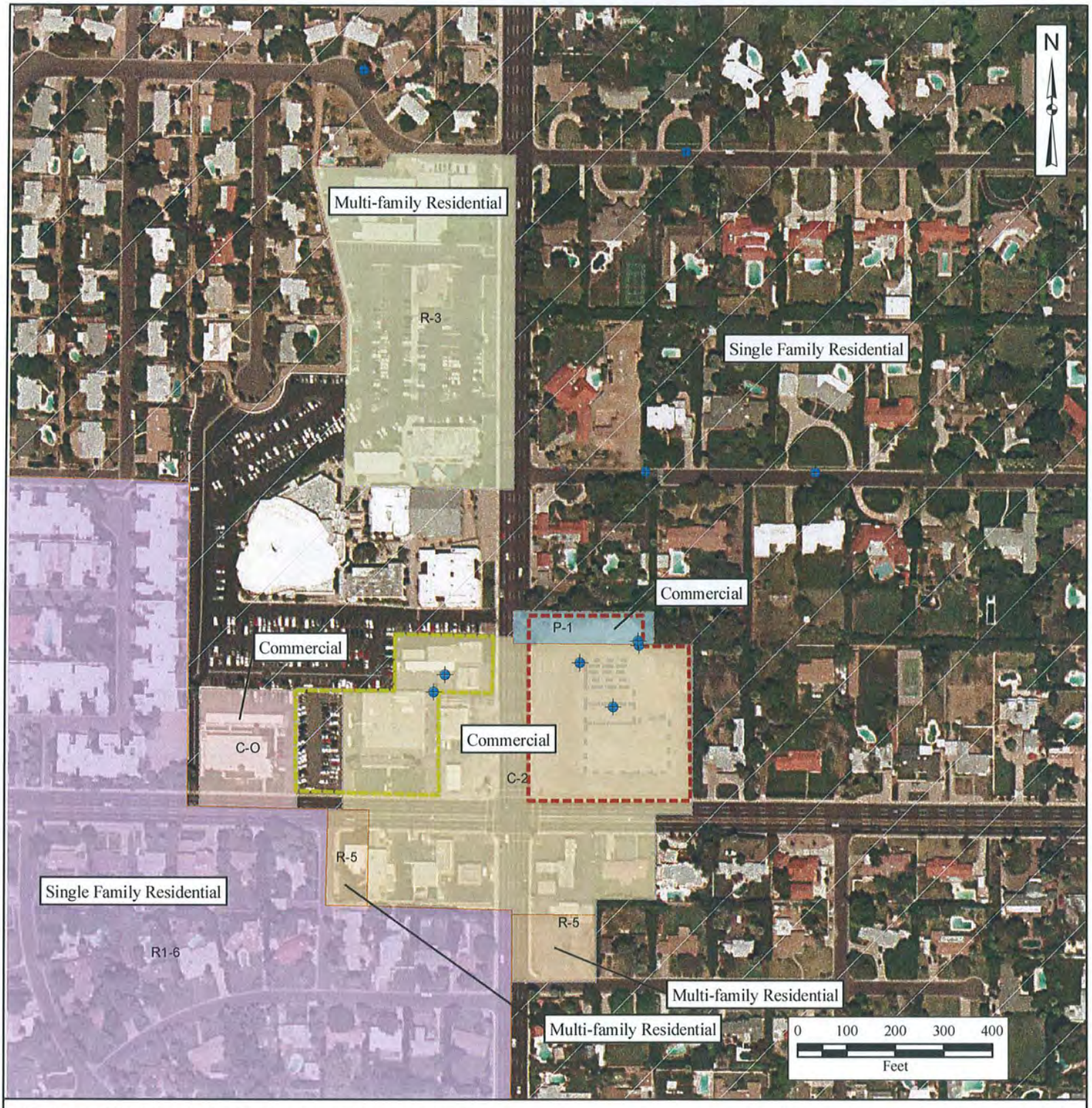
PCE Concentration Trend
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011

Figure 20



Data Sources: City of Phoenix Planning Dept; Maricopa County Assessor Webpage.

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Legend

- Monitor Well
- Bayless Property Boundary
- SCI Property Boundary
- Former Buildings

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Landuse Classification and Zoning
Remedial Investigation Report
7th Ave & Bethany Home Rd
WQARF Site

April 2011

Figure 21

APPENDIX A

ADWR Well Records

Appendix A
ADWR Registered within One Mile
Remedial Investigation Report
7th Ave Bethany Home Rd WRAQF Site

ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
482046	400374.5	3708162	MONITORING		0	0		ONE CAMELBACK INC
482047	400374.5	3708162	MONITORING		0	0		ONE CAMELBACK INC
482048	400374.5	3708162	MONITORING		0	0		ONE CAMELBACK INC
535960	400374.5	3708162	MONITORING	7/19/1992 0:00	85	47		ONE CAMELBACK INC
537626	400374.5	3708162	MONITORING	1/16/1993 0:00	60	45		ONE CAMELBACK INC
563215	400374.5	3708162	MONITORING		0	0	EXXON CO USA,	
563216	400374.5	3708162	MONITORING		0	40	EXXON CO USA,	
563564	400374.5	3708162	NONE		0	0	EXXON,	
569732	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
569733	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
569734	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
569735	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
575580	400374.5	3708162	TEST		0	0		EXXON COMPANY USA
577252	400374.5	3708162	MONITORING	10/17/1999 0:00	60	42		EXXON COMPANY USA
577694	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
577695	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
577696	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
577697	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
579467	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
579468	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
579469	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
579470	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
579471	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
579472	400374.5	3708162	DEWATERING		0	0		ONE CAMELBACK INC.
209349	400171.6	3708166	MONITORING		100	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
209350	400171.6	3708166	MONITORING		0	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
209351	400171.6	3708166	MONITORING		100	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
209352	400171.6	3708166	MONITORING	1/10/2006 0:00	100	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
209353	400171.6	3708166	MONITORING		100	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
209354	400171.6	3708166	MONITORING		100	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
209355	400171.6	3708166	MONITORING		100	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
209749	400171.6	3708166	MONITORING		0	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
210612	400171.6	3708166	MONITORING		0	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
210613	400171.6	3708166	MONITORING		0	0		CITY OF PHOENIX OFFICE OF ENVIRONMENTAL PROGRAMS
214463	400171.6	3708166	MONITORING	2/24/2007 0:00	100	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
214464	400171.6	3708166	MONITORING	2/24/2007 0:00	100	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
482030	400171.6	3708166			0	0		OUTDOOR SYSTEMS INC
545292	400171.6	3708166	MONITORING		65	42		UNOCAL CORP
545316	400171.6	3708166	MONITORING	9/3/1994 0:00	60	46		WEICO CORP

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ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
545317	400171.6	3708166	MONITORING	9/3/1994 0:00	60	46	WEICO CORP,	
545318	400171.6	3708166	MONITORING	9/3/1994 0:00	60	46		WEICO CORP
545319	400171.6	3708166	MONITORING	9/3/1994 0:00	60	46		WEICO CORP
545320	400171.6	3708166	MONITORING	9/3/1994 0:00	60	46		WEICO CORP
551320	400171.6	3708166	MONITORING	9/8/1995 0:00	59	55		WEICO CORP
551321	400171.6	3708166	MONITORING	9/12/1995 0:00	62	55	WEICO CORP,	
551322	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
551323	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
551324	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
551325	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
551353	400171.6	3708166	MONITORING	9/8/1995 0:00	59	50	WEICO CORP,	
551354	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
551355	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
551356	400171.6	3708166	MONITORING		0	0	WEICO CORP,	
563214	400171.6	3708166	MONITORING		0	40		EXXON MOBIL OIL CORPORATION
572017	400171.6	3708166	TEST	11/9/1998 0:00	70	0		OUTDOOR SYSTEMS INC
572019	400171.6	3708166	TEST	11/10/1998 0:00	70	0		OUTDOOR SYSTEMS INC
572020	400171.6	3708166	TEST		0	0		OUTDOOR SYSTEMS INC
572021	400171.6	3708166	TEST		0	0		OUTDOOR SYSTEMS INC
572022	400171.6	3708166	TEST		0	0		OUTDOOR SYSTEMS INC
572023	400171.6	3708166	TEST		0	0		OUTDOOR SYSTEMS INC
572024	400171.6	3708166	TEST		0	0		OUTDOOR SYSTEMS INC
584471	400171.6	3708166	TEST	2/9/2001 0:00	112	48		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
584472	400171.6	3708166	TEST	1/25/2001 0:00	130	44		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
584473	400171.6	3708166	TEST	1/22/2001 0:00	302	43		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
584474	400171.6	3708166	TEST	2/8/2001 0:00	202	48		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
588109	400171.6	3708166	TEST	11/29/2001 0:00	120	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
588110	400171.6	3708166	TEST	11/29/2001 0:00	121	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
588111	400171.6	3708166	TEST	12/1/2001 0:00	120	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
588112	400171.6	3708166	TEST	10/13/2001 0:00	120	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
588113	400171.6	3708166	TEST	10/12/2001 0:00	120	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
904075	400171.6	3708166	NONE	2/1/2006 0:00	60	0		CITY OF PHOENIX
904076	400171.6	3708166	NONE	2/7/2006 0:00	60	0		CITY OF PHOENIX OFFICE OF ENVIROMENTAL PROGRAMS
906719	400171.6	3708166	REMEDIATION	3/27/2007 0:00	60	0		CORNERSTONE AT CAMELBACK LLC
906720	400171.6	3708166	REMEDIATION		0	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
906721	400171.6	3708166	REMEDIATION		0	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
906802	400171.6	3708166	MONITORING	4/13/2007 0:00	100	0		ADEQ
545296	400376.6	3708364	MONITORING	7/14/1998 0:00	60	48		UNOCAL CORPORATION
546220	400376.6	3708364	MONITORING	10/30/1994 0:00	55	44		UNOCAL CORPORATION

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ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
546221	400376.6	3708364	MONITORING	10/31/1994 0:00	57	46		UNOCAL CORPORATION
563213	400376.6	3708364	MONITORING		0	45	EXXON CO USA,	
565456	400376.6	3708364	MONITORING		60	48		EXXON MOBIL OIL CORP
565457	400376.6	3708364	MONITORING		60	48		EXXON MOBIL OIL CORP
207555	400173.8	3708368	MONITORING		0	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
207557	400173.8	3708368	MONITORING		0	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
207558	400173.8	3708368	MONITORING		0	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
544558	400173.8	3708368	MONITORING	8/31/1994 0:00	65	48		UNOCAL CORPORATION
545293	400173.8	3708368	MONITORING	9/1/1994 0:00	65	46		UNOCAL CORPORATION
545294	400173.8	3708368	MONITORING	9/4/1994 0:00	65	45		UNOCAL CORPORATION
545295	400173.8	3708368	MONITORING	9/1/1994 0:00	65	45		UNOCAL CORPORATION
546222	400173.8	3708368	MONITORING	10/28/1994 0:00	57	45		UNOCAL CORPORATION
546223	400173.8	3708368	MONITORING	10/29/1994 0:00	57	45		UNOCAL CORPORATION
555202	400173.8	3708368	MONITORING	4/16/1996 0:00	70	50		UNOCAL CORPORATION
555203	400173.8	3708368	MONITORING		0	0	UNICAL CORP,	
555204	400173.8	3708368	MONITORING		0	0	UNOCAL CORP,	
570724	400173.8	3708368	TEST	1/19/1999 0:00	70	47		UNOCAL CORPORATION
570725	400173.8	3708368	TEST	1/19/1999 0:00	70	47		UNOCAL CORPORATION
570726	400173.8	3708368	TEST	1/20/1999 0:00	70	47		UNOCAL CORPORATION
570727	400173.8	3708368	TEST	1/20/1999 0:00	70	47		UNOCAL CORPORATION
570728	400173.8	3708368	TEST	1/21/1999 0:00	70	47		UNOCAL CORPORATION
570729	400173.8	3708368	TEST	1/18/1999 0:00	70	47		UNOCAL CORPORATION
570730	400173.8	3708368	DOMESTIC	1/22/1999 0:00	70	47		UNOCAL CORPORATION
570731	400173.8	3708368	TEST	8/9/1999 0:00	70	48		UNOCAL CORPORATION
588433	400173.8	3708368	TEST	10/11/2001 0:00	71	46		UNOCAL CORPORATION
588434	400173.8	3708368	TEST	10/11/2001 0:00	71	46		UNOCAL CORPORATION
588435	400173.8	3708368	TEST	10/11/2001 0:00	71	46		UNOCAL CORPORATION
588436	400173.8	3708368	TEST	10/11/2001 0:00	71	46		UNOCAL CORPORATION
588437	400173.8	3708368	TEST	10/11/2001 0:00	71	46		UNOCAL CORPORATION
608423	399363	3708384	IRRIGATION	1/19/1968 0:00	403	94	SALT RIVER PROJECT,	
211574	398556.5	3708407	MONITORING	4/17/2006 0:00	75	57		EXXON MOBIL OIL CORPORATION
211575	398556.5	3708407	MONITORING	4/17/2006 0:00	73	56		EXXON MOBIL OIL CORPORATION
533485	398556.5	3708407	MONITORING	11/19/1991 0:00	70	60	MOBIL OIL CORP,	
533486	398556.5	3708407	MONITORING	5/6/1992 0:00	75	54		EXXON MOBIL OIL CORPORATION
533487	398556.5	3708407	MONITORING	12/11/1991 0:00	75	56		EXXON MOBIL OIL CORPORATION
533488	398556.5	3708407	MONITORING	12/12/1991 0:00	75	56	MOBIL OIL CORP,	
533489	398556.5	3708407	MONITORING	12/13/1991 0:00	75	56		EXXON MOBIL OIL CORPORATION
538152	398556.5	3708407	MONITORING	2/19/1993 0:00	70	56	MOBIL OIL CORP,	
538153	398556.5	3708407	MONITORING	2/23/1993 0:00	70	56	MOBIL OIL CORP,	

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ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
538154	398556.5	3708407	MONITORING	2/23/1993 0:00	70	56	MOBIL OIL CORP,	
543594	398556.5	3708407	MONITORING	6/29/1994 0:00	68	53	MOBIL OIL CORP,	
543595	398556.5	3708407	MONITORING	11/30/1994 0:00	75	52	MOBIL OIL CORP,	
543596	398556.5	3708407	MONITORING	12/1/1994 0:00	95	52	MOBIL OIL CORP,	
588258	398556.5	3708407	TEST	10/11/2002 0:00	80	57		EXXON MOBIL OIL CORP
900656	398556.5	3708407	MONITORING		70	55		EXXON MOBIL OIL CORPORATION
211542	400378.9	3708565	MONITORING	6/7/2006 0:00	100	62		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
211541	400176.3	3708569	MONITORING	6/9/2006 0:00	100	62		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
86538	399973.6	3708572	NONE	12/22/1980 0:00	150	0	AZ PUBLIC SERVICE,	
548573	399567.8	3708580	NONE	4/11/1995 0:00	69	57	CIRCLE K CORP #1741,	
548574	399567.8	3708580	MONITORING	4/12/1995 0:00	67	57		TOSCO MARKETING DBA CIRCLE K #1741
548575	399567.8	3708580	MONITORING	4/12/1995 0:00	65	57	CIRCLE K CORP #1741,	
548576	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP #1741,	
548577	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP #1741,	
548578	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP #1741,	
548579	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP #1741,	
548580	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP #1741,	
548581	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP #1741,	
548582	399567.8	3708580	MONITORING		0	0	CIRCLE K CORP#1741,	
563821	400786.5	3708759	NONE		0	0	SOUTHWEST GAS CORP,	
215732	400381.3	3708766	TEST		0	0		SHELL OIL PRODUCTS US
215733	400381.3	3708766	TEST		0	0		SHELL OIL PRODUCTS US
215734	400381.3	3708766	TEST		0	0		SHELL OIL PRODUCTS US
545788	400381.3	3708766	MONITORING	10/3/1994 0:00	77	52	TEXACO REFINING,	
545789	400381.3	3708766	MONITORING	10/4/1994 0:00	77	52	TEXACO REFINING,	
545790	400381.3	3708766	MONITORING	10/5/1994 0:00	77	52	TEXACO REFINING,	
546192	400381.3	3708766	MONITORING		0	0	TEXACO REFINING,	
546545	400381.3	3708766	MONITORING		0	0	TEXACO REFINING,	
546546	400381.3	3708766	MONITORING		0	0	TEXACO ENVIRON SERV,	
546547	400381.3	3708766	MONITORING		0	0	TEXACO ENV. SERVICES,	
555805	400381.3	3708766	MONITORING		0	0	CIRCLE K STORES INC,	
555806	400381.3	3708766	MONITORING		0	0	CIRCLE K STORES INC,	
555807	400381.3	3708766	MONITORING		0	0	CIRCLE K STORES INC,	
555808	400381.3	3708766	MONITORING		0	0	CIRCLE K STORES INC,	
555809	400381.3	3708766	MONITORING		0	0	CIRCLE K STORES INC,	
560138	400381.3	3708766	MONITORING	1/15/1997 0:00	77	50	TEXACO REFINING,	
560139	400381.3	3708766	MONITORING	1/16/1997 0:00	76	50	TEXACO REFINING,	
560140	400381.3	3708766	MONITORING		0	0	TEXACO REFINING,	
560141	400381.3	3708766	MONITORING	1/17/1997 0:00	75	50	TEXACO REFINING,	

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560142	400381.3	3708766	MONITORING		0	0	TEXACO REFINING,	
900712	400381.3	3708766	REMEDIATION		85	68		SHELL OIL PRODUCTS, U.S.
900928	400381.3	3708766	MONITORING		90	70		SHELL OIL PRODUCTS U.S.
901320	400381.3	3708766	MONITORING		90	63		SHELL OIL PRODUCTS U.S.
901799	400381.3	3708766	MONITORING		0	0		SHELL OIL PRODUCTS, US
901800	400381.3	3708766	MONITORING		93	71		SHELL OIL PRODUCTS, US
595079	400586.3	3708963	STOCK		123	66	WALKER, ROBERTS C	
207556	400181.3	3708971	MONITORING		0	0		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
608425	400181.3	3708971	IRRIGATION	8/25/1971 0:00	405	118	SALT RIVER PROJECT,	
565337	399371.1	3708987	MONITORING		0	0		AZ DEPT OF ENVIRONMENTAL QUALITY
565338	399371.1	3708987	MONITORING		0	0		AZ DEPT OF ENVIRONMENTAL QUALITY
565339	399371.1	3708987	MONITORING		0	0		AZ DEPT OF ENVIRONMENTAL QUALITY
565340	399371.1	3708987	MONITORING		0	0		AZ DEPT OF ENVIRONMENTAL QUALITY
565341	399371.1	3708987	MONITORING		0	0		AZ DEPT OF ENVIRONMENTAL QUALITY
565342	399371.1	3708987	MONITORING		0	0		AZ DEPT OF ENVIRONMENTAL QUALITY
549225	398566.5	3709010	MONITORING	5/15/1995 0:00	59	58	ADEQ-UST HYDROLOGY,	
549226	398566.5	3709010	MONITORING	5/15/1995 0:00	59	58	ADEQ-UST HYDROLOGY,	
549227	398566.5	3709010	MONITORING	5/16/1995 0:00	59	58	ADEQ-UST HYDROLOGY,	
549228	398566.5	3709010	MONITORING	5/16/1995 0:00	59	58	ADEQ-UST HYDROLOGY,	
549229	398566.5	3709010	MONITORING	5/17/1995 0:00	59	58	ADEQ-UST HYCROLOGY,	
549230	398566.5	3709010	MONITORING		0	0	ADEQ-UST HYDROLOGY,	
549536	398566.5	3709010	MONITORING	5/12/1995 0:00	85	58	ADEQ UST HYDROLOGY,	
549537	398566.5	3709010	MONITORING	5/18/1995 0:00	85	58	ADEQ UST HYDROLOGY,	
549538	398566.5	3709010	MONITORING	5/19/1995 0:00	85	58	ADEQ UST HYDROLOGY,	
549539	398566.5	3709010	MONITORING	5/19/1995 0:00	85	58	ADEQ HYDROLOGY,	
550681	398566.5	3709010	MONITORING		0	0	ADEQ,	
556013	398566.5	3709010	MONITORING	4/30/1996 0:00	70	57	ADEQ,	
556014	398566.5	3709010	MONITORING	5/1/1996 0:00	70	57	ADEQ,	
556015	398566.5	3709010	MONITORING	5/1/1996 0:00	75	57	ADEQ,	
628952	400283.3	3709069	IRRIGATION	9/15/1946 0:00	550	100	JACKSON, RUSSELL,	
204375	400993.5	3709157	MONITORING		110	89		CONOCO PHILLIPS COMPANY
204376	400993.5	3709157	MONITORING		110	89		CONOCO PHILLIPS COMPANY
204377	400993.5	3709157	MONITORING		110	91		CONOCO PHILLIPS COMPANY
204378	400993.5	3709157	MONITORING		110	90		CONOCO PHILLIPS COMPANY
204379	400993.5	3709157	MONITORING		110	91		CONOCO PHILLIPS COMPANY
204458	400993.5	3709157	REMEDIATION		110	91		CONOCO PHILLIPS COMPANY
204459	400993.5	3709157	REMEDIATION		110	91		CONOCO PHILLIPS COMPANY
204460	400993.5	3709157	REMEDIATION		110	91		CONOCO PHILLIPS COMPANY
204461	400993.5	3709157	REMEDIATION		110	91		CONOCO PHILLIPS COMPANY

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204462	400993.5	3709157	REMEDIATION		110	91		CONOCO PHILLIPS COMPANY
550231	400993.5	3709157	MONITORING	7/19/1995 0:00	109	78		CONOCO PHILLIPS COMPANY
550232	400993.5	3709157	MONITORING	7/20/1995 0:00	113	78	CIRCLE K CORP,	
550233	400993.5	3709157	MONITORING	7/24/1995 0:00	114	78		CONOCO PHILLIPS COMPANY
550234	400993.5	3709157	MONITORING		0	0	CIRCLE K CORP,	
550235	400993.5	3709157	MONITORING		0	0	CIRCLE K CORP,	
550236	400993.5	3709157	MONITORING		0	0	CIRCLE K CORP,	
555898	400993.5	3709157	MONITORING	4/24/1996 0:00	109	90	CIRCLE K STORES 3744,	
555899	400993.5	3709157	MONITORING		0	0	CIRCLE K STORES 3744,	
555900	400993.5	3709157	MONITORING		0	0	CIRCLE K STORE 3744,	
555903	400993.5	3709157	MONITORING		0	0	CIRCLE K STORES 3744,	
555904	400993.5	3709157	MONITORING		0	0	CIRCLE K STORES 3744,	
555905	400993.5	3709157	MONITORING		0	0	CIRCLE K STORES 3744,	
570973	400993.5	3709157	TEST	10/28/1998 0:00	95	75		CONOCO PHILLIPS COMPANY
570974	400993.5	3709157	TEST	10/29/1998 0:00	88	75		CONOCO PHILLIPS COMPANY
570975	400993.5	3709157	TEST	11/2/1998 0:00	95	75		CONOCO PHILLIPS COMPANY
570976	400993.5	3709157	TEST	11/4/1998 0:00	95	75		CONOCO PHILLIPS COMPANY
570977	400993.5	3709157	TEST	11/5/1998 0:00	95	75		CONOCO PHILLIPS COMPANY
584933	400993.5	3709157	TEST	1/23/2001 0:00	105	84		CONOCO PHILLIPS COMPANY
584934	400993.5	3709157	TEST	1/24/2001 0:00	105	84		CONOCO PHILLIPS COMPANY
608424	400993.5	3709157	IRRIGATION	10/2/1964 0:00	400	145	SALT RIVER PROJECT,	
803822	400488.4	3709267	DOMESTIC	1/1/1922 0:00	200	180	CHESHIRE, DAVID,	
806965	400186	3709373	NONE	12/23/1994 0:00	30	0	UNITED TITLE AGENCY,	
588385	399781.3	3709380	TEST	10/26/2001 0:00	155	0		SOUTHWEST GAS CORPORATION
534422	401200.8	3709556	MONITORING	2/24/1992 0:00	161	130	MOBIL OIL CORP,	
533329	401202.8	3709757	NONE		0	0	CIRCLE K CORP,	
533330	401202.8	3709757	NONE	10/10/1991 0:00	133	130		CONOCO PHILLIPS COMPANY
548628	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548629	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548630	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548631	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548632	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548633	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548634	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
548635	401202.8	3709757	MONITORING		0	0	CIRCLE K CORP #1541,	
558226	401202.8	3709757	MONITORING	7/8/1996 0:00	150	106	CIRCLE K STORES 1541,	
558227	401202.8	3709757	NONE	3/25/1997 0:00	150	104		CONOCO PHILLIPS COMPANY
558228	401202.8	3709757	NONE	3/26/1997 0:00	150	104		CONOCO PHILLIPS COMPANY
558229	401202.8	3709757	NONE	3/27/1997 0:00	142	104		CONOCO PHILLIPS COMPANY

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Remedial Investigation Report
7th Ave Bethany Home Rd WRAQF Site

ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
558230	401202.8	3709757	MONITORING		0	0	CIRCLE K STORES 1541,	
558231	401202.8	3709757	MONITORING		0	0	CIRCLE K STORES1541,	
534423	401000	3709760	MONITORING	4/27/1992 0:00	160	130		MOBIL OIL CORPORATION
579180	401000	3709760	NONE	3/8/2000 0:00	105	0		EXXON COMPANY USA
588248	401000	3709760	TEST	8/22/2001 0:00	120	0		EXXON MOBIL REFINING & SUPPLY CO
588249	401000	3709760	TEST	8/29/2001 0:00	132	0		EXXON MOBIL REFINING & SUPPLY CO
588250	401000	3709760	TEST	8/30/2001 0:00	110	0		EXXON MOBIL REFINING & SUPPLY CO
559543	399584.3	3709786	MONITORING	2/19/1997 0:00	100	729	CHEVRON PRODUCTS CO,	
559544	399584.3	3709786	MONITORING	2/21/1997 0:00	90	72	CHEVRON PRODUCTS CO,	
559545	399584.3	3709786	MONITORING	2/24/1997 0:00	90	72	CHEVRON PRODUCTS CO,	
559546	399584.3	3709786	MONITORING		0	0	CHEVRON PRODUCTS CO,	
562644	399584.3	3709786	MONITORING		0	0	CHEVRON PRODUCTS CO,	
562645	399584.3	3709786	MONITORING		0	0	CHEVRON PRODUCTS CO,	
567429	399584.3	3709786	MONITORING	4/3/1998 0:00	95	72		CHEVRON PRODUCTS COMPANY
617696	399584.3	3709786	IRRIGATION	5/1/1922 0:00	242	0	SALT RIVER PROJECT,	
617824	399584.3	3709786	IRRIGATION	3/29/1922 0:00	242	0	SALT RIVER PROJECT,	
207877	399382.5	3709791	REMEDIATION		102	83		CONOCO PHILLIPS COMPANY
207878	399382.5	3709791	REMEDIATION		105	83		CONOCO PHILLIPS COMPANY
207879	399382.5	3709791	REMEDIATION		97	83		CONOCO PHILLIPS COMPANY
210565	399382.5	3709791	NONE	2/18/2006 0:00	103	84		CONOCO PHILLIPS COMPANY
558021	399382.5	3709791	MONITORING	6/21/1996 0:00	95	74		TOSCO CORPORATION
558022	399382.5	3709791	MONITORING	6/21/1996 0:00	95	75		TOSCO CORPORATION
558023	399382.5	3709791	MONITORING	6/21/1996 0:00	95	74		TOSCO CORP
558024	399382.5	3709791	MONITORING	6/21/1996 0:00	95	74		TOSCO CORPORATION
585493	399382.5	3709791	TEST		0	0		CONOCO PHILLIPS COMPANY
626546	398780.4	3709809	MUNICIPAL	5/1/1986 0:00	471	140		PHOENIX CITY OF
556690	397777.7	3709836	NONE		0	0	CHEVRON PRODUCTS CRP,	
556691	397777.7	3709836	MONITORING		0	0	CHEVRON PRODUCTS CO,	
556692	397777.7	3709836	MONITORING		0	0	CHEVRON PRODUCTS CO,	
556693	397777.7	3709836	MONITORING		0	0	CHEVRON PRODUCTS CO,	
578949	397777.7	3709836	TEST		0	0		CHEVRON USA
546987	401204.4	3709959	NONE	1/13/1995 0:00	155	111	MOBIL OIL CORP,	
552701	401204.4	3709959	NONE	11/20/1995 0:00	110	84	MOBIL OIL CORP,	
552702	401204.4	3709959	MONITORING	11/16/1995 0:00	143	109	MOBIL OIL CORP,	
552703	401204.4	3709959	MONITORING	11/16/1995 0:00	130	110		MOBIL BUSINESS RESOURCES CORP
552704	401204.4	3709959	MONITORING	11/17/1995 0:00	130	110	MOBIL OIL COR,	
552705	401204.4	3709959	MONITORING	11/19/1995 0:00	130	110	MOBIL OIL CORP,	
521997	401002.1	3709962	NONE	8/5/1988 0:00	185	0	MOBIL OIL CORP,	
529029	401002.1	3709962	MONITORING	8/18/1990 0:00	133	140		MOBIL OIL CORPORATION

