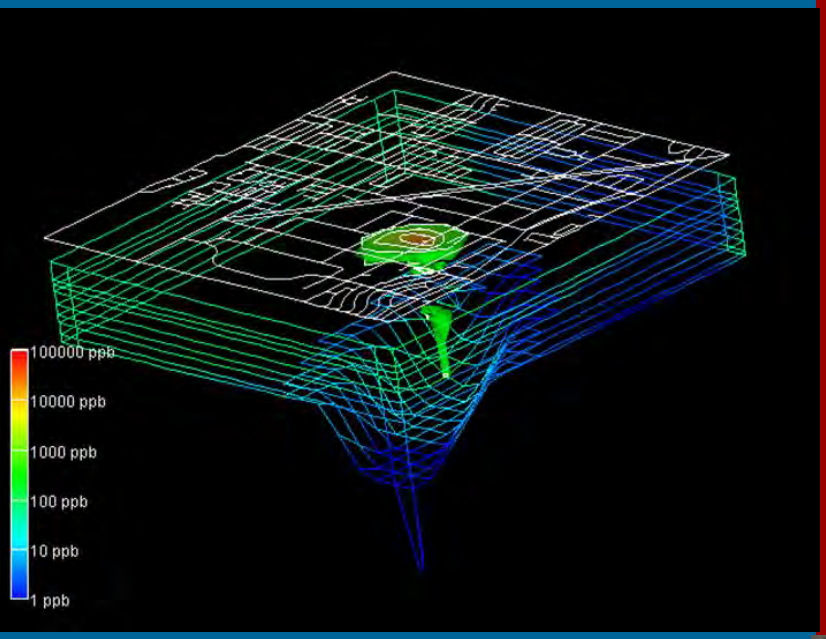
Final Remedial Investigation Report



West Central Phoenix North Plume Site Phoenix, Arizona

Volume I of IV

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EXECUTIVE SUMMARY

LFR Inc. (LFR) has prepared this draft remedial investigation (RI) report for the West Central Phoenix North Plume (WCP North Plume) Water Quality Assurance Revolving Fund (WQARF) site under ADEQ Contract 99-0017 and Task Assignments 99-0051 and 04-0033AA, and prepared this draft RI report to meet the requirements of the Arizona Revised Statutes (A.R.S.) §49-287.03 and Arizona Administrative Code (A.A.C.) R18-16-406.

Four facilities have been identified as likely sources of the groundwater contamination in the WCP North Plume site. The four facilities are as follows: F&B Mfg. Co. (F&B), Pyramid Industries, Inc. (Pyramid) facility, Rinchem facility, and Hill Brothers facility. Field investigation activities at the four facilities in the WCP North Plume site have been conducted since 1984. The RI field activities have included: soil and soil-gas sampling, groundwater monitoring well installations, water level measurements, groundwater monitor well sampling, HydroPunch® groundwater sampling, SimulProbe® soil and groundwater sampling, aquifer testing, geophysical surveys, and limited groundwater modeling.

The F&B Mfg. Co. facility is located at 4316 North 39th Avenue. F&B manufactures metal aircraft and spacecraft parts and performs sheet metal forming, light machining, and assembly. Historical records indicate that F&B began operations at the facility in 1967. A number of solvents have reportedly been used at the F&B facility including tetrachloroethene (PCE), 1,1,1-trichloroethane (TCA), acetone, and toluene. A number of hazardous wastes have reportedly been generated at the F&B facility including spent oil and sludge containing chromic acid and alkaline etching solution. F&B performed degreasing operations in a vapor degreasing tank located above a concrete vault. PCE was used as the degreasing solvent until approximately October 1987. F&B reportedly used TCA as the degreasing solvent thereafter. This degreasing tank (solvent dip tank) was located in the northwest portion of the building. The highest concentrations of PCE in soil and groundwater have been detected near this portion of the building. F&B's hazardous waste storage facility is located near the southwestern corner of the property and is used to store chemicals as well as wastes.

The Pyramid Industries, Inc. facility is located at 4330 North 39th Avenue. Pyramid operated a telephone and television cable riser boxes manufacturing facility from 1977 to 1994. Operations at the facility required the use of acids, caustics, heavy metals, paints, and methylene chloride. The facility property consists of two adjoining parcels. Since 1997, National Environmental Waste, a plastic recycling company, and Intermountain Lumber Company have occupied the southern parcel. Since 1999, the northern parcel has been occupied by M&S Enterprise, who operates a recycling business.

The Rinchem facility is located at 4115 West Turney Avenue. Rinchem operated a chemical warehouse and distribution facility that handled solvents, oils, and fuels. Rinchem also blended custom solvents at this facility. A repackaging area and chemical processing area were located immediately adjacent to the tank farm. Packaged chemicals were stored

in original containers and 55-gallon drums in the warehouse. Bulk chemicals were stored in an aboveground storage tank farm, which contained approximately 30 tanks of various sizes. Rinchem was the only company that operated at the facility from facility construction in 1982 through June 1993. The property is currently occupied by Tarr, Inc. whom operates a chemical warehouse and distribution operation.

The Hill Brothers facility is located at 4450 North 42nd Avenue. The Hill Brothers facility has operated as a chemical distribution facility at this location since 1969. Bulk chemicals were received at the Hill Brothers facility via railroad cars and tanker trucks. Chemicals that include acids, bases, solvents, chlorine, and concrete additives were stored in above ground storage tanks on-site prior to transfer into containers for distribution. Wastewater is treated by neutralizing pH prior to discharge to the COP sewer system. The handling of solvents and repackaging of TCA was discontinued in 1989.

Several contaminants have been detected in soil and groundwater samples collected during field investigations at the four facilities. The primary contaminants of concern are PCE, trichloroethene (TCE), and 1,1-dichloroethene (1,1-DCE). These compounds have been detected in soil samples collected from borings on the facility properties and/or in groundwater samples collected from monitor wells in the WCP North Plume site. Other VOCs including cis-1,2-dichloroethene (cis-1,2-DCE), TCA, vinyl chloride, benzene, toluene, ethylbenzene, and total xylenes have also been detected at concentrations above their respective Arizona residential soil remediation levels (SRLs), groundwater protection levels (GPLs), or Arizona aquifer water quality standards (AWQSs). In addition, metals including arsenic, beryllium, chromium, lead, and nickel have been detected above SRLs and AWQSs at the Pyramid facility.

PCE concentrations detected in the soil beneath the F&B Mfg. Co. facility exceeded the residential SRLs and GPLs. PCE, TCE, and 1,1-DCE have also exceeded their respective AWQSs in groundwater at the facility. The highest concentrations have been detected near the former vapor degreaser. Concentrations of PCE in groundwater at the source area approach the solubility limit for PCE, suggesting the presence of dense non-aqueous phase liquid (DNAPL). Based on the observed groundwater concentrations, DNAPL PCE also appears to be present in saturated zone sediments. The dissolved phase PCE groundwater plume that is associated with the presumed DNAPL PCE source area extends over 1,000 feet downgradient.

VOCs detected on the Pyramid facility have been highest on the south side. PCE has been detected in soil samples at the Pyramid facility above the GPL in the southwestern corner of the facility. PCE, TCE, and 1,1-DCE have been detected in groundwater samples above their respective AWQSs. Concentrations of VOCs have also been detected in shallow soil-gas samples collected along the western boundary of the Pyramid facility and on the neighboring Billboard Poster property. It appears that this contamination is likely associated with an off-site source such as the release at the F&B Mfg. Co. facility to the south. While onsite activities have impacted soil and may have impacted groundwater, the distribution of contaminants suggests a greater influence from the offsite sources.

PCE, TCE, and TCA were detected on the Rinchem facility above their respective GPLs in soil samples in the former repackaging area to a depth of 50 feet bgs. Other VOCs have

been detected to depths of 130 feet bgs but not above GPLs or SRLs. The highest concentrations have been detected in the former repackaging area. Soil-gas samples collected in 2002 confirm the presence of VOCs at depth. Groundwater samples confirm the presence of VOCs, including PCE, TCE, 1,1-DCE, vinyl chloride, cis-1,2-dichloroethene, benzene, and toluene at concentrations exceeding their respective AWQSs. Groundwater samples collected from WCP-21, which is located immediately downgradient from the facility, have consistently had higher concentrations than upgradient wells.

PCE and TCE have been detected in soil-gas and soil samples collected at the Hill Brothers facility. Soil-gas samples collected near the solvent packaging area contained the highest concentrations of PCE and TCE. The highest concentrations of 1,1-DCE and TCA were detected near the maintenance storage and fuel area. TCE, PCE, and 1,1-DCE have also been detected in groundwater samples collected using a Hydropunch® in the solvent packaging area and in the chemical mixing area. In addition, groundwater samples collected from monitor wells around the facility contain PCE, TCE, and 1,1-DCE contamination above AWQSs.

LFR, on behalf of ADEQ, implemented an early response action (ERA) consisting of soil vapor extraction (SVE) in August 2001 to remediate the PCE contamination beneath the source area. In addition, LFR removed approximately 210 cubic yards of soil beneath the source area during two excavations in July 2000 and September 2001. As of April 2006, 40,857 pounds of PCE have been removed from the source area.

Land uses for the WCP North Plume site area are expected to remain predominantly industrial or light industrial. The zoning pattern in the area has been long established and there are no foreseeable changes for the future. Current and future groundwater uses within the WCP North Plume site area include: the possible need for additional City of Phoenix drinking water wells to augment production in the WCP area sometime in the future and a potential water treatment plant to be built by SRP on the Grand Canal sometime in the future which would change the use of the groundwater from irrigation to drinking water.

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
ADWR	Arizona Department of Water Resources
A.R.S.	Arizona Revised Statutes
AST	aboveground storage tank
AWQS	Aquifer Water Quality Standard
Basin & Range	Basin & Range Hydrogeologists, Inc.
bgs	below ground surface
Billboard Poster	Billboard Poster Company, Inc.
BTEX	benzene, toluene, ethylbenzene, and total xylenes
cis-1,2-DCE	cis-1,2-dichloroethylene or cis-1,2-dichloroethene
COP	City of Phoenix
CPT	cone penetration testing
1,1-DCA	1,1-dichloroethane
1,1-DCE	1-dichloroethene
DNAPL	dense nonaqueous phase liquid
DO	dissolved oxygen
Earth Tech	Earth Technology Corporation
EPA	U.S. Environmental Protection Agency
ERA	Early Response Action
ESA	Environmental Site Assessment
FASP	Field Analytical Services Program
F&B	F&B Mfg. Co.
FID	flame ionization detector
FSP	Field Sampling Plan
ft/day	feet per day
ft/ft	foot per foot
GAC	granular activated carbon
Geomatrix	Geomatrix Associates, Inc.
gpd/ft^2	gallons per day per square foot
GPL	Groundwater Protection Limit
gpm	gallons per minute
GSC	Glenrosa Service Center
HBGL	Health-Based Guidance Level
Hill Brothers	Hill Brothers Chemical Company
IDW	investigation-derived waste
K_{OC}	organic carbon partition coefficient
LAU	Lower Alluvial Unit
lbs/day	pounds per day
LFR	LFR Levine·Fricke
LNAPL	light nonaqueous-phase liquid

MAU	Middle Alluvial Unit
MCL	maximum contaminant level
MDL	method detection limit
MEK	methyl ethyl ketone
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
ml	milliliters
MRL	method reporting limit
msl	mean sea level
MTBE	methyl tertiary-butyl ether
PA	Preliminary Assessment
PCE	tetrachloroethylene or tetrachloroethene
ppm	parts per million
PSC	Preliminary Site Characterization
psi	pounds per square inch
PVC	polyvinyl chloride
Pyramid	Pyramid Industries, Inc.
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
redox	oxidation-reduction
RI	Remedial Investigation
Rinchem	Rinchem Company
RSRL	Residential Soil Remediation Level
scfm	standard cubic feet per minute
SI	Site Inspection
SVM	soil-vapor monitoring
SRL	Soil Remediation Level
SRP	Salt River Project
SVE	soil-vapor extraction
SVETS	soil-vapor extraction and treatment system
TCA	1,1,1-trichloroethane
TCE	trichloroethylene or trichloroethene
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
trans-1,2-DCE	trans-1,2-dichloroethylene or trans-1,2-dichloroethene
UAU	Upper Alluvial Unit
USBR	United States Bureau of Reclamation
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound
w.c.	water column
WCP	West Central Phoenix
Weston	Weston Solutions, Inc.
WQARF	Water Quality Assurance Revolving Fund
WTI	Western Technologies, Inc.

1.0 WEST CENTRAL PHOENIX NORTH PLUME CONCEPTUAL SITE MODEL

LFR Inc. (LFR) has conducted a remedial investigation (RI) of the West Central Phoenix North Plume (WCP North Plume) Water Quality Assurance Revolving Fund (WQARF) site under Arizona Department of Environmental Quality (ADEQ) Contract 99-0017 and Task Assignments 99-0051 and 04-0033 AA, and prepared this RI report to meet the requirements of the Arizona Revised Statutes (A.R.S.) §49-287.03 and Arizona Administrative Code (A.A.C.) R18-16-406. The objective of this RI was to collect sufficient information to determine the appropriate cleanup actions needed at the site. The information collected during the RI includes the physical characteristics of the site; the nature, extent, and sources of the contamination; and the actual and potential impacts of contaminants to public health, welfare, and the environment. The RI also identifies present and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be impacted by the contamination. This report summarizes the activities completed as part of the RI, including drilling, soil and soil-gas sampling, well installation, groundwater elevation and water quality monitoring, and aquifer testing within the WCP North Plume site.

1.1 Introduction

In 1982, the volatile organic compound (VOC), trichloroethene (TCE), was detected in several City of Phoenix (COP) municipal wells located in west central Phoenix. Subsequent groundwater sampling confirmed the presence of TCE at concentrations above the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL). ADEQ subsequently designated the area of groundwater contamination as the WCP WQARF site and recommended further study under the State Superfund (WQARF) program. The WCP WQARF area was placed in the WQARF Priority List in 1987. Based on data obtained during the Phase I investigation, the WQARF area boundaries were redefined in 1989 to encompass those areas where groundwater quality data indicated halogenated VOC contamination. The WCP WQARF area was bounded by 35th, 51st, and 59th Avenues on the west; Encanto Boulevard and McDowell Road on the south; Black Canyon Freeway, 27th Avenue, and Grand Avenues on the east; and Campbell Avenue and Indian School Road on the north (Figure 1).

The WCP WQARF investigation included the compilation of geological, hydrological, and land use information about the area and the development of a list of businesses in the area that potentially used, stored, or disposed of hazardous substances. Facilities on the list were evaluated based on the results of detailed literature searches, groundwater sampling investigations, limited field reconnaissance, and responses to questionnaires. Some facilities in the WCP area conducted site characterizations that included groundwater sampling and evaluation. ADEQ also installed monitoring wells and performed area-wide groundwater contamination and groundwater flow evaluations in the WCP area. ADEQ used the data from these investigations to identify VOC contaminant plume areas based on identified source areas and site-specific groundwater data.

Currently, the following five WQARF sites within the WCP area have been established pursuant to A.R.S. §49-287.01: West Osborn Complex, West Grand Avenue, East Grand Avenue, North Canal, and North Plume.

The WCP North Plume site is bounded approximately by Hazelwood Street to the north, 38th Avenue to the east, Indian School Road to the south, and 43rd Avenue to the west (Figure 2). The WCP North Plume Site consists of four facilities: F&B Mfg. Co. (F&B) facility, Pyramid Industries, Inc. facility (Pyramid), Rinchem facility (Rinchem), and Hill Brothers facility (Hill Brothers) as shown on Figure 3.

1.2 WCP North Plume Area Facility Descriptions

1.2.1 F&B Mfg. Co. Facility

The F&B facility is located at 4316 North 39th Avenue in Phoenix, Arizona (Figure 4). F&B manufactures metal aircraft and spacecraft parts and performs sheet metal forming, light machining, and assembly at the facility. F&B utilizes solvents, hydraulic oils, and chromic acid in its operations. The property on which the F&B facility stands was cultivated land until F&B began leasing the location in 1967. By March 1967, F&B had completed construction of its facility and begun operations. The following discussion of F&B's operations was obtained from "Results of Data Collection Activities for F&B Mfg. Co. Environmental Investigation," prepared by Basin & Range Hydrogeologists, Inc. (Basin & Range, 1991d).

Fabrication processes include metal parts forming, cutting, grinding, and welding. F&B Mfg. Co.'s finishing processes involve deburring, degreasing, and heat corrosion treating. Metal parts forming is accomplished using hydraulically operated presses and punches that require the use of hydraulic oil. Spent hydraulic oil is reportedly disposed of off site. Water-based cutting fluids are reportedly used with grinding and cutting machinery to protect the equipment and facilitate the grinding process. Following removal of excess water, waste cutting fluids are reportedly disposed of as hazardous waste. In some of F&B's machinery, an ethylene glycol mixture or water is reportedly used as a coolant.

Grinding and deburring, degreasing, heat treating, and corrosion treating (alodining) are performed during finishing operations. Deburring tumblers contain abrasive pellets and a mixture of water, soap, and a lubricant containing alcohol. That liquid mixture is reportedly discharged to the sewer.

Degreasing operations were performed in a vapor degreasing tank located above a concrete vault. F&B used PCE and TCA as its degreasing solvent; however, PCE was reportedly used until approximately October 1987. Vapors were produced when the TCA was heated and parts were lowered into the tank (above the liquid) for vapor degreasing. Some of the TCA was reportedly reclaimed, and the sludge that accumulated on the bottom of the tank was reportedly disposed of as hazardous waste. However, much of the TCA was lost to evaporation. F&B reportedly used approximately 500 gallons of TCA per month.

Metal parts are heat treated in a vacuum furnace containing argon gas. Following the heat treatment process, parts are cooled in water quench tanks.

Alodining or corrosion treating involves submerging parts in a series of nine 550-gallon (approximate capacity) tanks containing dilute chromic acid, alkaline soap, alkaline etching solution, and rinse water. Spent solution from the tanks is pumped to F&B's pretreatment facility where it is treated (by chrome destruction, neutralization, pH adjustment) prior to discharging to the sewer.

Before construction of the on-site pretreatment facility, spent chromic acid was reportedly pumped into a 1,000-gallon tank where it was neutralized and metals were precipitated out of the liquid. Sludge generated during this process was reportedly contained in 55-gallon drums and disposed of as a hazardous waste. Following treatment, samples of effluent were reportedly analyzed for chromium and the effluent was discharged to the sewer system.

Parts are inspected through exposure to a penetrant (known as Zyglo) which is followed by observation under ultraviolet light. Spent penetrant is reportedly discharged to the sewer.

Construction of F&B's secured hazardous waste storage facility was completed during July 1990. That storage facility is located near the southwestern corner of the property and is used to store chemicals as well as wastes. The following types of hazardous waste were stored in the hazardous waste storage facility:

- F001-spent oil/toluene/TCA
- F002-spent cutting oil, oil/TCA
- F003-spent cutting oil, oil/TCA
- F019-sludge from pre-treatment plant
- D001-spent Acetone

Acetone was reportedly stored inside the main building. TCA, Draw Clean 366 L (38 percent TCA), mineral spirits, and Chem-tool (38 percent TCA) were stored in the hazardous waste storage facility.

An aboveground storage tank (AST) containing liquid argon is located near the southwestern corner of the parking lot outside of the building. Liquid argon is reportedly used in the vacuum furnace and for welding activities.

A number of solvents have reportedly been used at the F&B Mfg. Co. facility, including PCE, TCA, acetone, and toluene. A number of hazardous wastes have reportedly been generated at the F&B facility, including spent oil and sludge containing chromic acid and alkaline etching solution.

F&B performed degreasing operations in a vapor degreasing tank located above a concrete vault. PCE was used as the degreasing solvent until approximately October

1987. F&B reportedly used TCA as the degreasing solvent thereafter until the late 1990s. This degreasing tank (solvent dip tank) was located in the northwestern portion of the building, east of monitoring wells F&B-1 and F&B-2. The highest concentrations of PCE in soil and groundwater have been detected near this portion of the building. F&B's hazardous waste storage facility is located near the southwestern corner of the property and is used to store chemicals as well as wastes.

1.2.2 Pyramid Facility

The Pyramid facility is located at 4330 North 39th Avenue (Figure 5). Pyramid operated a telephone and television cable riser box manufacturing facility from 1977 to 1994. Operations at the facility required the use of acids, caustics, heavy metals, paints, and methylene chloride. The facility property consists of two adjoining parcels. Since 1997, National Environmental Waste, a plastic recycling company, and Intermountain Lumber Company have occupied the southern parcel. Since 1999, the northern parcel has been occupied by M&S Enterprise, a scrap metal recycler.

The manufacturing process at the Pyramid facility was initiated with the cutting and forming of galvanized metal in presses. The metal parts were then hung on a conveyor, passed over five chemical tanks, and then sprayed with chemicals. The first tank contained a caustic wash (primarily sodium hydroxide). The second tank contained a water rinse. The third tank contained a zinc-phosphate solution. The fourth tank was a water rinse. The fifth tank was a chromic acid rinse (ADEQ, 1990). The solutions were piped to a wastewater pre-treatment system and then discharged into the COP sanitary sewer in accordance with Pyramid's Industrial Wastewater Discharge Permit. The metal parts were then dried and painted. Locations of historical operations are shown in Figure 5.

The wastewater pre-treatment process removed metals from solution by precipitation. The resulting process sludge reportedly contained zinc, lead, and chromium and was stored in containers until removal from the facility by Disposal Control Services, Inc. (ADEQ, 1990).

Pyramid also reportedly operated three spray-painting booths at the facility. Paint hooks were reportedly cleaned by dipping them into a Sno-Flake Cold Stripper, which is 80 to 90 percent methylene chloride. Most of the methylene chloride reportedly was lost to evaporation, and the remaining spent solvent was transported off site for disposal by Disposal Control Services, Inc. Methylene chloride is the only chlorinated solvent reported by Pyramid to have been used at the facility (ADEQ, 1990).

1.2.3 Rinchem Facility

Rinchem is located at 4115 West Turney Avenue. Rinchem operated a chemical warehouse and distribution facility that handled solvents, oils, and fuels (Figure 6). Rinchem also blended custom solvents at this facility. Rinchem was the only company that operated at the facility from facility construction in 1982 through June 1993. The

property is currently occupied by Tarr, Inc., which operates a chemical warehouse and distribution operation.

Chemicals were stored in the warehouse and the bulk storage area of the facility depending on compatibility. Packaged chemicals were stored in original containers and 55-gallon drums in the warehouse. Bulk chemicals were stored in an AST farm, which contained approximately 30 tanks of various sizes. The tank farm was located on the southern side of the property. A pumping station for bulk rail shipments of chemicals, including TCE, PCE, TCA, methylene chloride, acetone, methyl ethyl ketone (MEK), toluene, chlorinated solvent blend, and a methylene chloride/TCA blend, was located in the southeastern corner of the property, adjacent to an aboveground pipeline and dry well.

Chemicals stored in the tank farm were either delivered by truck or in bulk by railroad tank car. Shipments delivered by truck were delivered to the south end of the tank farm for transfer or storage. Chemicals delivered by rail car were pumped from the southeastern corner of the property to the tank farm via the pipeline along the southern boundary of the property.

Custom mixes were created in the repackaging and blending area south of the tank farm. The repackaging and blending area was concrete floored and sloped to a concrete-lined sump located in the northern portion of the area. Approximately 20,000 to 25,000 gallons of solvents were reportedly packaged in this area each week (Four Corners, 1994). Following packaging, solvents were stored in the repackaging and blending area while awaiting shipment.

1.2.4 Hill Brothers Facility

The Hill Brothers facility is located at 4450 North 42nd Avenue (Figure 7). Hill Brothers has operated a chemical distribution facility at this location since 1969. Prior to 1969, the location was developed as agricultural land.

Bulk chemicals are received at the Hill Brothers facility via railroad cars and tanker trucks. Chemicals that include acids, bases, alcohols, acetone, methylene chloride, PCE, toluene, TCA, xylene, chlorine, and concrete additives have been or currently are stored in ASTs on site prior to transfer into containers for distribution. Wastewater is treated by neutralizing pH prior to discharge to the COP sewer system. The handling and repackaging of solvents was discontinued in 1989.

1.3 Physical Setting

1.3.1 Land Use

The WCP North Plume site lies within a heavily industrialized area of west central Phoenix, and is zoned as general industrial by the COP Zoning Department. In general, commercial properties are concentrated near the intersections of major streets (43rd

Avenue, 39th Avenue, Indian School Road, and Grand Avenue). Industrial properties occupy most of the land enclosed by these thoroughfares. Residential areas are located north of Grand Avenue. Alhambra High School is located approximately 0.25 mile northeast of the WCP North Plume site.

1.3.2 Hydrogeologic Setting

The WCP North Plume site is located within the Western Salt River Valley Sub-basin of the Basin and Range physiographic province. The Western Salt River Valley Sub-basin is an alluvial-filled basin of sedimentary deposits ranging in thickness from less than 100 feet at the margins of the basin to over 10,000 feet in the central areas of the basin (Corkhill et al., 1993). The Sub-basin is mostly surrounded by mountains composed of Tertiary and older igneous and metamorphic rocks and minor amounts of Tertiary consolidated sedimentary rocks. The crystalline and consolidated sedimentary rocks also form the basement complex that lies beneath Quaternary and late-Tertiary unconsolidated or semiconsolidated basin-fill alluvial sediments.

Several classification systems have been used to describe the alluvial fill underlying the Western Salt River Valley. In 1976, the U.S. Bureau of Reclamation (USBR) developed the widely recognized classification system that divided the alluvial fill into the upper alluvial unit (UAU), middle alluvial unit (MAU), and lower alluvial unit (LAU). The MAU was defined by the predominance of fine-grained materials. The LAU was described as a conglomerate. The UAU was defined as a mixture of coarse and fine-grained materials. This led to some confusion as to where the contact between the UAU and MAU was located.

In 1989, the U.S. Geological Survey (USGS) published its regional basin study of the Western Salt River Valley that included a similar classification for the alluvial fill. Differences between the two classification systems included the division of the LAU into an Upper and Lower LAU, where the Upper LAU was the equivalent of the USBR's MAU. In addition, the USGS' MAU classification incorporated the lower fine-grained interval of the USBR's UAU. The USGS classification was said to correlate with previous classifications by the USGS in the Eastern Salt River Valley. That classification system defined the UAU as a coarse-grained and mostly de-watered unit, the MAU as a predominately fine-grained unit, and the LAU as a weakly to moderately cemented sand and gravel unit. Underlying the LAU were the conglomeratic Tertiary Red Unit and Precambrian crystalline rocks.

Groundwater occurs primarily in the basin-fill alluvium. Historically, accumulation of groundwater resulted as mountain-front recharge near basin margins or as infiltration in ephemeral streams and washes. More recently, artificial recharge has been introduced as deep percolation of excess irrigation, sewage effluent, and from man-made surface-water features. Much of the developed portion of the Salt River Valley was historically used for crop irrigation. In these areas, even after irrigation ceases and the land is put to different uses, residual water saturation in the vadose zone remains relatively high compared to native undeveloped areas.

The natural groundwater gradient in the WCP North Plume site vicinity is to the west-southwest. Regional groundwater flow is greatly influenced by groundwater pumping. The introduction of the turbine pump in the late 1940s enabled groundwater to be extracted from greater depths and over expanded applications. Increased groundwater usage resulted in pumping centers that altered the natural gradient. Seasonal variations in groundwater demand and pumping also resulted in transient groundwater conditions. More recently, reduced dependency on groundwater and increased surface-water utilization has resulted in rebounding of groundwater elevations in some areas.

1.3.3 Topography

The elevation of the WCP North Plume site ranges between approximately 1,117 feet above mean sea level (msl) to approximately 1,133 feet msl. The regional ground surface slopes to the south with a gradient from approximately 20 feet per mile.

1.3.4 Climate

The West Salt River Valley Sub-basin lies in the northern Sonoran desert and is characterized by hot summers and cool winters. In July, the average maximum and minimum daily temperatures are 105 degrees Fahrenheit (°F) and 80 °F. In December, the average maximum and minimum daily temperatures are 65 °F and 39 °F (Sellers and Hill, 1974). Average rainfall on the valley floor is approximately 7.5 inches per year. The average annual pan evaporation rate measured in Tempe, Arizona, for the period from 1969 through 1973 was 72 inches (Sellers and Hill, 1974). Potential evapotranspiration may equal pan evaporation, with both averaging approximately 10 times the average annual rainfall amount (Brown and Pool, 1989).

1.3.5 Surface Water

Surface-water runoff flow is primarily controlled by the COP storm sewer system. The valley is drained by several ephemeral streams and washes that generally flow only during large storm events. Several man-made surface-water features exist, including lakes and canals. These features can serve as areas of groundwater recharge particularly where they are unlined. The Grand Canal is located approximately 1 mile to the south. Historically, the canal has influenced groundwater flow in the region. A concrete liner was placed in the canal in January 1998 (Weston, 1998b). The canal was originally constructed above grade to prevent surface-water runoff from entering the canal. Prior to emplacement of the concrete liner, considerable water percolated through the bottom of the canal into the vadose zone. It was generally believed that this caused a groundwater mound along the axis of the canal creating horizontal gradients to the north and south of the canal axis. However, since the emplacement of the concrete liner, the canal's influence on local groundwater flow has diminished.

1.4 Site Contaminants

The primary VOC contaminants of concern in the groundwater in the WCP North Plume site include the chlorinated solvents PCE, TCE, and 1,1-DCE. Other VOC contaminants that have been detected include vinyl chloride, TCA, cis-1,2-dichloroethene (cis-1,2-DCE), benzene, toluene, ethylbenzene, and xylenes. In addition, metals including arsenic, beryllium, chromium, lead, and nickel have also been detected.

1.5 Contaminant Sources

1.5.1 WCP North Plume Facilities

F&B Mfg. Co. Facility

PCE was the primary solvent used in degreasing operations and was used at the site until approximately 1987. The degreasing tank (solvent dip tank) was located in the northwestern portion of the building, east of monitoring wells F&B-1 and F&B-2 (Figure 4). The highest concentrations of PCE in soil and groundwater have been detected near this portion of the building.

Pyramid Facility

Potential source areas have been identified during past investigations at the Pyramid facility and include the following areas (Figure 5).

West Area

The identified areas of concern in this area include the hook cleaning area, paint room, and wastewater treatment system.

Southeast Area

A storm drain is present in this area.

Main Building Area

Areas of concern in the main building included the tool room and sewer connection.

Former UST Area

Former gasoline and diesel USTs were located in this area.

Southwestern Corner/Dry Well Area

Review of historical aerial photographs indicated the historical storage of drums in this area (Weston, 2002b). A COP Fire Department and Arizona Department of Health Services (ADHS) Bureau of Waste Control site inspection conducted in 1984 reported the facility's estimated drum inventory to include 141 full drums, 252 empty drums, and 8 leaking drums (Weston, 2002). Spills and poor hazardous waste handling

practices have also been documented in this area (ADEQ, 1993). A dry well was also present in this area.

Northern Area

A concrete slab in this area was used in the past for a chemical storage area.

Rinchem Facility

Potential sources at the Rinchem facility include the tank farm and repackaging area (Figure 6). Chemicals, including petroleum and naphtha-based solvents (Rinsolve), chlorinated solvents, alcohols, and benzene, toluene, ethylbenzene, and total xylenes (BTEX), were stored in a tank farm located on the western side of the property. A complete list of chemicals can be found in ADEQ's Site Inspection Report (ADEQ, 1992) and in Table 2-1 of Four Corners' Preliminary Site Characterization report (Appendix A; Four Corners, 1994). The repackaging area and chemical processing area were located immediately adjacent to the tank farm. Three sumps are located on the property: two are located in the tank farm and repackaging area and the third is along the southern boundary. Results of a passive soil-gas survey conducted by Weston in March and April 2002 identified elevated concentrations of VOCs including PCE, TCE, and 1,1-DCE at these locations (Weston, 2002a).

Hill Brothers Facility

Areas of concern include the former solvent packing and storage area on the south side of the facility, the maintenance storage and fuel island area on the southeastern corner of the property, the brine tanks and maintenance shade canopy area on the western side, the retention basin on the northern side, and the drum loading docks just south of the warehouse building (Figure 7).

1.5.2 Other Properties

Glenrosa Service Center

The COP Glenrosa Service Center (GSC) is located at 4019 West Glenrosa Avenue. A fuel leak was discovered in May 1986 during the process of upgrading the fueling facilities. An inventory deficit of approximately 420,000 gallons of unleaded gasoline was related to an underground storage tank (UST) system release. A groundwater remediation program was implemented at the facility in 1986.

Interim remedial measures at the GSC facility include pumping floating light non-aqueous phase liquids (LNAPL), pumping groundwater to prevent the further spread of floating LNAPL and dissolved hydrocarbons, and soil-vapor extraction to remove gasoline hydrocarbons from soil above the water table. The resulting interim remediation system included 31 monitoring wells, six groundwater recovery wells, two air strippers, three barrier wells, five soil-vapor extraction wells, four air sparge wells, one vadose-zone observation well, one dual completion sparge/monitoring well, and

one thermal oxidizer. Through July 2002, over 153,000 gallons of gasoline hydrocarbons were removed from the subsurface.

In 1992, analytical testing of groundwater samples collected from 12 of the 20 monitoring wells sampled at the GSC indicated the presence of VOCs. Seven monitoring well locations (GSC-17, GSC-18, GSC-21, GSC-22, GSC-25, and GSC-GTD) with detectable VOCs in the groundwater occur along the eastern and western portions of the site (Figure 3). The VOCs detected in these wells include TCE, 1,1-DCE, and PCE. In September 2005, the maximum detected concentrations of TCE, 1,1-DCE, and PCE were 216 μg/l in GSC-21, 377 μg/l in GSC-22, and 11,600 μg/l in GSC-21, respectively (LFR, 2006).

In 1992, in the central portion of the GSC, 1,2-dichloroethane (1,2-DCA) and TCA were detected at maximum concentrations of 119 μg/l and 10.6 μg/l, respectively. In 1997, TCE was detected at a maximum concentration of 11 μg/l in one centrally located well, MW-28 (Fluor Daniel, 1998).

In 2002, the COP prepared a Revised Corrective Action Plan for the GSC that included an air sparging barrier system, soil-vapor extraction, and an on-site vacuum-enhanced liquid petroleum hydrocarbon recovery system. Monitored natural attenuation was selected for off-site petroleum hydrocarbons (IT, 2002).

Billboard Poster

The Billboard Poster facility (Billboard Poster) is located at 3940 West Montecito Avenue. Billboard Poster is a printing company that specializes in billboards and other advertising signs. The Billboard Poster building was constructed sometime between 1969 and 1971 (Weston, 2002a). Prior to Billboard Poster, the property was occupied by several commercial businesses, including C-F Networks, Tyco Filters, Inc., Tyco Crystal Products, Quartztec, and McCreary's Western Wear and Pew, Inc. Billboard Poster has occupied the property since 1997.

In January 2001, a soil-gas survey conducted by Weston on the eastern side of the site showed elevated concentrations of VOCs, including PCE, TCE, and 1,1-DCE (Weston, 2002a).

Property at 4245 N. 40th Avenue

This property is a vacant lot located at the southeastern corner of 40th Avenue and Montecito Drive in Phoenix, Arizona, occupying approximately 33,000 square feet. A Phase I Environmental Site Assessment (ESA) was conducted for the property by LFR in 2001. According to records at Phoenix City Hall, the vacant lot and the property immediately to the south belong to Quality Choice Foods. The vacant lot is located immediately west of the F&B Mfg. Co. facility. Based on the results of LFR's assessment, groundwater beneath the vacant lot is likely contaminated with VOCs. Soil along the vacant lot's eastern boundary may also be impacted by VOCs, based on the proximity of known VOC contamination beneath the F&B Mfg. Co. facility. However,

no specific past or present source of hazardous materials releases was identified directly on the vacant lot.

1.6 Migration Pathways

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

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

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

Groundwater Pathway

Domestic consumption of groundwater is a pathway of concern when humans use private wells that tap into the underlying groundwater close to the site. Exposure will occur as a result of ingestion, inhalation, and direct dermal contact with chemicals during domestic activities. This pathway is considered to be complete for the site since municipal water wells may tap into aquifers that may have been affected by VOCs. However, municipal water wells that have been affected by the VOC plume have been shut down and drinking water for the area comes from a different source.

Air Pathway

Inhalation can occur from exposure to fugitive dusts from surficial soils and from exposure to contaminated air due to volatilization of the contaminants of concern. Inhalation of VOCs in air may occur as a result of chemicals volatilizing from the underlying unsaturated soil or aquifer. Exposure by the inhalation pathway would be negligible outdoors, but may be significant indoors where vapors cannot readily disperse (e.g., in on-site buildings).

Soil Contact Pathway

Direct soil contact is a pathway of concern in areas where contaminated soils are exposed to human contact. However, there appears to be little chance for direct human exposure to contaminated soils as the majority of the facilities are paved or covered by permanent structures. Sampling at the facilities has indicated that contaminated soils occur under asphalt parking lots or asphalt-surface storage areas, or under concrete floors of buildings.

1.7 Environmental Receptor Indication and Discussion

On-site human receptors are adults working in and around the facilities. Potential exposure may occur as a result of the workers coming into contact with chemical vapors that are released from subsurface soils into on-site buildings. The potential health risk associated with exposure to VOC vapors released from soil has been evaluated by the ADHS (ADHS, 1992). Because the facilities are largely covered with buildings and paved parking or storage areas, exposure to VOCs is considered minimal.

The WCP North Plume site is in a commercial and industrial area. The closest residential development is located approximately 0.2 mile northeast of the WCP North Plume site's northern boundary. Residents and industry in the area receive their drinking water from the municipal water supply.

There are no ecological receptors in the WCP North Plume site. Vegetation is limited to decorative grass, bushes, and trees surrounding buildings. No evidence of distressed vegetation has been observed on any of the facilities.

2.0 REMEDIAL INVESTIGATION ACTIVITIES

Field investigation activities for the WCP North Plume site have been conducted between 1984 and 2005. Field activities have included soil and soil-gas sampling, groundwater monitoring well installations, groundwater elevation measurements, groundwater sampling, Hydropunch® and SimulProbe® sampling, aquifer testing, and groundwater modeling. As required under A.R.S. §49-287.03(E), data have been collected to adequately characterize the site for the purpose of developing and evaluating effective remediation alternatives. The data collected during the field investigations presented in this section were used to develop an understanding of the site hydrogeology (Section 4.0), nature and extent of contamination (Section 6.0), and contaminant fate and transport (Section 7.0).

Several parties have conducted the field investigations described in the following sections. These include, EPA, Earth Technology Corporation ("Earth Tech"), Western Technologies, Inc. (WTI), EMCON, LAW/Crandall, SCS Engineers, Four Corners, Basin & Range, Weston, and LFR.

2.1 Summary of Previous Investigations

2.1.1 F&B Mfg. Co. Facility

The following summation of previous environmental investigations conducted at the F&B facility was obtained from information included in "Results of F&B Mfg. Co.'s Remedial Investigation/Feasibility Study Groundwater Investigation," prepared by Basin & Range (Basin & Range, 1994a); and "Phase II Remedial Investigation/Feasibility Study Workplan F&B Mfg. Co. 4316 North 39th Avenue, Phoenix, Arizona," prepared by Roy F. Weston, Inc. (Weston, 1998c). The locations of potential source areas and other areas of interest are shown on Figure 4.

ADEQ PA/SI (1989)

The first environmental investigations of the F&B facility began in 1989 when the ADEQ conducted a preliminary assessment/site investigation (PA/SI). Research of available records maintained by both F&B and regulatory agencies concerning the use of hazardous materials and waste management practices prompted the ADEQ to collect preliminary vadose-zone data and conduct groundwater sampling of nearby, existing monitoring wells (Tables 1 and 2; Figure 8). Results obtained from these investigations indicated that chlorinated solvents likely emanating from the F&B facility were present in underlying soils and possibly in downgradient groundwater.

Basin & Range's Investigations (1990-1994)

As a result of the PA/SI, F&B conducted an investigation consisting of intrusive soil-gas and soil sampling directly beneath the F&B Mfg. Co. facility (Figure 9). Between 1990 and 1992, a total of approximately 36 soil-gas samples were collected, utilizing

vapor probes driven to depths from 0 to 10 feet bgs. Approximately 80 soil samples were collected utilizing both a hand auger and drill rig. Depths ranged from one foot below ground surface (bgs) to 100 feet bgs.

The soil sampling at the site indicated that PCE had leaked from a degreaser into the soil under the building (Tables 3, 4, and 5). A soil sample collected at approximately 5 feet below the degreaser contained PCE concentrations of 5,400 milligrams per kilogram (mg/kg). Concentrations of PCE found beneath the vapor degreaser from samples at depth ranged from 0.17 mg/kg to 710 mg/kg, which are above the Arizona Soil Remediation Levels (residential SRLs) and Groundwater Protection Limits (GPLs). Analytical results for groundwater samples collected from monitoring wells at the site have indicated that groundwater beneath the degreaser contained high concentrations of PCE up to 150,000 μg/l (Table 6). Other contaminants, such as TCE and TCA, were also detected in groundwater samples, but at significantly lower concentrations (less than 8 μg/l).

In September 1992, Basin & Range (on behalf of F&B) completed the installation of one Westbay MP System™ (Westbay) monitoring well nest immediately west of F&B's building (monitoring well F&B-1). The Westbay™ monitoring well contains a series of sampling ports that are separated by inflatable packers and bentonite seals. Each port has its own screen interval, allowing depth-specific groundwater samples to be collected. Five depth-specific ports were completed between depths of approximately 105 to 215 feet bgs. Analytical results collected from the well in October 1992 indicated the presence of PCE in each of the five zones above the Aquifer Water Quality Standards (AWQS; Table 6). The shallow zone at 105 feet bgs had the highest concentration (87,000 µg/l) and the deepest zone at 210 feet bgs had a concentration of 890 µg/l. Based on these data, F&B installed another Westbay™ monitoring well 10 feet north of the original in April 1993 (monitoring well F&B-2). F&B-2 was designed with 11 sampling ports at greater depths (230 to 490 feet bgs) to delineate the vertical extent of PCE contamination. Initial laboratory analysis of samples from each of these ports indicated the presence of PCE in concentrations ranging from 52 µg/l to 880 µg/l. The highest concentration in monitoring well F&B-2 was obtained from a depth of approximately 430 feet bgs.

In September 1993, Basin & Range completed the installation of a third Westbay™ monitoring well nest (monitoring well F&B-3) in the southeastern corner of F&B parking lot; and in January 1994, F&B completed the installation of a fourth Westbay™ monitoring well nest (monitoring well F&B-4) directly east of the F&B facility in the COP right-of-way along 39th Avenue. Analytical results from F&B-3 and F&B-4 indicated the presence of elevated PCE concentrations (ranging from 8.1 µg/l to 8,200 µg/l) above the AWQS, albeit lower than the concentrations from F&B-1 and F&B-2 (Table 6). Concentrations were generally higher in F&B-4 than they were in F&B-3. Concentrations from both F&B-3 and F&B-4 were highest in the shallow ports in each well (at 109 feet bgs); however, the only sample that yielded non-detect results was collected from the sampling port in F&B-3 at 209 feet bgs.

Basin & Range conducted falling-head aquifer tests on the Westbay™ wells between April 1993 and February 1994 (Basin & Range, 1994a). Hydraulic conductivities were calculated using an analytical solution developed by Hvorslev (1951; in Fetter [1994]). The falling-head tests were conducted by injecting a slug of potable water into discrete Westbay™ test zones. The results of the testing are shown in Table 7. Calculated hydraulic conductivities in shallow MAU ports (105 to 115 feet bgs, 130 to 140 feet bgs, and 155 to 165 feet bgs, respectively) in F&B-1, F&B-3, and F&B-4 ranged from 3.57 gallons per day per square foot (gpd/ft^2) to 24.17 gpd/ft^2. Calculated hydraulic conductivities in ports screened between 255 and 265 feet bgs ranged from 92.09 gpd/ft^2 in F&B-2 to 228.20 gpd/ft^2 in F&B-4. Calculated hydraulic conductivities in the LAU ports ranged from 2.19 gpd/ft^2 in F&B-2 at 405 to 415 feet bgs to 143.28 gpd/ft^2 in F&B-4 at 480 to 490 feet bgs.

2.1.2 Pyramid Facility

Environmental investigations that were conducted at the Pyramid site from 1995 to 1998 indicated the presence of several chlorinated hydrocarbons and heavy metals at concentrations that exceeded their respective AWQSs, residential SRLs, and GPLs. Information regarding the investigations conducted at the Pyramid facility is included in the "Site Characterization Report, Pyramid Industries Facility, WCP North Plume WQARF Registry Site, 4330 North 39th Avenue, Phoenix, Arizona," prepared by Weston (Weston, 2002b). The locations of potential source areas and other areas of interest are shown on Figure 5.

WTI Wastewater Treatment Area Investigation (1984)

WTI conducted investigations in the wastewater treatment area in June 1984. Soil samples were collected from four borings drilled near the wastewater treatment system pit to evaluate the sludge and soil for hazardous waste characteristics. A solvent scan for specific compounds was conducted on the soil samples. The compounds analyzed for include methylene chloride, MEK, xylene, cellosolve, butyl cellosolve, cellosolve acetate, n-butyl acetate, n-butanol, and isopropanol. In addition, the samples were also analyzed for flash point, pH, and extraction procedure toxicity of trace metals. None of the samples exhibited hazardous wastes characteristics. The analytical results of the eight selected solvents were less than the detection limit of 1 mg/kg.

Samples of liquid from the pit, stripper waste, and sludge from the pit were also collected and analyzed for hazardous waste characteristics. Liquid from the pit and stripper waste exhibited hazardous waste characteristics, based on their concentrations of chromium and lead.

WTI Wastewater Storage Yard Investigation (1984)

WTI collected soil samples from the storage yard in August 1984. Surface soil samples were collected at a depth of 8-inches bgs at 16 locations. The soil samples were analyzed with a solvent scan for methylene chloride, xylene, butyl cellosolve,

cellosolve acetate, n-butyl acetate, n-butanol, isobutanol, and toluene. The analytical results of the eight selected solvents were less than the detection limit of 1 mg/kg

ADEQ PA (1990) and SI (1993)

ADEQ conducted a PA and an SI of the Pyramid facility on behalf of the EPA in February 1990 and July 1993, respectively. Sampling for the SI included the collection of soil-gas, surface soil, and subsurface soil samples. Twelve soil-gas samples from nine locations were collected and analyzed on site by an EPA Field Analytical Services Program (FASP) mobile laboratory.

Soil-gas samples were collected from depths of 11 to 11.5 feet bgs (Figure 10). Six of these samples exhibited detectable concentrations of 1,1-DCE ranging from 7.4 μg/l to 2,700 μg/l. The highest concentrations of 1,1-DCE observed in soil gas were from the samples collected west of the main building on the Pyramid facility. Methylene chloride was also detected in one western sample location at a concentration of 2.2 μg/l. TCE was detected in soil-gas samples collected from three locations at concentrations ranging from 1.2 to 7.9 μg/l. PCE was detected in soil-gas samples collected from seven locations with concentrations ranging from 1.9 μg/l to 560 μg/l. The highest concentration of PCE was from a soil-gas sample collected in the southeastern corner of the property. Benzene was detected in soil-gas samples collected from two locations at concentrations of 2.3 and 5.4 μg/l. Toluene was detected at concentrations of 1.1 μg/l to 11 μg/l in soil-gas samples collected from seven locations. Ethylbenzene, chlorobenzene, and total xylenes were also detected in soil-gas samples at concentrations less than 3.8 μg/l.

In addition to the soil-gas sampling, ADEQ also collected nine surface soil samples from 0 to 2 feet bgs as part of the SI (Figure 10). These samples were analyzed for total metals analysis. Detectable concentrations of metals were present in all of the samples. Most of the detected concentrations were below or near the concentration of metals detected in the background sample collected from the property. Concentrations of beryllium in seven of the surface soil samples ranged from 0.34 mg/kg to 0.56 mg/kg and exceeded the 1993 Arizona Health Based Guidance Levels (HBGLs) of 0.32 mg/kg. However, the detected concentrations of beryllium did not exceed the current residential SRL for beryllium of 1.4 mg/kg. Additionally, three samples had lead concentrations ranging from 48.8 to 193 mg/kg, which exceeded the background sample result for lead of 5.8 mg/kg, but were below the residential SRL for lead of 400 mg/kg.

Earth Tech Site Characterization (1995)

Earth Tech implemented a soil sampling investigation in February and March 1995 (Earth Tech, 1995). The objective of the investigation was to evaluate the potential presence of VOCs in soils near the former gasoline UST, the former diesel UST, and the former wastewater pretreatment system, the previous container storage area, and at the locations of previous soil-gas detections.

Eleven boreholes were drilled in these areas, with eight boreholes drilled to 15 feet bgs and three boreholes drilled to 50 feet bgs (Figure 10). Soil samples collected during the investigation were analyzed for halogenated VOCs. Samples collected from the UST area were also analyzed for aromatic VOCs and total petroleum hydrocarbons. No analytes were detected above laboratory reporting limits with the exception of two soil samples from borehole ET-B-11 that were drilled in the parking lot on the south side of the Pyramid property. Soil samples were collected at 5, 10, and 15 feet bgs. PCE concentrations were 0.08 mg/kg at 5 feet, 0.12 mg/kg at 10 feet, and less than the detection limit of 0.05 mg/kg at 15 feet bgs.

Earth Tech performed an aerial photograph review of the area around borehole B-11 to identify possible sources of the detected PCE. Its review did not reveal any activities on the Pyramid property that could have caused a release of PCE in this area. A release of PCE involving a drywell on the F&B facility, located approximately 90 feet south of borehole ET-B-11, was identified by Earth Tech during its review of sampling data. In addition, Earth Tech identified a storm drain between the F&B and Pyramid properties that is located approximately 20 feet from borehole ET-B-11. The report indicates that the storm drain may have acted as a conduit for contaminant transport from F&B to the Pyramid facility.

Weston's Phase I Remedial Investigation (1998)

Weston conducted a Phase I RI for ADEQ in June 1998 (Weston, 1998b). The purpose of the Phase I RI at the Pyramid facility was to evaluate the potential contribution of the facility to known groundwater contamination beneath the WCP North Plume Site. Six specific areas were assessed during the investigation. The specific areas are listed below.

- West Area;
- Southeast Area;
- Main Building Area;
- Former UST Area;
- Southwest Corner/Dry well Area; and
- Northern Area.

The Phase I RI investigation consisted of the drilling and sampling of four shallow boreholes, five angle boreholes, and six boreholes extending to groundwater (Tables 8 and 9; Figure 11). Groundwater samples were obtained using the Hydropunch® method from each of the deeper borehole (Tables 10 and 11; Figure 12).

PCE was the only VOC detected in soil samples (Table 8). Detected metal concentrations were below residential and non-residential SRLs in all samples except for three samples in the Northern Area that exceeded the residential SRL for arsenic (Table 9).

West Area

Three areas of concern were identified: the hook cleaning area, the wastewater treatment area, and the area where high concentrations of 1,1-DCE were detected in previous soil-gas samples. Borings HB-4 and B-8 through B-10 were drilled and sampled west of the main building. Borings B-8 and B-9 were drilled at an angle beneath the former wastewater treatment area. Metal concentrations in soil samples collected from the borings were below residential and non-residential SRLs and VOCs were not detected at concentrations exceeding the method reporting limits (MRLs). PCE was detected in the southernmost borehole, B-10, located near the former hook cleaner. PCE concentrations were detected at 0.12, 0.071 and 0.12 mg/kg in soil samples collected from 5, 10, and 20 feet bgs, respectively (Figure 11).

Southeast Area

Soil and groundwater beneath the southeastern corner of the facility was investigated with borings to evaluate previous detections of PCE in soil and soil-gas samples in this area. Detectable concentrations of PCE were present in samples from borings HB-5 and B-13, confirming previous detections of PCE in this area. PCE was present in all of the soil samples from HB-5, from depths of 10 feet to 108 feet bgs. The highest concentration of PCE was found in the sample collected from a depth of 90 feet bgs. PCE was also detected in a soil sample collected at a depth of 15 feet from boring B-13, which was drilled at an angle beneath the southeastern corner of the main building (Figure 11).

Main Building Area

Vertical and angled boreholes were located in the main building and around the periphery of the building to evaluate the potential presence of contaminants beneath the main building. Boreholes were located to obtain soil samples from beneath areas of concern in the building based on reported historical practices (e.g., tool room, sewer connection). No VOCs were observed at concentrations above laboratory detection limits in soil samples collected from borings B-8, B-9, B-11, B-12, and B-15. PCE was detected in boring B-14 at depths of 15 and 20 feet bgs at concentrations of 0.23 and 0.14 mg/kg, respectively (Figure 11).

Former UST Area

Boring B-7 was located in the area of former USTs to test for the presence of petroleum hydrocarbons in soils beneath the former tanks. Soil samples collected from boring B-7 did not contain detectable concentrations of petroleum hydrocarbons or halogenated and aromatic VOCs (Figure 11).

Southwest Corner/Dry Well Area

Boring B-14 was located near the dry well in the loading dock area to evaluate potential releases to the subsurface through the dry well. PCE was detected in soil samples from depths of 15 and 20 feet bgs at concentrations of 0.23 and 0.14 mg/kg, respectively.

Detectable PCE concentrations were below MRLs in samples collected from 5 and 10 feet bgs (Figure 11).

Soil samples from boring HB-6 were found to contain PCE at concentrations ranging from 0.28 to 2.5 mg/kg. The highest concentration (2.5 mg/kg) was detected in a soil sample collected at 80 feet bgs (Figure 11).

Northern Area

Three borings, HB-1, HB-2, and HB-3, were drilled on the northern portion of the facility (Figure 11). HB-3 was located north of a concrete pad formerly used for chemical storage to evaluate the potential for soil contamination from potential releases in the area. No VOCs were detected in soil samples collected from borings HB-1, HB-2, and HB-3. A soil sample collected from 100 feet bgs in HB-1 contained arsenic at a concentration of 11 mg/kg. In addition, two samples from HB-3 at 50 and 80 feet contained arsenic at concentrations of 13 mg/kg, and 13 mg/kg, each.

Hydropunch® Groundwater Sample Analytical Results

In addition to the soil samples, six groundwater samples were collected using the Hydropunch® method from borings HB-1 through HB-6 upon encountering the groundwater (Figure 12). VOCs were detected in groundwater samples collected from borings HB-3 through HB-6 (Table 10). PCE concentrations were the highest of the VOCs detected, ranging from 920 µg/l in boring HB-5 to 19,000 µg/l in boring HB-6. Concentrations of 1,1-DCE ranged from less than 5 µg/l in boring HB-5 to 160 µg/l in boring HB-6. TCE concentrations ranged from 9 µg/l in boring HB-4 to 17 µg/l in borings HB-5 and HB-6. In addition, metal concentrations were detected above AWQSs for arsenic, beryllium, total chromium, lead, and nickel in groundwater samples from HB-3, HB-4, and HB-5 (Table 11). The groundwater sample from HB-6 contained total chromium and lead at concentrations exceeding the AWQSs.

2.1.3 Rinchem Facility

Previous investigations at the Rinchem facility have included soil-gas surveys, subsurface soil sampling, and groundwater monitoring well installation and sampling. Each of these investigations, conducted by Rinchem and ADEQ, are summarized briefly in the following sections. Information regarding the investigations conducted at the Rinchem facility is included in the "Remedial Investigation Work Plan, Rinchem Facility, 4115 West Turney Avenue, Phoenix, Arizona," prepared by Weston (Weston, 2000a). The locations of potential source areas and other areas of interest are shown on Figure 6.

ADEQ Preliminary Assessment (1989) and Site Inspection (1991)

In 1991, ADEQ collected soil and soil-gas samples as part of a Site Inspection (ADEQ 1992). Several VOCs, including 1,1-DCA, 1,1-DCE, cis-1,2-dichloroethylene (cis-1,2-DCE), PCE, and TCA were detected in soil-gas samples, specifically near a concrete

sump in the former repackaging area. Soil samples collected at a depth of 17 feet bgs near the former repackaging area contained detectable concentrations of DCA, cis-1,2-DCE, and TCA. Surficial soil samples collected in the former tank farm area also contained concentrations of toluene, ethylbenzene, and xylenes.

SCS Engineers Soil Investigation (1992)

In 1992, SCS Engineers performed a limited soil sampling investigation at the facility focusing on the potential impacts from chemical handling activities (Table 12). Soil samples were collected near the dry wells and in the southeastern corner of the property near the rail distribution connection. Sediments from the dry well chambers and surficial soil samples were analyzed for hydrocarbon compounds and VOCs. Analytical results from these soil samples indicated the presence of petroleum hydrocarbon compounds near the bulk chemical loading area in the southeastern portion of the property. Soil samples collected from other areas along the southern boundary and from the dry wells did not contain detectable concentrations of hydrocarbons or VOCs above laboratory detection limits.

LAW/Crandall Soil Investigation (1993)

In 1993, LAW/Crandall collected shallow soil samples in the eastern and southern portions of the facility to determine if hydrocarbons or pesticides were present in shallow soils. A total of 190 soil samples were collected from borings up to 3 feet deep along the eastern and southern boundaries of the property. Samples collected from the same boring were composited into one sample. Sixty-eight samples were submitted to an analytical laboratory for analysis for total petroleum hydrocarbons (Table 13). No total recoverable petroleum hydrocarbons were detected in any composite sample (Four Corners, 1999).

Four Corners Soil-Gas Survey and Subsurface Soil Investigation (1994)

In 1994, Four Corners conducted a preliminary site characterization at the Rinchem facility (Four Corners, 1995). Several VOCs including 1,1-DCE, 1,1-DCA, trichloromethane, TCE, PCE, acetone, carbon tetrachloride, methyl ethyl ketone (MEK), TCA, vinyl chloride, methylene chloride, chloroethane, cis-1,2-DCE, benzene, toluene, ethylbenzene, and total xylenes were detected in soil gas samples collected at the facility (Table 14; Figure 13). Soil samples were also collected both outside and inside the facility (Table 15). Several compounds, including TCE, PCE, TCA, DCA, acetone, methylene chloride, MEK, and toluene, were detected in the soil samples. The highest concentrations were detected in soil borings (B-11 and B-13) completed near Sump-1 in the former repacking area. Soil samples collected from boring B-13 contained detectable concentrations of PCE, TCE, and TCA above GPLs at several depths (Table 15). PCE was detected above GPLs with concentrations of 9.7 mg/kg, 21 mg/kg, and 21 mg/kg at depths of 10, 30, and 50 feet bgs, respectively. TCE was detected above GPLs with concentrations of 1.2 mg/kg and 1.2 mg/kg at depths of 10 and 30 feet bgs, respectively. TCA was detected above GPLs with concentrations of 17 mg/kg and 17 mg/kg at depths of 30 and 50 feet bgs, respectively. In addition, concentrations of PCE detected in boring B-11 at a depth of 10 feet bgs

(1.4 mg/kg) exceeded the GPL. Soil samples were also collected for physical properties analysis. A summary of the soil physical properties results is included in Table 16.

Groundwater samples were collected using the Hydropunch® method from deeper soil borings B-5 and borings B-8 through B-13 (Figure 14). The highest concentrations of contaminants were detected in a groundwater sample collected from B-13 (Table 17). Concentrations of acetone (up to 110,000 µg/l), methylene chloride (up to 13,000 µg/l), toluene (up to 3,600 µg/l), PCE (up to 60 µg/l), TCE (up to 480 µg/l), cis-1,2-DCE (up to 250 µg/l), 1,1-DCE (up to 150 µg/l), DCA (up to 380 µg/l), and TCA (up to 16 µg/l) were all detected in the groundwater. Benzene, 1,1-DCE, TCE, PCE, vinyl chloride, and cis-1,2-DCE were detected above their respective AWQS in the B-5 and B-8 groundwater samples. Benzene, 1,1-DCE, TCE, and PCE were detected above their respective AWQS in the B-10, B-11, and B-12 groundwater samples. Toluene and TCE were detected above their respective AWQS in the B-13 groundwater sample.

2.1.4 Hill Brothers Facility

Since 1989, several preliminary investigations have been performed at the Hill Brothers facility. These investigations are summarized briefly in the following sections. Information regarding the investigations conducted at the Hill Brothers facility is included in the "Remedial Investigation and Feasibility Study Work Plan, Hill Brothers Facility, 4450 North 42nd Avenue, Phoenix, Arizona" prepared by Weston (Weston 2001a). The locations of potential source areas and other areas of interest are shown on Figure 7.

ADEQ Preliminary Assessment and Site Inspection (1989)

A PA report was completed in 1989 by ADEQ for the EPA. The report indicated that the potential for a release existed due to the nature of the facility operations. As a result of the PA, ADEQ performed an SI at the Hill Brothers facility for the EPA. The SI included the collection of soil-gas and soil samples and a cone penetration test (CPT) for information on site stratigraphy. Based upon the information obtained from the CPT and from historical waste management practices at the facility, soil-gas samples were collected near the solvent packaging area (HB-1-5 ft), the maintenance storage and fuel island area (HB-2-14 ft), the brine tanks and maintenance shade canopy area (HB-3-15 ft), and the retention basin (HB-4-15 ft) (Figure 15). VOCs, including PCE, TCE, 1,1-DCE, and TCA, were detected at concentrations above reporting limits in the soil-gas samples collected (Table 18; Figure 15).

One soil sample was collected near the solvent packaging area at a depth of 12 feet bgs. The sample contained methylene chloride at a concentration of 0.001 mg/kg; acetone at 0.011 mg/kg; 1,1-DCE at 0.008 mg/kg; DCA at 0.007 mg/kg; TCA at 0.015 mg/kg; TCE at 0.003 mg/kg; benzene at 0.007 mg/kg; PCE at 0.009 mg/kg; toluene at 0.007 mg/kg; and total xylenes at 0.007 mg/kg.

EMCON Preliminary Site Characterization Report (1996)

EMCON conducted a Preliminary Site Characterization (PSC) in October 1996 (EMCON, 1997). The PSC consisted of an exploratory boring near the former maintenance storage shed area (B-1), the former solvent packaging area (B-2), the maintenance shade canopy (B-3), the drum loading area south of the elevated loading dock (B-4), the former empty solvent drum storage area south of dry storage (B-5), and the former solvent storage area (B-6). Borings B-1, B-2, B-3, and B-6 were drilled to groundwater, which was encountered at depths between 121 to 126 feet bgs. Borings B-4 and B-5 were advanced to 70 feet bgs. Soil samples were collected at 5-foot intervals to 50 feet and at 10-foot intervals thereafter. The locations of the borings are shown on Figure 16.

A total of 90 soil samples were analyzed for VOCs by an on-site mobile laboratory using EPA Method 8010/8020 (Table 19). Selected samples were submitted to a fixed-based laboratory for analysis using the same method. In addition, in situ Hydropunch® groundwater samples were collected from the four borings advanced to groundwater (Table 20; Figure 17). Soil samples collected at a depth of 100 feet bgs in boring B-2 in the former solvent packing area contained TCE and PCE at maximum concentrations of 0.032 mg/kg and 0.031 mg/kg, respectively. PCE was also detected in soil at a concentration of 0.026 mg/kg near the drum loading area at a depth of 5 feet bgs.

Groundwater TCE, PCE and 1,1-DCE were detected in groundwater samples collected using the Hydropunch® method contained TCE, PCE and 1,1-DCE above their AWQS (Table 20). The maximum concentrations detected were from boring B-2 near the former solvent packaging area. TCE was detected above its AWQS in samples B-2 (86 μg/L and 46 μg/L) and B-3 (84 μg/L). PCE was detected above its AWQS in samples B-2 (72 μg/L and 51 μg/L) and B-3 (7.7 μg/L). 1,1-DCE was detected above its AWQs in samples B-2 (29 μg/L and 30 μg/L) and B-3 (23 μg/L). The maximum concentrations detected were from boring B-2 near the former solvent packaging area. TCE was detected at a concentration of 86 μg/l, PCE at 72 μg/l, and 1,1-DCE at 30 μg/l were detected in the groundwater sample from B-2.

Geomatrix Passive Soil-Gas Survey (2003)

In 2003, a passive soil-gas survey was performed at the Hill Brothers facility by Geomatrix. The purpose of the passive soil-gas survey was to provide a screening level evaluation of potential VOC release areas identified in previous investigations and to assess if these areas needed additional investigation. Fifty-three sample locations were selected around the following areas:

- former solvent packing area
- former solvent storage area
- drum loading area
- former empty solvent drum storage area
- former maintenance storage shed area
- area adjacent to the maintenance shade canopy

The GORE-SORBER® modules were installed in February 2003 to a depth of 3 feet bgs (Figure 18). The modules were left in the ground for a period of 13-14 days. The modules were analyzed by Gore's laboratory for VOCs by modified EPA Methods 8260A/8270A. The results of the passive soil-gas survey identified several areas coinciding with the aforementioned areas of concern where concentrations of VOCs were elevated (Appendix B).

2.2 Summary of RI Field Investigations

RI field investigation activities for the F&B, Pyramid, Rinchem, and Hill Brothers facilities were started in 1998. Field investigations included the drilling and installation of monitoring wells, collection of soil-gas samples, collection of in situ soil and groundwater samples, geophysical testing, groundwater monitoring, and an aquifer test. Field activities were conducted in accordance with the procedures outlined in the following field sampling plans (FSPs) and quality assurance project plans (QAPPs):

- LFR's "Field Sampling Plan for the F&B Mfg. Co. Facility, West Central Phoenix North Plume Site," dated July 2000
- LFR's "Quality Assurance Project Plan for the F&B Mfg. Co. Facility, West Central Phoenix North Plume Site," dated October 1999
- Weston's "Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Rinchem Facility, WCP North Plume Site, 4115 East Turney Avenue, Phoenix, Arizona," dated April 2000
- Weston's "Remedial Investigation Field Sampling Plan, Rinchem Facility, WCP North Plume Site, 4115 West Turney Avenue, Phoenix, Arizona," dated April 2002
- Weston's "Remedial Investigation Field Sampling Plan, Hill Brothers Facility, WCP North Plume Site, 4450 North 42nd Avenue, Phoenix, Arizona," dated February 2001
- Weston's "Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Hill Brothers Facility, WCP North Plume Site, 4450 North 42nd Avenue, Phoenix, Arizona," dated February 2001
- Weston's "Phase I Remedial Investigation Sampling and Analysis Plan, Pyramid Industries Site," dated 1997
- Weston's "Remedial Investigation/Feasibility Study Field Sampling Plan, Pyramid Industries Site, 4330 North 39th Avenue, Phoenix, Arizona," dated July 1999
- Weston's "Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Pyramid Industries Site, 4330 North 39th Avenue, Phoenix, Arizona," dated July 1999

Further detail of field methodologies can be found in the above listed FSPs and QAPPs and in Weston's "Site Characterization Report, Pyramid Industries Facility, WCP North Plume WQARF Registry Site, 4330 North 39th Avenue, Phoenix, Arizona,"

dated December 2002 (2002b); Weston's "Technical Memorandum, Status of Hill Brothers Remedial Investigation: Results of Initial Phase – Offsite Groundwater Investigation," dated April 10, 2002; and LFR's "Technical Report Summarizing 1999 Phase II Remedial Investigation Results and Proposal to Install Additional Wells, ADEQ F&B Mfg. Co. Facility," dated May 2000.

As part of the RI field investigation, 38 shallow MAU, 11 MAU, and 8 deep MAU/LAU monitoring wells were installed in the WCP North Plume site by LFR and Weston (Figure 3). The well installations for the RI field investigation began in 1998. The monitoring wells were installed by several different drilling methods, including mud-rotary, hollow-stem auger, and air hammer percussion. Before drilling began, access agreements were obtained from property owners and permits were acquired from Arizona Department of Water Resources (ADWR) and the COP. All monitoring wells were constructed in accordance with the work plans and field sampling plans for each facility.

In general, the locations and depths of the wells were selected to evaluate the horizontal and vertical extent of groundwater contamination. Specific rationales for each monitoring well are discussed in the FSPs for each facility. Each monitoring well was constructed in accordance with the ADWR's Well Construction and Drillers Rules, Arizona Administrative Code, Article 8. Monitoring well construction details are summarized in Table 21. Boring logs are included in Appendix C.

The following sections discuss the RI field investigation activities for each facility chronologically.

2.2.1 F&B Mfg. Co. Facility

1999

Drilling and Monitor Well Installation

In 1999, 16 monitoring wells were drilled around the F&B Mfg. Co. facility using mud-rotary and hollow-stem auger drilling methods. Five well nests with wells completed in different vertical intervals and two individual wells were installed. At the well nest locations, a pilot hole was initially drilled using the mud-rotary method and geophysically logged. Soil cuttings were collected every 5 feet from the circulating mud for lithologic descriptions. Screen intervals for the wells at each nest were selected after both the soil cuttings and geophysical logs were evaluated.

Two shallow wells were installed using the mud-rotary method. One well, WCP-35B, was installed at the base of the UAU, and did not encounter groundwater. The other shallow well installed using the mud-rotary method was WCP-36S, which was installed within the current water table depth in the upper portion of the MAU. These shallow wells were completed with 40 feet of stainless steel screen.

Three additional shallow wells (WCP-34S, WCP-38S, and WCP-39S) were installed utilizing the hollow-stem auger drilling method. WCP-34S was installed to complete the WCP-34 nest. Wells WCP-38S and WCP-39S were installed to further delineate the crossgradient and downgradient, lateral extent of shallow groundwater contamination. Split-spoon soil samples were collected every 5 feet for lithologic description. These wells were screened across the water table with a 40-foot screen interval from approximately 110 to 150 feet bgs.

Six middle-depth wells (WCP-33M, WCP-34M, WCP-35M, WCP-36M, WCP-37M2, and WCP-37M3) were installed at a target depth of approximately 270 feet bgs in the MAU. Monitoring wells WCP-33M, WCP-34M, WCP-35M, WCP-36M, and WCP-37M3 were screened within a laterally continuous, prolific water-bearing sandy unit identified in each of the geophysical logs collected. Monitoring well WCP-37M2 was screened in the lower portion of the MAU in a sandy zone at 370 to 390 feet bgs. Each middle-depth well was completed with 20 feet of stainless steel screen. An additional blank steel casing was installed in each of these wells to isolate the upper MAU water-bearing zone from the lower water-bearing zones. This double casing was installed to minimize the potential for downward migration of contaminants during drilling, and to ensure that samples collected from these wells are representative of the screened interval.

Five deep wells (WCP-33L, WCP-34L, WCP-35L, WCP-36L, and WCP-37L) were installed in the LAU below a depth of 350 feet. The deep wells were completed with 20 feet of stainless steel screen and were screened within the upper portion of the LAU. These wells were also double-cased to minimize the potential for downward migration of contaminants during drilling, and to ensure that samples collected are representative of the screened interval.

Depth-Specific Groundwater and Soil Sampling

In addition to collecting soil samples every 5 feet for lithologic description, LFR collected several depth-specific samples utilizing the SimulProbe® sampling technique. The purpose of these discrete samples was to: assist in the real-time vertical characterization of VOC contaminants at the site, provide a vertical profile of the lithologic and chemical characteristics of the vadose zone at the site, assist in the selection of appropriate well screen intervals and well construction details, and assist in the development of a site conceptual model by providing data regarding the vertical as well as the horizontal distribution of VOCs beneath the site. A description of the SimulProbe® sampling technique can be found in LFR's FSP for the F&B Mfg. Co. facility.

The SimulProbe® is a device that collects groundwater in one half of its canister and soil in the other half. To collect groundwater, the upper half of the canister must be kept under pressure with nitrogen, which is supplied through plastic tubing attached to a nitrogen tank at the surface. Due to limited borehole space, the plastic tubing often ruptured or failed to maintain pressure; as a result, the water canister was often filled with drilling fluid. It was also often difficult to drive the SimulProbe® into native,

undisturbed soil without damaging the sampling device or the nitrogen line. Lack of sufficient hydrostatic pressure within the aquifer, once the SimulProbe® was successfully emplaced into the native materials with the nitrogen line still intact, also contributed to the difficulty associated with obtaining depth-specific groundwater. Despite these difficulties, LFR was able to collect 33 depth-specific soil samples and 10 depth-specific groundwater samples for laboratory analysis.

LFR submitted 33 depth-specific soil samples for laboratory analysis for physical parameters while drilling using the mud-rotary method. LFR attempted to collect a discrete soil and groundwater sample from significant sandy layers encountered at each nested well location. Because of the difficulty in defining lithologic zones during mud rotary drilling, depth-specific SimulProbe® samples were only collected from pilot borings (the LAU well at each well nest) at depths below 300 feet bgs at a limited number of intervals. Based on an evaluation of the pilot borings, LFR selected additional intervals for depth-specific soil and groundwater sampling in the second boring at each well nest location. A summary of depth-specific analytical data is included in Tables 22, 23, and 24.

Ten water samples were submitted for laboratory analysis of VOCs during the mud-rotary drilling. All of the discrete groundwater samples and most of the soil samples were collected with the SimulProbe®. LFR elected to use a split-spoon sampler to collect soil only when it became apparent that the SimulProbe® would not be able to collect a discrete groundwater sample.

Geophysical Logging

LFR contracted Southwest Geophysical to perform geophysical logging of each of the pilot borings in the original five nests (WCP-33L, WCP-34L, WCP-35L, WCP-36L, and WCP-37L) of the monitoring wells and in WCP-73L. The geophysical logging consisted of the following methods: gamma-neutron, spontaneous potential, resistivity, and caliper. Data from these logs were used to determine the screen interval for the deep monitoring well and to guide the drilling and construction of other monitoring wells in the nest. The geophysical log also provided data for the geological interpretation of the alluvial units and basement rock. Figures 19 through 24 show the geophysical logs for each well in addition to lithologic description and well construction information. Copies of the geophysical logs are included in Appendix D.

2000

Drilling and Monitor Well Installation

Five shallow wells (WCP-35S, WCP-65S, WCP-67S, WCP-68S, and WCP-69S) were installed utilizing the hollow-stem auger drilling method. One shallow well, WCP-66S, was drilled utilizing the air hammer percussion method due to auger refusal during the first drilling attempt. Wells WCP-65S, WCP-66S, WCP-67S, WCP-68S, and WCP-69S were installed to further delineate the crossgradient and downgradient, lateral extent of shallow groundwater contamination. Split-spoon soil samples were

collected every 5 feet for lithologic description. These wells were screened across the water table with a 40-foot screen interval from approximately 110 to 150 feet bgs. Monitoring wells WCP-66S and WCP-69S were screened across the water table with a 50-foot screen set in the interval between 110 to 160 feet bgs. WCP-35S was drilled as a replacement well for WCP-35B, which has always been dry.

Four middle-depth wells (WCP-36M2, WCP-70M, WCP-71M, and WCP-72M) were drilled using a combination of the mud-rotary and air hammer percussion drilling methods. Each of these 4-inch-diameter wells was completed with the same rig capable of utilizing both methods. WCP-70M, WCP-71M, and WCP-72M were screened in the prolific water-bearing sandy unit in the MAU at a depth of approximately 258 to 278 feet bgs and completed with 20 feet of stainless steel screen. Monitoring well WCP-36M2 was screened in the lower portion of the MAU in a sandy zone at 370 to 390 feet bgs and completed with 20 feet of stainless steel screen. Cutting samples were collected every 5 feet from the rig's discharge line and were used to describe lithology.

One deep well (WCP-73L) was installed in the LAU below a depth of 350 feet. The deep wells were completed with 20 feet of stainless steel screen. This well was also double-cased to minimize the potential for downward migration of contaminants during drilling, and to ensure that samples collected are representative of the screened interval.

Geophysical Logging

LFR contracted Southwest Geophysical to perform geophysical logging of WCP-73L. The geophysical logging consisted of the following methods: gamma-neutron, spontaneous potential, resistivity, and caliper. Data from these logs were used to determine the screen interval for the deep monitoring well and to guide the drilling and construction of other monitoring wells in the nest. The geophysical log also provided data for the geological interpretation of the alluvial units and basement rock. Figure 24 shows the geophysical logs for this well in addition to lithologic description and well construction information. A copy of the geophysical logs is included in Appendix D.

Aquifer Testing

LFR conducted an aquifer test in December 2000. The objective of this test was to estimate aquifer properties, such as transmissivity, hydraulic conductivity, and storage coefficients, and to assess potential aquifer boundary conditions within identified hydrostratigraphic units in the vicinity of the F&B facility. In addition, hydrogeologic components of the site conceptual model were formulated based on the aquifer test data.

Based on the site constraints, the WCP-33 well cluster was selected as the extraction wells for the aquifer tests (Figure 3). The WCP-33 middle-depth and lower wells (WCP-33M and WCP-33L) are located on the eastern side of 39th Avenue. The shallow well (WCP-33S) is located on the Pyramid facility. Observation wells were located on the street, within the COP Glenrosa Service Center facility, the F&B facility, and the

Pyramid facility. LFR obtained permission to access these wells from the respective property owners prior to conducting the aquifer tests. Results of the aquifer testing are discussed in Section 4.2.3 and test data are provided in Table 25.

Three different screened intervals were tested during the aquifer testing phase of the project. The shallow interval (WCP-33S) is screened from 100 to 140 feet bgs. The middle interval (WCP-33M) is screened from 256 to 276 feet bgs. The lower interval (WCP-33L) is screened from 420 to 440 feet bgs.

Selection of appropriate pumping equipment and associated pumping rates for the tests was based on projections of sustainable well yield from analysis of development data. Drawdown and recovery in the pumping wells were monitored using a 100-pounds-per-square-inch (psi) vibrating wire piezometer connected to a datalogger and a portable computer. Water-level responses in nearby monitoring wells were also monitored during the tests. A 25-psi vibrating wire piezometer was used to monitor water level responses in nearby 4-inch-diameter monitoring wells. The Westbay well (F&B-4) was monitored using specialized Westbay monitoring equipment. Ten ports were monitored using 250-psi pressure transducers.

Shallow Well WCP-33S

Two slug tests were performed on WCP-33S instead of a 24-hour pumping test, because the necessary projected sustained pumping test rate would have been too low for effects to be observed in the selected observation wells. LFR measured the water level in WCP-33S prior to installation of the pumping equipment. A 2-inch Rediflo Grundfos® submersible pump was installed in the well at a depth of 137 feet bgs. The water level was allowed to recover to its static level prior to pumping. The well was pumped at 10 gallons per minute (gpm) for approximately one minute and the water level decreased to the top of the pump (a drop of approximately 10 feet of water). The pump was turned off and the water level was allowed to recover to its static level. Measurements were recorded every minute. The well reached 80 percent recovery after 58 minutes and 99 percent recovery after 110 minutes.

A second slug test was performed following complete recovery of the well. The well was pumped at a lower rate (1 gpm) for approximately three minutes until the water level reached the top of the pump. The pump was turned off and water level was allowed to recover to its static level. Water-level measurements were recorded every minute. The well reached 80 percent recovery after 54 minutes and 100 percent recovery after 105 minutes. A summary of the slug test drawdown data and plots of drawdown and recovery curves are included in Appendix E.

Middle-Depth Well WCP-33M

Before conducting the 24-hour pumping test, LFR conducted a step-drawdown test to evaluate well efficiency and determine a suitable pumping rate. A 3-inch Rediflo Grundfos® submersible pump was used to pump the monitoring well at three successively higher pumping rates (50 gpm, 69 gpm, and 73 gpm) for approximately

one hour each. Following the step-drawdown test, the monitoring well was allowed to recover to its static level overnight.

LFR conducted a constant-rate pumping test on December 13 and 14, 2000. Depth-to-water measurements were collected with a piezometer connected to a data logger. The measurement intervals used were as follows:

Duration of Aquifer Test	Water-Level Measurement Interval
From 0 to 2 minutes	Every 0.1 second
From 2 to 10 minutes	Every 30 seconds
From 10 to 16 minutes	Every 1 minute
From 16 to 100 minutes	Every 2 minutes
From 100 to 720 minutes	Every 10 minutes
From 720 to 1,440 minutes	Every 30 minutes

The well was pumped at a constant rate of 69 gpm. Maximum drawdown in the well was 31 feet. After the pumping period, the well was allowed to recover. The well reached 98 percent recovery after one minute. A summary of the pumping test time drawdown data and plots of drawdown and recovery curves are included in Appendix E.

Deep Well WCP-33L

LFR conducted a step-drawdown test to evaluate well efficiency and determine a suitable pumping rate. A 3-inch Rediflo Grundfos® submersible pump was used to pump the monitoring well at three successively higher pumping rates (30 gpm, 45 gpm, and 65 gpm) for approximately one hour each. Following the step-drawdown test, the monitoring well was allowed to recover to its static level overnight. The measurement interval used was the same as the WCP-33M test above.

LFR conducted a constant-rate pumping test on December 7 and 8, 2000. The well was pumped at a constant rate of 60 gpm. The maximum drawdown was approximately 62 feet. After the pumping period, the well was allowed to recover. The well reached 96 percent recovery after one minute. A summary of the pumping test time drawdown data and plots of drawdown and recovery curves are included in Appendix E.

2.2.2 Pyramid Industries Facility

1999

Drilling and Monitor Well Installation

Nine soil/monitoring well borings (B-16 through B-21 and monitoring wells WCP-31, WCP-32, and WCP-33) were drilled and constructed in August and September 1999 under the direction of Weston. WCP-31 was constructed on the southern portion of the property to monitor the PCE concentrations migrating from beneath the F&B Mfg. Co. facility toward the Pyramid facility and was screened from 101 to 141 feet bgs. WCP-32 was constructed on the western and downgradient side of the property to evaluate the groundwater quality beneath the western side of the facility and was screened from 101 to 141 feet bgs. WCP-33S was constructed on the eastern side of the property to evaluate the eastern extent of the VOC contamination and was screened from 100 to 140 feet bgs. WCP-33S is part of the nested WCP-33 well set.

Depth-Specific Soil and Groundwater Sampling

One hundred and twenty-seven soil samples were collected at varying depths for VOC and metals analysis from the soil/monitor well borings (Tables 26 through 29). The soil samples were collected using a split-spoon sampler. Hydropunch® samples were collected from soil borings B-16 through B-22 and from WCP-31, WCP-32, and WCP-33S (Figure 25). Groundwater samples were collected using the Hydropunch® sampler at a depth just below the depth the first groundwater was encountered (Table 30).

Depth-Specific Soil-Gas Sampling

In August 1999, soil-gas samples were collected at depths of 10 feet bgs on the Pyramid facility and Billboard Poster property, respectively (Table 31). Soil-gas samples were collected by Tracer and analyzed for VOCs.

2001

Drilling and Monitor Well Installation

Two soil borings (B-22, B-23) and one shallow monitoring well (WCP-91) were drilled in January 2001. The monitoring well, WCP-91, was installed in the northeastern corner of the Billboard Poster facility located immediately west of the Pyramid facility and was screened from 111.4 to 151.4 feet bgs. This well was installed to evaluate anomalous groundwater elevations in WCP-32 and to further evaluate groundwater quality.

Depth-Specific Soil-Gas Sampling

In January 2001, soil-gas samples were collected at depths of 10 feet bgs on the Pyramid facility and Billboard Poster property, respectively (Table 31). Soil-gas samples were collected by Tracer and analyzed for VOCs.

2.2.3 Rinchem Facility

1998

Drilling and Monitor Well Installation

In 1998, seven shallow groundwater monitoring wells (WCP-18, WCP-19, WCP-20, WCP-21, WCP-22, WCP-23, and WCP-24) were constructed on and around the perimeter of the Rinchem facility as part of a Phase I RI (Weston 1998a). The wells were installed in the upper portions of the MAU and were screened between 105 to 145 feet bgs. Groundwater samples were collected from the monitor wells and analyzed for natural attenuation parameters (Table 32).

Depth-Specific Soil Sampling

Soil samples were collected from the WCP-20 borehole at 50, 60, 80, 90, 100, 110, and 120 feet bgs for VOC analysis by EPA Method 8021B (Table 33). The samples were collected because high flame ionization detector (FID) readings were observed during drilling.

2000

Drilling and Monitor Well Installation

Nine shallow monitoring wells (WCP-49, WCP-50, WCP-51, WCP-52, WCP-53, WCP-54, WCP-55, WCP-56, and WCP-57) were installed in the upper portions of the MAU in January 2000 to further evaluate:

- the groundwater gradient and flow direction;
- the concentration and distribution of VOCs to the west, north, and south of the facility;
- the concentration and distribution of VOCs in groundwater on the facility; and
- potential sources west and south of the facility

Monitor well WCP-49 was screened from 110 to 150 feet bgs. Monitor wells WCP-50, WCP-51, and WCP-55 were screened from 110.5 to 150.5 feet bgs. Monitor well WCP-52 was screened from 112.5 to 152.5 feet bgs. Monitor well WCP-53 was screened from 119 to 159 feet bgs. Monitor well WCP-54 was screened from 118 to 158 feet bgs. Monitor well WCP-56 was screened from 111 to 151 feet bgs. Monitor well WCP-57 was screened from 120 to 160 feet bgs.

One middle-depth monitoring well (WCP-58) was installed to evaluate the vertical extent of VOC contamination downgradient from the Rinchem facility. The well was drilled to a depth of 290 feet bgs and was screened across the sandy zone between 270 and 290 feet bgs.

Geophysical Logging

Southwest Geophysical conducted geophysical logging on WCP-58 following the completion of drilling. The geophysical logging consisted of the following methods: gamma-neutron, electrical, spontaneous potential, resistivity, and caliper. A copy of the geophysical logs is included in Appendix D. Geophysical logging confirmed the presence of a laterally continuous sand lens observed at other well sites at a depth of 270 to 290 feet bgs beneath the Rinchem facility. WCP-58 was screened across this sand lens.

2002

Drilling and Monitor Well Installation

A middle-depth well (WCP-74) was drilled and installed in 2002 to evaluate the vertical extent of VOC contamination on the Rinchem facility. The well was drilled to a depth of 290 feet bgs and was screened across the sandy zone between 270 and 290 feet bgs.

Depth-Specific Soil and Soil-Gas Sampling

SimulProbe® samples were collected during the drilling of WCP-74 (Table 34). The purpose of the depth-specific samples was to help characterize the vertical extent of contamination and to help determine the screen interval for the well. Soil and groundwater samples were collected during the drilling process. Soil samples were analyzed for VOCs by EPA Method 8260B.

Soil and soil-gas samples were also collected during drilling activities in May 2002. Seven soil borings (SB-1 through SB-7) were drilled on the Rinchem property. Soil and soil-gas samples were collected at approximately every 5 feet using the mini-SimulProbe® sampler (Tables 35 and 36; Figures 26 and 27).

2.2.4 Hill Brothers Facility

2001

Drilling and Monitor Well Installation

Seven shallow groundwater monitoring wells (WCP-75, WCP-76, WCP-77, WCP-78, WCP-79, WCP-80, and WCP-81) were constructed on and around the perimeter of the Hill Brothers facility in 2001. The purpose of the monitoring wells was to further evaluate:

- the groundwater gradient and flow direction;
- the concentration and distribution of VOCs to the east, west, northwest, and southwest of the facility; and

- potential sources to the east, west, and south of the facility. The wells were installed in the upper portions of the MAU

Monitor well WCP-75 was screened from 120 to 160 feet bgs. Monitor well WCP-76 was screened from 124 to 164 feet bgs. Monitor well WCP-77 was screened from 125 to 165 feet bgs. Monitor well WCP-78 was screened from 126 to 166 feet bgs. Monitor well WCP-79 was screened from 125 to 165 feet bgs. Monitor well WCP-80 was screened from 128.5 to 168.5 feet bgs. Monitor well WCP-81 was screened from 123 to 163 feet bgs.

One middle-depth well (WCP-82) was drilled immediately west of the Hill Brothers facility in 2001. The purpose of the well was to evaluate the vertical extent of VOC contamination downgradient from the facility. The well was drilled to a depth of 325 feet bgs and was screened across the sandy zone between 280 and 300 feet bgs.

Depth-Specific Soil and Groundwater Sampling

Soil samples were collected at 5-foot intervals during the drilling of shallow monitoring wells WCP-75 through WCP-81. Selected samples were submitted to NEL Laboratories for analysis of VOCs in accordance with EPA Method 8260B (Table 37).

Seven Hydropunch® groundwater samples were collected from just below the groundwater surface during shallow monitoring well installation of WCP-75 through WCP-81 (Table 38).

SimulProbe® samples were collected at 30-foot intervals during the drilling of WCP-82 (Table 39). The groundwater samples were collected at 174, 204, 233, and 293 feet bgs. No samples were recovered at depths of 140 and 260 feet bgs.

Geophysical Logging

Southwest Geophysical also conducted geophysical logging on WCP-82 following the completion of drilling. The geophysical logging consisted of the following methods: gamma-neutron, electrical, spontaneous potential, resistivity, and caliper. A copy of the geophysical log is included in Appendix D. The logs confirmed the presence of a laterally continuous sand lens observed at other well sites beneath the Hill Brothers facility at a slightly deeper level (280 to 300 feet bgs) than at the F&B facility to the east. Based on information from the logs, the monitoring well was screened across this sand lens.

2003

Passive Soil-Gas Survey

In 2003, a passive soil-gas survey was performed at the Hill Brothers facility by Geomatrix. The purpose of the passive soil-gas survey was to provide a screening level evaluation of potential VOC release areas identified in previous investigations and to

assess if these areas needed additional investigation. Fifty-three sample locations were selected around the following areas:

- former solvent packing area
- former solvent storage area
- drum loading area
- former empty solvent drum storage area
- former maintenance storage shed area
- area adjacent to the maintenance shade canopy

The GORE-SORBER® modules were installed in February 2003 to a depth of 3 feet bgs. The modules were left in the ground for a period of 13-14 days. The modules were analyzed by Gore's laboratory for VOCs by modified EPA Methods 8260A/8270A.

2.2.5 Groundwater Elevation Measurements

LFR began collecting groundwater elevation measurements in November 1999. The monitoring well network initially included 36 ports in the four multi-port Westbay™ wells installed on F&B property, the 25 wells installed by LFR as part of the ADEQ's RI, three wells installed at the Pyramid facility, an AT&T well, and 8 wells installed at the COP Glenrosa Service Center. An additional 10 monitoring wells were added to the network in 2000. Weston began monitoring wells in the Rinchem and Hill Brothers network in July 1999. A total of 25 monitoring wells are included in the Rinchem and Hill Brothers monitoring network. In September 2002, ADEQ directed LFR to incorporate the Rinchem and Hill Brothers monitoring wells into the existing F&B monitoring well network. A summary of groundwater elevation measurements since 1999 is included in Appendix F. Hydrographs for the WCP North Plume monitoring wells are included in Appendix G.

The locations of the wells in the WCP North Plume area monitoring well network are shown on Figure 3. A total of 73 monitoring wells and four Westbay™ wells (F&B-1 through F&B-4) that have a total of 36 sampling ports are included in the WCP North Plume monitoring well network. Groundwater levels were measured in the 4-inch-diameter wells using a Solinst™ water level meter. Water levels were recorded to the nearest 0.01 foot. For consistency, readings were taken from a mark on the north side of the well casing. Piezometric readings were taken from the Westbay™ ports in the four F&B wells using Westbay™ equipment and Westbay™ standard operating procedures. Fluid pressures were recorded from each port and converted to equivalent elevations.

2.2.6 Groundwater Sampling

Groundwater samples were collected from the monitoring well network beginning in November 1999 and have been periodically monitored on a quarterly or semi-annual basis (at a minimum) since that time (Figure 3). During the first few rounds, the samples were analyzed for VOCs by EPA Method 8260 and the 13 Priority Pollutant Metals, as well as manganese and iron. Groundwater samples were also analyzed annually for inorganic ions (chloride, nitrate, sulfate, sulfide), alkalinity, iron, manganese, and light gases (methane, ethane, ethylene, and propane). In the initial sampling event conducted in November 1999, samples were collected for both dissolved and total metals. Samples for dissolved metals were filtered in the field. In subsequent sampling events, only dissolved metals were analyzed. Beginning in September 2003, samples were analyzed for VOCs only. A summary of groundwater analytical results for selected VOCs is included in Appendix F. Hydrographs, including PCE, TCE, and 1,1-DCE concentrations versus time are included in Appendix G. Electronic files of all sampling events since 1999 is included in Appendix H.

Four-Inch-Diameter Monitoring Wells

Initially, both low-flow and high-flow purge methods were utilized for the shallow, middle, and deep 4-inch-diameter monitoring wells. It was determined that low-flow purging was the most practical method and provided the most reliable, consistent data; therefore, the low-flow purge method was used in subsequent sampling events. During purging, the pH, specific conductivity, turbidity, temperature, dissolved oxygen (DO), and oxidation-reduction (redox) potential of the purged water was monitored and recorded. The wells were purged until the parameters stabilized. A groundwater sample was collected after stabilization.

LFR also performed field analyses of four natural attenuation parameters: ferrous iron and three distinct valence states of manganese (Table 40). The analyses were performed immediately after sample collection using Hach spectrophotometers. The results of these field analyses represent a form of quality assurance/quality control (QA/QC) against laboratory analytical results. LFR began performing these field analyses in May 2000.

In December 2003, a discrete interval sampler was used to collect groundwater samples from the monitor well network. The discrete interval sampler was lowered to a depth of approximately 3 feet below the water table. In wells where the water column was greater than 10 feet, a second sample was collected approximately 4 feet above the bottom of the well.

Westbay™ Wells

The Westbay™ wells were sampled using specialized Westbay™ sampling equipment. Samples were collected by transferring collected water from the Westbay™ equipment directly into sample bottles. The wells were not purged before sampling began. Groundwater samples were initially collected from all 36 Westbay™ ports. Samples

were collected from selected ports only based on the analytical results in subsequent events. In recent monitoring events, the uppermost port in F&B-3 and F&B-4 has been dry due to the regional declining groundwater elevations.

2.2.7 Investigative Derived Waste

Investigative-derived wastes (IDW) generated during the field investigations included drill cuttings, drilling mud, development water, and purge water. All waste materials were handled according to the guidelines established in each facility's work plans and in accordance with state and federal regulations. No IDW was hazardous waste. A summary of IDW handling, laboratory results for IDW analyses, manhole entry permits, and related IDW documentation are included in Appendix I.

Soil

For wells that were drilled using a mud-rotary method, two forms of IDW were generated: drill cuttings and drilling mud. Drill cuttings were collected in roll-off bins. Upon completion of the wells, the mud was removed by a vacuum truck. Excess liquids standing in the cuttings bin were also removed by a vacuum truck. The contents of the vacuum truck were then transported to the subcontractor's yard and placed in another, 20-cubic-yard bin.

A representative sample from each bin (solids and liquids) was collected and analyzed for VOCs by EPA method 8260. An additional sample was collected for a paint filter analysis from each solid bin to determine whether free liquids were present in the waste. The samples must contain no free liquids to be disposed of as solid material, as per landfill requirements. Solid materials were disposed of at the Southwest Regional Landfill and liquid materials were disposed of at a land application farm near Goodyear, Arizona.

For the wells that were drilled using the air hammer percussion or hollow-stem auger drill methods-rotary method, only solid waste was generated. Cuttings were collected either in 55-gallon drums or in roll-off bins. The minimal water that was generated during drilling was allowed to evaporate. A composite soil sample was collected from the drums or bins and analyzed to evaluate appropriate disposal options. The drums or bins were typically moved to an off-site storage yard pending receipt of the analytical results. Following receipt, the solid materials were disposed at the Southwest Regional Landfill or Butterfield Landfill.

Water

Groundwater was extracted during the following RI activities: well development, groundwater sampling, and aquifer testing. All extracted groundwater from each facility's investigations was handled in the following manner. The purged water was containerized onsite in 55-gallon drums or a Baker tank on site and sampled for VOCs by EPA Method 624, priority pollutant metals, total recoverable oil and grease, total

cyanide, total sulfide, and pH. Following receipt of the analytical results, and appropriate disposal option was selected. Some of the extracted groundwater was disposed of at Resource Recovery Techniques of Arizona, Inc. Most of the extracted groundwater was disposed of in the City of Phoenix (COP) sanitary sewer system. A manhole entry permit was required in order to dispose of water in the COP sewer system. After obtaining the manhole entry permit, the extracted groundwater was disposed in the sanitary sewer in accordance with COP rules and regulations. Within 30 days following discharge of the water, a status report indicating the amount of water, date and time of disposal, and location of disposal was submitted to the COP. IDW generated during the aquifer testing program was treated with granular activated carbon (GAC) prior to discharge to the COP sewer system.

3.0 EARLY RESPONSE ACTION ACTIVITIES

Early response actions (ERAs), as described in A.A.C. R18-16-405, have been performed at the F&B facility only. Thus, the ERA activities described in this section pertain specifically to the F&B facility.

ERA activities at the F&B facility comprise 1) excavation and disposal of VOC-affected soil, 2) pilot testing of a soil-vapor extraction and treatment system (SVETS), and 3) installation and operation of a SVETS. Wastes derived from each of these activities were appropriately managed in accordance with the characteristics of each specific waste type.

On behalf of ADEQ, LFR completed an Early Response Action Plan (ERAP) dated May 16, 2000. The ERAP presented the proposed remedial measures to address VOC-affected soil at the F&B facility. These remedial measures included the installation of a soil-vapor monitoring (SVM) well network, and a SVETS. LFR installed SVM and soil-vapor extraction (SVE) wells in June and July 2000 and conducted an SVE pilot test in July 2000.

3.1 Summary of ERA Field Investigations

LFR conducted an initial investigation of the facility in June 2000, which provided an understanding of the site lithology and an approximation of the extent and location of the PCE soil-vapor source area beneath the former vapor degreaser sump area. SVE and SVM wells were installed at the facility and a pilot SVE test was performed during June and July 2000. The pilot test was designed to determine the effectiveness of SVE as a remediation alternative to treat the PCE-affected soil in the vadose zone. The entire pilot test is summarized in the "Summary Report Soil-Vapor Extraction Well Installation and Pilot Test, F&B Mfg. Co. Facility," dated October 31, 2000 ("the Summary Report").

LFR installed five SVE wells and one SVM well approximately 20 to 40 feet west of the former vapor degreaser sump location, on F&B property. The SVM well, SVM-1, is the closest of these wells to the former vapor degreaser sump location. During the installation of SVM-1, LFR collected soil samples from depths ranging from 5 feet bgs to 91 feet bgs. Three samples collected between 25 feet bgs and 65 feet bgs from SVM-1 did not contain detectable levels of PCE. However, a sample collected from the same borehole at 91 feet bgs contained detectable PCE at a laboratory reported value of 3,900 mg/kg. Additionally, soil samples collected during the drilling of three of the five SVE wells were found to contain concentrations of PCE; the highest concentration was 5,000 mg/kg.

3.2 PCE-Contaminated Soil Removal Activities

Excavation and disposal of VOC-affected soil located beneath the former degreaser sump was performed to cost-effectively remediate the affected soils in the vicinity of the suspected source of PCE contamination at the F&B facility.

3.2.1 Initial Soil Removal Activities

To minimize disturbance of F&B's operations, the excavation was completed in a span of five days during the Independence Day extended holiday weekend. In July 2000, LFR removed the vapor degreaser sump and highly contaminated soil from beneath the sump by excavating to a depth of approximately 11 feet bgs. Approximately 55 cy of contaminated soil and debris were removed. All excavated soil and debris was placed into roll-off bins and staged on the vacant lot immediately west of the F&B facility. This soil and debris was later characterized and appropriately disposed of as discussed in Section 3.6. Characterization sample results were as high as 1,100 mg/kg of PCE in one of the waste bin samples.

The 11-foot depth was achieved utilizing excavation equipment and shoring. Eleven feet was the limit of the excavation equipment. Further excavation was attempted manually; however, vapor concentrations were too high for worker exposure, upon disturbance of native soil. LFR also attempted to remove soils utilizing a vacuum truck; however, the soil was too dense (clayey) to be air lifted.

3.2.2 Subsequent Soil Removal Activities

Following these initial excavation activities, the portion of the F&B building surrounding the former degreaser sump location was removed to make room for larger equipment necessary to deepen the excavation and remove additional contaminated soil. During the week of September 16, 2001, LFR performed additional soil removal activities in the vicinity of the former vapor degreaser sump, resulting in the removal of 100 cy of contaminated soil to a depth of approximately 22 feet bgs. All excavated soil and debris was placed into roll-off bins and staged on the vacant lot immediately west of the F&B facility. This soil and debris was later characterized and appropriately disposed of.

The purpose of both of the soil removal operations was to excavate and dispose of as much of the most heavily contaminated soil as possible. The total excavation dimensions were approximately 15 feet wide by 13 feet long by 22 feet deep, with the volume of material removed equal to approximately 155 cy. The void created by the excavation was filled with concrete slurry and finished to grade. Excavated soil was placed into lined roll-off bins, and the soil was then characterized and transported off site for disposal. The ultimate disposition of the excavated soil is explained in Section 3.6.

3.3 Soil-Vapor Extraction Pilot Test

The SVE pilot test was conducted during the week of July 17, 2000. The pilot test was designed to determine the effectiveness of SVE as a remediation alternative to treat the PCE-affected soil in the vadose zone beneath the former vapor degreaser sump location. The entire pilot test is summarized in the Summary Report.

Before the initial SVE test activities began, LFR mobilized to the facility. On July 14, 2000, the SVE equipment trailer and electrical power generator were delivered to the facility and were set up. Additionally, piping connections between the SVE equipment and the SVE wells were made; and all equipment and instrumentation were tested. On July 17, 2000, the vacuum trials were run on several SVE wells to obtain estimates of operating parameters from those wells. The SVE pilot tests on wells SVE-1 through SVE-4 were performed between July 18 and 20. A combined test using wells SVE-1 through SVE-4 was performed on July 20. The pilot test for SVE-5 was performed on July 25, 2000. SVE-5 was installed after the initial four wells were tested, as a replacement for SVE-4, because SVE-4 did not produce sufficient flow.

3.3.1 Soil-Vapor Sampling Results

Soil-vapor samples were collected in July 2000 to determine the baseline PCE concentrations in the soil vapor from all SVE and SVM wells. The sample results are summarized below:

Location	Screen Interval (feet bgs)	Sample Date	PCE Conc. (ppmv)
SVE-1	20.6-34.4	7/18/00	2,000
SVE-2	42.7-60.2	7/18/00	7,900
SVE-3	71.8-76.5	7/19/00	17,000
SVE-4	85.5-95.1	a	a
SVE-5	75.1-79.8	7/25/00	12,000
SVM-1-30	25-30	7/27/00	220
SVM-1-48	43-48	7/27/00	2,900
SVM-1-61	56-61	7/27/00	7,300
SVM-1-77	72.5-77.5	7/27/00	11,000
SVM-1-95	90-95	7/27/00	20,000
SVM-2-30	25-30	7/27/00	930
SVM-2-48	43-48	7/27/00	2,200
SVM-2-61	56-61	7/27/00	3,600

Location	Screen Interval (feet bgs)	Sample Date	PCE Conc. (ppmv)
SVM-2-77	72.5-77.5	7/27/00	4,900
SVM-2-95	90-95	7/27/00	7,700
SVM-3-30	25-30	7/27/00	1,500
SVM-3-48	43-48	7/27/00	2,700
SVM-3-61	56-61	7/27/00	2,600
SVM-3-77	72.5-77.5	7/27/00	3,000
SVM-3-95	90-95	7/27/00	4,400

Notes:
a = SVE-4 could not be sampled due to lack of sufficient airflow.
ppmv = parts per million by volume

3.3.2 Site Lithology

Lithologic logs from SVM and SVE well borings, and the two soil borings advanced in the southern parking lot of the F&B facility, provided data regarding the vadose-zone sediments beneath the facility. Data from these borings indicated that sediments beneath the facility consist of damp silty clay from the ground surface to approximately 10 to 15 feet bgs. This damp silty clay is underlain by sediments ranging from sandy gravels to silty sands, with lesser amounts of sandy to silty clay, to a depth of approximately 75 feet bgs. Caliche was encountered at approximately 75 to 80 feet bgs. The caliche interval is underlain by silty clay to a depth of at least 92 feet bgs (the total depth drilled). Boring logs from groundwater wells installed throughout the site indicate that the interval from 80 feet bgs to approximately 220 feet bgs consists mostly of silty clay with interbedded sand lenses. Groundwater has historically been encountered as high as 102 feet bgs, and is currently encountered at approximately 120 feet bgs.

3.3.3 Equipment

The SVE equipment included a skid-mounted vacuum blower and appurtenant equipment such as condensate knock-out, silencer, filter, and associated piping, valves, and instrumentation. The vacuum blower used was a Roots RAI-36 positive displacement blower with a 5-horsepower motor. The blower operated at approximately 2,800 revolutions per minute and the literature indicated that it was rated for a maximum flow rate of 250 standard cubic feet per minute (scfm) and up to 10 inches of mercury vacuum.

The condensate knock-out was a steel centrifugal-type vapor-liquid separator with a 55-gallon reservoir. Water can be generated by SVE systems mainly from condensation of humidity in the extracted soil vapor. The silencer dampened the pulsation and

minimized noise generated by the blower. The filter removed particulates from the vapor stream to minimize damage to the blower.

GAC was used to control VOC emissions during the test. The GAC system included a single 200-pound adsorber piped inline on the vacuum side of the blower. The GAC was profiled and transported as a listed hazardous waste to Pollution Control Industries in Millington, Tennessee, for incineration.

The tests were performed by connecting the vacuum blower assembly to each individual SVE well using 2-inch flexible polyvinyl chloride (PVC) pipe. On the connector piping, a spool was installed that included a pitot tube/differential pressure gauge for flow rate measurement and a pressure/vacuum gauge.

3.3.4 Test Protocol and Data Collection

The purposes of the SVE tests were to collect data to evaluate the effectiveness of SVE at F&B, and to develop design criteria for a full-scale system.

Before the SVE tests began, the system was verified for tightness to ensure no leaks were present. Additionally, baseline pressure/vacuum measurements were collected from each interval of each SVM well.

At the start of each SVE test, initial vacuum and flow rate measurements were collected at the SVE well. Soil-vapor extraction was initiated from each SVE well at a reduced soil-vapor flow rate and then gradually increased during each test. This procedure was performed to obtain flow rate versus applied vacuum trends from each SVE well, as well as to evaluate the vacuum response at each SVM well interval versus applied vacuum at the SVE well. Once the vacuum response in nearby SVM wells appeared to stabilize, the vacuum applied to the SVE well was increased, thereby increasing the soil-vapor flow rate. After each applied vacuum increase, several rounds of SVM vacuum response data were collected.

Vacuum response measurements were collected from each SVM interval approximately every 15 minutes during the tests. The vacuum measurements were collected by direct connection to the top of the SVM interval casing. Threaded caps with hose barbed lab cocks were installed at the top of each SVM interval. A Magnehelic™ gauge was connected to the hose barb using flexible Tygon tubing for the vacuum measurement.

VOC concentrations were monitored periodically using a photoionization detector. These data were collected to evaluate the magnitude of VOC mass extracted from the soil beneath the former degreaser. Additionally, discrete soil-vapor samples were collected from the vapor stream extracted from the SVE wells near the end of the individual tests. The discrete samples were collected by direct connection using Summa® canisters from a port located on the blower system inlet piping.

3.3.5 Summary of Pilot Test Results

The pilot test data indicated that relatively high soil-vapor flow rates were achievable from wells SVE-1 and SVE-2. The flow rate of extracted vapor from well SVE-3 was found to be much lower than that from wells SVE-1 and 2, even at higher applied vacuum. Minimal vapor flow rates were measured from well SVE-5, even at the maximum applied vacuum. Again, no measurable vapor flow was observed from well SVE-4 at the maximum applied vacuum.

The data from the tests on wells SVE-1 and SVE-2 indicated that no significant increases in the soil-vapor flow rates were observed at applied vacuums above 50 or 60 inches water column (w.c.) Further, the SVM data indicated that little additional increase in vacuum response was detected above applied vacuums at wells SVE-1 and SVE-2 of 40 to 50 inches w.c. These applied vacuum measurements correspond to soil-vapor flow rates of approximately 100 to 130 scfm in each well.

The data collected from the test on well SVE-3 indicate that no significant change in the soil-vapor flow rate (25 scfm) was observed for applied vacuums above 82 inches w.c. At these operating parameters, sufficient vacuum response was detected at all the SVM wells to indicate influence from the vacuum applied at SVE-3.

The data collected from the SVM wells during tests on wells SVE-1, SVE-2, and SVE-3 indicate that vacuum response was measured in each interval at all SVM well locations, up to 180 feet from the former vapor degreaser area. As expected, the vacuum response in the SVM wells generally increased with an increase in applied vacuum at the SVE well and generally decreased with distance from the SVE well. These trends are typical of SVE systems.

It should be noted that, on occasion, vacuum responses were measured in SVM well intervals not horizontally corresponding with the screened interval of the tested SVE well. This may suggest that secondary porosity or some other type of cross-communication is present in the vadose zone. These data also suggest that extraction from SVE wells is not limited to the horizontal plane, and that influence across the entire vadose zone is likely present in the vicinity of the former vapor degreaser.

Soil-vapor flow rates from well SVE-4 were not measurable with existing equipment. The poor performance from this well was likely due to the low-permeability soils at the corresponding depth. Although vacuum response was measured in SVM intervals at 85 to 95 feet bgs during the other SVE tests, the SVE well bore was likely smeared with clayey material during drilling, thus limiting vapor flow. Although the test indicated that very little if any soil-vapor flow could be produced from this well, it is assumed through experience that SVE will affect the VOC concentrations in this soil interval due to VOC diffusion into the sandy soil interval above due to vapor diffusion from residual PCE in fine-grained material.

Using the data collected, approximately 239 pounds of PCE were extracted during the SVE pilot test activities.

3.3.6 Resulting Soil-Vapor Extraction System Design Parameters

The data collected from the SVE pilot test indicated that extraction from wells SVE-1, SVE-2, and SVE-3 would provide sufficient influence in the vicinity of the former vapor degreaser. Based on historical data (ERAP), as well as analytical results of soil samples collected both during well installation and at various locations inside the building in the area of the former vapor degreaser, the source of PCE-affected soils appears to be located directly beneath and in the immediate vicinity of the former vapor degreaser. The operating parameters used in the tests on wells SVE-1, SVE-2, and SVE-3 influenced areas well beyond the vicinity of the former vapor degreaser. The SVE data indicated vacuum influence up to 180 feet away (in SVM-3) from the SVE wells.

The data collected from the SVE test indicated that a soil-vapor extraction system using a blower capable of pumping up to 400 scfm at a vacuum of up to 95 inches w.c. would adequately influence the source of PCE-affected soil at F&B. Although results of the test indicate that the combination of wells SVE-1, SVE-2, and SVE-3 will produce approximately 300 scfm, it was recommend that the blower be oversized to accommodate potential additional wells in the future.

3.4 Summary of SVETS Installation, Startup & Routine O&M

As previously mentioned, LFR installed the SVM and SVE wells in June and July 2000. Following the production and approval of designs and the acquisition of access agreements, construction of the SVETS was conducted from June to September 2001. The purpose of the SVETS is to limit the threat to groundwater from PCE-contaminated soil in the vadose zone beneath the former vapor degreaser sump by extracting PCE-affected soil vapor from the source area vadose-zone soils. The following subsections contain a description of the SVETS as installed, the sampling points in the system, the shakedown activities that were performed prior to and following the system startup, and contaminated soil removal activities.

3.4.1 SVE System Description

As previously explained in Section 3.2, the SVE system includes five extraction wells (SVE-1, SVE-2, SVE-3, SVE-4, and SVE-5). All five of the extraction wells terminate in concrete vaults at the ground surface along the northwestern side of the F&B building and were installed at various angles under the building to place the screened portions of each well directly beneath the former vapor degreaser sump location at specified intervals.

Pertinent SVE well data are provided in the following summary.

SVE Well	Total Depth (feet bgs)	Zenith Angle (degrees)	Screen Length (feet)	Screen Interval (feet bgs)
SVE-1	34.4	45	20	20.6 – 34.4
SVE-2	60.2	29	20	42.7 – 60.2
SVE-3	76.5	21	5	71.8 – 76.5
SVE-4	95.1	16	10	85.5 – 95.1
SVE-5	79.8	20	5	75.1 – 79.8

The wells are connected to an underground piping network that conveys extracted soil vapor to the treatment system, which is located inside the fenced courtyard at the northwestern end of the F&B building. The underground piping network surfaces adjacent to the treatment system and terminates in a manifold that is connected to the treatment system.

