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URS

FINAL
FEASIBILITY STUDY FOR
WEST CENTRAL PHOENIX
WEST GRAND AVENUE WQARF SITE

Prepared for
ARIZONA DEPARTMENT OF
ENVIRONMENTAL QUALITY

URS Job No. 23446355
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LIST OF ACRONYMS	
AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
ARS	Arizona Revised Statutes
AWQS	Aquifer Water Quality Standard
bgs	below ground surface
BTEX	benzene, toluene, ethybenzene and xylenes
btoc	below top of casing
COC	contaminant of concern
COP	City of Phoenix
1,1-DCE	1,1-dichloroethene
EPA	U.S. Environmental Protection Agency
ERA	Early Response Action
FS	Feasibility Study
LAU	Lower Alluvial Unit
Layke	Layke Incorporated
lbs	pounds
LUST	leaking underground storage tank
MAU	Middle Alluvial Unit
MCL	Maximum Contaminant Level
mg/Kg	milligrams per Kilograms
MTP	Michigan Trailer Park
NFA	no further action
PA	Preliminary Assessment
PCE	tetrachloroethene
PID	photoionization detector
RI	Remedial Investigation
RO	Remedial Objectives
SI	Site Inspection
Site	West Central Phoenix West Grand Avenue
SRP	Salt River Project
SRV	Salt River Valley
SVE	soil vapor extraction
TCA	1,1,1-trichloroethane
TCE	trichloroethene
µg/L	microgram per Liter
UAU	Upper Alluvial Unit
UST	underground storage tank
URS	URS Corporation

LIST OF ACRONYMS	
VOCs	volatile organic compounds
WCP	West Central Phoenix
WGA	West Grand Avenue
WP	Work Plan
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

A Feasibility Study (FS) is a process to identify a Reference Remedy and alternative remedies that appear to be capable of achieving the Remedial Objectives (ROs) for a site. This FS report was prepared for the West Central Phoenix (WCP) West Grand Avenue (WGA) Water Quality Assurance Revolving Fund (WQARF) study area (Site) in accordance with the FS Work Plan (WP) completed by URS Corporation (URS) on behalf of the Arizona Department of Environmental Quality (ADEQ) in March 2013. The Site is located in Phoenix, Arizona (Figure 1).

1.1 PURPOSE AND SCOPE

This FS was developed in accordance with the Arizona Administrative Code (AAC) Title 18, Chapter 16, Section 407 (AAC, 2002). As required, the objectives of an FS include:

- The development of alternatives and recommendation of a final Remedy (Section 6.0) capable of achieving the ROs stated in the Proposed RO Report completed by ADEQ in May 2005, and
- The evaluation of each of the identified remedies based on the comparison criteria given in Arizona Revised Statues (ARS) §49-282.06 (Section 7.0).

In addition, based on the objectives stated above, this FS presents a recommendation for the preferred Remedy which complies with the requirements of ARS §49-282.06 (Section 8.0). As required, the selected remedial action shall:

- Assure the protection of public health and welfare and the environment.
- To the extent practicable, provide for the control, management or cleanup of the hazardous substances in order to allow the maximum beneficial use of the waters of the state.
- Be reasonable, necessary, cost-effective and technically feasible.

1.2 REPORT ORGANIZATION

This FS report has been organized into the flowing sections:

- Section 1.0 – INTRODUCTION
- Section 2.0 – SITE BACKGROUND: This section presents a summary of the Site description, physiographic setting, the nature and extent of the contamination, summary

of the previous assessments, current conditions, and early response actions (ERAs) associated with the Site.

- Section 3.0 – SITE CONCEPTUAL MODEL: This section presents a summary of the Site conceptual model including the areas of delineation for potential additional remediation, contamination fate and transport, and areas of potential data gaps.
- Section 4.0 – REMEDIAL OBJECTIVES: This section provides a summary of the ROs selected by ADEQ in 2005.
- Section 5.0 – REMEDIAL STRATEGIES CONSIDERED: This section provides an analysis of the potential remedial strategies for the WCP WGA site considered acceptable to achieve the ROs and comply with the requirements of AAC R18-16-407.
- Section 6.0 – REFERENCE REMEDY AND ALTERNATIVE REMEDIES: This section provides information regarding the selected Reference Remedy and two alternative remedies for groundwater within the WCP WGA site.
- Section 7.0 – DETAILED COMPARISON OF REFERENCE AND ALTERNATIVE REMEDIES: This section summarizes comparison of the reference and alternative remedies that appear to be capable of achieving ROs.
- Section 8.0 – PROPOSED REMEDY: This section presents the proposed Remedy.
- Section 9.0 – RESOURCES: This section provides references for report citations.

2.0 SITE BACKGROUND

This section presents a summary of the Site description, physiographic setting and nature and extent of the contamination. Additional information presented in this section includes a summary of the previous assessments, current conditions, risk evaluation and ERAs associated with the Site.

2.1 SITE DESCRIPTION

The WCP WGA study area is bounded approximately by Osborn Road to the north, 31st Avenue to the east, Thomas Road to the south and 35th Drive to the west in Phoenix, Arizona (ADEQ, 2012). The WCP WGA plume boundaries reflect the estimated historic extent of the contaminant plume. Figure 1 presents the WCP WGA site boundary originally established in 1998, as well as the currently designated WQARF boundary, as redefined in June 2003.

2.2 SITE GEOLOGY

The Site is located within the West Salt River Valley (SRV) which consists of thick basin fill deposits of unconsolidated to semi-consolidated late Tertiary to Quaternary-Age sediments overlying bedrock. The thickness of the basin-fill deposits varies from less than 100 feet near the margins of the basin to more than 10,000 feet in the central areas of the basin (Corkhill et al., 1993). The regional aquifer is comprised of basin-fill deposits consisting of conglomerate, gravel, sand, silt, clay, and evaporites. The deposits have been divided into hydrogeologic units and are discussed in Section 2.3. Fault-blocked mountain ranges trend northwest to southeast in the SRV, characteristic of the Basin & Range physiographic province. The SRV floor includes Precambrian to middle Tertiary-age crystalline and middle Tertiary-to Quaternary-age extrusive rocks (Brown and Pool, 1989). Although not considered a regional scale aquifer, the crystalline units may transmit small amounts of water where fracturing has occurred (Corkhill et al., 1993).

The stratification of rock layers below the WGA Site and in the surrounding area consists of heterogeneous alluvial/fluvial valley-fill deposits consistent with the regional geology. Coarse- and fine-grained materials alternate in the stratigraphic sequences. Site investigations within the area of the Site have found several fine-grained sequences consisting of silt, silt with sand, sandy silt, lean clay, and lean clay with sand. Interspersed with the fine-grained sequences were course-grained zones of silty sand, well-graded sand, well-graded sand with silt, poorly-graded sand, clayey sand, and well-graded gravel. Between 75 and 120 feet below ground surface (bgs), dense calcified caliche zones were observed (ADEQ, 2004).

2.3 SITE HYDROGEOLOGY

The SRV includes two distinct but interconnected alluvial groundwater basins, the West SRV and the East SRV. The WCP WGA site is located within the West SRV. Three hydrogeologic units have been defined by the United States Bureau of Reclamation, the USGS, and the ADWR.

In descending stratigraphic order, the three units include the Upper Alluvial Unit (UAU), the Middle Alluvial Unit (MAU) and the Lower Alluvial Unit (LAU). The UAU is reported to be between 300 and 400 feet thick in the West SRV and was once the primary source of groundwater. (Corkhill et al., 1993). However, groundwater withdrawal has resulted in dewatering of the unit. The MAU is estimated to begin at 300 feet to 400 feet bgs and is approximately 650 feet thick in the West SRV. Corkhill et al. stated that the MAU is the primary source of groundwater in the SRV and speculated that the recoverable groundwater in the unit originated from interbedded coarse layers (1993). The LAU is estimated to be found at approximately 1,000 feet bgs in the West SRV and may be up to 1,600 feet thick (Corkhill et al., 1993).

Groundwater pumping significantly influences regional groundwater flow in the West SRV. Data collected beginning in 1913 were used to develop historical water level elevation contour maps. These maps depict a west to southwest flow direction having a gradient of approximately 0.002 feet per foot (United States Bureau of Reclamation, 1977). Major sources of groundwater recharge in the SRV include infiltration in the Salt River, seepage losses from irrigation canals, and infiltration of excess irrigation. A major source of artificial recharge to the UAU in the WCP area was the Grand Canal, an irrigation canal that transports water across the SRV. Surface water from the Salt and Verde Rivers and groundwater pumped by the Salt River Project (SRP) supply the Grand Canal. The Grand Canal's influence on recharge of the UAU has been reduced since many areas of the canal have been lined in recent years.

The following information has been excerpted from the ADEQ Site Narrative (ADEQ, 2012):

> "Due principally to the ongoing drought, [groundwater elevation] has declined considerably in the past several years. In 1992, the depth to groundwater was approximately 98 feet bgs, and by April 2002, it was approximately 124 feet bgs measured in monitor Well WCP-10. Groundwater levels in Well WCP-10 decreased below the well construction depth of 130 feet bgs before September 2002. As of December 2001 groundwater flowed to the south-southwest beneath the Site at a gradient of approximately 0.003.

The Grand Canal is located along the northern edge of the Site. The Grand Canal is generally lined on the bottom and both sides in the vicinity of the Site. However, some recharge to the aquifer occurs due to infiltration from the canal."

An irrigation well owned by SRP is located approximately 900 feet east of the WGA Site and according to the Remedial Investigation (RI) report "groundwater generally flows to the south-southwest within the WCP WGA WQARF site when SRP does not operate the irrigation well" (ADEQ, 2004). As a part of an agreement with ADEQ, SRP has not operated this irrigation well since April 1999.

2.4 SITE REGISTRY

In 1982, the City of Phoenix detected volatile organic compounds (VOCs) in four municipal wells within the area of the WCP site. Groundwater sampling between 1982 and 1989 confirmed the presence of VOCs. During those investigations trichloroethene (TCE) was detected above the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL). In 1987, the WCP WQARF Site was placed on the WQARF Priority List. Data obtained indicated three primary areas of VOC contamination, which were known as the "Main Plume Area', the "WCP North Plume Site" and the "Southeast Area." Subsequent investigations indicated that the "Main Plume Area" consisted of several separate plumes of contamination, including the WGA Site. ADEQ established the WQARF Registry, replacing the Priority List, in 1997. In 1998, the WCP WQARF Site was divided into five WQARF Registry sites, one of which is the WGA Site.

2.5 SOURCE AREA DEFINITION

Groundwater contamination at the WCP WGA site was identified to be emanating from the Layke Incorporated (Layke) facility, located at 3330 West Osborn Road in Phoenix, Arizona. Layke began operations at its facility in 1967. The operations included the manufacturing of metal parts that utilized various chemical cutting oils, water-soluble cutting fluids, and solvents. The solvent used included tetrachloroethene (PCE) in 1982; TCE from 1969 to approximately 1985; and 1,1,1-trichloroethane (TCA) from 1983 to 1988. Reportedly, solvents and cutting oils were stored in 55-gallon drums at the facility and the water-soluble oils were stored in an underground storage tank (UST). Information reviewed indicated that although the UST was found to be intact (at the time of removal), evidence of leakage was found around the entrance to the tank and tank cover.

2.6 PREVIOUS INVESTIGATIONS

A summary of the previous investigations for the WCP WGA site is included in the RI report completed by ADEQ in 2004 and are included below. Tables summarizing the results for the previous soil sampling events, along with the associated figures, were excerpted from the RI report (ADEQ, 2004) and are included in Appendix A. A summary of the analytical data collected during the previous groundwater investigations is included in Table 1. Figure 2 includes the location of the associated monitoring wells within the Site and the current groundwater flow direction.

2.6.1 Preliminary Assessment/Site Inspection (1989)

In 1989, on behalf of EPA, ADEQ performed a preliminary assessment (PA) at the Layke facility. Due to the historic use of TCE and potential concerns regarding disposal practices at the facility, ADEQ recommended that a site inspection (SI) be conducted. ADEQ conducted a SI at the Layke facility in 1989. The SI investigation included soil and soil vapor sampling. Soil vapor samples (collected at approximately 10 feet bgs) in the vicinity of the UST and within the chemical storage/handling area indicated TCE concentrations of 910 microgram per Liter (µg/L) and 56 µg/L, respectively. In addition, one soil sample was collected at a depth of approximately 15.5 feet bgs within the chemical storage/handling area. No TCE was detected in this soil sample. Based on these data and information obtained regarding Layke's chemical usage, ADEQ referred the site for further investigation and remedial action.

2.6.2 Soil Investigations (1990 – 1991)

In 1990, the UST was removed from the Layke facility and several soil investigations were conducted including sampling of the UST contents (sludge) and soil sampling within the UST basin. In addition, subsurface soil samples were collected in the chemical storage area. A total of 13 soil samples and one sludge sample were collected and submitted to the laboratory for VOC analysis. Analytical results indicated the presence TCE, PCE and low levels of benzene, toluene, ethylbenzene and xylenes (BTEX) in the soil samples collected. Concentrations of TCE in the soil samples ranged from 0.01 milligram per Kilogram (mg/Kg) to 230 mg/Kg. The sludge sample was found to contain TCE at 1,400 mg/Kg, 1,1-dichloroethene (1,1-DCE) at 2 mg/Kg, PCE at 24 mg/Kg and low levels of BTEX. Split samples collected by ADEQ at that time confirmed the presence of VOCs. Based on the results of this sampling event, the Layke facility was assigned leaking UST (LUST) case file number 0922.01. ADEQ recommended that additional sampling be conducted in order to define the vertical and lateral extent of contamination in the vicinity of the UST.

In 1991, seven soil borings were advanced to depths ranging from 10 to 90 feet bgs in the area of the former UST basin. Soil samples were collected from these soil borings. The analytical results for these samples indicated concentrations of TCE ranging from below the laboratory limit (<0.01 mg/Kg) to 76 mg/Kg at a depth of 10 feet bgs. At depths greater than 10 feet bgs, concentrations of TCE up to 3.7 mg/Kg were reported. PCE was detected at 2.2 mg/Kg at a depth of 10 feet bgs and up to 0.35 mg/Kg at depths greater than 10 feet bgs. In addition, BTEX was detected above the soil remediation standard at a depth of 10 feet bgs and at low levels at greater depths. A split sample collected on behalf of ADEQ (LU-203-10) indicated the presence of TCE at 3,700 mg/Kg and PCE at 440 mg/Kg in an area beneath the UST basin. Soil borings LU-201, LU-202 and LU-203 were converted to soil vapor extraction (SVE) wells to depths of 60, 60 and 48 feet bgs, respectively, and later used during an ERA utilizing SVE. The remaining soil borings were backfilled with granular bentonite.

Based on the results of the 1991 investigation, it was concluded that the majority of the hydrocarbon and VOC contamination was detected beneath the former UST and extended to a depth of approximately 30 feet bgs. In addition, low concentrations of VOCs were detected in a silty clay unit located at approximately 55 to 65 feet bgs.

2.6.3 Installation and Sampling of Monitoring Wells (1992 – 2001)

During groundwater investigation within the WCP study area conducted between 1992 and 1994, monitoring well WCP-4 was installed within the Layke facility and an upgradient monitoring well (WCP-8) was installed north of the Grand Canal. WCP-4 was installed to determine the vertical extent of the VOC soil contamination in the area of the former UST and to evaluate whether groundwater had been impacted. Due to problems encountered during the installation of monitoring well WCP-4, two soil borings had to be drilled. Soil samples were collected from each borehole. Analytical results indicated the presence of TCE (49 mg/Kg) at a depth of 19 feet bgs. TCE was also detected at depths of 60.5 to 94.5 feet bgs (below the silty clay layer), with a maximum concentration of 0.090 mg/Kg.

From 1992 to 1994, analytical results of groundwater samples collected from WCP-4 indicated TCE concentrations ranging from 290 µg/L to 420 µg/L (including the duplicate samples). Although low levels of other VOCs were detected, TCE was the only analyte detected above the Aquifer Water Quality Standard (AWQS). During the same time frame, no TCE, above the laboratory limit of 0.5 µg/L, was detected in monitoring well WCP-8.

In 1995, two shallow groundwater monitoring wells (WCP-10 and WCP-11) were installed. WCP-10 is located downgradient (to the south) and WCP-11 is located crossgradient (to the

west) of the Layke facility. After the installations were completed, these monitoring wells were sampled twice and monitoring well WCP-4 was sampled once. Analytical results indicated the presence of TCE in WCP-4 at 140 µg/L and in WCP-10 at 37-45 µg/L. No TCE, above the laboratory limit of 0.5 µg/L was detected in the samples collected from WCP-11.

In 1996, annual groundwater monitoring was conducted throughout the WCP area. This monitoring event included the sampling of wells WCP-4, WCP-8, WCP-10 and WCP-11. No TCE was detected in WCP-8 and WCP-11, TCE was detected in WCP-4 and WCP-10 at 190 µg/L and 33 µg/L, respectively.

Between 1996 and 2001, wells WCP-4, WCP-8, WCP-10, WCP-11 and MW-103s were sampled during the RI investigation for the WCP West Osborn Complex. Monitoring well MW-103s is located downgradient (to the southwest) of the Layke facility. Analytical results indicated the following: TCE was detected in WCP-4 at concentrations ranging from 0.58 µg/L to 3.1 µg/L, with no TCE detected during some of the sampling events; no TCE was detected in WCP-8; TCE in WCP-10 ranged from 3.9 µg/L to 29 µg/L; TCE was detected in WCP-11 at concentrations ranging from 0.6 µg/L to 3.8 µg/L, with no TCE detected during some of the sampling events; and TCE detected in MW-103s ranged from 28 µg/L to 59 µg/L. In addition, low levels of 1,1-DCE and PCE were detected in MW-103s.

In March 2001, during the no further action (NFA) investigation noted below, one round of groundwater samples was collected from WCP-4 and WCP-10. At that time, WCP-11 was dry and therefore was not sampled. TCE was not detected in WCP-4, but was detected in WCP-10 at 8 µg/L.

2.6.4 Layke NFA Investigation (2000 – 2002)

In December 2000, Layke submitted a NFA request to ADEQ for a portion of the facility on which an ERA had been conducted (see Section 2.7). The NFA request was restricted to TCE in soil and groundwater within an 80-foot diameter of the former UST location. After review of the historical information, ADEQ concluded that there was insufficient information to grant a NFA determination due to the need for confirmatory samples in the area remediated by the SVE system, the need to investigate other potential areas of concern, and the need to evaluate any residual groundwater contamination beneath the Layke facility.

ADEQ conducted a NFA investigation at the Layke facility between March 2001 and January 2002. This investigation included groundwater sampling, advancement of soil borings, and the collection of soil, soil vapor and Hydropunch® samples. Between December 2001 and January

2002, nine soil borings were drilled within the vicinity of the former UST basin and the chemical storage/handling area. These areas were selected based on historical information and were considered to be within areas known or suspected as having been impacted by VOCs. Five soil borings were advanced in the vicinity of the former UST basin to evaluate the effectiveness of the SVE system in remediating the area. Four soil borings were advanced in the vicinity of the chemical storage/handling area to evaluate the presence and/or absence of VOCs. The soil borings were advanced to approximately 136 feet bgs, and soil and soil vapor samples were collected at approximate 20-foot intervals from 10 feet bgs to 126 feet bgs. Soil samples were collected in EnCore™ samplers and a SimulProbe® sampler (with Tedlar™ bags) was used to collect the soil vapor samples.

No VOCs, above the laboratory limit, were detected in the soil samples collected. Low levels of VOCs were detected in the soil vapor samples collected. Within the area of the former UST basin, TCE was detected at 1.2 µg/L to 6.1 µg/L and no 1,1-DCE or PCE was detected. Within the chemical storage/handling area no TCE or PCE was detected above the laboratory reporting limits; however, 1,1-DCE was detected at 1.1 µg/L to 1.8 µg/L.

At the completion depth of the nine soil borings (approximately 136 feet bgs), Hydropunch® samplers were attached and groundwater was collected via dedicated disposable bailers. No VOCs were detected above the laboratory reporting limit in the groundwater samples collected.

2.7 EARLY RESPONSE ACTIONS

In anticipation that remediation of VOCs and hydrocarbons would be necessary at the Layke facility, three soil borings were converted to SVE wells in 1995 (see Section 2.6.2). An ERA consisting of a SVE system was implemented by Layke at its facility from March 1995 until 1998.

Installation of the SVE system was conducted from March 1 through May 26, 1995, and the SVE system was tested on March 29, 1995. Monitoring of the SVE system included collecting vapor samples of the system exhaust and screening the system exhaust vapors with a photoionization detector (PID). ADEQ raised several performance issues regarding the operation and sampling of the SVE system including the validity of the sampling and analysis documentation. Therefore, it was difficult to accurately estimate the actual mass of VOCs removed from the soil. Consequently, although Layke's contractor estimated approximately 100 pounds (lbs) of TCE were extracted during the first 6 months of operation of the treatment system, ADEQ's contractor estimated that 250 to 300 lbs of TCE were extracted during that same time period. In November 1997, TCE removal had decreased to an estimated rate of less than 0.007 lbs/day

(ADEQ, 2004). The RI Report states that, in 1998, Layke shut down the SVE system due to financial reasons and due to the fact that VOC concentrations in the treatment system exhaust were no longer detectable. A rebound test was planned, but was never performed. An NFA Investigation was, however, conducted in 2001-2002 (see Section 2.6.4).

2.8 CURRENT CONDITIONS

Groundwater samples were collected at monitoring well WCP-235 (located approximately 23.5 feet east of WCP-10) in 2008, 2012 and early 2013. Monitoring well WCP-235 (ADWR registration number 55-908753) was installed in May 2008 and is screened in the interval of 128 to 173 feet bgs (Locus, 2008). At the time of installation, according to ADWR imaged records, water was encountered at about 138 feet bgs. A groundwater sample collected following well installation in 2008 contained TCE at a concentration of 2.1 µg/L (Locus, 2008).

Depth-to-groundwater in WCP-235 was measured at 137.10 feet below top of casing (btoc) on October 10, 2012 and at 138.37 feet btoc on January 16, 2013 (URS, 2013). Well WCP-10 was dry on both dates. During groundwater sampling conducted in October 2012, TCE, PCE and 1,1-DCE were not detected above the respective laboratory reporting limits of 1.0 µg/L, 1.0 µg/L and 2.0 µg/L in the collected field original sample or in the field duplicate sample. The groundwater sample collected from WCP-235 in January 2013 showed TCE at a concentration of 1.0 µg/L, which is less than the AWQS of 5 µg/L. No PCE or 1,1-DCE were detected at concentrations above the respective laboratory reporting limits.

3.0 SITE CONCEPTUAL MODEL

This section presents a summary of the Site conceptual model including the areas of delineation for potential additional remediation, contamination fate and transport, and areas of potential data gaps.

3.1 DELINEATION OF REMEDIATION AREAS

The source of chlorinated VOCs in soil and groundwater within the Site was determined by ADEQ to be the former UST located within the Layke facility (ADEQ, 2004). Field investigation activities within the Site were conducted between 1989 and 2013 and have included: soil and soil vapor sampling, Hydropunch® sampling, groundwater monitoring well installations, and groundwater monitoring well sampling. Several contaminants were detected in soil and groundwater samples collected during field investigations within the Site. The primary contaminant of concern is TCE. TCE, PCE, and 1,1-DCE have been detected in soil samples collected at the Layke facility. TCE is the only chlorinated VOC detected in groundwater at concentrations above the AWQS within the area of the former UST basin and/or in wells within the WCP WGA site. 1,1-DCE has been detected in wells within the WCP WGA at concentrations ranging from 0.9 µg/L to 2.0 µg/L. PCE has not been detected in groundwater samples collected within the WCP WGA.

3.1.1 Soil Remediation Area

Contaminants in soils beneath the Layke facility have included TCE from approximately 3 feet to 95 feet bgs in the area beneath the former UST basin and associated piping. In addition, PCE was found in the same area at approximately 3 feet to 20 feet bgs. Layke implemented an ERA to remediate the PCE and TCE contamination in soils beneath the facility. Soil remediation at the Layke facility, through the use of a SVE system, resulted in soils meeting the established soil remediation standards. Therefore, ADEQ granted an NFA status in 2002, pursuant to ARS §49-287.01. Based on the information provided in the RI, no further remediation of soils within the Layke facility is required and therefore no ROs were proposed in the RO Report. No remedial strategies for soils have been included in this FS for the Layke facility.

3.1.2 Soil Vapor Remediation Area

A decline in TCE concentrations in soil vapor samples collected in the area around the former UST basin was noted from 910 µg/l (in 1989) to less than 6.1 µg/L (at a depth of 126 feet bgs in 2001/2002). TCE, PCE, and 1,1-DCE were not detected above the laboratory limits (ranging

from 0.5 µg/L to 1.0 µg/L) in soil vapor at the Layke facility at a depth of 11 feet. Therefore based on the available data, no further remediation of the soil vapor within the Layke facility is required and no remedial strategies for soil vapor have been included in the this FS.

3.1.3 Groundwater Remediation Area

Groundwater investigation activities conducted in the area of the Site have included sampling of the following:

- Monitoring wells WCP-4, WCP-8, WCP-10 and WCP-11 from 1992 to 2001,
- Wells installed for the WCP West Osborn Complex RI,
- Wells installed for the WCP East Grand Avenue site RI,
- Hydropunch® groundwater samples from the soil borings advanced on the Layke facility in 2001/2002, and
- Monitoring well WCP-235 in 2008, 2012 and 2013.

TCE is the only contaminant found in the groundwater within the Site at levels above the AWQS. TCE was detected above the AWQS in only two monitoring wells; WCP-4 (located within the Layke facility) and WCP-10 (which was installed as the downgradient well). Between 1992 and 2001, TCE concentrations in WCP-4 decreased from 420 µg/L in 1992 to below the laboratory limit starting in 1999. TCE concentrations in WCP-10 decreased from 45 µg/L in 1995 to 5 µg/L in June 2001. It should be noted that although the downgradient well, WCP-10, has been dry since 2004, groundwater samples were collected at monitoring well WCP-235 (located approximately 23.5 feet east of WCP-10) in 2008, 2012 and early 2013. The most recent data indicated that TCE was detected within this well at a concentration of 1.0 µg/L, which is below the AWQS of 5 µg/L. These data are discussed further below (Section 3.2)

3.2 FATE AND TRANSPORT OF CONTAMINANTS

According to the RI report, after the ERA was complete and the source of contamination had been removed, the groundwater contamination plume became a "slug" that moved downgradient (i.e., in a south to southwest direction). At the time the RI was written, the plume was localized in a small area approximately 900 feet downgradient of the source area.

Figure 3 indicates the concentration of TCE in monitoring wells, WCP-4, WCP-10, WCP-235, WCP-103S, and WCP-202S as a function of time. The locations of the wells are summarized below:

- WCP-4 (screened from 90 to 130 feet bgs) is located within the Layke facility, but is currently dry;
- WCP-10 (screened from 86 to 126 feet bgs and currently dry) is located about 900 feet to the south of the Layke facility; this location was proximally downgradient of the Layke facility prior to lining of the Grand Canal;
- WCP-235 is located about 23.5 feet east of WCP-10 and is screened in a deeper interval (128 to 173 feet bgs);
- WCP-103S (screened from 90 to 130 feet bgs) is a well associated with the West Osborn Complex WQARF Registry Site and is located about 960 feet southwest (the approximate direction of groundwater flow in the shallow portion of the aquifer since the lining of the Grand Canal); and
- WCP-202S is a well with a deeper screen (130 to 165 feet bgs) installed to replace the dry WCP-103S and is also located southwest of WCP-10.

