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EPA/ROD/R09-91/065
September 1991

EPA

Superfund Record of Decision:

Indian Bend Wash Area (Operable Units 1, 4, 5, 6), AZ

50272-101

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Indian Bend Wash Area (Operable Units 1, 4, 5, 6), AZ
Second Remedial Action

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16. Abstract (Limit: 200 words)

The Indian Bend Wash Area site is an active electronics manufacturing and metal plating facility located in the cities of Scottsdale and Tempe, Maricopa County, Arizona. The site consists of two study areas, the North Indian Bend Wash (NIBW) and South Indian Bend Wash (SIBW), both of which contain portions that lie in the 100-year floodplain of the IBW. The NIBW area is the focus of this Record of Decision (ROD) and consists of four operable units; 1, 4, 5, and 6. Land use within the 10-square mile NIBW study area is mainly residential, commercial/industrial, and developed open space (parks and golf courses). In addition, the Salt River Pima-Maricopa Indian Community maintains a portion of NIBW as Cropland. The Indian Bend Wash provides the major surface water drainage for the NIBW area. Since 1950, various electronics manufacturing and metal plating facilities, as well as other industries, have been active at NIBW. Onsite operations have included the use and disposal of organic solvents. During operations, waste solvents and wastewater containing solvents were released from solvent storage tanks and pipes directly to dry wells, surface pits, ponds, lagoons, and the ground surface. In 1981, the State conducted well sampling and identified VOC contamination in several municipal supply

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Indian Bend Wash Area (Operable Units 1, 4, 5, 6), AZ
Second Remedial Action
Contaminated Media: soil, gw
Key Contaminants: VOCs (benzene, PCE, TCE, toluene), other organics, metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 100
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Abstract (Continued)

wells. EPA investigations have concluded that the methods used for solvent disposal led to soil contamination, which in turn acted as a source of contamination for underlying alluvial units. A 1988 ROD provided for remediation of the middle and deep alluvial units at NIBW. This ROD addresses contamination in the vadose zone and in the upper alluvial unit within the NIBW area. However, because the vadose zone overlies the upper alluvial unit, which overlies the middle and deep alluvial units, remedial actions documented in this ROD are dependent upon successful completion of the 1988 ROD. The primary contaminants of concern affecting the soil and shallow ground water are VOCs including benzene, PCE, TCE, and toluene; other organics; and metals including arsenic, chromium, and lead. EPA has designated 13 areas at NIBW for potential contamination in the vadose zone. Twelve of these Areas are designated by number. The 13th area is in the vicinity of several city of Scottsdale ground water supply wells.

The selected remedial action for this site includes installing a soil vapor extraction system for Areas 7 and 8 consisting of soil vapor extraction wells, a manifold collection system, a vacuum pump, and a vapor-phase carbon adsorption system; installing additional soil vapor monitoring wells to continue investigations in Areas 3, 5, 6, 9, 11, and 12 with either soil vapor extraction or no further action remedies as needed; conducting no further action for Areas 1, 2, 4, 10, and the City of Scottsdale wells; and ground water monitoring in the upper alluvial unit. The estimated present worth cost for this remedial action is a minimum of $21,576,000, depending upon the need for soil vapor extraction in Areas 3, 5, 6, 9, 11, and 12, which includes an annual O&M cost of at least $935,000 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific soil and ground water criteria are based on the more stringent of State water quality standards, Federal MCLs, or non-zero MCLGs. These criteria include PCE 5 ug/l (MCL), TCE 5 ug/l (MCL), toluene 1000 ug/l (MCL), arsenic 50 ug/l (MCL), chromium 50 ug/l (State), and lead 50 ug/l (MCL).

RECORD OF DECISION
NORTH INDIAN BEND WASH O.U. 1, 4, 5, 6
SUPERFUND SITE

Volume 1 of 3:
Declaration, Decision Summary, and
Appendix A--ARARs and Other Criteria for NIBW

September 1991

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EPA Work Assignment No. 31-01-966G6-P20

CONTENTS

CONTENTS (Continued)

Volume 1 (Continued)

Figures (Continued)

Tables

CONTENTS (Continued)

I. DECLARATION

A. SITE NAME AND LOCATION

This Record of Decision (ROD) is for North Indian Bend Wash, the northern portion of the Indian Bend Wash Superfund site. The Indian Bend Wash site is located in the cities of Scottsdale and Tempe, Maricopa County, Arizona. The site includes a portion of the Salt River Pima-Maricopa Indian Community.

B. STATEMENT OF BASIS AND PURPOSE

In September 1988, EPA selected a remedy for deep and middle-depth ground water at North Indian Bend Wash (NIBW). Building upon that 1988 remedy, this decision document selects additional remedial actions for the vadose zone and shallow ground water. This document also identifies applicable or relevant and appropriate requirements (ARARs) and other criteria with which the 1988 remedy and the remedies selected in this document shall comply. EPA has chosen these remedial actions for NIBW in accordance with the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. Section 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (1986) (CERCLA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300 (NCP). Data collected at NIBW have been collected and analyzed in accordance with EPA-approved sampling and quality assurance plans. EPA considers site data to be of adequate quality to support the selection of remedies presented in this document. Appendix B of this ROD contains the index for the Administrative Record File upon which this decision is based.

The State of Arizona concurs with the selected remedies.

C. ASSESSMENT OF THE SITE

Releases of volatile organic compounds (VOCs) such as trichloroethene (TCE) have contaminated the vadose zone and ground water at NIBW. Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response actions selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

D. DESCRIPTION OF THE SELECTED REMEDIES

In September 1988, EPA selected a ground-water remedy for the Middle Alluvial Unit (MAU) and the Lower Alluvial Unit (LAU) at NIBW. That remedy, commonly referred to as the Scottsdale Operable Unit remedy, consists of ground-water extraction using four City of Scottsdale wells, treatment at a central facility with air stripping and vapor-phase carbon adsorption, and placement of treated water into Scottsdale's municipal water supply system. Although the initial configuration of the extraction well field is limited to the four Scottsdale wells designated in the 1988 ROD, the remedy requires containment and capture of all ground water in the MAU and LAU with VOC levels that exceed federal drinking water standards (and certain other levels, as discussed in this document). To achieve full containment and capture, the Scottsdale Operable Unit remedy requires extensive ground-water monitoring and a supplemental analysis to determine appropriate additional response actions to ensure full capture in the MAU and LAU.

This document selects additional response actions to address the vadose zone and the Upper Alluvial Unit (UAU) at NIBW. However, because the vadose zone overlies the UAU, and the UAU in turn overlies the MAU and LAU, the success and appropriateness of the remedial actions described in this ROD are dependent upon successful implementation of the 1988 ROD.

EPA has investigated 13 areas at NIBW for potential contamination in the vadose zone. EPA has designated twelve of these areas by number; the thirteenth area is the vicinity of several City of Scottsdale ground-water supply wells. In five of the areas EPA has studied, Areas 1, 2, 4, 10 and the City of Scottsdale wells, data indicate that the amount of VOCs present **is not sufficient to warrant further action.** At Areas 7 and 8, analyses indicate the mass of VOCs present could continue to contaminate underlying ground water for hundreds of years. Therefore, for Areas 7 and 8, EPA has chosen **Soil Vapor Extraction**, including

- Additional soil vapor monitoring wells,
- Soil vapor extraction wells,
- Piping to a vacuum extraction system, and
- Vapor-phase carbon adsorption.

The vadose zone remedies for Areas 7 and 8 include periodic evaluation of the potential ground-water quality impacts from the residual mass and distribution of VOCs in the vadose zone.

For Areas 3, 5, 6, 9, 11 and 12, EPA data indicate that vadose zone contamination may threaten ground-water quality. However, at this time, EPA does not have sufficient information to determine if Soil Vapor Extraction is warranted in these areas. Therefore, EPA is selecting **additional response actions to further characterize the extent of**

VOC contamination in these areas. The response actions vary from area to area, but include

- Shallow soil gas sampling,
- Depth-specific soil vapor monitoring, and
- Estimating potential ground-water impacts due to migration of VOC mass from the vadose zone.

Based on the further characterization of Areas 3, 5, 6, 9, 11 and 12, EPA will require **Soil Vapor Extraction** for those areas that threaten to contaminate ground water at levels above federal drinking water standards. For areas that do not present this threat, EPA believes **no further action** will be necessary.

Under existing conditions, there appears to be significant migration of VOCs out of the UAU (1) through ground-water flow down wells that provide a conduit between the UAU and the lower units and (2) through vertical ground-water flow across large areas of the contact between the UAU and the MAU. Available data also indicate contaminated areas of the UAU generally overlie areas of the MAU and/or LAU that are also already contaminated. Analyses by the Arizona Department of Water Resources indicate that, with the Scottsdale Operable Unit remedy in place to address contamination in the MAU and LAU, the estimated time required to achieve acceptable levels of VOCs in the UAU and in the overall ground-water system is not likely to change significantly whether or not ground-water extraction from the UAU is included as part of the remedy. In addition, the limited and variable saturated thickness of the UAU could make it difficult to operate and maintain an effective UAU ground-water extraction system. **Therefore, EPA has determined that ground-water extraction from the UAU is not warranted at this time.** However, in order to ensure (1) that the mass of VOCs in the UAU is significantly and continuously decreasing due to migration to the MAU and/or LAU and (2) that VOCs are not migrating to uncontaminated areas in the UAU, MAU or LAU, EPA is selecting **an expanded ground-water monitoring program,** including additional ground-water monitoring wells in the UAU and MAU. If analyses indicate the mass of VOCs in the UAU is migrating into the MAU and/or LAU too slowly or that formerly uncontaminated areas of the UAU, MAU or LAU are becoming contaminated by migration of VOCs within or from the UAU, EPA will reassess the appropriateness of additional ground-water extraction and treatment at NIBW.

E. STATUTORY DETERMINATIONS

The selected remedies for NIBW, including the Scottsdale Operable Unit remedy, are protective of human health and the environment, comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial

actions, and are cost-effective. The NIBW remedies utilize permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element.

Because the NIBW remedial actions will result in hazardous substances remaining on-site above health-based levels while ground-water extraction continues, a review will be conducted within five years after commencement of the remedial actions to ensure the remedies continue to provide adequate protection of human health and the environment.

Daniel W. McGovern
Regional Administrator, EPA Region IX

9.12.91
Date

II. DECISION SUMMARY

A. SITE NAME, LOCATION AND DESCRIPTION

The Indian Bend Wash Superfund site consists of two study areas--North Indian Bend Wash (NIBW) and South Indian Bend Wash (SIBW)--primarily in Scottsdale and Tempe, Maricopa County, Arizona (See Figure 1). This Record of Decision addresses remedial actions for NIBW. SIBW is the subject of an ongoing Remedial Investigation.

1. LOCATION

The NIBW study area encompasses the ten square miles bounded on the north by Chaparral Road, on the east by Pima/Price Road, on the west by Scottsdale/Rural Road and on the south by the southern edges of Sections 11 and 12, Township 1 North, Range 4 East. Approximately eight square miles of NIBW are within the City of Scottsdale, while approximately one square mile is within the City of Tempe and another square mile is part of the Salt River Pima-Maricopa Indian Community (See Figure 2).

2. LAND USE

Irrigation activities began in the late 1800s with the completion of the Arizona Canal and were consolidated with the formation of the Salt River Valley Water Users Association (SRVWUA) in the early 1900s. By 1943, most of the study area was irrigated using surface water provided by the Salt River Project (SRP) for the SRVWUA members, supplemented by ground-water pumpage. Urbanization has gradually decreased the area under irrigation. At present, approximately 70 percent of NIBW is residential, 23 percent is commercial/industrial and 7 percent is developed open space (parks, golf courses, etc.). Current land use patterns are not likely to change significantly in the near future because the area is nearly completely developed. The Salt River Pima-Maricopa Indian Community maintains the area along the east and southeast of NIBW as irrigated cropland.

3. POPULATION

The 1990 resident population within NIBW was approximately 42,810. Due to tourism and winter residency, the population in the area increases during the winter and decreases in the summer. Although the City of Scottsdale predicts continued population growth through the year 2000, the population increase within the study area is likely to be limited by the existing high degree of development.

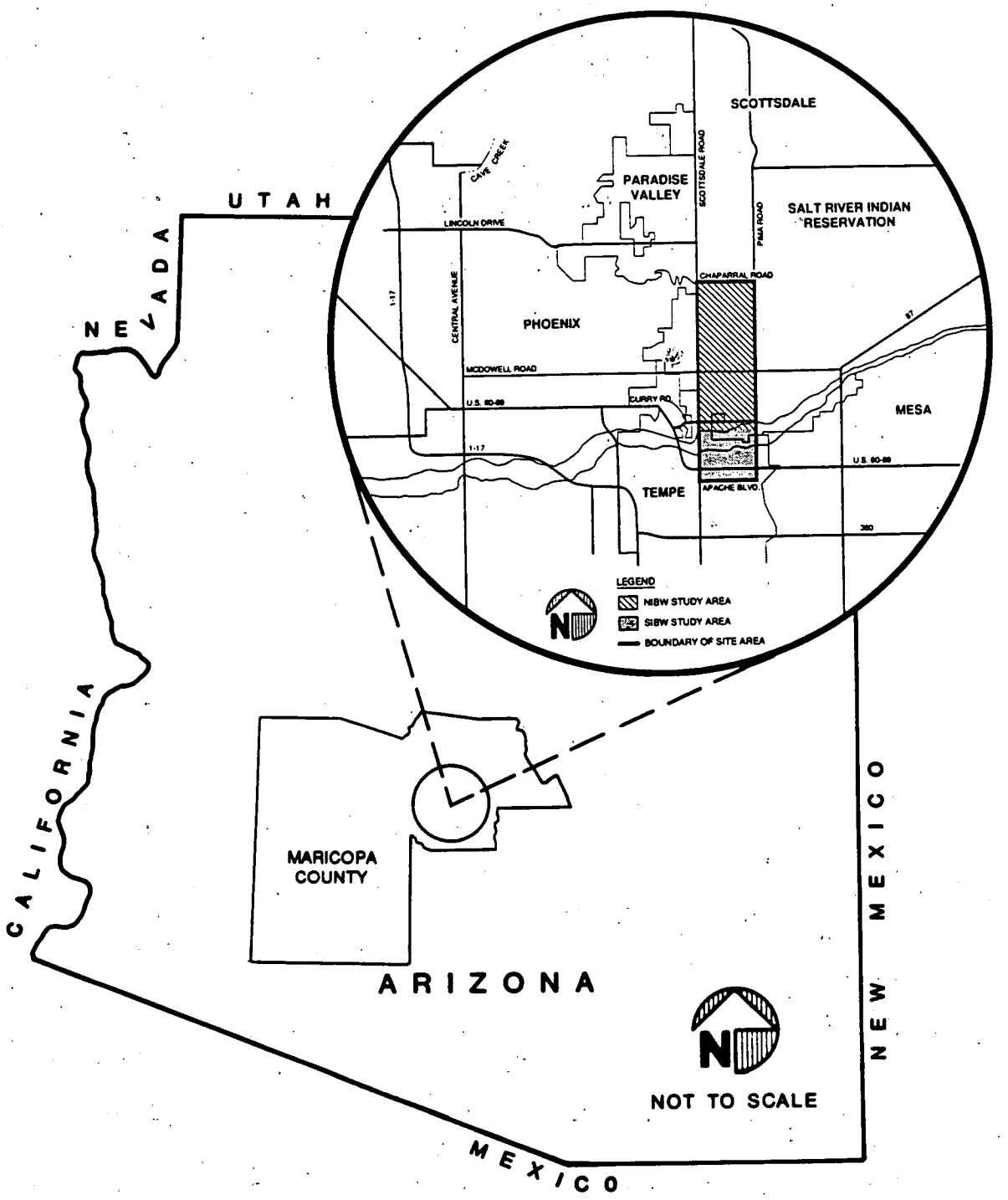


FIGURE 1
SITE LOCATION MAP
NORTH INDIAN BEND WASH ROD

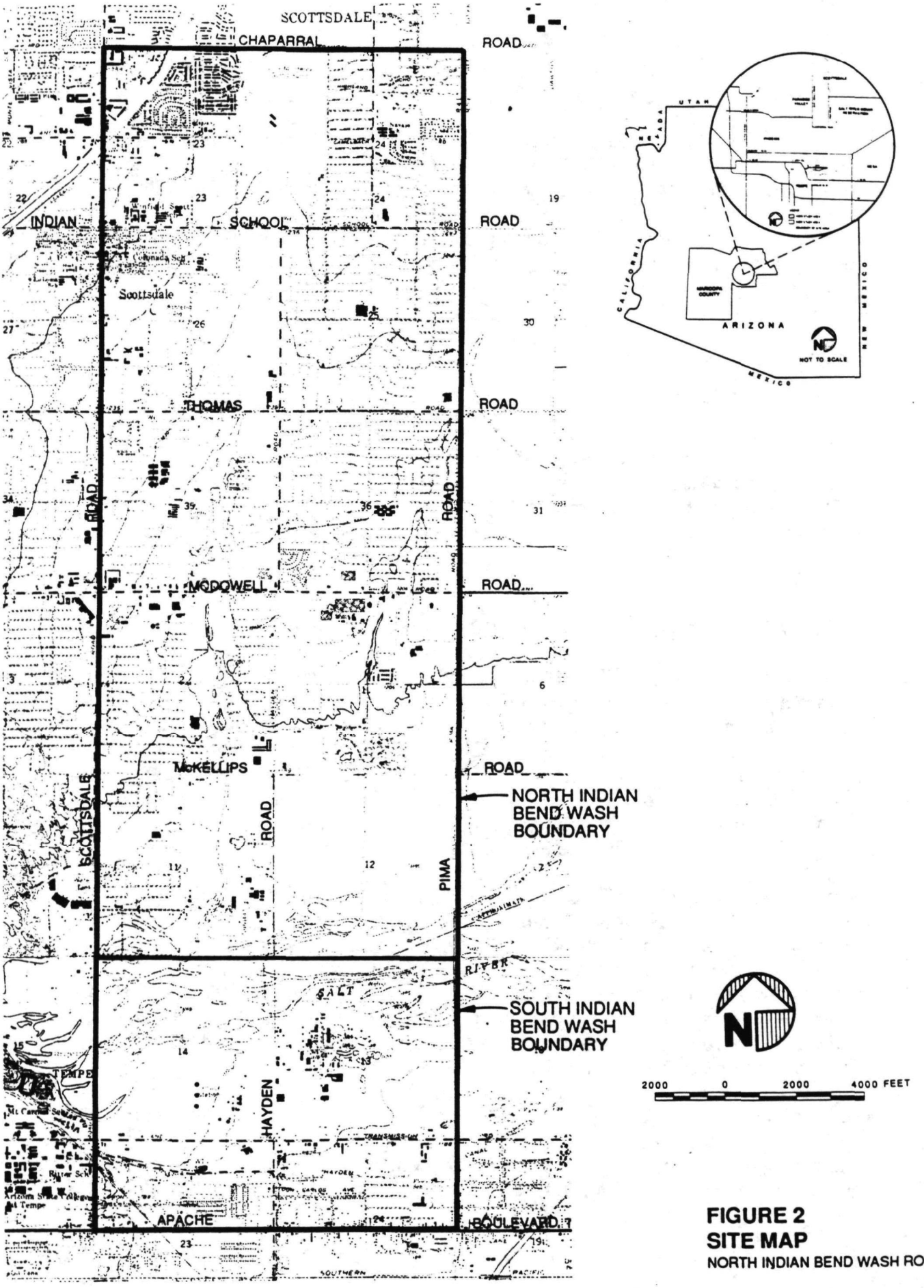


FIGURE 2
SITE MAP
NORTH INDIAN BEND WASH ROD

4. CLIMATE

The climate in the study area is semiarid. The average daily maximum temperature is 85°F, and the average daily minimum temperature is 55°F. As a long-term average, winds are from the west at 6 miles per hour. Precipitation averages 7 inches of rain per year. More than two-thirds of the annual precipitation occurs in summer and winter. Winter rains are more gentle and of longer duration than the summer rains, which occur as short, intense, localized thunderstorms. Pan evaporation, measured at the nearby Mesa Experimental Farm, averaged 108.66 inches per year between 1972 and 1986.

5. TOPOGRAPHY

The surface topography of NIBW is relatively flat. The surface ranges from 1290 feet above mean sea level at the corner of Chaparral and Scottsdale Roads down to approximately 1160 feet above mean sea level in the bottom of the Salt River bed. Slopes of the overall land surface range between 0.2 percent to 3 percent. Slopes of more than 100 percent are present locally on bank protection for the Indian Bend Wash and the Salt River.

6. SURFACE WATER

The Indian Bend Wash (the "Wash") provides the major surface water drainage for the NIBW area. Historically, the Wash was a natural desert wash emptying southward into the Salt River. During the 1970s, the U.S. Army Corps of Engineers, Maricopa County and the City of Scottsdale developed the Wash as a "green belt" within NIBW. It now consists of a series of linked ponds surrounded by irrigated recreational areas such as parks and golf courses. The Wash is lined with concrete south of the southernmost pond. SRP canals or wells and City of Scottsdale wells provide water to fill the ponds and for irrigating the green belt. During periods of flooding, the ponds in the Wash may overflow and discharge water to the Salt River. A second major wash, the Granite Reef Wash, drains water along the eastern side of NIBW down to the Salt River.

Swimming and wading historically have been restricted in the ponds and connector streams in the Wash. However, fishing is permitted in several of the ponds. Fishing restrictions were issued in 1984 when VOCs were detected in ground water used to fill the ponds. Water, sediment and fish tissue samples confirmed the presence of VOCs in the ponds. By 1988, after discharge from contaminated wells had been halted, analyses of water, sediment and fish tissue samples indicated the ponds had returned to an uncontaminated state. Fishing is still prohibited in some of the ponds for reasons other than the presence of contaminants associated with the Superfund site.

The Salt River channel overlies the southern boundary of NIBW. Flow in the river near NIBW is a rare event because of the impoundment of runoff in SRP's reservoirs on the Salt and Verde Rivers. Normally, all water in the Salt River is diverted upstream from NIBW at Granite Reef Diversion Dam into the Arizona and South

Canals for irrigation and municipal use in the Phoenix area. Significant spills of water at Granite Reef Dam leading to flow by NIBW have occurred in the Salt River since 1964, although these spills had relatively short duration (usually less than 5 days). Recharge of ground water occurs during such flood events on the Salt River.

The 100-year floodplains of the Wash and the Salt River have been channelized by man-made "improvements". The 100-year floodplain for the Granite Reef Wash varies from approximately 1800 feet wide at Thomas and Pima Roads to approximately 400 feet wide at McKellips Road. Figure 3 shows the relationship of the NIBW surface water features to the 100-year floodplains and the Standard Project Floodplains (as defined by the U.S. Army Corps of Engineers).

7. GROUND WATER

Ground water in NIBW occurs principally in four alluvial units bounded below by relatively impermeable basement rocks (See Figure 4). The amount of storage and flow within the alluvial units varies considerably with area and depth. The shallowest occurrence of ground water is currently in the Upper Alluvial Unit (UAU) at approximately 100 feet below land surface. The Middle Alluvial Unit (MAU) and the Lower Alluvial Unit (LAU) underlie the UAU. The UAU is composed primarily of sand, gravel, cobbles and boulders, the MAU is composed primarily of sandy silts and clays, and the LAU is composed primarily of variably-cemented sands and gravels. The fourth alluvial unit, the Red Unit, is expected to occur between the LAU and the basement rocks, but the Red Unit has not been identified conclusively in NIBW drilling data.

Several municipalities and water purveyors pump water from within, or adjacent to, NIBW, including

- Arcadia Water Company,
- Paradise Valley Water Company,
- Salt River Pima-Maricopa Indian Community,
- Salt River Project,
- City of Scottsdale, and
- City of Tempe.

Most production wells in NIBW produce water from the MAU and LAU. Few, if any, wells pump water directly from the UAU.

Scottsdale obtains much of its drinking water from surface water supplied by SRP and the Central Arizona Project (CAP), and the remaining portion from ground water. The ratio of ground water to surface water is dependent upon available surface water supplies. In drought periods, the ground-water consumption increases. Approximately 24 existing production wells and 36 unused wells (abandonment procedures typically have not been documented), including the known municipal, industrial, domestic and irrigation wells, are located within NIBW.

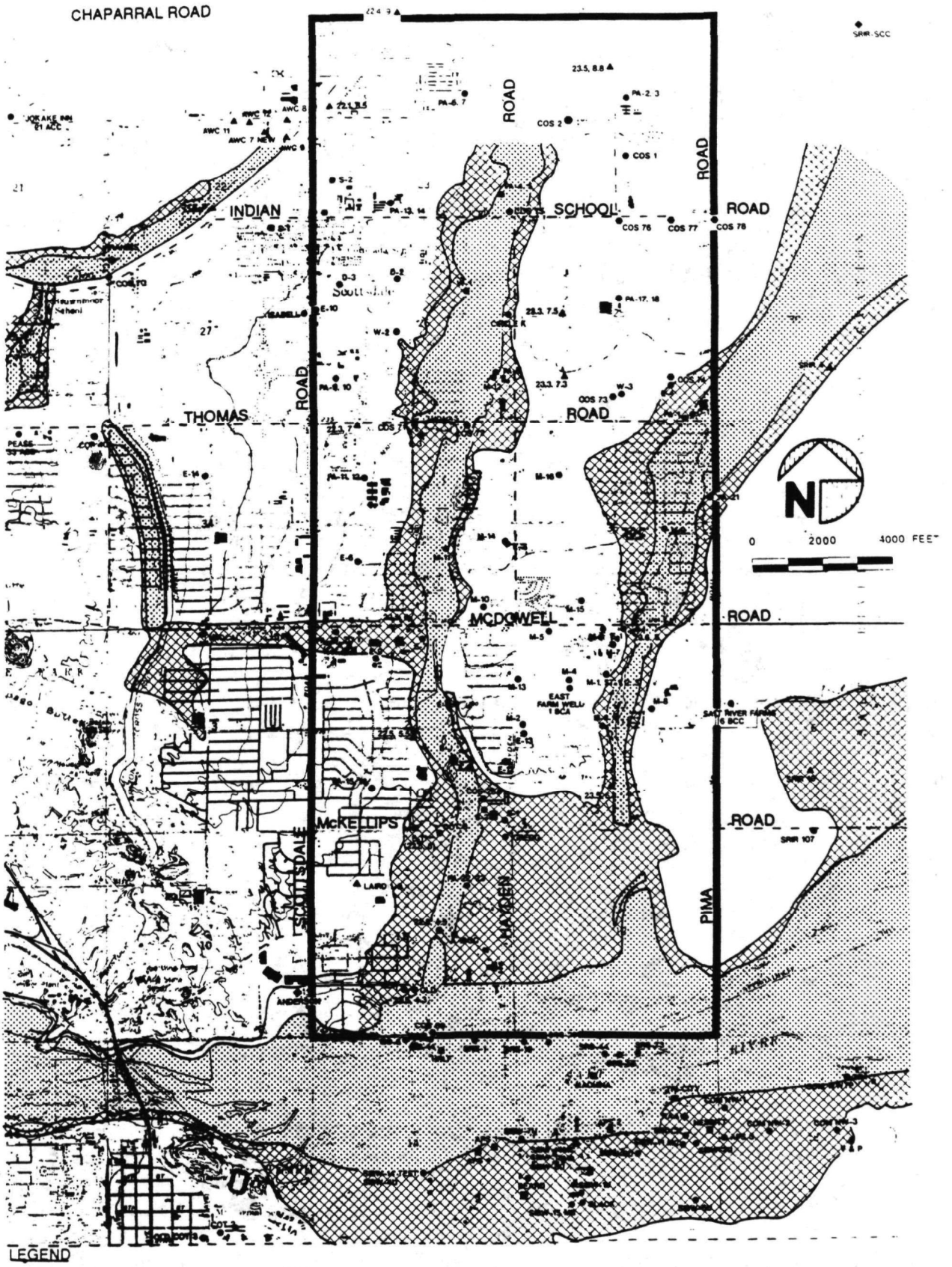


FIGURE 3
SURFACE WATER FEATURES
NORTH INDIAN BEND WASH ROD

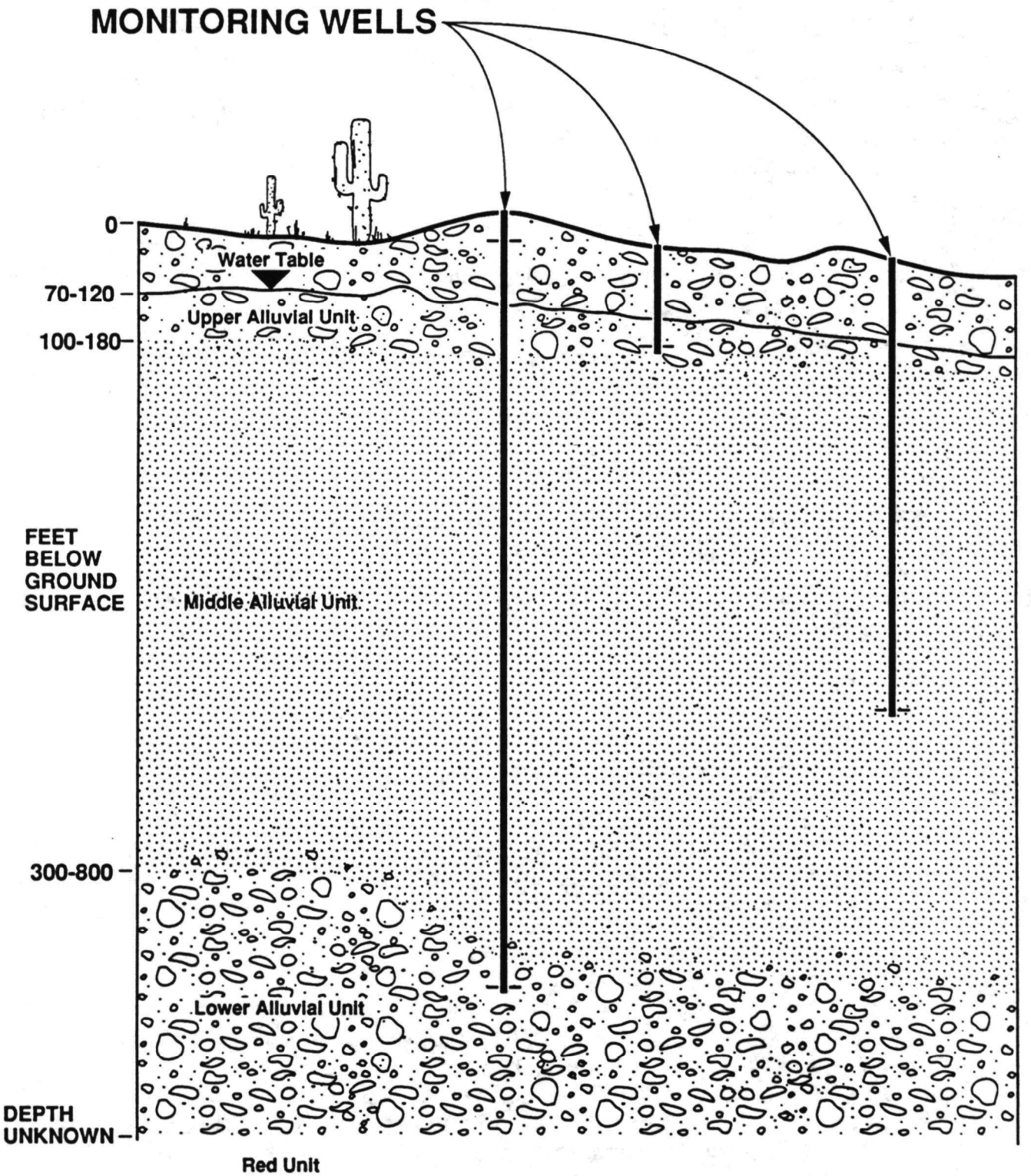


FIGURE 4
TYPICAL GEOLOGIC CROSS SECTION
NORTH INDIAN BEND WASH ROD

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. HISTORIC INDUSTRIAL ACTIVITIES

Various electronics manufacturing and metal plating facilities, as well as other industries, have been active at NIBW since at least the 1950s. Operations at many of these facilities have included the use and disposal of organic solvents. Several means of solvent disposal, including

- Release of waste solvents or wastewater containing solvents to dry wells,
- Release of wastewater containing solvents to surface pits, ponds and lagoons,
- Release from solvent storage tanks and pipes, and
- Release of solvents and other waste directly to the ground surface

have had the potential to contaminate soils and ground water in the study area.