Appendix A
ADWR Registered within One Mile
Remedial Investigation Report
7th Ave Bethany Home Rd WRAQF Site

ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
529030	401002.1	3709962	NONE	8/17/1990 0:00	200	0	MOBIL OIL CORP,	
531822	401002.1	3709962	MONITORING	5/31/1991 0:00	165	138		MOBIL OIL CORPORATION
531823	401002.1	3709962	MONITORING	5/31/1991 0:00	160	140		MOBIL OIL CORPORATION
531824	401002.1	3709962	MONITORING	6/6/1991 0:00	165	137		MOBIL OIL CORPORATION
531825	401002.1	3709962	MONITORING	6/6/1991 0:00	160	140		MOBIL OIL CORPORATION
533651	401002.1	3709962	MONITORING	11/27/1991 0:00	135	135		MOBIL OIL CORPORATION
533652	401002.1	3709962	MONITORING	12/4/1991 0:00	130	0		MOBIL OIL CORPORATION
533653	401002.1	3709962	MONITORING	3/23/1992 0:00	174	130		MOBIL OIL CORPORATION
534274	401002.1	3709962	TEST	4/6/1992 0:00	160	131		MOBIL OIL CORPORATION
534421	401002.1	3709962	MONITORING	2/26/1992 0:00	161	137		MOBIL OIL CORPORATION
543094	401002.1	3709962	MONITORING	4/22/1994 0:00	157	24		MOBIL OIL CORPORATION
552415	401002.1	3709962	MONITORING	11/22/1995 0:00	160	110		MOBIL OIL CORPORATION
552416	401002.1	3709962	MONITORING		0	0	MOBIL OIL CORP,	
554015	401002.1	3709962	MONITORING		0	0	MOBIL OIL CORP,	
554016	401002.1	3709962	MONITORING		0	0	MOBIL OIL CORP,	
568453	401002.1	3709962	MONITORING		0	0		MOBIL OIL CORPORATION
568454	401002.1	3709962	MONITORING		0	0		MOBIL OIL CORPORATION
568455	401002.1	3709962	MONITORING		0	0		MOBIL OIL CORPORATION
568456	401002.1	3709962	MONITORING		0	0		MOBIL OIL CORPORATION
568457	401002.1	3709962	MONITORING		0	0		MOBIL OIL CORPORATION
568458	401002.1	3709962	NONE		0	0		MOBIL OIL CORPORATION
575426	401002.1	3709962	TEST	11/2/1999 0:00	131	102		EXXON MOBIL OIL CORP
575427	401002.1	3709962	TEST	11/4/1999 0:00	132	13		EXXON MOBIL OIL CORP
575428	401002.1	3709962	TEST	11/10/1999 0:00	135	104		EXXON MOBIL OIL CORP
575429	401002.1	3709962	TEST	10/29/1999 0:00	133	104		EXXON MOBIL OIL CORP
575430	401002.1	3709962	TEST		0	0		EXXON MOBIL OIL CORP
626547	401002.1	3709962	MUNICIPAL	1/1/1952 0:00	607	170		CITY OF PHOENIX WATER SERVICES
400367	400598	3709969	DOMESTIC		0	0	HUNTS, DAVID	
205270	399586.9	3709987	TEST		125	87		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205271	399586.9	3709987	MONITORING		115	87		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205272	399586.9	3709987	TEST	11/1/2004 0:00	75	88		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205273	399586.9	3709987	MONITORING		115	87		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205299	399586.9	3709987	REMEDIATION	11/2/2004 0:00	75	88		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205300	399586.9	3709987	REMEDIATION	11/2/2004 0:00	75	88		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205301	399586.9	3709987	REMEDIATION	11/3/2004 0:00	75	87		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
205302	399586.9	3709987	MONITORING	11/4/2004 0:00	75	87		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
213660	399586.9	3709987	MONITORING		230	93		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
551330	399586.9	3709987	MONITORING	10/30/1995 0:00	100	80		CITY OF PHOENIX
551331	399586.9	3709987	MONITORING	10/31/1995 0:00	100	79		CITY OF PHOENIX

Appendix A
ADWR Registered within One Mile
Remedial Investigation Report
7th Ave Bethany Home Rd WRAQF Site

ADWR Registry #	Easting	Northing	Wateruse	Date Installed	Well Depth	Water level	Owner	Company
551332	399586.9	3709987	MONITORING	11/1/1995 0:00	100	79		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
551333	399586.9	3709987	MONITORING		0	0	WALGREENS,	
551334	399586.9	3709987	MONITORING		0	0	WALGREENS,	
567883	399586.9	3709987	TEST		0	0		CHEVRON PRODUCTS COMPANY
608429	398785.6	3710010	IRRIGATION	7/1/1962 0:00	600	150	SALT RIVER PROJECT,	
617714	397780.9	3710038	IRRIGATION	7/11/1923 0:00	201	149	SALT RIVER PROJECT,	
806789	400397.3	3710174	IRRIGATION	12/31/1950 0:00	300	5	WOLF, G.VAN VELSOR,	
208275	399588.8	3710188	MONITORING		124	87		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
214357	399588.8	3710188	MONITORING		130	84		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
588389	398787.8	3710211	NONE	11/8/2001 0:00	265	0		SOUTHWEST GAS CORPORATION
530919	401207.3	3710361	MONITORING	3/2/1991 0:00	175	165	INMAN, RONALD,L	
530966	401207.3	3710361	NONE		0	0	MAR-ENE LAND CO,	
532264	401207.3	3710361	MONITORING	8/2/1991 0:00	170	156	INMAN, RONALD,L	
532265	401207.3	3710361	MONITORING	8/2/1991 0:00	170	156	INMAN, RONALD,L	
532266	401207.3	3710361	MONITORING	8/2/1991 0:00	170	157	INMAN, RONALD,L	
537382	401207.3	3710361	MONITORING	12/11/1992 0:00	125	0	MAR-ENS LAND CO,	
537383	401207.3	3710361	MONITORING	12/11/1992 0:00	65	0	MAR-ENE LAND CO,	
563800	401207.3	3710361	MONITORING	8/26/1997 0:00	145	127	MAR-ENE LAND CO,	
208276	399590.5	3710389	MONITORING		124	92		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
208274	399389.8	3710394	MONITORING		124	94		ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
907448	401208.8	3710563	MONITORING		0	0		ADEQ
907450	401208.8	3710563	MONITORING		0	0		ADEQ
907451	401208.8	3710563	MONITORING		0	0		ADEQ
907452	401208.8	3710563	MONITORING		0	0		ADEQ
907609	401208.8	3710563	NONE		0	0		ADEQ
626549	399192	3710601	MUNICIPAL	8/1/1958 0:00	678	220	PHOENIX, CITY OF,	
608426	399594	3710791	IRRIGATION	9/5/1961 0:00	600	122	SALT RIVER PROJECT,	
638674	400907.3	3710869	IRRIGATION	1/1/1968 0:00	140	0	SARGENT,M J	
629586	399595.8	3710992		12/1/1941 0:00	300	0	SAPPINGTON,S R	
639860	400706.8	3711074	IRRIGATION		0	0	YOUNG,J P	
206130	400204.3	3711384	DOMESTIC		270	149	CROZIER, SCOTT & MARY	
808103	400204.3	3711384	OTHER - PRODUC	1/1/1973 0:00	0	0	CROZIER, SCOTT & MARY	
639652	400003.8	3711589	IRRIGATION		0	0	FIRST BAPTIST CHURCH,	
583167	399400.6	3711802	TEST	1/12/2001 0:00	260	0		SOUTHWEST GAS CORPORATION

APPENDIX B

Lithologic Boring Logs

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-1

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-18-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-19-2004	Logged By	: C. Stinson, B. Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 HS Auger-Coring	Latitude	: 33ø31'28.50285"N
Driller	: Kevin	Longitude	: 112ø04'53.97122"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION from Continuous Core	CUTTINGS (% Gravel, % Sand, % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
0			No recovery from 0 to 2 ft below ground surface (bgs).				Note: -SV - Soil Vapor Sample -S - Soil Sample -GW - Groundwater Sample -GT - Geotech Sample
5	ML		Sandy SILT, reddish brown, dry, mostly fine sand, low plasticity, trace of fine rounded gravel with trace of coarse gravel.		29-38-50	09:45	SB1-05-SV = 3.6 ug/L SB1-05-S = <0.05 mg/Kg
10			Sandy SILT, pinkish white, dry, fine to med. sand, low plasticity.				
15			SILT, light brown, dry, fine sand with a trace of med. sand, low plasticity.		11-15-17	10:40	SB1-15-SV = 94 ug/L
20			Sandy SILT, pinkish white, fine sand with 1/4" to 3/4" cemented pieces, low plasticity.				
25	SW		WELL GRADED SAND with gravel, light gray, dry, fine to coarse sand, fine subangular gravel with a trace of med. gravel, non-plastic.		14-12-21	11:00	SB1-25-SV = 210 ug/L
30							
35	CL		Silty CLAY, pinkish white, dry, few fine sand, low to med. plasticity.		18-27-28	11:30	SB1-35-SV = 500 ug/L
40	SP		POORLY GRADED SAND, light gray, dry, mostly all med. sand, few fine and coarse sand, trace of fine rounded gravel.				
45	SM		Silty SAND, light brown, dry, mostly all fine sand, few med. to coarse sand, few fine subrounded gravel, non-plastic.		25-44-50	12:35	SB1-45-SV = 1000 ug/L SB1-45-S = <0.05 mg/Kg
50							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-1

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-18-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-19-2004	Logged By	: C. Stinson, B. Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 HS Auger-Coring	Latitude	: 33ø31'28.50285"N
Driller	: Kevin	Longitude	: 112ø04'53.97122"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION from Continuous Core	CUTTINGS (% Gravel, % Sand, % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
50	SM		SILTY SAND				
	SW		WELL GRADED SAND with fine gravel.				
55	SW-SM		WELL GRADED SAND WITH SILT, reddish white, dry, fine to coarse sand with 1/2" pieces cemented with CaCO3, non-plastic.		91-50 for 3"	13:20	At 55', missed vapor sample due to equipment failure. SB1-55-S = <0.05 mg/Kg
60	SM		SILTY SAND, reddish light brown, dry, med. to coarse sand with 1/2" to 3/4" cemented pieces, trace of fine angular gravel,				
65			Darker brown spots observed at 65 ft.		38-12-10	13:55	SB1-65-SV = 2800 ug/L SB1-65-S = 0.65 mg/kg
			SILTY SAND, light brown, dry, fine sand with trace of med. sand, low plasticity.				
70							
75					18-32-50 for 3	14:30	SB1-75-SV = 670 ug/L SB1-75-S = <0.05 mg/kg
	ML		Sandy SILT, white with CaCO3 pieces.				
80			Clayey SILT with sand, light brown, dry, all fine sand with trace of med. sand, low plasticity.				
85	CL		Silty CLAY, white with CaCO3 pieces.		10-14-18	14:55	SB1-85-SV = 25 ug/L
	ML		Clayey SILT, reddish brown, damp, fine sand with mostly low plasticity silt, mostly dense cores beginning at 90 ft.				Encountered groundwater at approx. 87 ft bgs.
90					49-98-100 f 6		SB1-90-GW = 1600 ppb
			Sandy SILT, white, dry, fine to med. sand, 1/4" to 1" pieces cemented with CaCO3, slight plasticity.				
95							
	SM						
100							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-1

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-18-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-19-2004	Logged By	: C. Stinson, B. Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 HS Auger-Coring	Latitude	: 33ø31'28.50285"N
Driller	: Kevin	Longitude	: 112ø04'53.97122"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION from Continuous Core	CUTTINGS (% Gravel / % Sand / % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
100	SM		SILTY SAND, reddish brown, damp, fine to med. sand with trace of coarse sand, 1/4" CaCO3 cemented pieces.		91-100 for 6"		Note: from 95 ft to 125 ft bgs, dense clay which did not produce enough water for a hydropunch sample to be collected.
			reddish yellow with trace of gravel.				
105	CL		Sandy CLAY, white with CaCO3 pieces.				
	SM		SILTY SAND, fine sand with 1/2" cemented pieces.				
110	ML		Sandy SILT, white, damp, fine to med. sand, low plasticity, 1/4" to 1" pieces cemented with CaCO3.		62-68-100 f10		
115	CL		Sandy CLAY, light brown, moist, fine sand in low to med. plasticity clay, very dense.				
120			Sandy CLAY, pinkish white, fine sand in low-med. plasticity clay, 1/4" to 3/4" pieces cemented with CaCO3.		27-34-36		SB1-120-GT Core submitted for geotech analysis. SB1-125-S = <0.05 mg/Kg TD of boring 125'
125							
130							
135							
140							
145							
150							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-2

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-20-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-20-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.33699"N
Driller	: Kevin	Longitude	: 112ø04'53.59469"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION	Blow Count	Time	Samples Collected, PCE Results
0					Note: -SV - Soil Vapor Sample -S - Soil Sample -GW - Groundwater Sample
5	SM	SILTY SAND, brown, dry, low plasticity fines, fine to coarse sand, fine subrounded to subangular gravel,	87-50-50 f5		SB2-05-SV = 35 ug/L Headspace PID = 10 ppm
10	ML/CL	SILT/CLAY, tan/beige, dry, low plasticity.	18-18-20	07:30	
15	SM	SILTY SAND, fine to coarse sand, slight plasticity silt, fine subrounded gravel.	18-18-20		SB2-15-SV = 120 ug/L Headspace PID = 50 ppm SB2-15-S = <0.05 mg/Kg
20	ML	Sandy SILT, light brown, dry, non-plastic silt, fine sand.	19-21-27		
25		Sandy SILT, light brown, dry, slight plasticity silt, fine sand.	23-24-27	08:15	SB2-25-SV = 110 ug/L Headspace PID = 67 ppm
30		SILT with sand, dark brown, dry, low plasticity silt with clay, fine sand, consolidated pieces.	20-29-38	08:30	
35	ML/CL	SILT with sand, brown, dry to damp, low plasticity silt with more clay, fine sand.	12-16-30	08:50	SB2-35-SV = 330 ug/L Headspace PID = 64 ppm
40	SW	WELL GRADED SAND, light brown, dry, fine to coarse sand, fine subrounded to subangular gravel, trace of fines.	14-17-19	09:05	
45	SM	SILTY SAND with gravel, brown, dry to damp, fine to coarse sand, fine to med. subangular gravel, non-plastic,	39-50 for 5	09:20	SB2-45-SV = 1900 ug/L Headspace PID = 63 ppm SB2-45-S = <0.05 mg/Kg
50					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-2

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-20-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-20-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.33699"N
Driller	: Kevin	Longitude	: 112ø04'53.59469"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION	Blow Count	Time	Samples Collected, PCE Results
50	SM	Poorly graded SILTY SAND, strong brown, dry to damp, fine to med. sand.	22-25-23		
55	SM	Well graded SILTY SAND, brown, dry, fine to coarse sand, fine subangular gravel, slight plasticity.	39-50 for 3	09:45	SB2-55-SV = 1000 ug/L Headspace PID = 28 ppm
60	SM	SILTY SAND, same as at 55 ft bgs, slight plasticity.	47-50 for 5	10:10	Headspace PID = 9999 ppm
65	ML	Sandy SILT, brown, dry to damp, fine to med. sand, slight to low plasticity.	16-19-24	10:25	SB2-65-SV = 1900 ug/L Headspace PID = 1200 ppm
70	ML/CL	SILT with sand, brown, damp, fine sand, slight plasticity.	15-15-21	10:45	Headspace PID = 589 ppm
75	ML/CL	Same as at 70 ft bgs.	19-25-31	11:10	SB2-75-SV = 4900 ug/L Headspace PID = 1340 ppm SB2-75-S = 0.079 mg/Kg
80	ML/CL	SILT with sand and clay, strong brown, moist, fine sand with a trace of coarse sand, low to med. plasticity.	17-19-22	11:25	SB2-80-SV = 6100 ug/L Headspace PID = 560 ppm SB2-80-S = 0.21 mg/Kg
85	CL	Silty CLAY, strong brown, moist, med. plasticity.	10-14-18		Headspace PID = 680 ppm
90	CL	Silty CLAY with sand, strong brown, moist, fine to coarse sand, low to med. plasticity.	11-14-18	12:00	SB2-90-GW = 1400 ppb Headspace PID = 420 ppm TD of boring 90 ft bgs
			36-51-55	12:10	Attempted hydropunch 92-94 ft bgs.
95					
100					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-3

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-20-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-21-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.86108"N
Driller	: Kevin	Longitude	: 112ø04'53.75295"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
0					Note: -SV - Soil Vapor Sample -S - Soil Sample -GW - Groundwater Sample -GT - Geotech Sample
5	SM	SILTY SAND, strong brown, damp, fine to coarse sand, fine subangular to angular gravel, slight plasticity.	9-11-12	15:30	SB3-05-SV = 62 ug/L Headspace PID = 95 ppm
10	SM	SILTY SAND with clay, beige, damp, fine to med. sand, slight to low plasticity.	9-10-11		Headspace PID = 97 ppm
15	SM	Same as previous.	9-27-47	16:00	SB3-15-SV = 260 ug/L
20	SM	Same as previous.	20-26-50 for5	16:15	
25	ML	SANDY SILT with clay, brown, damp, fine to coarse sand, slight to low plasticity.	24-27-39	07:10	SB3-25-SV = 100 ug/L Headspace PID = 82 ppm SB3-25-S = <0.05 mg/Kg
30	SM	SILTY SAND, strong brown, less damp, fine to coarse sand, slight plasticity.	38-50 for 5		
	SW-SM	WELL GRADED Gravelly SAND WITH SILT, fine to coarse sand, fine to med. gravel, non-plastic.			
35	SM	SILTY SAND, brown, less damp, fine to coarse sand, slight plasticity.	14-29-27	07:30	SB3-35-SV = 41 ug/L Headspace PID = 434 ppm
40	SW-SM	WELL GRADED SAND WITH SILT, brown, damp, fine to coarse sand, fine gravel, non-plastic.	12-16-18	08:10	Headspace PID = 9999 ppm
45	SM	SILTY SAND, brown, less damp, fine to med. sand, slight to low plasticity.	23-42-50 for4	08:20	SB3-45-SV = 290 ug/L Headspace PID = 1378 ppm
50					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-3

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-20-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-21-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.86108"N
Driller	: Kevin	Longitude	: 112ø04'53.75295"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
50	SM		32-50-for 5		Headspace PID = 9999 ppm SB3-50-GT
55	SW-SM	WELL GRADED SAND WITH SILT, brown, less damp, fine to coarse sand, fine gravel, non-plastic.	17-26-39	09:00	SB3-55-SV = 1500 ug/L Headspace PID = 1359 ppm SB3-55-S = 0.083 mg/Kg
60	SM	SILTY SAND, brown, damp, fine to med. sand, non-plastic.	48-50 for 2	09:15	Headspace PID = 576 ppm
65	ML	SANDY SILT, strong brown, moist, fine sand, slight plasticity.	13-19-19		SB3-65-SV = 2100 ug/L Headspace PID = 511 ppm SB3-65-S = 0.15 mg/Kg
70	SM	Well Graded SILTY SAND, brown, less damp, fine to coarse sand, fine subangular gravel.	18-26-34		Headspace PID = 4755 ppm SB3-70-GT
75	ML	Clayey SILT, reddish brown, moist, fine sand, low to med. plasticity.	22-27-41	09:55	SB3-75-SV = 3200 ug/L Headspace PID = 9999 ppm SB3-75-S = 0.27 mg/Kg
80		Same as previous.	18-29-38	10:15	SB3-80-SV = 2500 ug/L Headspace PID = 505 ppm SB3-80-S = 0.29 mg/Kg
85	CL	CLAY, beige, moist, med. plasticity.	10-12-19		Headspace PID = 749 ppm
		CLAY with sand and silt, beige to reddish brown, moist to wet, fine to coarse sand, trace of fine and med. gravel, low to med. plasticity.	23-38-50 for3	10:50	SB3-90-GT SB3-90-GW = 10000 ppb Headspace PID = 2238 ppm TD of boring 90 ft bgs.
90					
95					
100					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-4

7th Avenue and Bethany Home Road ADEQ ERA Site Investigation Phoenix, Arizona	Start Date	: 10-22-2004	Sampling Method : Mini-probe, Hydropunch
	Finish Date	: 10-22-2004	Logged By : Brian Sperrazza
	Drilling Subcontractor	: Heber Mining & Exploration	Location : ERA Source Area
	Drill Rig	: CME-95 Hollow Stem Auger	Latitude : 33ø31'28.77222"N
1761-109	Driller	: Kevin	Longitude : 112ø04'54.23503"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel / % Sand / % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
0							Note: -SV = Soil Vapor Sample -S = Soil Sample -GW = Groundwater Sample -GT = Geotech Sample
5	SM		SILTY SAND, brown 7.5YR 4/3, moist, dense, fine to coarse sand, fine gravel.		10-16-21	07:05	SB4-05-SV =7.2 ug/L Headspace PID = 600 ppm
10	SM		SILTY SAND, light brown 7.5YR 6/3, dry, very dense, fine to coarse sand.		19-41-40		
15	SM		SILTY SAND, brown 7.5YR 5/4, damp, med. density.		10-11-14	07:30	SB4-15-SV = 22 ug/L SB4-15-S = <0.05 mg/Kg
20	SM		SILTY SAND, brown 7.5YR 4/4, dry, med. density.		16-16-19		
25	SM		SILTY SAND, light brown 7.5YR 6/3, damp, dense, fine to coarse sand, trace of fine gravel.		16-19-22	07:55	SB4-25-SV = 110 ug/L
30	SW-SM		WELL GRADED SAND WITH SILT, light brown 7.5YR 6/4, dry, very dense, fine to coarse sand, fine subrounded to subangular gravel.		37-50 for 5	08:20	
35	SM		SILTY SAND, brown 7.5YR 5/2, damp, very dense, fine to coarse sand.		21-35-36	08:30	SB4-35-SV = 100 ug/L
40	SM		Poorly Graded SILTY SAND, light brown 7.5YR 6/3, dry, dense, fine to med. sand with a trace of coarse sand.		16-19-20	08:45	SB4-41-GT
45	SM		SILTY SAND, light brown 7.5YR 6/3, damp, very dense, fine to med. sand.		37-40-50 for5	09:05	SB4-45-SV = 22 ug/L
50	ML						

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-4

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-22-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-22-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.77222"N
Driller	: Kevin	Longitude	: 112ø04'54.23503"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel, % Sand, % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
50	ML		SANDY SILT, strong brown 7.5YR 5/6, damp, very dense, fine sand, slight plasticity.		28-37-45	09:15	SB4-51-GT
55	SM		Well Graded SILTY SAND, light brown 7.5YR 6/3, less damp, very dense, fine to coarse sand, fine gravel.		29-36-21	09:30	SB4-55-SV = 590 ug/L
60	GM		Well Graded SILTY GRAVEL, light brown 7.5YR 6/3, dry, very dense, fine to med. subrounded to subangular gravel, fine to coarse sand.		50-30-20	09:45	
65	SM		Well Graded SILTY SAND, brown 7.5YR 5/4, less damp, very dense, fine to coarse sand, fine gravel.		21-30-32	10:00	SB4-65-SV = 1300 ug/L SB4-65-S = 0.075 mg/Kg
70	GM		Well Graded SILTY GRAVEL, light brown 7.5YR 6/3, dry, very dense, fine to med. subrounded to subangular gravel, fine to coarse sand.		36-50 for 5	10:15	
75	SC		CLAYEY SAND, light brown 7.5YR 6/3, less damp, very dense, fine to coarse sand, fine gravel, low to med. plasticity.		22-25-38	10:25	SB4-75-SV = 920 ug/L SB4-75-S = 0.16 mg/Kg
80			Same as previous.		16-20-24	10:45	SB4-80-SV = 1800 ug/L SB4-80-S = 0.55 mg/Kg
85					15-24-38		
	CL		CLAY, strong brown 7.5YR 4/6, moist, dense, fine sand, med. plasticity.				SB4-90-GW = 1300 ppb
90			CLAY, brown 7.5YR 4/4, moist, very dense, fine sand, med. plasticity.		49-50 for 3	11:35	TD of boring 90 ft bgs,
95							
100							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-5

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-22-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-23-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.32846"N
Driller	: Kevin	Longitude	: 112ø04'54.34640"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
0						Note: -SV = Soil Vapor Sample -S = Soil Sample -GW = Groundwater Sample -GT = Geotech Sample
5			SILTY SAND, light brown 7.5YR 6/3, dry, very dense, fine to coarse sand, fine gravel.	25-36-37		SB5-05-SV = 11 ug/L
10			Same as previous.	45-31-44	12:25	
15			SILTY SAND, light brown 7.5YR 6/3, less damp, very dense, fine to coarse sand, trace of fine gravel.	12-15-22		SB5-15-SV = 160 ug/L
20			Same as previous.	26-32-42		
25	SM		SILTY SAND, brown 7.5YR 5/4, less damp, very dense, fine to coarse sand.	18-27-32	12:55	SB5-25-SV = 140 ug/L
30			Same as previous.	26-39-50 for4		
35			Same as previous.	17-28-39	13:20	SB5-35-SV = 310 ug/L
40			Poorly Graded SILTY SAND, light brown 7.5YR 6/3, damp, very dense, fine sand, trace of fine gravel.	20-25-33	13:35	
45			Same as previous.	12-19-24	09:10	SB5-45-SV = 330 ug/L Headspace PID = 6509 ppm SB5-45-S = 0.13 mg/Kg
50						

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-5

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-22-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-23-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.32846"N
Driller	: Kevin	Longitude	: 112ø04'54.34640"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
50	SM	Same as previous.	20-42-50		SB5-50-GT Headspace PID = 9999 ppm
55	SW-SM	WELL GRADED SAND WITH SILT, light brown 7.5YR 6/4, damp, very dense, fine to coarse sand, finr to med. subrounded gravel.	20-32-38	09:30	SB5-55-SV = 1900 ug/L Headspace PID = 240 ppm SB5-55-S = <0.05 mg/Kg
60	SP-SM	POORLY GRADED SAND WITH SILT, brown 7.5YR 5/2, damp, very dense, fine sand, fine gravel.	37-50 for5		Headspace PID = 1126 ppm
65	SM	Poorly Graded SILTY SAND, light brown 7.5YR 6/4, moist, very dense, fine sand.	21-42-50 for5		SB5-65-SV = 2600 ug/L Headspace PID = 484 ppm SB5-65-S = 0.19 mg/Kg
70		Poorly Graded SILTY SAND, brown 7.5YR 5/3, moist, dense, fine sand.	13-18-29		SB5-70-GT Headspace PID = 105 ppm
75	ML	Sandy SILT, strong brown 7.5YR 4/6, moist, dense, fine sand, low plasticity.	20-22-41	10:35	SB5-75-SV = 630 ug/L Headspace PID = 9999 ppm
80		Sandy SILT, med. density.	8-13-17	10:50	SB5-80-SV = 2400 ug/L Headspace PID = 750 ppm SB5-80-S = 0.65 mg/Kg
85		Sandy SILT, strong brown 7.5YR 4/6, moist, med. density, fine sand, slight to low plasticity.	13-17-25		Headspace PID = 498 ppm
90	SM	Well Graded SILTY SAND, strong brown 7.5YR 4/6, moist to wet, very dense, fine to coarse sand, fine to med. gravel.	21-37-50 for4	11:15	SB5-90-GW = 2200 ppb Headspace PID = 990 ppm TD of boring 90 ft bgs.
95					
100					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-6

