SECOND FIVE-YEAR REVIEW REPORT FOR INDIAN BEND WASH SUPERFUND SITE MARICOPA COUNTY, ARIZONA

PREPARED BY

U.S. Army Corps of Engineers

FOR

U.S. Environmental Protection Agency

Region IX

Approved by: Date:

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Executive Summary

This is the second Five-Year Review (FYR) of the Indian Bend Wash (IBW) Superfund Site (Site) located in Maricopa County, Arizona. The purpose of this FYR is to determine if the remedy is and will continue to be protective of human health and the environment.

In 1987, EPA divided the IBW Site into two areas, encompassing approximately 13 square miles of the Paradise Valley Groundwater Basin; including 10 square mile North Indian Bend Wash (NIBW), located in the City of Scottsdale (COS) and the 3 square mile South Indian Bend Wash (SIBW), located in Tempe. Groundwater within the IBW footprint is an important source of drinking water for the Phoenix metropolitan area. In 1981, trichloroethene (TCE) was discovered in the ground water from several COS and City of Phoenix municipal wells at concentrations exceeding Arizona Department of Health Services action levels in effect at that time. In 1982, the IBW Site was placed on EPA's National Priorities List (NPL). As EPA began its IBW investigation, the highest levels of volatile organic compounds (VOCs) were found in groundwater in Scottsdale, and EPA initially focused resources there.

The decision documents for the selection of the NIBW remedy include the 1988 Scottsdale Groundwater Record of Decision (ROD), the 1991 Shallow Soils and Groundwater ROD, the 2001 Final ROD Amendment, and the 2012 Explanation of Significant Differences (ESD). The SIBW decision documents for the selection of the remedy include the September 1993 Vadose Zone ROD, 1998 Groundwater ROD, and the 2004 ROD Amendment.

In the 2001 Final ROD Amendment, EPA selected the final remedy for the NIBW to address aquifer restoration by containment, treatment, and monitoring of VOCs in groundwater, as well as soil remediation actions, to protect long-term human health and the environment. In 2012, the ESD required a change in treatment location and technology for an extraction well that ultimately provides a potable supply of water for the COS. Components of the NIBW remedy include:

- Five groundwater extraction and treatment systems (Central Groundwater Treatment Facility, Miller Road Treatment Facility, NIBW Granular Activated Carbon (GAC) Treatment Facility, Area 7, and Area 12). The five groundwater extraction and treatment systems continue to operate as part of the ongoing groundwater remedial efforts for NIBW.

- Area 6, 8, and 12 soil vapor extraction (SVE) systems were operated and decommissioned based on performance data; the Area 6 SVE system had been implemented as a voluntary action not required by EPA. Decommissioning occurred prior to the initiation of this FYR and was approved by the EPA. The Area 7 SVE system was operated intermittently from July 1994 to December 2009 when it was shut down for long-term rebound testing. EPA issued approval for the decommissioning of the Area 7 SVE Treatment System in April 2015. Decommissioning activities were performed in August and September 2015 and the decommissioning report submitted on November 18, 2015. The Area 7 SVE Treatment System was already removed by the time of the FYR Site Inspection.

The four extraction wells connected to the Central Groundwater Treatment Facility (CGTF) extract groundwater from VOC plumes in the Middle Alluvial Unit (MAU) and Lower Alluvial Unit (LAU). The Miller Road Treatment Facility (MRTF) treats and contains VOCs in LAU groundwater extracted by wells owned by the Arizona American Water. The MRTF wells and the NIBW GAC Treatment Facility (NGTF) extraction well (PCX-1) contain the VOC plume at the northern portion of the NIBW area and keep VOC-impacted groundwater from migrating toward the pumping center associated with Arizona American Water's wellfield. The NGTF is a newly constructed facility that came online in 2013 to treat contaminated groundwater from an LAU extraction well owned by the Salt River Project (SRP). The Area

7 remedy extracts groundwater from three MAU wells and is a critical remedy component, which removes VOCs and prevents contamination from migrating to the southwest margin of the Site and into the LAU. The Area 12 remedy extracts and treats MAU groundwater and prevents higher concentrations of VOCs in the MAU from migrating to the southwest margin and then into the LAU.

In the 2004 ROD Amendment, EPA selected the final remedy for SIBW to address groundwater restoration by monitored natural attenuation (MNA) in order to protect long-term human health and the environment.

The SIBW MNA remedy has successfully reduced VOC concentrations in groundwater in the Upper Alluvial Unit (UAU) in the western and central plumes, and the MAU in the eastern plume. All concentrations of COCs in the UAU western and central plume have been below the MCL for several sampling events. In an attempt to reduce TCE concentrations expeditiously in the eastern plume, in-situ chemical oxidation (ISCO) was performed by injecting an oxidant into MAU wells in June 2013. Post-ISCO sampling conducted in October 2015, none had TCE concentrations greater than the MCL of 5 ug/L.

The NIBW remedial actions are contributing to restoring groundwater for beneficial use. Treated groundwater is a supplied to the City of Scottsdale and Paradise Valley potable water system, is delivered of treated water to Salt River Project for irrigation use, and to shallow injection wells that recharge the UAU aquifer and provide hydrological containment. The groundwater extraction and treatment remedy is controlling exposure to contaminated groundwater, and preventing lateral migration of VOCs in groundwater.

The treatment facilities are operating as intended. However, there have been unexpected O&M difficulties including problems with communication systems at the groundwater extraction and treatment system (GWETS) and release of untreated groundwater at the startup of the NGTF in 2013. On June 18, 2016 there was a release of approximately 1.2 million gallons of raw water from a ruptured transmission pipeline for CGTF. Four groundwater extraction and treatment facilities rely on air stripping to remove the volatile contaminants followed by Vapor Granular Activated Carbon (VGAC) to reduce concentrations of the COCs prior to be discharged through the emission stack. Recent air emission sampling (2015) at Area 12 GWETS, has shown a four-fold increase in TCE concentration than what was previously assumed in the original emission risk assessment. Review of emissions monitoring data is warranted to determine if VGAC treatment is currently meeting the standard of protectiveness.

Vapor Intrusion risk was not originally evaluated for SIBW. To address this potential exposure pathway, the 2011 Five Year Review included a screening evaluation and concluded the potential for vapor intrusion from groundwater contamination was not a pathway of concern at SIBW or at NIBW. During the past five years, EPA IRIS program revised the toxicity assessment for TCE in 2011 setting more conservative toxicity criteria for TCE risk assessment. Therefore, another screening evaluation of vapor intrusion potential from groundwater contamination was performed for the current Five Year Review; this screening evaluation again concluded that vapor intrusion from groundwater contamination is not a pathway of concern.

The 2011 vapor intrusion screening evaluation considered only groundwater contamination; it did not consider the potential for vapor intrusion from residual volatile contamination located in the vadose zone (soil vapor) at the source areas. A current review of TCE concentrations in soil vapor evaluation now identifies vapor intrusion as a potential concern for some SIBW and NIBW source areas. The 1991 ROD for SIBW and the 1993 ROD for NIBW, which selected a cleanup remedy for the vadose zone in the source areas, only considered the potential of contaminant mass migrating to groundwater and did not consider the vapor intrusion exposure pathway. Therefore, taking into consideration the change in

toxicity criteria for TCE and the identification of a new exposure pathway, the source areas should be screened for potential VI risk.

Indoor air sampling for the DCE Circuits property at SIBW has been conducted annually since 2009, most recently in November 2015. With a single exception, TCE and PCE indoor air concentrations have been below their respective EPA industrial indoor air protective risk ranges since January 2013. The exception being a single detection of TCE at 6.77 µg/m3, which is mid-range in the TCE protective exposure range and therefore still considered protective. The DCE Circuits property currently is used for industrial or commercial purposes. Across the street from the DCE Circuits property, on East 8th Street is an apartment complex that has not been screened for potential residential vapor intrusion. Soil gas samples collected beneath the DCE Circuits Site along E. 8th Street, in 2011 and 2012, contained elevated concentrations of TCE. Both the 2011 and 2012 results exceeded Arizona SGHHSLs for soil gas for residential vapor intrusion concerns.

A protectiveness determination of the remedy at North Indian Bend Wash Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by collecting ambient air samples around the groundwater treatment facilities and completing a revised emission exposure assessment; and by completing a vapor intrusion assessment around the source areas. It is expected that these actions will take approximately one year to complete, at which time a protectiveness determination will be made. In addition, to be protective in the long-term, the following actions must be completed:

- Complete the inspection, maintenance and possible replacement of the NIBW pipelines, and
- Upgrade the communication system for the facility

A protectiveness determination of the remedy at South Indian Bend Wash Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by completing a vapor intrusion assessment for the residential properties adjacent to DCE Circuits property and around the source areas. It is expected that these actions will take approximately one year to complete, at which time a protectiveness determination will be made.

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List of Abbreviations

1,1-DCE	1,1-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
µg/L	micrograms per liter
µg µ/m^3	micrograms per cubic meter
AAL	Arizona action level
AAW	Arizona American Water Company
ADEQ	Arizona Department of Environmental Quality
ADHS	Arizona Department of Health Services
ADWR	Arizona Department of Water Resources
ARAR	applicable or relevant and appropriate requirement
AROD	Record of Decision Amendment
ATSDR	Agency for Toxic Substances and Disease Registry
AWQS	Arizona Ambient Water Quality Standards
AZPDES	Arizona Pollution Discharge Elimination System
bgs	below ground surface
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERP	Contingency and Emergency Response Plan
CGTF	Central Groundwater Treatment Facility
COC	contaminant of concern
COS	City of Scottsdale
CFR	Code of Federal Regulations
CWTP	Chaparral Water Treatment Plant
DMR	Data Monitoring Report
EPA	U.S. Environmental Protection Agency
ELCR	excess lifetime cancer
EPCOR	EPCOR Water Services, Inc.
ESD	Explanation of Significant Differences
FSA	Feasibility Study Addendum
FYR	Five Year Review
GAC	granular activated carbon
Gilbane	Gilbane Federal
GMEP	Groundwater Monitoring and Evaluation Plan
gpm	gallons per minute
GWETS	groundwater extraction and treatment system
HASP	health and safety plan
HBGL	Human Health-Based Guidance Level
HHRA	human-health risk assessment
HQ	hazard quotient
IBW	Indian Bend Wash
ICs	institutional controls
IRIS	Integrated Risk Information System

ISCO	in-situ chemical oxidation
ITSI	Innovative Technical Solutions, Inc.
LAU	lower alluvial unit
LGAC	liquid granular activated carbon
MAU	middle alluvial unit
MCL	maximum contaminant level
MNA	monitored natural attenuation
MRTF	Miller Road Treatment Facility
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NGTF	NIBW Granular Activated Carbon (GAC) Groundwater Treatment Facility
NIBW	North Indian Bend Wash
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
OSHA	Occupational Safety and Health Administration
PCs	Participating Companies
PCE	tetrachloroethene
PVARF	Paradise Valley Arsenic Removal Facility
RAO	Remedial Action Objective
RfC	Reference Concentration
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Levels
SAP	Sampling and Analysis Plan
SIBW	South Indian Bend Wash
Site	IBW Superfund site
SRP	Salt River Project
SVE	soil vapor extraction
TCE	trichloroethene
TTHM	total trihalomethanes
UAU	upper alluvial unit
USACE	U.S. Army Corps of Engineers
UU/UE	unlimited use and unrestricted exposure
UV/Ox	ultraviolet light/ chemical oxidation
vGAC	vapor phase granular activated carbon
VI	vapor intrusion
VOC	volatile organic compound

1 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) has prepared this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, 40 Code of Federal Regulation (CFR) Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP) and EPA policy.

This is the second FYR for the Indian Bend Wash (IBW) Superfund Site (the Site). The triggering action for this statutory review of the IBW is the completion date of the previous FYR; 23 September 2011. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site at levels above those that would allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two remaining groundwater OUs that are each addressed in this FYR. The North Indian Bend Wash (NIBW) OU includes the groundwater extraction and remedy at the northern portion of the IBW Superfund Site and the South Indian Bend Wash (SIBW) OU includes the Monitored Natural Attenuation (MNA) remedy for groundwater at the southern portion of the Site.

The Indian Bend Wash Superfund Site FYR was led by Carolyn d'Almeida of the EPA, Region 9. The primary participants included:

- Carolyn d'Almeida – U.S. Environmental Protection Agency Region 9; Project Lead
- Kenneth Heim, PhD – U.S. Army Corps of Engineers (USACE) New England District; Hydrogeologist
- Cynthia Colquitt – U.S. Army Corps of Engineers New England District; Risk Assessor
- Matthew Masten, P.E. – U.S. Army Corps of Engineers Los Angeles District; Engineer

The review began at the project kickoff meeting on October 26, 2015.

Table 1-1. Five-Year Review Summary

SITE IDENTIFICATION		
Site Name: Indian Bend Wash (IBW) Superfund Site		
EPA ID: AZD980695969 (NIBW and SIBW)		
Region: 9	**State:** AZ	**City/County:** Scottsdale and Tempe / Maricopa
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Carolyn d'Almeida		
Author affiliation: U.S. Environmental Protection Agency, Region 9		
Review period: 10/26/2015 - 4/20/2016		
Date of site inspections: NIBW 2/10/16 and SIBW 4/20/16		
Type of review: Statutory for IBW		
Review number: 2		
Triggering action date: 9/23/2011		
Due date *(five years after triggering action date)*: 9/23/2016		

1.1 Background

The NIBW and SIBW areas were identified to facilitate management of the Site cleanup because each area had distinct sources of contamination and the NIBW groundwater plumes were not contiguous with the SIBW groundwater plumes. Additionally, the Salt River is considered a hydrologic divide for groundwater flow in the upper alluvial unit.

1.2 Physical Characteristics

The groundwater table has fluctuated more than 50 feet at the IBW Site over the last twenty years. These fluctuations in groundwater levels can either leave residual areas of contamination when the water table falls, or cause vadose zone contaminants to become dissolved in the groundwater when the groundwater table rises (EPA, 1998). The geologic formations underlying the IBW are divided into three alluvial units, designated as the Upper Alluvial Unit (UAU), Middle Alluvial Unit (MAU), and Lower Alluvial Unit

(LAU). Nearby environmentally sensitive areas include the Salt River and surrounding wetlands. No environmentally sensitive areas have been identified within the NIBW area (EPA, 2011).

Prior to 1967, groundwater was the primary source of potable water for the City of Tempe. In 1967, the John G. Martinez Water Treatment Plant was constructed, allowing the City of Tempe to rely predominantly on surface water to meet its potable water needs. Groundwater is used for stand-by potable supply and for industrial purposes, primarily those of the Arizona Public Service Ocotillo Power Station. The City of Mesa, located outside but adjacent to the SIBW area, uses groundwater for municipal supply. Large production wellfields located north of the NIBW groundwater plume, draw groundwater primarily from the LAU and to a lesser extent from the MAU. The UAU is not used for potable supply.

1.2.1 North Indian Bend Wash

The NIBW Site, shown on Figure 1-1, is located north of the Salt River within the City of Scottsdale (COS), Arizona (approximately 10 square miles). The NIBW area is located within the southern portion of the Paradise Valley Basin in the eastern portion of the Salt River Valley, an irrigated region around the lower course of the Salt River (Figure 1-1). The river is seasonally fed by mountain streams near the Mogollon Rim of the Mogollon Plateau and, provided there is an adequate supply of water, it flows southwest to join the Gila River in south-central Arizona. Otherwise, the Salt River bed is typically dry downstream of Tempe. The Salt River only flows during major rainfall and snow events and with the exception of these high flow events, all water is diverted at a point upstream of Tempe and Scottsdale. The Paradise Valley Basin is bounded by the McDowell Mountains to the northeast, the Phoenix Mountains to the west, and Camelback Mountain and the Papago Buttes to the southwest. The Paradise Valley Basins continues and deepens to the east.

Land use in the NIBW area is a mix of residential, industrial/commercial, agricultural, public and private recreational, undeveloped space, and waterways and is divided roughly as follows: 53.5 percent residential, 40.0 percent undeveloped/open space/agricultural, and 6.5 percent industrial/commercial (Scottsdale Economic Vitality Department, June 2009). In the NIBW area, a small number of large industrial facilities including semiconductor production, electroplating and finishing, and the aerospace industry have operated since the 1950s for various periods of time. Operations at many of these facilities have been discontinued, but have historically included the use and disposal of organic solvents. Several means of solvent disposal were used including discharge to dry wells, unlined ponds, or storage tanks leading to soil and groundwater contamination. Groundwater is primarily used for municipal and irrigation purposes. Complex water rights and apportionment of groundwater among various municipal, quasi-governmental, and private entities govern groundwater use in the NIBW area. Several municipalities and water purveyors extract groundwater from within, or adjacent to, the NIBW groundwater plume.

1.2.2 South Indian Bend Wash

The SIBW Site, shown on Figure 1-1, includes approximately three square miles of groundwater for cleanup and is located in the City of Tempe. As defined by the 1998 Record of Decision (ROD), the Site is bounded by Apache Boulevard to the south, Rural Road to the west, Loop 101-Price Freeway to the east, and the Salt River to the north.