EPA has grouped possible source facilities by location into "potential source areas" (See Figure 5). Table 1 presents a summary of information pertaining to each of the potential source areas. In many of the potential source areas, buildings and other structures covering large portions of the areas continue to be used for industrial and commercial operations.

2. SITE DISCOVERY

In October 1981, the City of Phoenix detected volatile organic compounds (VOCs) in two of its wells in Scottsdale/Tempe area. The State of Arizona, SRP and the cities of Phoenix, Scottsdale and Tempe conducted additional sampling that identified VOCs--primarily trichloroethene (TCE)--in several other municipal supply wells in the Indian Bend Wash area. Based on these initial indications of contamination and further sampling, EPA proposed the Indian Bend Wash for inclusion on the National Priorities List (NPL) in September 1982. The Indian Bend Wash Superfund site achieved final NPL status on September 1, 1983.

3. SITE INVESTIGATIONS

The earliest hydrological studies in NIBW and adjoining areas were conducted by Davis (1897), Lee (1905), and Meinzer and Ellis (1915). Later studies by Arteaga et al. (1968), Halpenny et al. (1967) and Laney and Hahn (1986) contained additional detailed work on the hydrogeology of the Paradise and Salt River Valleys in the vicinity of NIBW. These studies emphasized the regional hydrogeology and water supplies of the area.

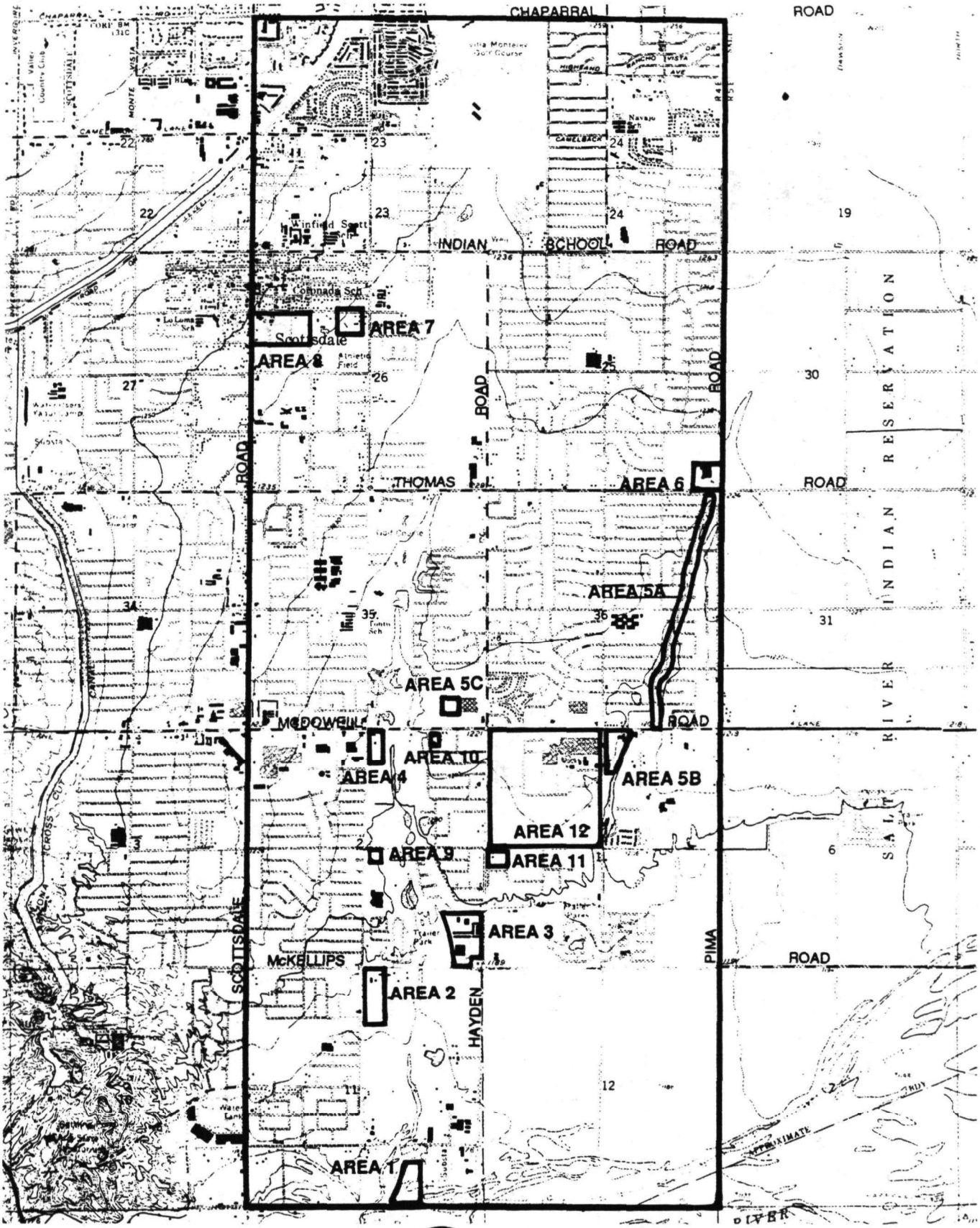


FIGURE 5
POTENTIAL CONTAMINANT SOURCE AREAS
NORTH INDIAN BEND WASH ROD

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area 1, Maricopa County Parcel No. 132-17-005D						
City of Scottsdale Sewage Treatment Facility South of Curry Road and West of Hayden Road	---	Early 1960s	Two sewage polishing ponds totaling 11.1 acres	Sewage effluent	Release of liquid effluent to ponds. Nature of pond lining is unknown.	Ponds were removed and/or filled in 1980 as part of the Army Corps of Engineers' Indian Bend Wash Channelization Program.
Area 2, Maricopa County Parcel No. 132-7-001C						
City of Scottsdale Sewage Treatment Plant	1959	1966	Primary treatment facility with 13.4 acres of oxidation ponds	Unknown	Release of liquid effluent to ponds. Nature of pond lining is unknown.	Oxidation in ponds was preceded by primary treatment.
City of Scottsdale Maintenance Yard	1966	Present	Equipment maintenance/storage	Unknown	Unknown	
Area 3, Maricopa County Parcel Nos. 131-15-013B,C; 131-15-109A, 131-15-011N, and 131-15-012A						
Marro Plating/ Technical Metal Finishing Corporation 7811 E. Pierce Street	06/71	7/86	Metal finishing operations	1,1,1-TCA, metal hydroxide sludge	Waste hauler, recycling.	
Marro Plating/ Plainville West 7811 E. Pierce Street	7/86	Present	Metal finishing	1,1,1-TCA	Waste hauler.	
Genesis II Electronics, Inc. 7901 E. Pierce Street	1976	Present		Isopropanol, oil, Freon-TMS	Wastes stored onsite.	An underground gasoline storage tank may be located on the property.
Beckman Instruments 350 N. Hayden Road	12/73	03/82	Gas discharge display assembly, etching, washing, screen printing, soldering	TCE, chloroethene, Freon-TF -TMS, -TWD602, toluene, isopropanol, methanol, acetone, hydrofluoric acid	Direct release onto the ground, discharge to drains, waste haulers.	
Comtech 350 N. Hayden Road	04/82	11/84	Manufacture and testing of electrical components	TCE, isopropanol, Freon, 1,1,1-TCA	Recycling, release to city sewer.	
Fairchild Data 350 N. Hayden Road	12/84	Present	Circuit board assembly, wave soldering and cleaning, metal immersion coating	1.1,1-TCA, TCE, ferric chloride solution, Freon-TMS, oakite L-25 and L-33, ammonium persulfate solution, isopropanol	Waste hauler, release to city sewer.	

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area 3 (Continued)						
Sperry Information	07/70	12/73	Degreasing	Freon-TA, hydrofluoric acid, methanol, isopropanol	Recycling, release to city sewer.	
Hainey's Machine Tool Co., Inc.	12/70	Unknown	Machining of metal parts	Cutting oils and solvents		
Area 4, Maricopa County Parcel No. 131-12-142						
Ames Meat Southeast corner of intersection of Miller and McDowell Roads	Pre-1949	1957 (?)	Catfish ponds, livestock pens, meat processing	Unknown	Unknown	
Golf Driving Range	1964	(?)	Recreational	N/A	N/A	
Gas Station	1970	(?)	Commercial	Unknown	Unknown	
Race Track	1970	(?)	Recreational	Unknown	Unknown	
Multifamily Housing Display Division	1979	(?)	Residential	N/A	N/A	
Area 5, Maricopa County Parcel No. Not Identified						
Salt River Project Granite Reef Well (A-1-4) 1ABA1 (SRP 23.6E, 6N)	--	--	Water supply well	Solvents (Shell 360, Mirachem 100)	Unknown	Pump equipment was reportedly cleaned at a maintenance yard with solvent degreaser. At various times, pump lubrication oil has been found floating on the ground water in the well. Analysis of the floating oil has indicated that TCE concentrations in the oil may have ranged from less than 100 µg/l to more than 30,000 µg/l (Montgomery & Associates, Inc., 04/01/88). SRP personnel maintain that TCE has moved preferentially from solution in the ground water to solution in the floating oil.
K-Mart	--	--	Shopping Center	--	Unknown	Organic solvent use is not known for this site.

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area 5 (Continued)						
Granite Reef Wash	--	--	Drainage channel	--	Unknown	VOCs detected in soils and soil gas. Drainage of Area 6 facilities may be related.
Area 6, Maricopa County Parcel No. 130-39-001a,b,d						
Siemens Components, Inc. 8700 E. Thomas Road	1974	05/82	Manufacture of zener diodes	Hydrofluoric acid, Freon, methanol, ethanol, MEK, manganese nitrate, TCE, chloroethene, phenol, sodium hydroxide, ammonia, potassium ferricyanide, potassium silver cyanide	Recycled, waste hauler, release to sewer.	ADEQ RCRA inspection identified waste solvent storage area with unsealed drums and evidence of spillage, November 1981.
Dickson Electronics 8700 E. Thomas Road	6/67	1974	Manufacture of electrical components	Etching acid, TCE	Organic solvents and neutralized acid discharged to city sewer, recycling of solvents and cyanide.	
Micro Semiconductor 8700 East Thomas Road	05/82	Present	Manufacture of electrical components	1,1,1-TCA, chloroethene, isopropanol, etching acid, cyanide	Recycled, waste hauler, neutralized compounds released to city sewer.	
Area 7, Maricopa County Parcel Nos. 130-24-0050D, J; 130-24-005G						
Rolamech 3719 N. 75th Street	1974	Present	Manufacture of pens and metal machining	1,1,1-TCA, cutting oil	Waste hauler	Filed notification of storage tank buried since approximately 1940 of unknown size or contents.
Dickson Electronics	1961	1967	Manufacture of electrical components	Solvents	Unknown	
City of Scottsdale		Present	Police Impound Yard	--	Unknown	
Area 8, Maricopa County Parcel No.(s) Not Identified						
Dickson Electronics (248 South Wells Fargo; later designated 300, 308, and 310 South Wells Fargo)	05/60		Manufacture of silicon wafers	TCE, PCE	Unknown	

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area 8 (Continued)						
Dickson Electronics (Southwest corner of 2nd Street and Wells Fargo)			Manufacture of solid-state circuit breakers	Solvents	Unknown	
Dickson Electronics (310 S. Wells Fargo)[a]			Manufacture and assembly of tantalum capacitors	Unknown	Unknown	
Dickson Electronics (425 E. 2nd Street)	1964	1967	Assembly of zener diodes, product testing	Solvents	Release to dry wells and/or cesspool/septic system	Maricopa County Health Department approved construction of a waste disposal pit, April 1962.
Dickson Electronics (Ball Park Plaza/Civic Center Plaza)[a]		Present	Field effect transistor operations	Unknown	Unknown	
The Strip Joynt 2940 N. 73rd Street	01/72	09/86	Furniture stripping	Methylene chloride; 1,1,1-TCA	Waste sludge spread on the ground onsite	
Bells of the West 2940 N. 73rd Street	04/87	Present	Manufacture of wind bells	Unknown	Unknown	
City of Scottsdale	pre-1961	Pre-1972	Sign painting	Unknown	Unknown	
Arizona Public Service	pre-1961	1965	Vehicle storage	Unknown	Unknown	
Frontier Motors	--	--	Auto repair	Unknown	Unknown	
Unidentified	10/84	09/87	Storage of tile, stone, decorative metalwork; paint spraying	Unknown	Unknown	
Marro Plating 22 E. 4th Street (address since changed)	1962	1966	Metal finishing	TCE	Discharge of industrial wastewater to septic system and/or vacant lot	

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area 9, Maricopa County Parcel No. Not Identified						
Salt River Project Well (A-1-4) 2DBB (SRP 22.5E, 5.5N)	--[b]	--	Water supply well	Organic solvents (Shell 360, Mirachem 100)	Unknown	Pump equipment was reportedly cleaned at a maintenance yard with solvent degreaser. At various times, pump lubrication oil has been found floating on the ground water in the well. Analysis of the floating oil has indicated that TCE concentrations in the oil may have ranged from 21,000 µg/l to more than 100,000 µg/l (Montgomery & Associates, Inc., 04/01/88). SRP personnel maintain that TCE has moved preferentially from solution in the ground water to solution in the floating oil.
Area 10, Maricopa County Parcel No. Not Identified						
Advance Auto Supply			Automotive component machining	Cutting oils, solvents	Discharge to city sewer system	
Area 11, Maricopa County Parcel No. Not Identified						
Dickson Electronics (Southeast corner Hayden and Roosevelt)	1964	1966	Tantalum capacitor assembly	Unknown	Unknown	
Union 76	1965	1979	Auto repair	Unknown	Unknown	
Motorola	1968	1969	Office	Unknown	Unknown	

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area 12, Maricopa County Parcel No. 131-09-002C						
Motorola Government Electronics Group 8201 E. McDowell Road	1957	Present	Manufacture of electrical components	TCE (1957-1976), PCE, 1,1,1-TCA, MEK, toluene, methylene chloride, Freon, isopropyl alcohol, metal plating waste, beryllium oxide, gasoline	Small quantities may have joined wastewater which went to dry wells from 1957 to 1959; dry wells were 20 to 200 feet deep. Small quantities may have joined wastewater which went to infiltration/evaporation lagoons from 1959 to 1980. Tank and pipeline leakage. Release directly to ground. Recycling, waste hauler. Two 5-foot-diameter dry wells approximately 25 feet deep occasionally received cooling tower discharge or soap solutions resulting from washing and rinsing of tools.	In December of 1986, a release of approximately 5 to 10 gallons of 1,1,1-TCA occurred at the corner of Building 6 at the Hayden Road site of Motorola GEG. Two sampling efforts were completed subsequent to this release to determine the vertical and horizontal extent of contamination. The data derived from these sampling efforts did not determine the vertical extent of 1,1,1-TCA since samples collected at the deepest depths still contained 1,1,1-TCA at three to five times the analytical detection limit. ADEQ files did not have any type of follow-up report as to whether any efforts were made to clean up this release. On October 10, 1981, Motorola personnel reported to the EPA a release from a 500-gallon waste solvent tank. Approximately 10 feet of soil was removed from beneath the tank when the tank was removed. After removal of the tank, the area beneath the tank was apparently excavated to a depth of approximately 60 feet. The results from the analysis of samples collected during the deep excavation indicated that contaminants had not been released to the vadose zone. June 1981, soils with precipitated metals beneath the retired surface impoundments were excavated and shipped to a smelter. September 1982, an industrial wastewater treatment plant pipeline leak was detected. Six cubic yards of soil were removed and soil samples were collected to a depth of 24 feet.

Table 1
NIBW Potential Source Areas

Occupant	From	To	Land Use or Activities	Types of Materials Used	Methods of Release	Comments
Area COS Wells, Maricopa County Parcel No. Not Identified						
City of Scottsdale Well No. 6, SRP 23.3E, 7.5N (A-2-4) 25BCD, Nos. 25, 71, 72, 73, 75, and 76	--[c]	--	Water supply well	Solvents (Shell 360, Mirachem 100)		Pump equipment owned by SRP was reportedly cleaned at a maintenance yard with solvent degreaser. At various times, pump lubrication oil has been found floating on the ground water in the well. Analysis of the floating oil has indicated that TCE concentrations in the oil may have ranged from less than 10 µgl to 2,000 µg/l (Montgomery & Associates., Inc., 04/01/88). SRP personnel maintain that TCE has moved preferentially from solution in the ground water to solution in the floating oil.

[a]This facility may be outside "designated" boundary of Area 8.
[b]Well constructed November 1948.
[c]Well constructed November 1949 and deepened November 1953.

Numerous studies related to contamination have been performed at NIBW since 1980. Table 2 is a chronology of important studies and related events at NIBW since 1980.

EPA began the Remedial Investigation for the Indian Bend Wash site in June 1984. EPA released its Phase I Remedial Investigation Report in August 1986. In April 1988, as the overall Remedial Investigation/Feasibility Study (RI/FS) continued, the City of Scottsdale completed the Operable Unit Feasibility Study for Remediation of Groundwater in the Southern Scottsdale Area (Scottsdale OUFS). The Scottsdale OUFS focused on development and analysis of remedial action alternatives for contamination in the MAU and LAU. EPA released the overall North Indian Bend Wash RI/FS, which focuses on contamination in the UAU and in the vadose zone, in April 1991. The relationship between the Scottsdale Operable Unit and the overall RI/FS is discussed in greater detail in Section II.D of this Record of Decision.

As indicated in Table 2, the study of contamination at NIBW has included many types of activities conducted by various entities. The Arizona Department of Health Services first coordinated these numerous activities through the Indian Bend Wash TCE Task Force, which met between March 1982 and September 1984. A Project Committee formed by EPA in October 1984 superseded the Task Force. During the RI/FS, the Project Committee has been an information-dissemination body through which EPA maintains communication with state and local agencies, potentially responsible parties (PRPs) and their contractors, and various other interested parties.

4. ENFORCEMENT ACTIVITIES

EPA has sent RCRA 3007/CERCLA 104(e) information request letters regarding NIBW to eighteen parties. EPA also has conducted interviews, title searches and financial assessments at the site. Table 1 includes information regarding many of the potential PRPs for NIBW. There are also a few property owners in the study area who are not listed in Table 1 but who could be potentially liable.

Eleven parties received Special Notice Letters notifying them of their potential liability for the Scottsdale Operable Unit remedy. Following issuance of this ROD, EPA expects to send Special Notice Letters for the remainder of the work and for past response costs.

During the RI/FS, Motorola Government Electronics Group (Motorola) entered into three Administrative Orders on Consent (Consent Orders) with EPA over the period from February 1985 through July 1987. Under these Consent Orders, Motorola has installed 21 ground-water monitoring wells, measured water levels, sampled groundwater, tested production wells and performed shallow soil gas sampling. Outside any EPA enforcement mechanism, Motorola also has installed at least 19 additional ground-water monitoring wells and performed soil borings.

Table 2
Chronology of Events at North Indian Bend Wash

Date	Activity
6/80	Investigation of Motorola Government Electronics Group was conducted.
12/80	Motorola conducted a soil boring/sampling program of trace metals in former waste impoundments (Higgens and Hansen, 1981).
10/81	TCE was detected in Phoenix water supply wells COP 35 and COP 36.
11/81-12/81	Additional well sampling conducted by ADHS, Salt River Project, City of Phoenix, City of Scottsdale and City of Tempe, found TCE in eight wells, including COS 6, COS 31, COS 75 (formerly COP 34), COS 72 (formerly COP 35), and COS 71 (formerly COP 36) as well as three others.
12/81	Soil sampling for VOCs began at Motorola and in Indian Bend Wash by ADHS (ADHS, 1982).
3/82	ADHS established IBW TCE Task Force.
5/82	U of A collected soil gas samples adjacent to Well SRP 23.6E,6N and COP 35.
5/2/82	SRP sampled soil in boring at Well SRP 23.6E,6N.
6/82	ADWR inventoried wells and conducted aquifer test of COP 35.
6/82	EPA-FIT (Ecology and Environment) collected data from the Indian Bend Wash site for use in the EPA's hazard ranking system.
9/82	EPA--FIT sampled 20 wells.
9/82	Indian Bend Wash site was nominated for inclusion on EPA's National Priorities List (NPL).
10/82	Six soil borings advanced by Dames & Moore in Area 1 for City of Scottsdale. ADHS took soil samples and sampled COS 69. Dames & Moore sampled soil gas for methane.
2/83	EPA-FIT conducted sampling at Comtech Data Corporation (formerly Beckman).
4/83	SRP sampled storm event on Granite Reef Wash at McDowell.
7/83-8/83	SRP conducted aquifer test of Well SRP 23.6E,6N and collected VOC samples.
8/83	Motorola advanced three soil borings: ST-1, ST-2, and ST-3, analyzed selected soil samples from them for VOCs, completed them as Upper Alluvial Unit monitoring wells, and collected VOC and inorganic water quality samples. Water-level monitoring began with these wells.
9/1/83	Indian Bend Wash site appeared on NPL in Federal Register.
9/83	EPA developed Remedial Action Master Plan to guide site investigation activities.
1-6/84	City of Scottsdale sampled water and fish in ponds in Indian Bend Wash.
6/1/84	Remedial Investigation of the Indian Bend Wash site officially began.

Table 2
Chronology of Events at North Indian Bend Wash

Date	Activity
Summer 1984	Motorola installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from 13 monitoring wells: Upper Alluvial Unit Wells: M-2UA, M-3UA, M-4UA, M-5UA, M-6UA, and M-7UA Middle Alluvial Unit Wells: M-1MA, M-2MA, M-3MA, M-4MA, M-5MA, M-6MA, and M-7MA
10/84	Project Committee formulated by EPA with ADHS, ADWR, USGS, City of Phoenix, City of Scottsdale, City of Tempe, Motorola GEG, Beckman Instruments, and others.
10/84	ADWR contaminant transport modeling study began. ADWR installed a water-level recorder OU ST-2 and began monitoring.
11/84	Beckman conducted onsite soil sampling in seven boreholes and completed two of these as soil vapor monitoring wells.
11-12/84	Beckman conducted onsite shallow soil gas sampling and sampled two soil vapor monitoring wells.
3/85	Fish sampling was conducted by Arizona Game and Fish in some Indian Bend Wash ponds.
3/85	Administrative consent orders were signed by EPA and Motorola, and EPA and Beckman.
Spring 1985	Motorola installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from 10 monitoring wells including: Upper Alluvial Wells: M-8UA, M-9UA, M-10UA, M-11UA, and M-12UA Middle Alluvial Wells: M-9MA, M-10MA, M-11MA, and M-12MA Lower Alluvial Well: M-10LA
7/85	City of Tempe collected depth-specific samples from Well COT 6 with packers.

Table 2
Chronology of Events at North Indian Bend Wash

Date	Activity
Summer 1985	Beckman installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from four monitoring wells: Upper Alluvial Wells: B-J, B-UA-1, and B-UA-3 Middle Alluvial Well: B-MA-1 EPA installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from seven monitoring wells and one piezometer: Upper Alluvial Wells: E-1UA, E-2UA, E-3UA, E-4UA, and E-5UA Middle Alluvial Well: E-1MA Middle Alluvial Piezometer: E-1MP Lower Alluvial Well: E-1LA
1985	City of Scottsdale installed an air stripper on COS 6.
11/85	Forty-two wells were sampled as part of community well sampling program.
6/86	Nine areas were identified north of the Salt River by the EPA for source investigations.
8/86	Motorola signed an Administrative Order on Consent to conduct shallow soil gas testing and spinner logging.
8/86	Phase I RI report was written by Ecology and Environment for the EPA.
9/86	Motorola conducted soil gas survey adjacent to existing UAU monitoring wells.
10/86	Dames & Moore conducted soil sampling from five auger borings and four backhoe pits near a storage tank and chemical storage area at Motorola.
10/86-1/88	Motorola conducted spinner logging on SRP 23.6E,6N, SRP 22.5E,5.5N, SRP 23.3E, 7.5N, SRP 23.3E,7.3N, SRP 22.5E,6N, COS 25, COS 71, COS 72, COS 75, and COT 6.
2/87	The EPA conducted a shallow soil gas survey in Areas 1, 2, 3, 4, 5, 6, 7, and 8.
2/87-3/87	Motorola and EPA conducted a 10-day aquifer test with Well SRP 236E, 6N.
6/87	The EPA conducted additional shallow soil gas sampling in Areas 3, 5, 6, 7, 8, and 9.

Table 2
Chronology of Events at North Indian Bend Wash

Date	Activity
8/87-2/88	Motorola installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from 11 monitoring wells: Upper Alluvial Wells: M-13UA, M-15UA, and M-16UA Middle Alluvial Wells: M-14MA, M-15MA, and M-16MA Lower Alluvial Wells: M-2LA, M-5LA, M-9LA, M-14LA, and M-16LA
9/87-12/87	Motorola decommissioned three onsite wells.
12/87	The EPA conducted additional shallow soil gas sampling in Areas 3 and 8.
1/88-3/89	EPA sampled soils at Areas 2, 3, 4, 5, 6, 7, 8, and 9.
2/88	The EPA collected sediment, fish, and water samples from Indian Bend Wash ponds.
Summer 1988	Beckman installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from UAU Well E-12UA. The EPA installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from six monitoring wells: Upper Alluvial Wells: E-6UA, E-7UA, and E-9UA Middle Alluvial Wells: E-5MA and E-8MA Lower Alluvial Well: E-7LA
4/88	Scottsdale OUFS Public Comment Draft.
9/21/88	Scottsdale OU ROD signed.
11/88	SRP and Gradient sampled soils and soil gas at 23.6E,6N and 22.5E,5N for VOCs
2/89-3/89	EPA installed soil vapor wells at Areas 3, 6, 7, 8, 10, and 11 and UAU Well E-13UA at Area 11.
6/89	Administrative consent order signed by EPA and Siemens.
6/89-8/89	Siemens installed, conducted aquifer tests, and collected VOC and inorganic water quality samples from four monitoring wells: Middle Alluvial Wells: S-1MA, S-2MA Lower Alluvial Wells: S-1LA, S-2LA
9/89	EPA shallow soil gas sampling at Motorola.
11/89-12/89	EPA shallow soil gas sampling at COS wells.

EPA issued a Unilateral Administrative Order (Unilateral Order) to Beckman Instruments (Beckman) in July 1984. After challenging the Unilateral Order, Beckman agreed to install and monitor four ground-water monitoring wells and to perform soil borings. Beckman has installed and monitored an additional ground-water monitoring well under a December 1988 Consent Order.

The Siemens Corporation (Siemens), as a successor to Dickson Electronics, entered into a Consent Order with EPA in July 1989. Under the Consent Order, Siemens has installed and sampled four ground-water monitoring wells. Motorola and Siemens also recently installed additional ground-water monitoring wells outside the scope of their Consent Orders with EPA.

In July 1989, EPA issued a Unilateral Order to Advanced Auto Supply, Beckman, Dickson Electronics, Marro Plating, Motorola, Plainville West, Salt River Project, Siemens and the Strip Joynt. The Unilateral Order required the recipients to implement the remedy for the MAU and LAU. After amending the Unilateral Order in December 1989, EPA agreed to negotiate a Consent Decree with Beckman, Motorola, Salt River Project and Siemens on the condition that they comply with the Unilateral Order until the Consent Decree became effective. The Department of Justice expects to lodge the Consent Decree with the Federal District Court in Phoenix in the fall of 1991.

In the near future, EPA will commence enforcement activities to implement the response actions selected in this ROD and to recover EPA's past response costs.

C. HIGHLIGHTS OF COMMUNITY PARTICIPATION

EPA currently maintains NIBW information repositories at the EPA Region 9 office in San Francisco and at the Scottsdale, Tempe and Phoenix Public Libraries. The EPA Region 9 office and the Scottsdale and Tempe Public Libraries maintain copies of the entire Administrative Record File on microfilm, while the Phoenix Public Library maintains a collection of selected key site documents, including the RI/FS. In addition, the Arizona Department of Environmental Quality maintains an information repository in its Phoenix office.

