Health Consultation

NORTH INDIAN BEND WASH, AREA 7 GROUNDWATER EXTRACTION AND TREATMENT FACILITY

SCOTTSDALE, MARICOPA COUNTY, ARIZONA

EPA FACILITY ID: AZD980695969

MARCH 8, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

Arizona Department of Health Services
Office of Environment Health
Environmental Health Consultation Services
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

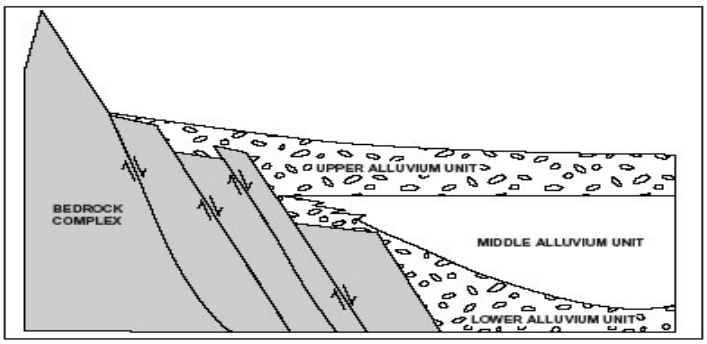
Introduction

The North Indian Bend Wash (NIBW) Superfund site was added to the National Priorities List in 1983. Three (3) companies are identified as potentially responsible parties for contributing to the contamination of groundwater beneath this site; Motorola, Siemens, and SmithKline Beacham. The Area 7 Groundwater Extraction and Treatment System (GWETS) was placed into service to remove volatile organic compounds (VOCs) from contaminated aquifers. During the operation of this facility, community members became concerned over the possibility of health risks associated with VOC emissions being produced by the air stripper at this site. Releases of trichloroethylene (TCE), perchloroethylene (PCE), and chloroform were of particular interest to local residents and businessmen. In response to a request from the NIBW Community Involvement Group, the Arizona Department of Health Services (ADHS) reviewed existing data and performed a health consultation to evaluate the potentially adverse health effects due to VOCs created by air emissions from the Area 7 Treatment System.

Background

Area 7 is located at the southeast corner of 75th Street and 2nd Street in the City of Scottsdale, Maricopa County, Arizona. The groundwater treatment system is located in the southeast corner of Area 7 in an area approximately 56 feet by 75 feet. The Area 7 GWETS shares the corner of 75th and 2nd Streets with an industrial manufacturing facility. The vicinity of Area 7 includes the Scottsdale Shopping Mall to the northeast, the Scottsdale Stadium (Spring and Fall League professional baseball) to the southeast, a parking lot to the south, and residential single-family houses and commercial buildings to the north. Within ½ mile of the site are: two (k-12) schools, one hospital, and one nursing home. Demographics from the US Census Bureau (2000) estimate that this zip code (85251) has an estimated population of 37,890. The race and ethnicity make-up is 75% white, 12% black, 12% latino. The age groups and percentages are as follows: < 5 years old 6.8%, > 18 years old 74%, and > 65 years old 16.7%.

Before environmental regulations were established to protect groundwater supplies from industrial waste, local industries could disposed of their unwanted organic solvents either directly onto the ground, or they could inject them into dry wells. Several industries within the NIBW site engaged in this practice until the 1970's, which resulted in the local contamination of groundwater. The solvents traveled through the soil matrix contaminating the upper, middle, and lower aquifers with VOC's (see Figure 1).



Source: EPA, *North Indian Bend Wash, Proposed Plan* 2001

Figure 1. Components of Groundwater Aquifers

The current levels of VOC's in the groundwater exceed the water quality standards established by the US Environmental Protection Agency (EPA). Maximum Contaminant Levels (MCLs) are enforceable values established by the EPA to protect public health. The purpose of the Area 7 Middle Alluvial Unit (MAU) groundwater remediation system is to both contain and capture the highest concentrations of VOCs immediately down gradient of Area 7.