Land in the SIBW area is developed for residential, commercial, and industrial uses including circuit and electronics manufacturing, plastics manufacturing, dry cleaning, metal electroplating and finishing, auto

service, landfills, and quarries, which have operated since the 1950s. The area between Apache Boulevard and University Drive is primarily residential. Land use north of University Drive is largely retail and commercial, including light-industrial and auto repair/scrap facilities in the area south of the Salt River. The area east of Rural Road is primarily used by Arizona State University for off-campus student housing, dormitories, athletic fields, a golf course, and includes many single-family homes. The northernmost area of SIBW has been developed into a regional retail center. The SIBW area also includes the Salt River itself, which is ephemeral and flows during storm events and during releases from Roosevelt Dam. While many of these operations have been discontinued, they included the use and disposal of organic solvents, which have led to soil and groundwater contamination.

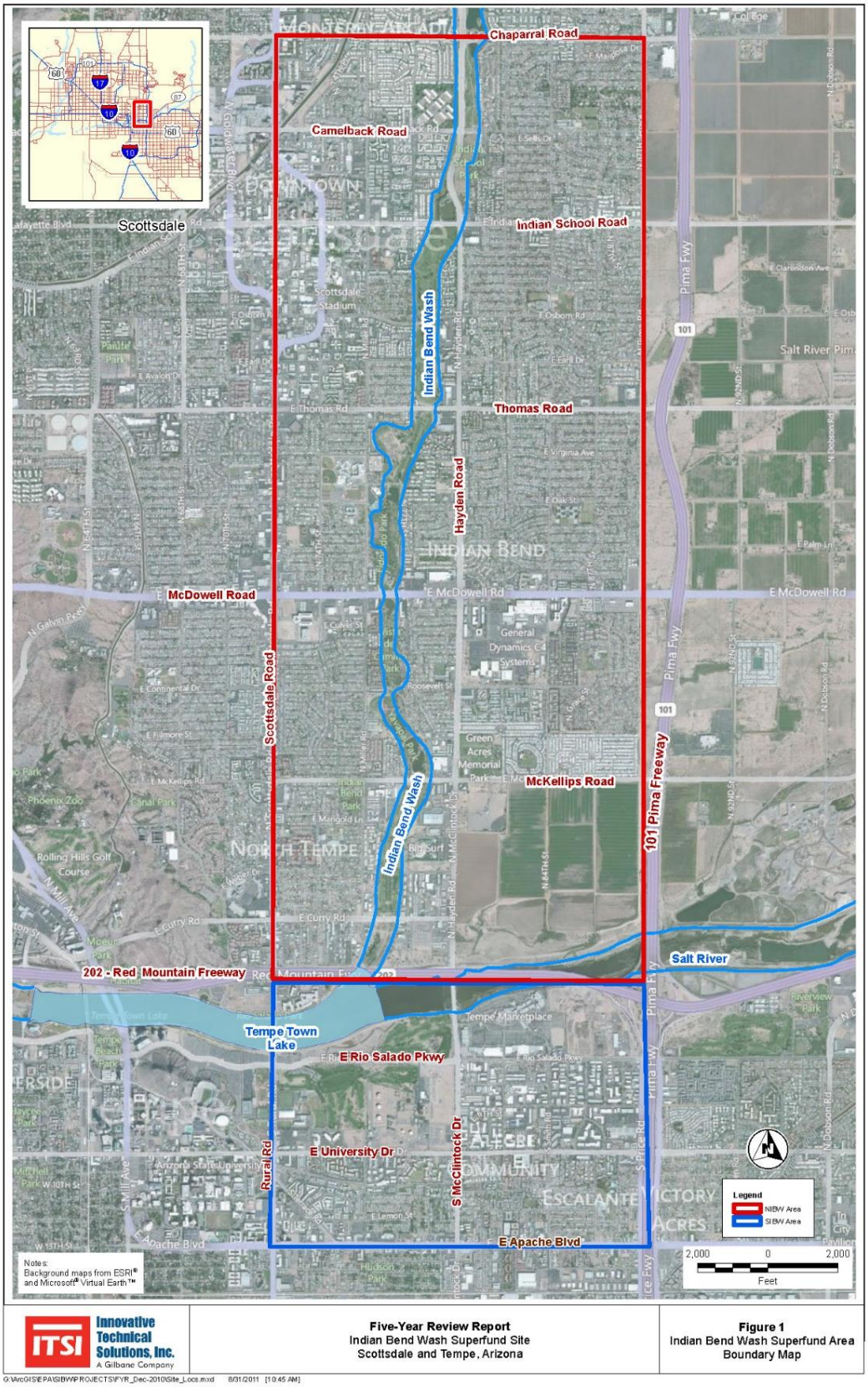


Figure 1-1. Location Map (EPA, 2011) for the Indian Bend Wash Superfund Site

1.3 Geology/Hydrology

1.3.1 North Indian Bend Wash

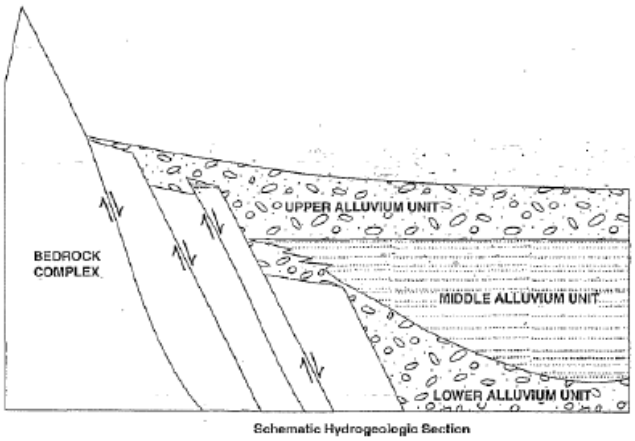
The NIBW contaminated groundwater plume is located in a highly developed urban setting approximately 10 square miles in size in the general vicinity of the Salt River to the south, Chaparral Road to the north, the Pima freeway (Loop 101) to the east, and Scottsdale Road to the west. No environmentally sensitive areas have been identified within the NIBW area. Portions of the NIBW area are located within a 100-year flood zone. NIBW groundwater is present in three distinct groundwater units; the upper (UAU), middle (MAU) and lower (LAU) alluvial units. Data indicate trichloroethene (TCE) and tetrachloroethene (PCE) are present in groundwater in the UAU, MAU and LAU.

The UAU in the vicinity of the NIBW consists primarily of sand, course gravel, cobbles, and boulders. The depth to the water table in the UAU ranges from approximately 65 feet to approximately 104 feet below ground surface (bgs), with 40 to 100 feet of saturated thickness. In NIBW, the direction of groundwater movement in the UAU is from east to west in the area south of McDowell Road, and from northeast to southwest in the vicinity of Thomas Road. The UAU groundwater flows from all directions toward the southwest margin of the NIBW area where bedrock is encountered and groundwater moves vertically into the underlying alluvial units. (Figure 1.2)

The MAU in the vicinity of the NIBW primarily consists of silt, clay, and interbedded fine sands that transmit much of the water that occurs in the unit. The thickness of the MAU ranges from approximately 360 to 660 feet. Water elevations in wells screened in the MAU are under hydraulically confined conditions and occur at depths between approximately 90 feet and 150 feet bgs.

The LAU consists of weakly to strongly cemented gravel, boulders, sand, sandy clay, and silty sand, with some interbedded clayey zones. The LAU is coarser grained than the MAU and is the principal alluvial unit in the region. The LAU is at least 500 feet thick and likely thicker than 700 feet at some parts of the site. The LAU thins out at the basin margin in the vicinity of exposed bedrock at the southwest margin and near the mountainous part of Paradise Valley. Water elevations in wells perforated in the LAU are under confined conditions and occur at depths of between approximately 129 and 341 feet bgs.

Figure 1.2 Schematic Hydrogeologic Cross Section



Groundwater in the upper alluvial unit generally moves from east to west across the Site toward the southwest margin. Upon reaching the southwest margin, groundwater in the upper alluvial unit moves downward into the lower alluvial unit either directly or through a thin layer of middle alluvial unit sediments. This movement results from the regional downward hydraulic gradient caused by large-scale historic and current pumping of the lower alluvial unit – principally at production wells located to the north. This downward vertical movement in the southwest margin is facilitated by the thinning and, in some areas the absence, of middle alluvial unit sediments west of Scottsdale Road. Large production wellfields located north of the NIBW groundwater plume, draw groundwater primarily from the lower alluvial unit and to a lesser extent from the middle alluvial unit. The upper alluvial unit is not used for potable supply.

1.3.2 South Indian Bend Wash

Portions of the SIBW area are located within a 100-year flood zone. The groundwater table fluctuates more than 50 feet at the Site. These fluctuations in groundwater levels can either leave residual areas of contamination when the water table falls, or cause vadose zone contaminants to become dissolved in the groundwater when the groundwater table rises (EPA, 1998).

The SIBW groundwater is present in three distinct alluvial units: the UAU, MAU, and LAU. The UAU is distributed across the entire SIBW area. The UAU has an upper layer of clay and sandy silt, and a lower layer primarily composed of sand, gravel, cobble, and boulders. The upper layer is typically not present near the Salt River but is more than 20 feet thick locally south of the Salt River channel. The UAU is encountered from ground surface to approximately 110 to 170 feet bgs further south.

The groundwater flow direction in the UAU is toward the south to southwest during non-river flow conditions in the Salt River. These flow directions shift to the south to southeast during river flow conditions in the Salt River when recharge influences groundwater flow directions. Groundwater flow through the UAU unit originates mainly from Salt River recharge (during flow events) and lateral inflow moves vertically downward, eventually entering the MAU.

The MAU occurs throughout the SIBW area and consists primarily of clay and sandy silt with significant interbedded layers of sand/gravel mixtures.

The LAU is beneath the MAU. During the SIBW remedial investigation, the LAU was encountered only once. There, it was encountered at 500 feet bgs and was composed of conglomerate dominated by weakly cemented gravel, sand, silt, and rock fragments. Because it has only been encountered at one location, limited data exist to determine the thickness of the LAU in the SIBW area. Additionally, limited data exist to estimate groundwater flow directions in the LAU.

2 Remedial Actions Summary

2.1 Basis for Taking Action

In 1981, TCE was discovered in the groundwater at several municipal wells at concentrations exceeding the Arizona Department of Health Services (ADHS) action levels and federal maximum contaminant levels (MCLs) in effect at that time. The contaminated wells included Salt River Project wells No. 6 and 31, and City of Phoenix wells No. 34, 35, and 36 (currently COS wells No. 75, 72, and 71, respectively).

EPA then sampled 20 additional wells in the surrounding areas, including the City of Tempe production wells. Results from this sampling indicated TCE and PCE concentrations in some of the City of Tempe production wells above federal MCLs. In 1982, the IBW Site was placed on the EPA's National Priorities List (NPL).

Groundwater at the IBW site was historically contaminated with volatile organic compounds (VOCs) at concentrations above MCLs. In the NIBW area, the contaminants of concern (COCs) are TCE, PCE, chloroform, 1,1-dichloroethene (1,1-DCE), and 1,1,1-trichloroethane (1,1,1-TCA). In the SIBW area, the COCs are TCE, PCE and 1,1-DCE.

2.2 Remedy Selection

2.2.1 North Indian Bend Wash

The decision documents for the selection of the NIBW remedy include the 1988 Scottsdale Groundwater Record of Decision (ROD) (EPA, 1988), the 1991 Shallow Soils and Groundwater ROD (EPA, 1991), the 2001 Final ROD Amendment (EPA, 2001), and the 2012 Explanation of Significant Differences (ESD) (EPA, 2012). These documents are discussed below, including a presentation of the remedial action objectives (RAOs) and major components of the selected remedy.

Summary of 1988 Groundwater ROD

This original NIBW partial remedy was developed to address VOCs in the MAU and LAU in the Scottsdale area (EPA, 1988). Between March and October of 1990, 23 new monitoring wells were installed, including 12 new MAU wells and 11 new LAU wells. The 1988 ROD included extensive collection and analysis of groundwater samples, and VOC mass flux analyses to assess groundwater quality over approximately the first year of remedy implementation to determine if additional remedial action would be needed.

The RAOs indicated in the 1988 ROD are:

- Protect public health and the environment by protecting unaffected wells from VOCs.
- Provide a mechanism for the long-term management of the VOC-affected groundwater in order to improve the regional aquifer's suitability for potable use and potential recharge/recovery activities by the city [COS].
- Provide a potable water source for the COS, within the constraints of projected water demands, while utilizing existing facilities to the maximum extent feasible.

The chemical-specific groundwater cleanup standards were assigned based on Arizona proposed or adopted MCLs and Human Health-Based Guidance Levels (HBGLs), EPA MCLs, Arizona Action Levels (AALs), or levels determined based on a risk assessment. The applicable drinking water standards and the established cleanup standards as listed in the 1988 ROD are shown in Table 2-1.

Table 2-1. 1988 ROD-Specified Cleanup Standards: North Indian Bend Wash

Chemical	Drinking Water Standards (µg/L)		Cleanup Standards for Treated Water (µg/L)
	State	Federal	
TCE	5	5	5
PCE	1	—	0.67*
1,1,-DCE	7	7	7
1,1,1-TCA	200	200	200
Chloroform**	3	—	0.5

Notes:
— = none established; µg/L = micrograms per liter
* Arizona HBGL (human health based guidance levels)
** Not a byproduct of municipal water supply chlorination
Source: U.S. EPA 1988 Record of Decision

Summary of 1991 Shallow Soils and Groundwater ROD

In September 1991, EPA issued the Shallow Soils and Groundwater ROD (EPA, 1991) and selected additional remedial actions for the vadose zone and the UAU at NIBW, neither of which were addressed in the 1988 ROD (EPA, 1991). As part of the vadose zone and UAU remedy, potential source areas were investigated and categorized, and additional investigations were conducted at locations of potential sources including at Areas 3, 5a-5b-5c, 6, 7, 9, 11, and 12. Field investigation data and results of modeling indicated that at all areas except for Areas 7 and 12, concentrations of VOCs in the vadose zone did not represent a threat to underlying groundwater. As a result, EPA did not require vadose zone remediation in Areas 3, 5a-5b-5c, 6, 9, and 11. At Areas 7, 8, and 12 soil vapor extraction (SVE) was determined to be warranted and was subsequently implemented to eliminate the threat to groundwater (Table 2-3).

The remedy outlined in the 1991 ROD addressed the potential for VOCs in the UAU to migrate down to the MAU and LAU by 1) vertical movement across the contact between the UAU and underlying units, and 2) conduit flow in wells perforated across the UAU and MAU and/or LAU. A total of 44 new monitoring wells were installed in the three specified groundwater units of the Site during 1992 and 1993, including: 37 in the UAU, 4 in the MAU, 1 in the MAU/LAU, and 2 in the LAU.

The remedy described in the 1991 ROD addressed VOCs that had already migrated from the UAU to the underlying MAU and LAU by capturing the groundwater plume using the existing Central Groundwater Treatment Facility (CGTF) extraction and treatment remedy for the MAU and LAU. This ROD also revised certain cleanup standards for water treatment and established cleanup standards for groundwater.

The RAOs for the vadose zone and UAU ROD were to:

- Remove the potential for continued groundwater contamination due to migration of contamination from the vadose zone.
- Reduce VOC mass in the vadose zone to a level that no longer threatens to contaminate underlying groundwater.

The chemical-specific groundwater cleanup standards in the 1991 ROD were assigned based on Arizona proposed or adopted MCLs or HBGLs, EPA MCLs, AALs, or levels determined based on a risk

assessment. The applicable water standards (state and federal) and the established cleanup standards for the primary chemicals of concern are shown in Table 2-2.