Each extraction well consists of a 2-inch-diameter, slotted, schedule 40, PVC casing pipe screened in the vadose zone as described above. Each well includes wellhead equipment connecting the well to the extraction system piping network. Wellhead equipment consists of a sample tap with ball valve, a vacuum gauge, and a ball valve to isolate the well. The wellhead equipment is installed in traffic-rated, concrete underground utility vaults. Technical specifications and manufacturers' specifications for wellhead components and other SVETS components are provided in the Summary Report.

The extraction wells are connected to the manifold by 3-inch-diameter, schedule 40, PVC piping located in an underground trench. The extraction system piping slopes downward from the treatment system to the SVE wells to allow moisture in the piping to drain back into the wells. Five 3-inch lines carry extracted soil vapor from the SVE wells to the treatment system. These five main lines join into one 4-inch line to form a manifold. The manifold is then connected to the water separator and air filter, which is attached to the SVE skid.

The SVETS's major components are a water separator, an air filter, a blower, a silencer, an aftercooler, six carbon adsorption canisters (three pairs of vessels arranged in lead-lag series), and associated mechanical and electrical controls. Treated soil vapor is discharged via vent stacks on the tops of the three lag carbon vessels.

3.4.2 Soil-Vapor Treatment System Description

Downstream from the SVE blower and aftercooler, the extracted soil gas is discharged through the vapor treatment system. The vapor treatment system consists of three sets of GAC vessels that are set up in a lead-lag series. This system is designed to remove virtually all of the entrained VOCs from the soil-vapor stream before the stream is

discharged to the atmosphere. The treated vapor is discharged through a stack that extends approximately 12 feet above the ground surface on each lag GAC vessel.

3.4.3 Sampling Locations

Sampling ports are located at various places on the treatment system piping. Sampling ports for each SVE well are located at the manifold and are labeled SP-SVE-1, SP-SVE-2, SP-SVE-3, SP-SVE-4, and SP-SVE-5, corresponding to wells SVE-1 through 5, respectively. Sample port INF-1 is located downstream from the aftercooler unit and is used to sample the combined influent soil-vapor stream. Sample ports 1A, 2A, and 3A are located downstream from the lead vessel in each pair of carbon vessels and are used to collect samples for measuring breakthrough of the lead vessels prior to scheduling carbon change outs. Sample ports 1B, 2B, and 3B are located downstream from the lag vessel in each pair of carbon vessels and are used to sample the three effluent soil-vapor streams.

3.4.4 Startup Activities

During the week of August 19, 2001, equipment and control-system shakedown activities were performed. Startup and routine operation and maintenance of the SVETS were initiated on August 28, 2001.

Shakedown

After the system was completely assembled, the shakedown activities included a series of tests of the major SVETS components and the entire system. These included the following activities:

Testing the high vacuum alarm. The high vacuum alarm was tested by allowing the blower to pump air from the atmosphere, while slowly covering the flange opening to induce a high vacuum. The alarm was successfully triggered at approximately 13 inches of mercury (Hg) vacuum and the system automatically shut down immediately following the alarm condition.

Testing the low vacuum alarm. The low vacuum alarm was tested by completely opening the blower to the atmosphere during its operation so that a low vacuum situation was created. The alarm was successfully triggered at approximately 0.5 inch of Hg vacuum and the system automatically shut down immediately following the alarm condition.

Testing the high water alarm. The high water alarm was tested by filling the knock-out drum with potable water to produce a high water level in the tank. The alarm was successfully triggered at approximately 60 gallons of water and the system automatically shut down immediately following the alarm condition.

Testing the high pressure alarm. The high pressure alarm was tested by closing the valves on the exhaust (pressure) side of the blower to create a high pressure condition downstream from the blower. The alarm was successfully triggered at approximately 6.0 psi and the system automatically shut down immediately following the alarm condition.

Testing the high temperature alarm. The high temperature alarm was tested by shutting down the aftercooler and allowing the temperature to increase downstream from the aftercooler. The alarm was successfully triggered at 120 °F (49° Celsius) and the system automatically shut down immediately following the alarm condition.

All of the shutdown alarms functioned properly during the shakedown period.

Startup

Following shakedown, system startup activities commenced on August 28, 2001. The startup activities include the following:

Baseline SVM sampling. All 15 SVM wells were sampled on August 27, 2001, one day prior to startup, to provide baseline soil-vapor concentration data under static conditions.

SVE and treatment system sampling. Samples were collected from each sample port as well as the combined influent sample port and ambient air, approximately 1 hour after initial startup on August 28, 2001. This sampling was performed to determine the initial VOC concentrations within the soil-vapor stream from each SVE well and the initial VOC concentrations within the combined soil-vapor stream upon startup. On August 31, 2001, another sample was taken from the combined influent sample port to help characterize changes in VOC concentrations within the combined soil-vapor stream over time.

SVETS monitoring. Monitoring of the SVETS began immediately after startup. For the first hour, the SVETS was monitored every 10 minutes. The monitoring parameters included:

- the vacuum of the five SVE wells at the manifold (measured in inches of H2O)
- the influent temperature (measured in °F)
- the influent vacuum (measured in inches of Hg)
- the temperature after the blower(measured in °F)
- the temperature after the aftercooler (measured in °F)
- the pressure after the blower (measured in pounds per square inch gauge [psig])
- the total airflow (measured in scfm)

After the initial hour of increased monitoring frequency, these parameters were monitored on a daily basis during startup testing, which lasted approximately three days. Following startup, routine operation began on September 4, 2001, and these parameters were monitored two to three times a week.

SVETS operation modifications. During the first hour after initial startup, the air dilution valve was modulated to determine the optimum amount of dilution air to allow into the process stream. The air dilution valve was initially set to the fully open position, and subsequently closed in increments to provide multiple data points from which an optimal valve position could be chosen. It was finally determined that the system would perform best with the dilution valve totally closed, resulting in a process stream that consisted of 100 percent soil vapor.

3.4.5 SVETS Routine Operation and Maintenance

Routine operation of the SVETS includes inspection and record keeping, startup and shutdown procedures, and the adjustment of a series of valves and temperature controllers to optimize system performance. The routine operation and maintenance procedures performed on the SVETS are provided below.

SVETS Inspection and Record Keeping

Routine inspection of the SVETS is to be performed at least once per week. When applicable, system inspection shall coincide with periodic monitoring and sampling rounds. Additional site visits and system inspections are scheduled as needed for additional monitoring, maintenance, and repairs.

During routine operation and maintenance visits, visual inspection is conducted on the SVETS equipment and electrical controls located on the skid at the F&B facility. Observations and SVETS operating parameters are recorded on a field operation sheet entitled, “ADEQ F&B SVETS Weekly Log Sheet.”

Monitoring Program

The monitoring program consists of collecting routine field measurements with an FID, periodic measurements with a pitot tube airflow sensor, periodic treatment system samples for laboratory analysis, filling out a field operations sheet during each site visit, recording the vacuum at the wellheads, and recording the vacuum at the SVM wells. The field operations sheets are filled out a minimum of once every week or whenever a field technician is on site. Monitoring of the vacuum at the SVE wellheads and SVM wellheads are performed on a quarterly basis. Table 3 of the Summary Report presents a summary of the soil-vapor monitoring plan, including the monitoring point identification, monitoring parameter, method, type, and frequency.

The field operation sheet includes the name of the technician, the date and time of the visit, whether or not the system is running, whether or not there are any alarms present

and which alarms, the 12 monitoring points summarized below, the position of the dilution valve, the results of field sampling conducted with an FID, the results of field airflow measurements conducted with a pitot tube, and additional comments regarding SVETS operations.

The SVE well monitoring consists of monthly FID monitoring at the SVE manifold. Monitoring is performed by isolating each well at the manifold, attaching the FID to the sample port, opening the ball valve of the sample port, and waiting for 30 seconds to allow the FID to stabilize. The readings are recorded as parts per million (ppm) VOCs. The sample port valve is then closed and the extraction well flow rate valve is opened.

FID monitoring of the VOC concentrations at the soil-vapor treatment system consists of collecting samples from the influent to the carbon vessels and from between the carbon vessels in a Tedlar® bag. The sample in the Tedlar® bag is connected to a FID to measure the VOC concentration of the sample. The monitoring is performed this way so that the pressure from the SVETS will not overwhelm the pump in the FID and result in a false concentration reading. The readings are recorded as ppm VOCs. Monitoring of the airflow from each of the SVE wells at the SVE manifold consists of temporarily installing a Dwyer® pitot tube into the threaded ports on the extraction system pipes of the SVE manifold. A differential pressure gauge is attached to the pitot tube and the differential air pressure is recorded. This measurement along with the static pressure and the temperature are used to determine the airflow. The equation used can be found in the manufacturer's instructions in Appendix C of the Summary Report.

Personnel wear appropriate personal protective equipment (such as gloves and respirator) while monitoring the airflow on the pressure side of the system.

Monitoring of the vacuum at the SVE wellheads consists of opening the five wellhead vaults and recording the vacuum gauge readings in inches of water column from the existing gauges. Monitoring at the SVM wellheads is performed by opening the wellhead plates and attaching a vacuum gauge to each well and recording the vacuum reading in inches of water column.

Sampling Program

Sampling ports are located at various locations on the treatment system piping. Sampling ports for each SVE well are located at the manifold and are labeled SVE-1, SVE-2, SVE-3, SVE-4, and SVE-5, respectively. Sample port INF-1 (influent soil vapor) is located after the aftercooler unit. Sample ports 1A, 2A, and 3A are located at the effluent of the lead vessels in the first, second, and third pair of carbon vessels, respectively. Sample ports 1B, 2B, and 3B are located at the effluent of the lag vessels in the first, second, and third pair of vessels, respectively.

The sampling program consists of collecting vapor samples at the combined influent, the soil-vapor treatment system, and the SVM wells. The soil-vapor treatment system

samples consist of samples from sample port INF-1 and the carbon vessel sample ports 1A, 2A, 1B, 2B, 1C, and 2C. The SVM well samples consist of one sample from each of the five SVM wells within the three SVM vaults, resulting in a total of 15 SVM samples. These samples are collected on varying schedules, which may be revised in the future, as additional sampling data become available by which to evaluate SVETS performance.

SVETS Sampling

Samples from the soil-vapor treatment system are collected monthly immediately following the initial startup period. The sampling frequencies may be adjusted as required by the carbon loading rates and capacities. Each month a sample is taken of the combined influent (INF-1) and the effluent of all of the GAC vessels being used (1A, 2A, 1B, 2B, 1C, and 2C). Each sample is collected by attaching the quick-connector to the sample port, opening the ball valve of the sample port, purging the valve and quick-connector, attaching the 1-liter sample canister to the quick-connector, and allowing 30 seconds for collection of the sample. Then the sample canister is disconnected from the quick-connector, the sample port valve is closed, and the quick-connector is disconnected from the sample port valve.

Data gathered from these sampling events provide the instantaneous concentration of PCE, which then can be used to calculate the average daily amount of PCE captured.

SVM Sampling

The SVM samples are collected annually following the initial startup period. Each sample is collected by purging 3 well volumes of soil vapor from the SVM well with a vacuum pump, attaching the quick-connector to the sample port, opening the needle valve of the sample port, purging the valve and quick-connector, attaching the 1-liter sample canister to the quick-connector, and allowing 30 seconds for collection of the sample. Then the sample canister is disconnected from the quick-connector, the sample port valve is closed, and the quick-connector is disconnected from the sample port valve. The SVM sampling will continue annually, until increased monitoring is necessary to characterize the subsurface prior to decommissioning the SVETS.

SVETS Reporting

The remedial program for the facility includes periodic reporting to ADEQ. The quarterly reports include information related to the operation and maintenance of the SVETS.

3.5 SVETS Operational Summary

Through June 2008, approximately 41,549 pounds of PCE has been extracted from the vadose-zone soils beneath the former degreaser sump location at the F&B facility (Figure 28). Approximately 80 percent of the total PCE mass removal through June

2008 occurred during the first six months of operation of the SVETS. From startup through January 2002, approximately 34,400 pounds of PCE was extracted from the vadose zone. At startup, the SVETS mass removal rate was approximately 4,200 pounds per day (lbs/day) and dropped to approximately 40 lbs/day after approximately three months of operation. The SVETS mass removal rate was measured in March 2004 at approximately 5 lbs/day, and is anticipated to decline asymptotically over time. For a more detailed summary of SVETS operations, refer to the "F&B SVETS Operation & Evaluation Report" for the specific period of coverage.

Concentrations of PCE in SVE wells and SVM wells at all depth intervals have decreased since initial startup in August 2001. The following table presents the percent reduction of PCE that has been obtained in each of the SVE and SVM wells from start-up through the dates listed.

Well	Start Date	Last Sample Date	% Reduction
SVE-1	8/28/2001	9/11/2002	99.994
SVE-2	8/28/2001	9/11/2002	99.939
SVE-3	8/28/2001	9/11/2002	99.968
SVE-4	8/28/2001	9/11/2002	94.867
SVE-5	8/28/2001	9/11/2002	99.805
SVM-1-48	8/27/2001	12/17/2003	99.996
SVM-1-61	8/27/2001	12/17/2003	99.981
SVM-1-77	8/27/2001	12/17/2003	99.986
SVM-1-95	8/27/2001	12/17/2003	95.106
SVM-2-30	8/27/2001	12/17/2003	99.985
SVM-2-61	8/27/2001	12/17/2003	99.983
SVM-2-77	8/27/2001	12/17/2003	99.971
SVM-2-95	8/27/2001	12/17/2003	99.700
SVM-3-30	8/27/2001	12/17/2003	99.977
SVM-3-48	8/27/2001	12/17/2003	99.975
SVM-3-77	8/27/2001	12/17/2003	99.996
SVM-3-95	8/27/2001	12/17/2003	93.148

As shown in the table above, percent reduction of PCE in wells screened across the interval from approximately 85 to 95 feet bgs (SVE-4, SVE-5, SVM-1-95, SVM-2-95, and SVM-3-95) is lower than that measured in wells screened from approximately 20 to 85 feet bgs. This is likely due to the presence of low-permeability soils (caliches and/or silty clay) over the screen intervals for these wells that results in vapor flow rates that are significantly less than those in the more permeable soils from 20 to 85 feet bgs.

Based on the reduction in the concentrations of PCE in the SVE and SVM samples, it is likely that the majority of the vapor-phase PCE (i.e., over 99 percent in most instances) that was present at the time of SVE startup has been removed from the pore spaces of the soil. Thus, it is likely that the PCE mass removal rate is now being governed by the diffusion of dissolved PCE in vadose-zone moisture, the diffusion of PCE absorbed to soil particles, and possible residual dense non-aqueous phase liquid (DNAPL) PCE in the non-wetted pore spaces of the soil. Furthermore, based on the continual high concentrations of PCE found in the soil-vapor samples from SVM-1-95 and SVE-4 (screened at 85.5-95.1 feet bgs), it is likely that the majority of the PCE mass in the vadose zone exists within the silty clay layer, at approximately 80 to 100 feet bgs.

3.6 Investigative-Derived Waste

3.6.1 Soil Removal Action

All soil excavated during each of the two removal activities was placed into roll-off bins and staged on the vacant lot immediately east of the F&B facility. This soil was later characterized and appropriately disposed of.

For the initial removal action, which was conducted in July 2000, excavated soil and debris was disposed of at three different disposal facilities: 1) Waste Management Butterfield Station, Mobile, Arizona; 2) US Ecology, Beatty, Nevada; and 3) Onyx Incineration Facility, Port Arthur, Texas. Table 41 summarizes the quantity estimates, waste types, and ultimate disposal location. For the subsequent removal action, which was conducted in September 2001, all excavated soil and debris was characterized and disposed of as non-hazardous waste at Waste Management Butterfield Station, Mobile, Arizona.

3.6.2 SVETS Vapor-Phase Carbon

Transportation and disposal of the spent GAC is performed by Cameron Environmental Inc., and its subcontractors. The spent GAC is transported via a hazardous waste transporter to a hazardous waste landfill near Beatty, Nevada (US Ecology, Inc.). The spent carbon is incinerated and then landfilled. Copies of the Uniform Hazardous Waste Manifests and other materials pertaining to the spent GAC that was transported during each reporting period are located in Appendix D of each "F&B SVETS Operation & Evaluation Report." All destruction certificates are sent directly to the generator (ADEQ) and are not available in the "F&B SVETS Operation & Evaluation Reports."

4.0 HYDROGEOLOGY

The WCP North Plume site is located in the western portion of the Salt River Valley. Details regarding the regional and local geology and hydrogeology can be obtained from a report prepared by the USGS entitled, "Hydrogeology of the Western Part of the Salt River Valley Area, Maricopa County, Arizona" (Brown and Pool, 1989). Geologic information from that report and from more recent investigations is summarized below.

4.1 Regional Geology

The WCP North Plume site is located within the Western Salt River Valley Sub-basin of the Basin and Range physiographic province. The Basin and Range province is characterized by isolated mountain ranges separated by alluvial valleys and basins. The mountain ranges tend to follow a northwest-trending alignment. The fault-blocked mountain ranges are generally composed of a complex suite of igneous, metamorphic, and well lithified sedimentary rocks.

The Western Salt River Valley Sub-basin is an alluvium-filled basin of sedimentary deposits with a maximum projected thickness of approximately 11,000 feet (Brown and Pool 1989). The Sub-basin is mostly surrounded by mountains composed of Precambrian to middle Tertiary igneous and metamorphic rocks and minor amounts of Tertiary consolidated sedimentary rocks. Metamorphic rocks include schist, gneiss, metavolcanics, and quartzite. Igneous rocks include granite, rhyolite, and basalt. Tertiary sedimentary rocks overlying the crystalline rocks include the Tempe beds and Camels Head Formation (also known as the Red Unit). This unit consists of reddish breccia, conglomerate, sandstone, and siltstone. The crystalline and consolidated sedimentary rocks also form the basement complex that lies beneath Quaternary and late-Tertiary unconsolidated or semiconsolidated basin-fill alluvial sediments. The basin-fill deposits consist of interbedded conglomerate, gravel, sand, silt, and clay.

Groundwater occurs primarily in the basin-fill alluvium. The alluvium has been subdivided into unique hydrogeologic units that are discussed in detail below. The bedrock may transmit small quantities of water, primarily in fractures, but is not considered a significant source of water on a regional scale (Corkhill et al., 1993).

4.2 Site Geology

LFR's interpretation of the geology of the WCP North Plume site is based on the lithologic description of the cuttings from the borings and the downhole geophysical logs collected from well boreholes. Figures 29 and 30 show cross-sections of the area with LFR's geologic interpretation of the WCP North Plume site. The following sections discuss the different stratigraphic units encountered during RI drilling activities.

4.2.1 Alluvial Geology

Upper Alluvial Unit (UAU)

The UAU is Quaternary in age and consists primarily of gravel, sand, and silt deposited in an open basin as channel, floodplain, and alluvial fan deposits. In the WCP North Plume area, the UAU is approximately 80 feet thick and is unsaturated. UAU sediments in the WCP North Plume site represent a thick, coarsening upward sequence that appears similar to prograding alluvial fan deposits.

Middle Alluvial Unit (MAU)

The MAU is Quarternary and late-Tertiary in age and consists primarily of silt, clay, and siltstone with silty sand and gravel interbeds. The MAU was deposited in a closed basin primarily as playa deposits. Coarse-grained interbeds represent channel and flood plain deposits along drainages. These interbeds are the dominant water-yielding sediments in the MAU. They tend to be laterally continuous in the primary transport direction and pinch out laterally toward basin margins.

In the WCP North Plume site, the MAU begins at a depth of approximately 80 feet bgs. The base of the MAU was observed at depths ranging from 404 feet bgs at the WCP-33 well location to 598 feet bgs at the WCP-36 well location. A prominent feature of the MAU in the WCP North Plume site is a laterally continuous coarse-grained interval that occurs at approximately 250 to 280 feet bgs. Previous investigations in the area have described this interval as a basal UAU sand; however, it is overlain by nearly 200 feet of fine-grained sediments that are consistent with MAU sediments. In addition, sedimentary features of that and other coarse-grained intervals within the MAU (as observed on geophysical logs and in core samples) suggest a different depositional environment than the overlying UAU sediments. In general, textural trends (coarse basal contacts with fining upward sediment sequences) and sedimentary structures suggest the coarse-grained intervals within the MAU were deposited in a fluvial/flood plain environment. In contrast, UAU sediments in the WCP North Plume site represent thicker, coarsening upward sequences that appear more similar to prograding alluvial fan deposits.

The interval between 250 feet and 280 feet bgs also appears to be a very prolific zone with respect to groundwater production. Westbay® monitoring wells installed at the F&B facility provide high resolution vertical gradient information that shows both downward and upward vertical gradients converging on the target interval. This likely occurs because of head loss in the confined sandy interval resulting from regional pumping stresses and leakage (storage loss) from the confining layers both above and below that interval.

Lower Alluvial Unit (LAU)

The LAU is Tertiary in age and consists of a mixture of sand, gravel, silt, clay, siltstone, mudstone, and reworked basement material deposited as fluvial, alluvial fan, playa, and evaporite deposits. The LAU overlies the crystalline bedrock and red unit.

In the WCP North Plume site, the LAU consists primarily of coarse-grained sediments and varies from a few feet (presumably reworked basement) to 200 feet in thickness. The presence of a thick sequence of LAU sediments appears related to local faulting. LAU sediments are thickest within down-dropped fault blocks and are thin or absent on the up-thrown sides of those fault blocks. Where present, the LAU is fully saturated and confined by overlying MAU sediments.

4.2.2 Bedrock Geology

Bedrock was encountered at the base of each deep boring. Bedrock core was obtained and thin sections of the bedrock were sent to Spectrum Petrographics, Inc., in Winston, Oregon, for petrographic analysis. The bedrock was identified as a mixed cataclasite and was probably formed by regional dynamothermal metamorphism, hydrothermal alteration, and cataclasis of metapelite and altered quartz diorite. A copy of the thin section analysis is included in Appendix J.

Beneath the WCP North Plume site, LFR has interpreted the presence of a tilted down-dropped block of basement rock that dips to the southwest and is bounded by normal faults that trend in a northeast/southwest direction (Figures 29 and 30). The normal faults are likely related to a large concealed fault (Grand Avenue Fault) that trends northwest and lies to the northeast of the F&B facility. Basement rock on the southwestern side of this fault is deeper than that on the northeastern side. The normal faults beneath the F&B facility are likely splays off the larger Grand Avenue Fault. The depth to bedrock varied from 440 feet bgs at the WCP-34 well to 755 feet bgs at the WCP-36 well.

4.2.3 Hydraulic Properties of Hydrostratigraphic Units

LFR conducted an aquifer test on the nested well WCP-33 in the WCP North Plume site. The purpose of the test was to evaluate the hydraulic properties of the different hydrostratigraphic units within the WCP North Plume site. The results of the tests are presented in Table 25 and can be reviewed in addition to Basin & Range's falling head permeameter tests of the F&B Westbay wells (Table 7).

Based on the slug tests conducted during LFR's aquifer test program, the hydraulic conductivity in the upper MAU is estimated to be approximately 0.5 gpd/ft^2. This value is similar to hydraulic conductivities estimated from other monitoring wells in the area, which are screened over the same interval.

Estimated transmissivities for the middle-depth MAU well (WCP-33M) ranged between 1.2×10^4 and 3.25×10^4 gpd/ft. Storage coefficient estimated from the observation

wells were between 1.13 x 10^{-5} and 8.40 x 10^{-6} (dimensionless). The drawdown curves are generally typical of a leaky aquifer with storage in the confining layer.

Estimated transmissivities for the LAU well (WCP-33L) ranged between 1.38 x 10^{4} and 6.62 x 10^{4} gpd/ft. Storage coefficient estimated from the observation wells were between 2.22 x 10^{-3} and 5.86 x 10^{-5} (dimensionless). The drawdown curves are generally typical of a confined aquifer.

The estimated hydraulic conductivities from both the Basin & Range and IT Corporation aquifer tests are generally consistent with the results of LFR's shallow MAU slug test. The results of Basin & Range's falling-head tests are also consistent with the estimated transmissivities calculated from LFR's middle MAU and LAU aquifer tests assuming the aquifer thickness used by LFR of 80 and 350 feet, respectively.

No aquifer boundary conditions were observed within the identified stratigraphic units in the vicinity of the F&B facility because the durations of the aquifer tests were too short. Logistics precluded longer tests. In addition, there was no affect seen in the LAU despite the proximity of the pumping well to the Grand Avenue Fault zone, or the graben-like structure that is underneath the F&B facility.

The results of the aquifer tests were generally consistent with the pre-test conceptual model. The shallow MAU is believed to be unconfined or semiconfined depending on the nature of the sediments in the screened interval. The middle MAU behaved like a leaky aquifer with storage in the confining layer. The LAU behaved like a confined aquifer.

4.3 Groundwater Flow Conditions

Groundwater elevations have been monitored on a regular basis at the WCP North Plume site since 1999. Depth to groundwater data have been used to determine horizontal and vertical groundwater flow directions and produce potentiometric surface maps since November 1999.

4.3.1 Groundwater Elevations

Regional

Regional groundwater flow in the West Salt River Valley is greatly influenced by groundwater pumping. Historical water-level elevation contour maps developed using historical data from 1913 show a west to southwest flow direction having a gradient of approximately 0.002 (USBR, 1977). Major sources of recharge in the Salt River Valley are from infiltration in the Salt River, seepage losses from irrigation canals and excess irrigation.

Increased groundwater usage has resulted in regional groundwater level declines and local groundwater sinks near pumping centers that have altered natural gradients. Seasonal variations in groundwater demand and pumping have also resulted in transient groundwater elevation conditions. In recent years, the Salt River Valley has been experiencing a drought that has caused groundwater elevations to decline in all alluvial units throughout the basin.

WCP North Plume Site

Shallow MAU

Following the regional trend of groundwater elevation decline, the water table in the WCP North Plume site has declined by approximately 35 feet since late 1995. Depth to groundwater in the area in 1995 was approximately 105 feet bgs (Earth Tech, 1994). In 1999, depth to groundwater ranged from 115 to 124 feet bgs (Appendix F). In 2003, depth to groundwater ranged from approximately 126 to 140 feet bgs. The Grand Canal, which is located to the south of the WCP North Plume site, was historically a major source of artificial recharge to the UAU. The Grand Canal was lined in early 1998 and its local influence on recharge to the UAU has diminished, contributing to the water table decline.

Historically, higher groundwater elevations have been observed in wells WCP-32 and the shallow F&B Westbay™ ports. Variations in well construction along with changes in lithology may cause elevation data to vary between wells based on the elevation of the screen interval. For example, the water level in WCP-32 may be higher than the water level in other nearby wells because of differences in well construction and the presence of vertical gradients. Alternatively, the water elevation in this well may be higher than in other shallow wells because the screen interval does not intersect a sand lens commonly found at this horizon.

Shallow monitoring wells located on the northwestern side of the WCP North Plume site (WCP-65S, WCP-66S, WCP-67S, WCP-38S, WCP-39S, and GSC-31, in particular) appear to exhibit seasonal fluctuations in groundwater elevation while other shallow monitoring wells typically show a constant decrease in groundwater elevation. February and March appear to be high groundwater elevation months while August and September appear to be the lowest groundwater elevation months.

Groundwater elevations in monitoring well WCP-66S are particularly unusual in that they are consistent with the groundwater elevations in the LAU monitoring wells. In addition, the seasonal fluctuations that are evident in the LAU wells are mimicked by WCP-66S, which is screened from 118 to 158 feet bgs. Based on the lithologic log for WCP-66S, it appears that this well is screened predominately in finer grained materials with some sandy intervals. In addition, during the drilling of WCP-66S, auger refusal was encountered at a depth of approximately 125 feet bgs. The initial boring was abandoned and a new boring was drilled using an air rotary casing hammer drill rig. Drill cuttings below 125 feet bgs indicate hard, cemented materials and the drill rig had difficulty drilling through this material.

Groundwater elevations in WCP-66S and other deep, LAU monitoring wells suggest that a connection exists between the shallow MAU and LAU in this area. The proximity of this well to nearby normal faults suggests that the lithologic unit that WCP-66S is screened across may be in communication with deeper alluvial units through fault-related means.

Lower MAU and LAU

Within the WCP WQARF area, there are seven municipal wells owned by the COP and nine irrigation wells operated and maintained by the Salt River Project (SRP). Only one COP well is active (COP 72) and is pumped as needed based on demand. This well is located approximately 4,500 feet northeast of the F&B Mfg. Co. facility. Four of the SRP irrigation wells (11.2E-7.7N, 10.5E-7.5N, 9.5E-7.7N, and 8.5E-7.5N) have not been pumped since 1999 per an agreement with ADEQ because of their potential influences on contaminated plume migration. The other five wells (8E-8.5N, 7.5E-7.5N, 8E-6.5N, 7E-6.8N, and 7E-7.8N) are pumped as needed based on demand. In general, demand for groundwater is greater in summer months and tends to decline in the winter months. As a result of changes in pumping volumes, seasonal variations in groundwater elevations are observed in monitoring wells that are screened across the same units as the pumping wells. These seasonal variations are mainly seen in wells screened across the sand lens in the MAU (250 to 290 feet bgs; "M" wells) and in the LAU ("L" wells).

Groundwater elevations in the deeper wells (MAU and LAU) have also exhibited a generally decreasing trend since 1999, but with seasonal variations. Typically, the groundwater elevations in the deeper monitoring wells tend to increase during the winter months and decrease during the summer months. This is likely due to the influences of regional groundwater pumping. Since 1999, groundwater elevations in the MAU and LAU have decreased by approximately 12 and 10 feet, respectively.

4.3.2 Horizontal Groundwater Flow

Middle Alluvial Unit

Shallow MAU

Depth-to-groundwater data have been collected over the last five years and have been used to calculate groundwater flow directions and produce potentiometric surface maps. Potentiometric maps of the WCP North Plume site have been prepared for May 2001, December 2003, March 2004, September 2004, March 2005, September 2005, March 2006, September 2006, March 2007, September 2007, March 2008, and June 2008 (Figures 31 through 42). Groundwater data collected from the monitoring events indicate that groundwater flows generally to the northwest across the WCP North Plume site. However, a southwesterly component of flow is seen along the southern boundary of the WCP North Plume site.

Flow directions have historically been influenced by pumping associated with groundwater remediation activities on the COP's Glenrosa Service Center facility located between the F&B Mfg. Co. facility and the Rinchem facility. A groundwater remediation system was installed in response to a gasoline release and operated from 1988 to October 2000. Currently, the COP is in the process of constructing an air sparge system to further remediate the gasoline release.

Lower MAU

Potentiometric maps have also been produced for wells screened in the lower MAU ("M" wells) for December 2000, December 2002, March 2003, September 2004, September 2005, September 2006, September 2007, and March 2008 (Figures 43 through 50). Groundwater data indicate that groundwater flow is predominantly to the west across the WCP North Plume site. Flow directions in the lower MAU are likely controlled by pumping systems to the west.

Lower Alluvial Unit

In the LAU, water level elevations increase with increasing depth of the screen interval demonstrating an upward vertical gradient. The only LAU wells monitored in the WCP North Plume site are located immediately around the F&B Mfg. Co. facility. The deep wells are screened over very different intervals and the elevation data should not be considered representative of a homogeneous unit. However, the groundwater elevation data from these wells apparently indicate that the groundwater flow direction in the LAU is generally in a southerly direction.

4.3.3 Vertical Groundwater Flow

The vertical flow generally converges toward the prolific water-bearing sands and gravels from 255 to 280 in the lower MAU (Figures 51 and 52). Detailed vertical gradient data collected from the F&B Westbay™ well ports show that both downward and upward vertical groundwater gradients are evident in the MAU that converge towards this sandy interval. This likely occurs because of head loss in the confined sandy interval resulting from regional pumping stresses and leakage (storage loss) from the confining layers both above and below that interval.

5.0 DATA QUALITY ASSESSMENT

Data quality assessment was performed in accordance with the procedures outlined in the following Data Management Plans (DMPs) and QAPPs:

- LFR's "Data Management Plan for the F&B Mfg. Co. Facility, West Central Phoenix North Plume Site," dated October 1999
- LFR's "Quality Assurance Project Plan for the F&B Mfg. Co. Facility, West Central Phoenix North Plume Site," dated October 1999
- Weston's "Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Rinchem Facility, WCP North Plume Site, 4115 East Turney Avenue, Phoenix, Arizona," dated April 2000
- Weston's "Data Management Plan, Rinchem Facility, WCP North Plume Site, 4115 West Turney Avenue, Phoenix, Arizona," dated January 2000
- Weston's "Data Management Plan, Hill Brothers Facility, WCP North Plume Site, 4450 North 42nd Avenue, Phoenix, Arizona," dated August 2000
- Weston's "Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Hill Brothers Facility, WCP North Plume Site, 4450 North 42nd Avenue, Phoenix, Arizona," dated February 2001
- Weston's "Data Management Plan, Phase II Remedial Investigation/Feasibility Study, Pyramid Industries Site, 4330 North 39th Avenue, Phoenix, Arizona," dated July 1999
- Weston's "Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Pyramid Industries Site, 4330 North 39th Avenue, Phoenix, Arizona," dated July 1999

5.1 QA/QC Techniques and Results

QA/QC techniques are outlined in detail in the above-mentioned QAPPs. QA/QC included procedures and protocols to ensure that technical data generated during the investigative and remedial activities for the WCP North Plume site are accurate, precise, and complete. QA is defined as an integrated program designed to ensure reliability of monitoring and measurement data. QC is defined as the routine application of procedures for obtaining prescribed performance standards for monitoring and measuring.

QA/QC techniques for sampling include adherence to the procedures outlined in EPA approved methodologies, ADEQ Sampling and Guidance Documents, and the project FSP. These procedures apply to soil and groundwater sampling and decontamination procedures, sample numbering, sample handling, and sample documentation.

QC measures were implemented to ensure the accuracy and representativeness of field and analytical data. Such QC measures implemented at the site included the collection of field quality control samples (field blanks, trip blanks, and field duplicates). The

frequency of the collection of these quality control samples was outlined in the QAPPs. In addition, performance evaluation samples were submitted to the laboratory to check laboratory QC, and the contracted laboratory was required to follow a strict QC program, which included the analysis of blank spikes, laboratory control samples, method blanks, surrogates, matrix spike/matrix spike duplicates, internal standards, duplicate sample analysis, and known value check analysis.

Field equipment was required to be calibrated each day and recorded on field sheets or in a field log book. Field measurements such as water levels, purge parameters, and organic vapor analysis were recorded in the field book or on daily log sheets.

Assessment of both field and laboratory activities was evaluated by audits. Three types of audits, performance, system, and field, were utilized during field activities. The performance audit is a review of the existing project and QC data to determine the accuracy of a total measurement system or component of the system. This was accomplished by submitting a performance evaluation sample to the laboratory.

A system audit is used to verify adherence to QA policies and standard operating procedures. A system audit may involve the on-site review of equipment and personnel at laboratories and offices. Prior to the start of field sampling, a meeting was conducted with the contracting laboratory to review procedures and policies.

A field audit involves an site visit by the auditor (e.g., Project Manager, Project Director, ADEQ Project Manager) to the field site where field activities are being conducted. During the course of the field activities, LFR's and Weston's Project Managers as well as ADEQ's Project Hydrogeologist and ADEQ's Project Manager made several trips to the site to observe field activities.

5.2 Data Validation

A thorough review of the data was performed in accordance with the QA/QC program detailed in the QAPPs for each facility investigation. Laboratory data underwent a data validation process that included activities conducted by the following three groups:

- laboratory personnel
- LFR and Weston QA Officer
- data validation contractor (Quality by Design)

Laboratory personnel validated data at the time of analysis and reporting through reviews of the raw data for any nonconformance of the analytical method protocols. At a minimum, laboratory data will be validated according to the CLP criteria outlined in the following documents:

- Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis (U.S. EPA, 1994)

- Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analysis (U.S. EPA, 1994)

When the data was received from the laboratory, a completeness check was performed on 100 percent of the data (see Section 4.3.2.1 of the F&B QAPP). The cursory review consisted of a check with the chain-of-custody form to see that all samples were received and reported, that the analyses requested were analyzed for, and that the results appear to be in the format requested for submittal to ADEQ. An analysis completion form was also completed during the review of each laboratory report. Laboratory data that were collected to characterize waste for disposal purposes were not reviewed by a QA Officer as discussed in the project QAPPs.

Following the completeness check, the data was entered into a preliminary electronic database. Data verification included an evaluation of data provided on the laboratory's typewritten report. Data validation consisted of a review of sample and QC results and the accompanying raw data. Data verification and data validation procedures are described fully in each facility's project QAPP.

Initially, Quality by Design conducted full CLP equivalent data validation on all analytical data collected to characterize the site, including quarterly groundwater samples. Several issues arose during the validation process of the laboratory data. Some of the issues included the following:

- incorrect documentation, including missing information, incorrect reporting, incorrect dilution
- incomplete documentation, including missing QC analyses, missing custody documentation, omitted information
- chain-of-custody discrepancies between laboratories

Corrective actions for these issues involved the following:

- Quality by Design issued notices requesting the laboratory to respond to the issues at hand. The contracting laboratory was required to respond in a timely fashion in order for Quality by Design to complete the validation report.
- The contracting laboratory was required to provide the missing documentation to Quality by Design.
- Laboratory reports with incorrect or missing information were reissued with the corrections.
- Field personnel were requested to print legibly on chain-of custodies to avoid confusion by the laboratory.

Once the data were validated, Quality by Design issued a final report that described the acceptability of the reported laboratory data, any deficiencies found, and recommendations regarding the use of the data. The report also included a summary table listing all data qualifier flags and recommendations. The majority of data were not flagged. Data that was rejected was not used in the analysis. The data were flagged largely due to laboratory control issues. These data are marked in the final reports and in the electronic database as warranted.

6.0 NATURE AND EXTENT OF CONTAMINATION

The understanding of the nature and extent of soil contamination at each of the facilities and groundwater contamination within the WCP North Plume site has been developed from data generated during the field investigations presented in Section 2.0. The following sections discuss the distribution of the VOC contaminants in the soil and groundwater in the WCP North Plume site.

6.1 Contaminants

6.1.1 Contaminants of Concern

Several contaminants have been detected in groundwater and soil samples collected during field investigations at the F&B, Pyramid, Rinchem, and Hill Brothers facilities and in the WCP North Plume site. The primary contaminants of concern are PCE, TCE, and 1,1-DCE. These compounds have been detected in soil samples and groundwater samples collected from the facilities and/or the WCP North Plume wells. The relevant standards against which these contaminants are compared are established by the State of Arizona and include AWQS, GPLs, and SRLs. The following table lists the relevant standards for all the contaminants of concern at the WCP North Plume site.

Contaminant of Concern	AWQS (µg/l)[1]	GPL (mg/kg)[2]	Residential SRL (mg/kg)	Nonresidential SRL (mg/kg)
PCE	5	1.3	53	170
TCE	5	0.61	27	70
1,1-DCE	7	0.81	0.36	0.8

1. µg/L = micrograms per liter
2. mg/kg = milligrams per kilogram

Detectable concentrations of contaminants of concern above the GPL and/or SRLs have been detected in soil at the F&B Mfg. Co. facility (PCE), Pyramid facility (PCE), and Rinchem facility (PCE and TCE) as shown in Tables 3, 4, 8, 15, 27, 28, 29, and 36. The presence of 1,1-DCE is likely due to the degradation of PCE and/or TCE by reductive chlorination.

Detectable concentrations of contaminants of concern above AWQS have been detected in groundwater samples at the F&B Mfg. Co. facility (PCE, TCE, and 1,1-DCE), Pyramid facility (PCE, TCE, and 1,1-DCE), Rinchem (PCE, TCE, and 1,1-DCE), and Hill Brothers facility (PCE, TCE, and 1,1-DCE) as shown in Tables 2, 6, 10, 17, 20, 30, 38, and 39. In addition, groundwater monitoring results from wells installed on or adjacent to each facility have indicated PCE, TCE, and 1,1-DCE concentrations above AWQSs (Tables 2 and 6; Appendix F).

6.1.2 Other Detected Contaminants

Vinyl chloride has been detected in the past in groundwater at concentrations above the AWQS at the Rinchem facility. Recently, however, concentrations of vinyl chloride have been below laboratory detection limits and the AWQS. Detectable concentrations of cis-1,2-DCE and vinyl chloride are likely due to the degradation of PCE and/or TCE by reductive chlorination.

Detectable concentrations of several petroleum hydrocarbons have been previously observed in soil samples collected from investigations conducted at the Pyramid and Rinchem facilities, but none above the SRLs and GPLs. Petroleum hydrocarbons have been detected in groundwater samples collected during monitoring events for the WCP North Plume site and have largely been associated with wells located on or near the COP Glenrosa Service Center where a documented gasoline release has occurred.

Acetone has been detected in soil samples collected at the Rinchem facility but not at concentrations above the residential SRL. Methylene chloride has also been detected in soil samples at the Rinchem facility and in dry well sediment samples at the Pyramid facility at concentrations below the residential SRL. Methylene chloride has also been detected in groundwater at the Rinchem facility.

In addition, elevated concentrations of certain metals have been detected in soil samples collected from the F&B Mfg. Co. and Pyramid facilities. Table 3 shows a summary of the metals results at the F&B Mfg. Co. facility and Tables 9, 27, and 29 show a summary of metal concentrations detected at the Pyramid facility. Chromium was detected in soil samples collected at the F&B Mfg. Co. facility. Soil samples were analyzed for chromium following the Toxicity Characteristic Leaching Procedure (TCLP). TCLP is a sample preparation method for characterizing wastes under the Resource Conservation and Recovery Act (RCRA) regulations that involve leaching and diluting of the sample. The RCRA Regulatory Action Level for chromium is 5.0 mg/l. Chromium was detected at concentrations between <0.05 to 0.24 mg/l. However, the TCLP concentration is not equivalent to total chromium concentrations, on which the SRLs are based.

Both arsenic and chromium were detected in soil samples at the Pyramid facility. Arsenic was detected at concentrations above the SRLs but not the GPL (Table 9, 27, and 29). Typical background concentrations of arsenic in soils from the Phoenix

metropolitan area range from 3.1 mg/kg to 24 mg/kg with an average concentration of 9.4 mg/kg (Ball, 1990). Soil sample results for chromium were below both the SRLs and GPL (Table 9, 27, and 29).

Metals have been detected in groundwater samples above AWQS at the Pyramid facility. Arsenic, beryllium, chromium, lead, and nickel were detected in groundwater samples collected from borings (Table 11). Chromium was detected above the AWQS in groundwater samples collected from WCP-32.

Nitrate-Nitrite (as N) has historically been detected above AWQS in groundwater from samples collected at the Rinchem facility (Table 32). Concentrations ranged from 6.6 mg/L to 25 mg/L. The presence of nitrate-nitrite (as N) was used as an indicator that reductive dechlorination was occurring in groundwater at the facility.

The following table lists the relevant standards for other detected contaminants at the WCP North Plume site.

Other Detected Contaminants	AWQS (µg/L)[1]	GPL (mg/kg)[2]	Residential SRL (mg/kg)	Nonresidential SRL (mg/kg)
cis-1,2-DCE	70	4.9	31	100
TCA	200	1	1,200	4,800
Vinyl Chloride	2	NE	0.016	0.035
Benzene	5	0.71	0.62	1.4
Toluene	1,000	400	790	2,700
Ethylbenzene	700	120	1,500	2,700
Xylenes (total)	10,000	2,200	2,800	2,800
Acetone	NE	NE	2,100	8,800
Methylene Chloride	5	NE	77	180
Nitrate-Nitrite (as N)	10	NE	100,000 (Nitrate) 6,500 (Nitrite)	1,000,000 (Nitrate) 68,000 (Nitrite)
Arsenic	50	290	10	10
Beryllium	4	23	1.4	11
Chromium	100	590	2,100	4,500
Lead	50	290	400	2,000

Other Detected Contaminants	AWQS (µg/L)[1]	GPL (mg/kg)[2]	Residential SRL (mg/kg)	Nonresidential SRL (mg/kg)
Nickel	100	590	1,500	34,000

Note:

1. µg/L = micrograms per liter
2. mg/kg = milligrams per kilogram
3. NE = Not Established

6.2 Contaminant Sources

F&B Mfg. Co. Facility

Based on results of soil-gas, soil, and groundwater sample chemical analyses, PCE is the primary VOC of concern at the F&B Mfg. Co. facility. PCE has been detected at the highest frequency and at concentrations that are orders-of-magnitude higher than other VOCs in soil gas, soil, and groundwater samples collected from the facility. This finding is consistent with the use of PCE in degreasing operations from approximately 1967 to 1987.

Results of previous investigations also indicate that soil directly beneath the degreaser is the primary source for PCE in the vadose zone and in underlying groundwater. PCE was detected in a soil sample collected beneath the degreaser from a depth of approximately 5 feet bgs at a concentration of 5,400 mg/kg (Table 3). PCE was also detected at 710 mg/kg (40 feet bgs), 180 mg/kg (80 feet bgs), and 66 mg/kg (100 feet bgs) beneath the degreaser (Table 4). As discussed in Section 3.2.1, LFR removed highly contaminated soil from beneath the vapor degreaser sump by excavating to a depth of approximately 11 feet bgs. This soil contained concentrations as high as 1,100 mg/kg of PCE (Table 41). These data indicate that PCE released from the degreaser likely migrated vertically through the vadose zone to groundwater.

PCE has also been detected in soil-gas samples collected from other portions of the facility. For example, PCE has been detected at concentrations up to 1,510 µg/l in soil-gas samples collected from the southern parking lot, and at a concentration of 140 µg/l in a sample collected from the northeastern corner of the facility (Tables 1 and 5). PCE was not detected at concentrations above 1 mg/kg, however, in soil samples collected from these locations.

Pyramid Facility

Pyramid facility manufactured telephone and television cable riser boxes. Operations at the facility required the use of many chemicals, including acids, caustics, heavy metals, paints, and methylene chloride. Several source areas have been identified during site investigations as detailed in Section 1.6. Based on results of soil-gas, soil, and

groundwater investigations, PCE, TCE, 1,1-DCE, methylene chloride, and arsenic have been detected at the Pyramid facility. Elevated concentrations of PCE and methylene chloride have been detected in the southwestern portion of the facility. The highest concentrations of PCE in soil were detected in HB-6 at 80 feet bgs (2.5 mg/kg) and were detected at concentrations above the GPL (Table 8). Arsenic has been detected in soil samples along the northern portion of the property (Table 9, 27, and 29). Arsenic, beryllium, chromium, lead, and nickel have been detected in groundwater samples along the western and southern sides of the property (Table 11).

Although PCE use at Pyramid has not been documented, analytical results of shallow soil samples collected from the southern and western portions of the facility indicate that possible releases occurred near the loading dock/dry well, paint room, and historical hook cleaner areas. Methylene chloride and PCE were detected in the dry well sediment sample. Samples collected from soil borings drilled near the dry well also had detectable concentrations of these contaminants, indicating that contaminants may have been introduced to the subsurface through the dry well (Weston, 2002).

An on-site source area for 1,1-DCE and TCE was not clearly identified. Samples from only one soil boring (B-22) had detectable concentrations of either compound (Table 28). This boring was located on the Billboard Poster property near the locations where the highest 1,1-DCE concentrations in soil-gas were detected (Table 31).

Results of Hydropunch® groundwater sampling and the groundwater sampling from the four monitoring wells installed as part of the site characterization confirm that the highest concentrations of VOCs are on the southern side of the Pyramid facility (Table 10). This is also consistent with the results of groundwater sampling from WCP-31. Monitoring well WCP-31 has had consistently high concentrations of PCE (Appendix F).

Weston's Site Characterization Report (Weston, 1998b) indicated that spills and poor hazardous waste handling practices have been documented in previous investigation reports. Weston concluded that on-site activities have affected soil and may have affected groundwater at the facility (Weston, 2002b). However, the distribution and concentration of VOCs detected in groundwater indicate a greater influence from off-site sources (specifically, the F&B facility). The distribution and concentration of VOCs detected in groundwater samples from beneath the Pyramid facility and the presence of VOCs in soil-gas samples are most likely associated with the groundwater plume emanating from the F&B facility.

Rinchem Facility

Rinchem operated a chemical warehouse and distribution facility that handled solvents, oils, and fuels. Rinchem also blended custom solvents at this facility. Chemicals were stored in a tank farm located on the western side of the property. A repackaging area and chemical processing area were located immediately adjacent to the tank farm.

Soil and soil-gas samples collected at the facility indicate the presence of VOCs such as PCE, 1,1-DCE, TCA, DCA, and cis-1,2-DCE. The highest concentrations of PCE, TCE, TCA, and methylene chloride were detected in soil samples from boring B-13 at 30 and 50 feet bgs in boring B-13, located near a concrete sump in the former repackaging area, at 21 mg/kg, 1.2 mg/kg, 17 mg/kg, and 0.78 mg/kg, respectively (Table 15). Soil samples collected near the former repackaging area also contained detectable concentrations of DCA and cis-1,2-DCE. Surficial soil samples collected in the former tank farm area also contained concentrations of benzene, toluene, ethylbenzene, total xylenes, and petroleum hydrocarbons (Table 15).

Analytical results for soil and soil-gas samples collected in May 2002 near the former repackaging area and Sump-1 suggest that contaminated soils still exist in the subsurface. Concentrations of VOCs were detected in soil samples from WCP-49/SB-4 boring to a depth of 130 feet bgs (Table 36). PCE was detected above its SRLs and/or GPLs to a depth of 40 feet bgs. TCE was detected above GPLs at 20 and 25 feet bgs. Concentrations of acetone, cis-1,2-dichloroethene, 1,1-dichloroethane, MEK, 4-methyl-2-pentanone, toluene, ethylbenzene, and total xylenes were also detected in soil samples from the WCP-49/SB-4 boring. Soil samples collected from WCP-74 boring had low concentrations of methylene chloride at depths of 135 feet bgs (0.16 mg/kg) and 165 feet bgs (0.15 mg/kg) as shown in Table 34. Of the seven borings drilled and sampled, WCP-49/SB-4 was located where the highest VOC concentrations were detected (Table 36).

Groundwater samples collected using the Hydropunch® method from deeper soil borings (B-5 and borings B-8 through B-13) indicated that the highest concentrations of contaminants were detected in a groundwater sample collected from B-13 beneath the former repackaging area (Table 17). Concentrations of VOCs detected in a groundwater sample collected from boring B-5, located south and hydraulically upgradient from boring B-13, were significantly lower, suggesting a release of hazardous substances to groundwater beneath the facility.

Hill Brothers Facility

Soil and soil-gas samples collected during EMCON's Preliminary Site Characterization near the former solvent repacking area, the maintenance storage and fuel island area, the brine tanks and maintenance shade canopy area, and the retention basin indicated the presence of VOCs, including PCE, TCE, 1,1-DCE, and TCA at concentrations above laboratory reporting limits (EMCON, 1997; Table 19 and 20). Soil samples collected at a depth of 100 feet bgs near the former solvent repacking area contained PCE and TCE at maximum concentrations of 0.031 mg/kg and 0.032 mg/kg, respectively (Table 19). PCE was also detected in soil near the drum loading area at a depth of 5 feet bgs at a concentration of 0.026 mg/kg (Table 19). Hydropunch® groundwater samples indicated the presence of PCE, TCE, and 1,1-DCE in groundwater above their respective AWQSs (Table 20). The highest VOC concentrations in groundwater were detected in boring B-2 near the former solvent packing area.

A passive soil-gas survey was performed by Geomatrix in 2003 to provide a screening level evaluation of potential VOC release areas identified in previous investigations and to assess if these areas needed additional investigation (Geomatrix, 2003). PCE, TCE, 1,1-DCE, TCA, chloroform, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, chlorobenzene, carbon tetrachloride, and 1,4-dichlorobenzene were detected. PCE, TCE, 1,1-DCE, and chloroform were detected at the greatest concentrations in the vicinity of the previously suspected source areas (Appendix B). The maximum concentration of PCE detected was 46.78 µg per sample at the PG-13 location. The maximum concentration of TCE detected was 25.78 µg per sample at the PG-14 location. The maximum concentration of 1,1-DCE detected was 209.57 µg per sample at the PG-14 location.

6.3 Distribution of Contaminants

6.3.1 Distribution and Trends of Soil Contamination

Volatile Organic Compounds

F&B Mfg. Co. Facility

Soil and soil-gas samples collected at the F&B Mfg. Co. facility between 1989 and 1991 indicate that the former vapor degreaser is the primary source of subsurface PCE contamination. The soil sampling data indicated that the highest PCE concentrations extended from approximately 1 foot to 105 feet bgs, in the area around the former vapor degreaser (Figure 9). PCE concentrations between 1 foot and 105 feet exceeded GPLs and residential SRLs. The highest concentration was detected at a depth of 5 feet bgs near the former vapor degreaser at 5,400 mg/kg (Table 3). The following ranges of PCE contamination were detected: 0.42 to 710 mg/kg at 25 feet bgs; 4.3 to 5.7 mg/kg at 50 feet bgs; 0.35 to 180 mg/kg at 76 feet bgs; and 61 to 66 mg/kg at 100 feet bgs (Table 4).

Baseline soil-vapor samples collected from the SVM wells installed for the ERA showed increasing concentrations of PCE with depth with the highest concentrations at the 90 to 95 foot interval (Section 3.2.1). Soil-vapor samples collected in December 2003 show a 93 percent to 99 percent reduction in concentrations in all sample intervals from the SVM and SVE wells. These data indicate that the vapor phase PCE that was present at the time of the SVE startup has been removed from the pore spaces of the soil. The current PCE mass removal rate is now likely governed by the diffusion of dissolved PCE in vadose-zone moisture, the diffusion of PCE absorbed to soil particles, and possible DNAPL PCE in the non-wetted pore spaces of the soil.

The vertical and horizontal extent of potential DNAPL has yet to be characterized. DNAPL tends to migrate vertically downward through unsaturated and saturated soils within zones of continuous DNAPL. Experiments have shown that even relatively small differences in hydraulic conductivity can inhibit downward migration and cause lateral spreading. A minor contrast in grain-size distribution such as the transition from coarse-grained soils to finer-grained soils can cause lateral spreading of DNAPL

(Kueper, 1989). A transition between coarser UAU soils and finer-grained MAU soils occurs at a depth of approximately 80 feet bgs beneath the F&B Mfg. Co. facility.

Pyramid Facility

Soil and soil-gas analytical data have been collected at the Pyramid facility between 1998 and 2001 (Tables 8, 26, 28, and 31). The trend and distribution of contamination suggests that there may be a VOC source area in the southwestern portion of the Pyramid facility. The primary VOCs detected during the soil-gas surveys at the facility were PCE, TCE, and 1,1-DCE (Table 31). Other detected VOCs included TCA, carbon tetrachloride, ethylbenzene, total xylenes, methylene chloride, and TCE. The highest concentrations of PCE and 1,1-DCE in soil vapors were detected on the Billboard Poster property to the west of the Pyramid facility. It is likely that the soil-gas concentrations are related to a source emanating from the F&B Mfg. Co. facility to the south.

Soil samples have been collected from shallow and deep borings drilled on the Pyramid facility (Table 8, 26, and 28). PCE was detected in soil samples throughout the vadose zone, but was most prevalent in borings on the southern portion of the facility (Figures 10 and 11). The highest concentrations of PCE occurred in soil samples collected from 80 to 111 feet bgs. The highest concentration of PCE was 2,500 µg/kg at 80 feet bgs in HB-6, located in the southwestern corner of the facility property, near the F&B Mfg. Co. facility, where a potential DNAPL release of PCE has occurred. As described in Section 4.0 and noted above, a transition between coarser UAU soils and finer-grained MAU soils occurs at a depth of approximately 80 feet bgs.

Soil samples collected from borings drilled west of the main building also had detectable concentrations of PCE at depths ranging from 1 to 121 feet bgs. The highest concentration of PCE west of the main building was detected in boring B-17 at 106 feet bgs. Boring B-22, which was drilled on the Billboard Poster property, was the only boring that had detectable concentrations of TCE and 1,1-DCE in addition to PCE. None of the detected concentrations of TCE or 1,1-DCE exceeded the GPL. However, concentrations of 1,1-DCE at depths of 86, 96, and 106 feet bgs did exceed the residential SRL (Table 28).

The high concentrations of PCE observed in the southwest corner of the property are likely related to the release at F&B Mfg. Co. facility as the DNAPL reached the less permeable MAU unit and spread laterally. The distribution and concentration of VOCs detected in soil and soil gas samples around the Pyramid facility are most likely associated with the documented underlying groundwater plume emanating from the F&B facility.

Rinchem Facility

Soil and soil-gas analytical data have been collected at the Rinchem facility between 1991 and 2002 (Table 12, 13, 14, 15, 33, 34, 35, and 36). The soil sampling data indicate that VOC contamination extended from 8 feet to 131 feet bgs near Sump-1 in

the area of the former repackaging area (Figures 13, 26, and 27). PCE contamination above the residential SRL and/or GPL extended from approximately 18 feet to 40 feet bgs in soil samples collected from SB-4/WCP-49 boring (Table 36). TCE concentrations also exceeded their respective GPLs in this area at depths of 20 and 25 feet bgs in the SB-4/WCP-49 boring (Table 36). The concentrations in SB-4 (WCP-49) suggest that residual contamination may still be present in the soils near Sump-1.

Hill Brothers Facility

Soil and soil-gas analytical data have been collected at the Hill Brothers facility between 1989 and 1997 (Figures 15 and 16). Soil samples collected at locations where VOCs were detected in soil-gas samples contained low concentrations of PCE (0.031 mg/kg) and TCE (0.032 mg/kg) as shown in Table 19. No VOCs have been detected above residential SRLs or GPLs in soil samples collected at the facility.

Geomatrix conducted a passive soil-gas survey in 2003. PCE, TCE, 1,1-DCE, and chloroform were detected at the greatest concentrations in the vicinity of the previously suspected source areas (Appendix B). The maximum concentration of PCE detected was 46.78 µg per sample at the PG-13 location near the former empty solvent drum storage area. The maximum concentration of TCE detected was 25.78 µg per sample at the PG-14 location near the former empty solvent drum storage area. The maximum concentration of 1,1-DCE detected was 209.57 µg per sample at the PG-14 location near the former empty solvent drum storage area (Geomatrix, 2003).

Metals

F&B Mfg. Co. Facility

Four soil samples collected during Basin & Range's hand-auger soil investigation in 1991 (Basin & Range, 1991a) were analyzed for TCLP chromium. The highest concentration detected in the soil samples was 0.24 milligrams per liter (mg/l) which is well below the RCRA regulatory level of 5 mg/l (Table 3). Additional samples were collected during drilling activities in 1991. Sample HAB-2-5 had a detection of 0.1 mg/L and HAB-4-1 had a detection of 0.07 mg/l (Table 3).

Pyramid Facility

Arsenic was detected at concentrations above the Arizona residential and non-residential SRL of 10 mg/kg in several soil samples at varying depths throughout the facility (Tables 9 and 29). However, there were no soil samples had concentrations that exceeded the GPL for arsenic of 290 mg/kg. Sediment samples collected from the dry well also did not exceed the Arizona SRLs or GPL for arsenic. Typical background concentrations of arsenic in soils from the greater Phoenix area range from 3.1 mg/kg to 24 mg/kg with an average concentration of 9.4 mg/kg (Ball, 1990). Based on the spatial distribution and the relatively consistent concentrations of arsenic in soils at the Pyramid facility, it appears that the detected arsenic is naturally occurring and represents a background for soils in the area (Weston, 2002).

Soil sample results for chromium were below the Arizona residential and non-residential SRLs and below the GPL (Tables 9 and 29). As mentioned in Section 1.2.2, chromic acid was used in the manufacturing process at the Pyramid facility. Liquid from the pit and stripper waste exhibited hazardous waste characteristics based on chromium concentrations when sampled in 1984 by WTI (WTI, 1984b).

Sample results for beryllium in soil samples collected during ADEQ's 1993 site inspection ranged from 0.34 to 0.56 mg/kg and exceeded the 1993 HBGL of 0.32 mg/kg. However, the detected concentrations of beryllium did not exceed the current residential SRL for beryllium of 1.4 mg/kg.

Sample results for lead concentrations ranged from 48.8 to 193 mg/kg. These results exceeded the background sample result for lead of 5.8 mg/kg, but were below the residential SRL for lead of 400 mg/kg.

Sample results for antimony (0.35 mg/kg to 0.72 mg/kg), barium (43.6 mg/kg to 252 mg/kg), cadmium (0.052 mg/kg to 0.90 mg/kg), cobalt (5.6 mg/kg to 21.4 mg/kg), copper (11 mg/kg to 80 mg/kg), iron (11,000 mg/kg to 25,900 mg/kg), lead (3.9 mg/kg to 18 mg/kg), manganese (161 mg/kg to 920 mg/kg), molybdenum (0.20 mg/kg to 1.0 mg/kg), nickel (9 mg/kg to 50.1 mg/kg), selenium (0.28 mg/kg to 0.49 mg/kg), thallium (0.42 mg/kg to 3.2 mg/kg), vanadium (20.3 mg/kg to 73.8 mg/kg), and zinc (15 mg/kg to 72 mg/kg) in soil samples collected during the 1998, 1999, and 2001 investigations contained detectable concentrations above the laboratory detection limits (Tables 9 and 29). However, none of the results were above the Arizona residential SRL or GPL for their respective metal analytes. No mercury or silver was detected above laboratory detection limits in any sample collected.

Rinchem Facility

Because of the nature of operations at the Rinchem facility, metals were not considered a contaminant of concern. Soil samples collected were not analyzed for metals.

Hill Brothers Facility

Because of the nature of operations at the Hill Brothers facility, metals were not considered a contaminant of concern. Soil samples collected were not analyzed for metals.

6.3.2 Distribution and Trends of Groundwater Contamination

Volatile Organic Compounds

The distribution of groundwater contamination was evaluated based on analytical results obtained from monitor well samples and Hydropunch® samples. The results of the Hydropunch® samples were used as a tool to evaluate the distribution of contaminants and are discussed in the following sections relative to groundwater

samples collected from permanent monitor wells. The difference between Hydropunch® data and monitor well data is discussed briefly below.

Hydropunch® samples were generally collected close to the unsaturated zone-groundwater table interface. Shallow monitor well samples were generally collected from depths between 5 to 10 feet below the groundwater table surface. At source areas, contaminant concentrations tend to decrease with depth in groundwater as chemicals are sorbed onto the surfaces of fine-grained sediments. In addition, the sampling technique between the two also lends to potential variances in analytical results. Monitor well purging allows for the mixing of higher and lower concentrations of contaminants as water is pulled into the monitor well.

Analytical results for selected VOCs are summarized in Appendix F. The horizontal distributions of PCE concentrations in groundwater from shallow, middle, and deep monitoring wells for selected years are shown in Figures 53 through 79. Figures 51 and 52 show the vertical distributions of PCE concentrations in the F&B Westbay™ wells for November/December 1999 and May 2001, respectively.

F&B Mfg. Co. Facility

Groundwater samples have been collected from the F&B Westbay™ wells since 1992 and from surrounding wells in the WCP North Plume monitoring well network since 1999. The highest concentrations of PCE have been detected at the F&B Mfg. Co. facility (up to 140,000 µg/l). Other VOCs detected include TCE and 1,1-DCE. However, because PCE concentrations have been so high, the analytical laboratories have needed to dilute the groundwater samples significantly and this has potentially masked the detection of TCE and 1,1-DCE in the shallow wells. However, when detected in the water table wells, TCE and 1,1-DCE have exceeded their respective AWQSs.

Beneath the source area, concentrations of PCE have exceeded the AWQS in groundwater samples collected from F&B-1 and F&B-2 to a depth of 484 feet bgs. However, concentrations in sample ports below the sand lens unit (below the port at 259 feet bgs) have decreased significantly since the first sampling and are currently below the AWQS, with the following exceptions: F&B-2 at 384 feet bgs (10 µg/l; March 12, 2003); F&B-2 at 409 feet bgs (16 µg/l; March 12, 2003); and F&B-2 at 434 feet bgs (12 µg/l; March 11, 2003). Concentrations in the deepest sampling port in F&B-2 (484 feet bgs) have decreased from 590 µg/l in May 1993 to 3.2 µg/l in March 2003.

A similar pattern is observed in Westbay™ wells F&B-3 and F&B-4. PCE concentrations have decreased significantly and remained below the AWQS in sampling ports below 109 feet bgs in both wells, with the exceptions of F&B-3 at 434 feet bgs and F&B-4 at 259 feet bgs. PCE concentrations in the uppermost ports (109 feet bgs) in these wells contained concentrations well above the AWQS until they went dry in 2000 (Appendix F). Concentrations in the next port (159 feet bgs) have been at or below the AWQS since 2000 and are currently below the AWQS (Appendix F).

Concentration below the deepest Westbay™ ports have been monitored by WCP-73L located immediately downgradient of from the F&B Mfg. Co. facility. WCP-73L is screened from 525 feet to 545 feet bgs. No VOCs have been detected in this well since sampling began in November 2000. Based on this information, the high concentrations detected during the initial sampling rounds of the deep Westbay™ sampling ports are believed to be the result of well construction activities. Concentrations below the sand lens are typically much lower than those above it. The sand lens appears to be hydraulically connected to pumping centers located west of the WCP North Plume site and upward vertical gradients exist below the sand lens. Additionally, flushing of the sand lens has likely occurred over time resulting in reduced observed VOC concentrations.

Monitoring wells associated with the Glenrosa Service Center delineate the western and northern extent of contamination in the shallow MAU originating from the F&B Mfg. Co. facility. Monitoring well WCP-33S on the Pyramid facility and WCP35S and WCP-34S delineate the plume to the northeast, east, and south.

PCE detected in groundwater samples collected from GSC wells located along the eastern property boundary of the GSC range in concentrations from 73 to 11,600 µg/l in September 2005. Previous sampling data for these wells indicated that PCE concentrations had steadily increased over time while the remediation system at Glenrosa Service Center was operating, suggesting that the remediation system was affecting groundwater flow and migration of dissolved PCE in the shallow MAU (water table) as available hydrocarbons were being removed. Concentrations of PCE in GSC-21 at the Glenrosa Service Center increased from 10 µg/l in July 1993 to 6,300 µg/l in January 1996 to 12,000 µg/l in January 1998. The remediation system was turned off in October 2000 and concentrations in GSC-21 have decreased slightly to 11,600 µg/l in September 2005. The same trend in PCE concentrations is seen in GSC-10, GSC-25, and GSC-26, although the concentrations are not as high as at GSC-21. Concentrations in GSC-31 to the northwest of F&B have historically been less than 5 µg/l, indicating that the northern extent of the plume has been characterized.

As stated above, groundwater samples from deeper zones beneath the F&B site in wells F&B-2, F&B-3, and F&B-4 exhibit concentrations of PCE near or above the AWQS at depths to 484 feet bgs. A small plume emanating from the F&B Mfg. Co. facility and extending west to WCP-72M is present in the sand lens in the middle MAU. The highest concentration detected in WCP-72M is 30 µg/l. WCP-74, which is located approximately 450 feet west and downgradient from WCP-72M, has historically been non-detect.

No VOC concentrations have been detected in off-site monitoring wells deeper than the sand lens (“M” wells), except at WCP-36L2. However, concentrations detected have been below the AWQS (Appendix F).

Occurrence of DNAPL Phase

The magnitude of the concentrations detected in groundwater samples from the Westbay™ wells located immediately downgradient from the former degreaser location approach the solubility limit of 150,000 µg/l for PCE, suggesting the presence of free-phase PCE as DNAPL. There is a high likelihood that DNAPL is present when dissolved-phase concentrations in groundwater in the vicinity of the source exceed 1 to 5 percent of the solubility limit. PCE concentrations measured in the two shallow ports of F&B-1 (115 and 135 feet bgs) are significantly higher than 1,500 to 7,500 µg/l, suggesting the presence of DNAPL at these depths. In addition, concentrations in samples greater than 1 percent of the solubility limit of PCE have been detected in the lower intervals of F&B-1, the uppermost interval of F&B-4, WCP-31, and GSC-25.

Pyramid Facility

Groundwater investigation activities at the Pyramid facility include the collection of Hydropunch® samples collected during the site characterization investigation activities by Weston and the collection of groundwater samples from groundwater monitoring wells in the WCP North Plume area, including WCP-31, WCP-32, WCP-33S, and WCP-91 (Figures 12 and 25).

A total of 13 boreholes and three monitoring well boreholes (WCP-31, WCP-32, and WCP-33S) were drilled on the Pyramid facility and sampled using Hydropunch® methods (Tables 10, 11, and 30). The highest concentrations of PCE in Hydropunch® groundwater samples were 28,000 µg/l detected in boring B-16 and 13,000 µg/l detected in the boring for monitoring well WCP-31 (Table 30). These two borings are located along the southern side of the Pyramid property, directly north of and hydrologically downgradient from the F&B facility. The lowest PCE concentration (2 µg/l) was detected in the Hydropunch® groundwater sample collected from the boring for monitoring well WCP-33S (HP-33S-120) located northeast of the Pyramid building (Table 30). Detected PCE concentrations in Hydropunch® groundwater samples exceeded the Arizona AWQS for PCE in each of the borings drilled and sampled on the southern and southwestern portion of the facility. Hydropunch® groundwater samples, collected in HB-1, HB-2, and HB-3, located on the northern portion of the facility, did not exhibit detectable concentrations of PCE.

The AWQSs for 1,1-DCE and TCE were exceeded in several Hydropunch® groundwater samples collected from borings on the southern and western portion of the facility (Tables 10, 11, and 30). No groundwater samples collected from borings on the northern portion of the facility had detectable concentrations of TCE and 1,1-DCE.

In general, Hydropunch® groundwater sample results reflect the overall distribution of the contaminant plume as defined by the groundwater monitoring data. VOC concentrations in Hydropunch® groundwater samples were highest on the southern and western portions of the facility and decreased in the northern direction.

The distribution of PCE, TCE, and 1,1-DCE in groundwater similarly corresponds to the presence of a source area on the F&B Mfg. Co. facility to the south. Concentrations are highest in monitoring well WCP-31, which is located historically downgradient and currently crossgradient from the F&B Mfg. Co. facility. PCE concentrations tend to decrease in a northerly direction across the Pyramid facility. Monitoring wells WCP-32 and WCP-91, although located approximately 50 feet apart, have consistently displayed varying concentrations of PCE in groundwater. WCP-91 is screened 10 feet deeper than WCP-32 and is screened across more sand units. The finer-grained interval that WCP-32 is screened across may not be flushing as readily as other intervals, resulting in higher residual VOC concentrations in groundwater.

Analytical data have been used to develop concentration contour maps for PCE, TCE, and 1,1-DCE. Figures 53 through 129 present PCE, TCE, and 1,1-DCE concentration contour maps for groundwater samples for selected time periods. As shown in the figures, contaminants from the documented release at the F&B Mfg. Co. facility have migrated to the north and northeast, across the southern portion of the Pyramid facility. The vertical extent of groundwater contamination on the Pyramid facility appears to be characterized. Analytical data from groundwater samples collected from deeper MAU ("M") wells located to the east (WCP-33M) and west (WCP-37M3) of the Pyramid facility suggest that groundwater contamination has not migrated vertically.

Rinchem Facility

Groundwater investigation activities at the Rinchem facility include the collection of Hydropunch® samples collected during initial site characterization activities and the collection of groundwater samples from groundwater monitoring wells in the WCP North Plume area, including WCP-18, WCP-19, WCP-20, WCP-21, WCP-22, WCP-23, WCP-24, WCP-49, WCP-51, WCP-52, WCP-53, WCP-54, WCP-55, WCP-56, WCP-57, WCP-58, and WCP-74 (Table 17; Figure 14; and Appendix C). The distribution of groundwater contamination was evaluated based on analytical results obtained from these samples.

Eight boreholes were sampled using Hydropunch® methods. PCE, TCE, 1,1-DCE, TCA, vinyl chloride, cis-1,2-DCE, and methylene chloride were detected above AWQSs in samples collected from the former tank area and former repackaging area (Table 17). Groundwater samples have been collected from monitoring wells installed on and around the Rinchem facility since 2000. Analytical results for selected contaminants are shown in Appendix F.

In general, Hydropunch® groundwater sample results reflect the overall distribution of the contaminant plume as defined by the groundwater monitoring data. The distribution of VOCs in groundwater suggests the presence of a source area on the Rinchem facility. Concentrations upgradient from the facility are low to non-detect while concentrations on the facility and downgradient are above their respective AWQSs. The presence of a free-product plume on the Glenrosa Service Center facility to the east and upgradient from the Rinchem facility may have an impact on concentrations upgradient from the Rinchem facility. Co-metabolism of the chlorinated solvents with the gasoline may be occurring. VOCs detected in GSC monitoring wells on the eastern side of

(upgradient from) the Glenrosa Service Center occur at concentrations in the thousands of parts per billion while immediately upgradient from the Rinchem facility VOC concentrations occur in the tens of parts per billion or lower. Chlorinated VOCS are likely commingled with the free-product plume.

Analytical data have been used to develop concentration contour maps for PCE, TCE, and 1,1-DCE in groundwater for selected periods of time (Figures 53 through 129). As shown in the figures, contaminants from Rinchem appear to have migrated to the northwest. Groundwater samples collected from deep MAU monitoring wells WCP-58 and WCP-74 suggest that groundwater contamination has not migrated vertically downward.

Hill Brothers Facility

Groundwater investigation activities at the Hill Brothers facility include the collection of Hydropunch® samples from four borings during preliminary site characterization activities and the collection of groundwater samples from monitoring wells in the WCP North Plume area, including WCP-54, WCP-75, WCP-76, WCP-77, WCP-78, WCP-79, WCP-80, WCP-81, and WCP-82. The distribution of groundwater contamination was evaluated based on analytical results obtained from these samples. In general, Hydropunch® groundwater sample results reflect the overall distribution of the contaminant plume as defined by the groundwater monitoring data. Analytical data have been used to develop concentration contour maps for selected periods of time for PCE, TCE, and 1,1-DCE (Figures 41 through 66).

HydroPunch® groundwater samples collected in 1996 by EMCON indicated concentrations of PCE, TCE, and 1,1-DCE above AWQSs in the area of the solvent packing area and the maintenance shed (Table 20; Figure 17). Groundwater sampling from monitoring wells installed around the Hill Brothers facility began in April 2001. Analytical results for selected contaminants are shown in Appendix F.

Although groundwater elevations have declined by approximately 10 feet since the first groundwater monitoring event, contaminant concentrations have remained relatively consistent (Appendix F). Concentrations of PCE exceeded AWQS in WCP-77, WCP-79, and WCP-80. Concentrations of TCE exceeded the AWQS in monitoring wells WCP-75, WCP-77, WCP-78, WCP-79, and WCP-81. Concentrations of 1,1-DCE exceeded AWQS in WCP-77, WCP-78, and WCP-79. Monitoring wells WCP-54 and WCP-75 are located hydraulically upgradient from the Hill Brothers facility (Figure 3). Monitoring wells WCP-77, WCP-78, WCP-79, and WCP-80 are located hydraulically downgradient from the Hill Brothers facility (Figure 3).

The distribution of PCE, TCE, and 1,1-DCE in groundwater suggests that a source area may exist on the Hill Brothers facility. Concentrations of VOCs upgradient from the Hill Brothers facility are typically lower than those immediately downgradient from the facility. The western extent of the plume is not clearly defined and will need additional work. Groundwater samples collected from deep MAU monitoring well WCP-82 suggest that groundwater contamination has not migrated vertically downward.

Other Locations

Concentrations of TCE and PCE have been detected in wells located in the southwestern portion of the WCP North Plume site. Groundwater samples from monitoring well WCP-69S have consistently had concentrations of TCE above the AWQS, while concentrations in samples from wells GSC-GTD and WCP-68S, which are located hydraulically upgradient, have been either non-detect or below AWQS (Appendix F). It is possible that the concentrations detected in this area are related to the WCP North Canal WQARF site located to the south and are a result of a more northerly groundwater flow direction in the past when the Grand Canal was unlined, prior to 1998 (GeoTrans, 2004).

Metals

F&B Mfg. Co. Facility

Groundwater samples collected at the F&B Mfg. Co. facility have been analyzed for dissolved and total metals from November 1999 through March 2003. Metals, including arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, and zinc have been detected above laboratory detection limits. However, chromium is the only metal detected above AWQS. Chromium was detected in the dissolved-phase in the 115-foot-bgs port of F&B-1 at concentrations of 0.12 mg/l, 0.11 mg/l, and 0.35 mg/l in February 2002, May 2002, and March 2003, respectively. However, these concentrations were below the historical total chromium concentrations from this sampling port. Analytical results for metals are included in Appendix H.

Pyramid Facility

HydroPunch® groundwater samples collected from borings on the Pyramid facility in 1998 were analyzed for metals. Arsenic, beryllium, chromium, lead, and nickel were detected above their respective AWQSs in samples from HB-3, HB-4, and HB-5 (Table 11). Chromium and lead were detected above their AWQSs in HB-6. The highest concentrations were detected in the groundwater sample from HB-3, which was located on the northern portion of the facility near the chemical storage area.

The only metal detected in the groundwater samples from the monitor wells above a regulatory standard was chromium, which was detected in a sample from WCP-32 at a concentration of 179 μg/l. WCP-32 is located hydrologically downgradient from the water treatment system area, which had a documented release in 1984. It is likely that the chromium detected in groundwater at WCP-32 was due to historical practices at the Pyramid facility and the impact appears to be localized.

Analytical results for metals are included in Appendix H.

Rinchem Facility

Groundwater samples have been collected for iron and manganese analysis as part of the natural attenuation analysis at the Rinchem facility. Elevated iron concentrations were observed in the zone of potential reductive dechlorination (Weston, 1998). No samples have had concentrations of metals above their respective AWQSs. Analytical results for metals are included in Appendix H.

Hill Brothers Facility

Groundwater samples have been collected for dissolved metals analysis and iron and manganese analysis as part of the natural attenuation analysis at the Hill Brothers facility. No samples have had concentrations of metals above their respective AWQSs. No other samples for metals have been collected at the facility. Analytical results for metals are included in Appendix H.

7.0 CONTAMINANT FATE AND TRANSPORT

This section describes the mechanisms involved in the fate and transport of soil and groundwater contaminants at the WCP North Plume site. The contaminants of concern in the WCP North Plume sites are halogenated VOCs. Transport of VOCs is controlled by several different mechanisms, including the type of subsurface medium and geochemical conditions in the material through which the compounds are migrating. Physical and chemical transformations of the contaminants can also affect their fate and transport. The following sections discuss the fate and transport of the contaminants of concern in soils and groundwater.

7.1 Fate and Transport in Soils

The exact nature of a VOC release is not always known. VOCs can be released to the environment as a free-phase immiscible liquid (DNAPL), as a dissolved-phase component of a liquid waste stream, or as vapor phase. The nature of the release will have broad implications with respect to the type and duration of remedial activities.

Where a DNAPL release has occurred, migration in the subsurface is density driven and occurs within zones of interconnected DNAPL within the soil pore spaces. In such zones, the DNAPL in different pore openings forms an immiscible-phase continuum through the intervening pore throats. Experiments have shown that even relatively small differences in hydraulic conductivity can inhibit downward migration and cause lateral spreading of DNAPLs. Once the release ceases, the forces driving DNAPL movement dissipate and the DNAPL in the pore openings become disconnected to form a zone of residual DNAPL (Pankow and Cherry, 1996).

Within the overall zone of DNAPL contamination, it is often impractical to define specific locations of residual zones. As such, remedial technologies must be directed over a larger area of interest (Kueper, 1992). Residual DNAPL in the vadose zone can produce a vapor plume that, after many years, can move downward or can come in contact with infiltrating water and reach the water table. In field experiments, such vapor plumes have been shown to migrate vertically over many tens of meters or more and result in groundwater contamination with maximum concentrations in the thousands of micrograms per liter (Shikaze and Sudicky, 1994; Pankow and Cherry, 1996).

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

VOCs will pass through unsaturated soils at different rates depending on physical properties of the soils. Soil physical properties such as permeability, moisture content,

and organic carbon content affect the rate of migration of VOCs in soil. Physical properties of the compound itself such as specific gravity, Henry's Law constant (K_H), water solubility, octanol-water partition coefficient (K_{OW}), and organic carbon partition coefficient (K_{OC}) also affect its fate and transport. Table 42 lists some of the physical properties for PCE, TCE, and 1,1-DCE. Table 43 lists some of the physical properties that affect fate and transport.

Organic carbon is present in all soils and causes certain chemicals to adsorb to soil. The adsorptive properties of soil depend largely on the total amount of organic carbon available and the nature of the contaminant contacting it. K_{OC} is a measure of the capacity for an organic chemical to adsorb to soil. The higher the K_{OC} value, the more readily the compound adsorbs to the soils. Based on their K_{OC} values, PCE, TCE, and 1,1-DCE generally pass more quickly through an unsaturated soil horizon than does water. TCE and 1,1-DCE are expected to have high mobility in soil, while PCE is expected to have moderate mobility in soil.

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

Volatilization of PCE, TCE, and 1,1-DCE from moist soil surfaces is an important fate process and is related to their respective Henry's Law constants. Contact of VOCs in liquid or vapor phases with moisture in soils results in VOC contamination of the soil moisture, which is also known as pore water. Release of VOCs dissolved in pore water is typically much slower than volatilization from a free-phase VOC liquid. Therefore, moist soils retain evidence of VOCs that have passed through the soil column longer than soils with low moisture content (Cohen and Mercer, 1993).

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

Applying these VOC soil migration principles to the site-specific conditions at the facilities in the WCP North Plume site provides a framework for analysis of the soil site data. Where collected, the moisture content of soil samples collected in the vadose zone within the WCP North Plume site varied from 7.6 percent (dry) to 18.6 percent (moist).

Soils in the UAU are generally coarse but vary from silt and silty sands to silty gravel, sandy gravel, and gravel. Within the WCP North Plume site, the UAU extends to a depth of approximately 80 feet bgs. Below the UAU, the MAU is generally fine grained with interbedded sand lenses. The transition from coarse UAU sediments to fine MAU sediments results in reduced permeability and likely causes lateral spreading of VOCs. VOC migration in the coarse UAU sediments is likely to be nearly vertical. Coarse sediments with low moisture content are unlikely to have substantial residual VOC contamination even in areas where VOC liquids may have passed through from a potential surface release.

At the WCP North Plume site, the highest concentrations of VOCs detected in soil samples are typically observed near the UAU/MAU contact or in fine-grained sediments within the UAU. Analytical results from soil and groundwater samples collected from beneath the F&B Mfg. Co. facility in the vicinity of the former vapor degreaser suggest that DNAPL is present. Thick sequences of finer-grained MAU sediments with thin sandy interbeds are encountered in the unsaturated zone below 80 feet bgs, and extend vertically for several hundred feet to include saturated sediments. It is unlikely that contaminants in the form of DNAPL would penetrate MAU sediments to any great distance vertically, unless preferential pathways, such as fractures, were present. Where DNAPL releases are suspected, it would be reasonable to assume that residual DNAPL occurs at the UAU/MAU interface (unsaturated), and that leachate infiltration and/or vapor-phase diffusion extends down further to the water table; however, VOC concentrations in the uppermost saturated sediments beneath the F&B facility have historically approached the saturation limit for PCE, indicating that DNAPL may have penetrated through 30 or more feet of unsaturated MAU.

At other facilities within the WCP North Plume site, there is little evidence of residual DNAPL in the subsurface. As such, vertical migration of vapor-phase VOCs and dissolved-phase VOCs in infiltrating water would be the primary mechanisms of transport in soils at those facilities. For example, PCE, TCE, and TCA concentrations in soil samples collected in the vicinity of Sump-1 at the Rinchem facility were above their respective GPLs to a depth of 50 feet bgs. Below this depth, concentrations were below laboratory detection limits.

At the Pyramid facility, one soil sample contained PCE concentrations above its GPL. This sample was collected at a depth of 80 feet bgs in the southwestern corner of the property. However, this contamination is likely related to the DNAPL source emanating from the F&B Mfg. Co. facility to the south.

7.2 Fate and Transport in Groundwater

Beneath source areas, contaminants may enter the saturated zone as DNAPL, dissolved-phase infiltration/leachate, or through mass transfer from vapor-phase contamination in the vadose zone. If present as DNAPL, the contaminants of concern in the WCP North Plume are denser than water and are capable of moving vertically in the saturated zone; however, the extent of vertical migration is dependent on several factors, including chemical properties of the contaminant (e.g., specific gravity,

viscosity, interfacial tension), and the degree of heterogeneity within the vadose zone and underlying aquifer. Vertical migration is expected to be greater in coarser sediments than in fine-grained sediments. Fine-grained sediments characteristically have smaller pores and pore-throat dimensions, resulting in greater capillary resistance to infiltrating DNAPL in saturated sediments. If the DNAPL encounters a finer-grained unit, differences in hydraulic conductivity can inhibit downward migration and cause lateral spreading of DNAPLs.

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

Advection

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

$$V = K\, i/\theta_e$$

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

In the WCP North Plume site, contaminant plumes are generally oriented in the direction of the groundwater gradient. Concentrations are generally higher in the vicinity of source areas and decline both longitudinally (downgradient) and laterally away from the sources. The width of a contaminant plume may be controlled by hydrodynamic dispersion, variations in the groundwater gradient conditions, or a combination of those two factors.

Hydrodynamic Dispersion

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

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

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

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

Retardation

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

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

$$K_d = K_{oc} * f_{oc}$$

where:
- K_d = Distribution Coefficient (milliliters water per grams soil [ml_{water}/g_{soil}])
- K_{OC} = Organic Carbon Partition Coefficient (milliliters water per grams organic carbon [ml_{water}/g_{OC}])
- f_{OC} = Fraction of Organic Carbon (grams organic carbon per grams soil [g_{OC}/g_{soil}])

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

$$Rd = 1 + \frac{\rho b(Kd)}{\rho e}$$

where: R_d = Retardation Factor (no units)
ρ_b = Bulk Density (grams per cubic centimeter [g/cm^3])
K_d = Distribution Coefficient (ml_{water}/g_{soil})
η_e = Effective Porosity (ml_{water}/cm^3_{soil})

At the WCP North Plume site, K_{OC} values for PCE, TCE, and 1,1-DCE indicate that these VOCs are not likely to readily adsorb to suspended solids or sediment in saturated sediments. In addition, sediments in the WCP North Plume site are relatively low in organic material. Total organic carbon content for samples collected on the Pyramid facility ranged from 0.07 percent to 0.13 percent (f_{OC} = 0.0007 to 0.0013) (Weston, 2002b).

In shallow MAU sediments, soil physical property testing indicates that bulk density values range between 1.50 to 1.81 g/cm^3 and effective porosity values range between 34 percent and 43 percent (0.34 to 0.43). For the middle MAU, bulk density ranges between 1.38 to 1.42 g/cm^3 and effective porosity values range between 43.2 percent and 46.9 percent (0.43 to 0.47; LFR, 2000). Using these values, the following table summarizes the results of retardation calculations obtained from the above equations for the shallow MAU and the middle MAU saturated sediments beneath the WCP North Plume site:

Chemical	K_{OC}	f_{OC}	K_d	R_d
Shallow MAU				
PCE	237	0.0013	0.308	2.296
TCE	101	0.0013	0.131	1.551
1,1-DCE	64	0.0013	0.083	1.349
Middle MAU				
PCE	237	0.0013	0.308	1.951
TCE	101	0.0013	0.131	1.404
1,1-DCE	64	0.0013	0.083	1.256

Retardation factors are then used to adjust the average groundwater velocity to reflect an average contaminant velocity in the MAU using the following relationship:

$$R_d = V/V_c$$

where: R_d = Retardation Factor (no units)
V = Average Groundwater Velocity (ft/d)
V_c = Contaminant Velocity (ft/d)

Based on the results of the aquifer testing conducted by LFR in December 2000 and Basin & Range's falling-head permeameter tests in 1993 and 1994, hydraulic conductivities for the shallow MAU range from 0.16 ft/day to 14.34 ft/day. The current gradient in the shallow MAU is 0.003 ft/ft.

Hydraulic conductivities for the MAU sand lens range from 0.49 to 31 ft/day based on aquifer tests by LFR and Basin & Range. The current groundwater gradient in the MAU is 0.002 ft/ft. The following table summarizes the results of the calculations obtained from the above equations for the shallow MAU and the middle MAU at the WCP North Plume site:

Chemical	V (ft/yr)	Vc (ft/yr)
Shallow MAU		
PCE	21.9	8.44
TCE	21.9	13.04
1,1-DCE	21.9	15.31
Middle MAU		
PCE	49.28	25.22
TCE	49.28	35.10
1,1-DCE	49.28	39.23

Based on this information and an assumption of the time of release, it is possible to estimate the length of the contaminant plume (L_c) emanating from facilities in the WCP North Plume site using the following formula:

$$L_c = V_c*(\text{Age of release})$$

The F&B Mfg. Co. facility started operations in 1967. PCE use was discontinued in 1987. Assuming that the initial release occurred during the time of operations at the facility, the estimated contaminant migration distances downgradient from the source for PCE, TCE, and 1,1-DCE in the shallow MAU are approximately 625 feet, 965 feet, and 1,133 feet, respectively. Contaminant migration for PCE, TCE, and 1,1-DCE in the sand lens in the MAU are approximately 933 feet, 1,295 feet, and 1,448 feet, respectively.

The Rinchem facility began operations in 1982. Assuming that the initial release occurred during the time of operations at the facility, the estimated contaminant migration distances downgradient from the property for PCE, TCE, and 1,1-DCE are approximately 372 feet, 574 feet, and 674 feet, respectively.

The Hill Brothers facility began operations in 1969. Assuming that the initial release occurred during the time of operations at the facility, the estimated contaminant migration distances downgradient from the property for PCE, TCE, and 1,1-DCE are approximately 591 feet, 913 feet, and 1,072 feet, respectively.

The observed distribution of contaminants is in general agreement with the calculated distances from sources. However, contaminant velocities and estimated length of the plume should be viewed as qualitative indicators. Actual migration rates can very greatly from these estimates for many reasons, including horizontal and vertical heterogeneities in hydraulic conductivity, porosity, TOC, and changes in hydraulic gradient. In addition, the above calculations use simplifying assumptions and neglect the effects of contaminant degradation and dispersion. At the F&B Mfg. Co. facility, the SVE system has been operating since August 2001.

Attenuation

Attenuation accounts for the multitude of chemical and biochemical reactions that can alter contaminant concentrations in groundwater flow systems. Of those reactions, the most applicable for contaminants of concern for the WCP North Plume site include redox reactions and microbial cell synthesis. The rate of attenuation is highly variable and complex, and depends on many factors, including groundwater geochemistry, type and density of micro-biological agents in the soil, availability of oxygen (aerobic or anaerobic conditions), and chemical stability within those environments, to name a few. Most alluvial aquifers in the Salt River Valley occur naturally in an aerobic (oxidized) state. PCE and TCE (two primary contaminants of concern at the WCP North Plume site) are very stable under aerobic conditions and therefore would be expected to attenuate very slowly. Other compounds, such as petroleum hydrocarbons, degrade more easily in aerobic environments and are therefore not as persistent as PCE and TCE. In an anaerobic (reducing) environment, dechlorination of PCE and TCE occurs more readily, and results in the formation of several daughter products, including cis-1,2-DCE, methylene chloride, and vinyl chloride. Groundwater samples have been collected at each of the facilities and analyzed for natural attenuation parameters including manganese, iron, ethane, ethene, methane, alkalinity, nitrate-nitrite, sulfate, sulfide, and chloride. Analytical results are included in Appendix H.

At the COP Glenrosa facility, releases of petroleum hydrocarbons have induced biological activity resulting in attenuation of certain hydrocarbon constituents. Increased oxygen demand placed on the system by microorganisms degrading the hydrocarbons has likely created reducing conditions in the vicinity of the source area. Additionally, co-metabolism of PCE and TCE can occur in the vicinity of petroleum hydrocarbon degradation and increase the rate of attenuation of those chemical compounds. While conditions at the Glenrosa facility may aid in mass reduction for chemicals of concern at the WCP North Plume site, for the purpose of this remedial investigation, impacts of attenuation can be conservatively ignored unless significant evidence exists to indicate that attenuation processes are sufficient to substantially remediate the site. Conditions outside the immediate vicinity of the Glenrosa site do not indicate that attenuation is occurring at an appreciable rate.

At the Rinchem facility, an evaluation of contaminant distribution patterns and indicator parameters suggested that natural attenuation (reductive dechlorination facilitated by anaerobic bacteria) may be occurring in groundwater beneath the facility. Additionally, indicator parameters such as alkalinity, methane, sulfate/sulfide, iron, and DO are suggestive that reductive dechlorination may have occurred at the Rinchem facility (Table 32). Vinyl chloride and cis-1,2-DCE have been detected in groundwater samples from monitoring wells downgradient from the suspected source area near sump-1. However, more recently, vinyl chloride concentrations have been below the AWQS and/or non-detect. This suggests that the reductive dechlorination occurring at the Rinchem facility may be a local effect.

8.0 LAND AND WATER USE

LFR has prepared a Land and Water Use report for the WCP North Plume site to meet the requirements established under A.A.C. R18-16-406 (D). The purpose of the report is to gather information regarding current and foreseeable uses of land or waters that have been or are threatened to be affected by a contaminant release. The written report is presented in its entirety in Appendix K.

The land and water uses most likely relevant to discussion of remedial objectives are presented below.

8.1 Land Uses

The zoning pattern in the area has been long established and there are no foreseeable changes for the future. Land uses for the F&B facility property, Pyramid facility property, Rinchem property, Hill Brothers facility property, and within the North Plume WQARF site area are expected to remain predominantly industrial or light industrial.

8.2 Groundwater Uses

Current and future groundwater uses within the North Plume WQARF site area include the following:

- The COP anticipates the possible need for well expansion in the WCP area at some time in the future.
- The SRP owns several wells in the area and will continue to need the wells to be operational to supplement surface-water supplies. A water treatment plant may be built on the Grand Canal sometime in the future, which would change the use of the groundwater from irrigation to drinking water.

8.3 Surface-Water Uses

Surface water has not been affected.

9.0 SUMMARY AND CONCLUSIONS

The purpose of the RI conducted at the WCP North Plume site was to determine the nature and extent of contaminants at the site. The RI also identified present and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be affected by the contamination. Based upon the data collected, the following sections discuss conclusions that can be drawn with regard to the nature and extent of contamination at the WCP North Plume site.

9.1 F&B Mfg. Co. Facility

The primary source of contamination at the F&B Mfg. Co. facility is the former vapor degreaser. PCE contamination in the soil extended from approximately 5 feet to 105 feet bgs in the area near the former vapor degreaser. The PCE contamination exceeded the SRLs and GPLs.

Concentrations of PCE in groundwater in F&B-1 approach the solubility limit for PCE, which suggests the presence of DNAPL. Based on the observed groundwater concentrations, DNAPL PCE also appears to be present in saturated-zone sediments. The dissolved phase PCE groundwater plume that is associated with the presumed DNAPL PCE source area extends over 1,000 feet downgradient.

The lateral extent and magnitude of DNAPL PCE migration away from the degreaser source in the subsurface has not been adequately characterized with the existing data. Additional work to define the DNAPL zone is necessary in order to determine appropriate cleanup actions.

The lateral extent of groundwater contamination has not been determined based on the subsurface impact at the Glenrosa Service Center and the number of monitoring wells that have gone dry downgradient. The concentrations in these wells have historically been non-detect or below AWQS.

9.2 Pyramid Facility

Several suspected sources of contamination have been identified on the Pyramid facility, including the loading dock/dry well, paint room, and historic hook cleaner. Spills and poor hazardous waste handling practices have been documented in previous investigations. VOCs detected on the facility are highest on the south side. Both soil samples and groundwater samples collected from Hydropunch® and monitoring wells indicate that high concentrations of PCE (above GPLs and AWQS) are present in the subsurface beneath the southern portion of the property. Concentrations of VOCs have also been detected in shallow soil-gas samples collected along the western boundary of the Pyramid facility and on the neighboring Billboard Poster property. It appears that this contamination is likely associated with an off-site source such as the release at the F&B Mfg. Co. facility to the south. While onsite activities have impacted soil and may have impacted groundwater, the distribution of contaminants suggests a greater influence from the offsite sources.

9.3 Rinchem Facility

Several suspected sources have been identified on the Rinchem facility, including the former repackaging area and former tank farm. Soil and soil-gas samples collected in these areas have recorded the highest concentrations of VOCs detected on site. Some of the VOCs detected include PCE, TCE, 1,1-DCE, DCA, methylene chloride, acetone, MEK, and BTEX. The highest concentrations have been detected in the former repackaging area. PCE, TCE, and TCA were detected above their respective GPLs in soil samples in the former repackaging area to a depth of 50 feet bgs. Other VOCs have been detected to depths of 130 feet bgs but not above GPLs or SRLs. Soil-gas samples collected in 2002 confirm the presence of VOCs at depth.

Groundwater samples confirm the presence of VOCs, including PCE, TCE, 1,1-DCE, methylene chloride, and benzene at concentrations exceeding their respective AWQSs. Groundwater samples collected from WCP-21, which is located immediately downgradient from the facility, have consistently had higher concentrations than upgradient wells. Evaluation of contaminant distribution patterns and indicator parameters suggested that natural attenuation (reductive dechlorination facilitated by anaerobic bacteria) may be occurring in groundwater beneath the facility.

9.4 Hill Brothers Facility

Soil-gas samples collected near the solvent packaging area contained the highest concentrations of TCE and PCE. The highest concentrations of 1,1-DCE and TCA were detected near the maintenance storage and fuel area. TCE, PCE, and 1,1-DCE were also detected in groundwater samples collected using a Hydropunch® in the solvent packaging area and in the chemical mixing area. Groundwater samples from the monitoring wells located upgradient and downgradient from the facility suggest that a source may be present on the facility. The lateral extent of the plume is not well defined on the western side. Concentrations in WCP-78 exceed the AWQS for TCE.

The results of a passive soil-gas survey conducted in 2003 confirmed the presence of VOCs in soil vapor in areas previously identified as areas of concern. As a result, additional investigative work is being conducted at the Hill Brothers facility by Geomatrix.

9.5 Additional Issues

TCE groundwater concentrations in monitoring well WCP-69S in the southwestern portion of the WCP North Plume site have consistently been above AWQS. Concentrations of TCE in upgradient wells have been non-detect or below AWQS. The contamination in these wells appears to be separate from the regional WCP North Plume. It is possible that the concentrations detected in this area are related to the WCP North Canal WQARF site located to the south and are a result of a more northerly groundwater flow direction in the past when the Grand Canal was unlined prior to 1998.

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11.0 LIMITATIONS

The opinions and recommendations presented in this report are based upon the scope of services, information obtained through the performance of the services, and the schedule as agreed upon by LFR and the party for whom this report was originally prepared. This report is an instrument of professional service and was prepared in accordance with the generally accepted standards and level of skill and care under similar conditions and circumstances established by the environmental consulting industry. No representation, warranty, or guarantee, express or implied, is intended or given. To the extent that LFR relied upon any information prepared by other parties not under contract to LFR, LFR makes no representation as to the accuracy or completeness of such information. This report is expressly for the sole and exclusive use of the party for whom this report was originally prepared for a particular purpose. Only the party for whom this report was originally prepared and/or other specifically named parties have the right to make use of and rely upon this report. Reuse of this report or any portion thereof for other than its intended purpose, or if modified, or if used by third parties, shall be at the user's sole risk.

Results of any investigations or testing and any findings presented in this report apply solely to conditions existing at the time when LFR's investigative work was performed. It must be recognized that any such investigative or testing activities are inherently limited and do not represent a conclusive or complete characterization. Conditions in other parts of the project site may vary from those at the locations where data were collected. LFR's ability to interpret investigation results is related to the availability of the data and the extent of the investigation activities. As such, 100% confidence in environmental investigation conclusions cannot reasonably be achieved.

LFR, therefore, does not provide any guarantees, certifications, or warranties regarding any conclusions regarding environmental contamination of any such property. Furthermore, nothing contained in this document shall relieve any other party of its responsibility to abide by contract documents and applicable laws, codes, regulations, or standards.

TABLES

Table 1 - Analytical Results from the July 1989 ADEQ Soil-Gas Sampling Investigation Performed at the F&B Mfg. Co. Facility WCP North Plume Site Phoenix, Arizona

Sample I.D. (ft/bgs)	Date Sampled	1,1-DCE (µg/L)	TCA (µg/L)	TCE (µg/L)	PCE (µg/L)	TPH (µg/L)	Benzene (µg/L)
FNB1-18	7/22/89	<0.6	**3**	**26**	**140**	**23**	ND
FNB1-35	7/22/89	<2	**0.06**	**2**	**130**	**40**	ND
FNB2-18	7/26/89	**2**	**6**	**0.5**	**2**	**2**	ND
FNB2-35	7/26/89	**4**	**4**	**0.6**	**48**	**18**	ND
FNB3-18	7/27/89	<30	**24**	**3**	**1,500**	**300**	ND
FNB4-18	7/26/89	**2**	**7**	**4**	**1,200**	**400**	**1**
FNB5-17	7/31/89	<0.4	**2**	**2**	**50**	NA	ND
FNB5-35	7/31/89	<8	**6**	**2**	**310**	NA	**2**

NOTES: Bold results indicate results above laboratory detection limits.

1,1-DCE = 1,1-Dichloroethylene
TCA = 1,1,1-Trichloroethane
TCE = Trichloroethylene
PCE = Tetrachloroethylene
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed

Table 2 - Analytical Results from the July 1989 ADEQ PA/SI
Groundwater Sampling at the F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Well I.D.	Date Sampled	Vinyl Acetate (µg/L)	1,1-DCE (µg/L)	TCE (µg/L)	PCE (µg/L)	Benzene (µg/L)	Ethylbenzene (µg/L)	Toluene (µg/L)	Total Xylenes (µg/L)
GSC-MW-10	7/18/89	**34**	ND	**23**	ND	**5**	**1**	ND	ND
GSC-MW-10 (dup)	7/18/89	**40**	ND	**19**	ND	**7**	**1**	ND	ND
GSC-MW-25	7/18/89	**4**	ND	**7**	**6**	ND	ND	ND	ND
GSC-MW-21	7/18/89	ND	ND	**1**	ND	ND	ND	ND	ND
GSC-MW-22	7/18/89	ND	ND	ND	ND	ND	ND	ND	ND
GSC-MW-17	7/18/89	**230**	**2**	ND	ND	**440**	ND	**11**	**650**
GSC-MW-19	7/18/89	ND	ND	ND	ND	**14,000**	**1,000**	**10,000**	**11,000**
AZ AWQS		NE	7	5	5	5	700	1,000	10,000

NOTES:
1,1-DCE = 1,1-Dichloroethylene
TCE = Trichloroethylene
PCE = Tetrachloroethylene
ND = Not Detected
AZ AWQS = Arizona Aquifer Water Quality Standard
NE = Not Established
(dup) = Duplicate Sample
Highlighted numbers indicate results above AWQS
Bold numbers indicate results above laboratory method detection limits

Table 3 - Summary of Analytical Results for the February 1991 Hand Auger Soil Samples at the F&B Mfg. Co. Facility WCP North Plume Site Phoenix, Arizona

Sample I.D.	Date Sample Collected	PCE (mg/kg)	TCA (mg/kg)	TCLP Chromium (mg/L)
HAB-1-5	02/20/91	**5,400**	ND	NA
HAB-2-5	02/20/91	**0.090**	ND	**0.1**
HAB-2-6	02/20/91	ND	ND	NA
HAB-4-1	02/20/91	**0.305**	**0.011**	**0.07**
HAB-4-5	02/20/91	ND	ND	NA
HAB-5-1	02/20/91	**0.095**	ND	<0.05
HAB-5-5	02/20/91	**0.011**	ND	NA
HAB-6-1	02/21/91	ND	ND	**0.24**
HAB-6-5	02/21/91	ND	ND	NA
HAB-7-1	02/21/91	ND	ND	**0.24**
HAB-7-5	02/21/91	ND	ND	NA
HAB-8-1	02/21/91	ND	ND	NA
HAB-8-5	02/21/91	ND	ND	NA
HAB-9-1	02/21/91	ND	ND	NA
HAB-9-5	02/21/91	ND	ND	NA
ADEQ RSRL		53	1,200	2,100
ADEQ NSRL		170	4,800	4,500
GPLs		1.3	1	590
RCRA Regulatory Level		-	-	5.0

Note:

PCE = Tetracholorethene
1,1,1-TCA = 1,1,1-Trichloroethane
ND = Not Detected
ADEQ NSRL = Arizona Department of Environmental Quality Non-Residential Soil Remediation Levels
ADEQ RSRL = Arizona Department of Environmental Quality Residential Soil Remediation Levels
GPLs = Groundwater Protection Limits

Highlighted numbers indicate results above ADEQ standards.
Bold numbers indicate results above laboratory method detection limits.

Table 4 - Summary of Soil Sampling Activities Performed at the F&B Mfg. Co. Facility from December 1990 to April 1991
WCP North Plume Site
Phoenix, Arizona

Sample I.D.	Date Sample Collected	PCE (mg/kg)	TPH (mg/kg)
B1-3.5	12/10/90	**0.116**	NA
B1-10	12/10/90	<0.01	NA
B1-15	12/10/90	<0.01	NA
B2-5	12/11/90	<0.01	NA
B2-10	12/11/90	<0.01	NA
B2-15	12/11/90	<0.01	NA
BRH-3-1	03/27/91	**0.217**	NA
BRH-3-5	03/27/91	**0.025**	NA
BRH-3-10	03/27/91	ND	NA
BRH-3-15	03/27/91	ND	NA
BRH-4-1	03/27/91	**0.189**	NA
BRH-4-5	03/27/91	**0.125**	NA
BRH-4-10	03/27/91	**0.02**	NA
BRH-4-15	03/27/91	ND	NA
BRH-5-1	03/27/91	**0.263**	NA
BRH-5-5	03/27/91	**0.04**	NA
BRH-5-10	03/27/91	ND	NA
BRH-5-15	03/27/91	ND	NA
BRH-6-1	03/27/91	**0.487**	NA
BRH-6-5	03/27/91	ND	NA
BRH-6-10	03/27/91	ND	NA
BRH-6-15	03/27/91	ND	NA
BRH-7-1	03/27/91	**0.207**	NA
BRH-7-5	03/27/91	**0.238**	NA
BRH-7-10	03/27/91	ND	NA
BRH-7-15	03/27/91	ND	NA
BRH-8-2	03/28/91	**0.155**	NA
BRH-8-5	03/28/91	**0.147**	NA
BRH-8-10	03/28/91	ND	NA
BRH-8-15	03/28/91	ND	NA
BRH-9-1	03/28/91	**0.13**	NA
BRH-9-5	03/28/91	ND	NA
BRH-9-10	03/28/91	ND	NA
BRH-9-15	03/28/91	NA	NA
ADEQ NRSL		170	18,000
ADEQ RSRL		53	4,100
GPLs		1.3	NE

Table 5 - 1990 Soil Vapor Analytical Results (µg/L)
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Sample I.D.	Sample Date	1,1-DCE	1,2-Trans DCE	TCE	PCE	1,1-DCA	TCA	Acetone	MEK	Toluene	M&P Xylenes	O-Xylenes
SG-01A	11/13/1990	**0.05**	ND	**0.11**	**31.6**	ND	**0.05**	ND	ND	**0.05**	**0.09**	**0.17**
SG-01B	11/13/1990	**0.47**	ND	**0.79**	**290**	ND	**0.28**	ND	**0.01**	**0.12**	**0.01**	ND
SG-02A	11/13/1990	**0.90**	**0.22**	**1.17**	**56.90**	ND	**0.22**	**0.36**	**0.13**	**0.09**	**0.73**	**0.55**
SG-02B	11/13/1990	**0.52**	ND	**1.00**	**270**	ND	**0.18**	**0.25**	**0.06**	**0.17**	**0.13**	**0.07**
SG-03A	11/13/1990	**1.93**	ND	**3.94**	**480**	ND	**0.89**	**0.84**	**0.02**	**3.31**	**0.04**	**0.52**
SG-04A	11/13/1990	**0.99**	ND	**1.44**	**350**	ND	**0.80**	**0.07**	**0.05**	**0.20**	**0.16**	**0.08**
SG-05A	11/13/1990	**0.75**	ND	**1.56**	**290**	ND	**1.71**	ND	ND	**0.04**	**0.04**	**0.05**
SG-05B	11/13/1990	**0.24**	ND	**1.68**	**72**	ND	**2.09**	ND	ND	**0.04**	**0.04**	**0.26**
SG-06A	11/13/1990	**5.57**	ND	**7.65**	**600**	ND	**4.42**	ND	**0.03**	**4.00**	**0.05**	**0.29**
SG-07A	11/13/1990	**8.70**	ND	**9.37**	**680**	ND	**6.24**	ND	**0.39**	**0.38**	**7.94**	ND
SG-08A	11/13/1990	**17.40**	ND	**9.01**	**600**	ND	**12.50**	ND	**0.08**	**7.20**	**0.10**	**0.17**
SG-09A	11/13/1990	ND	ND	ND	ND	ND	ND	ND	ND	**0.13**	**0.15**	**0.05**
SG-09B	11/13/1990	ND	ND	ND	**0.09**	ND	ND	ND	ND	**0.13**	**0.13**	**0.05**
SG-10A	11/13/1990	**31.20**	ND	**12.05**	**130**	ND	**19.90**	ND	ND	**0.03**	ND	**0.03**
SG-10B	11/13/1990	**24.30**	ND	**11.50**	**1,200**	ND	**25.90**	ND	ND	**2.03**	**0.08**	**0.71**
SG-11B	11/13/1990	**2.18**	ND	**0.49**	**180**	ND	**3.63**	ND	**0.19**	**0.04**	**0.04**	ND
SG-12B	11/13/1990	**18.90**	ND	**6.03**	**840**	**0.05**	**56.50**	ND	**0.78**	**0.53**	ND	**1.46**
SG-13B	11/13/1990	**28.10**	ND	**6.92**	**1,010**	ND	**49.30**	ND	ND	ND	**0.04**	ND
SG-14B	11/14/1990	**14.20**	ND	**6.62**	**1,020**	ND	**22.60**	ND	ND	**0.21**	**0.09**	ND
SG-15B	11/14/1990	**18.30**	ND	**9.16**	**1,100**	ND	**22.00**	ND	ND	**0.14**	**0.11**	ND
SG-16B	11/14/1990	**4.82**	ND	ND	**162**	ND	**475.00**	ND	ND	**0.12**	**0.25**	**0.06**
SG-17B	11/14/1990	**26.10**	ND	**11.30**	**1,370**	ND	**92.30**	ND	ND	**0.19**	**0.15**	**0.08**
SG-18B	11/14/1990	**34.70**	ND	**12.20**	**1,510**	ND	**184.00**	ND	ND	**0.13**	**0.13**	ND
SG-19B	11/14/1990	**39.60**	ND	**9.06**	**1,150**	**2.71**	**79.20**	ND	ND	**0.17**	**0.12**	**0.04**
SG-20B	11/14/1990	**10.30**	ND	**7.25**	**1,140**	ND	**66.90**	ND	ND	**0.06**	**0.08**	ND
SG-21B	11/14/1990	**12.60**	ND	**4.66**	**900**	ND	**48.70**	ND	ND	**0.06**	ND	ND
SG-22A	11/14/1990	**14.80**	ND	**2.89**	**650**	ND	**42.80**	ND	ND	**0.03**	ND	ND
SG-22B	11/14/1990	**16.90**	ND	**2.65**	**635**	ND	**42.00**	ND	ND	**0.04**	ND	ND
SG-23A	11/14/1990	**24.40**	ND	**5.46**	**780**	ND	**57.30**	ND	ND	**0.10**	ND	ND
SG-24A	11/14/1990	**13.50**	ND	**0.85**	**275**	ND	**44.30**	ND	ND	**0.10**	**0.04**	ND
SG-25A	11/14/1990	**15.60**	ND	**2.87**	**230**	ND	**86.90**	**0.11**	**0.31**	**0.13**	**0.05**	ND
SG-26A	11/14/1990	**5.63**	ND	**0.57**	**150**	ND	**38.20**	ND	ND	ND	ND	**0.26**
SG-27A	11/14/1990	**5.46**	ND	**1.41**	**110**	ND	**37.10**	ND	ND	**0.07**	ND	ND
SG-28A	11/14/1990	ND	ND	ND	**4.44**	ND	ND	ND	ND	**0.17**	**0.10**	**0.05**
SG-29A	11/14/1990	**4.00**	ND	**3.30**	**515**	ND	**13.50**	ND	**0.08**	**0.07**	ND	ND
SG-30A	11/14/1990	**6.84**	ND	**7.60**	**1,160**	ND	**6.21**	ND	**0.06**	**0.04**	**0.05**	ND

Notes: Samples collected on November 13 &14, 1990
Bold numbers indicate results above laboratory detection limits.