EPA also maintains a computerized Indian Bend Wash mailing list, currently with over 1,000 addresses. In addition to continually updating the mailing list, EPA sent a fact sheet in December 1990 to approximately 35,000 addresses in the area of the Indian Bend Wash Superfund site in an effort to expand the list.

EPA also operates and publicizes a toll-free information message line to enable interested community members to call EPA with questions or concerns about Indian Bend Wash Superfund site activities. Beginning in the fall of 1990, EPA has been responding

to numerous inquiries about effects of potential Superfund liability upon residential and small business property located within or near the site boundaries.

Below is a chronological list of other community relations activities EPA has conducted for NIBW in order to comply with the public participation requirements of CERCLA Section 113(k)(2)(B) and 117.

- July 1984--Distributed a letter and fact sheet announcing the start-up of RI/FS activities.
- August 1984--Held a public meeting to provide a summary of the Superfund process and to inform interested parties of upcoming RI/FS activities.
- September 1984--Released a Community Relations Plan based upon interviews with Phoenix, Scottsdale and Tempe residents and State and local officials.
- February 1985--Distributed a fact sheet updating the community on RI/FS and enforcement activities.
- July 1986--Distributed a fact sheet informing the community about the completion of the Phase I Remedial Investigation Report and other activities, including the community well sampling program and the lake and fish sampling program.
- August 1986--Held a public meeting to update the community on site activities, to present the results of the Phase I Remedial Investigation and to discuss future RI/FS activities.
- April 1988--Published a public notice in the Arizona Republic announcing the start of the public review and comment period and the scheduled public meeting for the Scottsdale OUFS.
- April 1988--Mailed the Proposed Plan fact sheet for the Scottsdale OU remedy to the site mailing list.
- May 1988--Held a public meeting to present the EPA's preferred alternative for the Scottsdale OU, answer questions, hear concerns and receive formal public comments.
- October 1988--Mailed a fact sheet announcing the remedy selected for the Scottsdale OU.
- March 19, 1991--Mailed Administrative Record File to Scottsdale and Tempe Public Libraries.

- April 10, 1991--Mailed the RI/FS and the Proposed Plan factsheet for the UAU and vadose zone remedies to the Scottsdale, Tempe, and Phoenix Public Libraries and the NIBW Project Committee. Mailed Proposed Plan factsheets to the site mailing list.

- April 15, 1991--Started a 30-day public review and comment period for the overall RI/FS and the Proposed Plan for the UAU and vadose zone remedies. Appendix C of this ROD presents the public comments received and EPA's responses.

- May 1, 1991--Published public notices in the Arizona Republic and the Scottsdale Arizona Progress announcing a 30-day extension (through June 13, 1991) to the public review and comment period.

- May 3, 1991--Mailed a flyer announcing the comment period extension to the site mailing list.

- May 7, 1991--Mailed an Administrative Record supplement to the Scottsdale and Tempe Public Libraries.

- May 8, 1991--Held a public meeting to present the EPA's preferred alternatives for the UAU and soils, answer questions, hear concerns and receive formal public comments.

- May 31, 1991--Mailed fact sheets announcing the availability of the Administrative Record supplement to the site mailing list. Published a public notice in the Arizona Republic announcing the availability of the Administrative Record supplement.

- June 6, 1991--Published public notices in the Arizona Republic and the Scottsdale Arizona Progress announcing the availability of the Administrative Record Supplement.

D. SCOPE AND ROLE OF THIS DECISION DOCUMENT WITHIN THE SITE STRATEGY

This ROD focuses on remedial measures for soils and the UAU, which are not specifically addressed by the Scottsdale Operable Unit remedy. In addition, Appendix A of this ROD identifies the applicable or relevant and appropriate requirements (ARARs) and other criteria to be considered (TBCs) for both the Scottsdale Operable Unit remedy and the remedies selected in this ROD.

Ground-water contamination is an area-wide problem at NIBW, extending vertically through the UAU, MAU and LAU and currently spread across approximately 6 square

miles (See Figures 6, 7 & 8). EPA has studied soil contamination in more limited areas, in association with historical practices that may have led to releases of VOCs at particular facilities. Soil areas studied as potential continuing source areas generally overlie contaminated groundwater. As shown on Figures 6 through 8, contaminated areas in the UAU also generally overlie contaminated areas of the MAU and/or LAU, although in some areas the UAU and LAU are contaminated while the intervening MAU is not.

As previously discussed, the UAU directly overlies the MAU; the saturated UAU is itself overlain by unsaturated soils. It is likely that VOCs have migrated, and continue to migrate, downward through the soil profile, laterally in the saturated UAU, downward into the MAU and LAU, and laterally in the MAU and LAU. Contaminants in the UAU are likely to enter the MAU and LAU both through leakage at the UAU/MAU contact and through water-supply wells with openings across large vertical intervals. Therefore, contaminated soils are effectively a source of contamination to the saturated UAU (or the MAU where the UAU is not saturated), and the saturated UAU in turn acts as a source to the underlying alluvial units. Because of this relationship between the unsaturated soils and the saturated UAU, MAU and LAU, remedial actions selected in this Record of Decision are tied closely to the Scottsdale Operable Unit remedy and will rely upon full compliance with the terms of the proposed Consent Decree negotiated for that remedy.

As shown in Table 2, EPA signed the Record of Decision selecting the Scottsdale Operable Unit remedy in September 1988. The 1988 ROD requires ground-water extraction from the MAU and LAU using four existing City of Scottsdale production wells, treatment with air stripping and vapor-phase carbon adsorption to remove VOCs, and placement of the treated water into Scottsdale's municipal distribution system. The proposed Consent Decree, which is expected to replace the Unilateral Order, requires Motorola, Siemens, Beckman and SRP to (1) operate and maintain a groundwater monitoring program, including the installation of 23 additional groundwater monitoring wells; (2) fund treatment system design costs above $500,000; (3) construct the treatment plant and pipelines leading from the extraction wells to the plant; (4) reimburse the City of Scottsdale for the costs of operating the treatment plant; and (5) reimburse EPA and the State of Arizona for oversight costs. The City of Scottsdale is designing the treatment plant and the pipelines. Scottsdale is providing $250,000 for the design and the State of Arizona is providing a grant for an additional $250,000. Scottsdale also has agreed to operate the extraction and treatment system and to accept the treated water into its distribution system.

Although EPA expects the four wells specified in the 1988 ROD to remove a large portion of the mass of VOCs in the MAU and LAU, additional extraction at other locations is likely to be necessary to achieve full capture in the MAU and LAU. Additional ground-water extraction also may be appropriate in order to address areas of high contaminant concentrations or to reduce the time for achieving in-situ ARARs.

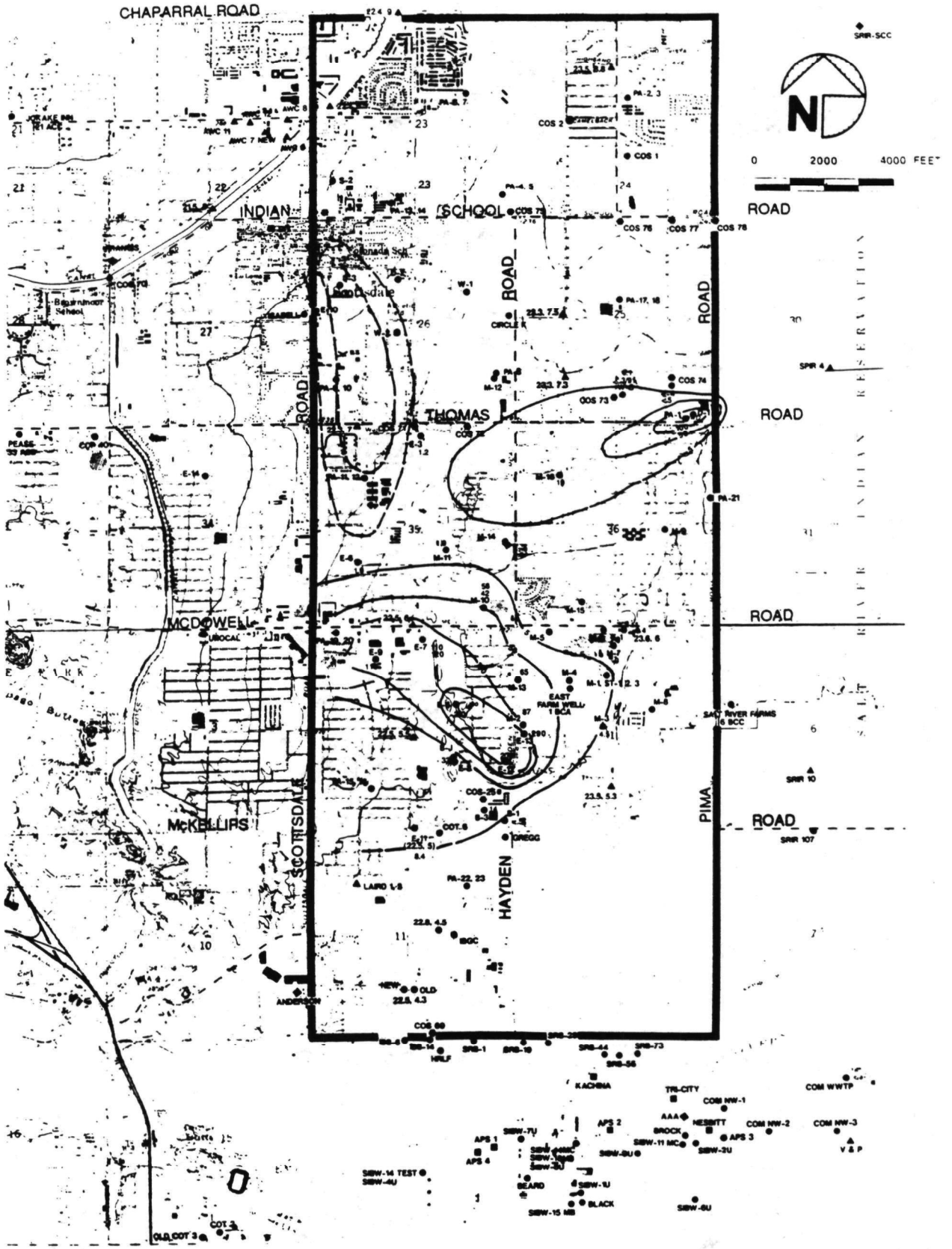
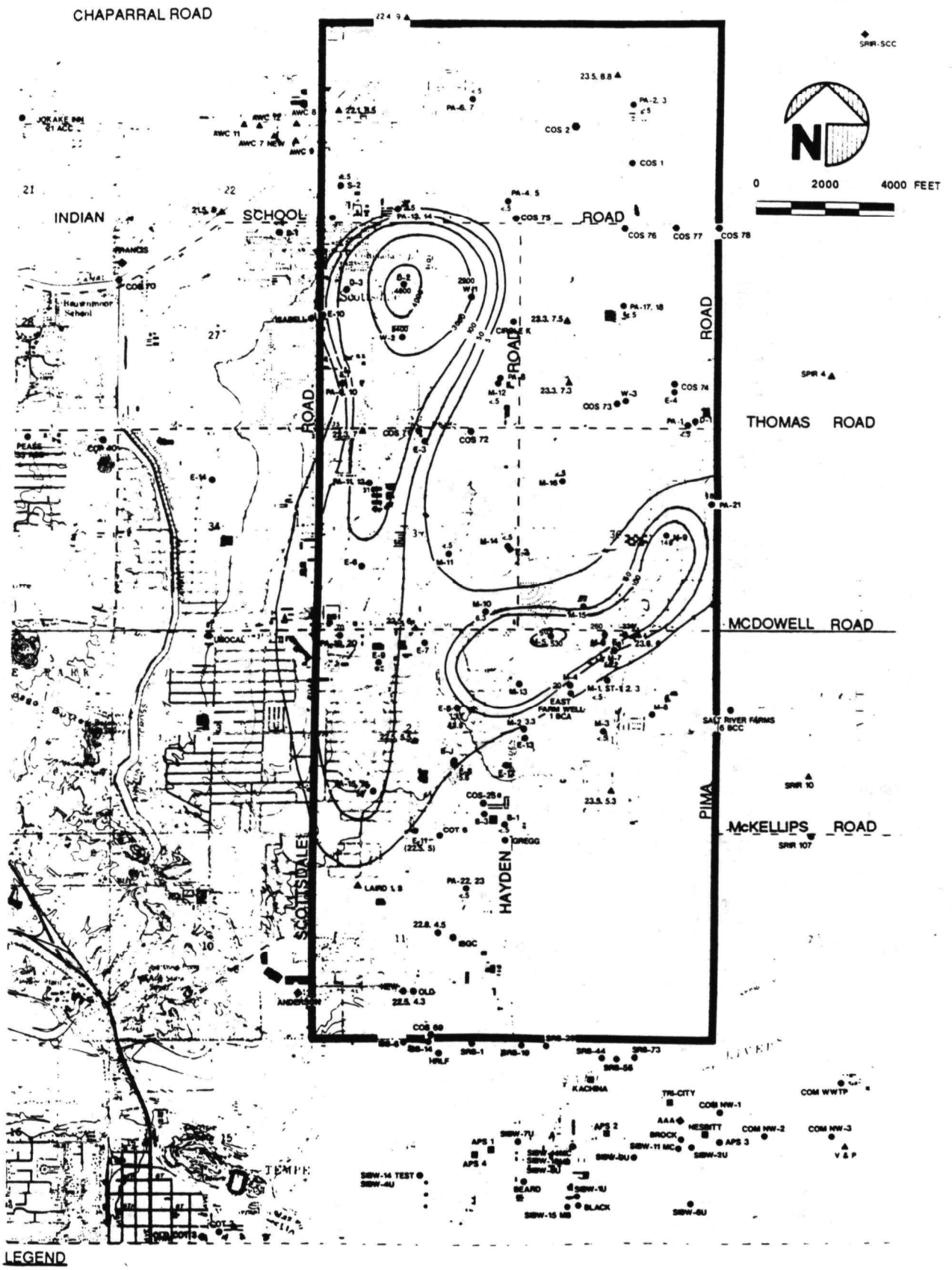


FIGURE 6
APRIL 1991 CONTOURS FOR UAU TCE GREATER THAN 5 ug/l
NORTH INDIAN BEND WASH ROD

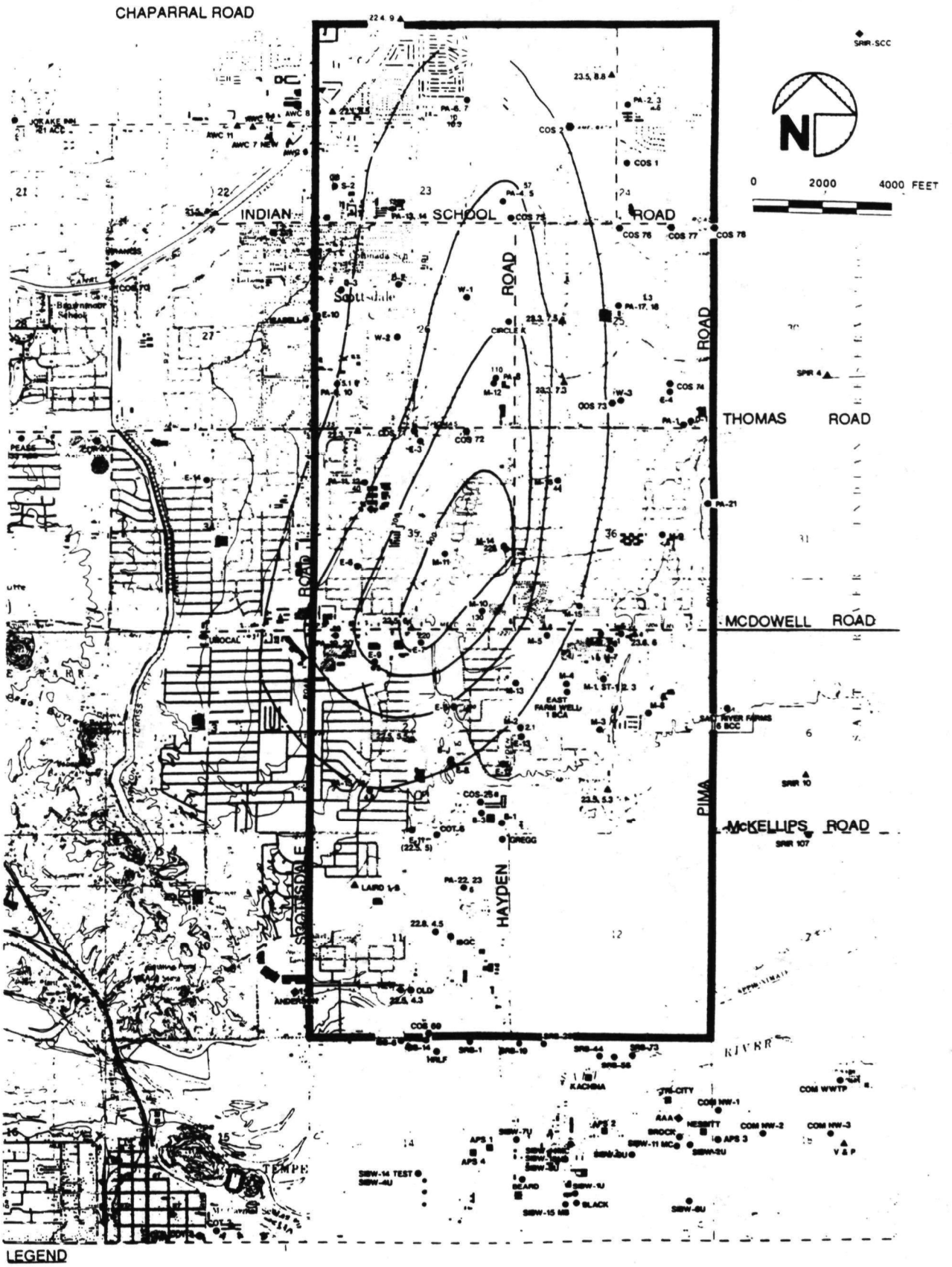


LEGEND

COS 78 WELL IDENTIFICATION NUMBER

- ▲ AGRICULTURAL PRODUCTION WELL
- ● MUNICIPAL PRODUCTION WELL
- ● MONITORING WELL(S), TEST HOLES OR DESTROYED WELLS WITH LITHOLOGIC INFORMATION
- ◆ DOMESTIC PRODUCTION WELL
- ■ INDUSTRIAL SUPPLY WELL

FIGURE 7
APRIL 1991 CONTOURS FOR MAU TCE GREATER THAN 5 ug/l
NORTH INDIAN BEND WASH ROD



LEGEND

COS 78 WELL IDENTIFICATION NUMBER
- ▲ AGRICULTURAL PRODUCTION WELL
- ⬢ MUNICIPAL PRODUCTION WELL
- ● MONITORING WELL(S), TEST HOLES OR DESTROYED WELLS WITH LITHOLOGIC INFORMATION
- ◆ DOMESTIC PRODUCTION WELL
- ■ INDUSTRIAL SUPPLY WELL

FIGURE 8
APRIL 1991 CONTOURS FOR LAU TCE GREATER THAN 5 ug/l
NORTH INDIAN BEND WASH ROD

Therefore, the proposed Consent Decree requires the settling PRPs to evaluate the Scottsdale Operable Unit extraction and treatment system and to propose measures to ensure the success of the MAU/LAU cleanup. EPA and the settling PRPs then will negotiate the implementation of any such additional measures.

E. SUMMARY OF SITE CHARACTERISTICS

1. CONTAMINANTS OF CONCERN

Industrial facilities at NIBW have used the VOCs TCE, tetrachloroethene (PCE) and 1,1,1-trichloroethane (1,1,1-TCA), typically as solvents. These compounds, along with chloroform, 1,1-dichloroethene (DCE), and to some extent 1,2-dichloroethene (1,2-DCE: cis- and trans-), have been detected in deep and shallow soil, deep and shallow soil gas, and groundwater from monitoring wells and supply wells. Trace metals do not appear to be present from other than natural sources.

Table 3 summarizes the NIBW data for selected VOCs that have been found in the UAU, MAU, LAU, surface water, soils and soil vapor. Although this document focuses on the compounds listed in Table 3, other VOCs that have been detected less frequently contribute to the contaminant mass present and to the potential health risks posed by the site.

Several contaminant release mechanisms may be influencing the transport of contaminants at the site, including

1. Leaching of contaminants from source areas by infiltration and percolation of precipitation, wastewater or irrigation water to the water table;

2. Movement of relatively pure product (i.e. pure TCE) from a source to the water table to form a nonaqueous-phase liquid source; and

3. Soil gas contamination of ground water by infiltration of water dissolving the gas phase contaminants, which percolate to the water table, and/or soil gas migrating along the water table and diffusing into the ground water.

All of these mechanisms may exert some influence on contaminants within NIBW. Movement of relatively pure product would result in the highest levels and, potentially, long-term releases into the ground water. However, investigations to date have not confirmed the existence of any nonaqueous-phase liquid sources at NIBW. Available data indicate a large fraction of VOCs in the vadose zone is present as soil vapor.

Table 3
Summary of Contaminant Concentrations by Media

Sheet 1 of 2

	Concentrations				Number of Sample Locations	Number of Detections/ No. of Samples
	Maximum	Minimum	Median	Mean		
Ground-Water Samples (µg/l of water solution)						
UAU						
TCE	2,500	ND	16	126	35	633/809
PCE	910	ND	1.1	35	35	467/797
DCE	650	ND	0	20	35	390/795
TCA	362	ND	0	5.4	35	176/783
CFM	160	ND	0.6	4.9	35	413/746
MAU						
TCE	7,000	ND	2.3	155	36	306/551
PCE	72	ND	0	3.3	36	193/548
DCE	23	ND	0	0.9	36	125/547
TCA	10	ND	0	0.03	36	9/547
CFM	39	ND	0	4.1	36	202/539
LAU						
TCE	340	ND	5	40	22	131/199
PCE	18	ND	0.4	2	22	104/196
DCE	7	ND	0	0.3	22	29/200
TCA	3	ND	0	0.04	22	7/200
CFM	35	ND	2	3	22	125/189
Soil Samples (µg/kg of soil)						
TCE	10,000	0	0	165.95	67	75/425
PCE	320	0	0	1.64	67	12/425
DCE	60	0	0	0.47	67	4/425
TCA	40	0	0	0.38	67	9/425
CFM	600	0	0	6.21	67	19/425
Soil Gas Samples, Shallow (µg/l of soil gas)						
TCE	500	0	1.10	7.55	515	403/515
PCE	4,900	0	0.42	16.34	515	440/515
DCE	1,600	0	0.14	13.93	515	314/515
TCA	140	0	0.02	1.75	515	322/515
CFM	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]

Table 3
Summary of Contaminant Concentrations by Media

	Concentrations				Number of Sample Locations	Number of Detections/ No. of Samples
	Maximum	Minimum	Median	Mean		
Soil Gas Samples, Deep (µg/l of soil gas)						
TCA	6,770	0	29	680.12	7	20/25
PCE	238	0	6.9	33.45	7	20/25
DCE	88	0	0	9.08	7	6/25
TCA	74	0	0	7.7	7	10/25
CFM	43	0	0	2.63	7	8/25
Surface-Water Samples (µgl/l of water solution)						
TCE	76	0	0	22.51	15	7/15
PCE	3	0	0	0.52	15	5/15
DCE	0	0	0	0	15	0/15
TCA	0	0	0	0	15	0/15
CFM	1	0	0	0.17	15	3/15

[a]Chloroform was not analyzed for in all of these tests.

Note: ND indicates less than the detection limit.
Means and medians were calculated by setting NDs to zero.

Because TCE is the most widespread contaminant at NIBW, its fate is discussed below. The other VOCs identified at NIBW have similar fate characteristics.

With TCE's relatively high vapor pressure, volatilization is the most significant removal mechanism when TCE is released onto surface soils. Once TCE is released into the atmosphere, it is readily photo-oxidized, ultimately to hydrochloric acid (HCl), carbon monoxide (CO) and carbon dioxide (CO_2). While these breakdown products are undesirable as components of photochemical smog, the long-distance transport and accumulation of TCE itself in the atmosphere generally has not been a concern because its half-life in air is approximately 3.7 days.

Soil properties and conditions governing the movement of air through soils and subsequent volatilization of TCE from unsaturated soils include soil porosity, temperature, convective currents and barometric changes. TCE sorption to soils increases most significantly with high organic content in soils. Sorption also increases with clay content, increases slightly with decreasing temperature, increases moderately with increasing salinity of soil water and decreases moderately as dissolved organic content increases.

Reported soil adsorption coefficients for TCE indicate high mobility in soils and low potential adsorption. Therefore, TCE leaches readily to groundwater. Once TCE reaches ground water, volatilization ceases to be a significant process. Biodegradation takes over but is relatively slow. Therefore, with minimal volatilization and slow biodegradation, TCE is expected to persist for months to years.

Estimates from soil and soil gas concentrations indicate TCE is present in the vadose zone at some of the potential source areas in quantities from tens to hundreds of pounds. The Arizona Department of Water Resources has estimated that, as of 1988, approximately 313 gallons of TCE were present in UAU ground water, and approximately 5900 gallons of TCE were present in the overall ground-water system. Although EPA has not estimated the total quantity of other VOCs in the vadose and saturated zones, in some areas VOCs other than TCE are expected to represent a significant proportion of the total quantity of VOCs present. Future monitoring and analyses will take into account all VOCs identified at NIBW.

2. POTENTIAL SOURCE AREAS

As previously stated, Figure 5 and Table 1 provide information regarding 13 areas EPA has studied as potential sources of contamination at NIBW. Some of these areas are associated with only one suspected source activity or facility, while others may have had several operations that could have contributed to the contamination. The 12 areas shown on Figure 5 and the Scottsdale wells are discussed further in Section II.I (THE SELECTED REMEDIES) of this ROD.

EPA also studied the Indian Bend Wash ponds. The Indian Bend Wash ponds were designed to be constructed of compacted natural materials. Based on seepage tests

conducted in 1979 and 1980 at two of the ponds, the Salt River Project estimated average seepage rates at 0.003 to 0.029 feet per day. For several years, water pumped from nearby Salt River Project and municipal wells was used to maintain the level of the ponds. Some of these wells are now known to have been contaminated. Water quality sampling in 1984 indicated that several of the ponds were contaminated with VOCs, but historic water quality data are not available to estimate the mass of VOCs that could have seeped through the bottom of the ponds. EPA conducted additional water quality sampling at the Indian Bend Wash ponds in 1988, by which time the use of contaminated wells to fill the ponds had been discontinued. One water sample contained VOCs at a level just above the detection limit; all other results were below the detection limit.

3. RECHARGE SOURCES/SURFACE WATER

The dominant source of recharge at NIBW appears to be irrigation by the Salt River Pima-Maricopa Indian Community. The heavy agricultural irrigation occurs to the east of NIBW; hydrographs indicate water then flows laterally under NIBW within the UAU. UAU modeling in the RI/FS assumed recharge from the source ranging from 1,000 to 1,600 acre-feet per year. Additional irrigated lands just to the east of the model boundary may add substantially to this estimate.

Recharge at NIBW also may come from residential irrigation (estimated at approximately 270 acre-feet per year) and flood irrigation of parks, schools and cemeteries (estimated at 300 to 400 acre-feet per year). Seepage also occurs from the laterals that make up SRP's surface water delivery system.

As discussed previously in Section II.A.7, three prominent surface water features are present at NIBW: the Indian Bend Wash pond system, the Granite Reef Wash and the Salt River. Assuming a seepage rate of 0.01 feet per day and an approximate total pond surface area of 20 acres, the Indian Bend Wash ponds may provide approximately 70 acre-feet of recharge per year. The Salt River appears to be an important source of recharge at NIBW when the river is flowing. The Salt River does not flow frequently, principally because of the Granite Reef Dam. However, hydrographs indicate that winter releases from Granite Reef Dam add to summer peaks in UAU water levels from irrigation. Noticeable recharge impacts due to the intermittent flow in the Indian Bend Wash and the Granite Reef Wash are not evident.

Infiltration from precipitation seems insignificant in the hydraulic analysis for NIBW ground-water flow because of low amounts of precipitation, lack of catchments resulting in ponding and high evapotranspiration.

4. GROUND WATER

a. UAU

The UAU consists of unconsolidated sand, gravel, cobbles and boulders, with local thin interbeds of silt and clay. The combined thickness of the saturated and unsaturated zones of the UAU ranges between 110 and 170 feet. The elevation of the base of the UAU lies between 1,030 and 1,126 feet above sea level within NIBW.

The saturated UAU appears to be an unconfined aquifer. Water levels measured during July 1989 were between 1,085 and 1,115 feet in elevation and were roughly 90 to 140 feet below land surface. The saturated thickness at monitoring well locations ranged from 0 to approximately 34 feet based on July 1989 measurements. This saturated thickness generally decreases to the north.

The horizontal gradient in the UAU during July 1989 ranged from approximately 0.0023 to 0.0046 towards the west-northwest over the majority of the area. The gradient fluctuates seasonally, becoming steeper in the summer and flatter in the winter. The horizontal hydraulic conductivity ranges from 370 to 4,200 gallons per day per square foot (gpd/ft^2). No systematic zonation of hydraulic conductivity estimates is apparent from available information. Average porosity has been estimated to be approximately 0.30 to 0.35 based on lithologic and geophysical logs, and the specific yield has been estimated to range from 0.15 to 0.20 based on comparisons with published values for similar materials.

b. MAU

The MAU consists of weakly cemented, interbedded clay, silt, sand and gravel. The MAU ranges in thickness from approximately 250 to 800 feet at NIBW. The base of the MAU lies between 300 and 800 feet in elevation. The base of the unit appears to dip to the east in the study area. Individual aquifers in the MAU are expected to be confined where there is a saturated thickness in the UAU. Individual aquifers in the MAU may also be confined where there is not a saturated thickness in the UAU. Water levels (based on wells screened between 250 and 300 feet below land surface) measured during July 1989 ranged from 1025 to 1050 feet above sea level, or approximately 155 to 202 feet below land surface. Horizontal gradients in the MAU change significantly in magnitude and direction during the year in response to groundwater pumping. The most recent water level measurements suggest that a "trough" occurs across the site such that water tends to flow to the south-southeast in the northern portion of the site and to the north-northwest in the southern portion of the site. Horizontal hydraulic conductivity estimates for the MAU range from 7 to 690 gpd/ft^2.

c. LAU

The LAU consists of weakly to strongly cemented gravel, boulders, sand, sandy clay, silty sand and interbedded clay. The portion of the LAU penetrated by monitoring

wells has generally coarser-grained materials than the MAU. The thickness of the LAU in the study area is not well known. A few water supply wells in the northern portion of NIBW may have reached the contact between the LAU and the Red Unit. However, drillers' lithology descriptions of these wells are imprecise and therefore do not identify the LAU/Red Unit contacts with certainty.