Table 2-2. 1991 ROD-Specified Cleanup Standards: North Indian Bend Wash

Chemical	Drinking Water Standard (µg/L)		Cleanup Standard for Treated Water and In-Situ Groundwater (µg/L)
	State	Federal	
TCE	3.2	5	5
PCE	0.67	5	5
1,1,-DCE	7	7	7
1,1,1-TCA	200	200	200
Chloroform*	6*	100	6

Notes:
— = none established; µg/L = micrograms per liter
* Not a byproduct of municipal water supply chlorination
Source: U.S. EPA 1991 Record of Decision

Table 2-3. Summary of Details and Work Conducted at Source Areas NIBW Superfund Site

Occupant	Land Use or Activities	Types of Materials Used	Vadose Zone Remedy Decisions			Groundwater Remedy Decisions		
			Recommended Work	Work Conducted	EPA Closure Approval Date	Recommended Work	Work Conducted	EPA Closure Approval Date
Area 1, Maricopa County Parcel No. 132-17-005D								
City of Scottsdale Sewage Treatment Facility	Two sewage polishing ponds totaling 11.1 acres	Sewage effluent	No further action	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Area 2, Maricopa County Parcel No.132-77-001c								
City of Scottsdale Sewage Treatment Plant	Primary treatment facility, 13.4 acres of oxidation ponds	Unknown	No further action	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
City of Scottsdale Maintenance Yard	Equipment maintenance/Storage	Unknown						
Area 3, Maricopa County Parcel Nos. 131-15-013B, C; 131-15-011N, and 131-15-012A								
Marro Plating/Technical Metal Finishing Corporation	Metal finishing operations	1,1,1-TCA, metal hydroxide sludge	No further action	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Marro Plating/Plainville West	Metal finishing	1,1,1-TCA						
Genesis II Electronics Inc.		Isopropanol, oil, Freon-TMS						
Beckman Instruments	Gas discharge display assembly, etching, washing, screen printing, soldering	TCE- chloroethene, Freon-TF-TMS, -TWD602, toluene, isopropanol, methanol, acetone, hydrofluoric acid						
Comtech	Manufacture and testing of electrical components	TCE, isopropanol, Freon, 1,1,1-TCA						
Fairchild Data	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						
Sperry Information	Degreasing	Freon-TA, hydrofluoric						

Occupant	Land Use or Activities	Types of Materials Used	Vadose Zone Remedy Decisions			Groundwater Remedy Decisions		
			Recommended Work	Work Conducted	EPA Closure Approval Date	Recommended Work	Work Conducted	EPA Closure Approval Date
		acid, methanol, isopropanol						
Hainey's Machine Tool Co., Inc.	Machining of metal parts	Cutting oils and solvents						
Area 4, Maricopa County Parcel No. 131-12-142								
Ames Meat	Catfish ponds, livestock pens, meat processing	Unknown	No further action	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Golf Driving Range	Recreational	N/A						
Gas Station	Commercial	Unknown						
Race Track	Recreational	Unknown						
Multifamily Housing Display Division	Residential	N/A						
Area 5, Maricopa County Parcel No. Not Identified								
5A - Granite Reef Wash	Drainage channel		Shallow soil gas sampling; install and sample one SVM well; conduct groundwater threat analysis	Recommended work conducted, except EPA waived groundwater threat analysis due to low concentrations in vadose zone; concluded no groundwater threat	3/24/1995	Not applicable	Not applicable	Not applicable
5B - Salt River Project Granite Reef Well (A-1-4) 1ABA1 (SRP 23.6E, 6N)	Water-supply well	Solvents (Shell 360, Mirachem 100)	Install and sample one SVM well and conduct groundwater threat analysis	Recommended work conducted, except EPA waived groundwater threat analysis due to low concentrations in vadose zone; concluded no groundwater threat	12/16/1993	Not applicable	Not applicable	Not applicable
5C - K-Mart	Shopping center		Install and sample one SVM well and	Recommended work conducted;	6/27/1994	Not applicable	Not applicable	Not applicable

Occupant	Land Use or Activities	Types of Materials Used	Vadose Zone Remedy Decisions			Groundwater Remedy Decisions		
			Recommended Work	Work Conducted	EPA Closure Approval Date	Recommended Work	Work Conducted	EPA Closure Approval Date
			conduct groundwater threat analysis	concluded no groundwater threat				
Area 6, Maricopa County Parcel No. 130-39-001a,b,d								
Siemens Components, Inc.	Manufacture of Zener diodes	Hydrofluoric acid, Freon, methanol, ethanol, MEK, manganese nitrate, TCE, chloroethene, phenol, sodium hydroxide, ammonia, potassium ferricyanide, potassium silver cyanide	Install and sample two SVM wells; sample one existing SVM well; conduct groundwater threat analysis	Recommended work conducted; concluded no groundwater threat but voluntary SVE program was conducted	3/27/1995	Not applicable	Not applicable	Not applicable
Dickson Electronics	Manufacture of electrical components	Etching acid, TCE						
Micro Semiconductor	Manufacture of electrical components	Solvents						
Area 7, Maricopa County Parcel Nos.								
Rolamech	Manufacture of pens and metal machining	1,1,1-TCA, cutting oil	Install and operate SVE system; prepare semiannual mass flux estimates; conduct semiannual groundwater threat analysis for determination of completion	Recommended work conducted; voluntary installation of additional SVE well; voluntary implementation of UAU groundwater extraction program	3/3/2016	Operation of MAU extraction program to capture areas where concentrations were elevated relative to surrounding vicinity	Recommended work is being conducted, since Amended CD adopted work that was originally implemented voluntarily as selected remedial action	Pending
Dickson Electronics	Manufacture of electrical components	Solvents						
City of Scottsdale	Police impound yard	--						

Occupant	Land Use or Activities	Types of Materials Used	Vadose Zone Remedy Decisions			Groundwater Remedy Decisions		
			Recommended Work	Work Conducted	EPA Closure Approval Date	Recommended Work	Work Conducted	EPA Closure Approval Date
Area 8, Maricopa County Parcel No.(s) Not Identified								
Dickson Electronics	Manufacture of silicon wafers	TCE, PCE	Install and operate SVE system; prepare semiannual mass flux estimates; conduct semiannual groundwater threat analysis for determination of completion	Recommended work conducted	7/21/1997	Not applicable	Not applicable	Not applicable
Dickson Electronics	Manufacture of solid-state circuit breakers	Solvents						
Dickson Electronics	Manufacture and assembly of tantalum capacitors	Unknown						
Dickson Electronics	Assembly of Zener diodes, product testing	Solvents						
Dickson Electronics	Field effect transistor operations	Unknown						
The Strip Joynt	Furniture stripping	Methylene chloride; 1,1,1-TCA						
Bells of the West	Manufacture of wind bells	Unknown						
City of Scottsdale	Sign painting	Unknown						
Arizona Public Service	Vehicle storage	Unknown						
Frontier Motors	Auto repair	Unknown						
Unidentified	Storage of tile, stone, decorative metalwork; paint spraying	Unknown						
Marro Plating	Metal finishing	TCE						
Area 9, Maricopa County Parcel No. Not Identified								
Salt River Project Well (A-1-4) 2DBB (SRP 22SE, 5.5N)	Water-supply well	Organic solvents (Shell 360, Mirachem 100)	Install and sample one SVM well and conduct groundwater threat analysis	As recommended; concluded no groundwater threat	12/16/1993	Not applicable	Not applicable	Not applicable
Area 10, Maricopa County Parcel No. Not Identified								
Advance Auto Supply	Automotive component machining	Cutting oils, solvent	No further action	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Occupant	Land Use or Activities	Types of Materials Used	Vadose Zone Remedy Decisions			Groundwater Remedy Decisions		
			Recommended Work	Work Conducted	EPA Closure Approval Date	Recommended Work	Work Conducted	EPA Closure Approval Date
Area 11, Maricopa County Parcel No. Not Identified								
Dickson Electronics	Tantalum capacitor assembly	Unknown	Install and sample two SVM wells and conduct groundwater threat analysis	As recommended; conducted additional EPA-recommended soil gas investigations; concluded no groundwater threat		Not applicable	Not applicable	Not applicable
Union 76	Auto repair	Unknown						
Motorola	Office	Unknown						
Area 12, Maricopa County Parcel No. 131-09-002C								
Motorola Government Electronics Group	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	Install and sample five SVM wells and conduct groundwater threat analysis	As recommended; concluded groundwater threat warranting implementation of SVE; SVE conducted until groundwater threat analysis indicated no groundwater threat	8/18/2000	Operation of MAU extraction program to capture areas where concentrations are elevated relative to surrounding vicinity	Recommended work is being conducted, since Amended CD adopted work that was originally implemented voluntarily as selected remedial action	Pending

Summary of 2001 ROD Amendment

Following the construction and initial operation of the remedy selected in 1988 for groundwater, EPA determined that the groundwater plume had not been contained as intended. Specifically, the LAU groundwater plume was moving to the north and threatening the drinking water supply of the Town of Paradise Valley. To prevent VOC impact to the production wells serving the Town of Paradise Valley and a portion of the COS, additional actions were proactively implemented to achieve capture of the groundwater VOCs plume, including construction of the Miller Road Treatment Facility (MRTF) and the Area 7 and Area 12 Groundwater Extraction and Treatment Systems. The source control remedial actions for the vadose zone were also expanded as part of the final remedy. These actions were completed on a voluntary basis and had not been documented in a previous record of decision.

The purpose of the 2001 ROD Amendment (EPA, 2001) was to select a final remedial action for NIBW and consolidate previous actions, including the former voluntary actions, into one final document. Since the remedies in the 1988 and 1991 RODs were still utilized at the time, the 2001 ROD is considered an "Enhanced Remedy" and includes additional remedial actions to be taken. The 2001 Final ROD Amendment (EPA, 2001) addresses aquifer restoration by containment, treatment, and monitoring of VOCs in groundwater as well as soil remediation actions.

The RAOs indicated in the 2001 ROD Amendment are:

- Restore the UAU, MAU and LAU to drinking water quality by decreasing the concentrations of the contaminants of concern to below the cleanup standards.
- Protect human health and the environment by eliminating exposure to contaminated groundwater.
- Provide the COS with a water source that meets MCLs for NIBW contaminants of concern (VOCs).
- Achieve containment of the groundwater plume by preventing any further lateral migration of contaminants in groundwater.
- Reuse of the water treated at the Site to the extent possible in accordance with Arizona's Groundwater Management Act.
- Mitigate any soil contamination that continues to impact groundwater.
- Provide long-term management of contaminated groundwater to improve the regional aquifer's suitability for potable use.

EPA selected Alternative 3A in the 2001 ROD Amendment, which required groundwater containment in the MAU and LAU aquifers; restoration of the groundwater to drinking water standards via removal of the COCs; groundwater extraction at Areas 7 and 12; continued groundwater monitoring in the UAU, MAU, and LAU; periodic updates to the groundwater model; installation of one new extraction well; and treatment of all extracted groundwater.

The Enhanced Remedy inherently includes the requirements of the 1988 and 1991 RODs. The Enhanced Remedy consists of work that had already been completed by the time of the 2001 ROD and also the following:

- Groundwater monitoring in the UAU, MAU, and LAU including the periodic input of current groundwater data into the groundwater model to assess the accuracy over time of model projections in the Feasibility Study Addendum (FSA).
- Groundwater plume containment in the MAU and LAU, as measured by monitoring of sentinel wells and demonstration of an inward hydraulic gradient.
- With the exception of continued use of the MRTF and wells PVWC-14, PVWC-15 and PCX-1, the voluntary actions (actions taken to prevent contamination of Paradise Valley wells but not documented in a previous ROD) will become required actions.
- Treated water and groundwater left in place shall not contain VOCs present above the cleanup standards.
- Extraction of groundwater from CGTF extraction wells.
- Operation of the CGTF to treat the groundwater extracted from CGTF extraction wells.
- Implementation of a priority pumping scheme which includes increased pumping from the most contaminated CGTF extraction wells.
- Use of spare pumps to avoid long down-times for CGTF extraction wells (COS71A and COS75A).
- The goal for minimum total annual average pumping rate will remain at 6,300 gallons per minute for the wells connected to the CGTF.
- Extraction of and treatment of groundwater from wells PVWC-14, PVWC-15 and PCX-1 or wells that are equivalent to these wells in location, depth, design, capacity etc.
- The goal for minimum total annual average pumping rate will be established at 5,480 gallons per minute for the wells PVWC-14, PVWC-15 and PCX-1 (or wells that are equivalent in location, depth, design, capacity etc.).
- Operation of the Area 7 and Area 12 groundwater treatment systems.
- Installation of one extraction well and one recharge well in the vicinity of Area 7 with upgrades to the Area 7 treatment plant to accommodate increased production.
- If groundwater data indicates that the Area 7 and Area 12 groundwater plumes are migrating toward the southwest margin, contingency actions, potentially including additional wells or increased pumpage in these areas, shall be evaluated and implemented.
- Completion of the soil cleanup action in progress at Area 7 in 2001.

The established cleanup standards as listed in the 2001 ROD are shown in Table 2-4.

Table 2-4. 2001 ROD-Specified Cleanup Standards: North Indian Bend Wash

Chemical	Cleanup Standards for Treated Water (µg/L)
TCE	5
PCE	5
1,1,-DCE	6
1,1,1-TCA	200
Chloroform*	6*

Notes:
µg/L = micrograms per liter
* Not a byproduct of municipal water supply chlorination; Arizona HBGL (human health based guidance levels)
Source: U.S. EPA 2001 Record of Decision (amendment)

Summary of 2012 ESD

A change in remedy technology from air stripping to liquid-phase granular activated carbon (LGAC) operated in a lead/lag configuration for the extracted groundwater from well PCX-1. This enabled the construction of the NIBW Granular Activated Carbon (GAC) Treatment Facility (NGTF) to treat the extracted groundwater until contaminant concentrations from PCX-1 are significantly below the MCL of 5.0 µg/L. This ESD also included conveyance of the treated groundwater to the COS water treatment plant for potable use, or delivery to the Salt River Project (SRP) when needed, results in the drinking water use adopted by the 2001 Record of Decision Amendment (AROD) (EPA, 2012).

The ESD issued in 2012 (EPA, 2012) required a change in the treatment technology and end-use for well PCX-1, which had been part of the groundwater remedy for the MRTF selected in the 2001 ROD Amendment (EPA, 2001). These changes were in response to two incidences of contaminated groundwater entering the Arizona American Water Company (AAW) Paradise Valley Arsenic Removal Facility (PVARF) and subsequently the AAW's potable supply system; one in 2007 and one in 2008. Immediately following the 2008 incident, AAW indicated it was no longer willing to accept the treated water from PCX-1.

The RAOs and cleanup standards specified in the 2001 AROD did not change as a result of this ESD.

Current North Indian Bend Cleanup standards

A summary of current cleanup standards from all decision documents is illustrated in Table 2-5.

Table 2-5. Summary of ROD-Specified Cleanup Standards: North Indian Bend Wash

Chemical	Drinking Water Standards (µg/L)		Cleanup Standards for Treated Water (µg/L)	Source
	State	Federal		
TCE	3.2	5	5	1991 ROD
PCE	0.67	5	5	1991 ROD
1,1,-DCE	7	7	6	2001 ROD
1,1,1-TCA	200	200	200	1988 ROD
Chloroform*	6	100	6	1991 ROD

Notes:

*Not a byproduct of municipal water supply chlorination; Arizona HBGL (human health based guidance levels)

2.2.2 South Indian Bend Wash

In 1988, EPA separated the SIBW area into two operable units (OUs): a soils OU and a groundwater OU. The decision documents for the selection of the remedy include the September 1993 vadose zone ROD, the 1998 groundwater ROD, and the 2004 ROD amendment, which modified the groundwater remedy based on data from ongoing groundwater monitoring. These documents are discussed below, including a presentation of the Site's RAOs and major components of the selected remedy.

Summary of 1993 ROD

The vadose zone ROD (EPA, 1993) outlines the selection of soil vapor extraction (SVE) and vapor-phase GAC (vGAC) treatment of extracted soil vapor. The ROD includes two innovative approaches: the use of a "presumptive remedy", which allows EPA to presume that a particular technology (SVE in this case) would be appropriate in cases where it would be effective, and the use of a "plug-in" approach which allows facilities/parcels to be "plugged-in" to the presumptive remedy allowing for streamlined time frames and less documentation to implement the remedy at multiple separate but similar sub-sites. The "plug-in" criteria were established in this ROD and are based on VLEACH[1] modeling. Under this remedy, EPA established a groundwater monitoring well network consisting of 30 wells installed by EPA, wells installed by potentially responsible parties, and production wells which existed prior to EPA's investigation. An additional 32 groundwater monitoring wells were installed by the end of 1993. The final phase of the remedial investigation (RI) was completed in 1997.

The RAOs in the 1993 ROD are:

- Adequately protect human health from the ingestion or inhalation of VOCs that migrate from the vadose zone to groundwater.
- Adequately protect human health from the inhalation of VOCs that migrate from the vadose zone to the atmosphere.
- Control the sources of continuing groundwater contamination to minimize loss of the groundwater resources and reduce the degree of groundwater cleanup that may be required.

EPA issued four Unilateral Administrative Orders and one Administrative Order on Consent for focused remedial investigation work at five of the eight sub-sites identified during the initial phases of the RI. Arizona Public Service made the determination that SVE was appropriate at its site in lieu of conducting focused remedial investigation work. Arizona Public Service implemented SVE successfully at this sub-site, and EPA approved its closure report in April 2001 documenting that soil cleanup at the site had been completed.

The first "plug-in determination" (i.e., EPA's finding of whether a facility met the "plug-in" criteria to require SVE treatment) was issued in February 1994 for the DCE Circuits sub-site which required SVE

[1] VLEACH leach is a One-Dimensional Finite-Difference Vadose Zone Leaching Model, supported by the U.S. EPA (EPA, 1997), which describes the movement of an organic contaminant within and between three phases: (1) as a solute dissolved in water, (2) as a gas in the vapor phase, and (3) as an adsorbed compound in the solid phase. The leaching is simulated in a number of distinct, user-defined polygons vertically divided into a series of user-defined cells. At the end of the simulation, the results from each polygon are used to determine an area-weighted ground-water impact for the modeled area], groundwater mixing zone calculations, and a comparison of VOC concentrations to the maximum contaminant levels.

treatment. The second plug-in determination was issued in January 2002, in which EPA did not require SVE treatment for the following seven facilities: Eldon, Circuit Express, Allstate Mine Supply, Desert Sportswear, Cerprobe, Service and Sales, and City of Tempe Right-of-Way.

The 1993 ROD established the cleanup standards shown in Table 2-6 (EPA, 2011).