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-25-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-26-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'27.75961"N
Driller	: Kevin	Longitude	: 112ø04'53.56355"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Note: -SV = Soil Vapor Sample
-S = Soil Sample
-GW = Groundwater Sample

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
5	SM		Well Graded SILTY SAND, light brown 7.5YR 6/3, less damp, dense, fine to coarse sand, fine to med. subrounded gravel.	15-25-33	12:30	SB6-05-SV = 38 ug/L Headspace PID = 440 ppm
10	SM		Same as previous.	27-25-50 for5		Headspace PID = 1500 ppm
15	SM		Poorly Graded SILTY SAND, brown 7.5YR 4/3, damp, dense, fine to med. sand.	10-11-16	13:00	SB6-15-SV = 67 ug/L Headspace PID = 230 ppm
20	SM		Well Graded SILTY SAND, brown 7.5YR 5/3, less damp, very dense, fine to coarse sand, fine subrounded gravel.	24-27-33		Headspace PID = 8346 ppm
25	SM		Same as previous.	12-14-19		SB6-25-SV = 130 ug/L
30	SM		Well Graded SILTY SAND, brown 7.5YR 5/3, dry, very dense, fine to coarse sand, fine gravel.	31-50 for 5		Headsapce PID = 62 ppm
35	SM		Same as previous.	17-28-30	13:40	SB6-35-SV = 290 ug/L Headspace PID = 110 ppm
40	SM		Same as previous.	18-19-23		Headspace PID = 580 ppm
45	SM		Poorly Graded SILTY SAND, light brown 7.5YR 6/3, dry, dense, fine and coarse sand.	19-28-50 for5	14:10	SB6-45-SV = 180 ug/L Headspace PID = 110 ppm
50						

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-6

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-25-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-26-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'27.75961"N
Driller	: Kevin	Longitude	: 112ø04'53.56355"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
50	SM	Well Graded SILTY SAND, fine to coarse sand.	24-19-16	14:20	Headspace PID = 530 ppm
55	SW-SM	WELL GRADED SAND WITH SILT, light brown 7.5YR 6/4, less damp, dense, fine to coarse sand, fine to med. subrounded gravel.	15-19-20		SB6-55-SV = 840 ug/L Headspace PID = 550 ppm SB6-55-S = 0.069 mg/Kg
60		Same as previous.	26-40-50 for5	14:50	Headspace PID = 9999 ppm
65	SM	Well Graded SILTY SAND, brown 7.5YR 5/2, less damp, dense, fine to coarse sand, trace of fine gravel.	10-11-17	15:00	SB6-65-SV = 620 ug/L Headspace PID = 880 ppm SB6-65-S = 0.18 mg/Kg
70		Same as previous.	18-20-50 for5		Headspace PID = 9999 ppm
75		Same as previous.	29-46-50 for4	15:30	SB6-75-SV = 2100 ug/L SB6-75-S = 0.13 mg/Kg
80		Same as previous.			SB6-80-SV = 2400 ug/L
85	ML	Sandy SILT, brown 7.5YR 4/2, moist, low to med. plasticity fines, fine to coarse sand.		16:00	
90	SM	Well Graded SILTY SAND, brown 7.5YR 4/3, moist to wet, very dense, fine to coarse sand, fine to med. subrounded to subangular gravel.	27-38-50 for4	07:30	SB6-90-GW = 56 ppb TD of boring 90 ft bgs.
95					
100					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-7

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-26-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-26-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.64049"N
Driller	: Kevin	Longitude	: 112ø04'53.31560"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
0						Note: -SV = Soil Vapor Sample -S = Soil Sample -GW = Groundwater Sample -GT = Geotech Sample
5	SW-SM		WELL GRADED SAND WITH SILT, light brown 7.5YR 6/3, less damp, dense, fine to coarse sand, fine gravel.	11-13-21	10:00	SB7-05-SV = 72 ug/L Headspace PID = 9999 ppm SB7-05-S = <0.05 mg/Kg
10	GW-GM		WELL GRADED GRAVEL WITH SILT, pinkish gray 7.5YR 6/2, less damp, very dense, fine to med. gravel, fine to coarse sand.	22-36-38		
15	SM		Poorly Graded SILTY SAND, brown 7.5YR 5/4, damp to moist, med. density, fine and med. sand with trace of coarse sand.	8-10-11		SB7-15-SV = 200 ug/L Headspace PID = 9999 ppm
20			Well Graded SILTY SAND, light brown 7.5YR 6/3, less damp, very dense, fine to coarse sand, fine gravel.	26-33-40		
25	SW-SM		WELL GRADED SAND WITH SILT, brown 7.5YR 5/2, less damp, very dense, fine to coarse sand, fine to med. gravel.	25-25-28		SB7-25-SV = 110 ug/L Headspace PID = 9999 ppm
30	SM/ML		Poorly Graded SILTY SAND/Sandy SILT, brown 7.5YR 5/3, less damp, very dense, fine sand.	25-32-50 for5	10:50	Headspace PID = 9999 ppm
35			Same as previous.	15-25-28	11:00	SB7-35-SV = 1300 ug/L Headspace PID = 9999 ppm
40	SW-SM		WELL GRADED SAND WITH SILT, brown 7.5YR 5/4, less damp, dense, fine to coarse sand, fine subrounded gravel.	17-16-28	11:20	Headspace PID = 4200 ppm
45	SM/ML		Same as previous.	39-50 for 6		SB7-45-SV = 650 ug/L Headspace PID = 1500 ppm
50	SW-SM					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-7

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-26-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-26-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.64049"N
Driller	: Kevin	Longitude	: 112ø04'53.31560"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel / % Sand / % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
50	SW-SM		WELL GRADED SAND WITH SILT, brown 7.5YR 5/3, less damp, very dense, fine to coarse sand, fine gravel.		26-28-32		Headspace PID = 9999 ppm
55	SM		Well Graded SILTY SAND, brown 7.5YR 5/2, less damp, very dense, fine to coarse sand, fine gravel.		47-50 for 4	12:20	SB7-55-SV = 1700 ug/L Headspace PID = 1000 ppm SB7-55-S = <0.05 mg/Kg
60	SM/ML		Well Graded SILTY SAND/Sandy SILT, light brown 7.5YR 6/3, less damp, very dense, fine to coarse sand, fine subangular gravel.		41-50 for 4		Headspace PID = 1700 ppm
65			Same as previous.		30-25-41		SB7-65-SV =1700 ug/L Headspace PID = 880 ppm SB7-65-S = 0.11 mg/Kg
70			Same as previous.		50 for 1		Headspace PID = 830 ppm
75	SP-SM		POORLY GRADED SAND WITH SILT, brown 7.5YR 4/4, damp, very dense, mostly fine sand.		25-27-29	13:10	SB7-75-SV = 780 ug/L Headspace PID = 280 ppm
80	SM		Well Graded SILTY SAND, brown 7.5YR 4/4, damp, very dense, fine to coarse sand.		24-41-50 for 3	13:30	SB7-80-SV = 2700 ug/L Headspace PID = 120 ppm SB7-80-S = 0.31 mg/Kg
85	ML		Sandy SILT, strong brown 7.5YR 4/6, damp to moist, low to med. plasticity fines, fine to med. sand.		12-13-24		Headspace PID = 1000 ppm
90	SM/SC		Well Graded SILTY SAND/CLAYEY SAND, light brown 7.5YR 6/4, damp, very dense, fine to coarse sand, trace of fine gravel.		28-26-23	14:15	SB7-90-GT SB7-90-GW = 4800 ppb Headspace PID = 840 ppm TD of boring 90 ft bgs.
95							
100							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-8

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-27-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-27-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'29.57000"N
Driller	: Kevin	Longitude	: 112ø04'54.76961"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
0					Note: -SV = Soil Vapor Sample -S = Soil Sample -GW = Groundwater Sample
5	SW-SM	WELL GRADED SAND WITH SILT, light brown 7.5YR 6/2, dry, dense, fine to coarse sand, fine gravel with a trace of med. gravel.	22-24-21	08:55	SB8-05-SV = 1.2 ug/L Headspace PID = 1500 ppm
10		Same as previous.	43-50 for 4		Headspace PID = 8900 pm
15			23-24-27		SB8-15-SV = Not sampled Headspace PID = 77 ppm
20	SM	Poorly Graded SILTY SAND, brown 7.5YR 5/5, damp, dense, mostly fine sand with some med. sand. Same as previous.	28-33-41		Headspace PID = 65 ppm
25		Well Graded SILTY SAND, brown 7.5YR 5/2, damp, dense, fine to coarse sand, trace of fine gravel.	24-23-24		SB8-25-SV = Not sampled Headspace PID = 62 ppm
30	SW	WELL GRADED Gravelly SAND, grey 7.5YR 6/1, dry, dense, fine to coarse sand, fine to med. subrounded gravel.	16-19-39		Headspace PID = 40 ppm
35	SM	Well Graded SILTY SAND, brown 7.5YR 5/4, damp to moist, dense, fine to coarse sand.	17-25-38		SB8-35-SV = Not sampled Headspace PID = 85 ppm
40	SP	WELL GRADED SAND, grey 7.5YR 5/1, less damp, dense, mostly med. sand, trace of coarse gravel.	17-25-35	09:40	Headspace PID = 900 ppm
45	SM/ML	SILTY SAND, Sandy SILT, brown 7.5YR 5/4, moist, very dense, mostly fine sand.	30-22-31		SB8-45-SV = 11 ug/L Headspace PID = 100 ppm
50					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-8

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-27-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-27-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'29.57000"N
Driller	: Kevin	Longitude	: 112ø04'54.76961"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
50	SM/ML	Same as previous.	17-22-50 for4		Headspace PID = 1780 ppm
55	SP-SM	POOIRLY GRADED SAND WITH SILT, brown 7.5YR 5/3, damp, dense, mostly med. sand with some fine and coarse sand, trace of coarse gravel.	13-14-22		SB8-55-SV = 20 ug/L Headspace PID = 170 ppm
60	SW-SM	WELL GRADED SAND WITH SILT, brown 7.5YR 5/4, damp, very dense, fine to coarse sand, fine to med. subrounded gravel.	26-29-40		Headspace PID = 9999 ppm
65	SM	SILTY SAND, light brown 7.5YR 6/3, damp to moist, very dense, fine to coarse sand, trace of fine subrounded gravel.	62-50 for 5		SB8-65-SV = 25 ug/L Headspace PID = 80 ppm
70	SM/SC	SILTY SAND/ CLAYEY SAND, light brown 7.5YR 6/3, moist, very dense, fine and med. sand.	100 for 5		Headspace PID = 110 ppm
75	SM/ML	Poorly Graded SILTY SAND/ Sandy SILT, brown 7.5YR 5/4, moist, very dense, mostly fine sand.	24-29-40	11:30	SB8-75-SV = 97 ug/L Headspace PID = 220 ppm
80		Same as previous.	11-13-20		SB8-80-SV = 290 ug/L Headspace PID = 260 ppm SB8-80-S = <0.05 mg/Kg
85			14-15-23		Headspace PID = 30 ppm
90	ML	Clayey SILT, strong brown 7.5YR 4/6, moist, low to med. plasticity fines, fine sand.	32-50 for 5	12:05	SB8-90-GW = 1600 ppb Headspace PID = 30 ppm TD of boring 90 ft bgs.
95					
100					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-9

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-27-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-29-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'29.25775"N
Driller	: Kevin	Longitude	: 112ø04'53.66236"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Note: -SV = Soil Vapor Sample
-S = Soil Sample
-GW = Groundwater Sample

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
0						
5	SM		Well Graded SILTY SAND, light brown 7.5YR 6/3, dry to less damp, dense, fine to coarse sand, fine subrounded to subangular gravel.	15-20-23		SB9-05-SV = 4.5 ug/L Headspace PID = 210 ppm
10	SM		Same as previous.	22-23-32		Headspace PID = 110 ppm
15	SM		Well Graded SILTY SAND, brown 7.5YR 5/3, damp, dense, fine to coarse sand.	14-18-20		SB9-15-SV = Not sampled Headspace PID = 80 ppm
20	SM		Same as previous.	27-38-44		Headspace PID = 60 ppm
25	SM		Poorly Graded SILTY SAND, brown 7.5YR 5/2, damp, very dense, mostly fine sand.	23-32-37		SB9-25-SV = Not sampled
30	SM		Well Graded SILTY SAND, light brown 7.5YR 6/2, damp, very dense, fine to coarse sand, trace of fine gravel.	39-50 for 6		Headspace PID = 120 ppm
35	SM/ML		Poorly Graded SILTY SAND/ Sandy SILT, brown 7.5YR 4/3, damp, very dense, mostly fine sand, slight plasticity.	28-32-36		SB9-35-SV = Not sampled Headspace PID = 100 ppm
40	SM/ML			15-19-22		
	SW		WELL GRADED SAND, grey 7.5YR 6/2, dry, dense, fine to coarse sand, trace of fine gravel.			
45	ML		SILT with sand, brown 7.5YR 5/3, damp to moist, very dense, non to slight plasticity fines, fine sand.	29-41-48	14:49	SB9-45-SV = 130 ug/L
50						

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-9

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-27-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-29-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'29.25775"N
Driller	: Kevin	Longitude	: 112ø04'53.66236"W

CUTTINGS: % Gravel, % Sand, % Fines (20 40 60 80)

Depth in Feet	USCS	DESCRIPTION of Cuttings	Blow Count	Time	Samples Collected, PCE Results
50	SP-SM	POORLY GRADED SAND WITH SILT, light brown 7.5YR 6/3, less damp, very dense, mostly med. sand, trace of fine gravel.	22-25-36		
55	SW-SM	WELL GRADED SAND WITH SILT, light brown 7.5YR 6/3, dry, very dense, fine to coarse sand, fine to med. subangular gravel.	28-50 for 4		SB9-55-SV = 27 ug/L
	SM/ML	SILTY SAND, Sandy SILT.			
60	SW-SM	WELL GRADED SAND WITH SILT, light brown 7.5YR 6/3, dry, very dense, fine to coarse sand, fine to med. subangular gravel.	22-24-50 for5	15:25	
65	SM/ML	SILTY SAND, Sandy SILT, brown 7.5YR 5/4, damp to moist, dense, fine and med. sand.	17-27-30		SB9-65-SV = 46 ug/L
70		Same as previous.	66-50 for 4		
75		Same as previous.	19-28-34		SB9-75-SV = 230 ug/L
80	ML	Clayey Sandy SILT, strong brown 7.5YR 5/6, moist, med. density, low to med. plasticity fines, fine sand.	10-17-20		SB9-80-SV = 260 ug/L SB9-80-S = 0.52 mg/Kg
85		Same as previous.	12-15-20	08:30	Headspace PID = 530 ppm
	ML/SM	Sandy SILT/ SILTY SAND, strong brown 7.5YR 4/6, moist to wet, dense, low plasticity fines, fine to coarse sand, fine gravel.	17-21-29		SB9-90-GW = 9600 ppb Headspace PID = 15 ppm
90	CL	Sandy CLAY with silt, brown 7.5YR 5/3, moist to wet, dense to very dense, low plasticity fines, fine to coarse sand, trace of fine to med. gravel			
95					
100					

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-9

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-27-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 10-29-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'29.25775"N
Driller	: Kevin	Longitude	: 112ø04'53.66236"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel, % Sand, % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
100	CL		Sandy CLAY with silt, brown 7.5YR 5/3, moist to wet, dense to very dense, low plasticity fines, fine to coarse sand, trace of fine to med. gravel				
105							
110							
115							TD of boring 116' bgs.
120							
125							
130							
135							
140							
145							
150							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-10

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-28-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 11-1-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.90676"N
Driller	: Kevin	Longitude	: 112ø04'55.08940"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel / % Sand / % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
0							Note: -SV = Soil Vapor Sample -S = Soil Sample -GW = Groundwater Sample -GT = Geotech Sample
5	SM		Well Graded SILTY SAND, brown 7.5YR 5/3, less damp, med. density, fine to coarse sand, trace of fine gravel.		10-14-18		SB10-05-SV = 5.1 ug/L SB10-05-S = <0.05 mg/Kg
10			Same as previous.		13-16-17		
15	SM/ML		Poorly Graded SILTY SAND, Sandy SILT, brown 7.5YR 4/4, damp, dense, mostly fine and, slight plasticity fines.		15-18-25		SB10-15-SV = Not sampled
20			Same as previous.		20-19-17		
25	SM		Well Graded SILTY SAND, brown 7.5YR 5/3, damp, very dense, fine to coarse sand, trace of fine gravel.		25-49-34		SB10-25-SV = Not sampled
30	SW-SM		WELL GRADED SAND WITH SILT, grey 7.5YR 6/2, dry, dense, fine to coarse sand, fine and med. gravel.		16-17-24		
35	SM		Well Graded SILTY SAND, brown 7.5YR 4/2, damp to moist, very dense, fine to coarse sand, fine gravel.		32-36-42		SB10-35-SV = Not sampled
40	SM/ML		Poorly Graded SILTY SAND, Sandy SILT, strong brown 7.5YR 4/6, moist, very dense, fine and med. sand, low plasticity fines.		19-36-40		
45					22-38-40		SB10-45-SV = 50 ug/L
50	ML		SILT, brown 7.5 YR 5/3, moist, very dense, slight plasticity fines, fine sand.				

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MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-10

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-28-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 11-1-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.90676"N
Driller	: Kevin	Longitude	: 112ø04'55.08940"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel, % Sand, % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
50	SM		Well Graded SILTY SAND.		42-50 for 4		
55	SW-SM		WELL GRADED SAND WITH SILT, gray 7.5YR 6/2, less damp, very dense, fine to coarse sand, fine to med. subrounded to subangular gravel.		18-20-23		SB10-55-SV = 67 ug/L
60	SM		Well Graded SILTY SAND, strong brown 7.5YR 5/6, damp to moist, very dense, fine to coarse sand, trace of fine gravel.		18-50 for 4	12:15	
65	SM/SC		Well Graded SILTY SAND/ CLAYEY SAND, brown 7.5YR 5/2, moist, very dense, fine to coarse sand.		41-50 for 5		SB10-65-SV = 93 ug/L
70			Same as previous.		36-50 for 5		
75	ML/CL		Sandy SILT/ CLAY, brown 7.5YR 4/3, moist, dense, low plasticity fines, fine sand.		16-23-35		SB10-75-SV = 57 ug/L
80			Same as previous.		14-16-22		SB10-80-SV = 160 ug/L (est.) SB10-80-S = 0.36 mg/Kg
85			Sandy SILT/ CLAY, strong brown 7.5YR 4/6, moist, low plasticity fines, fine to coarse sand, trace fine gravel.		16-18-23	13:55	
90	SM		Well Graded SILTY SAND, brown 7.5YR 5/2, wet, very dense, fine to coarse sand, fine to med. gravel.		21-40-41		SB10-90-GW = 1600 ug/L
95			Poorly Graded SILTY SAND, light brown 7.5YR 6/2, moist to wet, dense, fine sand.		19-23-28	10:15	
100							

03-24-2005

MALCOLM PIRNIE

Lithologic Log for Soil Boring SB-10

7th Avenue and Bethany Home Road
ADEQ
ERA Site Investigation
Phoenix, Arizona

1761-109

Start Date	: 10-28-2004	Sampling Method	: Mini-probe, Hydropunch
Finish Date	: 11-1-2004	Logged By	: Brian Sperrazza
Drilling Subcontractor	: Heber Mining & Exploration	Location	: ERA Source Area
Drill Rig	: CME-95 Hollow Stem Auger	Latitude	: 33ø31'28.90676"N
Driller	: Kevin	Longitude	: 112ø04'55.08940"W

Depth in Feet	USCS	GRAPHIC	DESCRIPTION of Cuttings	CUTTINGS (% Gravel, % Sand, % Fines; 20 40 60 80)	Blow Count	Time	Samples Collected, PCE Results
100	SM		Same as previous.		25-35-50for3		
105	ML		Sandy Clayey SILT, brown 7.5YR 5/3, moist to wet, low to med. plasticity fines, fine sand.		20-20-31		
110			Same as previous.		22-24-37		
115			Same as previous.		42-29-34	11:15	SB10-115-GT TD of boring 116' bgs.
120							
125							
130							
135							
140							
145							
150							

03-24-2005

MALCOLM PIRNIE

Boring Log for Vapor Boring VB-1

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Auger
Finish Date	: Oct. 10, 2006	Driller, Helpers	: Miguel, Auran
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0		ML		Light brown Sandy SILT, trace to little Gravel, slightly plastic, DRY, sand is fine to medium grained.	10	20	70
5							
10							
15		ML		Light brown to light grey Sandy SILT, trace to little Gravel, slightly plastic, DRY.	5	25	70
20							
25		SM		Dark brown Silty SAND, Poorly graded, trace Gravels, loose to slightly plastic, DRY.			
30							
35		SW-SM		Light brown to dark brown SAND with Silt, some Gravel, trace clay, well graded, DRY.	20	70	10
40							

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MALCOLM PIRNIE

Boring Log for Vapor Boring VB-1

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Auger
Finish Date	: Oct. 10, 2006	Driller, Helpers	: Miguel, Auran
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
40		SW-SM					
45		ML		Light brown-light grey SILT with Sand, trace Clays, slightly plastic, DRY.	5	30	65
50							
55		ML-SP		Light brown to grey Sandy SILT, trace Clays and Gravels, slightly plastic, DRY, sand is medum grained and poorly graded.	5	30	65
60							
65		SP-SM		Light brown, fine to medium grained SAND with Silt, trace Clays and Gravels, poorly graded, slighlty moist.	T	90	10
70							
75		ML		Light to dark Brown Sandy SILT with Clay, trace gravel, slightly plastic, moist.	5	25	70
80							

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MALCOLM PIRNIE

Boring Log for Vapor Boring VB-2

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Auger
Finish Date	: Oct. 10, 2006	Driller, Helpers	: Miguel, Auran
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Ryan Schaefer	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0		ML-SM		Light brown Sandy SILT, small amounts of Gravels, Low plasticity, DRY.			
5							
10		ML		Light brown Sandy Silt with traces of Gravel, slightly plastic, DRY	10	20	70
15							
20		CL		Brown to dark brown, Silty CLAY with Sand, traces of Gravel, slightly moist, moderately plastic.	5	30	65
25							
30		SW-SM		Grey to dark grey SAND with Gravels, traces of Silt, well graded, loose, DRY	5	25	70
35							
40					5	90	5

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MALCOLM PIRNIE

Boring Log for Vapor Boring VB-2

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Auger
Finish Date	: Oct. 10, 2006	Driller, Helpers	: Miguel, Auran
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Ryan Schaefer	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
40							
45		ML-CL		Light brown to brown Sandy SILT with Clay, traces of Gravels, low to moderate plasticity, DRY, soft.			
50					5	25	70
55		SM		Light to dark brown Silty SAND with small amounts of Gravels, soft, slightly plastic, poorly graded, DRY.			
60					5	50	45
65		ML-SM		Light to dark brown Sandy SILT with Clay and trace Gravels, low to moderate plasticity, soft, DRY			
70					T	30	70
75		ML		Brown to dark brown Clayey SILT with Sand, small amounts of Gravels, soft, slighty moist, low to moderately plastic.			
80					5	20	75

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Boring Log and Construction for Monitor Well MW-6

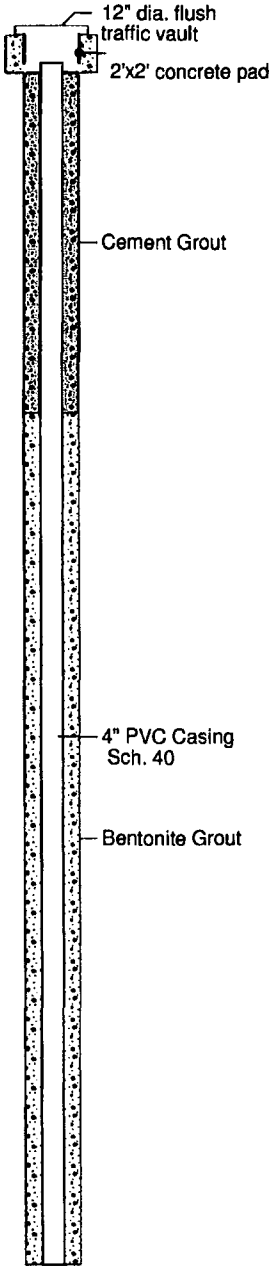
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
Off-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Sept. 19, 2005	Drill Rig	: Auger, BK-81
Finish Date	: Sept. 21, 2005	Driller, Helpers	: Andrew, Steve & David
Location	: 352 W. Berridge Ln, Phx, AZ	Sampling Method	: Split-Spoon
Logged By	: Chris Stinson	Northing	: 33o, 31', 32.8 " N
Drilling Subcontractor	: Yellow Jacket Drilling	Easting	: 112o, 4', 49.5" W

ADWR ID: 55-206275
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines	Blows per 6"	Time
0–10		CL		Sandy CLAY, brown 7.5YR 5/4, dry, med plasticity fines, fine to coarse sand, fine sub-angular gravel.	10	25	65	12 20 23	0930
10–20		ML		Clayey SILT, brown 7.5YR 5/3, dry, low plasticity fines, fine sand.	0	5	95	11 13 30	0949
20–30		SM		Well Graded SILTY SAND, brown 7.5YR 5/4, dry, fine to coarse sand, non-plastic fines, fine sub-angular gravel.	15	55	30	13 18 32	1012
30–40		SW		WELL GRADED SAND, brown 7.5YR 5/3, dry, fine to coarse sand, fine sub-angular gravel.	15	85	<5	13 18 25	1056
40–50		SW-SM		WELL GRADED SAND WITH SILT, pinkish gray 7.5YR 6/2, dry, fine to coarse sand, fine sub-angular gravel, non-plastic fines.	25	60	15	20 20 27	1130
50–65		GP		POORLY GRADED GRAVEL, light gray 7.5YR 7/1, dry, fine sub-angular gravel, fine to coarse sand, trace of fines.	55	40	5	20 50 f 5	1224



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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-6

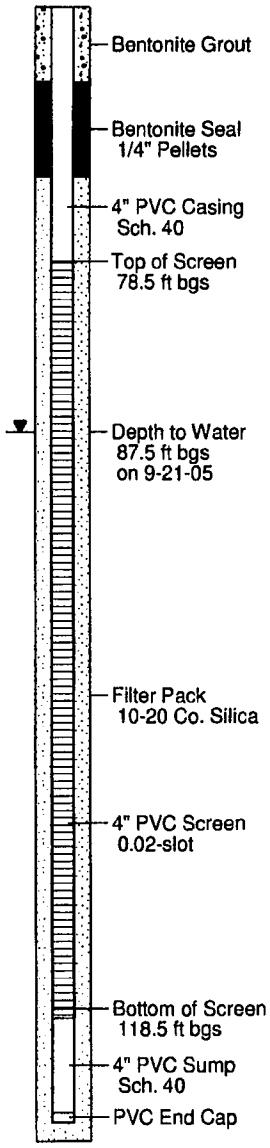
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
Off-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Sept. 19, 2005	Drill Rig	: Auger, BK-81
Finish Date	: Sept. 21, 2005	Driller, Helpers	: Andrew, Steve & David
Location	: 352 W. Berridge Ln, Phx, AZ	Sampling Method	: Split-Spoon
Logged By	: Chris Stinson	Northing	: 33o, 31', 32.8 " N
Drilling Subcontractor	: Yellow Jacket Drilling	Easting	: 112o, 4', 49.5" W