Table 6 - PCE Concentrations in F&B Westbay Monitor Wells (µg/L)
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Well	Zone	Screen Interval	SAMPLE DATE											
			Oct-92	May-93	Oct-93	Feb-94	Apr-94	Jul-94	Oct-94	Jan-95	Apr-95	Jul-95	Oct-95	May-98
F&B-1	1	105-115	**87,000**	**83,000**	**100,000**	**95,000**	**130,000**	**140,000**	**85,000**	**96,000**	**68,000**	**110,000**	**87,000**	**72,000**
		Dup.	**75,000**	**79,000**	**110,000**	**140,000**	**120,000**	**140,000**	**71,000**	**91,000**	**120,000**			
	2	130-140	**1,200**	**270**	**110**	**64,000**	**130,000**	**150,000**	**140,000**	**130,000**	**80,000**	**130,000**	**130,000**	**1,100**
	3	155-165	**1,400**	**1,200**	**120**	**6,600**	**58,000**	**32,000**	**1,100**	**33,000**	**30,000**	**29,000**	**3,000**	NS
	4	180-190	**650**	**220**	**150**	**170**	**4,400**	**590**	**210**	**2,700**	**2,400**	**2,400**	**280**	NS
	5	205-215	**890**	**440**	**1,300**	**730**	**4,100**	**1,000**	**650**	**1,800**	**2,000**	**1,800**	**300**	NS
F&B-2	1	230-240		**520**	**180**	**130**	**140**	**95**	**19**	**30**	**74**	**35**	**14**	NS
		Dup.		**790**	**150**	**130**	**100**	**88**	**22**	**56**	**60**			
	2	255-265		**380**	**160**	**200**	**120**	**110**	**39**	**34**	**66**	**61**	**14**	NS
	3	280-290		**52**	**13**	**26**	**8.3**	**15**	**11**	**5.6**	**9.1**	**10**	**5.2**	NS
	4	305-315		**190**	**12**	**25**	**6.9**	**16**	**12**	**4**	**10**	**11**	**7**	NS
	5	330-340		**140**	**16**	**26**	**4**	**6.4**	**3.9**	**2.9**	**9.8**	**12**	**5.7**	NS
	6	355-365		**770**	**49**	**20**	**13**	**4.4**	**6.2**	**4.3**	**4.2**	**3.1**	**6.6**	NS
	7	380-390		**680**	**170**	**170**	**130**	**89**	**57**	**74**	**91**	**76**	**92**	NS
	8	405-415		**690**	**290**	**220**	**170**	**180**	**140**	**160**	**140**	**200**	**140**	NS
	9	430-440		**880**	**230**	**230**	**230**	**250**	**230**	**230**	**220**	**200**	**240**	**190**
	10	455-465		**750**	**180**	**60**	**55**	**43**	**38**	**37**	**38**	<2	**57**	NS
	11	480-490		**590**	**94**	**39**	**36**	**20**	**24**	**19**	**23**	<2	**31**	**5**
F&B-3	1	105-115			**450**	**490**	**390**	**380**	**310**	**210**	**190**	**190**	**140**	**310**
		Dup.			**590**	**520**	**350**	**340**	**370**	**360**	**360**			NS
	2	155-165			**62**	**8.1**	**9.4**	**9.4**	**7.9**	**5.2**	**6.7**	**6.1**	**4**	NS
	3	205-215			<2	<2	**6.4**	<2	<2	<2	<2	<2	<2	NS
	4	255-265			**75**	**9.6**	**12**	**2.6**	**3.4**	<2	**2**	<2	**2**	NS
	5	305-315			**21**	**25**	**15**	**5.1**	**3.9**	<2	**3**	**2.1**	**2.2**	NS
	6	330-340			**66**	**31**	**20**	**4.2**	**3.4**	<2	**2**	<2	**2**	NS
	7	355-365			**76**	**34**	**21**	**4.1**	**2.5**	<2	**2**	<2	<2	NS
	8	380-390			**42**	**20**	**29**	**8.7**	**7.9**	**7.1**	**6.2**	**5.5**	**4.4**	NS
	9	430-440			**27**	**12**	**30**	**8.2**	**16**	**9.3**	**8.5**	**8.9**	**8.9**	NS
	10	480-490			**30**	**18**	**43**	**5.8**	**12**	**8.7**	**7.5**	**5.4**	**8.7**	**3.3**
F&B-4	1	105-115				**6,100**	**7,600**	**4,600**	**7,900**	**6,400**	**3,600**	**4,200**	**4,400**	**3,100**
		Dup.				**8,200**	**7,200**	**8,400**	**8,800**	**6,900**	**5,700**			NS
	2	155-165				**60**	**32**	**16**	**14**	**20**	**21**	**13**	**17**	NS
	3	205-215				**24**	**6.7**	**4.9**	**3.8**	**17**	**3**	**2.3**	**2.7**	NS
	4	255-265				**190**	**150**	**85**	**63**	**91**	**45**	**46**	**33**	**18**
	5	305-315				**82**	**15**	**8.5**	**7.9**	**5.2**	**6**	**6.6**	**5.3**	NS
	6	330-340				**65**	**16**	**7.3**	**5.1**	**3.1**	**5.1**	**6**	**6.4**	NS
	7	355-365				**110**	**24**	**12**	**15**	**12**	**14**	**15**	**14**	NS
	8	380-390				**70**	**15**	**7.9**	**9.7**	**5.9**	**6.7**	**7.9**	**7.7**	NS
	9	430-440				**15**	**9.9**	**4.4**	**5.5**	**2**	**4.3**	**5**	**3.3**	NS
	10	480-490				**29**	**12**	**8.7**	**8.8**	**8.1**	**420**	**7.7**	**8.2**	1.8
AZ AWQS			5											

Notes: NS = Not Sampled
Dup. = Duplicate Sample
<2 = Not detected at laboratory detection limit of 2.0 µg/L.
AWQS = Aquifer Water Quality Standard for PCE is 5 micrograms per liter
Bold numbers indicate detections above laboratory method detection limits
Highlighted numbers indicate concentrations above AWQS for PCE

Table 7 - Basin & Range Falling-Head Test Results
F&B Westbay Wells
WCP North Plume Site
Phoenix, Arizona

Well	Screened Interval	ft/sec	ft/day	gpd/ft2
F&B-1	105-115	3.740E-05	3.23	24.17
	130-140	2.366E-05	2.04	15.29
	155-165	2.059E-05	1.78	13.31
	180-190	1.770E-06	0.15	1.14
	205-215	1.097E-05	0.95	7.09
F&B-2	230-240	3.222E-04	27.84	208.23
	255-265	1.425E-04	12.31	92.09
	280-290	8.815E-05	7.62	56.97
	305-315	2.301E-05	1.99	14.87
	330-340	1.014E-04	8.76	65.53
	355-365	7.942E-06	0.69	5.13
	380-390	2.281E-05	1.97	14.74
	405-415	3.389E-06	0.29	2.19
	430-440	1.306E-05	1.13	8.44
	455-465	5.472E-06	0.47	3.54
	480-490	4.153E-06	0.36	2.68
F&B-3	105-115	0.000E+00	0.00	0.00
	155-165	3.471E-05	3.00	22.43
	205-215	2.653E-05	2.29	17.15
	255-265	1.988E-04	17.18	128.48
	280-290	5.708E-06	0.49	3.69
	305-315	1.446E-05	1.25	9.35
	330-340	7.544E-06	0.65	4.88
	380-390	1.305E-05	1.13	8.43
	430-440	1.860E-05	1.61	12.02
	480-490	5.726E-06	0.49	3.70
F&B-4	105-115	1.660E-04	14.34	107.28
	155-165	5.517E-06	0.48	3.57
	205-215	1.534E-04	13.25	99.14
	255-265	3.531E-04	30.51	228.20
	280-290	5.878E-06	0.51	3.80
	305-315	7.312E-06	0.63	4.73
	330-340	7.046E-05	6.09	45.54
	380-390	1.088E-04	9.40	70.31
	430-440	2.598E-05	2.24	16.79
	480-490	2.217E-04	19.15	143.28

Notes:
Aquifer test performed in April 1993 and January 1994
ft/sec= feet per second
ft/day= feet per day
gpd/ft^2= gallons per day per feet squared

Table 8 - VOCs Detected in Soil Samples from Weston's 1998 Investigation
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

		Analytes (mg/kg)				
Boring	**Depth (feet bgs)**	**PCE**	**TCE**	**1,1-DCE**	**cis 1,2-DCE**	**1,1-DCA**
HB-1	5	<0.05	<0.05	<0.05	<0.05	<0.05
	40	<0.05	<0.05	<0.05	<0.05	<0.05
	90	<0.05	<0.05	<0.05	<0.05	<0.05
	100	<0.05	<0.05	<0.05	<0.05	<0.05
	110	<0.05	<0.05	<0.05	<0.05	<0.05
HB-2	5	<0.05	<0.05	<0.05	<0.05	<0.05
	20	<0.05	<0.05	<0.05	<0.05	<0.05
	70	<0.05	<0.05	<0.05	<0.05	<0.05
	100	<0.05	<0.05	<0.05	<0.05	<0.05
	107	<0.05	<0.05	<0.05	<0.05	<0.05
HB-3	5	<0.05	<0.05	<0.05	<0.05	<0.05
	50	<0.05	<0.05	<0.05	<0.05	<0.05
	80	<0.05	<0.05	<0.05	<0.05	<0.05
	100	<0.05	<0.05	<0.05	<0.05	<0.05
	107	<0.05	<0.05	<0.05	<0.05	<0.05
HB-4	5	<0.05	<0.05	<0.05	<0.05	<0.05
	15	<0.05	<0.05	<0.05	<0.05	<0.05
	50	<0.05	<0.05	<0.05	<0.05	<0.05
	50D	<0.05	<0.05	<0.05	<0.05	<0.05
	90	<0.05	<0.05	<0.05	<0.05	<0.05
	107	<0.05	<0.05	<0.05	<0.05	<0.05
	107D	<0.05	<0.05	<0.05	<0.05	<0.05
HB-5	10	**0.092**	<0.05	<0.05	<0.05	<0.05
	40	**0.065**	<0.05	<0.05	<0.05	<0.05
	60	**0.096**	<0.05	<0.05	<0.05	<0.05
	60D	**0.093**	<0.05	<0.05	<0.05	<0.05
	90	**0.46**	<0.05	<0.05	<0.05	<0.05
	108	**0.16**	<0.05	<0.05	<0.05	<0.05
	108D	**0.18**	<0.05	<0.05	<0.05	<0.05
HB-6	5	**0.45**	<0.05	<0.05	<0.05	<0.05
	50	**0.33**	<0.05	<0.05	<0.05	<0.05
	50D	**0.3**	<0.05	<0.05	<0.05	<0.05
	80	**2.5**	<0.05	<0.05	<0.05	<0.05
	100	**0.75**	<0.05	<0.05	<0.05	<0.05
	108	**0.44**	<0.05	<0.05	<0.05	<0.05
	108D	**0.28**	<0.05	<0.05	<0.05	<0.05
B-7	20	<0.05	<0.05	<0.05	<0.05	<0.05
	25	<0.05	<0.05	<0.05	<0.05	<0.05
B-8	15	<0.05	<0.05	<0.05	<0.05	<0.05
	20	<0.05	<0.05	<0.05	<0.05	<0.05
	25	<0.05	<0.05	<0.05	<0.05	<0.05
	30	<0.05	<0.05	<0.05	<0.05	<0.05

Table 8 - VOCs Detected in Soil Samples from Weston's 1998 Investigation
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

		Analytes (mg/kg)				
Boring	**Depth (feet bgs)**	**PCE**	**TCE**	**1,1-DCE**	**cis 1,2-DCE**	**1,1-DCA**
B-9	15	<0.05	<0.05	<0.05	<0.05	<0.05
	20	<0.05	<0.05	<0.05	<0.05	<0.05
	25	<0.05	<0.05	<0.05	<0.05	<0.05
	30	<0.05	<0.05	<0.05	<0.05	<0.05
B-10	5	**0.12**	<0.05	<0.05	<0.05	<0.05
	10	**0.071**	<0.05	<0.05	<0.05	<0.05
	15	<0.05	<0.05	<0.05	<0.05	<0.05
	20	**0.12**	<0.05	<0.05	<0.05	<0.05
B-11	15	<0.05	<0.05	<0.05	<0.05	<0.05
	20	<0.05	<0.05	<0.05	<0.05	<0.05
	25	<0.05	<0.05	<0.05	<0.05	<0.05
	30	<0.05	<0.05	<0.05	<0.05	<0.05
B-12	15	<0.05	<0.05	<0.05	<0.05	<0.05
	20	<0.05	<0.05	<0.05	<0.05	<0.05
	25	<0.05	<0.05	<0.05	<0.05	<0.05
	30	<0.05	<0.05	<0.05	<0.05	<0.05
B-13	15	**0.069**	<0.05	<0.05	<0.05	<0.05
	20	<0.05	<0.05	<0.05	<0.05	<0.05
	25	<0.05	<0.05	<0.05	<0.05	<0.05
	30	<0.05	<0.05	<0.05	<0.05	<0.05
B-14	5	<0.05	<0.05	<0.05	<0.05	<0.05
	10	<0.05	<0.05	<0.05	<0.05	<0.05
	15	**0.23**	<0.05	<0.05	<0.05	<0.05
	20	**0.14**	<0.05	<0.05	<0.05	<0.05
B-15	5	<0.05	<0.05	<0.05	<0.05	<0.05
	10	<0.05	<0.05	<0.05	<0.05	<0.05
ADEQ Residential SRL		**53**	**27**	**0.36**	**31**	**500**
ADEQ Non-residential SRL		**170**	**70**	**0.8**	**100**	**1,700**
GPL		**1.3**	**0.61**	**0.81**	**4.9**	**NE**

Notes: bgs = below ground surface
mg/kg = milligrams per kilogram
Bold indicates result above laboratory detection limits.
Highlighted indicates result above ADEQ SRL or GPL.
SRL = Soil Remediation Level
GPL = Groundwater Protection Limit
PCE = Tetrachloroethene
TCE = Trichloroethene
1,1-DCE = 1,1-Dichloroethene
cis 1,2-DCE = cis 1,2-Dichloroethene
1,1-DCA = 1,1-Dichloroethane

Table 9 – Metals Detected in Soil Samples from Weston's 1998 Investigation
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

Boring	Date	Depth (feet bgs)	Arsenic (mg/kg)	Beryllium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
B-9	5/4/98	15	<5	<0.5	**10**	**31**	**7**	**17**	**33**
		20	**5**	**0.7**	**27**	**26**	**10**	**34**	**46**
		25	<5	**0.9**	**25**	**23**	**16**	**28**	**46**
		30	<5	<0.5	**14**	**18**	**5**	**19**	**29**
B-10	5/4/98	5	**5**	**0.6**	**22**	**24**	**11**	**28**	**40**
		10	**7**	<0.5	**18**	**18**	**8**	**21**	**32**
		15	**6**	<0.5	**7**	**39**	<5	**18**	**36**
		20	<5	**0.9**	**31**	**38**	**15**	**41**	**61**
B-11	5/1/98	15	<5	<0.5	**5**	**11**	<5	**12**	**15**
		20	<5	**0.5**	**19**	**21**	**6**	**27**	**38**
		25	<5	**0.5**	**19**	**17**	**7**	**20**	**35**
		30	<5	<0.5	**7**	**17**	<5	**18**	**22**
B-12	5/1/98	15	<5	<0.5	**9**	**18**	<5	**15**	**23**
		20	<5	<0.5	**8**	**18**	<5	**14**	**22**
		25	<5	<0.5	**9**	**19**	<5	**17**	**26**
		30	<5	<0.5	**9**	**17**	<5	**18**	**24**
B-13	5/4/98	15	<5	<0.5	**8**	**11**	<5	**14**	**18**
		20	<5	<0.5	**6**	**18**	**6**	**17**	**22**
		25	**5**	<0.5	**18**	**17**	**8**	**19**	**32**
		30	<5	<0.5	**11**	**31**	**5**	**18**	**43**
B-14	5/1/98	5	<5	0.5	**22**	**19**	**9**	**22**	**37**
		10	<5	<0.5	**9**	**13**	<5	**15**	**22**
		15	<5	**0.5**	**24**	**23**	**7**	**34**	**43**
		20	<5	<0.5	**5**	**15**	<5	**10**	**18**
B-15	5/1/98	5	<5	**0.7**	**27**	**26**	**10**	**34**	**46**
		10	**6**	<0.5	**17**	**17**	**5**	**17**	**29**
ADEQ Residential SRL			10	1.4	2,100	2,800	400	1,500	23,000
ADEQ Non-residential SRL			10	11	4,500	63,000	2,000	34,000	510,000
GPL			290	23	590	NE	290	590	NE

Notes: bgs- below ground surface
Bold results indicate result above laboratory detection limit.
Highlighted results indicate result above ADEQ RSRL, NSRL, or GPL
GPL- Groundwater Protection Limits
SRL-Residential Soil Remediation Levels

Table 9 – Metals Detected in Soil Samples from Weston's 1998 Investigation
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

Boring	Date	Depth (feet bgs)	Arsenic (mg/kg)	Beryllium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)
HB-1	4/27/98	5	**5**	**0.6**	**27**	**26**	**12**	**28**	**46**
		40	**8**	**0.7**	**29**	**25**	**12**	**34**	**43**
		90	**7**	**0.8**	**45**	**80**	**12**	**32**	**72**
		100	**11**	**0.7**	**65**	**24**	**12**	**32**	**41**
		110	**5**	**0.6**	**30**	**17**	**9**	**21**	**29**
HB-2	4/29/98	5	**6**	**0.8**	**40**	**34**	**15**	**41**	**58**
		20	<5	<0.5	**8**	**22**	<5	**13**	**25**
		70	**5**	**0.6**	**24**	**18**	**6**	**20**	**39**
		100	**7**	**0.7**	**50**	**18**	**8**	**25**	**36**
		107	**8**	<0.5	**36**	**14**	**6**	**20**	**26**
HB-3	4/28/98	5	**7**	**0.7**	**30**	**30**	**12**	**35**	**49**
		50	**13**	**0.8**	**29**	**23**	**13**	**29**	**42**
		80	**13**	**0.8**	**31**	**30**	**12**	**30**	**41**
		100	**9**	**0.7**	**24**	**13**	**12**	**20**	**28**
		107	**6**	**0.6**	**65**	**14**	**9**	**23**	**31**
HB-4	5/5/98	5	**5**	**0.7**	**29**	**28**	**12**	**35**	**48**
		15	<5	<0.5	**5**	**11**	**5**	**9**	**16**
		50	**5**	**1**	**23**	**26**	**18**	**44**	**51**
		90	<5	**0.7**	**120**	**15**	**11**	**32**	**32**
		107	**8**	<0.5	**13**	**13**	**13**	**22**	**16**
HB-5	5/6/98	10	**6**	<0.5	**15**	**19**	<5	**18**	**28**
		40	<5	<0.5	**7**	**23**	<5	**14**	**28**
		60	<5	<0.5	**21**	**25**	**5**	**19**	**30**
		90	**6**	**0.6**	**83**	**16**	**5**	**31**	**35**
		108	**6**	**0.6**	**41**	**16**	**10**	**22**	**33**
HB-6	5/8/98	5	<5	**0.8**	**27**	**25**	**13**	**31**	**48**
		50	**8**	**0.6**	**32**	**22**	**8**	**27**	**36**
		80	**6**	**0.8**	**28**	**28**	**13**	**36**	**47**
		100	<5	**0.7**	**100**	**15**	**8**	**27**	**36**
		108	<5	<0.5	**30**	**11**	<5	**14**	**20**
B-7	5/1/98	20	**5**	0.6	**22**	**26**	**9**	**29**	**42**
		25	**5**	<0.5	**17**	**26**	**5**	**20**	**43**
B-8	5/4/98	15	<5	<0.5	**9**	**14**	**6**	**16**	**23**
		20	**7**	**0.6**	**24**	**23**	**10**	**31**	**52**
		25	**6**	**0.6**	**21**	**18**	**9**	**22**	**38**
		30	<5	<0.5	**8**	**14**	<5	**17**	**19**

Table 10 – VOCs Detected in Groundwater Samples from Weston's 1998 Investigation
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

Boring/Analysis Method	Sample Date	1,1-DCE (µg/L)	PCE (µg/L)	cis-1,2-DCE (µg/L)	1,1-DCA (µg/L)	TCE (µg/L)	Acetone (µg/L)	MEK (µg/L)	Chloroform (µg/L)	Toluene (µg/L)
HB-1 (601/602)	4/28/98	<1	<1	<1	<1	<1	NA	NA	<1	<1
HB-1 (624)		<5	<5	<5	<5	<5	<50	<10	<5	<5
HB-2 (601/602)	4/30/98	<1	<1	<1	<1	<1	NA	NA	<1	<1
HB-2 (624)		<5	<5	<5	<5	<5	<50	<10	<5	<5
HB-3 (601/602)	4/29/98	**1.4**	<1	<1	<1	<1	NA	NA	<1	<1
HB-3 (624)		<5	<5	<5	<5	<5	<50	<10	<5	<5
HB-4 (601/602)	5/5/98	**55**	**7,300**	<50	<50	<50	NA	NA	<1	<1
HB-4D (601/602)		**51**	**8,100**	<50	<50	<50	NA	NA	<1	<1
HB-4 (624)		**82**	**11,000**	**8**	**5**	**9**	<50	<10	<5	<5
HB-4D (624)		**110**	**7,900**	**8**	<5	**9**	<50	<10	<5	<5
HB-5 (601/602)	5/7/98	<10	**920**	**17**	<10	<10	NA	NA	<1	<1
HB-5 (624)		<5	**1,400**	**25**	<5	**17**	**99**	**19**	<5	<5
HB-6 (601/602)	5/8/98	<100	**19,000**	<100	<100	<100	NA	NA	<1	<1
HB-6 (624)		**160**	**19,000**	**20**	**17**	**17**	<50	<10	**8**	**7**
AWQS		**7**	**5**	**70**	**NE**	**5**	**NE**	**NE**	**NE**	**1,000**

Notes: µg/L = micrograms per liter
AWQS = Arizona Aquifer Water Quality Standard
Highlighted results indicate an exceedance of the AWQS.
Bold numbers indicate results above laboratory method detection limits
NE = Not established

Table 11 - Metals Detected in Groundwater Samples from Weston's 1998 Investigation
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

Boring	Sample Date	Arsenic (mg/L)	Beryllium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Nickel (mg/L)	Zinc (mg/L)
HB-1	4/28/98	<0.005	<0.005	**0.03**	**0.03**	<0.05	<0.04	**0.34**
HB-2	4/30/98	**0.011**	<0.005	**0.08**	**0.03**	<0.05	<0.04	**0.19**
HB-3	4/29/98	**0.14**	**0.025**	**2.1**	**0.66**	**0.33**	**0.88**	**1.5**
HB-4	5/5/98	**0.13**	**0.01**	**0.7**	**0.34**	**0.13**	**0.39**	**1.5**
HB-5	5/7/98	**0.1**	**0.012**	**1.1**	**0.46**	**0.6**	**0.49**	**2**
HB-6	5/8/98	**0.019**	<0.005	**0.16**	**0.09**	**0.07**	**0.09**	**0.76**
AWQS		**0.05**	**0.004**	**0.1**	**NE**	**0.05**	**0.1**	**NE**

mg/L = milligrams per liter
AWQS = Arizona Aquifer Water Quality Standard
Highlighted results indicate an exceedance of the AWQS.
Bold numbers indicate results above laboratory method detection limits
NE= Not established

Table 12 - Soil Sample Results from SCS Engineers 1992 Phase II Investigation
Rinchem Facility
WCP North Plume Area
Phoenix, Arizona

Sample ID	Total VOCs (µg/L)	TPH (mg/kg)	SRL (TPH)
R-D1 (east drywell)	ND	31	4,100
R-D2 (west drywell)	ND	14	4,100
R-S1 (standpipes)	ND	978	4,100
R-S2 (aboveground piping)	ND	50	4,100
R-S3 (loading dock and drywell)	ND	106	4,100

Notes:

1. SCS Engineers, October 21, 1992, "Limited Phase II Environmental Assessment, 4115 West Turney, Phoenix, Arizona"
2. VOCs = Volatile Organic Compounds using EPA Method 8240
3. TPH = Total Petroleum Hydrocarbons using Arizona BLS-181
4. Arizona Department of Environmental Quality Residential Soil Remediation Level (1999).
5. ND = analyte not detected above laboratory detection limits

Table 13 - Soil Sample Results from Law Engineering's 1993 Investigation
Rinchem Facility
WCP North Plume Area
Phoenix, Arizona

Borehole	Sampling Depth (feet)	TRPH (mg/kg)	Borehole	Sampling Depth (feet)	TRPH (mg/kg)
1B	0.5 - 1.5	<20	2B	0.5 - 1.5	<20
1B	2 - 3	<20	2B	2 - 3	<20
1C	0.5 - 1.5	<20	2C	0.5 - 1.5	<20
1C	2 - 3	<20	2C	2 - 3	<20
1D	0.5 - 1.5	<20	2D	0.5 - 1.5	<20
1D	2 - 3	<20	2D	2 - 3	<20
1E	0.5 - 1.5	<20	2E	0.5 - 1.5	<20
1E	2 - 3	<20	2E	2 - 3	<20
1F	0.5 - 1.5	<20	2F	0.5 - 1.5	<20
1F	2 - 3	<20	2F	2 - 3	<20
1G	0.5 - 1.5	<20	2G	0.5 - 1.5	<20
1G	2 - 3	<20	2G	2 - 3	<20
1H	0.5 - 1.5	<20	2H	0.5 - 1.5	<20
1H	2 - 3	<20	2H	2 - 3	<20
1I	0.5 - 1.5	<20	2I	0.5 - 1.5	<20
1I	2 - 3	<20	2I	2 - 3	<20
1J	0.5 - 1.5	<20	2J	0.5 - 1.5	<20
1J	2 - 3	<20	2J	2 - 3	<20
1K	0.5 - 1.5	<20	2K	0.5 - 1.5	<20
1K	2 - 3	<20	2K	2 - 3	<20
1L	0.5 - 1.5	<20	2L	0.5 - 1.5	<20
1L	2 - 3	<20	2L	2 - 3	<20
1M	0.5 - 1.5	<20	2M	0.5 - 1.5	<20
1M	2 - 3	<20	2M	2 - 3	<20
3A	0.5 - 1.5	<20	8A	0.5 - 1.5	<20
3A	2 - 3	<20	8A	2 - 3	<20
4A	0.5 - 1.5	<20	9A	0.5 - 1.5	<20
4A	2 - 3	<20	9A	2 - 3	<20
5A	0.5 - 1.5	<20	10A	0.5 - 1.5	<20
5A	2 - 3	<20	10A	2 - 3	<20
6A	0.5 - 1.5	<20	11A	0.5 - 1.5	<20
6A	2 - 3	<20	11A	2 - 3	<20
7A	0.5 - 1.5	<20	12A	0.5 - 1.5	<20
7A	2 - 3	<20	12A	2 - 3	<20

Notes:
1. Law Engineering, February 5, 1993, "Final Report of Soil Sampling Activities, Rinchem Site, 4115 West Turney Avenue, Phoenix, Arizona"
2. TRPH = Total Recoverable Petroleum Hydrocarbons using Arizona BLS-181

Table 14 - Soil Vapor Analytical Results from Four Corner's 1994 Investigation
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Sample Identification/ Analyte	Date	1,1- DCE	1,1- DCA	TCM	TCE	PCE	Acetone	Carbon Tetrachloride	MEK	1,1,1-TCA	Vinyl Chloride	Methylene Chloride	Chloroethane	cis-1,2-DCE	Benzene	Toluene	Ethylbenzene	Total Xylens
								µg/L										
B-5 (60-61)	10/19/94	**160**	**8.6**	NA	<2.0	NA	NA	<2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5 (70-71)	10/19/94	**360**	<10	NA	<10	NA	NA	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5 (80-81)	10/19/94	**0.86**	<0.10	NA	<0.10	NA	NA	<0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5 (90-91)	10/19/94	**240**	**5.9**	NA	**6.4**	NA	NA	**3.1**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5 (100-101)	10/19/94	**0.63**	<0.10	NA	<0.10	NA	NA	<0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5 (110-111)	10/19/94	**340**	<10	NA	<10	NA	NA	<10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8 (10-11)	10/13/94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**12**	**8**	**34**	**97**
B-8 (20-21)	10/13/94	<0.10	<0.10	<0.10	<0.10	<0.10	**3**	NA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.33**	**0.2**	**0.6**
B-8 (30-31)	10/13/94	<0.10	**0.64**	**1.3**	<0.10	<0.10	<0.10	NA	**3.3**	<0.10	**53**	<0.10	<0.10	<0.10	**11**	**11**	**2**	**5.8**
B-8 (40-41)	10/13/94	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10	<0.10	**0.37**	<0.10	<0.10	<0.10	**0.37**	**0.16**	**0.96**	**3.1**
B-8 (50-51)	10/13/94	<0.10	<0.10	<0.10	<0.10	<0.10	**0.76**	NA	**0.14**	<0.10	**0.24**	<0.10	<0.10	<0.10	<0.10	**0.32**	<0.10	**0.32**
B-8 (60-61.5)	10/13/94	<1.0	**6.8**	**2.1**	<1.0	<1.0	<1.0	NA	**6.1**	<1.0	**140**	<1.0	<1.0	<1.0	**35**	**16**	<1.0	<2.5
B-8 (70-71)	10/13/94	**0.12**	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.16**	**0.32**	<0.10	<0.25
B-8 (100-101)	10/13/94	**48**	**6.7**	**3.3**	**4.7**	<1.0	<1.0	NA	<1.0	**0.44**	**56**	<1.0	<1.0	**2.7**	**87**	**65**	**3.1**	**6.8**
B-9 (80-81)	10/17/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<1.0	**1.3**	<1.0	<1.0	<1.0	**44**	**35**	**2**	**5.2**
B-9 (90-91)	10/17/94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**20**	**12**	**2.2**	**1.4**
B-9 (100-101)	10/17/94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.21**	<0.10	**0.31**	**0.71**
B-9 (110-111)	10/17/94	**0.8**	**0.83**	**0.28**	<0.10	<0.10	**8.7**	NA	<0.10	<0.10	**2.3**	<0.10	<0.10	<0.10	**13**	**14**	**1.8**	**3.7**
B-10 (10-11)	10/20/94	**64**	<2.0	<2.0	<2.0	**7.4**	<2.0	NA	<2.0	**85**	<2.0	<2.0	**7.8**	**66**	NA	NA	NA	NA
B-10 (20-21)	10/20/94	<0.10	<0.10	<0.10	<0.10	<0.10	**0.22**	NA	<0.10	**0.16**	<0.10	<0.10	<0.10	<0.10	NA	NA	NA	NA
B-10 (30-31)	10/20/94	**17**	**29**	**0.58**	<0.10	<0.10	<0.10	NA	<0.10	**10**	<0.10	<0.10	<0.10	**5.9**	NA	NA	NA	NA
B-10 (60-61)	10/20/94	**90**	**57**	**1.2**	**3.8**	**3.2**	<1.0	NA	<1.0	**46**	<1.0	<1.0	<1.0	**8.3**	**3.9**	**21**	<1.0	<2.5
B-10 (70-71)	10/20/94	**94**	**48**	<10	<10	<10	**150**	NA	<10	**70**	<10	<10	<10	<10	<10	**92**	<10	<25
B-10 (80-81)	10/20/94	**0.99**	**0.26**	<0.10	<0.10	<0.10	**8**	NA	**1**	**0.33**	<0.10	<0.10	<0.10	<0.10	<0.10	**1**	<0.10	<0.25
B-10 (90-91)	10/20/94	**190**	**56**	<2.0	<2.0	<2.0	**2.7**	NA	**8.1**	**34**	<2.0	**74**	<2.0	**9.6**	**3.4**	**30**	<2.0	<5.0
B-10 (100-101)	10/20/94	**4.5**	**1.4**	<0.10	**0.16**	<0.10	**7.3**	NA	**1.1**	**0.77**	<0.10	**1.1**	<0.10	**0.18**	**0.24**	**1.3**	<0.10	<0.25
B-10 (110-111)	10/20/94	**980**	**230**	<10	**38**	**13**	**120**	NA	**46**	**55**	<10	**570**	<10	**38**	**42**	**120**	<10	<25
B-11 (10-11)	10/21/94	<1.0	**26**	<1.0	<1.0	<1.0	<1.0	NA	<1.0	**14**	<1.0	**10**	<1.0	**24**	**2.6**	**54**	<1.0	<2.5
B-11 (20-21)	10/21/94	**0.14**	<0.10	<0.10	<0.10	<0.10	**0.26**	NA	<0.10	**0.28**	<0.10	<0.10	<0.10	<0.10	<0.10	**0.71**	<1.10	<0.25
B-11 (30-31)	10/21/94	**5.1**	**20**	<2.5	<2.5	<2.5	<2.5	NA	<2.5	**28**	<2.5	<2.5	<2.5	**2.7**	<2.5	**3.7**	<2.5	<6.3
B-11 (40-41)	10/21/94	<1.0	**17**	<1.0	<1.0	<1.0	**7.1**	NA	<1.0	**21**	<1.0	**1.2**	<1.0	**4.7**	**1.9**	**26**	<1.0	<2.5
B-11 (50-51)	10/21/94	<10	<10	<10	<10	<10	**260**	NA	<10	<10	<10	<10	<10	<10	NA	NA	NA	NA
B-11 (60-61)	10/21/94	**7.4**	**4.7**	<2.5	<2.5	<2.5	**7.1**	NA	<2.5	**3.9**	<2.5	<2.5	<2.5	<2.5	<2.5	**6.2**	<2.5	<6.3
B-11 (70-71)	10/21/94	**12**	**5.3**	<1.0	<1.0	<1.0	**6.7**	NA	<1.0	**4**	<1.0	<1.0	<1.0	<1.0	<1.0	**17**	<1.0	<2.5
B-11 (80-81)	10/21/94	<1.0	<1.0	<1.0	<1.0	<1.0	**31**	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	<1.0	<2.5
B-11 (90-91)	10/21/94	<0.10	<0.10	<0.10	<0.10	<0.10	**0.35**	NA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	NA	NA	NA
B-11 (100-101)	10/21/94	**5.5**	**1.2**	<0.10	**0.13**	<0.10	**19**	NA	**3.7**	<0.10	<0.10	<0.10	<0.10	**0.48**	**0.1**	**2.3**	<0.10	<0.25
B-11 (110-111)	10/21/94	**3.1**	**0.73**	<0.10	**0.26**	<0.10	**54**	NA	**5.6**	<0.10	<0.10	**30**	<0.10	<0.10	**0.23**	**0.36**	<0.10	<0.25
B-12 (10-11.5)	10/24/94	0.23	**1.1**	**0.76**	<0.10	<0.10	**1.9**	NA	**1.8**	<0.10	**37**	<0.10	<0.10	**3.8**	**3.1**	**10**	**8.7**	**19**
B-12 (20-21.5)	10/24/94	<0.10	**2.6**	**4.1**	<0.10	<0.10	**0.76**	NA	**2.2**	<0.10	**130**	<0.10	<0.10	**0.83**	**4**	**12**	**4.2**	**6.2**
B-12 (30-31.5)	10/24/94	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	<0.10	<0.10	**0.57**	<0.10	<0.10	<0.10	**0.31**	**0.3**	**0.17**	**0.28**
B-12 (40-41.5)	10/24/94	<0.10	<0.10	<0.10	<0.10	<0.10	**0.71**	NA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	NA	NA	NA	NA
B-12 (50-51)	10/24/94	<0.10	<0.10	<0.10	<0.10	<0.10	**0.36**	NA	**0.19**	<0.10	**0.94**	<0.10	<0.10	**0.12**	NA	NA	NA	NA
B-12 (60-61.5)	10/24/94	<0.10	**0.15**	<0.10	<0.10	<0.10	<0.10	NA	**0.81**	<0.10	**1.3**	<0.10	<0.10	<0.10	<0.10	**0.38**	<0.10	<0.25
B-12 (70-71.5)	10/24/94	<0.10	**0.14**	<0.10	<0.10	<0.10	**0.85**	NA	**2.8**	<0.10	**0.84**	<0.10	<0.10	<0.10	<0.10	**0.98**	<0.10	<0.25
B-12 (80-81.5)	10/24/94	<0.10	<0.10	<0.10	<0.10	<0.10	**1.7**	NA	**2.1**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.14**	<0.10	<0.25
B-12 (90-91.5)	10/24/94	**3.8**	**0.86**	**0.23**	**0.12**	<0.10	**0.93**	NA	**0.23**	<0.10	**5.1**	<0.10	<0.10	**0.33**	**1.5**	**1.2**	<0.10	<0.25
B-12 (100-101)	10/24/94	<0.10	**0.77**	<0.10	<0.10	**0.1**	**0.97**	NA	**0.54**	<0.10	<0.10	<0.10	<0.10	<0.10	NA	NA	NA	NA
B-12 (110-111)	10/24/94	**19**	**24**	**8**	**22**	**2.7**	**13**	NA	**4.3**	**1.2**	**69**	<0.10	<0.10	<0.10	**15**	**7.1**	**2.7**	**3.9**
B-13 (10-11)	10/25/94	**13**	**17**	<0.10	<0.10	**3**	**3**	NA	**2.5**	**59**	<0.10	**12**	<0.10	<0.10	**1.7**	**15**	**1.8**	**5.1**
B-13 (20-21.5)	10/25/94	<0.10	**0.17**	<0.10	<0.10	<0.10	**0.55**	NA	<0.10	**4.8**	<0.10	**0.8**	<0.10	<0.10	<0.10	**1.8**	<0.10	<0.25
B-13 (30-31.5)	10/25/94	**99**	**90**	<10	<10	<10	<10	NA	<10	**1500**	<10	**480**	<10	<10	**44**	**350**	<10	<25
B-13 (40-41.5)	10/25/94	**110**	**65**	<10	<10	<10	**77**	NA	<10	**1200**	<10	**410**	<10	<10	**34**	**370**	<10	<25
B-13 (50-51.5)	10/25/94	<0.10	<0.10	<0.10	<0.10	<0.10	**0.26**	NA	<0.10	2.7	<0.10	**0.48**	<0.10	<0.10	**0.18**	**2.5**	<0.10	<0.25
B-13 (60-61.5)	10/25/94	**290**	**130**	<10	<10	<10	**110**	NA	**4.3**	**1200**	<10	**760**	<10	<10	**48**	**540**	**30**	**56**
B-13 (70-71.5)	10/25/94	**130**	**74**	<10	<10	<10	**60**	NA	**15**	**670**	<10	**310**	<10	<10	**47**	**430**	**26**	**42**
B-13 (80-81.5)	10/25/94	**0.5**	**0.53**	<0.10	<0.10	<0.10	**7.5**	NA	**13**	**3.3**	<0.10	**2.3**	<0.10	<0.10	**0.32**	**7.6**	**1.9**	**4.9**
B-13 (90-91)	10/25/94	**2.6**	**3.7**	<0.10	**0.27**	**0.19**	**5.8**	NA	**36**	**2.2**	<0.10	**33**	<0.10	<0.10	**0.52**	**11**	**1.6**	**4**
B-13 (100-101)	10/25/94	**290**	**120**	**6.3**	**36**	**20**	**6.8**	NA	**57**	**20**	**24**	**180**	<0.20	**41**	**8.1**	**71**	**12**	**27**
B-13 (110-111)	10/25/94	**420**	**120**	**4.3**	**34**	**7.6**	**2.5**	NA	**40**	**9.8**	<0.10	**730**	<0.10	**25**	<0.10	**130**	**7.8**	**14**

Notes: Bold numbers indicate results above laboratory method detection limits
NA = Not analyzed
1,1-DCE= 1,1 Dichloroethylene
1,1-DCA= 1,1 Dichloroethane
TCM= Trichloromethane
TCE= Trichloroethylene
PCE= Tetrachloroethylene
MEK= Methyl ethyl ketone
1,1,1-TCA= 1,1,1 Trichloroethane
cis-1,2 DCE= cis-1,2 Dichloroethylene

Table 15 - Soil Sample Analytical Results from Four Corner's 1994 Investigation
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Sample Identification/Analyte	Date	Benzene	Toluene	Ethylbenzene	Total Xylenes	TRPH	1,1-DCA	PCE	TCE	1,1,1-TCA	MC	Acetone	MEK
						mg/kg							
B-1 (1.5-3)	10/10/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-2 (2-3.5)	10/10/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-3 (2-3.5)	10/10/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-4 (0.5-2)	10/10/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-5 (50-51)	10/18/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-5 (60-61)	10/18/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-5 (70-71)	10/18/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-5 (120-121)	10/18/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-6 (65-66)	10/12/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-6 (70-71)	10/12/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-6 (75-76)	10/12/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-7 (65-66.5)	10/11/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-7 (70-71.5)	10/11/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-7 (75-76.5)	10/11/94	<0.10	<0.10	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-8 (10-11)	10/13/94	<0.10	**12**	**9.6**	**29**	**520**	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-8 (30-31)	10/13/94	<0.10	**0.66**	**0.53**	**5.1**	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-10 (10-11)	10/13/94	<0.10	<0.10	<0.10	<0.25	**390**	<0.10	**0.3**	<0.10	<0.10	<0.10	<0.10	<1.0
B-11 (10-11)	10/21/94	**0.21**	**8.5**	**9.2**	**34**	**160**	<0.10	**1.4**	<0.10	**0.65**	0.39	**1**	<1.0
B-11 (30-31)	10/21/94	<0.10	<0.10	<0.10	<0.25	**66**	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-11 (115-116)	10/21/94	<0.10	**0.76**	**0.97**	**5**	**23**	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-12 (10-11.5)	10/24/94	<0.10	**0.75**	**2.2**	**5.2**	**330**	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-12 (20-21.5)	10/24/94	<0.10	<0.10	<0.10	0.5	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-12 (119.5-120)	10/24/94	<0.10	**0.39**	**0.34**	**2.8**	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-13 (10-11)	10/25/94	**0.51**	**19**	**10**	**44**	**1,700**	<0.10	**9.7**	<0.10	4.7	<0.10	**3.2**	**4.2**
B-13 (30-31.5)	10/25/94	**2**	**32**	**20**	**44**	**1,300**	**0.15**	**21**	**1.2**	**17**	**0.78**	**3.1**	<1.0
B-13 (50-51.5)	10/25/94	<0.10	**1.9**	**0.19**	**0.71**	**140**	**0.15**	**21**	**1.2**	**17**	**0.78**	**2.2**	**2.0**
B-13 (119.5-121)	10/25/94	<0.10	**0.13**	<0.10	<0.25	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-14 (10-11)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-14 (20-21.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-14 (30-31)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-15 (10-11.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-15 (20-21.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-15 (29.5-31)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-15A (10-11.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-16 (10-11)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-16 (20-21.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-16 (30-31)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-17 (10-11.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-17 (20-21.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-17 (29.5-31)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-18 (10-11.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-18 (20-21.5)	10/28/94	<0.05	<0.05	<0.05	<0.1	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
B-18 (29.5-31)	10/28/94	<0.05	<0.05	<0.05	<0.10	<20	<0.10	<0.10	<0.10	<0.10	<0.10	<1.0	<1.0
ADEQ Residential SRL		0.62	790	1,500	2,800	7,000	500	53	27	1,200	77	2,100	7,100
ADEQ Non-residential SRL		1.4	2,700	2,700	2,800	24,500	1,700	170	70	4,800	180	8,800	27,000
GPL		0.71	400	120	2,200	NE	NE	1.3	0.61	1	NE	NE	NE

Notes: Bold numbers indicate results above laboratory method detection limits.
Highlighted resuts indicate detections above ADEQ standards.
Samples B-12(119.5- 120) and B-13(119.5-121) were most likely sampled below the water table
SRL= Residential Soil Remediation Level
NSRL=Non-Residential Soil Remediation Level
GPL= Groundwater Protection Level
NE= Not established standards
TRPH= Total Recoverable Petroleum Hydrocarbons
1,1 DCA= 1,1-Dichloroethane
PCE= Tetrachloroethylene
TCE= Trichloroethylene
1,1,1-TCA= 1,1,1-Trichloroethane
MC= Methylene Chloride
MEK= Methyl ethyl ketone

Table 16 - Summary of Soil Physical Properties from Four Corner's 1994 Investigation
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Sample No./Unit Designation	Date	Soil Classification	Dry Density (lbs./cf)	Moisture (%)	Specific Gravity	Permeability (cm/sec)	Liquid Limit	Plasticity Index
B-9 (40-41)/ Unit B	10/17/1994	SC-SM	104.4	18.6	2.559	4.78E-07	31	7
B-5 (70-71)/ Unit C	10/19/1994	SM	102.7	6.1	2.67	1.43E-03	No Value	No Value
B-12 (90-91)/ Unit C	10/24/1994	SM	99.9	16.1	2.625	3.54E-05	No Value	No Value
B-10 (100-101)/ Basal Section of Unit C	10/20/1994	SM	104	7.6	2.681	3.47E-03	No Value	No Value
B-13 (120-121)/ Unit D	10/25/1994	ML-CL	103.3	16.6	2.559	2.74E-07	35	11

Notes: SC=Sandy Clay
SM=Sandy Silt
ML=Silt
CL=Clay
No Value=No value, Liquid Limit and Plasticity Index Calculation are not valid for sandy soil
lbs/cf = pounds per cubic foot
% = percent
cm/sec = centimeters per second
Unit B,C,D= Stratigraphic units identified at the Rinchem facility

Table 17 - Groundwater Analytical Results from Four Corner's 1994 Investigation
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Sample Identification/Analyte	Date	Benzene	Toluene	Ethylbenzene	Xylenes	1,1-DCE	1,1-DCA	TCE	PCE	1,2,4-TMB	Acetone	1,1,1-TCA	VC	MC	cis-1,2-DCE	1,2 DCA	TPH
							µg/L										
B-5 (GW)	10/19/94	<125	<10	<10	<20	<1	1.3	**1**	**1**	<20	<2,000	**0.9**	NA	NA	NA	**1.3**	**0.87**
B-8 (GW)	10/14/94	**23**	<10	<10	<20	**61**	**110**	**380**	**23**	<20	<2000	**16**	**26**	**340**	**250**	NA	**2.3**
B-9 (GW)	10/18/94	**18**	<10	<10	<20	**58**	**74**	**330**	**34**	<20	<2,000	<10	**26**	<40	**130**	NA	**10**
B-25 (GW)[1]	10/18/94	**15**	<10	<10	<10	**58**	**75**	**320**	**21**	<20	<2,000	<10	**25**	<40	<125	NA	**7.9**
B-10 (GW)	10/20/94	**15**	**290**	**26**	**108**	**97**	**63**	**88**	**31**	**23**	<2,000	**10**	<10	**660**	**27**	NA	**4.6**
B-11 (GW)	10/24/94	**39**	**22**	<10	<20	**150**	**63**	**480**	**60**	<20	**2,200**	<10	<10	**7,400**	<10	NA	**1.1**
B-12 (GW)	10/25/94	**17**	<10	<10	<20	**42**	**35**	**180**	**15**	<20	**2,100**	<10	<10	**530**	**52**	NA	**2.7**
B-13 (GW)	10/26/94	<125	**3,600**	**200**	**880**	<125	**380**	**440**	<125	<250	**110,000**	<125	<125	**13,000**	<125	NA	**4.4**
AWQS		5	1,000	700	10,000	7	NE	5	5	NE	NE	200	2	NE	70	5	NE

Notes: Bold numbers indicate results above laboratory method detection limits
Highlighted results indicate detections above AWQS
NE = Not Established
[1]Split of B-9 (GW)
1,1-DCE = 1,1-Dichloroethylene
1,1-DCA = 1,1-Dichloroethane
PCE = Tetrachloroethylene
TCE = Trichloroethylene
1,2,4-TMB = 1,2,4 Trichlorobenzene
1,1,1-TCA = 1,1,1-Trichloroethane
VC = Vinyl Chloride
MC = Methylene Chloride
cis-1,2-DCE = cis-1,2-Dichloroethylene
1,2-DCA = 1,2-Dichloroethane
TPH = Total Petroleum Hydrocarbons

Table 18 - Soil Gas Analytical Data from ADEQ's 1989 Investigation
Hill Brothers Chemical Company
WCP North Plume Site
Phoenix, Arizona

Sample Location	Date	1,1-DCE	trans-DCE	TCA	TCE	PCE	THC
HB1-5 ft.	7/21/89	**66**	<8	**46**	**14.0**	**19**	**140.0**
HB2-14 ft.	7/21/89	**270**	<20	**190**	**1.0**	**2**	**130.0**
HB3-15 ft.	7/21/89	**32**	<2	**1**	**12.0**	**2**	**8.0**
HB4-15 ft.	7/21/89	<0.03	<0.4	**0.02**	**0.003**	**0.01**	<0.03

Notes: All results in micrograms per liter (µg/L)
Bold numbers indicate results above laboratory detection limits.
1,1-DCE = 1,1-Dichloroethylene
trans-DCE = trans-Dichloroethylene
TCA = Trichloroethane
TCE = Trichloroethylene
PCE = Tetrachloroethylene
THC = Total Hydrocarbons

Table 19 - Soil Analytical Results from EMCON's 1996 Investigation
Hill Brothers Chemical Company
WCP North Plume Site
Phoenix, Arizona

Sample ID	Date Sampled	1,1 DCE	DCM	1,2-DCE	1,1-DCA	Benzene	1,1,1-TCA	TCE	Toluene	PCE	Ethylbenzene	Xylene
B1-5'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-10'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-15'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-20'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-25'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-30'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-35'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-40'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-45'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-50'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-60'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-70	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-80'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-90'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-100'	10/21/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-110'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B1-120'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-5'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-10'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-15'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-20'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-25'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-30'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-35'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-40'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-45'	10/22/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-50'	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-60'	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-70'	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-90'	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-100'	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	**0.032**	<0.050	**0.031**	<0.050	<0.050
B2-110'	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B2-120	10/23/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-5'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-10'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-15'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-20'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-25'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-30'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-35'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-40'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-45'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-50'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-60	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-70'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-80'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-90'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-100'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-110	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B3-120'	10/24/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050

Table 19 - Soil Analytical Results from EMCON's 1996 Investigation
Hill Brothers Chemical Company
WCP North Plume Site
Phoenix, Arizona

Sample ID	Date Sampled	1,1 DCE	DCM	1,2-DCE	1,1-DCA	Benzene	1,1,1-TCA	TCE	Toluene	PCE	Ethylbenzene	Xylene
B4-5'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	**0.026**	<0.050	<0.050
B4-10'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-15'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-20'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-25'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-30'	10/28/1966	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-35'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-40'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-45'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-50'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-60'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B4-70'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-5'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-10'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-15'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-20'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-25'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-30'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-35'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-40'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-45'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-50'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-60'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B5-70'	10/29/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-5'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-10'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-20'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-25'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-30'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-35'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-40'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-45'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-50'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-60'	10/25/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-70'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-80'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-90'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-100'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-110'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
B6-120'	10/28/1996	<0.025	<0.025	<0.025	<0.025	<0.050	<0.025	<0.02	<0.050	<0.02	<0.050	<0.050
ADEQ Residential SRL		0.36	NE	31	500	0.62	1,200	27	790	53	1,500	2,800
ADEQ Non-residential SRL		0.8	NE	100	1,700	1.4	4,800	70	2,700	170	2,700	2,800
GPL		0.81	NE	NE	NE	0.71	1	0.61	400	1.3	120	2,200

Notes:
Bold numbers indicate results above laboratory reporting limits
Results in mg\kg
Analytical Method 8010/8020
NE= Not established standards
SRL= Soil Remediatin Levels
NSRL= Non-Residential Remediation Levels
GPL= Groundwater Protection Levels
1,1 DCE= 1,1-Dichloroethylene
1,2-DCE= 1,2 Dicchloroethlene
DCM= Dichloromethane
1,1,1-TCA= 1,1,1-Trichloroethane
TCE= Trichloroethylene
PCE= Tetrachloroethylene
1,1-DCA= 1,1-Dichloroethane
1,2-DCA= 1,2-Dichloroethane

Table 20 - Groundwater Analytical Results from EMCON's 1996 Investigation
Hill Brothers Chemical Company
WCP North Plume Site
Phoenix, Arizona

Boring	Sample ID	Date	1,1 DCE	DCM	1,1,1-TCA	TCE	PCE	Acetone	2-Butanone	Bromo-dichloromethane	Chloroform	1,1-DCA	1,2-DCA	Methylene Chloride
B-1	B1	10/22/96	**6.9**	<1.0	<1.0	**4**	**4.3**	NA	NA	NA	NA	<1.0	NA	NA
B-2	B2	10/23/96	**29**	**1.4**	<1.0	**86D**	**72D**	NA	NA	NA	NA	<1.0	NA	NA
B-2	B2*[1]	10/23/96	**30**	NA	<1.0	**46**	**51**	**58**	**20**	<1	**18**	<1	<1	**2**
B-3	B3	10/24/96	**23**	<1.0	<1.0	**84D**	**7.7**	NA	NA	NA	NA	<1.0	NA	NA
B-6	B6-W	10/28/96	**3.8**	<1.0	<1.0	**2.6**	**3.3**	NA	NA	NA	NA	<1.0	NA	NA
AWQS			7	5	200	5	5	NE	NE	NE	NE	NE	5	5

Notes:
Samples analyzed by EPA Method 8010/8020
[1] - Sample analyzed with EPA Method 8260 at a stationary lab
All results in micrograms per liter
Bold numbers indicate results above laboratory method detection limits
Highlighted numbers indicate results above AWQS
NA - indicated sample not analyzed for that parameter
D - indicates the compound was analyzed at a greater dilution
NE - AWQS not established

1,1 DCE= 1,1-Dichloroethylene
DCM= Dichloromethane
1,1,1-TCA= 1,1,1-Trichloroethane
TCE= Trichloroethylene
PCE= Tetrachloroethylene
1,1-DCA= 1,1-Dichloroethane
1,2-DCA= 1,2-Dichloroethane

Table 21 - Monitor Well Construction Data
WCP North Plume Site
Phoenix, Arizona

Facility	Well Designation	ADEQ Well Number	ADWR Registration Number	Year Well Installed	Top of Casing-TOC (feet MSL)	Well Depth (feet bgs)	Well Screen Interval (feet bgs)	Well Screen Interval (feet MSL)	Lithologic Unit Monitored	Well Owner
F&B/Pyramid	WCP-31	58851	55-574156	1999	1121.00	141	101-141	1020.00-980.00	MAU	ADEQ
	WCP-32	58852	55-574157	1999	1124.20	141	101-141	1023.20-983.20	MAU	ADEQ
	WCP-33S	58853	55-574158	1999	1123.80	140	100-140	1022.80-982.80	MAU	ADEQ
	WCP-33M	58433	55-573076	1999	1122.85	276	256-276	866.85-846.85	MAU	ADEQ
	WCP-33L	58434	55-573077	1999	1122.77	440	420-440	702.77-682.77	LAU	ADEQ
	WCP-34S	58435	55-573079	1999	1116.71	140	100-140	1016.71-976.71	MAU	ADEQ
	WCP-34M	58436	55-573078	1999	1116.58	275	255-275	861.58-841.58	MAU	ADEQ
	WCP-34L	58437	55-573080	1999	1116.61	442	422-442	694.61-674.61	LAU	ADEQ
	WCP-35B	58438	55-573081	1999	1120.79	110	70-110	1050.79-1010.79	UAU/MAU	ADEQ
	WCP-35S	59274	55-581251	2000	1120.58	150	110-150	1010.58-970.58	MAU	ADEQ
	WCP-35M	58439	55-573082	1999	1120.75	270	250-270	870.75-850.75	MAU	ADEQ
	WCP-35L	58440	55-573083	1999	1120.66	425	405-425	715.66-695.66	LAU	ADEQ
	WCP-36S	58441	55-573084	1999	1120.64	136	96-136	1024.64-984.64	MAU	ADEQ
	WCP-36M	58442	55-573085	1999	1120.50	272	252-272	868.50-848.50	MAU	ADEQ
	WCP-36M2	59283	55-581498	2000	1120.76	397	374.5-394.5	746.26-726.26	MAU	ADEQ
	WCP-36L2	58443	55-573086	1999	1120.76	625	605-625	515.76-495.76	LAU	ADEQ
	WCP-37M2	58444	55-573088	1999	1113.78	388	368-388	745.78-725.78	MAU	ADEQ
	WCP-37M3	58445	55-573087	1999	1114.33	280	260-280	854.33-834.33	MAU	ADEQ
	WCP-37L	58446	55-573075	1999	1113.87	461	441-461	672.87-652.87	LAU	ADEQ
	WCP-38S	58447	55-577656	1999	1127.87	150	100-150	1027.87-977.87	MAU	ADEQ
	WCP-39S	58448	55-577657	1999	1129.89	150	100-150	1029.89-979.89	MAU	ADEQ
	WCP-65S	59275	55-581249	2000	1131.38	150	110-150	1021.38-981.38	MAU	ADEQ
	WCP-66S	59276	55-582828	2000	1128.10	160	118-158	1010.10-970.10	MAU	ADEQ
	WCP-67S	59277	55-582466	2000	1124.72	150	110-150	1014.72-974.72	MAU	ADEQ
	WCP-68S	59278	55-581248	2000	1117.29	150	110-150	1007.29-967.29	MAU	ADEQ
	WCP-69S	59279	55-582566	2000	1118.80	160	110-160	1008.8-958.8	MAU	ADEQ
	WCP-70M	59280	55-581497	2000	1117.73	278	258-278	859.73-839.73	MAU	ADEQ
	WCP-71M	59281	55-582565	2000	1120.17	278	258-278	862.17-842.17	MAU	ADEQ
	WCP-72M	59282	55-582567	2000	1123.32	278	258-278	865.32-845.32	MAU	ADEQ
	WCP-73L	59284	55-584274	2000	1121.57	545	525-545	596.57-576.57	LAU	ADEQ
	WCP-91	59452	55-584902	2001	1124.47	151.4	111.4-151.4	1013.07-973.07	MAU	ADEQ
	WCP-220	68578	55-214045	2007	1122.14	200	120-200	922.14-1002.14	MAU	ADEQ
	WCP-225	67439	55-905709	2006	1112.44	165	120-165	947.44-992.44	MAU	ADEQ
	GSC-01A	64048	55-597416	2003	1126.47	170	82-170	1044.47-956.47	MAU	COP
	GSC-10	57220	55-514744	1986	1120.80	135	95-130	1025.80-990.80	MAU	COP
	GSC-21	57230	55-518070	1987	1121.94	150	120-150	1001.94-971.94	MAU	COP
	GSC-22	57231	55-518071	1987	1123.19	150	120-150	1003.19-973.19	MAU	COP
	GSC-25	57195	55-521984	1988	1121.05	136	106-136	1015.05-985.05	MAU	COP
	GSC-25A	64038	55-597418	2003	1122.64	190	82-190	1040.64-932.64	MAU	COP
	GSC-27	57197	55-523286	1989	1125.94	150	120-150	1005.94-975.94	MAU	COP
	GSC-31	57201	55-558019	1996	1126.12	150	100-150	1026.12-976.12	MAU	COP
	GSC-33	64039	55-597426	2003	1121.81	200	82-200	921.81-1039.81	MAU	COP
	GSC-34	64040	55-597425	2003	1122.21	200	82-190	922.21-1040.21	MAU	COP
	GSC-39	64045	55-597420	2003	1122.43	200.4	82.4-200	922.03-1040.03	MAU	COP
	GSC-40	64046	55-597419	2003	1123.39	200.8	82.4-200	922.59-1040.99	MAU	COP
	GSC-48	64047	55-597417	2003	1127.14	200	82-200	927.14-1045.14	MAU	COP
	GSC-49	NA	55-905709	2005	1128.33	200	80-200	928.33-1048.33	MAU	COP
	GSC-GTD	57203	55-514566	1986	1119.42	130	90-130	1029.42-989.42	MAU	COP
Rinchem/Hills Brothers	GSC-17	57227	55-515556	1986	1121.90	145	105-145	1016.9-976.90	MAU	COP
	GSC-18	57228	55-515557	1987	1121.02	150	110-150	1011.02-971.02	MAU	COP
	GSC-19	57229	55-515558	1987	1123.53	140	100-140	1023.53-983.53	MAU	COP
	GSC-23	57232	55-518072	1987	1124.96	150	110-150	1014.96-974.96	MAU	COP
	GSC-24	57233	55-520313	1988	1123.02	150	110-150	1013.02-973.02	MAU	COP
	GSC-46	NA	55-215630	2007	1124.95	176	80-175	948.95-1044.95	MAU	COP
	WCP-18	58841	55-568270	1998	1122.44	145	105-145	1017.44-977.44	MAU	ADEQ
	WCP-19	58842	55-568269	1998	1122.58	145	105-145	1017.58-977.58	MAU	ADEQ
	WCP-20	58843	55-568256	1998	1123.44	145	105-145	1018.44-978.44	MAU	ADEQ
	WCP-21	58844	55-568271	1998	1123.22	145	105-145	1018.22-978.22	MAU	ADEQ
	WCP-22	58845	55-568272	1998	1124.45	145	105-145	1019.45-979.45	MAU	ADEQ
	WCP-23	58846	55-568280	1998	1124.45	145	105-145	1019.45-979.45	MAU	ADEQ
	WCP-24	58847	55-568255	1998	1125.02	145	105-145	1020.02-980.02	MAU	ADEQ
	WCP49	61819	55-591566	2000	1122.29	150	110-150	1012.09-972.09	MAU	ADEQ
	WCP-50	58862	55-578055	2000	1122.05	150.5	110.5-150.5	1011.55-971.55	MAU	ADEQ
	WCP-51	58863	55-578054	2000	1121.85	150.5	110.5-150.5	1011.35-971.35	MAU	ADEQ
	WCP-52	58864	55-578024	2000	1122.69	152.5	112.5-152.5	1010.19-970.19	MAU	ADEQ
	WCP-53	58865	55-578062	2000	1127.03	159	119-159	1008.03-968.03	MAU	ADEQ
	WCP-54	58866	55-578061	2000	1126.33	158	118-158	1008.33-968.33	MAU	ADEQ
	WCP-55	58867	55-578060	2000	1120.96	150.5	110.5-150.5	1010.46-970.46	MAU	ADEQ
	WCP-56	58868	55-578057	2000	1121.26	151	111-151	1010.26-970.26	MAU	ADEQ
	WCP-57	58869	55-578059	2000	1128.23	160	120-160	1008.23-968.23	MAU	ADEQ
	WCP-58	58870	55-578058	2000	1124.80	290	270-290	854.80-834.80	MAU	ADEQ
	WCP-74	61818	55-576595	2002	1123.50	290	270-290	853.50-833.50	MAU	ADEQ
	WCP-75	59414	55-585576	2001	1125.41	160	120-160	1005.41-965.41	MAU	ADEQ
	WCP-76	59415	55-585107	2001	1125.41	164	124-164	1001.41-961.41	MAU	ADEQ
	WCP-77	59416	55-585106	2001	1126.59 (old elevation)	165	125-165	1001.59-961.59	MAU	ADEQ
	WCP-77	59416	55-585106	2001	1124.04 (new elevation)	165	125-165	1001.59-961.59	MAU	ADEQ
	WCP-78	59417	55-585105	2001	1126.91	166	126-166	1000.91-960.91	MAU	ADEQ
	WCP-79	59418	55-585104	2001	1127.14	165	125-165	1002.14-962.14	MAU	ADEQ
	WCP-80	59419	55-585103	2001	1129.19	168.5	128.5-168.5	1000.69-960.69	MAU	ADEQ
	WCP-81	59420	55-585577	2001	1126.79	163	123-163	1003.79-963.79	MAU	ADEQ
	WCP-82	61817	55-585575	2001	1127.49	325	280-300	847.49-827.49	MAU	ADEQ
	WCP-221	68579	55-214047	2007	1124.60	200	120-200	924.6-1004.60	MAU	ADEQ
	WCP-222	68580	55-214048	2007	1124.50	200	120-200	924.5-1004.50	MAU	ADEQ
	WCP-223	68581	55-214046	2007	1127.12	200	120-200	927.12-1007.12	MAU	ADEQ
	WCP-224	68582	55-214043	2006	1122.65	200	120-200	922.65-1002.65	MAU	ADEQ

Notes: 1. MSL = Feet above Mean Sea Level
2. bgs = Feet below ground surface
3. UAU = Upper Alluvial Unit; MAU = Middle Alluvial Unit; and LAU = Lower Alluvial Unit
4. NA = Not Available

Table 22 - In Situ Soil Analytical Results
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Sample ID	Sampling Date	Sample Depth (feet bgs)	Analyte (mg/kg)			
			PCE	TCE	1,1-DCE	Benzene
WCP-MW-35M-SP-water	5/5/1999	130	<0.5	<0.5	<0.5	<0.5
WCP-MW-35M-SP-water	5/5/1999	130(dup)	<0.5	<0.5	<0.5	<0.5
WCP-MW-35M-SP-water	5/12/1999	205	<0.5	<0.5	<0.5	<0.5
WCP-MW-35M-SP-water	5/12/1999	240	<0.5	<0.5	<0.5	<0.5
WCP-MW-35M-SP-water	5/13/1999	260	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-SP-water	5/29/1999	161	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-SP-water	5/29/1999	161 (dup)	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-SP-water	5/29/1999	219	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-SP-water	5/30/1999	315	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-SP-water	5/30/1999	380	<0.5	<0.5	<0.5	<0.5
WCP-MW-37M/L-SP-water	6/13/1999	335	<0.5	<0.5	<0.5	<0.5
WCP-MW-37M-SP-water	6/25/1999	225	<0.5	<0.5	<0.5	<0.5
WCP-MW-35-SP-water-EB	5/17/1999	--	<0.5	<0.5	<0.5	<0.5
WCP-MW-35M-TB-1	5/6/1999	--	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-TB-water	5/30/1999	--	<0.5	<0.5	<0.5	<0.5
WCP-MW-36M-FB-water	5/30/1999	--	<0.5	<0.5	<0.5	**1.5**
ADEQ Residential SRL			53	27	2.3	0.62
ADEQ Non-residential SRL			170	70	8	1.4
GPL			1.3	0.61	0.81	0.71

Notes:

SP = SimulProbe Sample
TB = Trip blank
FB = Field blank
EB = Equipment blank
mg/kg = milligrams per kilogram
dup = duplicate sample

PCE = Tetrachloroethene
TCE = Trichloroethene
1,1-DCE = 1,1-Dichloroethene

Table 23 - In Situ Soil Physical Property Data
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Sample ID	Sample Date	Sample Depth (feet bgs)	Moisture Content (% wt)	Bulk Density (g/cc)	Effective Porosity (% bulk volume)	Total Organic Carbon (mg/kg)	Permeability (millidarcy)	Hydraulic Conductivity (cm/s)	USCS/ASTM Description (1)	Median Grain Size (mm)	Particle Size Distribution, weight percent						Silt & Clay
											Gravel	Sand Size			Silt	Clay	
												Coarse	Medium	Fine			
WCP-MW-35M-SP-Soil	5/5/1999	106.0	13.2	1.57	42.1	430.0	4400.0	4.27E-03	Medium Sand	0.543	0.00	5.48	57.74	29.55	(2)	(2)	7.23
WCP-MW-35M-SP-Soil	5/5/1999	129.0	16.0	1.50	43.5	ND	143.0	1.38E-04	Fine Sand	0.344	0.00	0.00	46.32	17.55	30.50	5.63	36.13
WCP-MW-35M-SP-Soil	5/29/1999	206.0	25.4	1.43	47.2	ND	2296.0	2.34E-03	Fine Sand	0.155	0.00	5.48	57.74	29.55	(2)	(2)	7.23
WCP-MW-35M-SP-Soil	5/12/1999	241.5	33.0	1.42	46.2	ND	2.2	2.27E-06	Fine Sand	0.043	0.00	0.00	2.30	36.76	47.39	13.55	60.94
WCP-MW-35M-SP-Soil	5/12/1999	242.0	37.6	1.38	46.9	ND	0.335	3.40E-07	Silt	0.029	0.00	0.00	3.05	25.71	57.22	14.03	71.24
WCP-MW-35M-SP-Soil	5/13/1999	260.5	23.1	1.49	43.2	1100.0	3811.0	3.88E-03	Fine Sand	0.441	0.00	0.00	3.05	25.71	57.22	14.03	71.24
WCP-MW-35M-SP-Soil	5/1/1999	385.0	47.2	1.46	45.4	ND	4.4	4.15E-06	Fine Sand	0.194	7.81	6.79	15.15	44.96	(2)	(2)	25.29
WCP-MW-35M-SP-Soil	5/1/1999	483.0	8.4	1.74	36.5	760.0	1710.0	1.67E-03	Medium Sand	2.089	0.00	53.82	27.51	10.85	(2)	(2)	7.82
WCP-MW-36M-SP-Soil	5/29/1999	161.0	29.0	1.81	33.8	ND	28.8	2.91E-05	Fine Sand	0.233	2.46	4.93	25.85	42.89	(2)	(2)	23.87
WCP-MW-36M-SP-Soil	5/29/1999	219.5	27.6	1.48	44.2	570.0	86.7	8.51E-05	Fine Sand	0.101	0.00	0.00	2.50	53.55	37.24	6.71	43.95
WCP-MW-36M-SP-Soil	5/19/1999	366.5	24.8	1.45	45.1	ND	95.0	9.66E-05	Fine Sand	0.07	0.00	0.00	4.72	43.58	45.97	5.73	51.70
WCP-MW-36M-SP-Soil	5/30/1999	380.0	19.7	1.55	41.8	ND	1580.0	1.55E-03	Fine Sand	0.155	0.00	0.00	3.07	73.51	18.19	5.22	23.42

Notes:

Samples collected with Simulprobe while drilling wells
(1) = based on mean from trask
(2) = D422 does not differentiate between silt/clay fraction
feet bgs = feet below ground surface
g/cc = grams per cubic centimeter
% bulk volume = percent bulk volume
mg/kg = milligrams per kilogram
cm/s = centimeter per second
USCS/ASTM = Unified Soil Classification System/ American Standard Testing Methods
mm = millitmeter

Table 24 - In Situ Groundwater Analytical Results
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Sample ID	Sample Depth (feet)	Sample Date	Benzene (µg/l)	1,1-DCA (µg/l)	1,1-DCE (µg/l)	Ethyl Benzene (µg/l)	PCE (µg/l)	1,1,1-TCA (µg/l)	TCE (µg/l)	Toluene (µg/l)	Total Xylenes (µg/l)
WCP-MW-35M-SP-water	130	5/5/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-35M-SP-water	130(dup)	5/5/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-35M-SP-water	205	5/12/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-35M-SP-water	240	5/12/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-35M-SP-water	260	5/13/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-36M-SP-water	161	5/29/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-36M-SP-water	161 (dup)	5/29/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-36M-SP-water	315	5/30/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-36M-SP-water	380	5/30/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-37M/L-SP-water	335	6/13/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
WCP-MW-37M-SP-water	225	6/25/1999	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5	<1.0	<1.5
AWQS			5	NE	7	700	5	200	5	1,000	10,000

Notes:

µg/l = micrograms per liter
dup = duplicate
1,1-DCA = 1,1-Dichloroethane
1,1-DCE = 1,1-Dichloroethene
PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-Trichoroethane
TCE = Trichloroethene
AWQS = Aquifer Water Quality Standard

Table 25 - Summary of Aquifer Test Data Collected Between December 7-18, 2000 for the F &B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona

Well	Depth Interval (feet bgs)	R (ft)	CONFINED AQUIFER MODEL						LEAKY AQUIFER MODEL			SLUGTEST
			THEIS		COOPER-JACOB		THEIS RECOVERY		HANTUSH			BOUWER & RICE
			T (gpd/ft)	S	T (gpd/ft)	S	T (gpd/ft)	S	T (gpd/ft)	S	B	K (gpd/ft2)
WCP-33S	125-140	1										
Test 1												0.5021
Test 2												0.5146
WCP-33M	238-280	1			1.20E+04	9.71E-17	1.90E+04		7.86E+03	5.50E-08	7.70E-05	
WCP-35M	243-273	828			1.71E+04	1.34E-05	1.66E+04		1.47E+04	1.61E-05	3.89E-02	
WCP-36M	241-278	1075			3.25E+04	2.78E-05	3.02E+04		2.23E+04	3.08E-05	6.79E-02	
WCP-37M	245-280	594			2.31E+04	8.69E-06	2.11E+04		1.90E+04	8.40E-06	3.02E-02	
F&B-4-259	251-267	465			1.34E+04	2.72E-05	1.63E+04		1.74E+04	1.13E-05	2.62E-02	
WCP-33L	407-442	1	1.38E+04	3.19E-06								
WCP-35L	393-430	828	4.50E+04	2.84E-04	5.73E+04	1.20E-04	3.33E+04					
WCP-36L	590-630	1018	4.98E+04	5.86E-05	5.99E+04	5.62E-05	3.76E+04					
WCP-37L	428-465	589	5.57E+04	3.22E-04	6.62E+04	1.16E-04	3.93E+04					
WCP-73L	520-550	536	4.08E+04	4.08E-04	3.70E+04	7.03E-04	1.30E+04					
F&B4PR1	478-492	445	4.14E+04	3.11E-04	4.96E+04	1.57E-04	4.15E+04					
F&B4PR2	427-443	445	4.51E+04	6.56E-04	4.24E+04	1.97E-04	4.18E+04					
F&B4PR3	378-393	445	5.72E+04	2.39E-03	4.90E+04	7.68E-04	4.29E+04					
F&B4PR4	352-366	445	5.53E+04	2.22E-03	5.10E+04	7.14E-04	3.78E+04					

Notes:
feet bgs = feet below ground surface
gpd/ft = gallons per day per foot
gpd/ft2 = gallons per day per foot squared
R = distance from pumping well in feet
T = Transmissivity
S = Storage coefficient
B = Leakage factor
K = Hydraulic conductivity
M aquifer is assumed to extend from 220 to 300 feet bgs, for an average thickness of 80 feet
L aquifer is assumed to extend from 350 to 700 feet bgs, for an average thickness of 350 feet
The M data fits the Hantush leaky aquifer model
The L data fits the Theis confined aquifer model
Partial penetration was considered in both analyses
Based on above analysis, the Hydraulic Conductivity (K) of the MAU aquifer is in the order of 230 gpd/ft2
Based on above analysis, the Hydraulic Conductivity (K) of the LAU aquifer is in the order of 140 gpd/ft2

Table 26 - Shallow Soil Sample and Dry Well Sediment Sample Results - VOCs
Pyramid Industries
WCP North Plume Site
Phoenix, Arizona

Shallow Soil Samples Collected During Initial Soil-Gas Survey (August 9-10, 1999) EPA Method 8021B					
Sample ID	**Date Collected**	**PCE (mg/kg)**	**1,1-DCE (mg/kg)**	**TCE (mg/kg)**	**Other Analytes Detected (mg/kg)**
SS-B.5-5-12	8/10/99	<0.098	<0.098	<0.098	None
SSB.5-4-10	8/10/99	<0.098	<0.098	<0.098	None
SS-B-3.5-11	8/10/99	<0.095	<0.095	<0.095	None
SS-B-4.5-11	8/10/99	<0.099	<0.099	<0.099	None
SS-B-5-2-11	8/10/99	<0.1	<0.1	<0.1	None
SS-B-7-2-11	8/10/99	<0.094	<0.094	<0.094	None
SS-B-1.5-11	8/10/99	<0.090	<0.090	<0.090	None
SS-B-5-11	8/10/99	<0.086	<0.086	<0.086	None
SS-B-4-5	8/10/99	<0.095	<0.095	<0.095	None
SS-2.5-14	8/10/99	<0.069	<0.069	<0.069	None
SS-B-DW-1	8/10/99	<0.088	<0.088	<0.088	None
DW-3	9/16/99	**0.48**	<0.1	<0.1	Acetone (0.1 mg/kg), methylene chloride (0.25 mg/kg), bis[2-ethylhexyl]phthalate (6.8 mg/kg), and di-n-octylphthalate (13 mg/kg).
SRL		53	0.36	27	
NSRL		170	0.80	70	
GPL		1.3	0.81	0.61	

Shallow Soil Samples Collected During Second Soil-Gas Survey (January 22-23, 2001) EPA Method 8260B					
Sample I.D.	**Date Collected**	**PCE (mg/kg)**	**1,1-DCE (mg/kg)**	**TCE (mg/kg)**	**Other Analytes Detected (mg/kg)**
SG-F07-09	1/23/01	<0.089	<0.089	<0.089	None
SG-F05-09	1/23/01	<0.1	<0.1	<0.1	None
SG-F09-09	1/23/01	<0.090	<0.090	<0.090	None
SG-D/E 3.5-09	1/23/01	<0.1	<0.1	<0.1	None
ADEQ Residential SRL		53	0.36	27	
ADEQ Non-residential SRL		170	0.80	70	
GPL		1.3	0.81	0.61	

Notes: Depth of sample indicated by last digit in sample id (e.g., SG-F07-09 collected at 9 feet bgs).
SS-B-7-2-11 is a duplicate sample of SS-B-5-2-11.
SS-B-DW-1 and DW-3 are dry well samples.
mg /kg = milligrams per kilogram
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
TCE = Trichloroethene
GPL= Groundwater Protection Levels
SRL =Residential Soil Remediation Level
NSRL= Non-Residential Remediation Level

Table 27 – Shallow Soil Sample and Dry Well Sediment Sample Results - Metals
Pyramid Industries
WCP North Plume Site
Phoenix, Arizona

Soil Samples Collected During Soil-Gas Survey (August 9-10, 1999) Results														
Sample I.D.	**Date Collected**	**Antimony**	**Arsenic**	**Beryllium**	**Cadmium**	**Chromium**	**Copper**	**Lead**	**Nickel**	**Selenium**	**Silver**	**Thallium**	**Zinc**	**Mercury**
SS-B.5-5-12	8/10/99	<5.0	**10**	<2.5	<2.5	**16**	**19**	**5.4**	**18**	<5.0	<2.5	<2.5	**24**	<0.083
SSB.5-4-10	8/10/99	<5.0	**8.2**	<2.5	<2.5	**22**	**22**	**5.8**	**22**	<5.0	<2.5	<2.5	**28**	<0.083
SS-B-3.5-11	8/10/99	<5.0	**7.3**	<2.5	<2.5	**21**	**20**	<5.0	**21**	<5.0	<2.5	<2.5	**224**	<0.083
SS-B-4.5-11	8/10/99	<5.0	**9.4**	<2.5	<2.5	**20**	**20**	<5.0	**21**	<5.0	<2.5	<2.5	**7**	<0.083
SS-B-5-2-11	8/10/99	<5.0	**9.4**	<2.5	<2.5	**23**	**23**	**5.4**	**24**	<5.0	<2.5	<2.5	**29**	<0.083
SS-B-7-2-11	8/10/99	<5.0	**10**	<2.5	<2.5	**23**	**22**	**5.5**	**24**	<5.0	<2.5	<2.5	**30**	<0.083
SS-B-1.5-11	8/10/99	<5.0	**8.2**	<2.5	<2.5	**19**	**18**	<5.0	**19**	<5.0	<2.5	<2.5	**23**	<0.083
SS-B-5-11	8/10/99	<5.0	**10**	<2.5	<2.5	**20**	**22**	**5.6**	**23**	<5.0	<2.5	<2.5	**30**	<0.083
SS-B-4-5	8/10/99	<5.0	**8.1**	<2.5	<2.5	**30**	**25**	**6.9**	**29**	<5.0	<2.5	<2.5	**34**	<0.083
SS-2.5-14	8/10/99	<5.0	**7.8**	<2.5	<2.5	**15**	**18**	<5.0	**18**	<5.0	<2.5	<2.5	**21**	<0.083
SS-B-DW-1	8/10/99	<5.0	**6.3**	<2.5	<2.5	**20**	**2.6**	**8.6**	**22**	<5.0	<2.5	<2.5	**85**	<0.083
SRL		31	10	1.4	38	2,100	2,800	400	1,500	380	380	NE	23,000	6.7
NSRL		680	10	11	850	4,500	63,000	2,000	34,000	8,500	8,500	NE	510,000	180
GPL		35	290	23	29	590	NE	290	590	290	NE	12	NE	12

Notes: Bold numbers indicate results above laboratory detection limits.
Highlighted numbers indicate results above SRL, NSRL, or GPL.
Units in milligrams/kilogram (mg/kg)
SRL = Soil Remediation Levels
NSRL= Non-Residential Soil Remediation Levels
NE= No Established Standard

Table 28 - Soil Sample Analytical Data - VOCs
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

SAMPLE ID	SAMPLE DATE	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane	1,1-Dichloroethene	Acetone	Benzene	Chloromethane	cis-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	Trichloroethene	Vinyl chloride
DW-3	09/16/99	<0.1	<0.1	<0.1	<0.1	**0.1**	<0.1	<0.1	<0.1	**0.25**	**0.48**	<0.1	<0.1	<0.1
SB-B16-001	09/15/99	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098
SB-B16-006	09/15/99	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.13**	<0.1	<0.1	<0.1
SB-B16-011	09/15/99	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099
SB-B16-031	09/15/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**0.3**	<0.11	<0.11	<0.11
SB-B16-046	09/15/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**1.1**	<0.11	<0.11	<0.11
SB-B16-061	09/15/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**0.34**	<0.11	<0.11	<0.11
SB-B16-066	09/15/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.49**	<0.12	<0.12	<0.12
SB-B16-076	09/15/99	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B16-096	09/15/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.66**	<0.12	<0.12	<0.12
SB-B16-111*	09/15/99	<0.11	<0.11	<0.11	<0.11	**0.18**	<0.11	<0.11	<0.11	<0.11	**2**	<0.11	<0.11	<0.11
SB-B16-111D*	09/15/99	<0.097	<0.097	<0.097	<0.097	**0.1**	<0.097	<0.097	<0.097	**0.21**	**1.8**	<0.097	<0.097	<0.097
SB-B17-001	09/12/99	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	**0.33**	<0.099	<0.099	<0.099
SB-B17-006	09/12/99	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088	**0.1**	<0.088	<0.088	<0.088
SB-B17-011	09/12/99	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	**0.079**	<0.095	<0.095	<0.095
SB-B17-031	09/12/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**0.2**	<0.11	<0.11	<0.11
SB-B17-046	09/12/99	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.36**	<0.10	<0.10	<0.10
SB-B17-061	09/12/99	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098
SB-B17-076	09/12/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**0.18**	<0.11	<0.11	<0.11
SB-B17-080.5	09/12/99	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	**0.75**	<0.15	<0.15	<0.15
SB-B17-091	09/12/99	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	**0.75**	<0.14	<0.14	<0.14
SB-B17-106	09/12/99	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	**1.2**	<0.098	<0.098	<0.098
SB-B17-106D	09/12/99	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	**0.39**	<0.098	<0.098	<0.098
SB-B18-001	09/16/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.28**	<0.12	<0.12	**0.21**	<0.12	<0.12	<0.12
SB-B18-006	09/16/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**0.24**	<0.11	<0.11	<0.11
SB-B18-011	09/16/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.18**	<0.12	<0.12	<0.12
SB-B18-026	09/16/99	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.18**	<0.10	<0.10	<0.10
SB-B18-051	09/16/99	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.1**	<0.10	<0.10	<0.10
SB-B18-061	09/16/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.076**	<0.12	<0.12	<0.12
SB-B18-071	09/16/99	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	**0.25**	<0.13	<0.13	<0.13
SB-B18-081	09/16/99	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	**0.88**	<0.14	<0.14	<0.14
SB-B18-096	09/16/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.26**	**0.23**	<0.12	<0.12	<0.12
SB-B18-111*	09/16/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.25**	**0.064**	<0.12	<0.12	<0.12
SB-B18-111D*	09/16/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	**0.24**	<0.11	<0.11	<0.11	<0.11
SB-B19-001	08/18/99	<0.093	<0.093	<0.093	<0.093		<0.093	<0.093	<0.093	<0.093	**0.16**	<0.093	<0.093	<0.093
SB-B19-007	08/18/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B19-012	08/18/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B19-047	08/18/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B19-057	08/18/99	<0.097	<0.097	<0.097	<0.097		<0.097	<0.097	<0.097	<0.097	<0.097	<0.097	<0.097	<0.097
SB-B19-072	08/19/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	**0.35**	<0.10	<0.10	<0.10
SB-B19-081	08/19/99	<0.13	<0.13	<0.13	<0.13		<0.13	<0.13	<0.13	<0.13	**0.39**	<0.13	<0.13	<0.13
SB-B19-086	08/19/99	<0.14	<0.14	<0.14	<0.14		<0.14	<0.14	<0.14	<0.14	**0.56**	<0.14	<0.14	<0.14
SB-B19-102	08/19/99	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
SB-B19-111*	08/19/99	<0.14	<0.14	<0.14	<0.14		<0.14	<0.14	<0.14	<0.14	**0.29**	<0.14	<0.14	<0.14
SB-B19-111D*	08/19/99	<0.14	<0.14	<0.14	<0.14		<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
SB-B20-001	08/25/99	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
SB-B20-007	08/25/99	<0.095	<0.095	<0.095	<0.095		<0.095	<0.095	<0.095	<0.095	**0.065**	<0.095	<0.095	<0.095
SB-B20-012	08/25/99	<0.097	<0.097	<0.097	<0.097		<0.097	<0.097	<0.097	<0.097	<0.097	<0.097	<0.097	<0.097
SB-B20-022	08/25/99	<0.095	<0.095	<0.095	<0.095		<0.095	<0.095	<0.095	<0.095	**0.068**	<0.095	<0.095	<0.095
SB-B20-037	08/25/99	<0.097	<0.097	<0.097	<0.097		<0.097	<0.097	<0.097	<0.097	<0.097	<0.097	<0.097	<0.097
SB-B20-062	08/25/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	**0.077**	<0.10	<0.10	<0.10
SB-B20-072	08/25/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	**0.16**	<0.10	<0.10	<0.10
SB-B20-072D	08/25/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B20-082	08/26/99	<0.15	<0.15	<0.15	<0.15		<0.15	<0.15	<0.15	<0.15	**0.16**	<0.15	<0.15	<0.15
SB-B20-082RE	08/26/99	<0.15	<0.15	<0.15	<0.15		<0.15	<0.15	<0.15	<0.15	**0.27**	<0.15	<0.15	<0.15
SB-B20-092	08/26/99	<0.13	<0.13	<0.13	<0.13		<0.13	160	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
SB-B20-106	08/26/99	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	**0.31**	<0.12	<0.12	<0.12
SB-B21-001.5	08/20/99	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
SB-B21-007	08/20/99	<0.092	<0.092	<0.092	<0.092		<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092
SB-B21-012	08/20/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B21-027	08/20/99	<0.095	<0.095	<0.095	<0.095		<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095	<0.095
SB-B21-041	08/20/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B21-062	08/20/99	<0.098	<0.098	<0.098	<0.098		<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098	<0.098
SB-B21-077	08/20/99	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
SB-B21-081	08/20/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B21-102	08/20/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
SB-B21-112*	08/20/99	<0.15	<0.15	<0.15	<0.15		<0.15	<0.15	<0.15	<0.15	**2.3**	<0.15	<0.15	<0.15
SB-B21-112D*	08/20/99	<0.17	<0.17	<0.17	<0.17		<0.17	<0.17	<0.17	<0.17	**1.1**	<0.17	<0.17	<0.17
SB-B22-011	01/24/01	<0.015	<0.017	<0.012	<0.013	<0.027	<0.013	<0.022	<0.016	<0.019	<0.021	<0.017	<0.020	<0.017
SB-B22-021	01/24/01	<0.016	<0.018	<0.013	<0.014	<0.028	<0.014	<0.023	<0.017	<0.020	<0.023	<0.018	<0.021	<0.018
SB-B22-036	01/24/01	<0.016	<0.018	<0.013	<0.014	<0.028	<0.014	<0.023	<0.016	<0.019	<0.022	<0.017	<0.021	<0.017
SB-B22-046	01/24/01	<0.015	<0.017	<0.013	<0.013	<0.027	<0.013	<0.022	<0.016	<0.019	<0.021	<0.017	<0.020	<0.017
SB-B22-066	01/24/01	<0.016	<0.018	<0.013	<0.013	<0.028	<0.013	<0.022	<0.016	<0.019	**0.05**	<0.017	<0.020	<0.017
SB-B22-076	01/24/01	<0.019	<0.021	<0.015	**0.15**	<0.033	<0.016	<0.027	<0.019	<0.023	**0.049**	<0.020	**0.046**	<0.020
SB-B22-086	01/24/01	<0.020	<0.022	<0.016	**0.49**	<0.035	<0.017	<0.029	<0.021	<0.024	**0.046**	<0.022	**0.11**	<0.022
SB-B22-096	01/24/01	<0.020	<0.023	<0.017	**0.7**	<0.036	<0.017	<0.029	<0.021	<0.025	**0.037**	<0.022	**0.11**	<0.022
SB-B22-106	01/24/01	<0.020	<0.023	<0.017	**0.68**	<0.036	<0.017	<0.029	<0.021	<0.025	<0.028	<0.022	**0.044**	<0.022
SB-B22-121	01/24/01	<0.018	<0.020	<0.015	<0.016	<32	<0.016	<0.026	<0.019	<0.022	**0.45**	<0.020	<0.024	<0.020
SB-B22-128*	01/24/01	<0.017	<0.020	<0.014	<0.015	<0.031	<0.015	<0.025	<0.018	<0.021	**0.28**	<0.019	<0.023	<0.019
SB-B22-128D*	01/24/01	<0.018	<0.020	<0.015	<0.015	<0.031	<0.015	<0.025	<0.018	<0.022	**0.26**	<0.019	<0.023	<0.019
SB-B23-011	01/25/01	<0.016	<0.018	<0.013	<0.014	<0.029	<0.014	<0.023	<0.017	**0.14**	<0.023	<0.018	<0.021	<0.018
AZ Residential SRL (mg/kg)		1,200	4.4	500	0.36	2,100	0.62	12	31	77	53	790	27	0.016
AZ Non-residential SRL (mg/kg)		4,800	11	1,700	0.8	8,800	1.4	26	100	180	170	2,700	70	0.035
GPL (mg/kg)		1	NE	NE	0.81	NE	0.71	NE	4.9	NE	1.3	400	0.61	NE

Table 28 - Soil Sample Analytical Data - VOCs
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

SAMPLE ID	SAMPLE DATE	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethane	1,1-Dichloroethene	Acetone	Benzene	Chloromethane	cis-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Toluene	Trichloroethene	Vinyl chloride
SB-B23-021	01/25/01	<0.018	<0.020	<0.015	<0.015	<0.031	<0.015	<0.025	<0.018	<0.022	<0.025	<0.020	<0.023	<0.020
SB-B23-036	01/25/01	<0.016	<0.018	<0.013	<0.014	<0.029	<0.014	<0.023	<0.017	<0.020	<0.023	<0.018	<0.021	<0.018
SB-B23-046	01/25/01	<0.017	<0.019	<0.014	<0.015	<0.030	<0.015	<0.025	<0.018	<0.021	<0.024	<0.019	<0.023	<0.019
SB-B23-061	01/25/01	<0.020	<0.022	<0.016	<0.017	<0.034	<0.017	<0.028	<0.020	<0.024	<0.027	<0.021	<0.025	<0.021
SB-B23-071	01/25/01	<0.024	<0.027	<0.019	<0.020	<0.042	<0.020	<0.034	<0.024	<0.029	<0.033	<0.026	<0.031	<0.026
SB-B23-086	01/25/01	<0.022	<0.024	<0.018	<0.018	**0.16**	<0.018	<0.031	<0.022	<0.026	<0.030	<0.024	<0.028	<0.024
SB-B23-096	01/25/01	<0.020	**0.069**	<0.016	<0.017	<0.035	<0.017	<0.028	<0.020	<0.024	<0.027	<0.021	<0.026	<0.021
SB-B23-106	01/25/01	<0.019	<0.021	<0.015	<0.016	<0.033	<0.016	<0.027	<0.019	<0.023	<0.026	<0.020	<0.024	<0.020
SB-B23-116	01/25/01	<0.021	<0.023	<0.017	<0.018	<0.036	<0.018	<0.029	<0.021	<0.025	<0.029	<0.023	<0.027	<0.023
SB-B23-128	01/25/01	<0.017	<0.019	<0.014	<0.014	<0.029	<0.014	<0.024	<0.017	<0.020	<0.023	<0.018	<0.022	<0.018
SB-B23-128D	01/25/01	<0.017	<0.019	<0.014	<0.014	<0.030	<0.014	<0.024	<0.017	<0.020	<0.023	<0.018	<0.022	<0.018
SG-D/E 3.5-09	01/23/01	<0.017	<0.019	<0.014	<0.014	<0.029	<0.014	<0.024	<0.017	<0.020	<0.023	<0.018	<0.022	<0.018
SG-F05-09	01/23/01	<0.017	<0.019	<0.014	<0.014	<0.029	<0.014	<0.024	<0.017	<0.020	<0.023	<0.018	<0.022	<0.018
SG-F07-09	01/23/01	<0.015	<0.016	<0.012	<0.012	<0.026	<0.012	<0.021	<0.015	<0.018	<0.020	<0.016	<0.019	<0.016
SG-F09-09	01/23/01	<0.015	<0.017	<0.012	<0.013	<0.026	<0.013	<0.021	<0.015	<0.018	<0.021	<0.016	<0.019	<0.016
WCP-31-001	09/21/99	<0.12	<0.12	<0.12	<0.12	<0.021	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
WCP-31-006	09/21/99	<0.11	<0.11	<0.11	<0.11	<0.024	<0.11	<0.11	<0.11	<0.11	**0.15**	<0.11	<0.11	<0.11
WCP-31-011	09/21/99	<0.097	<0.097	<0.097	<0.097	<0.018	<0.097	<0.097	<0.097	<0.11	**0.19**	<0.097	<0.097	<0.097
WCP-31-031	09/21/99	<0.11	<0.11	<0.11	<0.11	<0.023	<0.11	<0.11	<0.11	<0.14	**1.1**	<0.11	<0.11	<0.11
WCP-31-051	09/21/99	<0.097	<0.097	<0.097	<0.097	<0.020	<0.097	<0.097	<0.097	<0.097	**0.28**	<0.097	<0.097	<0.097
WCP-31-071	09/21/99	<0.11	<0.11	<0.11	<0.11	<0.026	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
WCP-31-081	09/21/99	<0.12	<0.12	<0.12	<0.12	<0.028	<0.12	<0.12	<0.12	<0.14	**0.65**	**0.15**	<0.12	<0.12
WCP-31-096	09/21/99	<0.12	<0.12	<0.12	<0.12	<0.031	<0.12	<0.12	<0.12	<0.12	**0.33**	<0.12	<0.12	<0.12
WCP-31-106	09/22/99	<0.10	<0.10	<0.10	<0.10	<0.13	<0.10	<0.10	<0.10	<0.10	**0.2**	<0.10	<0.10	<0.10
WCP-31-111*	09/22/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	**0.14**	<0.12	<0.12	<0.12
WCP-31-111'D*	09/22/99	<0.11	<0.11	<0.11	<0.11	<0.016	<0.11	<0.11	<0.11	<0.11	**0.16**	<0.11	<0.11	<0.11
WCP-32-006	09/13/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
WCP-32-006RE	09/13/99	R	R	R	R	R	R	R	R	R	R	R	R	R
WCP-32-011	09/13/99	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
WCP-32-016	09/13/99	<0.091	<0.091	<0.091	<0.091	<0.091	<0.091	**0.28**	<0.091	<0.091	<0.091	<0.091	<0.091	<0.091
WCP-32-041	09/13/99	<0.096	<0.096	<0.096	<0.096	<0.096	<0.096	**0.26**	<0.096	<0.096	<0.096	<0.096	<0.096	<0.096
WCP-32-051	09/13/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
WCP-32-071	09/13/99	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099	<0.099
WCP-32-071RE	09/13/99	R	R	R	R	R	R	R	R	R	R	R	R	R
WCP-32-076	09/13/99	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
WCP-32-091	09/14/99	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
MW-WCP-32-106	09/14/99	<0.11	<0.11	<0.11	<0.11	R	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
MW-WCP-32-111	09/14/99	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092	<0.092
MW-WCP-32-111D	09/14/99	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
MW-33S-001	08/23/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
MW-33S-012	08/23/99	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
MW-33S-022	08/23/99	<0.10	<0.10	<0.10	<0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
MW-33S-032	08/23/99	<0.13	<0.13	<0.13	<0.13		<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13
MW-33S-042	08/23/99	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
MW-33S-067	08/24/99	<0.0300	<0.030	<0.030	<0.030		<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
MW-33S-082	08/24/99	<0.17	<0.17	<0.17	<0.17		<0.17	**0.27**	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
MW-33S-092	08/24/99	<0.0340	<0.034	<0.034	<0.034		<0.034	<0.034	<0.034	<0.034	<0.034	<0.034	<0.034	<0.034
MW-33S-102	08/24/99	<0.11	<0.11	<0.11	<0.11		<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
MW-33S-102B	08/24/99	<0.12	<0.12	<0.12	<0.12		<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
MW-33S-107	08/30/99	<0.12	<0.12	<0.12	<0.12	R	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
WCP-MW-091-011	01/22/01	<0.015	<0.017	<0.013	<0.013	<0.027	<0.013	<0.022	<0.016	<0.019	<0.021	<0.017	<0.020	<0.017
WCP-MW-091-026	01/22/01	<0.016	<0.017	<0.013	<0.013	<0.027	<0.013	<0.022	<0.016	<0.019	<0.022	<0.017	<0.020	<0.017
WCP-MW-091-036	01/22/01	<0.015	<0.017	<0.013	<0.013	<0.027	<0.013	<0.022	<0.016	<0.019	<0.022	<0.017	<0.020	<0.017
WCP-MW-091-051	01/22/01	<0.017	<0.019	<0.014	<0.014	<0.029	<0.014	<0.024	<0.017	<0.020	<0.023	<0.018	<0.022	<0.018
WCP-MW-091-071	01/22/01	<0.020	<0.023	<0.017	<0.017	<0.036	<0.017	<0.029	<0.021	<0.024	<0.028	<0.022	<0.026	<0.022
WCP-MW-091-081	01/22/01	<0.022	<0.024	<0.018	<0.018	<0.038	<0.018	<0.031	<0.022	<0.026	<0.030	<0.024	<0.028	<0.024
WCP-MW-091-091	01/22/01	<0.022	<0.024	<0.018	<0.018	<0.038	<0.018	<0.031	<0.022	<0.026	<0.030	<0.024	<0.028	<0.024
WCP-MW-091-101	01/22/01	<0.020	<0.023	<0.017	<0.017	<0.036	<0.017	<0.029	<0.021	<0.025	<0.028	<0.022	<0.026	<0.022
WCP-MW-091-116	01/22/01	<0.019	<0.021	<0.015	<0.016	<0.033	<0.016	<0.027	<0.019	<0.023	<0.026	<0.020	<0.024	<0.020
WCP-MW-091-116D	01/22/01	<0.019	<0.021	<0.015	<0.016	<0.033	<0.016	<0.027	<0.019	<0.023	<0.026	<0.020	<0.024	<0.020
WCP-MW-091-128*	01/23/01	<0.017	<0.019	<0.014	<0.015	<0.030	<0.015	<0.025	<0.018	<0.021	<0.024	<0.019	<0.022	<0.019
AZ Residential SRL (mg/kg)		1,200	4.4	500	0.36	2,100	0.62	12	31	77	53	790	27	0.016
AZ Non-residential SRL (mg/kg)		4,800	11	1,700	0.8	8,800	1.4	26	100	180	170	2,700	70	0.035
GPL (mg/kg)		1	NE	NE	0.81	NE	0.71	NE	4.9	NE	1.3	400	0.61	NE

Notes: * Indicates saturated soil sample. This data was not used for soil evaluation and should not be compared to SRLs or GPLs.
SRL = Soil Remediation Limit
GPL = Minimum Groundwater Protection Level
mg/kg = milligrams per kilogram
R = Rejected Data
D = Duplicate Sample
RE = Replicate Analyses
NE = Not established
Bolded analytical result indicates analyte detected above the Method Detection Limit.