Figure 3 includes TCE concentration data from WCP-4 and Hydropunch® samples collected at the Layke facility as a single data set, data from WCP-10 and WCP-235 as a data set, and WCP-103S and WCP-202S as a data set. In addition, groundwater elevation data from the same wells are presented on the Chart. With the exception of the Hydropunch® data, concentrations presented in the timeframe up to 2002 are from the shallower well and data collected after 2002 are from the deeper well. Figure 3 indicates the general decrease in TCE concentrations to less than the AWQS of 5 µg/L in water beneath the Layke facility and wells WCP-10/WCP-235 following the ERA source removal. There has also been a slight decrease in TCE concentration at the downgradient location associated with WCP-103S and WCP-202S. It should be noted that the TCE concentrations measured in these wells are associated with the West Osborn Complex WQARF Site. If, however, a "slug" of TCE was moving downgradient from the WGA site with no corresponding attenuation, it would be expected to be observed at this location. Instead, the concentration at this location has been gradually decreasing with time with a minor exception noted in December 2008. Therefore, the TCE in groundwater at the WGA site is believed to have attenuated following removal of the source.

A review of historic and recent PCE data for groundwater samples collected from WCP WGA wells WCP-4, WCP-8, WCP-10, WCP-11 and WCP-235 indicates that PCE concentrations have been non-detect. However, PCE has been detected in groundwater samples collected from WCP WOC MW-103S and MW-202S (Tetra Tech, 2011). These data indicate that the contaminants detected in the WCP WOC wells are most likely from the WCP WOC plume and not the WCP WGA plume.

3.3 AREAS OF UNCERTAINTY

Areas of uncertainty noted in the RI report include: 1) lack of rebound test following cessation of SVE; and 2) vertical delineation of the plume. The data gaps associated with these areas and a discussion of additional actions needed, if any, to address these data gaps is summarized below.

Based on the information provided in the RI report, in 1998, Layke shut down the SVE system due to financial reasons and due to the fact that VOC concentrations in the treatment system exhaust were no longer detectable. A rebound test was planned, but was never performed. As described in Section 2.7, soil and soil vapor samples were, however, collected in 2001-2002 to demonstrate that the SVE system had achieved soil remediation levels in the vadose zone. A decline in TCE concentrations in soil vapor samples collected in the area around the former UST was noted (from 910 µg/l in 1989 to less than 6.1 µg/L (at a depth of 126 feet bgs) in 2001-2002).

An assessment of soil vapor intrusion to indoor air has not been performed. As documented in the RI Report (ADEQ, 2004), TCE, PCE, and 1,1-DCE were not detected in soil vapor at the Layke facility at a depth of 11 feet in any of the nine borings at laboratory reporting limits ranging from 0.5 µg/L to 1.0 µg/L. Therefore, this FS report does not propose activities for such an evaluation.

Based on information provided in the RI report, only the upper portion of the aquifer at the West Grand Avenue site has been sampled. In addition, the RI report states that "further definitive characterization of the vertical extent of groundwater contamination is unknown at this time and will be addressed during the FS, if needed, based on the selected remedial alternative." The characterization of the vertical extent of groundwater contamination is not considered to be necessary at this time based on a comparison of TCE concentration data in wells WCP-10 and WCP-235 which are screened in different intervals. Well WCP-10 is screened from 86 to 126 feet bgs. WCP-235 is screened from 128 to 173 feet bgs. TCE concentrations in samples collected from WCP-10 ranged from 45 µg/L in 1995 to 5 µg/L in June 2001 with a general decreasing trend. Concentrations in the adjacent, deeper-screened well, WCP-235, show a continuing decreasing trend from 2.1 µg/L in 2008 to 1.0 µg/L in 2013. Because the two wells were not sampled concurrently, a direct comparison cannot be made between WCP-10 and WCP-235 concentrations. The decreasing TCE concentrations observed in WCP-235, however, are an indicator that there is not a vertical component to the TCE dissolved plume.

4.0 REMEDIAL OBJECTIVES

This section provides a summary of the ROs selected by ADEQ in 2005. The ROs were established for the reasonably foreseeable uses of land and groundwater within the WCP WGA Site. According to the Proposed RO Report (ADEQ, 2005) the following ROs were used as basis in the performance of the FS.

4.1 REMEDIAL OBJECTIVES FOR LAND USE

Land uses within the Site are expected to remain predominately industrial (A-2) or light industrial (A-1). Soil remediation at the Layke facility, through the use of a SVE system (see Section 2.7), resulted in soils meeting the established soil remediation standards. Therefore, ADEQ granted a NFA status in 2002. Based on this, no ROs are proposed for soils.

4.2 REMEDIAL OBJECTIVES FOR GROUNDWATER USE

Current and potential groundwater uses identified within the WCP WGA site include: 1) the possible future use of groundwater for drinking water purposes by the City of Phoenix (COP); 2) the future use of SRP wells; 3) the future use of the Michigan Trailer Park drinking water well; and 4) the future use of the Danone Water (Danone) drinking water well.

Specifically, the proposed RO for the COP groundwater supply is "to restore or provide for the use of the COP groundwater supply if it becomes impacted by the TCE groundwater contamination emanating from the WCP WGA site. This action would be needed for as long as the level of contamination in the identified groundwater resource threatens or prohibits its use." According to the online well database provided by ADWR, there are three COP groundwater supply wells within 1 mile of the Site (ADWR, 2013). COP-69 (ADWR number 55-626551) is located northeast (upgradient) of the Site. Groundwater supply wells COP-70 and COP-71 (ADWR numbers 55-626552 and 55-626553, respectively) are located southwest (downgradient) from the Site. These wells were removed from service in 1982.

The proposed RO for the SRP wells as stated in the RO report is "to protect for the use of the SRP groundwater supply threatened by the TCE contamination emanating from the WCP WGA site should the wells be lost due to changes in groundwater flow direction that would affect the concentration of TCE at the wells. This action would be needed for as long as the level of contamination in the identified groundwater resource threatens or prohibits its use." (ADEQ, 2005) The SRP wells in the area of the WCP WGA site are located either crossgradient or upgradient to the Site. The SRP wells do not appear to be affected by TCE originating from the

WOC WGA Site. The SRP wells are not currently being pumped in accordance with an agreement between ADEQ and SRP.

The proposed RO for the Michigan Trailer Park (MTP) well is "to protect for the use of the Michigan Trailer Park groundwater supply threatened by the TCE contamination emanating from the WCP WGA site should the wells be lost due to changes in groundwater flow direction that would affect the concentration of TCE at the well. This action would be needed immediately." The MTP well is located approximately 950 feet east of and upgradient and crossgradient to the source of the contamination (Layke facility). This well is registered under the Arizona Department of Water Resources (ADWR) number 55-618512. There are no construction records for this well to indicate whether pumping at the MTP well extracts water from the same portion of the aquifer as that impacted within the WGA Site.

The Danone well is located within the DS Water of America, Inc. property and is owned by this entity. According to the RO report, the proposed RO for the Danone well is "to protect for the use of the Danone groundwater supply threatened by the TCE contamination emanating from the WCP WGA site should the wells be lost due to changes in groundwater flow direction that would affect the concentration of TCE at the well. This action would be needed immediately." The Danone well is located approximately 1,500 feet south of and crossgradient to downgradient of the Layke facility. In addition, according to the online well database provided by ADWR, a notice of intent to drill a replacement well for the Danone well was filed with ADWR and it was approved on November 27, 2012 (ADWR, 2013). Water withdrawn from both of these wells is obtained from a deeper, non-contaminated aquifer (i.e., the MAU). The current and proposed wells are registered under the ADWR numbers 55-800680 and 55-221831, respectively. It should be noted that the existing Danone Well is located within the East Grand Avenue WQARF Site study area.

5.0 REMEDIAL STRATEGIES CONSIDERED

This section provides an analysis of the potential remedial strategies for the WCP WGA site considered acceptable by ADEQ for achieving the ROs and to comply with the requirements of AAC R18-16-407. As stipulated by AAC R18-16-407(F), the following strategies were considered in development of the Reference Remedy and alternative remedies:

- Plume remediation to achieve water quality standards for COCs throughout the Site;
- Containment within specific boundaries;
- Controlled migration;
- Source control;
- Monitoring; and
- No action.

The remedial strategies applicable to the Site were selected based on information included in the RI report and best engineering, geological and/or hydrogeological judgment. Therefore, remedial strategies considered in development of the Reference Remedy and alternative remedies are as follows.

- Source control is a strategy to eliminate or mitigate a continuing source of contamination.
- Monitoring is a strategy to observed and evaluate the contamination at the site through the collection of data.
- No action is a strategy that consists of no action at a site.

The source of contamination within the Site is the former UST located within the Layke facility. Response actions taken to date have included the removal of the UST and the installation and operation of a SVE system within the Layke facility. Soil and soil vapor samples collected demonstrated that the SVE system achieved soil remediation levels in the vadose zone.

TCE is the only contaminant historically found in the groundwater within the Site at levels above the AWQSs. In 1995, TCE was detected above the AWQS in WCP-4, located within the Layke facility. In 1996, TCE was detected above the AWQS in WCP-4 and WCP-10 (the downgradient well). After the source control was achieved through the completion of the ERA, TCE concentrations in groundwater decreased to less than laboratory reporting limits and only the downgradient portion of the plume (i.e., WCP-10) remained above the AWQS.

The groundwater flow direction and gradient had resulted in TCE movement in a south to southwest direction. At the time the RI was concluded, the dissolved plume was localized in a

small area approximately 900 feet downgradient of the source area. Monitoring well WCP-235 is located in the approximate center of the localized plume. According to the RI report, the horizontal extent of TCE contamination within the Site had been adequately defined by monitoring wells WCP-4, WCP-8, WCP-10 and WCP-11. In addition, the decreasing TCE concentrations observed in monitoring well WCP-235 are an indicator that there is not a vertical component to the TCE dissolved plume. The most recent data indicate the TCE was detected within this well at a concentration of 1.0 µg/L, below the AWQS of 5 µg/L.

The remedial strategy of source control has been achieved within the WCP WGA site. Based on the information summarized above and the ROs given in Section 4.0, remedial strategies selected include monitoring and no action.

6.0 REFERENCE REMEDY AND ALTERNATIVE REMEDIES

This section provides information regarding the selected reference and two alternative remedies for groundwater within the WCP WGA site. Based on the information summarized in Section 5.0, the remedial strategies selected are additional groundwater monitoring or no action.

6.1 REFERENCE REMEDY

The remedial strategy and measures for the Reference Remedy include two additional groundwater monitoring and sampling investigations within calendar year 2013. During each sampling event, the depth to groundwater will be measured at monitoring well WCP-235, and a groundwater sample and corresponding duplicate will be collected following low-flow purging of the well. In addition, each sampling event will include collection of an equipment blank. The groundwater samples will be submitted to an Arizona-licensed laboratory for analysis of VOCs using U.S EPA Method SW8260B. A monitoring report will be completed at the conclusion of the two sampling events. This report will include a description of the sampling methodologies, a summary of field measurements, a summary of analytical results, a comparison of analytical results to historical data, conclusions, and additional recommendations (if any).

Monitoring well WCP-235 is registered under ADWR number 55-908753. This well is owned by ADEQ and is located within the City of Phoenix right-of-way at the approximate address of 3332 West Flower Street. Although the well is located within the City right-of-way, the well is located within the parking lane of the street, and the City has stated that a lane closure or right-of-way permit is not required to collect a sample from the well. No other permits or approvals are anticipated at this time.

If, at the conclusion of the two sampling events, TCE concentrations remain less than the AWQS, all wells associated with the WGA WQARF Site will be abandoned in accordance with ADWR requirements. An ADWR Notice of Intent to Abandon a Well will be filed and, it is anticipated, that a City of Phoenix lane closure permit will be required for well abandonment activities.

As summarized in Section 5.0, source control has been achieved within the WCP WGA site. The ROs include the protection of groundwater within the area of the Site (see Section 4.0). As previously described, the horizontal extent of TCE contamination within the Site has been adequately defined and there appears to be no vertical component to the plume. Therefore, this Reference Remedy has been selected to further demonstrate that the ROs for the Site have been achieved.

6.2 MORE AGGRESSIVE ALTERNATIVE REMEDY

The More Aggressive Alternative Remedy selected includes a longer time period for the monitoring program. This alternative includes quarterly groundwater monitoring for a period of 2 years (eight quarters). Groundwater samples will be collected as described above for the Reference Remedy. Results will be reported on an annual basis. As described above, no permits are expected to be required.

If, at the conclusion of the eight sampling events, TCE concentrations remain less than the AWQS, all wells associated with the WGA WQARF Site will be abandoned in accordance with ADWR requirements. An ADWR Notice of Intent to Abandon a Well will be filed and, it is anticipated, that a City of Phoenix lane closure permit will be required for well abandonment activities.

6.3 LESS AGGRESSIVE ALTERNATIVE REMEDY

A review of the analytical results from the three rounds of groundwater sampling conducted in 2008, 2012 and 2013, indicate that the groundwater in WCP-235 does not contain concentrations of VOCs that exceed the applicable AWQS. The most-recent sampling event (January 2013) reported a TCE concentration of 1.0 µg/L, which is less than the AWQS of 5 µg/L. In addition, the observed concentrations are consistent with the long-term trends for the Site. Based on this information, the Less Aggressive Alternative Remedy selected is no action.

The only activity associated with this alternative is the abandonment of all wells associated with the WGA WQARF Site in accordance with ADWR requirements. An ADWR Notice of Intent to Abandon a Well will be filed and, it is anticipated, that a City of Phoenix lane closure permit will be required for well abandonment activities.

7.0 DETAILED COMPARISON OR REFERENCE REMEDY AND ALTERNATIVE REMEDIES

This section summarizes comparison of the reference and alternative remedies that appear to be capable of achieving ROs. As specified in R18-16-407, the primary basis for the evaluation includes practicability, risks, costs and benefits.

7.1 PRACTICABILITY

The evaluation of the practicability of the reference and alternative remedies includes the consideration of feasibility, short and long-term effectiveness and reliability, site-specific conditions and characteristics of the contamination, as summarized below:

- **Feasibility.** The groundwater monitoring proposed in the Reference Remedy and More Aggressive Remedy is considered to be feasible. The existing well, WCP-235, is accessible and is screened across the top of the upper alluvial aquifer. Monitoring at additional existing wells (WCP-4, WCP-8, WCP-10, and WCP-11) within the boundaries of the Site is not feasible due to the decrease in the groundwater elevation such that groundwater is below the depth of the screened interval of the wells. The Less Aggressive Remedy, which involves no action, is also feasible.
- **Short-Term Effectiveness.** The evaluation of short-term effectiveness is intended to take into account the amount of time until a remedy protects human health and the environment. Based on groundwater monitoring results, the TCE concentrations observed at the Site are currently less than the AWQS. Therefore, the proposed Remedies are considered to be effective in the short term.
- **Long-Term Effectiveness.** The long-term effectiveness of each of the three remedies is evaluated based on the past trend in groundwater concentrations. Groundwater concentrations have been decreasing at the Site and are expected to continue that trend in the future. Thus, all three Remedies are considered to be effective in the long term.
- **Reliability.** The reliability of the Remedies is based on the dependability and consistency of groundwater monitoring. Groundwater sampling and analytical procedures for volatile organic compounds are well established and provide reliable data. The overall trend from past sampling indicates a decreasing TCE concentration at the Site. The TCE concentration data are repeatable as evidenced by 2012 and 2013 sampling events. The proposed monitoring for the Site associated with the Reference and More Aggressive Remedies includes quality assurance samples.

- **Site Specific Conditions.** TCE concentrations in groundwater at the Site have decreased to values less than the AWQS of 5 µg/L (see Figure 3). Since the lining of the Grand Canal, groundwater flow direction is consistently to the southwest in the shallow part of the UAU and the gradient is relatively shallow (0.003 ft/ft). All three Remedies considered have taken into account the Site Specific Conditions. Future pumping at area wells (City of Phoenix, SRP, Michigan Trailer Park, and Danone) may result in changing groundwater flow direction and gradients, as discussed further in Section 7.2.
- **Characteristics of Contamination.** The contamination at this Site is dissolved TCE. There is no indication that TCE existed as DNAPL within the aquifer. The source of the TCE was removed by removal of a UST and implementation of an SVE system. In addition, the lining of the Grand Canal resulted in a decrease in groundwater elevation at the source area of about 45 feet (see Figure 3). Thus, there is an interval of separation between the remediated source zone soil and the aquifer. As a result, dissolved TCE concentrations have decreased as a result of source remediation and downgradient natural attenuation to values less than the AWQS.

7.2 RISKS

The evaluation of risk must include consideration of the overall protectiveness of public health and the environment under reasonably foreseeable use scenarios and end uses of the water. As required by R18-16-407, this evaluation must also address:

- The contaminant's fate and transport, concentration and toxicity.
- Current and future land and water uses.
- Pathways and duration of exposure.
- Changes in risk.

As discussed in Section 3.2, the TCE in groundwater at the WGA Site appears to have attenuated based on groundwater concentration trends at the source area and downgradient at the well pair WCP-10/WCP-235. TCE concentrations further downgradient (i.e., within the West Osborn Complex Shallow Groundwater System TCE plume) are higher than those observed at WCP-10/WCP-235. Thus, there is little risk that the low levels of TCE observed at the WGA Site (i.e., 5 µg/L or less since 2001) will result in increased risk at downgradient locations.

A risk associated with all three Remedies (and considered to be equal for the three) is primarily associated with potential changes to groundwater flow direction and gradient as a result of renewed pumping at the nearby COP and SRP wells. If TCE has attenuated throughout the Site (and not just at the source and WCP-10/WCP-235), then the risk associated with nearby pumping

wells will be low. If, however, dissolved TCE exists at an intermediate point between the source and the monitoring well WCP-235, the dissolved contaminant could be mobilized toward the pumping well. This risk is considered to be low.

Pumping at the Michigan Trailer Park and the Danone Well(s) are not expected to result in contaminant transport from the WGA Site. The Danone Well(s) are screened within the MAU and the Michigan Trailer Park well is located up and cross-gradient of the Site. Affects from this well have not been observed at WGA. The risk associated with these wells is considered to be equal for all Remedies.

7.3 COSTS

The comparison of the estimated costs of the reference and alternative remedies is summarized on the following table:

Estimated Costs for the Reference and Alternative Remedies

	Reference Remedy	More Aggressive Alternative Remedy	Less Aggressive Alternative Remedy
Pre-Sampling Activities	$2,000	$2,000	$0
Groundwater Sampling and Analysis	$5,000	$20,000	$0
Annual Reporting (FY2013)	$2,500	$2,500	$0
Annual Reporting (FY2014)	$0	$2,500	$0
Well Abandonment: MW-4, MW-8, MW-10, MW-11 and MW-235	$23,000	$23,000	$23,000
TOTAL COST	**$32,500**	**$50,000**	**$23,000**

7.4 BENEFITS

A comparison of the benefit of the reference and alternative remedies includes an assessment of the value of the Remedy in terms of lowered risk, decrease in liability, and preservation of existing and future uses.

Each Remedy is considered to be of equal benefit based on the current groundwater conditions, wherein dissolved TCE concentrations are 1.0 µg/L or less. Each Remedy also preserves existing land uses.

7.5 COMPARISON OF REMEDIES

The following table provides a comparison of the reference and alternative remedies on a numeric basis. The evaluation criteria given are based upon the information summarized in Sections 7.1 through 7.4.

Numeric Comparison of the Reference and Alternative Remedies

	Reference Remedy	More Aggressive Alternative Remedy	Less Aggressive Alternative Remedy
Practicability • Practicable = 1 • Not Practicable = 0	1	1	1
Risks • Low = 3 • Medium = 2 • High = 1	3	3	3
Costs • Least Expensive = 3 • Mid-range Cost = 2 • Most Expensive = 1	2	1	3
Benefits • Beneficial = 1 • Not Beneficial = 0	1	1	1
TOTAL NUMERIC VALUE	7	6	8

8.0 PROPOSED REMEDY

It is recommended that the Less Aggressive Remedy be selected as the Final Remedy for the WCP WGA site. Based on the comparison with the Reference Remedy and More Aggressive Remedy, the Less Aggressive Remedy appears to:

- Provide for adequate protection of public health and welfare and the environment;
- Provide for the demonstration of the control and management of the groundwater contamination plume in order to allow the maximum beneficial use of the waters of the state; and
- Be reasonable, necessary, cost-effective and technically feasible.

In addition, the Less Aggressive Remedy is consistent with the regional groundwater management plans and general land use planning.

9.0 RESOURCES

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FIGURES

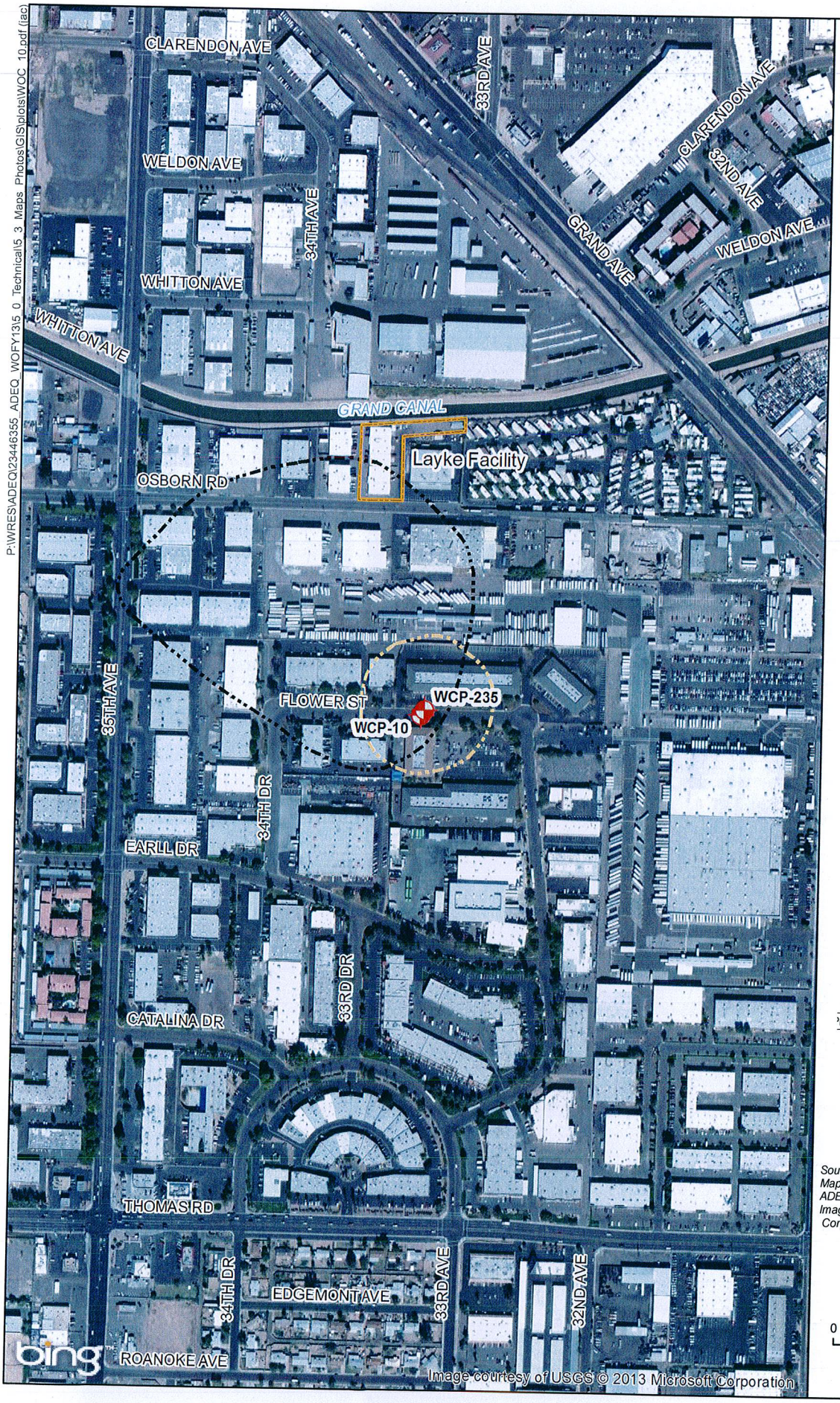

Figure 1
Boundaries of the WCP WGA Site

West Central Phoenix (WCP)
West Grand Avenue (WGA)
WQARF Site
Phoenix, AZ

Legend

- Well
- Current Estimated Plume Boundary
- Former Estimated Plume Boundary
- Layke Facility

Source:
Map Features:, ADOT 2012, ADEQ 2012, URS 2013
Imagery: Bing(c) 2010 Microsoft Corporation

N

0 500
Feet

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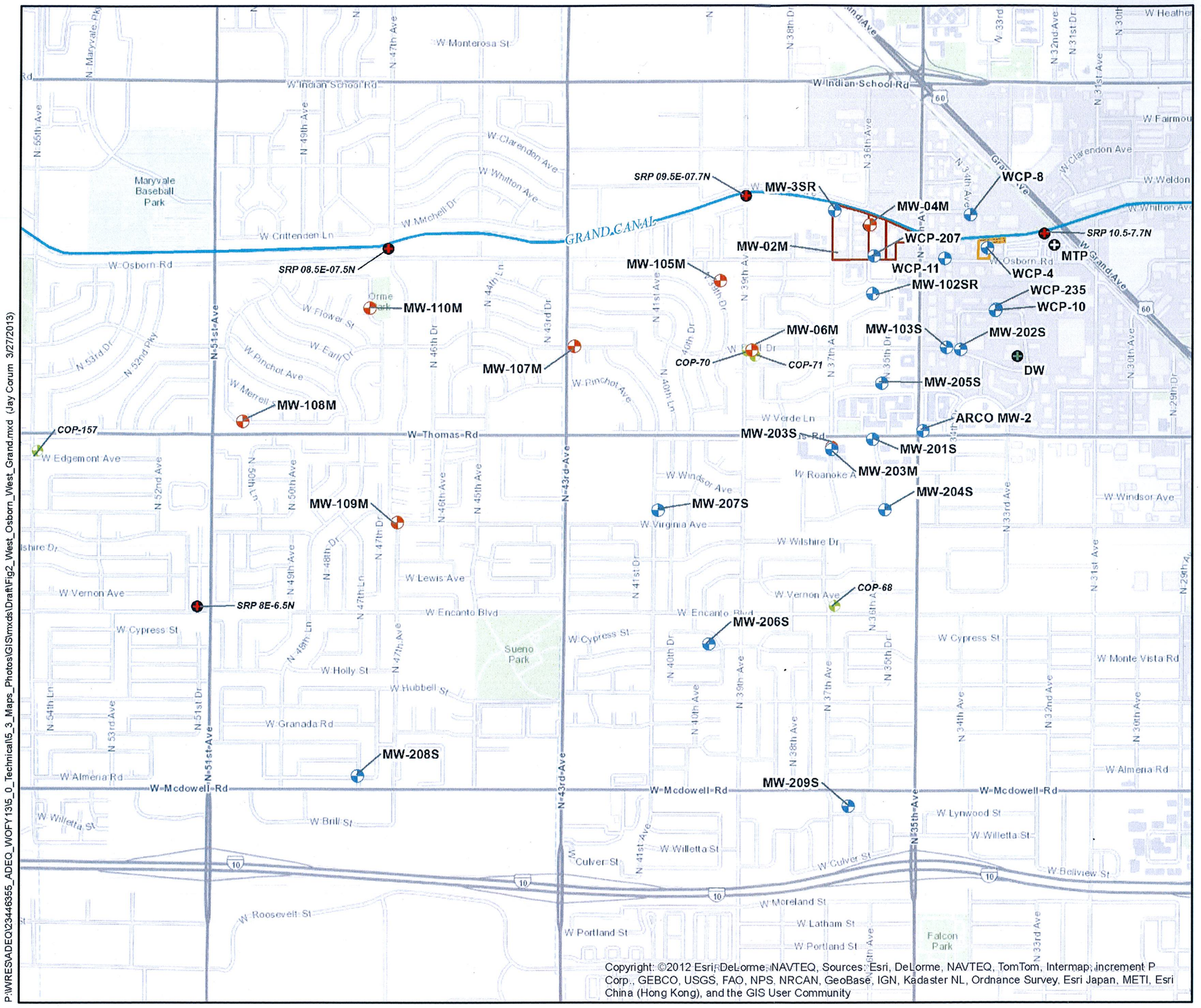
Figure 2
Well Location Map
West Grand Avenue and
West Osborn Complex WQARF SITE
Phoenix, AZ