ADWR ID: 55-206275
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines	Blows per 6"	Time
65–70		ML		Sandy SILT, brown 7.5YR 5/4, dry, slight plasticity fines, fine sand.	0	40	60	21 50	1415
70–75		SM		Poorly Graded SILTY SAND, brown 7.5YR 5/4, dry to damp, fine sand, non-plastic fines.	0	60	40	18 32 41	1438
75–80		CL		Silty CLAY, brown 7.5YR 5/3, damp, low to med plasticity fines, fine sand.	0	25	75	17 24 50	1455
80–85		ML		Sandy SILT, brown 7.5YR 5/3, damp to moist, low plasticity fines, fine sand.	0	35	65	12 30 50 f 5	1534
85–90		GM		Poorly Graded SILTY GRAVEL, brown 7.5YR 5/4, moist, fine angular to sub-angular gravel, fine to coarse sand, non-plastic fines.	60	20	20	50 f 6	1555
90–95		SM		Well Graded SILTY SAND, brown 7.5YR 5/3, wet, fine to coarse sand, non-plastic fines, fine to med sub-rounded gravel.	10	55	35	10 12 40	1621
95–100		SW		WELL GRADED Gravelly SAND, brown 7.5YR 5/3, wet, fine to coarse sand, fine to med sub-angular gravel.	30	70	<5	12 41 50 f 5	1656
100–105		SM		Well Graded SILTY SAND, pink 7.5YR 7/3, wet, fine to coarse sand w/ CaCO3 cementing, non-plastic fines, fine sub-angular gravel.	5	65	30	21 50 f 4	0740
105–110		ML		Sandy SILT, brown 7.5YR 5/3, wet, non-plastic fines, fine to coarse sand, trace of fine gravel.	5	35	60	20 50 f 5	0835
110–115				Sandy SILT, brown 7.5YR 5/3, wet, low plasticity fines, fine sand.	0	20	80	8 15 50	0950
115–120				Sandy SILT, light brown 7.5YR 6/3, wet, non-plastic fines cemented w/CaCO3, fine to coarse sand.	0	40	60	20 50 f 6	1115
120–125		CL		CLAY, brown 7.5YR 5/3, wet, med. plasticity fines.	0	5	95	12 15 35	1300
125–130									



09-21-2005

MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-7

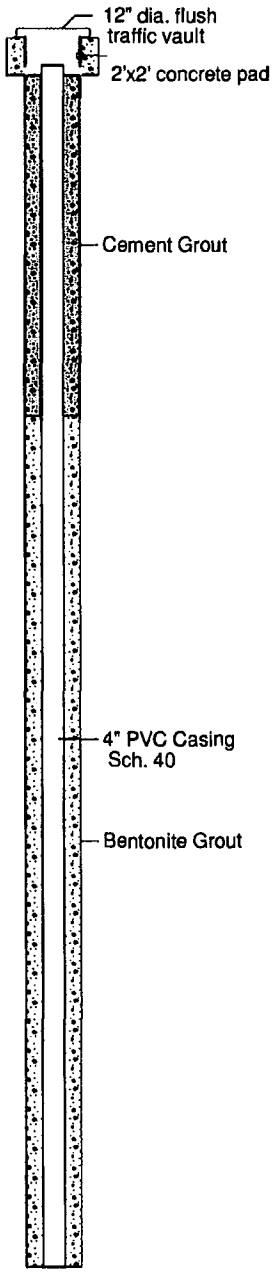
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
Off-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Sept. 14, 2005	Drill Rig	: Auger, BK-81
Finish Date	: Sept. 16, 2005	Driller, Helpers	: Andrew, Steve & Bruce
Location	: 522 W. Rose Ln, Phx, AZ	Sampling Method	: Split-Spoon
Logged By	: Chris Stinson	Northing	: 33o, 31', 39.2" N
Drilling Subcontractor	: Yellow Jacket Drilling	Easting	: 112o, 4', 52.6" W

ADWR ID: 55-206276
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines	Blows per 6"	Time
0–5		CL		CLAY, strong brown 7.5YR 5/6, dry, med to high plasticity fines, fine sand.	0	10	90	6 5 6	1505
10–20		ML		Clayey SILT, brown 7.5YR 5/4, dry, low plasticity fines, fine sand.	0	10	90	8 12 22	1515
25–30		ML		Sandy SILT, brown 7.5YR 5/3, dry, slight plasticity fines, fine sand.	0	25	75	11 40 28	1535
35–40		ML		Sandy SILT, light brown 7.5YR 6/3, dry, slight plasticity fines, fine sand.	0	25	75	19 42 50 f 5	1555
45–50		SW		WELL GRADED SAND, brown 7.5YR 5/4, dry, fine to coarse sand, fine sub-rounded gravel, non-plastic fines.	10	85	5	16 18 18	1612
55–60		SM		Well Graded SILTY SAND, light brown 7.5YR 6/3, dry, fine to coarse sand, non-plastic fines, fine sub-angular gravel.	10	45	45	45 50 f 2	1645
60–65		CL							



09-21-2005

MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-7

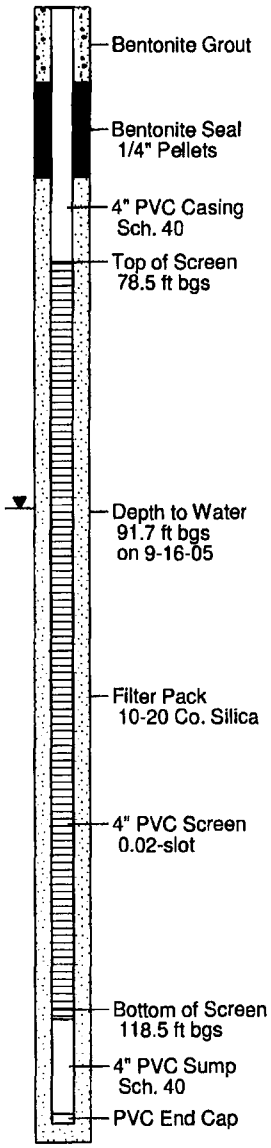
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
Off-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Sept. 14, 2005	Drill Rig	: Auger, BK-81
Finish Date	: Sept. 16, 2005	Driller, Helpers	: Andrew, Steve & Bruce
Location	: 522 W. Rose Ln, Phx, AZ	Sampling Method	: Split-Spoon
Logged By	: Chris Stinson	Northing	: 33o, 31', 39.2" N
Drilling Subcontractor	: Yellow Jacket Drilling	Easting	: 112o, 4', 52.6" W

ADWR ID: 55-206276
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines	Blows per 6"	Time
65		CL		Silty CLAY, light brown 7.5YR 6/4, dry, med. plasticity fines, fine sand.	0	15	85	28 50 f 4	0815
70									
75				Silty CLAY, brown 7.5YR 5/4, damp to dry, med plasticity fines, fine sand.	0	15	85	12 32 50 f 5	0845
80		ML		SILT, brown 7.5YR 5/4, dry to damp, low plastcity fines, fine sand.	0	20	80	18 42 50 f 5	0912
85		CL		CLAY, light brown 7.5YR 6/3, dry, med to high plasticity fines, fine sand.	0	5	95	40 50 f 5	0934
90		ML		Clayey SILT, brown 7.5YR 5/3, dry to damp, low plasticity fines, fine sand.	0	10	90	28 38 50 f 5	0951
95		SM		Poorly Graded SILTY SAND, light brown 7.5YR 6/3, moist, fine sand, non-plastic fines, some 1/4" to1/2" pieces cemented w/ CaCO3.	0	60	40	27 50	1018
100		GM		Well Graded SILTY GRAVEL, brown 7.5YR 5/3, wet, fine to med sub-angular gravel, fine to coarse sand, non-plastic fines.	50	30	20	30 50 f 2	1044
105		ML		Sandy SILT, light brown 7.5YR 6/3, dry, slight plasticity fines, fine sand, upper 2" of split-spoon is sand and gravel.	0	25	75	22 25 50 f 2	1218
110				Sandy SILT, brown 7.5YR 5/3, wet, low plasticity fines, fine sand.	0	20	80	20 50	1255
115				Clayey SILT, brown 7.5YR 5/4, wet, low plasticity fines, fine sand.	0	15	85	20 32 50 f 5	1345
120				Sandy SILT, brown 7.5YR 5/3, wet, non-plastic fines, fine sand.	0	20	80	30 50 f 2	1430
125				Sandy SILT, brown 7.5YR 5/4, wet, low plasticity fines, fine to med sand.	0	25	75	20 50 f 5	1555
130									



09-21-2005

MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-8

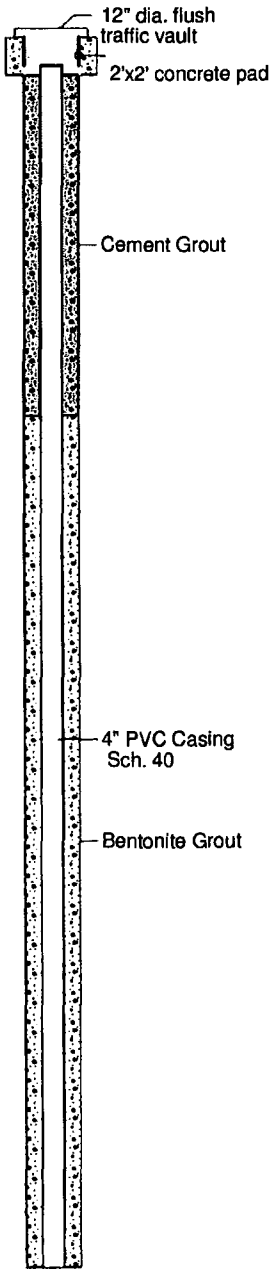
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
Off-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Sept. 12, 2005	Drill Rig	: Auger, BK-81
Finish Date	: Sept. 14, 2005	Driller, Helpers	: Andrew, Steve & Bruce
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Split-Spoon
Logged By	: Chris Stinson	Northing	: 33o, 31', 40.7" N
Drilling Subcontractor	: Yellow Jacket Drilling	Easting	: 112o, 05', 00.5" W

ADWR ID: 55-206274
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines	Blows per 6"	Time
0									
5		ML		Clayey SILT/ Silty CLAY, light brown 7.5YR 6/4, dry, med. plasticity fines, fine to med sand, trace of fine gravel.	5	15	80	11 23 23	0840
10				Sandy SILT, light brown 7.5YR 6/3, dry, low plasticity fines, fine to coarse sand, fine subangular gravel.	5	25	70	12 15 26	0850
15		CL		Silty CLAY, pink 7.5YR, 7/4, dry, med to high plasticity fines, fine sand, fine gravel.	T	5	95	18 18 20 f 5	0900
20				Silty CLAY, pink 7.5YR 7/4, dry, med. plasticity fines, fine sand.	0	5	95	35 50 f 5	0910
25		ML		Sandy SILT, pink 7.5 YR 7/3,m dry, low to med plasticity fines, fine to coarse sand, fine angular gravel.	5	25	70	18 20 7	0920
30		SW		WELL GRADED SAND, light brown 7.5YR 6/3, dry, fine to coarse sand, fine to med sub-angular gravel.	35	65	<5	18 25 48	0926
35		ML		Clayey SILT, pink 7.5YR 7/3, dry, low to med plasticity fines, fine to med sand.	0	10	90	20 50 f 5	0936
40		SW		WELL GRADED SAND, pinkish gray 7.5YR 6/2, dry, fine to coarse sand, fine to sub-angular gravel.	15	85	<5	13 25 35	0948
45		ML		Sandy SILT, pink 7.5YR 7/3, dry, slight plasticity fines, fine sand.	0	40	60	18 26 26	0958
50		SM		Well Graded SILTY SAND, light brown 7.5YR 6/4, dry, fine to coarse sand, slight to non-plastic fines.	0	50	50	20 31 50	1012
55		SW		WELL GRADED SAND, light brown 7.5YR 6/4, dry, fine to coarse sand, fine sub-angular gravel.	10	90	<5	21 40 35	1029
60		SM		SILTY SAND, light brown 7.5YR 6/4, dry, fine to coarse sand, low plasticity fines, fine sub-angular gravel.	5	55	40	45 50 f 3	1058
65									



09-21-2005

MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-8

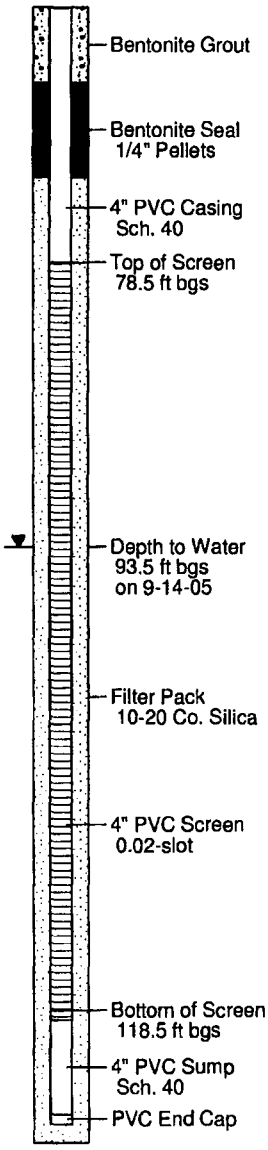
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
Off-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Sept. 12, 2005	Drill Rig	: Auger, BK-81
Finish Date	: Sept. 14, 2005	Driller, Helpers	: Andrew, Steve & Bruce
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Split-Spoon
Logged By	: Chris Stinson	Northing	: 33o, 31', 40.7" N
Drilling Subcontractor	: Yellow Jacket Drilling	Easting	: 112o, 05', 00.5" W

ADWR ID: 55-206274
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines	Blows per 6"	Time
65		ML		Sandy SILT, light brown 7.5YR 6/3, dry, low to med plasticity fines, fine to coarse sand, cemented w/CaCO3.	0	35	65	36 50 f 5	1140
70		CL		Silty CLAY, light brown 7.5YR 6/3, med plasticity fines, fine sand, cemented w/CaCO3.	0	5	95	50 f 5	1310
75				Silty CLAY, same as at 70 ft bgs.	0	5	95	25 50 f 5	1330
80				Silty CLAY, light brown 7.5YR 6/3, damp, med plasticity fines, fine sand, some CaCO3 cementing.	0	10	90	30 50 f 3	1519
85		ML		Clayey SILT, brown 7.5YR 5/3, moist, low plasticity fines, fine sand.	0	20	80	20 45 50 f 5	1550
90				Sandy SILT, brown 7.5YR 5/3, damp to moist, low plasticity fines, fine to med sand.	0	20	80	23 50	1607
95				Sandy SILT, brown 7.5YR 5/3, damp to moist, slight plasticity fines, fine sand.	0	20	80	20 50 f 4	0800
100		SM		Well Graded SILTY SAND, light brown 7.5YR 6/3, moist to wet, fine to coarse sand, non-plastic fines.	10	50	40	17 40 50 f 5	0820
105		CL		CLAY with Sand, pinkish gray 7.5YR 6/2, moist, med to high plasticity fines, fine to med sand.	0	15	85	35 50 f 2	0900
110				CLAY with Sand, brown 7.5YR 5/3, wet, med plasticity fines, fine sand.	0	15	85	20 50	0932
115				CLAY, same as at 110 feet bgs.	0	15	85	18 45 50 f 3	1025
120		ML		Sandy SILT, brown 7.5YR 5/4, wet, slight plasticity fines, fine sand.	0	25	75	20 50 f 5	1110
125				Sandy SILT, brown 7.5YR 5/4, wet, slight plasticity fines, fine sand.	0	30	70	14 35 50 f 2	1145
130									



09-21-2005

MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-9

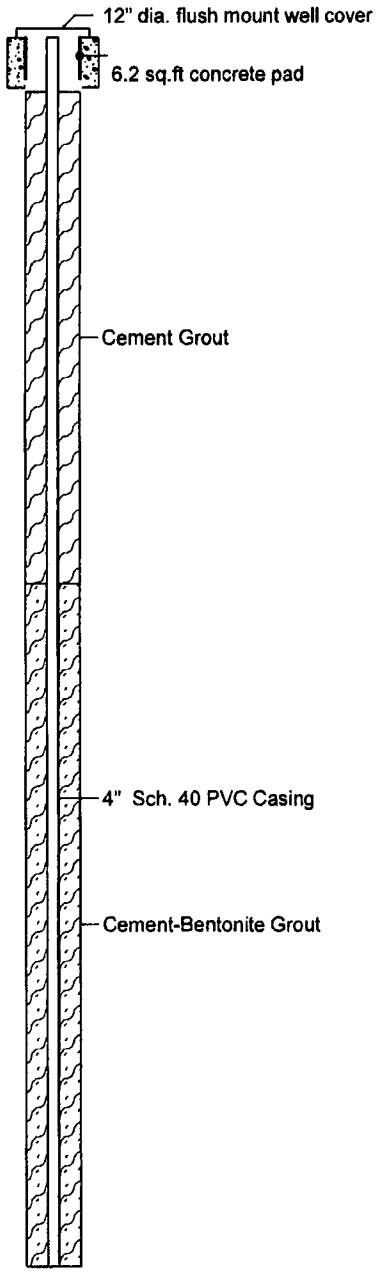
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Sonic, supersonic 2
Finish Date	: Oct. 11, 2006	Driller, Helpers	: Travis, James, Eric
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Core Barel
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0		ML-SP		Light brown Sandy SILT with Clay, trace Gravel, moderately plastic, DRY.			
5		CL-SP		Light brown-light gray sandy CLAY with Silt, little Sand and Gravel, medium stiff, slightly to moderately plastic, DRY.	15	15	70
15		ML/CL		Light brown to dark brown SILT and CLAY. trace Sand, trace Gravel, slightly plastic, DRY.	T	5	95
20		CL-SP		Light brown -gray sandy CLAY and SILT, trace to little Gravel, mediun stiff, moderately plastic, DRY.	10	25	65
25		CL-SP		Light brown-gray sandy CLAY with Gravel, moderately plastic, DRY.	10	25	65
35		SW-GW		Light to dark gray SAND and GRAVEL, trace Silt, well graded, very loose, DRY.	30	60	5
40		ML/CL		Light to dark brown SILT and CLAY, trace Sand, trace Gravel, moderately stiff-stiff, moderately plastic, DRY.	T	5	95
45							



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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-9

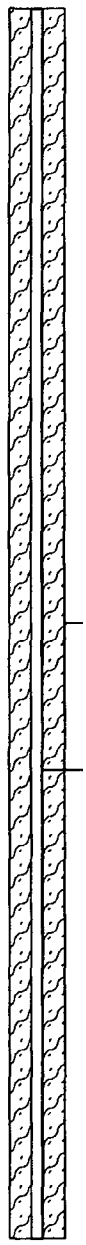
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Sonic, supersonic 2
Finish Date	: Oct. 11, 2006	Driller, Helpers	: Travis, James, Eric
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Core Barel
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Lithologic Description of Soil	% Gravel	% Sand	% Fines
45		ML/CL				
50		ML-SP	Light brown sandy SILT, slightly to non plastic, DRY.	T	45	55
55		SM	Light brown silty SAND, little Gravel, trace Clay, poorly graded, slightly loose, DRY.	10	60	30
		CL	Light brown CLAY with Silt, trace sand, trace Gravel, moderately plastic, DRY.	60	30	10
60		GW	Light gray GRAVEL with Sand and Silt, well graded, slightly loose, DRY.	5	10	85
65		CL	Light brown CLAY with Silt, little Sand, trace Gravel, moderately plastic, medium stiff to stiff, DRY.			
70						
75		SC	Light -dark brown clayey SAND, trace to little Gravel, slightly plastic, DRY.	5	80	15
80		ML	Light brown -gray SILT with Sand, trace Gravel, trace Clay, slighly to non plastic, soft, DRY.			
85		ML	Light brown -light gray SILT with Gravel, some Clay, medium stiff, slightly plastic, DRY to MOIST.	10	5	85
90			PID = 4.1 ppm			



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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-9

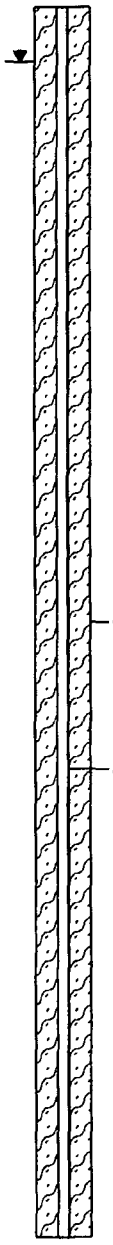
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Sonic, supersonic 2
Finish Date	: Oct. 11, 2006	Driller, Helpers	: Travis, James, Eric
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Core Barel
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Lithologic Description of Soil	% Gravel	% Sand	% Fines
90		ML				
95		ML	Light brown to gray SILT with Sand and clay, stiff, slightly plastic, DRY to MOIST.	0	20	80
			PID = 0.2 ppm	5	5	90
100		ML	Light gray SILT with Clay, trace to little Sand, trace Gravel, slightly to moderately plastic, MOIST.			
			PID = 0.0 ppm			
105			PID = 0.0 ppm			
110			PID = 0.0 ppm	10	50	40
		SM	light brown-gray silty SAND, little Gravel, poorly graded, WET.	5	5	90
115		ML/CL	Light brown-gray SILT and CLAY, stiff, moderately plastic, MOISt to WET.	0	15	85
			PID = 0.0 ppm			
120		ML	Light brown-gray SILT with Clay, little Sand, trace to little Gravel, slightly plastic, moderately stiff, MOIST.	5	10	85
				15	5	80
125		ML	Brown-gray SILT with Sand and Gravel, little Clay, slightly plastic, moderately stiff, MOIST. Sand is poorly graded, gravel is well graded.	15	10	75
		ML		T	10	90
130		ML	Brown -gray SILT with Clay, little Sand, slightly plastic, moderately stiff, MOIST to WET.	T	10	90
			Light gray SILT, little Sand, trace Gravel, slightly to non plastic, MOIST to WET.			
135						



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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-9

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Sonic, supersonic 2
Finish Date	: Oct. 11, 2006	Driller, Helpers	: Travis, James, Eric
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Core Barel
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	% Gravel	% Sand	% Fines
135		ML			5	10	85
		ML		Light gray SILT, little Clay, little Sand, trace Gravel, slightly to non plastic, soft to medium stiff, MOIST to WET.			
140		ML		Light gray SILT with Sand, trace to little Gravel, trace Clay, slightly plastic, soft to medium stiff, MOIST to WET.	5	35	60
145		ML		Light brown to gray SILT, trace Sand, trace Gravel, non plastic, soft to medium stiff, MOIST to WET.	5	5	90
150				PID = 0.0 ppm			
155				PID = 0.0 ppm			
160				PID = 0.0 ppm	5	5	90
		ML		Light brown to gray SILT, trace Sand, trace Gravel, slightly non plastic, MOIST to WET.	T	10	90
165		CL		Light gray sandy CLAY, some Silt, slightly plastic, stiff to very stiff, MOIST.			
170		ML		Light brown to gray SILT, trace to little Sand, trace Clay, non plastic to slightly plastic, MOIST to WET.	25	20	55
		CL		Light gray CLAY, some Sand, some Gravel, little Silt, slightly to non plastic, stiff to very stiff, MOIST. Sand and Gravel are well graded.	T	55	45
175		SP		Light to dark brown very fine SAND, some Silt, poorly graded, loose, WET.	T	85	15
		SP		Light brown to dark brown very fine SAND, trace to little Silt, poorly graded, loose, WET.	T	85	15
180							

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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-9

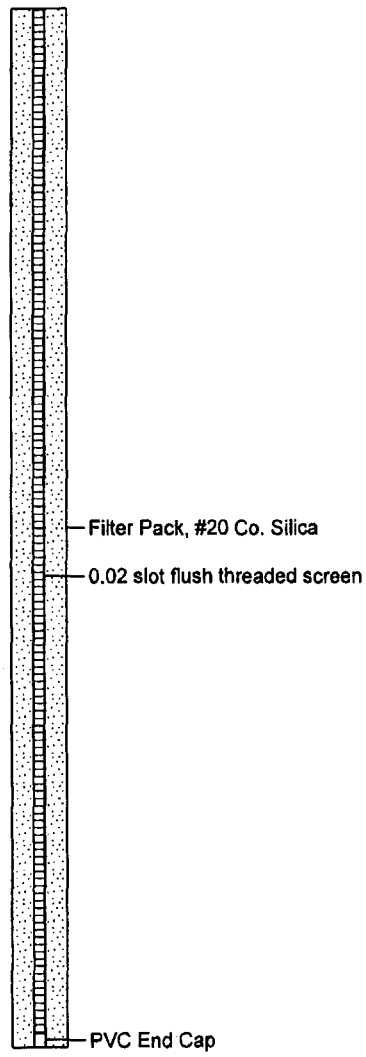
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-109

Start Date	: Oct. 9, 2006	Drill Rig	: Sonic, supersonic 2
Finish Date	: Oct. 11, 2006	Driller, Helpers	: Travis, James, Eric
Location	: 712 W. Rose Ln, Phx, AZ	Sampling Method	: Core Barel
Logged By	: Adrian Ezeagu	Northing	: 33.52 degrees N
Drilling Subcontractor	: WDC	Easting	: 112.08 degrees W

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
180		SP		Ligh to dark brown very fine SAND, trace to little Silt, poorly graded, loose, WET. PID = 0.0 ppm	T	85	15
185		ML		Light brown SILT, little to some Sand, trace Gravel, trace Clay, slightly plastic, MOIST to WET. PID = 0.0 ppm	5	10	85
190		CL		Light gray gravelly CLAY, some SAND, little Silt, medium stiff to stiff, slightly plastic, MOIST. Gravel is well graded. PID = 0.0 ppm	25	20	55
195		ML		Light brown SILT, little to some Sand, trace Gravel, slightly plastic, WET.	5	15	80
		SP		Light brown to gray SAND with Silt, trace Gravel, trace Clay, slightly loose, WET.			
200		CL		Light gray gravelly sandy CLAY, slightly plastic, medium stiff, MOIST. Sand is well graded.	20	25	55
205		SP		Light brown to gray very fine SAND, trace Silt, poorly graded, loose, WET.	T	80	10
		ML		Light brown SILT, trace Sand, slightly to non plastic, MOIST to WET.	5	5	85
210		SP		Light brown to gray fine SAND, trace Silt, poorly graded, loose, WET.	T	95	5
		ML/CL		Light brown SILT and CLAY, little SAND, slightly to moderately plastic, stiff, MOIST to WET.	5	5	90
215		ML		Light gray SILT, little SAND, little Gravel, slightly to non plastic, MOIST to WET.	10	10	80
220		CL		Light gray gravelly sandy CLAY, little to trace Silt, slightly plastic, medium stiff to stiff, MOIST, Sand and Gravel are well graded.	20	25	55
225					15	10	75



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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-10

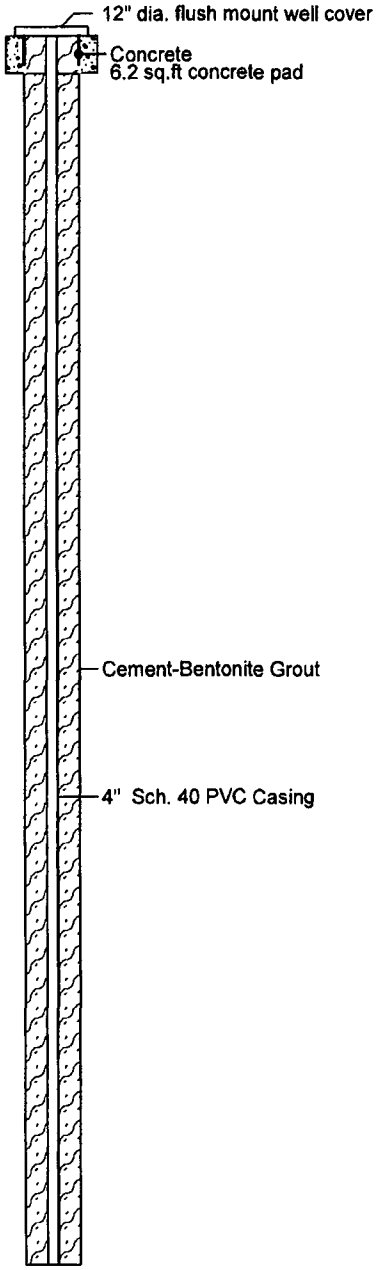
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-112