Table 29 - Soil Sample Analytical Data-Metals
Pyramid Industries Facilty
WCP North Plume Site
Phoenix, Arizona

SAMPLE ID	SAMPLE DATE	Antimony, Total	Arsenic, Total	Barium, Total	Beryllium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Copper, Total	Iron, Total	Lead, Total	Manganese, Total	Mercury, Total	Molybdenum, Total	Nickel, Total	Selenium, Total	Silver, Total	Thallium, Total	Vanadium, Total	Zinc, Total
DW-3	09/16/99	**14.5**	**5.2**	**157**	<0.21	**4.7**	**32.6**	**11.1**	**72.5**	**21200**	**137**	**387**	**0.07**	**4.5**	**36.6**	**1.0**	**0.39**	<0.57	**23.2**	**499**
SB-B16-001	09/15/99	R	**12.8**	**159**	**0.78**	**0.48**	**36.7**	**13.8**	**39.2**	**26100**	**9.8**	**636**	<0.02	<0.22	**41.0**	<0.35	<0.14	<0.80	**48.6**	**60.8**
SB-B16-006	09/15/99	<0.25	**10.9**	**138**	**0.75**	**0.51**	**34.5**	**12.4**	**32.4**	**23200**	**8.2**	**566**	<0.02	<0.15	**38.6**	<0.24	<0.1	<0.96	**41.6**	**53.3**
SB-B16-011	09/15/99	<0.32	**6.9**	**115**	<0.33	**0.40**	**24.6**	**8.5**	**21.4**	**17000**	**6.3**	**339**	<0.02	<0.19	**23.4**	<0.30	<0.12	<0.45	**37.5**	**39.3**
SB-B16-031	09/15/99	<0.25	**16.8**	**126**	**0.69**	**0.48**	**30.8**	**10.1**	**25.8**	**19700**	**8.0**	**419**	<0.02	<0.15	**31.5**	<0.23	<0.09	<0.69	**45.2**	**47.2**
SB-B16-046	09/15/99	<0.39	**10.6**	**104**	**0.91**	<0.25	**29.4**	**11.1**	**28.5**	**23300**	**10.5**	**510**	<0.02	<0.23	**33.2**	<0.36	<0.15	<0.95	**46.8**	**54.9**
SB-B16-061	09/15/99	<0.27	**6.8**	**68.9**	**0.56**	<0.18	**19.2**	**10.0**	**22.0**	**13700**	**6.0**	**368**	<0.02	<0.16	**32.1**	<0.25	<0.10	<0.86	**27.0**	**35.2**
SB-B16-066	09/15/99	<0.29	**11.4**	**86.3**	<0.60	<0.27	**45.3**	**10.6**	**19.5**	**18100**	**9.0**	**370**	<0.02	<0.17	**26.3**	<0.27	<0.11	<0.59	**47.4**	**35.1**
SB-B16-076	09/15/99	<0.25	**13.9**	**174**	<0.59	<0.31	**56.1**	**14.7**	**22.5**	**22100**	**8.6**	**555**	<0.02	<0.15	**32.0**	**0.33**	<0.09	<0.90	**71.8**	**35.0**
SB-B16-096	09/15/99	<0.35	**14.8**	**147**	**0.80**	<0.25	**56.9**	**7.4**	**30.2**	**23700**	**9.0**	**234**	<0.02	<0.21	**35.8**	**0.42**	<0.13	<0.73	**58.4**	**51.4**
SB-B16-111*	09/15/99	<0.36	**9.7**	**128**	**0.70**	**0.39**	**42.2**	**12.6**	**20.4**	**21900**	**7.7**	**590**	<0.02	<0.21	**29.6**	**0.45**	<0.14	<1.0	**53.0**	**39.2**
SB-B16-111D*	09/15/99	<0.36	**8.7**	**123**	<0.58	<0.22	**41.1**	**10.4**	**20.8**	**18300**	**7.4**	**567**	<0.02	<0.21	**25.1**	**0.38**	<0.14	<0.62	**43.9**	**35.9**
SB-B17-001	09/12/99	**0.30**	**11.4**	**138**	**0.97**	**0.62**	**36.8**	**14.9**	**38.9**	**25900**	**10**	**811**	<0.02	<0.12	**41.4**	<0.19	<0.08	**0.62**	**46.3**	**61.7**
SB-B17-006	09/12/99	<0.33	**6.7**	**95.2**	**0.68**	**0.35**	**28.8**	**10.6**	**26.0**	**20300**	**9.6**	**483**	<0.02	<0.19	**30.2**	<0.31	<0.12	**1.0**	**37.5**	**43.2**
SB-B17-011	09/12/99	<0.30	**10.1**	**88.1**	**0.41**	**0.46**	**21.6**	**7.8**	**20.5**	**15700**	**6.2**	**317**	<0.02	**0.20**	**23.6**	<0.28	<0.11	**0.85**	**39.3**	**35.2**
SB-B17-031	09/12/99	<0.36	**13.7**	**115**	**0.79**	**0.58**	**32.1**	**12.5**	**29.8**	**23600**	**9.9**	**485**	<0.02	**0.22**	**38.1**	<0.34	<0.14	**0.82**	**48.2**	**58.2**
SB-B17-046	09/12/99	<0.31	**7.6**	**65.2**	**0.52**	**0.33**	**22.8**	**7.5**	**19.8**	**16400**	**8.8**	**340**	<0.02	**0.34**	**20.1**	<0.29	<0.12	**0.44**	**36.7**	**37.5**
SB-B17-061	09/12/99	<0.27	**5.8**	**44.9**	**0.23**	**0.1**	**15.0**	**7.7**	**19.2**	**11200**	**4.1**	**233**	<0.02	<0.16	**21.3**	<0.25	<0.10	**0.39**	**23.6**	**23.5**
SB-B17-076	09/12/99	<0.38	**10.2**	**144**	**0.59**	**0.33**	**123**	**5.5**	**19.4**	**20200**	**6.5**	**179**	<0.02	<0.23	**27.4**	<0.36	<0.14	<0.54	**52.3**	**38.0**
SB-B17-080.5	09/12/99	<0.46	**14.3**	**151**	**0.79**	**0.52**	**109**	**8.7**	**27.9**	**28000**	**7.6**	**242**	<0.02	<0.27	**45.5**	<0.43	<0.17	**1.2**	**69.7**	**51.9**
SB-B17-091	09/12/99	<0.43	**15.0**	**206**	**1.2**	**0.68**	**70.8**	**10.8**	**41.9**	**31400**	**8.4**	**386**	<0.02	<0.26	**57.0**	<0.41	<0.16	**0.88**	**67.8**	**71.7**
SB-B17-106	09/12/99	<0.33	**10**	**83.9**	**0.47**	**0.28**	**50.7**	**5.7**	**15.6**	**15600**	**5.3**	**175**	<0.02	<0.19	**22.5**	<0.31	<0.12	**0.68**	**42.3**	**29.2**
SB-B18-001	09/16/99	**0.37**	**14.0**	**178**	**1.0**	**0.12**	**42.9**	**15.5**	**43.7**	**29200**	**11.3**	**779**	<0.02	<0.19	**42.7**	<0.30	<0.12	<2.2	**55.9**	**67.4**
SB-B18-006	09/16/99	<0.29	**8.5**	**127**	**0.78**	**0.07**	**34.7**	**12.7**	**35.7**	**23400**	**8.5**	**596**	<0.02	<0.17	**37.9**	<0.27	<0.11	<2.0	**41.4**	**51.7**
SB-B18-011	09/16/99	<0.36	**6.1**	**117**	**0.50**	<0.06	**20.3**	**7.4**	**18.1**	**14500**	**6.5**	**343**	<0.02	<0.21	**22.2**	<0.34	<0.14	<0.51	**29.9**	**34.2**
SB-B18-026	09/16/99	<0.30	**6.8**	**92.5**	**0.47**	<0.05	**17.6**	**6.8**	**22.4**	**13200**	**5.0**	**331**	<0.02	<0.18	**20.5**	<0.28	<0.11	<0.43	**25.7**	**35.7**
SB-B18-051	09/16/99	<0.28	**2.5**	**35.3**	**0.32**	<0.04	**6.9**	**3.3**	**9.8**	**6750**	**2.7**	**151**	<0.02	<0.17	**9.9**	<0.26	<0.10	<0.39	**13.3**	**17.3**
SB-B18-061	09/16/99	<0.29	**7.2**	**102**	**0.46**	<0.05	**14.1**	**7.0**	**24.0**	**11800**	**3.4**	**248**	<0.02	**0.23**	**26.0**	<0.27	<0.11	<0.41	**24.7**	**22.9**
SB-B18-071	09/16/99	<0.40	**8.3**	**138**	**1.0**	<0.06	**185**	**5.8**	**21.4**	**23600**	**6.3**	**204**	<0.02	<0.23	**30.1**	<0.37	<0.15	<0.56	**55.1**	**47.1**
SB-B18-081	09/16/99	<0.37	**10.6**	**66.2**	**1.0**	**0.20**	**51.9**	**8.5**	**28.5**	**20800**	**7.7**	**304**	<0.02	<0.22	**38.4**	<0.35	<0.14	<0.52	**51.1**	**50.6**
SB-B18-096	09/16/99	**0.44**	**16.0**	**252**	**0.87**	**0.11**	**58.7**	**15.0**	**29.2**	**25800**	**9.7**	**522**	<0.02	<0.20	**48.5**	<0.31	<0.12	<0.47	**71.3**	**47.4**
SB-B18-111*	09/16/99	**0.69**	**7.8**	**114**	**0.49**	<0.06	**49.0**	**8.0**	**18.6**	**17800**	**5.9**	**285**	<0.02	<0.22	**24.0**	<0.35	<0.14	<0.53	**46.0**	**33.1**
SB-B18-111D*	09/16/99	<0.31	**7.5**	**112**	**0.64**	<0.05	**42.5**	**9.9**	**19.2**	**15800**	**7.2**	**321**	<0.02	<0.18	**24.1**	<0.29	<0.12	<0.43	**39.2**	**34.9**
SB-B19-001	08/18/99	<0.32	**10.8**	**141**	**0.73**	<0.1	**30.3**	**11.1**	**32.8**	**22800**	**9.4**	**517**	<0.02	<0.19	**35.3**	<0.30	<0.12	<0.45	**46.8**	**51.7**
SB-B19-007	08/18/99	<0.40	**5.5**	**178**	**0.84**	<0.04	**24.9**	**9.9**	**26.0**	**19700**	**10.5**	**582**	<0.02	<0.17	**28.8**	<0.27	<0.11	<0.40	**34.9**	**44.9**
SB-B19-012	08/18/99	<0.38	**8.0**	**131**	<0.49	<0.05	**17.4**	**7.3**	**21.5**	**14400**	**6.0**	**368**	<0.02	<0.17	**21.4**	<0.27	<0.11	<0.41	**32.3**	**34.0**
SB-B19-047	08/18/99	<0.29	**4.2**	**36.4**	<0.34	<0.04	**7.0**	**3.3**	**11.2**	**7530**	**3.3**	**167**	<0.02	<0.16	**10.9**	<0.26	<0.10	<0.39	**15.4**	**16.3**
SB-B19-057	08/18/99	<0.30	**4.3**	**19.5**	<0.37	<0.05	**7.8**	**3.5**	**8.7**	**7420**	**2.9**	**133**	<0.02	<0.18	**11.2**	<0.28	<0.11	<0.42	**14.3**	**16.9**
SB-B19-072	08/19/99	**0.42**	**7.9**	**74.9**	**0.49**	<0.04	**21.6**	**6.3**	**18.5**	**13200**	**5.0**	**224**	<0.02	<0.17	**18.9**	<0.26	<0.10	<0.39	**36.3**	**26.2**
SB-B19-081	08/19/99	<0.41	**13.9**	**268**	<0.89	<0.06	**88.2**	**11.3**	**28.5**	**22000**	**8.9**	**478**	<0.02	<0.21	**42.0**	<0.34	<0.14	<0.51	**60.9**	**48.1**
SB-B19-086	08/19/99	<0.36	**10.2**	**116**	<1.0	<0.06	**139**	**8.1**	**29.9**	**24900**	**6.4**	**236**	<0.02	<0.22	**44.9**	<0.34	<0.14	<0.51	**50.0**	**51.8**
SB-B19-102	08/19/99	<0.32	**8.5**	**163**	<0.62	<0.05	**63.7**	**8.5**	**17.3**	**15800**	**6.2**	**285**	<0.02	<0.19	**24.3**	<0.30	<0.12	<0.46	**42.8**	**31.9**
SB-B19-111*	08/19/99	<0.36	**6.9**	**92.0**	<0.85	<0.06	**124**	**6.7**	**24.0**	**20500**	**5.5**	**222**	<0.03	<0.22	**35.7**	<0.34	<0.14	<0.51	**52.6**	**41.8**
SB-B19-111D*	08/19/99	<0.55	**7.5**	**73.8**	<0.70	<0.05	**80.4**	**6.8**	**22.0**	**17900**	**4.7**	**259**	<0.02	<0.20	**29.5**	<0.32	<0.13	<0.49	**40.2**	**37.2**
SB-B20-001	08/25/99	<0.33	**11.4**	**166**	**0.85**	**0.54**	**38.5**	**14.1**	**39.0**	**26500**	**9.8**	**683**	<0.02	<0.19	**42.2**	<0.31	<0.12	<0.50	**49.9**	**62.0**
SB-B20-007	08/25/99	<0.29	**5.4**	**87.2**	**0.64**	**0.30**	**26.1**	**9.4**	**22.7**	**18000**	**7.5**	**473**	<0.02	<0.17	**26.2**	**0.31**	<0.11	<0.49	**34.3**	**40.5**
SB-B20-012	08/25/99	<0.24	**7.1**	**119**	**0.40**	**0.32**	**19.1**	**7.3**	**19.7**	**14900**	**5.2**	**300**	<0.02	<0.14	**20.3**	<0.23	<0.09	<0.42	**33.4**	**35.8**
SB-B20-022	08/25/99	**0.41**	**7.8**	**104**	**1.1**	**0.35**	**32.5**	**10.5**	**28.2**	**23100**	**10.5**	**535**	<0.02	<0.18	**31.3**	**0.34**	<0.11	<0.50	**37.4**	**52.5**
SB-B20-037	08/25/99	**0.46**	**7.3**	**67.3**	**0.50**	**0.27**	**22.9**	**7.4**	**19.1**	**15400**	**4.8**	**310**	<0.02	<0.18	**23.0**	**0.35**	<0.11	<0.46	**34.5**	**31.5**
SB-B20-062	08/25/99	<0.30	**8.4**	**27.9**	**0.53**	**0.21**	**41.1**	**6.7**	**19.9**	**19000**	**4.9**	**173**	<0.02	<0.18	**24.7**	**0.36**	<0.11	<0.48	**41.3**	**32.5**
SB-B20-072	08/25/99	<0.31	**6.6**	**86.2**	**0.55**	**0.43**	**26.1**	**7.7**	**17.8**	**12300**	**6.4**	**312**	<0.02	<0.18	**22.3**	<0.29	<0.12	<0.50	**25.3**	**30.0**
SB-B20-072D	08/25/99	<1.4	**7.3**	**70.0**	**0.27**	**0.30**	**24.3**	**7.1**	**15.3**	**11500**	**6.0**	**276**	**0.07**	<0.84	**21.7**	<1.3	<0.53	<2.2	**21.7**	**27.6**
SB-B20-082	08/26/99	<0.37	**11.2**	**281**	**1.0**	**0.48**	**167**	**12.3**	**27.3**	**24500**	**10.4**	**644**	<0.02	<0.22	**44.2**	**0.43**	<0.14	<0.63	**75.9**	**50.5**
SB-B20-092	08/26/99	**0.44**	**14.0**	**220**	**1.2**	**0.46**	**79.8**	**14.2**	**37.3**	**27800**	**8.5**	**561**	<0.02	<0.21	**53.7**	<0.34	<0.13	<0.54	**64.6**	**64.2**
SB-B20-106	08/26/99	<0.34	**11.3**	**101**	**0.78**	**0.24**	**53.3**	**6.3**	**20.7**	**20300**	**6.3**	**231**	<0.02	<0.20	**27.2**	<0.32	<0.13	**0.62**	**50.9**	**38.4**
Residential SRL	mg/kg	31	10	5,300	1.4	38	2,100	4,600	2,800	NE	400	3,200	6.7	380	1,500	380	380	NE	540	23,000
Non-residential SRL	mg/kg	680	10	110,000	11	850	4,500	97,000	63,000	NE	2,000	43,000	180	8,500	34,000	8,500	8,500	NE	12,000	510,000
GPL	mg/kg	35	290	12,000	23	29	590	NE	NE	NE	290	NE	12	NE	590	290	NE	12	NE	NE

Table 29 - Soil Sample Analytical Data-Metals
Pyramid Industries Facilty
WCP North Plume Site
Phoenix, Arizona

SAMPLE ID	SAMPLE DATE	Antimony, Total	Arsenic, Total	Barium, Total	Beryllium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Copper, Total	Iron, Total	Lead, Total	Manganese, Total	Mercury, Total	Molybdenum, Total	Nickel, Total	Selenium, Total	Silver, Total	Thallium, Total	Vanadium, Total	Zinc, Total
SB-B21-001.5	08/20/99	R	13.3	193	1.1	0.60	44.4	17.3	45.1	31700	11.8	851	<0.02	<0.22	49.4	0.72	<0.14	3.8	54.7	74.6
SB-B21-007	08/20/99	<0.30	11.2	140	0.96	0.60	45.9	17.0	42.1	29600	10.6	811	<0.02	<0.18	50.2	<0.43	<0.11	2.7	49.9	68.5
SB-B21-012	08/20/99	<0.30	8.8	152	0.52	0.39	26.2	10.2	25.0	19400	8.2	468	<0.02	<0.18	28.5	<0.60	<0.11	2.1	38.7	47.5
SB-B21-027	08/20/99	<0.27	7.4	125	0.31	0.19	17.8	9.1	19.8	13300	4.6	421	<0.02	0.50	24.0	<0.08	<0.1	1.4	30.2	28.4
SB-B21-041	08/20/99	<0.27	5.4	69.7	0.33	0.17	16.2	7.0	18.1	15100	4.0	258	<0.02	<0.16	21.4	<0.11	<0.10	1.9	27.7	31.5
SB-B21-062	08/20/99	<0.30	6.5	117	0.31	0.11	14.7	7.4	17.1	11500	4.2	392	<0.02	0.22	28.6	<0.49	<0.11	1.1	23.8	54.9
SB-B21-077	08/20/99	<0.34	9.3	354	0.67	0.37	98.2	6.3	21.7	21900	5.3	166	<0.02	<0.20	32.1	<0.72	<0.13	2.1	55.0	43.9
SB-B21-081	08/20/99	<0.32	6.4	31.1	0.16	0.12	54.8	5.2	12.7	10300	3.7	125	<0.02	<0.19	23.2	<0.14	<0.12	0.71	29.6	21.2
SB-B21-102	08/20/99	<0.28	13.3	141	0.57	0.28	45.9	9.3	20.6	21400	7.5	404	<0.02	<0.17	26.0	<0.40	<0.10	2.7	60.1	36.6
SB-B21-112	08/20/99	<0.38	8.3	90.1	0.82	0.27	102	10.1	22.5	22000	5.0	210	<0.03	<0.22	36.1	<0.82	<0.14	2.6	42.4	48.6
SB-B21-112D*	08/20/99	<0.39	10.8	108	0.95	0.39	89.0	13.0	24.5	21700	7.3	258	<0.03	<0.23	37.8	<0.91	<0.15	2.5	44.9	47.8
SB-B22-011	01/24/01	0.90	10.2		0.47	<0.024	20.3		24.1		5.7		5		23.8	<0.21	<0.075	<0.37		34.2
SB-B22-021	01/24/01	<0.64	14.1		0.75	<0.025	30.7		30.7		7.7		7		33.8	0.25	<0.078	1.2		47.6
SB-B22-036	01/24/01	<0.67	7.9		0.56	<0.026	21.7		23.8		6.8		7		24.8	<0.23	<0.082	0.85		39.2
SB-B22-046	01/24/01	<0.56	4.7		<0.29	<0.022	12.1		13.5		3.2		4		14.3	<0.19	<0.068	0.64		22.2
SB-B22-066	01/24/01	<0.64	8.1		0.41	<0.080	18.4		16.6		5.0		5		17.8	<0.22	<0.077	0.73		28.3
SB-B22-076	01/24/01	<0.72	11.9		0.63	<0.028	79.2		17.7		5.6		9		23.5	<0.25	<0.087	<0.43		34.5
SB-B22-086	01/24/01	<0.78	15.7		0.96	<0.030	43.6		29.0		10.2		0		38.5	<0.27	<0.094	1.4		48.1
SB-B22-096	01/24/01	<0.78	15.3		0.91	<0.031	36.4		24.2		12.5		0		33.6	<0.27	<0.095	0.98		41.7
SB-B22-106	01/24/01	<0.77	9.6		0.77	<0.030	54.1		19.1		5.7		1		28.4	0.50	<0.093	0.57		39.2
SB-B22-121	01/24/01	<0.74	16.2		0.93	<0.029	40.1		27.3		7.0		9		44.3	<0.25	<0.090	0.82		44.4
SB-B22-128	01/24/01	<0.70	17.9		0.54	<0.027	86.7		17.0		3.1		8		26.8	<0.24	<0.085	<0.41		28.1
SB-B22-128D*	01/24/01	<0.70	10.2		0.49	<0.028	79.7		15.1		2.4		8		23.4	<0.24	<0.085	<0.42		25.7
SB-B23-011	01/25/01	<0.60	9.0		0.61	<0.054	26.9		25.5		7.6		5		29.7	<0.20	<0.073	<0.36		45.9
SB-B23-021	01/25/01	<0.75	12.4		0.92	<0.030	33.4		36.1		9.1		9		38.1	<0.26	<0.092	<0.46		56.6
SB-B23-036	01/25/01	<0.60	7.1		0.89	<0.024	28.3		25.2		9.6		6		25.6	<0.21	<0.073	<0.70		44.0
SB-B23-046	01/25/01	<0.70	7.0		0.62	<0.028	21.7		18.7		8.1		7		19.2	<0.24	<0.085	<0.42		40.0
SB-B23-061	01/25/01	<0.73	11.7		0.79	<0.029	77.1		26.0		7.4		9		38.2	<0.25	<0.089	<0.44		46.8
SB-B23-071	01/25/01	<0.79	9.3		0.70	<0.031	83.6		19.1		5.4		9		25.0	<0.27	<0.095	<0.47		37.0
SB-B23-086	01/25/01	<0.85	10.1		1.1	<0.033	242		27.1		5.7		4		43.0	<0.29	<0.10	<0.51		57.2
SB-B23-096	01/25/01	<0.77	15.1		1.1	<0.030	44.0		23.9		12.5		9		36.2	<0.26	<0.093	<0.46		43.6
SB-B23-106	01/25/01	<0.77	10.3		0.57	<0.030	88.3		13.8		4.5		9		20.8	<0.26	<0.093	<0.46		31.8
SB-B23-116	01/25/01	<0.79	17.1		1.1	<0.031	56.8		30.7		8.0		0		45.2	<0.27	<0.096	<0.47		51.8
SB-B23-128	01/25/01	<0.70	15.8		0.76	<0.028	45.4		21.2		6.3		8		34.8	<0.24	<0.086	<0.42		36.4
SB-B23-128D	01/25/01	<0.68	14.0		0.73	<0.027	42.3		18.8		7.9		8		35.6	<0.23	<0.082	0.76		37.7
WCP-31-001	09/21/99	<0.34	7.8	77.3	<0.37	<0.05	18.5	9.0	20.1	17300	5.5	413	<0.02	<0.20	25.5	<0.31	<0.13	<0.47	33.8	38.2
WCP-31-006	09/21/99	<0.35	7.3	127	0.82	<0.05	29.8	10.9	28.8	21300	10.6	567	<0.02	0.30	32.5	<0.33	<0.13	<0.49	37.9	52.9
WCP-31-011	09/21/99	0.28	11.4	155	<0.44	<0.04	21.1	8.0	21.9	16000	6.2	321	<0.02	<0.15	23.5	<0.24	<0.1	<0.36	41.2	38.3
WCP-31-031	09/21/99	<0.31	15.6	153	0.98	<0.05	33.4	13.0	33.5	25300	9.4	512	<0.02	<0.19	39.6	<0.29	<0.12	<0.44	53.4	66.7
WCP-31-051	09/21/99	<0.31	6.0	28.6	<0.35	<0.05	10.9	5.5	19.2	11800	4.0	192	<0.02	<0.18	14.0	<0.29	<0.11	<0.43	24.3	25.5
WCP-31-071	09/21/99	<1.5	8.5	57.5	0.68	<0.24	28.8	7.1	15.3	13700	6.5	266	<0.02	<0.89	22.5	<1.4	<0.56	<2.1	27.6	6.0
WCP-31-081	09/21/99	<1.8	9.8	82.2	0.65	<0.28	59.1	7.6	21.7	17200	6.2	306	<0.02	<1.0	32.1	<1.7	<0.66	<2.5	31.1	7.8
WCP-31-096	09/21/99	<0.35	11.1	161	0.72	<0.05	59.7	6.3	21.9	21200	5.3	174	<0.02	<0.21	32.3	<0.33	<0.13	<0.49	57.0	46.6
WCP-31-106	09/22/99	<0.33	11.3	198	0.69	<0.05	44.4	9.5	18.8	19400	8.1	324	<0.02	<0.20	25.2	<0.31	<0.13	<0.47	54.0	40.6
WCP-31-111*	09/22/99	<0.24	10.9	133	0.70	<0.04	56.6	8.6	24.1	19600	5.4	308	<0.02	<0.14	27.6	<0.23	<0.09	<0.34	51.7	44.4
WCP-31-111D*	09/22/99	0.42	11.7	77.4	<0.49	<0.05	96.1	6.6	17.6	18300	5.4	183	<0.02	<0.20	21.3	<0.32	<0.13	<0.48	51.3	33.0
Residential SRL	µg/kg	31	10	5,300	1.4	38	2,100	4,600	2,800	NE	400	3,200	6.7	380	1,500	380	380	NE	540	23,000
Non-residential SRL		680	10	110,000	11	850	4,500	97,000	63,000	NE	2,000	43,000	180	8,500	34,000	8,500	8,500	NE	12,000	510,000
GPL	mg/kg	35	290	12,000	23	29	590	NE	NE	NE	290	NE	12	NE	590	290	NE	12	NE	NE

Table 29 - Soil Sample Analytical Data-Metals
Pyramid Industries Facilty
WCP North Plume Site
Phoenix, Arizona

SAMPLE ID	SAMPLE DATE	Antimony, Total	Arsenic, Total	Barium, Total	Beryllium, Total	Cadmium, Total	Chromium, Total	Cobalt, Total	Copper, Total	Iron, Total	Lead, Total	Manganese, Total	Mercury, Total	Molybdenum, Total	Nickel, Total	Selenium, Total	Silver, Total	Thallium, Total	Vanadium, Total	Zinc, Total
WCP-32-006	09/13/99	<0.22	**9.0**	**144**	**0.86**	**0.40**	**38.1**	**13.6**	**36.0**	**24500**	**9.3**	**624**	<0.02	<0.13	**41.6**	<0.21	<0.08	<0.75	**43.3**	**56.8**
WCP-32-011	09/13/99	**0.41**	**10.4**	**134**	<0.47	<0.22	**23.6**	**9.1**	**24.4**	**18200**	**7.1**	**366**	<0.02	<0.20	**27.2**	<0.32	<0.13	<0.48	**43.6**	**39.3**
WCP-32-016	09/13/99	<0.30	**5.5**	**43.6**	<0.29	<0.08	**11.0**	**5.6**	**17.1**	**11000**	**3.3**	**252**	<0.02	<0.18	**15.5**	**0.38**	<0.11	<0.42	**20.3**	**26.4**
WCP-32-041	09/13/99	<0.33	**8.4**	**99.3**	**0.71**	<0.30	**38.2**	**10.1**	**31.7**	**21500**	**8.7**	**431**	<0.02	**1.0**	**31.3**	<0.31	<0.12	<0.47	**38.8**	**54.3**
WCP-32-051	09/13/99	<0.35	**10.9**	**99.2**	**0.72**	**0.44**	**35.6**	**10.8**	**27.2**	**22100**	**9.4**	**431**	<0.02	**0.38**	**32.0**	<0.33	<0.13	<0.50	**53.6**	**51.0**
WCP-32-071	09/13/99	<0.32	**8.8**	**105**	<0.44	<0.07	**26.9**	**8.6**	**24.4**	**15200**	**5.2**	**285**	<0.02	**0.59**	**29.5**	<0.30	<0.12	<0.45	**31.3**	**31.8**
WCP-32-076	09/13/99	<0.35	**12.3**	**171**	<0.50	**0.44**	**74.9**	**6.7**	**22.5**	**18900**	**5.5**	**252**	<0.02	<0.21	**27.0**	<0.33	<0.13	<0.58	**48.5**	**41.3**
WCP-32-091	09/14/99	<0.24	**15.7**	**311**	**0.98**	**0.38**	**56.6**	**21.4**	**36.1**	**25900**	**11.8**	**920**	<0.02	<0.15	**50.1**	<0.23	<0.09	<0.34	**73.8**	**57.7**
MW-WCP-32-106	09/14/99	**0.48**	**14.8**	**87.5**	**0.69**	**0.26**	**126**	**8.2**	**17.3**	**21700**	**5.2**	**188**	<0.02	<0.24	**31.8**	**0.49**	<0.15	**0.86**	**50.8**	**39.2**
MW-WCP-32-111	09/14/99	**0.57**	**12.7**	**157**	<0.55	**0.28**	**58.0**	**14.7**	**19.6**	**19100**	**11.3**	**904**	<0.02	<0.22	**30.0**	<0.34	<0.14	**0.86**	**47.2**	**36.7**
MW-33S-001	08/23/99	<0.31	**11.1**	**146**	**0.76**	**0.52**	**33.7**	**13.1**	**33.4**	**24900**	**10.7**	**602**	0.02	<0.18	**39.7**	<0.60	<0.12	**3.2**	**46.1**	**56.8**
MW-33S-012	08/23/99	<0.30	**7.9**	**211**	**0.44**	**0.47**	**22.0**	**9.2**	**24.5**	**16600**	**8.0**	**417**	<0.02	**0.20**	**27.4**	<0.44	<0.11	**1.9**	**34.7**	**41.8**
MW-33S-022	08/23/99	<0.31	**8.2**	**109**	**0.46**	**0.23**	**25.2**	**10.0**	**24.5**	**18400**	**6.5**	**434**	<0.02	<0.18	**33.8**	<0.11	<0.12	**2.2**	**34.1**	**40.7**
MW-33S-032	08/23/99	<0.30	**15.4**	**117**	**0.84**	**0.50**	**35.1**	**12.9**	**29.0**	**23800**	**9.7**	**491**	<0.02	**0.20**	**36.7**	<0.15	<0.11	**2.8**	**51.9**	**55.9**
MW-33S-042	08/23/99	**0.72**	**7.8**	**48.1**	**0.45**	**0.20**	**27.0**	**8.6**	**18.8**	**16300**	**5.4**	**300**	<0.02	<0.17	**26.3**	<0.12	<0.11	**1.9**	**35.0**	**34.7**
MW-33S-067	08/24/99	<0.31	**11.6**	**65.6**	**0.66**	**0.23**	**30.0**	**7.4**	**20.9**	**18300**	**6.8**	**194**	<0.02	**0.35**	**24.5**	**0.41**	<0.12	<0.49	**44.9**	**34.5**
MW-33S-082	08/24/99	**0.35**	**5.8**	**104**	**0.68**	**0.51**	**218**	**6.8**	**19.7**	**21400**	**5.0**	**193**	<0.02	<0.20	**36.1**	<0.32	<0.13	<0.58	**58.3**	**41.8**
MW-33S-092	08/24/99	<0.31	**7.6**	**119**	**0.63**	**0.90**	**41.6**	**8.2**	**20.1**	**14500**	**5.5**	**271**	<0.02	<0.19	**26.1**	<0.29	<0.12	<0.51	**29.2**	**35.9**
MW-33S-102	08/24/99	<0.33	**10.8**	**201**	**0.78**	**0.29**	**42.8**	**13.5**	**21.0**	**19900**	**10.4**	**533**	<0.02	<0.19	**28.2**	**0.39**	<0.12	<0.54	**54.1**	**40.9**
MW-33S-102B	08/24/99	<0.31	**11.1**	**252**	**0.76**	**0.34**	**46.2**	**14.5**	**23.9**	**21900**	**8.6**	**577**	<0.02	<0.19	**31.9**	<0.29	<0.12	<0.52	**55.0**	**44.1**
MW-33S-107	08/30/99	<0.23	**8.2**	**75.2**	**0.52**	**0.12**	**62.5**	**5.8**	**13.9**	**14600**	**4.8**	**161**	<0.02	<0.14	**20.7**	<0.22	<0.09	<0.33	**43.1**	**27.7**
WCP-MW-091-011	01/22/01	<0.68	**14.6**		**0.54**	**0.20**	**23.3**		**24.8**		**6.9**		6		**27.8**	<0.23	<0.083	**0.52**		**41.6**
WCP-MW-091-026	01/22/01	<0.64	**9.5**		**0.40**	**0.12**	**17.4**		**17.1**		**4.4**		5		**21.7**	**0.40**	<0.077	<0.38		**32.4**
WCP-MW-091-036	01/22/01	<0.67	**9.8**		**0.84**	**0.061**	**31.5**		**26.6**		**7.9**		7		**30.5**	<0.23	<0.082	**0.87**		**48.6**
WCP-MW-091-051	01/22/01	<0.69	**10.2**		**0.59**	**0.22**	**26.5**		**20.6**		**5.7**		7		**24.6**	<0.24	<0.084	**0.60**		**34.9**
WCP-MW-091-071	01/22/01	<0.70	**6.4**		**0.59**	**0.15**	**164**		**17.3**		**4.1**		9		**22.4**	<0.24	<0.085	**0.42**		**33.0**
WCP-MW-091-081	01/22/01	<0.79	**7.4**		**0.68**	**0.11**	**294**		**21.5**		**3.9**		0		**34.0**	<0.27	<0.096	<0.47		**42.0**
WCP-MW-091-091	01/22/01	<0.79	**15.8**		**0.86**	**0.066**	**56.0**		**24.9**		**4.4**		0		**37.5**	<0.27	<0.096	<0.47		**47.1**
WCP-MW-091-101	01/22/01	<0.72	**13.8**		**0.93**	**0.067**	**30.3**		**24.1**		**10.3**		0		**27.6**	<0.25	<0.087	<0.43		**46.0**
WCP-MW-091-116	01/22/01	<0.75	**16.7**		**0.90**	**0.052**	**85.0**		**23.6**		**5.1**		9		**36.8**	**0.28**	<0.091	<0.45		**42.1**
WCP-MW-091-116D	01/22/01	<0.74	**17.5**		**0.89**	<0.029	**54.8**		**25.7**		**7.6**		9		**38.6**	<0.25	<0.090	<0.44		**43.0**
WCP-MW-091-128*	01/23/01	<0.66	**13.9**		**0.66**	<0.026	**39.5**		**15.1**		**4.3**		8		**25.4**	<0.23	<0.080	<0.39		**27.8**
Residential SRL	mg/kg	31	10	5,300	1.4	38	2,100	4,600	2,800	NE	400	3,200	6.7	380	1,500	380	380	NE	540	23,000
Non-residential SRL	mg/kg	680	10	110,000	11	850	4,500	97,000	63,000	NE	2,000	43,000	180	8,500	34,000	8,500	8,500	NE	12,000	510,000
GPL	mg/kg	35	290	12,000	23	29	590	NE	NE	NE	290	NE	12	NE	590	290	NE	12	NE	NE

Notes: * Indicates saturated soil sample. These results should not be compared to SRLs or GPLs.
Residential SRL = Residential Soil Remediation Level
Non-residential SRL = Non-residential Soil Remediation Level
GPL = Groundwater Protection Level
mg/kg = milligrams per kilogram
R = Rejected data
D = Duplicate
NE = Not Established
Bold numbers indicate a result above laboratory detection limits
Highlighted numbers indicate a result above SRLs or GPLs

Table 30 - Hydropunch Groundwater Sample Analytical Results
Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona

SAMPLE ID	SAMPLE DATE	1,1,1-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Acetone	Benzene	Bromodichloromethane	Chlorobenzene	Chloroform	cis-1,2-Dichloroethene	Ethylbenzene	Methylene Chloride	Tetrachloroethene	Toluene	Trichloroethene	Vinyl chloride	Xylene (total)
HP-33S-120	08/31/99	<0.5	<0.5	<0.5	<0.5	R	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2**	<0.5	<0.5	<0.5	<0.5
HP-B16-116'	09/16/99	<250	<250	<250	<250	R	<250	<250	<250	<250	<250	<250	<250	**28000**	<250	<250	<250	<250
HP-B17-110	09/13/99	<0.5	**4**	<0.5	<0.5	<2	<0.5	**0.7**	**3**	**4**	**7**	<0.5	**2**	**8600**	<0.5	**9**	<0.5	<0.5
HP-B18-115	09/16/99	<5	<5	**8**	<5	R	<5	<5	<5	<5	**6**	<5	<5	**2800**	<5	**4**	<5	<5
HP-B19-115	08/19/99	<0.5	<0.5	**1**	<0.5		<0.5	<0.5	<0.5	**0.6**	**6**		<2	**550**		**8**	<0.5	
HP-B20-110	08/26/99	<0.5	**3**	**41**	<0.5		<0.5	<0.5	**2**	**2**	**4**		**0.8**	**6000**		**4**	<0.5	
HP-B21-115	08/20/99	<2	<2	**49**	<2		<2	<2	<2	<2	**4**		<2	**3100**		**4**	<2	
HP-B21-115A	08/23/99	<12	<12	**88**	<12		<12	<12	<12	<12	<12		<12	**7600**		<12	<12	
HP-B22-128	01/24/01	<0.3	<0.3	**3**	**0.8**	**4**	<0.2	<0.2	<0.2	**0.8**	**0.5**	<0.2	**0.6**	**840**	<0.2	**1**	<0.3	<0.5
HP-WCP-31-111	09/22/99	<0.5	**6**	**48**	<0.5	R	<0.5	**0.8**	**2**	**4**	**13**	<0.5	**1**	**13000**	**2**	**8**	<0.5	<0.5
AWQS	µg/L	5	NE	7	5	NE	5	NE	NE	NE	70	700	NE	5	1,000	5	2	10,000

Notes: AWQS= Arizona Water Quality Standards
NE= AWQS not established
Bold numbers indicates results above laboratory method detection limits
Highlighted numbers indicates results above AWQS
µg/L = micrograms per liter
R = Rejected data

Table 31 – August 9-10, 1999 Soil-Gas Sample Results
Pyramid Industries
WCP North Plume Site
Phoenix, Arizona

Sample I.D.	Tetrachloroethene (µg/L)	1,1-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Other Analytes Detected
SG-A01-10’	**190**	**36**	**3**	TVHC – 130
SG-A02-10’	**28**	**18**	**1**	TVHC – 32
SG-B01-10’	**84**	**37**	**3**	TVHC – 74
SG-B02-10’	**46**	**57**	**6**	TVHC – 720, ethylbenzene – 88, xylenes – 28, TCA – 0.08
SG-B03-10’	**12**	**32**	**3**	TVHC – 280, ethylbenzene – 34, xylenes – 28, methylene chloride – 11, carbon tetrachloride - 0.08
SG-B04-10’	**14**	**88**	**8**	TVHC – 77
SG-A03-10’	**6**	**7**	**0.3**	TVHC – 4
SG-A04-10’	**17**	**62**	**5**	TVHC – 50
SG-B06-10’	**2**	**25**	**3**	TVHC – 31, TCA – 0.008, carbon tetrachloride – 0.0008
SG-B06-10’	**2**	**16**	**2**	TVHC – 15
SG-B.5-5-10’	**2**	**25**	**1**	TVHC – 21
SG-B.5-4-10’	**14**	**69**	**5**	TVHC – 120
SG-B-3.5-10’	**7**	**40**	**3**	TVHC – 40
SG-B-2.5-10’	**9**	**11**	**2**	TVHC – 15, TCA – 0.05
SG-B-4.5-10’	**5**	**51**	**4**	TVHC – 46, TCA – 1
SG-B.5-2-10’	**15**	**13**	**0.9**	TVHC – 9
SG-B-1.5-10’	**53**	**30**	**3**	TVHC – 58
SG-B-5-10’	**2**	**24**	**2**	TVHC – 24
SG-B-4-5’	**0.01**	**0.04**	**0.004**	TVHC – 2

Table 31 – January 22-23, 2001 Soil-Gas Sample Results
Pyramid Industries
WCP North Plume Site
Phoenix, Arizona

Sample I.D.	Tetrachloroethene (µg/L)	1,1-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Other Analytes Detected
SG-C01-10’	**130**	**26**	**0.6**	None
SG-D01-10’	**660**	**250**	**4**	TCA – 0.004
SG-C02-10’	**76**	<400	<50	None
SG-D02-10’	**580**	<400	<50	None
SG-C03-10’	**18**	**37**	**1**	None
SG-D03-10’	**130**	**420**	**4**	None
SG-C04-10’	**61**	**220**	**4**	None
SG-D04-10’	**140**	**830**	**12**	TCA – 0.3
SG-C05-10’	**6**	**85**	**1**	None
SG-D05-10’	**1**	**31**	<0.3	None
SG-C06-10’	**6**	**230**	**3**	None
SG-D06-10’	**4**	**150**	**3**	TCA – 0.07
SG-C07-10’	**1**	**82**	**1**	None
SG-D07-10’	**5**	**310**	**5**	TCA – 0.1
SG-C08-10’	**0.8**	**100**	**1**	None
SG-D08-10’	**1**	**220**	**3**	None
SG-C09-10’	**0.2**	**40**	**0.4**	None
SG-D09-10’	**0.2**	**38**	**0.4**	None
SG-D10-10’	**0.4**	**150**	**1**	TCA – 0.09
SG-E03-10’	<0.02	<0.4	<0.05	None
SG-E03A-10’[(1)]	**190**	**740**	**11**	TCA – 0.6
SG-E03A-10’[(1)]	**200**	**820**	**13**	TCA – 0.7
SG-E04-10’	**28**	**320**	**5**	TCA – 0.6

Table 31 – January 22-23, 2001 Soil-Gas Sample Results
Pyramid Industries
WCP North Plume Site
Phoenix, Arizona

Sample I.D.	Tetrachloroethene (µg/L)	1,1-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Other Analytes Detected
SG-E05-10'	**22**	**460**	**8**	TCA – 1
SG-E06-10'	**12**	**390**	**10**	TCA – 2
SG-E07-10'	**9**	**710**	**12**	TCA – 1
SG-E08-10'	**1**	**160**	**2**	TCA – 0.08
SG-E09-10'(2)	**2**	**440**	**4**	None
SG-F07-10'	**9**	**620**	**14**	TCA – 3
SG-F08-10'	**0.7**	**110**	**2**	None
SG-F05-10'	**11**	**290**	**7**	TCA – 3
SG-D/E-3.5'	**21**	**140**	**2**	TCA – 0.10

Notes:
(1) Re-analyses of sample SG-E03-10'.
(2) Two samples were identified as SG-E08-10' in Tracer report; WESTON's field notes confirm that the second sample collected was actually SG-E09-10'.
(3) Bold numbers indicate results above laboratory detection limits.
(4) TCA = Tetrachloroethane
(5) TVHC = Total volatile hydrocarbons

Table 32 - Natural Attenuation Parameter Analytical Results from Weston's 1998 Investigation
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Constituent	Reporting Units	WCP-18 6/29/98	WCP-19 6/30/98	WCP-20 7/2/98	WCP-20D 7/2/98	WCP-21 7/2/98	WCP-22 7/2/98	WCP-23 6/30/98	WCP-24 6/30/98	GSC-17 6/30/98	GSC-23 6/30/98	GSC-24 6/30/98
Methane	µg/L	0.66	1.5	10	14	280	43	0.65	0.56	0.65	<0.50	<0.50
Ethene	µg/L	<0.50	<0.50	<0.50	<0.50	0.51	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Ethane	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Propane	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.89	<0.50	<0.50
Chloride	mg/L	410	470	330	NA	49	240	420	170	330	390	260
Nitrate-Nitrite (as N)	mg/L	25	24	21	NA	6.6	13	25	9.3	18	25	19
Sulfate	mg/L	240	200	230	NA	77	190	170	200	170	130	170
Total Alkalinity	mg/L	180	210	200	NA	520	300	130	250	190	130	230
Total Sulfide	mg/L	1.2	1.4	0.6	NA	1.6	1.4	0.6	1.4	1.2	0.8	1.2
Iron	mg/L	12	26	12	NA	18	23	7.3	10	0.18	0.16	0.75
Manganese	mg/L	0.3	0.58	0.29	NA	0.58	0.57	0.21	0.25	2.4	<0.05	2.5
Temperature	Degrees Fahrenheit	81.8	82	78.5	78.5	82.6	81.1	81.5	78.9	79.7	81.6	78.6
Specific Conductance	µmhos	1165	1007	965	965	826	1011	955	684	968	976	917
pH		7.58	7.52	7.69	7.69	7.26	7.66	7.62	7.66	7.32	7.71	7.37
Dissolved Oxygen	mg/L	87.2	79.6	79.3	79.3	9.5	23.1	89.1	65.8	39.1	39.9	36.3
Oxidation-Reduction Potential	mV	57.3	196.5	261	261	178.7	214	173.5	132.5	154.5	158.7	220

Notes: NA = Not Analyzed
µg/L = micrograms per liter
mg/L = milligrams per liter
µmhos = micromhos
mV = millivolts
D = Duplicate sample

Table 33 - Soil Sample Results from Boring WCP-20
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Analyte	Units	Sample Depth (ft bgs)							Residential SRL	Non-residential SRL	GPL
		50	60	80	90	100	110	120			
Benzene	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	0.62	1.4	0.71
Dichlorodifluoromethane	mg/kg	<0.11	<0.11	**0.34**	<0.097	<0.10	<0.10	<0.10	94	310	NE
1,1-Dichloroethane	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	500	1,700	NE
1,1-Dichloroethene	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	0.36	0.8	0.81
cis- 1,2-Dichloroethene	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	31	100	4.9
trans- 1,2-Dichloroethene	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	78	270	8.4
Ethylbenzene	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	1,500	2,700	120
Methylene chloride	mg/kg	<0.23	<0.21	**0.8**	**0.34**	0.021	<0.20	<0.19	77	180	NE
Tetrachloroethene	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	53	170	1.3
Toluene	mg/kg	**0.064**	**0.072**	**0.074**	**0.082**	**0.084**	**0.086**	**0.077**	790	2,700	400
1,1,1- Trichloroethane	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	1,200	4,800	1
Trichloroethene	mg/kg	<0.057	<0.054	**0.062**	<0.049	<0.050	<0.050	<0.050	27	70	0.61
Vinyl chloride	mg/kg	<16	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	0.016	0.035	NE
m&p-Xylenes	mg/kg	<0.11	<0.11	<0.10	<0.097	<0.10	<0.10	<0.10	2,800	2,800	2,200
o-Xylenes	mg/kg	<0.057	<0.054	<0.051	<0.049	<0.050	<0.050	<0.050	2,800	2,800	2,200

Notes: All results in milligrams per kilogram (mg/kg)
NE = Not Established
Bold numbers indcate results above laboratory detection limits.
Residential SRL = Arizona Residential Soil Remediation Level
Non-residential SRL = Arizona Non-residential Soil Remediation Level
GPL = Groundwater Protection Level
Samples collected on 6/13/98

Table 34 - Soil Sample Results from Boring WCP-74
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Analyte	Units	Sample Depth (ft bgs)					Residential SRL	Non-residential SRL	GPL
		135	165	195	231	270			
Benzene	mg/kg	<0.017	<0.017	<0.018	<0.015	<0.013	0.62	1.4	0.71
Acetone	mg/kg	<0.035	<0.036	**0.073**	<0.030	<0.026	2,100	8,800	NE
1,1-Dichloroethane	mg/kg	<0.016	<0.017	<0.017	<0.014	<0.012	500	1,700	NE
1,1-Dichloroethene	mg/kg	<0.017	<0.017	<0.018	<0.015	<0.013	0.36	0.8	0.81
cis- 1,2-Dichloroethene	mg/kg	<0.020	<0.021	<0.021	<0.018	<0.016	31	100	4.9
Ethylbenzene	mg/kg	<0.027	<0.028	<0.028	<0.023	<0.021	1,500	2,700	120
Methylene chloride	mg/kg	**0.16**	**0.15**	<0.025	<0.021	<0.018	77	180	NE
Tetrachloroethene	mg/kg	<0.028	<0.029	<0.029	<0.024	<0.021	53	170	1.3
Toluene	mg/kg	<0.022	<0.022	<0.023	<0.019	<0.016	790	2,700	400
1,1,1- Trichloroethane	mg/kg	<0.020	<0.021	<0.021	<0.017	<0.015	1,200	4,800	1
Trichloroethene	mg/kg	<0.026	<0.027	<0.027	<0.022	<0.020	27	70	0.61
Vinyl chloride	mg/kg	<0.022	<0.022	<0.023	<0.019	<0.016	0.016	0.035	NE
Xylenes (total)	mg/kg	<0.06	<0.062	<0.063	<0.052	<0.046	2,800	2,800	2,200

Notes: All results in milligrams per kilogram (mg/kg)
NE = Not Established
Bold numbers indicate results above laboratory detection limits.
Residential SRL = Arizona Residential Soil Remediation Level
Non-residential SRL = Arizona Non-residential Soil Remediation Level
GPL = Groundwater Protection Level
Samples collected between May 7-10, 2002

Table 35 - May 2002 Soil Gas Results
Rinchem Facility
WCP North Plume
Phoenix, Arizona

Soil Gas Results from SB-1

		Sample Depth (ft bgs)										
Analyte	**Units**	**11**	**26**	**36**	**51**	**61**	**76**	**86**	**96**	**106**	**116**	**126**
Tetrachloroethene	µg/L	**50**	**11**	**27**	**7.6**	**72**	**91**	**37**	**18**	**11**	**28**	**53**
Trichloroethene	µg/L	**8.2**	**1.8**	**7.2**	**3.2**	**38**	**45**	**23**	**7.6**	**4.9**	**21**	**36**
1,1-Dichloroethene	µg/L	**10**	**2.2**	**17**	**5.2**	**130**	**130**	**34**	**8.0**	**3.1**	**33**	**200**
cis-1,2-Dichloroethene	µg/L	**2.3**	<0.50	**1.2**	<0.50	**3.3**	**5.0**	**2.1**	**1.1**	**1.2**	**2.1**	**1.5**
Vinyl chloride	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Soil Gas Results from SB-2

		Sample Depth (ft bgs)										
Analyte	**Units**	**11**	**26**	**36**	**51**	**61**	**76**	**86**	**96**	**106**	**116**	**126**
Tetrachloroethene	µg/L	**5.1**	**2.2**	**5.4**	**3.0**	<0.50	**8.8**	**22**	**2.6**	**42**	**8.0**	**2.8**
Trichloroethene	µg/L	**1.6**	**0.74**	**1.8**	**1.6**	<0.50	**3.9**	**10**	**1.0**	**37**	**2.1**	**1.2**
1,1-Dichloroethene	µg/L	**5.5**	**2.3**	**4.5**	**3.1**	<1.0	**12**	**25**	**1.6**	**48**	**1.1**	<1.0
cis-1,2-Dichloroethene	µg/L	<0.50	<0.50	**0.65**	**1.1**	<0.50	**1.9**	**4.3**	<0.50	**20**	<0.50	<0.50
Vinyl chloride	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Soil Gas Results from SB-3

		Sample Depth (ft bgs)										
Analyte	**Units**	**11**	**26**	**36**	**51**	**61**	**76**	**86**	**96**	**106**	**116**	**126**
Tetrachloroethene	µg/L	**4.5**	**2.8**	**1.0**	**8.7**	**26**	**23**	**48**	**34**	**130**	**9.5**	**41**
Trichloroethene	µg/L	**280**	**53**	**1.2**	**8.2**	**30**	**15**	**39**	**31**	**86**	**7.9**	**38**
1,1-Dichloroethene	µg/L	**2.4**	**1.8**	**1.5**	**15**	**83**	**37**	**100**	**60**	**190**	**22**	**71**
cis-1,2-Dichloroethene	µg/L	<0.50	<0.50	<0.50	**2.4**	**4.4**	**2.3**	**7.7**	**6.2**	**23**	**2.6**	**2.7**
Vinyl chloride	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Soil Gas Results from SB-4 (WCP-49)

		Sample Depth (ft bgs)												
Analyte	**Units**	**6**	**11**	**16**	**21**	**26**	**31**	**36**	**41**	**46**	**51**	**56**	**61**	**66**
Tetrachloroethene	µg/L	**2.1**	**39**	**59**	**170**	**190**	**320**	**28**	**30**	**77**	**45**	**11**	**33**	**84**
Trichloroethene	µg/L	<0.50	**0.78**	**5.2**	**23**	**54**	**38**	**5.1**	**8.6**	**15**	**21**	**2.3**	**6.3**	**12**
1,1-Dichloroethene	µg/L	<1.0	<1.0	<1.0	**7.0**	**34**	**4.7**	<1.0	**3.7**	**3.1**	**6.9**	<1.0	**2.6**	**5.5**
cis-1,2-Dichloroethene	µg/L	<0.50	**2.2**	**82**	**80**	**76**	**32**	**9.2**	**17**	**19**	**59**	**6.6**	**11**	**21**
Vinyl chloride	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table 35 - May 2002 Soil Gas Results
Rinchem Facility
WCP North Plume
Phoenix, Arizona

Soil Gas Results from SB-4 continued

		Sample Depth (ft bgs)											
Analyte	**Units**	**71**	**76**	**81**	**86**	**91**	**96**	**101**	**106**	**111**	**116**	**121**	**126**
Tetrachloroethene	µg/L	**9.5**	**2.3**	**8.2**	**20**	**11**	<2.5	**8.4**	1.4	<0.50	**1.3**	<0.50	**2.7**
Trichloroethene	µg/L	<2.5	<0.50	<0.50	**0.99**	<5.0	<2.5	**3.1**	**0.51**	<0.50	**0.64**	<0.50	**0.89**
1,1-Dichloroethene	µg/L	<5.0	<1.0	<1.0	**1.2**	**95**	<5.0	<5.0	<1.0	<1.0	**1.8**	<1.0	<1.0
cis-1,2-Dichloroethene	µg/L	**12**	<0.50	**6.2**	**13**	**280**	<2.5	<2.5	**4.8**	<0.50	**23**	**3.5**	**6.4**
Vinyl chloride	µg/L	<25	<5.0	<5.0	<5.0	<50	<25	<25	<5.0	<5.0	<5.0	<5.0	<5.0

Soil Gas Results from SB-5

		Sample Depth (ft bgs)											
Analyte	**Units**	**16**	**26**	**41**	**46**	**56**	**66**	**81**	**86A**	**86B**	**101**	**116**	**126**
Tetrachloroethene	µg/L	<0.50	**4.3**	**1.7**	**5.1**	**12**	**22**	**11**	**13**	**5.0**	**6.7**	**38**	**50**
Trichloroethene	µg/L	<0.50	<0.50	**0.57**	**2.7**	**7.1**	**11**	**8.4**	**11**	**4.7**	**6.6**	**110**	**140**
1,1-Dichloroethene	µg/L	<1.0	<1.0	<1.0	**2.7**	**10**	**33**	**10**	**18**	**6.6**	**7.7**	**110**	**40**
cis-1,2-Dichloroethene	µg/L	<0.50	**0.60**	**6.6**	**22**	**53**	**96**	**30**	**35**	**10**	**15**	**68**	**17**
Vinyl chloride	µg/L	<5.0	**5.4**	**13**	**25**	**36**	**110**	**14**	**22**	**8.0**	**9.1**	**80**	**75**

Soil Gas Results from SB-6

		Sample Depth (ft bgs)										
Analyte	**Units**	**11**	**26**	**36**	**51**	**61**	**76**	**86**	**96**	**106**	**116**	**126**
Tetrachloroethene	µg/L	**11**	**3.5**	<0.50	<0.50	<0.50	<0.50	**3.1**	<0.50	<0.50	<0.50	<0.50
Trichloroethene	µg/L	<0.50	<0.50	<0.50	<0.50	**1.4**	<0.50	**2.7**	<0.50	<0.50	<0.50	**0.54**
1,1-Dichloroethene	µg/L	<1.0	<1.0	<1.0	<1.0	**17**	<1.0	**7.2**	<1.0	<1.0	<1.0	<1.0
cis-1,2-Dichloroethene	µg/L	<0.50	<0.50	<0.50	**6.3**	**30**	**4.6**	**11**	**1.6**	<0.50	<0.50	<0.50
Vinyl chloride	µg/L	<5.0	<5.0	**5.9**	**16**	**48**	**7.9**	**53**	<5.0	<5.0	<5.0	<5.0

Soil Gas Results from SB-7

		Sample Depth (ft bgs)										
Analyte	**Units**	**11**	**21**	**26**	**31**	**46**	**66**	**81**	**91**	**101**	**111**	**126**
Tetrachloroethene	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**4.0**	<1.0	<1.0
cis-1,2-Dichloroethene	µg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vinyl chloride	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**12**	<5.0	**78**	<5.0	**9.1**

Notes: All results are in micrograms per liter (µg/L).
ft bgs = feet below ground surface
Bold numbers indicate results above laboratory detection limits.

Table 36- May 2002 Soil Sample Analytical Results
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Soil Sample Results from Soil Boring SB-1													
		Sample Depth (ft bgs)											
Analyte	**Units**	**14**	**21**	**38**	**55**	**68**	**74**	**83**	**87**	**98**	**103**	**113**	**124**
Tetrachloroethene	ug/kg	<20	<25	<28	<24	<24	<30	<33	<29	<24	<21	<26	<23
Trichlorothene	ug/kg	<19	<23	<26	<22	<22	<28	<31	<27	<23	<20	<24	<22
1,1-Dichloroethene	ug/kg	<12	<15	<17	<15	<15	<18	<20	<18	<15	<13	<16	<14
cis- 1,2-Dichloroethene	ug/kg	<15	<18	<21	<18	<18	<22	<24	<22	<18	<16	<19	<17
Vinyl chloride	ug/kg	<16	<19	<22	<19	<19	<23	<26	<23	<19	<17	<20	<18
Acetone	ug/kg	<25	<31	<35	<30	<30	<38	<41	**200**	<31	<27	<33	<30
Methylene Chloride	ug/kg	<17	<21	<24	<21	<21	<26	<29	**140**	<21	<18	**160**	<20
1,1-Dichloroethane	ug/kg	<12	<14	<16	<14	<14	<17	<19	<17	<14	<12	<15	<14
1,1,1-Trichloroethane	ug/kg	<14	<18	<20	<17	<17	<21	<24	<21	<17	<15	<19	<17

Soil Sample Results from Soil Boring SB-2															
		Sample Depth (ft bgs)													
Analyte	**Units**	**13**	**25**	**34**	**40**	**48**	**64**	**73**	**85**	**88**	**93**	**106**	**113**	**117**	**129**
Tetrachloroethene	ug/kg	<22	<20	<25	<26	<28	<21	<25	<22	<26	<22	<25	<28	<22	<23
Trichlorothene	ug/kg	<20	<19	<24	<24	<26	<20	<24	<21	<25	<21	<24	<26	**46**	<22
1,1-Dichloroethene	ug/kg	<13	<12	<15	<16	<17	<13	<15	<14	<16	<13	<15	<17	<13	<14
cis- 1,2-Dichloroethene	ug/kg	<16	<15	<19	<19	<21	<16	<19	<17	<19	<16	<19	<21	<16	<17
Vinyl chloride	ug/kg	<17	<16	<20	<20	<22	<17	<20	<18	<21	<17	<20	<22	<17	<18
Acetone	ug/kg	<27	<25	<32	<33	<35	**130**	<32	<28	<33	<28	<32	<35	**310**	**290**
Methylene Chloride	ug/kg	**120**	<17	<22	<22	<24	<19	<22	<19	<23	**160**	<22	**250**	**360**	<20
1,1-Dichloroethane	ug/kg	<13	<12	<15	<15	<16	<13	<15	<13	**160**	<13	**220**	**150**	<13	<14
1,1,1-Trichloroethane	ug/kg	<16	<14	<18	<19	<20	<15	<18	<16	<19	<16	<18	<20	<16	<17

Soil Sample Results from Soil Boring SB-3													
		Sample Depth (ft bgs)											
Analyte	**Units**	**16**	**26**	**36**	**41**	**51**	**66**	**76**	**86**	**96**	**106**	**111**	**126**	**131**
Tetrachloroethene	ug/kg	<20	<22	<25	<24	<24	<21	<24	<26	<23	<21	<22	<25	<23
Trichlorothene	ug/kg	<19	<20	<23	<23	<23	<19	<23	<24	<21	<20	<21	**23**	<22
1,1-Dichloroethene	ug/kg	<12	<13	<15	<15	<15	<13	<15	<16	<14	<13	<14	<15	<14
cis- 1,2-Dichloroethene	ug/kg	<15	<16	<18	<18	<18	<15	<18	<19	<17	<16	<16	<18	<17
Vinyl chloride	ug/kg	<16	<17	<19	<19	<19	<16	<19	<20	<18	<17	<17	<19	<18
Acetone	ug/kg	<26	<27	<31	<31	<31	<26	<30	<32	<29	<27	<28	<31	<29
Methylene Chloride	ug/kg	<18	<19	<21	<21	**180**	<18	**140**	**120**	**110**	<18	<19	120	<20
1,1-Dichloroethane	ug/kg	<12	<13	<14	<14	<14	<12	<14	<15	<13	<12	<13	<15	<14
1,1,1-Trichloroethane	ug/kg	<15	<15	<18	<17	<17	<15	<17	<18	<16	<15	<16	<18	<17

Soil Sample Results from Soil Boring SB-4 (WCP-49)																				
		Sample Depth (ft bgs)																		
Analyte	**Units**	**8**	**18**	**20**	**25**	**40**	**46**	**50**	**55**	**69**	**74**	**85**	**100**	**105**	**115**	**130**	**135**	**165**	**195**	**231**	**270**
Tetrachloroethene	ug/kg	<23	**60,000**	**76,000**	**7,700**	**15,000**	<25	<27	<20	<22	<30	<15	<23	<22	<28	<22	<28	<29	<29	<24	<21
Trichlorothene	ug/kg	<21	<50	**3,900**	**750**	<47	<23	<25	<19	<21	<28	<14	<22	<20	<26	<20	<26	<27	<27	<22	<20
1,1-Dichloroethene	ug/kg	<14	<32	<25	<68	<310	<15	<16	<12	<13	<18	<89	<14	<13	<17	<13	<17	<17	<18	<15	<13
cis- 1,2-Dichloroethene	ug/kg	**72**	<39	<31	<82	**1,200**	**95**	**160**	**200**	<16	**390**	<110	**110**	<16	**340**	<16	<20	<21	<21	<18	<16
Vinyl chloride	ug/kg	<18	<42	<33	<87	<40	<19	<21	<16	<17	<23	<110	<18	<17	<22	<17	<22	<22	<23	<19	<16
Acetone	ug/kg	**3,900**	<670	**11,000**	**18,000**	**290,000**	**86,000**	**160,000**	**98,000**	**240,000**	**500,000**	**84,000**	**110,000**	**100,000**	**120,000**	<27	<35	<36	73	<30	<26
Methylene Chloride	ug/kg	<20	<460	<360	<97	<440	<22	<23	<18	<19	<26	<130	<20	<19	<24	<19	160	150	<25	<21	<18
1,1-Dichloroethane	ug/kg	<13	<310	<250	<65	<300	**51**	**93**	**140**	<13	**100**	<86	**130**	**100**	**410**	<13	<16	<17	<17	<14	<12
1,1,1-Trichloroethane	ug/kg	<16	<380	<300	<80	<360	<18	<19	<14	<16	<21	<100	<17	<15	<20	<15	<20	<21	<21	<17	<15

Table 36- May 2002 Soil Sample Analytical Results
Rinchem Facility
WCP North Plume Site
Phoenix, Arizona

Soil Sample Results from Soil Boring SB-5												
		Sample Depth (ft bgs)										
Analyte	**Units**	**21**	**36**	**51**	**61**	**71**	**76**	**86**	**106**	**116**	**126**	**131**
Tetrachloroethene	ug/kg	<26	<29	<24	<21	<23	<28	<28	<23	<26	<29	<25
Trichlorothene	ug/kg	<25	<27	<22	<19	<21	<26	<26	<17	<24	<27	<23
1,1-Dichloroethene	ug/kg	<16	<18	<15	<13	<14	<17	<17	<14	<16	<17	<15
cis- 1,2-Dichloroethene	ug/kg	<20	<22	<18	<15	<17	<20	**160**	<50	<19	<21	<18
Vinyl chloride	ug/kg	<21	<23	<19	<16	<18	<22	<22	<18	<20	<22	<19
Acetone	ug/kg	<33	<37	<30	<26	<29	<35	<35	<28	<32	<36	<31
Methylene Chloride	ug/kg	<23	<25	<21	<18	<20	<24	<24	<20	**330**	**170**	**140**
1,1-Dichloroethane	ug/kg	<16	<17	<14	<12	**110**	**220**	**360**	<17	<15	<17	<14
1,1,1-Trichloroethane	ug/kg	<19	<21	<17	<15	<16	<20	<20	<16	<18	<20	<18

Notes:

	Units	SRL	NSRL	GPL
Tetrachloroethene	ug/kg	53,000	170,000	1,300.0
Trichlorothene	ug/kg	27,000	70,000	610
1,1-Dichloroethene	ug/kg	360	800	810
cis- 1,2-Dichloroethene	ug/kg	31,000	100,000	4,900.0
Vinyl chloride	ug/kg	16	35	NE
Acetone	ug/kg	2,100,000	8,800,000	NE
Methylene Chloride	ug/kg	77,000	180,000	NE
1,1-Dichloroethane	ug/kg	500,000	1,700,000	NE
1,1,1-Trichloroethane	ug/kg	6,500	15,000	1,000

NE= No established standard
Highlighted numbers indicate results above established standards
Bold numbers indicate results above laboratory method detection limits
GPL= Groundwater Protection Levels
SRL= Residential Soil Remediation Levels
NSRL= Non-Residential Soil Remediation Levels

Table 37 - Summary of Soil Sample Analytical Results
Hill Brothers Facility
WCP North Plume Site
Phoenix, Arizona

Sample ID	Sample Depth (feet)	1,2,4-TMB (mg/kg)	Chloromethane (mg/kg)	Iodomethane (mg/kg)	MTBE (mg/kg	Toluene (mg/kg)	Freon (mg/kg)	Total Xylenes (mg/kg)
WCP-MW-078-041	41	**0.15**	ND	ND	ND	ND	ND	ND
WCP-MW-079-061	61	ND	ND	ND	ND	ND	ND	**0.13**
WCP-MW-079-136	136	ND	ND	**0.14**	**0.14**	ND	ND	ND
WCP-MW-079-136D	136 (dup)	ND	ND	**0.13**	**0.12**	ND	ND	ND
WCP-MW-081-121	121	ND	**3.3**	ND	ND	ND	ND	ND
WCP-MW-081-131	131	ND	ND	ND	ND	ND	**1.3**	ND
WCP-MW-081-131D	131 (dup)	ND	ND	ND	ND	ND	**0.71**	ND
WCP-MW-081-136	136	**0.19**	ND	ND	ND	**0.17**	**0.7**	**0.25**
Arizona Residential SRL		NE	12.0	NE	320	790	380	2,800
Arizona Non-residential SRL		NE	26.0	NE	3,300	2,700	1,300	2,800
GPL		NE	NE	NE	NE	400	NE	2,200

Notes: NE = No standard established
ND = Not detected above laboratory detection limits
mg/kg = milligrams per kilogram
dup = duplicate
1,2,4-TMB = 1,2,4-Trimethylbenzene
MTBE = Methyl tertbutyl ether
Freon = Trichlorofluoromethane
Residential SRL = Residential Soil Remediation Level
Non-residential SRL = Non-residential Soil Remediation Level
GPL = Groundwater Protection Level

Table 38 - Summary of Hydropunch® Groundwater Sample Analytical Results
Hill Brothers Facility
WCP North Plume Site
Phoenix, Arizona

Sample ID	Sample Depth (feet)	1,1-DCE (µg/l)	Acetone (µg/l)	Chloroform (µg/l)	PCE (µg/l)	TCE (µg/l)
HP-MW-075-138	138	ND	**75**	ND	ND	**15**
WCP-HP-076-138	138	ND	ND	ND	ND	ND
WCP-HP-077-136	136	ND	ND	**9.4**	**18**	ND
HP-078-142	142	**5.3**	ND	ND	ND	**12**
HP-079-142	142	ND	ND	**21**	**29**	ND
HP-080-146	146	ND	**5.5**	ND	ND	ND
WCP-HP-081-137	137	ND	ND	ND	ND	**5.2**
AWQS		7	NE	NE	5	5

Notes:

µg/l = micrograms per liter
ND = Not detected above laboratory detection limits
Bold numbers indicate results above laboratory detection limits
Highlighted numbers indicate results above AWQS
1,1-DCE = 1,1-Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
AWQS = Aquifer Water Quality Standard
NE = Not Established

Table 39 - Summary of 2001 SimulProbe™ Groundwater Sample Analytical Results
Hill Brothers Facility
WCP North Plume Site
Phoenix, Arizona

Sample ID	Sample Depth (feet)	TCE (µg/l)	PCE (µg/l)	1,1-DCE (µg/l)
WCP-SP-082-174	174	**8.4**	**4.0**	**2.1**
WCP-SP-082-204	204	ND	ND	ND
WCP-SP-082-233	233	ND	ND	ND
WCP-SP-082-260	260	ND	ND	ND
WCP-SP-082-293	293	ND	ND	ND
AWQS		5	5	7

Notes:

µg/l = micrograms per liter
ND = Not detected above laboratory detection limits
Bold numbers indicate results above laboratory detection limits
Highlighted numbers indicate results above AWQS
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1-DCE = 1,1-Dichloroethene
AWQS = Aquifer Water Quality Standard

Table - 40
Iron and Manganese Field Test Results
WCP North Plume
Phoenix, Arizona

AT&T

	05/22/2000	08/21/2000	11/14/2000	02/12/2001	05/15/2001	08/14/2001	11/12/2001	02/11/2002	
Fe^{2+}(mg/L)	-0.010	0.000	n/a	0.060	0.020	0.040	0.050	0.020	
Mn (mg/L)	0.019	0.026	n/a	0.092	0.980	0.092	0.112	0.115	
MnO_4- (mg/L)	0.041	0.057	n/a	0.199	0.213	0.200	0.243	0.248	
$KMnO_4$ (mg/L)	0.054	0.075	n/a	0.264	0.283	0.265	0.323	0.330	

GSC-MW10

	05/25/2000	08/29/2000	11/20/2000	02/19/2001	05/18/2001	08/17/2001	11/19/2001	02/15/2002	05/21/2002
Fe^{2+}(mg/L)	0.120	0.010	0.050	0.010	0.010	0.000	0.240	0.020	0.050
Mn (mg/L)	0.084	0.154	0.322	0.296	0.235	0.054	0.253	0.312	0.316
MnO_4- (mg/L)	0.182	0.334	0.698	0.640	0.508	0.118	0.549	0.676	n/a
$KMnO_4$ (mg/L)	0.241	0.443	0.927	0.850	0.675	0.156	0.729	0.898	n/a

GSC-MW21

	05/25/2000	08/29/2000	11/21/2000	02/20/2001	05/21/2001	08/17/2001	11/20/2001	02/20/2002	05/21/2002
Fe^{2+}(mg/L)	0.060	0.400	0.060	0.030	0.010	0.110	0.150	0.000	0.000
Mn (mg/L)	0.151	0.089	0.267	0.122	0.167	0.051	0.204	0.260	0.135
MnO_4- (mg/L)	0.327	0.192	0.577	0.264	0.362	0.110	0.452	0.563	n/a
$KMnO_4$ (mg/L)	0.434	0.255	0.767	0.351	0.481	0.146	0.601	0.748	n/a

GSC-MW22

	05/25/2000	08/25/2000	11/20/2000	02/19/2001	05/18/2001	08/20/2001	11/19/2001	02/15/2002	05/17/2002
Fe^{2+}(mg/L)	0.010	-0.010	0.020	0.020	0.010	0.050	0.080	-0.030	0.050
Mn (mg/L)	0.021	0.058	0.087	0.048	0.114	0.095	0.310	0.161	-0.007
MnO_4- (mg/L)	0.044	0.127	0.189	0.105	0.247	0.206	0.672	0.394	n/a
$KMnO_4$ (mg/L)	0.059	0.168	0.252	0.139	0.328	0.273	0.892	0.463	n/a

GSC-MW25

	05/25/2000	08/28/2000	11/20/2000	02/20/2001	05/21/2001	08/23/2001	11/20/2001	02/20/2002	05/21/2002
Fe^{2+}(mg/L)	0.010	-0.020	0.310	0.050	0.000	0.040	0.080	n/a	0.030
Mn (mg/L)	0.063	0.057	-0.320	0.117	0.115	0.134	0.218	n/a	-0.223
MnO_4- (mg/L)	0.136	0.122	-0.069	0.253	0.250	0.289	0.472	n/a	n/a
$KMnO_4$ (mg/L)	0.180	0.163	-0.091	0.337	0.331	0.384	0.627	n/a	n/a

GSC-MW27

	05/24/2000	08/25/2000	11/17/2000	02/16/2001	05/22/2001	08/16/2001	11/16/2001	02/19/2002	05/17/2002
Fe^{2+}(mg/L)	0.110	0.000	0.020	0.000	n/a	0.120	0.360	0.020	0.030
Mn (mg/L)	-0.002	0.051	0.139	1.210	n/a	0.064	0.144	0.285	0.068
MnO_4- (mg/L)	-0.004	0.111	0.302	0.262	n/a	0.138	0.311	0.616	n/a
$KMnO_4$ (mg/L)	-0.005	0.148	0.401	0.348	n/a	0.183	0.413	0.819	n/a

GSC-MW31

	05/23/2000	08/28/2000	11/16/2000	02/14/2001	05/22/2001	08/15/2001	11/15/2001	02/14/2002	05/16/2002
Fe^{2+}(mg/L)	0.010	0.020	0.180	-0.010	n/a	0.020	0.070	-0.020	n/a
Mn (mg/L)	0.008	0.096	0.160	-0.001	n/a	0.001	0.001	-0.006	n/a
MnO_4- (mg/L)	0.016	0.208	0.347	-0.002	n/a	0.001	0.002	-0.012	n/a
$KMnO_4$ (mg/L)	0.022	0.276	0.461	-0.002	n/a	0.002	0.003	-0.016	n/a

GSC-MWGTD

	05/23/2000	08/24/2000	11/16/2000	02/15/2001	05/17/2001	08/15/2001	11/14/2001	02/14/2002	05/16/2002
Fe^{2+}(mg/L)	0.030	0.050	0.380	0.080	0.000	0.060	0.100	0.020	n/a
Mn (mg/L)	0.110	over range	0.596	0.250	0.333	0.408	0.103	0.259	n/a
MnO_4- (mg/L)	0.238	over range	1.291	0.542	0.722	0.883	0.224	0.561	n/a
$KMnO_4$ (mg/L)	0.316	over range	1.715	0.720	0.959	1.173	0.297	0.746	n/a

WCP-31

	05/25/2000	08/29/2000	11/21/2000	02/20/2001	05/23/2001	08/23/2001	11/20/2001	02/20/2002	05/21/2002
Fe^{2+}(mg/L)	0.000	0.010	0.880	0.010	0.000	0.140	0.090	0.020	0.060
Mn (mg/L)	0.144	0.068	over range	0.101	0.166	0.066	0.056	0.220	0.126
MnO_4- (mg/L)	0.311	0.147	over range	0.218	0.359	0.143	0.120	0.477	n/a
$KMnO_4$ (mg/L)	0.413	0.196	over range	0.289	0.477	0.190	0.160	0.633	n/a

Table - 40
Iron and Manganese Field Test Results
WCP North Plume
Phoenix, Arizona

WCP-32

	05/24/2000	08/28/2000	11/20/2000	02/19/2001	05/23/2001	08/17/2001	11/19/2001	02/19/2002	05/20/2002
Fe^{2+}(mg/L)	0.320	0.020	1.940	0.050	0.000	0.020	0.020	0.020	0.020
Mn (mg/L)	0.070	0.075	0.636	0.136	0.217	0.021	0.151	0.248	0.370
MnO_4- (mg/L)	0.151	0.162	1.376	0.294	0.469	0.045	0.327	0.538	n/a
$KMnO_4$ (mg/L)	0.201	0.215	1.828	0.390	0.623	0.060	0.434	0.714	n/a

WCP-33L

	05/19/2000	08/23/2000	11/15/2000	02/15/2001	05/17/2001	08/16/2001	11/13/2001	02/14/2002	05/14/2002
Fe^{2+}(mg/L)	-0.040	0.010	0.150	-0.080	0.040	0.040	0.010	0.050	n/a
Mn (mg/L)	-0.007	0.003	0.083	0.050	0.018	0.018	0.035	0.056	n/a
MnO_4- (mg/L)	-0.015	0.066	0.181	0.108	0.039	0.040	0.076	0.121	n/a
$KMnO_4$ (mg/L)	-0.020	0.088	0.240	0.144	0.052	0.053	0.102	0.161	n/a

WCP-33M

	05/19/2000	08/23/2000	11/16/2000	02/15/2001	05/16/2001	August 2001	11/15/2001	02/13/2002	05/14/2002
Fe^{2+}(mg/L)	0.020	0.010	0.230	0.010	0.000	0.010	0.030	0.010	n/a
Mn (mg/L)	-0.005	0.006	0.151	0.037	0.014	0.014	0.031	0.034	n/a
MnO_4- (mg/L)	-0.011	0.013	0.327	0.081	0.031	0.029	0.067	0.074	n/a
$KMnO_4$ (mg/L)	-0.014	0.017	0.434	0.107	0.042	0.039	0.088	0.098	n/a

WCP-33S

	05/23/2000	08/23/2000	11/16/2000	02/15/2001	05/17/2001	08/16/2001	11/15/2001	02/13/2002	05/17/2002
Fe^{2+}(mg/L)	0.020	0.000	over range	0.000	0.110	0.020	0.130	-0.020	0.010
Mn (mg/L)	0.035	0.054	0.457	0.166	0.175	0.061	0.146	0.140	0.075
MnO_4- (mg/L)	0.076	0.118	0.990	0.359	0.378	0.131	0.317	0.304	n/a
$KMnO_4$ (mg/L)	0.101	0.157	1.315	0.477	0.502	0.175	0.421	0.404	n/a

WCP-34L

	05/22/2000	08/24/2000	11/14/2000	02/14/2001	05/16/2001	08/16/2001	11/14/2001	02/13/2002	05/15/2002
Fe^{2+}(mg/L)	0.040	0.010	0.020	0.030	-0.030	0.000	0.010	-0.040	n/a
Mn (mg/L)	0.000	0.000	0.003	0.016	0.003	0.000	-0.001	0.001	n/a
MnO_4- (mg/L)	0.001	0.001	0.009	0.034	0.006	0.001	-0.003	0.002	n/a
$KMnO_4$ (mg/L)	0.000	0.001	0.007	0.045	0.008	0.001	-0.003	0.003	n/a

WCP-34M

	05/22/2000	08/24/2000	11/14/2000	02/14/2001	05/15/2001	08/15/2001	11/14/2001	02/12/2002	05/15/2002
Fe^{2+}(mg/L)	0.010	0.010	1.120	-0.090	0.010	0.030	-0.060	-0.020	0.000
Mn (mg/L)	-0.002	0.046	0.361	0.158	0.025	0.009	0.054	0.088	0.099
MnO_4- (mg/L)	-0.005	0.099	0.783	0.342	0.055	0.025	0.117	0.190	0.215
$KMnO_4$ (mg/L)	-0.006	0.132	1.040	0.454	0.073	0.019	0.156	0.253	0.285

WCP-34S

	05/23/2000	08/22/2000	11/14/2000	02/16/2001	05/17/2001	08/17/2001	11/16/2001	02/15/2002	05/15/2002
Fe^{2+}(mg/L)	0.010	0.030	0.830	0.000	0.010	0.010	0.100	0.030	0.000
Mn (mg/L)	0.077	0.068	0.179	0.173	0.173	0.090	0.179	0.181	0.121
MnO_4- (mg/L)	0.166	0.147	0.388	0.374	0.376	0.195	0.387	0.392	0.262
$KMnO_4$ (mg/L)	0.220	0.195	0.515	0.497	0.499	0.259	0.514	0.520	0.348

WCP-35L

	05/18/2000	08/22/2000	11/13/2000	02/13/2001	05/14/2001	08/13/2001	11/12/2001	02/12/2002	05/13/2002
Fe^{2+}(mg/L)	-0.010	0.010	n/a	0.090	0.080	1.450	-0.020	0.030	n/a
Mn (mg/L)	0.011	0.007	n/a	0.006	0.006	0.061	0.016	0.033	n/a
MnO_4- (mg/L)	0.024	0.016	n/a	0.013	0.013	0.132	0.045	0.071	n/a
$KMnO_4$ (mg/L)	0.032	0.021	n/a	0.017	0.018	0.175	0.034	0.095	n/a

WCP-35M

	05/18/2000	08/22/2000	11/13/2000	02/12/2001	05/14/2001	08/13/2001	11/12/2001	02/11/2002	05/13/2002
Fe^{2+}(mg/L)	-0.010	0.030	n/a	0.240	0.030	0.210	0.000	0.020	n/a
Mn (mg/L)	0.006	0.009	n/a	0.474	0.015	0.002	0.039	0.094	n/a
MnO_4- (mg/L)	0.014	0.019	n/a	1.025	0.033	0.005	0.084	0.203	n/a
$KMnO_4$ (mg/L)	0.018	0.026	n/a	1.362	0.044	0.006	0.112	0.270	n/a

Table - 40
Iron and Manganese Field Test Results
WCP North Plume
Phoenix, Arizona

WCP-35S 2000

		08/23/2000	11/13/2000	02/12/2001	05/14/2001	08/13/2001	11/12/2001	02/11/2002	05/13/2002
Fe^{2+}(mg/L)		0.010	n/a	0.150	0.010	0.020	0.050	0.010	0.020
Mn (mg/L)		0.108	n/a	0.128	over-range	0.107	0.202	0.632	n/a
MnO_4- (mg/L)		0.234	n/a	0.298	over-range	0.232	0.437	1.369	n/a
$KMnO_4$ (mg/L)		0.310	n/a	0.369	over-range	0.309	0.580	1.818	n/a

WCP-36L2

	05/25/2000	08/28/2000	11/20/2000	02/20/2001	05/17/2001	08/17/2001	11/19/2001	02/19/2002	05/20/2002
Fe^{2+}(mg/L)	0.020	-0.020	1.250	0.110	-0.180	0.000	0.000	0.030	0.010
Mn (mg/L)	0.024	0.006	0.063	0.003	0.013	0.025	0.014	0.000	-0.001
MnO_4- (mg/L)	0.052	0.014	0.135	0.007	0.029	0.054	0.029	-0.001	-0.003
$KMnO_4$ (mg/L)	0.069	0.019	0.180	0.009	0.039	0.072	0.039	-0.001	-0.004

WCP-36M

	05/24/2000	08/29/2000	11/21/2000	02/19/2001	05/21/2001	08/21/2001	11/19/2001	02/15/2002	05/20/2002
Fe^{2+}(mg/L)	0.010	0.000	0.230	0.010	0.030	0.060	0.030	0.060	0.060
Mn (mg/L)	0.062	0.015	0.215	0.070	0.074	0.149	0.140	0.059	0.582
MnO_4- (mg/L)	0.135	0.034	0.465	0.152	0.159	0.323	0.303	0.127	1.260
$KMnO_4$ (mg/L)	0.179	0.042	0.618	0.201	0.211	0.429	0.402	0.169	1.673

WCP-36M2

				02/21/2001	05/22/2001	08/20/2001	11/15/2001	02/15/2002	05/16/2002
Fe^{2+}(mg/L)				0.010	0.020	0.010	-0.030	0.120	0.010
Mn (mg/L)				0.078	0.037	0.042	0.061	0.101	0.063
MnO_4- (mg/L)				0.170	0.080	0.091	0.132	0.218	0.137
$KMnO_4$ (mg/L)				0.255	0.106	0.121	0.176	0.290	0.182

WCP-36S

	05/24/2000	08/25/2000	11/17/2000	02/16/2001	05/18/2001	08/20/2001	11/16/2001	02/19/2002	05/19/2002
Fe^{2+}(mg/L)	0.670	0.010	0.150	0.030	0.050	0.100	1.010	0.030	0.030
Mn (mg/L)	0.004	0.136	0.478	0.223	0.401	0.047	0.111	0.333	0.133
MnO_4- (mg/L)	0.009	0.295	1.034	0.483	0.869	0.101	0.240	0.720	n/a
$KMnO_4$ (mg/L)	0.012	0.392	1.373	0.642	1.154	0.134	0.318	0.957	n/a

WCP-37L

	05/23/2000	08/25/2000	11/17/2000	02/19/2001	05/18/2001	08/22/2001	11/16/2001	02/18/2002	05/17/2002
Fe^{2+}(mg/L)	0.030	0.020	0.100	0.020	-0.220	-0.010	-0.460	-0.020	0.070
Mn (mg/L)	0.024	0.018	0.101	0.048	0.004	0.047	0.039	0.038	0.387
MnO_4- (mg/L)	0.052	0.040	0.219	0.104	0.008	0.103	0.084	0.082	0.838
$KMnO_4$ (mg/L)	0.068	0.053	0.290	0.138	0.010	0.136	0.111	0.109	1.114

WCP-37M2

	05/23/2000	08/28/2000	11/16/2000	02/16/2001	05/21/2001	08/21/2001	11/18/2001	02/18/2002	05/17/2002
Fe^{2+}(mg/L)	0.050	0.030	0.370	0.120	0.050	0.050	0.040	-0.020	0.020
Mn (mg/L)	0.044	0.066	0.132	0.105	0.085	0.121	0.147	0.117	0.203
MnO_4- (mg/L)	0.096	0.144	0.286	0.228	0.183	0.263	0.317	0.253	0.439
$KMnO_4$ (mg/L)	0.127	0.191	0.379	0.303	0.244	0.349	0.421	0.337	0.583

WCP-37M3

	05/24/2000	08/25/2000	11/17/2000	02/16/2001	05/18/2001	08/17/2001	11/16/2001	02/14/2002	05/23/2002
Fe^{2+}(mg/L)	0.000	0.010	n/a	-0.030	0.130	0.000	0.010	0.020	-0.020
Mn (mg/L)	0.019	0.001	n/a	0.036	0.013	0.037	0.025	0.067	0.170
MnO_4- (mg/L)	0.040	0.002	n/a	0.078	0.027	0.080	0.054	0.145	0.368
$KMnO_4$ (mg/L)	0.054	0.003	n/a	0.103	0.036	0.106	0.072	0.193	0.489

WCP-38S

	05/22/2000	08/24/2000	11/17/2000	02/14/2001	05/16/2001	08/16/2001	11/15/2001	02/14/2002	05/16/2002
Fe^{2+}(mg/L)	0.000	0.000	0.050	0.000	0.010	0.020	0.020	0.060	0.060
Mn (mg/L)	0.027	0.011	0.062	0.001	0.127	0.001	0.017	0.054	0.035
MnO_4- (mg/L)	0.059	0.023	0.135	0.001	0.275	0.003	0.036	0.116	n/a
$KMnO_4$ (mg/L)	0.078	0.030	0.179	0.002	0.365	0.004	0.048	0.154	n/a

Table - 40
Iron and Manganese Field Test Results
WCP North Plume
Phoenix, Arizona

WCP-39S

	05/22/2000	08/21/2000	11/15/2000	02/16/2001	05/15/2001	08/14/2001	11/14/2001	02/13/2002	05/15/2002
Fe^{2+}(mg/L)	0.070	0.030	n/a	0.000	0.010	0.010	0.060	0.010	n/a
Mn (mg/L)	0.111	0.090	n/a	0.122	0.191	0.086	0.242	0.327	n/a
MnO_4- (mg/L)	0.239	0.199	n/a	0.265	0.414	0.186	0.523	0.708	n/a
$KMnO_4$ (mg/L)	0.318	0.264	n/a	0.352	0.550	0.247	0.695	0.940	n/a

WCP-65S

		08/22/2000	11/15/2000	02/13/2001	05/14/2001	08/15/2001	11/12/2001	02/12/2002	05/15/2002
Fe^{2+}(mg/L)		0.020	0.270	0.000	0.020	0.050	0.030	-0.060	n/a
Mn (mg/L)		0.136	0.091	0.480	0.101	0.077	0.131	0.089	n/a
MnO_4- (mg/L)		0.294	0.196	1.039	0.219	0.166	0.283	0.193	n/a
$KMnO_4$ (mg/L)		0.391	0.260	1.300	0.790	0.221	0.376	0.257	n/a

WCP-66S

				02/13/2001	05/15/2001	08/13/2001	11/13/2001	02/12/2002	05/14/2002
Fe^{2+}(mg/L)				0.000	0.010	0.010	0.013	0.010	0.040
Mn (mg/L)				0.064	0.066	0.123	0.098	0.122	0.091
MnO_4- (mg/L)				0.138	0.142	0.266	0.211	0.264	0.197
$KMnO_4$ (mg/L)				0.183	0.184	0.353	0.281	0.351	0.262

WCP-67S

		08/23/2000	11/15/2000	02/13/2001	05/15/2001	08/13/2001	11/13/2001	02/12/2002	05/14/2002
Fe^{2+}(mg/L)		0.000	0.090	0.000	0.010	0.020	0.140	0.010	0.000
Mn (mg/L)		0.068	0.159	0.123	0.115	0.186	0.417	0.257	0.110
MnO_4- (mg/L)		0.148	0.344	0.266	0.249	0.402	0.903	0.557	0.238
$KMnO_4$ (mg/L)		0.197	0.457	0.354	0.331	0.534	0.417	0.740	0.317

WCP-68S

		08/22/2000	11/14/2000	02/14/2001	05/16/2001	08/14/2001	11/13/2001	02/11/2002	05/13/2002
Fe^{2+}(mg/L)		0.000	n/a	0.010	0.010	0.060	0.080	0.070	0.220
Mn (mg/L)		0.094	n/a	0.228	0.064	0.070	0.031	0.236	n/a
MnO_4- (mg/L)		0.203	n/a	0.493	0.138	0.151	0.068	0.511	n/a
$KMnO_4$ (mg/L)		0.270	n/a	0.656	0.183	0.201	0.091	0.678	n/a

WCP-69S

				02/15/2001	05/16/2001	08/20/2001	11/14/2001	02/13/2002	05/20/2002
Fe^{2+}(mg/L)				0.000	0.010	0.030	0.040	0.020	0.050
Mn (mg/L)				0.245	0.140	0.022	0.240	0.128	0.049
MnO_4- (mg/L)				0.530	0.302	0.048	0.520	0.277	n/a
$KMnO_4$ (mg/L)				0.704	0.401	0.063	0.691	0.368	n/a

WCP-70M

				02/13/2001	05/15/2001	08/14/2001	11/13/2001	02/11/2002	05/16/2002
Fe^{2+}(mg/L)				0.090	0.030	0.010	0.010	0.090	n/a
Mn (mg/L)				0.093	0.031	0.048	0.038	0.023	n/a
MnO_4- (mg/L)				0.201	0.070	0.105	0.083	0.049	n/a
$KMnO_4$ (mg/L)				0.267	0.093	0.139	0.111	0.065	n/a

WCP-71M

				02/20/2001	05/23/2001	08/20/2001	11/19/2001	02/19/2002	05/22/2002
Fe^{2+}(mg/L)				0.020	0.000	0.010	-0.020	0.050	0.030
Mn (mg/L)				0.047	0.122	0.098	0.013	0.101	0.092
MnO_4- (mg/L)				0.102	0.264	0.212	0.029	0.218	0.198
$KMnO_4$ (mg/L)				0.136	0.350	0.281	0.039	0.290	0.263

WCP-72M

				02/21/2001	05/23/2001	08/22/2001	11/20/2001	02/20/2002	05/22/2002
Fe^{2+}(mg/L)				0.040	0.000	0.010	0.010	0.060	-0.010
Mn (mg/L)				0.048	0.101	0.026	0.091	0.074	0.157
MnO_4- (mg/L)				0.103	0.220	0.057	0.198	0.159	0.340
$KMnO_4$ (mg/L)				0.137	0.292	0.075	0.263	0.212	0.452

Table - 40
Iron and Manganese Field Test Results
WCP North Plume
Phoenix, Arizona

WCP-73L

				02/22/2001	05/23/2001	08/23/2001	11/20/2001	02/20/2002	05/21/2002
Fe^{2+}(mg/L)				0.060	0.070	0.020	0.000	0.000	0.110
Mn (mg/L)				0.087	0.224	0.076	0.031	0.039	0.225
MnO_4- (mg/L)				0.187	0.486	0.165	0.068	0.084	0.486
$KMnO_4$ (mg/L)				0.249	0.645	0.219	0.091	0.112	0.646

WCP-91

					05/20/2001	08/19/2001	11/18/2001	02/17/2002	05/19/2002
Fe^{2+}(mg/L)					0.010	0.040	0.040	0.180	0.020
Mn (mg/L)					0.077	0.006	0.111	0.044	0.052
MnO_4- (mg/L)					0.166	0.014	0.241	0.096	n/a
$KMnO_4$ (mg/L)					0.220	0.018	0.320	0.128	n/a

Notes: mg/L = milligrams per liter
n/a = sample not analyzed

Table 41 - Summary of Investigative Waste Disposal During ERA Investigation
F&B Mfg. Co. Facility
WCP North Plume WQARF Site
Phoenix, Arizona

Bin Number	Type of Waste	Quantity Estimates (cubic yards)	Sample ID	Sample Date	Hazardous Constituents Present	Toxicity Characteristic Regulatory Level (40 CFR 261.24)	Waste Codes	Disposal Facility
66188	Excavated soil	8	RB-66188-3-7	7/13/2000	ND	N/A	N/H	Waste Management Butterfield Landfill
56844	Excavated soil	11	RB-56844-7-11	7/13/2000	ND	N/A	N/H	Waste Management Butterfield Landfill
61980	Excavated soil	5	RB-6198011	7/13/2000	PCE - 0.17 mg/kg	PCE - 0. 7 mg/kg TCLP	F001	US Ecology, Beatty, NV
66186	Excavated soil	3	RB-66186-Soil	7/13/2000	PCE - 0.22 mg/kg	PCE - 0. 7 mg/kg TCLP	F001	US Ecology, Beatty, NV
1996	Soil Cuttings	10	SVE-RB-1996	7/7/2000	PCE – 1,100 mg/kg TCA – 0.4 mg/kg	PCE - 0. 7 mg/kg TCLP	F001, D039	ONYX Incineration Facility, Port Arthur, TX
66181	Debris	2	RB-661881-Debris	7/13/2000	PCE - 2.3 mg/kg Cd – 3.9 mg/kg 0.049 mg/l TCLP Cr – 760 mg/kg 0.058 mg/l TCLP Pb – 10 mg/kg ND TCLP Ag – 7.9 mg/kg ND TCLP	PCE - 0.7 mg/kg TCLP Cd – 1.0 mg/l TCLP Cr – 5.0 mg/l TCLP Pb – 5.0 mg/kg TCLP Ag – 5.0 mg/kg TCLP	F001	US Ecology, Beatty, NV
61977	Debris	5	RB-61977-Concrete	7/13/2000	PCE - 0.64 mg/kg Ba – 160 mg/kg Cr – 65 mg/kg Pb – 7.9 mg/kg	PCE - 0.7 mg/kg TCLP Ba – 100 mg/l TCLP Cr – 5.0 mg/l TCLP Pb – 5.0 mg/kg TCLP	F001	US Ecology, Beatty, NV
53143	Debris	8	RB-53143-Concrete	7/13/2000	PCE – 0.46 mg/kg Ba – 150 mg/kg Cd – 0.54 mg/kg Cr – 73 mg/kg Pb – 7.8 mg/kg	PCE - 0.7 mg/kg TCLP Ba – 100 mg/l TCLP Cd – 1.0 mg/l TCLP Cr – 5.0 mg/l TCLP Pb – 5.0 mg/kg TCLP	F001	US Ecology, Beatty, NV

Notes:

Ba - Barium
Cd - Cadmium
Cr - Chromium (total)
Pb - Lead
Ag - Silver

N/A - Not Applicable
ND - Not Detected
N/H - Non-Hazardous Waste
mg/l - milligrams per liter TCLP
mg/kg - milligrams per kilogram

Table 42 - Physical Properties of Chemicals of Concern
WCP North Plume Site
Phoenix, Arizona

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
DCE	1.21	2,420	600	2.61E-02	3.25	31.7	64	135

Notes:

1. 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.

2. Adapted from ADEQ's Draft Remedial Investigation Report, West Central Phoenix West Grand Avenue Site, January 2004

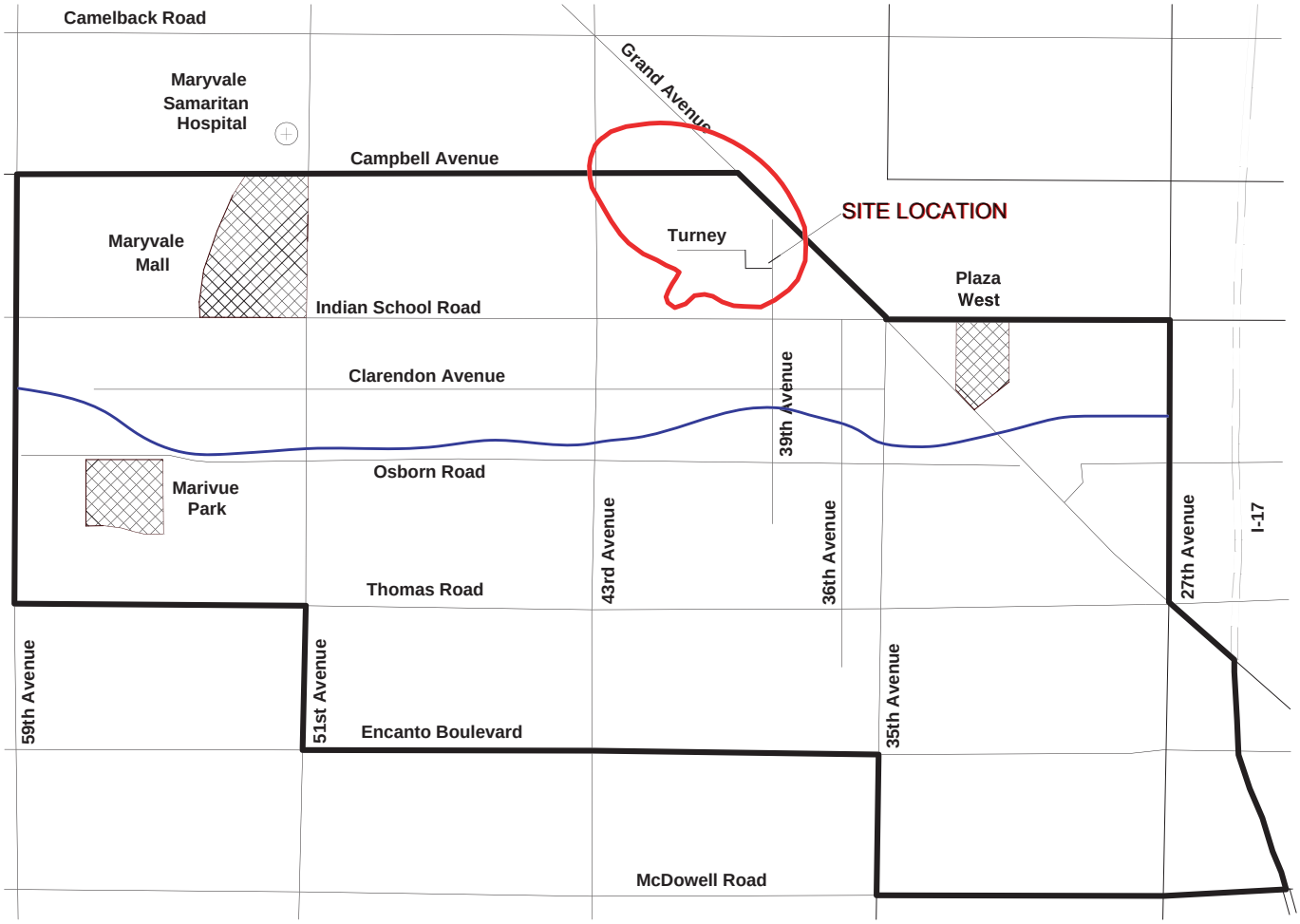
Table 43 - Physical Properties of Organic Contaminants That Affect Fate and Transport
WCP North Plume Site
Phoenix, Arizona

Physical Property	Range	Qualitative Description
Sorption- Soil Adsorption Coefficient (Koc)	<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 Koc	s>3,500 and Koc < 50	Very high mobility
	3,500 > s > 850 and 50 < Koc < 150	High mobility
	850 > s >150 and 150 < Koc < 500	Moderate mobility
	150 > s > 15 and 500 < Koc < 2,000	Low mobility
	15 > s > 0.2 and 2,000 < Koc <20,000	Slight mobility
	s < 0.2 and Koc > 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
	$3x10^{-7} < K_H < 1x10^{-3}$	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., 1998. Applied Hydrogeology, Second Edition, pp. 403-405

FIGURES



Legend

- 1989 Historical West Central Phoenix WQARF Area Boundary
- West Central Phoenix North Plume WQARF Registry Site
- Grand Canal

Approximate Scale
1 inch = 3000 feet

0 1500 3000 6000

Source: Weston's Site Characteriization, Pyramid Industries Facility, December 2002

Arizona Department of Environmental Quality
WCP WQARF Area
WCP North Plume Site
Phoenix, Arizona
Figure 1
Project No. 014-06854

LFR

Source: American Automobile Association, 1994

N

0 .5 Mile 1 Mile

Arizona Department of Environmental Quality

LFR

Site Vicinity Map
WCP North Plume Site
Figure 2
Project No. 6854

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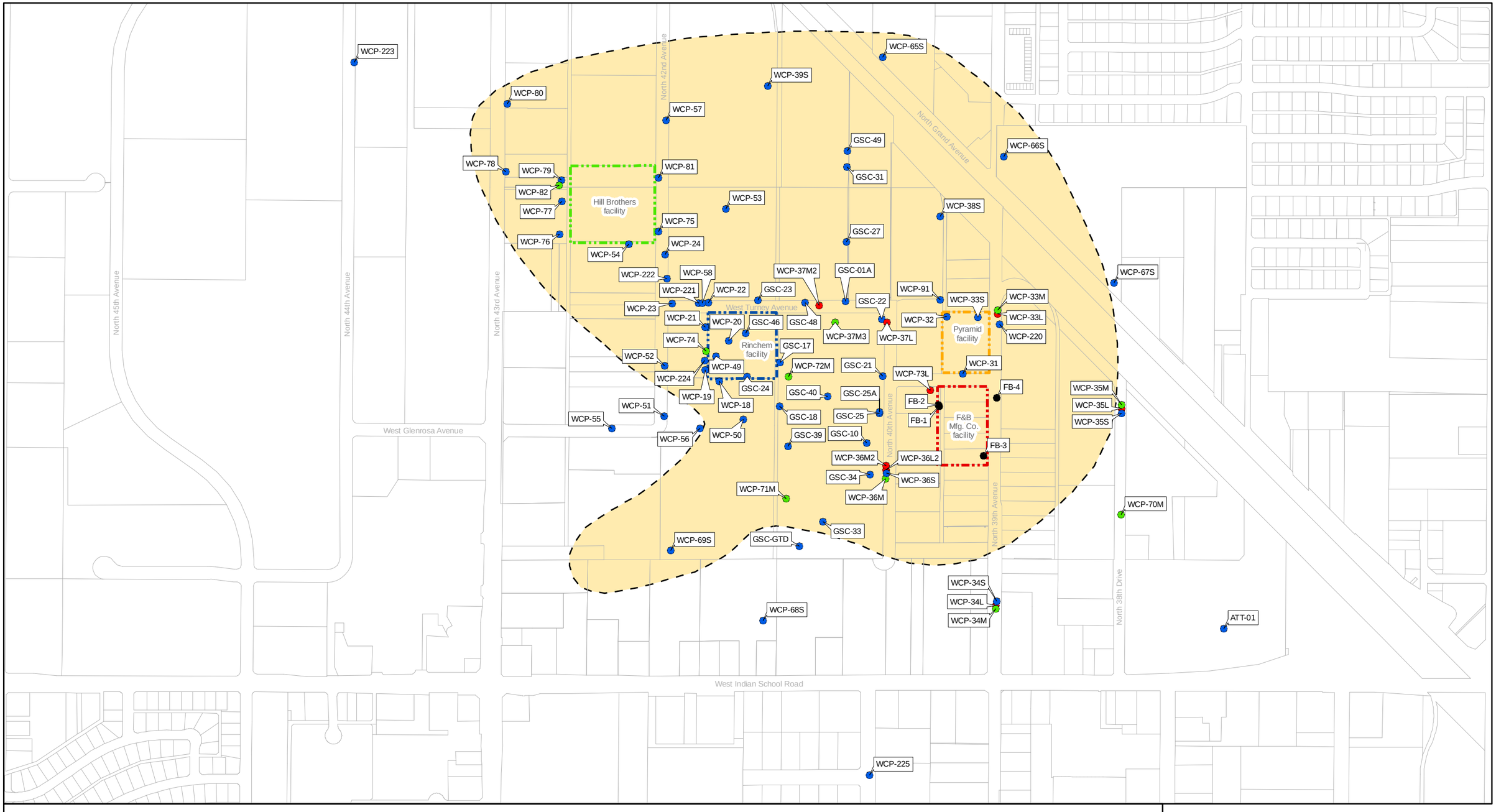


LEGEND

- Shallow MAU monitor well
- Middle-depth MAU monitor well
- Deep MAU monitor well
- F&B Westbay well
- Estimated plume boundary

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.

N

0 250 500 Feet

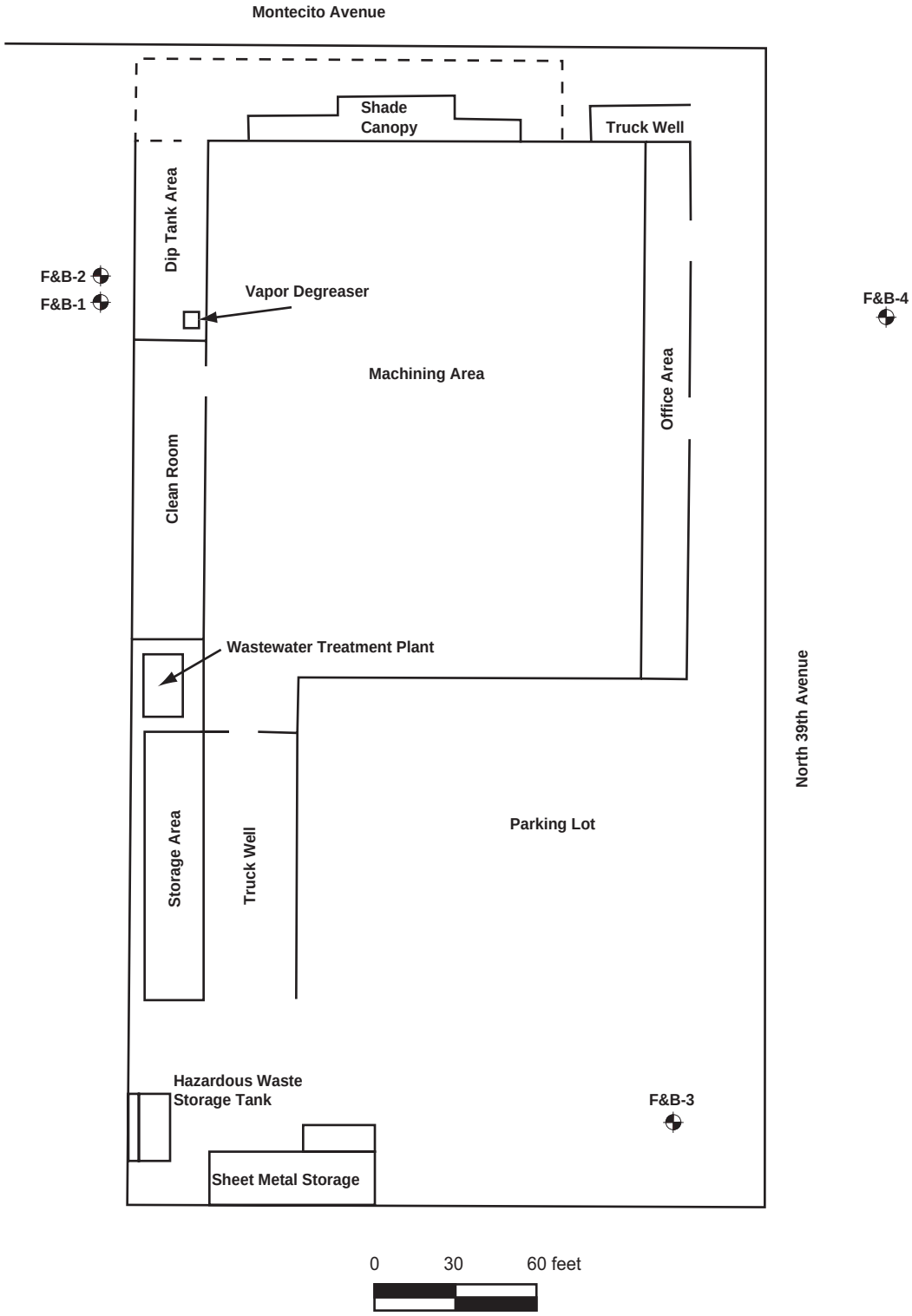
Scale: 1" = 500'

Well Location Map with Site Boundary

West Central Phoenix North Plume WQARF Site

LFR

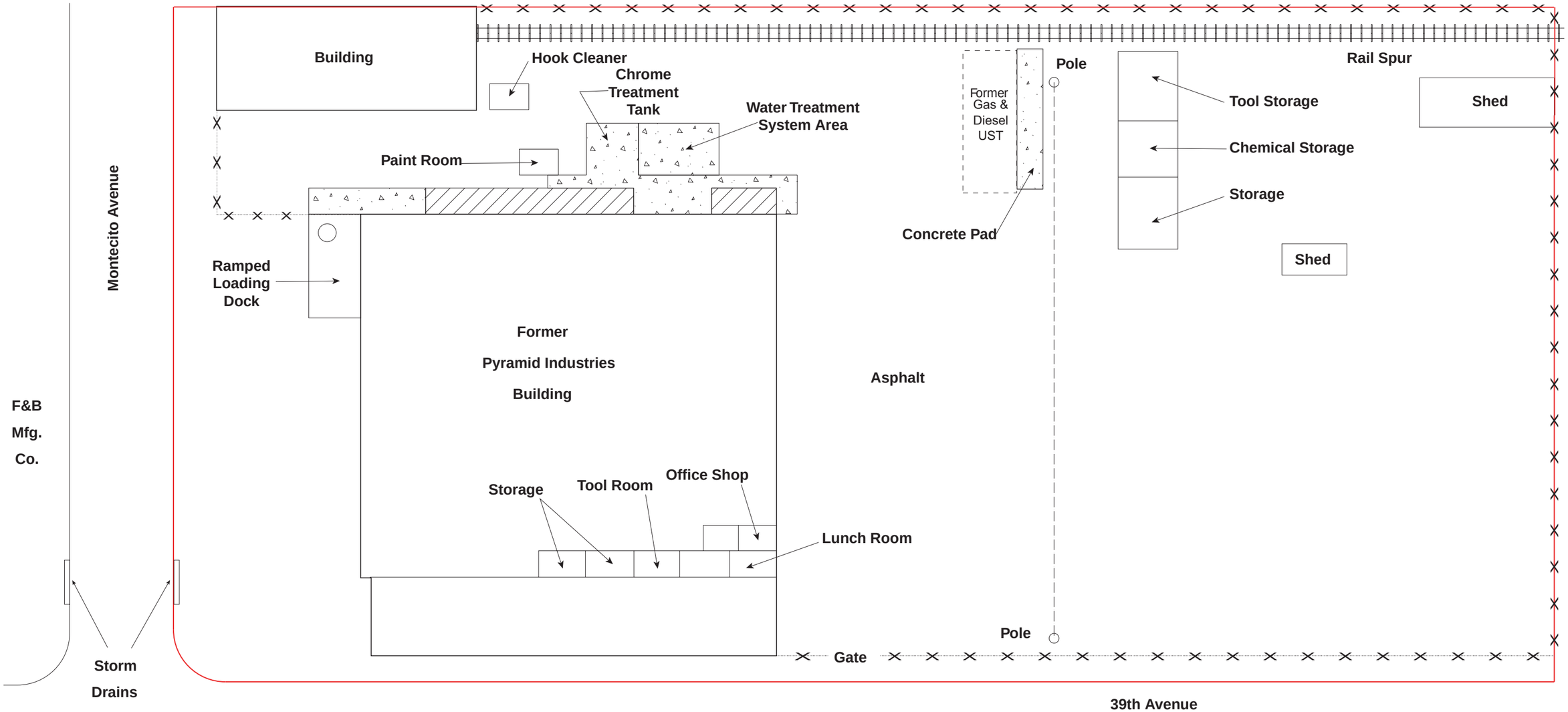
Figure 3



Monitor Well

Arizona Department of Environmental Quality
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona
Figure 4
Project No. 014-06854

LFR



Legend

- Dry Well
- Fence Line
- Concrete
- Overhead Electrical
- Property Boundary Line

Source:Weston's"Phase II RI/FS Workplan"

Approximate Scale
1 inch = 45 feet

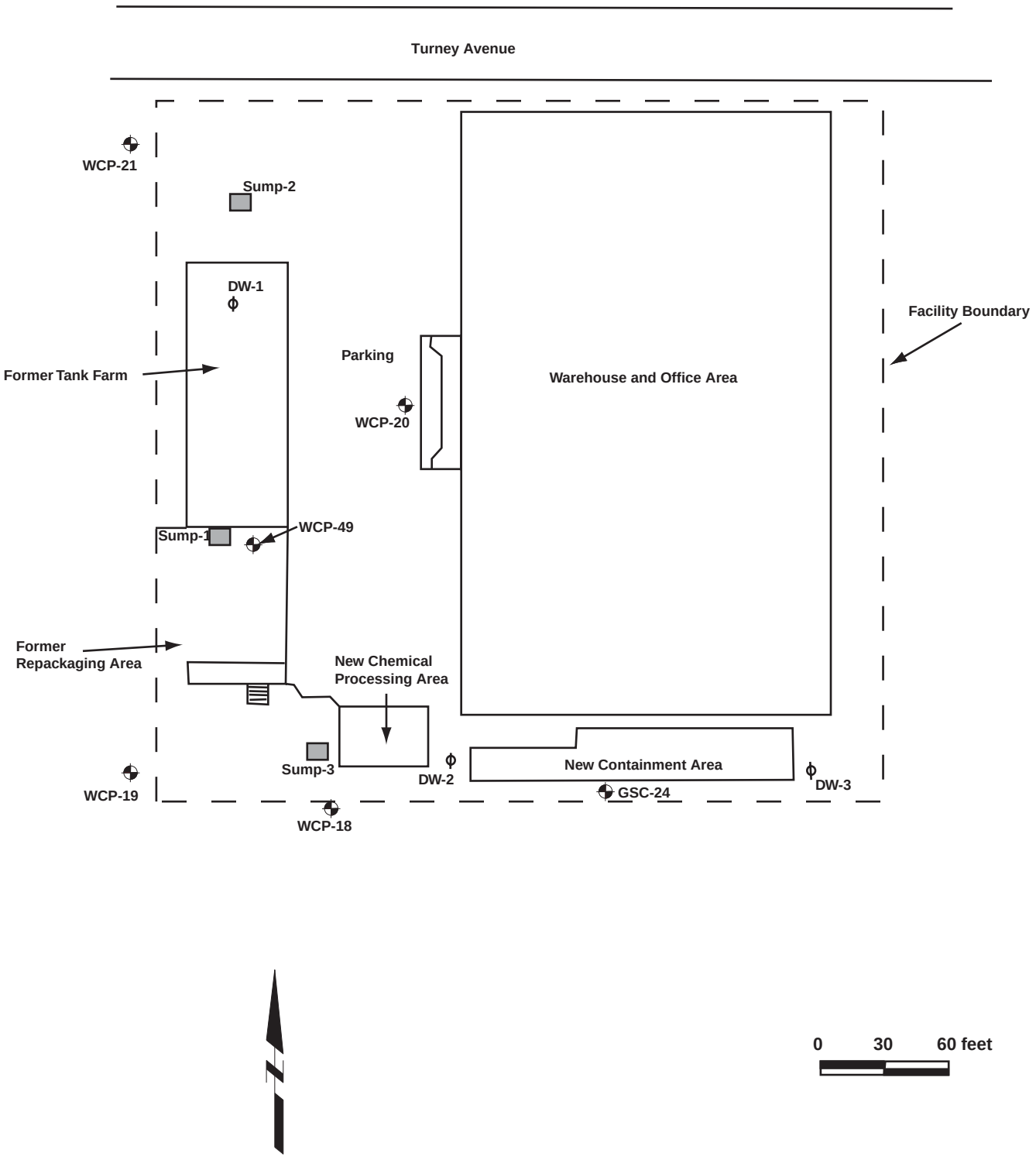
0 22.5 45 90

Arizona Department of Environmental Quality

Pyramid Industries Facility
WCP North Plume Site
Phoenix, Arizona
Figure 5

Project No. 014-06854

LFR



Map modified from Four Corner's "Preliminary Site Characterization Report Report"

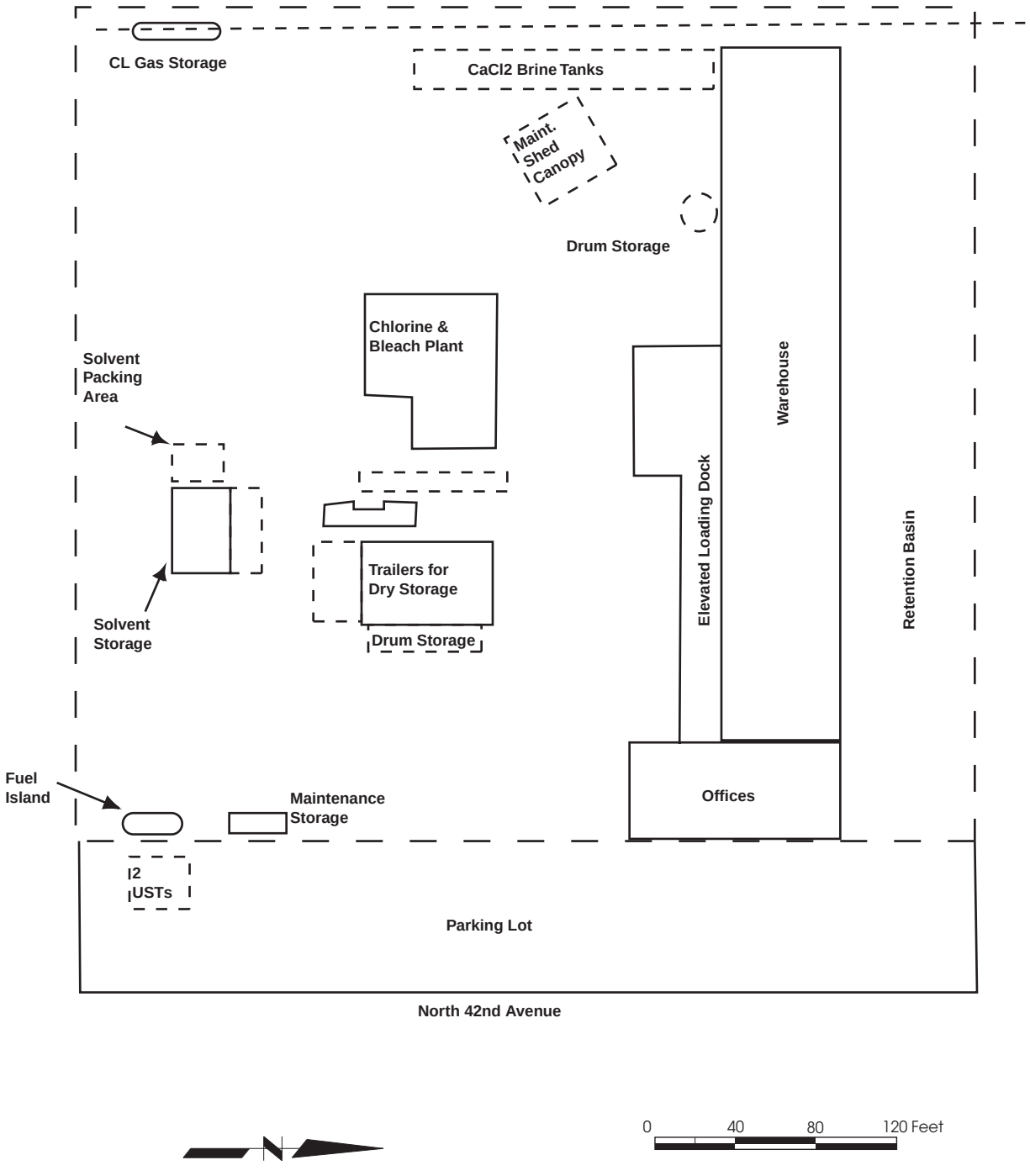
Sump
Dry Well
Monitor Well

Arizona Department of Environmental Quality

Rinchem Facility
WCP North Plume Site
Phoenix, Arizona
Figure 6

Project No. 014-06854-05

LFR



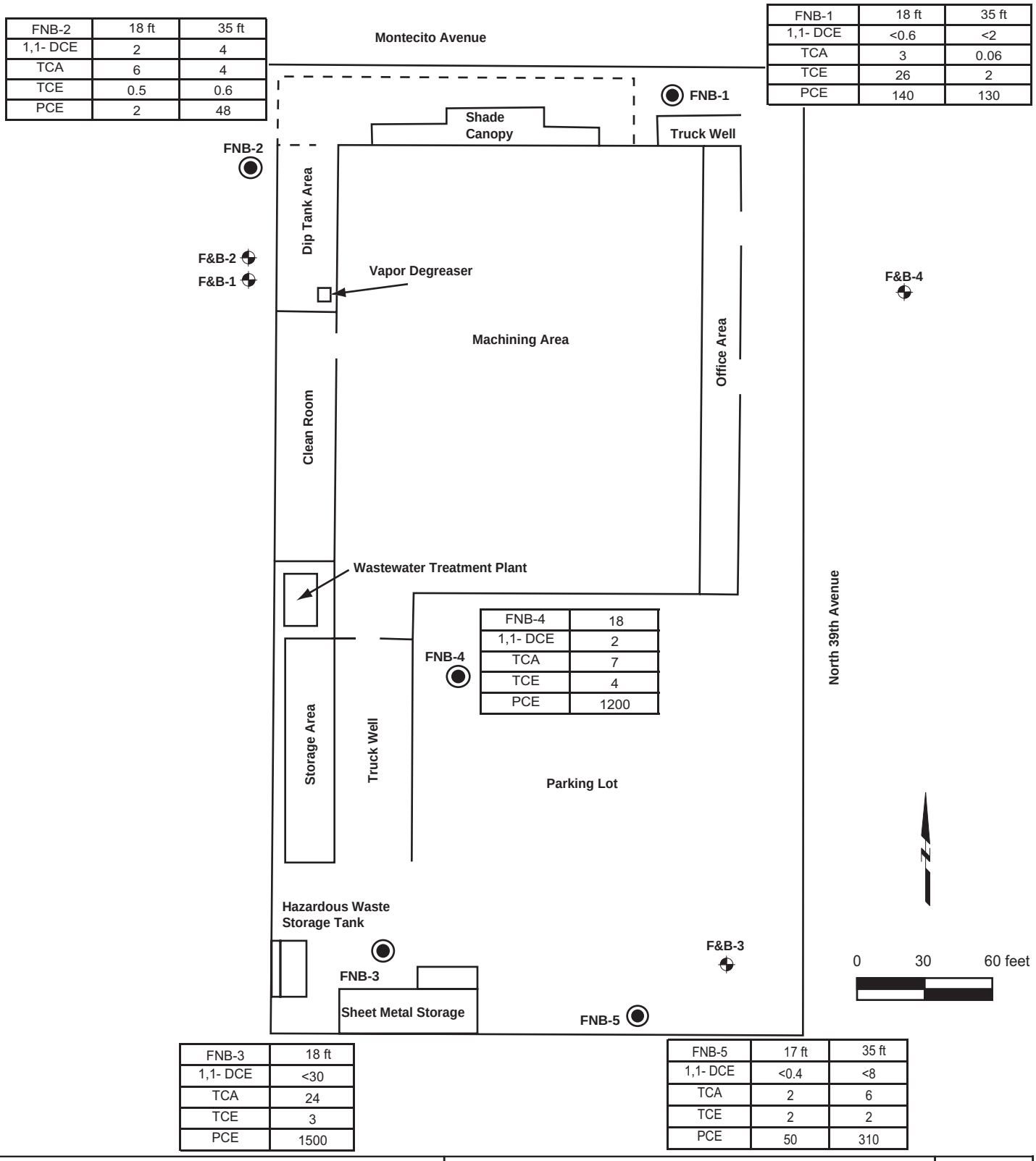
Map modified from EMCON's "Preliminary Site Characterization Report"

Arizona Department of Environmental Quality

Hill Brothers Facility
WCP North Plume Site
Phoenix, Arizona
Figure 7

Project No. 014-06854

LFR



FNB-2	18 ft	35 ft
1,1- DCE	2	4
TCA	6	4
TCE	0.5	0.6
PCE	2	48

FNB-1	18 ft	35 ft
1,1- DCE	<0.6	<2
TCA	3	0.06
TCE	26	2
PCE	140	130

FNB-4	18
1,1- DCE	2
TCA	7
TCE	4
PCE	1200

FNB-3	18 ft
1,1- DCE	<30
TCA	24
TCE	3
PCE	1500

FNB-5	17 ft	35 ft
1,1- DCE	<0.4	<8
TCA	2	6
TCE	2	2
PCE	50	310

Monitor Well

Soil Gas Sampling Locations (1989)

Notes: Analytical Results in µg/L

Arizona Department of Environmental Quality

Soil-Gas Sample Analytical Results from ADEQ's 1989 PA/SI Investigation at the F&B Mfg. Co. Facility

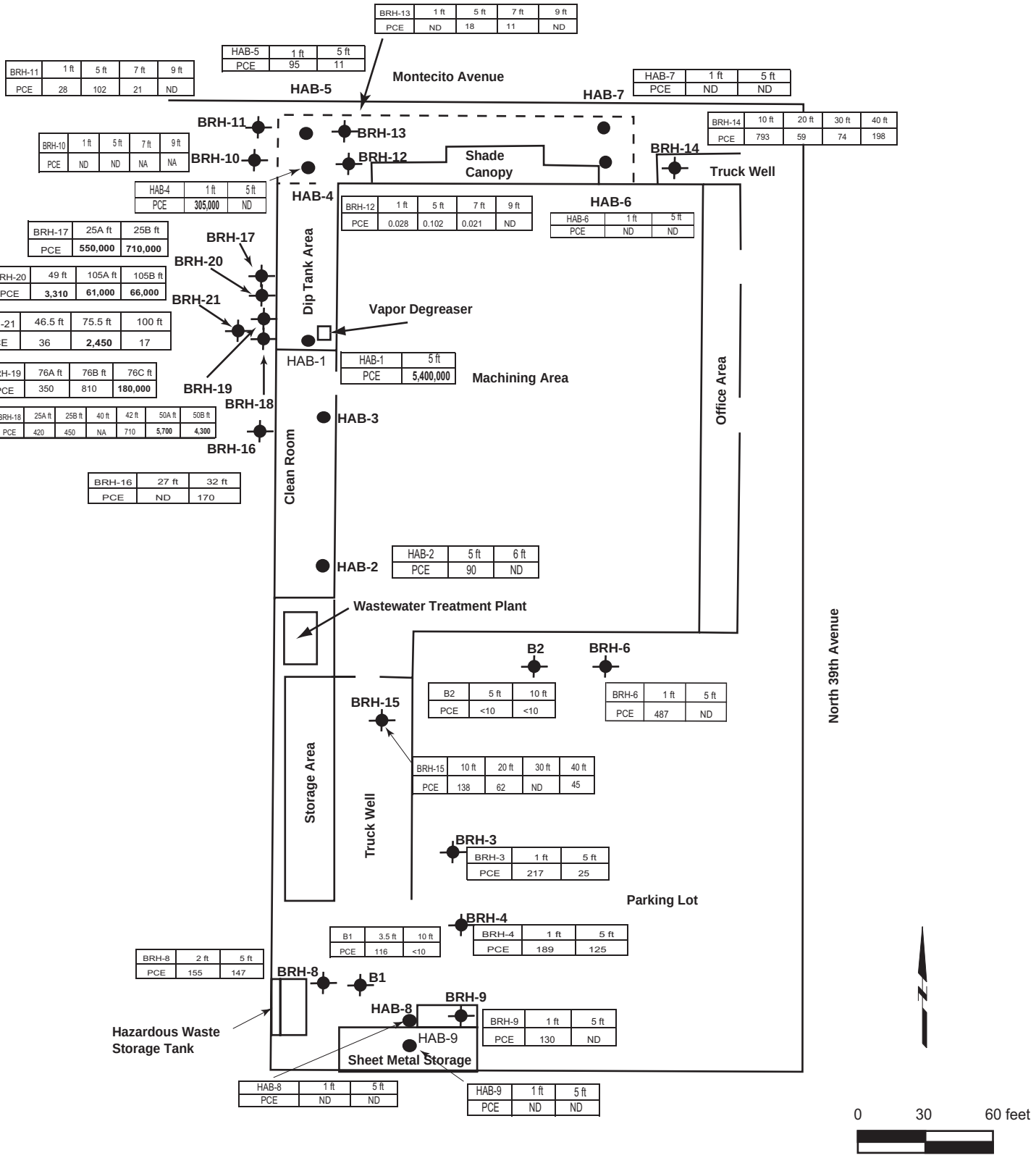
WCP North Plume Site

Phoenix, Arizona

Figure 8

Project No. 014-06854

LFR



Note: Bold indicates concentrations above Groundwater Protection Limits (GPLs)

Soil boring locations (1990-1991)

Hand auger locations (1991)

NA Not Analyzed

ND Not Detected above method detection limit

Analytical Results in µg/Kg

Arizona Department of Environmental Quality

Soil Sample Analytical Results from Basin & Range's 1990-1991 Investigations at the F&B Mfg. Co. Facility

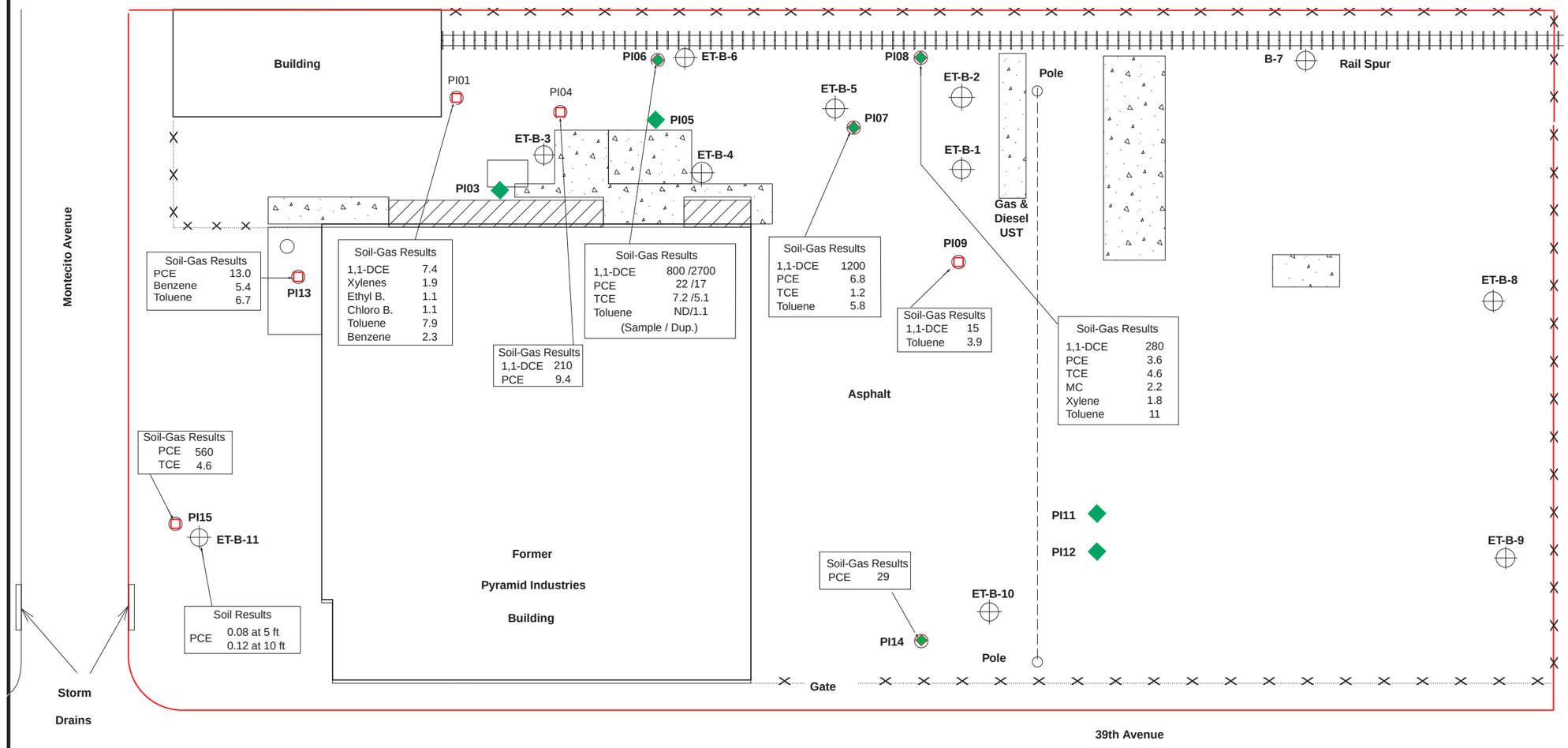
WCP North PLume Site

Phoenix, Arizona

Figure 9

Project No. 014-06854

LFR



Source: Weston's "Site Characterization Report, Pyramid Industries Facility, WCP North Plume WQARF Registry Site, 4330 North 39th Avenue, Phoenix, Arizona", December 2002.