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Arizona Department of Environmental Quality

Legend

- Shallow Ground Water System Monitoring
- Lower Sand and Gravel Unit
- City of Phoenix Water Supply Well
- Salt River Project Irrigation Well
- Michigan Trailer Park Well
- Danone Well
- Canal
- WOC Property Boundary
- West Grand Avenue Layke Facility

N

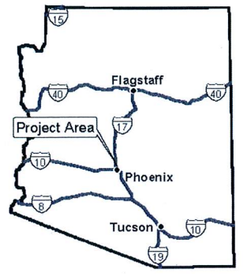
0 750 1,500 3,000

Feet

1 inch = 1,500 feet

Source:
Map Features:, ADOT 2009, ADEQ 2012, URS 2013
Base Map: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

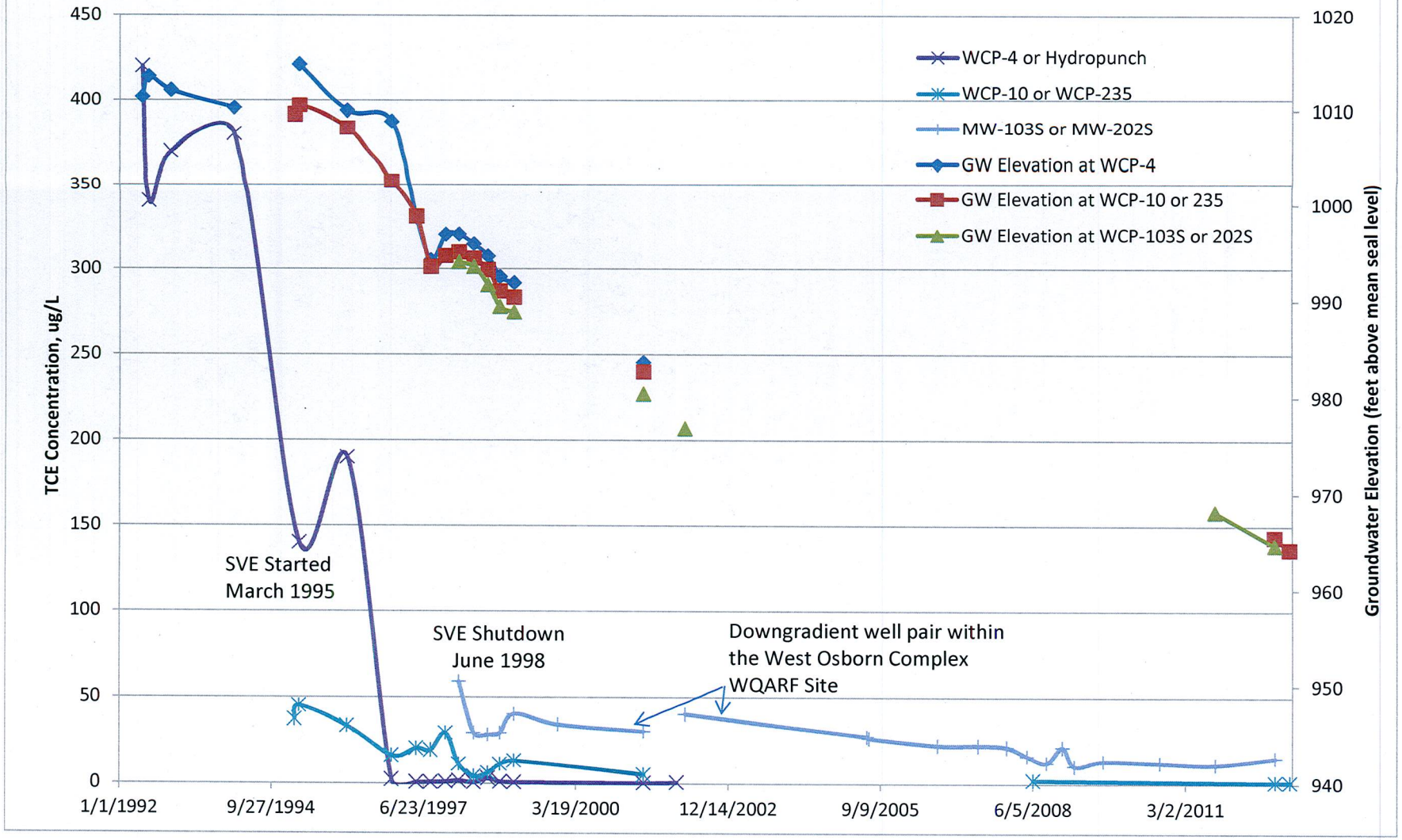
Coordinate System: NAD 1983 StatePlane Arizona Central FIPS 0202 Feet



URS

ADEQ Arizona Department of Environmental Quality

Figure 3. Groundwater Elevations and TCE Concentrations as a Function of Time West Grand Avenue WQARF Site



TABLES

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA
DETECTED VOLATILE ORGANIC COMPOUNDS
WEST GRAND AVENUE WQARF SITE

Monitoring Well	Date Sampled	1,1-DCE (µg/L)	TCE (µg/L)	PCE (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	1,2,4-TMB (µg/L)	1,1-DCA (µg/L)	TCA (µg/L)
WCP-4	5/29/1992	ND	**420**	ND	ND	48	ND	ND	ND	2.6	ND
WCP-4	7/10/1992	2.0	**340**	ND	ND	ND	ND	ND	ND	1.3	3.9
WCP-4*	7/10/1992	1.5	**290**	ND	ND	ND	ND	ND	ND	1.2	3.8
WCP-4	12/4/1992	1.6	**370**	ND	2.7	ND	ND	ND	ND	2.0	3.3
WCP-4	1/24/1994	ND	**380**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	3/28/1995	ND	**140**	ND	ND	ND	ND	ND	ND	0.6	ND
WCP-4	2/7/1996	ND	**190**	ND	ND	ND	ND	ND	ND	0.8	ND
WCP-4	11/25/1996	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	11/25/1996	ND	3.1	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	5/6/1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	8/9/1997	ND	0.58	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	11/14/1997	ND	0.76	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	2/10/1998	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	5/26/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	8/28/1998	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	11/9/1998	ND	0.85	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	2/11/1999	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	6/6/2001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4*	3/5/2001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-4	3/5/2001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	12/4/1992	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	2/18/1993	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	1/20/1994	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	2/8/1996	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	11/25/1996	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	11/25/1996	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	5/9/1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	8/9/1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	11/13/1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	2/12/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	5/20/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	8/21/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA
DETECTED VOLATILE ORGANIC COMPOUNDS
WEST GRAND AVENUE WQARF SITE

Monitoring Well	Date Sampled	1,1-DCE (µg/L)	TCE (µg/L)	PCE (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	1,2,4-TMB (µg/L)	1,1-DCA (µg/L)	TCA (µg/L)
WCP-8	11/6/1998	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	2/19/1999	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-8	6/2001	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
WCP-10	2/28/1995	1.0	**37**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	3/28/1995	0.9	**45**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10*	3/28/1995	1.0	**37**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	2/6/1996	ND	**33**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	11/22/1996	ND	**16**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	11/22/1996	ND	**20**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	5/8/1997	ND	**20**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	8/4/1997	ND	**19**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	11/14/1997	ND	**28**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	2/10/1998	ND	**11**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	5/18/1998	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	8/20/1998	ND	**5.9**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	11/5/1998	ND	**11**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	2/8/1999	ND	**13**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	3/5/2001	ND	**8**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-10	6/7/2001	ND	**5**	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	2/28/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11*	2/28/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	3/28/1995	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	2/7/1996	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	11/22/1996	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	11/22/1996	ND	0.6	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	5/6/1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	8/5/1997	ND	1.5	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	11/14/1997	ND	2.1	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	2/12/1998	ND	3.8	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	5/18/1998	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	8/21/1998	ND	0.93	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	11/9/1998	ND	0.7	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL DATA
DETECTED VOLATILE ORGANIC COMPOUNDS
WEST GRAND AVENUE WQARF SITE

Monitoring Well	Date Sampled	1,1-DCE (µg/L)	TCE (µg/L)	PCE (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	1,2,4-TMB (µg/L)	1,1-DCA (µg/L)	TCA (µg/L)
WCP-11	2/9/1999	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND
WCP-11	6/2001	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW-103s	2/9/1998	2	**59**	ND	ND	ND	ND	ND	ND	ND	ND
MW-103s	5/18/1998	ND	**29**	ND	ND	ND	ND	ND	ND	ND	ND
MW-103s	8/21/1998	0.78	**28**	ND	ND	ND	ND	ND	ND	ND	ND
MW-103s	11/6/1998	ND	**29**	ND	ND	ND	ND	ND	ND	ND	ND
MW-103s	2/9/1999	1.2	**40**	0.6	ND	ND	ND	ND	ND	ND	ND
MW-103s	6/7/2001	1	**30**	0.4	ND	ND	ND	ND	ND	ND	ND
WCP-235	10/10/2012	ND	ND	ND	2.1	3.4	4.5	4.1	1.1	ND	ND
WCP-235*	10/10/2012	ND	ND	ND	2.0	3.6	4.7	3.9	1.1	ND	ND
WCP-235	1/15 - 1/16/13	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND
WCP-235*	1/15 - 1/16/13	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND
ADEQ AWQS (µg/L)		7	5	5	5	1,000	700	10,000	NE	NE	200

NOTES:
Samples were analyzed using one of the following methods: EPA Method 601/602 or EPA Method 8260B
1,1-DCE = 1,1-Dichloroethene
TCE = Trichloroethene
PCE = Tetrachloroethene
1,2,4-TMB = 1,2,4-Trimethylbenzene
1,1-DCA = 1,1-Dichloroethane
TCA = 1,1,1-Trichloroethane
ADEQ = Arizona Department of Environmental Quality
AWQS = Aquifer Water Quality Standards
µg/L = micrograms per Liter
*Duplicate Sample
ND = Not Detected Above the Laboratory Reporting Limit
NE = Not Established
Bold = Analyte Detected ≥ the Applicable ADEQ AWQS

APPENDIX A

TABLES AND FIGURES FROM RI REPORT

WEST CENTRAL PHOENIX WEST GRAND AVENUE SITE
DRAFT REMEDIAL INVESTIGATION REPORT

LIST OF TABLES

Table 2-1
Soil Analytical Results
1990 Phase I Testing

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)	BTEX (mg/kg)
UST-VOC (sludge)	9/10/90	9/11/90	5'-6'	**1,400**	**2**	**24**	B: 4 T: 200 E: 10 X: 52
SS1-VOC	9/11/90	9/13/90	5'-6'	<0.01	<0.01	<0.01	T: 0.05
SS2-VOC	9/11/90	9/13/90	4'7"-5'8"	<0.01	<0.01	<0.01	T: 0.54
SS3-VOC	9/11/90	9/13/90	4'7"-5'10"	<0.01	<0.01	<0.01	T: 0.39
SB1-VOC-2.5	9/11/90	9/13/90	2.5'	<0.01	<0.01	<0.01	T: 0.06
SB1-VOC-10-11	9/11/90	9/13/90	10'-11'	<0.01	<0.01	<0.01	
SB1-VOC-20-21	9/11/90	9/13/90	20'-21'	<0.01	<0.01	<0.01	
SB2-VOC-1.5-2.5	9/11/90	9/13/90	1.5'-2. 5'	<0.01	<0.01	<0.01	T: 0.03
SB2-VOC-10-11	9/11/90	9/13/90	10'-11'	**0.01**	<0.01	<0.01	
SB2-VOC-20T	9/11/90	9/13/90	20'	<0.01	<0.01	<0.01	T: 0.06
SB2-VOC-20B	9/11/90	9/13/90	20'	<0.01	<0.01	<0.01	
UST-N (north)	10/17/90	10/17/90	11'	<0.01	<0.01	**0.2**	T: 0.50 E: 0.03 X: 0.08
UST-S (south)	10/17/90	10/17/90	12'	**20.8**	<0.01	**0.6**	T: 1.9 E: 0.65 X: 0.95
UST-P (pipe)	10/17/90	10/17/90	3'	**230**	<0.05	**4.9**	T: 10 E: 8.7 X: 7.7
Non-Residential ADEQ SRL (mg/kg)				70	0.8	170	B: 0.62 T: 790 E: 1,500 X: 2,800
Residential ADEQ SRL (mg/kg)				27	0.36	53	B: 1.4 T: 2,700 E: 2,700 X: 2,800
ADEQ GPL (mg/kg)				0.61	0.81	1.3	B: 0.71 T: 400 E: 120 X: 2,200

Table 2-1 (Continued)
Soil Analytical Results
1990 Phase I Testing

Notes:

TCE	= Trichloroethylene
PCE	= Tetrachloroethylene
1,1-DCE	= 1,1-Dichloroethylene
BTEX	= Benzene, Toluene, Ethylbenzene, Xylenes (total)
mg/kg	= milligrams per kilogram
SRL	= Soil Remediation Level
GPL	= Groundwater Protection Level
ft bgs	= feet below ground surface

Samples were analyzed using EPA Method 8010/8020.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate soil sample exceeds SRL (residential or non-residential) and/or GPL.

Table 2-2
Soil Analytical Results
1990 Phase I Testing - ADEQ Split Sampling

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)	BTEX (mg/kg)
SB1-20	9/11/90	9/11/90	20	<0.01	<0.01	<0.01	
SB2-11	9/11/90	9/11/90	11	<0.01	<0.01	<0.01	
SS1	9/11/90	9/11/90	5-5.5	<0.01	<0.01	<0.01	
SS3	9/11/90	9/11/90	5-5.5	<0.01	<0.01	<0.01	
UST-1 (south)	10/17/90	10/17/90	12	**46.1**	<0.01	**1.45**	T: 1.65 E: 0.43 X: 1.72
UST-2 (north)	10/17/90	10/17/90	11	**0.5**	<0.01	**0.03**	T: 0.06 X: 0.14
UST-3 (pipe)	10/17/90	10/17/90	3	**63.9**	<0.5	**1.3**	T: 6 X: 7
Non-Residential ADEQ SRL (mg/kg)				70	0.8	170	B: 0.62 T: 790 E: 1,500 X: 2,800
Residential ADEQ SRL (mg/kg)				27	0.36	53	B: 1.4 T: 2,700 E: 2,700 X: 2,800
ADEQ GPL (mg/kg)				0.61	0.81	1.3	B: 0.71 T: 400 E: 120 X: 2,200

Notes:

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes (total)
mg/kg = milligrams per kilogram
SRL = Soil Remediation Level
GPL = Groundwater Protection Level
ft bgs = feet below ground surface

Samples were analyzed using EPA Method 8010/8020.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate soil sample exceeds SRL (residential or non-residential) and/or GPL.

Table 2-3
Soil Analytical Results
1991 Phase II Testing

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)	BTEX (mg/kg)
LU-101B-10	3/9/91	3/15/91	10	**76**	<1.0	**2.2**	B: 3.9 T: 76 E: 16 X: 61
LU-101B-20	3/9/91	3/15/91	20	**3.7**	<0.20	**0.35**	T: 1.4 X: 0.59
LU-101B-30	3/9/91	3/15/91	30	<0.01	<0.01	<0.01	
LU-101B-40	3/9/91	3/15/91	40	<0.01	<0.01	<0.01	
LU-101B-50	3/9/91	3/15/91	50	<0.01	<0.01	<0.01	
LU-101B-60	3/9/91	3/15/91	60	<0.01	<0.01	<0.01	
LU-101B-70	3/9/91	3/15/91	70	<0.01	<0.01	<0.01	
LU-101B-80	3/9/91	3/15/91	80	<0.01	<0.01	<0.01	
LU-101B-85	3/9/91	3/15/91	85	<0.01	<0.01	<0.01	
LU-101B-90	3/9/91	3/15/91	90	<0.01	<0.01	<0.01	
LU-102B-10	3/9/91	3/15/91	10	<0.01	<0.01	<0.01	
LU-102B-20	3/9/91	3/15/91	20	<0.01	<0.01	<0.01	
LU-102B-30	3/9/91	3/15/91	30	<0.01	<0.01	<0.01	
LU-102B-40	3/9/91	3/15/91	40	<0.01	<0.01	<0.01	
LU-102B-50	3/9/91	3/15/91	50	<0.01	<0.01	<0.01	
LU-102B-60	3/9/91	3/15/91	60	**0.021**	<0.01	<0.01	
LU-102B-70	3/9/91	3/15/91	70	<0.01	<0.01	<0.01	
LU-102B-80	3/9/91	3/15/91	80	<0.01	<0.01	<0.01	
LU-DUP-102[(1)]	3/9/91	3/15/91	20	<0.01	<0.01	<0.01	
LU-103B-10	3/9/91	3/15/91	10	<0.01	<0.01	<0.01	
LU-103B-20	3/10/91	3/15/91	20	<0.01	<0.01	<0.01	
LU-103B-30	3/10/91	3/15/91	30	<0.01	<0.01	<0.01	
LU-103B-40	3/10/91	3/15/91	40	<0.01	<0.01	<0.01	
LU-103B-50	3/10/91	3/15/91	50	<0.01	<0.01	<0.01	
LU-103B-60	3/10/91	3/15/91	60	<0.01	<0.01	<0.01	
LU-103B-70	3/10/91	3/15/91	70	<0.01	<0.01	<0.01	
LU-103B-80	3/10/91	3/15/91	80	<0.01	<0.01	<0.01	

Table 2-3 (Continued)
Soil Analytical Results
1991 Phase II Testing

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)	BTEX (mg/kg)
LU-201B-20	5/4/91	5/7/91	20	**0.6**	<0.1	<0.1	
LU-201B-30	5/4/91	5/7/91	30	**0.02**	<0.01	<0.01	
LU-201B-40	5/4/91	5/7/91	40	<0.01	<0.01	<0.01	
LU-201B-50	5/4/91	5/7/91	50	<0.01	<0.01	<0.01	
LU-201B-60	5/4/91	5/7/91	60	**0.15**	<0.01	<0.01	
LU-201B-65	5/4/91	5/7/91	65	**0.02**	<0.01	<0.01	
LU-DUP-1[2]	5/4/91	5/7/91	30	**0.01**	<0.01	<0.01	
LU-202B-20	5/4/91	5/7/91	20	**0.03**	<0.01	<0.01	
LU-202B-30	5/4/91	5/7/91	30	<0.01	<0.01	<0.01	
LU-DUP-2[3]	5/4/91	5/7/91	30	<0.01	<0.01	<0.01	
LU-202B-40	5/4/91	5/7/91	40	<0.01	<0.01	<0.01	
LU-202B-50	5/4/91	5/7/91	50	<0.01	<0.01	<0.01	
LU-202B-60	5/4/91	5/7/91	60	**0.24**	<0.01	<0.01	
LU-203B-20	5/4/91	5/7/91	20	**0.8**	<0.01	**0.05**	T: 0.12
LU-203B-30	5/4/91	5/7/91	30	**0.01**	<0.01	<0.01	
LU-203B-40	5/4/91	5/7/91	40	<0.01	<0.01	<0.01	
LU-203B-45	5/4/91	5/7/91	45	<0.01	<0.01	<0.01	
LU-203B-50	5/4/91	5/7/91	50	<0.01	<0.01	<0.01	
LU-204B-20	5/4/91	5/7/91	20	<0.01	<0.01	<0.01	
LU-204B-30	5/4/91	5/7/91	30	**0.03**	<0.01	<0.01	
LU-204B-40	5/4/91	5/7/91	40	<0.01	<0.01	<0.01	
Non-Residential ADEQ SRL (mg/kg)				70	0.8	170	B: 0.62 T: 790 E: 1,500 X: 2,800
Residential ADEQ SRL (mg/kg)				27	0.36	53	B: 1.4 T: 2,700 E: 2,700 X: 2,800
ADEQ GPL (mg/kg)				0.61	0.81	1.3	B: 0.71 T: 400 E: 120 X: 2,200

Table 2-3 (Continued)
Soil Analytical Results
1991 Phase II Testing

Notes:

(1) Duplicate of LU-102B-20
(2) Duplicate of LU-201B-30
(3) Duplicate of LU-202B-30

TCE	= Trichloroethylene
PCE	= Tetrachloroethylene
1,1-DCE	= 1,1-Dichloroethylene
BTEX	= Benzene, Toluene, Ethylbenzene, Xylenes (total)
mg/kg	= milligrams per kilogram
SRL	= Soil Remediation Level
GPL	= Groundwater Protection Level
ft bgs	= feet below ground surface

Samples were analyzed using EPA Method 8010/8020.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate soil sample exceeds SRL (residential or non-residential) and/or GPL.

Table 2-4
Soil Analytical Results
1991 Phase II Testing - ADEQ Split Sampling

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)
LU-101-50	3/9/91	3/13/91	50	<0.01	<0.01	<0.01
LU-101-80	3/9/91	*	80	*	*	*
LU-101-85	3/9/91	*	85	*	*	*
LU-101-90	3/9/91	3/13/91	90	<0.01	<0.01	<0.01
LU-102-60	3/9/91	3/13/91	60	**0.14**	<0.01	<0.01
LU-103-80	3/10/91	3/13/91	80	<0.01	<0.01	<0.01
LU-201-40	5/4/91	N/A	40	**	**	**
LU-202-40	5/4/91	N/A	40	<0.005	<0.005	<0.005
LU-203-10	5/4/91	N/A	10	**3,700**	<0.005	**440**
Non-Residential ADEQ SRL (mg/kg)				70	0.8	170
Residential ADEQ SRL (mg/kg)				27	0.36	53
ADEQ GPL (mg/kg)				0.61	0.81	1.3

Notes:

* According to the chain-of-custody report, split samples collected by Earth Tech were submitted to a local laboratory on 3/12/91. However, laboratory analytical reports are not available because they were not submitted with the technical memorandum prepared by Earth Tech dated 3/19/91.

** According to the chain-of-custody report, a split sample collected by Earth Tech was sent to out-of-state laboratory on 3/12/91. However, laboratory analytical report erroneously reported sample as a water sample, and reported VOC concentrations as ND (Non Detect) in micrograms per liter (µg/L).

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
mg/kg = milligrams per kilogram
SRL = Soil Remediation Level
GPL = Groundwater Protection Level
ft bgs = feet below ground surface
N/A = Not Available

Samples were analyzed using EPA Method 8010.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate soil sample exceeds SRL (residential or non-residential) and/or GPL.

Table 2-5
Soil Analytical Results
1992 ADEQ Monitoring Well Installation and Sampling

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (µg/kg)	1,1-DCE (µg/kg)	PCE (µg/kg)	BTEX (µg/kg)
Layke-1-19	5/19/92	N/A	19	**49,000**	<0.5	**2,900**	T: 5,000 E: 11,000 X: 6,300
Layke-1A-10.5	5/20/92	N/A	10.5	<50	<50	<50	
Layke-1A-20.5	5/20/92	N/A	20.5	<50	<50	<50	
Layke-1A-30.5	5/20/92	N/A	30.5	<50	<50	<50	
Layke-1A-40.5	5/20/92	N/A	40.5	<50	<50	<50	
Layke-1A-50.5	5/20/92	N/A	50.5	<50	<50	<50	
Layke-1A-60.5	5/20/92	N/A	60.5	**70**	<50	<50	
Layke-1A-60.5 (D)	5/20/92	N/A	60.5	**44**	<50	<50	
Layke-1A-75.5	5/20/92	N/A	75.5	**90**	<50	<50	
Layke-1A-85.5	5/20/92	N/A	85.5	<50	<50	<50	
Layke-1A-94.5	5/20/92	N/A	94.5	**80**	<50	<50	
Non-Residential ADEQ SRL (µg/kg)				70,000	800	170,000	B: 620 T: 790,000 E: 1,500,000 X: 2,800,000
Residential ADEQ SRL (µg/kg)				27,000	360	53,000	B: 1,400 T: 2,700,000 E: 2,700,000 X: 2,800,000
ADEQ GPL (µg/kg)				610	810	1,300	B: 710 T: 400,000 E: 120,000 X: 2,200,000

Notes:

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes (total)
µg/kg = micrograms per kilogram
SRL = Soil Remediation Level
GPL = Groundwater Protection Level
ft bgs = feet below ground surface
D = Duplicate Sample
N/A = Not Available

Samples were analyzed using EPA Method 8010/8020.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL).
Shaded areas indicate soil sample exceeds SRL (residential or non-residential) and/or GPL.

Table 2-6
Well Construction Details
Monitoring Wells WCP-4 and WCP-8

	WCP-4	WCP-8
Date Completed	5/21/92	11/27/92
ADWR Number	55-535334	55-537381
ADEQ ID Number	57115	57263
Latitude	33° 29' 17.33"	33° 29' 22.38"
Longitude	112° 07' 49.11"	112° 07' 52.46"
Well Elevation (ft amsl)	1109.25	1109.92
Total Borehole Depth (ft)	130	124
Well Casing Type	Schedule 40 PVC	Schedule 40 PVC
Borehole Diameter (in)	10	10
Casing Diameter (in)	4	4
Screen Slot Size (in)	0.010	0.020
Screened Interval (ft bgs)	90-130	84-124
Blank Casing Interval (ft)	0-90	0-84
Filter Pack (ft bgs)	88-130	82-124
Bentonite Seal (ft bgs)	85-88	79-82
Grout (ft bgs)	0-85	0-82

Notes:

in = inches
ft = feet
ft bgs = feet below ground surface
ft amsl = feet above mean sea level
PVC = polyvinyl chloride

Table 2-7
Groundwater Analytical Results
1992 ADEQ Monitoring Well Installation and Sampling

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)	Other Analytes (µg/L)
WCP-4	5/29/92	1109.25	1011.45	**420**	<1.0	<1.0	Toluene: 48 1,1-DCA: 2.6
WCP-4	7/10/92	1109.25	1013.55	**340**	**2.0**	<0.5	1,1-DCA: 1.3 TCA: 3.9
WCP-4(D)	7/10/92	1109.25	1013.55	**290**	**1.5**	<0.5	1,1-DCA: 1.2 TCA: 3.8
WCP-4	12/4/92	1109.25	1012.15	**370**	**1.6**	<0.5	Benzene: 2.7 1,1-DCA: 2.0 TCA: 3.3
WCP-4	1/24/94	1109.25	1010.27	**380**	<5.0	<5.0	
WCP-8	12/4/92	1109.92	1013.24	<0.5	<0.5	<0.5	
WCP-8	2/18/93	1109.92	1011.55	<0.5	<0.5	<0.5	
WCP-8	1/20/94	1109.92	1011.64	<0.5	<0.5	<0.5	
Arizona AWQS (µg/L)				5	7	5	Benzene: 5 Toluene: 1,000 1,1-DCA: NE TCA: 200

Notes:

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
1,1-DCA = 1,1-Dichloroethane
TCA = 1,1,1-Trichloroethane
µg/L = micrograms per liter
Well Elev. = well elevation
GW Elev. = groundwater elevation
ft amsl = feet above mean sea level
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard
D = Duplicate Sample
NE = Not Established

Samples were analyzed using EPA Method 601/602.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 2-8
Well Construction Details
Monitoring Wells WCP-10 and WCP-11

	WCP-10	WCP-11
Date Completed	2/7/95	2/9/95
ADWR Number	55-547462	55-547461
ADEQ ID Number	57422	57421
Latitude	33° 29' 08.04"	33° 29' 15.70"
Longitude	112° 07' 47.71"	112° 07' 56.66"
Well Elevation (ft amsl)	1102.50	1107.66
Total Borehole Depth (ft)	130	125
Well Casing Type	Schedule 40 PVC	Schedule 40 PVC
Borehole Diameter (in)	10	10
Casing Diameter (in)	4	4
Screen Slot Size (in)	0.020	0.020
Screened Interval (ft bgs)	86-126	84-125
Blank Casing Interval (ft)	0-86	0-84
Filter Pack (ft bgs)	82-129	79-125
Bentonite Seal (ft bgs)	78-82	76-79
Grout (ft bgs)	0-78	1.5-76

Notes:

in = inches
ft = feet
ft bgs = feet below ground surface
ft amsl = feet above mean sea level
PVC = polyvinyl chloride

Table 2-9
Groundwater Analytical Results
1995 ADEQ Monitoring Well Installation and Sampling

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)	Other Analytes (µg/L)
WCP-4	3/28/95	1109.25	1014.83	**140**	<0.5	<0.5	1,1-DCA: 0.6
WCP-10	2/28/95	1102.50	1009.60[(1)]	**37**	**1.0**	<0.5	
WCP-10	3/28/95	1102.50	1010.54	**45**	**0.9**	<0.5	
WCP-10 (D)	3/28/95	1102.50	1010.54	**37**	**1.0**	<0.5	
WCP-11	2/28/95	1107.66	1013.46[(1)]	<0.5	<0.5	<0.5	
WCP-11 (D)	2/28/95	1107.66	1013.46[(1)]	<0.5	<0.5	<0.5	
WCP-11	3/28/95	1107.66	1014.20	<0.5	<0.5	<0.5	
Arizona AWQS (µg/L)				5	7	5	1,1-DCA: NE

Notes:

(1) Final groundwater elevations at the time well is completed obtained from well construction logs.