Table 2-6. 1993 ROD-Specified Cleanup Standards: South Indian Bend Wash

	Cleanup Standard (µg/L)		Cleanup Standard (µg/L)		Cleanup Standard (µg/L)
Acetone	700[a]	Dichlorodifluoromethane	1,400[a]	Styrene	100
Benzene	5	1,1-Dichloroethane	1,000[d]	1,2,2,2-Tetrachloroethane	0.08[d]
Benzyl Chloride	140[a]	1,2-Dichloroethane	5	Tetrachloroethene (PCE)	5
Bromodichloromethane	100	cis-1,2-Dichloroethane	70	Toluene	1,000
Bromoform	100	1,1-Dichloroethylene	7	1,2,4-Trichlorobenzene	70
Bromomethane	9.8[a]	trans 1,2-Dichloroethylene	100	1,1,1-Trichloroethane	200
Carbon Tetrachloride	5	1,2-Dichloropropane	5	1,1,2-Trichloroethane	5
Chlorobenzene	100	1,2-Dichloropropene	0.19[a]	Trichloroethene (TCE)	5
Chloroform	100	Dichlorotetrafluoroethane	100[b]	Trichlorofluoromethane	2,100[a]
Chloromethane	2.8[a]	Ethylbenzene	700	1,1,2-Trichloro-2,2,1-Trifluoroethane	210,000[a]
Dibromochloromethane	100	Hexachlorobutadiene	1.4[a]	Vinyl Chloride	2
1,2-Dibromoethane	0.05	Methylene Chloride	5[c]	Xylenes	10,000
1,2-Dichlorobenzene	600	Methylethylketone	350[a]		
1,3-Dichlorobenzene	600				
1,4-Dichlorobenzene	75				

All concentration levels in micrograms per liter (µg/L) and based on MCL unless otherwise noted.

Notes:

a. Level based on Arizona Health-Based Guidance Level (HBGL) for water (June 1992)
b. No formal toxicity standards exist for this compound, which is also known as FREON 114. Level is based on a limited no-observed-adverse-effect-level as determined by data from the Hazardous Substance Database, with an uncertainty factor of 10. The study used as the basis was Campbell DD et al Br J Ind Med 43:107-111 (1986).
c. Level based on proposed MCL.
d. Level based on EPA Region IX Preliminary Remediation Goals, Third Quarter, 1993 for tap water which are based on a 10^{-6} excess cancer risk or a non-cancer hazard index of 1 for a person drinking water at the concentration over an average lifetime.

Summary of 1998 ROD

The 1998 ROD (EPA, 1998) presents EPA's remedy and contingency remedy for groundwater. A remedy for the OU for VOCs in Soils was established in a 1993 ROD. The 1998 ROD addresses the Groundwater OU. Together the 1993 ROD and the 1998 ROD form the remedy for VOC contamination at IBW-South.

The general RAOs are:

- Maintain protection of human health and the environment by reducing the risk of potential exposure to contaminants.
- Expedite site cleanup and restoration.
- Use permanent solutions to the maximum extent practicable.

- Restore contaminated groundwater to the extent practicable to support existing and future uses.
- Achieve compliance with applicable or relevant and appropriate requirements (ARARs).
- Minimize untreated waste.

The groundwater RAOs are:

- Protect human health by minimizing the potential for human exposure to groundwater exceeding cleanup goals.
- Cost-effectively reduce contamination in groundwater to concentrations that meet cleanup goals to return groundwaters to their beneficial uses to the extent practicable within a time frame that is reasonable, given the particular circumstances of the site.
- Protect groundwater resources by preventing or reducing migration of groundwater contamination above ARARs.

The established cleanup standards as listed in the ROD are shown in Table 2-7.

Table 2-7. 1998 ROD-Specified Cleanup Standards: South Indian Bend Wash

	Aquifer Cleanup Standard	Discharge Limits for Tempe Canal & Re-injection	Discharge Limits for Town Lake (µg/L)	
	(MCL or HBGL)	(MCL or HBGL)	(A&W-Acute)	(A&W-Chronic)
Organics				
Benzene	5[b]	5[b]	2,700	180
Bromodichloromethane	100[b,c]	100[b,c]	-	
Chloromethane	2.7[d]	2.7[d]	270,000	15,000
Chloroform	100[b,c]	100[b,c]	14,000	900
1,2-Dibromoethane	0.05[b]	0.05[b]	-	-
1,2-Dichloroethane	5[b]	5[b]	59,000	41,000
1,1-Dichloroethene	7[b,e]	7[b,e]	15,000	950
1,2-Dichloropropane	5[b]	5[b]	26,000	9,200
Methylene Chloride	5[b]	5[b]	97,000	5,500
1,1,2,2-Tetrachloroethane	0.18[d]	0.17[i]	4,700	3,200
Tetrachloroethene (PCE)	5[b]	5[b]	6,500	680
Trichloroethene (TCE)	5[b]	5[b]	20,000	1,300
Inorganics				
Antimony		6[b]	88	30
Arsenic		50[f]	360	190
Barium		2,000[b]	-	-
Beryllium		4[b]	65	5.3
Cadmium		5[b]	-[h]	-[h]
Chromium (total)		100[b]	-	-
Copper		1,300[b,g]	-[h]	-[g]
Cyanide		200[b]	41[I]	9.7[I]
Lead		15[b,g]	-h	-[g]
Mercury		2[b]	2.4	0.01
Nickel		100[f]	-[h]	-[g]
Selenium		50[b]	20	2.0
Thallium		2[b]	700	150
Zinc		2,100[d]	-[g]	-[g]

a. Aquatic and Wildlife (A&W) (warm water fishery).
b. Maximum Contaminant Level (MCL).
c. For total trihalomethanes.
d. Human Health-Based Guidance Level (HBGL) for drinking water (December 1997 Update).
e. Maximum Contaminant Level Goal is identical to the MCL.
f. Arizona State MCL.
g. Action level, not to be exceeded in more than 10 percent of samples.
h. Concentrations vary depending on the hardness of the receiving water body.
i. Arizona water quality standard for drinking water sources.

Note: The Arizona Aquifer Water Quality Standards for benzene, 1-2 dichloroethane, 1,1-dichloroethene, 1,2- dichloropropane, PCE, total trihalomethanes, TCE, antimony, barium, beryllium, cadmium, chromium, cyanide, selenium, and thallium are identical to the federal MCLs; identical to the state MCL for nickel; and 50 µg/L for lead.

Summary of 2004 ROD Amendment

In June 2004, EPA amended the Groundwater OU ROD (EPA, 2004) based on data accumulated from historic groundwater monitoring indicating that TCE concentrations in the western UAU plume were decreasing at a rate such that remedial objectives could be met in a reasonable timeframe. A comparison of historical data with data collected in 2004 indicated that the western plume had migrated down-gradient moving south to southwest with the prevailing groundwater flow direction as predicted in the feasibility study, but that TCE concentrations had significantly decreased. During the RI, TCE was detected at concentrations as high as 540 µg/L in monitoring well SD3W-5U (now SIBW-5U). In 2004, TCE concentrations in this same well were below the MCL. Based on the January 2004 data, the highest TCE concentration in monitoring well SIBW-28U was 6.3 µg/L as compared to 43 µg/L at the time of the 1998 Groundwater ROD. Additionally, the data indicated that the plume was naturally attenuating and was relatively stable. Based on these site conditions, the groundwater remedy for the western UAU plume was changed from extraction and treatment to MNA. This ROD Amendment did not change the central and eastern plume MNA remedy.

The groundwater RAOs are:

- Protect human health by minimizing the potential for human exposure to groundwater exceeding cleanup standards.
- Cost-effectively reduce contamination in the western plume to concentrations that meet cleanup standards to return groundwater to its beneficial use to the extent practicable within a time frame that is reasonable, given the particular circumstances of the Site.
- Protect groundwater resources by preventing or reducing migration of groundwater contamination above ARARs.

The established cleanup standards as listed in the ROD are shown in Table 2-8.

Table 2-8. 2004 ROD-Specified Cleanup Standards: South Indian Bend Wash

Chemical	MCL/Cleanup Standards for Groundwater (µg/L)
PCE	5
TCE	5

2.3 Remedy Implementation

Implementation of the NIBW remedy began in 1992. Between 1992 and 1999, four groundwater extraction and treatment systems (CGTF, MRTF, Area 7, and Area 12) and four SVE systems (Area 6, Area 7, Area 8, and Area 12) were designed, constructed, and placed into routine operation and maintenance. The Area 6, 8 and 12 SVE systems were operated and decommissioned based on performance data; the Area 6 soil vapor extraction system was implemented as a voluntary action not required by EPA. The Area 7 SVE Treatment System was operated intermittently from July 1994 to December 2009 when it was shut down for long-term rebound testing. The Area 7 SVE system has since been decommissioned. The four groundwater extraction and treatment systems continue to operate as part of the ongoing remedial efforts for NIBW.

The following subsections provide a description of the various remedy components and a history of their construction and operation.

2.3.1 Groundwater Extraction and Treatment Systems

North Indian Bend Wash

Central Groundwater Treatment Facility (CGTF)

The CGTF was constructed between September 1992 and January 1994. The CGTF extracts groundwater from VOC plumes in the MAU and LAU using four extraction wells at a combined flow rate goal of 8,400 gallons per minute (gpm). The remedy is comprised of air stripping followed by vGAC to reduce the VOC concentration in the air stripper off-gas before discharge to the atmosphere. The CGTF includes three air stripper towers designed to operate in parallel. Groundwater is extracted from four wells COS-31, COS-71A (replacement well for COS-71), COS-72 and COS-75A (replacement well for COS-75.

There have been prior incidents of leaks associated with the CGTF. On May 13, 2005 a power outage caused a change in pressure and coupling failure in the raw water line at well site 72 resulting in a discharge of approximately 60,000 gallons to a drainage ditch. On January 22, 2007 a release of approximately 3000 gallons of raw water resulting from a shutdown of column 3 while a raw water influent valve was oscillating between open and closed. The discharge flowed across the CGTF parking lot and into the adjacent Pima Park; access was controlled as the site was monitored. Contingency and Emergency Response plans were established for all NIBW facilities in 2007. More recently, in June 2016, there was a release of approximately 1.2 million gallons of raw water from a ruptured transmission pipeline between Wells 71A/72 and the CGTF which occurred as the result of a power outage during a heat wave and communication delay between shutdown of the plant and shutdown of the wells and pipeline valves which caused the 23 year old pipe to burst.

Miller Road Treatment Facility (MRTF)

The MRTF was constructed between 1996 and 1997 and was originally designed to treat groundwater extracted from well PCX-1, which is owned by Salt River Project, and wells PV-14 and PV-15 which are owned by Arizona American Water, a private water company. The MRTF consists of three air stripper towers followed by vGAC to reduce the VOC concentration in the air stripper off-gas before discharge to the atmosphere. The MRTF extraction wells are primarily screened in the LAU. The MRTF remedy was installed to remove VOCs from the LAU and contain the TCE plume at the northern portion of the NIBW area from migrating toward the pumping center associated with AAW's wellfield.

In two incidents, one in 2007 and another in 2008, partially treated water from MRTF well PCX-1 was introduced into the AAW's potable supply. As a result, interim changes in system operations were implemented to prevent another incident. These include physically separating well PCX-1 from the potable water system and conveying PCX-1 treated effluent to the SRP Arizona Canal rather than to AAW's municipal system. EPA subsequently issued the 2012 ESD which selected a liquid-phase granular activated carbon (LGAC) system designed to treat groundwater extracted from well PCX-1 (See Northern Groundwater Treatment Facility section below)

In 2011, long-term changes were made based on a third-party engineering evaluation conducted from 2008 through 2010. The long-term changes included 1) installing new redundant system instrumentation for critical processes, 2) correcting wiring and system calibrations, and 3) adding control logic and set points to prevent well startup if the system is in manual mode.

Northern Groundwater Treatment Facility (NGTF)

The NGTF is a newly constructed facility that came online in 2013. The facility treats contaminated groundwater from extraction well PCX-1, which is screened in the LAU. Treated groundwater from the NGTF can be discharged to COS's CWTP or the Arizona Canal. The NGTF was designed and constructed by the NIBW participating companies (PCs) to treat VOCs in groundwater extracted from well PCX-1 using LGAC.

Area 7 Groundwater Extraction Treatment Facility (GWETS)

The source Area 7 remedy was constructed from 1998 to 1999 and currently extracts groundwater from three MAU wells. The Area 7 remedy includes a 5,000-gallon equalization tank to balance influent flows; an ultraviolet light/chemical oxidation (UV/Ox) system; a low-profile air stripper to remove any remaining VOCs from the UV/Ox effluent stream; and a vapor-abatement system using vGAC. The Area 7 groundwater extraction and treatment system is designed to treat up to 500 gpm with a maximum TCE concentration of 7,000 µg/L. Area 7 is a critical remedy component for removing VOCs from the MAU and controlling higher VOC concentrations in the MAU from migrating to the southwest margin and then into the LAU. Treated groundwater is injected into the UAU through one of two upgradient injection wells. The treated water may be discharged to the COS's sanitary sewer as an option during non-routine maintenance or following major system modifications.

Area 12 Groundwater Extraction and Treatment Facility (GWETS)

The source Area 12 remedy was constructed from 1998 to 1999 and extracts and treats groundwater from well MEX-1MA and the SRP Granite Reef Well, which are screened in the MAU. The Area 12 remedy, like the Area 7 remedy, removes VOCs from MAU groundwater and controls higher concentrations of VOCs in the MAU from migrating to the southwest margin and then into the LAU. Area 12 includes an air stripper tower and vGAC designed to treat up to 2,000 gpm with a maximum TCE concentration of 300 µg/L.

South Indian Bend Wash

There are no extraction systems operating at SIBW as the current remedy is MNA.

2.3.2 Soil Vapor Extraction Systems

Since 1992, one voluntary (Area 6) and three required SVE systems have been constructed and operated in the NIBW area. The Area 7 SVE system was demolished with the approval of EPA in 2015. In the SIBW area, one required (DCE Circuits) and two voluntary SVE systems have been constructed and operated. These are discussed in the following sections.

North Indian Bend Wash

NIBW Area 6 is the location of former Siemens and Dickson Electronic facilities where electronic component manufacturing occurred. The Area 6 SVE system was implemented voluntarily by Siemens

and operated from December 1998 to August 2000. The SVE system was decommissioned in August of 2000, followed by issuance of an Area 6 closure letter to EPA in October 2000.

NIBW Area 7 is the location of the former Rolamec facility where machining and pen manufacturing processes occurred. SVE treatment began operation in July 1994 and operated intermittently from 1994 to 2009 to address potential source areas in the UAU. Extracted soil vapor was passed through an aftercooler before being treated by two GAC vessels in a series configuration. The Area 7 SVE system was decommissioned in 2015, following EPA's letter of determination approving closure based upon attainment of remedial goals in the Upper Alluvial Unit.

NIBW Area 8 is the location of Dickson Electronics and Marro Plating where silicon wafers were manufactured and metal finishing occurred, respectively. The Area 8 SVE system operated from September 1995 through October 1996 and consisted of two sets of nested SVE wells, each containing three sub-wells which were screened at differing depths. The SVE wells were plumbed to a common header followed by an extraction blower. Treatment of extracted soil vapor included an aftercooler for temperature control and two vGAC vessels in series configuration. In July 1997, EPA issued a Notice of Determination that the Area 8 SVE had attained the specified remedial performance standards and the system was decommissioned.

NIBW Area 12 is the present location of a General Dynamics facility and the former location of the Motorola Government Electronics Group, where electronic components were manufactured. An SVE system was operated at Area 12 between 1996 and 1998 which removed approximately 946 pounds of VOCs from the soil. This system was decommissioned in 1998 when the performance criteria were met. In August 2000, EPA issued a letter determining that Area 12 SVE had attained the specified remedial performance standards.

South Indian Bend Wash

There are no SVE systems operating at SIBW.

2.3.3 Institutional Controls

The site ICs are non-engineering methods by which access to contaminated environmental media is restricted. The 1998 SIBW ROD outlines institutional controls which include various Arizona well siting, permitting, and construction restrictions, and notices distributed by the Arizona Department of Water Resources (ADWR), ADHS, or EPA concerning risks from exposure to contaminated groundwater. Although specifically identified for SIBW, these ICs are implemented sitewide by transmittal of a written notice of intent for well siting/permitting/construction from ADWR to EPA and Arizona Department of Environmental Quality (ADEQ) for review and written approval before implementation.

2.4 Operation and Maintenance (O&M)

Long term operation and maintenance is currently being conducted at NIBW and SIBW.

North Indian Bend Wash

The NIBW operation and maintenance activities consist of routine groundwater monitoring of the remedy extraction wells and monitoring well network, air emissions sampling for the air stripper towers, and treatment system operational monitoring (including influent and effluent). Cleaning of the air stripper

towers at the various groundwater extraction and treatment systems is also conducted as needed. The cleaning removes carbonate scale from the air stripper media which may inhibit volatilization and reduce treatment performance. Wastes produced during column cleaning are disposed offsite.

The NIBW groundwater monitoring includes periodic monitoring of existing production wells; influent and effluent locations at each groundwater treatment system; and numerous monitoring wells installed in the UAU, MAU and LAU. Monitoring activities have been conducted to meet requirements specified in decision documents and the PCs have conducted additional voluntary monitoring.