At NIBW, the LAU is confined by aquitards in the MAU. Water levels measured in February 1989 ranged from 1015 to 1031 feet in elevation or 166 to 212 feet below land surface. Flow within the LAU appears to be generally to the north. Horizontal hydraulic conductivity estimates for the LAU range from 80 to 3,000 gpd/ft^2.

d. Red Unit

The Red Unit underlies the LAU and overlies the bedrock complex in much of the NIBW area. The Red Unit consists of debris flow materials comprised of reddish-colored, well-cemented breccia, conglomerate, sandstone and siltstone. Water is most likely produced from fractures and faults within the Red Unit. As previously stated, data are not sufficient to characterize the Red Unit in significant detail.

e. Vertical Communication Between Units

There is an average downward vertical gradient of approximately 0.4 between the UAU and the MAU in the study area. Therefore, ground water flows downward from the UAU to the MAU, probably over a large area. Near the western boundary of the saturated UAU, ground water appears to flow laterally into the MAU. Vertical flow also appears likely between the MAU and LAU, between which there is an average downward vertical gradient of approximately 0.1. However, because the vertical hydraulic conductivities are not known, it is difficult to estimate the rate of vertical flow.

Fluid movement investigations in the study area indicate that ground water from the UAU and the upper portion of the MAU enters several water supply wells and travels downward into the lower units. There are at least 26 supply wells at NIBW that could serve as conduits because they cross the saturated UAU and the lower units, but the total discharge from the UAU and/or MAU by this mechanism is not known.

Available data generally indicate that seasonal changes in water levels are not transmitted between the alluvial units, but water levels in the UAU appear to be dependent on long-term average MAU water levels. The MAU and LAU also show somewhat similar responses in water levels over time. However, because large-capacity supply wells tend to be screened across portions of both the MAU and LAU, it is difficult to accredit the similarities in response to either direct withdrawal from each of the units or to actual communication between them.

F. SUMMARY OF SITE RISKS

1. HUMAN HEALTH RISKS

a. Toxicity Assessment

EPA has classified TCE as a probable human carcinogen based upon laboratory experiments indicating excess liver tumors in mice exposed to TCE through ingestion. Chloroform is classified as a probable human carcinogen based upon experiments that produced liver cysts in dogs and kidney tumors in mice through ingestion exposures. EPA considers 1,1-DCE a possible human carcinogen because of kidney tumors that developed in mice that were exposed through inhalation. PCE is either a possible or probable human carcinogen; EPA currently is assessing PCE's carcinogenic classification. The other VOCs of concern at NIBW have not been classified or have not been assessed for carcinogenicity.

In terms of non-cancer risks, the general class of VOCs found at NIBW can cause depression of the central nervous system, kidney and liver disorders, nausea, headaches, dizziness and respiratory irritation.

Table 4 includes the cancer potency slope factors and the non-cancer reference doses (RfDs) for the VOCs of concern at NIBW. Other compounds detected less frequently may contribute to the cancer and non-cancer risks posed by the site.

Table 4
NIBW VOCs of Concern
Cancer Potency Slope Factors
and Noncancer Reference Doses

Compound	Cancer Potency Slope Factor $(mg/kg/day)^{-1}$	Noncancer Reference Dose (RfD) (mg/kg/day)
Trichloroethene	0.011	0.00735
Tetrachloroethene	0.051	0.01
1,1-Dichloroethene	0.6	0.009
1,1,1-Trichloroethane		0.09
Chloroform	0.061	0.01

b. Exposure Assessment

i. Ground Water. The City of Scottsdale relies upon ground water for approximately 70 percent of its drinking water supply, with the remainder of its water coming from surface water supplies such as the Central Arizona Project. Beginning in 1981, Scottsdale began to monitor closely the level of VOCs in its NIBW ground water supply wells, discontinuing use of those with contamination above drinking water standards. One exception is Scottsdale's well #6, which is owned by SRP and leased by Scottsdale. Water from this well is pumped and treated by air stripping at the wellhead to meet drinking water standards before being placed into the distribution system.

The City of Tempe does not use any of the contaminated wells at the site to provide water for its distribution system. SRP supplies the bulk of Tempe's water from uncontaminated surface and ground-water supplies.

Based on the above discussion, no one receiving water from the local municipal distribution systems currently should be exposed to VOCs in their drinking water at levels above federal Maximum Contaminant Levels (MCLs).

Although inhalation and dermal exposures due to activities such as showering, cooking and domestic irrigation may introduce VOC exposures that are significant relative to exposure through ingestion, the careful management of the local distribution system should be minimizing the potential exposures from these routes.

SRP also supplies ground water for urban irrigation. However, the ground water supplied by SRP is not from contaminated wells at the site.

Some residents may operate small private ground-water wells within the contaminated area. Small private wells are not normally subject to the monitoring requirements applicable to the larger water supply systems. Although at this time EPA is not aware of the use of small private wells at NIBW, any such use could increase the potential for exposure to VOCs.

ii. Surface Water. The surface water provided for the NIBW area by SRP is not from the site and therefore should not increase potential exposures to VOCs unless the water is contaminated from other sources before reaching the site.

Sampling in the Indian Bend Wash ponds in 1988 failed to reveal the VOC contamination indicated by similar sampling in 1984. Furthermore, swimming is not allowed in any of the ponds, while fishing is prohibited in several of the ponds. Based on low to undetectable contaminant levels and restricted access, therefore, the IBW ponds do not appear to present significant potential exposures to VOCs.

iii. Soil and Soil Gas. Workers at facilities with VOCs in shallow soil gas may have low levels of exposure through inhalation. Otherwise, direct exposure to soil and soil gas contamination at land surface is expected to be minimal.

VOC contamination has been detected (at low levels) in only five surface soil samples. Based upon available data, therefore, EPA considers transport of contaminants via wind, surface water and erosion an unlikely exposure pathway and did not quantitatively evaluate this pathway in the risk assessment. Workers could be exposed to contaminated soil and soil gas during excavation activities. Residents living near areas of high soil-gas concentrations could have additional VOC exposures if the gas were to migrate to homes through conduits such as sewer lines and collects in crawl spaces or basement. Although these possible residential exposures cannot be quantified using available data, EPA believes they are minimal.

iv. Fish. Analyses of fish tissue samples in 1984 indicated VOC contamination was present in some fish taken from the IBW ponds. Sampling was repeated in 1988 after the City of Scottsdale had stopped using contaminated wells to fill the ponds. With the exception of one anomolous result for chloroform, the 1988 sampling indicated that the fish that were sampled were free of VOCs. Therefore, EPA considers the potential exposure to VOCs through ingesting fish from the IBW ponds to be minimal. Fishing in some of the ponds is currently restricted for reasons unrelated to EPA's Superfund activities.

c. Risk Characterization

EPA has estimated cancer and non-cancer human health risks due to potential exposures to VOCs at NIBW. EPA estimates cancer using assumptions EPA believes tend to favor health protectiveness. The risk estimates presented in this section are intended to be conservative but not unrealistic. Actual risks are unlikely to exceed, and may be less than, these estimates.

Site risks are discussed in the following sections by environmental medium. Tables 5 and 6 summarize the risk characterization for the exposure pathways at NIBW for which EPA was able to quantify the risk.

i. Ground Water. Using assumptions of 2 liters of water per day every day for 30 years by a 70 kilogram person, EPA has estimated an upper bound excess cancer risk due to reasonable maximum drinking water exposures at NIBW. In order to provide a baseline for comparison, EPA has estimated the excess cancer risk assuming the use of contaminated supply wells (which are actually currently closed) to supply drinking water, primarily from the MAU and LAU. Under this scenario, the excess cancer risk is estimated at approximately 10^{-4}, or one in ten thousand, from exposure to VOCs. The non-cancer hazard index for exposure to VOCs in water from these wells would be 0.95. If water from only the UAU were consumed, the cancer risk from VOCs is estimated at approximately 10^{-5}, and the non-cancer hazard index would be 0.11. As previously stated, inhalation and dermal exposures could increase these baseline risks

Table 5
Future Use Scenario
Estimated Excess Lifetime Cancer Risk and Noncancer Hazard Quotient for Ingestion of Chemicals in Drinking Water

	Water Concentration (Geometric Mean) (µg/l)	Carcinogenic Effects Chronic Daily Intake (mg/kg-day)	Slope Factor (kg-day/mg)	Excess Lifetime Cancer Risk	Noncarcinogenic Effects Chronic Daily Intake (mg/kg-day)	RfD (mg/kg-day)	NHQ
Existing Supply Well							
TCE	199.709	2.4×10^{-3}	0.011	2.7×10^{-5}	5.7×10^{-3}	0.00735	7.8×10^{-1}
PCE	49.94	6.1×10^{-4}	0.051	3.1×10^{-5}	1.4×10^{-3}	0.01	1.4×10^{-1}
1,1-DCE	4.971	6.1×10^{-5}	0.6	3.7×10^{-5}	1.4×10^{-4}	0.009	1.6×10^{-2}
1,1,1-TCA	1.252	1.5×10^{-5}			3.6×10^{-5}	0.09	4.0×10^{-4}
Chloroform	4.134	5.1×10^{-5}	0.0061	3.1×10^{-7}	1.2×10^{-4}	0.01	1.2×10^{-2}
Sum				9.5×10^{-5}			9.5×10^{-1}
Upper Alluvial Unit Only							
TCE	22.748	2.8×10^{-4}	0.011	3.1×10^{-6}	6.5×10^{-4}	0.00735	8.8×10^{-2}
PCE	5.259	6.4×10^{-5}	0.051	3.3×10^{-6}	1.5×10^{-4}	0.01	1.5×10^{-2}
1,1-DCE	3.078	3.8×10^{-5}	0.6	2.3×10^{-5}	8.8×10^{-5}	0.009	9.8×10^{-3}
1,1,1-TCA	0.688	8.4×10^{-6}			2.0×10^{-5}	0.09	2.2×10^{-4}
Chloroform	1.348	1.7×10^{-5}	0.0061	1.0×10^{-7}	3.9×10^{-5}	0.01	3.8×10^{-3}
Sum				3×10^{-5}			0.1

Exposure Assumptions:

Daily Intake = 2 liters/day
Body Weight = 70 kg
Exposure Frequency = 365 days/year
Exposure Duration = 30 years

Table 6
Summary of Estimated Excess Lifetime
Cancer Risks and Noncarcinogenic Health Effects
Potential from Deep Soil Ingestion Based on Maximum Reported Concentrations

Site	Detected Compound Exhibiting Carcinogenic Effects	Slope Factor (mg/kg/day)-1	Estimated Excess Liftime Cancer Risk	Detected Compound Exhibiting Noncarcinogenic Effects	RfD (mg/kf/day)	Daily Intake (mg/kg/day)	Daily Intake Exceeds RfD
Area 5	Chloroform	0.0061	1×10^{-11}	Chloroform	0.01	8.6×10^{-5}	No
Area 7	Trichloroethene	0.011	3×10^{-10}	NA	NA		NA
Area 8	Trichloroethene	0.011	7×10^{-12}	NA	NA		NA
Area 9	Chloroform	0.0061	2×10^{-12}	Chloroform	0.01	1.4×10^{-7}	No
Area 10	Trichlorethene	0.011	1×10^{-12}	NA	NA		NA
Area 11	Trichlorothene	0.011	1×10^{-12}	NA	NA		NA

NA = Not applicable.
Exposure Assumptions:
Daily Soil Intake--100 mg/day
Body Weight--70 kg
Number of days/week exposed--5 days
Number of weeks/year exposed--12 weeks
Number of years exposed--0.16 year

by increasing the overall exposure to VOCs. Steps taken by local water providers often help to reduce these baseline risks.

ii. Surface Water. With little or no VOCs detected and limited access, surface water does not appear to present an increase in excess cancer or non-cancer risk from VOCs.

iii. Soil and Soil Gas. Direct exposure to VOC-contaminated soil and soil gas in shallow soil does not appear to pose significant cancer or non-cancer risks. However, EPA expects transport of VOCs to the ground water from the vadose zone could contribute to the ground-water risks described previously.

Under a potential deep excavation scenario, the excess cancer risk to workers from exposure to VOCs would be approximately one-in-ten billion, assuming 100 milligrams of soil ingested five days a week over a twelve week period (excavation is considered a one-time event). None of the estimated potential daily intakes exceed reference doses.

EPA can not quantify risks due to other potential exposures to contaminated soils and soil gas with the available data.

iv. Fish. Based on the 1988 tissue samples from fish from the IBW ponds, ingestion of fish would not present an increase in either cancer or non-cancer risk from VOC exposure.

2. ENVIRONMENTAL EVALUATION

No endangered species or critical habitats have been identified at NIBW. Contamination at the site does not appear to threaten wetlands.

As previously stated, the condition of the IBW ponds was assessed in 1984 and again in 1988 through water and fish sampling. EPA also collected sediment samples. Although the 1984 sampling indicated that the water, sediment and fish contained VOCs, the 1988 sampling indicated that the use of uncontaminated ground water to fill the ponds apparently had flushed VOCs from the ponds. With the continued use of uncontaminated water to fill the ponds, fish and waterfowl do not appear at further risk.

G. DESCRIPTION OF ALTERNATIVES

As discussed in Section II.D of this Record of Decision, although this document focuses primarily on the vadose zone and the UAU, the success of the overall remedy for NIBW will be highly dependent upon the effectiveness of the remedy being implemented for the MAU and LAU, including any modifications. Some of the significant ARARs for NIBW are discussed in the following sections; Appendix A of this ROD identifies all of the ARARs for NIBW. Capital, annual operations and maintenance,

and total present worth cost estimates for vadose zone and UAU remedial action alternatives that underwent detailed analysis are presented in Section II.H.

1. VADOSE ZONE

a. Development and Screening of Alternatives

EPA has considered vadose zone (soil matrix, soil gas and liquid adhering to the soil matrix) remedial action for the 12 numbered areas shown on Figure 9 as well as for the area around several City of Scottsdale wells investigated at the site. Although EPA initially considered a wide range of technologies and other remedial measures, including excavation, soil washing and capping, the types of contaminants and the considerable depth of vadose zone contamination quickly reduced the number of possible options. As discussed in Section II.F.1.c.iii, vadose zone contamination does not appear to present significant risks through direct exposure. Therefore, analyses to date for NIBW indicate that the reason for remedial action for the vadose zone in any particular area of the site will be the potential impact upon ground water. The vadose zone alternatives considered in the detailed analysis were No Action and Soil Vapor Extraction.

b. Description of Remaining Alternatives

i. No Action. As required, the No Action alternative was developed for comparative purposes, but also may be appropriate for areas where the mass of VOCs in the vadose zone do not pose a threat to the underlying ground water. Under the no-action scenario, any VOC mass in the vadose zone would be allowed to migrate towards the ground-water table. No remedial measures would be implemented to speed or limit the rate of contaminant migration.

EPA has not been able to identify ARARs that pertain directly to soil. However, the Arizona Department of Environmental Quality's Health-Based Guidance Levels (HBGLs) for Contaminants in Drinking Water and Soil are other criteria that pertain to soil. Available data indicate the No Action alternative will comply with HBGLs for soil. But with continued contaminant migration to the water table, depending upon the distribution and mass of vadose zone contaminants, the No Action alternative may not comply with ground-water ARARs.

ii. Soil Vapor Extraction (SVE). For NIBW, the remedial action objective for SVE would be to remove the potential for continued ground-water contamination due to migration of contamination from the vadose zone; the criteria for the extent of an action would be achieving a residual distribution and mass of VOCs in the vadose zone that does not threaten to contaminate underlying ground water at levels exceeding federal drinking water standards (Maximum Contaminant Levels, or MCLs) and the other ground-water criteria selected in this ROD. The distribution and mass of residual VOCs would be evaluated at regular intervals throughout operation and/or monitoring of the SVE alternative. Figure 10 presents a flowchart of SVE operation based on the objective of protecting ground water.

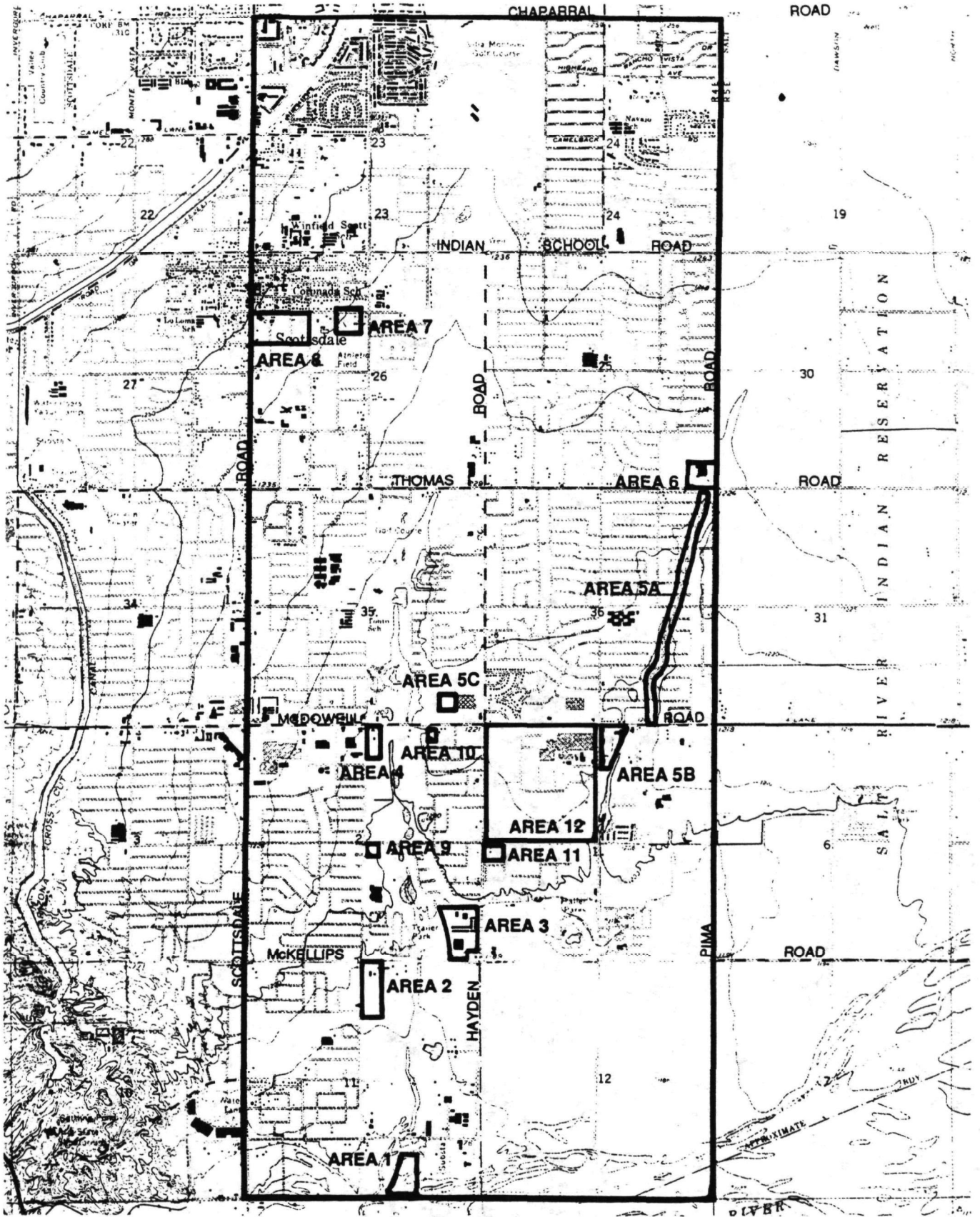


FIGURE 9
POTENTIAL CONTAMINANT SOURCE AREAS
NORTH INDIAN BEND WASH ROD

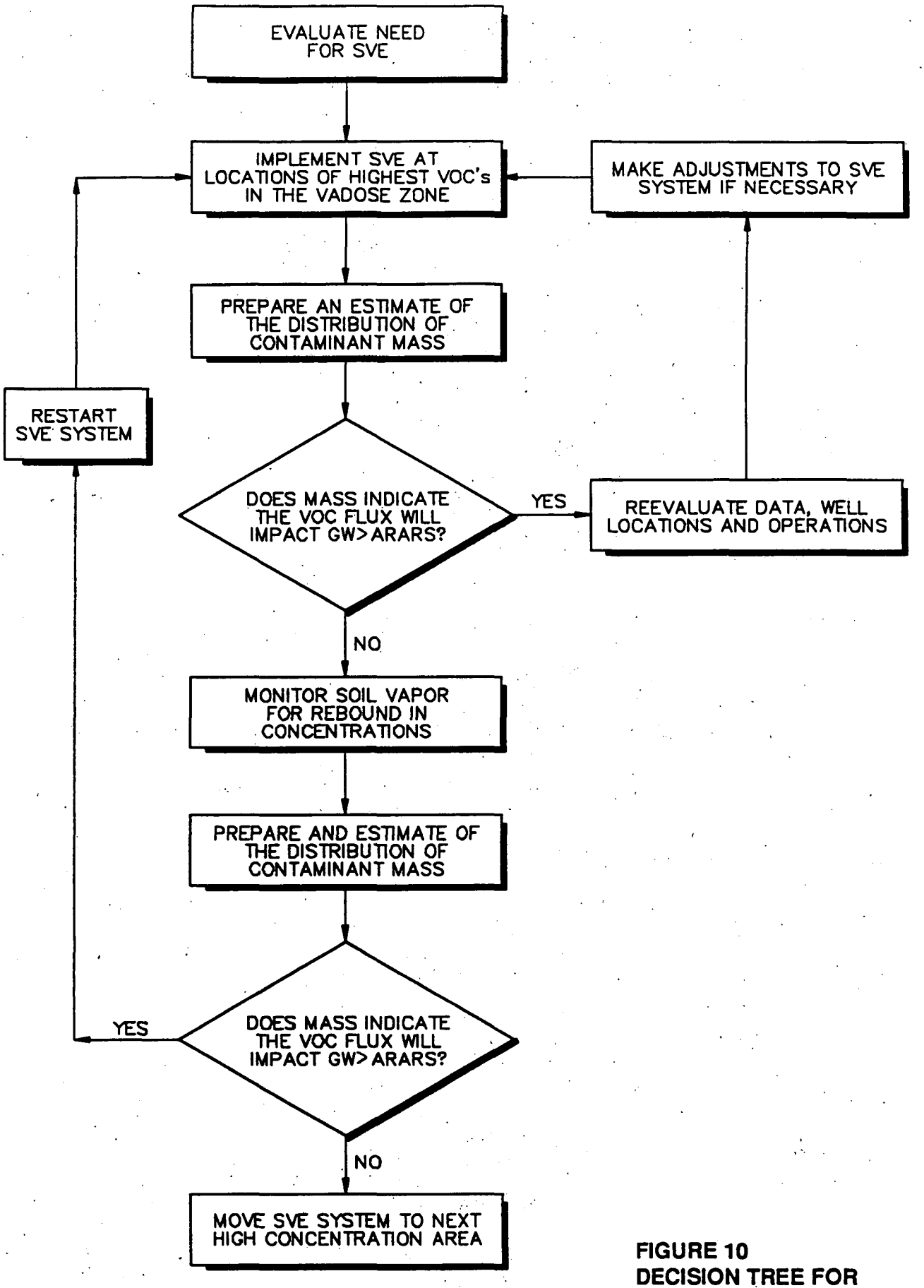


FIGURE 10
DECISION TREE FOR OPERATION OF SOIL VAPOR EXTRACTION SYSTEMS
NORTH INDIAN BEND WASH ROD

SVE consists of a network of extraction wells installed in the vadose zone, connected to the suction end of a vacuum unit through a collection manifold system. Injection of ambient air into the vadose zone may be necessary to enhance recovery. The vacuum extraction unit produces a vapor/air flow through the unsaturated zone into the extraction wells. The extracted gas flows through the collection system to the extraction unit where, at NIBW, it would be collected using a vapor-phase carbon adsorption system. Figure 11 is a diagram of a typical SVE system.

A network of multi-port soil vapor monitoring wells would be used to monitor the effectiveness of the SVE system. Data from the soil vapor monitoring wells would be used to revise the estimate of residual mass in the vadose zone. The mass estimate would then be used to estimate the remaining potential for contamination of underlying ground water.

One key ARAR for an SVE system would be the federal Clean Air Act. Specifically, an SVE system would have to comply with any regulations that are part of the State of Arizona's EPA-approved State Implementation Plan (SIP). In addition, VOC regulations adopted by Maricopa County but not in the SIP would be other criteria to be considered.

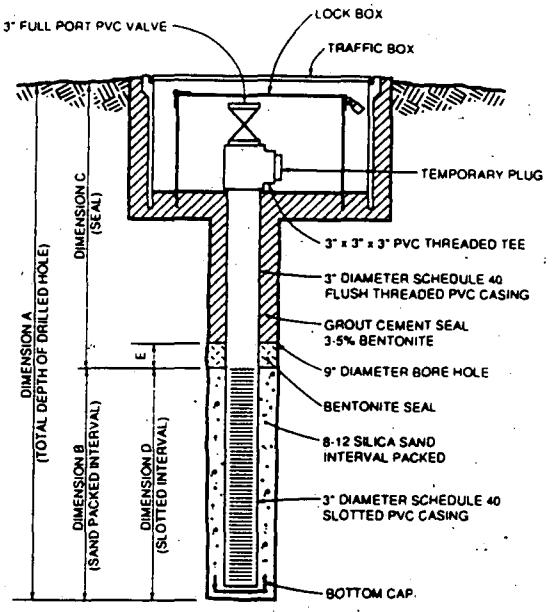
The federal Resource Conservation and Recovery Act (RCRA) would be an ARAR in several respects. Subpart X of RCRA, which addresses miscellaneous units, including any closure and post-closure care, would be applicable or relevant and appropriate to an SVE treatment system. The requirements of 40 CFR Parts AA and BB would be relevant and appropriate for air emissions from the SVE system. Under the "contained in" principle, the RCRA regulations would be applicable or relevant and appropriate for spent activated carbon, which would have to be managed as a hazardous waste. Subpart S, although not an ARAR, includes additional criteria to be considered.

2. GROUND WATER

a. Development and Screening of Alternatives

The ground-water remedial action components that remained after technology screening are listed in Table 7.

With the exception of the first two ground-water extraction components listed in the first column of Table 7, which do not require treatment or end use (beyond that included as part of the Scottsdale Operable Unit remedy), EPA combined each of the ground-water extraction components with each of the treatment components and in turn with each of the end use components. EPA initially formed a total of 50 ground-water alternatives and evaluated them based on effectiveness, implementability and cost. This screening process is summarized below; the full discussion is provided in Chapter 10 of the RI/FS.



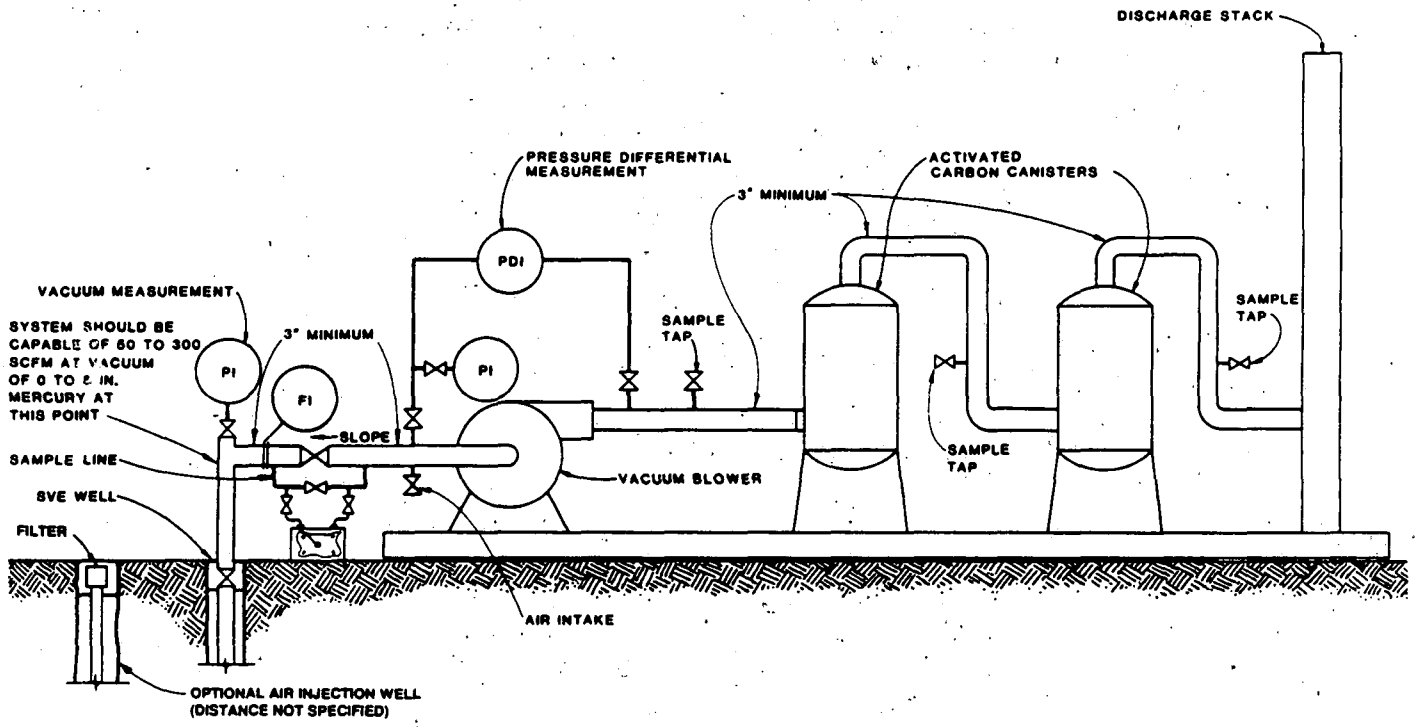


FIGURE 11
SCHEMATIC OF TYPICAL SOIL VAPOR EXTRACTION SYSTEM
NORTH INDIAN BEND WASH ROD

Table 7
Components of Ground-Water Remedial Action Alternatives

Ground-Water Extraction	Ground-Water Treatment	Treated Water End Use
No Action in UAU; Scottsdale Operable Unit Remedy in Place to Address the MAU & LAU	Liquid-Phase Carbon Adsorption	Municipal Distribution System (COS)
Monitoring of the Fate of the VOCs in the UAU w/o UAU Pumping[a]	Photochemical Oxidation	Recharge
UAU Pumping at 900 gpm[a,b]	Air Stripping w/o Vapor-Phase Carbon Adsorption	Mixed Use w/Recharge
UAU Pumping at 750 gpm[a,b]	Air Stripping w/Vapor-Phase Carbon Adsorption	Mixed Use w/o Recharge
UAU Pumping at 400 gpm[a,b]		

[a]Scottsdale Operable Unit remedy in place to address the MAU and LAU.
[b]Includes the monitoring required in the Monitoring w/o UAU Pumping option.