The system used at Area 7 uses ultraviolet oxidation (UV/Ox) to remove approximately 80 to 90 percent of the NIBW COC's. After the water flows through the UV/Ox, a tower influent manifold allows water from selected wells to be routed to the stripper column. As water trickles down a medium in the column, air is forced up from the bottom. During this process, the VOC's are transferred from the water to the air. The air is then passed through a granulated activated carbon (GAC) filter, where the VOC's are transferred from the air and adsorbed onto the material in the GAC filter. Clean air is then allowed to pass into the atmosphere. The decontaminated groundwater is reinjected into the upper aquifer, up gradient of Area 7. The treatment efficiency (UV/Ox + Stripper) for five (5) VOC's was evaluated from 1/6/2004 through 12/6/2004 and is presented on Table 1 below. Each day approximately four pounds of VOC's are removed by the Area 7 GWETS. This level is expected to decline over time (see Graph).

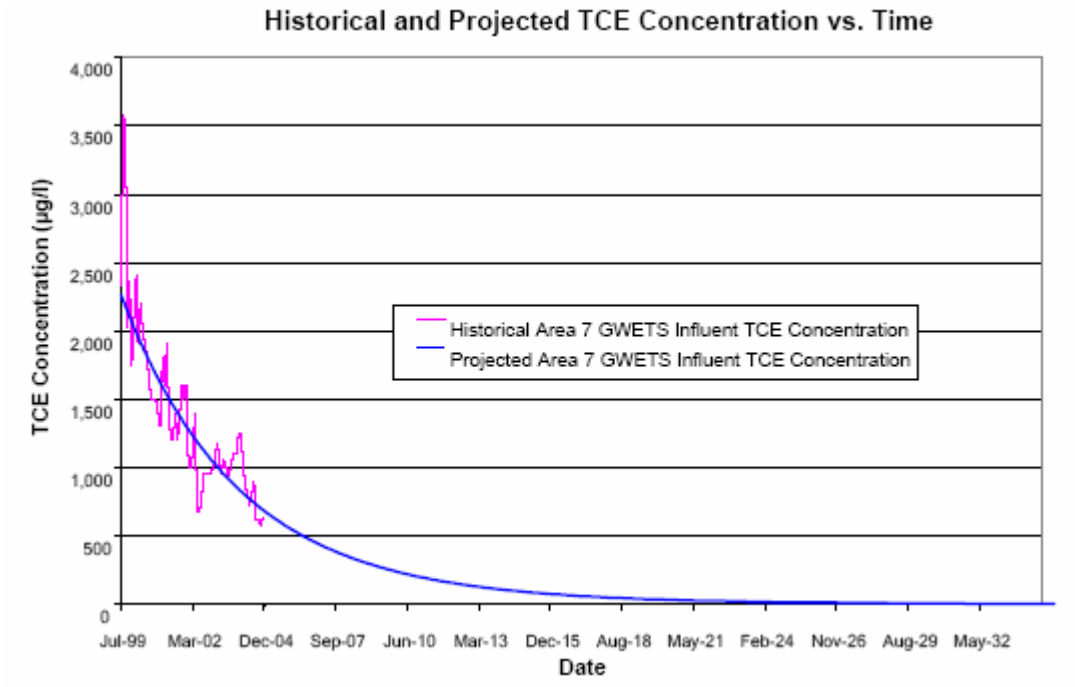
Table 1. Area 7 Treatment Efficiency. It shows the detected chemical concentrations (µg/L) in influent, after ultraviolet oxidation (UV/Ox) treatment, and after Air Stripper treatment

	1,1,1-TCA	1,1-DCE	TCM	PCE	TCE
Influent	<0.5	<0.5	0.74	5.07	845.17
Post UV/Ox	<0.5	<0.5	0.74	2.33	247.25
Post Air Stripper	<0.5	<0.5	<0.5	<0.5	<0.5

Source: 2004 Results for Volatile Organic Compounds in Groundwater Monitor Wells NIBW Area, Scottsdale, AZ

Figure 2. Area 7Air Stripper/GAC Filter System
Source: NIBW Participating Companies 4/7/05

Graph



Source: NIBW Superfund Site- Draft, Preliminary Risk Assessment 2005

Discussion

Data Collection:

CH2M HILL conducted ambient air sampling at the Area 7 site on February 16th and 17th, 2005. Concurrent meteorological data was collected from an on-site, Novalynx WS 16, portable weather station. During the 24-hour collection period the wind was calm over 80% of the time, with small gusts of 2.0 miles per hour from the northwest. Due to the limited amount of space within the Area 7 facility, most of the samples were located very close to the plant.