Start Date	: April 16, 2007	Drill Rig	: 10" HSA (CME 95)
Finish Date	: April 18, 2007	Driller, Helpers	: Jose, Brian, Miguel
Location	: Berridge Ln, Phx, AZ	Sampling Method	: Split Spoon
Logged By	: Adrian Ezeagu	Northing	:
Drilling Subcontractor	: WDC	Easting	:

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0							
10		CL		Light brown Sandy CLAY, trace Gravel, moderately plastic, DRY. PID = 0.2 ppm	10	20	70
20		ML		Light to dark brown clayey SILT, little Gravel, trace to little Sand, low to moderate plasticity, DRY. PID = 0.3 ppm	5	10	85
30		SM		Light brown to gray silty SAND, little coarse Gravel, trace to little Clay, poorly graded, DRY. Gravel is angular. PID = 0.4 ppm	10	50	40
40		ML		Light gray SILT, little Sand, little Clay, slightly plastic, DRY.	5	45	50
50		ML		Light brown-gray SILT with Sand, little fine to coarse Gravel, slightly to moderately plastic, DRY to MOIST.	10	40	50
60		ML		Light brown-gray SILT with Sand, little fine to coarse Gravel, slightly to moderately plastic, DRY to MOIST. PID = 0.1 ppm	10	40	50



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MALCOLM PIRNIE

Boring Log and Construction for Monitor Well MW-10

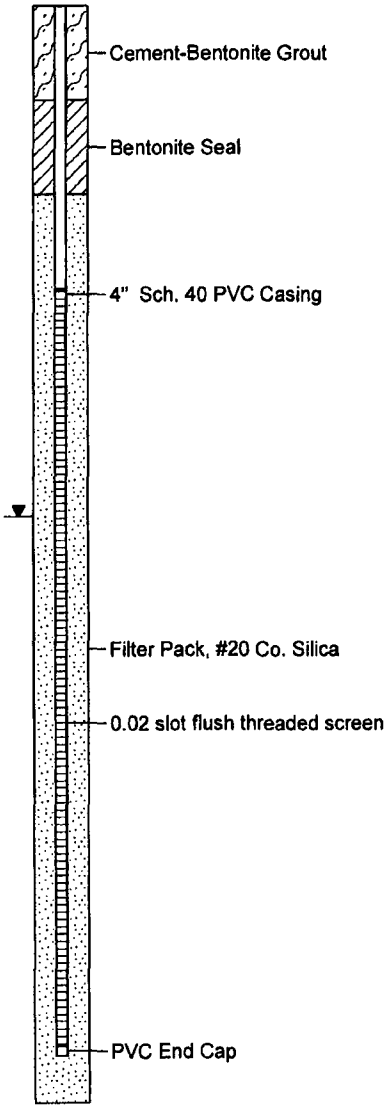
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-112

Start Date	: April 16, 2007	Drill Rig	: 10" HSA (CME 95)
Finish Date	: April 18, 2007	Driller, Helpers	: Jose, Brian, Miguel
Location	: Berridge Ln, Phx, AZ	Sampling Method	: Split Spoon
Logged By	: Adrian Ezeagu	Northing	:
Drilling Subcontractor	: WDC	Easting	:

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Surf. Elev.	USCS	Lithologic Description of Soil	% Gravel	% Sand	% Fines
65		ML				
		ML	Light brown to orange SILT, little to some Clay, trace Gravel, slightly plastic, MOIST. PID = 0.5 ppm	5	15	80
75		CL	Light brown sandy CLAY, some Silt, trace to little Gravel, moderately plastic, medium to very stiff, MOIST to WET. PID = 0.2 ppm	10	30	60
85		ML	Brown to light orange SILT, some Sand, little Gravel, trace Clay, slightly loose-slightly plastic, WET.	10	30	60
95		ML	Light gray SILT, little Sand, little to trace Gravel, soft to medium soft, slightly to moderately plastic, WET.	10	25	65
105		Ml/SP	Light brown to orange sandy SILT, some Gravel, some Clay, moderately plastic, soft, WET. PID = 0.3 ppm	15	35	50
		CL/SP/ML	Light gray gravelly CLAY, some Silt, some Sand, moderarately plastic, medium soft, WET. PID = 0.4 ppm	35	10	55
115		CL	Light brown to orange sandy CLAY, little Gravel, stiff, low to medium plasticity, MOIST. PID = 0.8 ppm	5	25	70
		CL	Light gray CLAY, trace Sand, medium plasticity, non cohesive, very stiff to hard, MOIST to DRY. PID = 0.4 ppm	5	5	90
125			End of boring.			



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MALCOLM PIRNIE

Boring Log (SB-1) and Construction for MW-11

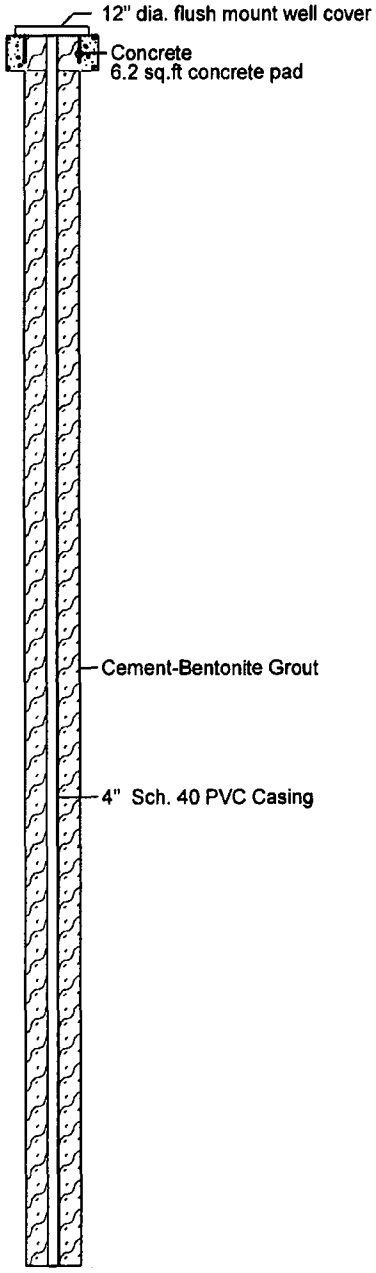
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 3, 2008	Drill Rig	: 10" HSA (CME 95)
Finish Date	: March 5, 2008	Driller, Helpers	: Joe, Jesus
Location	: 710 West Bethany Home Rd	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Blow Count	USCS	Lithologic Description of Soil	% Fines	% Sand	% Gravels
0	4 11	ML-CL	Light brown SILT with Clay, little Sand, trace Gravel, moderately plastic, DRY.	80	15	5
10	28 50 f 4	ML-CL	Light brown SILT with Clay, trace Gravel, slightly plastic, DRY.	85	10	5
20	18 50 f 4	ML-CL	Light brown SILT with Clay, little to some Sand, trace Gravel, slightly plastic, DRY.	80	15	5
30	35 50 f 5	ML-CL		65	35	T
40	18 20 7	CL-ML	Light gray CLAY with Silt, trace Sand, slightly plastic, DRY to MOIST.	90	5	5
50	18 25 48	SM	Light brown-gray silty SAND, trace Gravel, DRY to MOIST.	80	10	10
60	20 50 f 5	SM-CL	Light brown SILT and sandy CLAY, trace Gravel, DRY to MOIST.	60	35	5
70						



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MALCOLM PIRNIE

Boring Log (SB-1) and Construction for MW-11

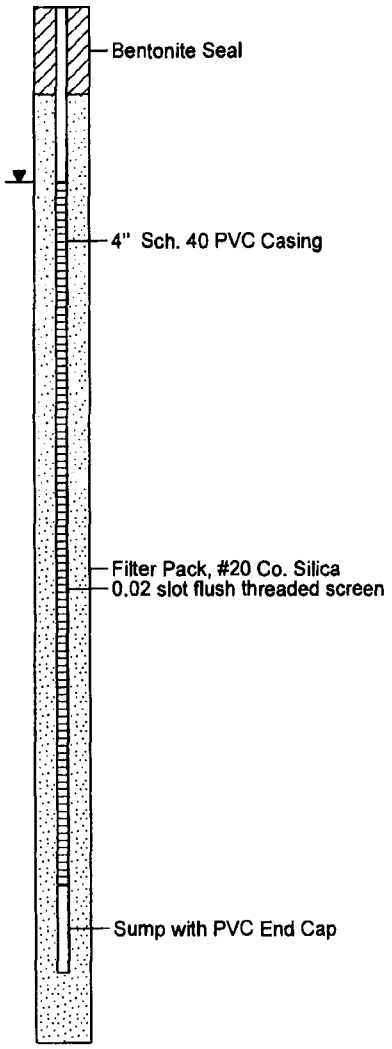
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 3, 2008	Drill Rig	: 10" HSA (CME 95)
Finish Date	: March 5, 2008	Driller, Helpers	: Joe, Jesus
Location	: 710 West Bethany Home Rd	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Blow Count	USCS	Lithologic Description of Soil	% Fines	% Sand	% Gravels
70		SM-CL				
	13 25 35	CL/SM	Light brown sandy CLAY, some Silt, trace to little Gravel, moderately plastic, MOIST to WET.	75	20	5
80		CL	Light brown CLAY, little Silt, trace to little Sand, trace Gravel, MOIST to WET.	90	10	T
90		ML-CL	Light brown SILT, little Clay, trace to little Sand, trace to little Gravel, moderately to highly plastic, soft to hard, WET.	60	20	20
	20 50 f 4			85	10	5
100	17 40 50 f 5			100	T	T
	35 50 f 2			80	15	5
110	20 50	ML	Light brown SILT, little Sand, slightly plastic, stiff, WET.	90	10	T
	18 45 50 f 3	CH	Light brown CLAY, trace to little Sand, trace to little Gravel, moderately to highly plastic, soft to hard, WET.	95	5	T
120	11 27	ML	Light brown SILT, little Sand, slightly plastic, stiff, WET.	90	10	T
	11 50 f 5	CL	Light brown CLAY, trace to little Sand, trace Gravel, MOIST to WET.	95	5	T
130			End of boring.			
140						



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MALCOLM PIRNIE

Boring Log (SB-2) and Construction for MW-12

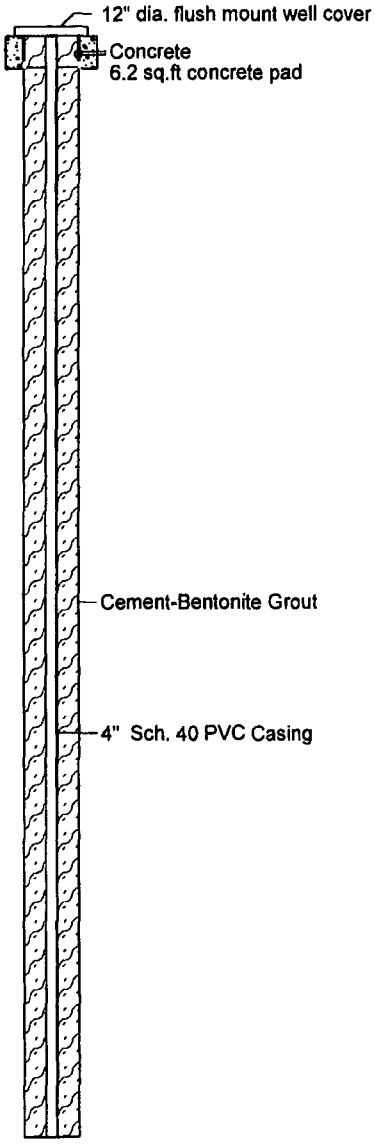
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 7, 2008	Drill Rig	: 10" HSA (CME 95)
Finish Date	: March 11, 2008	Driller, Helpers	: Joe, Jesus
Location	: 6022 North 7th Street	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Blow Count	USCS	Lithologic Description of Soil	% Gravels	% Sand	% Fines
0						
	16 50	ML-CL	Light brown SILT with Clay, little Sand, trace Gravel, moderately plastic, DRY.	T	15	85
10	21 50 f 5	CL	Light brown CLAY with Silt, trace Sand, moderately plastic, DRY.	T	5	95
20	33 50 f 4	ML	Light brown SILT, trace to little Sand, non to slightly plastic, DRY.	T	10	90
30	3 12	CL-ML	Light gray CLAY with Silt, trace to little Sand, slight to moderately plastic, DRY.	T	15	85
40	18 23	SM	Light brown-gray silty SAND, little Clay, trace to little Gravel, slightly plastic, DRY.	5	50	45
50	11 17			10	50	40
60	12 29	SC	Light brown to gray SILT with Clay, some Sand, trace to little Gravel, slightly plastic, DRY.	5	25	70
70						



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MALCOLM PIRNIE

Boring Log (SB-2) and Construction for MW-12

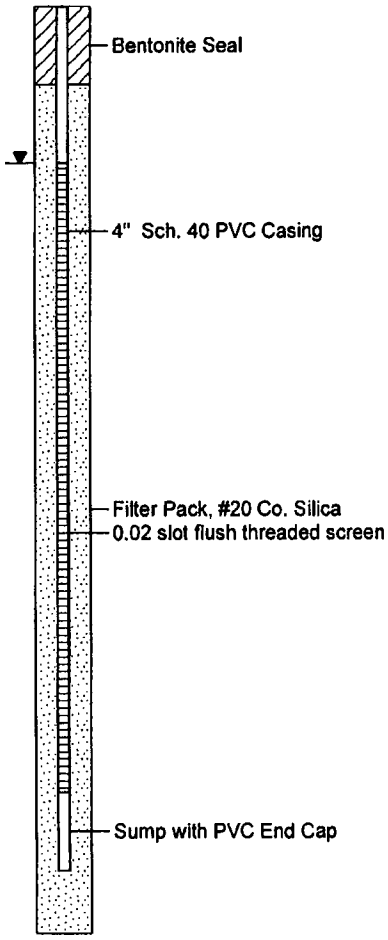
Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 7, 2008	Drill Rig	: 10" HSA (CME 95)
Finish Date	: March 11, 2008	Driller, Helpers	: Joe, Jesus
Location	: 6022 North 7th Street	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08

ADWR ID:
TOC Elevation: TBD

Depth in Feet	Blow Count	USCS	Lithologic Description of Soil	% Gravels	% Sand	% Fines
70	17, 33	SC	Light brown SILT, little to some Sand, moderately plastic, soft to medium stiff, MOIST to WET.	10	20	70
80	15, 27, 11, 26	ML	Light brown CLAY with Silt, trace to little Sand, trace Gravel, MOIST to WET.	5	10	85
		CL-ML	Light brown sandy gravelly CLAY, low to moderately plastic, soft to medium stiff, WET.	20	35	45
90	11, 50 f 3, 20, 50 f 2	CL-GC	Light brown SILT, little to some Sand, trace Gravel, Slighly plastic, WET.	5	10	85
100	50 f 3, 50 f 4	ML		T	40	60
110	33, 50 f 5	ML-CL	Light brown SILT, trace to little Sand, trace to little Gravel, moderately plastic, soft to hard, WET.	T	20	80
120	20, 50 f 6	ML	Light brown SILT, little Sand, slightly plastic, WET.	T	10	90
130	13, 43, 11, 22	CL	Light brown CLAY, moderately plastic, MOIST to WET	T	20	80
		ML-CL	Light brown SILT with Clay, some to little Sand, slight to moderately plastic, soft	T	30	70
				T	20	80
140			End of boring.			



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MALCOLM PIRNIE

Soil Boring Log SB-3

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 14, 2008	Drill Rig	: 8" HSA
Finish Date	: March 14, 2008	Driller, Helpers	: Joe, Jesus
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52 degrees N
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08 degrees W

Depth in Feet	Blow Count	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0							
10							
	27 50 f 1			Light brown SILT WITH Clay, trace Gravel, slightly plastic, DRY.	T	5	90
20							
	50 f 5				T	5	95
30		ML-CL					
	50 f 6				T	10	90
40							
	50 f 5			Light brown silty SAND, little Clay, trace to little Gravel, slightly plastic, DRY.			
50					5	55	40
60		SM		Light brown silty SAND, trace Gravel, trace to little Clay, some caliche nudules, non to slightly plastic, DRY.			
70							
80				End of Boring at 75 ft bgs.			

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MALCOLM PIRNIE

Soil Boring Log SB-4

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 14, 2008	Drill Rig	: 8" HSA
Finish Date	: March 14, 2008	Driller, Helpers	: Joe, Jesus
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52 degrees N
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08 degrees W

Depth in Feet	Blow Count	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0							
	4211						
10							
		ML-CL		Light brown SILT WITH Clay, trace Gravel, slightly plastic, DRY.	T	5	90
20					T	15	85
30					T	10	90
40					T	10	90
		SM		Light brown silty SAND, little Clay, trace to little Gravel, slightly plastic, DRY.	5	55	40
50							
60		CL-M		Light brown CLAY and SILT, little Sand, trace Gravel, Stiff, moderately plastic, DRY.	5	25	70
		ML		Light brown SILT with Sand, little to some Caly, slightly plastic, MOIST.	5	20	75
70					5	25	70
80							

End of Boring at 75 ft bgs.

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MALCOLM PIRNIE

Soil Boring Log SB-5

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 13, 2008	Drill Rig	: 8" HSA
Finish Date	: March 13, 2008	Driller, Helpers	: Joe, Jesus
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52 degrees N
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08 degrees W

Depth in Feet	Blow Count	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0							
10							
	10 38	ML-CL		Light brown SILT WITH Clay, trace Sand, trace Gravel, slightly plastic, DRY.	T	5	95
20	50 f 5				T	5	95
30	38 50 f 4				T	5	95
40	50 f 5				T	5	95
50	50 f 6	SM/SC		Light brown to gray silty and clayey SAND, trace to little Gravel, slightly plastic, DRY.	5	40	45
60	50 f 3	ML		Light brown SILT, trace to little Gravel, sand is poorly graded, slightly to moderately plastic, DRY.	10	25	65
70							
80							

End of Boring at 75 ft bgs.

06-04-2008 M:\1761109\Borings\2008 Drilling\SB-5.bor

MALCOLM PIRNIE

Soil Boring Log SB-6

Arizona Dept. of Environmental Quality
7th Avenue & Bethany Home Rd WQARF
On-Site Monitor Well Installation
Phoenix, Arizona

Project No. 1761-113

Start Date	: March 13, 2008	Drill Rig	: 8" HSA
Finish Date	: March 13, 2008	Driller, Helpers	: Joe, Jesus
Location	: 7th Ave. & Bethany Home Rd.	Sampling Method	: Split Spoon
Logged By	: Matt Branche	Northing	: 33.52 degrees N
Drilling Subcontractor	: Yellow Jacket	Easting	: 112.08 degrees W

Depth in Feet	Blow Count	USCS	Graphic	Lithologic Description of Soil	Size Distribution of Soils % Gravel	% Sand	% Fines
0							
10							
	15 31	ML-CL		Light brown SILT with Clay, trace Sand, trace Gravel, slightly to moderately plastic, DRY.	T	5	95
20	36 50 f 2				5	10	85
30	11 17	ML/CL		Light brown SILT and CLAY, trace to little Sand, trace Gravel, slightly plastic, soft to medium stiff, DRY.	T	10	90
40	27 50 f 2				5	5	90
50	21 50 f 2	ML-CL		Light brown SILT and CLAY, trace to little Gravel, ,non to slightly plastic, soft to medium stiff, DRY.	5	5	90
60					5	50	45
70	26 50 f 5	SM		Light brown silty SAND, trace Gravel, DRY			
80							

End of Boring at 75 ft bgs.

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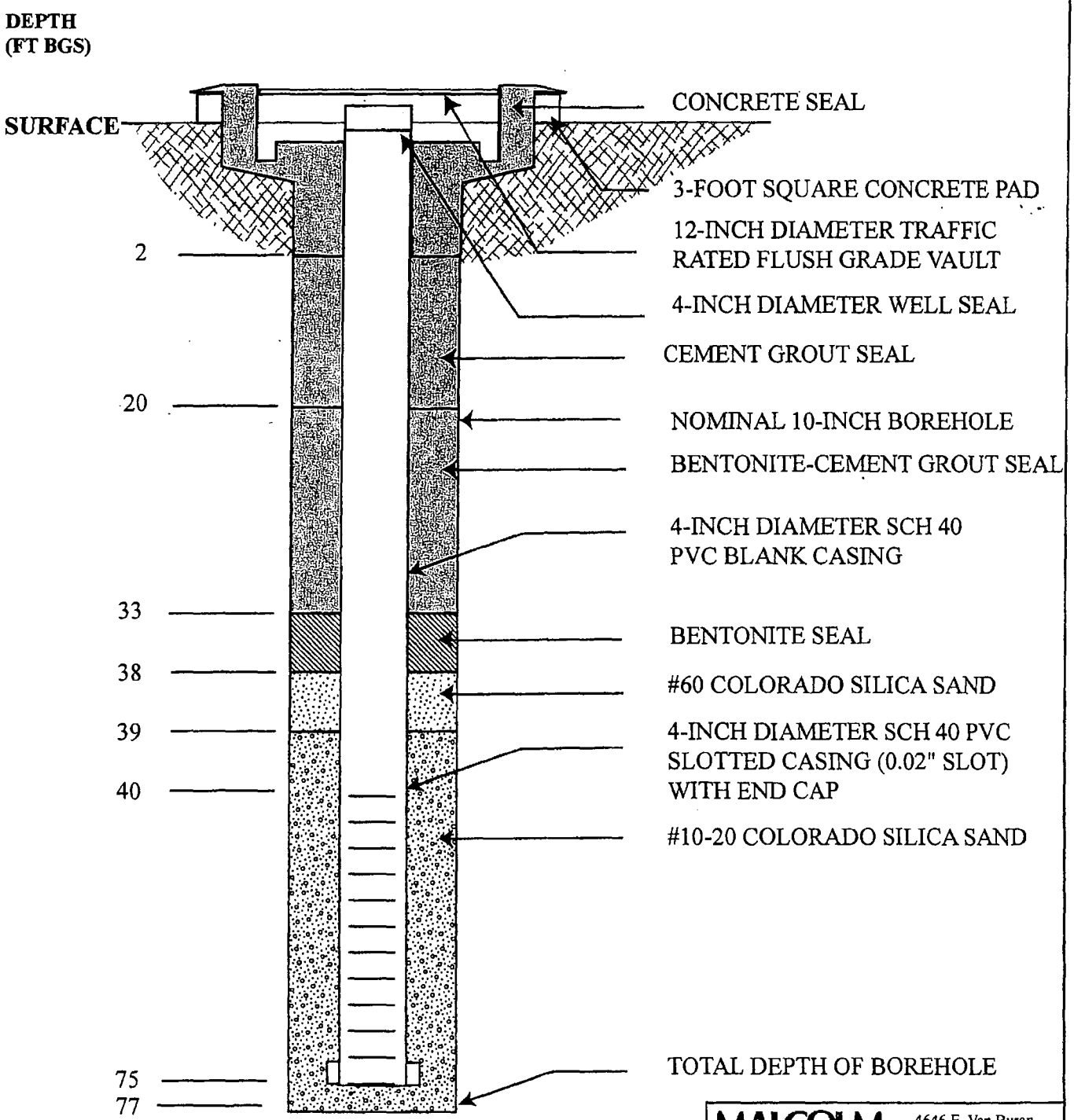
APPENDIX C

Well Construction Diagrams



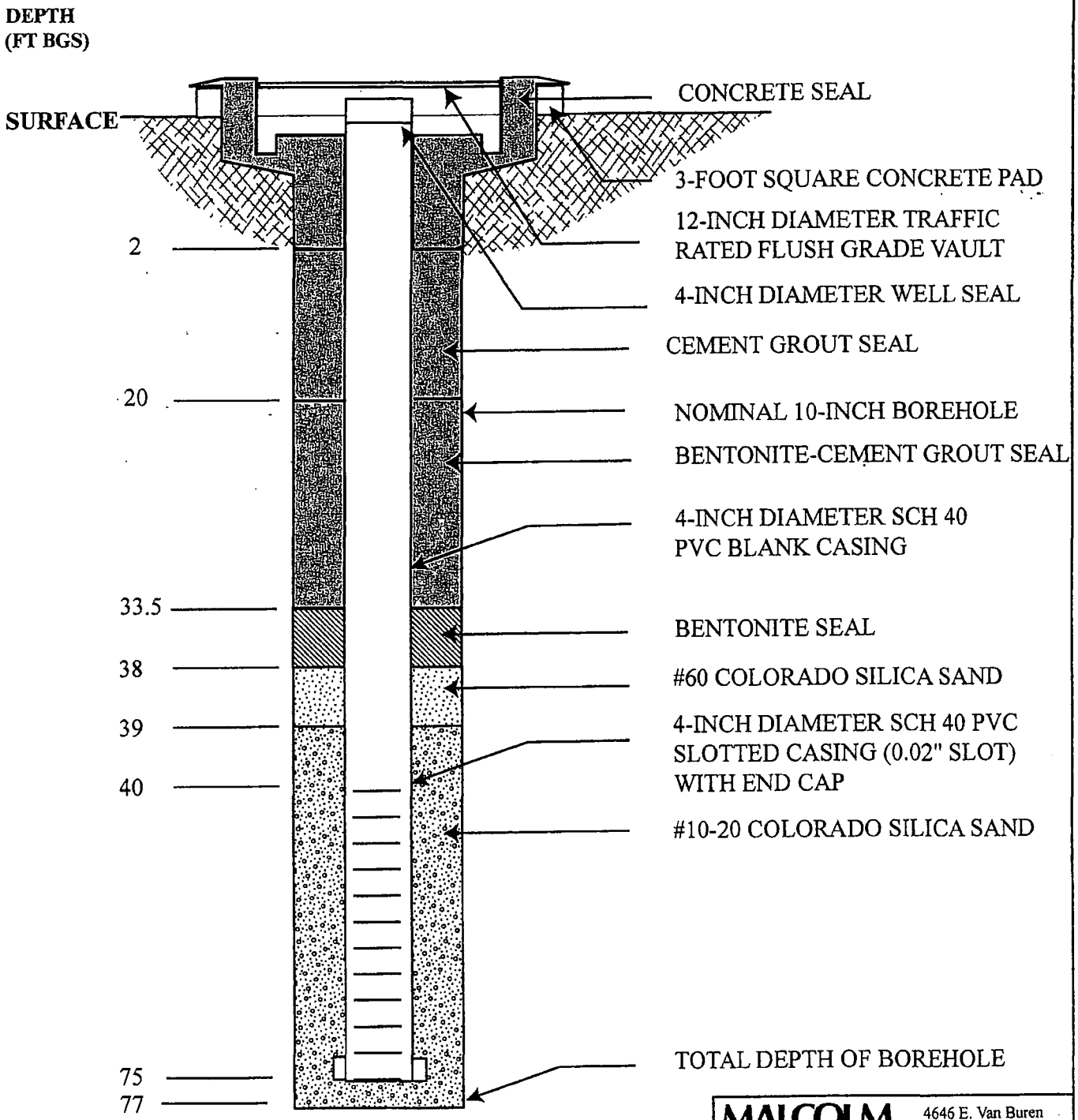
NOT TO SCALE

MALCOLM PIRNIE

4646 E. Van Buren St., Suite 400
Phoenix, AZ 85008

SVE-1
55-205272
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005



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Phoenix, AZ 85008

SVE-2
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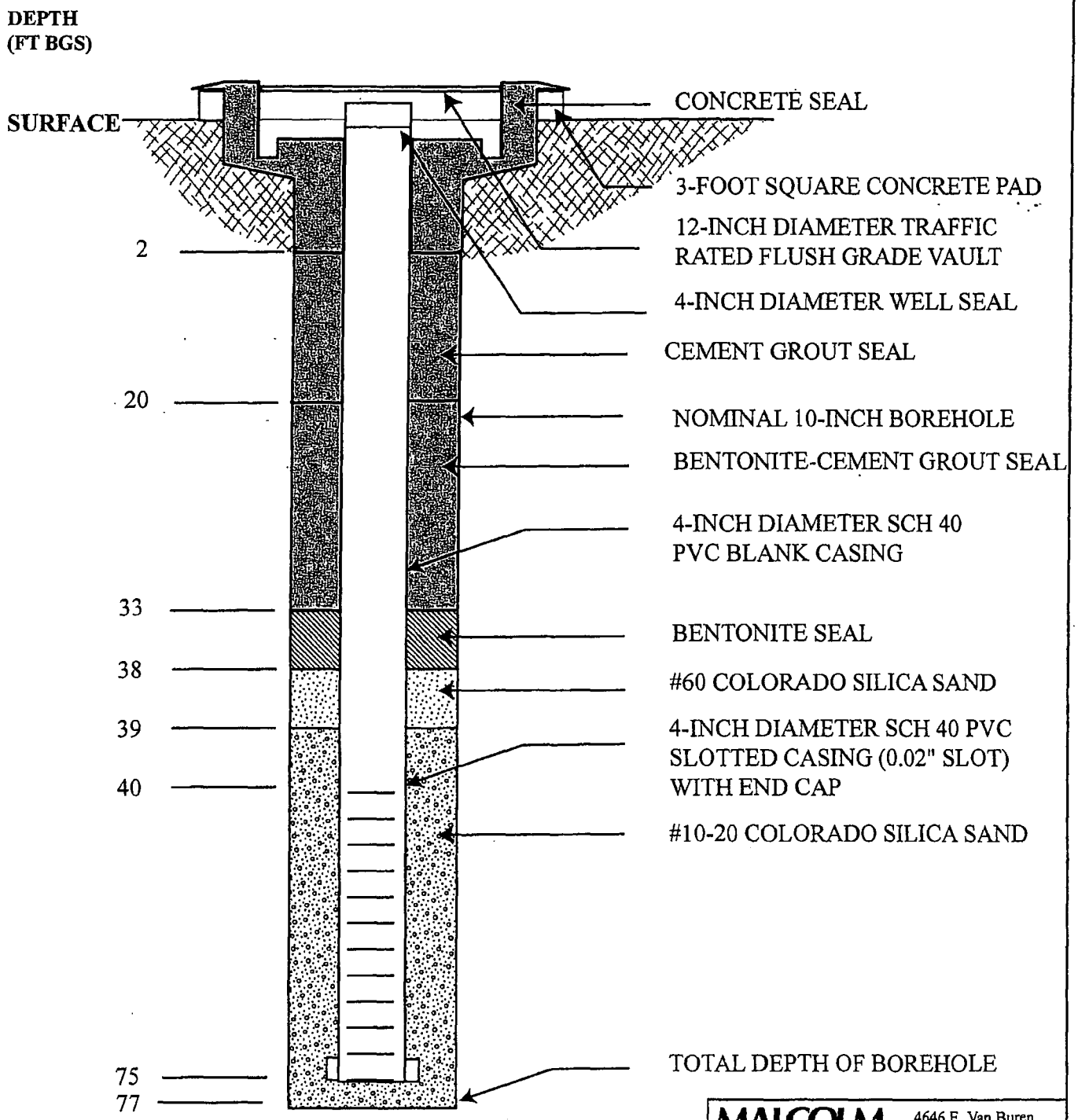
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005