EPA eliminated the "No Action in the UAU" alternative, which would allow unmonitored migration of VOCs, because EPA does not consider this alternative protective. The "Monitoring of the Fate of VOCs in the UAU without Pumping from the UAU" alternative was retained because the monitoring would provide information to determine if adequate protection of human health and the environment is attained without pumping from the UAU.

EPA removed from consideration all the alternatives that included air stripping without vapor-phase carbon adsorption as the treatment component (12 alternatives) because air stripping by itself does not reduce the toxicity, mobility or volume of VOCs. Air stripping without emission controls also would not be likely to meet Maricopa County air emission guidelines for VOCs. EPA screened out alternatives with liquid-phase carbon adsorption as the treatment component (12 alternatives) because a similar technology, vapor-phase carbon adsorption (in conjunction with air stripping), promises similar results at lower cost.

Of the remaining alternatives, EPA eliminated those with end uses other than recharge alone (18 alternatives). The UAU is saturated over only a thin interval. Therefore, the maximum available recharge would be needed to increase the feasibility of extraction from the UAU. In addition, EPA recently has encountered significant difficulties implementing remedies where specific water systems are designated as part of the end use for treated ground water. Therefore, because the objectives and constraints of a Superfund response action and of a particular supply system may not be reconcilable, EPA has screened out those alternatives that rely on a water distribution system as part

of the end use. Were water purveyors to express a greater interest in receiving treated water, a water distribution end use might be significantly more practicable.

b. Description of Remaining Alternatives

Table 8 lists the ground-water remedial action alternatives that remained for detailed evaluation. In Table 8, the different rates of extraction evaluated in the FS have been consolidated to form a single component. The rationale for consolidating the relevant alternatives is as follows:

- If an alternative that included ground-water extraction from the UAU were selected, the actual number, placement and pumping rate of extraction wells likely would be determined according to incremental design and implementation decisions, which would be based upon well and aquifer testing.

- Because of the potential difficulty of extracting water from the thin saturated thickness of the UAU, EPA expects that any alternative that includes ground-water extraction from the UAU would begin with the placement and operation of extraction wells in the area of the greatest saturated thickness. The 400 gpm rate is the estimated feasible extraction rate for two wells in the area of the greatest saturated thickness and contaminant concentrations.

- Depending on the degree of success obtained with initial wells, other extraction wells would be added incremen-tally in areas of more limited saturated thickness and/or lower contamination concentration. The 750 gpm and 900 gpm rates represent the estimated sustainable rates for two conceivable "final" configurations that were evaluated in the FS.

Table 8
Ground-Water Remedial Action Alternatives
Remaining After Screening

1.	Monitoring of the Fate of VOCs in the UAU without Pumping from the UAU
2.	UAU Pumping; Photochemical Oxidation; Recharge[a]
3.	UAU Pumping; Air Stripping with Vapor-Phase Carbon Adsorption; Recharge[a]

[a]Alternatives 2 and 3 include the additional monitoring required by Alternative 1 and assume the Scottsdale Operable Unit remedy is in place to address the MAU and LAU. Note that the numbers designating the alternatives do not conform to those used in the RI/FS and Proposed Plan.

1. Monitoring the Fate of VOCs in the UAU without Pumping from the UAU

As previously stated, this alternative does not include additional ground-water extraction or treatment beyond that required for the Scottsdale Operable Unit remedy. Monitoring wells would be installed in the UAU and MAU to track the fate of VOCs currently present in the UAU. The monitoring well network would be designed to allow evaluation of the rate of migration of VOCs from the UAU and of the locations within the UAU, MAU, and LAU to which the VOCs are migrating. If VOC mass reduction in the UAU were occurring too slowly (i.e., at a rate slower than indicated by ADWR's modeling analysis), or if formerly uncontaminated portions of the UAU, MAU or LAU were becoming contaminated, extraction from the UAU would be reassessed.

2. UAU Pumping; Photochemical Oxidation; Recharge

In addition to the monitoring network described above, this alternative would include extraction from the UAU, piping to a treatment facility and upgradient recharge of the treated water. As previously discussed, implementation likely would begin with extraction wells in the areas of greatest saturated thickness, with wells being added incrementally based upon the performance of previously installed wells. In the photochemical oxidation treatment, contaminated water would be injected with ozone and/or hydrogen peroxide before entering a reaction vessel. Ultraviolet lamps within the vessel would destroy the VOCs present in the water, creating carbon dioxide and halide ions. Recharge of the treated water would help to maintain a more stable saturated thickness.

3. UAU Pumping; Air Stripping with Vapor-Phase Carbon Adsorption; Recharge

This alternative is identical to Alternative 2, except that ground-water would be treated by air stripping with vapor phase carbon adsorption. In an air stripping tower, a high volume of air is forced upward past a lower volume of contaminated water trickling down through packing material. Because VOCs have a greater affinity for the vapor phase, the air would "strip" the VOCs from the water. The now-contaminated air would then pass through carbon filter units. VOCs in the air would adsorb, or cling, to the specially prepared carbon.

Key ARARs for ground-water remedial actions include the federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs). MCLs are applicable to the quality of drinking water at the tap and therefore would be considered relevant and appropriate for the quality of treated water being discharged to any water supply system that includes potential drinking water uses. Pursuant to 40 CFR Section 300.430(e)(2)(i)(B), MCLs and non-zero MCLGs are relevant and appropriate as in-situ aquifer water quality standards for ground water that is or may be used as drinking water. The state of Arizona interprets all aquifers of the state to be potential drinking water aquifers.

Both the Federal Water Quality Criteria and the State Water Quality Standards for Navigable Waters (A.R.S. Section 49-221 and implementing regulations) will be applicable or relevant and appropriate for surface-water discharges.

The RCRA "contained in" principle will apply to materials produced during the installation and sampling from monitoring wells.

As with the vadose zone alternatives, 40 CFR Subparts AA and BB will apply to air emissions from a ground-water treatment facility. Maricopa County Regulations 210, 320 and 330 are criteria to be considered in setting air emission requirements.

H. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the remedial action alternatives are compared in detail in terms of the nine criteria set forth in the National Contingency Plan:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long Term Effectiveness and Permanence
4. Short Term Effectiveness
5. Reduction of Toxicity, Mobility or Volume through Treatment
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

Comprehensive remedial action for NIBW will include vadose zone components in addition to ground-water components. EPA has not explicitly combined vadose zone alternatives and ground-water alternatives for detailed evaluation because ground-water alternatives have been designed to address an area-wide problem, while contamination in the vadose zone has been identified to date only within relatively limited areas. Nonetheless, analyses of vadose zone and ground-water alternatives are highly dependent upon one another. For example, analyses of ground-water pumping scenarios performed by ADWR as part of the RI/FS assumed that the potential for further releases of contaminants to the ground water would be addressed by vadose zone remedial actions at the potential source areas.

1. VADOSE ZONE

Because historic operations and resulting contaminant concentrations vary significantly across NIBW, EPA has evaluated the necessity for vadose zone cleanup on an area-specific basis. Based on the results of the RI and contaminant transport modeling presented in Appendix K of the FS, the vadose zone in both Area 7 and Area 8 has sufficient mass of TCE to pose a continued threat to the ground water. Other VOCs that add to the threat to ground water also are present in Areas 7 and 8. As a result, the comparative analysis summarized in this section focuses on Areas 7 and 8. For Areas 1, 2, 4, 10, and the Scottsdale wells, where there does not appear to be a significant threat to ground water, the No Action alternative is already protective and cost-effective and complies with ARARs. For Areas 3, 5, 6, 9, 11, and 12, if further study reveals a significant ground-water threat, the comparative analysis will essentially parallel the analysis for Areas 7 and 8. If these areas do not significantly threaten ground water, the No Action Alternative will be adequately protective, cost-effective, and will comply with ARARs.

a. Overall Protection of Human Health and the Environment

The No Action alternative would be protective of human health and the environment in the short term in that no significant exposure to soil or soil gas contamination is expected. However, because contaminated soil and soil vapor would be left in place, the chance for future exposure during potential deep excavation would remain. In the vicinity of Areas 7 and 8, the No Action alternative for the vadose zone is expected to result in VOC contamination of ground water above drinking water standards for hundreds of years.

The Soil Vapor Extraction alternative would offer greater overall protection in that the uncertainty regarding the fate of vadose zone contamination would be reduced. The expected long-term adverse impact on the ground water expected under the No Action alternative would be averted. However, an SVE alternative with carbon adsorption would produce a spent activated carbon residual and possibly low-level VOC air emissions.

b. Compliance with ARARS

The ARARS and other criteria for NIBW are presented in Appendix A. The SVE alternative should meet chemical-specific, location-specific and action-specific ARARs. The No Action alternative may not meet ARARs such as the ground-water protection provisions of the Arizona Environmental Quality Act (1986), because VOCs would continue to represent a continuing source of contamination to the underlying ground water.

c. Long-Term Effectiveness

Both alternatives would be expected to remain effective once a level of acceptable residual mass has been achieved in the vadose zone. Assuming no influx of additional contaminants to the vadose zone, most of the VOCs currently existing in the vadose zone are expected eventually to be leached or volatilized out of the vadose zone if SVE is not implemented. Although sorption to the soil is expected to be minor, some partitioning into the vapor phase (rebound) may occur after apparent equilibrium has been reached. This potential highlights the necessity for continued monitoring to assess the need for further response.

Some transition of VOCs into and out of the vapor phase and the aqueous phase is expected immediately above the contaminated water table. However, based upon contaminant transport modeling as presented in Appendix K of the FS, the principal driving force is expected to be infiltration of water through the vadose zone toward the ground-water table. Therefore, no significant net impact on the long-term effectiveness of either vadose zone alternative would be expected from vapor phase/liquid phase transitioning.

d. Reduction of Toxicity, Mobility or Volume through Treatment

The No Action alternative does not include any treatment to reduce toxicity, mobility or volume. As a result, it is expected that contaminants would continue to leach through the vadose zone to the underlying ground water and, to a lesser extent, would continue to be released by volatilization to the atmosphere. Biodegradation activity has not been characterized at NIBW, but if biodegradation is occurring at significant levels, it would be expected to decrease concentrations of VOCs.

The SVE alternative could reduce the mobility of most of the contaminant mass by sorbing it onto activated carbon. The volume of VOCs also may be reduced, depending upon the final disposition of the spent carbon. Low-level air emissions may result in increased mobility for a small portion of the contaminant mass that escapes the activated carbon. If the SVE system did not include activated carbon, neither toxicity, mobility or volume would be reduced until the VOCs were broken down, principally photochemically, in ambient air. Breakdown products would contribute to photochemical smog.

e. Short-Term Effectiveness

The No Action alternative would not present appreciable short-term direct contact or inhalation human health risks. Under the No Action scenario, however, the bulk of the contaminant mass is expected to migrate from the vadose zone over possibly hundreds of years. This contaminant mass would, therefore, continue to threaten the quality of underlying ground-water.

It is difficult to estimate accurately the time required to meet remedial action objectives with the SVE alternative. The rate of extraction is a function of site-specific characteristics, such as quantity and nature of VOC contaminations and depth to ground water. Based upon extraction rates cited by Malot (1985), Argelot, et al., (1985), and Woodward-Clyde (1984), the SVE alternative would be expected to remove the bulk of the vadose zone contaminant mass within several years. As a result, the threat to groundwater quality would be reduced significantly faster than under the No Action scenario.

Implementation of the SVE alternative would entail construction-related risks during drilling of vapor extraction and monitoring wells. However, with appropriate, readily available monitoring and protective equipment, safety risks associated with installation and operation of SVE systems at NIBW can be mitigated.

There could be low-level emissions of VOCs not captured by the activated carbon. Regeneration, treatment or disposal (most likely off-site) of spent carbon also would entail some handling and transportation risks.

f. Implementability

The No Action alternative would not have implementation obstacles. In addition, there are no operation and maintenance requirements for the No Action alternative.

Soil vacuum extraction has been used successfully to remove VOCs from soils. As an example, in Puerto Rico, the technique extracted about 250 pounds per day of carbon tetrachloride from unsaturated soil below an underground storage tank (Malot, 1985; Argelot, et al., 1985).

Soil vapor extraction appears to be effective even in relatively tight clayey silt and silty clay soil. It also appears to be applicable to the removal of contamination beneath buildings. The performance of similar systems in the past indicates that the use of an SVE system would result in a significant reduction of VOC contaminants present in unsaturated soils during the useful life of the equipment and wells. The vacuum pump and carbon recovery system could be temporary, skid-mounted equipment, and the wells and manifold could be removed or abandoned once remedial action objectives are achieved.

The most-desired locations for the SVE wells may be inaccessible. Nonetheless, EPA believes adequately effective locations could be found.

Spent carbon would require treatment, regeneration or disposal. Options for ultimate disposition would be expected to become increasingly limited over the course of the remedial action as nationwide restrictions on land disposal become more stringent. Otherwise, equipment and personnel should be readily accessible for the actions included in the SVE alternative.

g. Cost

The costs estimated in the FS for SVE systems at Areas 7 and 8, assuming 2 years of operation, are presented in Table 9.

Table 9
Estimated Costs for Soil Vapor Extraction Systems

	Capital	Average Annual Operations and Maintenance	Total Present Worth
Area 7	$482,000	$74,000	$619,000
Area 8	$278,000	$60,000	$387,000

Although it is difficult at this time to estimate costs associated with the No Action alternative for the vadose zone, they would be expected to include expenses for many decades of additional ground-water pump-and-treat activities in the MAU and LAU. No Action in the vadose zone may necessitate ground-water extraction directly from the UAU. Table 10 presents estimated costs for further characterization for Areas 3, 5, 6, 9, 11, and 12. If SVE is shown to be necessary for these areas, estimated remedial action costs will be similar to those shown in Table 9 with adjustments for area-specific requirements--the number of wells, their depths, etc.

Table 10
Estimated Costs for Further Vadose Zone Investigations ($)

Area	Shallow Soil Gas Cost	Soil Vapor Monitoring Well Costs		Data Reporting/ Interpretation Costs	Total
		Installation	Analytical		
3	0	18,700	6,400	8,250	33,350
5A	3,000	9,350	3,200	4,125	19,675
5B	0	9,350	3,200	4,125	16,675
5C	0	9,350	3,200	4,125	16,675
6	0	18,700	6,400	8,250	33,350
9	0	9,350	3,200	4,125	16,675
11	0	18,700	6,400	8,250	33,350
12	0	43,000	16,000	20,625	79,625

h. State Acceptance

Because the State of Arizona has the statutory responsibility to protect ground-water quality for all present and reasonably foreseeable future uses, the State supports the Soil Vapor Extraction alternative over the No Action alternative for those vadose zone areas that present a potential threat to ground-water quality. The Arizona Department of Environmental Quality encourages EPA to pursue an aggressive schedule for defining the potential threat to ground-water quality at Areas 3, 5, 6, 9, 11, and 12. ADEQ concurs with the requirement for implementation of the SVE alternative as soon as possible in those areas where a threat to ground water is determined to exist.

i. Community Acceptance

Community members strongly prefer alternatives that maximize the removal of hazardous substances from near their residences. Commentors at the RI/FS public meeting expressed a strong preference that potential threats from all possible source areas should be cleaned up.

2. GROUND WATER

a. Overall Protection of Human Health and the Environment

All three of the alternatives listed in Table 8 will provide significant overall protection of human health and the environment.

Alternative 1 would provide warning regarding potential human exposure to contaminated ground water through extensive sampling and analysis of the UAU, MAU and LAU in the North Indian Bend Wash. The ground-water monitoring also should indicate the rate and direction of contaminant mass flow within and out of the UAU. All of the alternatives rely heavily upon the Scottsdale Operable Unit remedy to contain and remove contaminants from the aquifer system. Therefore, the overall protectiveness of any of the ground-water alternatives will likely be highly dependent upon the Scottsdale Operable Unit remedy, including any modifications to that remedy.

In addition to the monitoring provided in Alternative 1, Alternatives 2 and 3 include ground-water extraction and treatment measures beyond the Scottsdale Operable Unit remedial action. By including ground-water extraction and treatment in areas of the UAU that have high contaminant levels, Alternative 2 and 3 could provide, at least in the short term, a reduction in uncertainty regarding the fate of some of the contamination. Modeling by ADWR suggests that the 750 gpm configuration evaluated in the FS would go further toward this end than the 400 gpm and 900 gpm configurations.

ADWR's modeling can be used as one measure of the potential reduction, with UAU extraction, in the uncertainty about the fate of VOCs currently present in the UAU. ADWR's work suggests that, for periods on the order of tens of years, the rate for reduction of contaminant mass, both within the UAU and within the entire

UAU/MAU/LAU system, may rely more heavily upon (1) natural and conduit-aided flow of contaminant mass from the UAU into the MAU and LAU and (2) Scottsdale Operable Unit remedial pumping, than upon ground-water pumping from the UAU.

Alternative 2 would be protective because its treatment component offers nearly complete on-site destruction of the contaminants of concern. By comparison, the overall protectiveness of Alternative 3 would be reduced slightly by (1) low-level air emissions from the air stripper(s) and (2) production of a treatment residual in the form of spent activated carbon. The spent carbon would require regeneration or treatment and eventual disposal off-site.

There is some risk that a lapse in the effectiveness of Scottsdale Operable Unit treatment facility could result in human exposure to untreated drinking water, although some dilution within the distribution system would be expected to reduce the levels of exposure. A similar problem with a UAU ground-water treatment system would not pose the same threat because an end use other than discharge to the distribution system is contemplated for the remaining UAU alternatives. Because the end use would be recharge, there should not be direct human contact.

b. Compliance with ARARs

Alternatives 1, 2 and 3 all likely would attain the ARARs and other criteria for in-situ ground water. Although Alternatives 2 and 3 initially would be expected to remove more VOC mass from the UAU than Alternative 1, ADWR's modeling suggests the time necessary to attain acceptable levels throughout the UAU will not differ substantially whether or not the UAU is pumped. ADWR's modeling also suggests the time required to attain ARARs throughout the MAU and LAU would not be altered significantly by pumping from the UAU.

Alternatives 2 and 3 would be able to meet the water quality ARARs that would be applicable to treated water intended for recharge. Alternatives 2 and 3 should also be able to attain ARARs for VOC air emissions.

ADWR's modeling suggests the initial configuration of the Scottsdale Operable Unit is insufficient to contain and capture the MAU and LAU ground water for which the contaminant levels currently exceed ARARs. Recent monitoring data from the site appears to support this interpretation. Therefore, the ability of the overall remedy for NIBW to attain ARARs for in-situ ground water, particularly within an acceptable time frame, likely will be highly reliant upon continuing evaluations of, and modifications to, the Scottsdale Operable Unit remedy. Limited air emissions are expected from the air stripping facility of the Scottsdale Operable Unit remedy, but the system will be designed to comply with air emissions ARARs.

c. Long-Term Effectiveness and Permanence

All of the alternatives are expected to provide essentially equivalent on-site long-term protection once acceptable levels have been met. Residual risks at the end of implementation should be at or below approximately one in one million. It may be difficult to identify satisfactorily when acceptable levels have been met, however, due to potential rebound of contaminant levels within the aquifer. Long-term monitoring would offer the ability to watch for potential rebound and the presence of extraction wells would make it easier to address concentration increases should they arise.

Alternative 3 potentially would result in some off-site risks after implementation is complete, depending upon the disposition of the spent activated carbon.

d. Short-Term Effectiveness

Alternative 1 would rely solely upon the Scottsdale Operable Unit to remove contaminant mass from the ground-water system. With respect to the UAU, therefore, Alternative 1 would rely upon existing flow of contamination from the UAU into the lower units via conduit wells and flow across the contact between the UAU and the MAU. Alternatives 2 and 3 offer some measure of greater short-term effectiveness through the direct removal of contaminant mass from the UAU. Recharge of treated water would minimize the chance for direct human contact to residual VOCs in the treated water.

The total clean-up time frame for the entire UAU/MAU/LAU system can not be reliably estimated at this time. As stated above, Alternatives 2 and 3 initially should accelerate reduction of contaminant mass within the UAU. ADWR's modeling suggests, however, that the additional direct mass removal provided by UAU ground-water extraction may not have a significant impact on the overall time to meeting acceptable levels in the MAU and LAU when compared to the Scottsdale Operable Unit remedy alone.

ADWR's modeling suggests that the original configuration of the Scottsdale Operable Unit remedy will allow some migration of contamination beyond the hydraulic influence of the extraction system. The rate and extent of this migration cannot be accurately estimated at this time. Nonetheless, ADWR's work suggests implementation of additional measures for the MAU and LAU will be necessary.

None of the UAU alternatives would be expected to introduce significant additional adverse impacts due to ground-water treatment activities. Alternatives 2 and 3 both would be expected to result in some low-level VOC air emissions. Alternative 3 would produce spent activated carbon that would require additional handling.

The Scottsdale Operable Unit remedy will have low-level VOC air emissions as a by-product of ground-water treatment. The emissions should not result in excess risk above one in one million. The Scottsdale Operable Unit will also include use of

treated water in the public supply system. As a result, people drinking the treated water would have at most an excess risk between one in one hundred thousand and one in one million due to residual VOCs. This risk likely would be reduced by some level of dilution within the supply system.

The installation of additional monitoring wells under Alternatives 1, 2 and 3 entails construction-related risks. However, potential accidents and exposures to contaminants could be reduced substantially through careful planning and appropriate precautions. The collection of samples would increase the likelihood of low-level (particularly worker) exposures. Experience at this site and others indicates this risk can be minimized through adherence to standard health and safety procedures. The additional activities included in Alternatives 2 and 3 would include some additional construction-related risks due to extraction and recharge well installation, pipeline installation and treatment facility construction. With appropriate mitigative measures, the additional construction-related risks associated with Alternatives 2 and 3 could be minimized. The Scottsdale Operable Unit remedy presents similar risks of accidents and exposures during construction.

There is some risk during implementation that supply wells could be placed in areas where the ground water is contaminated, but this risk probably is not substantial.

e. Reduction of Toxicity, Mobility or Volume through Treatment

All three remaining alternatives would rely heavily upon the Scottsdale Operable Unit remedy for reducing the mobility of contaminants through treatment. Whether or not the UAU is pumped, significant VOC mass is expected to travel from the UAU into the MAU and LAU. The Scottsdale Operable Unit remedy is designed to capture the bulk of the contaminant mass from the MAU and LAU on activated carbon, which itself would have to be regenerated or disposed of once spent. Some mobilization of the VOCs will occur during implementation of the Scottsdale Operable Unit remedy because of low level air emissions of VOCs not captured by the carbon. No reduction in toxicity or volume of contaminants would be expected unless the spent activated carbon is treated to destroy contaminants adsorbed to the carbon.

Over approximately the first ten years of operation, Alternatives 2 and 3 would offer reduction of mobility or volume of VOCs beyond the reductions offered by the Scottsdale Operable Unit remedy over the same period of time. Alternative 2 would reduce contaminant volume through on-site destruction of the contaminants removed from UAU ground water, while Alternative 3, employing the same treatment as the Scottsdale Operable Unit, would reduce the mobility of VOCs.

Over the longer term, however, the distinction between the alternatives with UAU pumping and Alternative 1 would be expected to diminish. This is principally due to the significant communication between the UAU and the lower units. Over its expected operating life, the Scottsdale Operable Unit remedy would be expected to capture and immobilize the VOCs that would otherwise be captured and immobilized

through UAU ground-water pumping and treatment. In fact, as discussed above, the Scottsdale Operable Unit remedy will be relied upon to capture significant amounts of VOCs migrating out of the UAU whether or not the UAU is pumped. The Scottsdale Operable Unit remedy is designed for continued evaluation to ensure full capture of VOCs in the MAU and LAU.

f. Implementability

All of the alternatives would require coordination and land availability for the installation of monitoring wells. Access agreements would also be required to provide for long-term monitoring at the well sites. The availability of materials, equipment and personnel to carry out the work should not be a significant issue. Appropriate well installation may be difficult because of lithologic changes.

Alternatives 2 and 3 would be more difficult to implement than Alternative 1 because of land requirements for piping and treatment equipment. Some necessary construction activity, particularly pipe installation, would be expected to disrupt traffic flow on major streets. Although sufficient land and easements are available in the North Indian Bend Wash to implement all of these alternatives, more difficulty would be expected as the size of the alternative increased.

Alternatives 2 and 3 would be difficult to implement because of the limited and variable saturated thickness of the UAU. Even with recharge, at least localized dewatering of the UAU would be expected to affect significantly the ability of the extraction wells to remain productive.

There are fewer uncertainties with Alternative 3 than Alternative 2 because air stripping and granular activated carbon technologies are used more commonly than photochemical oxidation. To compensate for its lesser certainty, Alternative 2 may require more extensive operations and maintenance requirements to monitor the adequacy of performance. On the other hand, Alternative 3 would have to be designed with careful consideration of the disposition of spent carbon, as options (such as land disposal) become more restrictive.

All alternatives likely would require replacement of some or all physical components (pipelines, treatment equipment, monitor wells, extraction wells, well pumps, etc.) before the remedial action objectives have been attained. Therefore, additional construction, with all the accompanying difficulties and risks, likely would be necessary in the future.

Extensive coordination may be necessary to most appropriately and expeditiously dispose of water produced during drilling and sampling events.

g. Cost

The estimated capital, annual operating and total present worth costs of the alternatives are summarized in Table 11. In this table, capital costs include only the initial outlays for each alternative. Replacement costs and salvage values are not reflected under Capital Costs but are reflected in the Total Present Worth Cost. The Total Present Worth Cost is based on 30 years at a discount rate of 6%. Capital and operating costs for the Scottsdale Operable Unit remedy are included. Costs are summarized by remedy component in Chapters 7, 8 and 9 of the RI/FS.

Table 11
Estimated Costs for Ground-Water Alternatives Undergoing Detailed Analysis
(in thousands of dollars)

Alternative	Capital Costs	Annual Operating Costs	Total Present Worth Costs
1	8,580	801	20,570
2	10,764 - 12,962	1,014 - 1,144	25,846 - 29,584
3	10,714 - 12,515	964 - 1,078	25,102 - 28,142

h. State Acceptance

The State of Arizona has expressed a preference that as much contamination as possible be removed from the ground water as soon as possible. The Arizona Department of Environmental Quality is concerned with the continued migration of contaminants from the UAU into the underlying sources of drinking water and the efficacy of allowing these contaminants to further migrate to the Scottsdale Operable Unit for ultimate removal. ADEQ prefers active remedial alternatives for ground-water contamination, especially those alternatives which remove highly contaminated ground water from source or "hot spot" areas. ADEQ concurs with the selected monitoring alternative but expects that UAU extraction will be required if the mass of contaminants does not decrease as predicted. Furthermore, ADEQ expects that if UAU extraction becomes necessary, EPA will require its implementation at the earliest possible time. The State is concerned about the effectiveness of the Scottsdale Operable Unit remedy, especially in light of ADWR's modeling results and the most recent monitoring data. There is discomfort with the idea that overall effectiveness may rely very heavily upon the ability to incorporate changes into the Scottsdale Operable Unit remedial action. With or without extraction, both ADWR and ADEQ put a high value on the ability to monitor comprehensively the flow of contamination at the NIBW site.

i. Community Acceptance

Alternative 1 is looked upon somewhat negatively by some in the community because of the lack of pumping from the UAU. Assurances of monitoring safeguards help address some of this concern. Alternatives 2 and 3 would have increased acceptance due to additional short-term actions to control contamination in ground water.

I. THE SELECTED REMEDIES

Based upon comparative analyses of the alternatives with respect to the nine evaluation criteria, EPA is selecting for NIBW the vadose zone and ground-water remedies described below. This section includes a discussion of some of the specific standards that shall be achieved by the selected alternatives for NIBW. Appendix A presents the complete list of ARARs and other criteria that shall be complied with/attained by the selected remedial actions.