The air samples were analyzed according to the EPA's TO-15 method in the Selective Ion Mode (SIM). The results showed detectable amounts of the following compounds: 1,3 Butadine, 1,1,2-Tricholoro-1,2,2-trifluroethane (Freon 113), Dichloromethane, Chloroform, Carbon tetrachloride, Benzene, Trichlorethene (TCE), Tetrachloroethene (PCE), and 1,1-Dichloroethene.

For the purpose of this report, the "background" samples collected by CH2M Hill are not considered true background samples, since they were taken from within the boundaries of the North Indian Bend Wash Superfund site, and within close proximity to three facilities currently using the air stripping method to remove VOCs from contaminated groundwater. The ADHS determined that background VOCs and air quality would be better represented by using data gleaned from the EPA's "AirData: Access to Air Pollution Data" website for Metropolitan Phoenix.

Exposure Pathways:

For the VOCs to affect a human population there must be a completed pathway. The ADHS and the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate both the environmental contamination as well as the potential for human exposure. A "Pathway Analysis" consists of five elements: 1) a source of contamination, 2) transport through an environmental medium, 3) a point of exposure, 4) a route of human exposure, and 5) a receptor population. For an exposure pathway to be completed all five elements must be present. Potential pathways are those where there is not sufficient evidence to show that all the elements are present now, but could be present in the future, or may have been present in the past. An eliminated exposure pathway is one in which at least one element of the pathway is not present and either will never be present, or is extremely unlikely that it will ever be present.

In the case of the North Indian Bend Wash, Area 7, the exposure pathway for VOCs by the route of inhalation is completed. The Source of Contamination is the Area 7 GWETS. The Area 7 site was identified as the source of contamination because it treats well water that is known to be contaminated with VOCs (the chemicals). The Environmental Medium is the air. The Point of Exposure is the outdoor ambient air surrounding this facility. The Route of Exposure is inhalation. The Receptor Population consists of the residents and business members of the community, surrounding Area 7.

Health Effects Evaluation:

Although a completed exposure pathway has been identified, people can only be harmed if they come into contact with a chemical over a sufficient period of time, and at a high enough dose to cause adverse health effects. To determine weather residents in the vicinity of Area 7 meet these criteria, existing data was reviewed.

The first step, after identifying exposure pathways, is to determine if the contaminants are present at health threatening concentrations (i.e. above the Comparison Value). If a contaminant is above the comparison value, it is selected for further analysis. However, just because a contaminant exceeds the comparison value, it does not necessarily mean that the contaminant *will* cause an adverse health effect. Comparison values are simply used as a screening tool to identify contaminants that should be looked at more closely and to determine if there *may* be any adverse health risks. In no instance did any of the VOCs in the air exceed the comparison value for non-cancer causing health effects.

Results:

The table below shows the results of the ambient air sampling that was done by CH2M Hill for the EPA, along with the 2004 background concentrations for Metropolitan Phoenix. Please note the following abbreviations: ppb = parts per billion; N/A = Not Available; ND = Non-Detect.

Table 2. Air Sampling Results for NIBW Area 7, February 16th & 17th, 2005

Contaminant	Background Level Metro Phoenix '04 (ppb)	Average Level at Intersection (ppb)	Average Concentration On-Site (ppb)	Non-Cancer Comparison Value (CV) (ppb)	Cancer Comparison Value (CV) (ppb)	Class.	Chemical of Concern Y/N
Benzene	1.01	0.480	0.563	3[a]	0.03	A	Yes
1,3- Butadiene	0.21	0.076	0.083	0.9[b]	0.01	B2	Yes
Carbon tetrachloride	0.09	0.085	0.087	30[c]	0.01	B2	Yes
Chloroform (TCM)	0.05	0.049	0.057	20[c]	0.008	B2	Yes
Dichloromethane (DCM)	0.31	0.160	0.188	300[c]	0.9	B2	No
Tetrachloroethene (PCE)	0.18	0.150	0.160	40[c]	N/A	UR	Yes
Trichloroethene (TCE)	0.025	0.033	1.933	100[a]	N/A	UR	Yes
1,1,2-Trichloro-1,2,2-trifluoroethane	N/A	0.071	0.072	4000[d]	N/A	UR	Yes
1,1,1-Trichloroethane	0.05	ND	ND	700[a]	N/A	D	No
1,1-Dichloroethene	0.39	ND	ND	20[a]	N/A	C	No
Vinyl Chloride	0.02	ND	ND	30[a]	0.04	A	No
1,1-Dichloroethane	0.025	ND	ND	126[d]	N/A	C	No
Cis-1,2-Dichloroethene	N/A	ND	ND	N/A	N/A	D	No
1,2-Dichloropropane	0.037	ND	ND	7[a]	N/A	UR	No
1,2-Dichlorobenzene	N/A	ND	ND	26[d]	N/A	D	No