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
1,1-DCA = 1,1-Dichloroethane
µg/L = micrograms per liter
Well Elev. = well elevation
GW Elev. = groundwater elevation
ft amsl = feet above mean sea level
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard
D = Duplicate Sample
NE = Not Established

Samples were analyzed using EPA Method 601/602.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 2-10
Groundwater Analytical Results
1996 ADEQ Groundwater Sampling

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)	Other Analytes (µg/L)
WCP-4	2/7/96	1109.25	1010.00	**190**	<0.5	<0.5	1,1-DCA: 0.8
WCP-8	2/8/96	1109.92	1012.27	<0.5	<0.5	<0.5	
WCP-10	2/6/96	1102.50	1008.18	**33**	<0.5	<0.5	
WCP-11	2/7/96	1107.66	1011.18	<0.5	<0.5	<0.5	
Arizona AWQS (µg/L)				5	7	5	1,1-DCA: NE

Notes:

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
1,1-DCA = 1,1-Dichloroethane
µg/L = micrograms per liter
Well Elev. = well elevation
GW Elev. = groundwater elevation
ft amsl = feet above mean sea level
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard
NE = Not Established

Samples were analyzed using EPA Method 601/602.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 2-11
Groundwater Analytical Results
1996-2001 WCP WOC RI Investigation

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl[1]	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
WCP-4	11/25/96	1109.25	1008.87	**2.0**	<0.5	<0.5
WCP-4[2]	11/25/96	1109.25	1008.87	**3.1**	<0.5	<0.5
WCP-4	5/6/97	1109.25	998.67	<0.5	<0.5	<0.5
WCP-4	8/9/97	1109.25	994.25	**0.58**	<0.5	<0.5
WCP-4	11/14/97	1109.25	996.92	**0.76**	<0.5	<0.5
WCP-4	2/10/98	1109.25	996.94	**1.4**	<0.5	<0.5
WCP-4	5/26/98	1109.25	995.92	<0.5	<0.5	<0.5
WCP-4	8/28/98	1109.25	994.65	**2.7**	<0.5	<0.5
WCP-4	11/9/98	1109.25	992.50	**0.85**	<0.5	<0.5
WCP-4	2/11/99	1109.25	991.89	<0.5	<0.5	<0.5
WCP-4[3]	6/6/01	1109.25	983.60	<0.2	<0.2	<0.2
WCP-8	11/25/96	1109.92	1006.79	<0.5	<0.5	<0.5
WCP-8[2]	11/25/96	1109.92	1006.79	<0.5	<0.5	<0.5
WCP-8	5/9/97	1109.92	1001.27	<0.5	<0.5	<0.5
WCP-8	8/9/97	1109.92	995.68	<0.5	<0.5	<0.5
WCP-8	11/13/97	1109.92	1001.01	<0.5	<0.5	<0.5
WCP-8	2/12/98	1109.92	1000.27	<0.5	<0.5	<0.5
WCP-8	5/20/98	1109.92	998.61	<0.5	<0.5	<0.5
WCP-8	8/21/98	1109.92	997.45	<0.5	<0.5	<0.5
WCP-8	11/6/98	1109.92	995.34	<0.5	<0.5	<0.5
WCP-8	2/19/99	1109.92	994.79	<0.5	<0.5	<0.5
WCP-8[3]	6/01	DRY	DRY	DRY	DRY	DRY
WCP-10	11/22/96	1102.50	1002.61	**16**	<0.5	<0.5
WCP-10[2]	11/22/96	1102.50	1002.61	**20**	<0.5	<0.5
WCP-10	5/8/97	1102.50	998.80	**20**	<0.5	<0.5
WCP-10	8/4/97	1102.50	993.53	**19**	<0.5	<0.5
WCP-10	11/14/97	1102.50	994.67	**29**	<1.0	<1.0
WCP-10	2/10/98	1102.50	995.05	**11**	<0.5	<0.5
WCP-10	5/18/98	1102.50	994.41	**3.9**	<0.5	<0.5
WCP-10	8/20/98	1102.50	993.21	**5.9**	<0.5	<0.5
WCP-10	11/5/98	1102.50	991.00	**11**	<0.5	<0.5
WCP-10	2/8/99	1102.50	990.36	**13**	<0.5	<0.5
WCP-10[3]	6/7/01	1102.50	982.62	**5**	<0.2	<0.2

Table 2-11 (Continued)
Groundwater Analytical Results
1996-1999 WCP WOC RI Investigation

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl[1]	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
WCP-11	11/22/96	1107.66	1006.62	<0.5	<0.5	<0.5
WCP-11[2]	11/22/96	1107.66	1006.62	**0.6**	<0.5	<0.5
WCP-11	5/6/97	1107.66	1001.35	<0.5	<0.5	<0.5
WCP-11	8/5/97	1107.66	996.37	**1.5**	<0.5	<0.5
WCP-11	11/14/97	1107.66	999.21	**2.1**	<0.5	<0.5
WCP-11	2/12/98	1107.66	998.25	**3.8**	<0.5	<0.5
WCP-11	5/18/98	1107.66	996.35	**2.7**	<0.5	<0.5
WCP-11	8/21/98	1107.66	995.19	**0.93**	<0.5	<0.5
WCP-11	11/9/98	1107.66	993.06	**0.70**	<0.5	<0.5
WCP-11	2/9/99	1107.66	992.21	**1.3**	<0.5	<0.5
WCP-11[3]	6/01	DRY	DRY	DRY	DRY	DRY
MW-103S	2/9/98	1100.81	994.02	**59**	**2.0**	<1.3
MW-103S	5/18/98	1100.81	993.53	**29**	<1.0	<1.0
MW-103S	8/21/98	1100.81	991.64	**28**	**0.78**	<0.5
MW-103S	11/6/98	1100.81	989.38	**29**	<0.5	<0.5
MW-103S	2/9/99	1100.81	988.81	**40**	**1.2**	**0.60**
MW-103S[3]	6/7/01	1100.81	980.62	**30**	**1**	**0.4**
Arizona AWQS (µg/L)				5	7	5

Notes:

Groundwater samples collected by United Industrial Corporation, except as noted.

[1] Groundwater elevations collected by United Industrial Corporation within a month of sampling date.
[2] Split groundwater sample collected by GZA GeoEnvironmental for ADEQ.
[3] Groundwater samples collected by Roy F. Weston for ADEQ in June 2001.

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
µg/L = micrograms per liter
Well Elev. = well elevation
GW Elev. = groundwater elevation
ft amsl = feet above mean sea level
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard

Samples were analyzed using EPA Method 601/602. Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 2-12
Groundwater Analytical Results-Other Parameters
1996-2001 WCP WOC RI Investigation

Monitor Well	Sample Date	Specific Cond.[1] (µmhos/cm)	TDS[2] (mg/L)	TOC[3] (mg/L)	Chloride[4] (mg/L)	Alkalinity[5] (mg/L)	Sulfate[6] (mg/L)
WCP-4	11/25/96	890	470	2.7	170	140	53
WCP-8	11/25/96	2,300	1,400	6.3	470	320	190
WCP-10	11/22/96	1,400	780	3.7	210	240	91
WCP-11	11/22/96	870	480	4.2	140	240	61

Notes:

(1) Samples analyzed using Method SM2510B.
(2) Samples analyzed using Method SM2540C.
(3) Samples analyzed using EPA Method 415.2.
(4) Samples analyzed using EPA Method 300.0.
(5) Samples analyzed using Method SM2320B.
(6) Samples analyzed using EPA Method 300.0.

Groundwater samples collected by United Industrial Corporation.

Monitor Well	Sample Date	Fe^{+2}[1] (mg/L)	NO_2, NO_3[2] (mg/L)	Mg[3] (mg/L)	Chloride[4] (mg/L)	Alkalinity[5] (mg/L)	Sulfate[6] (mg/L)
WCP-4	6/7/01	<0.050	0.77	<0.0025	140	152	58
WCP-8	6/01	DRY	DRY	DRY	DRY	DRY	DRY
WCP-10	6/7/01	<0.050	4.3	<0.0025	270	259	73.5
WCP-11	6/01	DRY	DRY	DRY	DRY	DRY	DRY
MW-103S	6/7/01	<0.050	2.1	<0.0025	220	242	86.9

Notes:

(1) Samples analyzed using Method 3500FED.
(2) Samples analyzed using EPA Method 353.2.
(3) Samples analyzed using EPA Method 6010B.
(4) Samples analyzed using EPA Method 352.2.
(5) Samples analyzed using Method 2320B.
(6) Samples analyzed using EPA Method 375.4.

Groundwater samples collected by ADEQ.

Table 2-12 (Continued)
Groundwater Analytical Results-Other Parameters
1996-2001 WCP WOC RI Investigation

Monitor Well	Sample Date	Methane[1] (µg/L)	Ethane[1] (µg/L)	Ethene[1] (µg/L)
WCP-4	6/7/01	<2.0	<4.0	<3.0

Notes:

[1] Samples analyzed using Method RSK175.

Groundwater samples collected by ADEQ.

Other Notes:

Specific Cond.	= specific conductance
µmhos/cm	= micromohs per centimeter
TDS	= total dissolved solids
TOC	= total organic carbon
mg/L	= milligrams per liter
µg/L	= micrograms per liter
Fe^{+2}	= ferrous iron
NO_2, NO_3	= nitrate, nitrite
Mg	= manganese (dissolved)

Table 2-13
Monitor Well Groundwater Analytical Results
2001-2002 Layke NFA Investigation

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)	DO (mg/L)	Redox (mV)
WCP-4	3/5/01	1109.25	984.30	<0.3	<0.3	<0.3	6.22	152
WCP-104[1]	3/5/01	1109.25	984.30	<0.3	<0.3	<0.3	--	--
WCP-10	3/5/01	1102.50	982.57	**8**	<0.3	<0.3	6.58	186
Arizona AWQS (µg/L)				5	7	5		

Notes:

[1] Duplicate sample of WCP-4.

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
µg/L = micrograms per liter
mg/L = milligrams per liter
Well Elev. = well elevation
GW Elev. = groundwater elevation
ft amsl = feet above mean sea level
DO = dissolved oxygen
Redox = oxidation-reduction potential
mV = millivolts
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard

Samples were analyzed using EPA Method 8260B.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 2-14
Soil Analytical Results
2001-2002 Layke NFA Investigation

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)	% Moist
LAY-SB-001-011	1/11/02	1/11/02	11	<0.046	<0.091	<0.046	12
LAY-SB-001-031	1/11/02	1/11/02	31	<0.047	<0.095	<0.047	15
LAY-SB-001-051	1/11/02	1/11/02	51	<0.049	<0.097	<0.049	4
LAY-SB-001-071	1/11/02	1/11/02	71	<0.047	<0.094	<0.047	4
LAY-SB-001-091	1/11/02	1/11/02	91	<0.045	<0.089	<0.045	9
LAY-SB-001-101	1/14/02	1/15/02	101	<0.045	<0.090	<0.045	9
LAY-SB-001-111	1/14/02	1/15/02	111	<0.047	<0.093	<0.047	10
LAY-SB-001-126	1/14/02	1/15/02	126	<0.047	<0.094	<0.047	4
LAY-SB-101-126[1]	1/14/02	1/15/02	126	<0.048	<0.097	<0.048	5
LAY-SB-002-011	1/8/02	1/9/02	11	<0.049	<0.098	<0.049	14
LAY-SB-002-031	1/8/02	1/9/02	31	<0.048	<0.096	<0.048	16
LAY-SB-002-051	1/8/02	1/9/02	51	<0.051	<0.10	<0.051	3
LAY-SB-002-071	1/8/02	1/9/02	71	<0.048	<0.096	<0.048	6
LAY-SB-002-091	1/8/02	1/9/02	91	<0.046	<0.092	<0.046	7
LAY-SB-002-111	1/8/02	1/9/02	111	<0.045	<0.090	<0.045	10
LAY-SB-002-126	1/8/02	1/9/02	126	<0.046	<0.093	<0.046	5
LAY-SB-002-126D	1/8/02	1/9/02	126	<0.044	<0.087	<0.044	--
LAY-SB-003-011	1/10/02	1/11/02	11	<0.043	<0.086	<0.043	8
LAY-SB-003-031	1/10/02	1/11/02	31	<0.052	<0.10	<0.052	16
LAY-SB-003-051	1/10/02	1/11/02	51	<0.050	<0.10	<0.050	3
LAY-SB-003-071	1/10/02	1/11/02	71	<0.044	<0.088	<0.044	11
LAY-SB-003-091	1/10/02	1/11/02	91	<0.044	<0.087	<0.044	10
LAY-SB-003-111	1/11/02	1/11/02	111	<0.047	<0.093	<0.047	12
LAY-SB-003-126	1/11/02	1/11/02	126	<0.056	<0.11	<0.056	3
LAY-SB-004-011	12/26/01	12/28/01	11	<0.047	<0.095	<0.047	17
LAY-SB-004-031	12/26/01	12/28/01	31	<0.049	<0.098	<0.049	12
LAY-SB-004-051	12/26/01	12/28/01	51	<0.045	<0.090	<0.045	3
LAY-SB-004-071	12/26/01	12/28/01	71	<0.049	<0.098	<0.049	14
LAY-SB-004-091	12/27/01	12/28/01	91	<0.050	<0.10	<0.050	9
LAY-SB-004-111	12/27/01	12/28/01	111	<0.043	<0.087	<0.043	12
LAY-SB-005-011	1/9/02	1/9/02	11	<0.043	<0.087	<0.043	13
LAY-SB-005-031	1/9/02	1/9/02	31	<0.050	<0.099	<0.050	14
LAY-SB-005-051	1/9/02	1/9/02	51	<0.047	<0.095	<0.047	2
LAY-SB-005-071	1/9/02	1/9/02	71	<0.046	<0.093	<0.046	5
LAY-SB-005-091	1/9/02	1/9/02	91	<0.047	<0.093	<0.047	6
LAY-SB-005-111	1/9/02	1/9/02	111	<0.050	<0.10	<0.050	11
LAY-SB-005-126	1/10/02	1/11/02	126	<0.049	<0.097	<0.049	4

Table 2-14 (Continued)
Soil Analytical Results
2001-2002 Layke NFA Investigation

Sample Number	Sample Date	Extraction Date	Sample Depth (ft bgs)	TCE (mg/kg)	1,1-DCE (mg/kg)	PCE (mg/kg)	% Moist
LAY-SB-006-011	1/3/02	1/4/02	11	<0.044	<0.088	<0.044	12
LAY-SB-006-031	1/3/02	1/4/02	31	<0.046	<0.092	<0.046	10
LAY-SB-006-051	1/3/02	1/4/02	51	<0.046	<0.091	<0.046	5
LAY-SB-006-071	1/3/02	1/4/02	71	<0.054	<0.11	<0.054	17
LAY-SB-006-091	1/3/02	1/4/02	91	<0.054	<0.11	<0.054	11
LAY-SB-006-111	1/3/02	1/4/02	111	<0.046	<0.091	<0.046	7
LAY-SB-006-126	1/4/02	1/4/02	126	<0.054	<0.11	<0.054	18
LAY-SB-007-011	12/31/01	1/2/02	11	<0.041	<0.083	<0.041	8
LAY-SB-007-031	1/2/02	1/2/02	31	<0.047	<0.094	<0.047	13
LAY-SB-007-051	1/2/02	1/2/02	51	<0.046	<0.093	<0.046	3
LAY-SB-107-051[2]	1/2/02	1/2/02	51	<0.049	<0.098	<0.049	4
LAY-SB-007-071	1/2/02	1/2/02	71	<0.053	<0.11	<0.053	18
LAY-SB-007-091	1/2/02	1/2/02	91	<0.048	<0.096	<0.048	13
LAY-SB-007-111	1/2/02	1/2/02	111	<0.046	<0.093	<0.046	8
LAY-SB-007-126	1/2/02	1/2/02	126	<0.046	<0.091	<0.046	8
LAY-SB-008-011	1/7/02	1/9/02	11	<0.046	<0.092	<0.046	14
LAY-SB-008-031	1/7/02	1/9/02	31	<0.048	<0.097	<0.048	16
LAY-SB-008-051	1/7/02	1/9/02	51	<0.051	<0.10	<0.051	6
LAY-SB-008-071	1/7/02	1/9/02	71	<0.047	<0.094	<0.047	14
LAY-SB-108-071[3]	1/7/02	1/9/02	71	<0.052	<0.10	<0.052	15
LAY-SB-008-091	1/7/02	1/9/02	91	<0.050	<0.10	<0.050	9
LAY-SB-008-111	1/7/02	1/9/02	111	<0.055	<0.11	<0.055	12
LAY-SB-008-126	1/7/02	1/9/02	126	<0.045	<0.089	<0.045	13
LAY-SB-009-011	12/28/01	12/29/01	11	<0.049	<0.098	<0.049	17
LAY-SB-009-031	12/28/01	12/29/01	31	<0.044	<0.088	<0.044	12
LAY-SB-009-051	12/28/01	12/29/01	51	<0.052	<0.10	<0.052	5
LAY-SB-109-051[4]	12/28/01	12/29/01	51	<0.052	<0.10	<0.052	9
LAY-SB-009-071	12/28/01	12/29/01	71	<0.047	<0.095	<0.047	15
LAY-SB-009-091	12/28/01	12/29/01	91	<0.049	<0.097	<0.049	6
LAY-SB-009-111	12/31/01	1/2/02	111	<0.041	<0.082	<0.041	11
Non-Residential ADEQ SRL (mg/kg)				70	0.8	170	
Residential ADEQ SRL (mg/kg)				27	0.36	53	
ADEQ GPL (mg/kg)				0.61	0.81	1.3	

Table 2-14 (Continued)
Soil Analytical Results
2001-2002 Layke NFA Investigation

Notes:

(1) Duplicate sample of LAY-SB-001-126.
(2) Duplicate sample of LAY-SB-007-051.
(3) Duplicate sample of LAY-SB-008-071.
(4) Duplicate sample of LAY-SB-009-051.

TCE	= Trichloroethylene
PCE	= Tetrachloroethylene
1,1-DCE	= 1,1-Dichloroethylene
mg/kg	= milligrams per kilogram
SRL	= Soil Remediation Level
GPL	= Groundwater Protection Level
ft bgs	= feet below ground surface
D	= Duplicate Sample
% Moist	= percent moisture

Samples were analyzed using EPA Method 8260B.

Table 2-15
Soil-Gas Analytical Results
2001-2002 Layke NFA Investigation

Sample Number	Sample Date	Analysis Date	Sample Depth (ft bgs)	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
LAY-SG-001-011	1/11/02	1/11/02	11	<1.0	<1.0	<1.0
LAY-SG-001-031	1/11/02	1/11/02	31	<1.0	<1.0	<1.0
LAY-SG-001-051	1/11/02	1/11/02	51	<1.0	<1.0	<1.0
LAY-SG-001-071	1/11/02	1/11/02	71	<1.0	<1.0	<1.0
LAY-SG-001-091	1/11/02	1/11/02	91	<1.0	<1.0	<1.0
LAY-SG-001-111	1/14/02	1/14/02	111	<1.0	<1.0	<1.0
LAY-SG-001-126	1/14/02	1/14/02	126	<1.0	<1.0	<1.0
LAY-SG-002-011	1/8/02	1/9/02	11	<1.0	<1.0	<1.0
LAY-SG-002-031	1/8/02	1/9/02	31	<1.0	<1.0	<1.0
LAY-SG-002-051	1/8/02	1/9/02	51	<1.0	<1.0	<1.0
LAY-SG-002-071	1/8/02	1/9/02	71	<1.0	<1.0	<1.0
LAY-SG-002-071A*	1/8/02	1/8/02	71	<1.0	<1.0	<1.0
LAY-SG-002-091	1/8/02	1/9/02	91	**1.2**	<1.0	<1.0
LAY-SG-002-111	1/8/02	1/9/02	111	<1.0	<1.0	<1.0
LAY-SG-002-126	1/8/02	1/9/02	126	<1.0	<1.0	<1.0
LAY-SG-003-011	1/10/02	1/10/02	11	<1.0	<1.0	<1.0
LAY-SG-003-031	1/10/02	1/10/02	31	<1.0	<1.0	<1.0
LAY-SG-003-051	1/10/02	1/10/02	51	<1.0	<1.0	<1.0
LAY-SG-003-071	1/10/02	1/10/02	71	<1.0	<1.0	<1.0
LAY-SG-003-091	1/10/02	1/10/02	91	<1.0	<1.0	<1.0
LAY-SG-003-111	1/11/02	1/11/02	111	<1.0	<1.0	<1.0
LAY-SG-003-126	1/11/02	1/11/02	126	<1.0	<1.0	<1.0
LAY-SG-004-011	12/26/01	12/27/01	11	<0.5	<1.0	<1.0
LAY-SG-004-031	12/26/01	12/27/01	31	<1.0	<1.0	<1.0
LAY-SG-004-051	12/26/01	12/27/01	51	<0.5	<1.0	<1.0
LAY-SG-004-071	12/26/01	12/27/01	71	**2.5**	<1.0	<1.0
LAY-SG-004-091	12/26/01	12/27/01	91	**2.0**	<1.0	<1.0
LAY-SG-004-111	12/27/01	12/27/01	111	**2.1**	<1.0	<1.0
LAY-SG-004-111B*	12/27/01	12/27/01	111	**2.2**	<1.0	<1.0
LAY-SG-005-011	1/9/02	1/10/02	11	<1.0	<1.0	<1.0
LAY-SG-005-031	1/9/02	1/10/02	31	<1.0	<1.0	<1.0
LAY-SG-005-051	1/9/02	1/10/02	51	<1.0	<1.0	<1.0
LAY-SG-005-071	1/9/02	1/10/02	71	<1.0	<1.0	<1.0
LAY-SG-005-091	1/9/02	1/10/02	91	<1.0	<1.0	<1.0
LAY-SG-005-111	1/9/02	1/10/02	111	**1.3**	<1.0	<1.0
LAY-SG-005-126	1/9/02	1/10/02	126	**6.1**	<1.0	<1.0

Table 2-15 (Continued)
Soil Analytical Results
2001-2002 Layke NFA Investigation

Sample Number	Sample Date	Analysis Date	Sample Depth (ft bgs)	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
LAY-SG-006-011	1/3/02	1/4/02	11	<1.0	<1.0	<1.0
LAY-SG-006-031	1/3/02	1/4/02	31	<1.0	<1.0	<1.0
LAY-SG-006-051	1/3/02	1/4/02	51	<1.0	<1.0	<1.0
LAY-SG-006-071	1/3/02	1/4/02	71	<1.0	<1.0	<1.0
LAY-SG-006-091	1/3/02	1/4/02	91	<1.0	<1.0	<1.0
LAY-SG-006-111	1/3/02	1/4/02	111	<1.0	<1.0	<1.0
LAY-SG-006-126	1/3/02	1/4/02	126	<1.0	**1.8**	<1.0
LAY-SG-007-011	1/2/02	1/2/02	11	<1.0	<1.0	<1.0
LAY-SG-007-031	1/2/02	1/2/02	31	<1.0	<1.0	<1.0
LAY-SG-007-051	1/2/02	1/2/02	51	<0.5	<1.0	<1.0
LAY-SG-007-071	1/2/02	1/2/02	71	<0.5	<1.0	<1.0
LAY-SG-007-091	1/2/02	1/2/02	91	<0.5	<1.0	<1.0
LAY-SG-007-111	1/2/02	1/2/02	111	<1.0	<1.0	<1.0
LAY-SG-007-126	1/2/02	1/2/02	126	<1.0	<1.0	<1.0
LAY-SG-008-011	1/7/02	1/8/02	11	<0.5	<1.0	<1.0
LAY-SG-008-031	1/7/02	1/8/02	31	<1.0	**1.1**	<1.0
LAY-SG-008-051	1/7/02	1/8/02	51	<0.5	<1.0	<1.0
LAY-SG-008-071	1/7/02	1/8/02	71	<0.5	<1.0	<1.0
LAY-SG-008-091	1/7/02	1/8/02	91	<0.5	<1.0	<1.0
LAY-SG-008-111	1/7/02	1/8/02	111	<0.5	<1.0	<1.0
LAY-SG-008-126	1/7/02	1/8/02	126	<0.5	<1.0	<1.0
LAY-SG-009-011	12/28/01	12/29/01	11	<1.0	<1.0	<1.0
LAY-SG-009-031	12/28/01	12/29/01	31	<1.0	<1.0	<1.0
LAY-SG-009-051	12/28/01	12/29/01	51	<1.0	<1.0	<1.0
LAY-SG-009-071	12/28/01	12/29/01	71	<1.0	<1.0	<1.0
LAY-SG-009-091	12/28/01	12/29/01	91	<1.0	<1.0	<1.0
LAY-SG-009-111	12/31/01	1/2/02	111	<1.0	<1.0	<1.0
LAY-SG-009-126	12/31/01	1/2/02	126	<1.0	<1.0	<1.0

Notes:

* Additional samples taken and analyzed onsite in the mobile laboratory to evaluate potential for vapor loss when soil-gas samples are analyzed at a fixed-based laboratory the day following collection.

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
ft bgs = feet below ground surface
µg/L = micrograms per liter

Samples were analyzed using EPA Method 8021B, Modified.

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL).

Table 2-16
Hydropunch® Groundwater Analytical Results
2001-2002 Layke NFA Groundwater Sampling

Monitor Well	Sample Date	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
LAY-HP-001-136	1/14/02	<0.5	<0.5	<0.5
LAY-HP-002-136	1/8/02	<0.5	<0.5	<0.5
LAY-HP-003-136	1/11/02	<0.5	<0.5	<0.5
LAY-HP-004-136	12/28/02	<0.5	<0.5	<0.5
LAY-HP-005-136	1/10/02	<0.5	<0.5	<0.5
LAY-HP-006-136	1/4/02	<0.5	<0.5	<0.5
LAY-HP-007-136	1/2/02	<0.5	<0.5	<0.5
LAY-HP-008-136	1/7/02	<0.5	<0.5	<0.5
LAY-HP-009-136	12/31/01	<0.5	<0.5	<0.5
LAY-HP-103-136	1/11/02	<0.5	<0.5	<0.5
Arizona AWQS (µg/L)		5	7	5

Notes:

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
µg/L = micrograms per liter
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard

Samples were analyzed using EPA Method 8260B.