1. VADOSE ZONE

EPA has grouped the vadose zone areas that have been studied into three categories: (a) those that do not appear to significantly threaten ground water, (b) those that continue to significantly threaten ground water and (c) those that may significantly threaten ground water, but that require further characterization and analysis to evaluate the degree of threat.

a. Areas 1, 2, 4, 10 and the City of Scottsdale Wells

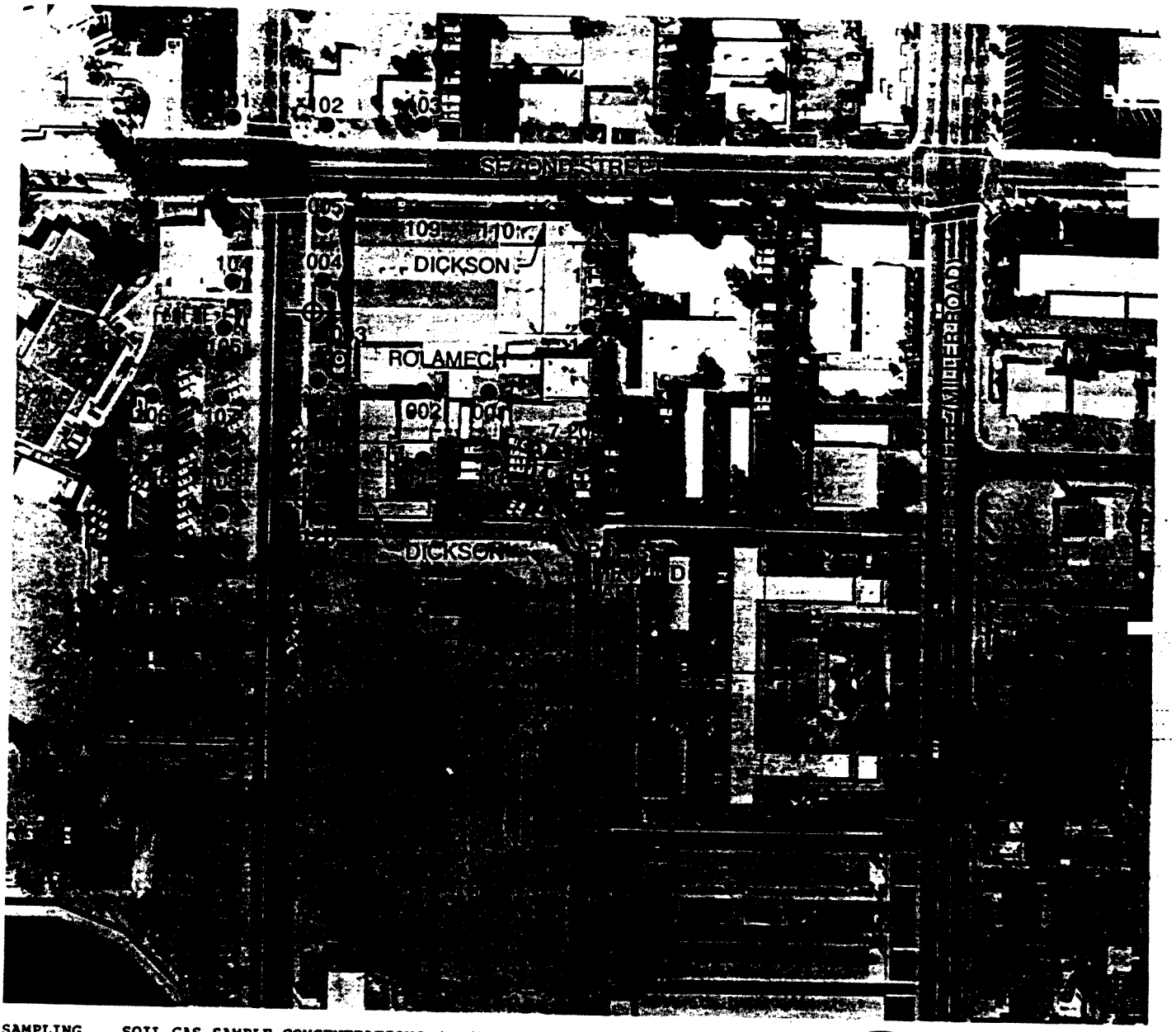
Based on available information, the vadose zone in Areas 1, 2, 4 and 10 and the City of Scottsdale Wells do not appear to present a continued threat to ground water from VOC contamination in the vadose zone. Data indicate that VOCs are not present at significant levels in these areas. Therefore, EPA is selecting **No Further Action** for the vadose zone in Areas 1, 2, 4 and 10 and at the COS Wells.

b. Areas 7 and 8

Because the vadose zone in Areas 7 and 8 present unacceptable threats to ground water, EPA is selecting **Soil Vapor Extraction** for Areas 7 and 8. The purpose of the SVE systems will be to reduce VOC mass in the vadose zone to a level that no longer threatens to contaminate ground water at levels above MCLs and other ground-water criteria selected in this ROD. The SVE system for Area 7 will consist of soil vapor extraction wells, a manifold collection system, a vacuum pump, and a vapor-phase carbon adsorption system. The extent of the area requiring remedial action at Area 7 can not be defined at this time. Therefore, the approach for implementation at Area 7 will be as follows:

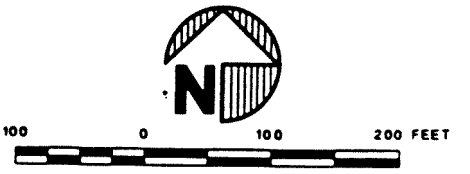
- Install additional soil vapor monitoring well clusters with completion intervals similar to well 7-209. At least three additional monitoring points, at the approximate locations shown in Figure 12, will be required.

- Install a soil vapor extraction well near well 7-209 and a second soil vapor extraction well near 7-207. Construct the appropriate soil vapor treatment facilities with capacity to add additional soil vapor extraction.



SAMPLING LOCATION	SOIL GAS SAMPLE CONCENTRATIONS (µg/l) TCE	1,1,1-TCA	PCE	1,1-DCE
001	27.0	5.00	2.30	47.0
002	25.0	12.0	3.60	59.0
003	41.0	0.56	6.60	ND
004	35.0	ND	0.88	5.30
005	24.0	ND	0.68	ND
101	6.80	ND	0.10	1.90
102	9.70	0.06	1.00	ND
103	7.70	0.05	0.84	0.14
104	ND	ND	0.01	0.60
105	3.60	ND	0.51	0.97
106	0.30	ND	0.12	ND
107	14.0	ND	1.40	0.98
108	23.0	ND	1.40	ND
109	31.0	ND	3.30	ND
110	18.0	0.03	2.00	1.70
111	15.0	ND	1.80	ND
112	24.0	ND	3.20	0.60
113	30.0	ND	3.60	1.60
114	17.0	ND	1.90	0.30
115	1.40	ND	5.20	0.28
116	9.60	1.90	4.20	45.0
117	9.10	0.60	4.60	11.0
118	5.60	0.01	1.30	0.96
119	18.0	0.01	2.30	0.59
120	21.0	0.02	3.00	1.20

ND = NOT DETECTED



LEGEND

- APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION
- SOIL GAS SAMPLING LOCATION
- EXISTING SOIL VAPOR MONITORING WELL
- PROPOSED SOIL VAPOR EXTRACTION WELL

FIGURE 12
AREA 7 SOIL VAPOR MONITORING AND EXTRACTION WELL LOCATIONS
NORTH INDIAN BEND WASH ROD

- Based on the results from the additional soil vapor monitoring wells, EPA may require additional extraction wells, or if the extent of contamination is still too uncertain, additional soil vapor monitoring wells will be required.

For Area 7, a single soil vapor extraction well should be capable of drawing 200 standard cubic feet per minute (scfm) of soil vapor. Based on the average TCE concentration in soil vapor monitoring point 7-209 of 2,945 micrograms per liter, at startup the SVE system may remove approximately 50 pounds of TCE per day. Therefore, in order to comply with air emission standards and to reduce the mobility and volume of hazardous substances, vapor-phase carbon emission controls will be included in the Area 7 SVE system.

The Area 8 SVE system will consist of soil vapor extraction wells, piping from the wells to the treatment system, a vacuum pump and a vapor-phase carbon adsorption system. As with Area 7, the total area of Area 8 requiring remedial action can not be determined with available information, so the approach for implementing SVE at Area 8 will be as follows:

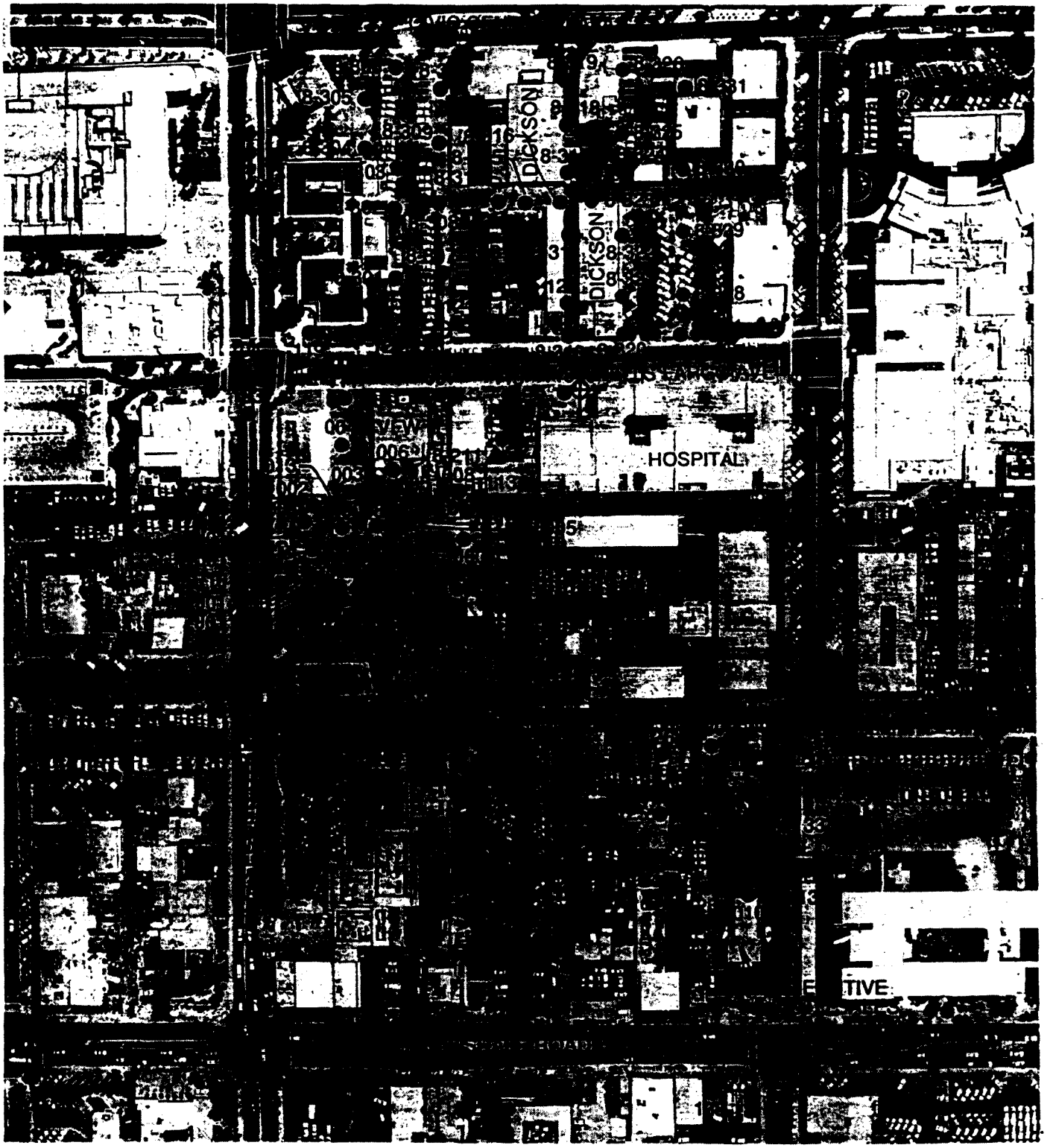
- Install additional soil vapor monitoring wells with completion intervals similar to 8-211. At least three additional monitoring points, at the approximate locations shown on Figure 13, will be required. (Data values for soil gas sampling points shown on Figure 13 are provided in Table 12.)

- Install a soil vapor extraction well near 8-211. Construct the appropriate soil vapor treatment facilities with the capacity to add additional soil vapor extraction.

- Based on the results from the additional soil vapor monitoring wells, EPA may require additional soil vapor extraction wells, or if the extent of the contamination is still too uncertain, EPA may require additional soil vapor monitoring wells.

At Area 8, a single vapor extraction well should be capable of drawing 200 scfm of soil vapor. Based on the average TCE concentration of 277 micrograms per liter at point 8-211, at startup the SVE system should remove approximately 5 pounds of TCE per day. Vapor-phase carbon air emission controls will be necessary as part of the Area 8 SVE system in order to comply with air emission standards and to reduce the mobility and volume of hazardous substances.

For both Areas 7 and 8, the VLEACH model, or a similar analytical tool determined acceptable by EPA, shall be used to evaluate the continued threat to ground water and, therefore, the need to continue operation of the SVE system and/or to install additional soil vapor monitoring wells (See Figure 10). Values for soil, contaminant, and underlying saturated zone parameters to be used in the application of VLEACH and



LEGEND

- APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION
- SOIL GAS SAMPLING LOCATION
- EXISTING SOIL VAPOR MONITORING WELL
- PROPOSED SOIL VAPOR EXTRACTION WELL

NOTE

FOR SOIL GAS SAMPLE CONCENTRATION DATA SEE TABLE 12

N

100 0 100 200 FEET

FIGURE 13
AREA 8 SOIL VAPOR MONITORING AND EXTRACTION WELL LOCATIONS
NORTH INDIAN BEND WASH ROD

Table 12
Soil Gas Results for Area 8
(µg/l)

Location	Soil Gas Sample Concentrations				
	CFM	TCE	1,1,1-TCA	PCE	1,1-DCE
001	NA	3.52	ND	0.225	9.210
002	NA	2.93	ND	0.113	ND
003	NA	2.69	0.147	0.154	0.729
004	NA	1.88	ND	0.172	ND
005	NA	14.00	ND	0.485	ND
006	NA	3.01	ND	0.847	ND
007	NA	14.10	ND	0.815	6.43
008	NA	5.35	ND	0.513	ND
101	NA	3.28	ND	1.16	1.43
102	NA	1.35	ND	1.22	1.75
103	NA	0.20	ND	0.45	0.60
104	NA	ND	ND	1.46	0.67
105	NA	0.66	0.02	1.75	0.28
106	NA	8.22	3.98	6.06	3.55
107	NA	ND	0.01	2.77	0.28
108	NA	6.12	0.04	2.48	3.96
109	NA	ND	0.01	3.54	0.40
110	NA	12.69	0.04	3.07	3.78
111	NA	0.55	0.06	1.41	1.33
112	NA	13.60	0.16	2.42	0.50
113	NA	42.54	ND	5.57	0.56
114	NA	32.93	0.17	2.48	3.28
115	NA	32.10	0.02	4.44	22.00
116	NA	9.76	0.02	1.23	2.12
117	NA	12.00	0.02	1.27	4.33
118	NA	11.68	0.96	1.64	4.54
119	NA	ND	ND	0.03	0.90

Table 12
Soil Gas Results for Area 8
(µg/l)

Location	Soil Gas Sample Concentrations				
	CFM	TCE	1,1,1-TCA	PCE	1,1-DCE
120	NA	0.54	ND	2.21	NA
121	NA	16.32	0.03	8.76	37.44
122	NA	2.53	0.29	6.15	2.54
123	NA	4.32	0.02	2.38	9.54
J001	NA	0.99	0.46	11.72	0.03
J002	NA	11.02	0.17	3.30	0.03
J003	NA	0.89	0.02	2.64	0.06
J004	NA	2.12	0.03	1.64	0.00
J005	NA	2.15	0.16	0.26	0.01
J006	NA	3.12	0.22	1.32	0.14
J007	NA	5.99	0.08	1.46	0.29
J007D	NA	7.80	0.11	1.86	1.05
J008	NA	0.00	0.00	4.05	8.85
J009	NA	8.41	2.24	5.92	0.22
J010	NA	10.12	0.10	5.06	1.04
J011	NA	2.72	0.32	1.16	0.13
J012	NA	3.83	0.07	0.91	0.31
J013	NA	0.00	0.15	0.89	0.27
J014	NA	2.20	0.00	0.65	0.46
J015	NA	2.07	0.00	0.45	0.16
009	NA	0.27	ND	0.04	ND
010	NA	2.20	0.05	0.16	ND
011	NA	0.03	ND	0.04	ND
012	NA	0.74	ND	0.05	ND
124	NA	1.40	5.60	0.97	ND
125	NA	5.90	66.0	2.60	1.70
126	NA	4.70	0.04	1.50	2.00

Table 12
Soil Gas Results for Area 8
(µg/l)

Location	Soil Gas Sample Concentrations				
	CFM	TCE	1,1,1-TCA	PCE	1,1-DCE
127	NA	6.00	0.32	4.20	0.57
128	NA	20.0	0.34	3.70	7.00
129	NA	7.40	13.0	2.40	5.20
130	NA	0.61	0.08	0.29	2.20
131	NA	0.08	0.07	0.99	3.00
132	NA	0.73	0.02	0.67	0.84
133	NA	0.06	0.02	0.11	0.46
134	NA	0.04	0.04	0.05	1.60
135	NA	ND	0.05	0.38	0.94
136	NA	ND	0.01	0.39	0.58
137	NA	ND	0.01	3.50	2.40
138	NA	ND	0.05	1.00	6.40
8-301	1.65	4.48	1.27	7.48	1.11
8-302	2.00	5.97	1.42	9.40	1.60
8-303	ND	10.50	ND	16.90	1.14
8-304	ND	0.27	ND	0.79	ND
8-305	ND	0.15	ND	0.60	ND
8-307	0.94	8.97	ND	12.10	6.71
8-308	0.62	17.60	0.37	23.30	4.16
8-309	0.55	28.80	0.31	52.90	1.09
8-310	1.07	2.50	0.83	4.88	0.66
8-311	ND	34.10	ND	40.40	45.90
8-312	0.17	40.00	ND	62.30	8.77
8-313	0.06	1.18	ND	0.12	2.72
8-314	ND	2.97	0.11	1.20	12.70
8-315	0.08	20.80	ND	22.60	19.90
8-316	0.13	18.40	0.18	18.70	23.40

Table 12
Soil Gas Results for Area 8
(µg/l)

Location	Soil Gas Sample Concentrations				
	CFM	TCE	1,1,1-TCA	PCE	1,1-DCE
8-317	ND	13.40	ND	10.90	3.09
8-318	ND	4.00	ND	4.17	2.66
8-319	ND	ND	ND	ND	ND
8-320	ND	0.57	0.05	0.02	3.63
8-321	ND	1.53	0.13	2.15	9.89
8-322	0.18	3.81	ND	2.44	19.80
8-323	ND	ND	ND	ND	ND
8-324	ND	3.23	ND	2.42	6.35
8-325	ND	1.36	ND	0.28	0.99
8-326	ND	ND	ND	ND	ND
8-327	0.02	0.07	0.02	ND	3.48
8-328	0.10	2.86	0.06	2.37	17.30
8-329	ND	ND	ND	ND	ND
8-330	ND	0.12	0.02	0.05	0.46
8-331	ND	0.31	ND	0.19	ND

Notes: ND = not detected.
NA = not analyzed.

mixing zone calculations shall be those selected by EPA and presented in Appendix K of the RI/FS, or other values approved by EPA based on additional field data or other information.

c. Areas 3, 5, 6, 9, 11 and 12

The amount and types of data for Areas 3, 5, 6, 9, 11 and 12 are not uniform. Available information suggests there may be a continued threat to ground water from VOC contamination in the vadose zone in these areas. However, data were not sufficient to estimate the mass of VOCs in the vadose zone. Therefore, evaluation of the need for remedial action at Areas 3, 5, 6, 9, 11 and 12 will be made after additional investigations, as discussed below.

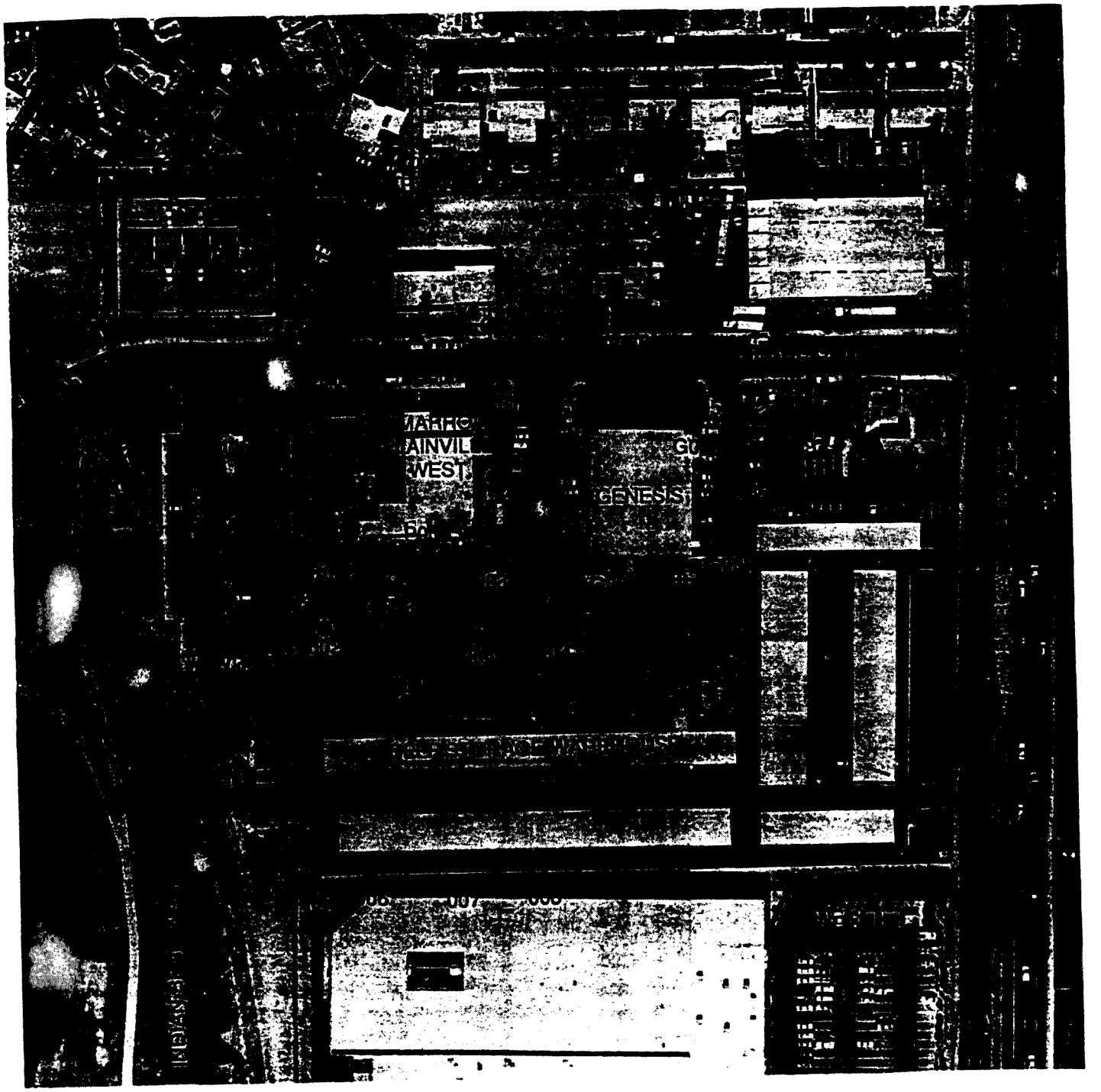
i. Area 3. At least two additional soil vapor monitoring wells, at the approximate locations shown on Figure 14, shall be installed. (Data values for Figure 14 are provided in Table 13.) Construction shall be similar to that of well 3-213. The purpose of these wells will be to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from these soil vapor monitoring wells shall be collected and analyzed. Additional soil vapor monitoring wells may be required based on information from the first two wells.

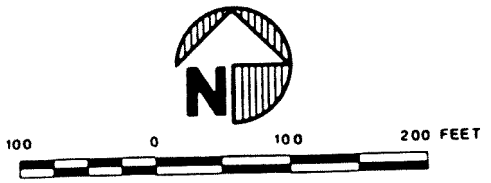
ii. Area 5. In Area 5A, further shallow soil gas sampling shall be performed in the Granite Reef Wash, in the vicinity of sample point 5-102. Based on the results of shallow soil gas sampling, at least one soil vapor monitoring well similar to well 3-213 shall be installed to estimate the extent, areally and vertically, vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from the soil vapor monitoring well shall be collected and analyzed. Additional soil vapor monitoring wells may be required based on information from the first well.

In Area 5B, at least one soil vapor monitoring well similar to well 3-213 shall be installed to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from this soil vapor monitoring well shall be collected and analyzed. Additional soil vapor monitoring wells may be required based on information from the first well.

A soil vapor monitoring well shall be installed in Area 5C at the approximate location shown on Figure 15 in order to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from this soil vapor monitoring well shall be collected and analyzed. Additional soil vapor monitoring wells may be required based on information from the first well.

iii. Area 6. Two soil vapor monitoring wells shall be installed at the approximate locations shown on Figure 16 in order to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from these soil vapor monitoring wells shall be collected and analyzed.





LEGEND

- APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION
- SOIL GAS SAMPLING LOCATION
- EXISTING SOIL VAPOR MONITORING WELL

NOTE

FOR SOIL GAS SAMPLE CONCENTRATION DATA SEE TABLE 13

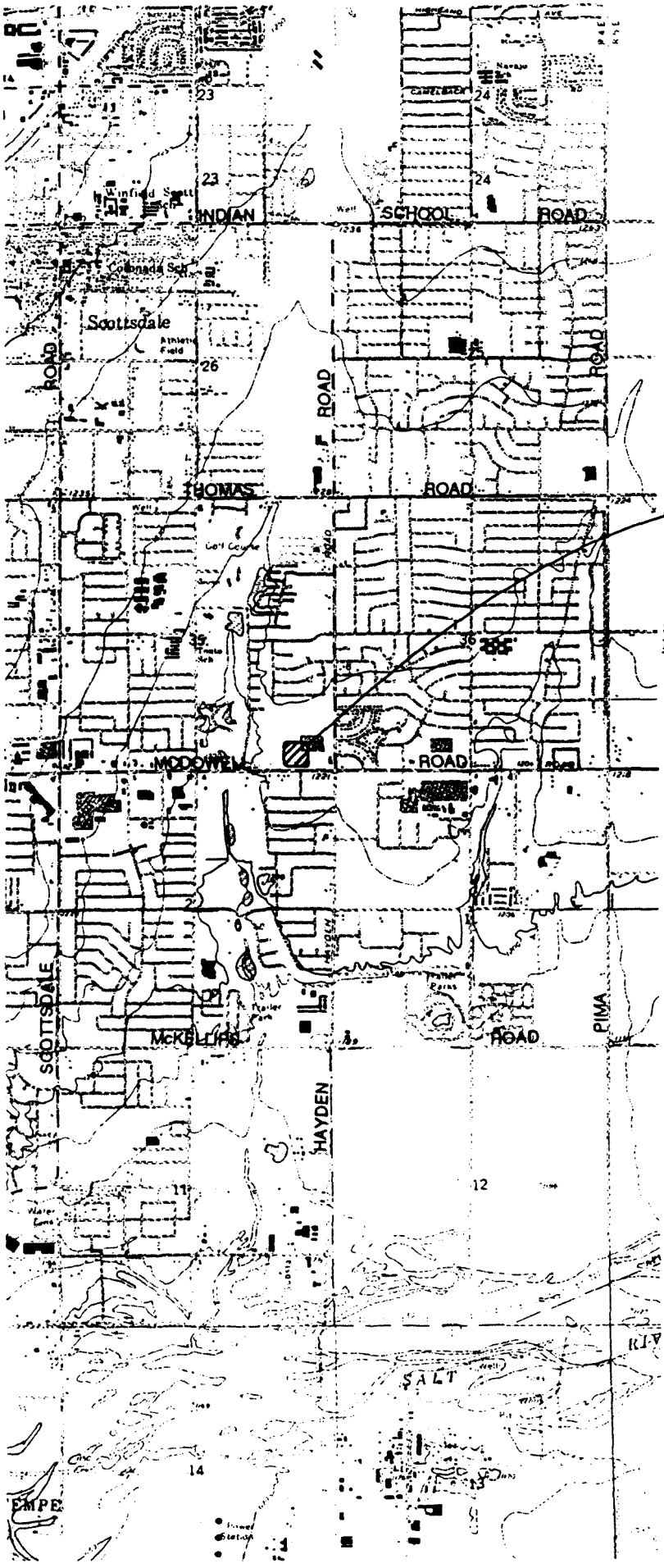
FIGURE 14
AREA 3 SOIL VAPOR MONITORING WELL LOCATIONS
NORTH INDIAN BEND WASH ROD

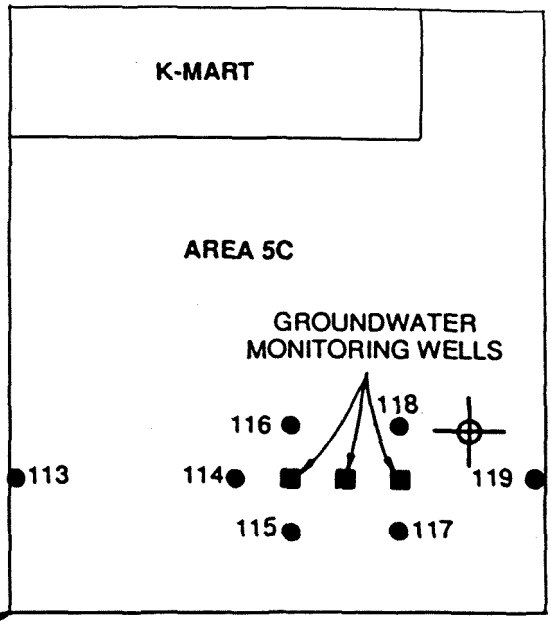
Table 13 Soil Gas Results for Area 3 (µg/l)					
Sampling Location	**TCE**	**1,1,1-TCA**	**PCE**	**1,1-DCE**	**1,2-trans-DCE**
001	20.0	2.60	0.64	5.50	NA
002	10.0	3.40	0.31	19.0	NA
003	4.40	2.30	0.32	ND	NA
004	19.0	2.10	0.46	5.0	NA
005	ND	ND	0.03	ND	NA
006	4.40	1.60	0.73	ND	NA
007	2.00	0.82	0.35	5.30	NA
008	0.22	0.093	0.17	ND	NA
101	14.0	4.30	2.20	7.20	NA
102	15.0	6.50	2.90	5.70	NA
103	17.0	3.70	2.00	3.50	NA
104	ND	0.02	0.04	0.46	NA
105	2.80	3.80	3.40	5.0	NA
106	6.60	ND	2.70	32.0	NA
107	11.0	ND	4.10	35.0	NA
108	ND	0.09	0.03	0.75	NA
109	3.70	0.23	2.60	4.1	NA
110	ND	0.12	0.14	0.24	NA
111	18.0	11.0	1.80	2.60	NA
112	13.0	5.40	2.70	0.14	NA
113	7.60	1.10	0.77	1.20	NA
114	14.0	5.60	2.0	6.80	NA
115	7.60	1.10	0.77	1.20	NA
G001	4.79	0.16	0.31	ND	ND
G002	0.61	ND	0.47	0.28	ND
G003	3.75	0.22	0.60	ND	ND
G004	0.70	0.09	0.35	0.13	ND
G004D	0.85	0.14	0.42	0.13	ND

Table 13
Soil Gas Results for Area 3
(µg/l)

Sampling Location	TCE	1,1,1-TCA	PCE	1,1-DCE	1,2-trans-DCE
G005	6.67	0.34	0.37	0.87	ND
G006	33.4	8.55	1.98	14.0	ND
G007	2.22	0.08	0.31	0.13	ND
P001	0.14	10.0	0.03	0.10	0.01
P002	20.68	137.0	0.46	20.4	0.31
P003	26.6	24.3	0.52	27.9	0.99

Note: ND = not detected.
NA = not analyzed.