[a] ATSDR's Environmental Media Evaluation Guide (EMEG)
[b] EPA's Reference Concentration (RfC): (0.2 ug/m3)
[c] ATSDR's Chronic EMEG
[d] EPA Region 3's Risk Based Concentration (RBC)

US EPA Cancer Classifications:

A Human Carcinogen (EPA – 1986 cancer assessment guidelines)
B1 Probable Human Carcinogen – limited human, sufficient animal studies (EPA – 1986 cancer assessment guidelines)
B2 Probable Human Carcinogen – inadequate human, sufficient animal studies (EPA – 1986 cancer assessment guidelines)
C Possible human carcinogen (no human, limited animal studies)
D Not classifiable as to human carcinogenicity
UR Under Review

Non-Cancer Health Effects Evaluation:

For all air samples (On-Site, at the intersection, and in Metropolitan Phoenix), **all VOCs were below the Comparison Value for non-cancer health effects**. Regarding the non-cancer risks, the following determinations can be made:

- Contaminants that tested higher on-site than both the intersection and background:
  - TCE
  - TCM
- Contaminants that tested higher than at the intersection sample, but lower than the background:
  - Benzene
  - 1,3-Butadiene
  - Carbon tetrachloride
  - DCM
  - PCE
- A contaminant that tested higher on-site than at the intersection, but for which background samples were not tested:
  - 1,1,2-Trichloro-1,2,2-trifluoroethane

Cancer Health Effects Evaluation:

Analysis was performed for 15 different chemicals, 9 of these had detectable levels, 7 of these exceeded the Comparison Value (CV) for chemicals with the potential to cause cancer. If the concentration is higher than the Cancer Comparison Value, or if a Comparison Value is not available, than the chemical is selected as a chemical of concern and is further evaluated. The following chemicals were selected for further evaluation:

1) **Benzene**

Carcinogenicity Classification: Benzene has been classified by the EPA as a known human carcinogen (EPA Class A). The excess lifetime cancer risk due to benzene from inhalation was estimated based on the EPA's inhalation Unit Risk Value. The excess lifetime cancer risk was 1.40×10^{-5}. This means that there is a potential increase in excess lifetime cancer of 1.4 cases per 100,000 persons. The US EPA defines the *Range of Acceptable Risk* as being one excess case in 10,000 to one in 1,000,000.

The ADHS has determined that the measured exposure to benzene at Area 7 falls within the range of acceptable risk, and therefore does not pose a public health hazard for cancer effects.

Brief Description of Chemical: Benzene is a colorless liquid with a sweet odor. This compound dissolves in water easily and evaporates readily into the air. Benzene is a highly flammable liquid and is a component of gasoline.

2) **1,3 – Butadiene**

Carcinogenicity Classification: EPA Class 2A, "probably carcinogenic to humans." 1,3-Butadiene undergoes changes in the cells of animals which can cause an inheritable alteration in genes, a mutation. The excess lifetime cancer risk due to 1,3 – Butadiene from inhalation was estimated based on the EPA's inhalation Unit Risk value. The excess lifetime cancer risk was calculated to be 5.51×10^{-6}. This means that there is a potential increase in excess lifetime cancer of 5.51 cases per 1,000,000 persons. The US EPA defines the *Range of Acceptable Risk* as being one excess case in 10,000 to one excess case in 1,000,000.

The ADHS has determined that the measured exposure to 1,3 butadiene at Area 7 falls within the range of acceptable risk, and therefore does not pose a public health hazard for cancer effects.