Table 4-1
Groundwater Elevations For Wells in and around the WCP WGA Site (ft amsl)

Monitor Well	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99	Jan-00	Feb-00	Mar-00
ARCO #5290 MW-2	985.91	985.40	984.64	984.01	983.29	982.53	982.09	981.68	981.76	981.72	981.69	982.00
ARCO #5290 MW-3	985.99	985.44	984.63	984.01	983.27	982.52	982.11	981.75	981.84	981.81	981.77	982.07
ARCO #5290 MW-4	986.19	985.67	984.83	984.23	983.52	982.78	982.34	981.90	981.93	981.88	981.86	982.12
Southwest Roofing MWB-2	985.81	987.53	988.17	988.02	987.53	987.21	987.19	987.08	987.11	987.38	987.45	987.64
Southwest Roofing MWB-3	985.78	987.44	988.02	987.87	987.40	987.06	986.63	986.95	986.97	987.26	987.32	987.51
Southwest Roofing MWB-4	985.66	987.62	988.36	988.20	987.71	987.43	987.39	987.32	987.36	987.61	987.75	987.93
WCP-4	983.75	986.64	987.41	987.48	987.07	986.95	986.80	986.79	986.91	987.04	987.12	987.20
WCP-8	986.03	988.93	989.40	989.49	989.10	989.23	989.16	989.18	989.29	989.33	989.31	989.12
WCP-10	986.53	986.77	986.80	986.62	986.14	985.80	985.46	985.23	985.32	985.43	985.57	985.78
WCP-11	985.71	987.10	987.54	987.55	987.19	987.07	986.92	986.85	986.87	986.95	986.94	986.91
WCP-89	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WCP-94	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WCP-204	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WOC MW-1S	986.58	987.54	987.96	988.01	987.63	987.54	987.43	987.35	987.39	987.43	987.38	987.31
WOC MW-4S	990.83	991.82	991.70	991.53	991.08	991.00	990.91	990.86	990.74	990.69	990.49	990.23
WOC MW-5S	987.34	988.21	988.15	988.07	987.66	987.57	987.49	987.47	987.48	987.47	987.31	987.09
WOC MW-6S	981.25	982.14	981.39	980.85	980.07	979.87	979.72	979.75	979.96	980.02	980.00	979.59
WOC MW-102S	987.25	986.97	986.98	986.90	986.59	986.36	986.15	985.99	985.99	985.99	985.96	985.96
WOC MW-103S	986.26	985.83	985.40	985.03	984.42	983.99	983.59	983.35	983.46	983.55	983.65	983.86
WOC MW-104S	985.96	985.43	984.84	984.42	983.78	983.36	982.93	982.65	982.70	982.71	982.76	982.81
WOC MW-201S	984.41	983.80	982.95	982.35	981.61	981.00	980.45	980.16	980.31	980.37	980.44	980.66

Table 4-1 (Continued)
Groundwater Elevations For Wells in and around the WCP WGA Site
(ft amsl)

Monitor Well	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Jan-01	Feb-01	Mar-01
ARCO #5290 MW-2	981.65	981.40	981.00	980.63	980.05	979.55	978.99	978.70	978.48	978.57	978.81	979.15
ARCO #5290 MW-3	981.84	981.43	981.09	980.63	980.03	979.47	978.87	978.52	978.26	978.31	978.59	979.01
ARCO #5290 MW-4	981.90	981.57	981.25	980.84	980.28	979.76	979.20	978.83	978.56	978.54	978.78	979.11
Southwest Roofing MWB-2	987.70	987.08	986.47	NM	NM	984.64	984.03	983.89	NM	985.28	986.11	984.70
Southwest Roofing MWB-3	987.56	986.93	986.33	985.65	985.06	984.50	983.88	NM	NM	987.22	985.59	984.46
Southwest Roofing MWB-4	987.95	987.33	986.71	986.01	985.39	984.82	984.25	984.09	983.87	984.31	985.36	984.99
WCP-4	986.98	986.50	986.06	985.50	984.81	984.59	983.82	983.69	983.54	983.70	984.04	984.32
WCP-8	988.80	988.31	987.93	987.32	986.70	986.25	985.98	985.91	985.85	985.76	DRY	DRY
WCP-10	985.68	985.29	984.86	984.35	983.66	983.04	982.45	982.06	981.83	981.90	982.26	982.67
WCP-11	986.71	986.33	985.97	985.53	984.95	984.36	DRY	DRY	DRY	DRY	DRY	DRY
WCP-89	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WCP-94	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WCP-204	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WOC MW-1S	987.07	986.69	986.34	985.91	985.28	984.80	984.33	984.01	983.85	983.79	983.89	984.04
WOC MW-4S	989.87	989.36	989.00	988.49	987.84	987.30	986.94	NM	986.60	986.52	986.53	986.52
WOC MW-5S	987.52	987.00	986.63	986.05	985.30	984.78	984.34	984.19	984.01	984.00	984.11	984.22
WOC MW-6S	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
WOC MW-102S	985.81	985.49	985.17	984.75	984.11	983.51	982.93	982.56	982.21	982.11	982.22	982.44
WOC MW-103S	983.70	983.26	982.86	982.36	981.69	981.02	980.44	980.05	979.80	979.90	980.20	980.63
WOC MW-104S	982.66	982.34	981.99	981.50	980.84	980.25	979.66	979.22	978.91	978.86	979.23	979.43
WOC MW-201S	980.53	980.10	979.68	979.20	978.53	977.98	977.42	977.11	976.83	976.97	977.25	977.75

Table 4-1 (Continued)
Groundwater Elevations For Wells in and around the WCP WGA Site
(ft amsl)

Monitor Well	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Apr-02	Sep-02
ARCO #5290 MW-2	979.51	979.50	978.77	DRY	DRY	DRY	DRY	DRY	975.57	DRY	975.37	973.49
ARCO #5290 MW-3	979.44	979.42	978.81	978.13	977.41	976.82	976.22	975.87	975.43	DRY	DRY	DRY
ARCO #5290 MW-4	979.51	979.54	979.02	978.40	977.82	NM	DRY	DRY	DRY	DRY	DRY	DRY
Southwest Roofing MWB-2	984.90	984.81	NM	983.10	981.33	980.96	980.96	980.44	980.52	980.43	980.33	DRY
Southwest Roofing MWB-3	984.84	984.99	983.80	983.98	979.88	981.42	NM	NM	NM	NM	NM	NM
Southwest Roofing MWB-4	985.28	985.00	984.18	983.60	982.11	981.20	981.21	980.79	980.88	980.76	980.61	DRY
WCP-4	982.83	984.05	983.29	982.29	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
WCP-8	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
WCP-10	981.55	983.01	982.37	981.55	980.74	980.00	979.39	978.99	978.69	978.56	978.52	DRY
WCP-11	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
WCP-89	984.13	984.16	983.18	982.39	981.50	980.60	980.12	NM	979.94	979.88	979.62	975.60
WCP-94	N/A	N/A	N/A	N/A	980.69	979.84	979.24	978.78	978.65	978.27	978.15	975.32
WCP-204	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	978.26	977.81	977.63	975.24
WOC MW-1S	983.99	983.62	983.16	NM	981.51	NM	DRY	DRY	DRY	DRY	DRY	DRY
WOC MW-4S	986.19	985.56	984.91	983.91	NM	NM	DRY	DRY	DRY	DRY	DRY	DRY
WOC MW-5S	983.22	982.71	982.07	981.08	980.27	NM	979.37	979.07	979.09	978.98	--	974.83
WOC MW-6S	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
WOC MW-102S	982.52	982.10	981.71	980.80	979.96	NM	978.83	978.55	978.44	978.05	--	974.03
WOC MW-103S	981.09	980.84	980.35	979.45	978.66	NM	977.24	976.79	976.55	976.43	--	972.71
WOC MW-104S	979.75	979.54	979.09	978.34	977.59	NM	976.25	975.81	975.56	975.35	--	971.66
WOC MW-201S	978.25	978.04	977.59	976.64	975.96	NM	974.78	974.40	974.34	974.06	--	971.34

Table 4-1 (Continued)
Groundwater Elevations For Wells in and around the WCP WGA Site
(ft amsl)

Notes:

ft amsl	=	feet above mean sea level
NM	=	not measured (unable to obtain access)
N/A	=	not applicable (well had not been installed yet)
DRY	=	well is dry
--	=	no data submitted by reporting party

Table 4-2
Well Elevations For Wells in and around the WCP WGA Site
(ft amsl)

Monitor Well	ADEQ ID	ADWR Number	Well Elevation
ARCO #5290 MW-2	57125	55-536034	1095.81
ARCO #5290 MW-3	57126	55-536033	1096.30
ARCO #5290 MW-4	57127	55-545742	1096.09
Southwest Roofing MWB-2	57182	55-538226	1106.29
Southwest Roofing MWB-3	57183	55-538227	1106.33
Southwest Roofing MWB-4	57189	55-538228	1105.81
WCP-4	57115	55-535334	1109.25
WCP-8	57263	55-537381	1109.92
WCP-10	57422	55-547462	1102.50
WCP-11	57421	55-547461	1107.66
WCP-89	59427	55-585116	1105.53
WCP-94	59431	55-586979	1101.57
WCP-204	60383	55-589528	1097.47
WOC MW-1S	57149	55-532636	1109.45
WOC MW-4S	57156	55-534122	1107.64
WOC MW-5S	57157	55-534123	1107.28
WOC MW-6S	57160	55-558699	1098.35
WOC MW-102S	58079	55-564733	1106.02
WOC MW-103S	58080	55-564982	1100.81
WOC MW-104S	58081	55-564984	1100.36
WOC MW-201S	58082	55-571594	1095.26

Notes:

ft ams = feet above mean sea level

Table 5-1
Physical Properties of Chemicals of Concern at the WCP WGA Site

Chemical	Specific Gravity (g/cm^3)	Aqueous Solubility @ 25°C (mg/L)	Vapor Pressure @ 25°C (mm Hg)	Henry's Law Constant @ 25°C ($atm\text{-}m^3/mol$)	Vapor Density	Boiling Point (°C)	K_{oc} (mL/g)	K_{ow}
TCE	1.46	1,280	69	9.85E-03	4.53	87.2	101	407
PCE	1.62	150	18.5	1.77E-02	5.7	121.3	200-237	2,512
1,1-DCE	1.21	2,500	600	2.61E-02	3.25	31.7	64	135

Notes:

All physical parameters obtained from: Toxicology Data Network, National Library of Medicine (Toxnet), Hazardous Substance Database, http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, July 2, 2003.

Henry's Law Constant (K_H): Compounds with constants greater than 1E-03 readily volatilize from water; compounds with constants less than 1E-05 are not as volatile.

Specific Gravity: Compounds with a density of greater than 1 have a tendency to sink in water (i.e., DNAPLs); compounds with a density of less than 1 have a tendency to float on water (i.e., LNAPLs).

Water Solubility: Highly soluble chemicals can be rapidly leached from wastes and soils and are mobile in groundwater; the higher the value, the higher the solubility.

Boiling Point: Useful in determining how quickly a chemical will produce a vapor or whether the chemical is in its gaseous state.

Octanol-Water Partition Coefficient (K_{ow}): Used in estimating the sorption of organic compounds on soils (high K_{ow} tends to adsorb more easily).

Organic Carbon Partition Coefficient (K_{oc}): Indication of the capacity for an organic chemical to adsorb to soil because organic carbon is responsible for nearly all adsorption in most soils (the higher the value, the more it adsorbs).

Vapor Pressure: Relative measure of volatility of a substance in pure state. The higher the vapor pressure, the more volatile.

Vapor Density: Compounds with a density of greater than 1 have a tendency to migrate downhill and accumulate in low lying areas. Chemicals that have a vapor density which is the same or less than the vapor density of air will disperse readily into the surrounding environment.

Table 5-2
1992-2001 Summary of Groundwater Analytical Results
WCP West Grand Avenue and West Osborn Complex Sites

Monitor Well	Sample Date	Sampler	Well Elev. ft amsl	GW Elev. ft amsl	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
WCP-4	5/29/92	ETC	1109.25	1011.45	**420**	<1.0	<1.0
WCP-4	7/10/92	ETC	1109.25	1013.55	**340**	**2.0**	<0.5
WCP-4 (D)	7/10/92	ETC	1109.25	1013.55	**290**	**1.5**	<0.5
WCP-4	12/4/92	ETC	1109.25	1012.15	**370**	**1.6**	<0.5
WCP-4	1/24/94	ETC	1109.25	1010.27	**380**	<5.0	<5.0
WCP-4	3/28/95	ETC	1109.25	1014.83	**140**	<0.5	<0.5
WCP-4	2/7/96	ETC	1109.25	1010.00	**190**	<0.5	<0.5
WCP-4	11/25/96	Geotrans	1109.25	1008.87	**2.0**	<0.5	<0.5
WCP-4	11/25/96	GZA	1109.25	1008.87	**3.1**	<0.5	<0.5
WCP-4	5/6/97	Geotrans	1109.25	998.67	<0.5	<0.5	<0.5
WCP-4	8/9/97	Geotrans	1109.25	994.25	**0.58**	<0.5	<0.5
WCP-4	11/14/97	Geotrans	1109.25	996.92	**0.76**	<0.5	<0.5
WCP-4	2/10/98	Geotrans	1109.25	996.94	**1.4**	<0.5	<0.5
WCP-4	5/26/98	Geotrans	1109.25	995.92	<0.5	<0.5	<0.5
WCP-4	8/28/98	Geotrans	1109.25	994.65	**2.7**	<0.5	<0.5
WCP-4	11/9/98	Geotrans	1109.25	992.50	**0.85**	<0.5	<0.5
WCP-4	2/11/99	Geotrans	1109.25	991.89	<0.5	<0.5	<0.5
WCP-4	3/5/01	Weston	1109.25	984.30	<0.3	<0.3	<0.3
WCP-4 (D)	3/5/01	Weston	1109.25	984.30	<0.3	<0.3	<0.3
WCP-4	6/6/01	Weston	1109.25	983.60	<0.2	<0.2	<0.2
WCP-8	12/4/92	ETC	1109.92	1013.24	<0.5	<0.5	<0.5
WCP-8	2/18/93	ETC	1109.92	1011.55	<0.5	<0.5	<0.5
WCP-8	1/20/94	ETC	1109.92	1011.64	<0.5	<0.5	<0.5
WCP-8	2/8/96	ETC	1109.92	1012.27	<0.5	<0.5	<0.5
WCP-8	11/25/96	Geotrans	1109.92	1006.79	<0.5	<0.5	<0.5
WCP-8	11/25/96	GZA	1109.92	1006.79	<0.5	<0.5	<0.5
WCP-8	5/9/97	Geotrans	1109.92	1001.27	<0.5	<0.5	<0.5
WCP-8	8/9/97	Geotrans	1109.92	995.68	<0.5	<0.5	<0.5
WCP-8	11/13/97	Geotrans	1109.92	1001.01	<0.5	<0.5	<0.5
WCP-8	2/12/98	Geotrans	1109.92	1000.27	<0.5	<0.5	<0.5
WCP-8	5/20/98	Geotrans	1109.92	998.61	<0.5	<0.5	<0.5
WCP-8	8/21/98	Geotrans	1109.92	997.45	<0.5	<0.5	<0.5
WCP-8	11/6/98	Geotrans	1109.92	995.34	<0.5	<0.5	<0.5
WCP-8	2/19/99	Geotrans	1109.92	994.79	<0.5	<0.5	<0.5
WCP-8	6/01	Weston	DRY	DRY	DRY	DRY	DRY

Table 5-2 (Continued)
1992-2001 Summary of Groundwater Analytical Results
WCP West Grand Avenue and West Osborn Complex Sites

Monitor Well	Sample Date	Sampler	Well Elev. ft amsl	GW Elev. ft amsl	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
WCP-10	2/28/95	ETC	1102.50	1009.60	**37**	**1.0**	<0.5
WCP-10	3/28/95	ETC	1102.50	1010.54	**45**	**0.9**	<0.5
WCP-10 (D)	3/28/95	ETC	1102.50	1010.54	**37**	**1.0**	<0.5
WCP-10	2/6/96	ETC	1102.50	1008.18	**33**	<0.5	<0.5
WCP-10	11/22/96	Geotrans	1102.50	1002.61	**16**	<0.5	<0.5
WCP-10	11/22/96	GZA	1102.50	1002.61	**20**	<0.5	<0.5
WCP-10	5/8/97	Geotrans	1102.50	998.80	**20**	<0.5	<0.5
WCP-10	8/4/97	Geotrans	1102.50	993.53	**19**	<0.5	<0.5
WCP-10	11/14/97	Geotrans	1102.50	994.67	**29**	<1.0	<1.0
WCP-10	2/10/98	Geotrans	1102.50	995.05	**11**	<0.5	<0.5
WCP-10	5/18/98	Geotrans	1102.50	994.41	**3.9**	<0.5	<0.5
WCP-10	8/20/98	Geotrans	1102.50	993.21	**5.9**	<0.5	<0.5
WCP-10	11/5/98	Geotrans	1102.50	991.00	**11**	<0.5	<0.5
WCP-10	2/8/99	Geotrans	1102.50	990.36	**13**	<0.5	<0.5
WCP-10	3/5/01	Weston	1102.50	982.57	**8**	<0.3	<0.3
WCP-10	6/7/01	Weston	1102.50	982.62	**5**	<0.2	<0.2
WCP-11	2/28/95	ETC	1107.66	1013.46	<0.5	<0.5	<0.5
WCP-11 (D)	2/28/95	ETC	1107.66	1013.46	<0.5	<0.5	<0.5
WCP-11	3/28/95	ETC	1107.66	1014.20	<0.5	<0.5	<0.5
WCP-11	2/7/96	ETC	1107.66	1011.18	<0.5	<0.5	<0.5
WCP-11	11/22/96	Geotrans	1107.66	1006.62	<0.5	<0.5	<0.5
WCP-11	11/22/96	GZA	1107.66	1006.62	**0.6**	<0.5	<0.5
WCP-11	5/6/97	Geotrans	1107.66	1001.35	<0.5	<0.5	<0.5
WCP-11	8/5/97	Geotrans	1107.66	996.37	**1.5**	<0.5	<0.5
WCP-11	11/14/97	Geotrans	1107.66	999.21	**2.1**	<0.5	<0.5
WCP-11	2/12/98	Geotrans	1107.66	998.25	**3.8**	<0.5	<0.5
WCP-11	5/18/98	Geotrans	1107.66	996.35	**2.7**	<0.5	<0.5
WCP-11	8/21/98	Geotrans	1107.66	995.19	**0.93**	<0.5	<0.5
WCP-11	11/9/98	Geotrans	1107.66	993.06	**0.70**	<0.5	<0.5
WCP-11	2/9/99	Geotrans	1107.66	992.21	**1.3**	<0.5	<0.5
WCP-11	6/01	Weston	DRY	DRY	DRY	DRY	DRY
MW-103S	2/9/98	Geotrans	1100.81	994.02	**59**	**2.0**	<1.3
MW-103S	5/18/98	Geotrans	1100.81	993.53	**29**	<1.0	<1.0
MW-103S	8/21/98	Geotrans	1100.81	991.64	**28**	**0.78**	<0.5
MW-103S	11/6/98	Geotrans	1100.81	989.38	**29**	<0.5	<0.5
MW-103S	2/9/99	Geotrans	1100.81	988.81	**40**	**1.2**	**0.60**
MW-103S	6/7/01	GZA	1100.81	980.62	**30**	**1**	**0.4**
Arizona AWQS (µg/L)					5	7	5

Table 5-2 (Continued)
1992-2001 Summary of Groundwater Analytical Results
WCP West Grand Avenue and West Osborn Complex Sites

Notes:

TCE	= Trichloroethylene
PCE	= Tetrachloroethylene
1,1-DCE	= 1,1-Dichloroethylene
µg/L	= micrograms per liter
Well Elev.	= well elevation
GW Elev.	= groundwater elevation
ft amsl	= feet above mean sea level
MCL	= Maximum Contaminant Level
AWQS	= Aquifer Water Quality Standard
D	= Duplicate Sample
ETC	= The Earth Technology Corporation for ADEQ
Geotrans	= Geotrans, Inc. for United Industrial Corporation
GZA	= GZA GeoEnvironmental, Inc. for ADEQ
Weston	= Weston Solutions, Inc. (formerly Roy F. Weston, Inc.)

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 5-3
2001-2002 Groundwater Analytical Results
WCP East Grand Avenue RI Investigation

Monitor Well	Sample Date	Well Elev. ft amsl	GW Elev. ft amsl[3]	TCE (µg/L)	1,1-DCE (µg/L)	PCE (µg/L)
WCP-89[1]	2/23/01	1105.53	982.63[4]	**1**	<0.3	<0.3
WCP-89[1]	4/24/01	1105.53	984.13	**1**	<0.3	<0.3
WCP-89[1]	6/6/01	1105.53	983.18	<0.2	<0.2	<0.2
WCP-89[2]	6/18/01	1105.53	983.18	**0.4**	<0.2	<0.2
WCP-89[1]	8/01/01	1105.53	981.50	<0.2	<0.2	<0.2
WCP-89[2]	10/31/01	1105.53	980.12	<0.2	<0.2	<0.2
WCP-89[2]	1/11/02	1105.53	979.88	<0.2	<0.2	<0.2
WCP-94[1]	8/9/01	1101.57	980.69	**12**	<0.2	<0.2
WCP-94[1]	9/20/01	1101.57	979.84	**11**	**0.4**	<0.2
WCP-94[2]	11/7/01	1101.57	978.78	**13**	**0.4**	<0.2
WCP-94[2]	1/23/02	1101.57	978.27	**11**	<0.2	<0.2
WCP-204[2]	12/18/01	1097.47	978.26	<0.2	<0.2	**0.3**
WCP-204[2]	1/21/02	1097.47	977.81	<0.2	<0.2	<0.2
Arizona AWQS (µg/L)				5	7	5

Notes:

Groundwater samples collected by ADEQ for the WCP East Grand Avenue RI Investigation. Samples were analyzed using EPA Method 8260B.

[1] Groundwater samples collected using the low-flow purge method and the pump discharge sample collection method.
[2] Groundwater samples collected using three casing volume purge method and the pump discharge sample collection method.
[3] Groundwater elevations taken within a month of sampling date.
[4] Final groundwater elevation at the time well is completed obtained from well construction log.

TCE = Trichloroethylene
PCE = Tetrachloroethylene
1,1-DCE = 1,1-Dichloroethylene
µg/L = micrograms per liter
Well Elev. = well elevation
GW Elev. = groundwater elevation
ft amsl = feet above mean sea level
MCL = Maximum Contaminant Level
AWQS = Aquifer Water Quality Standard

Bold areas indicate contaminant detections above the laboratory method detection limit (MDL). Shaded areas indicate groundwater sample exceeds AWQS.

Table 6-1
Physical Properties of Organic Contaminants that Affect Fate and Transport

Physical Property	Range	Qualitative Description
Sorption- Soil Adsorption Coefficient (K_{oc})	<10	Very weakly sorbed
	10 - 100	Weakly sorbed
	100 - 1,000	Moderately sorbed
	1,000 - 10,000	Moderately to strongly sorbed
	10,000 - 100,000	Strongly sorbed
	> 100,000	Very strongly sorbed
Mobility- Based on a combination of solubility (s) (mg/L) and K_{oc}	s > 3,500 and K_{oc} < 50	Very high mobility
	3,500 > s > 850 and 50 < K_{oc} < 150	High mobility
	850 > s > 150 and 150 < K_{oc} < 500	Moderate mobility
	150 > s > 15 and 500 < K_{oc} < 2,000	Low mobility
	15 > s > 0.2 and 2,000 < K_{oc} < 20,000	Slight mobility
	s < 0.2 and K_{oc} > 20,000	Immobile
Volatility- Henry's Constant (K_H) (atm m^3/mol)	$K_H < 3x10^{-7}$	Non-volatile
	$3x10^{-7} < K_H < 1x10^{-5}$	Low volatility
	$1x10^{-5} < K_H < 1x10^{-3}$	Moderate volatility
	$K_H > 10^{-3}$	High volatility

Sources: ATSDR Public Health Assessment Manual, http://www.atsdr.cdc.gov/HAC/HAGM/toc-html.htm, Chapter 6.

Fetter, C.W., 1988. Applied Hydrogeology, Second Edition, pp. 403-405.