Groundwater level monitoring is conducted by the NIBW PCs semi-annually in a network of up to 106 NIBW monitoring wells including UAU, MAU and LAU wells. In addition, water levels are monitored continuously at a select group of LAU monitoring and one extraction well. Groundwater quality monitoring is conducted for the five NIBW contaminants of concern: TCE, PCE, 1,1,1-TCA, 1,1-DCE, and chloroform. Data generated during monitoring activities is reported by the PCs in the annual site monitoring reports.

Monthly groundwater production data are compiled for wells that pump in excess of 35 gpm and are located within the area bounded by Indian Bend Road in the north, one mile south of McKellips Road in the south, Dobson Road in the east, and Invergordon Road in the west. Monthly and annual production data are presented in the annual site monitoring reports. In addition, the vapor abatement systems at the groundwater treatment facilities using air stripping to remove VOCs are sampled quarterly to monitor treatment performance.

Water quality monitoring for the five NIBW COCs include the following components:

- Monthly sampling (when operating) at the four (4) CGTF extraction wells, two (2) MRTF extraction wells and one (1) NGTF extraction well.
- Quarterly sampling (when operating) at the two (2) remaining Area 7 extraction wells, two (2) Area 12 extraction wells, and at a network of 22 MAU and LAU monitoring wells.
- Semi-annual sampling at three (3) LAU monitoring wells.
- Annual sampling at the remaining 61 UAU, MAU, and LAU monitoring wells.

South Indian Bend Wash

The SIBW operation and maintenance activities consist of routine groundwater monitoring for the eastern, central, and western plumes, and routine soil vapor and indoor air monitoring at the DCE Circuits sub-site.

To evaluate the MNA remedy, SIBW operation and maintenance activities for the western, central, and eastern plumes include collection of annual groundwater elevation levels from 21 SIBW wells and collection and analysis for COCs of groundwater samples from 12 wells (Gilbane, 2014a). These wells are screened in the UAU or UAU/MAU, based upon which SIBW plume they are intended to monitor.

3 Progress Since the Last Five-Year Review

3.1 Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statement from the 2011 FYR for the Indian Bend Wash Superfund Site stated the following:

> *"The remedies at the IBW Site are currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. The groundwater extraction and treatment systems which comprise the NIBW remedy are removing volatile organic compound (VOC) mass from the three groundwater zones, reducing VOC concentrations in groundwater, and treating VOC concentrations to below the maximum contaminant levels (MCLs). The groundwater plume is contained as demonstrated by analysis of groundwater data and predicted by groundwater modeling. At SIBW, identified source areas have been remediated and the monitored natural attenuation remedy has almost met the remedial action objective to restore groundwater to beneficial use. At the DCE Circuits sub-site, indoor air monitoring conducted since 2007 is ongoing to ensure concentrations remain within EPA's acceptable levels."*

The 2011 FYR included the following four recommendations and are reproduced verbatim in the four bullets that follow. Each recommendation and its current status is discussed in Table 3-1.

1. There was an incident in 2007 and another in 2008 at the Miller Road Treatment Facility (MRTF) in which partially treated groundwater from well PCX-1 was delivered to the potable supply system. As an interim measure, in 2008 the MRTF was reconfigured to convey treated water from well PCX-1 to a SRP canal instead of the potable supply system. This end use is consistent with the ROD and reflects the way the MRTF was originally operated for several years. Additionally, EPA added a recommendation for a physical secondary fail-safe for wells with a drinking water end use. The remedy is currently protective and the long-term configuration for the MRTF is presently being negotiated with the multiple water rights holders, but has not been finalized. This item will be addressed by finalizing selection of the long-term remedy in 2011 and implementation planned for 2012.

2. Key documents for the Miller Road Treatment Facility require updating to include as-built drawings, current process and instrumentation diagrams, and preventive maintenance tasks. The Contingency and Emergency Response Plan needs to be kept on site.

3. The Operations and Maintenance Manuals for the CGTF and Area 7 require updating to include current figures, a list of alarms, and a troubleshooting section.

4. The Area 12 O&M Manual requires updating to include discussion of performance monitoring, routine and preventive maintenance, and alarm testing and calibration protocols. Copies of as-built drawings, piping and instrumentation diagrams, and Sampling and Analysis Plans need to be kept on-site.

Table 3-1.Status of Recommendations from the 2011 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
NIBW	1	Negotiate a long term configuration for the MRTF.	Completed	A new groundwater treatment facility to treat water from well PCX-1 was constructed.	12/31/2013
NIBW	2	Update key MRTF key documents.	Completed	The MRTF O&M Plan and CERP were updated and submitted to EPA.	12/31/2014
NIBW	3	Update O&M manuals for CGTF and Area 7.	Completed	The O&M Plans were updated and submitted to EPA.	12/31/2014
NIBW	4	Update O&M manuals for Area 12.	Completed	The Area 12 O&M Plan was updated and submitted to EPA.	12/31/2014

3.2 Work Completed at the Site During this Five Year Review Period

The following work is either ongoing or has been completed at the NIBW Site, as indicated during the interviews.

- Changes in pumping equipment were made to increase pumping rates at two critical extraction wells – COS-75A (2012) and PCX-1 (2014), which provide capture for the majority of the LAU plume.
- Since 2010, optimization of the pumping regimen used at the Paradise Valley wells has had a beneficial impact on the LAU remedy. The PCs have worked successfully with EPCOR, the water provider who owns and operates the Paradise Valley wells and the MRTF, to implement a south to north pumping strategy that focuses pumping on the two Paradise Valley wells that are tied into the MRTF for treatment (PV-15 and PV-14). Pumping from the other Paradise Valley wells is added in a south to north order in response to demand. This approach has been shown through monitoring and modeling to optimize LAU plume containment.
- The NGTF was added to provide the overall remedy with additional flexibility and control of extraction and treatment of groundwater from PCX-1, which is a critical component of the LAU remedy.
- In 2014, CGTF extraction well COS-71 was replaced by the COS with well COS-71A, and in 2015 Area 7 source control extraction well 7EX-5MA was replaced by the PCs with well 7EX-6MA.
- The Area 7 vadose zone SVE remedy was certified complete in an EPA Letter of Determination dated April 22, 2015. The SVE system was decommissioned in 2015 and site closure was certified by EPA in a letter dated March 3, 2016.
- Alternatives for operation of the Area 7 MAU extraction wells are presently being evaluated to improve the effectiveness and efficiency of the groundwater remedy. This evaluation will assist in determining the proper balance between the two principal goals for the Area 7 source control

remedy: maintaining hydraulic containment of groundwater in the area of elevated VOC concentrations and maintaining high TCE mass removal rates.

- A total of 30 UAU monitor wells were abandoned in 2013 with the approval of EPA resulting in reduced monitoring costs without sacrificing the ability to effectively monitor the plume or the progress of the remedy.
- The NIBW PCs requested, and EPA approved, reduction of the operating air-to water ratio in the air strippers at the MRTF in 2015, resulting in reduced energy consumption and O&M costs.
- Based on review of the NIBW PCs' draft sampling and analysis plan (SAP) addendum for the Site, which is currently being finalized, EPA approved the use of HydraSleeve® sampling when aging dedicated pumps fail at monitoring wells. To date, 9 wells have been shifted to use of the HydraSleeve sampling protocol after their pumps failed. Four more wells will potentially be shifted to HydraSleeve sampling during the upcoming April 2016 monitoring round, and others will be added over time. This gradual shift away from traditional purge to an in-situ sampling approach reduces risks and costs associated with handling and disposal of investigation-derived wastes.
- Recognizing the significant power needs of a project of this magnitude, the NIBW PCs have sought to shift an increased amount of the power to green sources. In the past 5 years (2011-2015), the PCs have incorporated use of about 11 million kilowatt hours of green power into remedy implementation. This shift, at an additional cost of $116,000 to the PCs, reduces the project's carbon footprint and helps stimulate industrial markets for green power.
- On June 18, 2016 there was a release of approximately 1.2 million gallons of raw water from a ruptured transmission pipeline between Wells 71A/72 and the CGTF which occurred as the result of a power outage during a heat wave and communication delay between shutdown of the plant and shutdown of the wells and pipeline valves which caused the 23 year old pipe to burst. The leak entered a drainage ditch on a golf course and infiltrated into the ground and evaporated in the 110 degree heat. The City responded with a vacuum truck to pump water from the cavity of pipeline break, while public access was blocked and the site was closely monitored as the pipeline was repaired. Corrosion was noted at the site of the break. The City is currently planning leak detection surveys and inspections along the entire 6 mile pipeline to evaluate the current status.

The following work is either ongoing or has been recently completed at the SIBW Site.

- Indoor air sampling event for the DCE Circuits subsite conducted in November 2015 by Gilbane Federal (Gilbane) on behalf of EPA. The primary objective of monitoring at the Subsite buildings was to characterize the indoor air quality and enable evaluation of the potential for vapor intrusion (VI) from soil vapors underneath the building. Based on the indoor air sampling results, Gilbane determined that TCE and PCE indoor air concentrations have been below the EPA industrial indoor air protective risk ranges since January 2013 with the exception of TCE detected at 6.44 micrograms per cubic meter (µg /m3) (Gilbane, 2016).
- An enhanced attenuation study, consisting of in-situ chemical oxidation (ISCO) for the Eastern Plume in the MAU, has been implemented at groundwater monitoring wells SIBW-11MC, SIBW-13MC, SIBW-56 MC, SIBW-58MC, and SW-3 (for details, see the 2013 Middle Alluvial

Unit Enhanced Attenuation Study prepared by Gilbane). The specific objective of the enhanced attenuation study is to assess the ability of ISCO to reduce concentrations of TCE at these wells to below 2.5 µg/L in groundwater in the immediate vicinity of the five remaining wells at the Site with TCE concentrations still above or near the MCL of 5.0 µg/L and the groundwater site closure concentration of 2.5 µg/L. Post-ISCO sampling is ongoing and after 7 rounds of sampling, since March 2013 with the most recent being October 2015, all wells show concentrations less than 5 µg/L but two have concentrations greater than 2.5 µg/L; the highest post-ISCO TCE concentration measured was only 6.3 µg/L at SW-03 in October 2014. However, since rebound sampling is only conducted at injection wells these concentrations may not be reflective of the larger aquifer.

- Gilbane has abandoned all wells associated with the SIBW Superfund Site with the exception of the 21 wells that are currently in the sampling program. All wells in the UAU western and UAU central plumes have been below the MCL since 2011. All wells in the MAU eastern plume have been below the MCL for the last year.

4 Five-Year Review Process

4.1 Community Notification, Involvement and Site Interviews

A public notice indicating the completion of a Five-Year Review for the Indian Bend Wash Superfund Site was published in the Arizona Republic on Friday May 20, 2016. The results of the review and the report will be made available at the Scottsdale Public Library and the ADEQ office. This notice is included in Appendix E of this FYR.

4.2 Site Interviews

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date**.** The results of these interviews are summarized below. Interviews were conducted either in person or interview forms were filled out and provided to USACE during this FYR to provide insight into the general perception of the cleanup and the operations associated with the remedy. Three in-person interviews of various contractors and a representative of the COS were conducted at the NIBW site, and a single interview form, completed collectively by representatives of the PCs, was provided at a later date (Appendix F).

North Indian Bend Wash

There is a positive overall impression of the project. Stakeholders are working together successfully and cleanup goals are being met including capture and mass removal in the UAU, MAU and LAU. An example highlighted in one interview was the successful remediation of the UAU at Area 7, which resulted in the closure of the UAU groundwater extraction and SVE portions of the Area 7 system. The remedy is believed to be functioning as intended and meeting remedial objectives. Monitoring data have indicated that concentrations continue to decrease in the UAU and are decreasing or stable in many parts of the MAU and LAU. The treatment systems are monitored by an onsite staff or remotely on a continual

basis and there have been no significant changes to O&M requirements, maintenance schedules, or sampling routines in the past five years.

Minor changes include installation and operation of MAU extraction well 7EX-6MA to replace MAU extraction well 7EX-5MA and the decommissioning of the SVE system and UAU groundwater extraction well 7EX-1UA. The NIBW GAC treatment facility (NGTF) was completed in 2013 to treat water from PCX-1. A total of 30 UAU monitoring wells were abandoned in 2013 and sampling was reduced from semi-annual to annual at the remaining 28 UAU wells.

There have been some unexpected O&M difficulties including problems with communication systems at the groundwater extraction and treatment system (GWETS) and with a pipeline and release of untreated groundwater at the startup of the NGTF in 2013. Valve replacement and increased inspection is believed to have solved the problem at the NGTF. Several opportunities to optimize the system were mentioned in the interviews and generally included ways to improve operational and monitoring efficiency. None of the interviews indicated that changes to the Federal, State, County, or local laws or regulations that would affect the remedy protectiveness have occurred. Additional suggestions and recommendations included clarifying the existing ARARs and updating the Groundwater Management and Evaluation Plan (GMEP), the Sampling and Analysis Plan (SAP), and the Health and Safety Plan (HASP), and reducing the frequency of Technical Committee meetings.

South Indian Bend Wash

The selected MNA remedy is proving to be an effective way to return groundwater contaminant concentrations to below the drinking water MCLs. The UAU western and central plumes have naturally attenuated to below the MCL for drinking water as predicted. The 2015 sampling event indicated that all wells in the MAU eastern plume have VOC contaminant concentrations below the MCL. Monitoring data show that natural attenuation continues and that all three plumes are reducing in size and overall contaminant concentration.

There is no continuous O&M presence and activities at the site are typically limited to two groundwater sampling events per year. The frequency and number of wells sampled has been reduced twice. The first occurred in 2013 and reduced the sampling frequency from semi-annual to annual, and reduced the number of wells sampled from 41 to 21. The second reduction occurred in 2014 and reduced the number of wells sampled from 21 to 12. The spring sampling event (three wells in the MAU eastern plume) was added after ISCO injections to monitor post-injection performance. These reductions in sampling frequency and the number of wells sampled are a direct impact of reduction of size and concentration of groundwater contamination plumes due to the selected remedy (MNA).

Well SIBW-58MC was destroyed during non-SIBW construction activities in January 2014 by an outside party. The well was part of the enhanced attenuation study, and located at the center of the MAU Eastern Plume. The Eastern Plume can still be defined and monitored with upgradient and downgradient wells, but the loss of this well does present a data gap.

4.3 Data Review

This section presents a summary of recently collected data and a more detailed assessment is included in the Data Review Appendix B.

North Indian Bend Wash

The collective soil vapor extraction (SVE) remediation at NIBW has resulted in the removal of over 10,000 pounds of TCE from shallow vadose zone soils and these source areas are no longer an ongoing threat to groundwater. Area 7 soil-vapor extraction and treatment system, the last NIBW soil remediation site associated with the OU-2 Consent Decree, was decommissioned in 2015. From the inception of the NIBW groundwater remedy in 1994, about 108 billion gallons of groundwater have been extracted to remove an estimated 86,000 pounds of TCE. Furthermore, soil remedial actions have eliminated the threat to groundwater from historical sources of TCE at EPA-identified source areas. Presently, only 4 UAU monitoring wells have TCE concentrations that exceed the MCL; thus, the EPA approved of, and the NIBW PCs abandoned 30 UAU monitoring wells in 2013. Stable to declining trends in TCE concentrations are evident in most MAU and LAU monitoring and extraction wells.

The most recent samples collected during 2015 at 40 MAU wells indicated that 21 wells had TCE concentrations higher than the MCL, while TCE concentrations in groundwater in the MAU have been stable to declining. In general, TCE concentrations at MAU monitor wells down-gradient from the zones of capture associated with Area 7 have declined since the onset of source-control pumping and TCE concentrations at monitoring wells within these capture zones have also stabilized or decreased. Historical LAU water quality data demonstrate a clear trend of declining TCE concentrations in most wells in the southern half of the plume. The most recent samples collected during 2015 at 28 LAU wells indicated that 14 wells had TCE concentrations higher than the MCL and TCE concentrations observed in the northern LAU are, mostly stable or showing slightly decreasing trends, with the exception of wells PA-2LA, PG-42LA and PA-13LA.

Increasing TCE concentrations at PG-42LA are particularly significant since they are located in the LAU downgradient of the plume boundary. The increasing TCE concentration at PG-42LA is generally consistent but, more importantly, the highest TCE concentration of 3.3 µg /L was recently measured in October 2015. While the TCE concentration at PG-42LA remains below the MCL of 5 µg/L, this location should be carefully monitored in the future since it may be an indicator of plume migration in the LAU.

During January and March 2015, 1,4-dioxane was detected in 12 of 66 wells in concentrations ranging from below 0.22 -1.8 µg/l. A concentration of 0.42 µg/l was detected in the CGTF post treatment common sump. Some of these detections slightly exceed the one in a million excess cancer risk-based level for a lifetime 70 year exposure of 0.35 µg/L (0.35 ppb). These concentrations are within the Superfund protective exposure range (see above) for both a 30 year and 70 year RME scenario, however, future monitoring should include analysis for 1,4 dioxane to verify the trend is not increasing.