Brief Description of Chemical: 1,3-Butadiene is a colorless gas with a mild, aromatic, gasoline-like odor. It is non-corrosive but highly flammable. The vapor is heavier than air. 1,3- Butadiene is commercially available as a liquefied gas (under pressure) with a stabilizer added for shipment. Liquid 1,3-butadiene floats and boils on water. Because of 1,3-butadiene's physical properties, its fire and explosion potential might be more likely to occur, and therefore is of greater concern than its chronic health effects.

3) **Carbon Tetrachloride**

Carcinogenicity Classification: This substance is classified as a probable human carcinogen (EPA Class B2). Although there have been sufficient animal studies implicating this compound as being able to cause cancer, there is insufficient information regarding its affect on humans. The excess lifetime cancer risk due to carbon tetrachloride from inhalation was estimated based on the EPA's inhalation Unit Risk Value. The excess lifetime cancer risk was calculated to be 8.21×10^{-6}. This means that there is a potential increase in excess lifetime cancer of 8.21 cases per 1,000,000 persons. The US EPA defines the *Range of Acceptable Risk* as being one excess case in 10,000 to one excess case in 1,000,000.

The Arizona Department of Health Services has determined that the measured exposure to carbon tetrachloride in Area 7 falls within the range of acceptable risk, and therefore does not pose a public health hazard for cancer health effects.

Brief Description of Chemical: Carbon tetrachloride is most often found in the air as a colorless gas. It is not flammable and does not dissolve in water very easily. It was used in the production of refrigeration fluid and propellants for aerosol cans, as a pesticide, as a cleaning fluid and degreasing agent, in fire extinguishers, and in spot removers.

Because of its harmful effects, these uses are now banned and it is only used in some industrial applications.

4) **Chloroform (TCM)**

Carcinogenicity Classification: TCM is classified as likely to be carcinogenic to humans (EPA Class B2). Excess lifetime cancer risk due to Chloroform from inhalation was estimated based on the EPA's inhalation Unit Risk Value. The excess lifetime cancer risk was calculated to be 6.40×10^{-6}. This means that there is a potential increase in excess lifetime cancer of 6.4 cases per 1,000,000 persons. The EPA defines the *Range of Acceptable Risk* as being one excess case in 10,000 to one excess case in 1,000,000.

The Arizona Department of Health Services has determined that the measured exposure to chloroform in Area 7 falls within the range of acceptable risk, and therefore does not pose a public health hazard for cancer effects.

Brief Description of Chemical: Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. Chloroform was used as an inhaled anesthetic during surgery. Today, chloroform is mostly used to make other chemicals. It can also be formed in small amounts when chlorine is added to water.

5) **Tetrachloroethene (PCE)**

Carcinogenicity Classification:
PCE was classified as a probable human carcinogen (EPA Class B2). This classification has been withdrawn, and the EPA is conducting a review of this compound. The Arizona Department of Health Services classifies PCE as an indeterminate public health hazard for cancer health effects.

Brief Description of Chemical:
PCE is a synthetic compound used as a metal degreaser and fabric dry cleaner. PCE is a nonflammable liquid with a sweet odor. There are no natural sources of PCE.

6) **Trichloroethene (TCE)**

Carcinogenicity Classification:
TCE was classified as a probable human carcinogen (EPA Class B2). Target organs were considered to be the liver and kidney. This classification has been withdrawn, and the EPA is conducting a review of this compound.

The Arizona Department of Health Services classifies TCE as an indeterminate public health hazard for cancer health effects.

Brief Description of Chemical:
TCE is a non-flammable liquid that has a sweet odor. This is a man-made compound and is not found naturally in the environment. TCE is used as a metal degreaser, paint thinner, spot remover and in the making of adhesives.

7) **1,1,2 – Trichloro 1,2,2 – trifluoroethane**

Carcinogenicity Classification:
The EPA's inhalation Unit Risk value for 1,1,2 – Trichloro 1,2,2 – trifluoroethane is currently under review, so no quantitative risk can be assigned from the concentration detected at the site.

The Arizona Department of Health Services classifies 1,1,2 – Trichloro 1,2,2 – trifluoroethane as an indeterminate public health hazard for cancer health effects.