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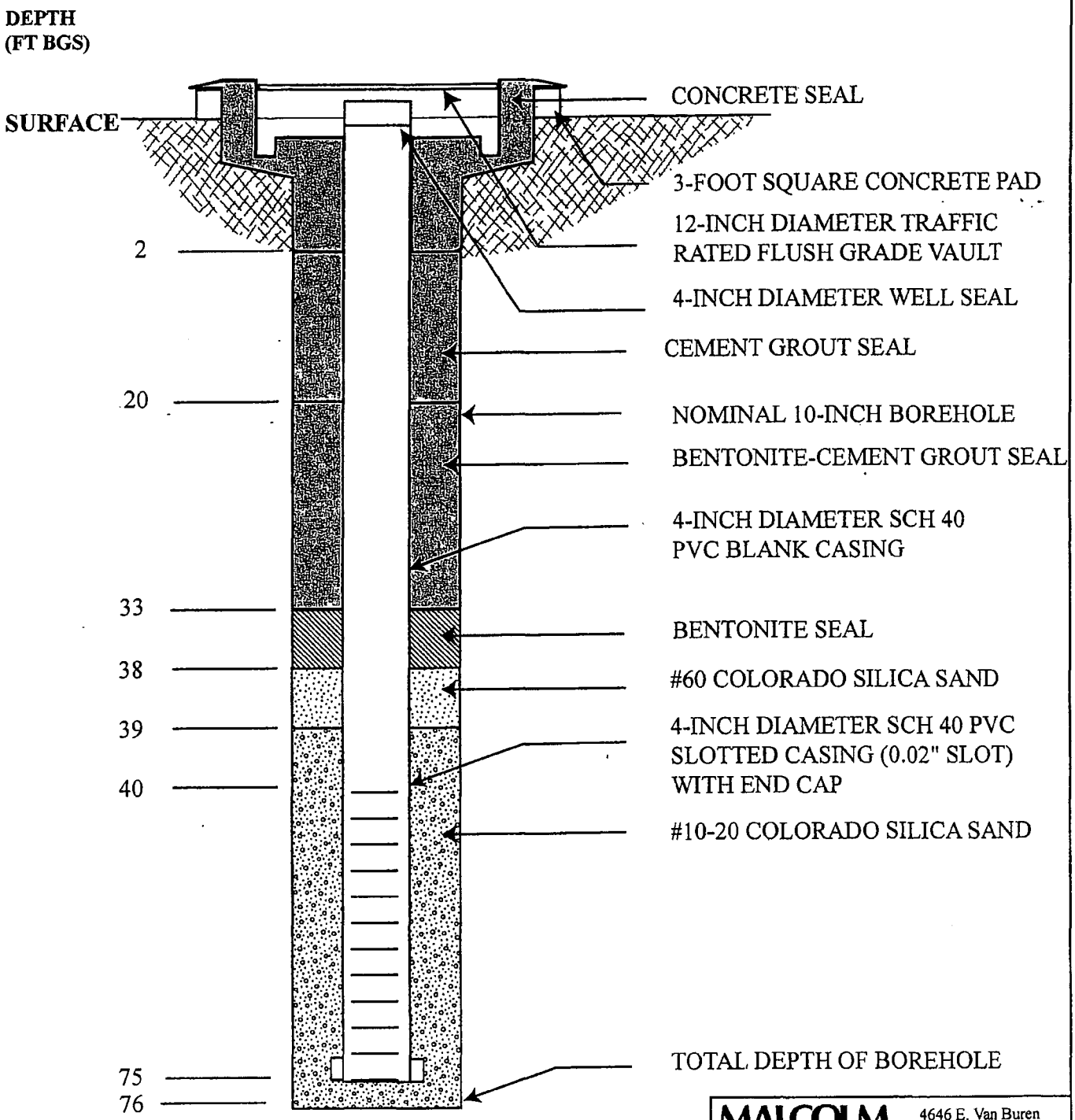
4646 E. Van Buren
St., Suite 400
Phoenix, AZ 85008

SVE-3
55-205300
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005



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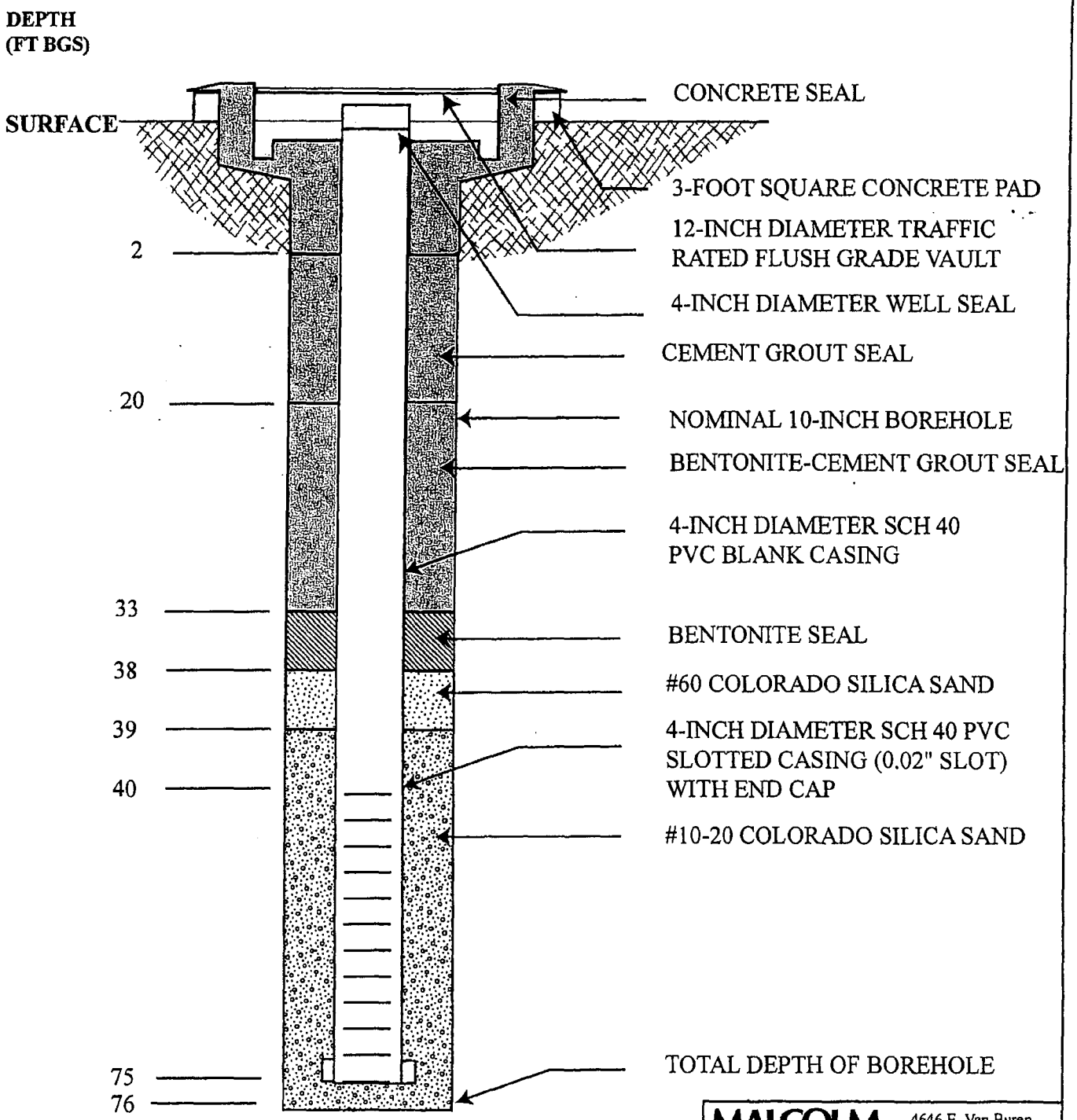
4646 E. Van Buren St., Suite 400
Phoenix, AZ 85008

SVE-4
55-205301
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005



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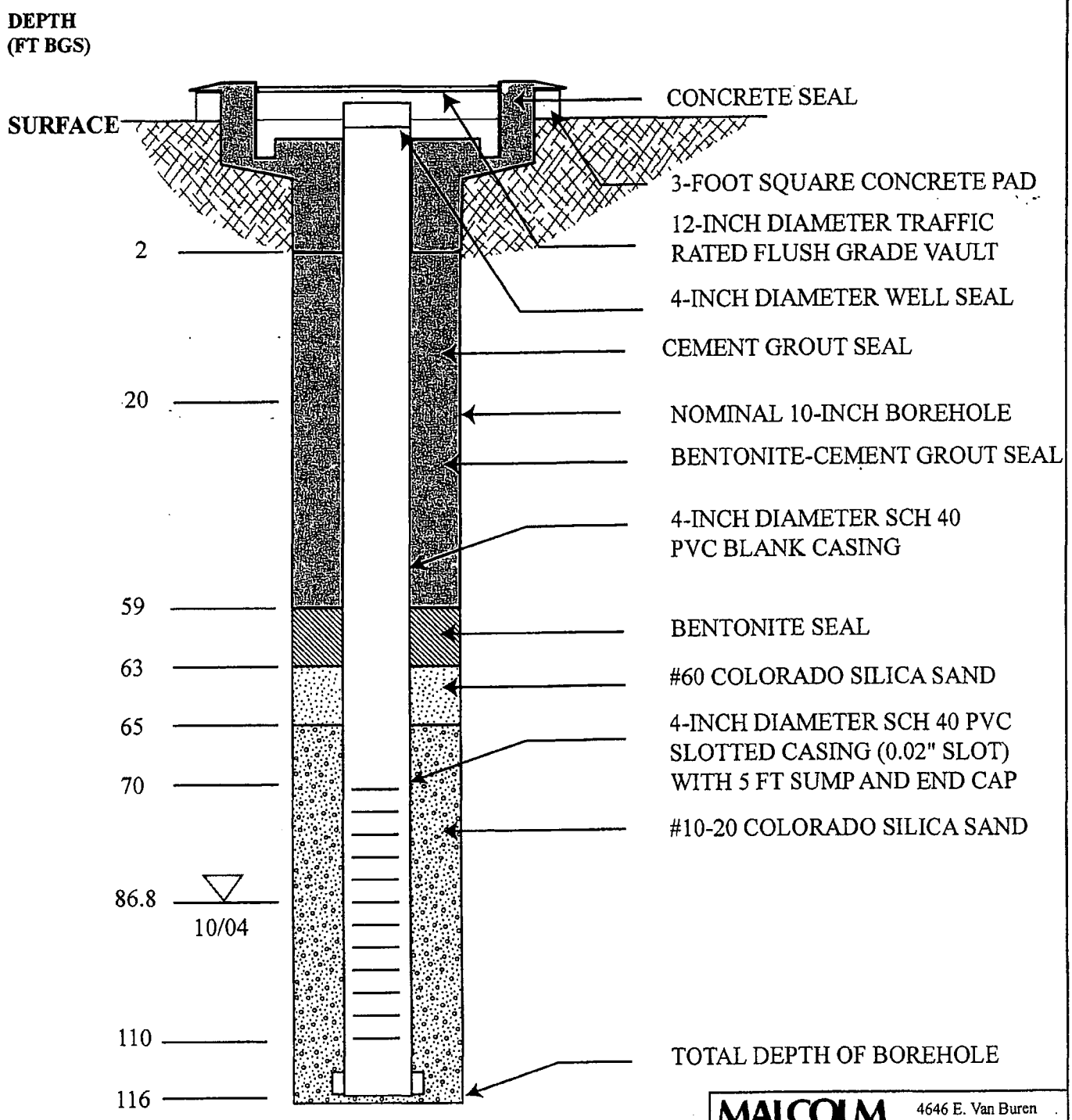
4646 E. Van Buren St., Suite 400
Phoenix, AZ 85008

SVE-5
55-205302
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005



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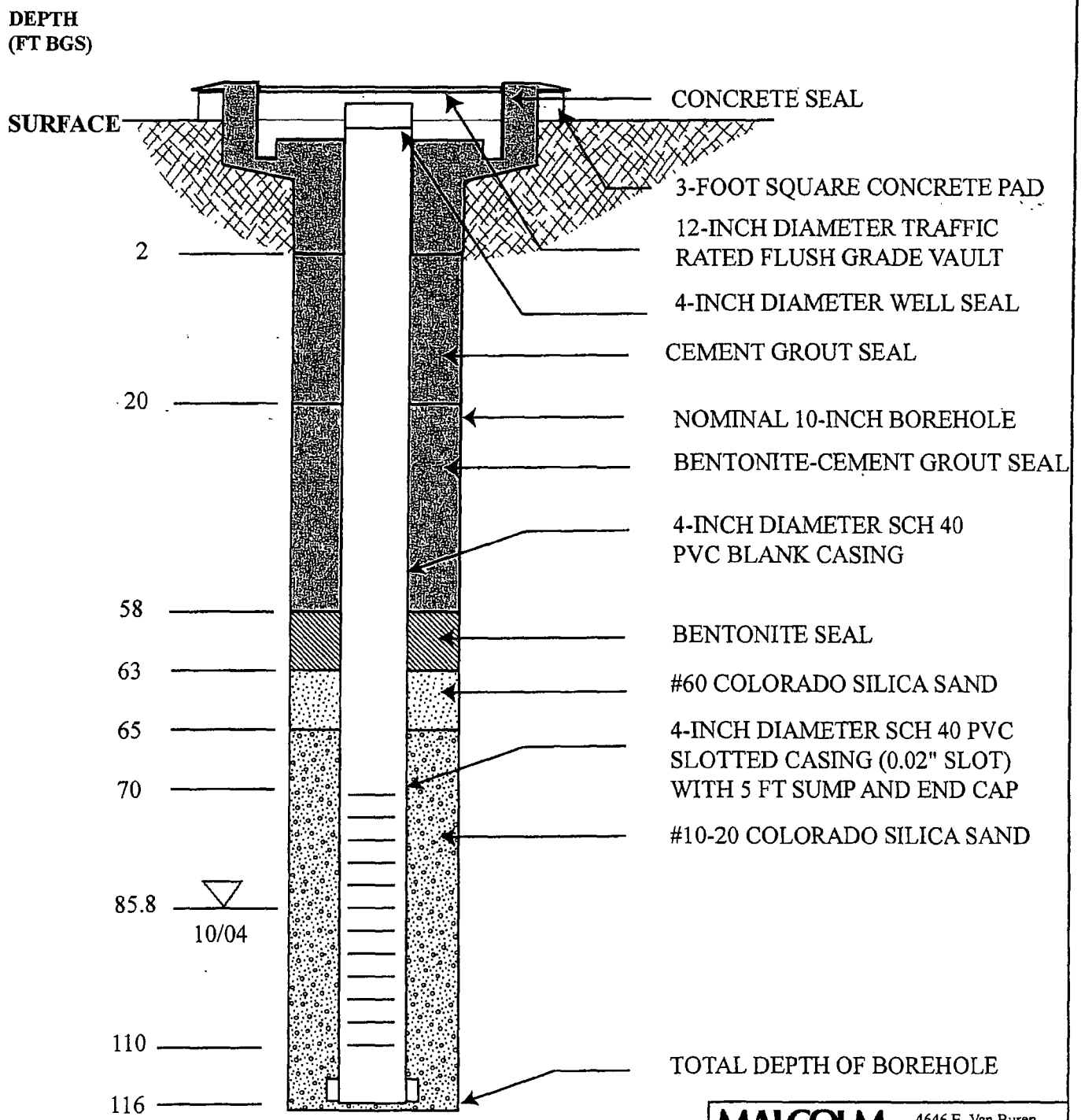
4646 E. Van Buren St., Suite 400
Phoenix, AZ 85008

MW-4
55-205271
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005

* First water level collected in open borehole.



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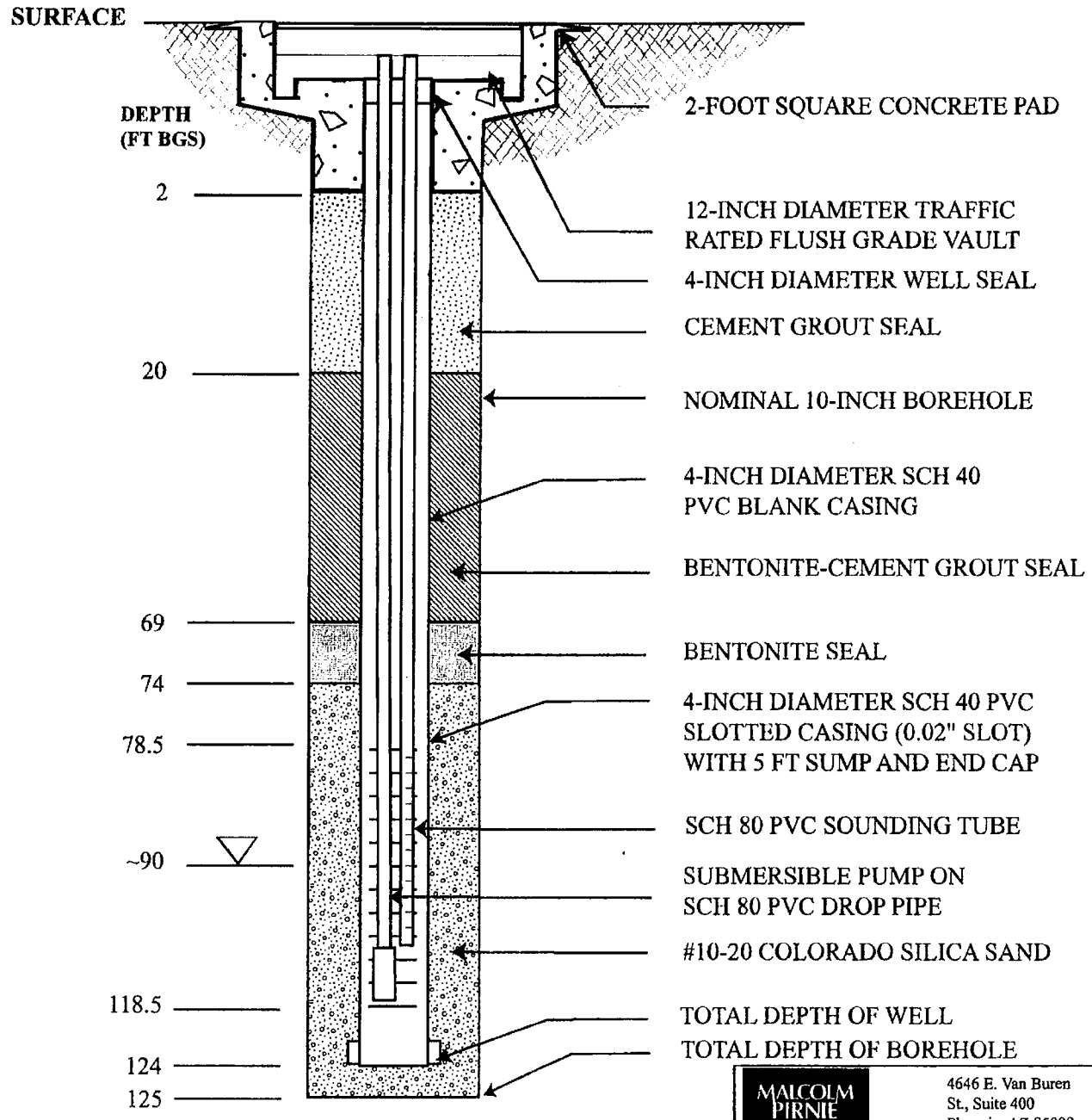
Phoenix, AZ 85008

MW-5
55-205273
As-Built Construction Diagram
ERA Evaluation Report
7th Ave. & Bethany Home Rd

June 2005

* First water level collected in open borehole.



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MALCOLM PIRNIE

4646 E. Van Buren
St., Suite 400
Phoenix, AZ 85008

MW-6, MW-7, MW-8
As Built Construction Diagram
Off-site Monitoring Well Installation
and Sampling Report
7th Ave. & Bethany Home Rd
WQARF Site

March 2006

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ADWR Registration
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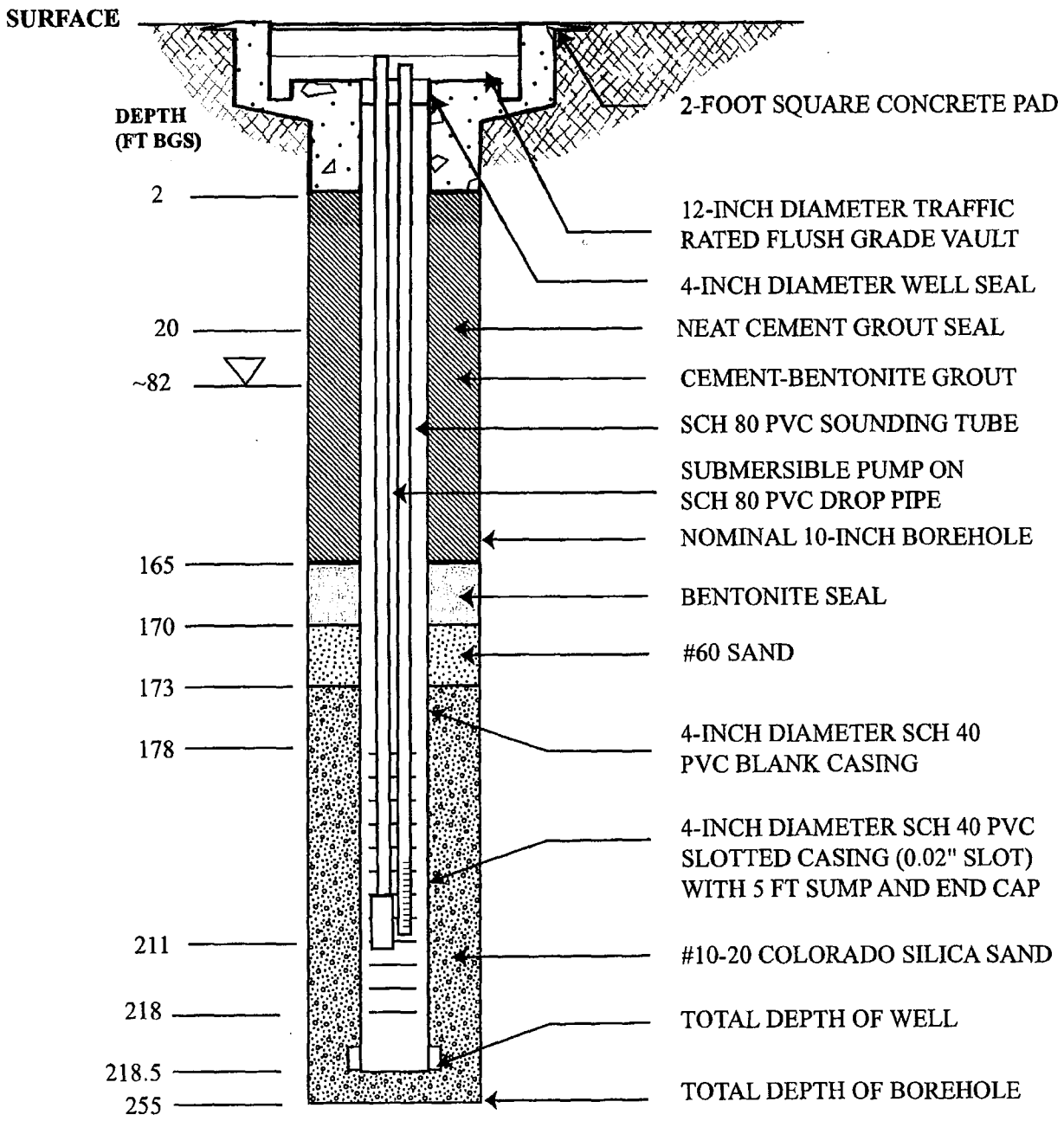

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St., Suite 400
Phoenix, AZ 85008