Treatment of extracted groundwater is an integral part of the NIBW remediation and occurs at several locations around the site and sampling and analysis demonstrated that treatment systems are operating effectively and that COC concentrations in treated waters from the CGTF, MRTF, and NGTF are consistently below regulatory standards. The combined groundwater extraction in the Area 7 GWETS and

Area 12 GWETS has achieved hydraulic containment throughout the MAU plume and treated water produced by all five NIBW GWETS is beneficially used.

The CGTF, MRTF, Area 7 GWETS and the Area 12 GWETS facilities rely on air stripping to remove the volatile contaminants followed by VGAC to reduce concentrations of the COCs prior to be discharged through the emission stack. Air emission samples are collected quarterly. In 2005, IBW Participating Companies prepared a draft Risk Assessment for the Area 12 GWETS plant including determining the risk from TCE exposure from air emissions. Concurrently, ATSDR prepared a Health Consult which independently assessed the risks from TCE exposure from air emissions. Both the Health Consult and the Risk Assessment determined that there was no unacceptable risk associated with the air emissions. In 2011, the toxicity re-assessment for TCE significantly lowered concentrations of concern to account for the new cancer potency information. In addition, new short-term exposure concerns have been identified. Recent air emission sampling (2015) at Area 12 GWETS, has shown a four-fold increase in TCE concentration than what was used in the Health Consult and the Risk Assessment. Review of emissions monitoring data is warranted to determine if VGAC treatment is currently meeting the standard of protectiveness.

South Indian Bend Wash

The 2015 annual groundwater level measurements made at 19 monitoring wells and water quality sampling at 11 monitoring wells in the UAU and MAU and reported in the 2015 Annual Report for SIBW, indicated that the highest concentration of TCE was detected in monitoring well SW-3 at 4.3 µg/L, which is below the MCL. The highest concentration of PCE was detected in monitoring well SIBW-61U at 3.0 µg/L, which is below the MCL.

In the UAU central plume PCE was detected in seven monitoring wells and in one monitoring well in the MAU eastern plume at concentrations greater than 0.5 µg/L, but less than the MCL. In the UAU western plume TCE was detected in one monitoring well and in the MAU eastern plume TCE was detected in four monitoring wells, at concentrations greater than 0.5 µg/L but less than the MCL. In one monitoring well in the MAU, cis-1,2-DCE was detected but at a concentration less than the MCL. Concentrations of COCs over time for each of the 11 wells that are still sampled annually show a generally declining trend.

The continual reduction of groundwater VOC concentrations at the UAU and MAU monitoring wells indicates that the MNA remedy is effectively controlling the migration of contaminants.

Indoor air sampling event for the DCE Circuits subsite has been conducted annually since 2009, most recently in November 2015. Indoor air concentrations in commercial business located on DCE Circuits subsite have declined significantly since 2011. Based on the indoor air sampling results, EPA determined that TCE and PCE indoor air concentrations have been below the EPA industrial indoor air protective risk ranges since with the exception of TCE detected at up to 6.77 $\mu g/m^3$ in January 2013. The DCE Circuits property currently is used for industrial or commercial purposes. Across the street from the DCE Circuits property, on East 8th Street is an apartment complex that has not been screened for potential residential vapor intrusion. Soil gas samples collected beneath the DCE Circuits Site along E. 8th Street, in 2011 and 2012, contained elevated concentrations of TCE. Both the 2011 and 2012 results exceeded Arizona SGHHSLs for soil gas for residential vapor intrusion concerns.

4.4 Site Inspection

The inspection of the North Indian Bend Wash area was conducted on 2/10/2016 and the inspection of the South Indian Bend Wash was conducted on 4/20/2016. Site inspections were conducted by the U.S. Army Corps of Engineers (USACE) with agency representatives, project managers, and project engineers present. The completed site inspection forms for NIBW and SIBW are all included in Appendix G and site inspection reports are included in Appendix H. The purpose of the inspection was to assess the protectiveness of the remedy.

Site inspections at NIBW were conducted by the USACE on 10 February 2016 at each of the five groundwater treatment systems, including the CGTF, MRTF, NGTF, Area 7, and Area 12 Groundwater Treatment Systems. Participants included:

- Matthew Masten, P.E – U.S. Army Corps of Engineers Los Angeles District (Inspection Lead)
- Leslie Katz – Montgomery & Associates
- Dennis Hall – Montgomery & Associates
- Terry Lockwood – Motorola
- Larry Lynch – Motorola
- James Lutton – Project Engineer, NIBW Project Engineer
- Suzanne Grendahl – City of Scottsdale
- Craig Miller – City of Scottsdale
- Stephanie Archabal – Gilbane, consultant to US EPA

The project manager and respective project engineers for each of the five treatment systems were in attendance and provided responses to the USACE interviewer; in one case the Water Quality Director from the COS was in attendance. Relevant documents were all on site and readily available. These documents included, where applicable: O&M manuals, as-built drawings, maintenance logs, health and safety plans, emergency response plans, O&M and safety Occupational Safety and Health Administration (OSHA) training records, air and effluent discharge permits, groundwater monitoring records, leachate extraction records and security records. O&M costs were not available during the inspections. In all cases, institutional controls were deemed to be adequate, there were no visible signs of vandalism, and access roads were adequate. Groundwater extraction wells, pumps, plumbing, and treatment systems were all in good working order and all chemicals were properly stored. In all cases, monitoring data were readily available and suggested that the groundwater plume is effectively contained and that contaminant concentrations are declining.

The site inspection at SIBW was conducted by the U.S. Army Corps of Engineers on 20 April 2016. Participants included:

- Matthew Masten, P.E. – U.S. Army Corps of Engineers Los Angeles District (Inspection Lead)
- Stephanie Archabal – Gilbane

Monitoring wells were inspected and found to be secure. Groundwater monitoring reports, as built drawings, a site-specific health and safety plan, and an emergency response plan were all readily available on site.

5 Technical Assessment

The following is a technical assessment of the IBW site based on the findings of FYR activities. This assessment answers three basic questions:

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are the exposure assumptions, toxicity data, cleanup standards, and remedial action objectives (RAOs) used at the time of remedy selection still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

5.1 NIBW Technical Assessment

5.1.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the decision documents. The IBW remedial actions are contributing to restoring groundwater for beneficial use, eliminating exposure to contaminated groundwater to protect human health and the environment, and preventing lateral migration of VOCs in groundwater. This includes actions completed to address VOCs in groundwater in the UAU, MAU and LAU, and the vadose zone. The IBW remedy is functioning as intended.

Remedial Action Performance

Groundwater extraction and treatment activities at NIBW have met the goal of preventing migration of contaminants and removing contaminant mass from groundwater, as supported by sampling data from monitor and extraction wells gathered since the 2001 ROD Amendment was issued. The Area 7 remedy has successfully reduced the UAU contaminant mass in groundwater and the UAU plume has decreased significantly. The Area 7 and Area 12 groundwater extraction and treatment systems in the MAU have contained the localized areas with the highest TCE concentrations and minimized migration toward the southwestern margin and into the LAU. In the LAU, the groundwater remedies are capturing the LAU plume and preventing it from reaching production wells located north of these groundwater treatment systems.

The VOCs concentration trends for most monitor wells in the central portions of the NIBW MAU and LAU plumes are decreasing or stable and the plume boundaries have stabilized or contracted slightly. This suggests removal of contaminant mass. Low conductivity of the MAU and high TCE concentrations within certain areas of the MAU plume suggest that this alluvial unit will take longer than the upper and LAU to restore. Soil vapor extraction systems have successfully removed contaminants of concern to levels protective of groundwater in soils at Areas 6, 7, 8, and 12.

System Operations/O&M

The NIBW groundwater extraction and treatment systems have achieved plume containment. Groundwater effluent from these systems is consistently below the laboratory detection limits which are significantly below the MCLs for TCE and the other NIBW contaminants of concern.

The O&M Manuals, preventative maintenance activities, Contingency Emergency Response Plan, Groundwater Monitoring & Evaluation Plan, and communication plans have been or are in the process of being updated. The NIBW soil vapor extraction and treatment system at the Area 7 UAU has been decommissioned, following the EPA approval of the report "*Decommissioning Summary Report, Area 7 Soil Vapor Extraction and Upper Alluvial Unit Groundwater System, North Indian Bend Wash Superfund Site, November 18, 2015*".

The NIBW Granular Activated Carbon Treatment Facility (NGTF) was completed in 2013 and is currently being expanded to add a fourth GAC treatment train which is anticipated to be on line in the fall of 2016. The NGTF treats water from PCX-1, which is the extraction well that captures the most significant portion of the LAU plume. Water from well PCX-1 was previously treated by air stripping at the MRTF. The NGTF provides the overall remedy with additional flexibility and control. During the change-over for treatment of PCX-1 from the MRTF to the NGTF, changes were made to increase the extraction rate at PCX-1. This results in increased removal of TCE mass by well PCX-1. Wastewater samples at treatment systems indicate that concentrations from samples collected in 2015 have consistently met permitted discharge limits.

Air emissions concentrations of TCE from the Area 12 GWETS have increased four-fold since the Risk Assessment and Health Consult were completed in 2005. There are no ambient air samples around Area 12 GWETS, Area 7 GWETS, CGTF, and MRTF treatment facility to verify that the emissions levels are still protective.

Implementation of Institutional Controls and Other Measures

The Site ICs are non-engineering methods by which access to contaminated environmental media is restricted. The 1998 SIBW ROD outlines institutional controls which include various Arizona well siting, permitting, and construction restrictions, and notices distributed by the ADWR, ADHS, or EPA concerning risks from exposure to contaminated groundwater. Although specifically identified for SIBW, these ICs are implemented sitewide by transmittal of a written notice of intent for well siting/permitting/construction from ADWR to EPA and Arizona Department of Environmental Quality for review and written approval before implementation.

5.1.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Standards, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

The exposure assumptions, toxicity data, cleanup standards, and RAOs used at the time of the remedy selection are still valid. Overall, there are no changes in exposure assumptions or toxicity data expected to affect standards levels or RAOs; the current NIBW cleanup standards and RAOs are still valid.

Risk-based Screening Levels (RSLs) are updated twice a year and the newest RSLs are based on the current toxicity factors as well as exposure factors. As shown in Table 1 of the Risk Assessment

(Appendix D), with the exception of the trihalomethanes (TTHM) cleanup goals are still protective based on the RSLs and the comparable protective cancer and non-cancer risk ranges (refer to the ARARs assessment in Appendix C for further information). In 2001, the EPA MCLs and MCL goals (MCLGs) for chloroform and bromodichloromethane changed and the federal MCLs for the individual compounds were eliminated in favor of an MCL for combined total TTHM. Specifically, the federal MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as TTHM. This change is not expected to change any clean-up goals.

EPA has updated the toxicity assessment for TCE, reclassifying TCE as a human carcinogen and increased the non-cancer potency factor nearly threefold due to identified concern with fetal cardiac malformation. The risk assessment was reviewed in light of this new development, as discussed in Appendix D. Based upon re-evaluation of the site risks, the air emissions exposure pathway for source Area 7 and Area 12 GWETS facilities warrant reassessment.

Vapor Intrusion risk was not originally evaluated as part of the risk assessments and Health Consultations for NIBW. Therefore, the 2011 Five Year Review included a screening evaluation of the potential for adverse health effects from VI based on groundwater contaminant concentrations and depth to groundwater. This 2011 VI screening evaluation concluded the potential of vapor intrusion from groundwater contamination was not a pathway of concern at the NIBW site. The EPA IRIS program issued a revised toxicity assessment for TCE in 2011 which set more conservative toxicity criteria for TCE risk assessment. In light of this revised toxicity assessment, another screening evaluation of vapor intrusion potential from groundwater contamination was performed for the current Five Year Review. Using 2015 monitoring data and the 2011 TCE toxicity criteria this screening evaluation again concluded that vapor intrusion from groundwater contamination is not a pathway of concern.

The 2011 vapor intrusion screening evaluation considered only groundwater contamination; it did not consider the potential for vapor intrusion from residual volatile contamination located in the vadose zone (soil vapor) at the source areas. A current review of TCE concentrations in soil vapor evaluation now identifies vapor intrusion as a potential concern for some NIBW source areas, which should be further assessed. The 1991 ROD, which selected a cleanup remedy for the vadose zone in the source areas, only considered the potential of contaminant mass migrating to groundwater and did not consider the vapor intrusion exposure pathway. Therefore, taking into consideration the change in toxicity criteria for TCE and the identification of a new exposure pathway, the source areas should be screened for potential VI risk.

5.1.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

The pipeline rupture during a weather related power outage has highlighted the need inspect aging pipeline infrastructure, and upgrade facility communications to prevent future emergency situations.

5.2 SIBW Technical Assessment

5.2.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the decision documents. The SIBW remedial actions are contributing to restoring groundwater for beneficial use, eliminating exposure to contaminated groundwater to protect human health and the environment, and preventing lateral migration of VOCs in groundwater. This includes actions completed to address VOCs in groundwater in the UAU, MAU and LAU, and the vadose zone. The SIBW remedy is functioning as intended.

Remedial Action Performance

At SIBW, all wells indicate decreased concentrations of TCE and PCE in the western, central, and eastern plumes. Rebound water quality data collected at the ISCO injection wells indicate that VOC concentrations are increasing following injections but these wells are not necessarily reflective of the larger aquifer. However, the most recent annual groundwater sampling in 2015 indicated that none of the monitoring wells had VOC concentrations above the MCLs. In addition, the plume areas have decreased dramatically since 2004.

System Operations/O&M

For SIBW, groundwater monitoring as part of the monitored natural attenuation remedy for SIBW is conducted according to the EPA approved groundwater monitoring plan. An analysis of groundwater quality data from these monitoring events indicates that the remedy is working as expected. The western, central and eastern groundwater plume areas show natural attenuation of VOCs to below the MCL in all monitoring wells.

Implementation of Institutional Controls and Other Measures

The site ICs are non-engineering methods by which access to contaminated environmental media is restricted. The 1998 SIBW ROD outlines institutional controls which include various Arizona well siting, permitting, and construction restrictions, and notices distributed by the ADWR, ADHS, or EPA concerning risks from exposure to contaminated groundwater. Although specifically identified for SIBW, these ICs are implemented sitewide by transmittal of a written notice of intent for well siting/permitting/construction from ADWR to EPA and ADEQ for review and written approval before implementation.

5.2.2 Question B: Are the exposure assumptions, Toxicity Data, Cleanup Standards, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup standards, and RAOs used at the time of the remedy selection are still valid. Overall, there are no changes in exposure assumptions or toxicity data expected to affect standards levels or RAOs; the current SIBW cleanup standards and RAOs are still valid.

RSLs are updated twice a year and the newest RSLs are based on the current toxicity factors as well as exposure factors. As shown in Table 1 of the Risk Assessment (Appendix D), with the exception of the TTHM, cleanup goals are still protective based on the RSLs and the comparable protective cancer and non-cancer risk ranges (refer to the ARARs assessment in Appendix C for further information). In 2001,

the EPA MCLs and MCL goals (MCLGs) for chloroform and bromodichloromethane changed and the federal MCLs for the individual compounds were eliminated in favor of an MCL for combined total TTHM. Specifically, the federal MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as TTHM. This change is not expected to change any clean-up goals.

During this review period, EPA updated the toxicity assessment for TCE; TCE was reclassified as "Carcinogenic to Humans" and a non-cancer hazard was identified: the potential to cause fetal cardiac malformations. Given the change in toxicity information and the elevated TCE concentrations in soil gas at DCE Circuits, further investigation is warranted to verify that VI is not impacting adjacent residences.

Vapor Intrusion risk was not originally evaluated for SIBW. To address this potential exposure pathway, the 2011 Five Year Review included a screening evaluation of the potential for adverse health effects from vapor intrusion based on groundwater contaminant concentrations and depth to groundwater. This 2011 VI screening evaluation concluded the potential for vapor intrusion from groundwater contamination was not a pathway of concern at SIBW. The EPA IRIS program revised the toxicity assessment for TCE in 2011 setting more conservative toxicity criteria for TCE risk assessment. Therefore, another screening evaluation of vapor intrusion potential from groundwater contamination was performed for the current Five Year Review; this screening evaluation again concluded that vapor intrusion from groundwater contamination is not a pathway of concern.

The 2011 vapor intrusion screening evaluation considered only groundwater contamination; it did not consider the potential for vapor intrusion from soil vapor at the source areas. A current review of TCE soil vapor concentrations now identifies vapor intrusion as a potential concern for some SIBW source areas, which should be further assessed.

5.2.3 Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

No, no other information has come to light that could call into question the protectiveness of the remedy. No new human or ecological receptors were noted for the SIBW site during the site inspection. No weather-related events have occurred that have affected remedy protectiveness. There is no other information that calls into question the current protectiveness of the remedy.