Brief Description of Chemical: Freon 113 is a colorless, nonflammable liquid. It does not occur naturally but is produced in large amounts. Because of ozone depletion concerns, EPA has restricted future US production of freon 113. The largest users of freon 113 are companies that use the chemical to clean metal surfaces. Until recently freon 113 has been used as a coolant in commercial and industrial air conditioners and as an ingredient in aerosols sprays. Foam makers use freon 113 as a blowing agent. Companies also use freon 113 to make high temperature lubricants and fluorocarbon resins.

Conclusions

The following VOC's: Vinyl chloride, 1,3-Butadiene, 1,1-Dichloroethene, Dichloromethane, 1,1-Dichloroethane, cis-1,2-Dichloroethene, Chloroform, 1,1,1-Trichloroethane, Carbon tetrachloride, Benzene, 1,2-Dichloropropane, and 1,2-Dichlorobenzene and based on the data presented in this report, and the current functionality of the Area 7 Groundwater Extraction and Treatment System, this facility poses **no apparent public health hazard for cancer or non-cancer health affects** at this time.

The following VOC's: 1,1,2-Trichloro-1,2,2-trifluoroethane, Trichloroethylene, Tetrachloroethylene, and based on the data presented in this report, and the current functionality of the Area 7 Groundwater Extraction and Treatment System, the facility currently poses no **apparent public health hazard** for non-cancer health affects, but **an indeterminant public health hazard** for cancer health effects at this time.

Recommendations

The Arizona Department of Health Services has the following recommendation:

- Continued monitoring the ambient air, and the air released from the air stripping towers to determine if future actions are required to avoid harmful exposure to the VOC's.

Public Health Action Plan

- The Arizona Department of Health Services will continue to review and evaluate data provided for this site.
- The Arizona Department of Health Services will notify the property owners in the area of the findings of this health consultation.

References

CH2M Hill 2005. Technical Memorandum. Prepared for the U.S. Environmental Protection Agency. NIBW Ambient Air Sampling Results from the February 14 to February 19, 2005 Air Sampling Event, April 12, 2005.

EPA 2005. AirData: Access to Air Pollution Data. EPA'S database on air pollution. Available at: www.epa.gov/air/data/. Last accessed on January 18, 2006.

EPA 1999. Compendium of Methods for Toxic Organic Air Pollutants. Pp. 15-1 to 15-4.

NIBW Participating Companies 2005. North Indian Bend Superfund Site, Draft Preliminary Risk Assessment, Area 7 Groundwater Extraction and Treatment System, January 20, 2005, (amended April 7, 2005).

ToxFAQ's. Agency for Toxic Substances and Disease Registry. http://www.atsdr.cdc.gov (search)

Wikipedia. http://en.wikipedia.org/wiki (search)

U.S. Census Bureau. http://www.census.gov (search)

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State Programs Section

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Gwen Eng

Office of Regional Operations, Region IX

Office of the Assistant Administrator

Certification

This North Indian Bend Wash, Area 7 Groundwater Extraction and Treatment System, Facility Health Consultation was prepared by the Arizona Department of Health Services under cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the exposure investigation report were begun. Editorial review was completed by Cooperative Agreement partner.