As-Built Well Diagram for MW-9
7th Ave. & Bethany Home Rd
WQARF Site

June 2007

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ADWR Registration
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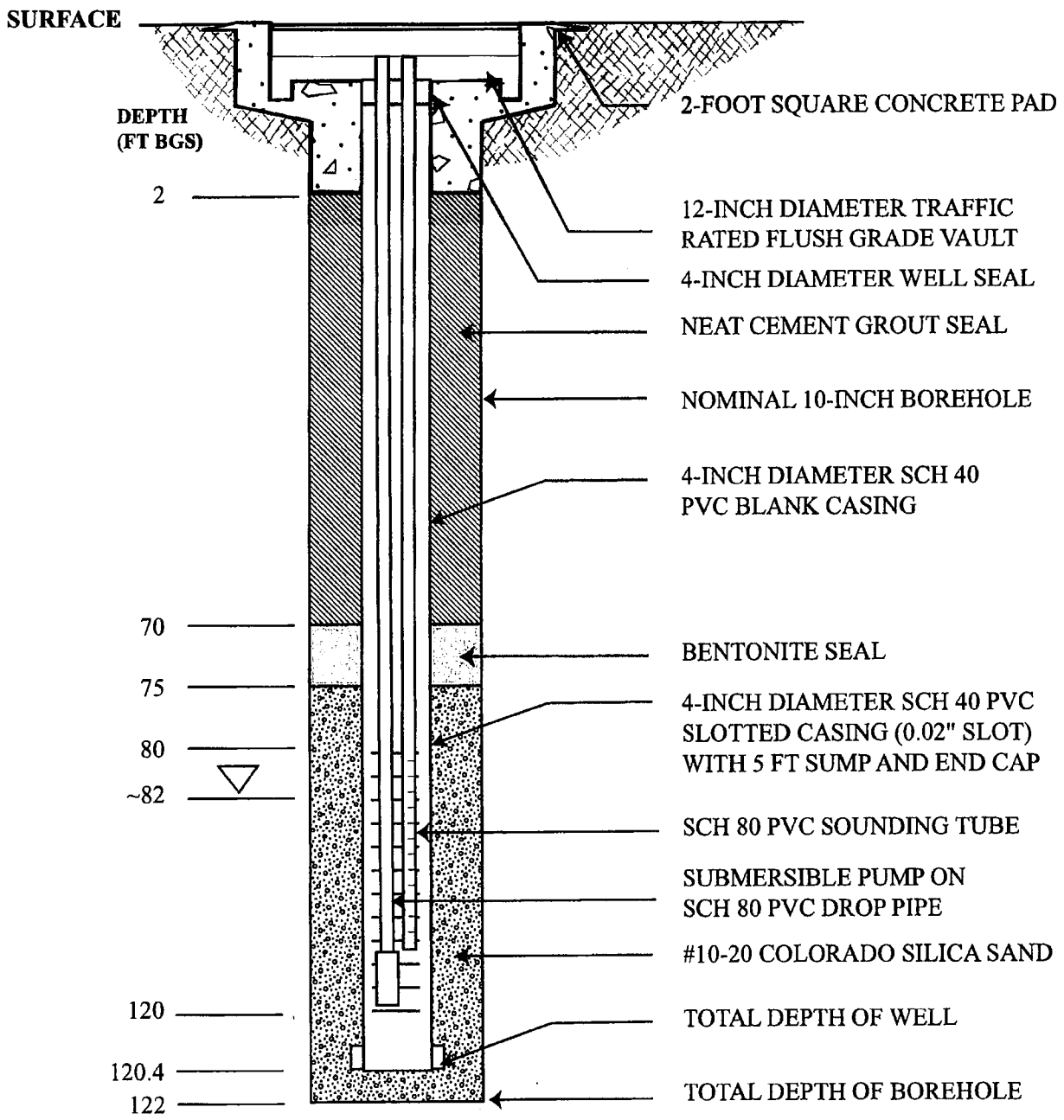

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St., Suite 400
Phoenix, AZ 85008

As-Built Well Diagram for MW-10
7th Ave. & Bethany Home Rd
WQARF Site

June 2007

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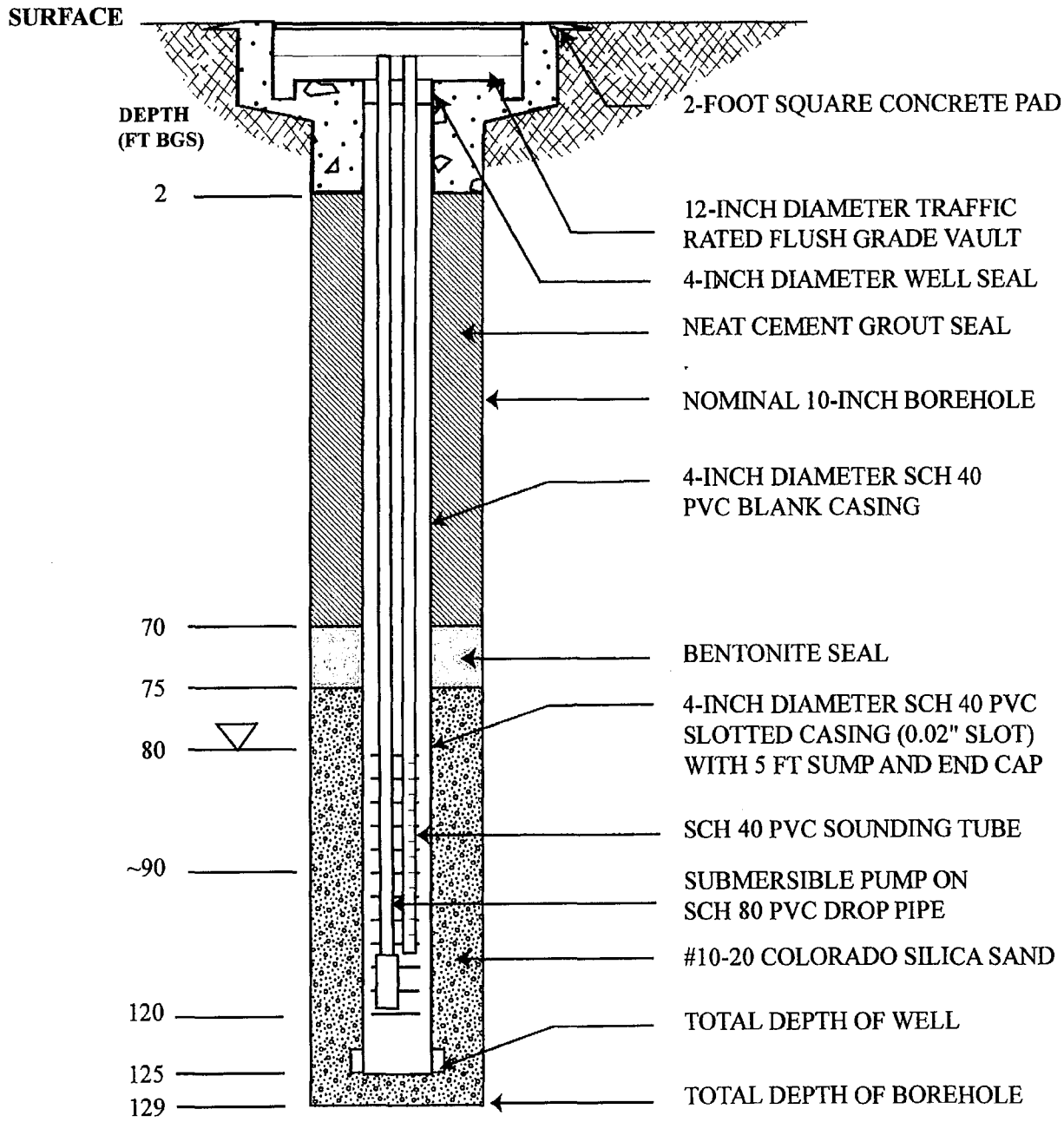
ADWR# 55-908604



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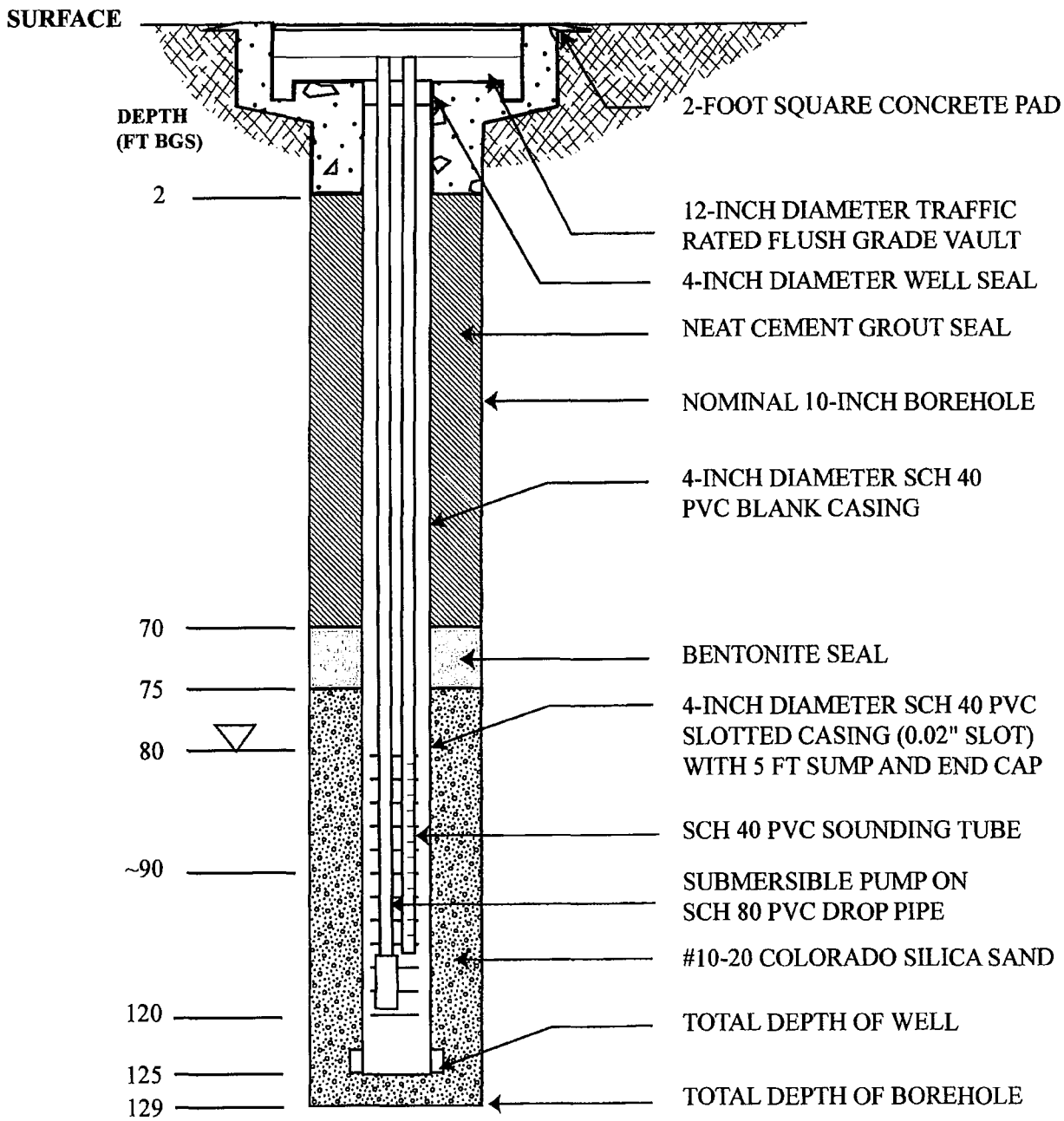
MALCOLM PIRNIE

4646 E. Van Buren
St., Suite 400
Phoenix, AZ 85008

MW-11
As Built Well Diagram
SCI Arizona Funeral Services

June, 2008

ADWR# 55-908605



NOT TO SCALE

MALCOLM PIRNIE

4646 E. Van Buren
St., Suite 400
Phoenix, AZ 85008

MW-12
As Built Well Diagram
SCI Arizona Funeral Services

June, 2008

APPENDIX D

Land and Water Use Questionnaires

LAND AND WATER USE STUDY QUESTIONNAIRE
FOR MUNICIPALITIES WITHIN THE
7TH AVENUE AND BETHANY HOME ROAD WQARF REGISTRY SITE

Please answer all questions. Mark "NA" for questions that are not applicable. Mark "UNK" if the answer is unknown to you at the time of completion. Please attach any additional pages as needed.

Municipality name: City of Phoenix

Date Questionnaire was completed: 5/29/09

Name of person completing Questionnaire: Donn Stoltzfus

Contact Name:

Title: Environmental Pgms Spec.

Division: Office of Environ. Pgms.

Address: 200 W. Washington, 14th Fl.
Phoenix, AZ 85003

Phone Number: (602) 256-5681

1. What is the current use of your municipality's property within the area of the 7th Avenue and Bethany Home Road WQARF site? (Boundaries are: Rose Lane to the north, Bethany Home Road, to the south, 6th Avenue to the east and 8th Avenue to the west).

   Commercial and Commercial Office
   Vacant parcel
   Residential Single-Family
   Residential Multi-Family
   Church

2. Please list the municipality's properties of concern/boundaries (neighborhood planning committees, zoning, canals, wells, etc.) within the 7th Avenue and Bethany Home Road WQARF site boundary.

   Alhambra Village Planning Committee

3. What are the foreseeable plans for the municipality property within the 7th Avenue and Bethany Home Road WQARF site boundary as far into the future as they are known and up to 100 years, if possible?

   None known or anticipated

4. Does the municipality have a published general plan for the property within the 7th Avenue and Bethany Home Road WQARF site boundary?

   Yes

5. Are parcel, zoning, or land maps available through the municipality? Where are they located?

   http://phoenix.gov/PLANNING/zonmaps.html

6. Please list any specific concerns the municipality is aware of within the 7th Avenue and Bethany Home Road WQARF site boundaries? Please list future concerns (e.g. - freeway expansion, water use, water availability, etc.)

   Likely redevelopment of NEC property 7th Avenue and Bethany Home Road

7. Please list any future zoning plans or area plans for the municipality within the 7th Avenue and Bethany Home Road WQARF site boundary.

   None planned

8. Please list any "special projects" projected or anticipated within the 7th Avenue and Bethany Home Road WQARF site boundary.

None planned, projected or anticipated.

9. If any property is leased (the municipality is the lessor), how long is the lease term?

N/A

10. If the property is leased, are there plans to renew the lease and is so, for how long?

N/A

11. Please list any environmental spill of material or waste products that has occurred within the municipality within the 7th Avenue and Bethany Home Road WQARF site boundary in the past 5 years?

Unknown

12 Is the municipality currently sampling groundwater wells in the 7th Avenue and Bethany Home Road WQARF site? If so, how often is the sampling conducted? Are analytical results being submitted to ADEQ for the groundwater database?

No

13. Does your municipality have an environmental manager or do you outsource environmental management to an environmental consulting firm? If so, please provide the following information:

Name: Phil McNeely
Title: Environ. Pgms. Manager
Address: Office of Environ. Pgms.
Phone Number: (602) 256-5654

14. Please indicate anticipated groundwater development by the municipality within the 7th Avenue and Bethany Home Road WQARF site boundary.

No immediate plans

15. Are their any groundwater wells owned by the municipality that have been affected by the 7th Avenue and Bethany Home Road WQARF site? If so, please list the well identification numbers. What is the current status of these wells (e.g. – shut down, still pumping)?

No

16. What is the future use (up to 100 years) for any wells that have been impacted by the 7th Avenue and Bethany Home Road WQARF site?

No immediate plans

Thank you for your time. The Project Manager, Scott Goodwin, or a representative from ADEQ's consultant, Malcolm Pirnie Inc., may follow-up on answers provided.

Scott D. Goodwin

From: Amadi Philip U (Phyl) [Phyl.Amadi@srpnet.com]
Sent: Wednesday, May 27, 2009 2:53 PM
To: Scott D. Goodwin
Subject: FW: WQARF Site - 7th Avenue and Bethany Home Road

Hi Scott: I am forwarding SRP's response to the WQARF Questionnaire dated April 27, 2009. I already left a message for you in this regard. Let me know if you need additional information. Thanks.

Phyl U. Amadi, Ph.D; P.G.
Senior Hydrogeologist
Environmental Compliance Department
1521 N. Project Drive
Tempe, AZ 85281-1206
Ph: (602) 236-2183; Fax: (602) 236-3407; E-mail: phyl.amadi@srpnet.com

---

From: Hay Steven M (Mark)
Sent: Wednesday, May 27, 2009 2:44 PM
To: Amadi Philip U (Phyl); Rauch Joseph H (Joe)
Cc: Bawden Thomas D (Thom); Casiraro Daniel J (Dan); Ramaley Karilee S; Streeper Matthew E (Matt)
Subject: RE: WQARF Site - 7th Avenue and Bethany Home Road

Here you go Phyl. I've numbered my responses so they correspond with the items in the questionnaire. The well Matt identified is well 13E-10N is currently out of service. However, it is currently registered with the state (55-617696) and we anticipate it will be returned to service in the future. Call if questions... Mark.

1. The Salt River Valley Water Users Association (SRP) owns and operates water conveyance structures and water supply wells that produce and convey water for it's shareholders.

2. SRP owns a water supply well at the southeast corner of Bethany Home Road and 7th Avenue. Though not technically in the WQARF site, it is literally just across the street. The well is 242 feet deep and produces about 1,000 gpm. It is not currently in service but we expect it will be returned to service at sometime in the future. SRP also owns a piped lateral that conveys irrigation water from north to south along 7th Avenue. And SRP owns and operates two (2) groundwater supply wells located within one half (1/2) mile of the site. Because of our reliance on groundwater during drought, SRP is very concerned with any water quality problems in the aquifer or with the threat of groundwater contamination. It is important to safeguard the ability to utilize these wells.

3. SRP anticipates all of it's properties in the vicinity of the 7th Avenue and Bethany Home Road WQARF site will remain in use in the future.

4. No.

5. No (Phyl - Zanjero maps maybe?)

6. Water use and availability will remain a concern in the vicinity of the 7th Avenue and Bethany Home Road WQARF site. Many of the properties in this area and downstream areas still irrigate with untreated canal water. We anticipate that will continue into the future. We also anticipate a drinking water plant will be built on the Grand Canal within the next 100-years and these wells and facilities will provide water to that plant.

7. None.

8. None.

9. NA

10. NA

11. None.

12. Water levels and water quality samples are collected regularly from the wells noted in #2 above (except for the well that is temporarily out of service). For additional information contact Dr. Gregg Elliott at 602.236.5545.

13. Phyl Amadi & company

14. The wells discussed in #2 are currently in production or are anticipated to be returned to production in the future.

15. The wells noted in #2 have had low levels of VOC's detected in them. To date, none have exceeded standards and are therefore still in service. The wells are:

    a. 12.5E-10N (55-608429)

    b. 13.1E-10.5N (55-608426)

16. As noted above, SRP anticipates all of it's properties, including it's water wells, in the vicinity of the 7th Avenue and Bethany Home Road WQARF site will remain in use in the future. Additionally, any plan to remediate groundwater needs to recognize the highly variable pumping scenarios that may occur in and around the site and the impacts that pumping could have on groundwater in the site. SRP uses its wells to supplement its surface water supplies. Therefore our annual pumping amounts can vary greatly. It is conceivable that during severe drought, the wells noted above may be utilized at their full annual registered volumes.

From: Amadi Philip U (Phyl)
Sent: Tuesday, May 26, 2009 3:17 PM
To: Hay Steven M (Mark); Rauch Joseph H (Joe)
Cc: Bawden Thomas D (Thom); Casiraro Daniel J (Dan); Ramaley Karilee S; Streeper Matthew E (Matt)
Subject: RE: WQARF Site - 7th Avenue and Bethany Home Road

Land Dept (Matt Streeper) found a 1922 deed recorded to SRP for a well site located southeast corner of 7th Avenue and Bethany Home (13E-10N). Please provide information on the status of this well, whether or not Groundwater plans to undertake any location-specific or area-wide activity likely to be affected by the ADEQ proposed WQARF remediation in the area. Please advise. Thanks

Phyl

From: Amadi Philip U (Phyl)
Sent: Tuesday, May 26, 2009 1:58 PM
To: Streeper Matthew E (Matt); Hay Steven M (Mark); Rauch Joseph H (Joe)
Cc: Bawden Thomas D (Thom); Casiraro Daniel J (Dan); Ramaley Karilee S
Subject: RE: WQARF Site - 7th Avenue and Bethany Home Road

Response to the ADEQ in this regard is due by COB tomorrow. I have yet to receive any feedback. Please advise

Phyl

From: Amadi Philip U (Phyl)
Sent: Monday, May 04, 2009 2:46 PM
To: Streeper Matthew E (Matt); Hay Steven M (Mark); Rauch Joseph H (Joe)
Cc: Bawden Thomas D (Thom); Casiraro Daniel J (Dan); Ramaley Karilee S
Subject: WQARF Site - 7th Avenue and Bethany Home Road

The state (ADEQ) forwarded a Questionnaire to various utilities supposedly located close to the plume boundary of the 7th Avenue and Bethany Home WQARF site. The questionnaire is seeking information relating to present and future land and water use likely to be affected and also incidences and occurrences of spills and releases likely to have contributed to the WQARF site. For SRP, information would essentially be about wells located nearby or land use activities pertaining to SRP's present or future facility expansion including service area operational activities likely to be affected by ADEQ's proposed remediation work in the area.

The site's official address is 540 W. Bethany Home or the northeast corner of 7th Avenue and Bethany Home. Site history and subsequent investigation confirm the presence of PCE and TCE in the groundwater. Site characterization report indicates the plume is bounded to the south by Bethany Home Road, to the north by Rose Lane, to the east by 3rd Avenue and to the west by 7th Avenue.

Please find attached copy of the questionnaire and have someone on your staff identify any SRP facilities that may be located within the stated boundaries. Relevant information should be forwarded to enable Environmental Compliance Department complete and finalize SRP's response accordingly.

Phyl U. Amadi
Environmental Compliance Department
1521 N. Project Drive
Tempe, AZ 85281-1206
Ph: (602) 236-2183; Fax: (602) 236-3407; E-mail: phyl.amadi@srpnet.com

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From: Hurtado Valerie C
Sent: Monday, May 04, 2009 1:46 PM
To: Amadi Philip U (Phyl)
Subject:

LAND AND WATER USE STUDY QUESTIONNAIRE
FOR UTILITIES WITHIN THE
7TH AVENUE AND BETHANY HOME ROAD WQARF REGISTRY SITE

Please answer all questions. Mark "NA" for questions that are not applicable. Mark "UNK" if the answer is unknown to you at the time of completion. Please attach any additional pages as needed.

Utility name: _____

Date Questionnaire was completed: _____

Name of person completing Questionnaire: _____

Contact Name: _____

Title: _____

Division: _____

Address: _____

_____

Phone Number: _____

1. What is the current use of your utilitiy's property within the area of the 7th Avenue and Bethany Home Road WQARF site? (Boundaries are: Rose Lane to the north, Bethany Home Road, to the south, 6th Avenue to the east and 8th Avenue to the west).

2. Please list the utility's properties of concern/boundaries (neighborhood planning committees, zoning, canals, wells, etc.) within the 7th Avenue and Bethany Home Road WQARF site boundary.

3. What are the foreseeable plans for the utility's property within the 7th Avenue and Bethany Home Road WQARF site boundary as far into the future as they are known and up to 100 years, if possible?

4. Does the utility have a published general plan for the property within the 7th Avenue and Bethany Home Road WQARF site boundary?

5. Are parcel, zoning, or land and water use maps available through the utility? Where are they located?

6. Please list any specific concerns the utility is aware of within the 7th Avenue and Bethany Home Road WQARF site boundaries? Please list future concerns (e.g. - freeway expansion, water use, water availability, etc.)

7. Please list any future zoning plans or area plans for the utility within the 7th Avenue and Bethany Home Road WQARF site boundary.

8. Please list any "special projects" projected or anticipated within the 7th Avenue and Bethany Home Road WQARF site boundary.

9. If any property is leased (the utility is the lessor), how long is the lease term?

10. If the property is leased, are there plans to renew the lease and is so, for how long?

11. Please list any environmental spill of material or waste products that has occurred within the utility's property within the 7th Avenue and Bethany Home Road WQARF site boundary in the past 5 years?

12 Is the utility currently sampling groundwater wells in the 7th Avenue and Bethany Home Road WQARF site? If so, how often is the sampling conducted? Are analytical results being submitted to ADEQ for the groundwater database?

13. Does your utility have an environmental manager or do you outsource environmental management to an environmental consulting firm? If so, please provide the following information:

    Name: _____
    Title: _____
    Address: _____
    Phone Number: _____

14. Please indicate anticipated groundwater development by the utility within the 7th Avenue and Bethany Home Road WQARF site boundary.

15. Are their any groundwater wells owned by the utility that have been affected by the 7th Avenue and Bethany Home Road WQARF site? If so, please list the well identification numbers. What is the current status of these wells (e.g. – shut down, still pumping)?

16. What is the future use (up to 100 years) for any wells that have been impacted by the 7th Avenue and Bethany Home Road WQARF site?

Thank you for your time. The Project Manager, Scott Goodwin, or a representative from ADEQ's consultant, Malcolm Pirnie Inc., may follow-up on answers provided.

APPENDIX E

Johnson and Ettinger Soil Gas Screen Spreadsheets

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	4.30E+00			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	300	10	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	30	30	350

END

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.7E-09	2.5E-06

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu g/m^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	6.20E+03			Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_S (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	460	10	SC		

MORE ↓

ENTER Vandose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SC	1.63	0.385	0.197	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
70	25	25	250

END

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.1E-06	1.7E-03

MESSAGE SUMMARY BELOW:

END

APPENDIX F

Final Remedial Objectives Report

FINAL REMEDIAL OBJECTIVES REPORT
7TH AVENUE ANS BETHANY HOME ROAD WQARF REGISTRY SITE PHOENIX, ARIZONA

Prepared by:

Arizona Department of Environmental Quality
Remedial Projects Unit
1110 West Washington
Phoenix, Arizona 85007

April 2011

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4.1 SURFACE WATER USE 4-1

LIST OF ABBREVIATIONS AND ACRONYMS

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AFY	Acre-Feet per Year
AWQS	Aquifer Water Quality Standard
COC	Contaminants of Concern
COP	City of Phoenix
ERA	Early Response Action
FS	Feasibility Study
MCL	Maximum Contaminant Level
RO	Remedial Objective
RI	Remedial Investigation
SVE	Soil Vapor Extraction
SRP	Salt River Project Agricultural Improvement and Power District
VOC	Volatile Organic Compounds
WQARF	Water Quality Assurance Revolving Fund

SECTION 1 INTRODUCTION

This remedial objectives (ROs) report has been prepared by the Arizona Department of Environmental Quality (ADEQ) with stakeholder input gathered during the 7th Avenue and Bethany Home Road community advisory board and public meetings, written comments received during the 45 day public comment period as well as land and water use study questionnaires gathered during the remedial Investigation (RI). Upon completion of this report, the final RI report will be available to the public.

ROs are established for 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. R-18-16406(D) 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 100 years unless site-specific information suggests a longer time period is more appropriate. Reasonably foreseeable uses are those likely to occur based on information provided by water providers, well owners, land owners, government agencies, and others. Not every use identified in the remedial investigation will have a corresponding RO. Uses identified in the RI may or may not be addressed based on information gathered during the public involvement process, Water Quality Assurance Revolving Fund (WQARF) limitations, and whether the use is reasonably foreseeable.

ROs chosen for the site will be evaluated in the feasibility study (FS), which will compare remedial measures and strategies required to meet ROs. A remedial strategy is one or a combination of the six general strategies identified in Paragraph B.4 of A.R.S. 49-282.06 (plume remediation, physical containment, controlled migration, source control, monitoring, and no action). A remedial measure is a specific action taken in conjunction with remedial strategies to achieve one or more ROs (for example, well replacement, well modification, water treatment, water supply replacement, and engineering controls).