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Figure 10
VOC Concentrations in Soil and Soil-Gas Samples from Previous Investigations at the Pyramid Industries Facility

Legend

- Dry Well
- Borehole (Earth Tech, 1995)
- Soil-Gas Sample Point (ADEQ, 1993)
- Soil Sample (ADEQ, 1993)
- Soil-Gas & Soil Samples (ADEQ, 1993)
- PCE 560 / TCE 4.6 — Result in µg/L (air) & mg/kg (soil)
- Fence Line
- Concrete
- Overhead Electrical
- Property Boundary Line
- ND — Contaminant not detected above the method detection limit.

Approximate Scale
1 inch = 40 feet

0 20 40 80

LFR

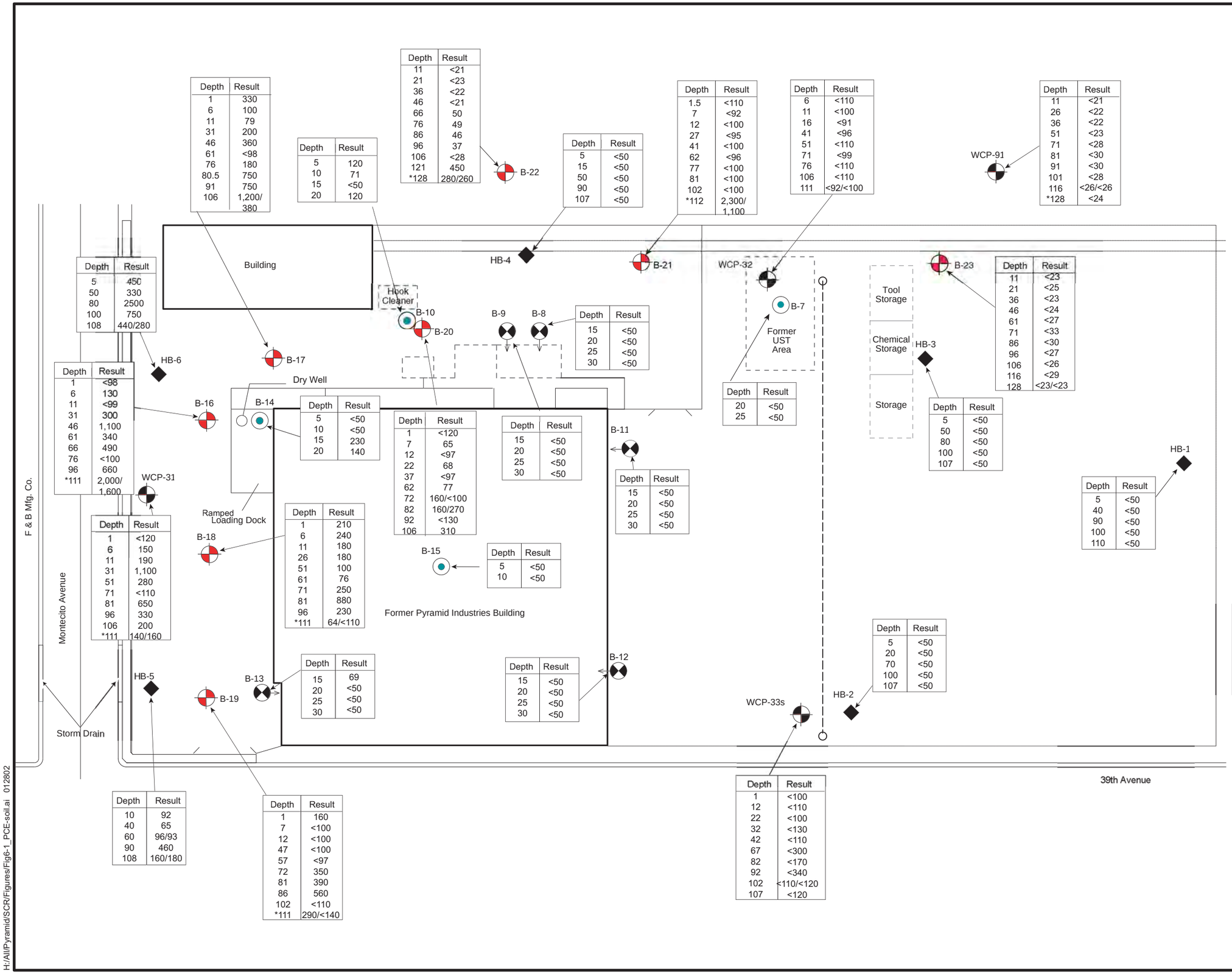


Figure 11
PCE Concentrations in Soil at the Pyramid Industries Facility

Legend

- Dry Well
- Shallow Borehole (Weston, 1998)
- Angle Borehole/Direction (Weston, 1998)
- Hydropunch Borehole (Weston, 1998)
- Groundwater Monitor Well (Weston, 1999/2001)
- Deep Borehole with Hydropunch® (Weston, 1999/2001)
- Historical Operation Locations
- Overhead Electrical

NOTES:

* Indicates saturated soil sample.
Depth in feet below ground surface. Results in µg/kg. Two results at same depth indicate duplicate sample.

Approximate Scale
1 inch = 40 feet

0 20 40 80

H:/All/Pyramid/SCR/Figures/Fig6-1_PCE-soil.ai 012802

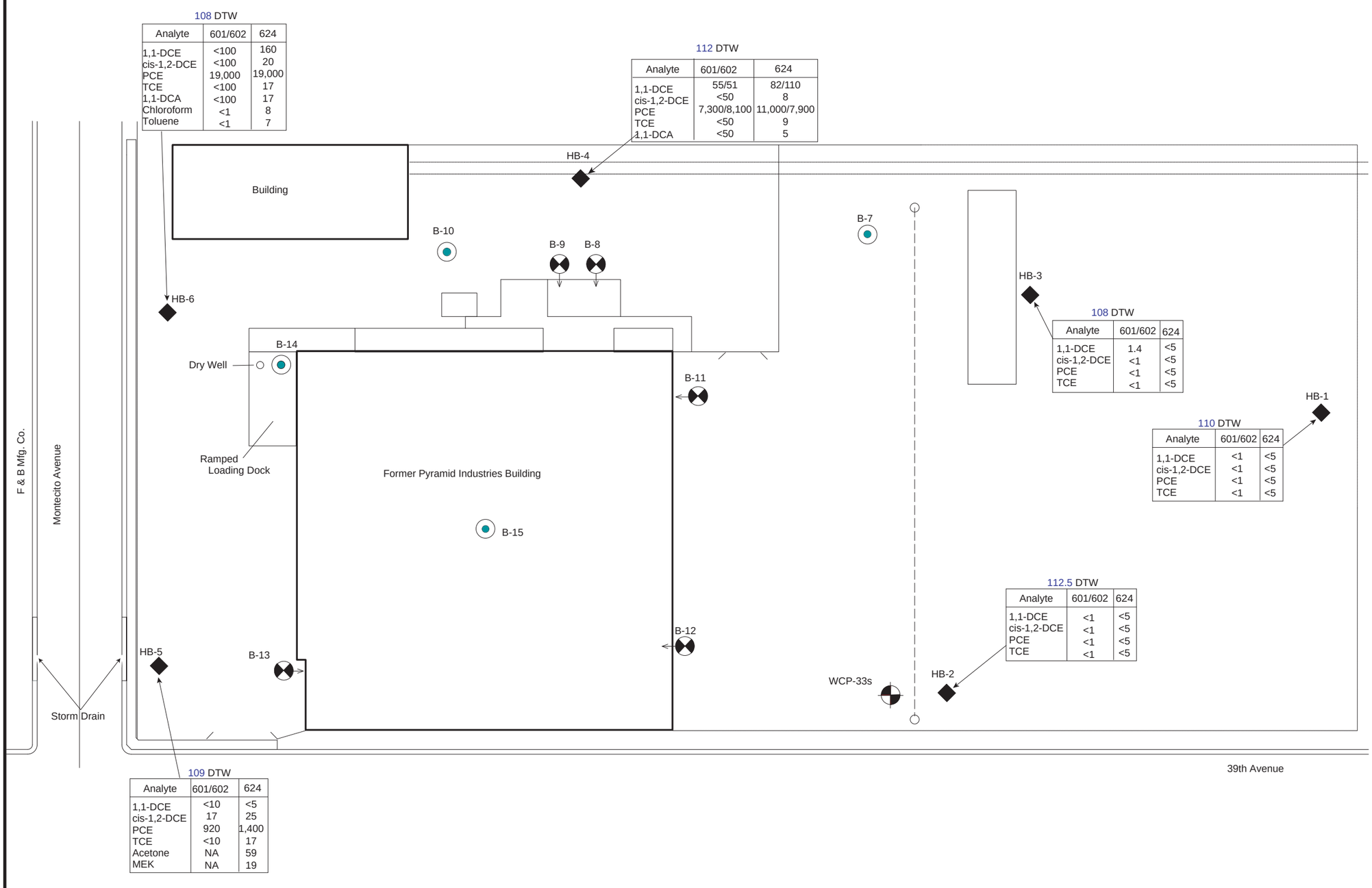


Figure 12
VOCs Detected in Hydropunch® Groundwater
Phase I Remedial Investigation
Pyramid Industries Facility

Legend

- Shallow Borehole (Weston, 1998)
- Angle Borehole/Direction (Weston, 1998)
- Hydropunch® Borehole (Weston, 1998)

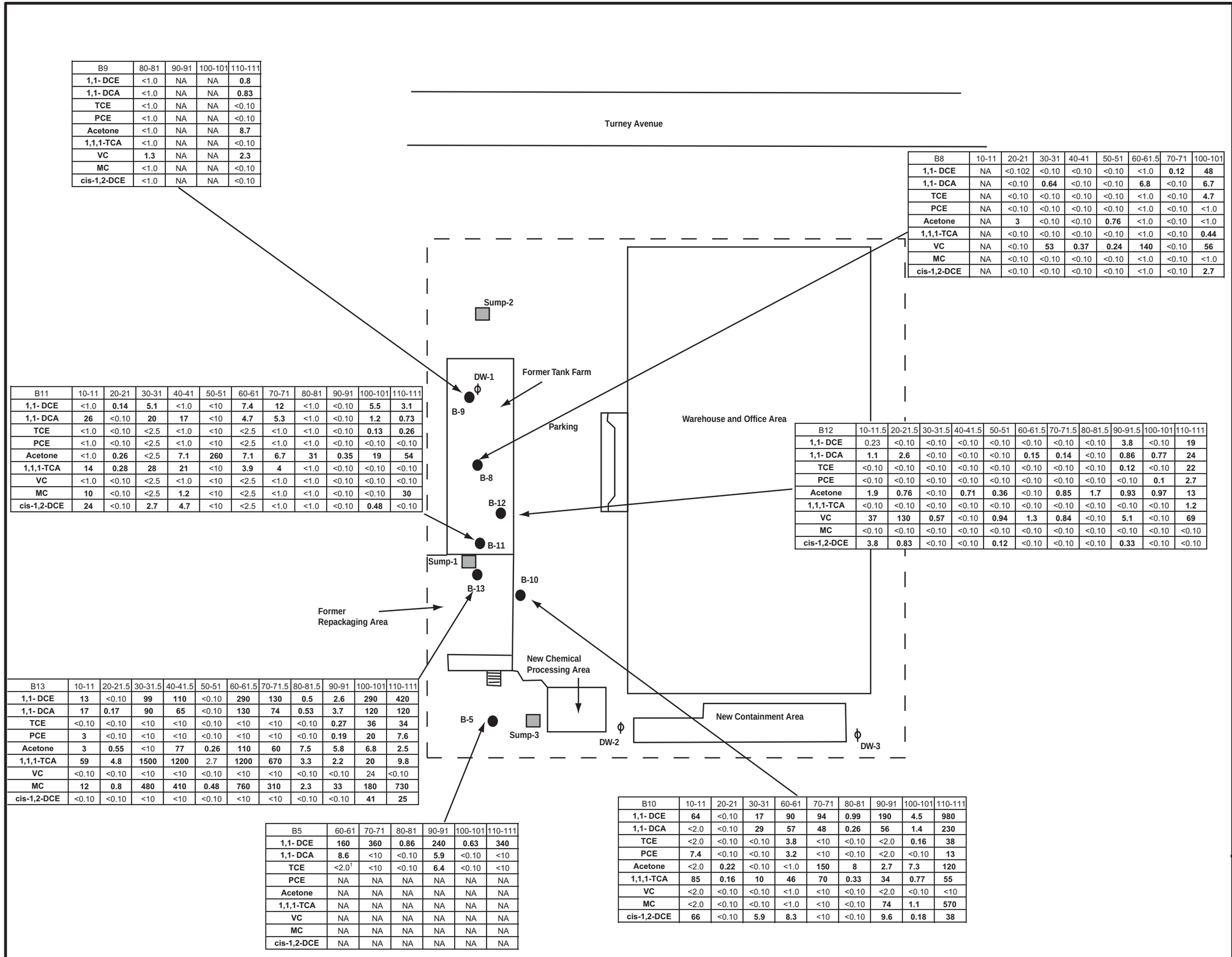
601/602 EPA Method 601/602
624 EPA Method 624
108 DTW Feet below ground surface
Depth to water

NOTES:

Results measured in µg/L. Two results at same depth indicate duplicate sample.

Approximate Scale
1 inch = 40 feet

0 20 40 80



B9	80-81	90-91	100-101	110-111
1,1- DCE	<1.0	NA	NA	**0.8**
1,1- DCA	<1.0	NA	NA	**0.83**
TCE	<1.0	NA	NA	<0.10
PCE	<1.0	NA	NA	<0.10
Acetone	<1.0	NA	NA	**8.7**
1,1,1-TCA	<1.0	NA	NA	<0.10
VC	**1.3**	NA	NA	**2.3**
MC	<1.0	NA	NA	<0.10
cis-1,2-DCE	<1.0	NA	NA	<0.10

B8	10-11	20-21	30-31	40-41	50-51	60-61.5	70-71	100-101
1,1- DCE	NA	<0.102	<0.10	<0.10	<0.10	<1.0	**0.12**	**48**
1,1- DCA	NA	<0.10	**0.64**	<0.10	<0.10	**6.8**	<0.10	**6.7**
TCE	NA	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10	**4.7**
PCE	NA	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10	<1.0
Acetone	NA	**3**	<0.10	<0.10	**0.76**	<1.0	<0.10	<1.0
1,1,1-TCA	NA	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10	**0.44**
VC	NA	<0.10	**53**	**0.37**	**0.24**	**140**	<0.10	**56**
MC	NA	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10	<1.0
cis-1,2-DCE	NA	<0.10	<0.10	<0.10	<0.10	<1.0	<0.10	**2.7**

B11	10-11	20-21	30-31	40-41	50-51	60-61	70-71	80-81	90-91	100-101	110-111
1,1- DCE	<1.0	**0.14**	**5.1**	<1.0	<10	**7.4**	**12**	<1.0	<0.10	**5.5**	**3.1**
1,1- DCA	**26**	<0.10	**20**	**17**	<10	**4.7**	**5.3**	<1.0	<0.10	**1.2**	**0.73**
TCE	<1.0	<0.10	<2.5	<1.0	<10	<2.5	<1.0	<1.0	<0.10	**0.13**	**0.26**
PCE	<1.0	<0.10	<2.5	<1.0	<10	<2.5	<1.0	<1.0	<0.10	<0.10	<0.10
Acetone	<1.0	**0.26**	<2.5	**7.1**	**260**	**7.1**	**6.7**	**31**	**0.35**	**19**	**54**
1,1,1-TCA	**14**	**0.28**	**28**	**21**	<10	**3.9**	**4**	<1.0	<0.10	<0.10	<0.10
VC	<1.0	<0.10	<2.5	<1.0	<10	<2.5	<1.0	<1.0	<0.10	<0.10	<0.10
MC	**10**	<0.10	<2.5	**1.2**	<10	<2.5	<1.0	<1.0	<0.10	<0.10	**30**
cis-1,2-DCE	**24**	<0.10	**2.7**	**4.7**	<10	<2.5	<1.0	<1.0	<0.10	**0.48**	<0.10

B12	10-11.5	20-21.5	30-31.5	40-41.5	50-51	60-61.5	70-71.5	80-81.5	90-91.5	100-101	110-111
1,1- DCE	0.23	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**3.8**	<0.10	**19**
1,1- DCA	**1.1**	**2.6**	<0.10	<0.10	<0.10	**0.15**	**0.14**	<0.10	**0.86**	**0.77**	**24**
TCE	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.12**	<0.10	**22**
PCE	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.1**	**2.7**
Acetone	**1.9**	**0.76**	<0.10	**0.71**	**0.36**	<0.10	**0.85**	**1.7**	**0.93**	**0.97**	**13**
1,1,1-TCA	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**1.2**
VC	**37**	**130**	**0.57**	<0.10	**0.94**	**1.3**	**0.84**	<0.10	**5.1**	<0.10	**69**
MC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
cis-1,2-DCE	**3.8**	**0.83**	<0.10	<0.10	**0.12**	<0.10	<0.10	<0.10	**0.33**	<0.10	<0.10

B13	10-11	20-21.5	30-31.5	40-41.5	50-51	60-61.5	70-71.5	80-81.5	90-91	100-101	110-111
1,1- DCE	**13**	<0.10	**99**	**110**	<0.10	**290**	**130**	**0.5**	**2.6**	**290**	**420**
1,1- DCA	**17**	**0.17**	**90**	**65**	<0.10	**130**	**74**	**0.53**	**3.7**	**120**	**120**
TCE	<0.10	<0.10	<10	<10	<0.10	<10	<10	<0.10	**0.27**	**36**	**34**
PCE	**3**	<0.10	<10	<10	<0.10	<10	<10	<0.10	**0.19**	**20**	**7.6**
Acetone	**3**	**0.55**	<10	**77**	**0.26**	**110**	**60**	**7.5**	**5.8**	**6.8**	**2.5**
1,1,1-TCA	**59**	**4.8**	**1500**	**1200**	2.7	**1200**	**670**	**3.3**	**2.2**	**20**	**9.8**
VC	<0.10	<0.10	<10	<10	<0.10	<10	<10	<0.10	<0.10	24	<0.10
MC	**12**	**0.8**	**480**	**410**	**0.48**	**760**	**310**	**2.3**	**33**	**180**	**730**
cis-1,2-DCE	<0.10	<0.10	<10	<10	<0.10	<10	<10	<0.10	<0.10	**41**	**25**

B5	60-61	70-71	80-81	90-91	100-101	110-111
1,1- DCE	**160**	**360**	**0.86**	**240**	**0.63**	**340**
1,1- DCA	**8.6**	<10	<0.10	**5.9**	<0.10	<10
TCE	<2.0[1]	<10	<0.10	**6.4**	<0.10	<10
PCE	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA
1,1,1-TCA	NA	NA	NA	NA	NA	NA
VC	NA	NA	NA	NA	NA	NA
MC	NA	NA	NA	NA	NA	NA
cis-1,2-DCE	NA	NA	NA	NA	NA	NA

B10	10-11	20-21	30-31	60-61	70-71	80-81	90-91	100-101	110-111
1,1- DCE	**64**	<0.10	**17**	**90**	**94**	**0.99**	**190**	**4.5**	**980**
1,1- DCA	<2.0	<0.10	**29**	**57**	**48**	**0.26**	**56**	**1.4**	**230**
TCE	<2.0	<0.10	<0.10	**3.8**	<10	<0.10	<2.0	**0.16**	**38**
PCE	**7.4**	<0.10	<0.10	**3.2**	<10	<0.10	<2.0	<0.10	**13**
Acetone	<2.0	**0.22**	<0.10	<1.0	**150**	**8**	**2.7**	**7.3**	**120**
1,1,1-TCA	**85**	**0.16**	**10**	**46**	**70**	**0.33**	**34**	**0.77**	**55**
VC	<2.0	<0.10	<0.10	<1.0	<10	<0.10	<2.0	<0.10	<10
MC	<2.0	<0.10	<0.10	<1.0	<10	<0.10	**74**	**1.1**	**570**
cis-1,2-DCE	**66**	<0.10	**5.9**	**8.3**	<10	<0.10	**9.6**	**0.18**	**38**

Figure 13
1994 Soil Gas Analytical Results from Four Corners Investigation at the Rinchem Facility

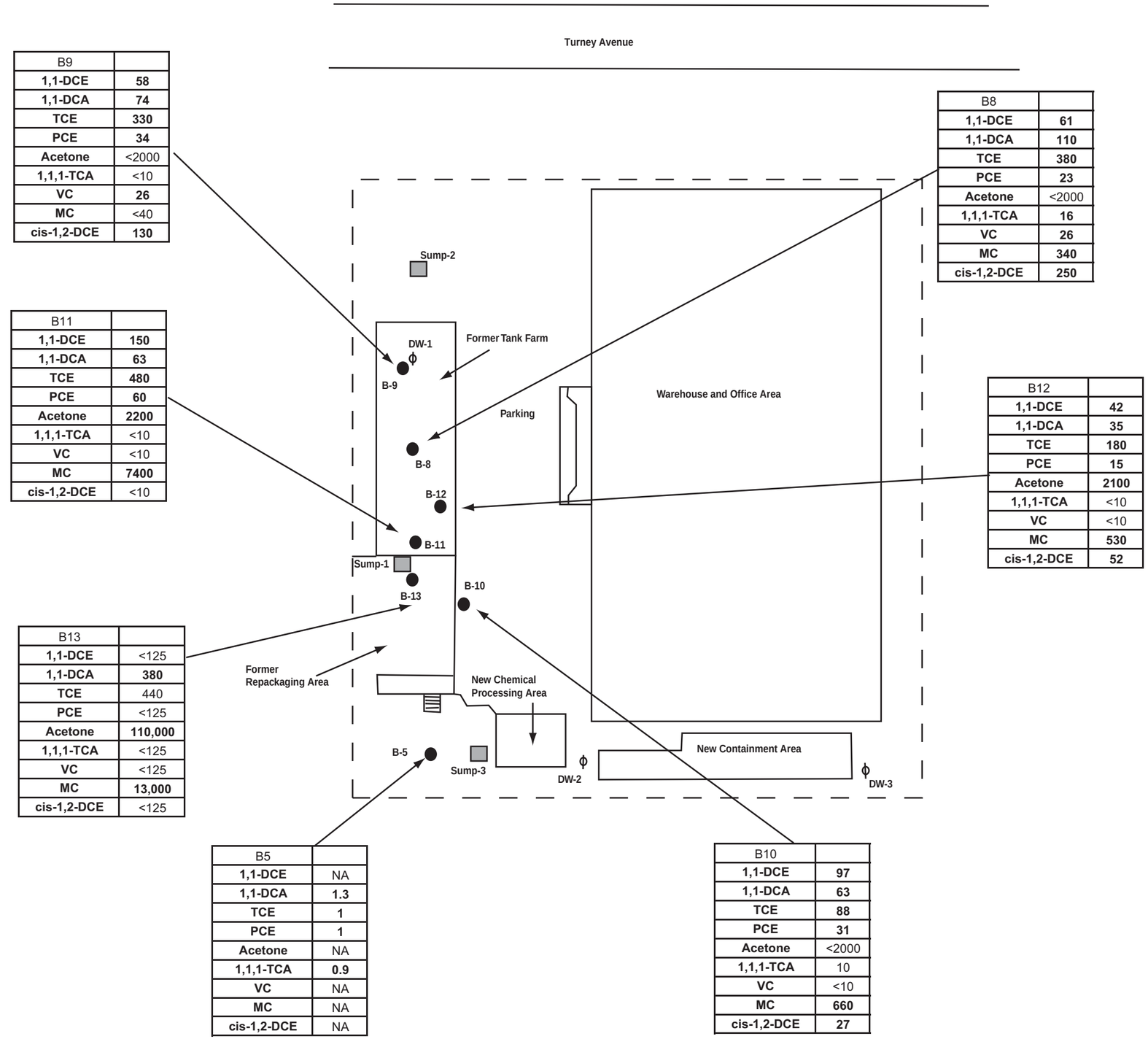
Legend

- ● Exploratory Boring (Four Corner's Oct.19-26, 1994)
- ▭ Sump
- ϕ Dry Well

NOTES: Results measured in µg/L.
1,1-DCE = 1,1-Dichloroethene
1,1-DCA = 1,1-Dichloroethane
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
VC = Vinyl Chloride
MC = Methylene Chloride
cis-1,2-DCE = cis-1,2-Dichloroethene
NA= Not Analyzed

Approximate Scale

0 30 60 feet



B9	
1,1-DCE	58
1,1-DCA	74
TCE	330
PCE	34
Acetone	<2000
1,1,1-TCA	<10
VC	26
MC	<40
cis-1,2-DCE	130

B8	
1,1-DCE	61
1,1-DCA	110
TCE	380
PCE	23
Acetone	<2000
1,1,1-TCA	16
VC	26
MC	340
cis-1,2-DCE	250

B11	
1,1-DCE	150
1,1-DCA	63
TCE	480
PCE	60
Acetone	2200
1,1,1-TCA	<10
VC	<10
MC	7400
cis-1,2-DCE	<10

B12	
1,1-DCE	42
1,1-DCA	35
TCE	180
PCE	15
Acetone	2100
1,1,1-TCA	<10
VC	<10
MC	530
cis-1,2-DCE	52

B13	
1,1-DCE	<125
1,1-DCA	380
TCE	440
PCE	<125
Acetone	110,000
1,1,1-TCA	<125
VC	<125
MC	13,000
cis-1,2-DCE	<125

B5	
1,1-DCE	NA
1,1-DCA	1.3
TCE	1
PCE	1
Acetone	NA
1,1,1-TCA	0.9
VC	NA
MC	NA
cis-1,2-DCE	NA

B10	
1,1-DCE	97
1,1-DCA	63
TCE	88
PCE	31
Acetone	<2000
1,1,1-TCA	10
VC	<10
MC	660
cis-1,2-DCE	27

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Figure 14
1994 HydroPunch® Groundwater Analytical Results from Four Corner's Investigation at the Rinchem Facility

Legend

- ● Exploratory Boring (Four Corner's Oct. 18-25,1994)
- ▭ Sump
- ϕ Dry Well

NOTES: Results measured in µg/L.
1,1-DCE = 1,1-Dichloroethene
1,1-DCA = 1,1-Dichloroethane
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
VC = Vinyl Chloride
MC = Methylene Chloride
cis-1,2-DCE = cis-1,2-Dichloroethene
NA = Not Analyzed For

Approximate Scale

0 30 60 feet

LFR

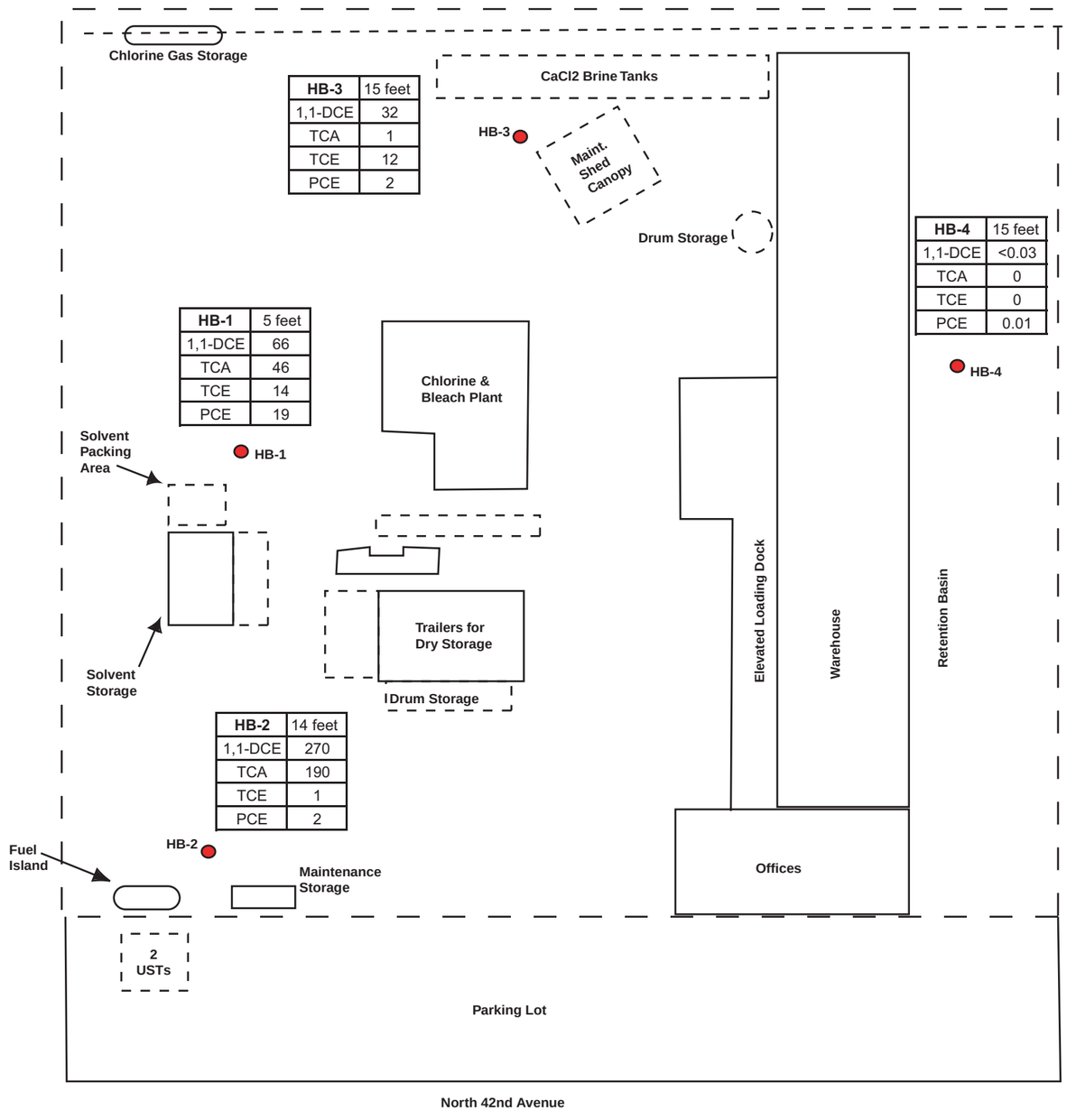

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Figure 15
VOCs Detected in
Soil Gas Sampling from
ADEQ's 1989 Site Inspection
Hill Brothers Facility

Legend

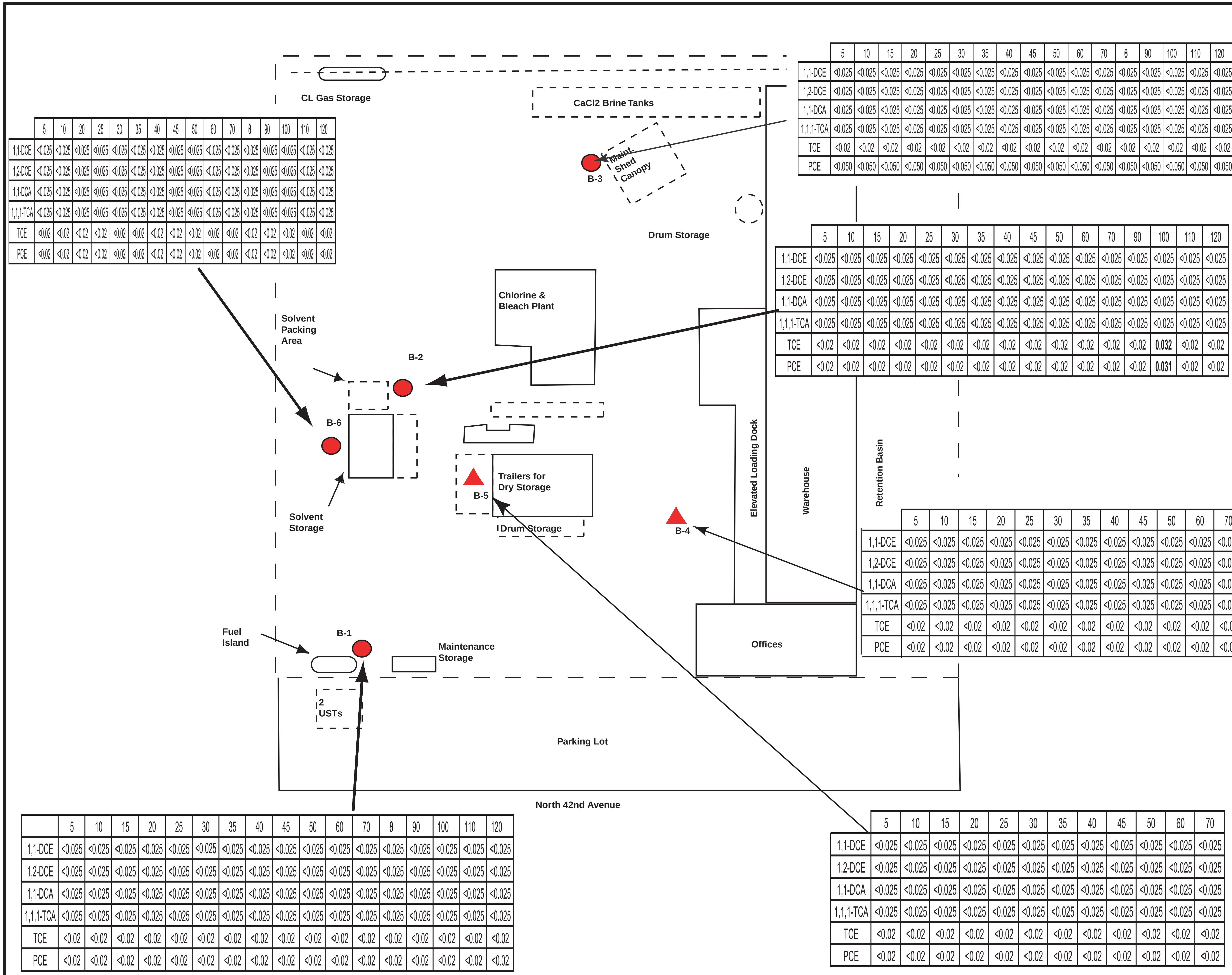
Shallow Borehole (ADEQ, 1989)

NOTES: Results measured in µg/L.

Approximate Scale

0 40 80 120 Feet

LFR



	5	10	20	25	30	35	40	45	50	60	70	8	90	100	110	120
1,1-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,2-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1-DCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1,1-TCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

	5	10	15	20	25	30	35	40	45	50	60	70	8	90	100	110	120
1,1-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,2-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1-DCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1,1-TCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PCE	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

	5	10	15	20	25	30	35	40	45	50	60	70	90	100	110	120
1,1-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,2-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1-DCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1,1-TCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.032**	<0.02	<0.02
PCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.031**	<0.02	<0.02

	5	10	15	20	25	30	35	40	45	50	60	70
1,1-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,2-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1-DCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1,1-TCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

	5	10	15	20	25	30	35	40	45	50	60	70
1,1-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,2-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1-DCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1,1-TCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

	5	10	15	20	25	30	35	40	45	50	60	70	8	90	100	110	120
1,1-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,2-DCE	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1-DCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
1,1,1-TCA	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
TCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PCE	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Figure 16
VOCs Detected in Soil Borings from EMCON's 1996 Preliminary Site Characterization
Hill Brothers Facility

Legend

Deep Exploratory Borehole (EMCON, 1997)

Intermediate Exploratory Boring (EMCON, 1997)

108 Feet below ground surface

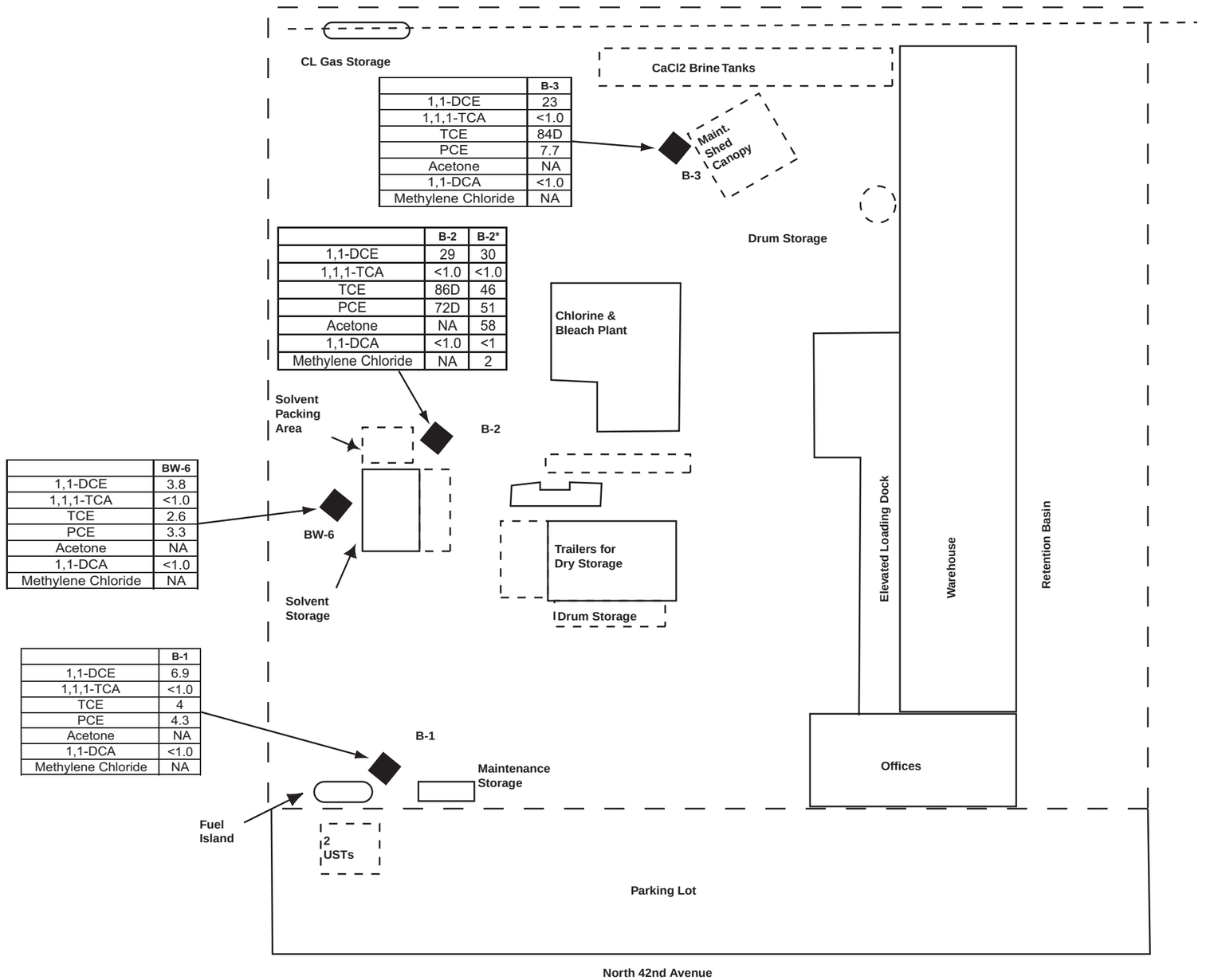
NOTES: Results measured in mg/kg.

N

Approximate Scale

0 40 80 120 Feet

LFR



	B-3
1,1-DCE	23
1,1,1-TCA	<1.0
TCE	84D
PCE	7.7
Acetone	NA
1,1-DCA	<1.0
Methylene Chloride	NA

	B-2	B-2*
1,1-DCE	29	30
1,1,1-TCA	<1.0	<1.0
TCE	86D	46
PCE	72D	51
Acetone	NA	58
1,1-DCA	<1.0	<1
Methylene Chloride	NA	2

	BW-6
1,1-DCE	3.8
1,1,1-TCA	<1.0
TCE	2.6
PCE	3.3
Acetone	NA
1,1-DCA	<1.0
Methylene Chloride	NA

	B-1
1,1-DCE	6.9
1,1,1-TCA	<1.0
TCE	4
PCE	4.3
Acetone	NA
1,1-DCA	<1.0
Methylene Chloride	NA

Figure 17
VOCs Detected with Hydropunch® during EMCON's 1996 Preliminary Site Characterization
Hill Brothers Facility

Legend

◆ Hydropunch® Borehole (Weston, 1998)

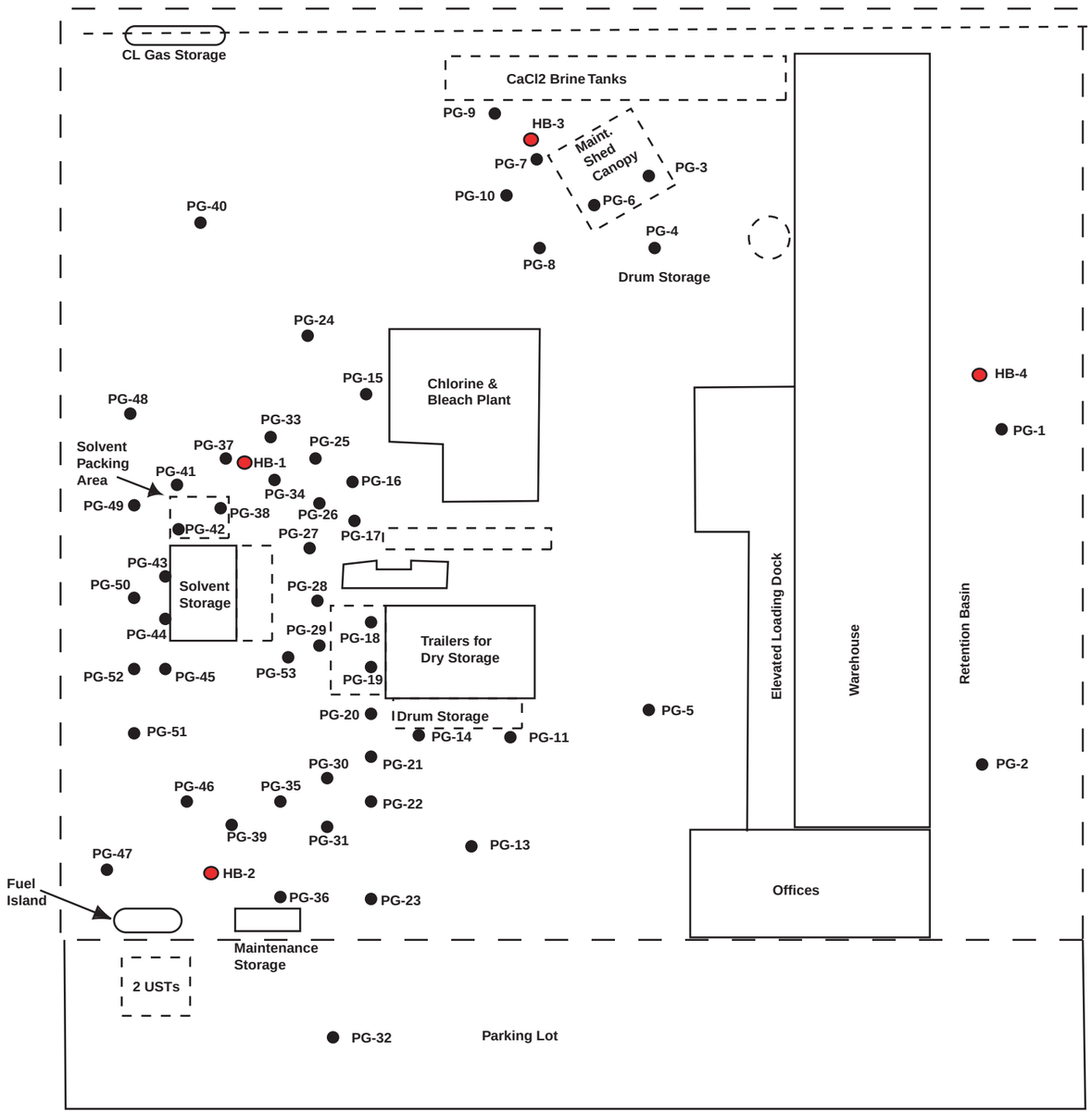
8010/8020 EPA Method 8010/8020
* 8260 EPA Method 8260
D Compound analyzed at a greater dilution

NOTES:

Results measured in µg/L. Two samples collected from B-2, but analyzed by different methods.

Approximate Scale

0 40 80 120 Feet



ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Figure 18
Passive Soil Gas Sampling Locations from Geomatrix's 2003 Investigation
Hill Brothers Facility

Legend

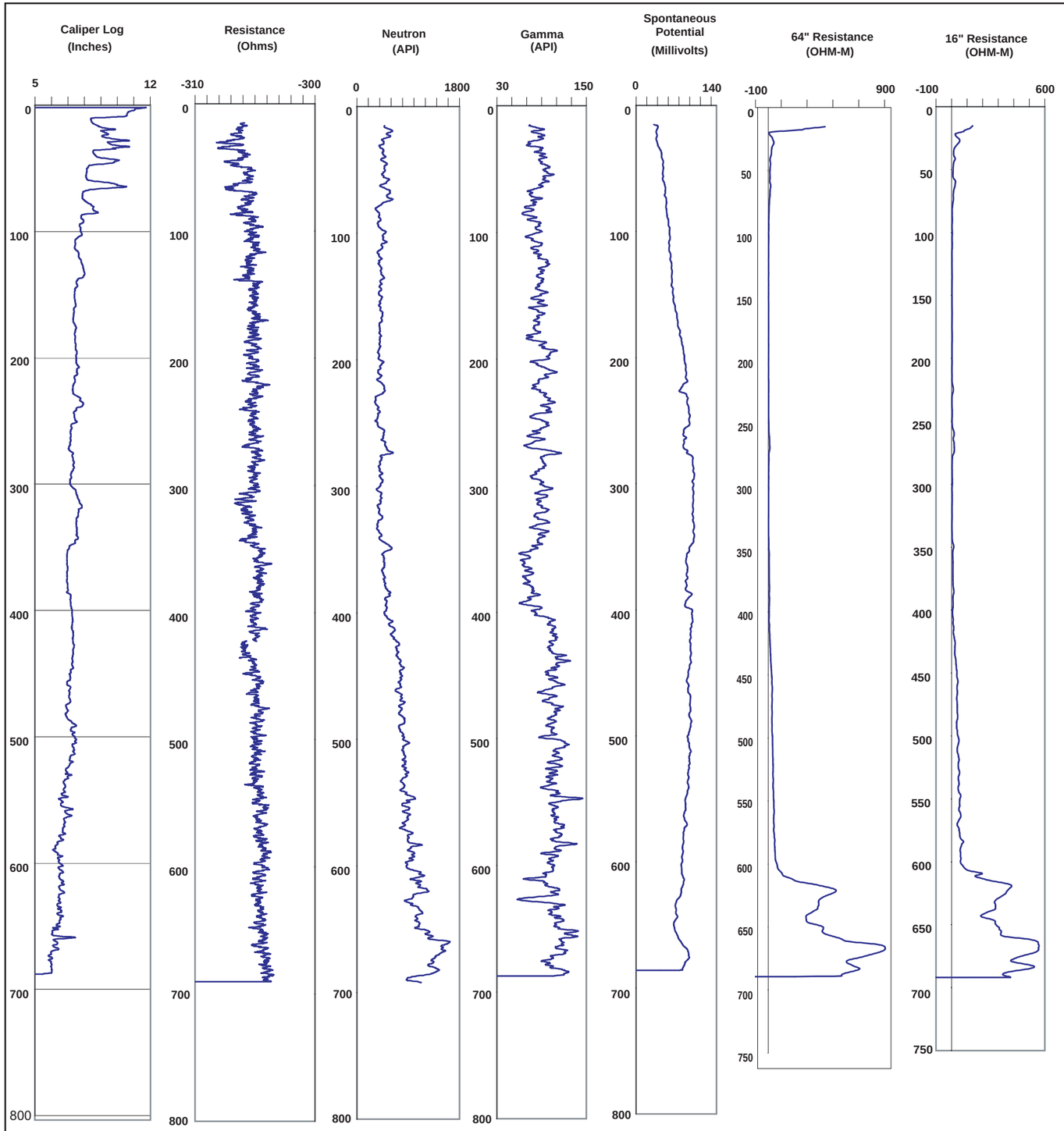
- Passive Soil Gas Sampling Location (Geomatrix, 2003)
- Shallow Borehole (ADEQ, 1989)

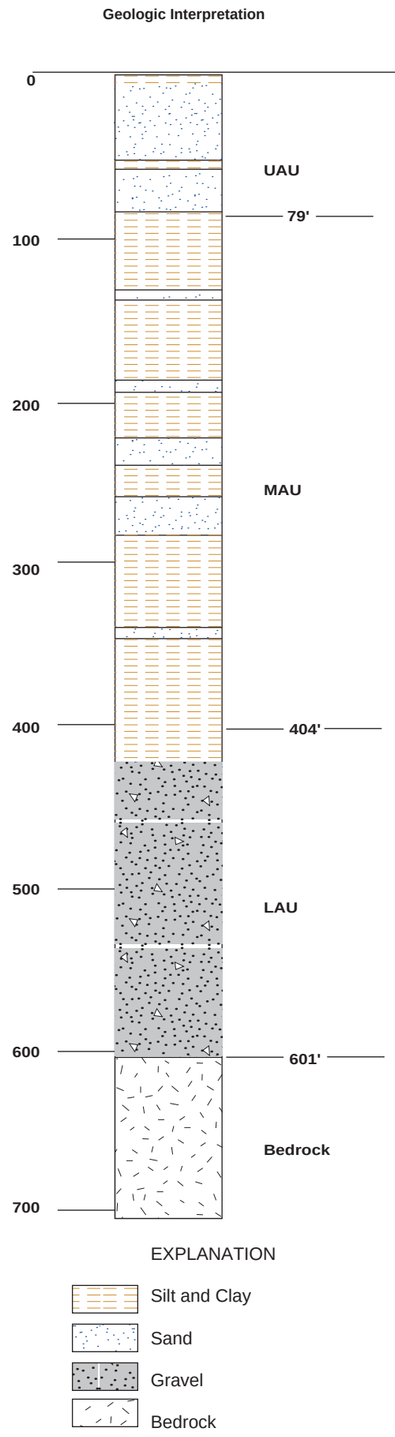
Approximate Scale

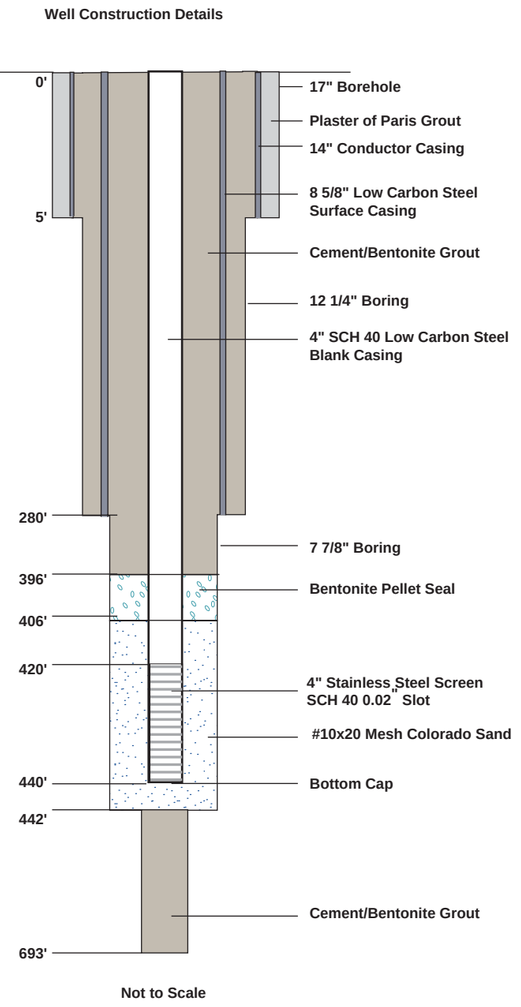
0 40 80 120 Feet

Source: Geomatrix's "Passive Soil Fas Survey, Hill Brothers Chemical Company", July 2003

LFR







Not to Scale

EXPLANATION

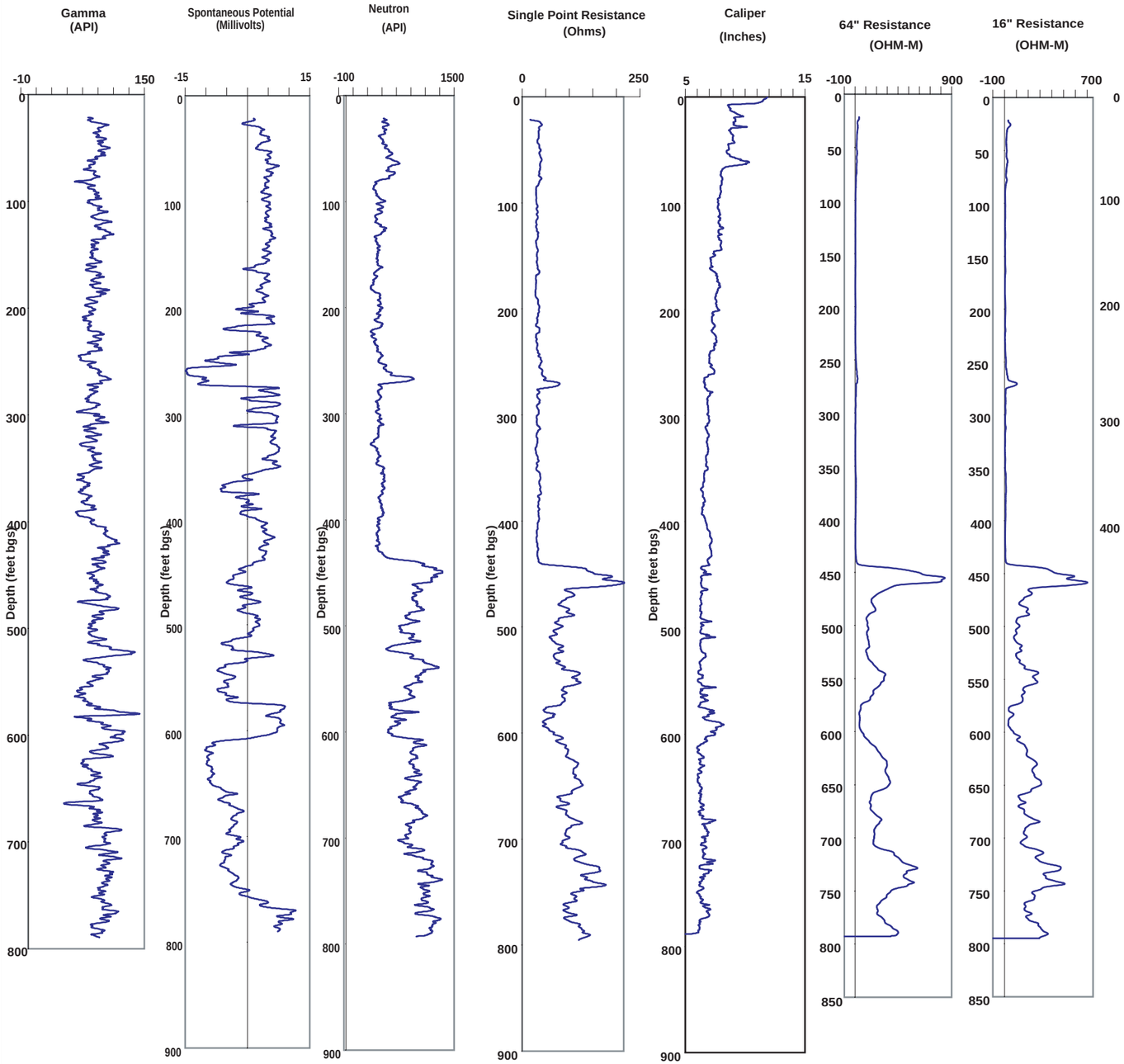
- Silt and Clay
- Sand
- Gravel
- Bedrock

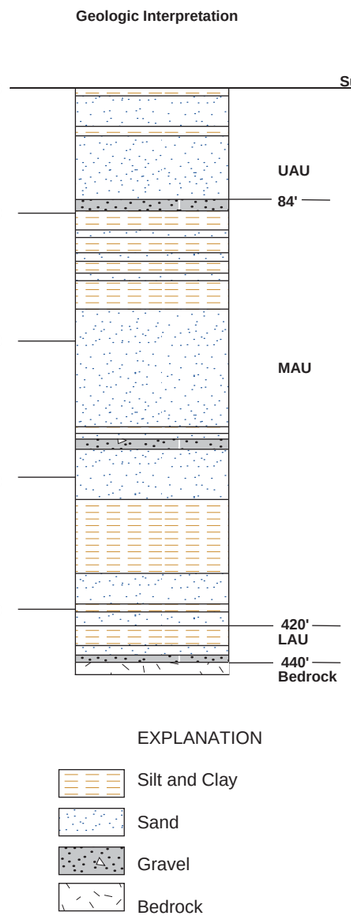
Arizona Department of Environmental Quality

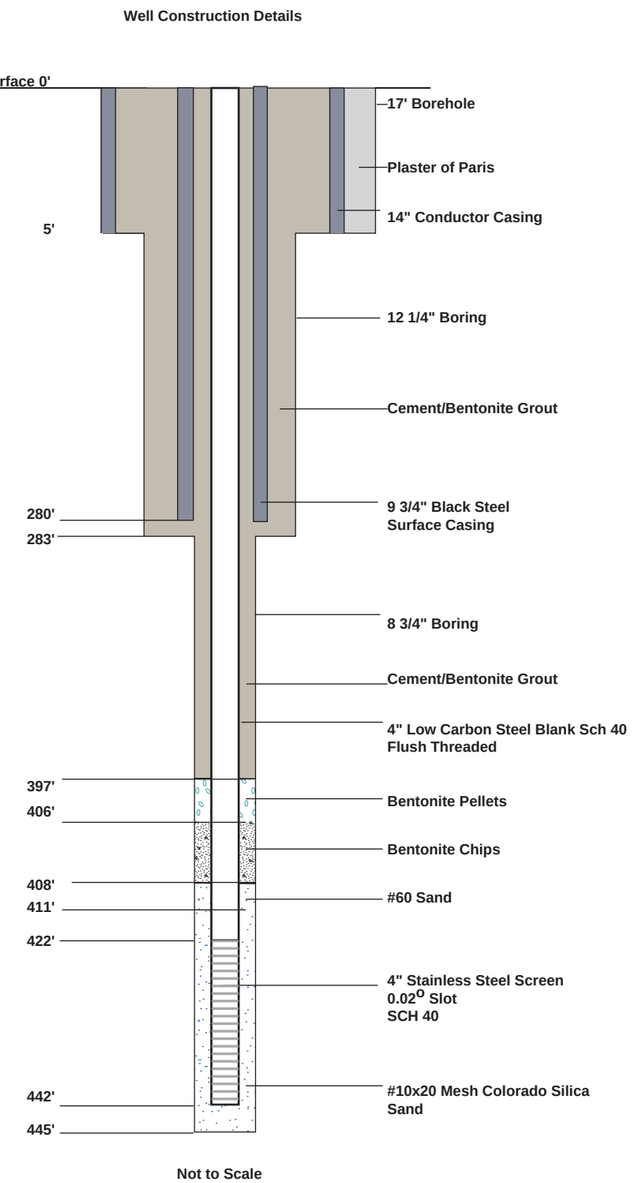
Geophysical Logs, Geologic Interpretation, and Well Construction Diagram for WCP-33L
WCP North Plume Site
Phoenix, Arizona
Figure 19
Project No. 6854

6854-128_053001DXH/meg

LFR







Arizona Department of Environmental Quality

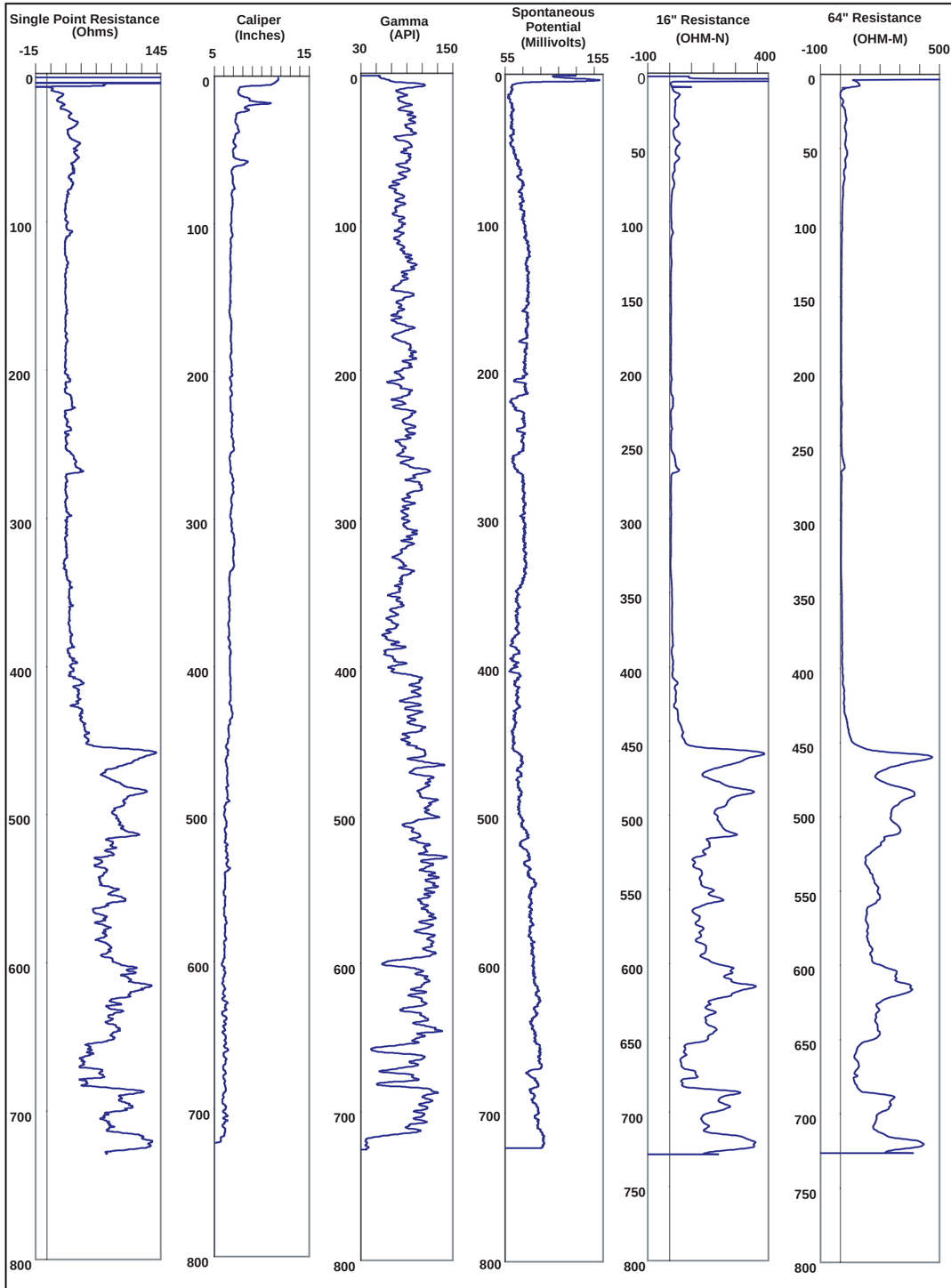
Geophysical Logs, Geologic Interpretation, and Well Construction Diagram for WCP-34L
WCP North Plume Site
Phoenix, Arizona

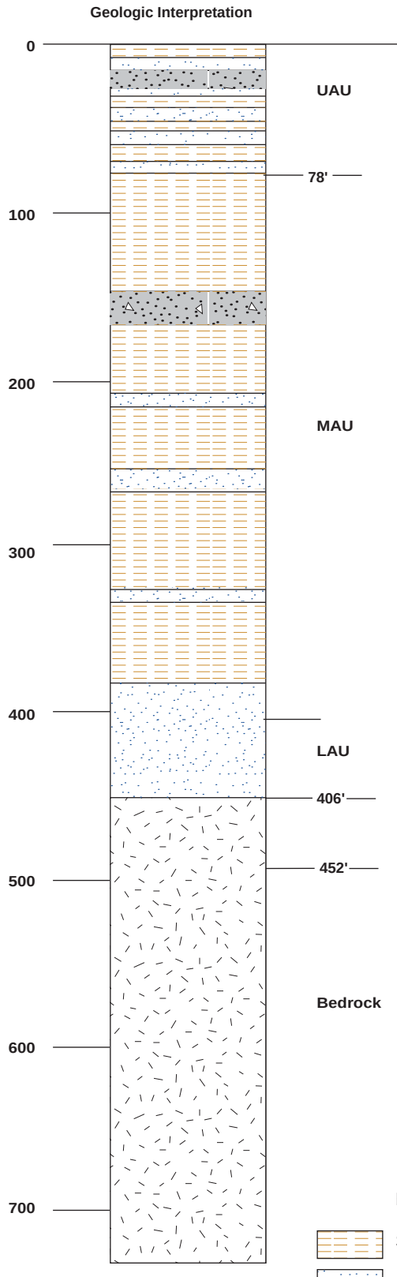
Figure 20

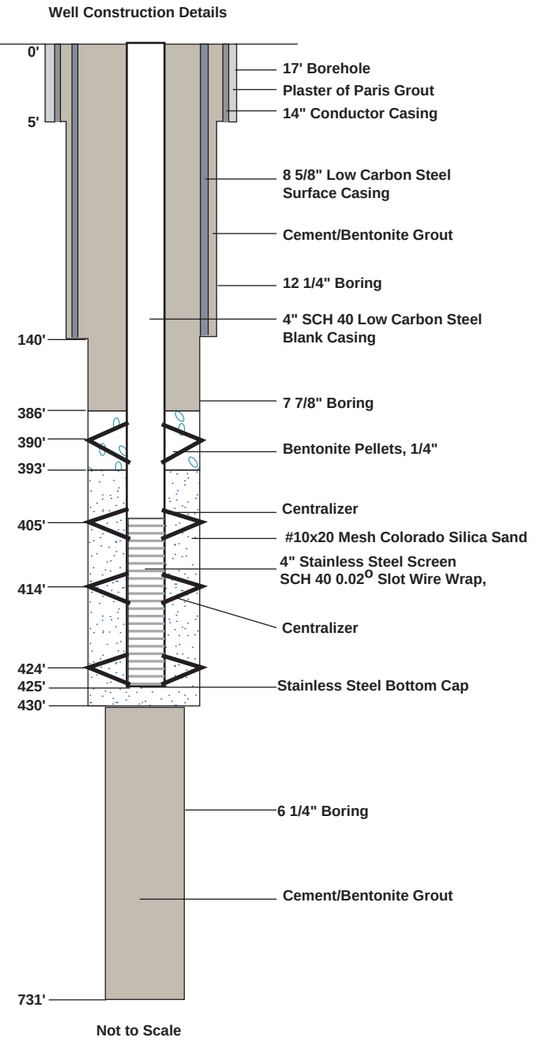
Project No. 6854

6854-129_053001DXH/meg

LFR







EXPLANATION

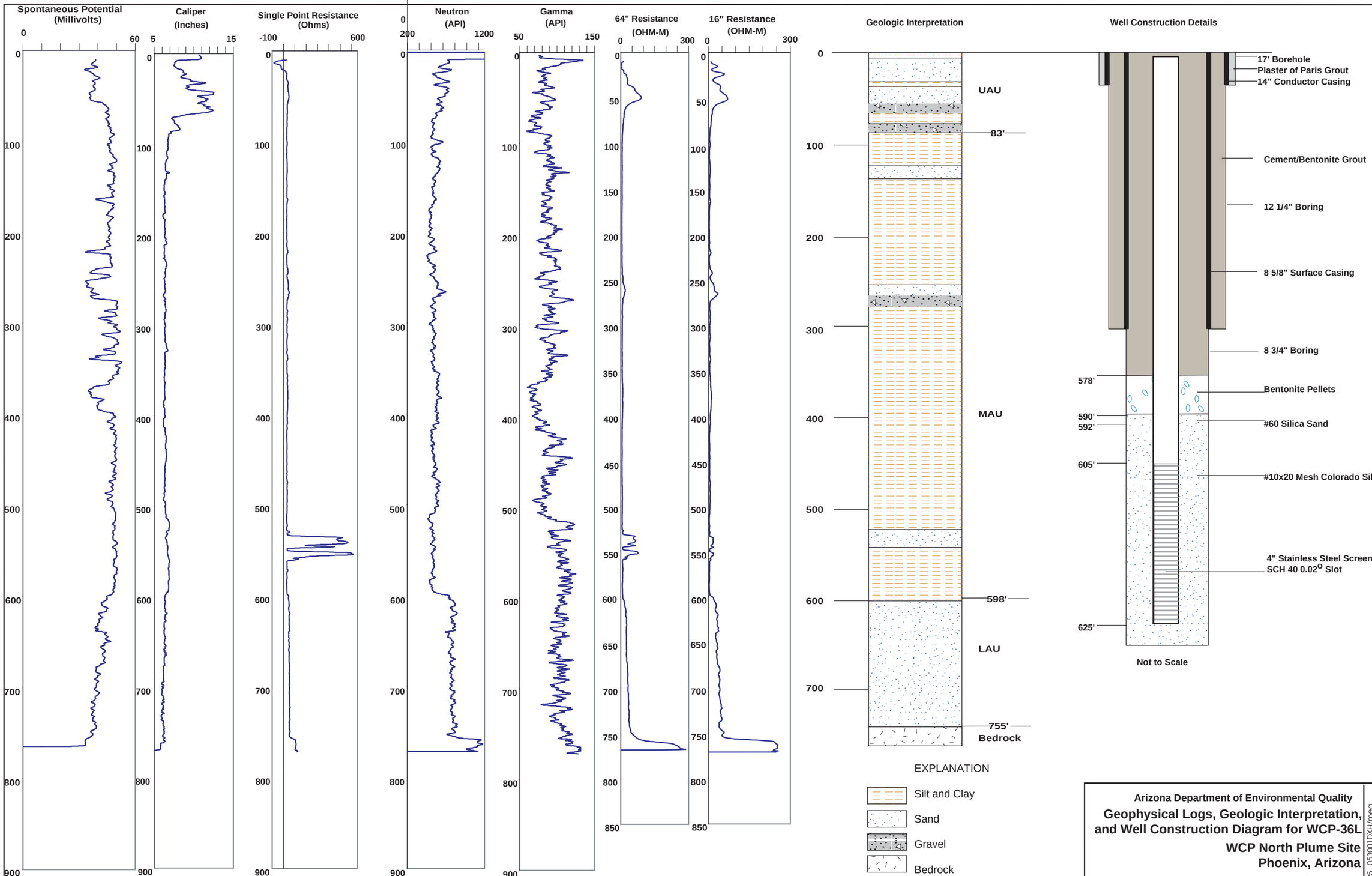
- Silt and Clay
- Sand
- Gravel
- Bedrock

Arizona Department of Environmental Quality

Geophysical Logs, Geologic Interpretation, and Well Construction Diagram for WCP-35L
WCP North Plume Site
Phoenix, Arizona
Figure 21
Project No. 6854

6854-127_053001DXH/meg

LFR



Arizona Department of Environmental Quality

Geophysical Logs, Geologic Interpretation, and Well Construction Diagram for WCP-36L

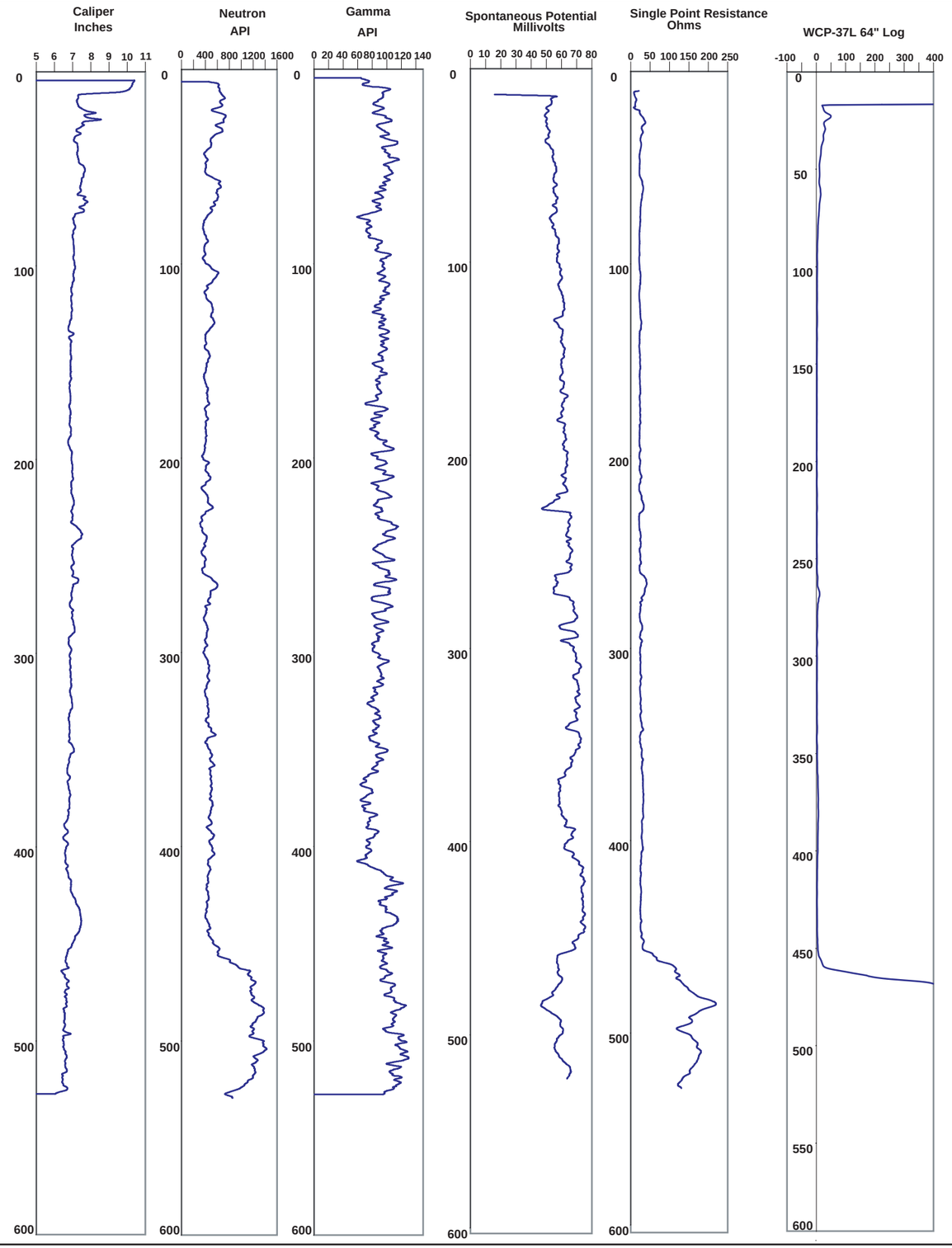
WCP North Plume Site
Phoenix, Arizona

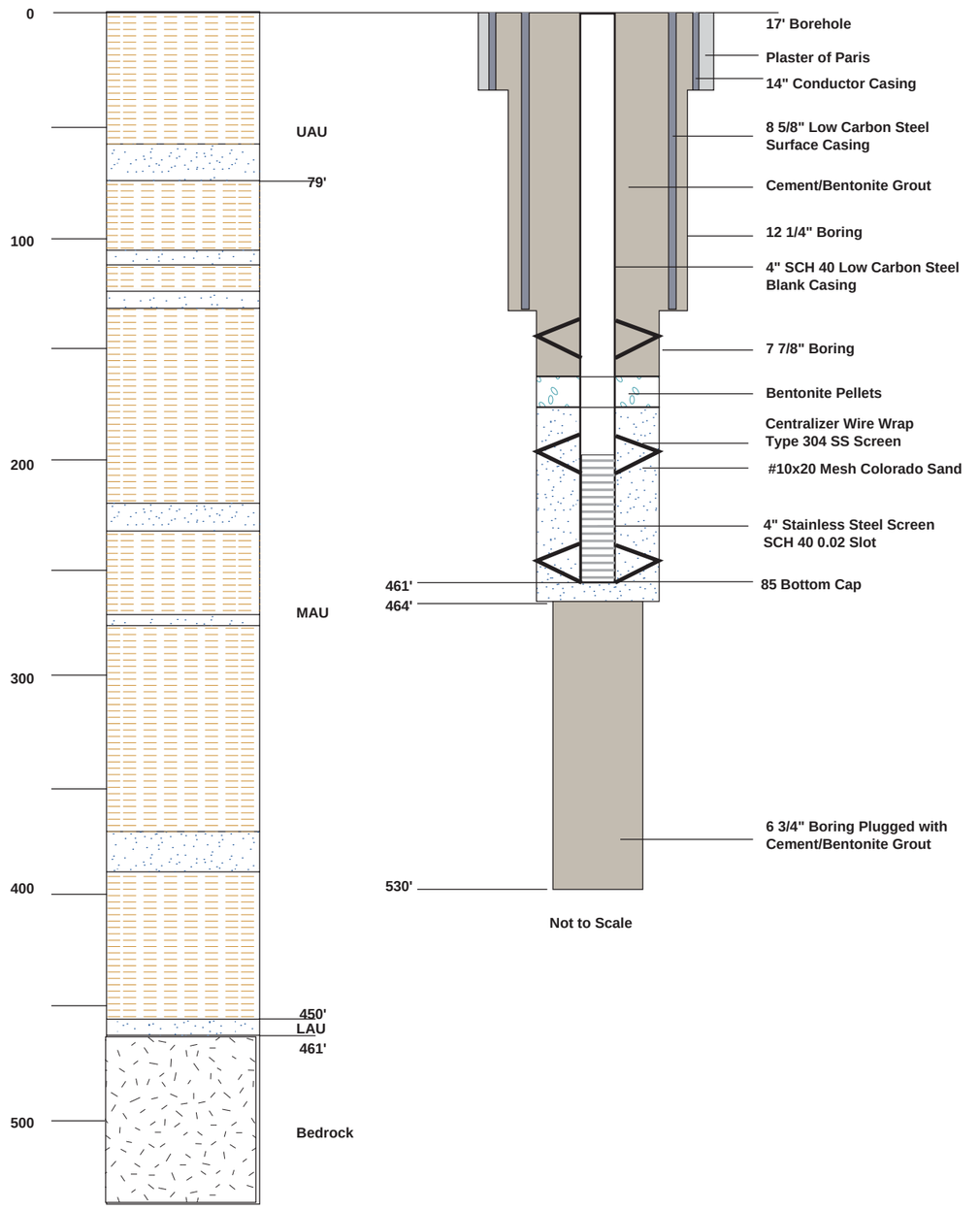
Figure 22

Project No. 6854

6854-125_053001DXH/meg

LFR





EXPLANATION

- Silt and Clay
- Sand
- Gravel
- Bedrock

Arizona Department of Environmental Quality

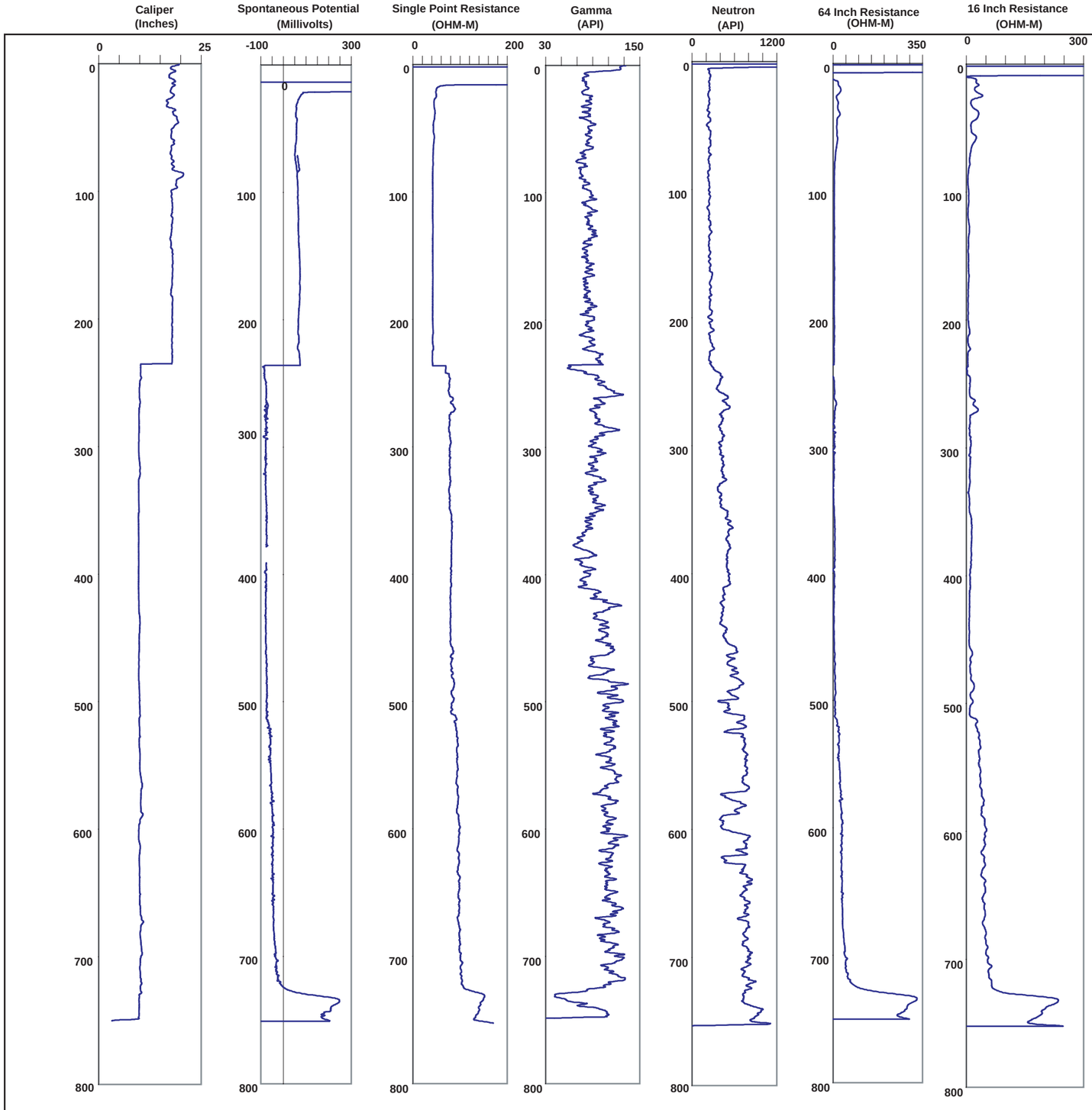
Geophysical Logs, Geologic Interpretation, and Well Construction Diagram for WCP-37L
WCP North Plume Site
Phoenix, Arizona

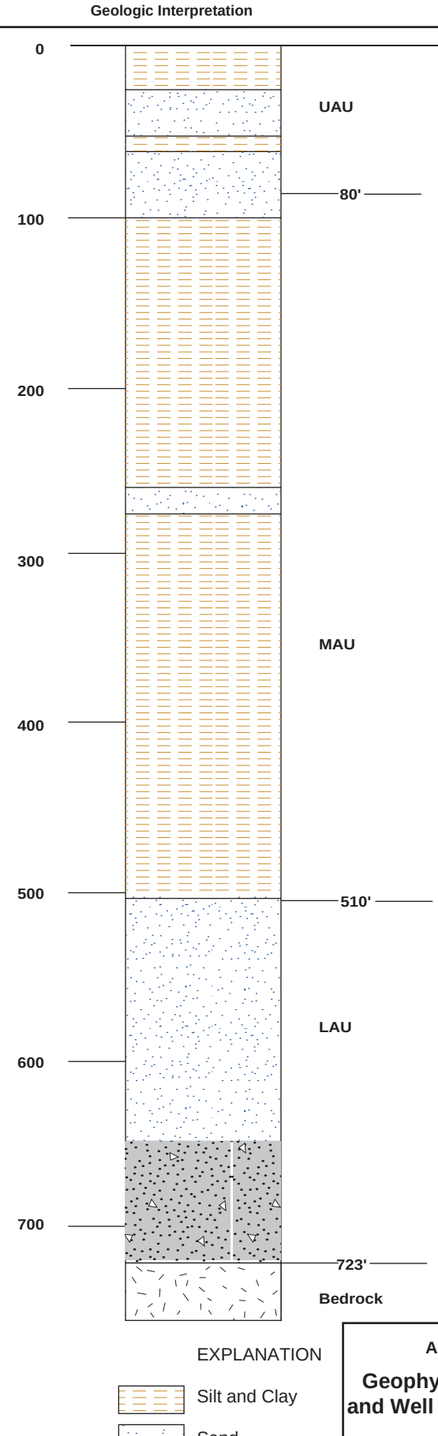
Figure 23

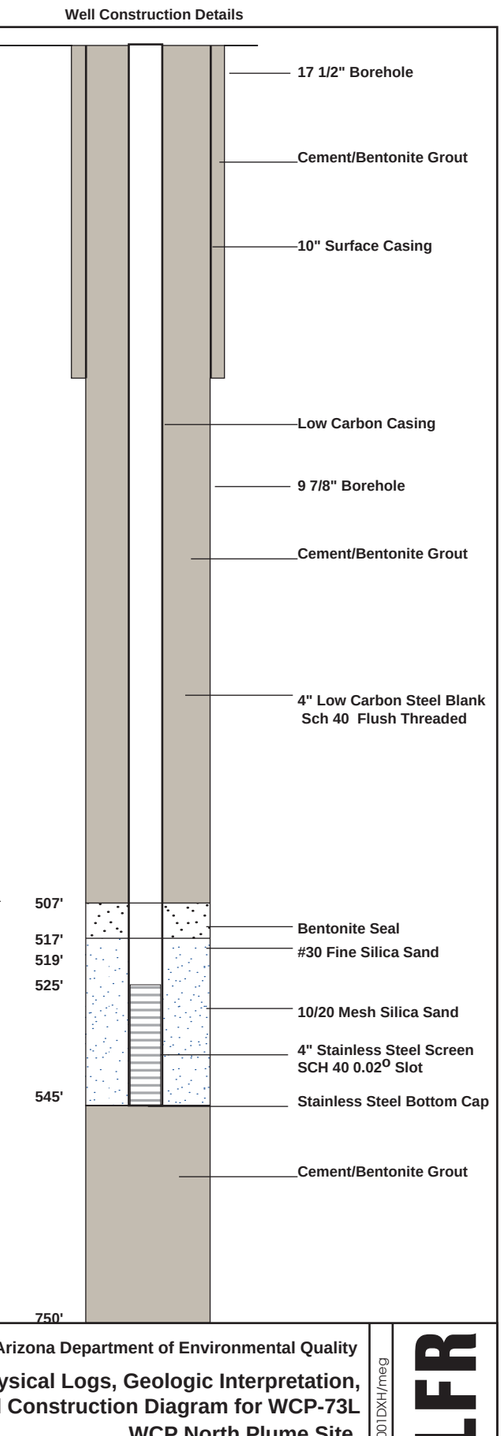
Project No. 6854

6854-125_053001DXH/meg

LFR







EXPLANATION

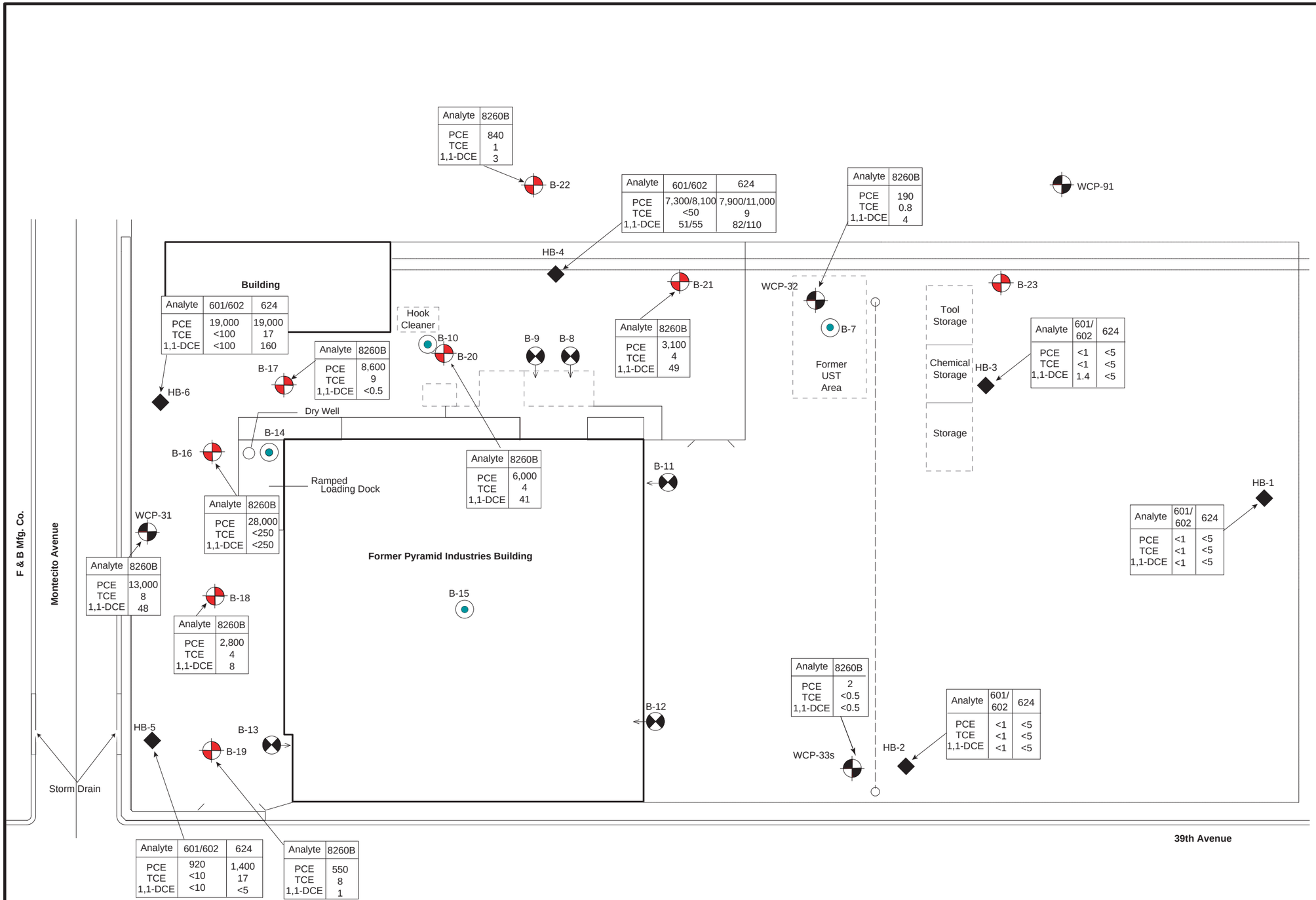
- Silt and Clay
- Sand
- Gravel
- Bedrock

Arizona Department of Environmental Quality

Geophysical Logs, Geologic Interpretation, and Well Construction Diagram for WCP-73L
WCP North Plume Site
Phoenix, Arizona
Figure 24
Project No. 6854

6854-124_053001DXH/meg

LFR



ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Figure 25
Hydropunch® Groundwater Results at the Pyramid Industries Facility

Legend

- Dry Well
- Shallow Borehole (Weston, 1998)
- Angle Borehole/Direction (Weston, 1998)
- Hydropunch® Borehole (Weston, 1998)
- Groundwater Monitor Well (Weston, 1999/2001)
- Deep Borehole with Hydropunch® (Weston, 1999/2001)
- Historical Operation Locations
- Overhead Electrical

601/602 EPA Method 601/602
624 EPA Method 624
8260B EPA Method 8260B

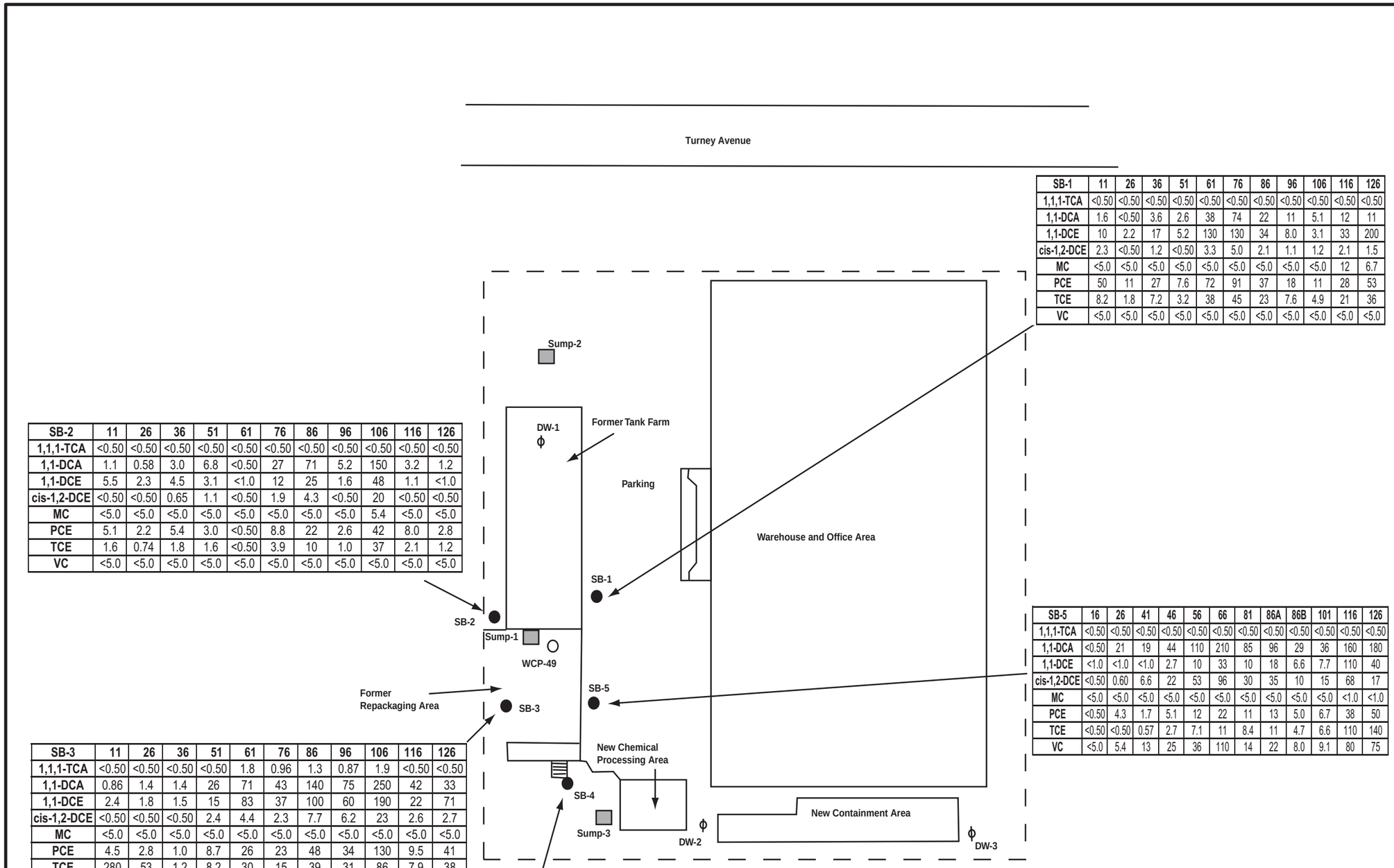
NOTES:

Results measured in µg/L. Two results at same depth indicate duplicate sample. Hydropunch samples were not collected from B-23 or WCP-91.