Charisse Walcott

Technical Project Officer

CAT, SSAB, DHAC, ATSDR

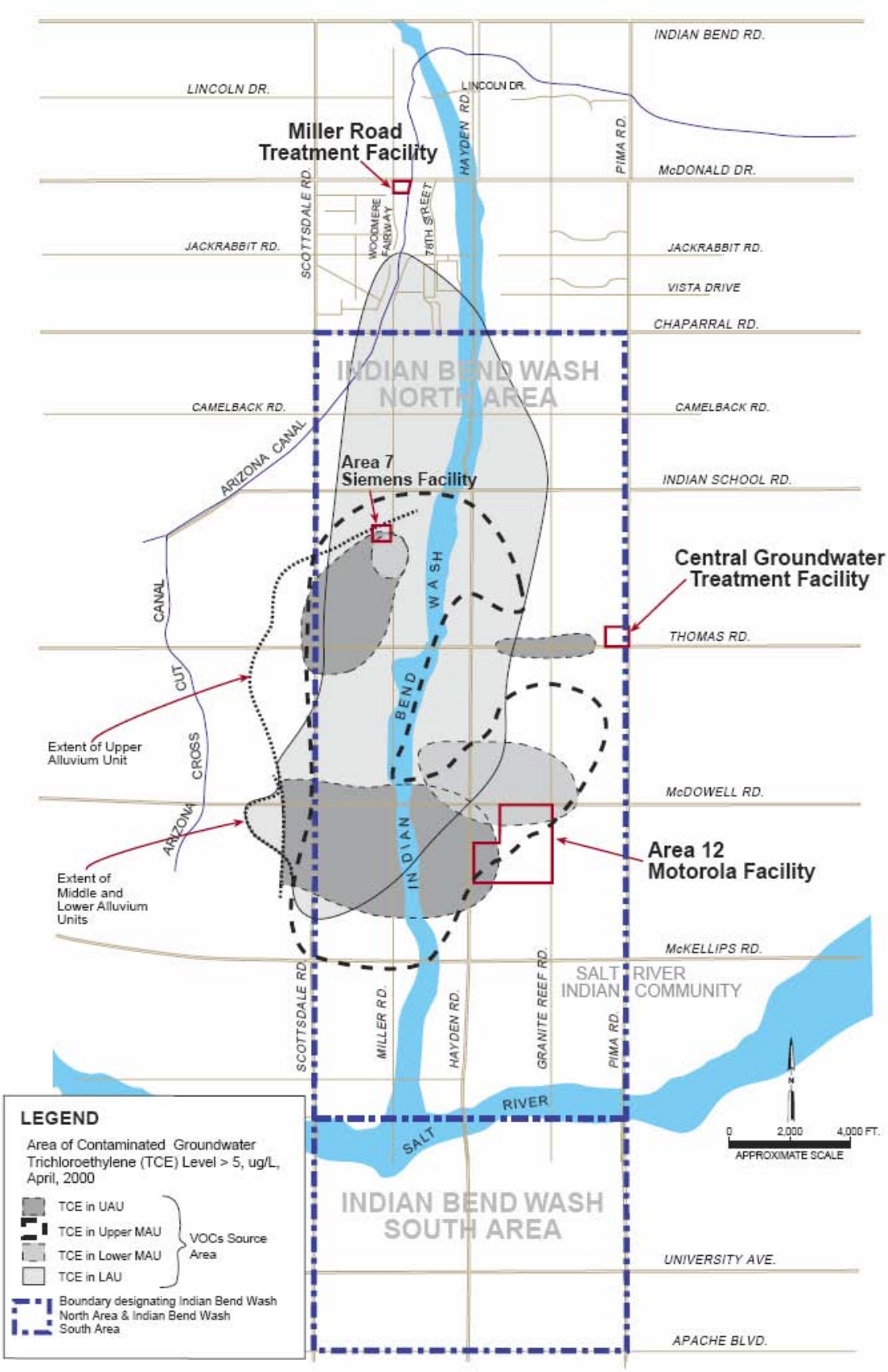
The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with the findings.