6 Issues/Recommendations

6.1 Issues and Recommendations

Table 6-1 Issues and Recommendations Identified in the Five-Year Review

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): NIBW	**Issue Category:** Remedy Performance			
	Issue: Given the recent pipeline rupture at Wells 71A/72, and the finding of corrosion at the rupture site the NIBW pipelines are due for inspection, maintenance and possible replacement to prevent such events in the future. Problems with communication delay between automatic shutdown of facility operations and pumping wells during power outages have been blamed for pipeline ruptures and discharges of raw untreated water on more than one occasion.			
	Recommendation: Complete the inspection, maintenance and possible replacement of the NIBW pipelines, and upgrade the communication system for the facility.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/1/2021
OU(s): NIBW	Issue Category: Remedy Performance			
	Issue: Based the revised toxicity values for TCE and the increase in TCE air emissions concentrations at Area 12, the air emissions exposure pathway for facilities should be reassessed.			
	Recommendation: Collect ambient air samples around the facilities, and update the exposure assessment for air emissions.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	9/30/2017
OU(s): NIBW	Issue Category: Remedy Performance			
	Issue: The original cleanup objective for vadose zone did not consider the vapor intrusion pathway from contamination in the vadose zone. Based the revised toxicity values for TCE, the potential risk for vapor intrusion from the vadose zone contamination, may pose a risk.			
	Recommendation: Reassess the potential for vapor intrusion from residual contamination in the vadose zone.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA	EPA	9/30/2017

OU(s): SIBW	Issue Category: Remedy Performance			
	Issue: The original cleanup objective for vadose zone did not consider the vapor intrusion pathway from contamination in the vadose zone. Based the revised toxicity values for TCE, the potential risk for vapor intrusion from the vadose zone contamination, may pose a risk.			
	Recommendation: Reassess the potential for vapor intrusion from residual contamination in the vadose zone.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA	EPA	9/30/2017

OU(s): SIBW	**Issue Category:** Remedy Performance			
	Issue: A vapor intrusion assessment of residential areas adjacent to the former DCE Circuits has not been conducted.			
	Recommendation: Complete a vapor intrusion assessment			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	EPA	EPA	9/30/2017

6.2 Other Findings

During the FYR the following recommendations were identified that would improve performance of the remedy and reduce costs, and update relevant documents if needed, but do not affect current and/or future protectiveness:

- The NIBW Facility Contingency and Emergency Response Plans should be reviewed and updated.
- Update the Groundwater Management and Evaluation Plan, the Sampling & Analysis Plan, the Health & Safety Plan, and other relevant NIBW documents, as needed.
- The findings of low levels of 1,4 dioxane in 2015 at NIBW warrant future monitoring.

7 Protectiveness Statement

Table 7-1. Protectiveness Statements

Protectiveness Statement(s)		
Operable Unit:	*Protectiveness Determination:*	*Planned Addendum Completion Date:*
NIBW	Protectiveness Deferred	9/30/2017
Protectiveness Statement: A protectiveness determination of the remedy at North Indian Bend Wash Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by collecting ambient air samples around the groundwater treatment facilities and completing a revised emission exposure assessment; and by completing a vapor intrusion assessment around the source areas. It is expected that these actions will take approximately one year to complete, at which time a protectiveness determination will be made. In addition, to be protective in the long-term, the following actions must be completed: • Complete the inspection, maintenance and possible replacement of the NIBW pipelines, and • Upgrade the communication system for the facility		
Operable Unit:	*Protectiveness Determination:*	*Planned Addendum Completion Date:*
SIBW	Protectiveness Deferred	9/30/2017
Protectiveness Statement: A protectiveness determination of the remedy at South Indian Bend Wash Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by completing a vapor intrusion assessment for the residential properties adjacent to DCE Circuits property and around the source areas. It is expected that these actions will take approximately one year to complete, at which time a protectiveness determination will be made.		

Table 7-2. Overall Protectiveness Statement

Sitewide Protectiveness Statement	
Protectiveness Determination:	*Planned Addendum Completion Date:*
Protectiveness Deferred	Not applicable
Protectiveness Statement: A protectiveness determination of the remedy at Indian Bend Wash Superfund Site cannot be made at this time until the following information is obtained: • collecting ambient air samples around the groundwater treatment facilities and completing a revised emission exposure assessment at NIBW • completing a vapor intrusion assessment for the residential properties adjacent to DCE Circuits property at SIBW and two vapor intrusion assessments at both NIBW and SIBW source areas.	

8 Next Review

The next five-year review report for the Indian Bend Wash Superfund Site is required in September 2021, five years from the completion (signature) date of this review.

Appendix A: List of Documents Reviewed

Records of Decision

EPA, 1988. Final Record of Decision, Scottsdale Groundwater Operable Unit, Indian Bend Wash Superfund Site, Scottsdale, Arizona. September.

EPA, 1991. Record of Decision, North Indian Bend Wash Superfund Site. September.

EPA, 1993. Record of Decision, VOCs in Vadose Zone, Indian Bend Wash Superfund Site, South Area, Tempe, Arizona, Plug-In and Presumptive Remedy Approach. September.

EPA, 1997. VLeach – A One-Dimensional Finite Difference Vadose Zone Leaching Model. Developed for the U.S. EPA

EPA, 1998. Record of Decision, VOCs in Groundwater Operable Unit, Indian Bend Wash Superfund Site, South Area, Tempe, Arizona. September.

EPA, 2001. Record of Decision Amendment for the North Indian Bend Wash Superfund Site, Final Operable Unit, Scottsdale, Arizona. September.

EPA, 2004. Record of Decision Amendment for the South Indian Bend Wash Superfund Site Groundwater Operable Unit, Tempe, Arizona. June.

Previous Five-Year Review

EPA, 2011. First Five-Year Review Indian Bend Wash Superfund Site, Scottsdale and Tempe, Maricopa County, Arizona. Prepared by U.S. Environmental Protection Agency Region 9, 75 Hawthorne Street San Francisco, California 94105. September 2011.

North Indian Bend Wash

ATSDR, 2005 Health Consultation, North Indian Bend Wash Area 12 Treatment Facility, City of Scottsdale, Maricopa County, Arizona, Prepared by US Department of Health and Human Services, Public Health Services, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, March 28, 2005

ATSDR, 2006 Health Consultation, North Indian Bend Wash Miller Road Treatment Facility, Scottsdale, Maricopa County, Arizona, Prepared by US Department of Health and Human Services, Public Health Services, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, March 2006

ATSDR, 2006 Health Consultation, North Indian Bend Wash Central Groundwater Treatment Facility, Scottsdale, Maricopa County, Arizona, Prepared by US Department of Health and Human Services, Public Health Services, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, September 2006.

ATSDR, 2007 Health Consultation, Area 7 Groundwater Extraction and Treatment Facility, Scottsdale, Maricopa County, Arizona, Prepared by US Department of Health and Human Services, Public Health Services, Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, March 8, 2007

NIBW PCs, 2004 Draft Preliminary Risk Assessment, Miller Road Treatment Facility (MRTF) North Indian Bend Wash Superfund Site, September 2004

NIBW PCs, 2005 Draft Preliminary Risk Assessment, Area 12 Groundwater Extraction and Treatment System (GWETS), North Indian Bend Wash Superfund Site, January 2005.

NIBW PCs, 2012. 2011 Site Monitoring Report, North Indian Bend Wash Superfund Site, Volumes I and II, dated March 5, 2012.

NIBW PCs, 2013. 2012 Site Monitoring Report, North Indian Bend Wash Superfund Site, Volumes I and II, dated March 14, 2013.

NIBW PCs, 2014. 2013 Site Monitoring Report, North Indian Bend Wash Superfund Site, dated February 28, 2014.

NIBW PCs, 2015. 2014 Site Monitoring Report, North Indian Bend Wash Superfund Site, Volumes I and II, dated February 27, 2015.

NIBW PCs, 2016. 2015 Site Monitoring Report, North Indian Bend Wash Superfund Site, Volumes I and II, dated February 29, 2016.

NIBW PCs, 2012. 2011 Annual Site Inspection Report Groundwater Treatment Facilities North Indian Bend Wash Superfund Site, Scottsdale, Arizona. September 2012.

NIBW PCs, 2013. 2012 Annual Site Inspection Report Groundwater Treatment Facilities North Indian Bend Wash Superfund Site, Scottsdale, Arizona. May 2013.

NIBW PCs, 2014. 2013 Annual Site Inspection Report Groundwater Treatment Facilities North Indian Bend Wash Superfund Site, Scottsdale, Arizona. April 2014.

NIBW PCs, 2015. 2014 Annual Site Inspection Report Groundwater Treatment Facilities North Indian Bend Wash Superfund Site, Scottsdale, Arizona. June 2015.

Montgomery & Associates, 2013. 2013 Groundwater Threat Analysis for Area 7 North Indian Bend Wash Superfund Site, Maricopa County, Arizona. August 29, 2013.

PCX-1 Treatment Facility 100% Design Documents and Response to Comments on PCX-1 Treatment Facility 90% Design Documents, submitted by NIBW PCs on August 28, 2012.

South Indian Bend Wash

CH2MHill, 2008. Technical Memorandum: Summary of Field Activities at South Indian Bend Wash DCE Circuits Subsite, October 2005 – May 2008

ITSI Gilbane, 2011. Monitored Natural Attenuation Monitoring Report, March 2011, South Indian Bend Wash Superfund Site, Tempe, Arizona. 18 July 2011.

ITSI Gilbane, 2012. Monitored Natural Attenuation Monitoring Report, Second Semi-Annual Sampling Event 2011, South Indian Bend Wash Superfund Site, Tempe, Arizona. 31 July 2012.

ITSI Gilbane, 2012. Monitored Natural Attenuation Monitoring Report, First Semi-Annual Sampling Event 2012, South Indian Bend Wash Superfund Site, Tempe, Arizona. 03 December 2012.

ITSI Gilbane, 2013. Monitored Natural Attenuation Monitoring Report, Second Semi-Annual Sampling Event 2012, South Indian Bend Wash Superfund Site, Tempe, Arizona. 15 January 2013

ITSI Gilbane, 2014. Monitored Natural Attenuation Monitoring Report, Annual Sampling Event 2013, South Indian Bend Wash Superfund Site, Tempe, Arizona. 23 June 2014.

ITSI Gilbane, 2014a. Technical Memorandum - Modification of Groundwater Sampling Composition, South Indian Bend Wash Superfund Site, Tempe, Arizona

Gilbane, 2015. Monitored Natural Attenuation Monitoring Report, Annual Sampling Event 2014, South Indian Bend Wash Superfund Site, Tempe, Arizona. 27 March 2015.

Gilbane, 2016. Draft Monitored Natural Attenuation Monitoring Report, Annual Sampling Event 2015, South Indian Bend Wash Superfund Site, Tempe, Arizona. 27 April 2016.

ITSI Gilbane, Indoor Air Sampling, Winter 2013, DCE Circuits Sub-site, South Indian Bend Wash (SIBW) Superfund Site, Tempe, Arizona. July 2, 2013.

ITSI Gilbane, 2014. Monitored Natural Attenuation Evaluation and Criteria, South Indian Bend Wash (SIBW) Superfund Site, Tempe, Arizona. April 18, 2014.

Gilbane, 2015. Damage to and Attempted Rehabilitation of Well SIBW-58MC, South Indian Bend Wash Superfund Site (SIBW), Tempe, Arizona. December 2, 2015.

Gilbane, 2014. Results for the Middle Alluvial Unit (MAU) Enhanced Attenuation Study, South Indian Bend Wash (SIBW) Superfund Site, Tempe, Arizona. October 29, 2014.

Gilbane, 2016. Draft Indoor Air Sampling, November 2015, DCE Circuits Subsite, South Indian Bend Wash (SIBW) Superfund Site, and Tempe, Arizona. Technical Memorandum to USEPA Region 9, dated April 28, 2016.

Appendix B: Data Review

Appendix B: Data Review

Appendix B summarizes the data reviewed for the Indian Bend Wash (IBW) site and is derived from data collected during the review period and associated annual monitoring reports available for the Indian Bend Wash (IBW) Superfund Site.

1.1. NIBW Data Review

This section provides a review of data collected during the Five Year Review (FYR) period and reported in various annual reports and technical memorandums specifically for the North Indian Bend Wash (NIBW) site. Data on air emissions from the treatment facilities is discussed separately from them review of groundwater data.

1.1.1. North Indian Bend Wash Remedial Action Objectives

This data summary section is intended to support the remedial action objectives indicated in the NIBW Record of Decision (ROD). The remedial action objectives indicated in the 2001 ROD amendment "Enhanced Remedy" for NIBW are:

- Restore the Upper Alluvial Unit (UAU), Middle Alluvial Unit (MAU) and Lower Alluvial Unit (LAU) to drinking water quality by decreasing the concentrations of the contaminants of concern (COCs) to below the cleanup standards.

- Protect human health and the environment by eliminating exposure to contaminated groundwater.

- Provide the City of Scottsdale (COS) with a water source that meets maximum contaminant levels (MCLs) for NIBW contaminants of concern (volatile organic compounds; VOCs).

- Achieve containment of the groundwater plume by preventing any further lateral migration of contaminants in groundwater.

- Reuse of the water treated at the Site to the extent possible in accordance with Arizona's Groundwater Management Act.

- Mitigate any soil contamination that continues to impact groundwater. Provide long-term management of contaminated groundwater to improve the regional aquifer's suitability for potable use.

The following is a qualitative discussion of the progress achieved in satisfying RAOs, based on review of data through 2015.

1.1.2. Soils Remediation

The NIBW Participating Companies (PCs) have implemented soil remediation using soil vapor extraction SVE at four U. S. Environmental Protection Agency (EPA) identified source areas including Areas 6, 7, 8, and 12. The collective soil remediation has resulted in the removal of over 10,000 pounds of TCE from the unsaturated zone and eliminated these sources as an ongoing threat for groundwater impacts. EPA provided a Letter of Determination in 2015 indicating that the soil remediation at Area 7 was complete and had met remedial goals for groundwater protection. The SVE system at Area 7, which was the last of the NIBW soil remediation sites associated with the operable unit 2 (OU2) Consent Decree (CD), was decommissioned with EPA's approval in 2015.

1.1.3. Groundwater Quality

Significant progress has been made toward the removal of NIBW COCs and restoration of groundwater to drinking water quality with respect to these COCs. As set forth in the amended ROD, cleanup standards for all NIBW COCs except chloroform are equivalent to MCLs adopted by EPA pursuant to the Safe Drinking Water Act. In 2015, the NIBW remedial actions resulted in the extraction and treatment of 5.6 billion gallons of groundwater and removal of over 2,300 pounds of TCE. From the inception of the NIBW groundwater remedy in 1994, about 108 billion gallons of groundwater have been extracted to remove an estimated 86,000 pounds of TCE. Furthermore, soil remedial actions have eliminated the threat to groundwater from historical sources of TCE at EPA identified source areas. As a consequence, TCE concentrations have dramatically decreased in the UAU and significantly decreased in portions of the MAU and LAU. The distribution of TCE plumes within the UAU, MAU and LAU in 2001 and again most recently in October 2015 are illustrated in Figures A-1, A-2 and A-3, respectively and TCE concentration trend graphs for NIBW wells are illustrated in Figures A-6, A-7 and A-8; which are included at the end of this appendix and are all taken from the 2015 Site Monitoring Report for the North Indian Bend Wash Superfund Site (NIBW PCs, 2016). The contoured TCE plumes in Figure A-1 indicate that the TCE plume in the UAU has decreased by about 90 percent from October 2001 to October 2015. The contoured TCE plumes in Figure A-2 illustrate notable decreases in TCE concentrations from October 2001 to October 2015 in the MAU area south and down-gradient from Area 7 due to implementation of the source control program. The contoured TCE plumes in Figure A-3 illustrate that changes in the magnitude and extent of TCE concentrations in LAU groundwater observed between October 2001 and October 2015 are generally small.

The most significant declines observed in TCE concentrations are in UAU groundwater (Figure A-6). According to UAU mass flux calculations, the estimated VOC mass in the UAU has declined from more than 11,000 pounds in 1993 to approximately 230 pounds in 2015, representing a decrease of about 98 percent in the past 22 years. TCE concentrations in the UAU have decreased correspondingly. Presently, only 4 UAU monitoring wells have TCE concentrations that exceed the MCL and the highest TCE concentration in the UAU is 8.1 ug/L at monitoring well PG-31UA (NIBW PCs, 2016). Historically, TCE concentrations in UAU groundwater were two to three orders of magnitude higher than at present. The extent of VOC impact in the UAU has also been greatly reduced and only small, very localized TCE plumes remain. Based on the widespread decrease of TCE in UAU groundwater throughout the NIBW site, EPA approved and the NIBW PCs conducted formal abandonment of 30 UAU monitoring wells in

2013. Based on groundwater data derived from October 2015 sampling, the performance criteria have been achieved for the UAU mass flux metric defined in the Groundwater Monitoring and Evaluation Plan (GMEP).