The FS will propose at least three remedies (a reference remedy and generally two alternative remedies) capable of meeting the ROs. A reference remedy is a combination of remedial strategies and measures capable of achieving the ROs, and is compared with alternative remedies for purposes of selecting a proposed remedy. An alternative remedy is a combination of remedial strategies and measures different from the reference remedy; alternative remedies are compared with the reference remedy for purposes of selecting a proposed remedy. Proposed remedies will also be generally compatible with future land use specified by land owners. Remedial actions should be reasonable, appropriate and cost-effective.

The 7th Avenue and Bethany Home Road WQARF Site consists of a contaminated groundwater plume located in the vicinity of 7th Avenue near Bethany Home Road in Phoenix, Arizona. The plume is bounded to the north by W. Rose Lane, to the south by W. Bethany Home Road, to the east by N. 5th Avenue and to the west by N. 8th Avenue.

One source of the groundwater contamination is the property located at 540 West Bethany Home Road, located at the northeast corner of 7th Avenue and Bethany Home Road. The property was originally developed into a small shopping center in 1952 which included a market, a variety of commercial shops, and a dry cleaning facility. The dry cleaning facility began operation in 1953

at the shopping center. Between 1952 and 1960, the shopping center was connected to an on-site septic system. In 1960, the shopping center was connected to the Phoenix sewer system and discharge to the septic system is believed to have terminated.

ADEQ initiated an Early Response Action (ERA) evaluation at the property in October 2004 to collect data necessary to characterize the source area of tetrachloroethene (PCE) contamination below the property. Based on the results of the ERA evaluation, a soil vapor extraction (SVE) system was designed and constructed at the property. Operation of the SVE system began in June 2005 and the system was shut down in January 2006. Over this time frame, approximately 380 pounds of PCE were removed from the subsurface soils. To determine if the volatile organic compounds (VOCs) remaining in the soil warranted further operation of the system, a rebound test was conducted in April 2006. The results of this test indicated there were not enough extractable VOCs remaining in the soils to warrant further operation of the system. Also in 2006, confirmation borings were drilled and sampled in the area of the SVE system confirming the concentrations of PCE remaining in the soils at the site are below the residential soil remediation level and groundwater protection level for PCE.

In addition to the three monitor wells on the property, four additional monitor wells were installed north of the property beginning in September 2005 to begin to define the extent of groundwater contamination down gradient from the property. The most recent groundwater sampling indicates the concentrations of PCE at and near the 540 West Bethany Home Road property range from 3.1 micrograms per liter (μg/l) to 320 μg/l.

To determine the depth of contamination at the property, a deep monitor well was installed in October 2006 to a depth of 218 feet. No contamination is present at that depth and the groundwater contamination appears to be present in the upper portion of the aquifer to the depth of the shallow monitoring wells of 125 feet. The depth to groundwater in this area is approximately 80 feet below ground surface and the groundwater flows to the north. The concentration of PCE in the groundwater is above the Arizona Aquifer Water Quality Standard (AWQS) for PCE of 5 μg/l.

Previous investigations at 6022 North 7th Avenue, located across 7th Avenue from the 540 West Bethany Home Road property, indicated a former dry cleaning business may have released PCE to a drywell, sump and septic system. From 1990 to 1992, contaminated soil was removed from the property.

ADEQ completed an evaluation of the 6022 North 7th Avenue property in March 2008. Results of the soil and soil vapor investigation indicate the PCE contamination is not present above the residential soil remediation level and groundwater protection level in the soils at this property. Two monitor wells were installed to evaluate the impact to groundwater and the most recent groundwater samples indicate the groundwater is impacted with PCE, trichloroethene (TCE) and vinyl chloride above their respective AWQS of 5 and 2 μg/l. Concentrations of PCE range from 1.4 to 24 μg/l. TCE is only present in one well at a concentration of 29 μg/l and vinyl chloride is present in the same well at a concentration of 3.7 μg/l.

Based upon review of public comment, the ROs are based on the following:

- Protect against possible exposure to hazardous substances in surface and subsurface soils that could occur during development of property based upon applicable zoning regulations.

- Protect against possible leaching of hazardous substances from the upper portion of the aquifer into deeper portions of the aquifer where groundwater use is occurring.

SECTION 2 REMEDIAL OBJECTIVES FOR LAND USE

The entire 7th Avenue and Bethany Home Road WQARF site is located within the City of Phoenix (COP) in city council district 6. The COP is comprised of 15 "urban villages" and the 7th Avenue and Bethany Home site is located in the Alhambra village. Within the area of the 7th Avenue and Bethany Home road site there is little acreage available to be developed in the future, and the area near the site is not expected to experience significant increases in either employment or residential growth.

Based on public comment, proposed ROs for current and future land use in the 7th Avenue and Bethany Home Road WQARF site are:

- Protect against possible exposure to hazardous substances from the release that could occur during typical industrial and residential uses.

SECTION 3 REMEDIAL OBJECTIVES FOR GROUNDWATER USE

The primary contaminants of concern (COC) present in the 7th Avenue and Bethany Home Road site include the following:

- chloroform
- cis 1,2-dichloroethene (cDCE)
- trans 1, 2 dichloroethene (tDCE)
- dichlorodifluoromethane (CFC-12)
- trichloroethene (TCE)
- tetrachloroethene (PCE)
- methyl-tert-butyl ether (MTBE)
- vinyl chloride (VC)

Only trichloroethene, tetrachloroethene and vinyl chloride are currently present at concentrations above their respective AWQS.

The following groundwater uses in the vicinity of the 7th Avenue and Bethany Home Road WQARF site have been identified:

- Municipal use
- Agricultural use
- Private use (including domestic, and irrigation)

3.1 Municipal Groundwater Use

The COP Water Services Department issued a final draft of their water resources plan (Plan) update in 2000. Plans for specific groundwater development within the 7th Avenue and Bethany Home Road area are not addressed in the Plan. Since 1985, groundwater use by the COP steadily declined due to the availability of Central Arizona Project water, gateway credits, and declining well system capacity. The COP indicates that it is essential to maintain sufficient groundwater production capacity to provide for flexible water system operations and ensure adequate supplies during drought and temporary water system outages. Projected groundwater use in normal supply years is assumed to be 15,000 acre-feet per year (AFY) in the Plan.

On January 2, 1998, the Arizona Department of Water Resources (ADWR) approved the COP's application for a designation of assured water supply. This designation signifies that the COP has sufficient renewable water supplies to support projected population growth through the year 2100. A portion of these water supplies includes groundwater.

According to the annual water withdrawal and use reports filed by the COP with ADWR, the COP has 34 active wells currently in production and from 1997 to 2008 these wells produced and average of 11,859 AFY of groundwater. None of these active wells are located in the vicinity of the 7th Avenue and Bethany Home Road site.

Due to water quality degradation (and the establishment of more stringent maximum contaminant levels [MCLs]), other wells were placed on inactive status. The total loss of COP well production for normal use from 1981 to 2000 due to elevated contaminant concentrations exceeds 90,000 AFY from the closure of over 60 wells. This represents 60 percent of the total production capacity of COP wells.

The COP maintains one well in the vicinity of the 7th Avenue and Bethany Home Road site, well number 58, (55-626549) is located in the NW/4 of the NE/4 of the SE/4 of Section 7, Range 2N, Township 3E. This well is located near 10th Avenue and Maryland, approximately one-quarter mile northwest of the 7th Avenue and Bethany Home Road site boundary. Well number 58 is cased from land surface to a depth of 606 feet and the interval open to the aquifer for water production is from 300 to 686 feet. The COP currently lists this well as disconnected and ADEQ is aware of no groundwater sample results from this well.

Degraded groundwater constitutes a vast reserve of water for use in meeting the COP's future water needs. The COP maintains wells for emergency use and future use in meeting service area water needs. These wells could be placed back in service with the addition of wellhead treatment systems or approved blending programs. Also, the COP holds "Special Pump Rights" with SRP, which are rights to groundwater well capacity developed by SRP. In order for the COP to maintain and use these rights in the future, it may be necessary to connect SRP wells directly to the COP water distribution system; this may require the addition of wellhead treatment systems.

According to COP's 50 year plan, the use of potentially degraded groundwater is likely to be somewhat limited within the next decade, but the COP will depend more heavily on this groundwater to provide for service area water demands later in the 50-year planning horizon. Specifically, new groundwater production capacity is needed starting in the year 2030 at 30,000 AFY, increasing to 55,000 AFY in 2050. Assuming average production of two million gallons per day and a 75 percent utilization factor, 18 new wells will be required beginning in 2030, with an additional 15 wells added by 2050.

Based on public comment, proposed ROs for current and future municipal groundwater use in the 7th Avenue and Bethany Home Road WQARF site are:

- To protect the supply of groundwater for municipal use and for the associated recharge capacity that is threatened by contamination emanating from the 7th Avenue and Bethany Home Road WQARF Site. To restore, replace or otherwise provide for the groundwater supply lost due to contamination associated with the 7th Avenue and Bethany Home Road WQARF Site. This action will be needed for as long as the need for the water exists, the resource remains available and the contamination associated with the 7th Avenue and Bethany Home Road WQARF Site prohibits or limits groundwater use.

3.2 Agricultural Groundwater Use

The Salt River Project Agricultural Improvement and Power District (SRP) is the only entity pumping groundwater for agricultural purposes in the vicinity of the 7th Avenue and Bethany Home Road site. Surface water is transported in the SRP Grand Canal, located approximately

one and one-half miles south of the 7th Avenue and Bethany Home Road site. SRP also owns and operates a piped lateral that conveys irrigation water from north to south along 7th Avenue. Local residential properties are irrigated with untreated water provided by SRP.

SRP has two wells in the vicinity of the 7th Avenue and Bethany Home road site which are used to pump groundwater for agricultural purposes but neither of the wells are located within the 7th Avenue and Bethany Home Road site boundary.

SRP well 13.1E -10.5N (55-608426) is located in the SW/4 of the SW/4 of the NW/4 of Section 8, Range 2N, Township 3E. The well is located near the intersection of 7th Avenue and Maryland, approximately one-quarter mile north of the 7th Avenue and Bethany Home site boundary. The ADWR database indicates well 13.1E-10.5N is cased from land surface to a depth of 600 feet and the interval open to the aquifer for water production is from 240 to 600 feet. SRP provided groundwater sample results from this well for the period from 1986 to 2009. Over this time period, concentrations of PCE ranged from not detected at 0.5 μg/l until 2000 to 4.6 μg/l in 2006. The most recent sample collected in 2009 detected PCE at a concentration of 2.4 μg/l.

SRP well 12.5E-10N (55-608429) is located in the SW/4 of the SW/4 of the SE/4 of Section 7, Range 2N, Township 3E. The well is located near the intersection of 15th Avenue and Bethany Home Road, approximately one-half mile west of the 7th Avenue and Bethany Home site boundary. The ADWR database indicates well 12.5E-10N is cased from land surface to a depth of 600 feet and the interval open to the aquifer for water production is from 250 to 600 feet. SRP provided groundwater sample results from this well for the period from 1986 to 2008. Over this time period, concentrations of PCE ranged from 3.4 μg/l in 1986 to not detected beginning in 2006. The most recent sample, collected in 2008, did not detect PCE above a concentration of 0.5 μg/l.

SRP also owns well 13E-10N (55-617696), located in the NE/4 of the NW/4 of the NW/4 of Section 17, Range 2N, Township 3E. The well is located near the intersection of 5th Avenue and Rancho Drive, approximately one-eight of a mile southeast of the 7th Avenue and Bethany Home Road site. This well is currently out of service but SRP anticipates it will be returned to service in the future. Well 13E-10N is cased from land surface to a depth of 242 feet and the ADWR database indicates the interval open to the aquifer for water production is from 0 to 242 feet. This would be an unusual open interval and may not be accurate. ADEQ has no groundwater sample results from this well.

In their land and water use questionnaire response, SRP indicates because of their reliance on groundwater to supplement their surface water supplies during periods of drought, SRP is very concerned with any water quality problems in the aquifer or with a threat of groundwater contamination. It is important to SRP to safeguard the ability to utilize their wells and SRP indicates it is conceivable that during periods of severe drought, SRP wells in the area may be utilized at their full annual registered volumes.

In addition SRP anticipates all of its wells in the vicinity of the 7th Avenue and Bethany Home road site will remain in use in the future. Therefore, SRP believes any plan to remediate

groundwater needs to recognize the highly variable pumping scenarios that may occur in and around the 7th Avenue and Bethany Home road site.

The annual use of groundwater by SRP will fluctuate depending upon the availability of surface water. Based on specific well information, the most reliable method of projecting future aquifer use by SRP may be through evaluation of their past aquifer use. Well 13.1-10.5E has pumped an average of 624 AFY from 1996 to 2009. Well 12.5-10N has pumped an average of 98 AFY from 1996 to 2009. This may represent the future average annual pumpage by SRP near the 7th Avenue and Bethany Home Road site.

Based on public comment, proposed ROs for current and future agricultural groundwater use in the 7th Avenue and Bethany Home Road WQARF site are:

- To protect the supply of groundwater for irrigation use and for the associated recharge capacity that is threatened by contamination emanating from the 7th Avenue and Bethany Home Road WQARF site. To restore, replace or otherwise provide for the groundwater supply lost due to contamination associated with the 7th Avenue and Bethany Home Road WQARF site. This action will be needed for as long as the need for the water exists, the resource remains available and the contamination associated with the 7th Avenue and Bethany Home Road WQARF site prohibits or limits groundwater use.

3.3 Private Groundwater Use

In July 2008, ADWR completed a comprehensive well inventory for wells within one mile of the 7th Avenue and Bethany Home Road site. The ADWR well database included seven wells with private ownership within one mile of the 7th Avenue and Bethany Home Road site. None of the wells are located within the 7th Avenue and Bethany Home Road site boundary. ADWR made several attempts to contact the well owners. Of the seven wells in the database, two were confirmed to exist, one was confirmed as abandoned and four were not located. A well not located during the field verification is not conclusive evidence that the well does not exist.

The Young well (55-702874), is located in the NE/4 of the NE/4 of the SE/4 of Section 7, Range 2N, Township 3E. The well is located near the intersection of 15th Avenue and Maryland, approximately one-quarter mile northwest of the 7th Avenue and Bethany Home Road site and its use is listed as domestic. The ADWR database indicates the Young well cased from the surface to 192 feet and the interval open to the aquifer for water production is from 50 to 192 feet. ADEQ has no groundwater sample VOC results from this well.

The Wolf well (55-806789) is located in the NW/4 of the SW/4 of the SE/4 of Section 8, Range 2N, Township 3E. The well is located near the intersection of 2nd Street and Rose Lane, approximately one-half mile east of the 7th Avenue and Bethany Home Road site and its use is listed as irrigation. The ADWR database indicates the Wolf well is 300 feet deep but no other construction information is available. ADEQ has no groundwater sample VOC results from this well.

Based on public comment, proposed ROs for current and future private groundwater use in the vicinity of the 7th Avenue and Bethany Home Road site are:

- To protect, restore, replace or otherwise provide a water supply for domestic and irrigation use by private well owners outside the current plume boundaries of the 7th Avenue and Bethany Home Road WQARF Site if the current use is impaired or lost due to contamination from the site. This action will be needed until municipal connections can be confirmed.

SECTION 4 REMEDIAL OBJECTIVES FOR SURFACE WATER

4.1 Surface Water Use

The only surface water use within one mile of the site is a pond located at the COP Palo Verde Golf Course located near the intersection of 15th Avenue and Maryland. According to the 2008 annual water withdrawal and use reports filed by the COP with ADWR, the majority of the 133 AFY provided to the Palo Verde Golf Course is supplied by SRP.

SRP provides its members with water for agricultural irrigation. SRP owns and operates a piped lateral that conveys irrigation water from north to south along 7th Avenue. Local residential properties in and near the 7th Avenue and Bethany Home Road site are irrigated with untreated water provided by SRP.

Surface water is also transported from east to west in the SRP Grand Canal, located approximately one and one-half miles south of the 7th Avenue and Bethany Home Road site. Oriented north-south from the Grand Canal, at approximate half-mile intervals are open and piped lateral canals that transport water by gravity flow southward. The lateral canals are fed by SRP production wells located in the vicinity of the 7th Avenue and Bethany Home Road site. SRP anticipates that a drinking water plant will be built on the Grand Canal within the next 100 years and the wells and facilities in the vicinity of the 7th Avenue and Bethany Home Road site will provide water to that plant.

Based on public comment, proposed ROs for current and future surface water use in the 7th Avenue and Bethany Home Road site are:

- To protect the supply of surface water for domestic and irrigation uses and for the associated recharge capacity that is threatened by contamination emanating from the 7th Avenue and Bethany Home Road WQARF site. To restore, replace or otherwise provide for the surface water supply lost due to contamination associated with the 7th Avenue and Bethany Home Road WQARF site. This action will be needed for as long as the need for the water exists, the resource remains available and the contamination associated with the 7th Avenue and Bethany Home Road WQARF site prohibits or limits surface water use.

APPENDIX G

Responsiveness Summary

RESPONSIVENESS SUMMARY

7TH AVENUE AND BETHANY HOME ROAD
WQARF REGISTRY SITE
PHOENIX, ARIZONA

Prepared by:

Arizona Department of Environmental Quality
Remedial Projects Unit
1110 West Washington
Phoenix, Arizona 85007

April 2011

RESPONSIVENESS SUMMARY
7TH AVENUE AND BETHANY HOME ROAD
WQARF REGISTRY SITE
PHOENIX, ARIZONA
APRIL 2011

INTRODUCTION

Pursuant to the requirements of the Arizona Administrative Code (ACC) R-18-16406(H) the Arizona Department of Environmental Quality (ADEQ) has prepared this comprehensive responsiveness summary for comments received on the 7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund (WQARF) Registry Site (the Site). The comment period for the Draft Remedial Investigation report was opened on August 10, 2010 for 45 days. The comment period for the Proposed Remedial Objectives was opened on February 11, 2011 for 45 days. ADEQ only received comments to the Draft Remedial Investigation report.

Comments were made by the Community Advisory (CAB) board as a whole and by a member of the CAB as an individual.

***Comment by the CAB*:**
The CAB would like to have ADEQ expand the discussion of the ADWR well survey report in the draft Remedial Investigation and if warranted additional information could be gathered during the Feasibility Study.

Response:
ADEQ agrees with this comment and the results of the Arizona Department of Water Resources (ADWR) well survey are now included in the Remedial Investigation report under Section 7, Land and Water Use Evaluation.

***Comment by the CAB*:**
We would also like to have the information of zoning issues within the City of Phoenix (COP) expanded, information of risk pathways expanded, in light to what is known regarding Salt River Project's uses of the water, and expand the information on the use of the COP well.

Response:
ADEQ did slightly expand the zoning discussion in section 7, Land and Water Use Evaluation. The section now reads as follows: The Bayless and SCI properties are under the jurisdiction of the City of Phoenix for planning purposes. Within the area of the 7th Avenue and Bethany Home Road Site there is little acreage available to be developed in the future, and the area near the Site is not expected to experience significant increases in either employment or residential growth. The zoning pattern in the area has been long established and there are no foreseeable changes for the future.

ADEQ believe it is important to note that the only currently undeveloped property in the area is the Bayless property. This property can meet both the residential and non-residential Soil Remediation Levels. Because the property can meet both Soil Remediation Levels, ADEQ granted the owners of the Bayless property a No Further Action determination for the soils at the property in December 2008.

ADEQ did not expand the discussion of the risk pathways. ADEQ believes the baseline risk assessment included in the Remedial Investigation Report is an evaluation of the basic risks associated with the Site. This baseline risk assessment is intended to be a brief discussion of which risk pathways at the Site are complete and the potential risk, or lack thereof, associated with the known concentrations at the Site.

ADEQ agrees and did expand the discussion of both the COP and the Salt River Project (SRP) wells in the area of the Site. The remedial investigation report now includes well construction information on these wells as well as a discussion of possible future use of these wells.

Comments from Individual CAB member:

Comment:
The property is currently a vacant lot and is zoned for commercial development and has been vacant for over 20 years. Will we give the owners the go-ahead to be able to sell, lease or build on this property? Or could they build on it now?

Response:
No change to the Remedial Investigation report required. ADEQ did grant the owners a No Further Action determination in December 2008 and the property owners are free to develop the property as they desire.

Comment:
Local residential properties in the area are irrigated with untreated water provided by SRP. Does the added water encourage further expansion of the plume from the contaminated property? Does this make the problem better or worse? Should the irrigation of property be stopped?

Response:
No change to the Remedial Investigation report required. ADEQ does not believe irrigation of the properties near the Site make the contamination from the Site worse and ADEQ does not believe irrigation of properties near the Site should be stopped.

Comment:
On page 55 section 7.2.1 ADWR registered well within on mile of the Sites states that no samples have exceed the AWQS for PCE of 5 μg/L in the two wells operated by SRP. It also states in the letter from SRP (May 27, 2009) that "SRP is very concerned with any water quality problems in the aquifer or with the threat of groundwater contamination. It is important to safeguard the ability to utilize these wells." I agree with this statement so what needs to be done to insure this?

Response:
No change to the Remedial Investigation on report required. ADEQ believes this issue was addressed in the Remedial Objectives for the Site. The Remedial Objectives for agricultural groundwater use are: To protect the supply of groundwater for irrigation use and for the associated recharge capacity that is threatened by contamination emanating from the 7th Avenue and Bethany Home Road WQARF Site. To restore, replace or otherwise provide for the groundwater supply lost due to contamination associated with the 7th Avenue and Bethany Home Road WQARF Site. This action will be needed for as long as the need for the water exists, the resource remains available and the contamination associated with the 7th Avenue and Bethany Home Road WQARF Site prohibits or limits groundwater use.

Comment:
On page 59 section 8.3 Baseline Risk Assessment conclusions: The surface water, air and soil pathways appear to be complete at the Site. The concentration of the contaminants known at the site do not appear to pose a substantial risk to human health. Does this mean that the site could be sold, leased or developed? Does this also mean that the concern is now only the plume of contaminants? Please define the language "do not appear" and "substantial" is not clear.

Response:
ADEQ agrees that the language is the Baseline Risk Assessment conclusions could be more definitive. ADEQ has removed the word appear from the conclusion.

Comment:
In the Conclusion and Summary on page 60 it talked about an active well 686 at feet. Will the plume reach this?

Response:
No change to the Remedial Investigation on report required. The well referenced in the comment is the COP inactive well located approximately one-quarter of a mile northwest from the current boundary of the groundwater contamination from the Site. ADEQ is concerned about the potential impact of this well from contamination from the Site and ADEQ believes this concern was addressed in the Remedial Objectives for the Site. The Remedial Objective for municipal groundwater use are: To protect the supply of groundwater for municipal use and for the associated recharge capacity that is threatened by contamination emanating from the 7th Avenue and Bethany Home Road WQARF Site. To restore, replace or otherwise provide for the groundwater supply lost due to contamination associated with the 7th Avenue and Bethany Home Road WQARF Site. This action will be needed for as long as the need for the water exists, the resource remains available and the contamination associated with the 7th Avenue and Bethany Home Road WQARF Site prohibits or limits groundwater use.

Comment:
Creating a 199 page document is important on some level. I think it is equally important to create a ONE Page (at most two) document that addresses the challenges, health concerns, and solutions in a clear, easily understood language for the public. The Conclusion and Summary on Page 60 is not what I am talking about. This is still confusing the lack a clear understanding of what happened and what still needs to be done. Most importantly what are our choices and what will happen to the property and our groundwater if we do nothing further.

Response:
No change to the Remedial Investigation on report required. ADEQ also believes that a one to two page document is important to discuss the health concerns and challenges associated with the Site. ADEQ uses the factsheets on the Site to discuss these issues with the public. The clear understanding of what needs to be done at the Site and what happens to the groundwater if we do nothing further are issues to be investigated and discussed in the next phase of the project, the Feasibility Study.

Comments

ADEQ
Arizona Department of Environmental Quality

COMMENT FORM

To comment Draft Remedial Investigation Report for the 7th Avenue and Bethany Home Road Water Quality Assurance Revolving Fund (WQARF) Site

Please provide the following:

Name: ___William Sowle

Organization/Company: __Citizen and CAB member

Address: ___346 West Rancho Drive

City, State, Zip: _____Phoenix, Arizona 85013

Phone: (602) 200-8626 E-Mail: wwsowle1@cox.net

Hi Felicia, Attached are my comments and questions for the upcoming July 14 meeting, which I cannot attend due to my school classes. Please let me know if these are the comments you had in mind. My goal is to accomplish what is needed in one year. (I am not sure why I was under this impression.) My question are directed at getting ADEQ and this committee focused. There should be clear objectives. Mine are to finally get this Site resolved. I am still amazed that after 20 years this has not long ago been put to bed. If this is that big a disaster than the responsible people should be made to pay all the costs of this cleanup. If there are no long term solutions than we should be clear about that too, but for us to continue to drag out the uncertainty any longer than is absolutely necessary is equally as bad. Please read these comments into the minutes since I cannot be there to say them myself. Sincerely, William Sowle

Please summarize your major comments or concerns below (use additional sheet if needed):

1. The property is currently a vacant lot and is zoned for commercial development and has been vacant for over 20 year. When will we give the owners the go-ahead to be able to sell, lease or build on this property? Or could they build on it now?

2. Local residential properties in the area are irrigated with untreated water provided by SRP. Does this added water encourage further expansion of the plume from the contaminated property? Does this make the problem better of worse? Should this irrigation of property be stopped?

3. On page 55 section 7.2.1 ADWR registered wells within one mile of the Site States that no samples have exceeded the AWQS for PCE of 5 ug/L in two well operated by SRP. It also states in the Letter from SRP's Scott Goodwin (May 27, 2009) That "SRP is very concerned with any water quality problems in the aquifer or with the threat of groundwater contamination. It is important to safeguard the ability to utilized these wells." I agree with this statement, so what needs to be done to insure this?

4. On page 59 section 8.3 Baseline Risk Assessment Conclusions: The surface water, air and soil pathways appear to be complete at the Site. The concentrations of the contaminants know at the Site do not appear to pose a substantial risk to human health. Does this mean that the Site could be sold, leased and developed? Does this also mean that the concern is now only the plume of contaminates? Please define: This language, "do not," " appear," and "substantial" is not clear.

Note: Either it poses substantial risk, or does not pose a risk, would be clear. If we are not sure then we should say: We are not sure if this will pose a risk. Or there is currently no risk, but we do not know about the future risk, but here are some possible outcomes based on today's scientific knowledge and then you quantify that risk.

5. In the Conclusion and Summary on page 60 it talked about an active well at 686 feet. Will the plume reach this?

6. Creating 199-page document is important on some level. I think it is equally important to create a ONE PAGE (at most two) document that addresses the challenges, health concerns, and solutions in a clear, easily understood language for the public. The Conclusion and Summary on page 60 is not what I am talking about. This is still confusing the lack a clear understanding of what happened and what still needs to be done. Most importantly what are our choices and what will happens to the property and our ground water if we do nothing further.

Note: Words like pathways, 5 ug/L need to be replaced with "safe" or "unsafe"; "your chances of being killed are the same as getting hit by lightning as long as you do not go stand under a big tree in an otherwise open landscape during a lightning storm." Well maybe not that exactly, but KISS (keep it simple 'simple')

Sincerely, William W. Sowle

You may also submit a copy of your oral statement and any attachments to:
ADEQ, Attention: Scott Goodwin, Project Manager,
1110 W. Washington Street, 4415B-1, Phoenix, AZ 85007

Deadline: Comments must be received to ADEQ by close of business Friday, July 30, 2010.

(Please Sign) date

Scott D. Goodwin

From: Johnson, Chad [Chad.Johnson@Sci-us.com]
Sent: Thursday, August 05, 2010 12:14 PM
To: Scott D. Goodwin
Subject: Official CAB
Follow Up Flag: Follow up
Flag Status: Red

Scott,

The CAB would like to have ADEQ expand the discussion of the ADWR well survey report in the draft RI, and if warranted additional information could be gathered during the FS. We would also like to have the information of zoning issues within COP expanded, information of risk pathways expanded, in light to what is known regarding Salt Rivers Project's uses of the water, and expand the information on the use of the COP well.

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