SAMPLING LOCATION	SOIL GAS SAMPLE CONCENTRATIONS (µg/l) TCE	1,1,1-TCA	PCE	1,1-DCE
101	ND	0.05	0.01	1.20
102	0.02	0.07	0.04	34.0
103	--	0.03	0.09	1.50
104	ND	2.40	0.05	1.30
105	ND	0.03	0.28	1.30
106	ND	0.10	0.06	0.81
107	ND	0.01	0.40	ND
108	ND	0.01	0.09	1.10
109	ND	0.04	0.11	1.10
110	0.29	0.04	0.13	1.70
111	ND	0.02	0.06	1.10
112	ND	0.02	0.13	2.20
113	3.10	0.01	2.90	20.0
114	3.30	ND	3.10	22.0
115	2.40	ND	3.00	4.80
116	5.40	ND	ND	16.0
117	3.50	0.10	3.40	19.0
118	4.80	0.02	3.80	30.0
119	4.80	ND	3.80	23.0

ND = NOT DETECTED

LEGEND

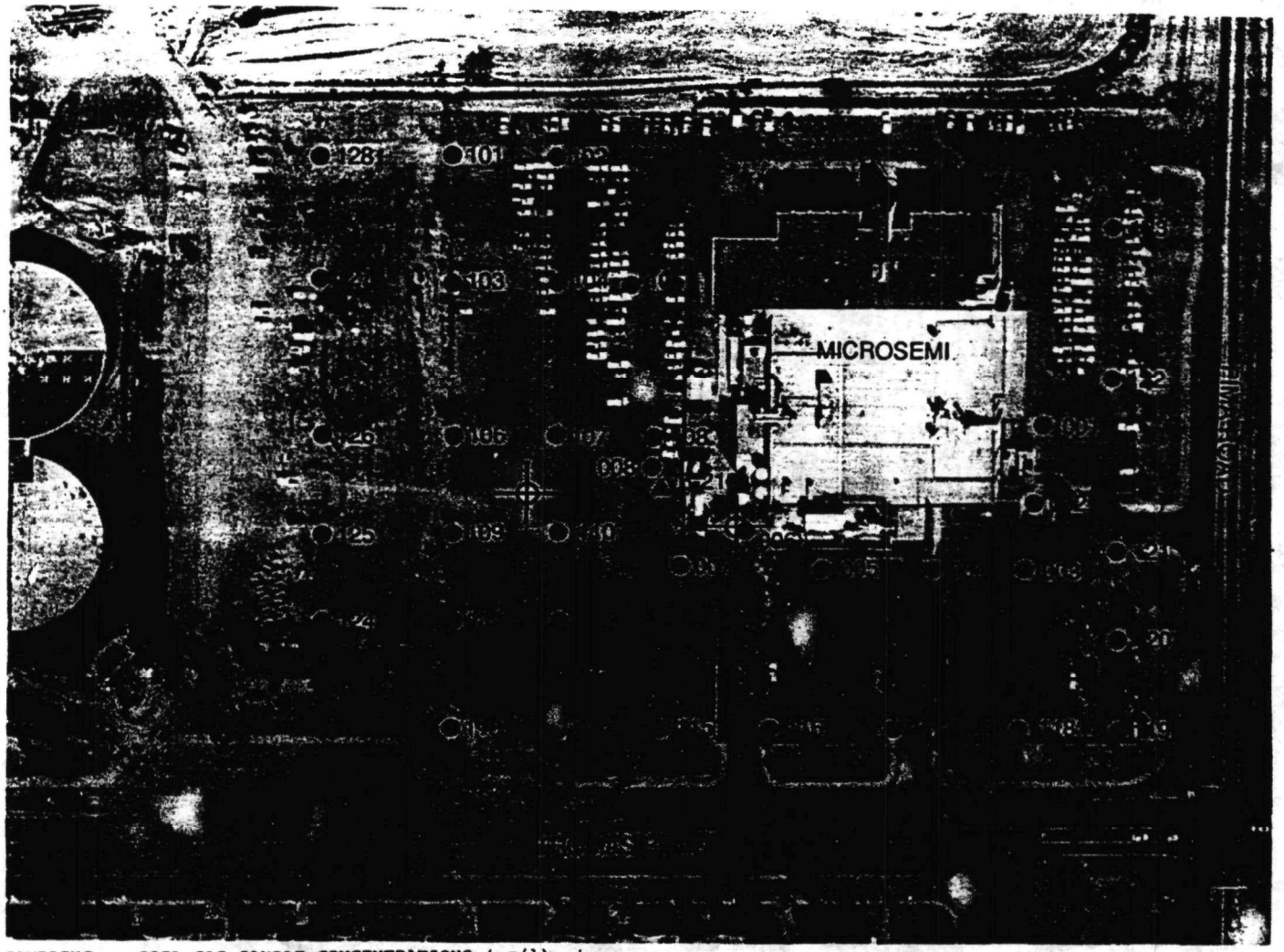
APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION

SOIL GAS SAMPLING LOCATION

N

1000 0 1000 2000 FEET

FIGURE 15
AREA 5 'C' SOIL VAPOR MONITORING WELL LOCATION
NORTH INDIAN BEND WASH ROD



SAMPLING LOCATION	SOIL GAS SAMPLE CONCENTRATIONS (µg/l) TCE	1,1,1-TCA	PCE	1,1-DCE
001	0.30	ND	0.01	ND
002	0.31	0.20	0.01	ND
003	4.50	0.28	0.60	ND
004	1.10	10.0	0.06	ND
005	2.40	1.30	ND	ND
006	19.0	1.80	0.22	ND
007	15.0	0.09	0.31	ND
008	45.0	0.17	0.42	ND
101	3.30	0.02	1.90	180.0
102	4.40	1.90	1.80	170.0
103	8.20	0.10	1.00	ND
104	0.23	4.30	2.40	89.0
105	8.80	0.38	1.50	84.0
106	9.90	ND	0.89	130.0
107	12.0	28.0	1.40	170.0
108	7.50	3.10	1.30	160.0
109	13.0	ND	0.79	220.0
110	10.0	16.0	1.30	120.0
111	8.90	1.40	1.20	140.0
112	6.60	4.60	0.85	67.0
113	ND	ND	ND	ND
114	ND	ND	ND	0.60
115	ND	0.03	ND	3.80
116	5.60	9.50	0.83	120.0
117	ND	1.90	0.70	97.0
118	ND	5.40	0.42	150.0
119	0.07	3.60	ND	17.0
120	0.47	3.40	0.23	110.0
121	0.60	10.0	2.40	150.0
122	ND	1.70	ND	280.0
123	ND	0.58	1.10	130.0
124	6.00	0.22	0.32	130.0
125	1.90	ND	0.59	31.0
126	1.60	0.02	0.21	81.0
127	1.50	0.01	0.61	39.0
128	0.03	ND	0.44	ND

ND = NOT DETECTED

LEGEND

- APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION
- SOIL GAS SAMPLING LOCATION
- EXISTING SOIL VAPOR MONITORING WELL

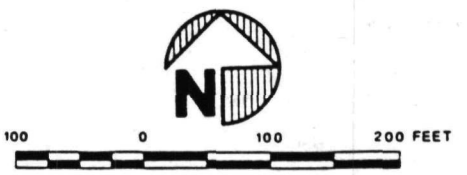


FIGURE 16
AREA 6 SOIL VAPOR MONITORING WELL LOCATIONS
NORTH INDIAN BEND WASH ROD

Additional soil vapor monitoring wells may be required based on information from the first two wells.

iv. **Area 9.** A soil vapor monitoring well shall be installed at the approximate locations shown on Figure 17 in order to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from this soil vapor monitoring well shall be collected and analyzed. Additional soil vapor monitoring wells may be required based on information from the first well.

v. **Area 11.** Two soil vapor monitoring well shall be installed at the approximate locations shown on Figure 18 in order to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from these soil vapor monitoring wells shall be collected and analyzed. Additional soil vapor monitoring wells may be required based on information from the first two wells.

vi. **Area 12.** Five soil vapor monitoring wells shall be installed at the approximate locations indicated on Figure 19 (data values for Figure 19 are presented in Table 14) in order to estimate the extent, areally and vertically, of vadose zone VOC contamination and to estimate its mass. Depth-specific soil gas samples from these soil vapor monitoring wells shall be collected and analyzed. Based on data from these five wells, additional soil vapor monitoring wells shall be installed and sampled, as necessary.

For each of these areas, data from the additional investigations described above shall be used in conjunction with existing information to develop VOC mass estimates as input for analyses with the VLEACH model, or a similar analytical tool determined acceptable by EPA. Mixing-zone calculations shall then be performed to estimate potential impacts on the underlying saturated zone. Values for soil, contaminant, and underlying saturated zone parameters to be used in the application of VLEACH and mixing-zone calculations shall be selected and approved by EPA based on field data from each area.

For areas that demonstrate a threat to ground water based on the VLEACH (or VLEACH equivalent) analysis, the detailed analysis applied to Areas 7 and 8 will be applicable. Therefore, the Soil Vapor Extraction alternative shall be implemented in areas where the vadose zone represents a threat to ground water quality at levels above the in-situ ground-water standards listed in Appendix A. The design of the SVE system for each such area will be designed based upon area-specific conditions. During implementation, samples from soil vapor monitoring wells and the application of VLEACH (or VLEACH equivalent) shall be used to continue to evaluate the necessary scope and duration of the vadose zone remedial action.

Consistent with the decision for Areas 1, 2, 4, 10 and the Scottsdale wells, the No Action alternative shall be selected for areas where the vadose zone does not threaten ground water quality at levels above the standards listed in Appendix A.

SAMPLING LOCATION	SOIL GAS SAMPLE CONCENTRATIONS (µg/l) TCE	1,1,1-TCA	PCE	1,1-DCE
101	3.00	ND	0.49	1.20
102	2.80	ND	0.52	2.40
103	0.64	ND	0.07	0.53

ND = NOT DETECTED

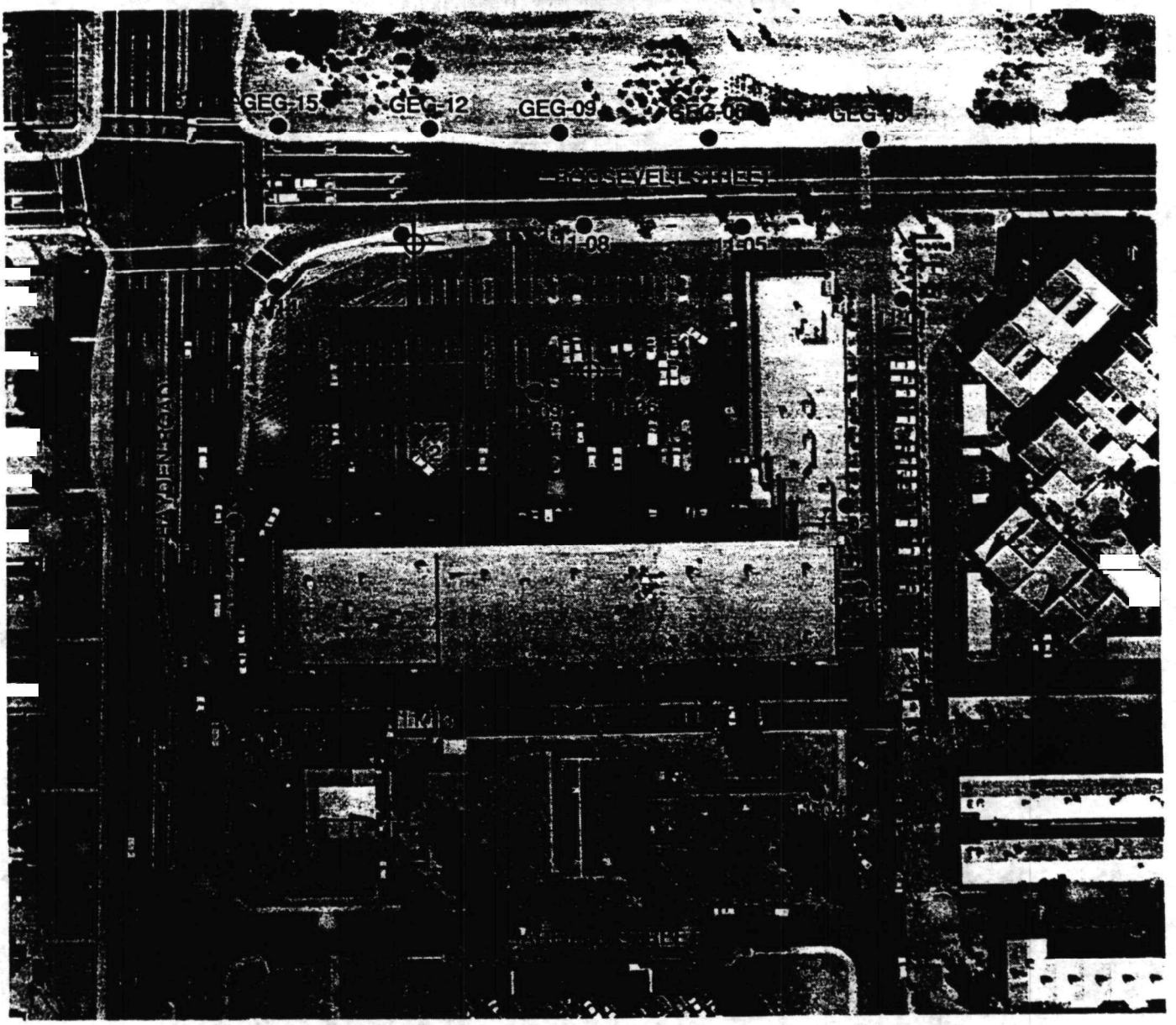
LEGEND

- APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION
- SOIL GAS SAMPLING LOCATION
- EXISTING SOIL VAPOR MONITORING WELL

N

100 0 100 200 FEET

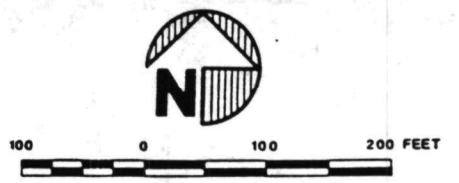
FIGURE 17
AREA 9 SOIL VAPOR MONITORING WELL LOCATION
NORTH INDIAN BEND WASH ROD



LOCATION	VCL	1,1-DCE	CHCL3	1,1,1-TCA	TCE	PCE
11-01	ND	0.49	0.14	ND	21.90	0.40
11-02	ND	0.14	0.07	ND	11.80	0.18
11-03	ND	0.06	0.13	ND	1.08	0.08
11-04	ND	ND	ND	ND	ND	ND
11-05	ND	0.71	0.12	ND	23.30	0.53
11-06	ND	1.08	0.35	ND	37.20	1.54
11-07	ND	ND	ND	ND	2.04	4.55
11-08	ND	1.36	0.54	ND	29.00	0.97
11-09	ND	3.19	1.37	ND	181.00	2.40
11-10	ND	0.20	0.04	ND	4.66	0.19
11-11	ND	1.79	0.34	ND	73.00	1.20
11-12	ND	1.26	0.79	ND	33.20	1.44
11-13	ND	0.13	0.08	ND	6.10	0.17
11-15	ND	1.04	0.29	ND	34.20	1.32
11-16	ND	0.06	0.20	0.02	9.27	0.17
11-17	ND	ND	0.08	ND	10.00	0.15
GEG-03	ND	0.31	0.02	ND	6.73	0.17
GEG-06	ND	0.39	ND	ND	4.43	0.11
GEG-09	ND	0.62	ND	ND	8.43	0.31
GEG-12	ND	1.18	ND	ND	17.60	0.52
GEG-15	ND	0.62	ND	ND	11.90	0.32

CONCENTRATIONS IN µg/l

Note: 11-14 not sampled. Too many buried utilities.

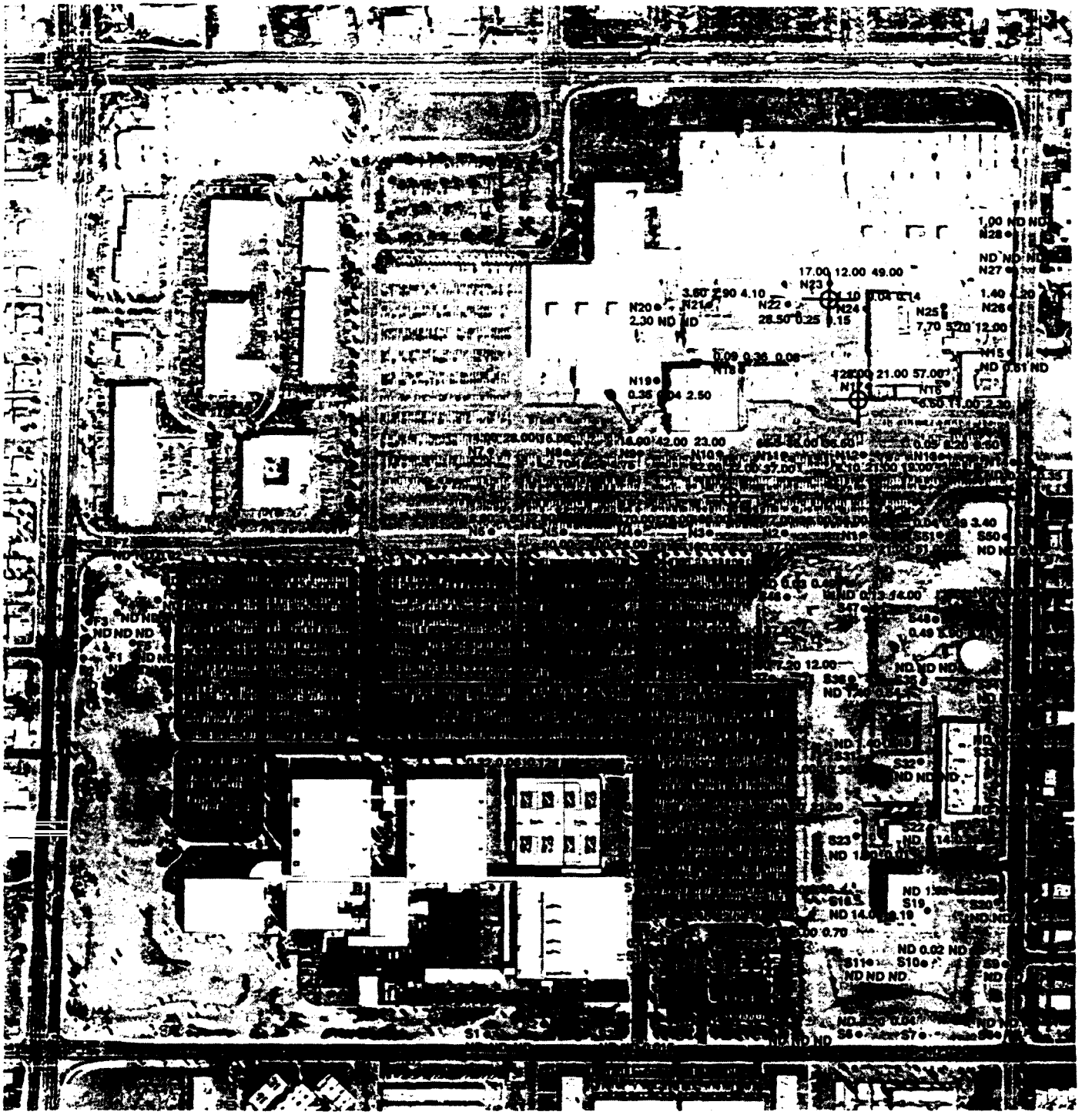


LEGEND

APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION

SOIL GAS SAMPLING LOCATION

FIGURE 18
AREA 11 SOIL VAPOR MONITORING WELL LOCATIONS
NORTH INDIAN BEND WASH ROD



LEGEND

APPROXIMATE ADDITIONAL SOIL VAPOR MONITORING WELL LOCATION

SOIL GAS SAMPLING LOCATION WITH RESULTS FOR DCE, TCE, AND PCE

N

100 0 100 200 FEET

NOTE

FOR SOIL GAS SAMPLE CONCENTRATION DATA SEE TABLE 14

FIGURE 19
AREA 12 SOIL VAPOR MONITORING WELL LOCATIONS
NORTH INDIAN BEND WASH ROD

Table 14
Soil Gas Results for Area 12
(µg/l)

Point	VCL	DCE	TCA	TCE	PCE
F01	<0.01	<0.01	<0.01	<0.01	<0.01
F02A	<0.01	<0.01	<0.01	<0.01	<0.01
F02B	<0.01	<0.01	<0.01	<0.01	<0.01
F03	<0.01	<0.01	<0.01	<0.01	<0.01
F03B	<0.01	<0.01	<0.01	<0.01	<0.01
F04	<0.01	<0.01	<0.01	<0.01	<0.01
F05	<0.01	<0.01	<0.01	<0.01	<0.01
F06	<0.01	<0.01	<0.01	<0.01	<0.01
F07	<0.01	<0.01	<0.01	<0.01	0.02
F08	<0.01	<0.01	<0.01	<0.01	<0.01
N01A	<0.01	18.00	1.60	18.00	56.00
N01B	<0.01	29.00	3.00	24.00	46.00
N02	<0.01	77.00	3.40	39.00	56.00
N03	<0.01	160.00	2.80	62.00	67.00
N04	<0.01	170.00	0.82	76.00	66.00
N05	<0.01	50.00	0.08	29.00	28.00
N06	<0.01	8.60	<0.01	1.80	2.80
N07	<0.01	14.00	0.09	28.00	16.00
N08A	<0.01	2.00	0.07	13.00	2.40
N08B	<0.01	3.40	0.18	24.00	7.10
N09	<0.01	16.00	0.20	42.00	23.00
N10	<0.01	42.00	0.15	32.00	37.00
N11A	<0.01	58.00	1.30	34.00	35.00
N11B	<0.01	75.00	2.20	38.00	38.00
N12	<0.01	8.10	1.10	21.00	19.00
N13	<0.01	0.05	0.57	8.20	8.50
N14	<0.01	<0.01	0.17	0.51	0.35
N15	<0.01	<0.01	<0.01	0.61	<0.01

Table 14
Soil Gas Results for Area 12
(µg/l)

Point	VCL	DCE	TCA	TCE	PCE
N16	<0.01	6.50	0.62	11.00	2.30
N17	<0.01	28.00	45.00	21.00	57.00
N18	<0.01	0.09	0.48	0.36	0.08
N19	<0.01	0.35	0.02	0.04	2.50
N20	<0.01	2.30	<0.01	<0.01	<0.01
N21	<0.01	3.60	0.90	2.90	4.10
N22A	<0.01	32.00	62.00	0.34	12.00
N22B	<0.01	25.00	53.00	0.16	6.30
N23	<0.01	17.00	<0.01	12.00	49.00
N24	<0.01	1.10	0.05	0.04	0.14
N25	<0.01	7.70	<0.01	5.70	12.00
N26	<0.01	1.40	<0.01	4.20	4.70
N27	<0.01	<0.01	<0.01	<0.01	<0.01
N28	<0.01	1.00	51.00	<0.01	<0.01
S01	<0.01	<0.01	0.23	<0.01	<0.01
S02	<0.01	<0.01	0.22	<0.01	<0.01
S03A	<0.01	<0.01	0.02	<0.01	0.03
S03B	<0.01	<0.01	<0.01	<0.01	<0.01
S04A	<0.01	<0.01	0.02	<0.01	<0.01
S04B	<0.01	<0.01	0.02	<0.01	<0.01
S05	<0.01	<0.01	<0.01	<0.01	<0.01
S06	<0.01	<0.01	0.02	3.20	0.04
S07	<0.01	<0.01	<0.01	<0.01	0.05
S08	<0.01	<0.01	<0.01	<0.01	<0.01
S09	<0.01	<0.01	<0.01	<0.01	<0.01
S10	<0.01	<0.01	<0.01	0.02	<0.01
S11	<0.01	<0.01	<0.01	<0.01	<0.01
S12	<0.01	0.11	0.04	25.00	0.70

Table 14
Soil Gas Results for Area 12
(µg/l)

Point	VCL	DCE	TCA	TCE	PCE
S13A	<0.01	0.05	0.08	6.20	0.15
S13B	<0.01	<0.01	0.10	6.90	0.13
S14	<0.01	0.47	0.09	3.70	0.15
S15	<0.01	5.50	0.05	13.00	0.89
S16	<0.01	6.40	1.30	32.00	3.30
S17	<0.01	0.82	0.27	29.00	2.60
S18	<0.01	<0.01	<0.01	14.00	0.19
S19A	<0.01	<0.01	0.03	2.10	0.06
S19B	<0.01	<0.01	0.03	0.94	0.15
S20A	<0.01	<0.01	0.02	<0.01	0.01
S20B	<0.01	<0.01	<0.01	<0.01	<0.01
S21	<0.01	<0.01	<0.01	<0.01	<0.01
S22	<0.01	<0.01	<0.01	0.14	0.28
S23	<0.01	<0.01	<0.01	1.30	0.01
S24	<0.01	2.80	0.82	38.00	21.00
S25	<0.01	26.00	3.60	61.00	15.00
S26	<0.01	0.79	0.15	1.60	0.32
S27	<0.01	0.32	0.11	0.06	0.12
S28	<0.01	0.21	0.05	0.16	0.30
S29A	<0.01	<0.01	<0.01	<0.01	<0.01
S29B	<0.01	<0.01	<0.01	<0.01	<0.01
S30A	<0.01	3.30	0.29	16.00	11.00
S30B	<0.01	3.10	0.20	14.00	9.70
S31	<0.01	<0.01	0.09	1.40	1.40
S32	<0.01	<0.01	<0.01	<0.01	<0.01
S33	<0.01	<0.01	0.02	0.02	0.33
S34	<0.01	<0.01	<0.01	<0.01	0.12
S35	<0.01	<0.01	<0.01	<0.01	<0.01

Table 14
Soil Gas Results for Area 12
(µg/l)

Point	VCL	DCE	TCA	TCE	PCE
S36	<0.01	<0.01	<0.01	1.40	0.54
S37	<0.01	7.00	0.07	7.20	12.00
S38A	<0.01	25.00	0.11	9.00	12.00
S38B	<0.01	18.00	0.06	4.20	7.60
S39	<0.01	16.00	0.01	7.50	8.40
S40	<0.01	1.90	0.11	0.94	0.87
S41	<0.01	0.39	0.02	0.08	0.13
S42	<0.01	0.73	<0.01	0.04	0.24
S43	<0.01	35.00	0.11	25.00	25.00
S44	<0.01	110.00	1.20	38.00	40.00
S45	<0.01	99.00	0.38	31.00	37.00
S46	<0.01	<0.01	<0.01	0.03	0.49
S47	<0.01	<0.01	<0.01	0.13	14.00
S48A	<0.01	0.49	0.26	6.80	7.30
S48B	<0.01	0.49	0.95	5.00	5.60
S49	<0.01	<0.01	<0.01	<0.01	<0.01
S50	<0.01	<0.01	0.02	<0.01	0.01
S51	<0.01	0.04	0.17	0.49	3.40

2. GROUND WATER

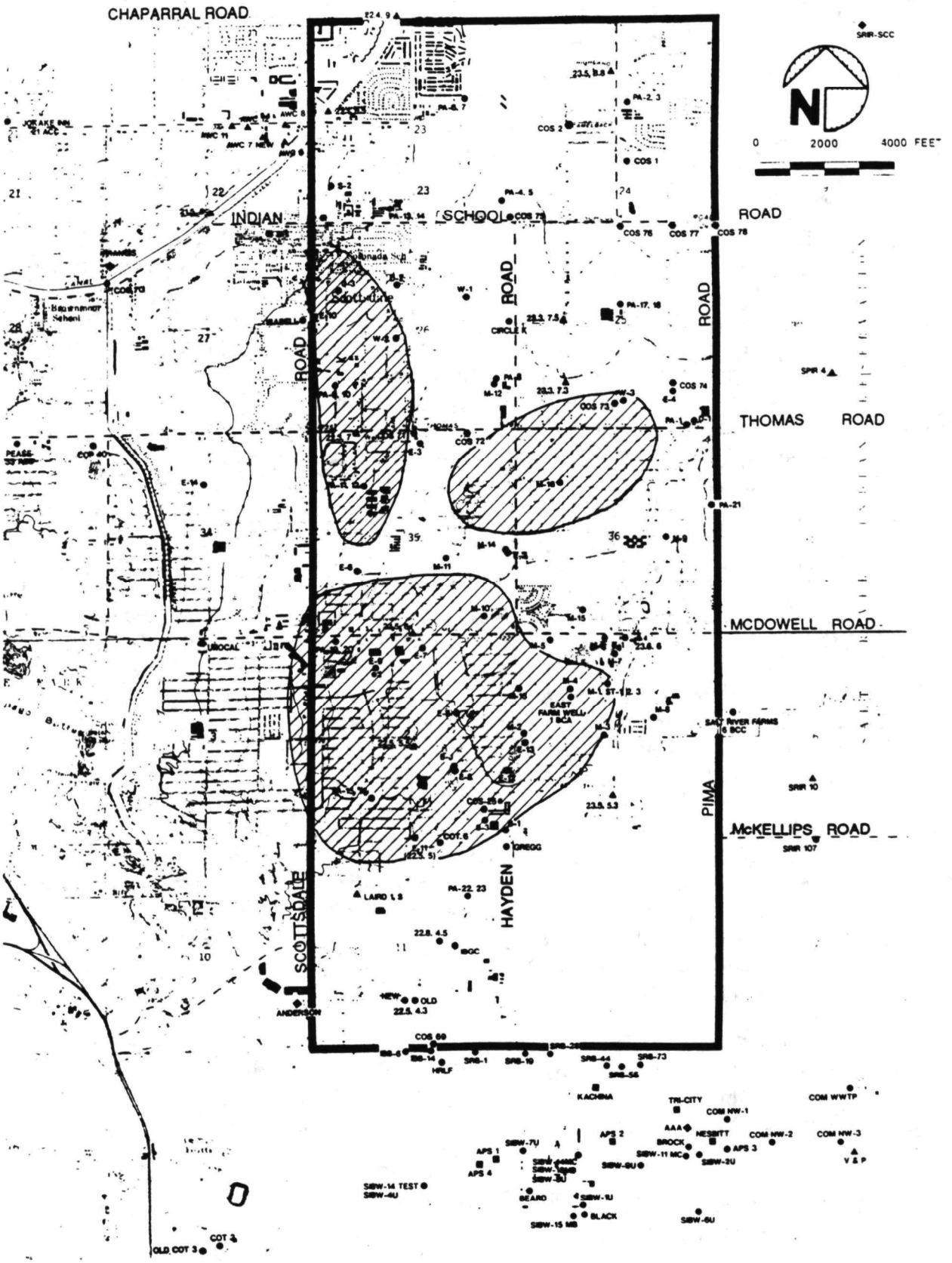
Because current analyses indicate UAU alternatives that include pumping would not significantly reduce the overall ground-water clean-up time when compared with not pumping from the UAU and do not otherwise offer significantly greater protection of human health or the environment, the pumping alternatives appear costly in proportion to their estimated effectiveness. However, in order for a remedy without UAU pumping to be protective, it will be necessary to ensure that the fate of VOCs from the UAU has been characterized accurately. Therefore, EPA is selecting **Monitoring the Fate of VOCs in the UAU without Pumping from the UAU.** This alternative relies upon (1) leakage through the contact of the UAU and the MAU/LAU and (2) flow through wells perforated through the UAU and the MAU and/or LAU to move VOCs in the UAU into the lower units. VOCs then will be captured by the Scottsdale Operable Unit remedy.