Approximate Scale
1 inch = 40 feet

0 20 40 80

LFR



SB-1	11	26	36	51	61	76	86	96	106	116	126
1,1,1-TCA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-DCA	1.6	<0.50	3.6	2.6	38	74	22	11	5.1	12	11
1,1-DCE	10	2.2	17	5.2	130	130	34	8.0	3.1	33	200
cis-1,2-DCE	2.3	<0.50	1.2	<0.50	3.3	5.0	2.1	1.1	1.2	2.1	1.5
MC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	12	6.7
PCE	50	11	27	7.6	72	91	37	18	11	28	53
TCE	8.2	1.8	7.2	3.2	38	45	23	7.6	4.9	21	36
VC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

SB-2	11	26	36	51	61	76	86	96	106	116	126
1,1,1-TCA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-DCA	1.1	0.58	3.0	6.8	<0.50	27	71	5.2	150	3.2	1.2
1,1-DCE	5.5	2.3	4.5	3.1	<1.0	12	25	1.6	48	1.1	<1.0
cis-1,2-DCE	<0.50	<0.50	0.65	1.1	<0.50	1.9	4.3	<0.50	20	<0.50	<0.50
MC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.4	<5.0	<5.0
PCE	5.1	2.2	5.4	3.0	<0.50	8.8	22	2.6	42	8.0	2.8
TCE	1.6	0.74	1.8	1.6	<0.50	3.9	10	1.0	37	2.1	1.2
VC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

SB-5	16	26	41	46	56	66	81	86A	86B	101	116	126
1,1,1-TCA	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-DCA	<0.50	21	19	44	110	210	85	96	29	36	160	180
1,1-DCE	<1.0	<1.0	<1.0	2.7	10	33	10	18	6.6	7.7	110	40
cis-1,2-DCE	<0.50	0.60	6.6	22	53	96	30	35	10	15	68	17
MC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<1.0	<1.0
PCE	<0.50	4.3	1.7	5.1	12	22	11	13	5.0	6.7	38	50
TCE	<0.50	<0.50	0.57	2.7	7.1	11	8.4	11	4.7	6.6	110	140
VC	<5.0	5.4	13	25	36	110	14	22	8.0	9.1	80	75

SB-3	11	26	36	51	61	76	86	96	106	116	126
1,1,1-TCA	<0.50	<0.50	<0.50	<0.50	1.8	0.96	1.3	0.87	1.9	<0.50	<0.50
1,1-DCA	0.86	1.4	1.4	26	71	43	140	75	250	42	33
1,1-DCE	2.4	1.8	1.5	15	83	37	100	60	190	22	71
cis-1,2-DCE	<0.50	<0.50	<0.50	2.4	4.4	2.3	7.7	6.2	23	2.6	2.7
MC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
PCE	4.5	2.8	1.0	8.7	26	23	48	34	130	9.5	41
TCE	280	53	1.2	8.2	30	15	39	31	86	7.9	38
VC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

SB-4	6	11	16	21	26	31	36	41	46	51	56	61	66	71	76	81	86	91	96	101	106	111	116	121	126
1,1,1-TCA	<0.50	19	110	320	450	280	34	58	63	120	11	30	94	17	<0.50	5.4	8.3	<5.0	<2.5	<2.5	<0.50	<0.50	<0.50	<0.50	3.0
1,1-DCA	<0.50	3.3	11	37	64	18	5.5	12	12	52	5.2	9.8	21	8.7	<0.50	2.5	8.8	360	<2.5	5.4	6.5	1.0	30	6.0	11
1,1-DCE	<1.0	<1.0	<1.0	7.0	34	4.7	<1.0	3.7	3.1	6.9	<1.0	2.6	5.5	<5.0	<1.0	<1.0	1.2	95	<5.0	<5.0	<1.0	<1.0	1.8	<1.0	<1.0
cis-1,2-DCE	<0.50	2.2	82	80	76	32	9.2	17	19	59	6.6	11	21	12	<0.50	6.2	13	280	<2.5	<2.5	4.8	<0.50	23	3.5	6.4
MC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	13	<5.0	<5.0	<5.0	<25	<5.0	<5.0	<5.0	<50	<25	<25	<5.0	<5.0	<5.0	<5.0	<5.0
PCE	2.1	39	59	170	190	320	28	30	77	45	11	33	84	9.5	2.3	8.2	20	11	<2.5	8.4	1.4	<0.50	1.3	<0.50	2.7
TCE	<0.50	0.78	5.2	23	54	38	5.1	8.6	15	21	2.3	6.3	12	<2.5	<0.50	<0.50	0.99	<5.0	<2.5	3.1	0.51	<0.50	0.64	<0.50	0.89
VC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<25	<5.0	<5.0	<5.0	<50	<25	<25	<5.0	<5.0	<5.0	<5.0	<5.0

Figure 26
Soil Gas Analytical Results from Weston's Investigation at the Rinchem Facility

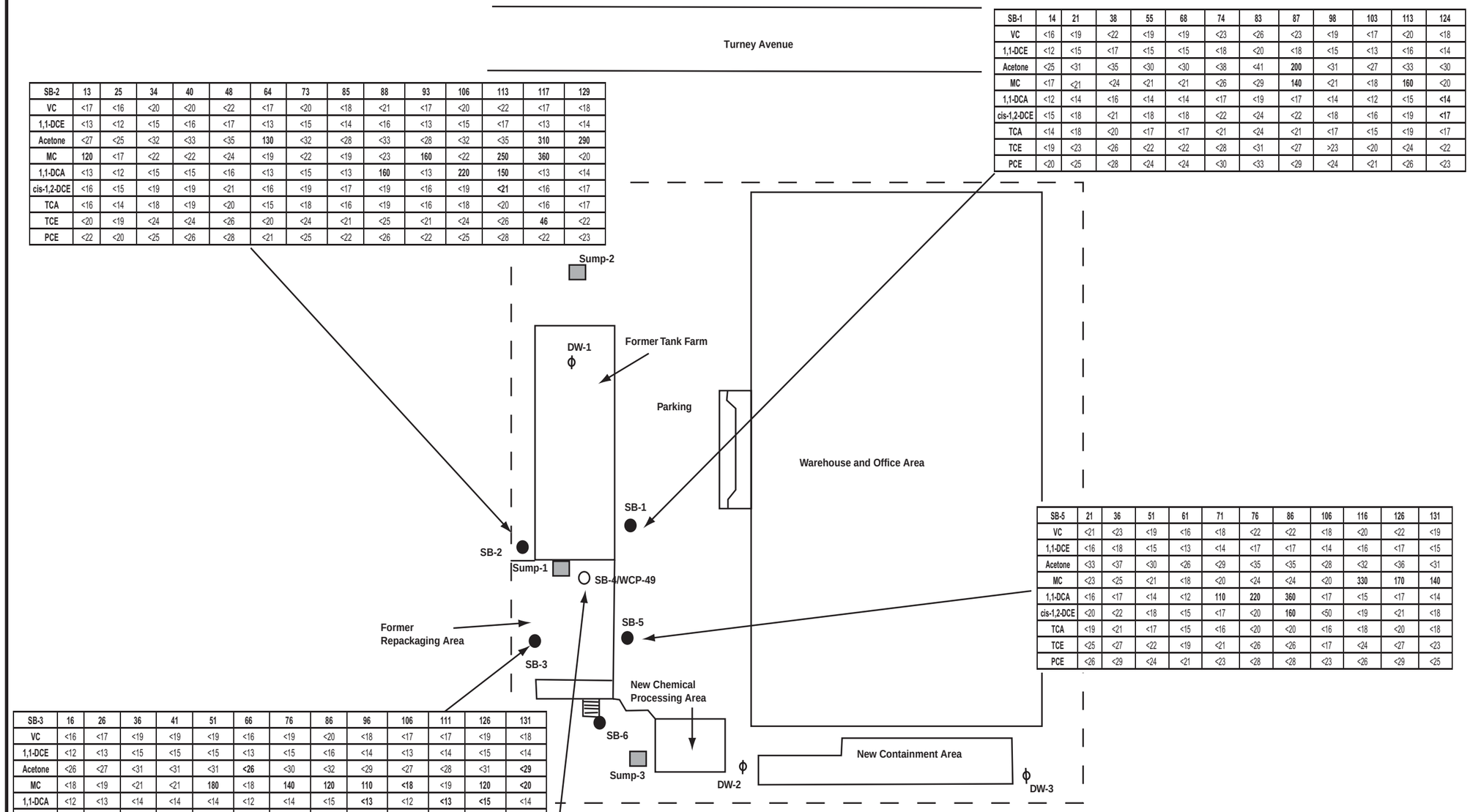
Legend

- ● Soil Gas Boring (Weston, May 2002)
- ▭ Sump
- ϕ Dry

NOTES:
Results measured in ug/L.
1,1-DCE = 1,1-Dichloroethene
1,1-DCA = 1,1-Dichloroethane
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
VC = Vinyl Chloride
MC = Methylene Chloride
cis-1,2-DCE = cis-1,2-Dichloroethene
NA = Not Analyzed For

N

Approximate Scale
0 30 60 feet



SB-2	13	25	34	40	48	64	73	85	88	93	106	113	117	129
VC	<17	<16	<20	<20	<22	<17	<20	<18	<21	<17	<20	<22	<17	<18
1,1-DCE	<13	<12	<15	<16	<17	<13	<15	<14	<16	<13	<15	<17	<13	<14
Acetone	<27	<25	<32	<33	<35	**130**	<32	<28	<33	<28	<32	<35	**310**	**290**
MC	**120**	<17	<22	<22	<24	<19	<22	<19	<23	**160**	<22	**250**	**360**	<20
1,1-DCA	<13	<12	<15	<15	<16	<13	<15	<13	**160**	<13	**220**	**150**	<13	<14
cis-1,2-DCE	<16	<15	<19	<19	<21	<16	<19	<17	<19	<16	<19	**<21**	<16	<17
TCA	<16	<14	<18	<19	<20	<15	<18	<16	<19	<16	<18	<20	<16	<17
TCE	<20	<19	<24	<24	<26	<20	<24	<21	<25	<21	<24	<26	**46**	<22
PCE	<22	<20	<25	<26	<28	<21	<25	<22	<26	<22	<25	<28	<22	<23

SB-1	14	21	38	55	68	74	83	87	98	103	113	124
VC	<16	<19	<22	<19	<19	<23	<26	<23	<19	<17	<20	<18
1,1-DCE	<12	<15	<17	<15	<15	<18	<20	<18	<15	<13	<16	<14
Acetone	<25	<31	<35	<30	<30	<38	<41	**200**	<31	<27	<33	<30
MC	<17	<21	<24	<21	<21	<26	<29	**140**	<21	<18	**160**	<20
1,1-DCA	<12	<14	<16	<14	<14	<17	<19	<17	<14	<12	<15	**<14**
cis-1,2-DCE	<15	<18	<21	<18	<18	<22	<24	<22	<18	<16	<19	**<17**
TCA	<14	<18	<20	<17	<17	<21	<24	<21	<17	<15	<19	<17
TCE	<19	<23	<26	<22	<22	<28	<31	<27	>23	<20	<24	<22
PCE	<20	<25	<28	<24	<24	<30	<33	<29	<24	<21	<26	<23

SB-5	21	36	51	61	71	76	86	106	116	126	131
VC	<21	<23	<19	<16	<18	<22	<22	<18	<20	<22	<19
1,1-DCE	<16	<18	<15	<13	<14	<17	<17	<14	<16	<17	<15
Acetone	<33	<37	<30	<26	<29	<35	<35	<28	<32	<36	<31
MC	<23	<25	<21	<18	<20	<24	<24	<20	**330**	**170**	**140**
1,1-DCA	<16	<17	<14	<12	**110**	**220**	**360**	<17	<15	<17	<14
cis-1,2-DCE	<20	<22	<18	<15	<17	<20	**160**	<50	<19	<21	<18
TCA	<19	<21	<17	<15	<16	<20	<20	<16	<18	<20	<18
TCE	<25	<27	<22	<19	<21	<26	<26	<17	<24	<27	<23
PCE	<26	<29	<24	<21	<23	<28	<28	<23	<26	<29	<25

SB-3	16	26	36	41	51	66	76	86	96	106	111	126	131
VC	<16	<17	<19	<19	<19	<16	<19	<20	<18	<17	<17	<19	<18
1,1-DCE	<12	<13	<15	<15	<15	<13	<15	<16	<14	<13	<14	<15	<14
Acetone	<26	<27	<31	<31	<31	**<26**	<30	<32	<29	<27	<28	<31	**<29**
MC	<18	<19	<21	<21	**180**	<18	**140**	**120**	**110**	**<18**	<19	**120**	**<20**
1,1-DCA	<12	<13	<14	<14	<14	<12	<14	<15	**<13**	<12	**<13**	**<15**	<14
cis-1,2-DCE	<15	<16	<18	<18	<18	<15	<18	<19	<17	<16	<16	**<18**	<17
TCA	<15	<15	<18	<17	<17	<15	<17	<18	<16	<15	<16	<18	<17
TCE	<19	<20	<23	<23	<23	<19	<23	<24	<21	<20	<21	**<23**	<22
PCE	<20	<22	<25	<24	<24	<21	<24	<26	<23	<21	<22	<25	<23

SB-4	8	18	20	25	40	46	50	55	69	74	85	100	105	115	130	135	165	195	231	270
VC	<18	<420	<330	<87	<400	<19	<21	<16	<17	<23	<110	<18	<17	<22	<17	<22	<22	<23	<19	<16
1,1-DCE	<14	<320	<250	<68	<310	<15	<16	<12	<13	<18	<89	<14	<13	<17	<13	<17	<17	<18	<15	<13
Acetone	**3,900**	<670	**11,000**	**18,000**	**290,000**	**86,000**	**160,000**	**98,000**	**240,000**	**500,000**	**84,000**	**110,000**	**100,000**	**120,000**	<27	<35	<36	**73**	<30	<26
MC	<20	<460	<360	<97	<440	<22	<23	<18	<19	<26	<130	<20	<19	<24	<19	**160**	**150**	<25	<21	<18
1,1-DCA	<13	<310	<250	<65	<300	**51**	**93**	**140**	<13	**100**	<86	**130**	**100**	**410**	<13	<16	<17	<17	<14	<12
cis-1,2-DCE	**72**	<390	<310	<82	**1,200**	**95**	**160**	**200**	<16	**390**	<110	**110**	<16	**340**	<16	<20	<21	<21	<18	<16
TCA	<16	<380	<300	<80	<360	<18	<19	<14	<16	<21	<100	<17	<15	<20	<15	<20	<21	<21	<17	<15
TCE	<21	<500	**3,900**	**750**	<470	<23	<25	<19	<21	<28	<140	<22	<20	<26	<20	<26	<27	<27	<22	<20
PCE	<23	**60,000**	**76,000**	**7,700**	**15,000**	<25	<27	<20	<22	<30	<150	<23	<22	<28	<22	<28	<29	<29	<24	<21

Figure 27
2002 Soil Sample Analytical Results from Weston's Investigation at the Rinchem Facility

Legend

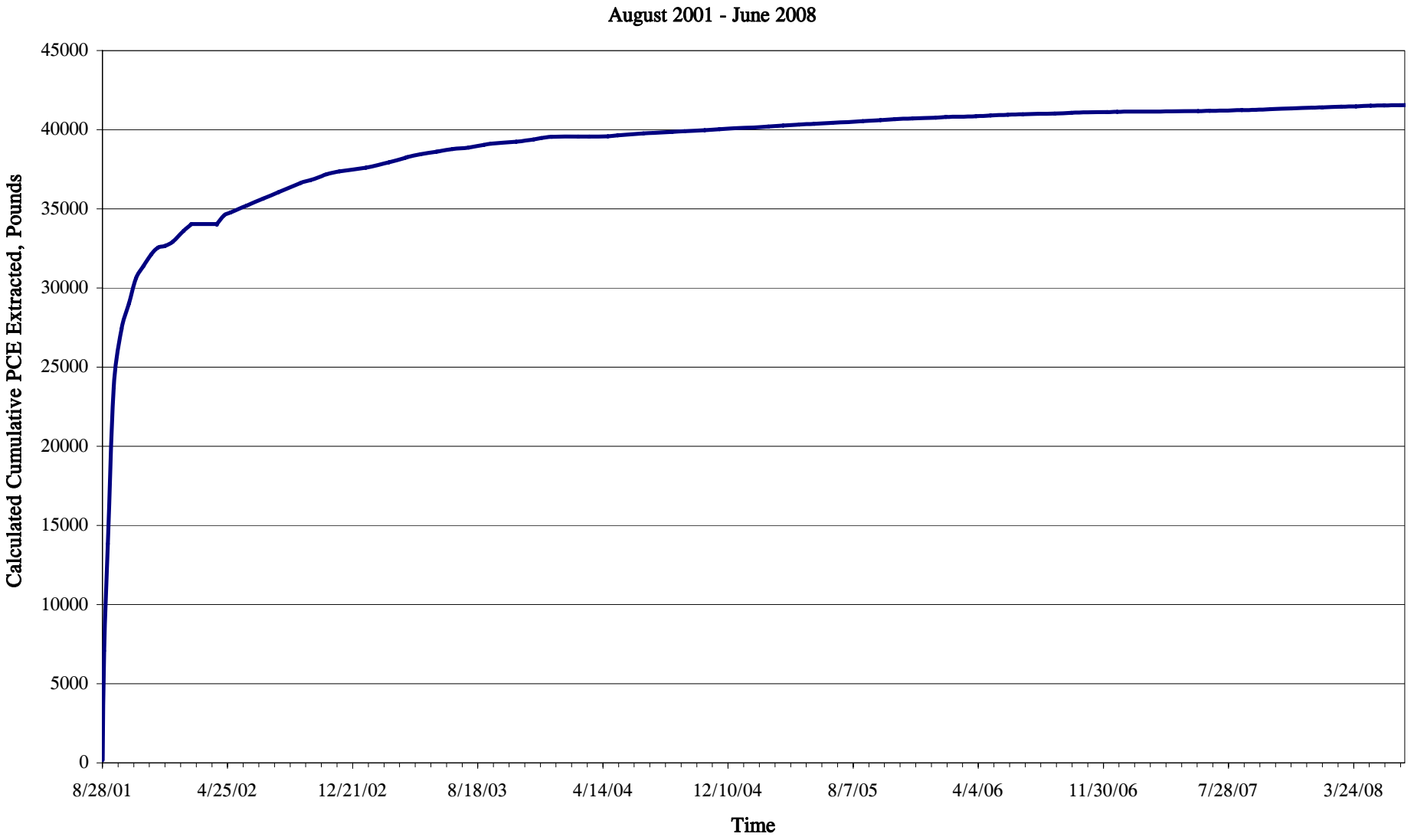
- ● Soil Boring (Weston, May 2002)
- ▭ Sump
- ϕ Dry Well

NOTES: Results measured in ug/kg.
1,1-DCE = 1,1-Dichloroethene
1,1-DCA = 1,1-Dichloroethane
TCE = Trichloroethene
PCE = Tetrachloroethene
1,1,1-TCA = 1,1,1-Trichloroethane
VC = Vinyl Chloride
MC = Methylene Chloride
cis-1,2-DCE = cis-1,2-Dichloroethene
NA = Not Analyzed For

N

Approximate Scale
0 30 60 feet

Figure 28 - Cumulative PCE Mass Extracted Versus Time
SVETS Operation and Evaluation Analysis
F&B Mfg. Co. Facility



S

N

W

WCP-34

F&B-3

F&B-4

WCP-33

WCP-37

1006.79

1004.51

UAU

MAU

LAU

Basement

Elevation (feet above mean sea level)

1100

1000

900

800

700

600

500

400

300

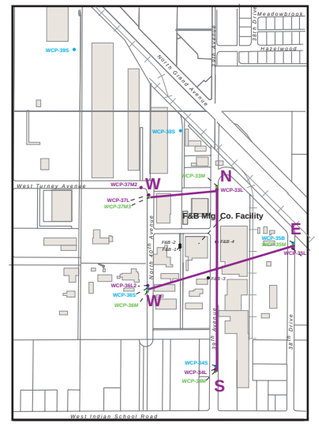
200

EXPLANATION

Deepest Extent of Well Nest with All Screen Intervals

16" Electrical Resistivity Log

Screen Interval



100'

0 Scale in Feet 200'

Horizontal Scale 1 inch=200 feet
Vertical Scale 1 inch=100 feet

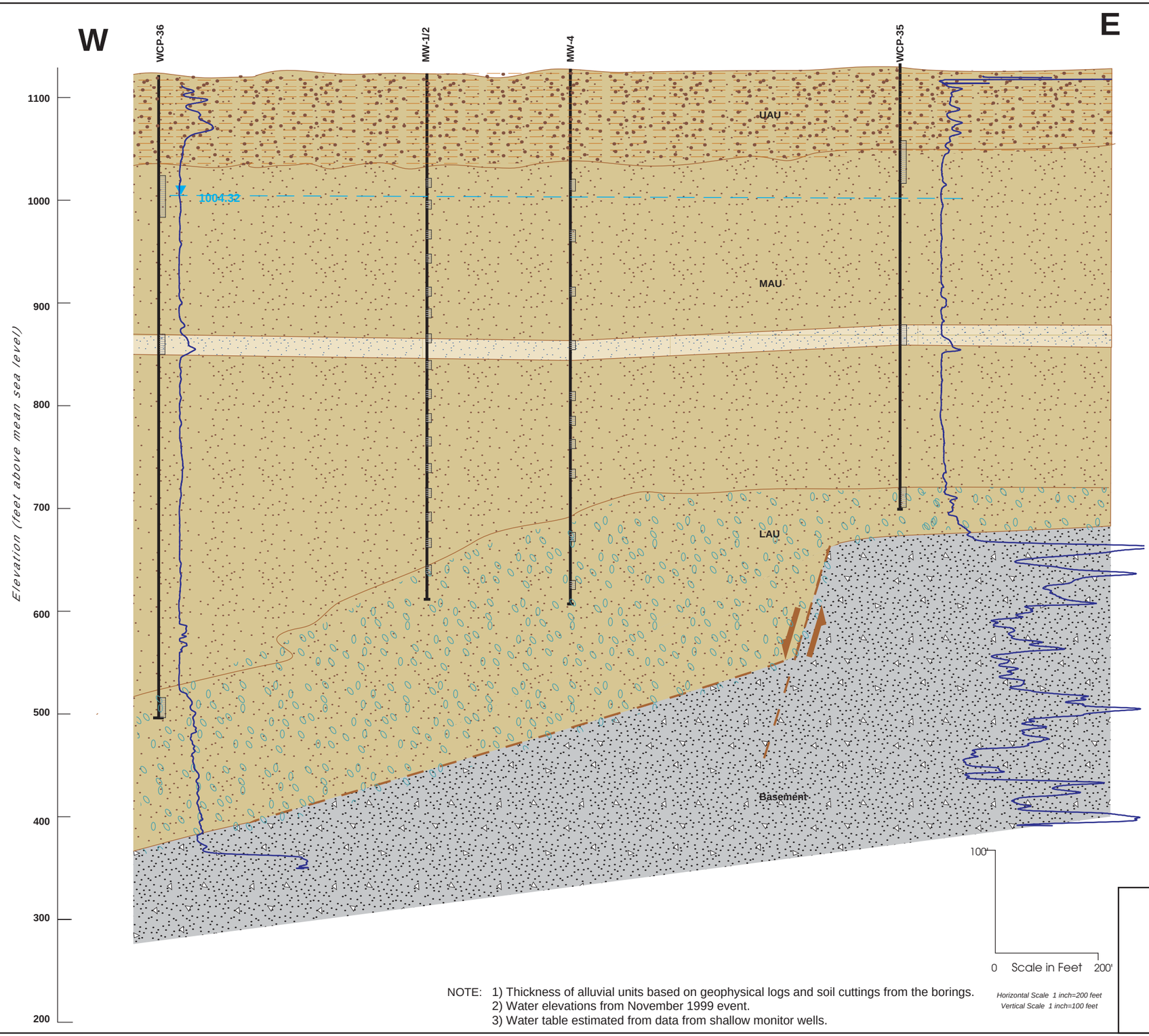
NOTES: 1) Thickness of alluvial units based on geophysical logs and soil cuttings from the borings.
2) Water elevations from November 1999 event.
3) Water table estimated from data from shallow monitor wells.

Arizona Department of Environmental Quality

North - South Trend
Geologic Cross Section
WCP North Plume Site
Phoenix, Arizona
Figure 29
Project No. 6854

6854-76_04102000KSRlmeg.srf

LFR

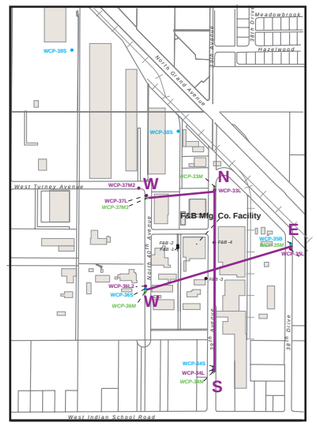


EXPLANATION

Deepest Extent of Well Nest with Old Screen Intervals

16" Electrical Resisitivity Log

Screen Interval



NOTE: 1) Thickness of alluvial units based on geophysical logs and soil cuttings from the borings.
2) Water elevations from November 1999 event.
3) Water table estimated from data from shallow monitor wells.

Horizontal Scale 1 inch=200 feet
Vertical Scale 1 inch=100 feet

Arizona Department of Environmental Quality

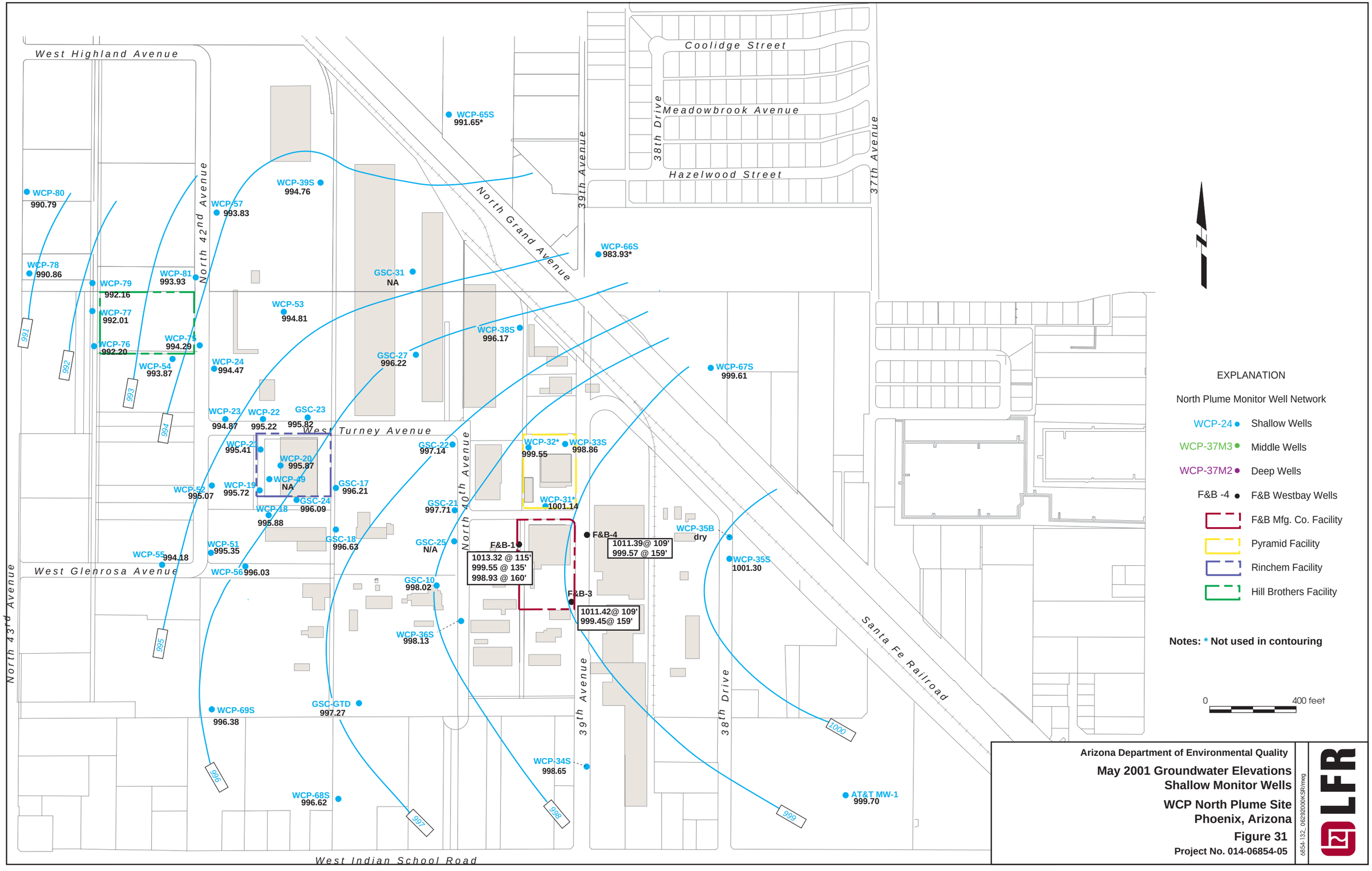
East - West Trend
Geologic Cross Section
WCP North Plume Site
Phoenix, Arizona

Figure 30

Project No. 6854

6854-75_04102000KSRmeg.sq

LFR



Arizona Department of Environmental Quality

May 2001 Groundwater Elevations
Shallow Monitor Wells

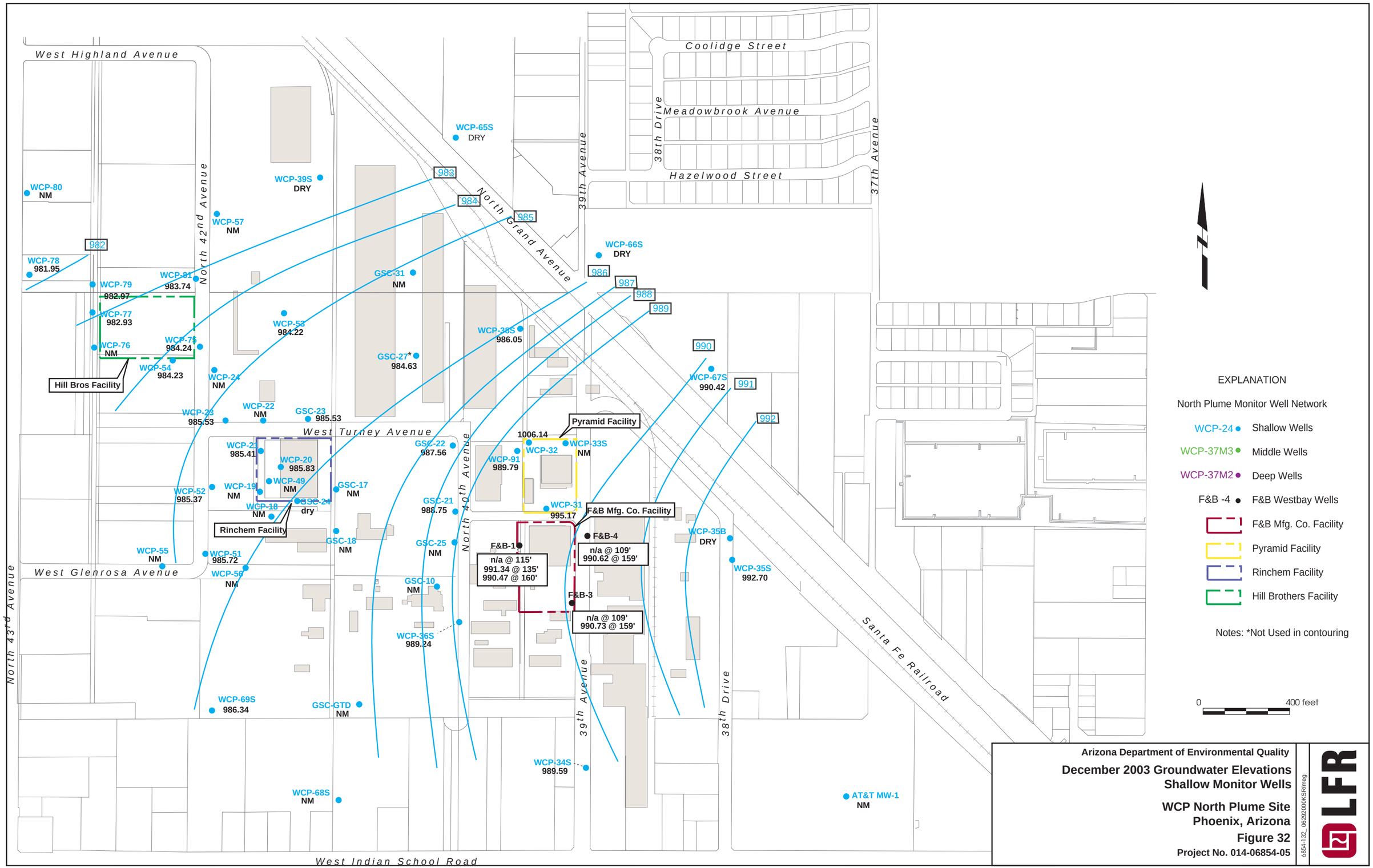
WCP North Plume Site
Phoenix, Arizona

Figure 31

Project No. 014-06854-05

6854-132_06292000KSR/meg

LFR



Arizona Department of Environmental Quality

December 2003 Groundwater Elevations
Shallow Monitor Wells

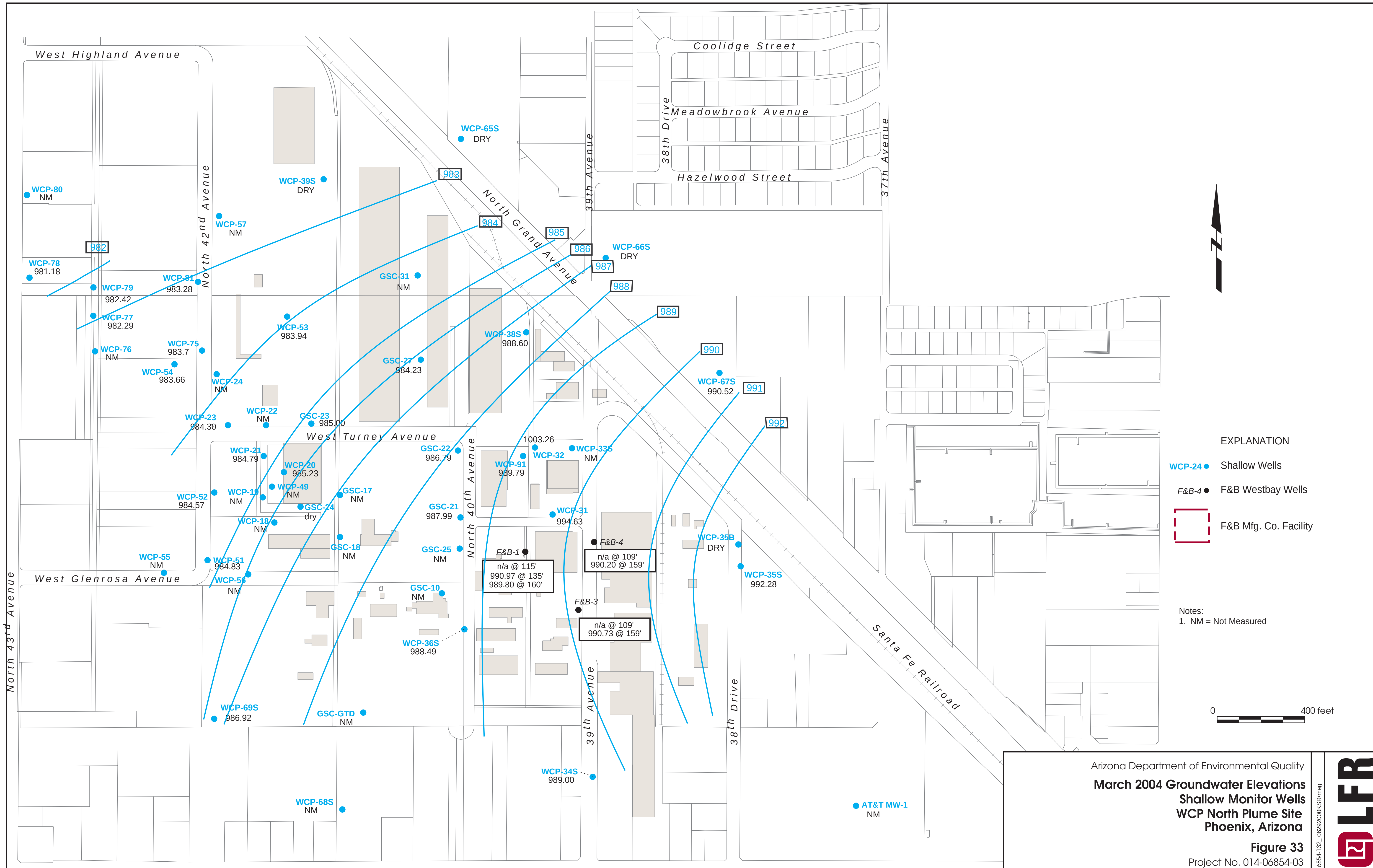
WCP North Plume Site
Phoenix, Arizona

Figure 32

Project No. 014-06854-05

6854-132_062302000KSRmeg

LFR



Arizona Department of Environmental Quality

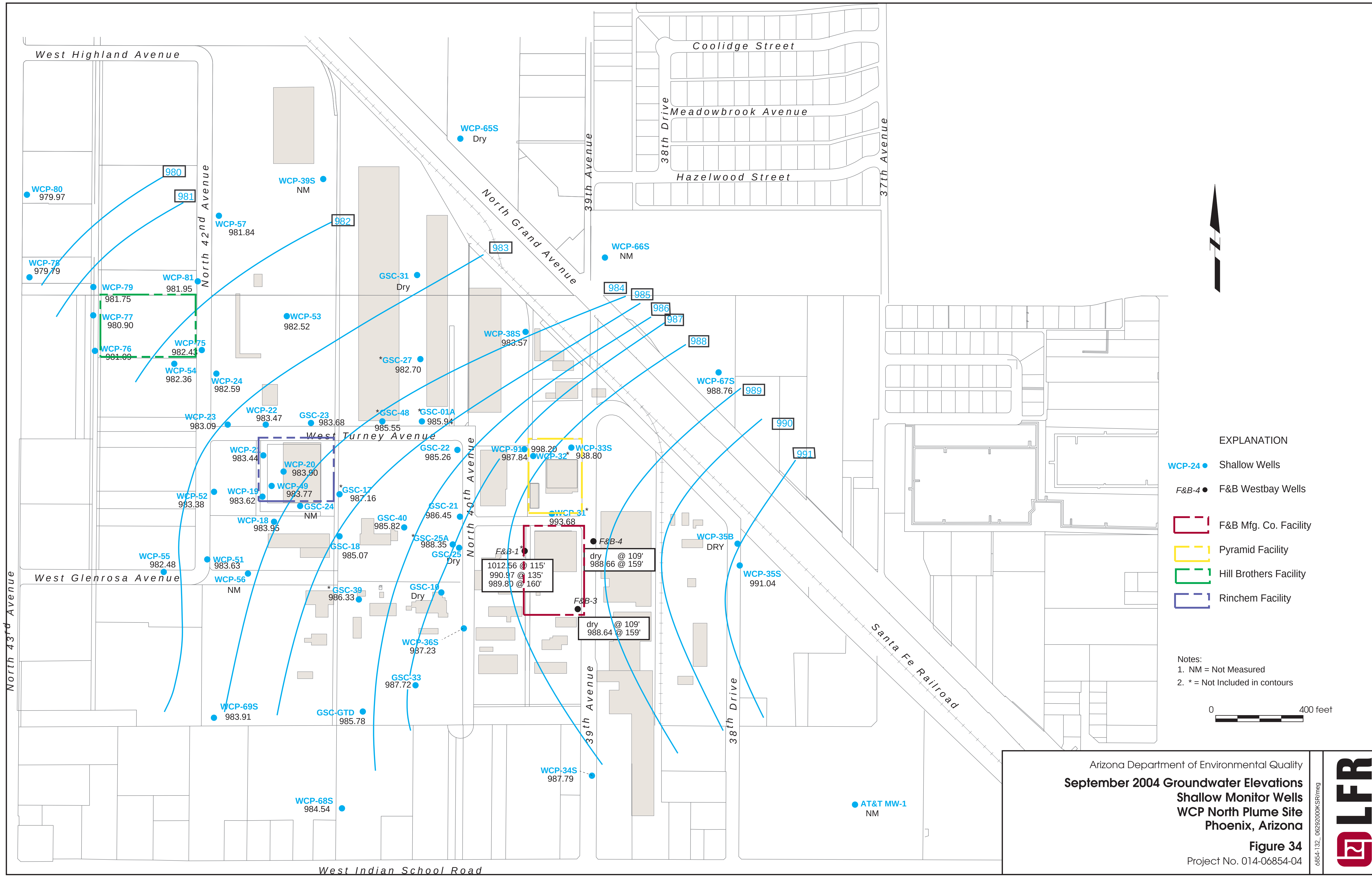
March 2004 Groundwater Elevations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 33

Project No. 014-06854-03

6854-132_06292000KSR/meg

LFR

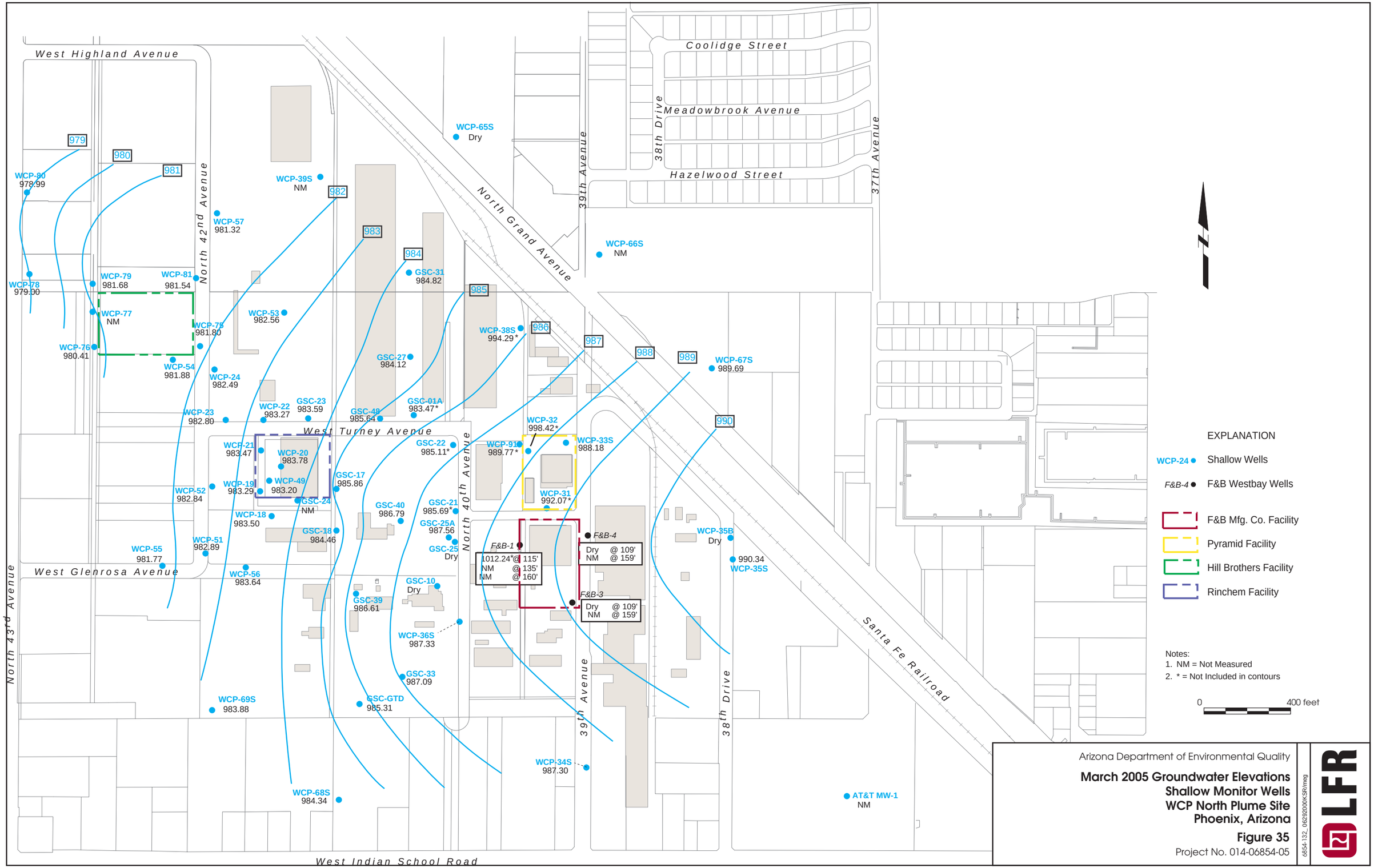

West Highland Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
37th Avenue
39th Avenue
North Grand Avenue
North 42nd Avenue
North 43rd Avenue
North 40th Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road
Santa Fe Railroad
980
981
982
983
984
985
986
987
988
989
990
991
WCP-65S Dry
WCP-39S NM
WCP-80 979.97
WCP-78 979.79
WCP-57 981.84
WCP-66S NM
GSC-31 Dry
WCP-81 981.95
WCP-79 981.75
WCP-77 980.90
WCP-76 981.09
WCP-75 982.43
WCP-54 982.36
WCP-53 982.52
WCP-24 982.59
WCP-38S 983.57
*GSC-27 982.70
WCP-67S 988.76
WCP-23 983.09
WCP-22 983.47
GSC-23 983.68
*GSC-48 985.55
*GSC-01A 985.94
WCP-21 983.44
WCP-20 983.90
WCP-49 983.77
WCP-19 983.62
WCP-52 983.38
*GSC-17 987.16
GSC-24 NM
GSC-22 985.26
WCP-91 987.84
998.26
WCP-32*
WCP-33S 988.80
GSC-21 986.45
WCP-18 983.95
GSC-40 985.82
*GSC-25A 988.35
GSC-25 Dry
GSC-18 985.07
WCP-31* 993.68
F&B-1
1012.56 @ 115'
990.97 @ 135'
989.80 @ 160'
F&B-4
dry @ 109'
988.66 @ 159'
F&B-3
dry @ 109'
988.64 @ 159'
WCP-35B DRY
WCP-35S 991.04
WCP-55 982.48
WCP-51 983.63
WCP-56 NM
*GSC-39 986.33
GSC-16 Dry
WCP-36S 987.23
GSC-33 987.72
WCP-69S 983.91
GSC-GTD 985.78
WCP-34S 987.79
WCP-68S 984.54
AT&T MW-1 NM
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
Notes:
1. NM = Not Measured
2. * = Not Included in contours
0
400 feet
LFR
6854-132_06292000KSR/meg

Arizona Department of Environmental Quality

September 2004 Groundwater Elevations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 34

Project No. 014-06854-04



Arizona Department of Environmental Quality

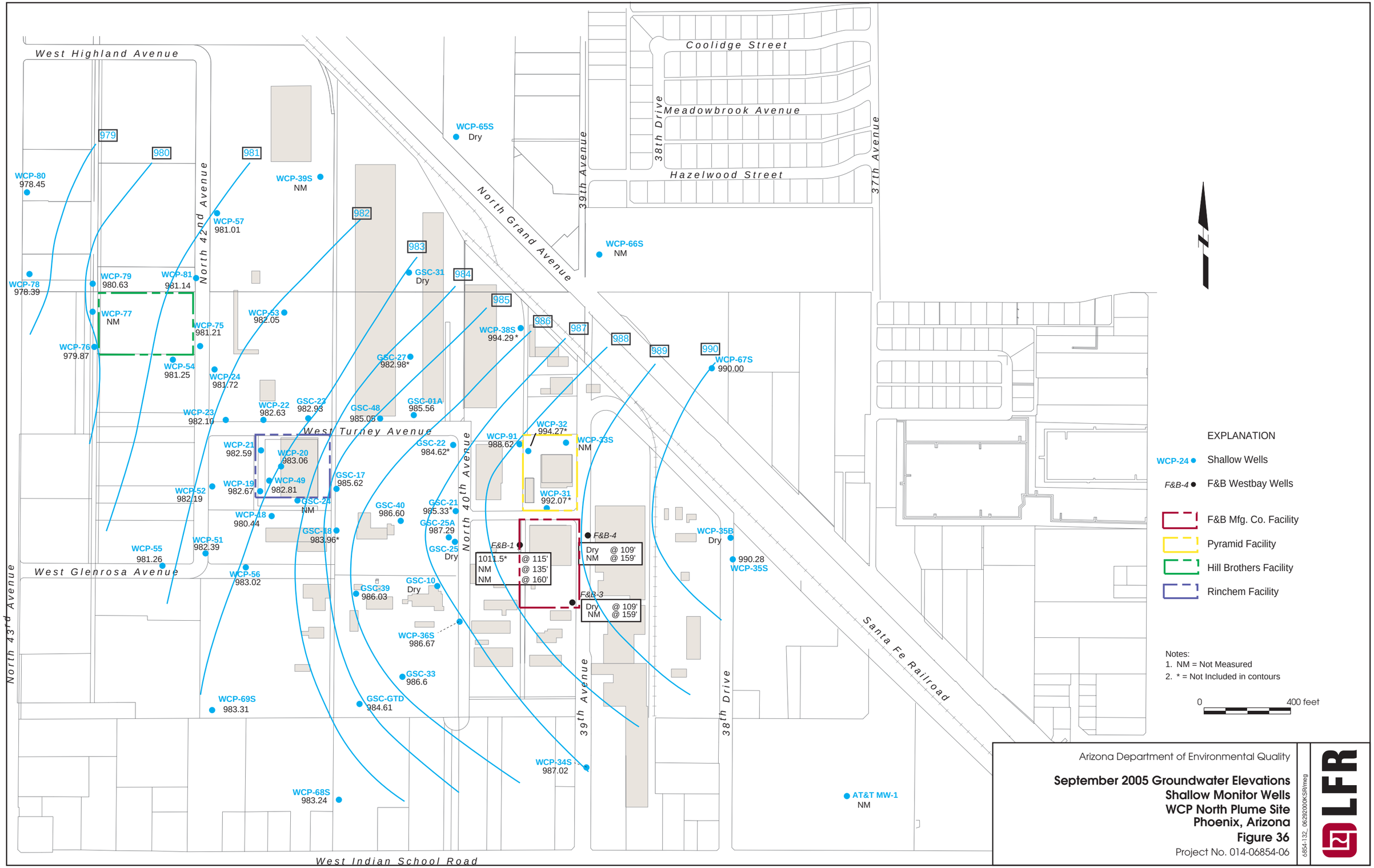
March 2005 Groundwater Elevations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

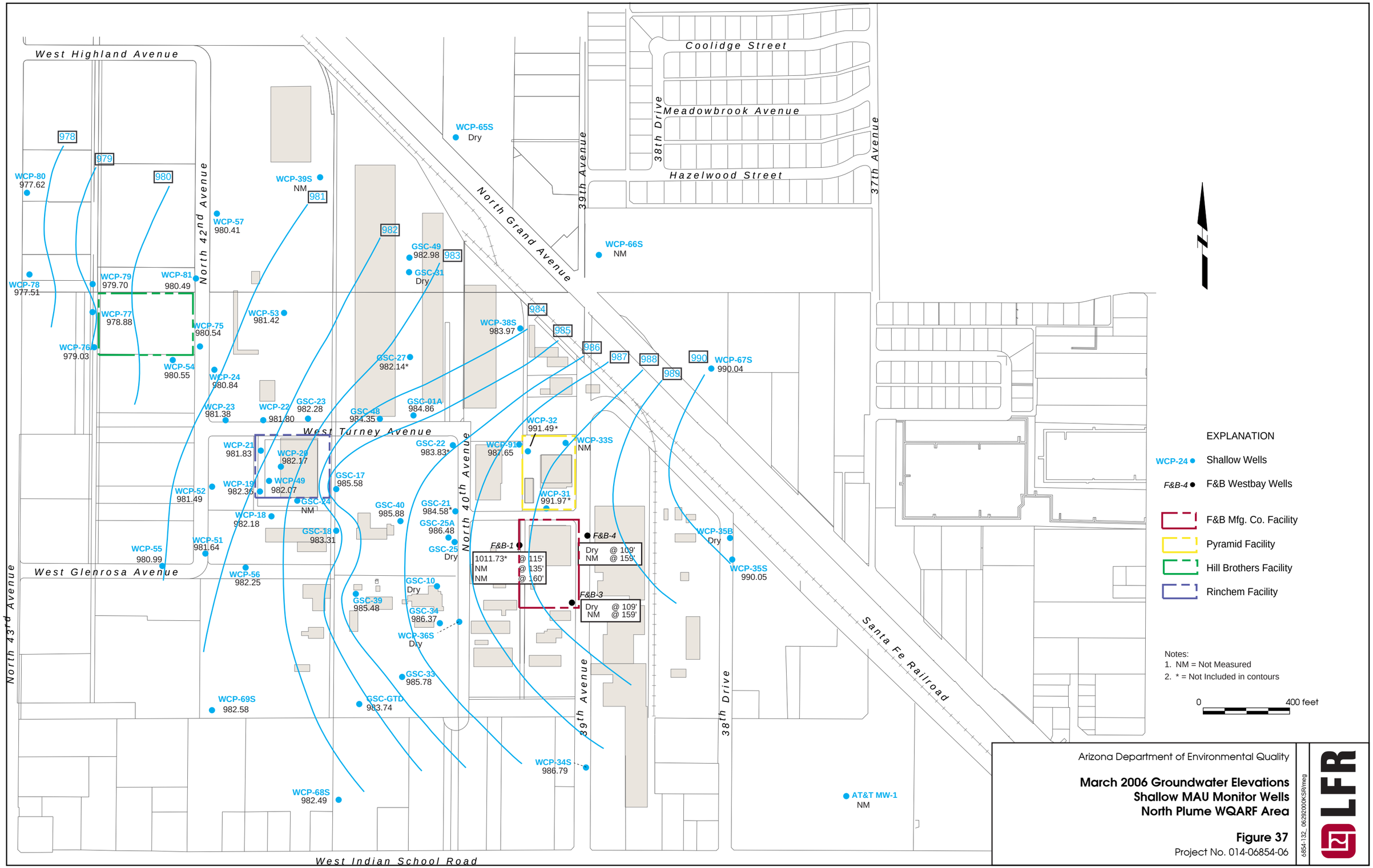
Figure 35

Project No. 014-06854-05

6854-132_06292006KSR/meg

LFR


West Highland Avenue
North 42nd Avenue
North Grand Avenue
39th Avenue
38th Drive
37th Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
Santa Fe Railroad
West Indian School Road
979
980
981
982
983
984
985
986
987
988
989
990
WCP-80 978.45
WCP-78 978.39
WCP-79 980.63
WCP-81 981.14
WCP-77 NM
WCP-76 979.87
WCP-75 981.21
WCP-54 981.25
WCP-57 981.01
WCP-39S NM
WCP-65S Dry
WCP-66S NM
WCP-53 982.05
GSC-31 Dry
WCP-24 981.72
WCP-38S 994.29*
GSC-27 982.98*
WCP-67S 990.00
WCP-23 982.10
WCP-22 982.63
GSC-23 982.93
GSC-48 985.05
GSC-01A 985.56
WCP-21 982.59
WCP-20 983.06
WCP-19 982.67
WCP-49 982.81
GSC-24 NM
GSC-17 985.62
GSC-22 984.62*
WCP-91 988.62
WCP-32 994.27*
WCP-33S NM
WCP-31 992.07*
WCP-52 982.19
WCP-18 980.44
GSC-18 983.96*
GSC-40 986.60
GSC-21 985.33*
GSC-25A 987.29
GSC-25 Dry
F&B-1
1011.5* NM NM
F&B-4
Dry @ 109' NM @ 159'
F&B-3
Dry @ 109' NM @ 159'
WCP-35B Dry
990.28 WCP-35S
WCP-55 981.26
WCP-51 982.39
WCP-56 983.02
GSC-39 986.03
GSC-10 Dry
WCP-36S 986.67
GSC-33 986.6
WCP-69S 983.31
GSC-GTD 984.61
WCP-34S 987.02
WCP-68S 983.24
AT&T MW-1 NM
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
Notes:
1. NM = Not Measured
2. * = Not Included in contours
0
400 feet
Arizona Department of Environmental Quality
September 2005 Groundwater Elevations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 36
Project No. 014-06854-06
0654-132_092200WSRmeg
LFR



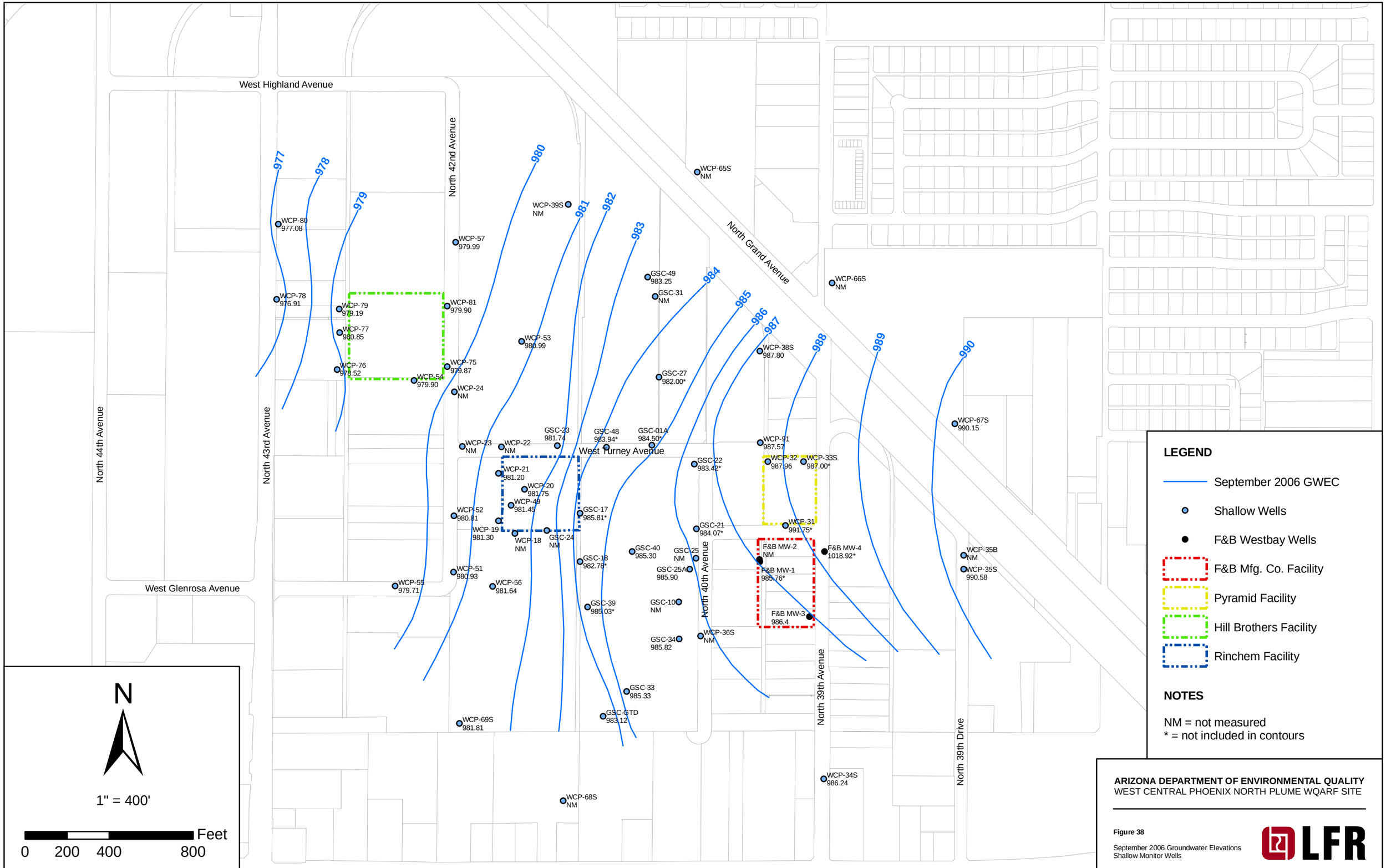
Arizona Department of Environmental Quality

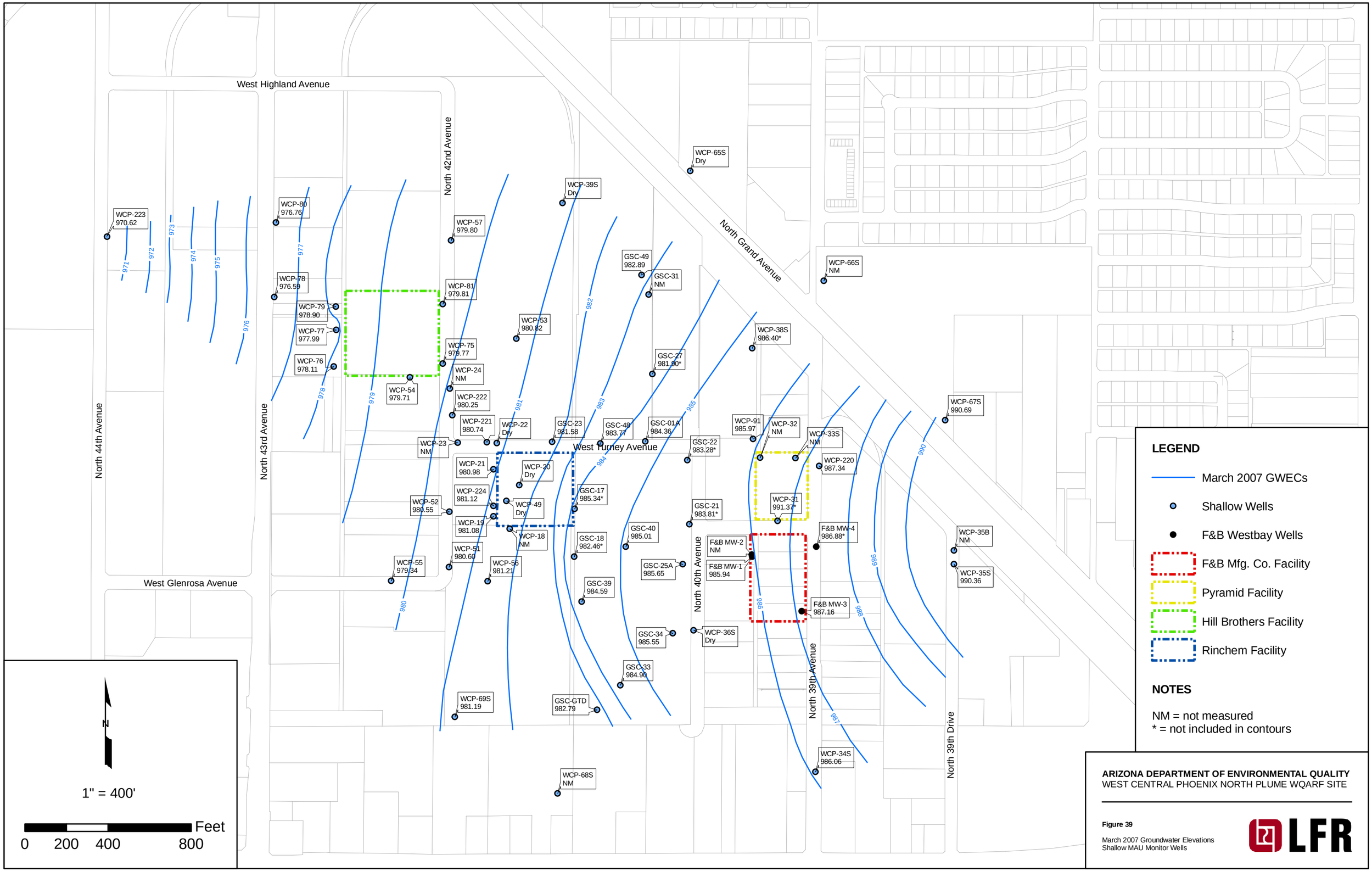
March 2006 Groundwater Elevations
Shallow MAU Monitor Wells
North Plume WQARF Area

Figure 37
Project No. 014-06854-06

6854-132_062920001KSR.meg

LFR


West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
North 42nd Avenue
North 43rd Avenue
North 44th Avenue
North 40th Avenue
North 39th Avenue
North 39th Drive
North Grand Avenue
977
978
979
980
981
982
983
984
985
986
987
988
989
990
WCP-80 977.08
WCP-78 976.91
WCP-79 979.19
WCP-77 980.85
WCP-76 978.52
WCP-54 979.90
WCP-57 979.99
WCP-81 979.90
WCP-75 979.87
WCP-24 NM
WCP-39S NM
WCP-53 980.99
WCP-65S NM
GSC-49 983.25
GSC-31 NM
GSC-27 982.00*
WCP-38S 987.80
WCP-66S NM
WCP-67S 990.15
GSC-23 981.74
GSC-48 983.94*
GSC-01A 984.50*
WCP-23 NM
WCP-22 NM
WCP-21 981.20
WCP-20 981.75
WCP-49 981.45
WCP-52 980.81
WCP-19 981.30
WCP-18 NM
GSC-24 NM
GSC-17 985.81*
WCP-91 987.57
WCP-32 987.96
WCP-33S 987.00*
GSC-22 983.42*
WCP-31 991.75*
GSC-21 984.07*
F&B MW-2 NM
F&B MW-1 985.76*
F&B MW-4 1018.92*
F&B MW-3 986.4
WCP-35B NM
WCP-35S 990.58
GSC-40 985.30
GSC-25 NM
GSC-25A 985.90
GSC-18 982.78*
WCP-51 980.93
WCP-55 979.71
WCP-56 981.64
GSC-39 985.03*
GSC-10 NM
WCP-36S NM
GSC-34 985.82
GSC-33 985.33
GSC-GTD 983.12
WCP-69S 981.81
WCP-68S NM
WCP-34S 986.24
N
1" = 400'
Feet
0
200
400
800
LEGEND
September 2006 GWEC
Shallow Wells
F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
NOTES
NM = not measured
* = not included in contours
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE
Figure 38
September 2006 Groundwater Elevations
Shallow Monitor Wells
LFR


West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 39th Drive
North Grand Avenue
WCP-223 970.62
WCP-80 976.76
WCP-57 979.80
WCP-39S Dry
WCP-65S Dry
WCP-78 976.59
WCP-81 979.81
GSC-49 982.89
GSC-31 NM
WCP-66S NM
WCP-79 978.90
WCP-77 977.99
WCP-53 980.82
WCP-75 979.77
WCP-38S 986.40*
WCP-76 978.11
WCP-24 NM
GSC-27 981.90*
WCP-54 979.71
WCP-222 980.25
WCP-67S 990.69
WCP-221 980.74
WCP-22 Dry
GSC-23 981.58
GSC-48 983.77
GSC-01A 984.36
WCP-91 985.97
WCP-32 NM
WCP-33S NM
WCP-23 NM
GSC-22 983.28*
WCP-220 987.34
WCP-21 980.98
WCP-20 Dry
WCP-224 981.12
GSC-17 985.34*
WCP-31 991.37*
WCP-52 980.55
WCP-49 Dry
GSC-21 983.81*
WCP-19 981.08
GSC-40 985.01
F&B MW-4 986.88*
WCP-18 NM
F&B MW-2 NM
WCP-35B NM
WCP-51 980.60
GSC-18 982.46*
WCP-55 979.34
WCP-56 981.21
GSC-25A 985.65
F&B MW-1 985.94
WCP-35S 990.36
GSC-39 984.59
F&B MW-3 987.16
GSC-34 985.55
WCP-36S Dry
GSC-33 984.99
WCP-69S 981.19
GSC-GTD 982.79
WCP-34S 986.06
WCP-68S NM
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
990
N
1" = 400'
Feet
0
200
400
800
LEGEND
March 2007 GWECs
Shallow Wells
F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
NOTES
NM = not measured
* = not included in contours
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE
Figure 39
March 2007 Groundwater Elevations
Shallow MAU Monitor Wells
LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_040_GWL_shallow_Sep_2007.mxd 12/16/2008

WCP-223 970.08
WCP-80 976.22
WCP-78 976.06
WCP-79 978.32*
WCP-77 977.41
WCP-76 977.54
WCP-54 979.01
WCP-57 978.90
WCP-81 978.94
WCP-75 979.22
WCP-24 NM
WCP-222 979.45
WCP-221 NM
WCP-22 980.34
WCP-23 NM
WCP-21 980.22
WCP-20 980.60
WCP-224 980.44
WCP-49 980.49
WCP-52 979.86
WCP-19 980.34
WCP-18 NM
WCP-51 980.00
WCP-55 978.81
WCP-56 980.66
WCP-69S 981.86
WCP-68S 981.08
WCP-39S Dry
WCP-53 979.73
GSC-23 980.29
GSC-17 984.64*
GSC-18 981.64*
GSC-39 983.77
GSC-49 981.38
GSC-31 NM
GSC-48 982.80
GSC-01A 983.27
GSC-27 980.62*
GSC-22 982.31*
GSC-21 983.09*
GSC-40 983.89
GSC-25A 985.02
WCP-36S Dry
GSC-34 984.90
GSC-33 984.31
GSC-GTD 982.22*
WCP-65S Dry
WCP-66S 972.07*
WCP-38S 983.23
WCP-91 984.84
WCP-33S NM
WCP-32 988.12*
WCP-31 991.95*
F&B MW-2 NM
F&B MW-1 984.98*
F&B MW-3 985.61
WCP-34S NM
WCP-220 986.62
F&B MW-4 986.03
WCP-67S 988.91
WCP-35B NM
WCP-35S 989.86

971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989

North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour

NOTES

- NM = groundwater elevation not measured during September 2007 event.
- * = measurement not included in contours.

N

0 200 400 Feet

Scale: 1" = 400'

September 2007 Groundwater Elevations, Shallow MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 40

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_041_GWL_shallow_Mar_2008.mxd 12/16/2008

WCP-223 970.32
WCP-80 975.79
WCP-57 978.74
WCP-65S Dry
WCP-66S 974.42*
WCP-78 975.72
WCP-81 978.73
WCP-79 978.19
WCP-77 977.27
WCP-76 977.26
WCP-75 978.83
WCP-54 978.80
WCP-53 979.77
GSC-49 981.98
WCP-38S 988.61*
GSC-27 980.88*
WCP-67S 989.90
WCP-222 979.29
WCP-221 979.85
WCP-22 980.27
GSC-23 980.60
GSC-48 982.74
GSC-01A 983.24
GSC-22 982.29*
WCP-91 985.62
WCP-33S 986.23
WCP-21 980.17
WCP-20 980.67
GSC-46 982.40*
WCP-32 989.02*
WCP-220 986.44
WCP-224 980.25
GSC-17 984.95*
WCP-31 991.91*
WCP-52 979.62
WCP-49 980.31
GSC-21 983.00*
WCP-19 980.22
GSC-40 983.98
F&B-4-159 984.89*
F&B-1-160 984.85
WCP-35S 989.76
GSC-18 981.80
WCP-51 979.90
WCP-55 978.51
WCP-56 980.69
GSC-25A 984.68
GSC-39 983.85
F&B-3-159 985.36
GSC-34 984.88
WCP-36S Dry
GSC-33 984.36
WCP-69S 980.13
WCP-34S 984.70
WCP-68S 981.11

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Glenrosa Avenue
West Turney Avenue
North Grand Avenue

971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989

LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour

NOTES

- NM = groundwater elevation not measured during March 2008 event.
- * = measurement not included in contours.

0 200 400 Feet
Scale: 1" = 400'

March 2008 Groundwater Elevations, Shallow MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 41

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North PlumeNP GIS\Projects\Final RI report\Fig_042_GWL_shallow_Jun_2008.mxd 12/16/2008

WCP-223 969.57
WCP-80 975.65
WCP-78 975.52
WCP-79 977.85
WCP-77 976.99
WCP-76 977.05
WCP-54 978.61
WCP-57 978.57
WCP-81 978.61
WCP-75 978.56
WCP-222 979.09
WCP-221 979.51
WCP-22 NM
WCP-21 979.84
WCP-20 980.31
WCP-224 980.06
WCP-49 980.09
WCP-52 979.37
WCP-19 979.96
WCP-51 979.57
WCP-55 978.25
WCP-56 NM
WCP-69S 979.64
WCP-68S 980.67
WCP-65S Dry
GSC-49 981.43
GSC-53 979.49
GSC-27 980.46*
GSC-23 980.31
GSC-48 982.46
GSC-01A 982.96
GSC-46 982.15*
GSC-17 984.49*
GSC-18 981.41
GSC-40 983.72
GSC-25A 984.69
GSC-39 983.48
GSC-34 984.65
GSC-33 984.06
GSC-22 982.04*
GSC-21 982.71*
WCP-66S 974.54*
WCP-38S 984.97
WCP-91 984.55
WCP-32 989.21*
WCP-33S 986.25
WCP-31 NM
WCP-220 986.42
F&B-4-159 984.68*
F&B-1-160 984.48
F&B-3-159 984.87
WCP-36S Dry
WCP-67S 989.90
WCP-35S 989.85
WCP-34S 984.72

970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue

LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour

NOTES

- NM = groundwater elevation not measured during June 2008 event.
- * = measurement not included in contours.

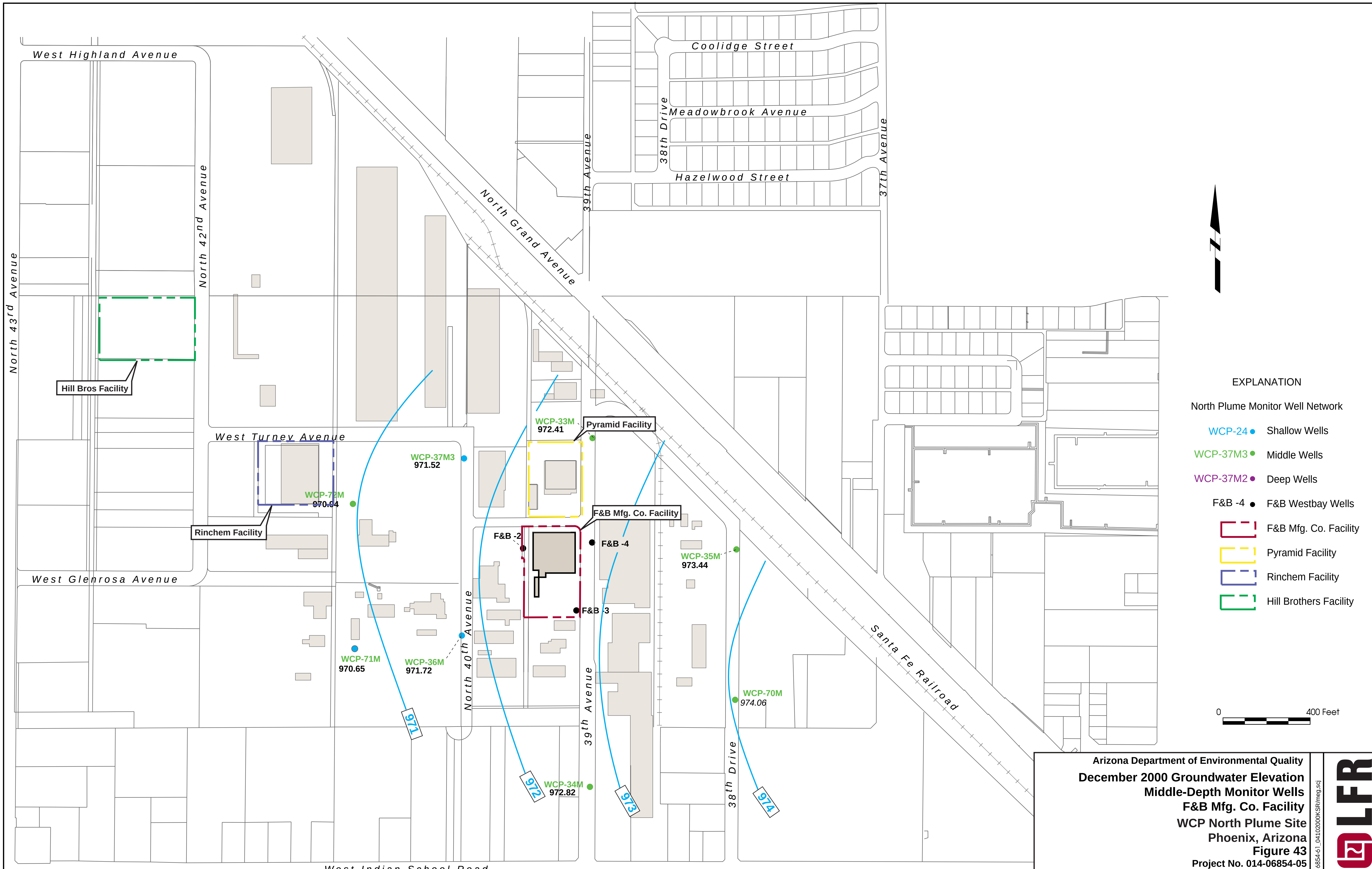
0 200 400 Feet
Scale: 1" = 400'

June 2008 Groundwater Elevations, Shallow MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 42


West Highland Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
37th Avenue
39th Avenue
North 42nd Avenue
North 43rd Avenue
North Grand Avenue
Hill Bros Facility
West Turney Avenue
Pyramid Facility
WCP-33M
972.41
WCP-37M3
971.52
WCP-72M
970.94
Rinchem Facility
F&B Mfg. Co. Facility
F&B -2
F&B -4
F&B -3
WCP-35M
973.44
West Glenrosa Avenue
North 40th Avenue
WCP-71M
970.65
WCP-36M
971.72
Santa Fe Railroad
WCP-70M
974.06
WCP-34M
972.82
971
972
973
974
West Indian School Road
EXPLANATION
North Plume Monitor Well Network
WCP-24 Shallow Wells
WCP-37M3 Middle Wells
WCP-37M2 Deep Wells
F&B -4 F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Rinchem Facility
Hill Brothers Facility
0
400 Feet
LFR

Arizona Department of Environmental Quality

December 2000 Groundwater Elevation
Middle-Depth Monitor Wells
F&B Mfg. Co. Facility
WCP North Plume Site
Phoenix, Arizona
Figure 43
Project No. 014-06854-05

West Highland Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
Coolidge Street
38th Drive
Meadowbrook Avenue
39th Avenue
Hazelwood Street
37th Avenue
WCP-82
Hill Bros Facility
WCP-58
957.18
West Turney Avenue
WCP-74
Rinchem Facility
WCP-72M
957.57
WCP-37M3
958.31
WCP-33M
959.27
Pyramid Facility
F&B Mfg. Co. Facility
F&B -2
960.42 @ 259
F&B -4
960.72 @ 259
F&B -3
960.45 @ 259
WCP-35M
960.51
West Glenrosa Avenue
WCP-71M
957.30
WCP-36M
958.58
North 40th Avenue
39th Avenue
Santa Fe Railroad
WCP-70M
961.10
38th Drive
WCP-34M
959.72
West Indian School Road
958
959
960
961

N

EXPLANATION

North Plume Monitor Well Network

WCP-24 Shallow Wells
WCP-37M3 Middle Wells
WCP-37M2 Deep Wells
F&B -4 F&B Westbay Wells

F&B Mfg. Co. Facility
Pyramid Facility
Rinchem Facility
Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality
December 2002 Groundwater Elevation
Middle-Depth Monitor Wells
North Plume WQARF Area
WCP North Plume Site
Phoenix, Arizona
Figure 44
Project No. 014-06854-05

6854-6 1_04102000KSRmeg.ssj

LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_045_GWL_middle_Mar_2003.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Indian School Road

WCP-82
960.40

Hill Brothers facility

WCP-74
958.54

Rinchem facility

WCP-72M
959.14

WCP-37M3
959.83

Pyramid facility

WCP-33M
960.87

FB-2-259*
962.17

FB-4-259*
962.01

FB-1

F&B Mfg. Co. facility

FB-3-259*
962.01

WCP-35M
962.00

WCP-71M
958.89

WCP-36M
960.14

WCP-70M
962.77

WCP-34M
961.35

959

960

961

962

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = Groundwater elevation considered anomalous and not used in contouring.
- Elevations expressed in feet above mean sea level (ft amsl).

N

0 250 500 Feet

Scale: 1" = 500'

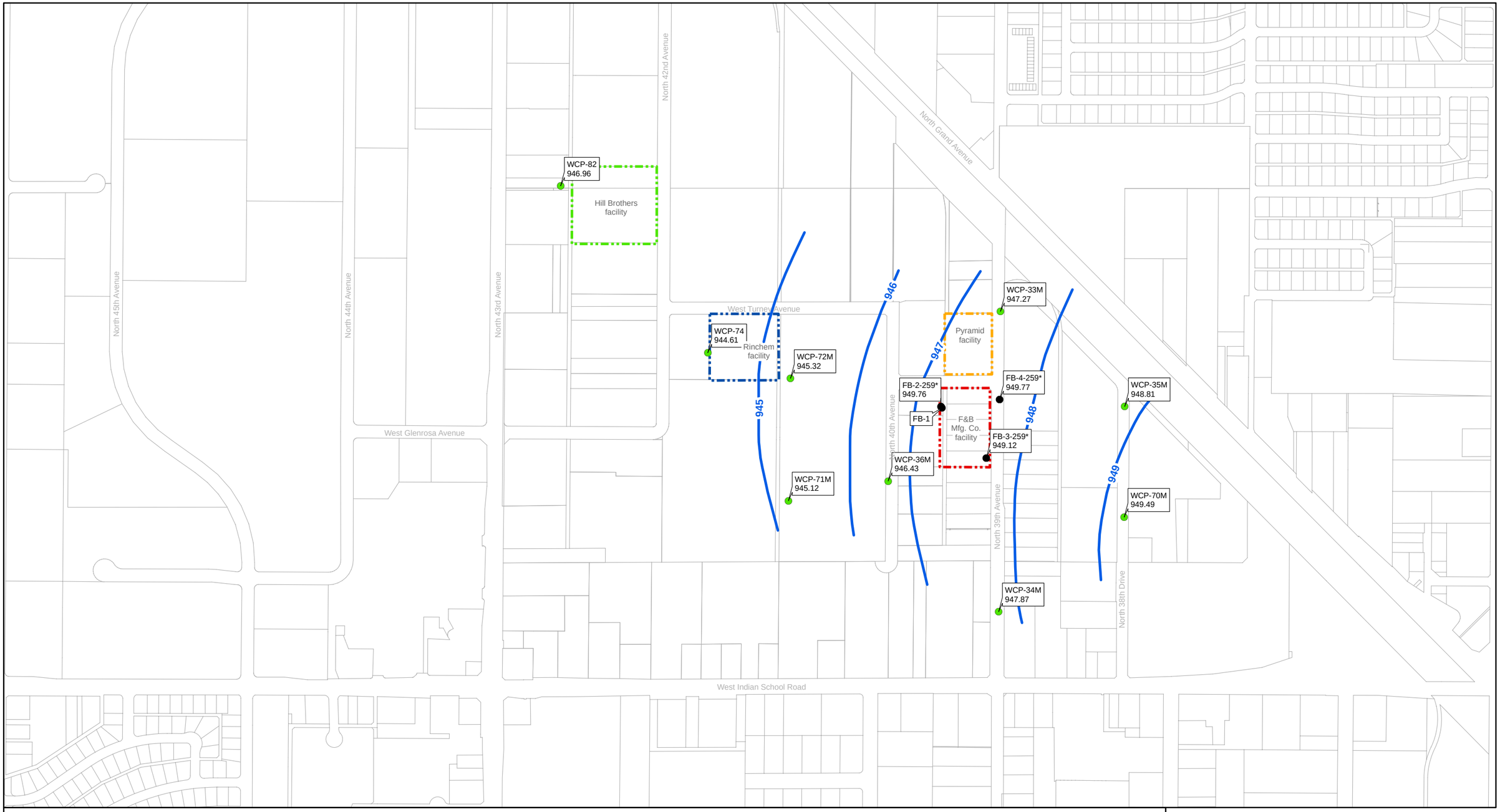
March 2003 Groundwater Elevations, Middle-Depth MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 45

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_046_GWL_middle_Sep_2004.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = Groundwater elevation considered anomalous and not used in contouring.
- Elevations expressed in feet above mean sea level (ft amsl).

N

0 250 500 Feet

Scale: 1" = 500'

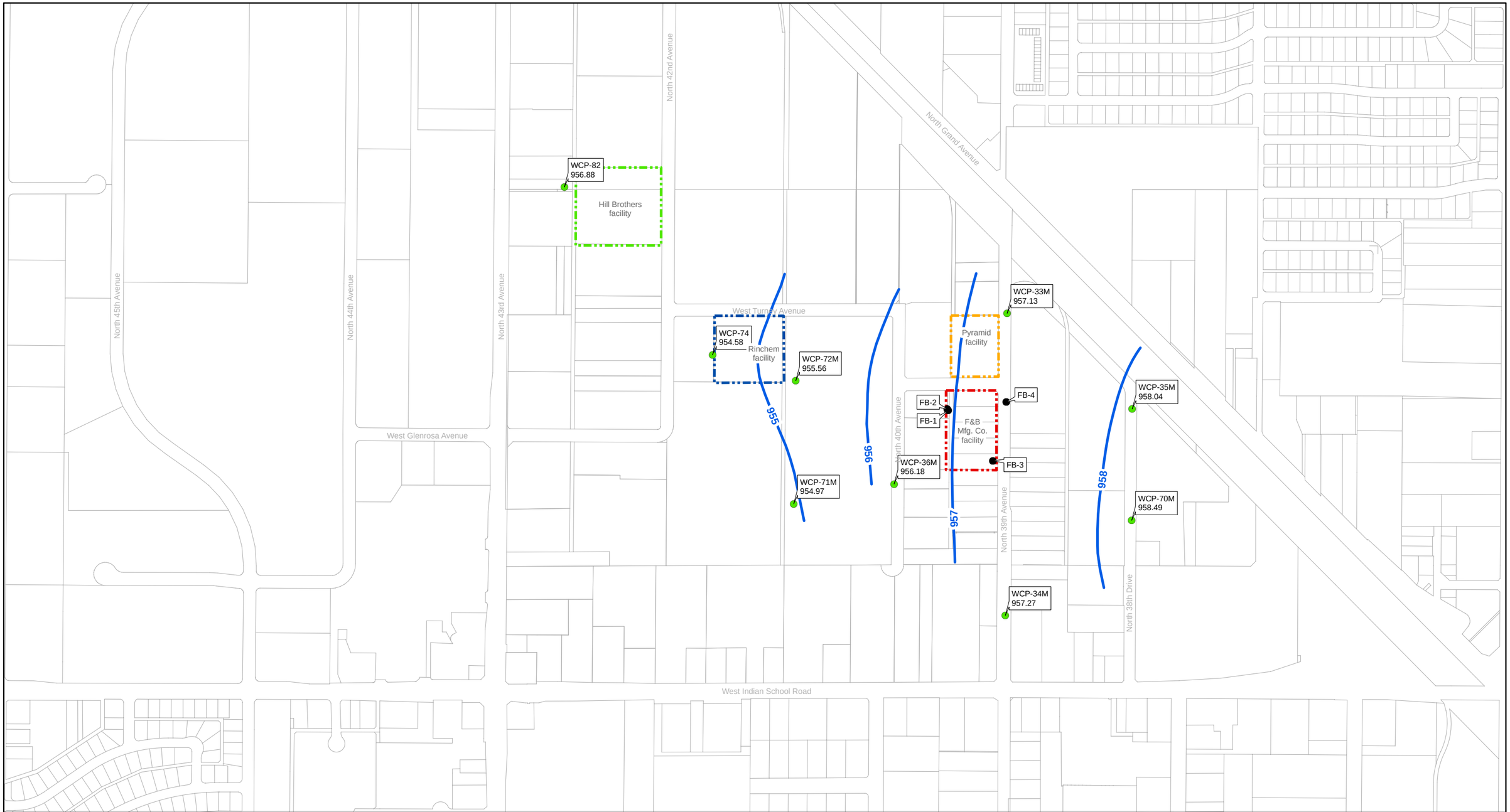
September 2004 Groundwater Elevations, Middle-Depth MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 46

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North PlumeNP GIS\Projects\Final RI report\Fig_047_GWL_middle_Sep_2005.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = Groundwater elevation considered anomalous and not used in contouring.
- Elevations expressed in feet above mean sea level (ft amsl).

N

0 250 500 Feet

Scale: 1" = 500'

September 2005 Groundwater Elevations, Middle-Depth MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 47

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_048_GWL_middle_Sep_2006.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Indian School Road

WCP-82
958.13
Hill Brothers facility
WCP-74
955.79
Rinchem facility
WCP-72M
956.80
WCP-71M
956.20
WCP-33M
958.14
Pyramid facility
FB-2-259
958.76
FB-4-259
958.67
FB-1
F&B Mfg. Co. facility
FB-3-259
958.69
WCP-36M
957.19
WCP-34M
958.20
WCP-35M
958.98
WCP-70M
959.39
956
957
958
959

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = Groundwater elevation considered anomalous and not used in contouring.
- Elevations expressed in feet above mean sea level (ft amsl).

N

0 250 500 Feet

Scale: 1" = 500'

September 2006 Groundwater Elevations, Middle-Depth MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 48

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_049_GWL_middle_Sep_2007.mxd 12/16/2008

WCP-82
953.65
Hill Brothers facility
North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Turney Avenue
WCP-74
951.22
Rinchem facility
WCP-72M
951.69
953
Pyramid facility
WCP-33M
953.21
FB-2-259*
954.49
FB-4-259*
954.26
WCP-35M
954.24
FB-1
F&B Mfg. Co. facility
FB-3-259*
954.24
954
North 40th Avenue
WCP-36M
952.37
WCP-71M
951.13
952
North 39th Avenue
WCP-70M
954.81
WCP-34M
953.43
North 38th Drive
West Glenrosa Avenue
West Indian School Road

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = Groundwater elevation considered anomalous and not used in contouring.
- Elevations expressed in feet above mean sea level (ft amsl).

N

Feet
0 250 500

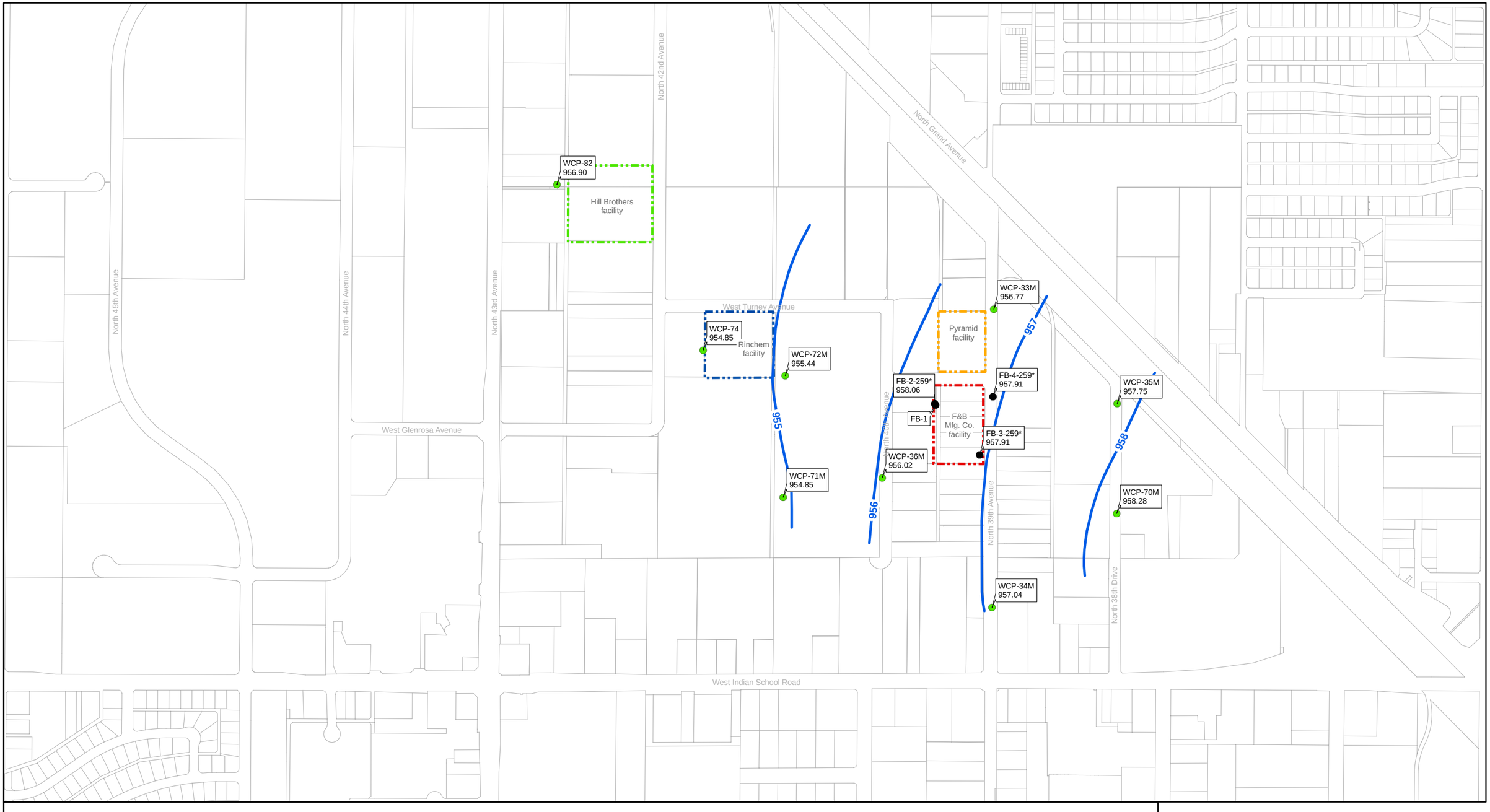
Scale: 1" = 500'

September 2007 Groundwater Elevations, Middle-Depth MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 49



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = Groundwater elevation considered anomalous and not used in contouring.
- Elevations expressed in feet above mean sea level (ft amsl).

0 250 500 Feet

Scale: 1" = 500'

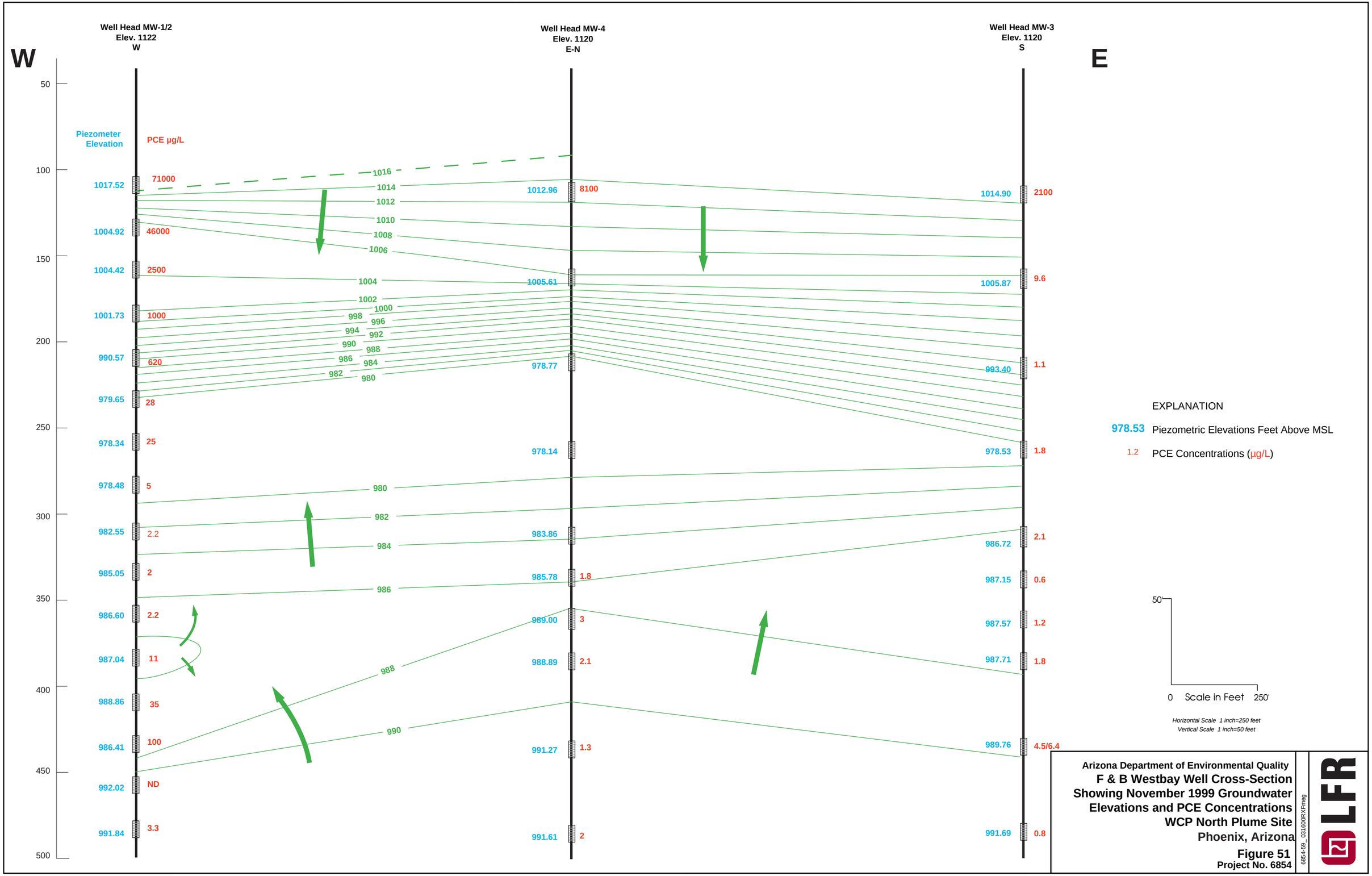
March 2008 Groundwater Elevations, Middle-Depth MAU Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 50

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_050_GWL_middle_Mar_2008.mxd 12/16/2008



Arizona Department of Environmental Quality

F & B Westbay Well Cross-Section Showing November 1999 Groundwater Elevations and PCE Concentrations

WCP North Plume Site

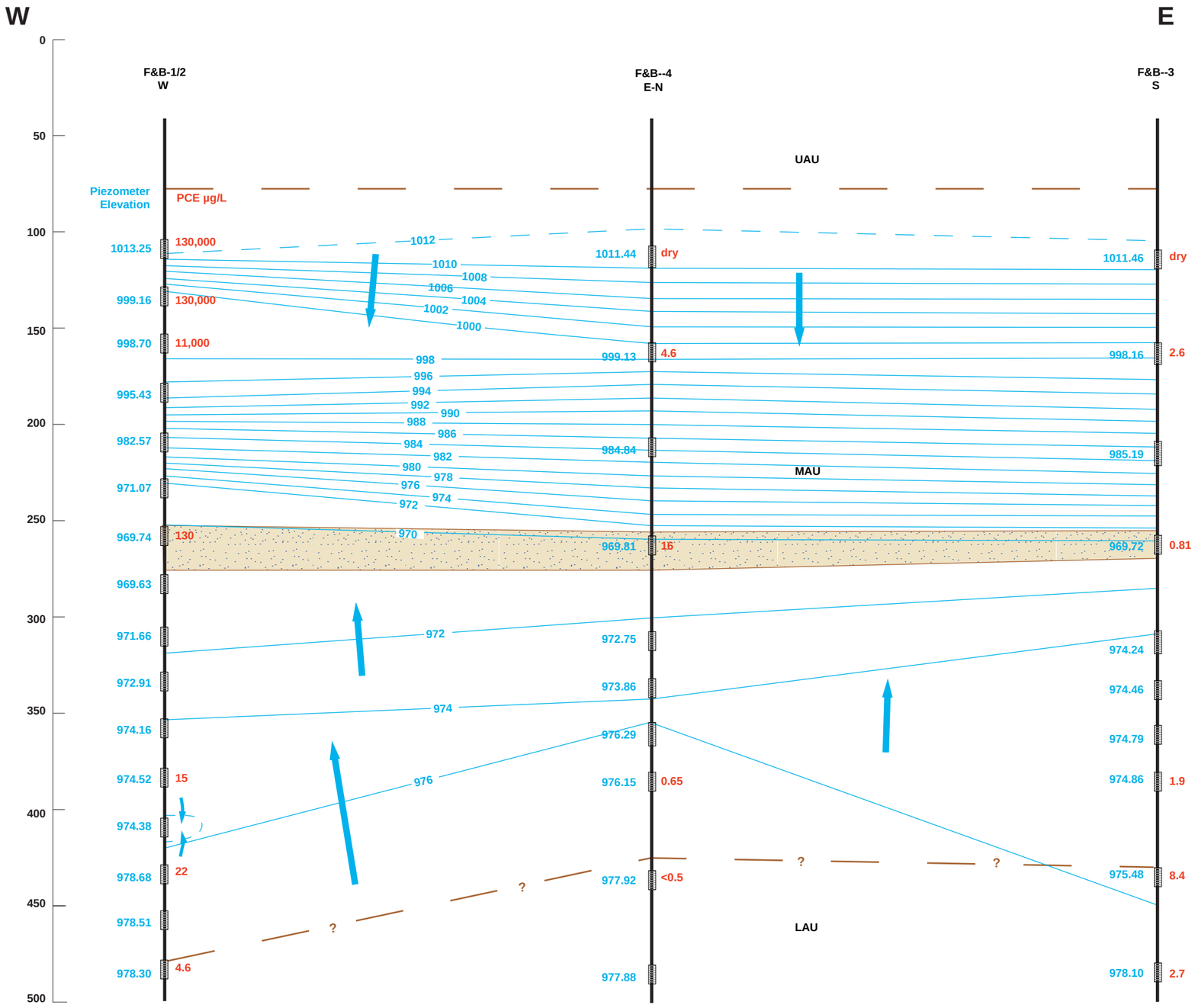
Phoenix, Arizona

Figure 51

Project No. 6854

6854-59_03160RXFmeg

LFR



Arizona Department of Environmental Quality

F&B Westbay Well Cross-Section Showing May 2001 Groundwater Elevations and PCE Concentrations

F&B Mfg. Co. Facility

WCP North Plume Site

Phoenix, Arizona

Figure 52

Project No. 6854

6854-59_04102000KSR/meg.sci

LFR

West Highland Avenue
North 42nd Avenue
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
West Indian School Road

WCP-39S <0.5
GSC-31 25
WCP-38S 22
WCP-53 <0.5
WCP-24 2.9
GSC-27 210
Hill Bros Facility
WCP-22 5.8
GSC-23 <0.5
WCP-23 <0.5
GSC-19 <250
WCP-21 18
WCP-20 1.1
GSC-17 <0.5
GSC-24 <0.5
WCP-19 2
WCP-18 <0.5
Rinchem Facility
GSC-18 <0.5
WCP-51 <0.5
WCP-50 <0.5
WCP-55 <0.5
WCP-56 <0.5
GSC-10 570
WCP-36S 120
GSC-GTD 26
GSC-22 430
Pyramid Facility
WCP-32 51
WCP-33S 7.9
WCP-31 31000
F&B Mfg. Co. Facility
GSC-21 6300
GSC-25 1900
F&B-1 71000 @ 115' 46000 @ 135'
F&B-4 8100 @ 109'
F&B-3 2100 @ 109' 9.6 @ 159
WCP-35B NA
WCP-34S 0.9
AT&T MW-1
2
5
10
100
1,000
10,000

EXPLANATION

North Plume Monitor Well Network

- WCP-24 Shallow Wells
- WCP-37M3 Middle Wells
- WCP-37M2 Deep Wells
- F&B -4 F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Rinchem Facility
- Hill Brothers Facility

0 400 feet

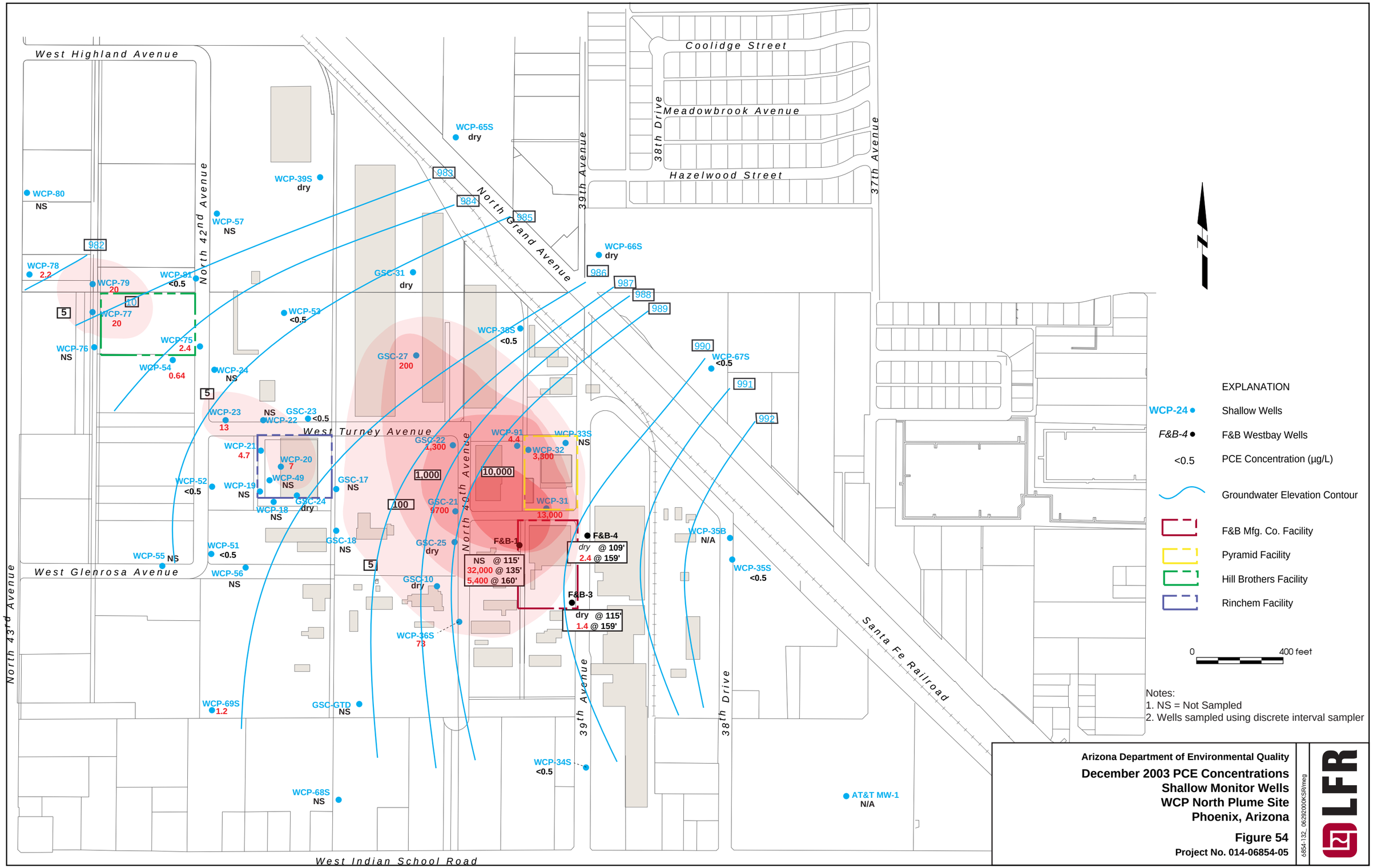
Arizona Department of Environmental Quality

November/December 1999 PCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 53
Project No. 014-06854-05

6854-45_04102000KSR(meg).srj

LFR



Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

Arizona Department of Environmental Quality

December 2003 PCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 54
Project No. 014-06854-05

6854-132_06292000KSR/meg

LFR

West Highland Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
North 42nd Avenue
38th Drive
39th Avenue
37th Avenue
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
West Indian School Road

WCP-80 NS
WCP-57 NS
WCP-39S dry
WCP-65S dry
WCP-66S dry
WCP-78 2.8
WCP-79 19
WCP-81 <0.5
WCP-77 23
WCP-75 3.1
WCP-76 NS
WCP-54 0.55
WCP-53 <0.5
GSC-31 dry
WCP-38S <0.5
GSC-27 170
WCP-24 1.6
WCP-67S <0.5
WCP-23 7.6
WCP-22 NS
GSC-23 <0.5
WCP-21 5
WCP-20 8.3
WCP-49 NS
GSC-22 670
WCP-91 <0.5
WCP-33S NS
WCP-32 3,000
WCP-52 <0.5
WCP-19 NS
GSC-17 NS
GSC-24 dry
WCP-18 NS
1,000
100
10,000
WCP-31 8,800
GSC-21 11,000
GSC-25 dry
F&B-1
F&B-4 dry @ 109' 2.7 @ 159'
NS @ 115' 43,000 @ 135' 6,100 @ 160'
F&B-3 dry @ 115' 1.1 @ 159'
WCP-35B N/A
WCP-35S <0.5
WCP-55 NS
WCP-56 NS
WCP-51 <0.5
GSC-18 NS
GSC-10 dry
WCP-36S 260
WCP-69S 1.1
GSC-GTD NS
WCP-34S <0.5
WCP-68S NS
AT&T MW-1 N/A

982 983 984 985 986 987 988 989 990 991 992

5

EXPLANATION

WCP-24 ● Shallow Wells
F&B-4 ● F&B Westbay Wells
<0.5 PCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility

0 400 feet

Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

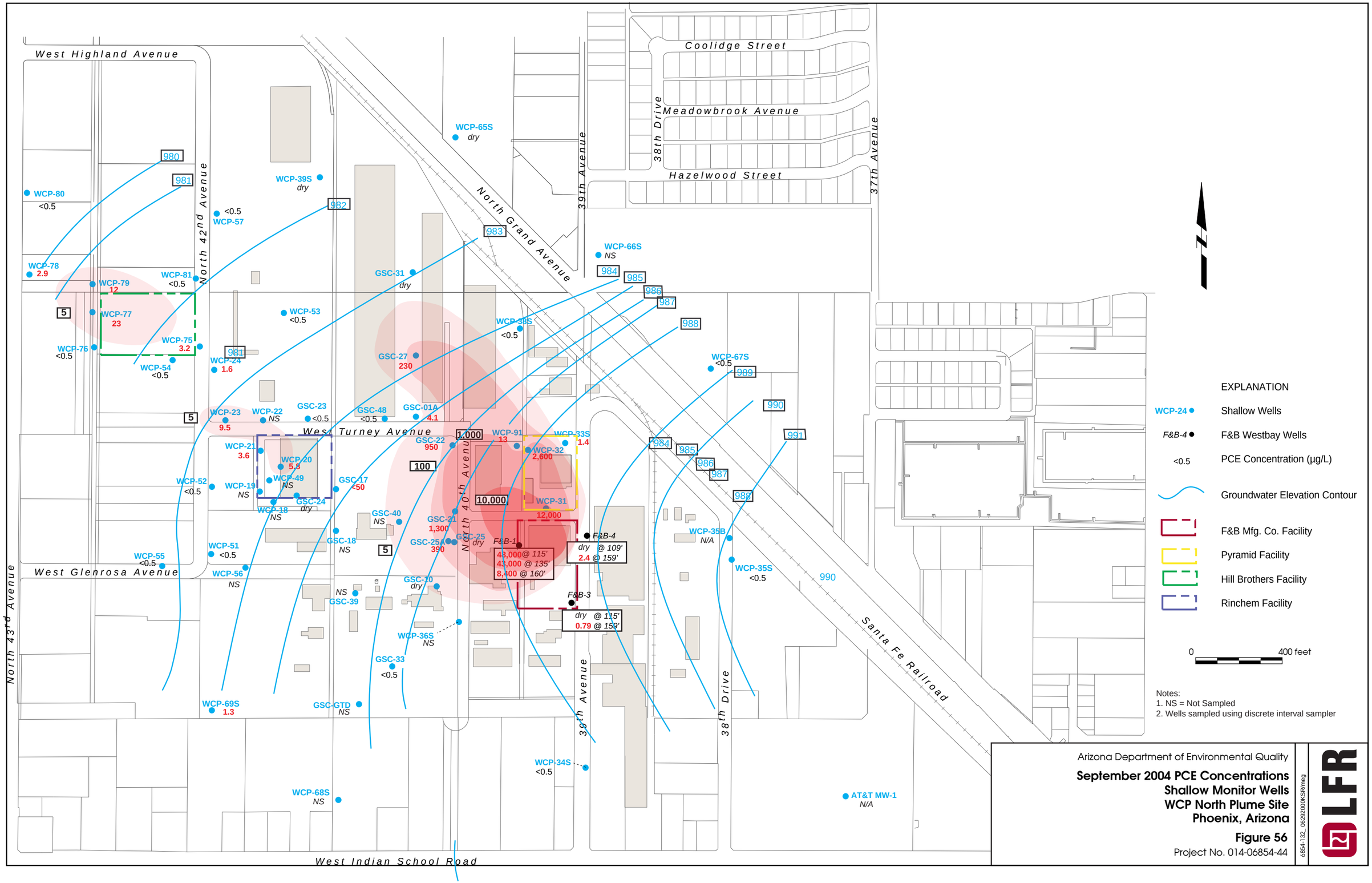
Arizona Department of Environmental Quality

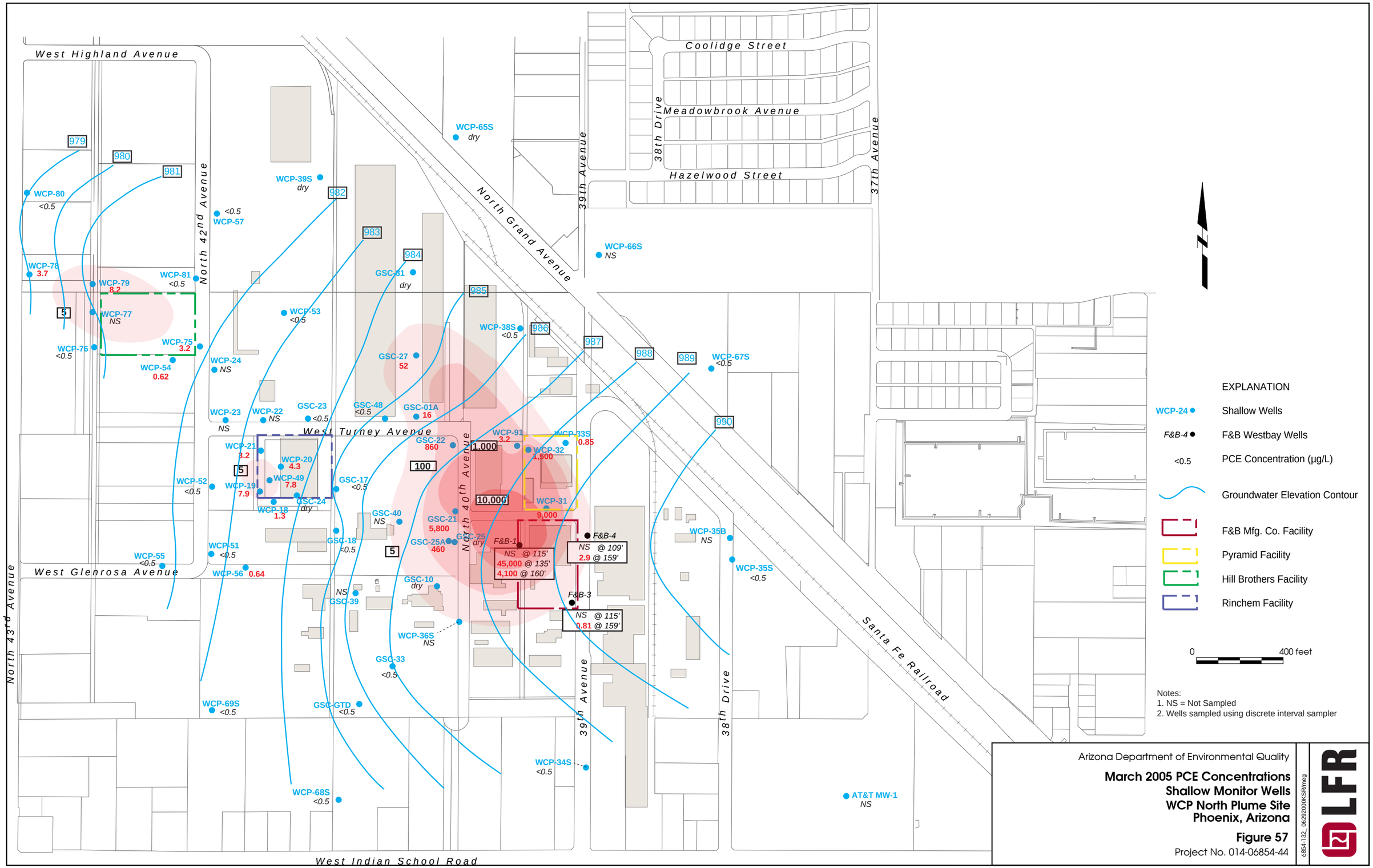
March 2004 PCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 55
Project No. 014-06854-44

6854-132_ 06292006KSRmeg

LFR


West Highland Avenue
North 42nd Avenue
Coolidge Street
38th Drive
Meadowbrook Avenue
39th Avenue
37th Avenue
Hazelwood Street
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
West Indian School Road
WCP-80 <0.5
WCP-78 2.9
WCP-79 12
WCP-77 23
WCP-76 <0.5
WCP-75 3.2
WCP-54 <0.5
WCP-81 <0.5
WCP-57 <0.5
WCP-39S dry
WCP-65S dry
WCP-53 <0.5
WCP-24 1.6
WCP-23 9.5
WCP-22 NS
GSC-23 <0.5
GSC-48 <0.5
GSC-01A 4.1
WCP-21 3.6
WCP-20 5.8
WCP-49 NS
WCP-19 NS
WCP-18 NS
GSC-24 dry
GSC-17 <50
WCP-52 <0.5
WCP-51 <0.5
WCP-55 <0.5
WCP-56 NS
GSC-40 NS
GSC-18 NS
GSC-25 dry
GSC-25A 390
GSC-21 1,300
GSC-22 950
WCP-91 13
WCP-33S 1.4
WCP-32 2,600
WCP-31 12,000
F&B-1 43,000 @ 115' 43,000 @ 135' 8,400 @ 160'
F&B-4 dry @ 109' 2.4 @ 159'
F&B-3 dry @ 115' 0.79 @ 159'
GSC-10 dry
GSC-39 NS
GSC-33 <0.5
WCP-36S NS
WCP-69S 1.3
GSC-GTD NS
WCP-68S NS
WCP-34S <0.5
GSC-31 dry
WCP-66S NS
WCP-38S <0.5
GSC-27 230
WCP-67S <0.5
WCP-35B N/A
WCP-35S <0.5
AT&T MW-1 N/A
980
981
982
983
984
985
986
987
988
989
990
991
5
100
1,000
10,000
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 PCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
September 2004 PCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 56
Project No. 014-06854-44
6854-132_ 06292006KSRmeg
LFR


West Highland Avenue
North 42nd Avenue
North Grand Avenue
39th Avenue
38th Drive
37th Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
West Turney Avenue
West Glenrosa Avenue
West Indian School Road
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
979
980
981
982
983
984
985
986
987
988
989
990
5
WCP-80 <0.5
WCP-78 3.7
WCP-79 8.2
WCP-81 <0.5
WCP-77 NS
WCP-76 <0.5
WCP-75 3.2
WCP-54 0.62
WCP-57 <0.5
WCP-24 NS
WCP-39S dry
WCP-53 <0.5
WCP-65S dry
GSC-31 dry
GSC-27 52
WCP-38S <0.5
WCP-66S NS
WCP-67S <0.5
WCP-23 NS
WCP-22 NS
GSC-23 <0.5
GSC-48 <0.5
GSC-01A 16
WCP-21 3.2
WCP-20 4.3
WCP-49 7.8
WCP-19 7.9
WCP-18 1.3
GSC-24 dry
GSC-17 <0.5
WCP-52 <0.5
GSC-22 860
WCP-91 3.2
WCP-33S 0.85
WCP-32 1,500
WCP-31 9,000
1,000
10,000
100
GSC-40 NS
GSC-21 5,800
GSC-25A 460
GSC-25 dry
GSC-18 <0.5
WCP-51 <0.5
WCP-55 <0.5
WCP-56 0.64
F&B-1
NS @ 115'
45,000 @ 135'
4,100 @ 160'
F&B-4
NS @ 109'
2.9 @ 159'
F&B-3
NS @ 115'
0.81 @ 159'
GSC-10 dry
NS
GSC-39
WCP-36S NS
GSC-33 <0.5
WCP-69S <0.5
GSC-GTD <0.5
WCP-68S <0.5
WCP-34S <0.5
WCP-35B NS
WCP-35S <0.5
AT&T MW-1 NS
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 PCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
March 2005 PCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 57
Project No. 014-06854-44
6854-132_ 06292006KSRmeg
LFR

West Highland Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
North 42nd Avenue
38th Drive
39th Avenue
37th Avenue
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad

979 980 981 982 983 984 985 986 987 988 989 990

WCP-80 2.3
WCP-78 23
WCP-79 7.2
WCP-81 <1.0
WCP-77 NS
WCP-75 3.3
WCP-76 <1.0
WCP-54 2.5
WCP-57 <1.0
WCP-39S dry
WCP-65S dry
WCP-66S NS
WCP-53 <1.0
GSC-31 dry
WCP-38S <1.0
GSC-27 16.6
WCP-24 NS
WCP-67S <1.0
WCP-23 NS
WCP-22 NS
GSC-23 <1.0
GSC-48 <1.0
GSC-01A 6.7
WCP-91 4.4
WCP-33S NS
WCP-32 32
GSC-22 2,020
1,000
10,000
100
WCP-31 10,700
WCP-21 4.6
WCP-20 5.7
WCP-49 2.4
WCP-19 8.3
WCP-18 NS
GSC-24 dry
GSC-17 <100
WCP-52 <1.0
GSC-40 NS
GSC-21 11,600
GSC-25 dry
GSC-25A 65.1
F&B-1
51,200 @ 115'
56,000 @ 135'
6,990 @ 160'
F&B-4 NS @ 109' 3.8 @ 159'
F&B-3 NS @ 115' <1.0 @ 159'
WCP-35B NS
WCP-35S <1.0
WCP-55 <1.0
WCP-56 <1.0
WCP-51 <1.0
GSC-18 <1.0
GSC-10 dry
NS GSC-39
WCP-36S NS
GSC-33 <1.0
WCP-69S 3.2
GSC-GTD <1.0
WCP-34S <1.0
WCP-68S <1.0
AT&T MW-1 NS

EXPLANATION

WCP-24 ● Shallow Wells
F&B-4 ● F&B Westbay Wells
<0.5 PCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility

0 400 feet

Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

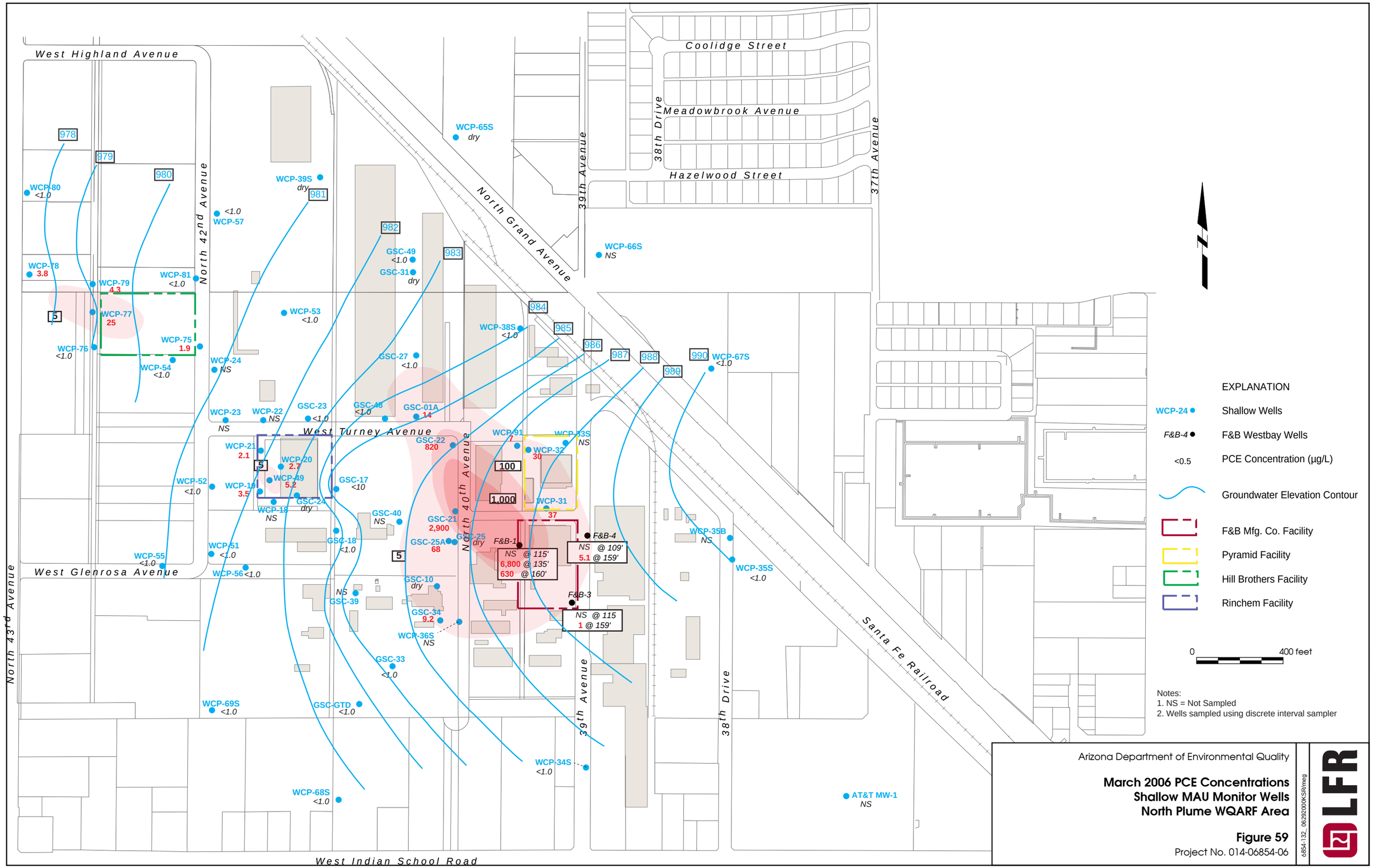
Arizona Department of Environmental Quality

September 2005 PCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 58
Project No. 014-06854-06

6854-132_ 06292006KSR.meg

LFR


West Highland Avenue
North 42nd Avenue
North 43rd Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
North 40th Avenue
Santa Fe Railroad
978
979
980
981
982
983
984
985
986
987
988
989
990
5
100
1,000
WCP-80 <1.0
WCP-78 3.8
WCP-79 4.3
WCP-81 <1.0
WCP-77 25
WCP-75 1.9
WCP-76 <1.0
WCP-54 <1.0
WCP-57 <1.0
WCP-39S dry
WCP-65S dry
WCP-66S NS
WCP-53 <1.0
GSC-49 <1.0
GSC-31 dry
WCP-38S <1.0
GSC-27 <1.0
WCP-67S <1.0
WCP-24 NS
WCP-23 NS
WCP-22 NS
GSC-23 <1.0
GSC-48 <1.0
GSC-01A 14
GSC-22 820
WCP-91 7
WCP-33S NS
WCP-32 30
WCP-31 37
WCP-21 2.1
WCP-20 2.7
WCP-49 5.2
WCP-19 3.5
WCP-18 NS
GSC-24 dry
GSC-17 <10
WCP-52 <1.0
GSC-40 NS
GSC-21 2,900
GSC-25A 68
GSC-25 dry
F&B-1
F&B-4 NS @ 109' 5.1 @ 159'
NS @ 115' 6,800 @ 135' 630 @ 160'
F&B-3 NS @ 115 1 @ 159'
WCP-35B NS
WCP-35S <1.0
WCP-55 <1.0
WCP-56 <1.0
WCP-51 <1.0
GSC-18 <1.0
GSC-10 dry
GSC-39 NS
GSC-34 9.2
WCP-36S NS
GSC-33 <1.0
WCP-69S <1.0
GSC-GTD <1.0
WCP-34S <1.0
WCP-68S <1.0
AT&T MW-1 NS
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 PCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
March 2006 PCE Concentrations
Shallow MAU Monitor Wells
North Plume WQARF Area
Figure 59
Project No. 014-06854-06
6854-132_ 06292006KSR.meg
LFR

West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 39th Drive
North Grand Avenue

977
978
979
980
981
982
983
984
985
986
987
988
989
990

?