Alan Yarbrough

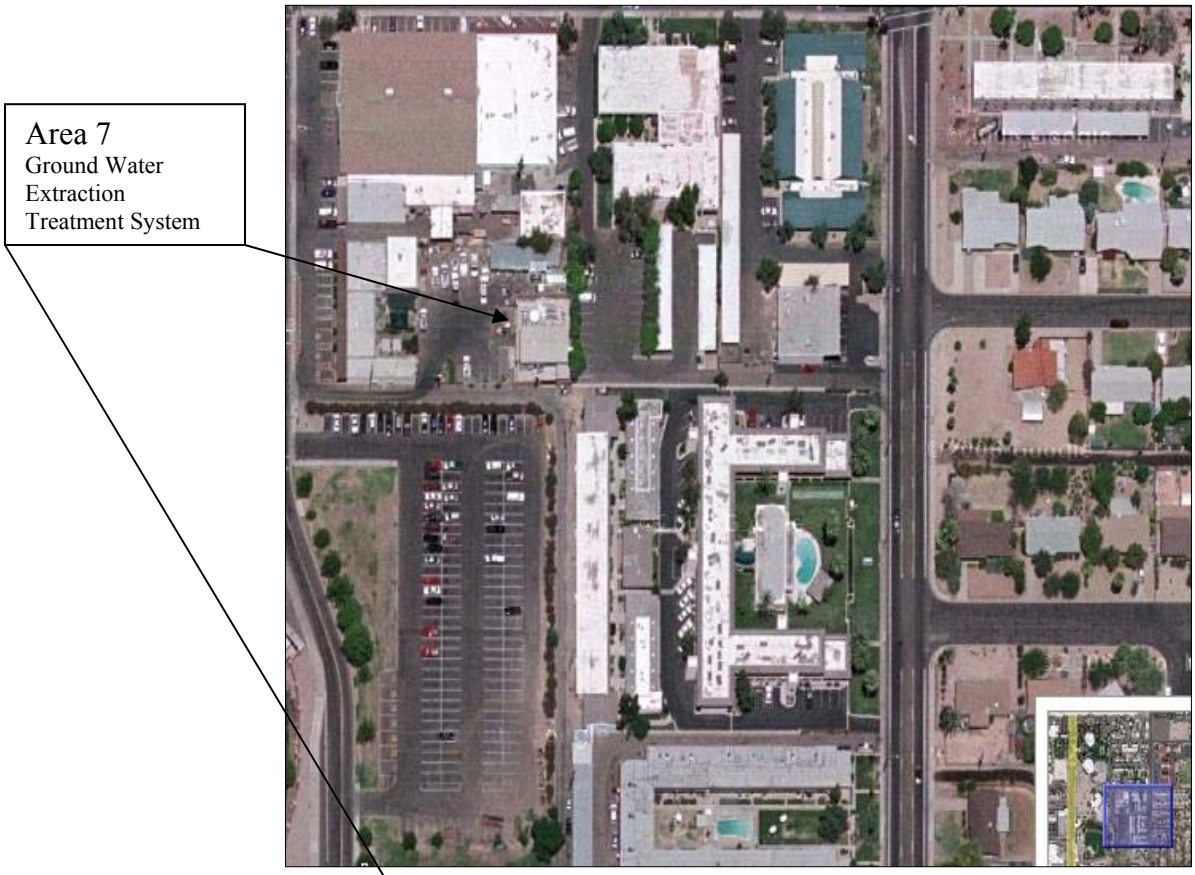
Team Leader-Cooperative agreement Program

CAT, SSAB, DHAC, ATSDR

APPENDIX A


INDIAN BEND RD.
LINCOLN DR.
LINCOLN DR.
Miller Road
Treatment Facility
HAYDEN RD.
PIMA RD.
McDONALD DR.
SCOTTSDALE RD.
WOODMERE FAIRWAY
78TH STREET
JACKRABBIT RD.
JACKRABBIT RD.
VISTA DRIVE
CHAPARRAL RD.
INDIAN BEND WASH
NORTH AREA
CAMELBACK RD.
CAMELBACK RD.
ARIZONA CANAL
Area 7
Siemens Facility
INDIAN SCHOOL RD.
Central Groundwater
Treatment Facility
THOMAS RD.
CANAL
CUT
CROSS
ARIZONA
INDIAN BEND WASH
Extent of Upper
Alluvium Unit
McDOWELL RD.
Area 12
Motorola Facility
Extent of
Middle and
Lower Alluvium
Units
McKELLIPS RD.
SALT RIVER
INDIAN COMMUNITY
SCOTTSDALE RD.
MILLER RD.
HAYDEN RD.
GRANITE REEF RD.
PIMA RD.
SALT RIVER
LEGEND
Area of Contaminated Groundwater
Trichloroethylene (TCE) Level > 5, ug/L,
April, 2000
TCE in UAU
TCE in Upper MAU
TCE in Lower MAU
TCE in LAU
VOCs Source
Area
Boundary designating Indian Bend Wash
North Area & Indian Bend Wash
South Area
0
2,000
4,000 FT.
APPROXIMATE SCALE
INDIAN BEND WASH
SOUTH AREA
UNIVERSITY AVE.
APACHE BLVD.

APPENDIX B



75th and 2nd Streets (crossroads), Scottsdale, AZ

Source: http://maps.google.com