Monitoring wells shall be installed in the UAU and MAU to track the fate of VOCs currently present in the UAU. The monitoring well network shall be designed to allow (1) evaluation of the rate of VOC mass reduction in the UAU due to migration of VOCs out of the UAU and (2) evaluation of the locations within the UAU, MAU and LAU to which VOCs presently in the UAU are migrating. If VOC mass in the UAU decreases significantly and continuously, or if uncontaminated areas of the UAU, MAU or LAU become contaminated because of migration of VOCs from the UAU, EPA shall re-evaluate ground-water pumping
from the UAU.

Initially, monitoring wells shall be installed in the UAU and MAU in the three general areas shown on Figure 20 where a contaminated saturated thickness has been identified in the UAU. The monitoring wells shall be installed to attain a density of at least one well in the UAU and MAU for each 40 acres. The exact numbers and locations of wells for each area shall be based upon the most recent indications of the extent of UAU contamination. As necessary, additional wells will be installed to monitor adequately the presence and migration of VOCs.

The 1988 Record of Decision for NIBW selected specific clean-up levels for water treated by the Scottsdale Operable Unit remedy but did not specify requirements for water remaining in place at the completion of remedial action. In this Record of Decision, EPA is selecting, and in some cases revising, standards for water treatment and for ground water left in place.

In the 1988 ROD, EPA selected a water treatment level for PCE corresponding to a one-in-one million (1×10^{-6}) excess cancer risk level because no federal drinking water standard for PCE existed at that time. EPA has now established a 5 micrograms per liter (or 5 parts per billion) MCL for PCE. This level corresponds to an excess cancer risk closer to one-in-one hundred thousand (1×10^{-5}). Because this risk is still low and the total risk will be within the acceptable risk range defined by EPA, EPA is now



LEGEND

COS 78 WELL IDENTIFICATION NUMBER
▲ AGRICULTURAL PRODUCTION WELL
● MUNICIPAL PRODUCTION WELL
● MONITORING WELL(S), TEST HOLES OR DESTROYED WELLS WITH LITHOLOGIC INFORMATION
◆ DOMESTIC PRODUCTION WELL
■ INDUSTRIAL SUPPLY WELL

FIGURE 20
AREAS IN THE UAU WITH A SATURATED THICKNESS ≥ 5 FT. AND CONTAMINATED ABOVE VOC MCLs
NORTH INDIAN BEND WASH ROD

selecting the 5 micrograms per liter MCL for PCE as the required clean-up standard for treated water as well as for ground water left in place at NIBW.

EPA also selected a treated water standard of 0.5 micrograms per liter for chloroform in the 1988 ROD. This standard corresponded to a one-in-one million excess cancer risk level. A federal drinking water standard exists for chloroform, but the standard specifically accounts for cases where chloroform is present as a by-product of chlorination, a process used to kill bacteria that could otherwise cause widespread illness and death. EPA has reassessed the potency of chloroform as a potential cause of cancer in humans. As a result, 6 micrograms per liter of chloroform now corresponds to the one-in-one million excess cancer risk level. Therefore, EPA is selecting 6 micrograms per liter as the required clean-up standard for both treated water and for ground water left in place at NIBW.

For most other VOCs at NIBW, EPA is selecting the MCLs as the required clean-up standards for both treated water and ground water left in place. Proposed MCLs and ADEQ Human Health-Based Guidance Levels will be the treated water and ground-water standards for certain other substances. As a result, the overall excess cancer risk from NIBW will be at most on the order of one-in-one hundred thousand, which is within EPA's acceptable risk range of 10^{-4} - 10^{-6}. Because some blending of water is likely within the municipal supply system and most VOCs will be well below their maximum allowable levels, the actual risk is expected to be even lower.

J. STATUTORY DETERMINATIONS

1. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

EPA believes the combination of SVE, ground-water monitoring and the previously selected Scottsdale Operable Unit remedy (including modifications, as necessary) is protective of human health and the environment.

Based on sampling performed at the site, EPA considers potential direct human exposures to VOCs in the vadose zone and surface water at NIBW to be minimal. Therefore, no measures are being required specifically to further reduce potential direct exposures, although the Soil Vapor Extraction designed for ground-water protection will, in fact, reduce the amount of VOCs available for potential direct exposures from the vadose zone.

At NIBW, the principal risk to human health is through contact with and ingestion of contaminated ground water. By removing from the vadose zone VOCs that could threaten ground-water quality and by carefully monitoring the fate of VOCs currently present in the UAU, the selected alternatives will help to ensure that the ground water underlying NIBW is returned to levels acceptable for drinking water use in a reasonable timeframe. In addition, water extracted from the MAU and LAU as part of

the site remedy shall be treated to meet all state and federal drinking water standards. The remedy shall attain an excess cancer risk level within the 10^{-4} - 10^{-6} risk range, and the Hazard Index for all non-cancer endpoints shall be less than 1.

During implementation, careful installation of the soil vapor monitoring and extraction wells and of the additional ground-water monitoring wells will prevent any unacceptable short-term risks.

2. COMPLIANCE WITH ARARS

Appendix A identifies the ARARs and other criteria for NIBW. The selected alternatives shall comply with all ARARs and other critieria identified in Appendix A.

3. COST-EFFECTIVENESS

The remedial actions selected by EPA for NIBW are cost-effective in that their costs are proportionate to their effectiveness.

EPA considers the costs for the selected vadose zone alternatives to be proportionate to their effectiveness in removing the potential for hundreds of years of ground-water contamination and avoidance of the substantial monitoring and clean-up costs that such contamination would entail.

Additional monitoring with no ground-water extraction from the UAU is cost-effective in that it will maximize the use of the investment in pumping from the MAU and LAU without sacrificing assurances about the fate of VOCs from the UAU.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA believes the alternatives selected for NIBW utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. EPA has determined that the selected alternatives provide the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; short-term effectiveness; implementability; and cost, considering State and community acceptance.

The SVE alternative will reduce the mobility and volume of VOCs, permanently eliminating a long-term threat to ground water without unreasonable costs or significant short-term negative impacts. The substantial period of time over which ground water quality could be impaired with no action was the significant factor in selecting SVE.

The Arizona Department of Environmental Quality has expressed a strong preference for ground-water extraction from the UAU and has requested that EPA evaluate additional UAU extraction alternatives. However, EPA believes the selected UAU alternative will provide essentially equivalent long-term effectiveness, with easier

implementation, less short-term risk, and at less cost, than alternatives that include UAU ground-water extraction. In addition, the required monitoring will provide data to evaluate whether or not the selected UAU alternative is actually effective and protective.

5. Preference for Treatment as a Principal Element

Although EPA is not selecting pumping and treatment of ground water from the UAU, the SVE systems and the Scottsdale Operable Unit air stripping facility (including vapor phase carbon adsorption) satisfy the statutory preference for the use of remedies that include treatment as a principal element.

K. SIGNIFICANT CHANGES

1. UAU AREAS REQUIRING MONITORING

Since the release of the RI/FS and Proposed Plan for public comment, recent data indicate additional areas of the UAU have sufficient saturated thickness and ground-water contaminant concentrations to warrant monitoring as part of the selected UAU ground-water alternative. Figure 20 indicates the UAU areas requiring monitoring based on recent information.

2. ARARs

Based on comments received during the public comment period, some ARARs or other criteria not included in the RI/FS are identified in this ROD. For example, the Arizona Aquifer Water Quality Standard of 50 µg/l is the most stringent ARAR for chromium. In addition, the vinyl chloride MCL of 2 µgl shall be an ARAR. ADEQ Human Health-Based Guidance Levels also have been considered in the selection of final clean-up requirements. All ARARs and other criteria with which the Scottsdale Operable Unit remedy and the remedies selected in this ROD shall comply are identified in Appendix A.

Appendix A
ARARs AND OTHER CRITERIA FOR NIBW

Appendix A
ARARs AND OTHER CRITERIA FOR NIBW

This appendix identifies ARARs and other criteria to be considered (TBCs) for the selected remedial actions for NIBW.

CHEMICAL-SPECIFIC ARARs AND TBCs

Table A-1 presents chemical-specific ARARs and other criteria for water arranged by chemical compound. The major regulations which contribute to the list of potential chemical-specific ARARs are the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), and Arizona Water Quality Standards for Navigable Waters. The chemical-specific TBCs for the NIBW site include (1) Arizona Department of Environmental Quality (ADEQ) Human Health-Based Guidance Levels for Contaminants in Drinking Water and Soil (HBGLs), (2) Federal Health Advisories, and (3) proposed ADEQ Water Quality Standards.

The SDWA Maximum Contaminant Level (MCL) standards are based on human consumption of water for drinking, cooking, bathing, etc. Economic considerations and technical feasibility of treatment processes are included in the justification for these levels. MCLs are applicable to the quality of drinking water at the tap pursuant to the Safe Drinking Water Act and are ARAR for treated ground water when the end use is drinking water.

Pursuant to 40 C.F.R. Section 300.430(e)(2)(i)(B), MCLs and non-zero Maximum Contaminant Level Goals are relevant and appropriate as in-situ aquifer standards for ground water that is or may be used for drinking water.

ADEQ Aquifer Water Quality Standards [A.R.S. Section 49-223 and implementing regulations] generally are identical to SDWA MCLs at this time, and therefore are not referenced in Table A-1. One notable exception is the 50 µg/l chromium Aquifer Water Quality Standard, which is more stringent than the current MCL and therefore is an ARAR and the selected water treatment standard for chromium for NIBW.

The CWA Water Quality Criteria are designed to protect aquatic life (both marine and freshwater). These standards are expressed on the bases of acute and chronic toxicity levels. Both the Federal Water Quality Criteria and the State Water Quality Standards for Navigable Waters [A.R.S. Section 49-221 and implementing regulations] are ARAR for surface-water discharges.

Table A-1
Chemical-Specific ARARs and Other Criteria for NIBW
(concentrations in µg/l)

Compound	Applicable or Relevant and Appropriate				Other Criteria to be Considered								Selected NIBW Cleanup Standard for Treated Water and In Situ Ground Water
			AWQC				U.S. EPA Health Advisories					ADEQ HBGLs for Water	
	SDWA MCL	SDWA MCLG	Toxicity	10^{-6} Cancer Risk	SDWA Proposed MCL	SDWA Proposed MCLG	1-day 10 kg	10-day 10 kg	Longer Term 10 kg	Longer Term 70 kg	Lifetime 70 kg		
1,1,1-Trichloroethane	200	200	19,000		200		140,000	35,000	35,000	125,000	1,000	200	200
1,1-Dichloroethane													
1,1-Dichloroethene	7	7		0.033			1,000	1,000	1,000	3,500	350	7	7
1,1,2-Trichloro-2,2,1-Trifluoroethane													
1,2-Dichloroethane	5			0.94	5		740	740	740	2,600	N/A	0.38	5
1,3-Dichlorobenzene							8,930	8,930	8,930	31,250	3,125	620	620
1,2-Dichloropropane	5					6		90				0.56	5
Methyl Ethyl Ketone							75,000	7,500	2,500	8,600	860	170	170
4-4'-DDT				>.0012								0.10	
Acetone												700	
Benzene	5			0.67	5		233	233	N/A	N/A	N/A	1.3	5
Bis(2-ethylhexyl)phthalate			21,000		4	0						3	4
Bromodichloromethane	100											0.19	100
Bromoform	100											0.19	100
Carbon Tetrachloride	5			0.42			4,000	160	71	250	N/A	0.27	5
Chlorobenzene	100	100				60	1,800	1,800	9,000	3,000	3,150	100	100
Chloroform	100			6								6	6
Dibromochloromethane												0.19	
Di-n-butylphthalate			44,000		4								4
Di-n-octyl phthalate													
Methylene chloride					5	0						4.7	5

Table A-1
Chemical-Specific ARARs and Other Criteria for NIBW
(concentrations in µg/l)

Compound	Applicable or Relevant and Appropriate				Other Criteria to be Considered								Selected NIBW Cleanup Standard for Treated Water and In Situ Ground Water
			AWQC				U.S. EPA Health Advisories						
									Longer Term				
	SDWA MCL	SDWA MCLG	Toxicity	10^{-6} Cancer Risk	SDWA Proposed MCL	SDWA Proposed MCLG	1-day 10 kg	10-day 10 kg	10 kg	70 kg	Lifetime 70 kg	ADEQ HBGLs for Water	
Styrene	100	100				140	27,000	20,000	20,000	70,000	7,000	5	100
Tetrachloroethene	5			0.88		0	N/A	34,000	1,940	6,800	N/A	0.67	5
Toluene	1,000	1,000	15,000			2,000	18,000	6,000	N/A	N/A	10,100	2,000	1,000
Trans-1,2-dichloroethene	100	100				70	2,720	1,000	1,000	3,500	350	100	100
Trichloroethene	5			2.8	5							3.2	5
Trichlorofluoromethane												2,100	2,100
Vinyl Chloride	2	0		2								0.02	2
Aluminum	20											73	20
Antimony		3	146		5/10			15				3	5
Arsenic	50			0.0025		50	50	50	50	50	50	50	50
Barium	2,000	2,000									1,800	5,000	2,000
Beryllium				0.0039	1	0						0.007	1
Boron													
Cadmium	5	5	10				43	8	5	18	18	5	5
Chromium	100	100	50				1,400	1,400	240	840	170	100	50
Copper	1,000				1,300	1,300						1,300	1,000
Lead	50		50			20			20 µg/day	20 µg/day	20 µg/day	20	50
Mercury	2	2	10			3					5.5	2	2
Nickel			15.4		100	100		1,000				100	100
Selenium	50	50	10			45						45	50
Silver	50		50									50	50

Table A-1
Chemical-Specific ARARs and Other Criteria for NIBW
(concentrations in µg/l)

Compound	Applicable or Relevant and Appropriate				Other Criteria to be Considered								Selected NIBW Cleanup Standard for Treated Water and In Situ Ground Water
			AWQC				U.S. EPA Health Advisories						
									Longer Term				
	SDWA MCL	SDWA MCLG	Toxicity	10^{-6} Cancer Risk	SDWA Proposed MCL	SDWA Proposed MCLG	1-day 10 kg	10-day 10 kg	10 kg	70 kg	Lifetime 70 kg	ADEQ HBGLs for Water	
Strontium													
Vanadium												7	
Zinc	5,000		5,000									5,000	5,000

Notes: ADEQ = Arizona Department of Environmental Quality.
AWQC = Ambient Water Quality Criteria; adjusted for consumption of drinking water only; fish ingestion component removed (U.S. EPA, 1986).
AWQC (10^{-6}) = The Ambient Water Quality Criteria resulting in a 10^{-6} excess lifetime cancer risk.
MCL = Maximum Contaminant Level.
MCLG = Maximum Contaminant Level Goal.
SDWA = Safe Drinking Water Act, 40 CFR 141, November 15, 1985.
U.S. EPA Health Advisories:
1-day/10 kg = Concentration of compound in drinking water that could pose a risk if consumed by a 10-kg child for 1 day.
10-day/10 kg = Concentration of compound in drinking water that could pose a risk if consumed by a 10-kg child for 10 days.
Longer Term/10 kg = Concentration of compound in drinking water that could pose a risk if consumed by a 10-kg child for more than 10 days.
Longer Term/70 kg = Concentration of compound in drinking water that could pose a risk if consumed by a 70-kg adult for more than 10 days.
Lifetime/70 kg = Concentration of compound in drinking water that could pose a risk if consumed by a 70-kg adult for a lifetime.

Federal Health Advisories are criteria developed by either EPA's Office of Drinking Water Health Advisory Program or the National Academy of Sciences (NAS). The Federal Health Advisories are based on NAS-Suggested Non-Adverse Response Levels (SNARLS) at which no known or anticipated adverse human health effects would occur, given an adequate margin of safety. ADEQ HBGLs have been selected as water treatment standards for 1,3-dichlorobenzene, methyl ethyl ketone, and trichlorofluoromethane. ADEQ HBGLs are also to be considered for direct exposure threats from potential soil ingestion.

LOCATION-SPECIFIC ARARs AND TBCs

Table A-2 identifies the location-specific ARARs and other criteria for NIBW. Location-specific ARARs differ from chemical-specific or action-specific ARARs in that they are not as closely related to the characteristics of the wastes at the site, or to the specific remedial alternative under consideration. Location-specific ARARs are concerned with the area in which the site is located. Actions may be required to preserve or protect aspects of the environment or cultural resources of the area that may be threatened by the existence of the site, or by the remedial actions to be undertaken at the site.

ACTION-SPECIFIC ARARs AND TBCs

Table A-3 identifies action-specific ARARs and other for NIBW. The actions included in Table A-3 are components of remedial actions selected in this ROD and the remedial action selected in the 1988 ROD (the Scottsdale Operable Unit remedy).

Further identification and discussion of OSHA requirements, air emissions requirements, and additional State ARARs and other criteria are provided following Table A-3.

Table A-2
Location-Specific ARARs and Other Criteria for NIBW

Location	Requirement	Prerequisite(s)	Citation	ARAR	Comments
1. Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; treatment, storage, or disposal.	40 CFR 264.18(b) (R18-8-264)	ARAR	Portions of the NIBW site are located within a 100-year floodplain. A RCRA facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.
2. Within floodplain	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	Executive Order 11988, Protection of Floodplains (40 CFR 6, Appendix A)	ARAR	Federal agencies are directed to ensure that planning programs and budget requests reflect consideration of flood-plain management, including the restoration and preservation of such land as natural undeveloped floodplains. If newly constructed facilities are to be located in a floodplain, accepted floodproofing and other flood control measures shall be undertaken to achieve flood protection. Whenever practical, structures shall be elevated above the base flood level rather than filling land. As part of any Federal plan or action, the potential for restoring and preserving floodplains to their natural beneficial values can be realized must be considered. Crossing of the IBW with piping or location of wells in the 100-year floodplain will be designed to result in no impact to flood surface profiles. Any potential pipe or well breakage due to flooding will likely not introduce new contamination because of the regional nature of the UAU contamination.
3. Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts.	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data.	National Archaeological and Historical Preservation Act (16 USC Section 469); 36 CFR Part 65	ARAR	The NIBW is essentially completely developed. Artifacts have been found in areas near NIBW.
4. Critical habitat upon which endangered species or threatened species depends	Action to conserve endangered species or threatened species, including consultation with the Department of the Interior.	Determination of endangered species or threatened species.	Endangered Species Act of 1973 (16 USC 1531 et seq.); 50 CFR Part 200, 50 CFR Part 402	ARAR	No endangered species are known to exist on the NIBW site.

Table A-2
Location-Specific ARARs and Other Criteria for NIBW

Location	Requirement	Prerequisite(s)	Citation	ARAR	Comments
5. Wetland	Action to minimize the destruction, loss, or degradation of wetlands. Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Executive Order 11990 Section 7.	Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A); Clean Water Act Section 404; 40 CFR Parts 230, 231	ARAR	If wetlands are located within the area of proposed Federal activities, the agency must conduct a Wetlands Assessment. If there is no practical alternative to locating in or affecting the wetland, the Agency shall act to minimize potential harm to the wetland. The Clean Water Act prohibits discharge of dredged or fill material into wetlands without a permit. Assessments will be performed at potential areas of activity (e.g., monitoring well installation) to identify wetlands and potential means of minimizing impacts.
6. Area affecting stream or river	Action to protect fish or wildlife.	Diversion, channeling, or other activity that modifies a stream or river and affects fish or wildlife.	Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40 CFR 6.302	ARAR	The Fish and Wildlife Coordination Act requires consultation with the Department of Fish and Wildlife prior to any action that would alter a body of water of the United States. This requirement could be applicable to any action that would result in modification of the Aqua Fria or Gila Rivers. NIBW actions will likely improve the quality of IIBW ponds. Spillage to the Gila River is infrequent and would likely not affect the Gila River. Fish in NIBW ponds are not there by natural causes, they are stocked.
7. Hazardous waste site	Actions to limit worker exposure to hazardous wastes or hazardous substances, including training and monitoring.	Construction, operations and maintenance or other activities with potential worker exposure.	28 CFR 1910.120	ARAR	

Table A-3
Action-Specific ARARs and Other Criteria for NIBW

Sheet 1 of 2

Action	Requirements	Prerequisites	Citation	ARAR	Comments
Air Stripping	RCRA standards for control of emissions of volatile organics.	RCRA hazardous waste.	40 CFR Subparts AA & BB	ARAR	The proposed standard requires reduction of VOC emissions from "product accumulator vessels," and leak detection and repair programs. Product accumulator vessels include air strippers.
	Control of air emissions of volatile organics and gaseous contaminants.	Emission of VOCs or gaseous air contaminants.	Maricopa County Rules 210, 320, 330.	TBC	
Container Storage (Onsite)	Containers of hazardous waste must be: • Maintained in good condition • Compatible with hazardous waste to be stored • Closed during storage (except to add or remove waste)	RCRA hazardous waste (listed or characteristic) held for a temporary period before treatment, disposal, or storage elsewhere, (40 CFR 264.10) in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled).	40 CFR 264-171 (R18-18-264.170, et seq.) 40 CFR 264.172 40 CFR 264.173	ARAR ARAR ARAR	These requirements are applicable or relevant and appropriate for any contaminated soil or ground water or treatment system waste that might be containerized and stored onsite prior to treatment or final disposal. Ground water or soil containing a listed waste must be managed as if it were a hazardous waste so long as it contains the listed waste.
	Inspect container storage areas weekly for deterioration.		40 CFR 264.174	ARAR	
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids.		40 CFR 264.175	ARAR	
	Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.				
	Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176	ARAR	
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177	ARAR	
	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178	ARAR	

Table A-3
Action-Specific ARARs and Other Criteria for NIBW

Action	Requirements	Prerequisites	Citation	ARAR	Comments
Direct Discharge of Treatment System Effluent	Applicable Federal water quality criteria for the protection of aquatic life must be complied with when environmental factors are being considered.	Surface discharge of treated effluent.	50 FR 30784 (July 29, 1985)	ARAR	See the initial screening table for chemical-specific ARARs.
	Arizona State Water Quality Standards for Navigable Waters	Discharge to navigable waters.	ARS 49-221	ARAR	
Treatment	Standards for miscellaneous units (long-term retrievable storage, thermal treatment other than incinerators, open burning, open detonation, chemical, physical, and biological treatment units using other than tanks, surface impoundments, or land treatment units) require new miscellaneous units to satisfy environmental performance standards by protection of ground water, surface water, and air quality, and by limiting surface and subsurface migration.	Treatment of hazardous wastes in units not regulated elsewhere under RCRA (e.g., air strippers).	40 CFR 264 (Subpart X)	ARAR	The substantive portions of these requirements will be applicable or relevant and appropriate to the construction, operation, maintenance, and closure of any miscellaneous treatment unit (a treatment unit that is not elsewhere regulated) constructed on the NIBW site for treatment and/or disposal of hazardous site wastes.
	Treatment of wastes subject to ban on land disposal must attain levels achievable by best demonstrated available treatment technologies (BDAT) for each hazardous constituent in each listed waste. BDAT standards are based on one of four technologies or combinations: for wastewaters (1) steam stripping; (2) biological treatment; or (3) carbon adsorption (alone or in combination with (1) or (2); and for all other wastes (4) incineration. Any technology may be used, however, if it will achieve the concentration levels specified.	Treatment of LDR waste.	40 CFR 268 (Subpart D)	ARAR	The substantive portions of these requirements are applicable to the disposal of any NIBW site wastes that can be defined as restricted hazardous wastes. The substantive portions of these requirements are relevant and appropriate to the treatment prior to and disposal of any NIBW site wastes that contain components of restricted wastes in concentrations that make the site wastes sufficiently similar to the regulated wastes. The requirements specify levels of treatment that must be attained prior to land disposal.
	Regulations for land-based corrective actions at RCRA facilities.	Land-based remedial action.	40 CFR Subpart S (Revised)	TBC	
Ground-Water Well Installation, Development, Testing, and Sampling	Any nonwaste material (e.g., ground water or soil) that contains a listed hazardous waste must be managed as if it were a hazardous waste.	Nonwaste material containing listed hazardous waste	RCRA "continued in" principle	ARAR	
Ground-Water Monitoring	Ground-water monitoring at new or existing RCRA disposal units.	Creation of a new disposal unit, remedial actions at an existing RCRA unit or disposal of RCRA hazardous waste	40 CFR, Subpart F	ARAR	

THE OCCUPATIONAL SAFETY AND HEALTH ACT (29 CFR 1910.120)

The Occupational Safety and Health Act (OSHA) requirements for worker protection, training, and monitoring are applicable to remedial actions at the NIBW site, and will also be applicable to the operation and maintenance of any treatment facilities, containment structures, or disposal facilities remaining onsite after the remedial action is completed.

OSHA regulates exposure of workers to a variety of chemicals in the workplace, and specifies training programs, health and environmental monitoring, and emergency procedures to be implemented at facilities dealing with hazardous waste and hazardous substances.

AIR EMISSIONS REQUIREMENTS

The Clean Air Act (CAA) has been implemented through a series of regulations (40 CFR 50-99) that define the air quality management programs used to achieve the CAA goals. The State of Arizona is responsible for preparation of a State Implementation Plan (SIP), which describes how the air quality programs will be implemented to achieve compliance with primary standards. Upon meeting the primary standards, an area is classified as "in attainment." The SIP must also identify how the programs will maintain attainment status for each of the primary pollutants. NIBW remedial actions must comply with the substantive requirements of the CAA and its related programs, including the EPA-approved Arizona SIP.

RCRA standards for control of VOC air emissions from units such as air strippers are found at 40 CFR Subparts AA and BB. These standards require reductions, but do not include specific numeric standards.

Recent guidance on control of air emissions from air strippers used at Superfund sites for ground-water treatment is to be considered for air stripper emissions at NIBW. Controls are most needed on sources with an actual emissions rate of 3 lb/hr or 15 lb/day or a potential rate of 10 tons per year of total VOCs because VOCs are ozone precursors (EPA OSWER Directive 9355.0-2.8, June 1989). The basis of the need for control indicates this guidance to be considered for SVE emissions at NIBW as well.

Maricopa County Rules 210, 320, and 330 are criteria to be considered for air emissions at NIBW. Maricopa County's January 1991 guidelines for implementing Rule 210 require VOC air emission controls for remediation sites where total uncontrolled VOC air emissions would exceed 3 pounds per day. The air emission controls must have an overall efficiency of at least 90 percent. These criteria are selected as the air emission standards for NIBW based on a consideration of the potential aggregate impacts of the numerous air stripping and soil vapor extraction systems that likely will be in operation at the site.

ADDITIONAL STATE ARARs AND TBCs

Portions of the Arizona statutory code for cleanup of hazardous substances related to contaminated ground water ("Arizona superfund", Ariz. Rev. Statute Section 49-282, et seq.) and implementing regulations (Ariz. Ad. Code R18-7-109, et seq.) are applicable or relevant and appropriate to the NIBW site. The implementing regulations incorporate by reference state law provisions that (1) establish that all definable aquifers are drinking water aquifers unless they qualify for an aquifer exemption and (2) establish water quality standards for these aquifers. Finally, the Arizona Superfund statute and regulations require that, to the extent practicable, NIBW remedial actions provide for the control, management, or cleanup of hazardous substances so as to allow the maximum beneficial use of the waters of the state.

Section 45-454.01 of the Arizona Groundwater Management Act (GMA) [A.R.S. Sections 45-454.01] is applicable or relevant and appropriate to the NIBW site. The remedial action selected in the 1988 ROD (Scottsdale Operable Unit remedy) requires an offsite use of the treated ground water. All offsite uses are subject to state law outside the context of the Superfund action. However, for activities conducted onsite, the substantive portions of the provisions referenced within Section 45-454.01 of the GMA shall be applicable or relevant and appropriate.

The Arizona Department of Water Resources well spacing guidelines are TBC.