WEST CENTRAL PHOENIX WEST GRAND AVENUE SITE
DRAFT REMEDIAL INVESTIGATION REPORT

LIST OF FIGURES

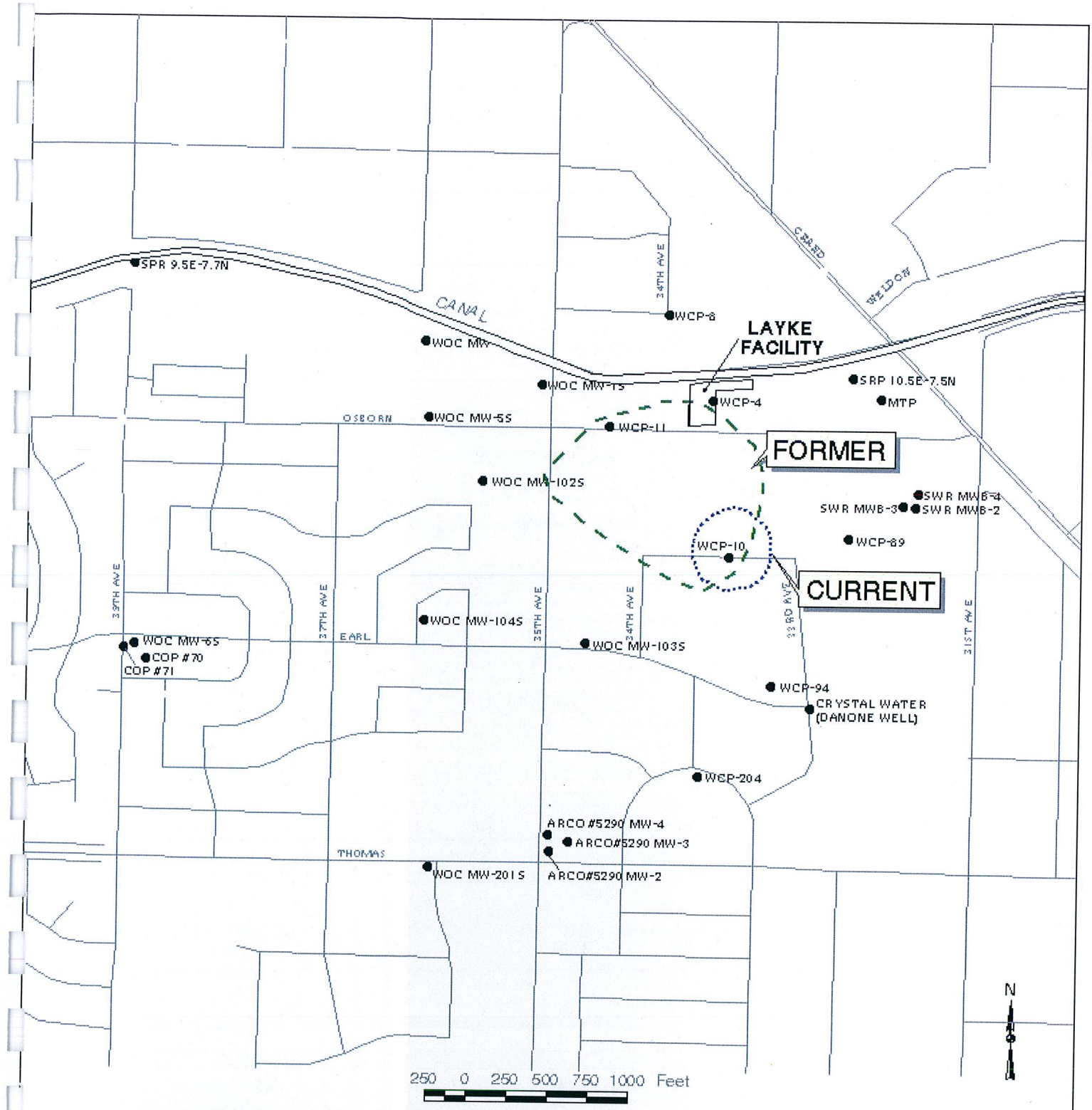


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Figure 1-1

Boundaries of the WCP WGA Site (Former and Current)

12/2003

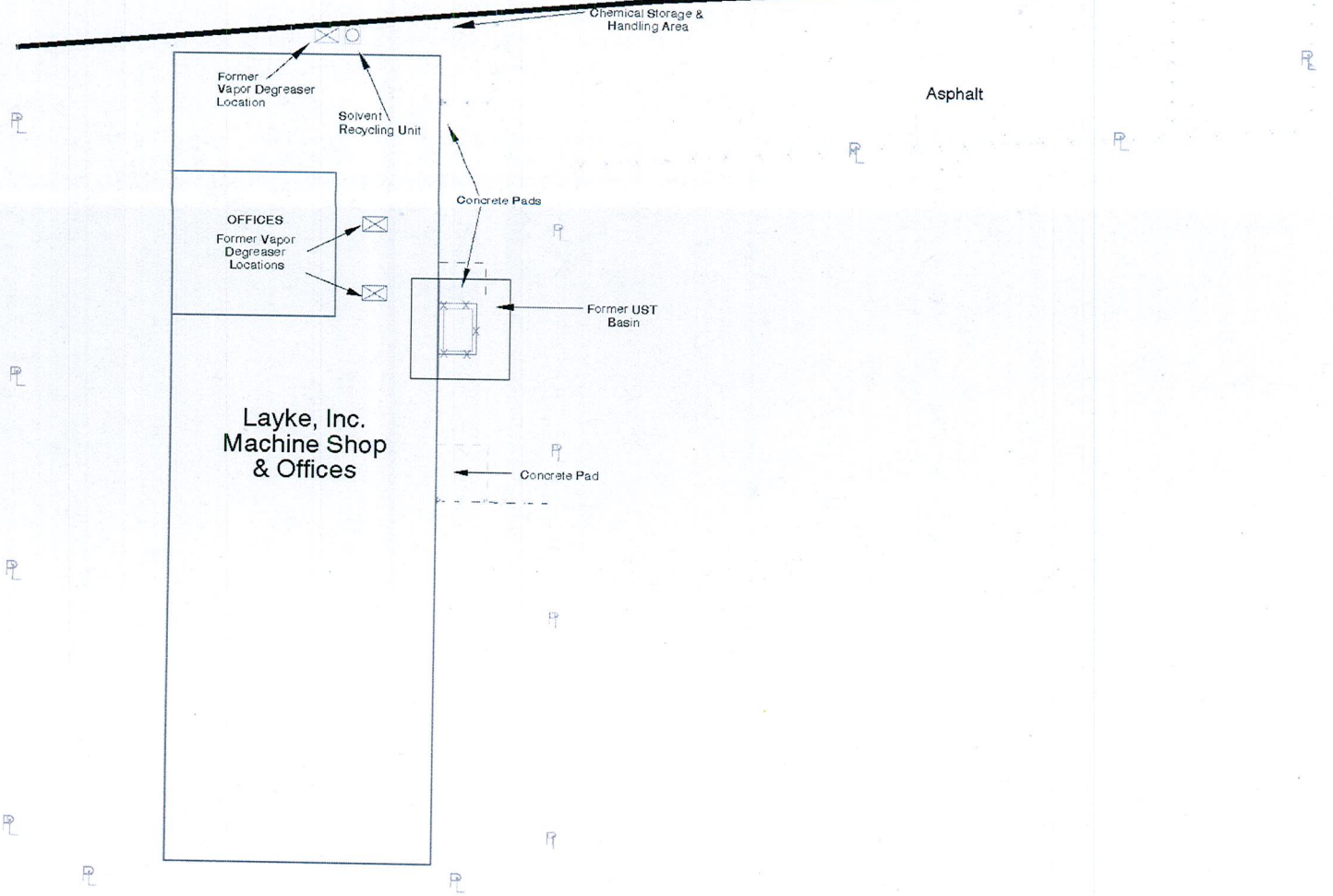

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Figure 1-2

Layke Facility Diagram

- Approx. Property Boundary
- Chain Link Fence
- Block Wall
- Vapor Degreaser
- Solvent Recycling Unit

N

0 20 40 60

12/2003

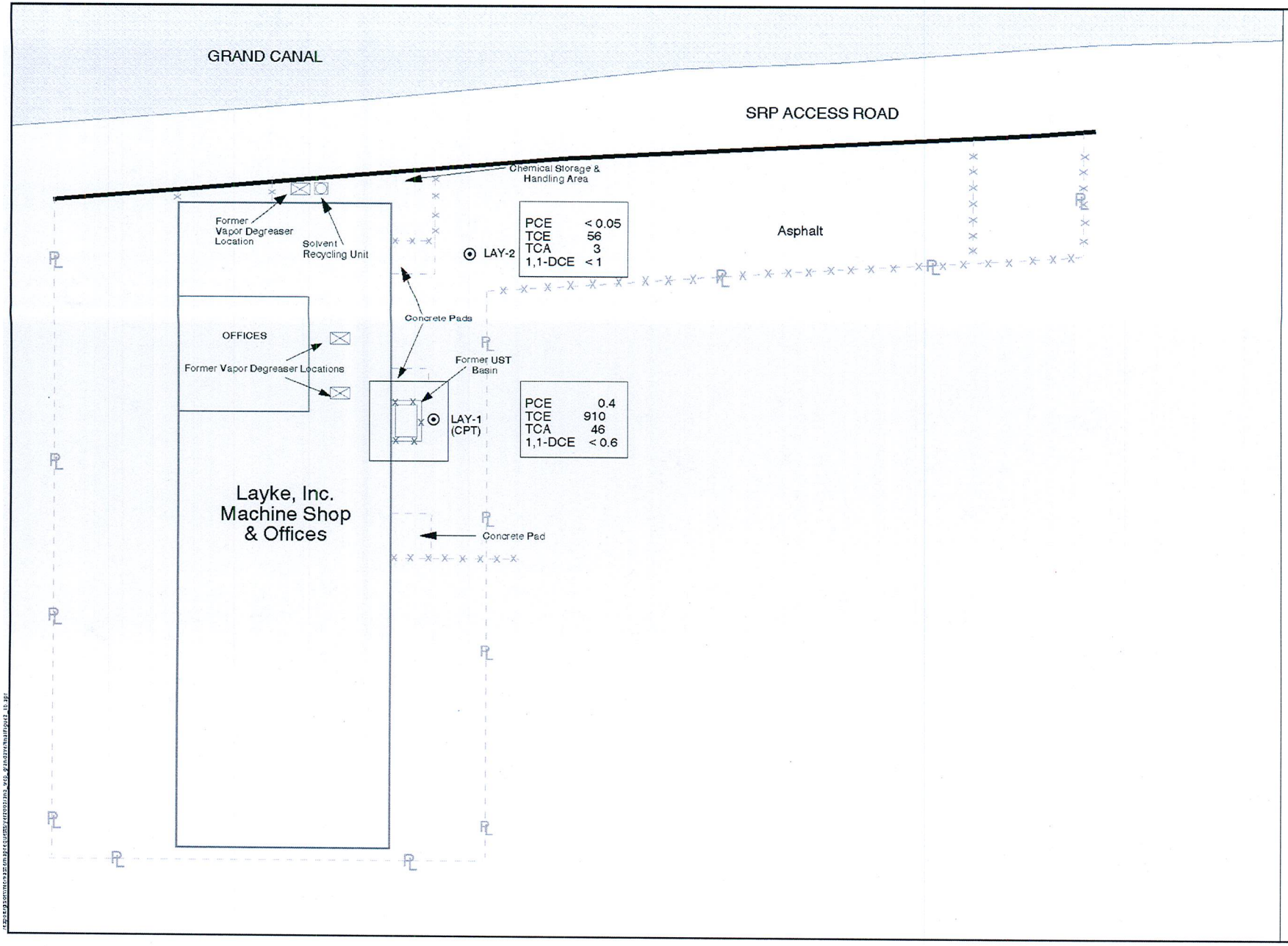

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Figure 2-1

1989 EPA PA/SI Investigation

- Approx. Property Boundary
- Chain Link Fence
- Block Wall
- Vapor Degreaser
- Solvent Recycling Unit
- LAY-2 — Soil-Gas Sample Location (SI, 1989)
- CPT — Cone Penetrometer Test Location

Note: Concentrations of VOCs in soil-gas are reported in µg/L.

N

0 20 40 60

12/2003

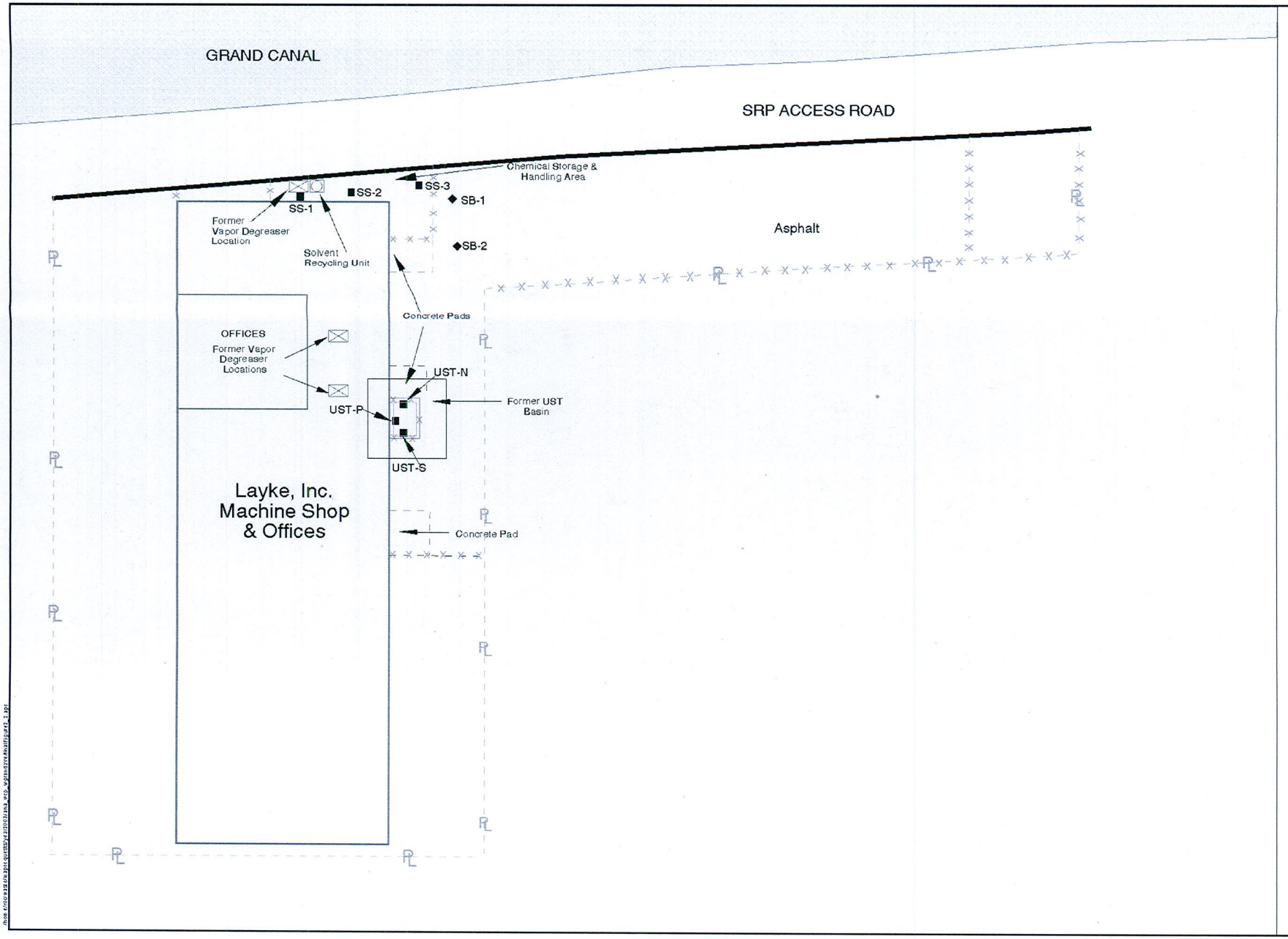

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Figure 2-2

1990 Phase I Testing

- Approx. Property Boundary
- Chain Link Fence
- Block Wall
- Vapor Degreaser
- Solvent Recycling Unit
- SS-1 Soil Sample Location from Excavation or Hand Auger (Phase I, 1990)
- SB-1 Soil Boring Location (Phase I, 1990)

N

0 20 40 60

12/2003

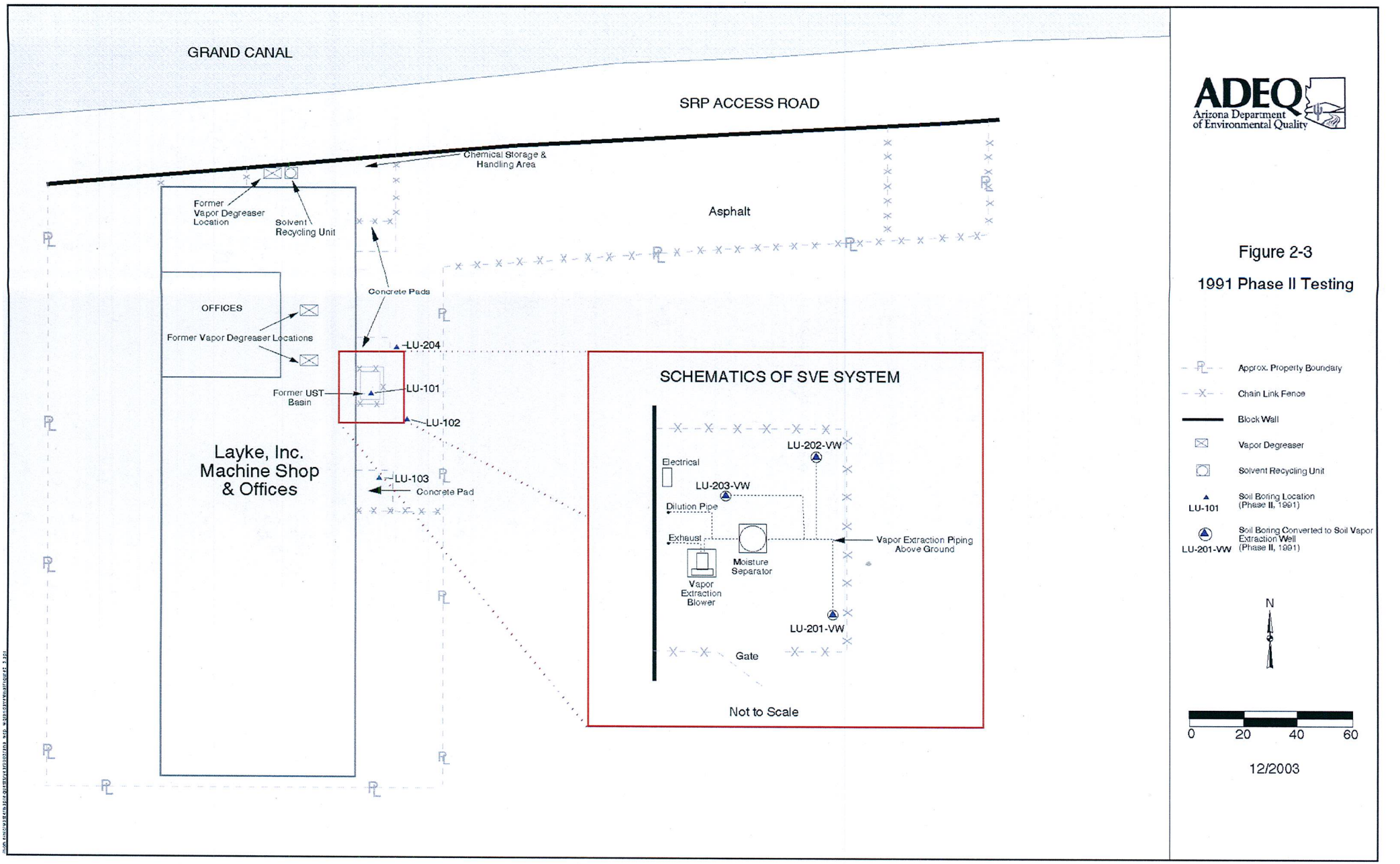
GRAND CANAL
SRP ACCESS ROAD
Chemical Storage & Handling Area
Former Vapor Degreaser Location
Solvent Recycling Unit
Asphalt
Concrete Pads
OFFICES
Former Vapor Degreaser Locations
LU-204
Former UST Basin
LU-101
LU-102
Layke, Inc. Machine Shop & Offices
LU-103
Concrete Pad
SCHEMATICS OF SVE SYSTEM
LU-202-VW
Electrical
LU-203-VW
Dilution Pipe
Exhaust
Vapor Extraction Piping Above Ground
Moisture Separator
Vapor Extraction Blower
LU-201-VW
Gate
Not to Scale
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Figure 2-3
1991 Phase II Testing
Approx. Property Boundary
Chain Link Fence
Block Wall
Vapor Degreaser
Solvent Recycling Unit
LU-101
Soil Boring Location (Phase II, 1991)
LU-201-VW
Soil Boring Converted to Soil Vapor Extraction Well (Phase II, 1991)
N
0
20
40
60
12/2003

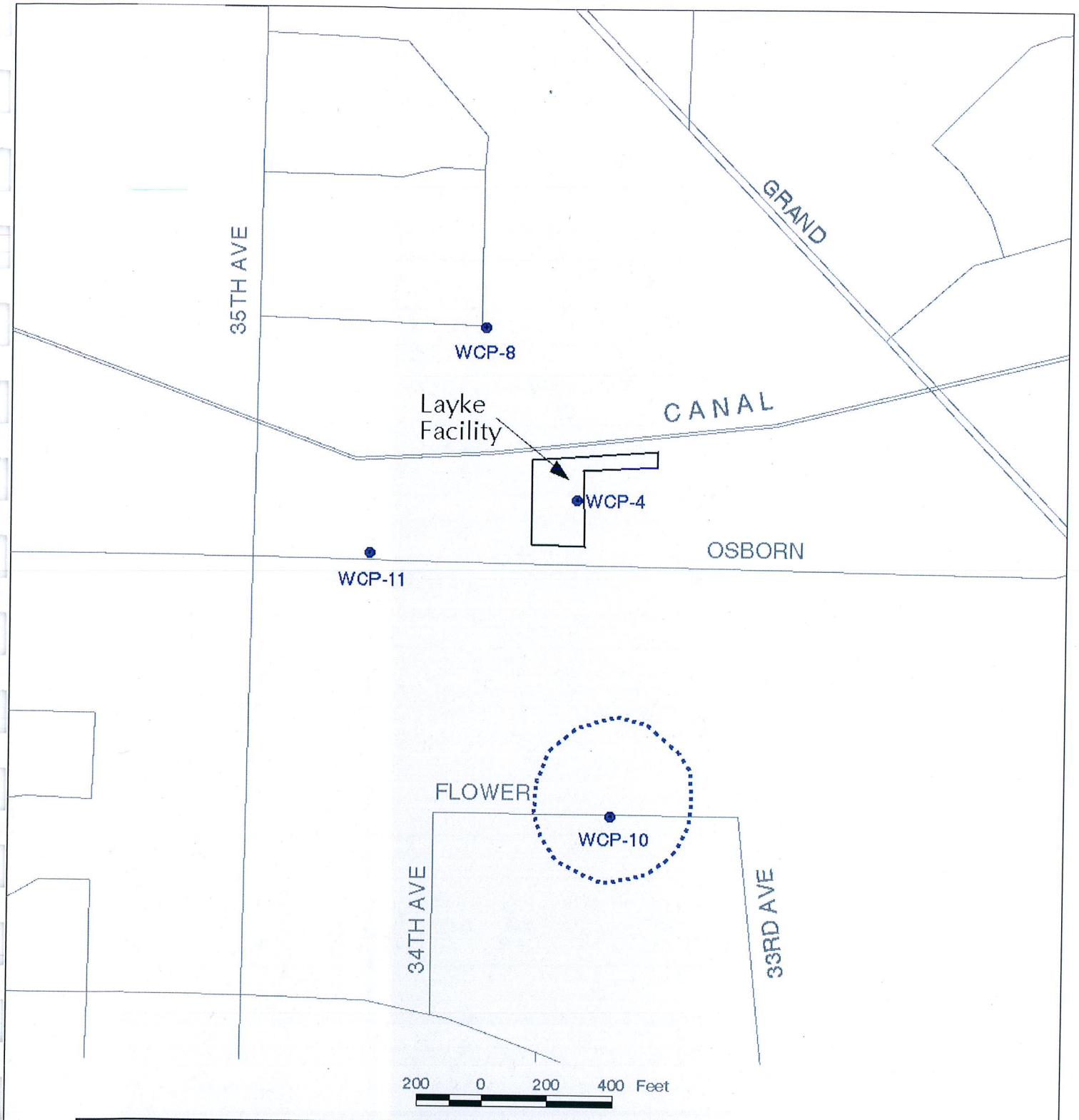

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Figure 2-4

Locations of Wells
WCP-4, WCP-8,
WCP-10 & WCP-11

12/2003

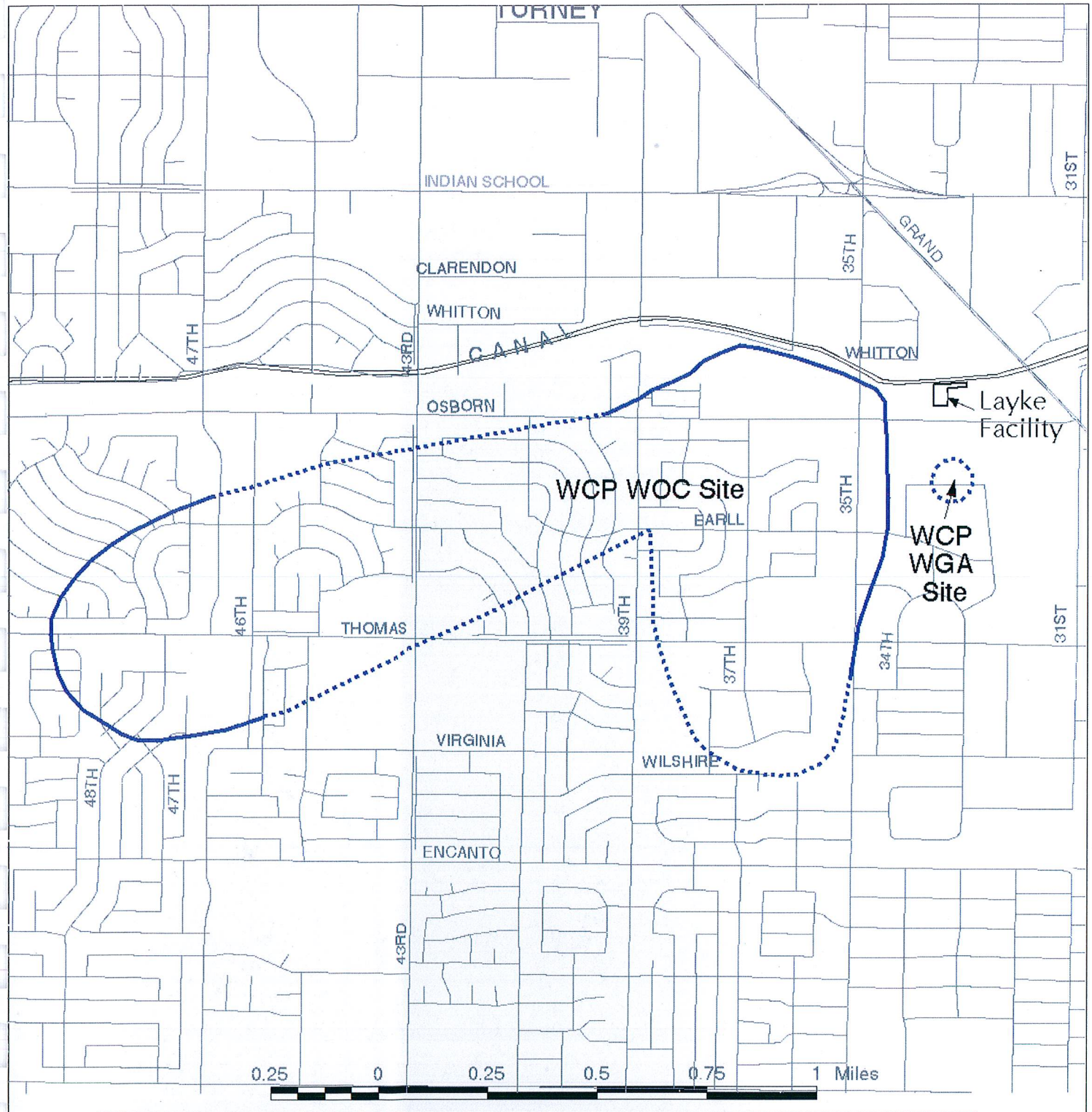

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Figure 2-5

Locations of the WCP WOC and WCP WGA Sites

12/2003

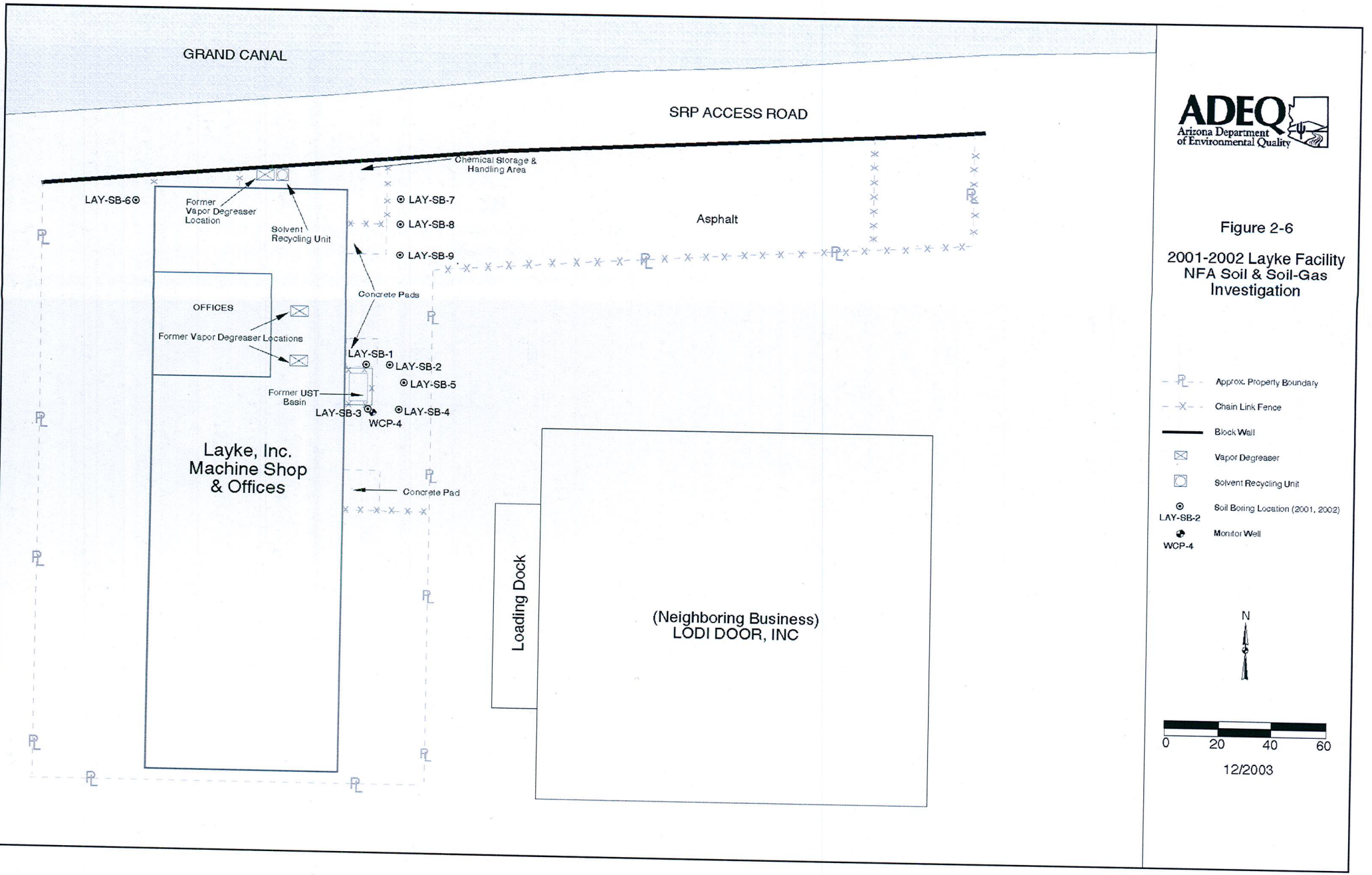

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Figure 2-6

2001-2002 Layke Facility NFA Soil & Soil-Gas Investigation

- Approx. Property Boundary
- Chain Link Fence
- Block Wall
- Vapor Degreaser
- Solvent Recycling Unit
- LAY-SB-2 — Soil Boring Location (2001, 2002)
- WCP-4 — Monitor Well