WCP-80 ND
WCP-57 ND
WCP-78 6.6
WCP-79 18
WCP-77 67
WCP-81 ND
WCP-76 ND
WCP-75 2
WCP-54 ND
WCP-24 NS
WCP-65S NS
WCP-39S NS
WCP-53 ND
GSC-49 ND
GSC-31 NS
WCP-66S NS
WCP-38S ND
GSC-27 4
WCP-67S ND
GSC-23 ND
GSC-48 1.5
GSC-01A 84
WCP-91 5.7
WCP-23 NS
WCP-22 ND
WCP-21 NS
WCP-20 3
WCP-49 ND
GSC-22 410
WCP-32 580
WCP-33S ND
WCP-52 ND
GSC-17 ND
WCP-19 2.1
WCP-18 NS
GSC-24 NS
GSC-21 320
WCP-31 3600
GSC-40 NS
GSC-25 NS
F&B MW-2 NS
F&B MW-4 6.1
F&B MW-1 2100
GSC-25A 620
WCP-35B NS
WCP-35S ND
WCP-51 ND
WCP-55 ND
WCP-56 ND
GSC-18 ND
GSC-10 NS
GSC-39 NS
F&B MW-3 ND
GSC-34 63
WCP-36S NS
GSC-33 ND
GSC-GTD ND
WCP-69S ND
WCP-34S ND
WCP-68S NS

N

1" = 400'

0 205 410 820 Feet

LEGEND

- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 mg/L
- September 2006 GWEC
- Shallow Wells
- F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Hill Brothers Facility
- Rinchem Facility

NOTES

NS = not sampled
ND = non-detect

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE

Figure 60

September 2006 PCE Concentrations
Shallow Monitor Wells

LFR

West Highland Avenue

West Glenrosa Avenue

West Turney Avenue

North 44th Avenue

North 43rd Avenue

North 42nd Avenue

North 40th Avenue

North 39th Avenue

North 39th Drive

North Grand Avenue

WCP-223 ND

WCP-80 ND

WCP-57 ND

WCP-39S Dry

WCP-65S Dry

WCP-78 5.5

WCP-79 10

WCP-77 64

WCP-76 ND

WCP-81 ND

WCP-53 ND

GSC-49 6.4

GSC-31 NS

WCP-66S NS

WCP-75 1.2

WCP-24 NS

WCP-54 ND

WCP-222 ND

WCP-221 2

WCP-22 Dry

GSC-23 ND

GSC-48 1.7

GSC-01A 92

WCP-91 ND

WCP-32 NS

WCP-33S NS

WCP-38S ND

GSC-27 3

WCP-67S ND

WCP-23 NS

WCP-21 1

WCP-20 Dry

WCP-224 ND

WCP-49 Dry

WCP-19 ND

GSC-17 ND

GSC-22 440

WCP-220 ND

WCP-31 6200

GSC-21 360

WCP-52 ND

WCP-18 NS

GSC-18 ND

GSC-40 6.4

F&B MW-4 7

WCP-35B NS

WCP-35S ND

WCP-51 ND

WCP-55 ND

WCP-56 ND

GSC-25A 1100

F&B MW-2 NS

F&B MW-1 2900

F&B MW-3 ND

GSC-39 NS

GSC-34 57

WCP-36S Dry

GSC-33 ND

GSC-GTD ND

WCP-69S NS

WCP-34S ND

WCP-68S NS

971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990

?

N

1" = 400'

0 200 400 800 Feet

LEGEND

- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 mg/L
- March 2007 GWECs
- Shallow Wells
- F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Hill Brothers Facility
- Rinchem Facility

NOTES

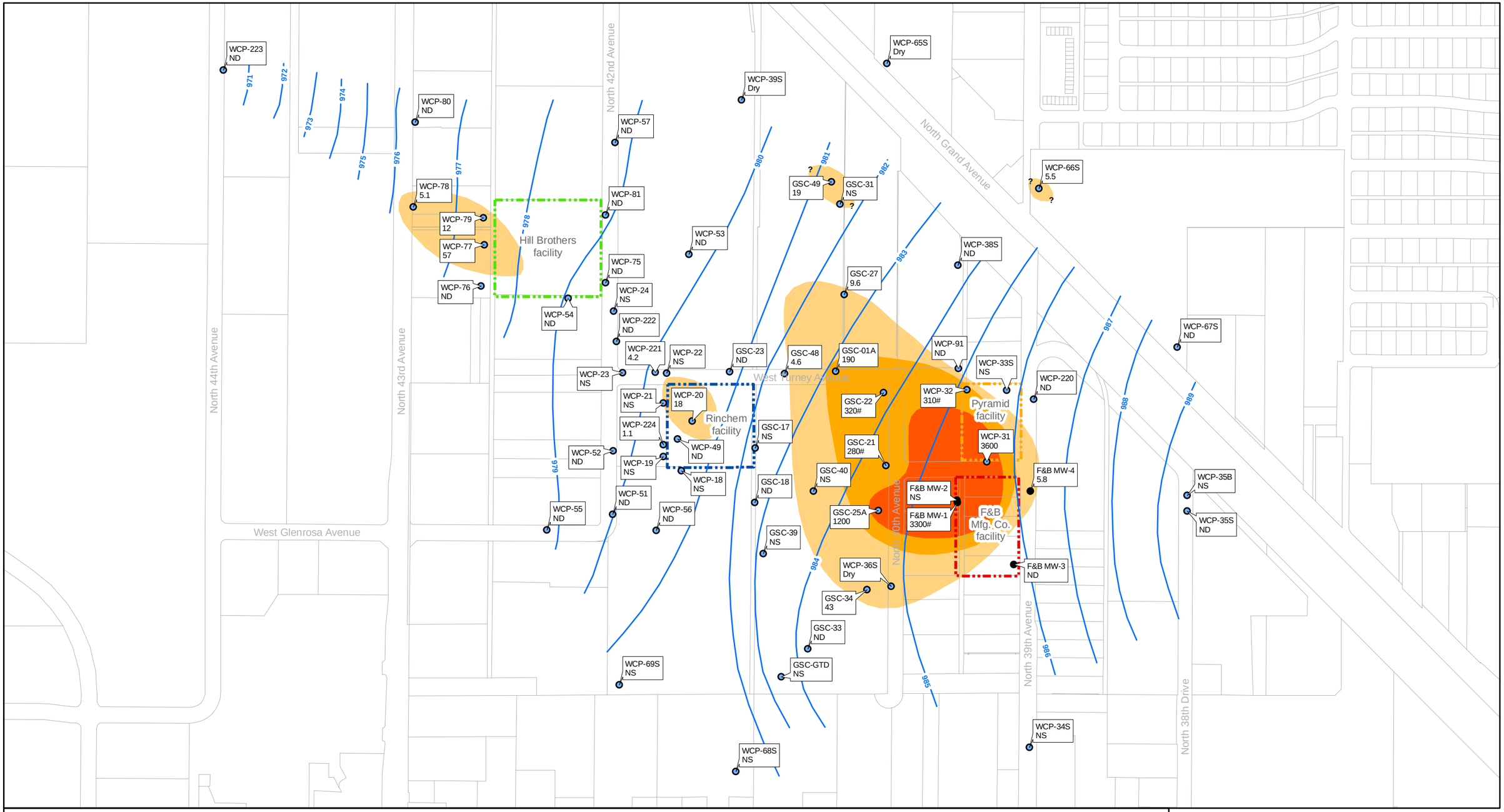
NS = not sampled
ND = non-detect

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE

Figure 61

March 2007 PCE Concentrations
Shallow Monitor Wells

LFR



LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- NM = monitor well not sampled during September 2007 event.
- ND = PCE concentration below laboratory detection limit.
- # = PCE concentration above laboratory upper calibration limit.

Feet
0 200 400
Scale: 1" = 400'

September 2007 PCE Concentrations, Shallow Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 62

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North PlumeNP GIS\Projects\Final RI report\Fig_062_PCE_shallow_Sep_2007.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_063_PCE_shallow_Mar_2008.mxd 12/16/2008

WCP-223 ND
WCP-80 ND
WCP-57 ND
WCP-65S NS
WCP-66S NS
WCP-78 4.2
WCP-79 9.8
WCP-77 31
WCP-76 ND
WCP-81 ND
WCP-75 ND
WCP-54 ND
WCP-53 ND
GSC-49 5.8
WCP-38S ND
GSC-27 1.3
WCP-67S ND
WCP-222 ND
WCP-221 8.4
WCP-22 NS
GSC-23 ND
GSC-48 2.3
GSC-01A 160
WCP-91 ND
WCP-33S ND
GSC-22 250
WCP-32 150
WCP-220 ND
WCP-21 NS
WCP-20 14
GSC-46 ND
WCP-224 2
GSC-17 ND
WCP-31 3100
GSC-21 840
WCP-52 ND
WCP-49 ND
WCP-19 NS
GSC-40 12
F&B-4-159 3.1
WCP-35S ND
GSC-18 ND
F&B-1-160 4100
WCP-51 ND
WCP-55 ND
WCP-56 ND
GSC-25A 950
GSC-39 NS
F&B-3-159 3.2
GSC-34 46
WCP-36S NS
GSC-33 ND
WCP-69S 0.62
WCP-34S ND
WCP-68S ND

971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989

North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- NS = monitor well not sampled during March 2008 event.
- ND = PCE concentration below laboratory detection limit.

0 200 400 Feet
Scale: 1" = 400'

March 2008 PCE Concentrations, Shallow Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 63

West Highland Avenue
North 42nd Avenue
Coolidge Street
Meadowbrook Avenue
38th Drive
Hazelwood Street
39th Avenue
37th Avenue
North Grand Avenue
West Turney Avenue
WCP-33M
<0.5
WCP-37M3
<0.5
F&B-2
23 @ 259'
18 @ 259'
F&B-4
10
F&B-3
1.8 @ 259'
WCP-35M
<0.5
West Glenrosa Avenue
North 43rd Avenue
WCP-36M
4.2
North 40th Avenue
1.0
39th Avenue
38th Drive
Santa Fe Railroad
WCP-34M
<0.5
West Indian School Road

EXPLANATION

North Plume Monitor Well Network

- WCP-24 • Shallow Wells
- WCP-37M3 • Middle Wells
- WCP-37M2 • Deep Wells
- F&B -4 • F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Rinchem Facility
- Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality

November/December 1999 PCE Concentrations
Middle Depth Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 64
Project No. 014-06854-05

6854-46 _ 04102000KSRmeg.srj

LFR

West Highland Avenue

North 42nd Avenue

North Grand Avenue

Coolidge Street

Meadowbrook Avenue

Hazelwood Street

38th Drive

39th Avenue

37th Avenue

West Turney Avenue

West Glenrosa Avenue

North 43rd Avenue

North 40th Avenue

39th Avenue

38th Drive

Santa Fe Railroad

West Indian School Road

WCP-33M
<0.5

WCP-37M3
<0.5

WCP-72M
10

F&B-2
160 @ 259'
100

F&B-4
12 @ 259'
10

F&B-3
<0.5@ 259'
1

WCP-35M
<0.5

WCP-71M
<0.5

WCP-36M
<0.5

WCP-70M
<0.5

WCP-34M
<0.5

N

EXPLANATION

North Plume Monitor Well Network

WCP-24 ● Shallow Wells

WCP-37M3 ● Middle Wells

WCP-37M2 ● Deep Wells

F&B -4 ● F&B Westbay Wells

F&B Mfg. Co. Facility

Pyramid Facility

Rinchem Facility

Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality

May 2002 PCE Concentrations
Middle Depth Monitor Wells
WCP North Plume Site
Phoenix, Arizona

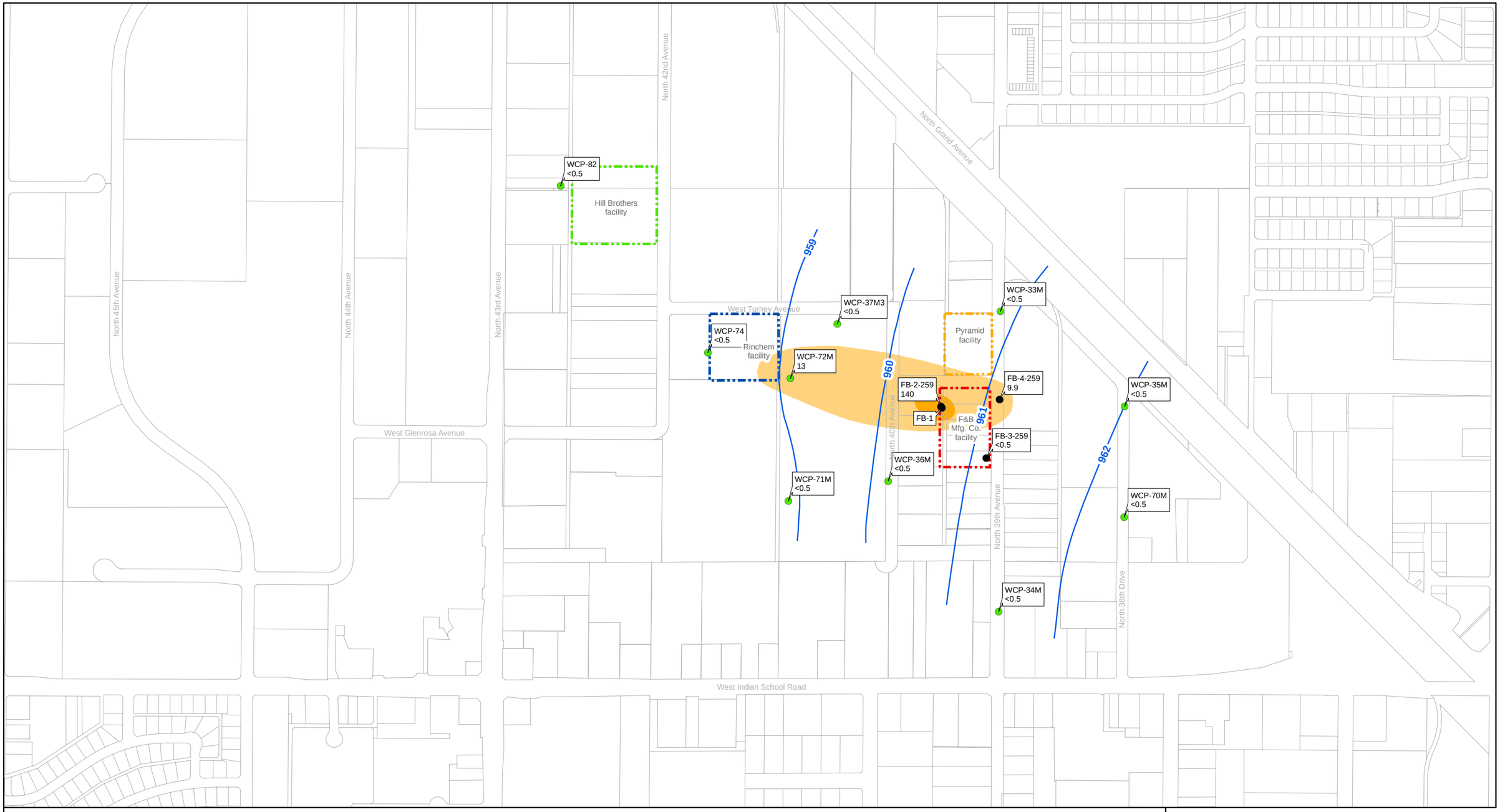
Figure 65

Project No. 014-06854-05

6854-46_04102006KSRmeg.srg

LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_066_PCE_middle_Mar_2003.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

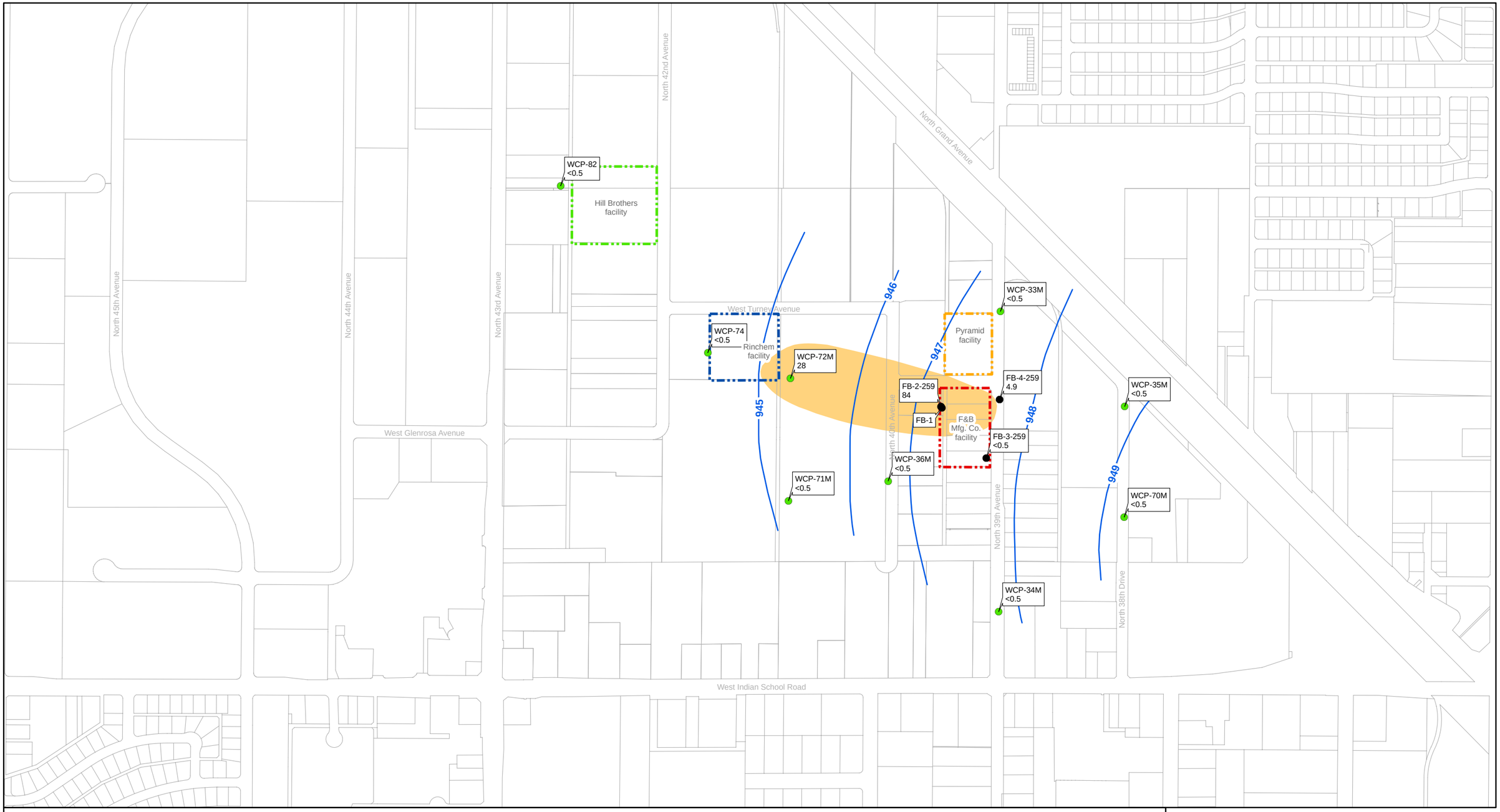
March 2003 PCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 66

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_067_PCE_middle_Sep_2004.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

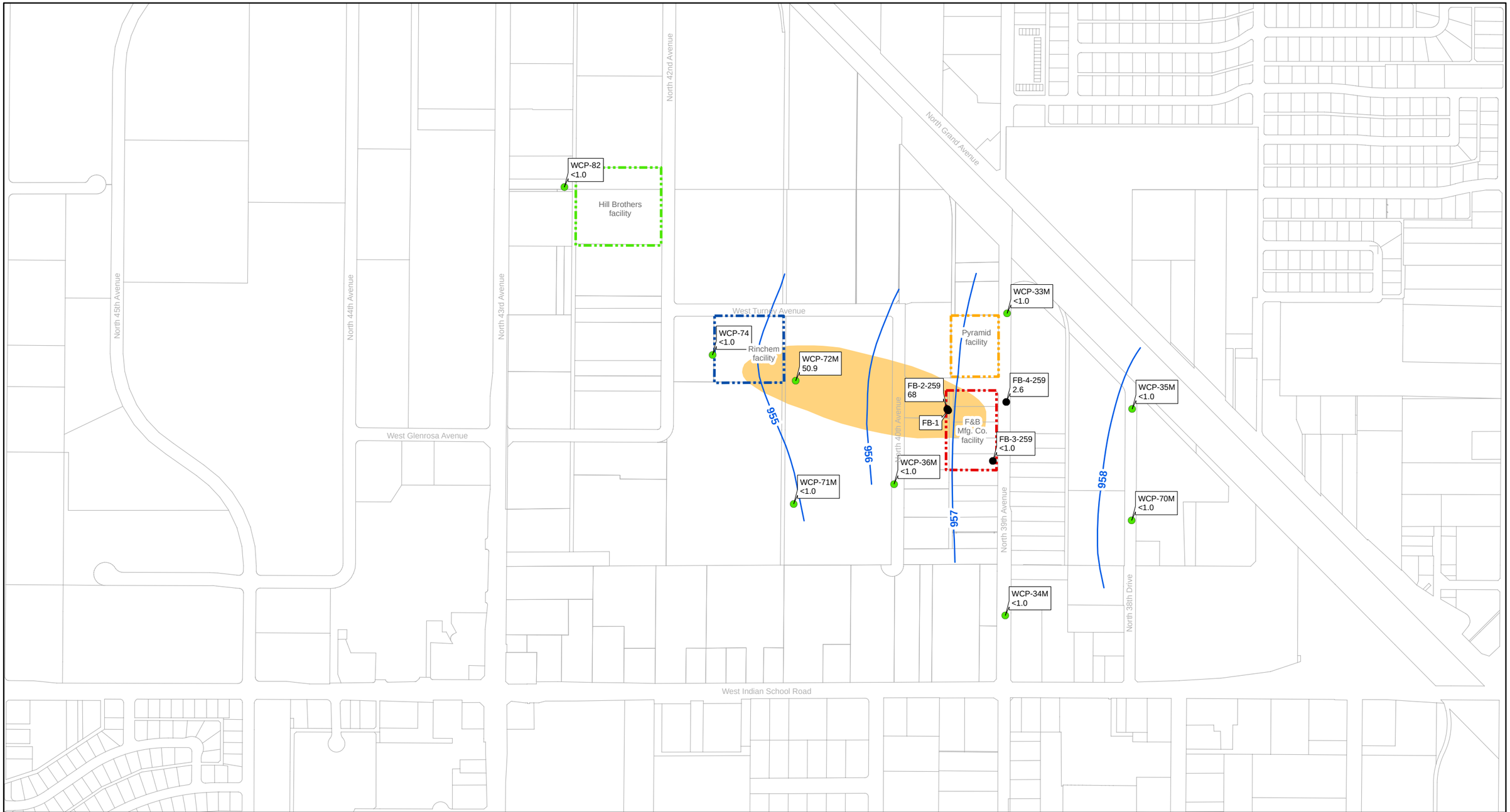
September 2004 PCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 67

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_068_PCE_middle_Sep_2005.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2005 PCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 68

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_069_PCE_middle_Sep_2006.mxd 12/16/2008

WCP-82 <1.0
Hill Brothers facility
WCP-74 <1.0
Rinchem facility
WCP-72M 5.2
WCP-71M <1.0
WCP-33M <1.0
Pyramid facility
FB-2-259 32
FB-1
FB-4-259 1.4
F&B Mfg. Co. facility
FB-3-259 <1.0
WCP-36M <1.0
WCP-35M <1.0
WCP-70M <1.0
WCP-34M <1.0
956
957
958
959
North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

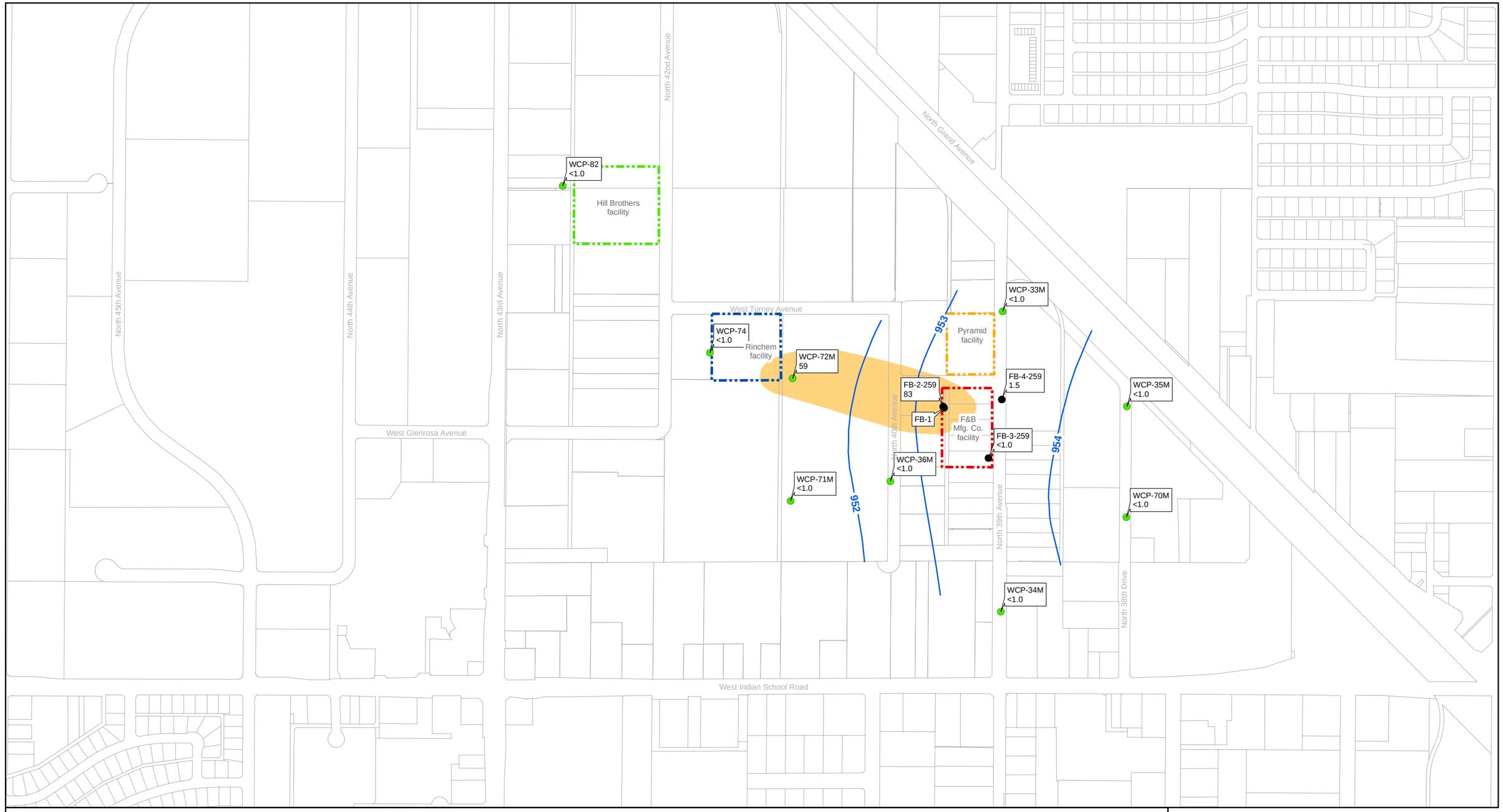
Scale: 1" = 500'

September 2006 PCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 69



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2007 PCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 70

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_070_PCE_middle_Sep_2007.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_071_PCE_middle_Mar_2008.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Indian School Road

WCP-82 <1.0
Hill Brothers facility
WCP-74 <1.0
Rinchem facility
WCP-72M 63
WCP-71M <1.0
WCP-33M <1.0
Pyramid facility
FB-2-259 61
FB-1
F&B Mfg. Co. facility
FB-4-259 <1.0
FB-3-259 <1.0
WCP-36M <1.0
WCP-34M <1.0
WCP-35M <1.0
WCP-70M <1.0
955
956
957
958

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- PCE = 5 - 100 ug/L
- PCE = 100 - 1000 ug/L
- PCE > 1000 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

0 250 500 Feet

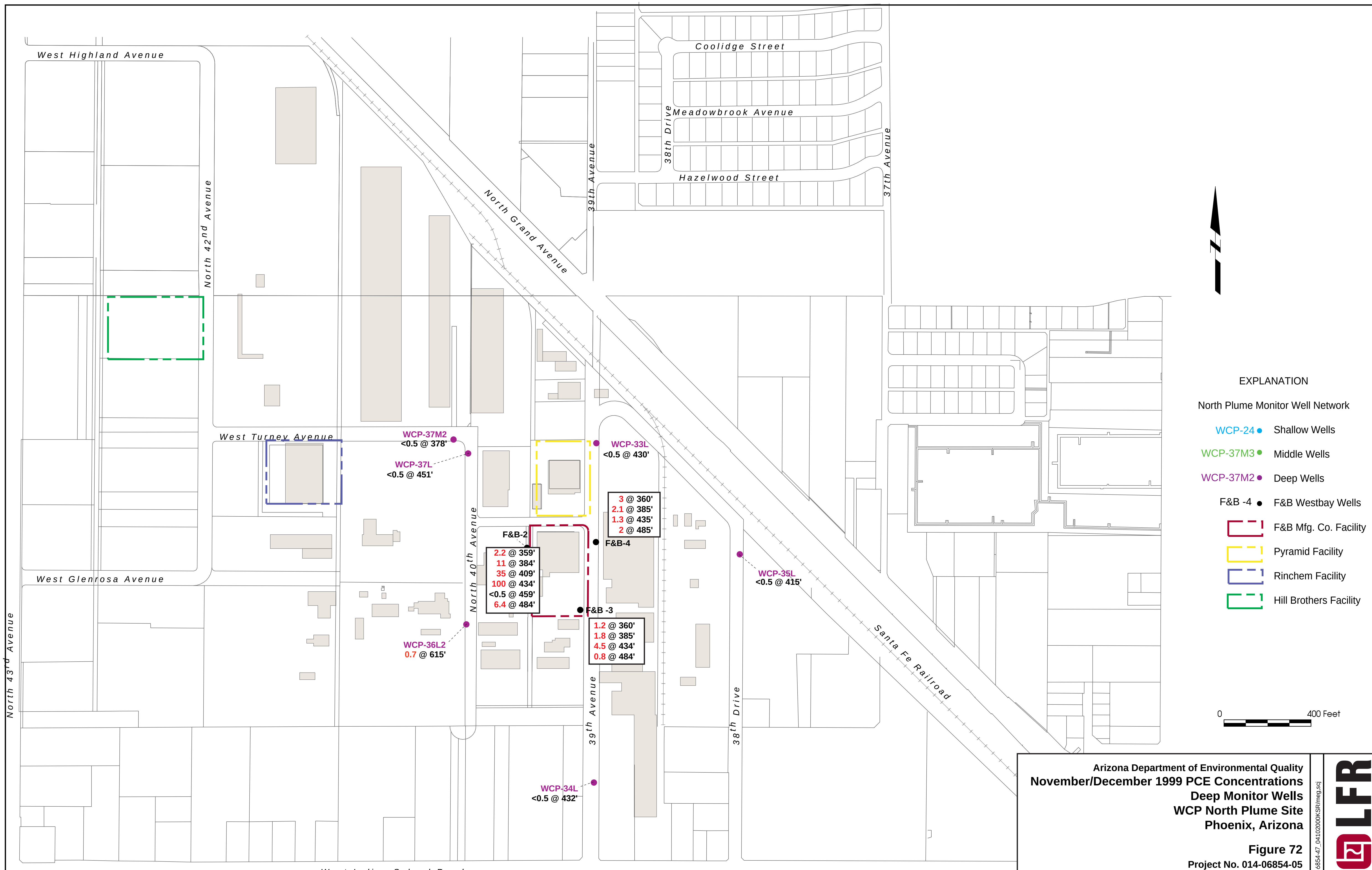
Scale: 1" = 500'

March 2008 PCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 71



West Highland Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
North 42nd Avenue
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
North 40th Avenue
North 43rd Avenue
Santa Fe Railroad
West Indian School Road
WCP-37M2
<0.5 @ 378'
WCP-37L
<0.5 @ 451'
WCP-33L
<0.5 @ 430'
3 @ 360'
2.1 @ 385'
1.3 @ 435'
2 @ 485'
F&B-2
F&B-4
2.2 @ 359'
11 @ 384'
35 @ 409'
100 @ 434'
<0.5 @ 459'
6.4 @ 484'
F&B-3
1.2 @ 360'
1.8 @ 385'
4.5 @ 434'
0.8 @ 484'
WCP-35L
<0.5 @ 415'
WCP-36L2
0.7 @ 615'
WCP-34L
<0.5 @ 432'
EXPLANATION
North Plume Monitor Well Network
WCP-24 Shallow Wells
WCP-37M3 Middle Wells
WCP-37M2 Deep Wells
F&B-4 F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Rinchem Facility
Hill Brothers Facility
0
400 Feet
6854-47_04102000KSR/meg.scj
LFR

Arizona Department of Environmental Quality

November/December 1999 PCE Concentrations
Deep Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 72

Project No. 014-06854-05

West Highland Avenue

North 42nd Avenue

West Turney Avenue

West Glenrosa Avenue

North 43rd Avenue

West Indian School Road

North Grand Avenue

Coolidge Street

Meadowbrook Avenue

Hazelwood Street

38th Drive

39th Avenue

37th Avenue

North 40th Avenue

Santa Fe Railroad

WCP-37M2 <0.5

WCP-37L <0.5

WCP-33L <0.5

WCP-73L <0.5

F&B -2 2.4@484' 14@434'

F&B -4 <0.5@485' <0.5@435'

F&B -3 --@484' 8.2@434'

WCP-35L <0.5

WCP-36M2 <0.5

WCP-36L2 3.4

WCP-34L <0.5

EXPLANATION

North Plume Monitor Well Network

WCP-24 ● Shallow Wells

WCP-37M3 ● Middle Wells

WCP-37M2 ● Deep Wells

F&B -4 ● F&B Westbay Wells

F&B Mfg. Co. Facility

Pyramid Facility

Rinchem Facility

Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality

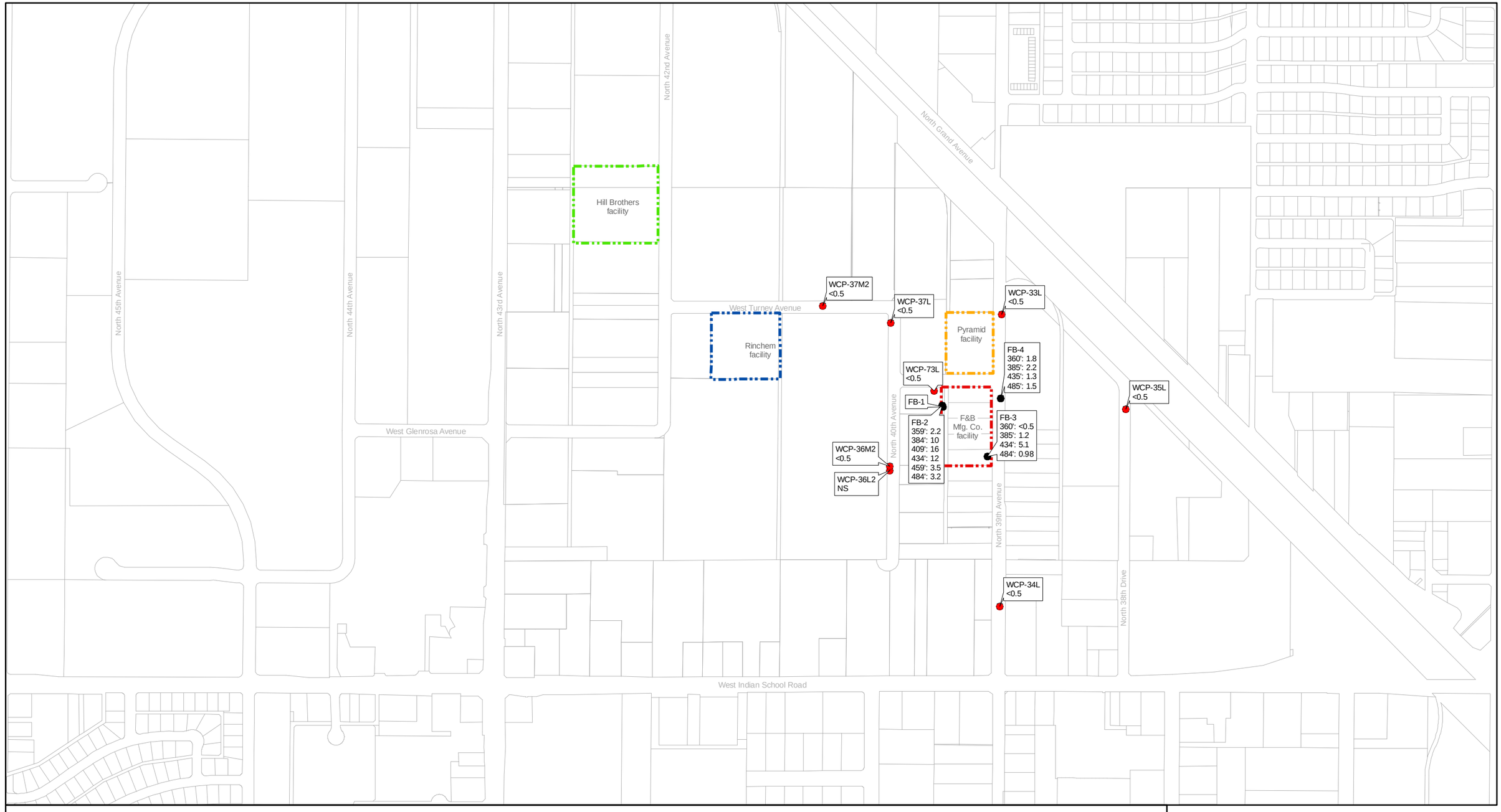
May 2002 PCE Concentrations
Deep Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 73

Project No. 014-06854-05

6854-130_021301KSR/meg

LFR



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

Feet
0 250 500

Scale: 1" = 500'

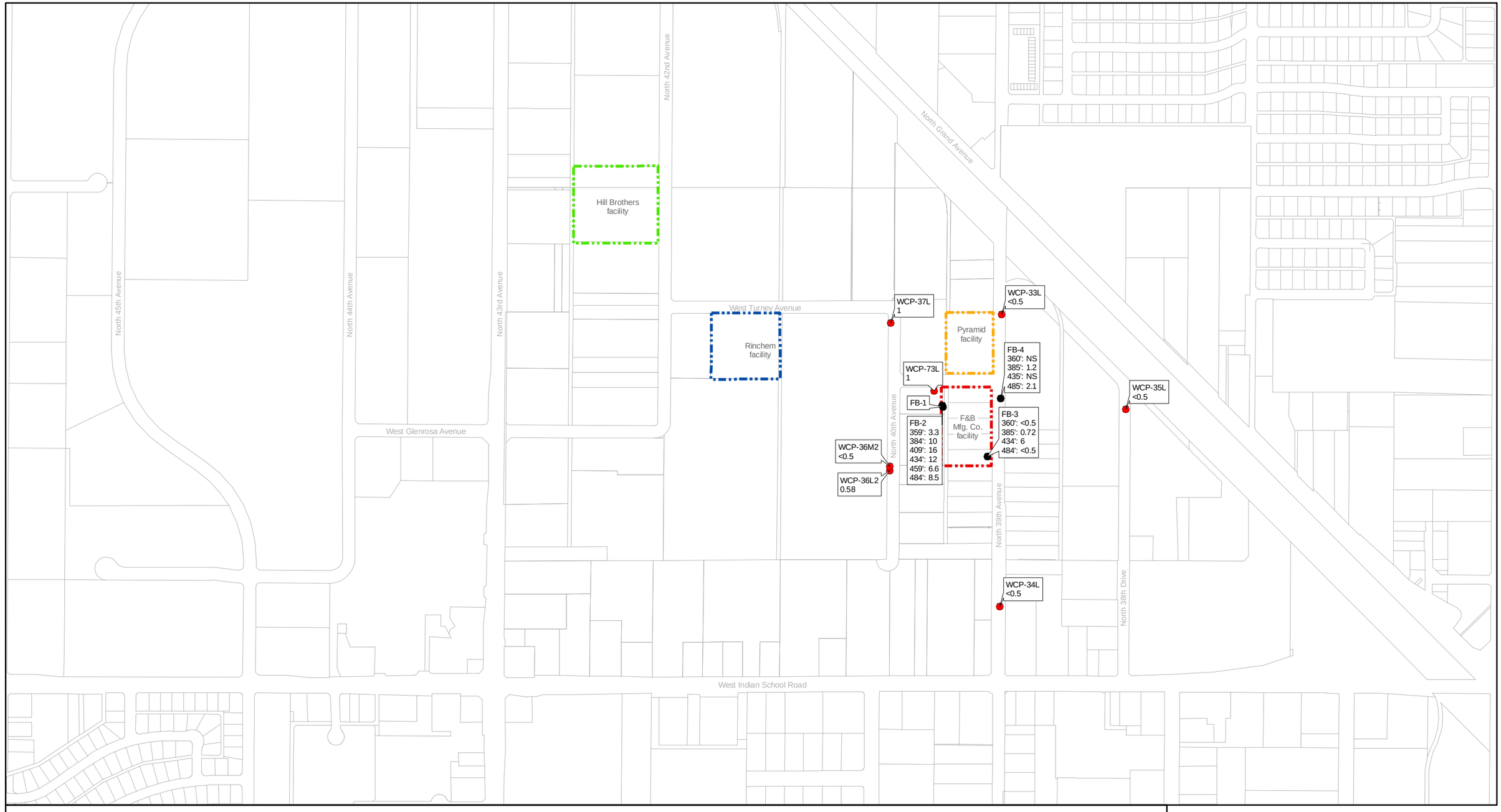
March 2003 PCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 74

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_074_PCE_deep_Mar_2003.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

Feet
0 250 500

Scale: 1" = 500'

September 2004 PCE Concentrations, Deep Monitor Wells

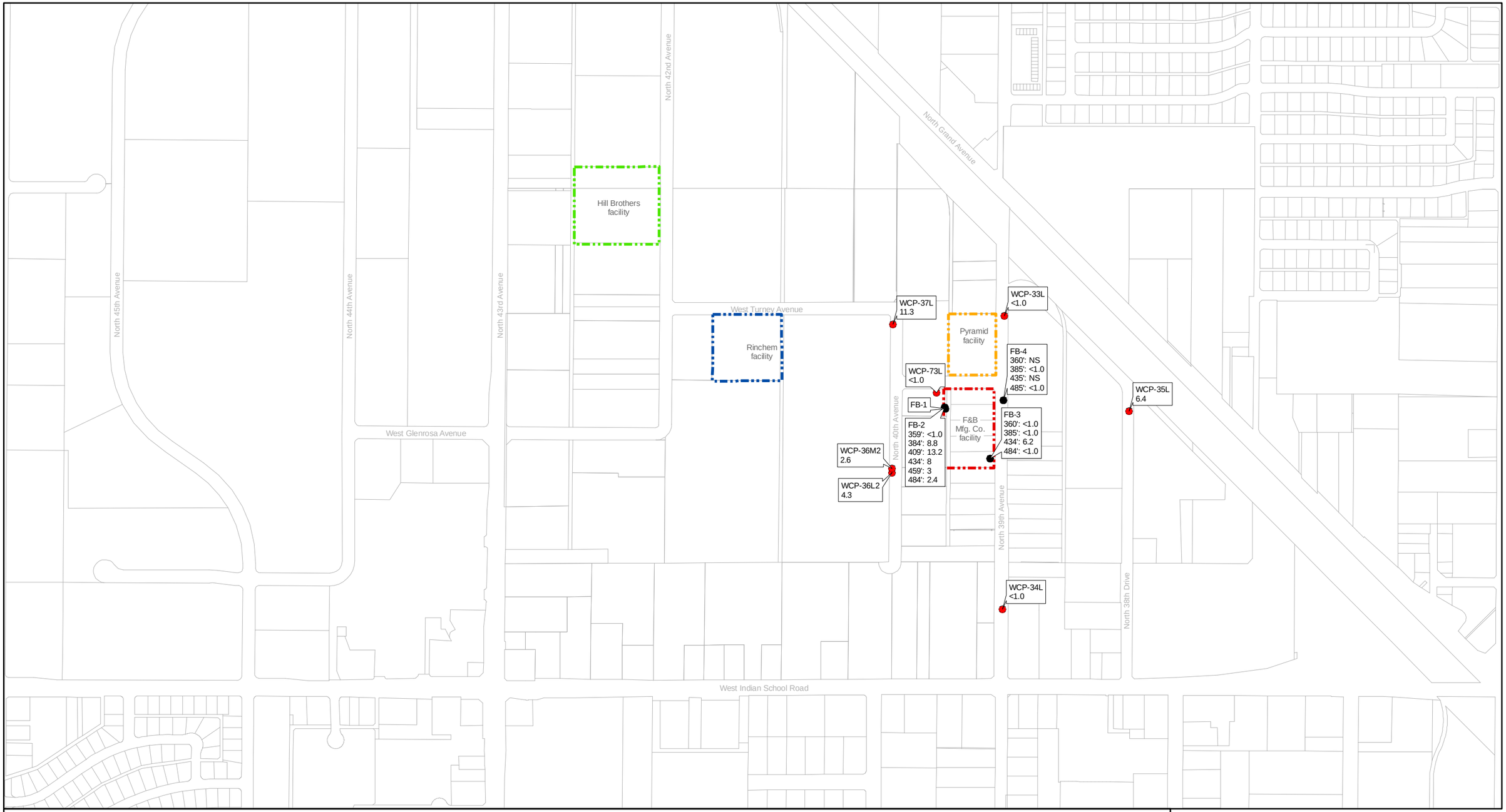
West Central Phoenix North Plume WQARF Site

LFR

Figure 75

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_075_PCE_deep_Sep_2004.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_076_PCE_deep_Sep_2005.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2005 PCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 76

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_077_PCE_deep_Sep_2006.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

WCP-37L <1.0
WCP-33L <1.0
WCP-73L 22
FB-4 360': NS 385': <1.0 435': <1.0 485': <1.0
FB-1
FB-2 359': 1 384': 5.8 409': 6.1 434': 4.2 459': 1.6 484': 4.3
FB-3 360': <1.0 385': <1.0 434': 5.4 484': <1.0
WCP-35L <1.0
WCP-36M2 <1.0
WCP-36L2 <1.0
WCP-34L <1.0

LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2006 PCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 77

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_078_PCE_deep_Sep_2007.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Glenrosa Avenue
West Turney Avenue
West Indian School Road

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

WCP-37L
4.1

WCP-33L
6.3

FB-4
360': NS
385': 1.4
435': <1.0
485': 67

FB-1

FB-2
359': <1.0
384': 5.6
409': 8.5
434': 8
459': 3.2
484': 2.2

FB-3
360': <1.0
385': <1.0
434': 4.6
484': <1.0

WCP-35L
<1.0

WCP-36M2
1.6

WCP-36L2
1.3

WCP-34L
5.9

LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

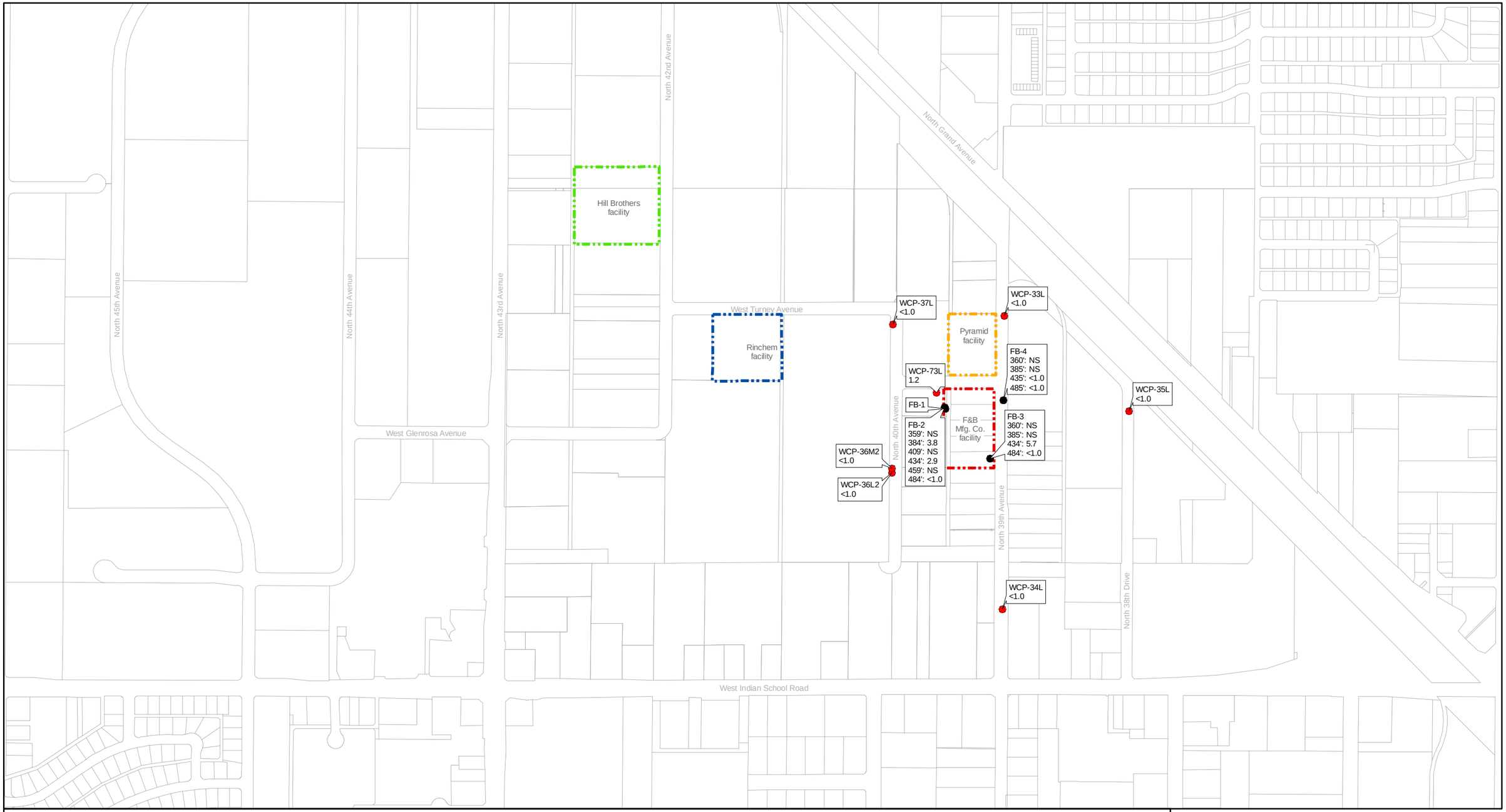
Scale: 1" = 500'

September 2007 PCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 78



H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_079_PCE_deep_Mar_2008.mxd 12/16/2008

LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = PCE concentration considered anomalous and not used in contouring.
- ND = PCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

Feet
0 250 500

Scale: 1" = 500'

March 2008 PCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 79

West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North 42nd Avenue
North 43rd Avenue
North 40th Avenue
North Grand Avenue
39th Avenue
38th Avenue
38th Drive
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
Santa Fe Railroad

WCP-80 NS
WCP-57 NS
WCP-65S dry
WCP-39S dry
WCP-78 18
WCP-81 5.8
WCP-79 33
WCP-77 44
WCP-75 27
WCP-76 NS
WCP-54 2.8
WCP-24 NS
WCP-53 <0.5
GSC-31 NS
WCP-66S dry
WCP-38S <0.5
GSC-27 3.8
WCP-67S <0.5
WCP-23 83
WCP-22 NS
GSC-23 0.67
WCP-21 13
WCP-20 19
WCP-49 NS
WCP-19 NS
GSC-17 NS
WCP-52 <0.5
GSC-24 dry
WCP-18 NS
GSC-22 120
WCP-91 <0.5
WCP-32 10
WCP-33S NS
GSC-21 21
WCP-31 18
GSC-25 NS
F&B-1 NS @ 115' <100 @ 135' <50 @ 160'
F&B-4 dry @ 109' <0.5 @159'
F&B-3 dry @ 109' <0.5 @ 159'
WCP-35B NA
WCP-35S <0.5
WCP-51 <0.5
WCP-55 NS
WCP-56 NS
GSC-18 NS
GSC-10 NS
WCP-36S <0.5
WCP-69S 11
GSC-GTD NS
WCP-34S 2.6
WCP-68S NS
AT&T MW-1 N/A

982 983 984 985 986 987 988 989 990 991 992

EXPLANATION

- WCP-24 ● Shallow Wells
- F&B-4 ● F&B Westbay Wells
- <0.5 TCE Concentration (µg/L)
- Groundwater Elevation Contour
- F&B Mfg. Co. Facility
- Pyramid Facility
- Hill Brothers Facility
- Rinchem Facility

0 400 feet

Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

Arizona Department of Environmental Quality

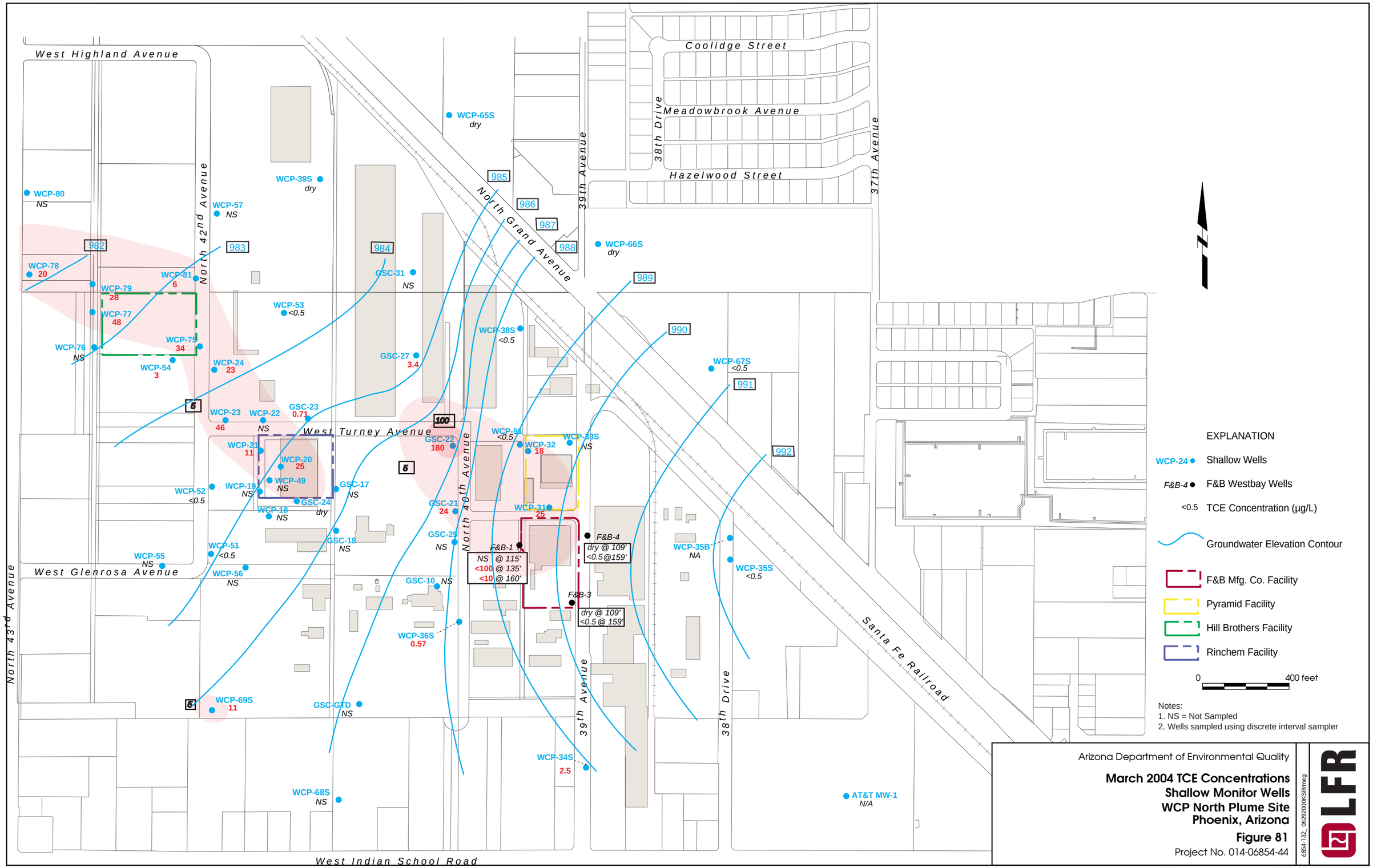
December 2003 TCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 80

Project No. 014-06854-05

6854-132_06292000KSRmeg

LFR


West Highland Avenue
North 42nd Avenue
North 43rd Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
North 40th Avenue
Santa Fe Railroad
WCP-80 NS
WCP-57 NS
WCP-39S dry
WCP-65S dry
WCP-66S dry
WCP-78 20
WCP-79 28
WCP-81 6
WCP-77 48
WCP-76 NS
WCP-75 34
WCP-54 3
WCP-53 <0.5
GSC-31 NS
WCP-38S <0.5
GSC-27 3.4
WCP-24 23
WCP-67S <0.5
WCP-23 46
WCP-22 NS
GSC-23 0.71
GSC-22 180
WCP-9A <0.5
WCP-33S NS
WCP-32 18
WCP-21 11
WCP-20 25
WCP-49 NS
WCP-19 NS
GSC-17 NS
GSC-24 dry
WCP-52 <0.5
WCP-18 NS
GSC-21 24
WCP-31 25
GSC-25 NS
F&B-1 NS @ 115' <100 @ 135' <10 @ 160'
F&B-4 dry @ 109' <0.5@159'
F&B-3 dry @ 109' <0.5 @ 159'
WCP-35B NA
WCP-35S <0.5
WCP-55 NS
WCP-56 NS
WCP-51 <0.5
GSC-18 NS
GSC-10 NS
WCP-36S 0.57
WCP-69S 11
GSC-GTD NS
WCP-34S 2.5
WCP-68S NS
AT&T MW-1 N/A
982
983
984
985
986
987
988
989
990
991
992
5
6
100
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 TCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
March 2004 TCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 81
Project No. 014-06854-44
6854-132_ 062920004KSR.meg
LFR

West Highland Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road
North 42nd Avenue
North 43rd Avenue
North 40th Avenue
North Grand Avenue
39th Avenue
38th Drive
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
37th Avenue
Santa Fe Railroad

980
981
982
983
984
985
986
987
988
989
990
991
1,000
10,000
100
5

WCP-80 1
WCP-78 20
WCP-79 16
WCP-81 5.6
WCP-77 52
WCP-75 35
WCP-76 <0.5
WCP-54 4.1
WCP-24 1.6
WCP-57 <0.5
WCP-39S dry
WCP-65S dry
WCP-53 <0.5
GSC-31 dry
GSC-27 3.6
WCP-38S <0.5
WCP-66S NS
WCP-67S <0.5
WCP-23 42
WCP-22 NS
GSC-23 0.59
GSC-48 14
GSC-01A 3.6
WCP-21 7.7
WCP-20 13
WCP-49 NS
WCP-18 NS
GSC-24 dry
GSC-22 78
WCP-91 <0.5
WCP-33S <0.5
WCP-32 29
WCP-31 35
WCP-52 <0.5
WCP-19 NS
GSC-17 <50
GSC-40 NS
GSC-21 8.8
GSC-25A 10
GSC-25 dry
GSC-18 NS
WCP-55 <0.5
WCP-51 <0.5
WCP-56 NS
GSC-39 NS
GSC-10 dry
WCP-36S NS
GSC-33 4.8
WCP-69S 11
GSC-GTD NS
WCP-68S NS
WCP-34S 0.87
F&B-1 <100 @ 115' <100 @ 135' <10 @ 160'
F&B-4 dry @ 109' <0.5 @ 159'
F&B-3 dry @ 115' <0.5 @ 159'
WCP-35B N/A
WCP-35S <0.5
AT&T MW-1 N/A

EXPLANATION

WCP-24 ● Shallow Wells
F&B-4 ● F&B Westbay Wells
<0.5 PCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility

0 400 feet

Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

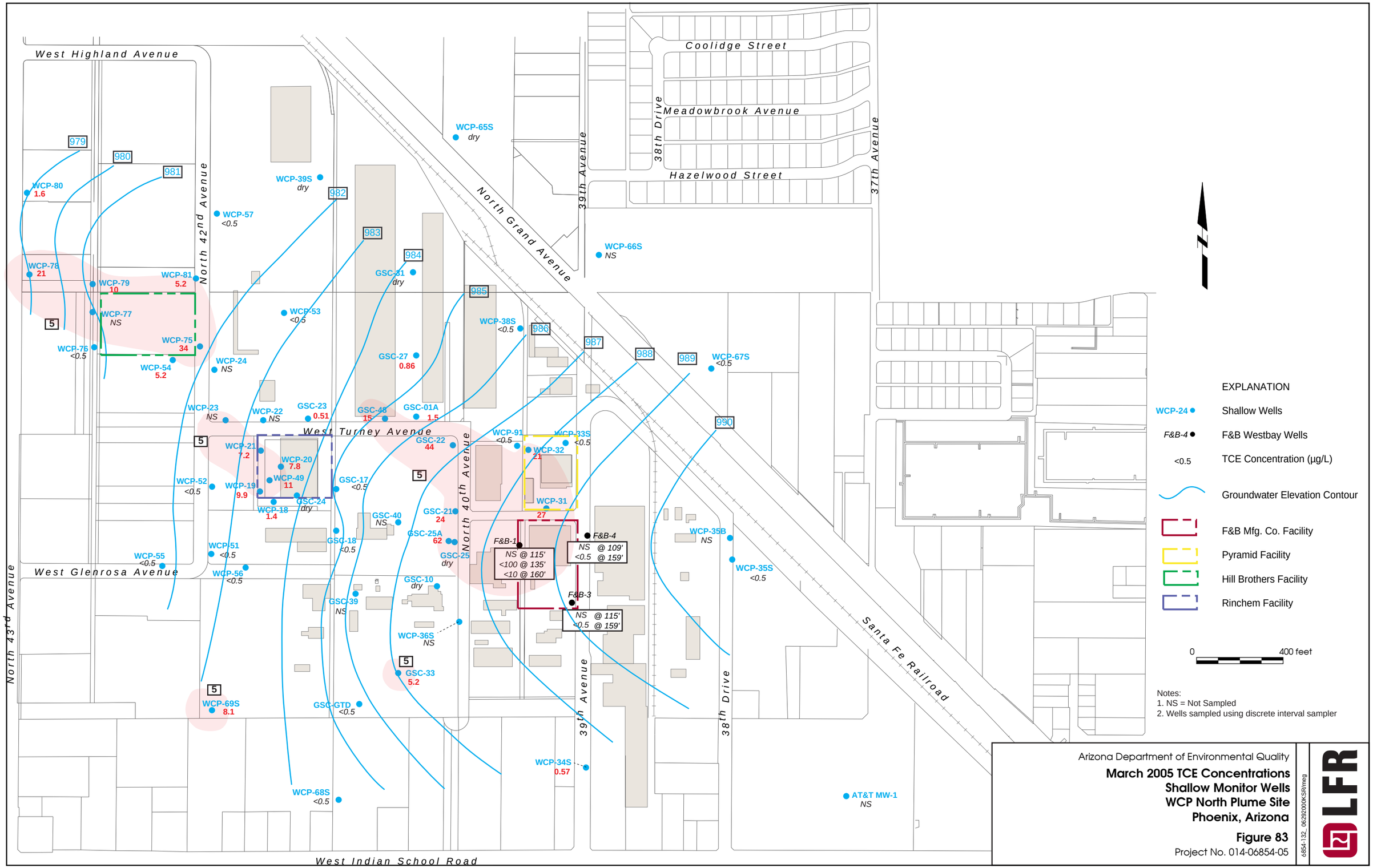
Arizona Department of Environmental Quality

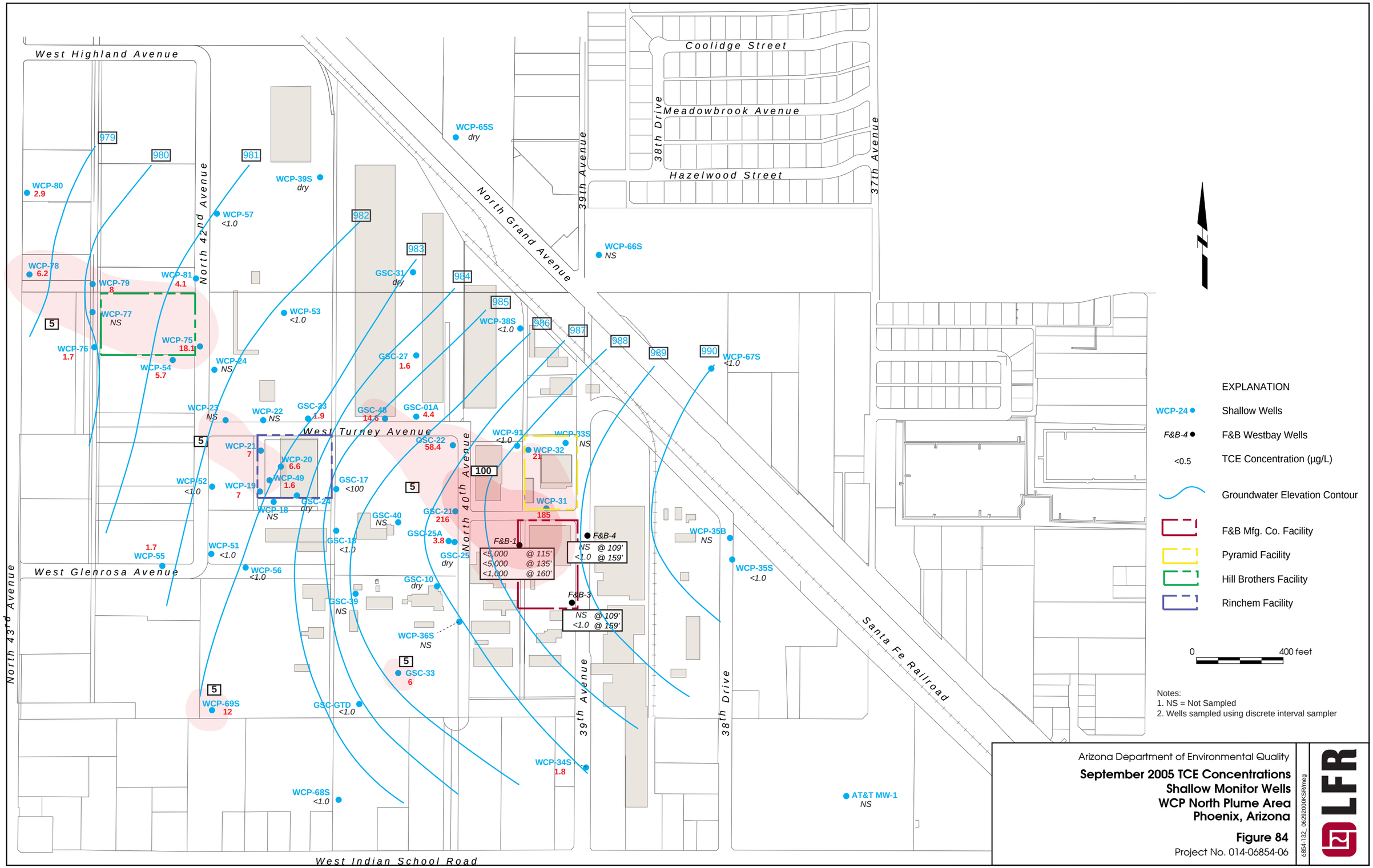
September 2004 TCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

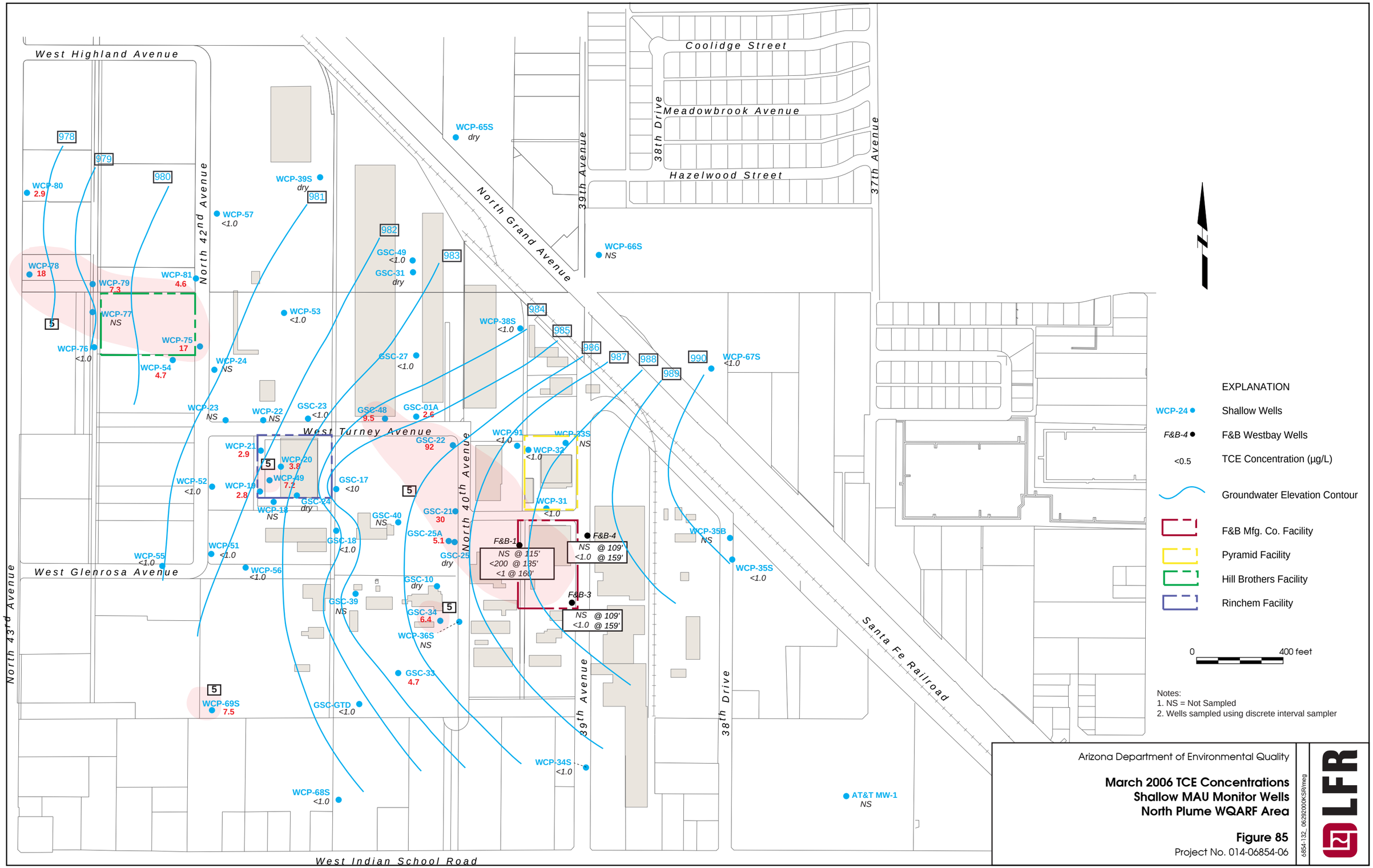
Figure 82
Project No. 014-06854-44

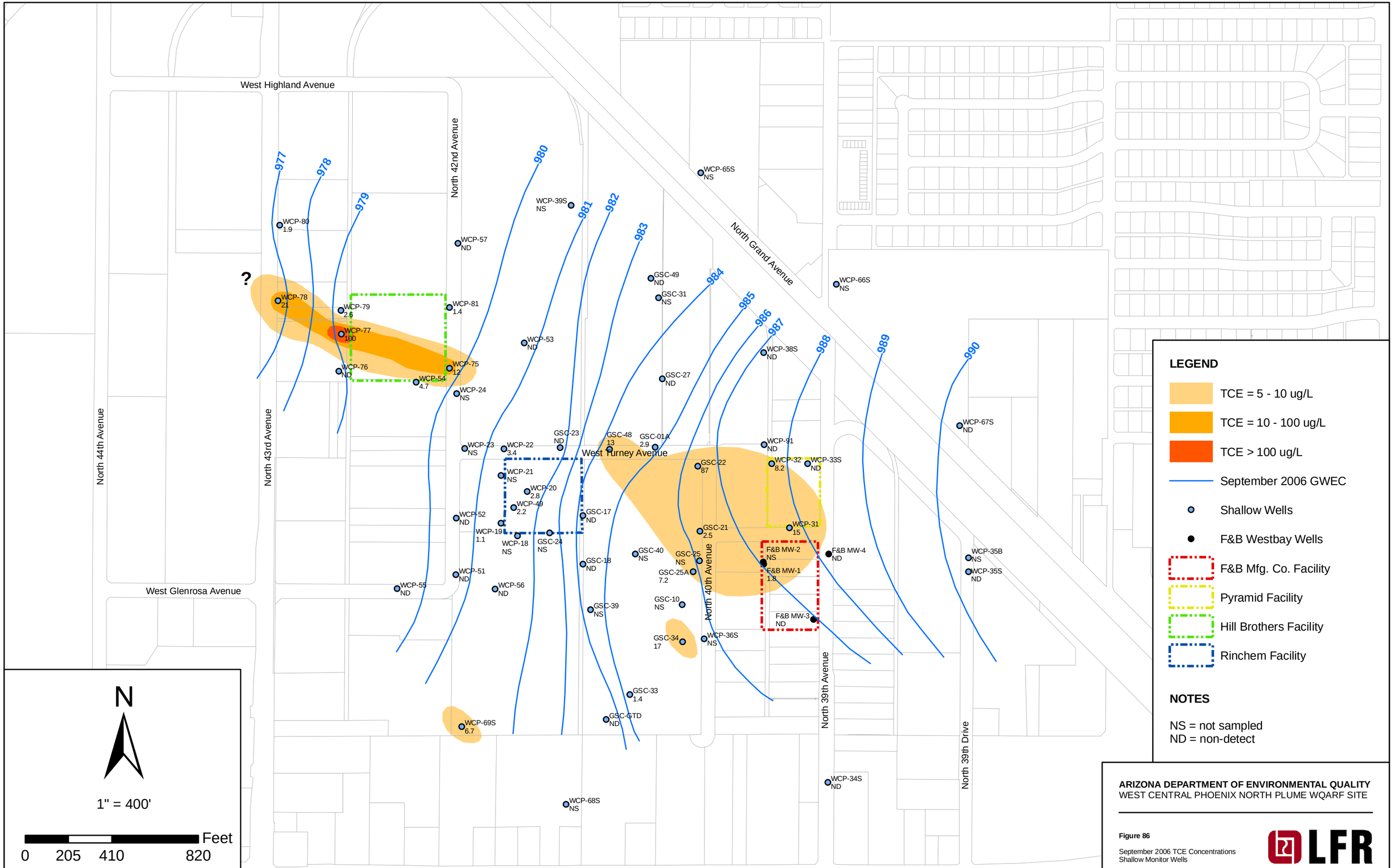
6854-132_ 06292000KSRmeg

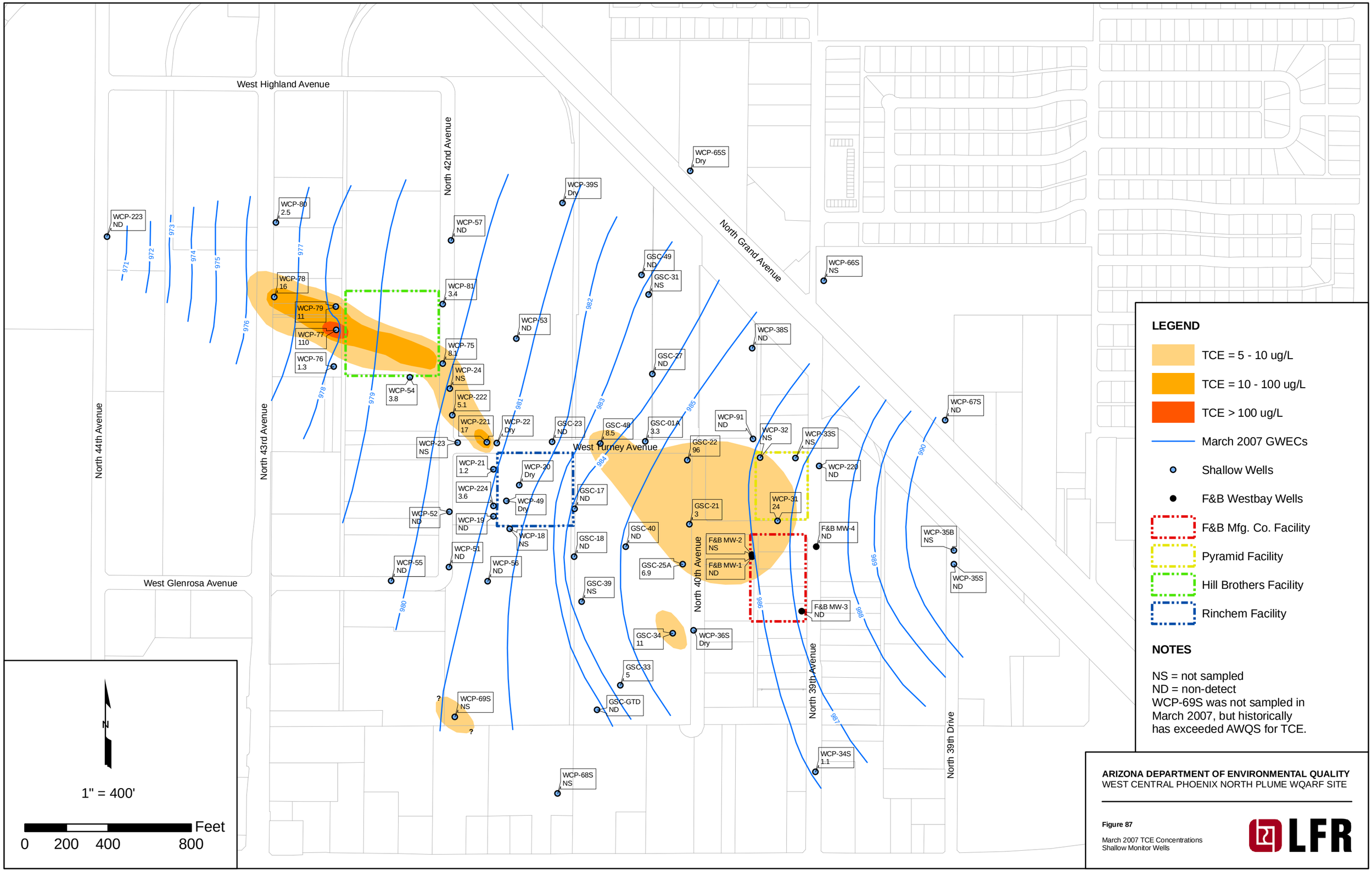
LFR


West Highland Avenue
North 42nd Avenue
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
West Indian School Road
979
980
981
982
983
984
985
986
987
988
989
990
WCP-80 1.6
WCP-78 21
WCP-79 10
WCP-81 5.2
WCP-77 NS
WCP-75 34
WCP-76 <0.5
WCP-54 5.2
WCP-57 <0.5
WCP-39S dry
WCP-65S dry
WCP-66S NS
WCP-53 <0.5
GSC-31 dry
WCP-38S <0.5
GSC-27 0.86
WCP-24 NS
WCP-67S <0.5
WCP-23 NS
WCP-22 NS
GSC-23 0.51
GSC-48 15
GSC-01A 1.5
GSC-22 44
WCP-21 7.2
WCP-20 7.8
WCP-49 11
WCP-19 9.9
WCP-18 1.4
GSC-24 dry
WCP-52 <0.5
GSC-17 <0.5
WCP-91 <0.5
WCP-33S <0.5
WCP-32 21
WCP-31 27
GSC-40 NS
GSC-21 24
GSC-25A 62
GSC-25 dry
GSC-18 <0.5
WCP-55 <0.5
WCP-51 <0.5
WCP-56 <0.5
F&B-1
NS @ 115'
<100 @ 135'
<10 @ 160'
F&B-4
NS @ 109'
<0.5 @ 159'
F&B-3
NS @ 115'
<0.5 @ 159'
WCP-35B NS
WCP-35S <0.5
GSC-10 dry
GSC-39 NS
WCP-36S NS
GSC-33 5.2
WCP-69S 8.1
GSC-GTD <0.5
WCP-34S 0.57
WCP-68S <0.5
AT&T MW-1 NS
5
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 TCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
March 2005 TCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 83
Project No. 014-06854-05
6854-132_ 06292000KSRmeg
LFR

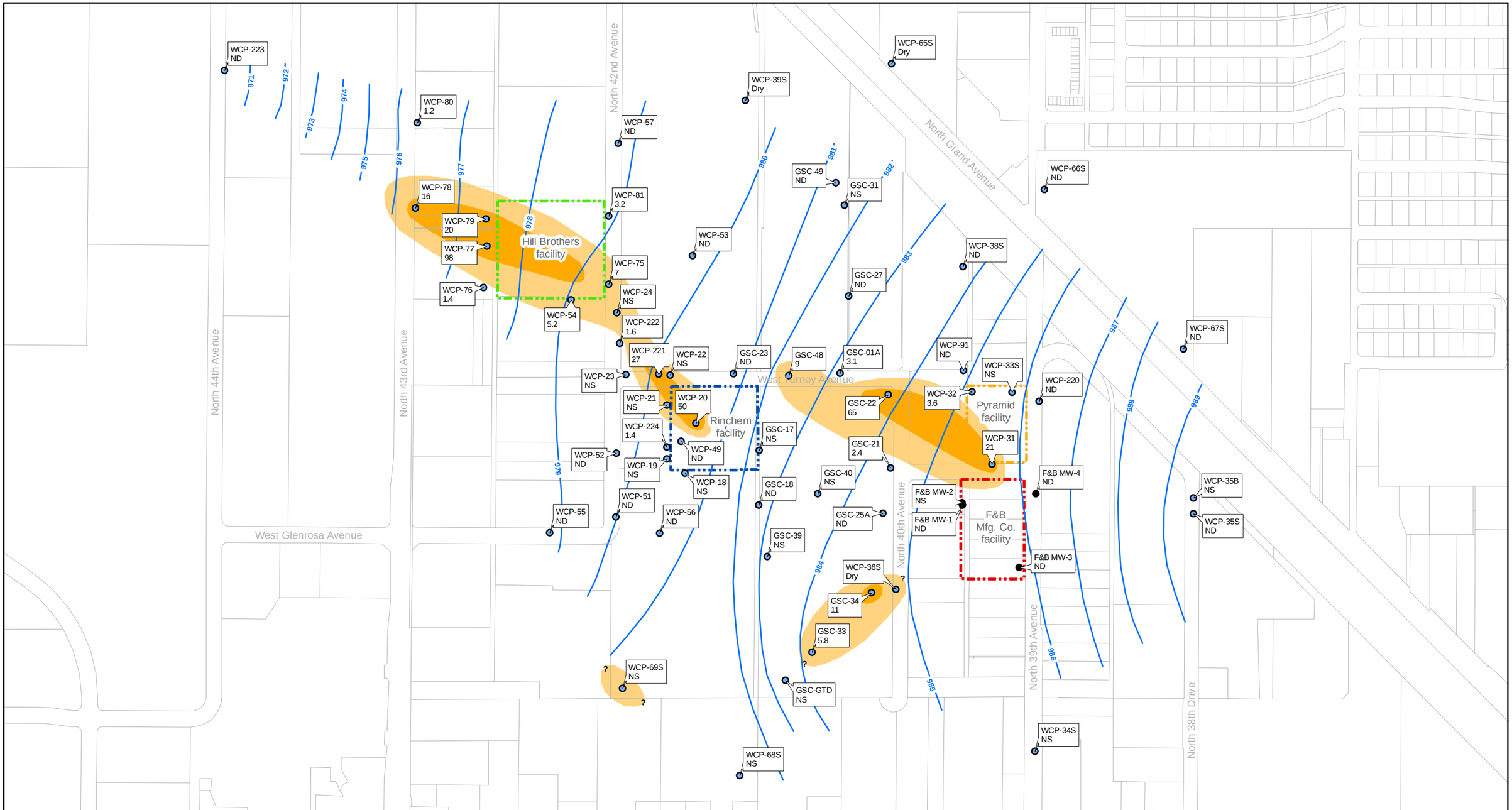

West Highland Avenue
North 42nd Avenue
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
979
980
981
982
983
984
985
986
987
988
989
990
100
5
WCP-80 2.9
WCP-78 6.2
WCP-79 8
WCP-81 4.1
WCP-77 NS
WCP-75 18.1
WCP-76 1.7
WCP-54 5.7
WCP-57 <1.0
WCP-39S dry
WCP-65S dry
WCP-66S NS
WCP-53 <1.0
GSC-31 dry
WCP-38S <1.0
GSC-27 1.6
WCP-24 NS
WCP-67S <1.0
WCP-23 NS
WCP-22 NS
GSC-23 1.9
GSC-48 14.6
GSC-01A 4.4
WCP-91 <1.0
WCP-33S NS
WCP-32 21
GSC-22 58.4
WCP-21 7
WCP-20 6.6
WCP-49 1.6
WCP-52 <1.0
WCP-19 7
GSC-17 <100
GSC-24 dry
WCP-18 NS
WCP-31 185
GSC-40 NS
GSC-21 216
GSC-25A 3.8
F&B-1
<5,000 @ 115'
<5,000 @ 135'
<1,000 @ 160'
F&B-4
NS @ 109'
<1.0 @ 159'
GSC-25 dry
WCP-35B NS
WCP-35S <1.0
1.7 WCP-55
WCP-51 <1.0
WCP-56 <1.0
GSC-18 <1.0
GSC-10 dry
GSC-39 NS
F&B-3
NS @ 109'
<1.0 @ 159'
WCP-36S NS
GSC-33 6
WCP-69S 12
GSC-GTD <1.0
WCP-34S 1.8
WCP-68S <1.0
AT&T MW-1 NS
N
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 TCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
September 2005 TCE Concentrations
Shallow Monitor Wells
WCP North Plume Area
Phoenix, Arizona
Figure 84
Project No. 014-06854-06
6854-132_ 06292006KSRmeg
LFR


West Highland Avenue
North 42nd Avenue
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
978
979
980
981
982
983
984
985
986
987
988
989
990
WCP-80 2.9
WCP-78 18
WCP-79 7.3
WCP-81 4.6
WCP-77 NS
WCP-75 17
WCP-76 <1.0
WCP-54 4.7
WCP-57 <1.0
WCP-39S dry
WCP-65S dry
WCP-66S NS
WCP-53 <1.0
GSC-49 <1.0
GSC-31 dry
WCP-38S <1.0
GSC-27 <1.0
WCP-24 NS
WCP-67S <1.0
WCP-23 NS
WCP-22 NS
GSC-23 <1.0
GSC-48 9.5
GSC-01A 2.6
WCP-21 2.9
WCP-20 3.8
WCP-49 7.2
WCP-52 <1.0
WCP-19 2.8
WCP-18 NS
GSC-24 dry
GSC-17 <10
GSC-22 92
WCP-91 <1.0
WCP-33S NS
WCP-32 <1.0
WCP-31 <1.0
GSC-40 NS
GSC-21 30
GSC-25A 5.1
GSC-25 dry
GSC-18 <1.0
WCP-55 <1.0
WCP-51 <1.0
WCP-56 <1.0
F&B-1
NS @ 115'
<200 @ 135'
<1 @ 160'
F&B-4
NS @ 109'
<1.0 @ 159'
F&B-3
NS @ 109'
<1.0 @ 159'
WCP-35B NS
WCP-35S <1.0
GSC-10 dry
GSC-39 NS
GSC-34 6.4
WCP-36S NS
GSC-33 4.7
WCP-69S 7.5
GSC-GTD <1.0
WCP-34S <1.0
WCP-68S <1.0
AT&T MW-1 NS
5
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 TCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
March 2006 TCE Concentrations
Shallow MAU Monitor Wells
North Plume WQARF Area
Figure 85
Project No. 014-06854-06
6854-132_ 06292006KSR/meg
LFR


West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
North Grand Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 39th Drive
977
978
979
980
981
982
983
984
985
986
987
988
989
990
?
WCP-80 1.9
WCP-57 ND
WCP-78 21
WCP-79 2.6
WCP-77 100
WCP-81 1.4
WCP-76 ND
WCP-75 12
WCP-54 4.7
WCP-24 NS
WCP-39S NS
WCP-65S NS
WCP-53 ND
GSC-49 ND
GSC-31 NS
WCP-66S NS
WCP-38S ND
GSC-27 ND
WCP-67S ND
GSC-23 ND
GSC-48 13
GSC-01A 2.9
WCP-23 NS
WCP-22 3.4
WCP-91 ND
GSC-22 87
WCP-32 8.2
WCP-33S ND
WCP-21 NS
WCP-20 2.8
WCP-49 2.2
WCP-52 ND
GSC-17 ND
WCP-19 1.1
WCP-18 NS
GSC-24 NS
GSC-21 2.5
WCP-31 15
GSC-40 NS
GSC-25 NS
F&B MW-2 NS
F&B MW-4 ND
GSC-25A 7.2
F&B MW-1 1.8
WCP-35B NS
WCP-35S ND
WCP-51 ND
WCP-55 ND
WCP-56 ND
GSC-18 ND
GSC-10 NS
GSC-39 NS
F&B MW-3 ND
GSC-34 17
WCP-36S NS
GSC-33 1.4
GSC-GTD ND
WCP-69S 6.7
WCP-34S ND
WCP-68S NS
N
1" = 400'
Feet
0 205 410 820
LEGEND
TCE = 5 - 10 ug/L
TCE = 10 - 100 ug/L
TCE > 100 ug/L
September 2006 GWEC
Shallow Wells
F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
NOTES
NS = not sampled
ND = non-detect
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE
Figure 86
September 2006 TCE Concentrations
Shallow Monitor Wells
LFR


West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 39th Drive
North Grand Avenue
WCP-223 ND
WCP-80 2.5
WCP-78 16
WCP-79 11
WCP-77 110
WCP-76 1.3
WCP-54 3.8
WCP-57 ND
WCP-81 3.4
WCP-75 8.1
WCP-24 NS
WCP-222 5.1
WCP-221 17
WCP-22 Dry
WCP-23 NS
WCP-21 1.2
WCP-224 3.6
WCP-20 Dry
WCP-49 Dry
WCP-52 ND
WCP-19 ND
WCP-18 NS
WCP-51 ND
WCP-55 ND
WCP-56 ND
WCP-39S Dry
WCP-53 ND
GSC-17 ND
GSC-18 ND
GSC-39 NS
GSC-23 ND
GSC-48 8.5
GSC-01A 3.3
GSC-49 ND
GSC-31 NS
GSC-27 ND
GSC-22 96
GSC-40 ND
GSC-25A 6.9
GSC-21 3
GSC-34 11
GSC-33 5
GSC-GTD ND
WCP-65S Dry
WCP-66S NS
WCP-38S ND
WCP-91 ND
WCP-32 NS
WCP-33S NS
WCP-220 ND
WCP-31 24
F&B MW-2 NS
F&B MW-1 ND
F&B MW-4 ND
F&B MW-3 ND
WCP-36S Dry
WCP-67S ND
WCP-35B NS
WCP-35S ND
WCP-34S 1.1
WCP-69S NS
WCP-68S NS
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
LEGEND
TCE = 5 - 10 ug/L
TCE = 10 - 100 ug/L
TCE > 100 ug/L
March 2007 GWECs
Shallow Wells
F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
NOTES
NS = not sampled
ND = non-detect
WCP-69S was not sampled in March 2007, but historically has exceeded AWQS for TCE.
N
1" = 400'
Feet
0
200
400
800
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE
Figure 87
March 2007 TCE Concentrations
Shallow Monitor Wells
LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North PlumeNP GIS\Projects\Final RI report\Fig_088_TCE_shallow_Sep_2007.mxd 12/16/2008



LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L

NOTES

- NM = monitor well not sampled during September 2007 event.
- ND = TCE concentration below laboratory detection limit.
- # = TCE concentration above laboratory upper calibration limit.

Feet
0 200 400
Scale: 1" = 400'

September 2007 TCE Concentrations, Shallow Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 88

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North PlumeNP GIS\Projects\Final RI report\Fig_089_TCE_shallow_Mar_2008.mxd 12/16/2008

North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989

WCP-223 ND
WCP-80 2.1
WCP-57 ND
WCP-65S NS
WCP-66S NS
WCP-78 15
WCP-79 16
WCP-77 52
WCP-76 3
WCP-81 3.5
WCP-53 ND
WCP-75 6.5
WCP-54 7.3
GSC-49 ND
GSC-27 ND
WCP-38S ND
WCP-67S ND
WCP-222 6
WCP-221 15
WCP-22 NS
GSC-23 ND
GSC-48 6
GSC-01A 3
WCP-91 ND
WCP-33S ND
WCP-21 NS
WCP-20 40
GSC-46 4.3
GSC-22 31
WCP-32 2
WCP-220 ND
WCP-224 2.3
WCP-49 ND
GSC-17 ND
GSC-21 5.3
WCP-31 16
WCP-52 ND
WCP-19 NS
GSC-40 ND
F&B-4-159 ND
GSC-18 ND
F&B-1-160 2.4
WCP-35S ND
WCP-51 ND
WCP-55 ND
WCP-56 ND
GSC-25A 4.3
GSC-39 NS
F&B-3-159 ND
GSC-34 10
WCP-36S NS
GSC-33 12
WCP-69S 3.6
WCP-34S 0.5
WCP-68S ND

LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L

NOTES

- NS = monitor well not sampled during March 2008 event.
- ND = TCE concentration below laboratory detection limit.

N

0 200 400 Feet

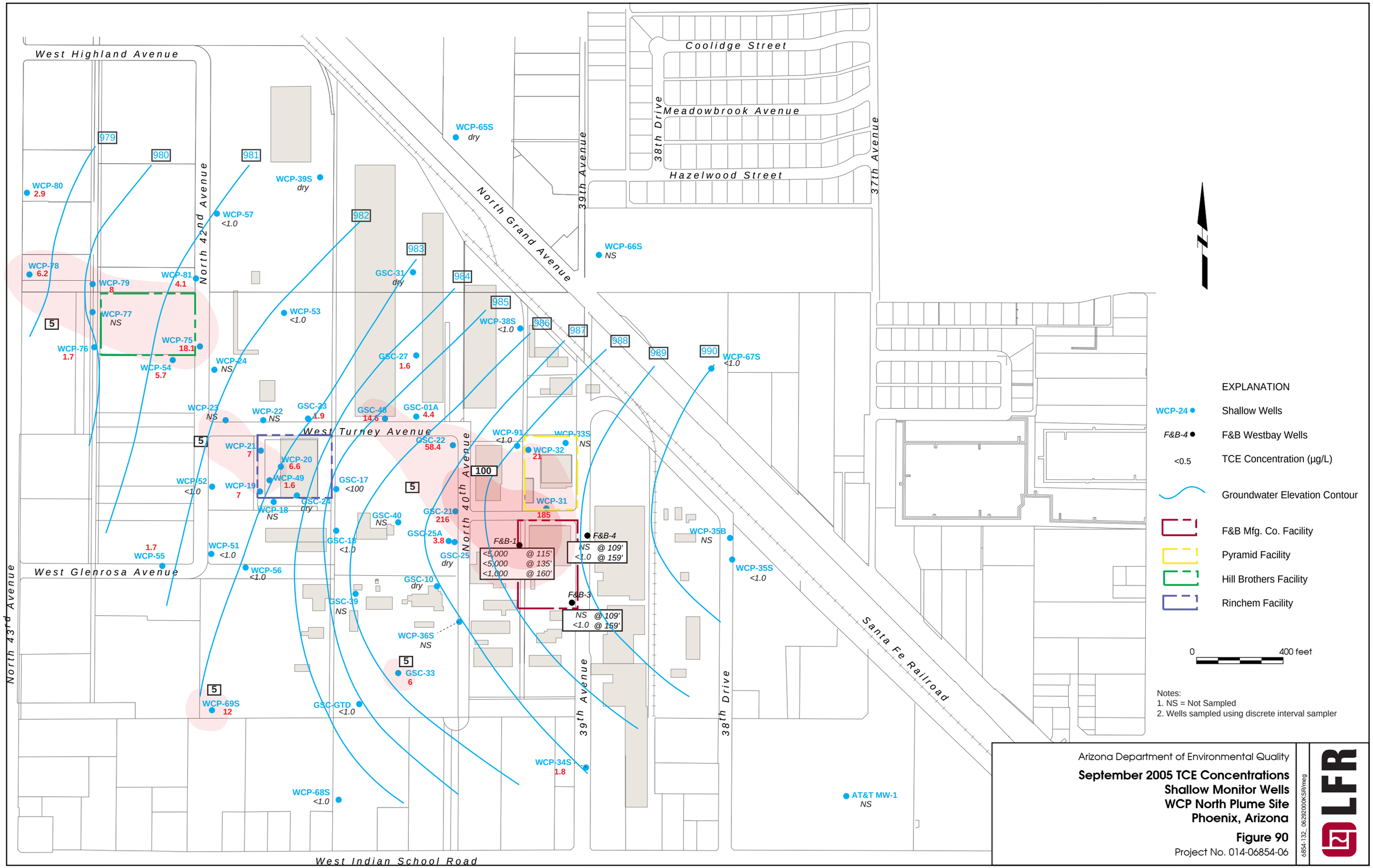
Scale: 1" = 400'

March 2008 TCE Concentrations, Shallow Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 89



Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

Arizona Department of Environmental Quality

September 2005 TCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 90

Project No. 014-06854-06

6854-132_ 06292006KSRmeg

LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_091_TCE_middle_Mar_2003.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Glenrosa Avenue
West Turney Avenue
West Indian School Road

WCP-82 <0.5
Hill Brothers facility
WCP-74 <0.5
Rinchem facility
WCP-37M <0.5
WCP-72M <0.5
WCP-71M <0.5
959
960
961
962
Pyramid facility
WCP-33M <0.5
FB-4-259 2.9
FB-2-259 <0.5
FB-1
F&B Mfg. Co. facility
FB-3-259 <0.5
WCP-36M <0.5
WCP-34M <0.5
WCP-35M <0.5
WCP-70M <0.5

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L
- TCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

March 2003 TCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 91

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_092_TCE_middle_Sep_2004.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North 40th Avenue
North 39th Avenue
North 38th Drive

WCP-82 <0.5
Hill Brothers facility
WCP-74 <0.5
Rinchem facility
WCP-72M <0.5
WCP-71M <0.5
WCP-33M <0.5
Pyramid facility
FB-2-259 <0.5
FB-4-259 4.5
FB-1
F&B Mfg. Co. facility
FB-3-259 <0.5
WCP-36M <0.5
WCP-35M <0.5
WCP-70M <0.5
WCP-34M <0.5

945
946
947
948
949

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L
- TCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

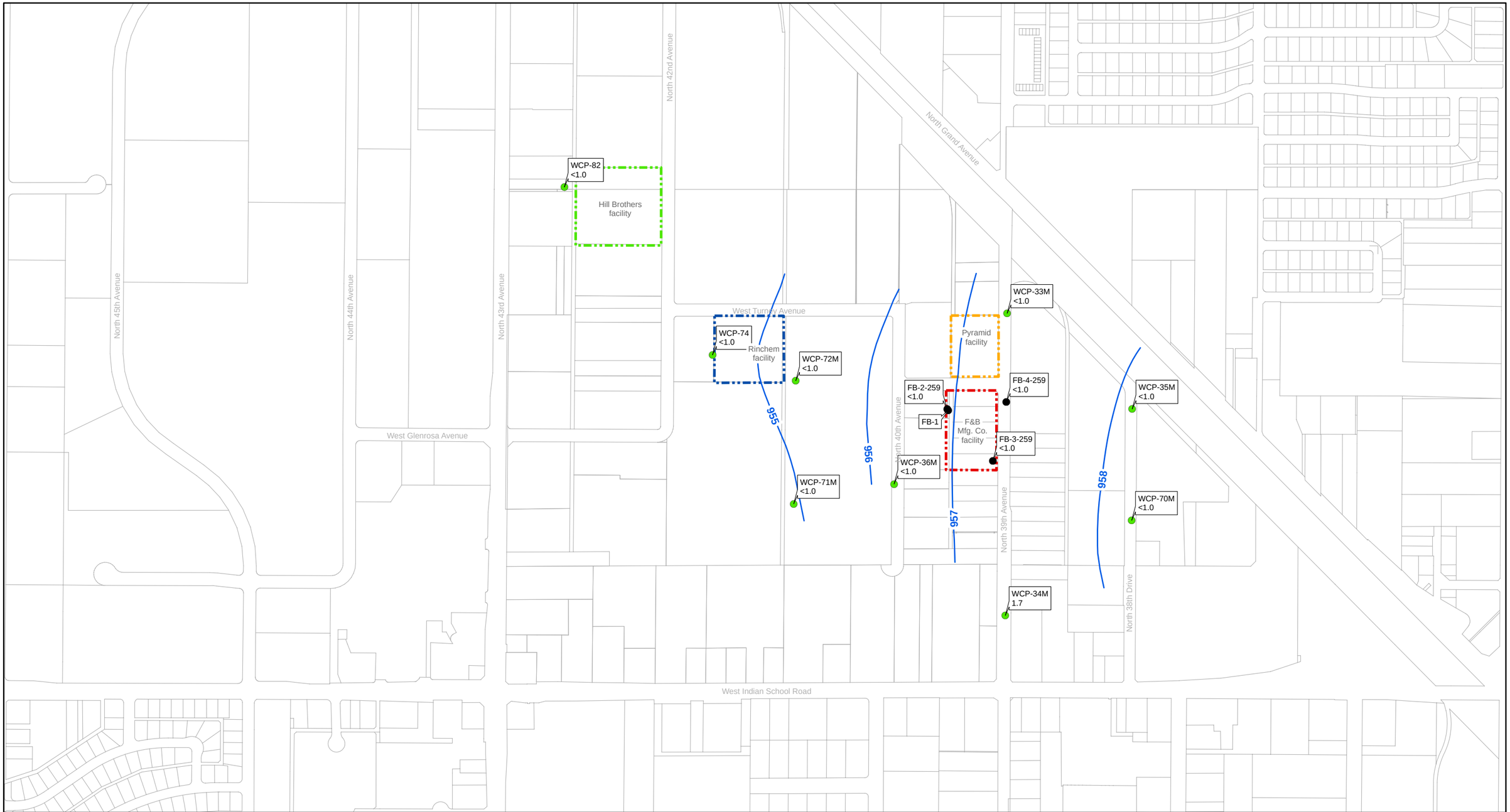
September 2004 TCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 92

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_093_TCE_middle_Sep_2005.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L
- TCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2005 TCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 93

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_094_TCE_middle_Sep_2006.mxd 12/16/2008

WCP-82 <1.0
Hill Brothers facility
WCP-74 <1.0
Rinchem facility
WCP-72M <1.0
WCP-71M <1.0
WCP-33M <1.0
Pyramid facility
FB-2-259 <1.0
FB-4-259 <1.0
FB-1
F&B Mfg. Co. facility
FB-3-259 <1.0
WCP-36M <1.0
WCP-35M <1.0
WCP-70M <1.0
WCP-34M <1.0
956
957
958
959
North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L
- TCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2006 TCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 94

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_095_TCE_middle_Sep_2007.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North 40th Avenue
North 39th Avenue
North 38th Drive

WCP-82 <1.0
Hill Brothers facility
WCP-74 <1.0
Rinchem facility
WCP-72M <1.0
WCP-71M <1.0
WCP-33M <1.0
Pyramid facility
FB-2-259 <1.0
FB-1
FB-4-259 <1.0
F&B Mfg. Co. facility
FB-3-259 <1.0
WCP-36M <1.0
WCP-35M <1.0
WCP-70M <1.0
WCP-34M <1.0
952
953
954
956

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L
- TCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

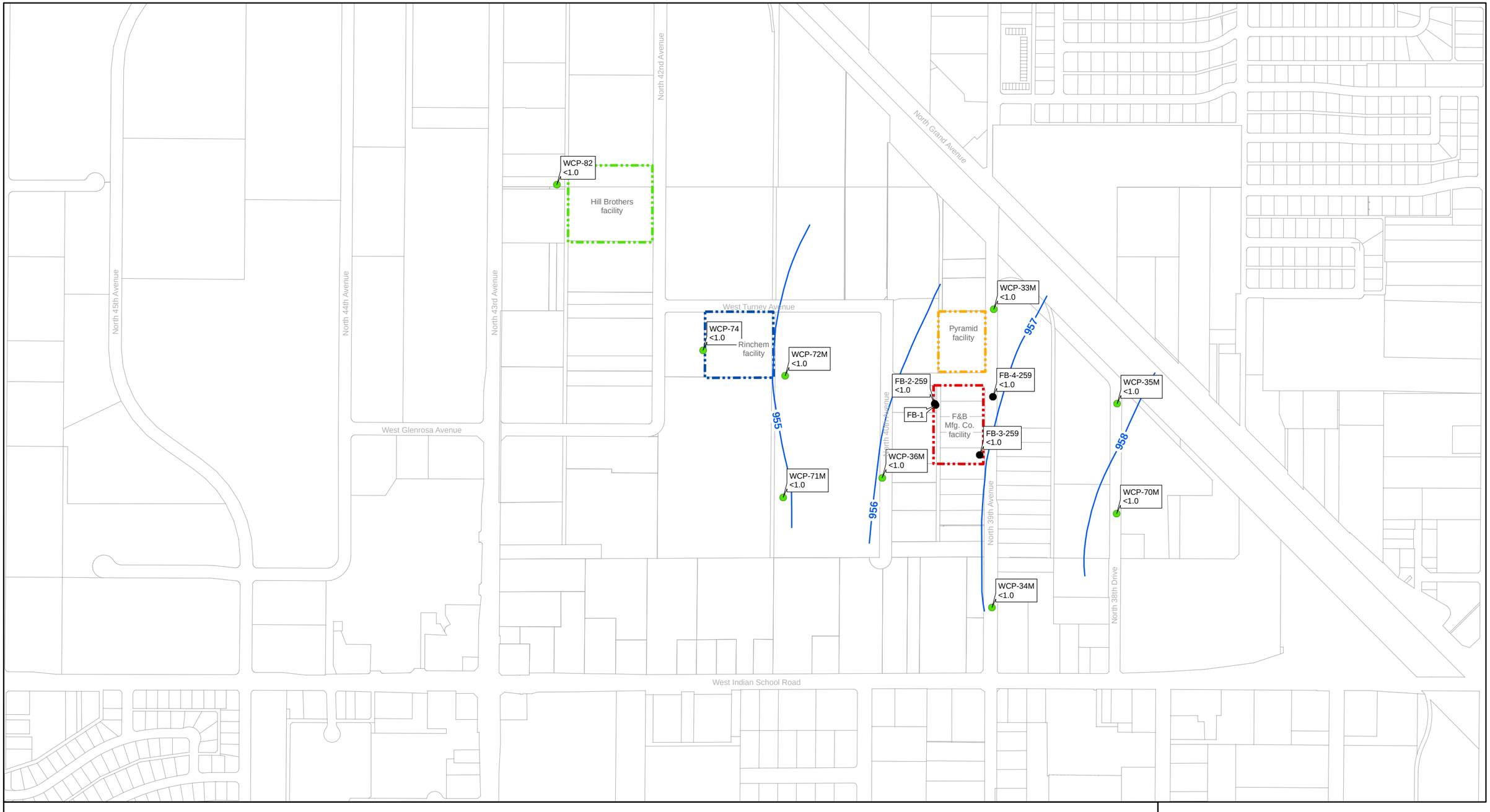
Scale: 1" = 500'

September 2007 TCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 95



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- TCE = 5 - 10 ug/L
- TCE = 10 - 100 ug/L
- TCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

0 250 500 Feet

Scale: 1" = 500'

March 2008 TCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 96

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_096_TCE_middle_Mar_2008.mxd 12/16/2008

West Highland Avenue
North 42nd Avenue
North Grand Avenue
39th Avenue
38th Drive
Meadowbrook Avenue
Coolidge Street
Hazelwood Street
37th Avenue
West Turney Avenue
WCP-37M2
<0.5
WCP-37L
<0.5
WCP-33L
<0.5
WCP-73L
<0.5
F&B -2
0.6 @484'
1.8@434'
F&B -4
<0.5@485'
<0.5@434'
WCP-35L
<0.5
North 40th Avenue
West Glenrosa Avenue
WCP-36M2
<0.5
WCP-36L2
<0.5
F&B -3
<0.5@484'
<0.5@434'
North 43rd Avenue
39th Avenue
38th Drive
Santa Fe Railroad
WCP-34L
<0.5
West Indian School Road

EXPLANATION

WCP-37M2 ● Deep Wells

F&B -4 ● F&B Westbay Wells

<0.5 TCE Concentration (µg/L)

F&B Mfg. Co. Facility

0 400 Feet

Arizona Department of Environmental Quality

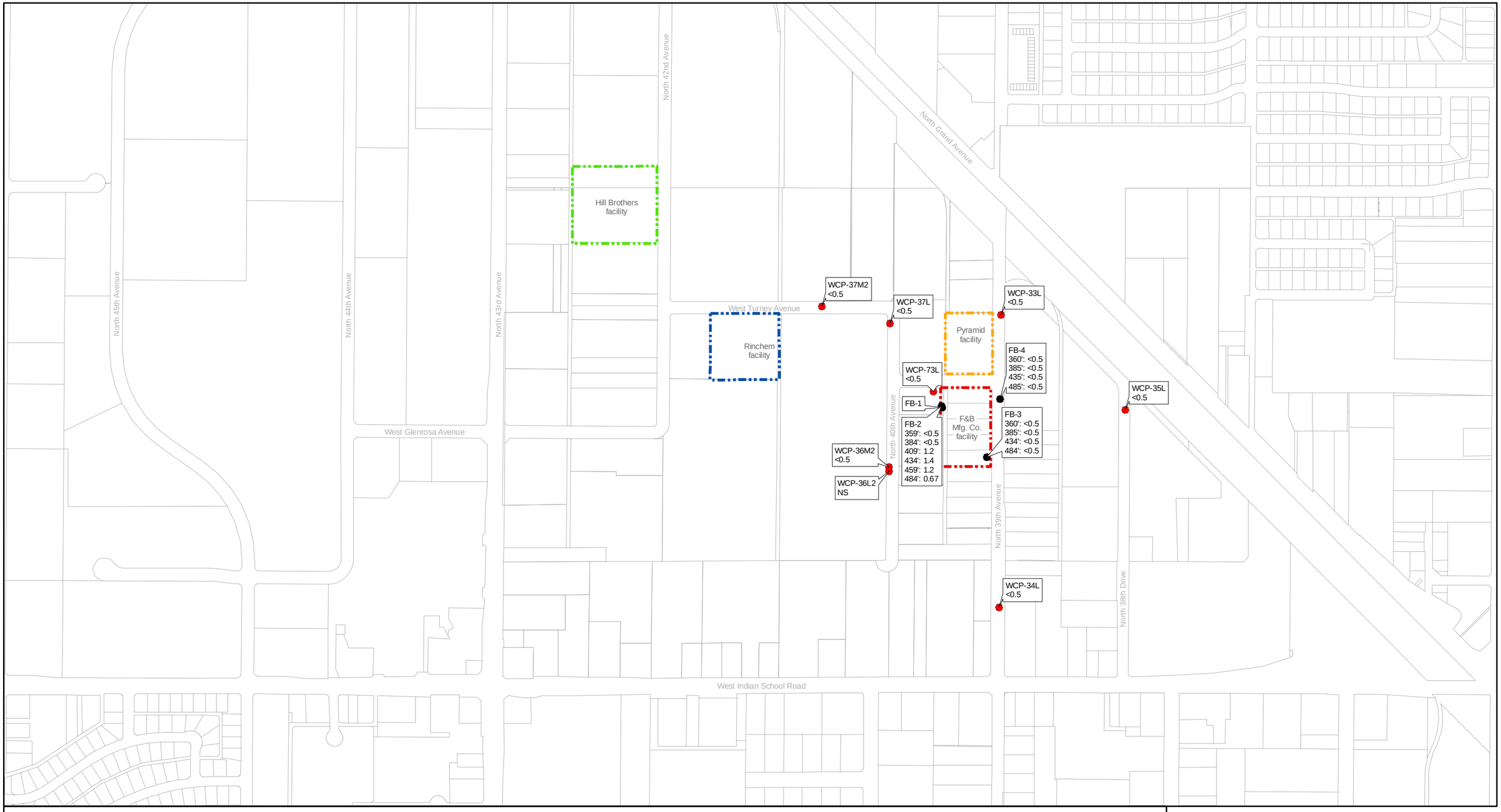
May 2002 TCE Concentrations
Deep Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 97

Project No. 014-06854-05

6854-130_021301KSR/meg

LFR



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

Feet
0 250 500

Scale: 1" = 500'

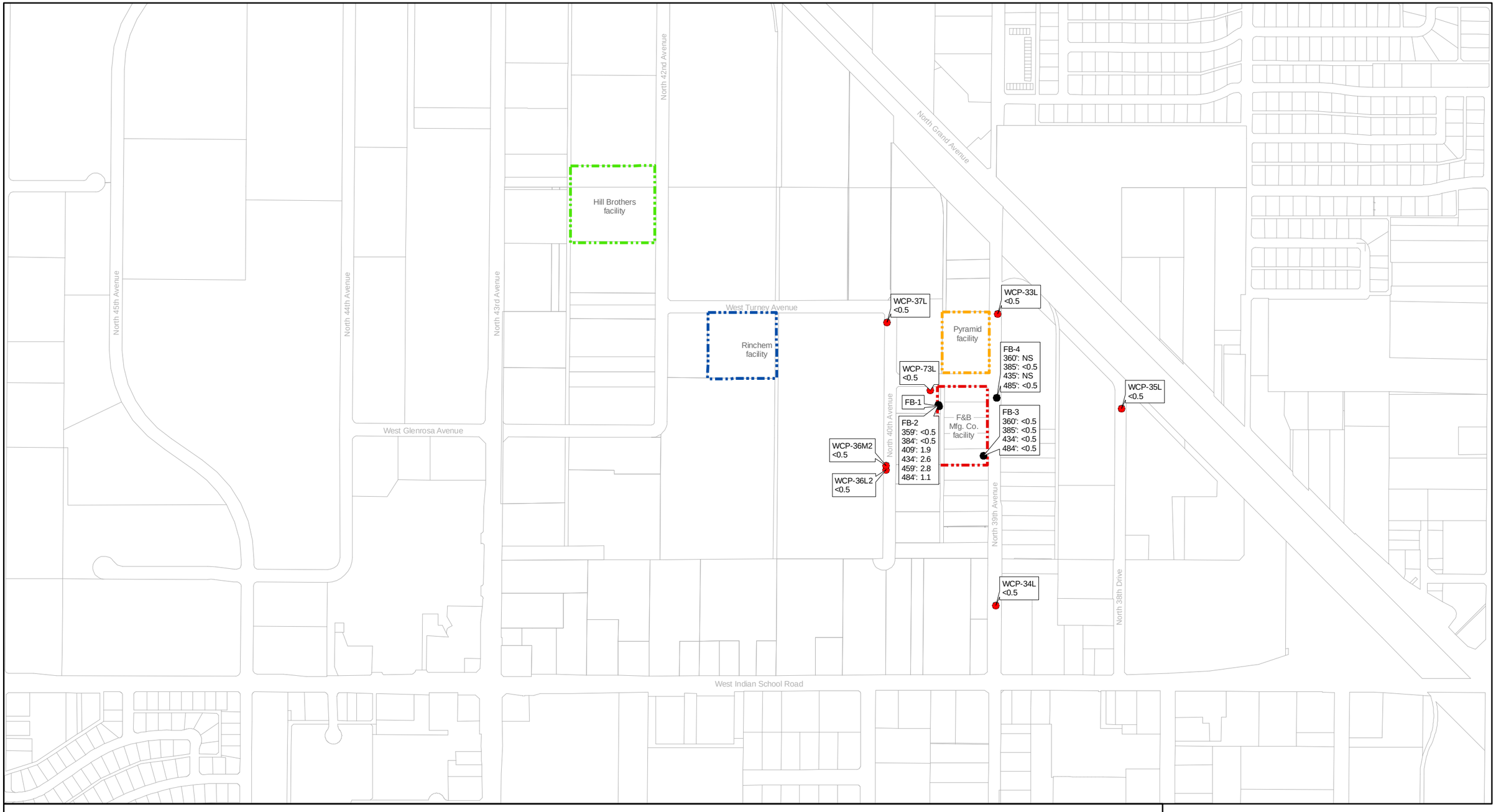
March 2003 TCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 98

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_098_TCE_deep_Mar_2003.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2004 TCE Concentrations, Deep Monitor Wells

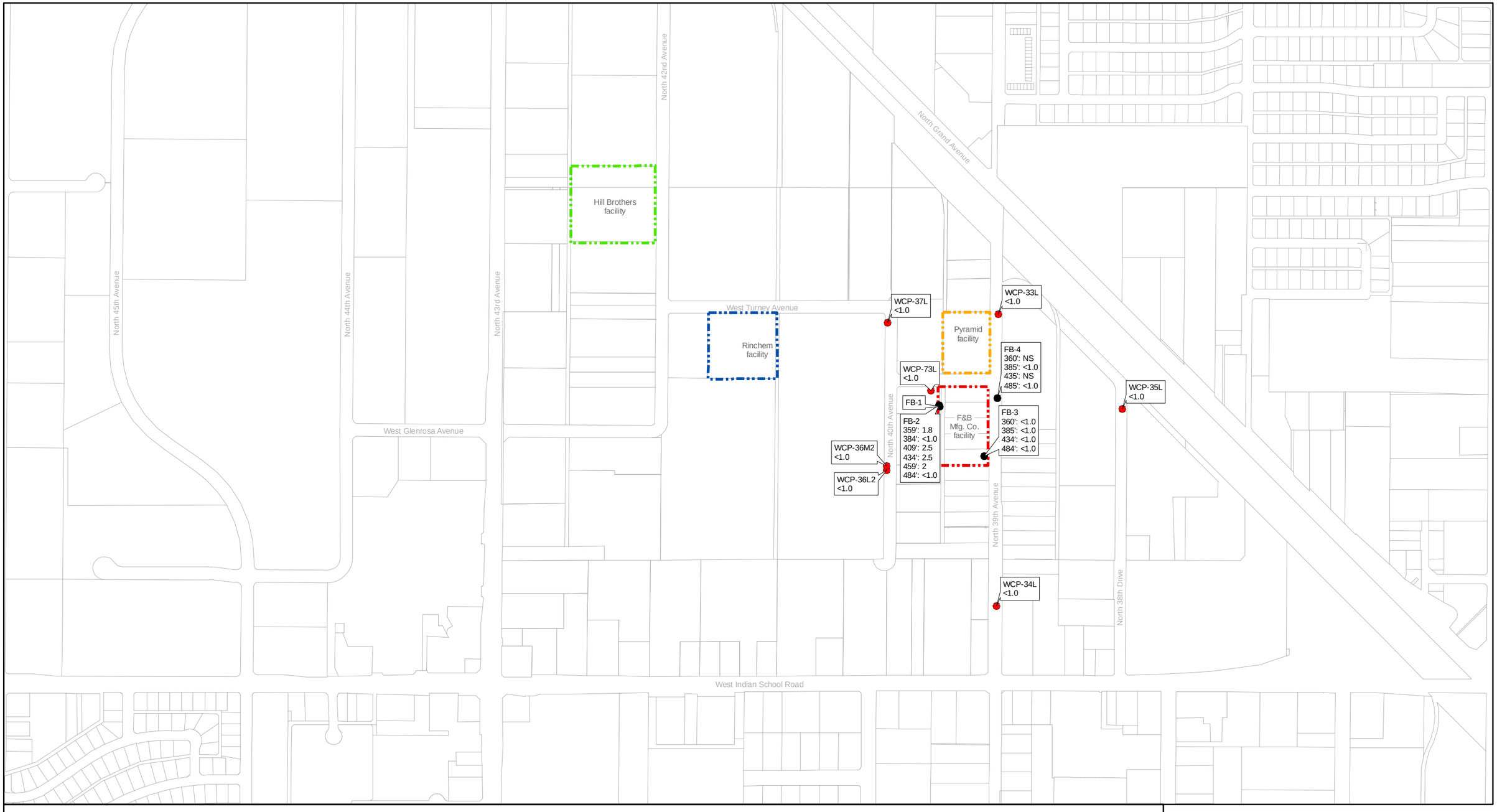
West Central Phoenix North Plume WQARF Site

LFR

Figure 99

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_099_TCE_deep_Sep_2004.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_100_TCE_deep_Sep_2005.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

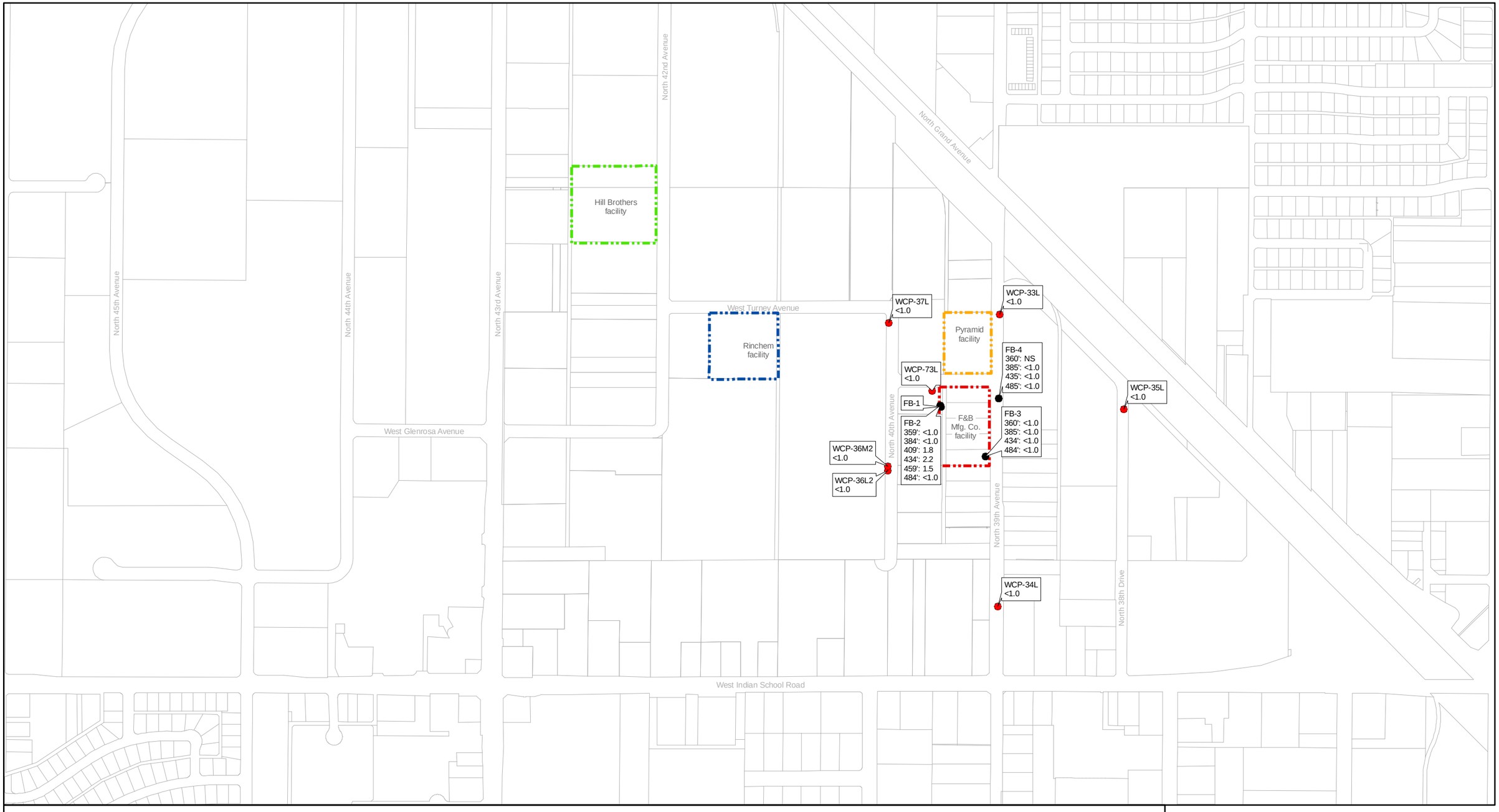
September 2005 TCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 100

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_101_TCE_deep_Sep_2006.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2006 TCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 101

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_102_TCE_deep_Sep_2007.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

WCP-37L
<1.0

WCP-33L
<1.0

FB-4
360': NS
385': <1.0
435': <1.0
485': 3.9

FB-1

FB-2
359': <1.0
384': <1.0
409': 2.4
434': 3.8
459': 2.2
484': <1.0

FB-3
360': <1.0
385': <1.0
434': <1.0
484': <1.0

WCP-35L
<1.0

WCP-36M2
<1.0

WCP-36L2
<1.0

WCP-34L
<1.0

LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

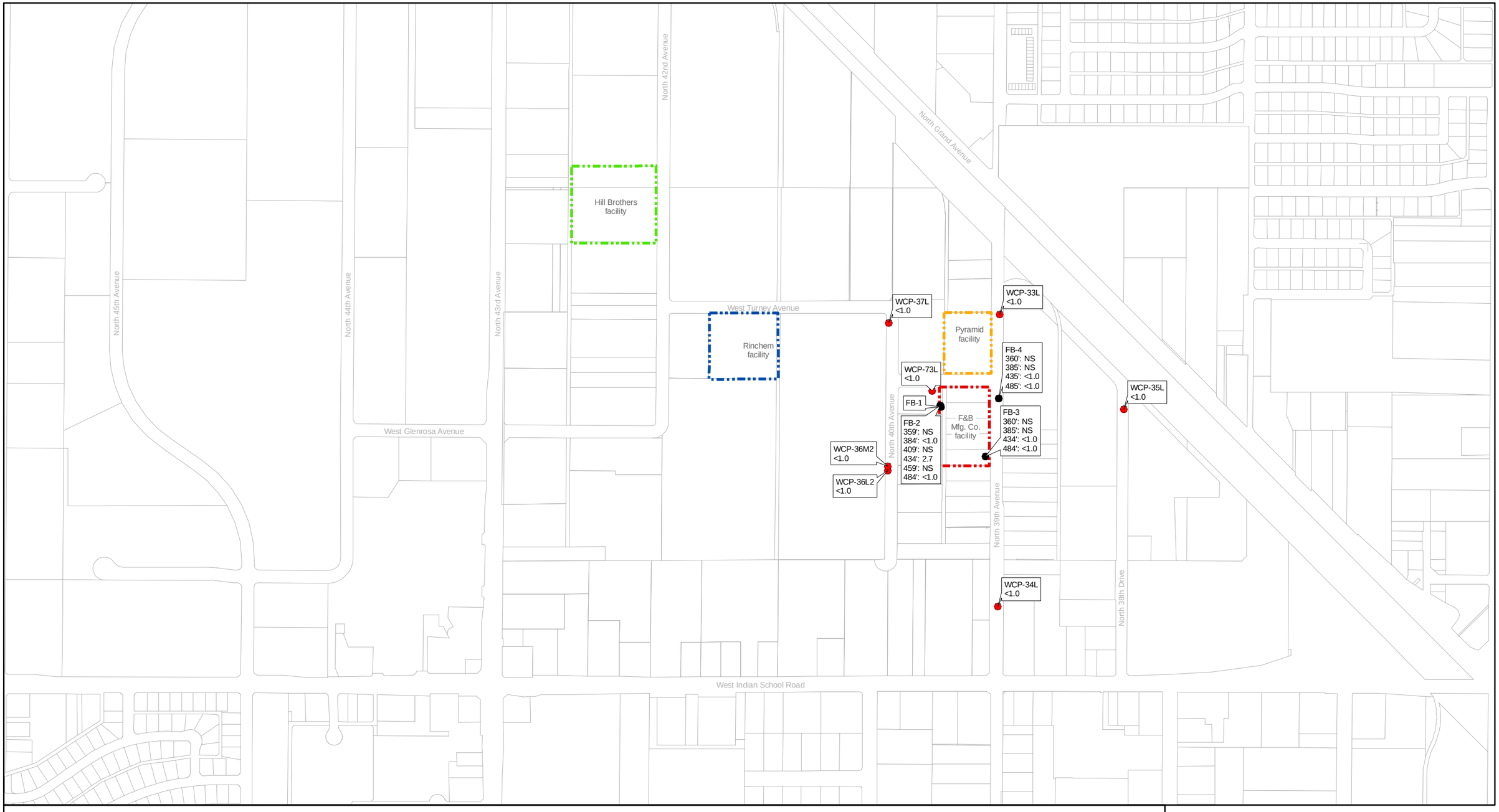
Scale: 1" = 500'

September 2007 TCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 102



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = TCE concentration considered anomalous and not used in contouring.
- ND = TCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

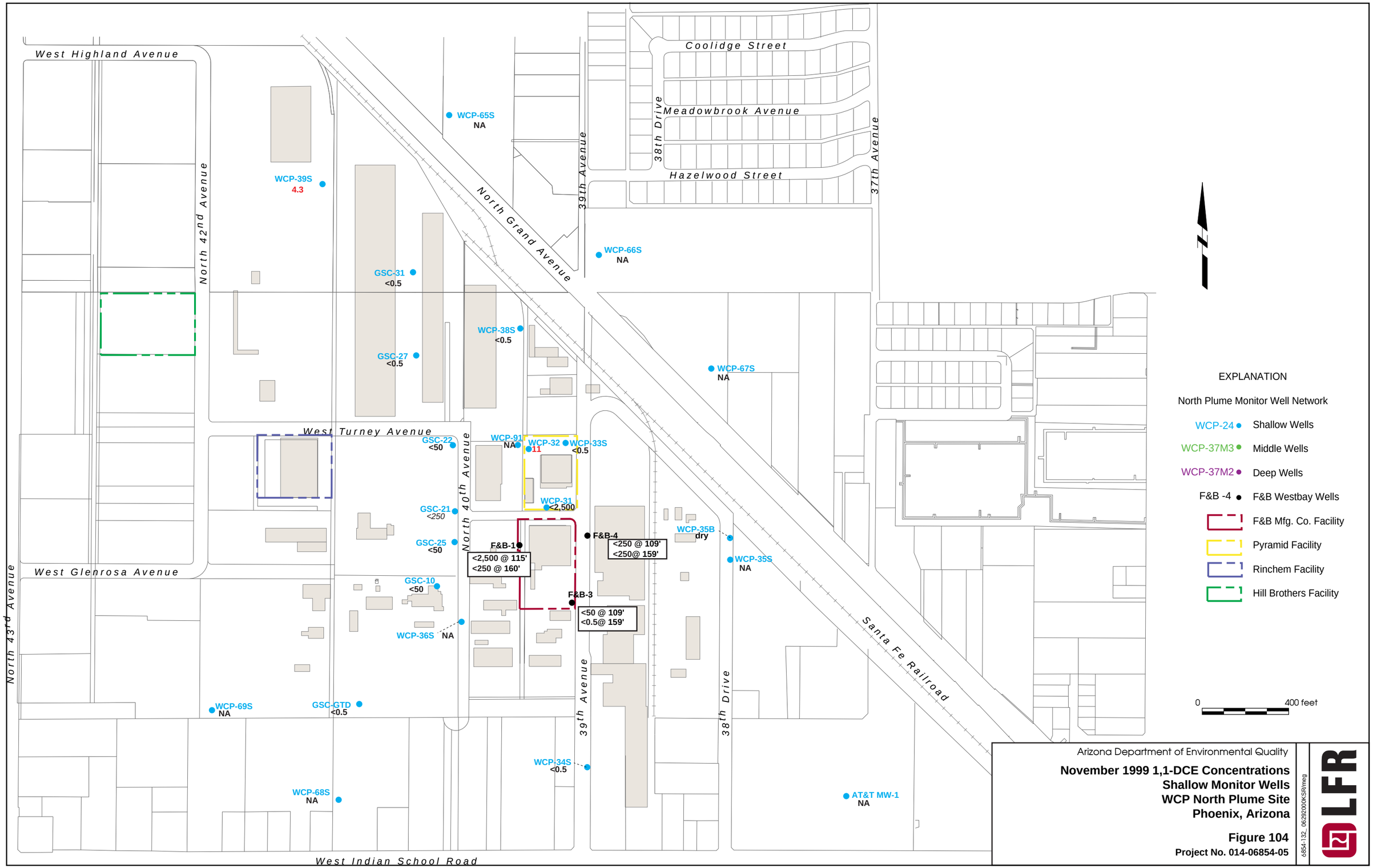
March 2008 TCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 103

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_103_TCE_deep_Mar_2008.mxd 12/16/2008



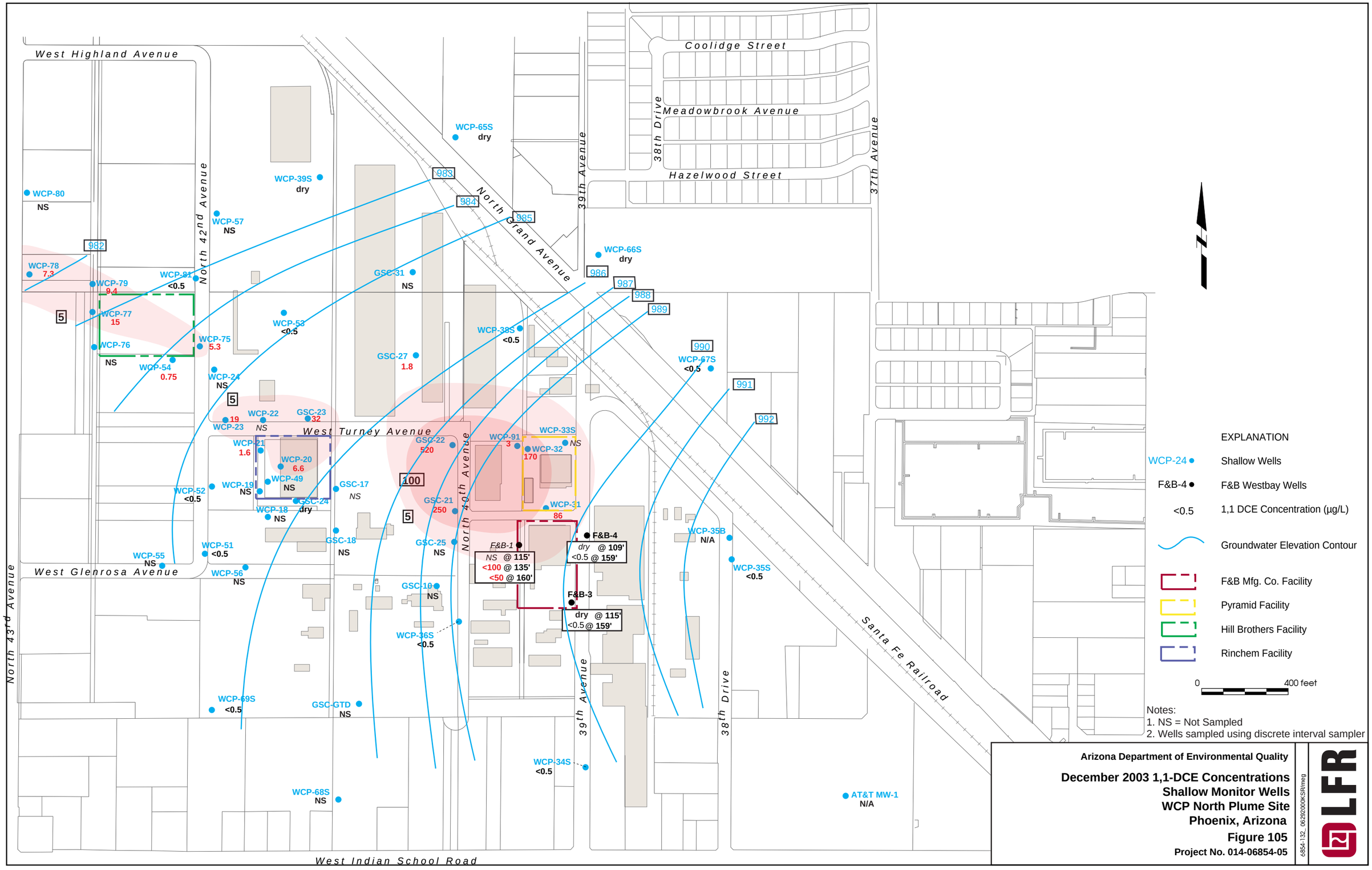
Arizona Department of Environmental Quality

November 1999 1,1-DCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 104
Project No. 014-06854-05

6854-132_ 06292000KSR\meg

LFR



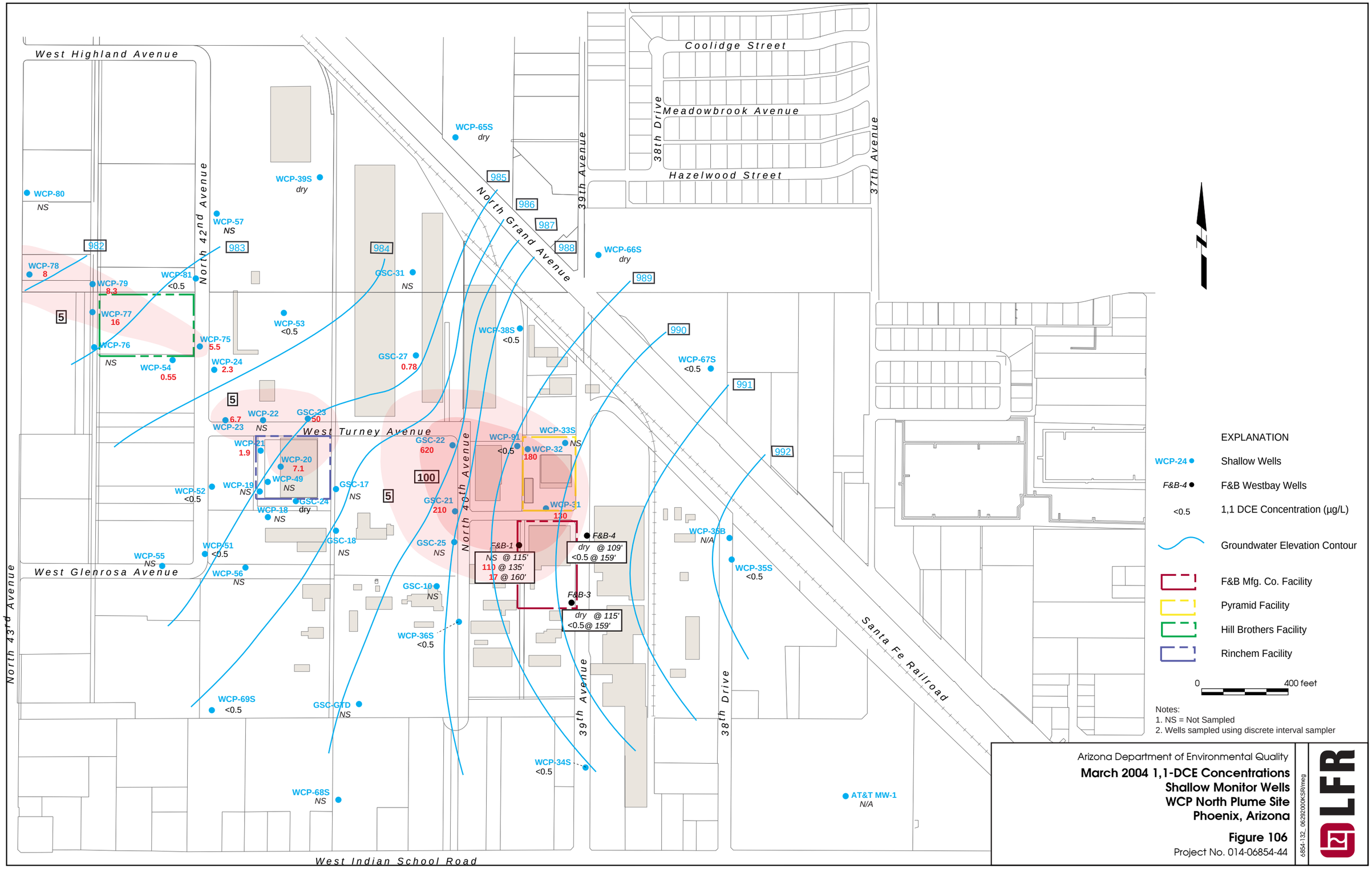
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

Arizona Department of Environmental Quality

December 2003 1,1-DCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 105
Project No. 014-06854-05

6854-132_06292000KSR\meg

LFR



Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

Arizona Department of Environmental Quality

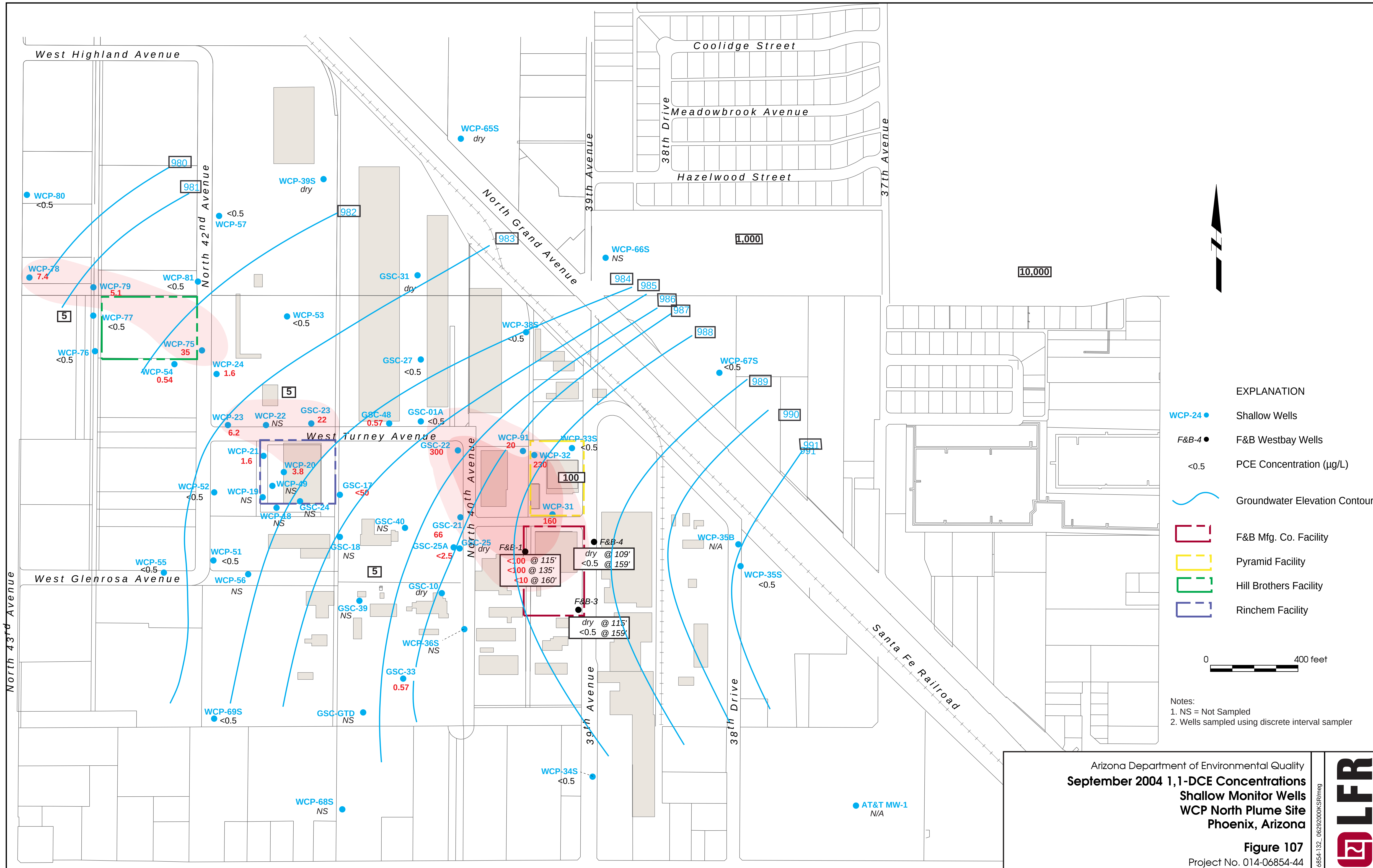
March 2004 1,1-DCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 106

Project No. 014-06854-44

6854-132_062920I0KSR\meg

LFR



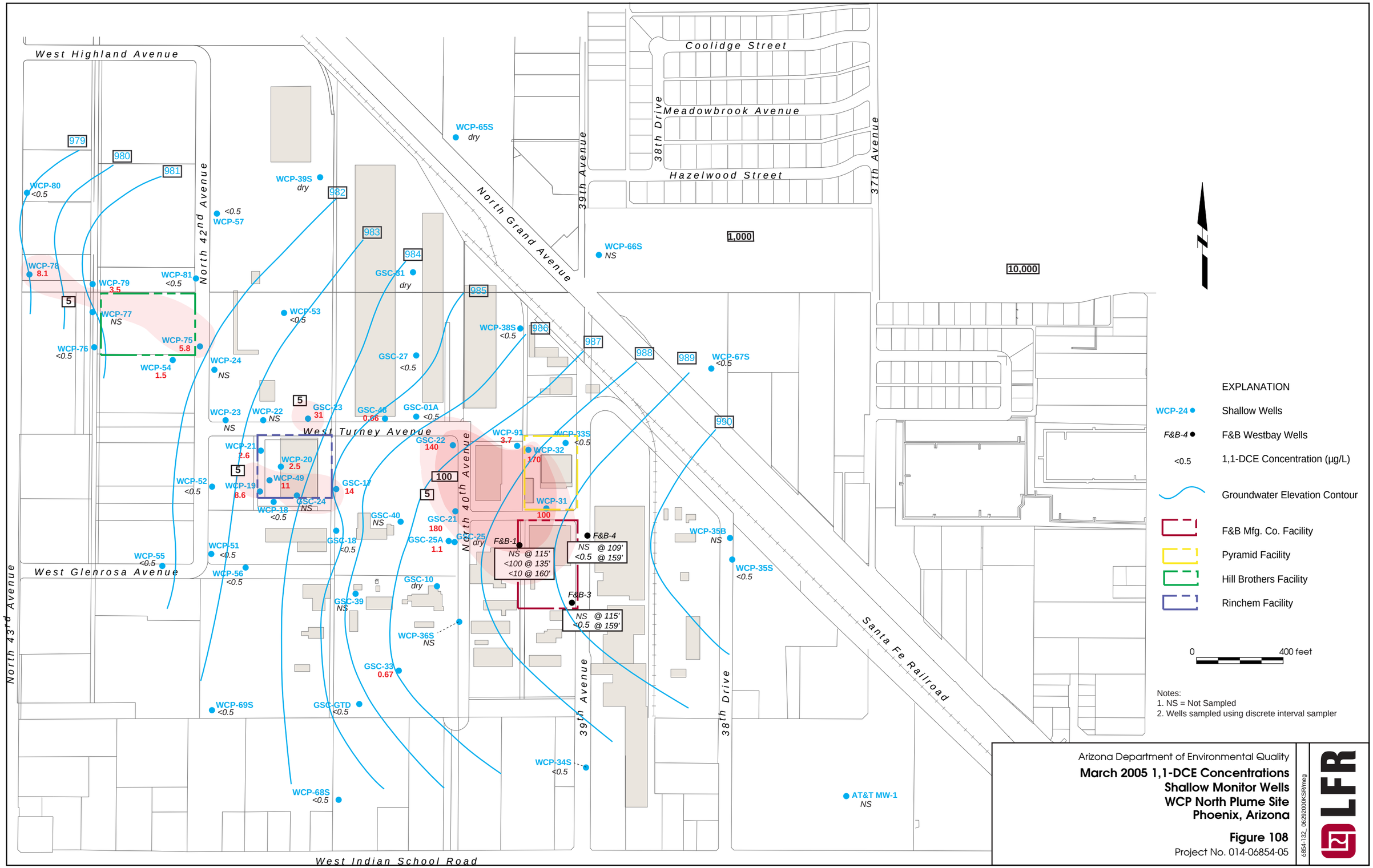
Arizona Department of Environmental Quality

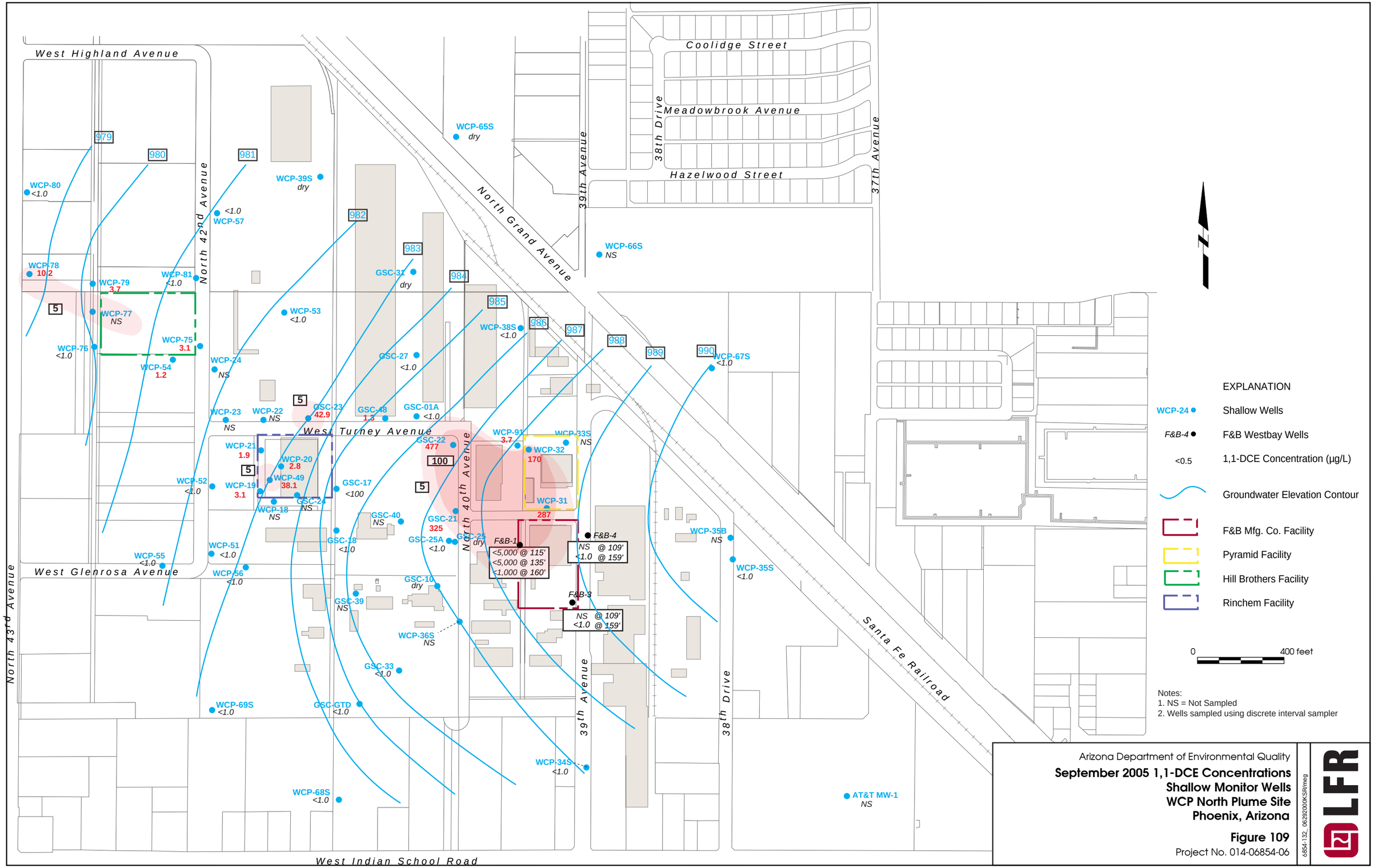
September 2004 1,1-DCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 107

Project No. 014-06854-44

LFR


West Highland Avenue
North 42nd Avenue
North 43rd Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
North 40th Avenue
Santa Fe Railroad
979
980
981
982
983
984
985
986
987
988
989
990
1,000
10,000
5
100
WCP-80 <0.5
WCP-78 8.1
WCP-79 3.5
WCP-81 <0.5
WCP-77 NS
WCP-75 5.8
WCP-76 <0.5
WCP-54 1.5
WCP-57 <0.5
WCP-39S dry
WCP-65S dry
WCP-53 <0.5
WCP-24 NS
WCP-23 NS
WCP-22 NS
GSC-23 31
GSC-48 0.66
GSC-01A <0.5
GSC-31 dry
GSC-27 <0.5
WCP-38S <0.5
WCP-66S NS
WCP-67S <0.5
WCP-21 2.6
WCP-20 2.5
WCP-49 11
WCP-19 8.6
WCP-18 <0.5
GSC-24 NS
GSC-17 14
GSC-22 140
WCP-91 3.7
WCP-33S <0.5
WCP-32 170
WCP-31 100
GSC-21 180
GSC-25A 1.1
GSC-25 dry
F&B-1 NS @ 115' <100 @ 135' <10 @ 160'
F&B-4 NS @ 109' <0.5 @ 159'
F&B-3 NS @ 115' <0.5 @ 159'
WCP-52 <0.5
WCP-51 <0.5
WCP-55 <0.5
WCP-56 <0.5
GSC-40 NS
GSC-18 <0.5
GSC-10 dry
GSC-39 NS
WCP-36S NS
GSC-33 0.67
WCP-69S <0.5
GSC-GTD <0.5
WCP-68S <0.5
WCP-34S <0.5
WCP-35B NS
WCP-35S <0.5
AT&T MW-1 NS
N
EXPLANATION
WCP-24 Shallow Wells
F&B-4 F&B Westbay Wells
<0.5 1,1-DCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
0
400 feet
Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler
Arizona Department of Environmental Quality
March 2005 1,1-DCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 108
Project No. 014-06854-05
6854-132_ 06292000KSRmeg
LFR



Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

Arizona Department of Environmental Quality

September 2005 1,1-DCE Concentrations
Shallow Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 109
Project No. 014-06854-06

6854-132_ 06292006KSRmeg

LFR

West Highland Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
North 42nd Avenue
38th Drive
39th Avenue
37th Avenue
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
West Indian School Road

978 979 980 981 982 983 984 985 986 987 988 989 990

WCP-80 <1.0
WCP-78 6
WCP-79 2.7
WCP-81 <1.0
WCP-77 2.1
WCP-75 3
WCP-76 <1.0
WCP-54 <1.0
WCP-57 <1.0
WCP-39S dry
WCP-65S dry
WCP-66S NS
WCP-53 <1.0
WCP-24 NS
WCP-38S <1.0
WCP-67S <1.0
GSC-49 <1.0
GSC-31 dry
GSC-27 <1.0
GSC-23 52
GSC-48 1.3
GSC-01A <1.0
WCP-23 NS
WCP-22 NS
WCP-21 <1.0
WCP-20 1.4
WCP-49 49
WCP-19 3.2
WCP-18 NS
GSC-17 68
GSC-24 NS
WCP-52 <1.0
WCP-55 <1.0
WCP-51 <1.0
WCP-56 <1.0
GSC-18 <1.0
GSC-40 NS
GSC-22 330
100
92
GSC-21
GSC-25A <1.0
GSC-25 dry
F&B-1
NS @ 115'
<200 @ 135'
<1 @ 160'
WCP-91 8.1
WCP-33S NS
WCP-32 3.2
WCP-31 <1.0
F&B-4
NS @ 109'
<1.0 @ 159'
F&B-3
NS @ 109'
<1.0 @ 159'
WCP-35B NS
WCP-35S <1.0
GSC-10 dry
GSC-39 NS
GSC-34 1.3
WCP-36S NS
GSC-33 <1.0
WCP-69S <1.0
GSC-GTD <1.0
WCP-34S <1.0
WCP-68S <1.0
AT&T MW-1 NS

5 5 5 5 5 100

N

EXPLANATION

WCP-24 ● Shallow Wells
F&B-4 ● F&B Westbay Wells
<0.5 1,1-DCE Concentration (µg/L)
Groundwater Elevation Contour
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility

0 400 feet

Notes:
1. NS = Not Sampled
2. Wells sampled using discrete interval sampler

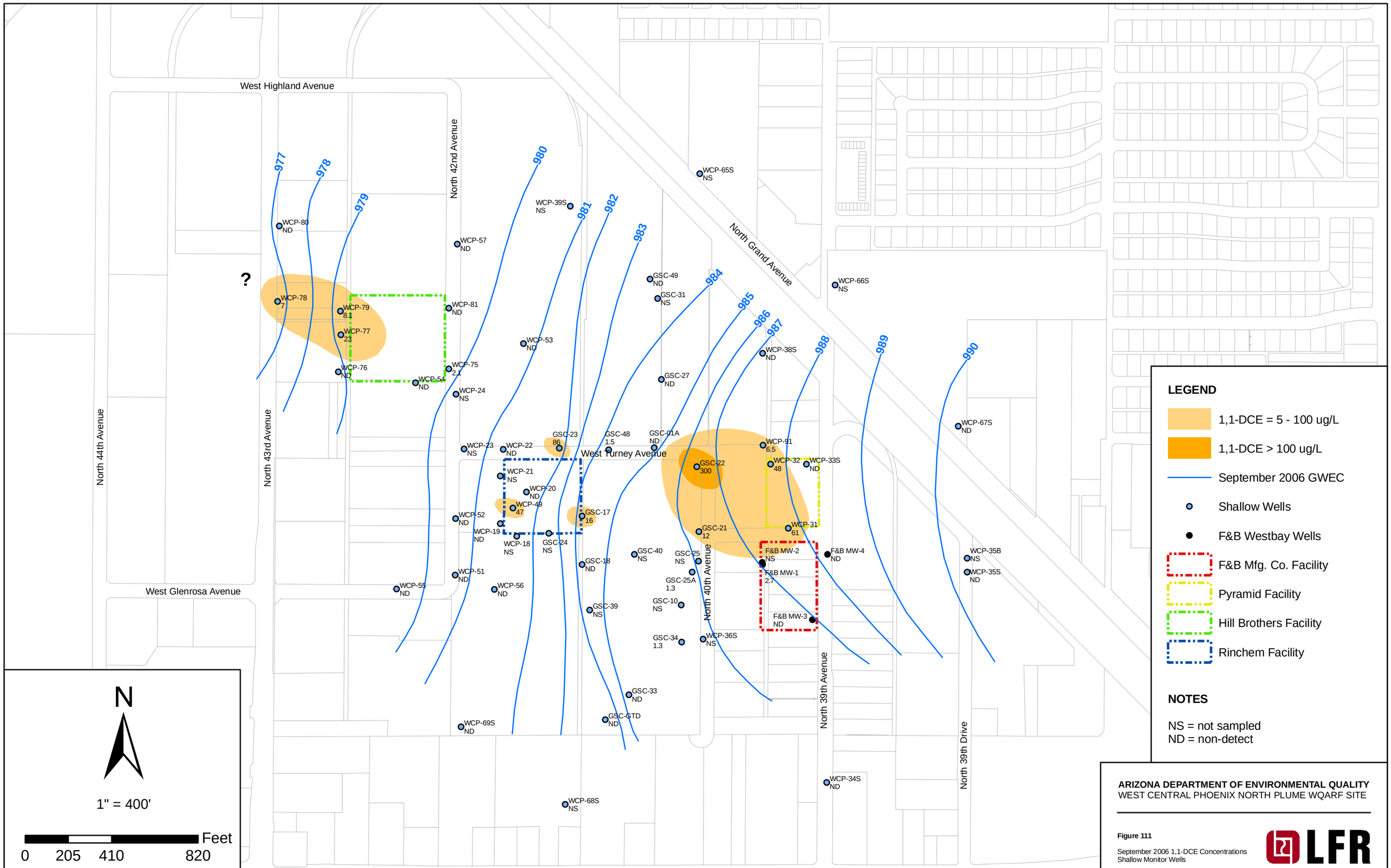
Arizona Department of Environmental Quality

March 2006 1,1-DCE Concentrations
Shallow MAU Monitor Wells
North Plume WQARF Area

Figure 110
Project No. 014-06854-06

6854-132_ 06292006KSR\meg

LFR


West Highland Avenue
West Glenrosa Avenue
West Turney Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 39th Drive
North Grand Avenue
977
978
979
980
981
982
983
984
985
986
987
988
989
990
?
WCP-80 ND
WCP-57 ND
WCP-78 7
WCP-79 8.1
WCP-77 23
WCP-81 ND
WCP-76 ND
WCP-75 2.1
WCP-54 ND
WCP-24 NS
WCP-39S NS
WCP-65S NS
GSC-49 ND
GSC-31 NS
WCP-66S NS
WCP-53 ND
WCP-38S ND
GSC-27 ND
WCP-67S ND
GSC-23 86
GSC-48 1.5
GSC-01A ND
WCP-91 6.5
WCP-23 NS
WCP-22 ND
GSC-22 300
WCP-32 48
WCP-33S ND
WCP-21 NS
WCP-20 ND
WCP-49 47
GSC-17 16
WCP-52 ND
WCP-19 ND
WCP-18 NS
GSC-24 NS
GSC-21 12
WCP-31 61
GSC-40 NS
GSC-25 NS
F&B MW-2 NS
F&B MW-4 ND
WCP-35B NS
WCP-35S ND
GSC-18 ND
F&B MW-1 2.7
WCP-51 ND
WCP-55 ND
WCP-56 ND
GSC-25A 1.3
GSC-10 NS
GSC-39 NS
F&B MW-3 ND
GSC-34 1.3
WCP-36S NS
GSC-33 ND
GSC-GTD ND
WCP-69S ND
WCP-34S ND
WCP-68S NS
N
1" = 400'
0 205 410 820 Feet
LEGEND
1,1-DCE = 5 - 100 ug/L
1,1-DCE > 100 ug/L
September 2006 GWEC
Shallow Wells
F&B Westbay Wells
F&B Mfg. Co. Facility
Pyramid Facility
Hill Brothers Facility
Rinchem Facility
NOTES
NS = not sampled
ND = non-detect
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE
Figure 111
September 2006 1,1-DCE Concentrations
Shallow Monitor Wells
LFR

West Highland Avenue

West Glenrosa Avenue

West Turney Avenue

North 44th Avenue

North 43rd Avenue

North 42nd Avenue

North 40th Avenue

North 39th Avenue

North 39th Drive

North Grand Avenue

WCP-223 ND

WCP-80 ND

WCP-57 ND

WCP-39S Dry

WCP-65S Dry

WCP-66S NS

WCP-78 6.8

WCP-79 4.6

WCP-77 28

WCP-81 ND

GSC-49 ND

GSC-31 NS

WCP-53 ND

WCP-38S ND

WCP-75 1.7

WCP-76 ND

WCP-24 NS

GSC-27 ND

WCP-54 ND

WCP-222 1.2

WCP-67S ND

WCP-221 6.7

WCP-22 Dry

GSC-23 240

GSC-48 1.1

GSC-01A ND

WCP-91 ND

WCP-32 NS

WCP-33S NS

WCP-23 NS

GSC-22 350

WCP-21 ND

WCP-20 Dry

WCP-220 ND

WCP-224 ND

WCP-49 Dry

GSC-17 22

WCP-31 90

WCP-52 ND

GSC-21 11

WCP-19 ND

GSC-40 ND

F&B MW-4 ND

WCP-35B NS

WCP-18 NS

F&B MW-2 NS

WCP-51 ND

GSC-18 ND

WCP-55 ND

WCP-56 ND

GSC-25A 2.2

F&B MW-1 ND

WCP-35S ND

GSC-39 NS

F&B MW-3 ND

GSC-34 1

WCP-36S Dry

GSC-33 1.2

WCP-69S NS

GSC-GTD ND

WCP-34S ND

WCP-68S NS

973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990

N

1" = 400'

0 200 400 800 Feet

LEGEND

- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L
- March 2007 GWECs
- Shallow Wells
- F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Hill Brothers Facility
- Rinchem Facility

NOTES

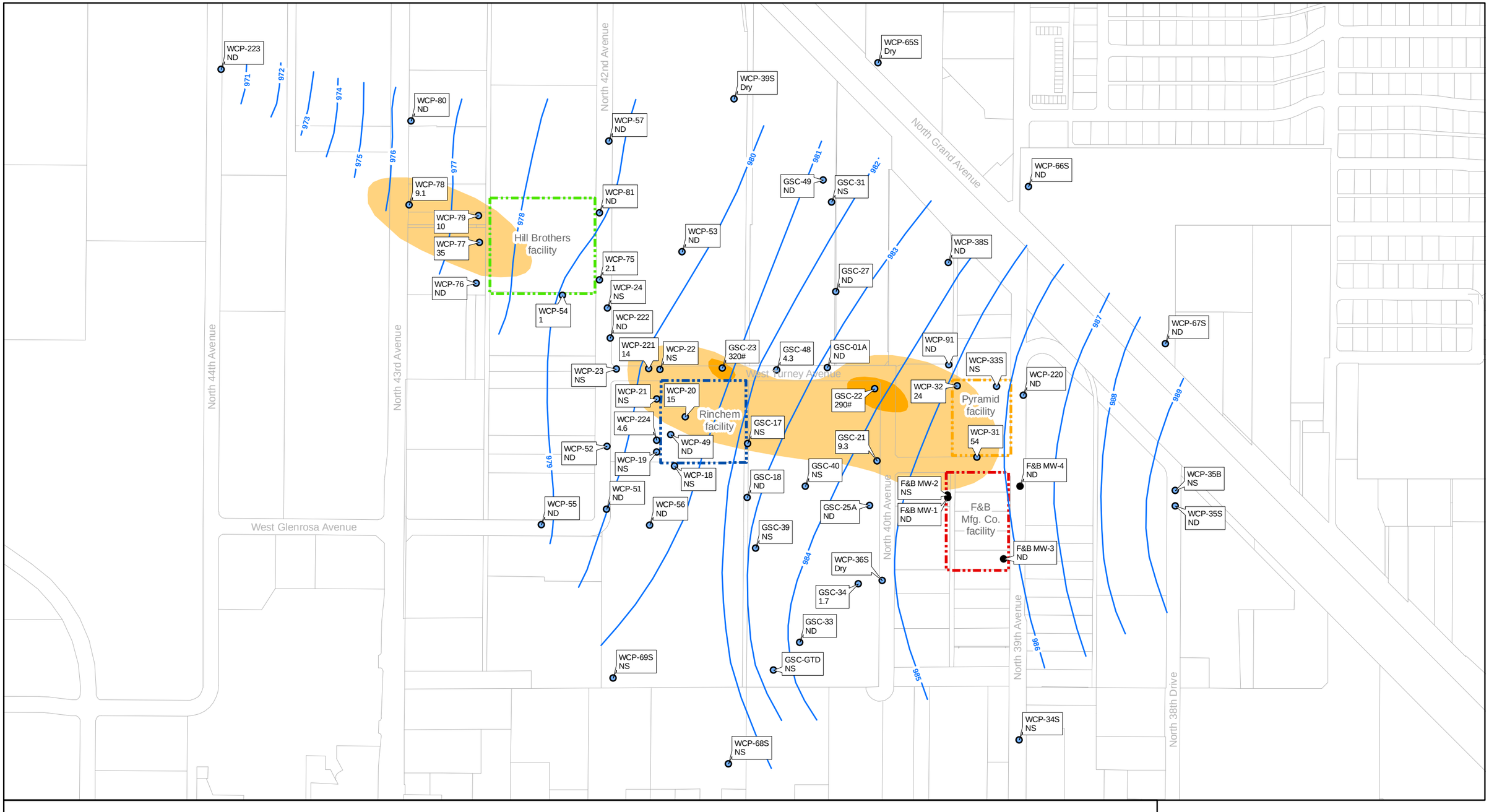
NS = not sampled
ND = non-detect
WCP-69S was dry in March 2007, but historically has exceeded AWQS for 1,1-DCE.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
WEST CENTRAL PHOENIX NORTH PLUME WQARF SITE

Figure 112

March 2007 1,1-DCE Concentrations
Shallow Monitor Wells

LFR



LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- NM = monitor well not sampled during September 2007 event.
- ND = 1,1-DCE concentration below laboratory detection limit.
- # = 1,1-DCE concentration above laboratory upper calibration limit.

N

0 200 400 Feet

Scale: 1" = 400'

September 2007 1,1-DCE Concentrations, Shallow Monitor Wells

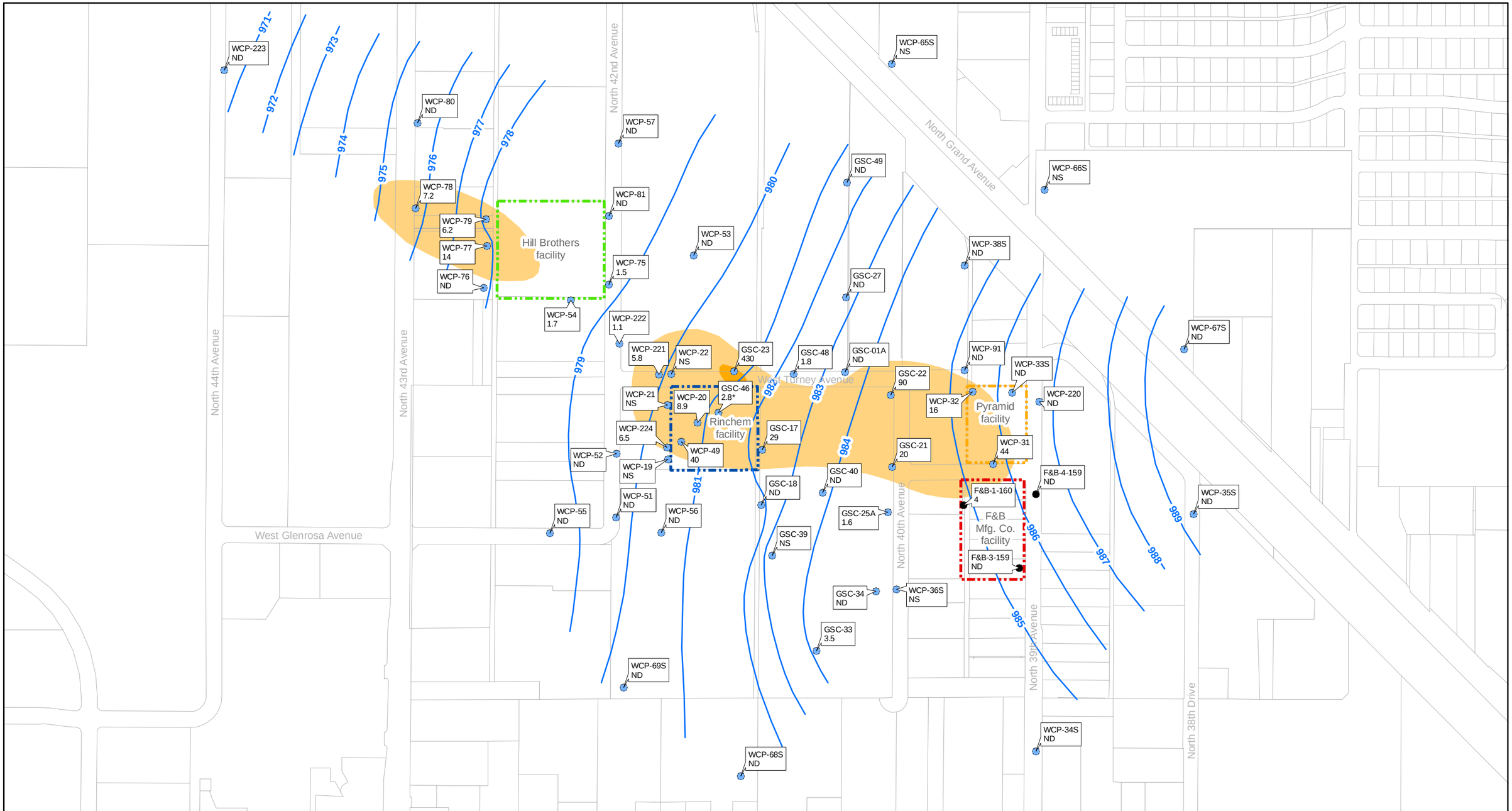
West Central Phoenix North Plume WQARF Site

LFR

Figure 113

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_113_11DCE_shallow_Sep_2007.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North PlumeNP GIS\Projects\Final RI report\Fig_114_11DCE_shallow_Mar_2008.mxd 12/16/2008



LEGEND

- Shallow monitor well
- F&B Westbay well
- GW elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- NS = monitor well not sampled during March 2008 event.
- ND = 1,1-DCE concentration below laboratory detection limit.
- * = concentration considered anomalous and not used in contouring.

Feet
0 200 400
Scale: 1" = 400'

March 2008 1,1-DCE Concentrations, Shallow Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 114

West Highland Avenue
North 42nd Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
North 40th Avenue
39th Avenue
38th Drive
Santa Fe Railroad
West Indian School Road

WCP-33M
<0.5

WCP-37M3
N/A

F&B-2
<0.5 @ 259'

F&B-4
<0.5 @ 259'

F&B-3
<0.5 @ 259'

WCP-35M
<0.5

WCP-36M
<0.5

WCP-34M
<0.5

N

EXPLANATION

North Plume Monitor Well Network

- WCP-24 ● Shallow Wells
- WCP-37M3 ● Middle Wells
- WCP-37M2 ● Deep Wells
- F&B -4 ● F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Rinchem Facility
- Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality

November 1999 1,1-DCE Concentrations
Middle Depth Monitor Wells
WCP North Plume Site
Phoenix, Arizona
Figure 115
Project No. 014-06854-05

6854-46_04102000KSRmeg.srg

LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_116_11DCE_middle_Mar_2003.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
West Glenrosa Avenue
West Turney Avenue
West Indian School Road
North 40th Avenue
North 39th Avenue
North 38th Drive

WCP-82 <0.5
Hill Brothers facility
WCP-74 <0.5
Rinchem facility
WCP-72M <0.5
WCP-71M <0.5
WCP-37M3 <0.5
959
960
961
962
Pyramid facility
WCP-33M <0.5
FB-2-259 <0.5
FB-1
F&B Mfg. Co. facility
FB-4-259 <0.5
FB-3-259 <0.5
WCP-36M <0.5
WCP-34M <0.5
WCP-35M <0.5
WCP-70M <0.5

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

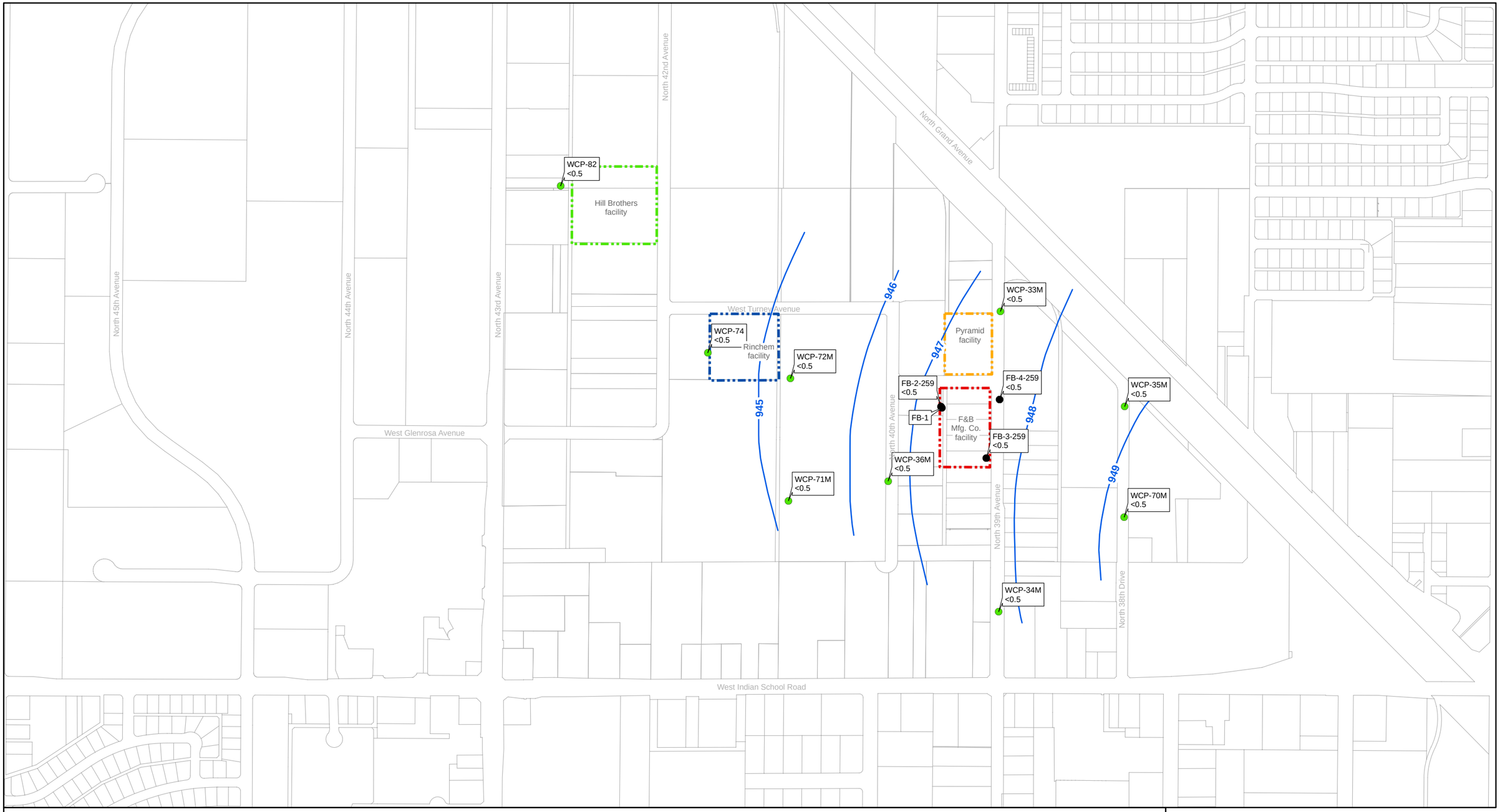
Scale: 1" = 500'

March 2003 1,1-DCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 116



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2004 1,1-DCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 117

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_117_11DCE_middle_Sep_2004.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_118_11DCE_middle_Sep_2005.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
North Grand Avenue
West Turney Avenue
West Glenrosa Avenue
West Indian School Road

WCP-82 <1.0
Hill Brothers facility
WCP-74 <1.0
Rinchem facility
WCP-72M <1.0
WCP-71M <1.0
WCP-33M <1.0
Pyramid facility
FB-2-259 <1.0
FB-4-259 <1.0
FB-1
F&B Mfg. Co. facility
FB-3-259 <1.0
WCP-36M <1.0
WCP-34M <1.0
WCP-35M <1.0
WCP-70M <1.0

955
956
957
958

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

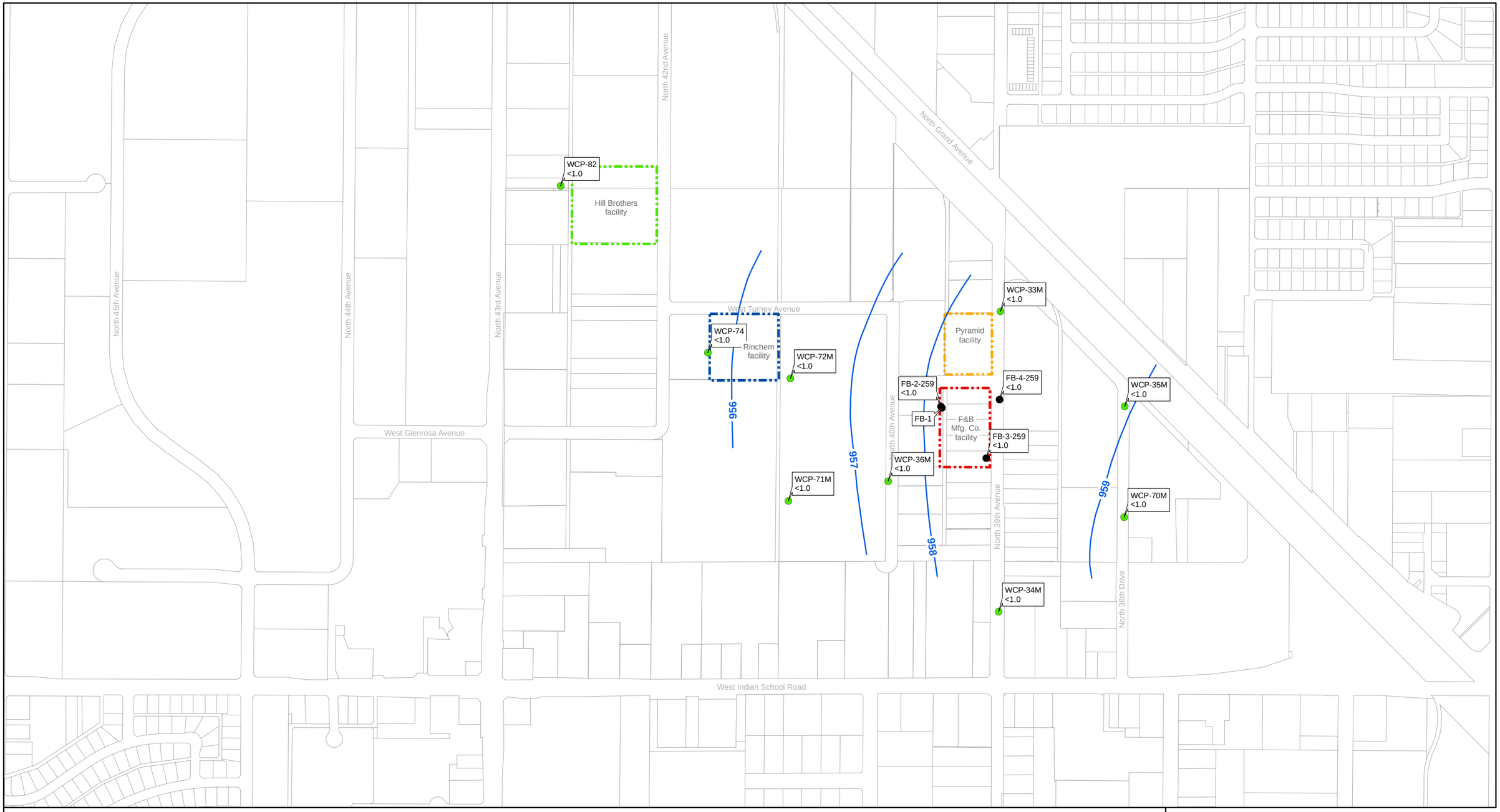
September 2005 1,1-DCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 118

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_119_11DCE_middle_Sep_2006.mxd 12/16/2008



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

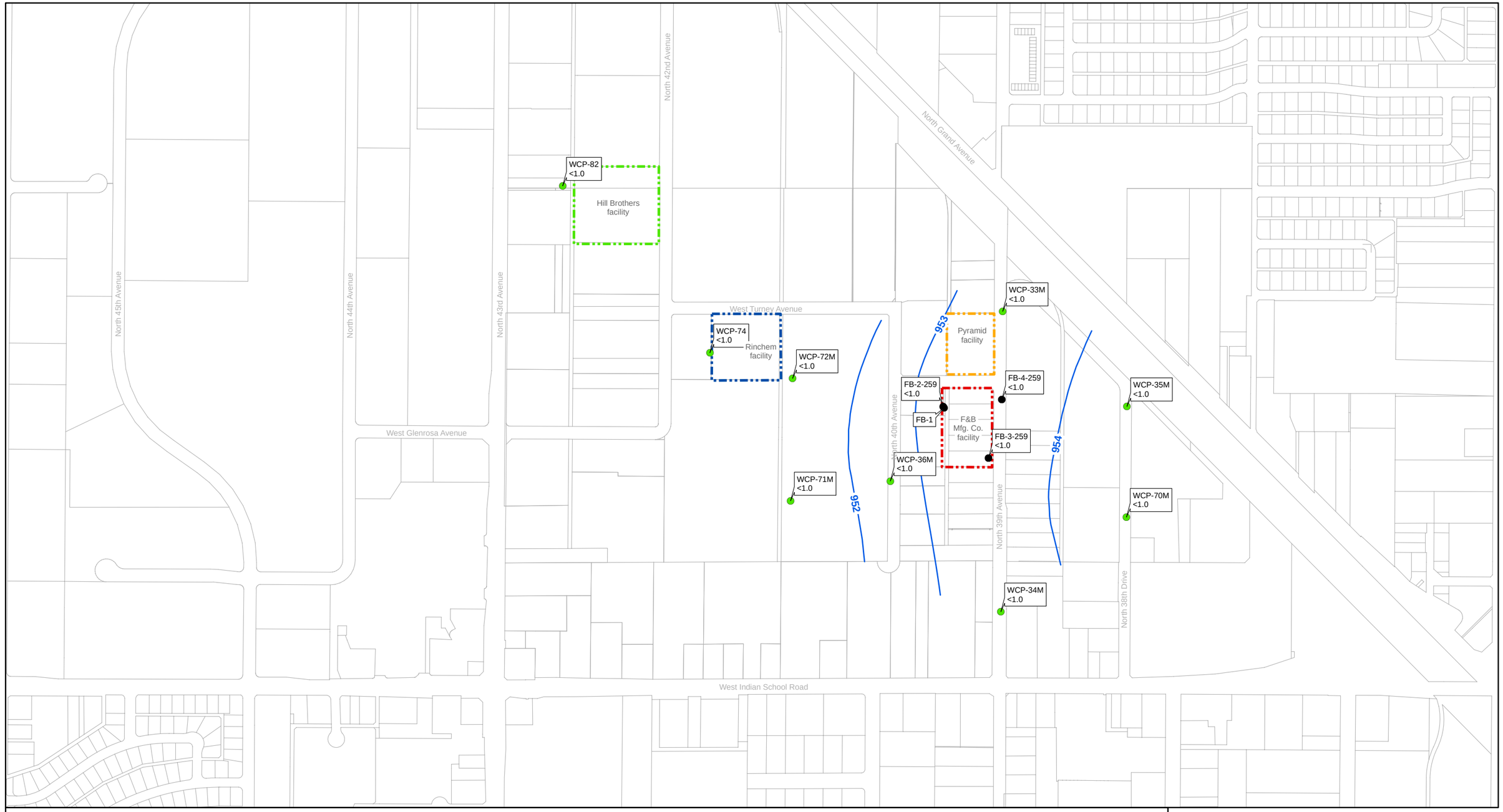
Scale: 1" = 500'

September 2006 1,1-DCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 119



H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_120_11DCE_middle_Sep_2007.mxd 12/16/2008

LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

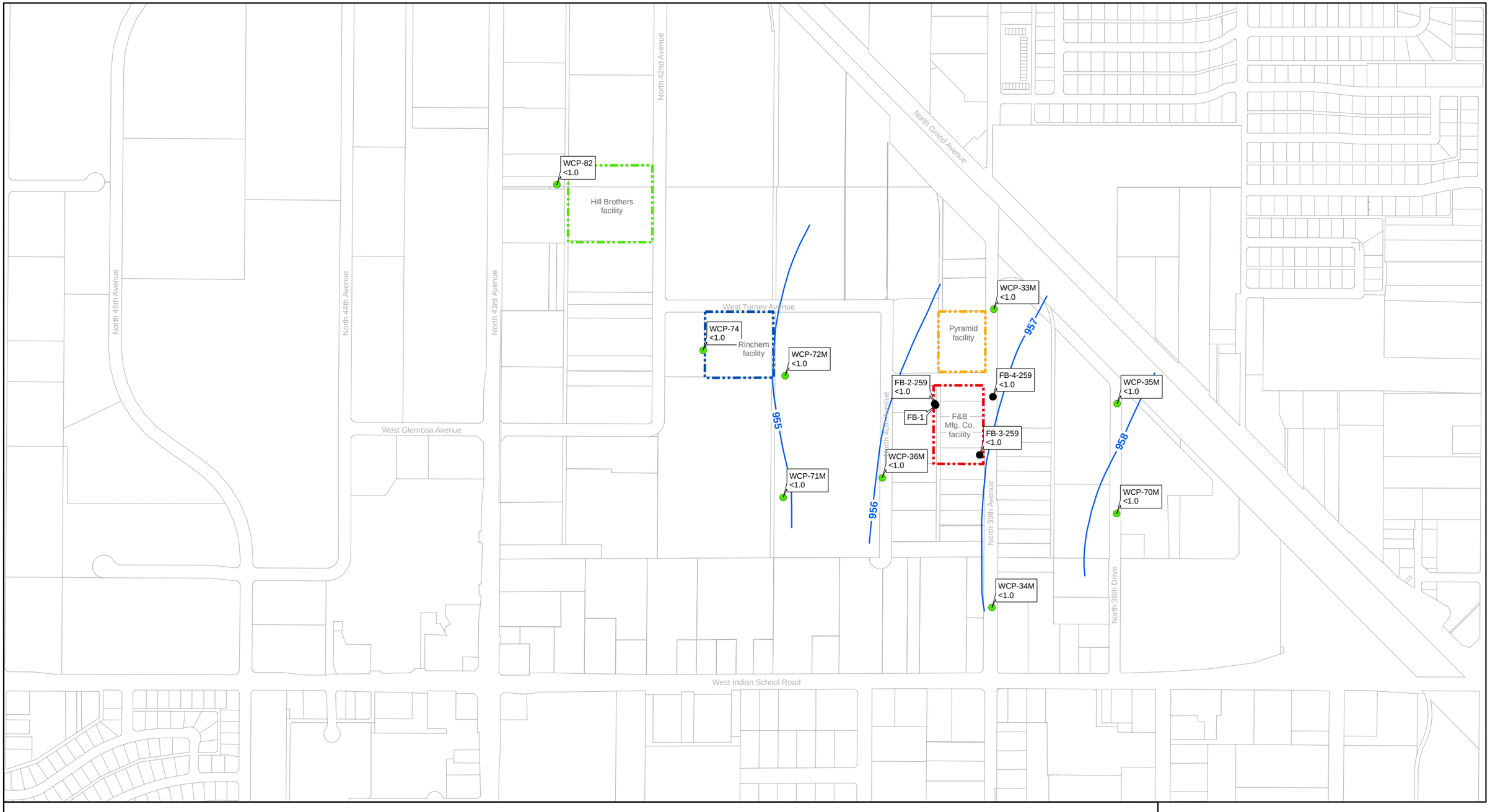
Scale: 1" = 500'

September 2007 1,1-DCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 120



LEGEND

- Middle-depth MAU monitor well
- F&B Westbay well
- Groundwater elevation contour
- 1,1-DCE = 5 - 100 ug/L
- 1,1-DCE > 100 ug/L

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- Concentrations expressed in micrograms per liter (ug/L).

0 250 500 Feet

Scale: 1" = 500'

March 2008 1,1-DCE Concentrations, Middle-Depth Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 121

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_121_11DCE_middle_Mar_2008.mxd 12/16/2008

West Highland Avenue
North 42nd Avenue
West Turney Avenue
West Glenrosa Avenue
North 43rd Avenue
West Indian School Road
North Grand Avenue
Coolidge Street
Meadowbrook Avenue
Hazelwood Street
38th Drive
39th Avenue
37th Avenue
North 40th Avenue
Santa Fe Railroad

WCP-37M2 <0.5
WCP-37L <0.5
WCP-33L <0.5
WCP-73L N/A
F&B -2 <5@434'
F&B -4 <0.5@385' <0.5@435'
F&B -3 <0.5@385' <0.5@434'
WCP-35L <0.5
WCP-36L2 <0.5
WCP-34L <0.5

EXPLANATION

North Plume Monitor Well Network

- WCP-24 ● Shallow Wells
- WCP-37M3 ● Middle Wells
- WCP-37M2 ● Deep Wells
- F&B -4 ● F&B Westbay Wells
- F&B Mfg. Co. Facility
- Pyramid Facility
- Rinchem Facility
- Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality

November 1999 DCE Concentrations
Deep Monitor Wells
WCP North Plume Site
Phoenix, Arizona

Figure 122
Project No. 014-06854-05

6854-130_021301KSR/meg

LFR

West Highland Avenue

North 42nd Avenue

Coolidge Street

Meadowbrook Avenue

Hazelwood Street

38th Drive

39th Avenue

37th Avenue

North Grand Avenue

West Turney Avenue

WCP-37M2
<0.5

WCP-37L
<0.5

WCP-33L
<0.5

North 40th Avenue

WCP-73L
<0.5

F&B -2
<0.5@384'
<0.5@434'

F&B -4
<0.5@385'
<0.5@435'

WCP-35L
<0.5

West Glenrosa Avenue

North 43rd Avenue

WCP-36M2
<0.5

WCP-36L2
<0.5

F&B -3
<0.5@385'
<0.5@434'

39th Avenue

38th Drive

Santa Fe Railroad

WCP-34L
<0.5

West Indian School Road

N

EXPLANATION

North Plume Monitor Well Network

WCP-24 ● Shallow Wells

WCP-37M3 ● Middle Wells

WCP-37M2 ● Deep Wells

F&B -4 ● F&B Westbay Wells

F&B Mfg. Co. Facility

Pyramid Facility

Rinchem Facility

Hill Brothers Facility

0 400 Feet

Arizona Department of Environmental Quality

May 2002 1,1-DCE Concentrations
Deep Monitor Wells
WCP North Plume Site
Phoenix, Arizona

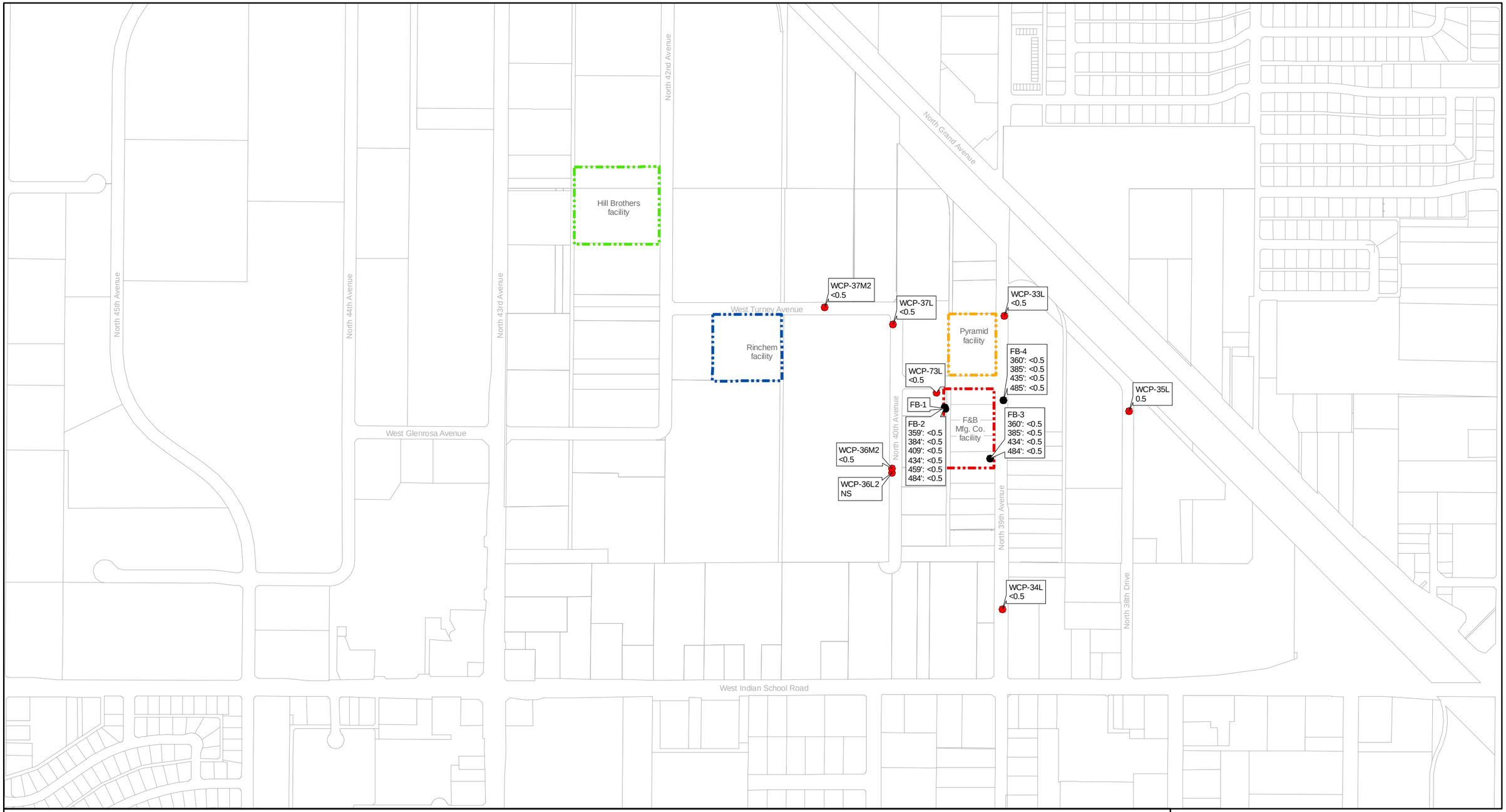
Figure 123

Project No. 014-06854-05

6854-130_021301KSR/meg

LFR

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_124_11DCE_deep_Mar_2003.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

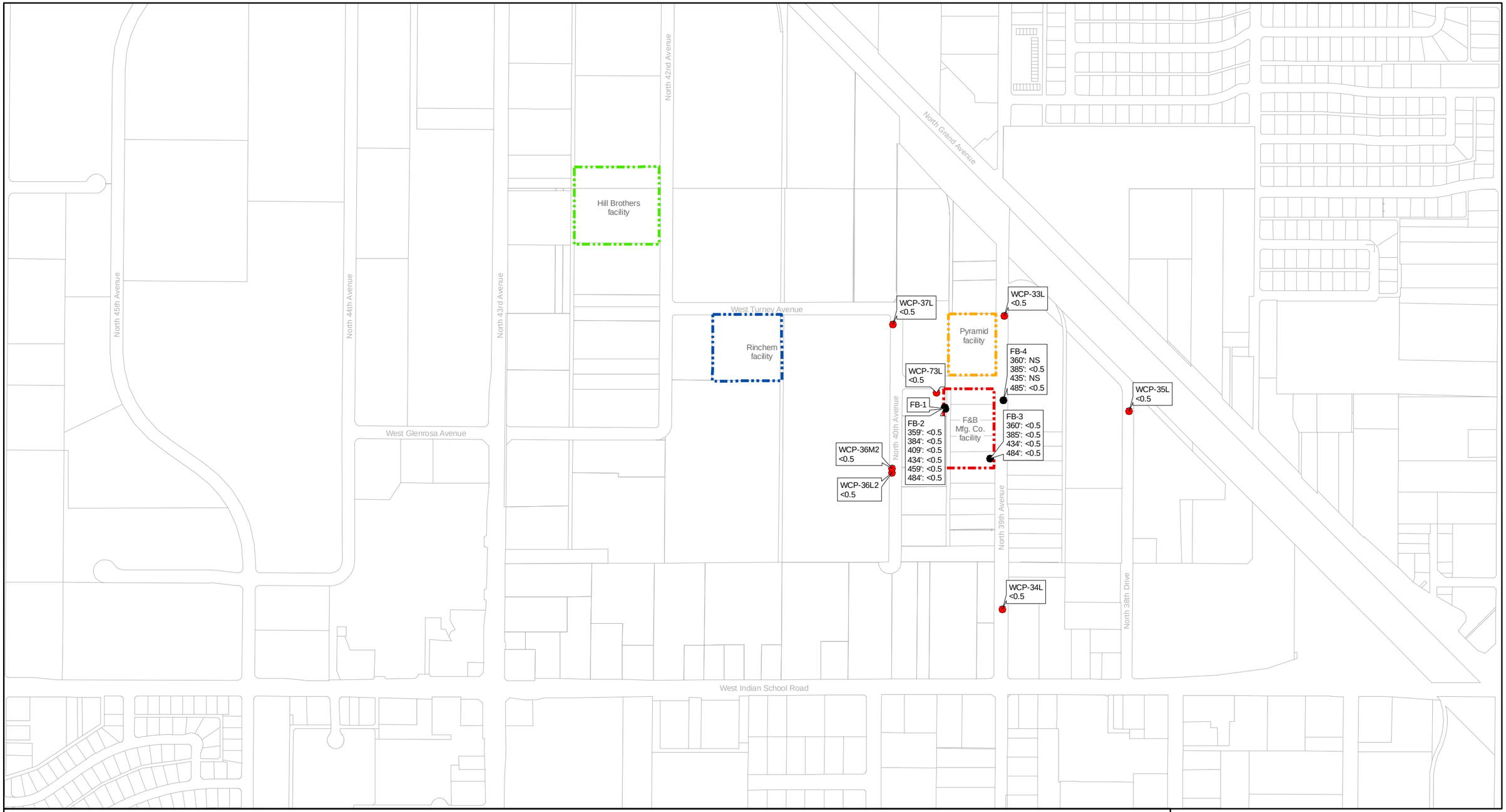
Scale: 1" = 500'

March 2003 1,1-DCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 124



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2004 1,1-DCE Concentrations, Deep Monitor Wells

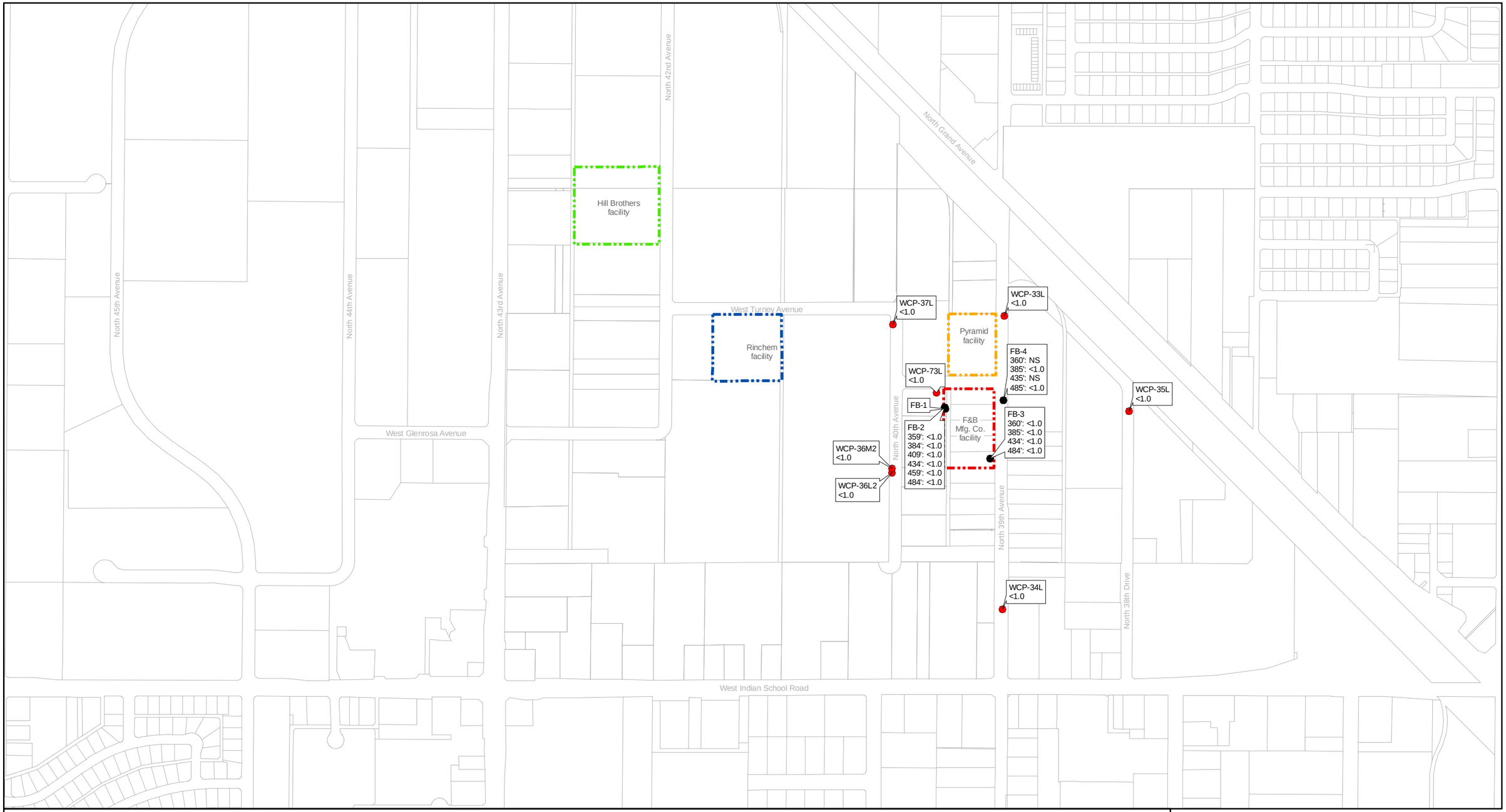
West Central Phoenix North Plume WQARF Site

LFR

Figure 125

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_125_11DCE_deep_Sep_2004.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_126_11DCE_deep_Sep_2005.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

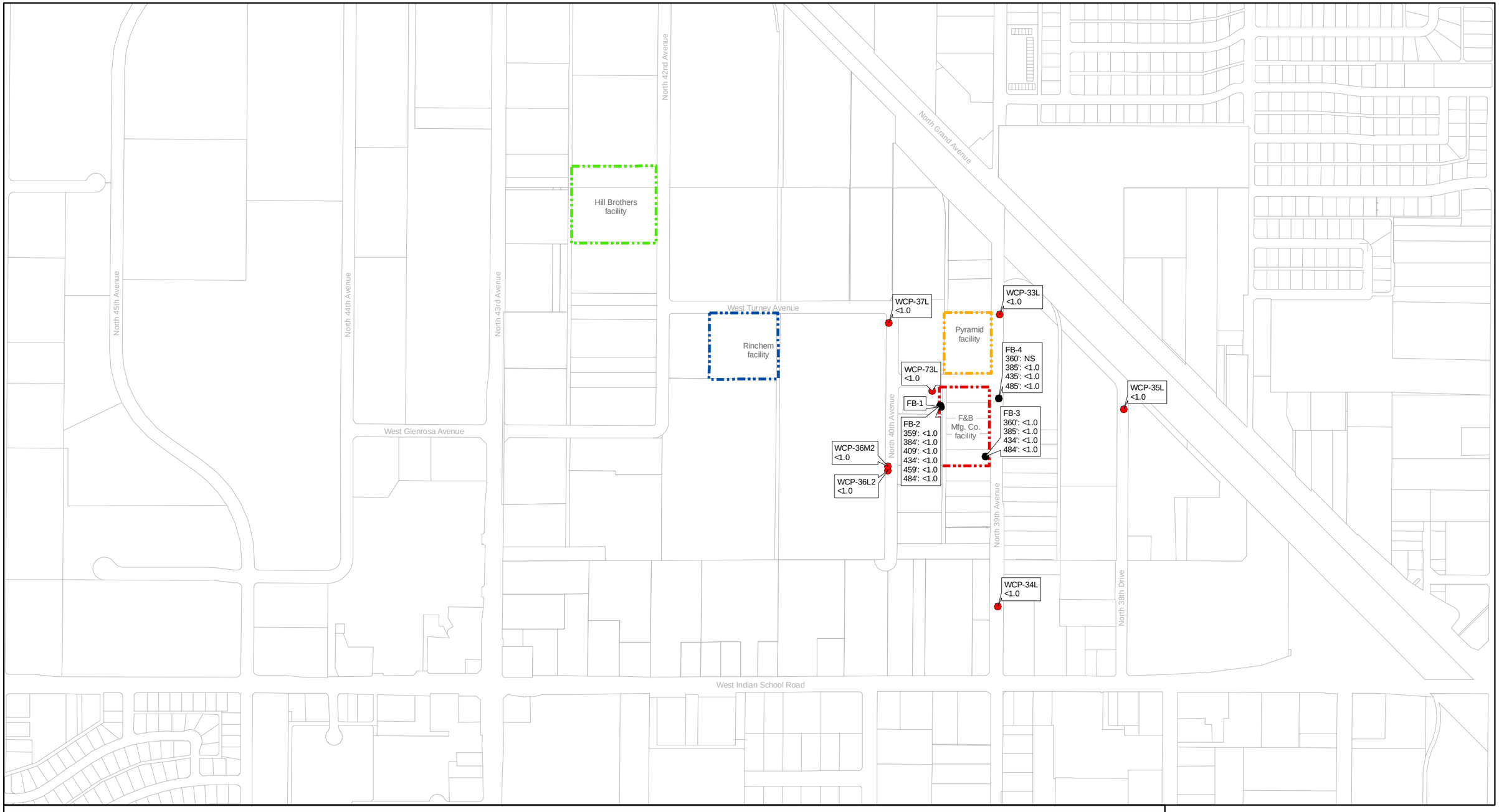
Scale: 1" = 500'

September 2005 1,1-DCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 126



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2006 1,1-DCE Concentrations, Deep Monitor Wells

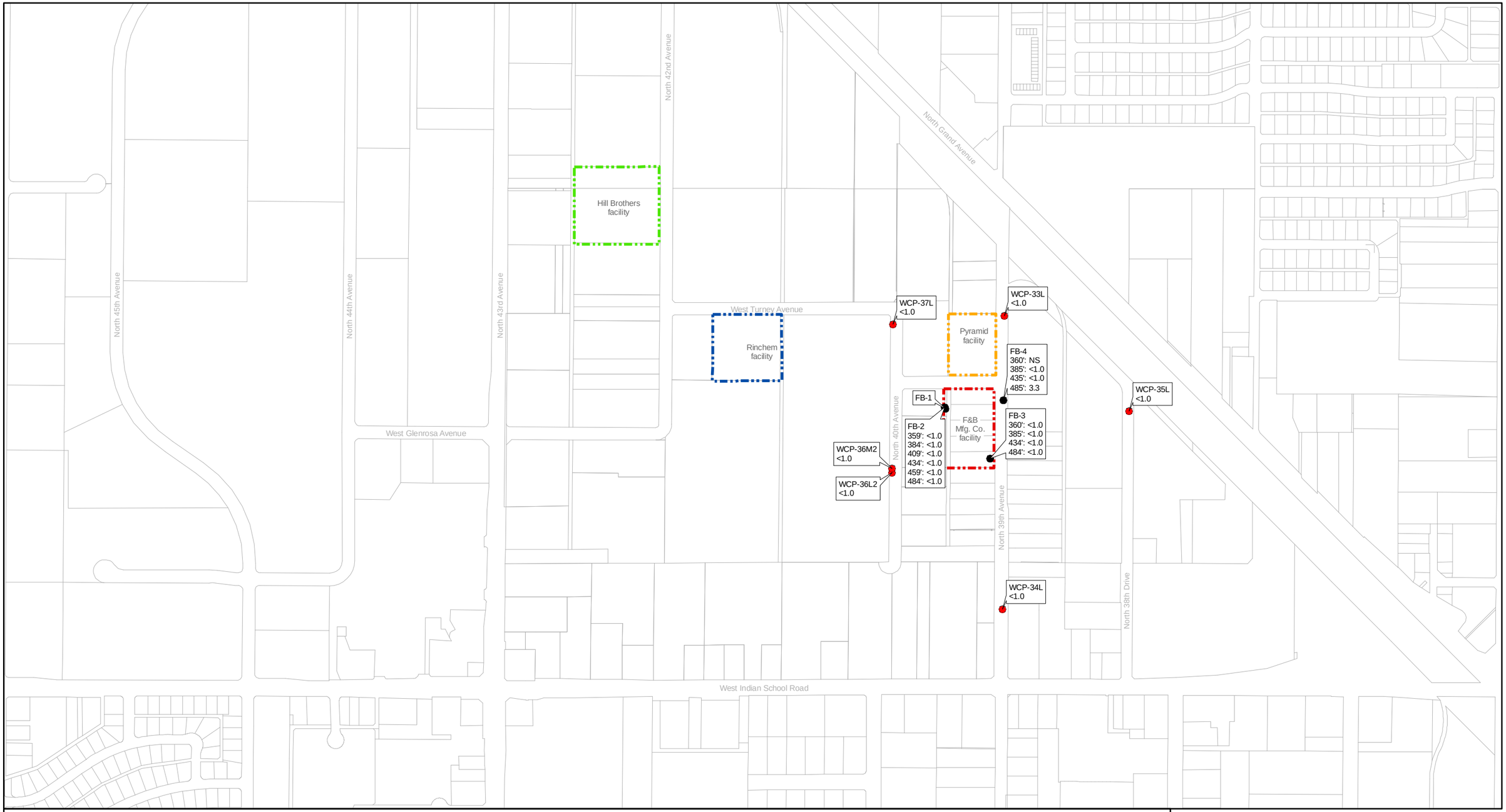
West Central Phoenix North Plume WQARF Site

LFR

Figure 127

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_127_11DCE_deep_Sep_2006.mxd 12/16/2008

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_128_11DCE_deep_Sep_2007.mxd 12/16/2008



LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

September 2007 1,1-DCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 128

H:\Project\ADEQ (Arizona Department of Environmental Quality)\North Plume\NP GIS\Projects\Final RI report\Fig_129_11DCE_deep_Mar_2008.mxd 12/16/2008

North 45th Avenue
North 44th Avenue
North 43rd Avenue
North 42nd Avenue
North Grand Avenue
North 40th Avenue
North 39th Avenue
North 38th Drive
West Glenrosa Avenue
West Turney Avenue
West Indian School Road

Hill Brothers facility
Rinchem facility
Pyramid facility
F&B Mfg. Co. facility

WCP-37L <1.0
WCP-33L <1.0
WCP-73L <1.0
FB-1
FB-2 359': NS 384': <1.0 409': NS 434': <1.0 459': NS 484': <1.0
FB-3 360': NS 385': NS 434': <1.0 484': <1.0
FB-4 360': NS 385': NS 435': <1.0 485': <1.0
WCP-35L <1.0
WCP-36M2 <1.0
WCP-36L2 <1.0
WCP-34L <1.0

LEGEND

- Deep MAU monitor well
- F&B Westbay well

NOTES

- Base map source: City of Phoenix Quarter Section Index Map, rev. September 2003.
- * = 1,1-DCE concentration considered anomalous and not used in contouring.
- ND = 1,1-DCE concentration below laboratory detection limit.
- NS = not sampled.
- Concentrations expressed in micrograms per liter (ug/L).

N

0 250 500 Feet

Scale: 1" = 500'

March 2008 1,1-DCE Concentrations, Deep Monitor Wells

West Central Phoenix North Plume WQARF Site

LFR

Figure 129

APPENDICES

Appendix A

List of Chemicals Used at the Rinchem Facility

Appendix B

Passive Soil Gas Results from Geomatrix's 2003 Investigation at the Hill Brothers Facility

Appendix C

Boring Logs

Appendix D

Geophysical Logs

Appendix E

Aquifer Test Results

Appendix F

Groundwater Elevation and Analytical Data for Selected Contaminants

Appendix G

Hydrographs and Concentrations Versus Time Plots for the WCP North Plume Monitoring Wells

Appendix H

Groundwater Analytical Data (electronic files)

Appendix I

Waste Disposal Receipts and City of Phoenix Discharge Permits

Appendix J

Thin Section Analysis Report

Appendix K

Land and Water Use Report

Appendix L

Remedial Objectives Report

Appendix M

Responsiveness Summary