N

0 20 40 60

12/2003

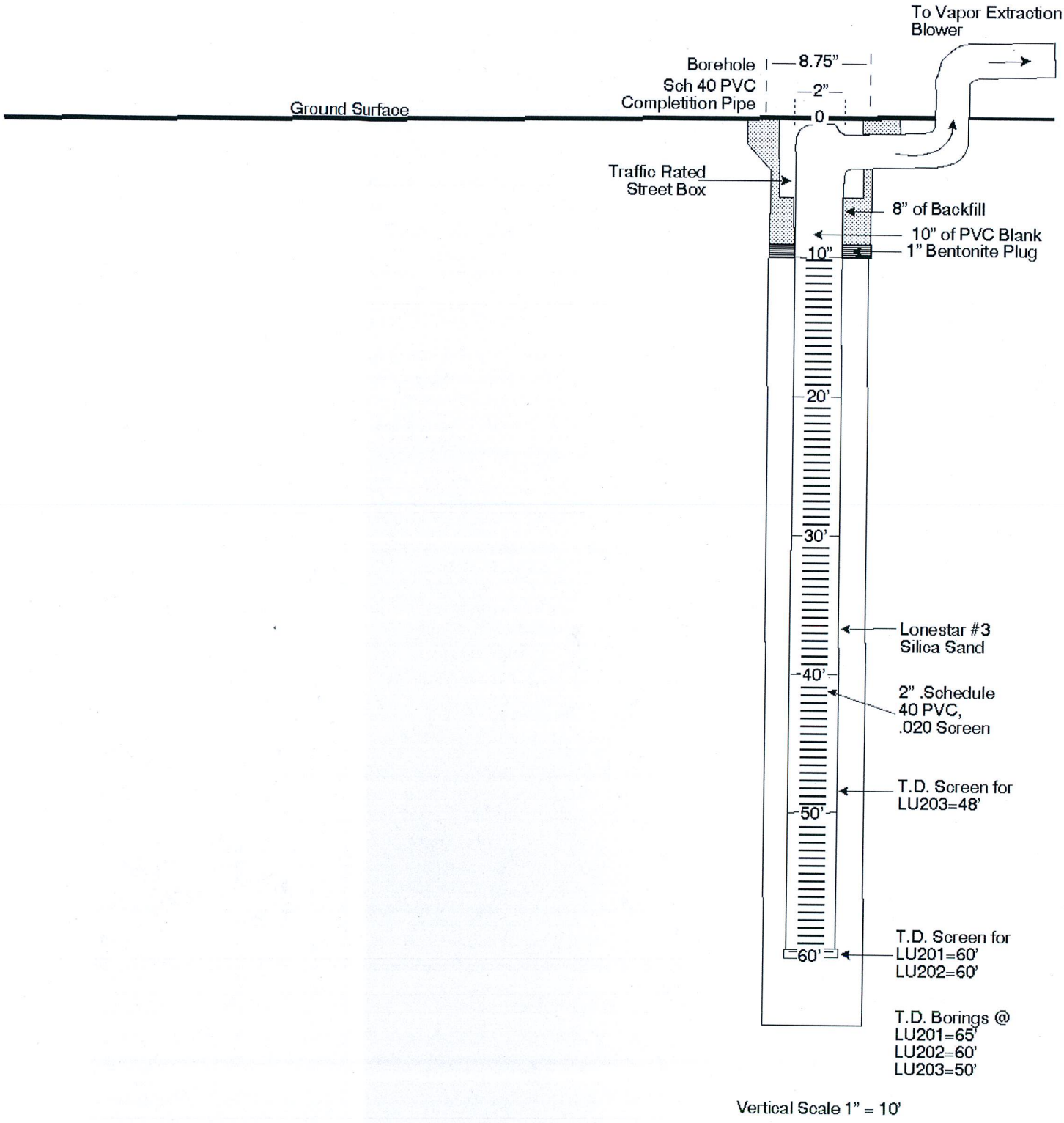

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Figure 3-1

Schematic for
Soil Vapor Extraction Wells
at the Layke Facility

12/2003

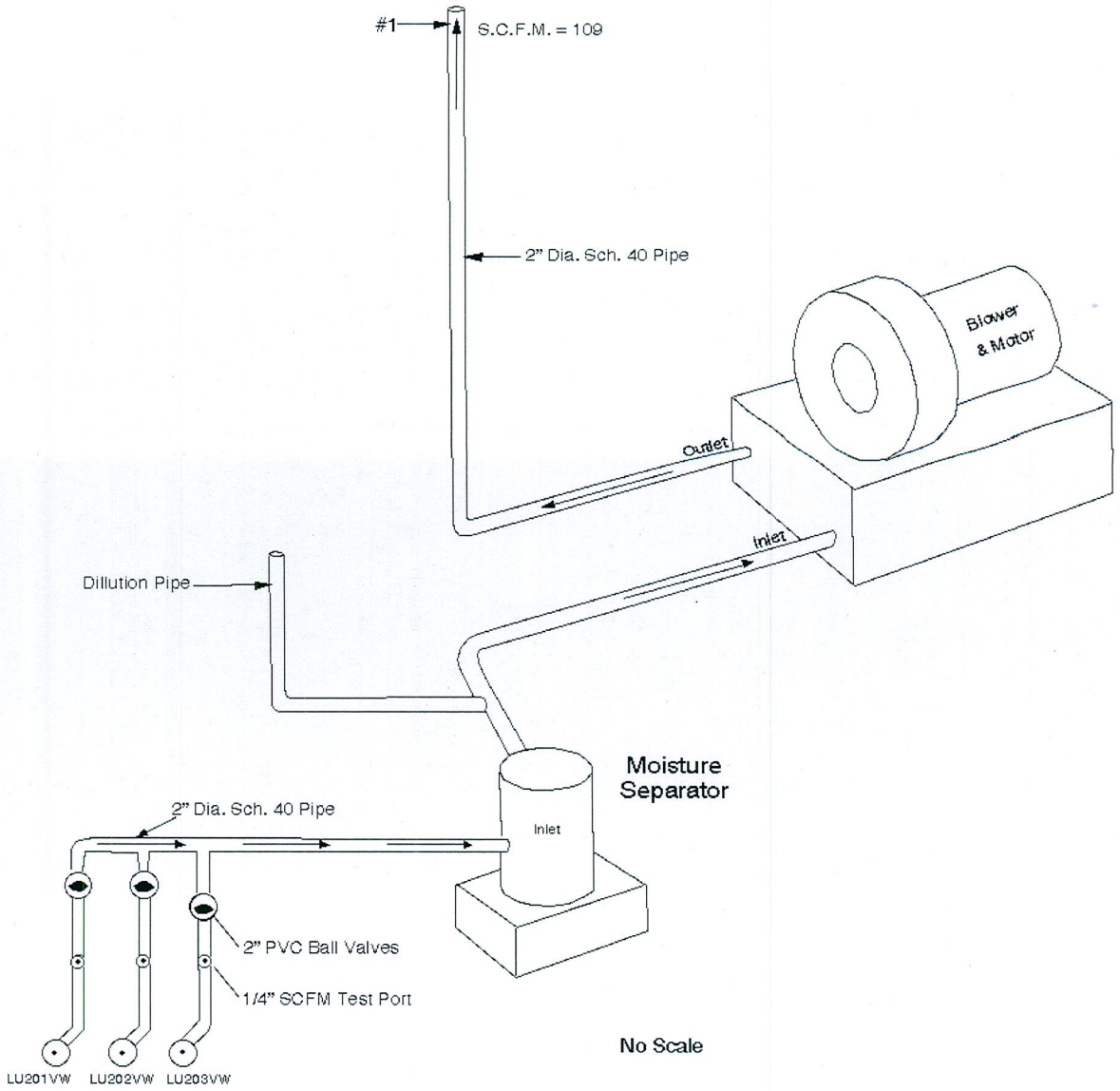

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Figure 3-2

Soil Vapor Extraction System Schematic at the Layke Facility

12/2003

/export/gisdevnlc/waste/maprequests/year2003/ana_wqpwgrandave/finalFigures_1.apr

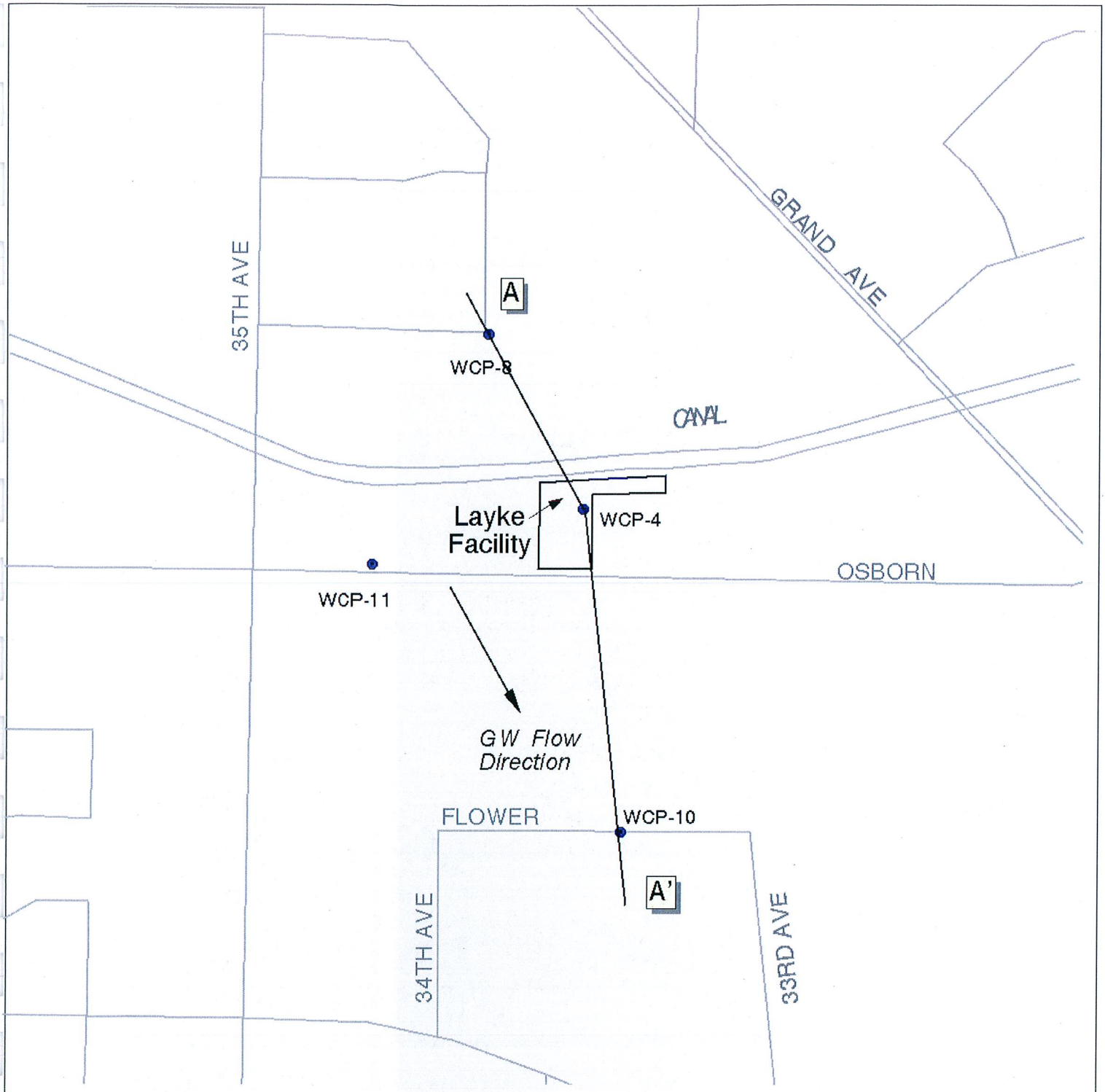

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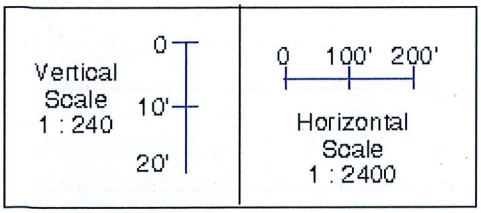
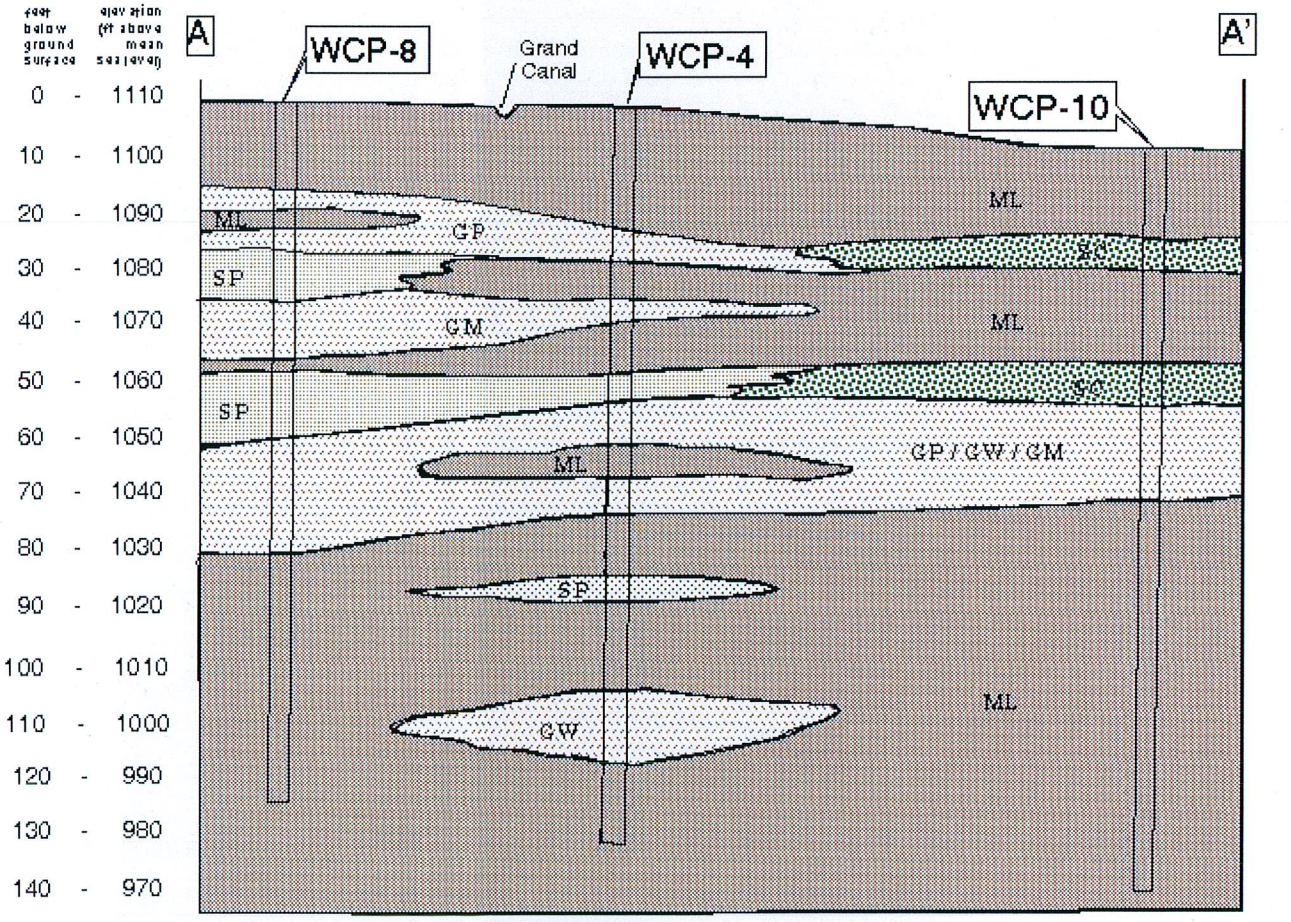
Figure 4-1

Line of Section at the Layke Facility

N

12/2003





GW - Well graded gravel or gravel sand mixture

GP - Poorly graded gravel or gravel sand mixture

GM - Clayey gravel, gravel, sand, silt mixture

SP - Poorly graded sand or gravelly sand

SC - Clayey sand, sand clay mixture

ML - inorganic silt with fine sand, silty fine sand

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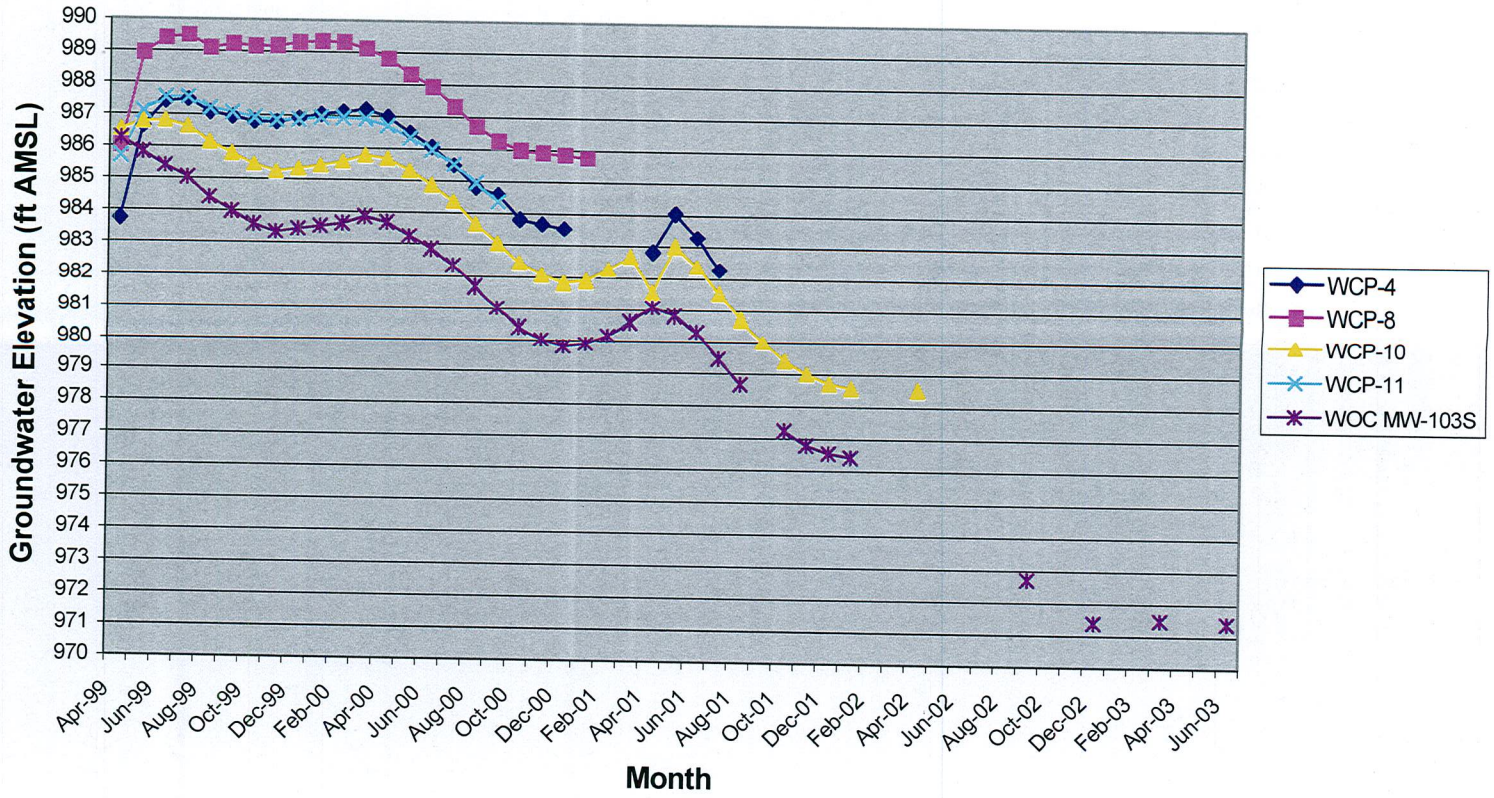
Figure 4-2

Cross Section A-A' at the Layke Facility

12/2003



Wells WCP-4, WCP-8, WCP-10 and WCP-11 are currently dry.

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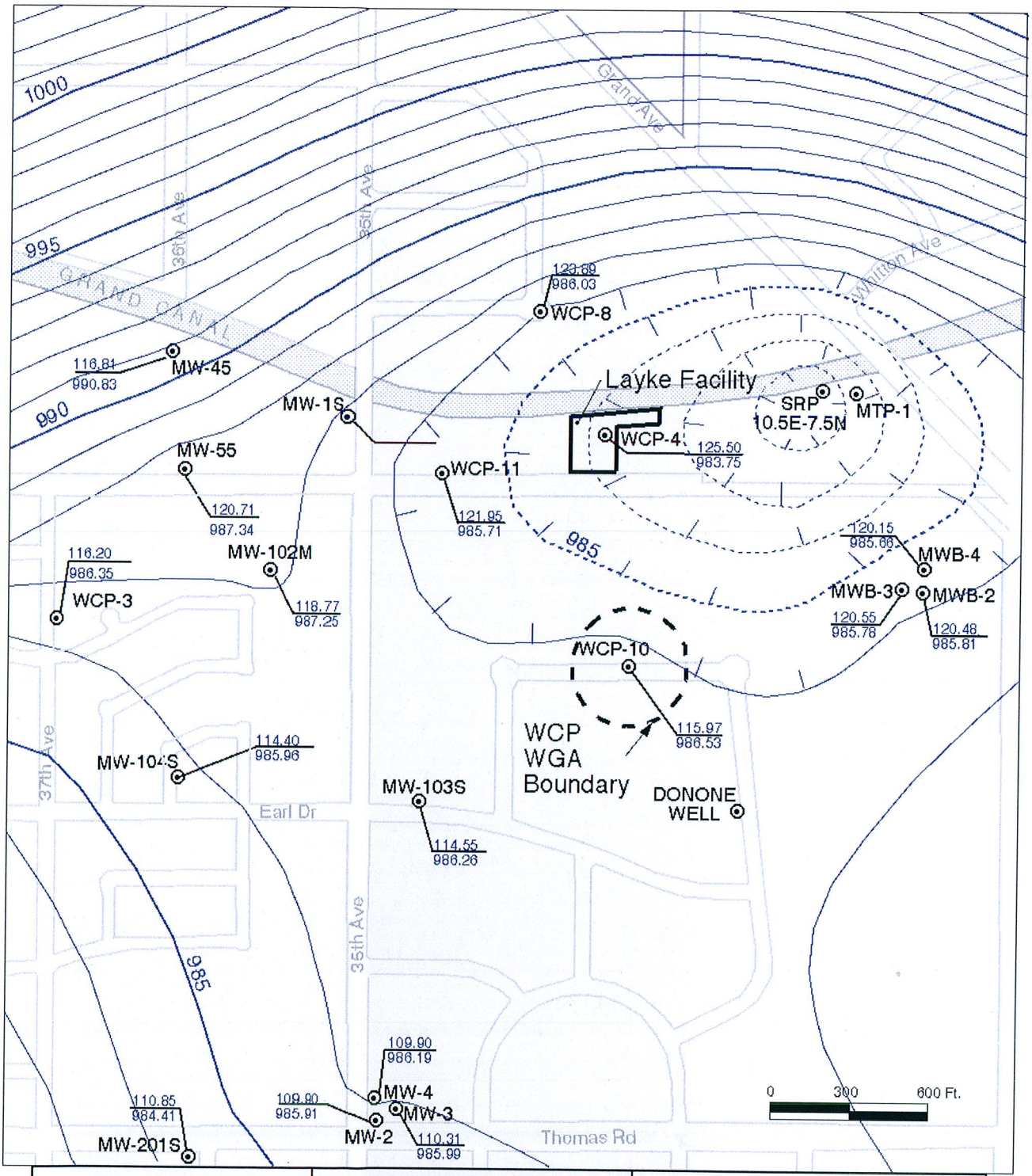
Figure 4-3

Hydrograph (April 1999 through June 2003)
WCP-4, WCP-8, WCP-10, WCP-11
& WOC MW-103S

12/2003

D:\AIV4500\EFACILITY\LAYKE\WCP WGA RI Report-Figure 4-3



Well

110.31 / 985.99 Depth to Groundwater / Groundwater Elevation

Canal

950 Groundwater Elevation Contour (1 Ft. Contour Interval)

Note:
All well locations are approximate.
Groundwater Elevations (feet above mean sea level), City of Phoenix Datum.
Contours are derived from a groundwater monitor well network that exceeds the area covered by this map.

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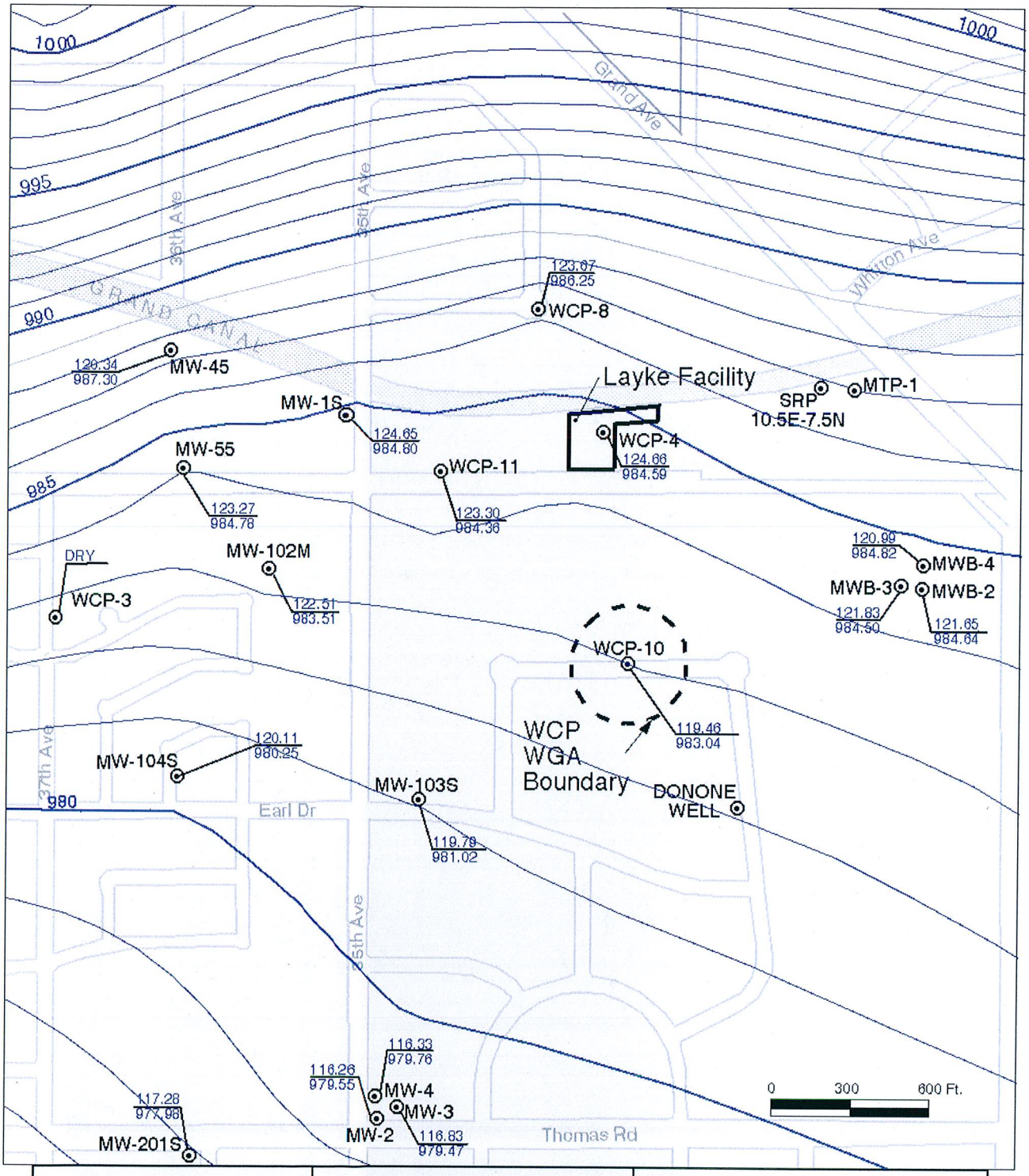
Figure 4-4
April 1999 Groundwater Elevations
at the WCP WGA Site

N

12/2003



Well

110.31 / 985.99 Depth to Groundwater / Groundwater Elevation

Canal

950 Groundwater Elevation Contour (1 Ft. Contour Interval)

Note:
All well locations are approximate.
Groundwater Elevations (feet above mean sea level), City of Phoenix Datum.
Contours are derived from a groundwater monitor well network that exceeds the area covered by this map.

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Figure 4-5
September 2000 Groundwater Elevations
at the WCP WGA Site

N

12/2003

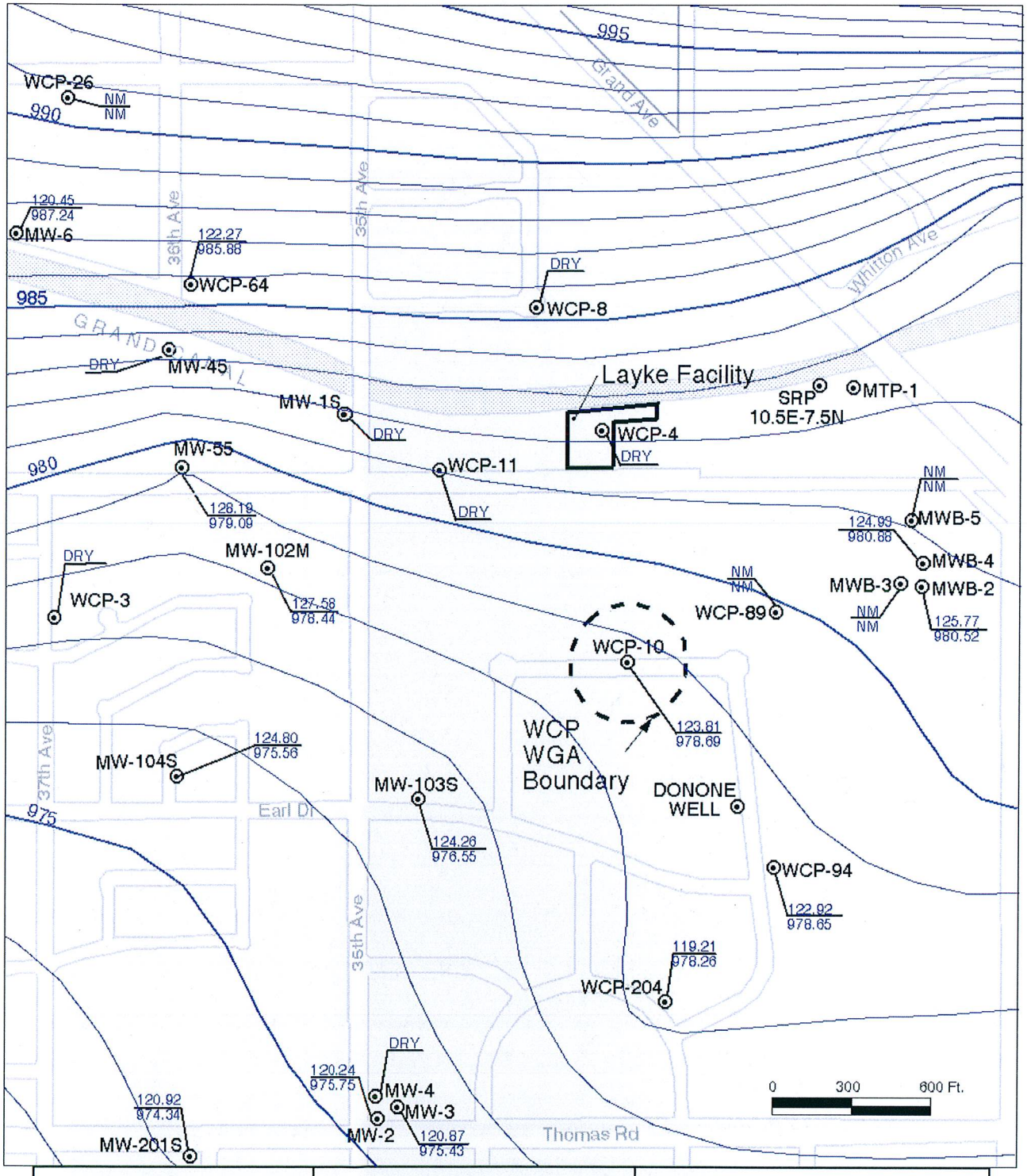

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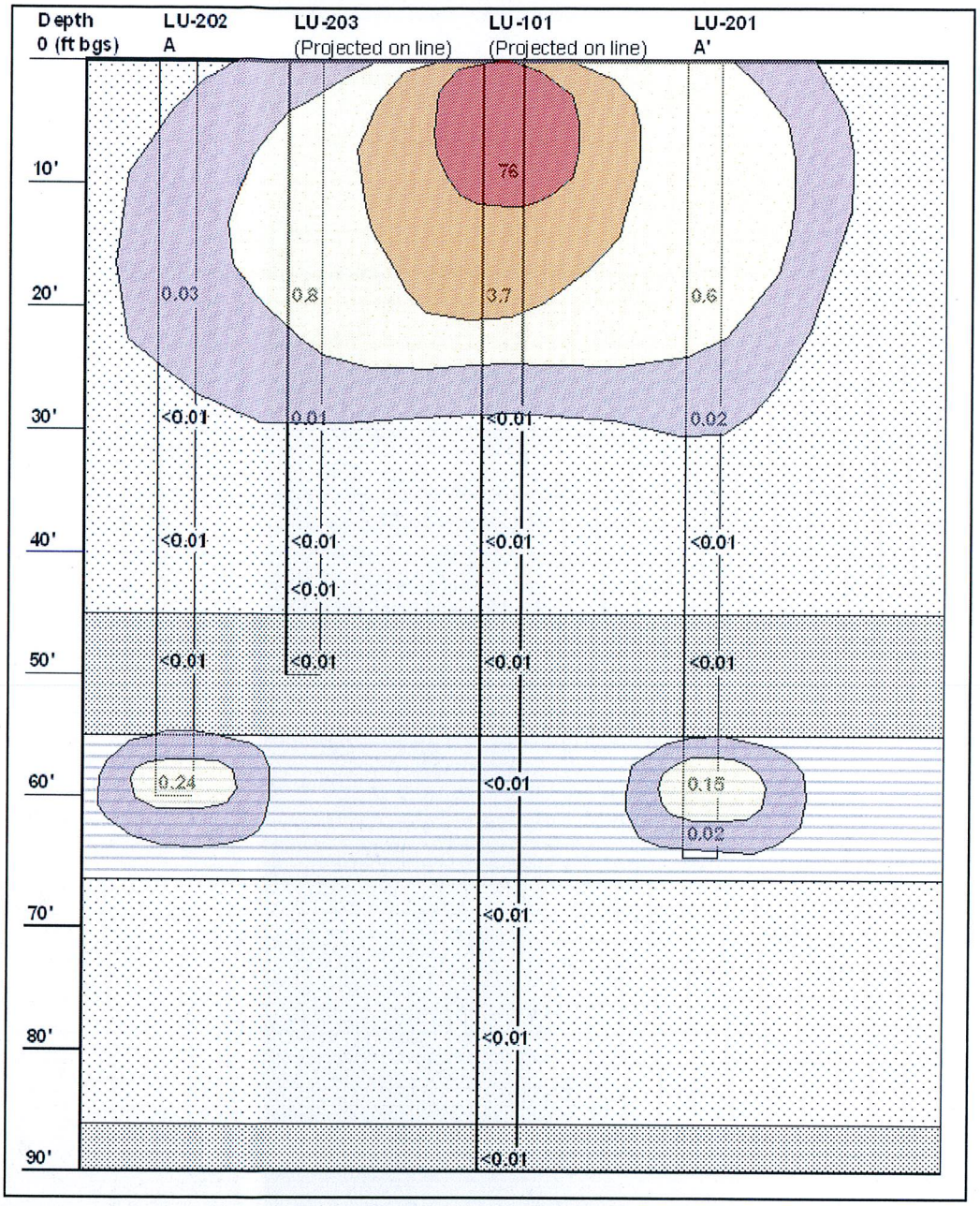
Figure 4-6
December 2001 Groundwater Elevations at the WCP WGA Site

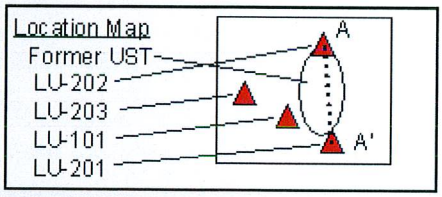
N

12/2003



TCE Concentration in mg/kg
in soil solid samples

- 100-50
- 50-1
- 1-0.1
- 0.1-0.01



Lithology

- Silty Sand
- Poorly Graded Sand
- Clayey silt with fine sand

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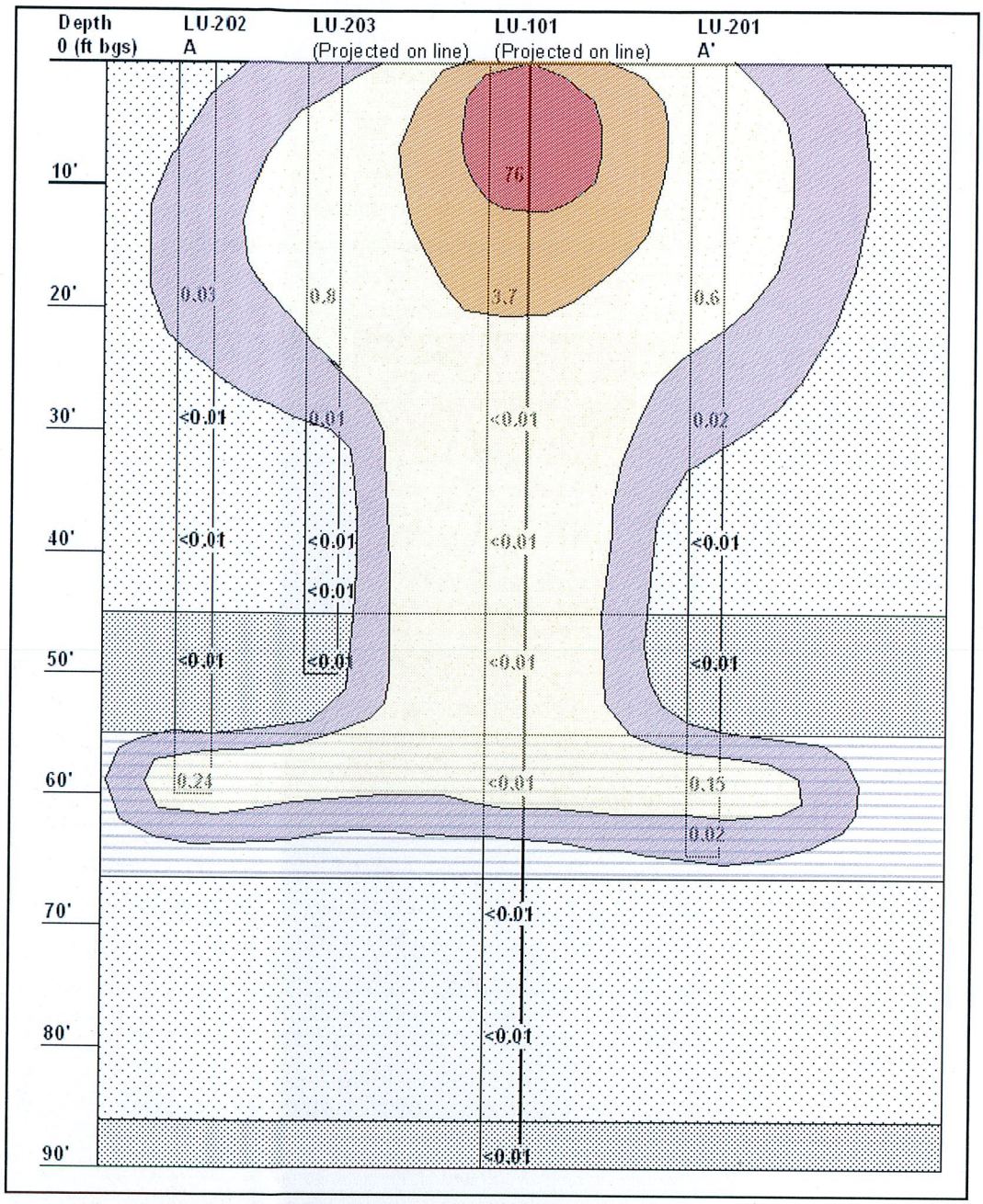
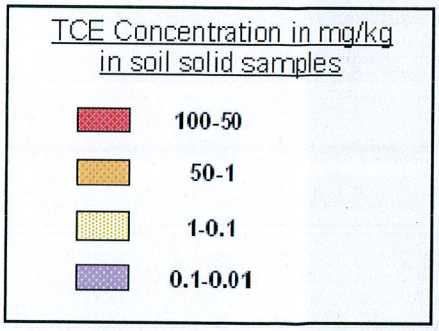
Figure 5-1

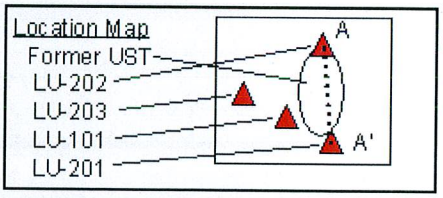
Previous Extent of Soil Contamination
at the Layke Facility Former UST Basin

12/2003

D:\AIV4500\EFACILITY\LAYKE\WCP WGA RI Report-Figure 5-1







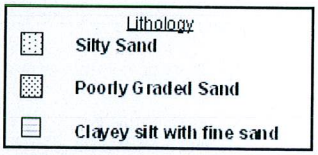


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Figure 5-2
Cross Section Depicting
Potential Release Pathways at the
Layke Facility

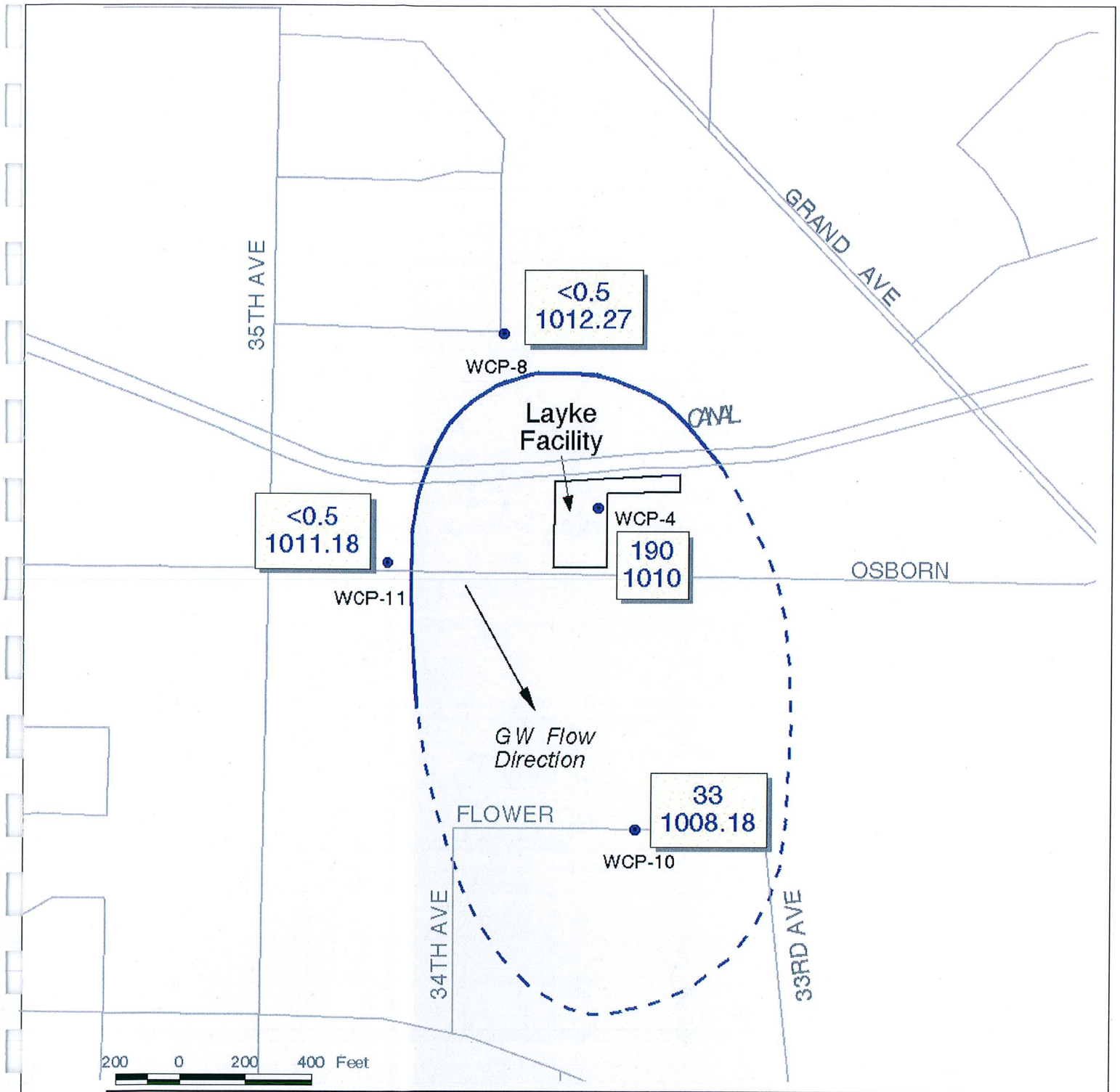

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Figure 5-3

TCE Concentration Contour Map
February 1996

12/2003

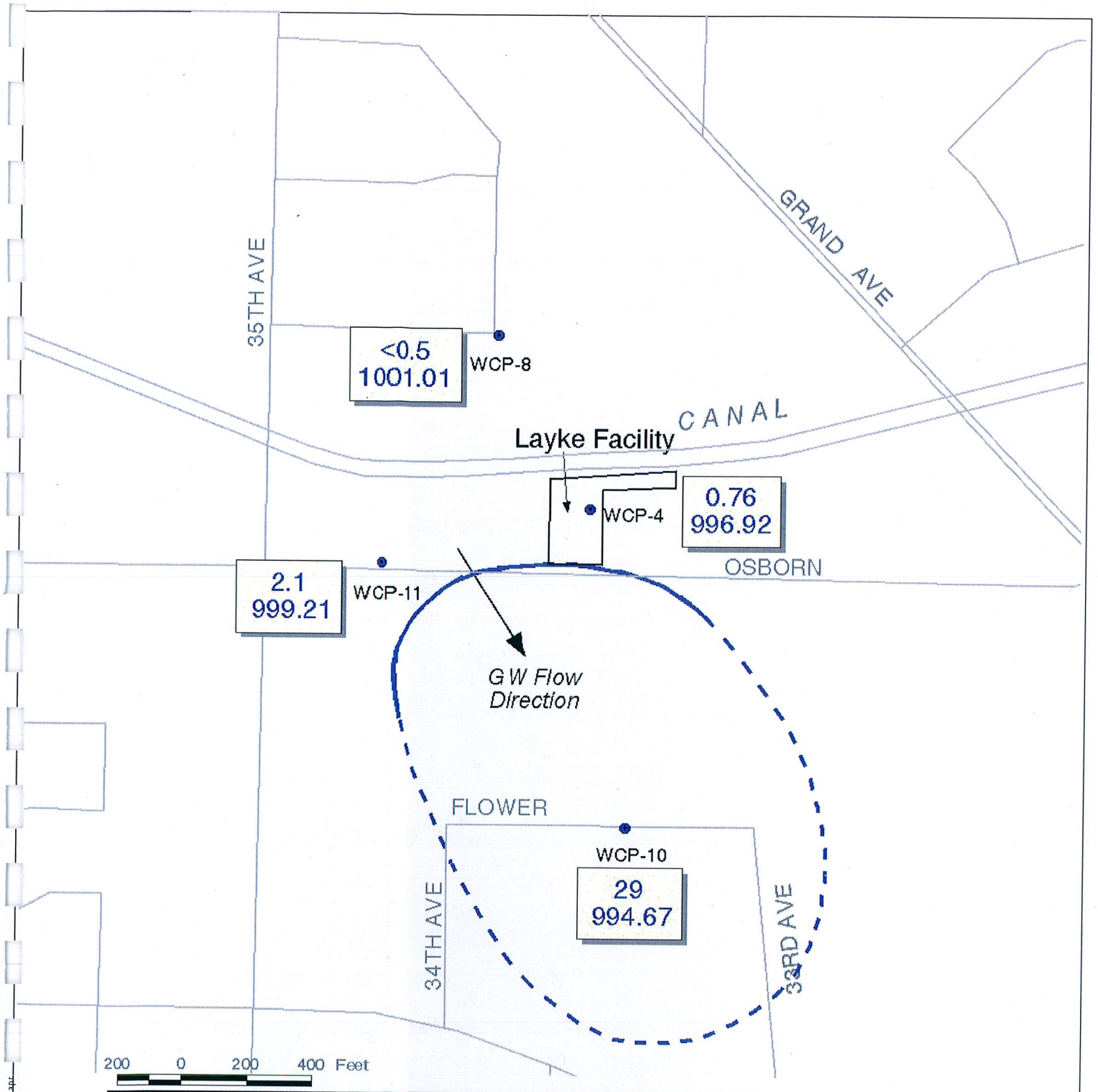

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Figure 5-4

TCE Concentration Coutour Map
February 1997

12/2003

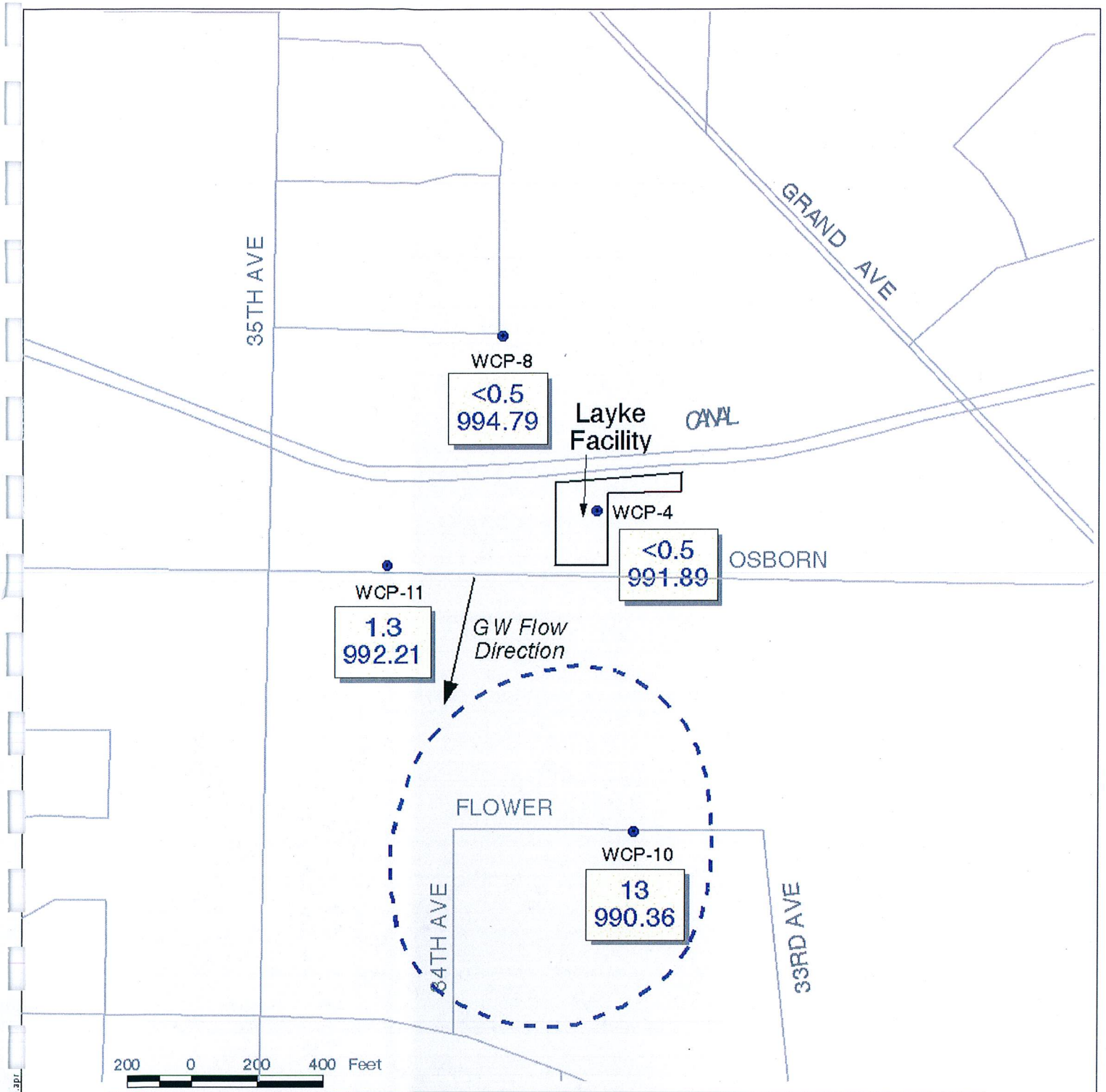

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Figure 5-5

TCE Concentration Contour Map
February 1999

12/2003