Stable to declining TCE concentrations are evident in most MAU (Figure A-7) and LAU (Figure A-8) monitoring and extraction wells. Within the MAU, water quality data obtained at monitoring and extraction wells generally show the positive effect of the significant mass removal that has taken place since initiation of the MAU source control programs. The most recent samples collected during 2015 at 40 MAU wells indicated that 21 wells had TCE concentrations higher than the MCL of 5 ug/L and the highest TCE concentration was 3,400 ug/L and, although elevated, show a dramatic decline from historic groundwater concentrations. With the exception of increasing trends at a few MAU wells due to changing pumping patterns, TCE concentrations in groundwater in the MAU are generally stable to declining. TCE concentrations at MAU monitoring wells down-gradient from the zones of capture associated with Area 7 (well PA-12MA) (Figure A-6) and Area 12 (well E-5MA) (Figure A-7) source control programs have generally declined since the onset of source control pumping, demonstrating the effectiveness of MAU source control in limiting TCE migration to the western margin. TCE concentrations at monitoring wells within these capture zones have also generally stabilized or decreased. Historical LAU water quality data demonstrate a clear trend of declining TCE concentrations in most wells in the southern half of the plume and progress toward aquifer restoration (Figure A-8). Consistent operation of Central Groundwater Treatment Facility (CGTF) extraction wells over the past 20 years has captured and limited the migration of higher TCE concentrations to the northern LAU extraction wells connected to the NIBW Granular Activated Carbon (GAC) Treatment Facility (NGTF) and Miller Road Treatment Facility (MRTF). The most recent samples collected during 2015 at 28 LAU wells indicated that 14 wells had TCE concentrations higher than the MCL of 5 ug/L and the highest TCE concentration was 200 ug/L.

With the exception of wells S-2LA, PA-13LA, and PG-42LA, TCE concentrations observed in the northern LAU are, for the most part, stable or showing slightly decreasing trends (Figure A-8). While increases at some wells are anticipated based on the remedy design for migration of LAU mass toward PCX-1 and the MRTF extraction wells, stabilizing and/or declining trends at other wells indicate that mass migration toward the northern LAU is being effectively controlled by extraction wells south of well PCX-1. Monitoring data reported on an on-going basis indicate pumping of well PCX-1 is responsible for capturing about 90 percent of the TCE mass extracted and treated by northern LAU extraction wells over time.

Low levels of 1,4 Dioxane have been detected during January – March 2015 sampling events. (Table A-1) 1,4, Dioxane is an emerging contaminant which currently has no federal drinking water standard and not currently subject to the RAOs of the remedy, however warrants future monitoring.

1.1.4. Groundwater Treatment

Treatment of extracted groundwater is an integral part of the NIBW remediation and occurs at several locations around the property including the CGTF, the MRTF, the NGTF, Area 7 and Area 12. Sampling

and analysis demonstrated that treatment systems are operating effectively and that contaminant of concern (COC) concentrations in the treated water are consistently below regulatory standards.

CGTF: Throughout 2015, samples of treated groundwater were collected from the common sump at the CGTF and analyzed for the NIBW COCs on a weekly basis when the treatment facility was in operation. NIBW COC concentrations in all 2015 common sump samples were consistently below cleanup standards identified in the amended ROD. Compliance monitoring data indicate all common sump samples had TCE concentrations at or below 0.50 ug/L and were below all other NIBW COCs. Quarterly results for treatment system performance sampling conducted by the COS at the CGTF are reported to EPA and Arizona Department of Environmental Quality (ADEQ).

MRTF: NIBW COC concentrations in all 2015 treated groundwater samples from MRTF treatment trains for wells PV-14 and PV-15 were consistently below cleanup standards set forth in the amended ROD. Compliance monitoring data, presented in Level 4 data analytical reports as part of the supplemental data reports submittal, indicate all samples were below 0.50 ug/L for TCE and were below all other NIBW COCs. Treated groundwater discharged to the Salt River Project (SRP) water supply system at the Arizona Canal outfall was tested monthly for TCE and pH and quarterly for physical and inorganic water quality parameters as required by the Arizona Pollutant Discharge Elimination System (AZPDES) permit. The results of sampling and analyses presented in monthly Data Monitoring Reports (DMRs) submitted to ADEQ document that the treated water discharge met the requirements of the AZPDES permit throughout 2015.

NGTF: EPA selected granular activated carbon (GAC) treatment of groundwater at the NGTF as the long-term solution for extraction well PCX-1 consistent with the explanation of significant differences (ESD) dated March 2012. The ESD does not change any of the applicable or relevant and appropriate requirements (ARARs) previously identified by EPA and therefore requires that treated groundwater from the NGTF meet the cleanup standards. Further, treated groundwater from the NGTF that is discharged to the SRP water supply system at the Arizona Canal is required to meet the requirements of an AZPDES permit.

As evidenced from the laboratory data for NGTF discharges going to both the Chaparral Water Treatment Plant (CWTP) and to the SRP Arizona Canal, NIBW COC concentrations in all treated water samples were below their respective MCLs in 2015. The NGTF consistently achieved the cleanup standards. In fact, performance monitoring data indicate all treated water samples were below 0.50 ug/L for TCE, PCE, 1,1-DCE, and TCA in 2015.

Treated groundwater discharged to the SRP water supply system at the Arizona Canal outfall was tested monthly for TCE, PCE, and pH; quarterly for inorganic water quality parameters; and at least semi-annually for 1,1-DCE, TCA, and chloroform, as required by the AZPDES permit. The results of sampling and analyses, presented in monthly DMRs submitted to ADEQ, document that the discharge met the requirements of the AZPDES permit throughout the 2015 operating period.

Area 7: Throughout 2015, samples of treated groundwater were collected from air stripper effluent at the Area 7 Groundwater Extraction and Treatment System (GWETS) and analyzed for NIBW COCs on a

monthly frequency when the system was in operation. The NIBW COC concentrations in all treated water samples from the Area 7 GWETS were below their respective MCLs in 2015; therefore, the discharge meets Arizona Ambient Water Quality Standards (AWQS) for these parameters. Results for treated groundwater from the Area 7 GWETS in 2015 showed that all of the NIBW COCs were below 0.50 ug/L. Treated groundwater that is discharged to Area 7 injection wells recharges the UAU groundwater system. Inorganic water quality in the UAU is typically of poorer quality than that of treated groundwater from the Area 7 GWETS, which is derived from the MAU. Injection of treated water from the Area 7 GWETS does not contribute to further degradation of inorganic water quality in UAU groundwater.

Area 12: Throughout 2015, samples of treated groundwater were collected from air stripper effluent at the Area 12 GWETS and analyzed for NIBW COCs on a monthly frequency when the system was in service. The NIBW COC concentrations in all treated water samples from the Area 12 GWETS were below their respective MCLs in 2015. Therefore, discharges from Area 12 GWETS met the requirements of the AZPDES permit. Results for treated groundwater from the Area 12 GWETS in 2015 showed that all of the NIBW COCs were below method detection limits. Additional sampling and analysis for physical and inorganic water quality parameters is reported in monthly DMRs submitted to ADEQ and EPA.

1.1.5. Groundwater Containment

The combined groundwater extraction associated with treatment at the CGTF, MRTF, NGTF, Area 7 GWETS, and Area 12 GWETS has achieved hydraulic containment throughout the MAU/LAU plume. Hydraulic containment within the MAU and LAU are illustrated in Figures A-4 and A-5, respectively; which are included at the end of this appendix and are all taken from the 2015 Site Monitoring Report for the North Indian Bend Wash Superfund Site (NIBW PCs, 2016). Although the October 2015 water level data were collected while the Area 7 source control extraction wells were not operating, historic water level data continue to demonstrate that the direction of groundwater movement within the MAU/LAU plume is generally toward NIBW extraction wells, thereby preventing vent groundwater from reaching the western margin and moving vertically to the LAU (i.e., inward hydraulic gradient in the MAU), which is consistent with the 2001 ROD Amendment with regard to the selected remedy, Alternative 3A. TCE concentrations at monitoring wells located near the edge or along the periphery of the MAU/LAU plume show decreasing trends in many parts of the site. In cases where increasing trends at specific wells have been noted (S-2LA and PG-42LA) (Figure A-8), the NIBW PCs continue to evaluate and report trends to the Technical Committee to ensure that the overall objectives of the LAU remedy are maintained. Increasing TCE concentrations at PG-42LA are particularly significant since they are located in the LAU downgradient of the plume boundary. The increasing TCE concentration at PG-42LA is generally consistent but, more importantly, the highest TCE concentration of 3.3 ug/L was recently measured in October 2015. While the TCE concentration at PG-42LA remains below the MCL of 5 ug/L this location should be carefully monitored in the future since it may be an indicator of plume migration in the LAU.

1.1.6. Groundwater Reuse

Treated water produced by all five NIBW GWETS is beneficially used. The CGTF and NGTF provide treated groundwater as a supply to the COS potable water system, or may alternately deliver treated water to SRP. The MRTF treats groundwater for use by EPCOR Water Services, Inc. USA (EPCOR). At Area 7, treated groundwater is delivered to shallow injection wells that recharge the UAU aquifer. At Area 12, treated groundwater is provided to the SRP water system for irrigation use. All NIBW end uses are consistent with beneficial use designations of the Arizona Department of Water Resources (ADWR) and in accordance with the Groundwater Management Act. Furthermore, the NIBW remedy has incorporated COS, SRP, and EPCOR as end users of treated groundwater in lieu of groundwater pumping they have historically conducted and would have otherwise relied upon in this area.

The NIBW PCs have closely coordinated the planning and implementation of NIBW remedial actions with the key water providers, including COS, SRP, and EPCOR. The efforts have strongly focused on defining mutually beneficial objectives for all parties involved in the remedy. For example, the NIBW remedy requires consistent and reliable groundwater extraction in the areas most favorable for capture and containment of the MAU/LAU plumes. The water providers have considerable, but variable, water demands in the NIBW Site area and a system of existing wells and infrastructure available for groundwater production.

Through technical discussions and cooperation, the parties have taken a number of steps to focus groundwater extraction and end uses for optimum water resource management. For example, the NIBW PCs have installed, modified, and replaced, as needed, a number of the water provider wells to improve groundwater plume capture and mass removal. To assure that the water providers can utilize the treated groundwater, the NIBW PCs have upgraded treatment systems and enhanced infrastructure and control systems for the water providers. The water providers have cooperated by prioritizing pumping to meet water demands using those wells most beneficial to the remedy.

1.1.7. Review of Treatment Facility Air Emissions

Air emissions data from all of the groundwater extraction and treatment system facilities employing air strippers as an element of groundwater treatment, specifically from the MRTF, CGTF, Area 7 and Area 12 GWETS were reviewed by the EPA Region 9 toxicologist, along with the ATSDR Health Consultations for each of these facilities that were prepared in the mid 2000's, and the 2005 risk assessment. While all of the NIBW treatment facilities have VGAC carbon filtration to treat vapor emissions before they are released to the atmosphere, the toxicity values for TCE have significantly changed since the ATSDR review determined the air emissions from the facilities posed no public health hazard. The 2005 Risk Assessment and ATSDR Health Assessments used different air dispersion models to reach similar conclusions. Review of the recent emissions data indicate concentrations of TCE sometimes exceed by four-fold the concentrations that were used in the ATSDR health evaluation, particularly at the Area 12 facility. Given the revised TCE toxicity

values, air monitoring in the surrounding communities is warranted to evaluate whether the current emissions controls at each of the facilities are adequately protective or require upgrading.

1.2. SIBW Data Review

This section provides a review of data collected during the FYR period and reported in various annual reports and technical memorandums for the SIBW site.

1.2.1. South Indian Bend Wash Remedial Action Objectives

On September 30, 1998, EPA issued a ROD defining the remedies to address VOCs in groundwater in the SIBW western, central, and eastern plumes. Monitored natural attenuation (MNA) was selected for the central and eastern plumes. Groundwater extraction and treatment was selected for the western plume because in 1998, EPA did not have sufficient data to demonstrate that the contaminant levels in the western plume were decreasing by natural attenuation and that cleanup standards could be met within a reasonable time frame. A ROD amendment was developed and finalized in September 2004 to document the change of remedy for the western plume from extraction and treatment to MNA. The contaminants of concern, as established in the ROD, are cis-1,2-dichloroethene (cis-1,2-DCE), PCE, and TCE.
An enhanced attenuation study was performed at five wells within the MAU eastern plume because TCE concentrations detected in these wells were above the cleanup standard, which is the MCL. The enhanced attenuation study examined the application of in-situ chemical oxidation (ISCO) to accelerate natural attenuation and the achievement of VOC cleanup goals in the eastern MAU plume, with the specific objective of assessing the ability of ISCO to reduce TCE concentrations to levels below the MCL in groundwater in the immediate vicinity of the five remaining wells at the Site with TCE concentrations still above or near the MCL. As part of the study, numerical modeling results determined that the TCE concentrations in these five wells likely would not drop below the MCL for 10 to 30 years with the selected remedy of MNA. The ISCO injections began on June 10, 2013, and were completed on June 20, 2013. Post-ISCO evaluation sampling has continued to evaluate the long term effects on VOC concentrations in groundwater.

In-situ chemical oxidation (ISCO) was performed with the injection of an oxidant (sodium permanganate) in June 2013 into five MAU wells within the eastern plume: SW-3, SIBW-11MC, SIBW-13MC, SIBW-56MC, and SIBW-58MC. Baseline sampling was conducted prior to ISCO injections, in March 2013. Seven rounds of post-ISCO sampling were performed in August and November 2013, February and May and 2014 October 2014, and March 2015 and October 2015 in the injection wells. Initially, injections were successful in lowering TCE concentrations below the MCL at these five wells but concentrations have rebounded to greater than the MCL and continue to be monitored. However, since rebound monitoring is only occurring at injection wells this may not be representative of the aquifer in general.
The remedial action objectives from the 1993, 1998 groundwater ROD, and the 2004 ROD Amendment are:

- Protect human health by minimizing the potential for human exposure to groundwater exceeding cleanup goals.

- Cost-effectively reduce contamination in groundwater to concentrations that meet cleanup goals to return ground waters to their beneficial uses to the extent practicable within a time frame that is reasonable, given the particular circumstances of the site.

- Protect groundwater resources by preventing or reducing migration of groundwater contamination above ARARs.

1.2.2. Groundwater Quality

The distribution of TCE plumes within the UAU and MAU are illustrated in Figure A-9 along with graphs of TCE concentrations (A-12 through A-23); which is included at the end of this appendix and is taken from the SIBW Monitored Natural Attenuation Monitoring Report (Gilbane, 2016). Similarly, the piezometric surfaces (groundwater elevations) of the UAU and MAU are illustrated in Figures A-7 and A-8, respectively, which are also included at the end of this appendix and were taken from the SIBW Monitored Natural Attenuation Monitoring Report (Gilbane, 2016).

The 2015 annual groundwater level measurements made at 19 monitoring wells (Figures A-10 and A-11) and water quality sampling at 11 monitoring wells provided an overview of the groundwater flow and of COC levels at SIBW. The highest concentration of TCE was detected in monitoring well SW-3 at 4.3 ug/L, which is below the MCL of 5 ug/L. The highest concentration of PCE was detected in monitoring well SIBW-61U at 3.0 ug/L which is below the MCL of 5 ug/L. PCE was detected in seven monitoring wells in the UAU central plume and was detected in one monitoring well in the MAU eastern plume, all at concentrations greater than 0.5 ug/L but less than the MCL of 5 ug/L. TCE was detected in one monitoring well in the UAU western plume and in four monitoring wells in the MAU eastern plume at concentrations greater than 0.5 ug/L but less than the MCL of 5 ug/L. TCE was also detected in one monitoring well in the MAU eastern plume at a concentration lower than the MCL of 5 ug/L – SW-3 at 4.3 ug/L. In monitoring well SW-3 in the MAU, cis-1,2-DCE was detected at a concentration of 1.0 ug/L, which was much less than the MCL of 70 ug/L. Concentrations of COCs over time for each of the 11 wells that are still sampled annually show a generally declining trends.

The continual reduction of groundwater VOC concentrations at the UAU and MAU monitoring wells indicates that the MNA remedy is effectively controlling the migration of contaminants at the SIBW and the RAOs are therefore being achieved.

1.2.3. Review of Indoor Air Data and Vapor Intrusion Assessment

The IBW RODs were written with the objective of protecting groundwater, before vapor intrusion was widely recognized as a potential concern. The RODs established “plug-in” criteria based upon groundwater protection levels for determining if individual identified source areas warranted the presumptive remedy of soil vapor extraction. The potential for vapor intrusion was not considered at the time the plug in criteria was established. Based upon the EPA Region 9 toxicologist’s review of the risk assessments and available data, reassessment of each of the source areas is warranted to

verify whether or not the remedy determinations remain protective in light of the revised toxicity values for TCE.

DCE Circuits located within SIBW is the last source area in IBW which has not yet received a closure determination. The site comprises two single story commercial buildings separated by a parking lot, currently on the National Register of Historic Places. The contaminants of concern at the site are the volatile organic compounds 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and tetrachloroethene (PCE) in groundwater and soil vapor, with TCE and PCE as the primary site COCs. EPA's actions at DCE Circuits have included soil removal, abandonment of a deteriorated underground storage tank, soil vapor extraction, capping of an unsealed soil vapor monitoring well, and installation of ventilation units in the four suites. The office suites include air circulation units to ensure indoor air concentrations of TCE and PCE stay within EPA's acceptable limits. Since 2007, indoor air monitoring in the four units has been ongoing at DCE Circuits which demonstrate on site indoor air concentrations have been attenuating over time. However, historic data from soil gas monitoring at the DCE Circuits site between 2001 and 2012 indicates that TCE concentrations at the time exceeded current residential soil gas screening levels and there no recent soil vapor data to confirm remedy protectiveness. Therefore, further assessment of this site is recommended.

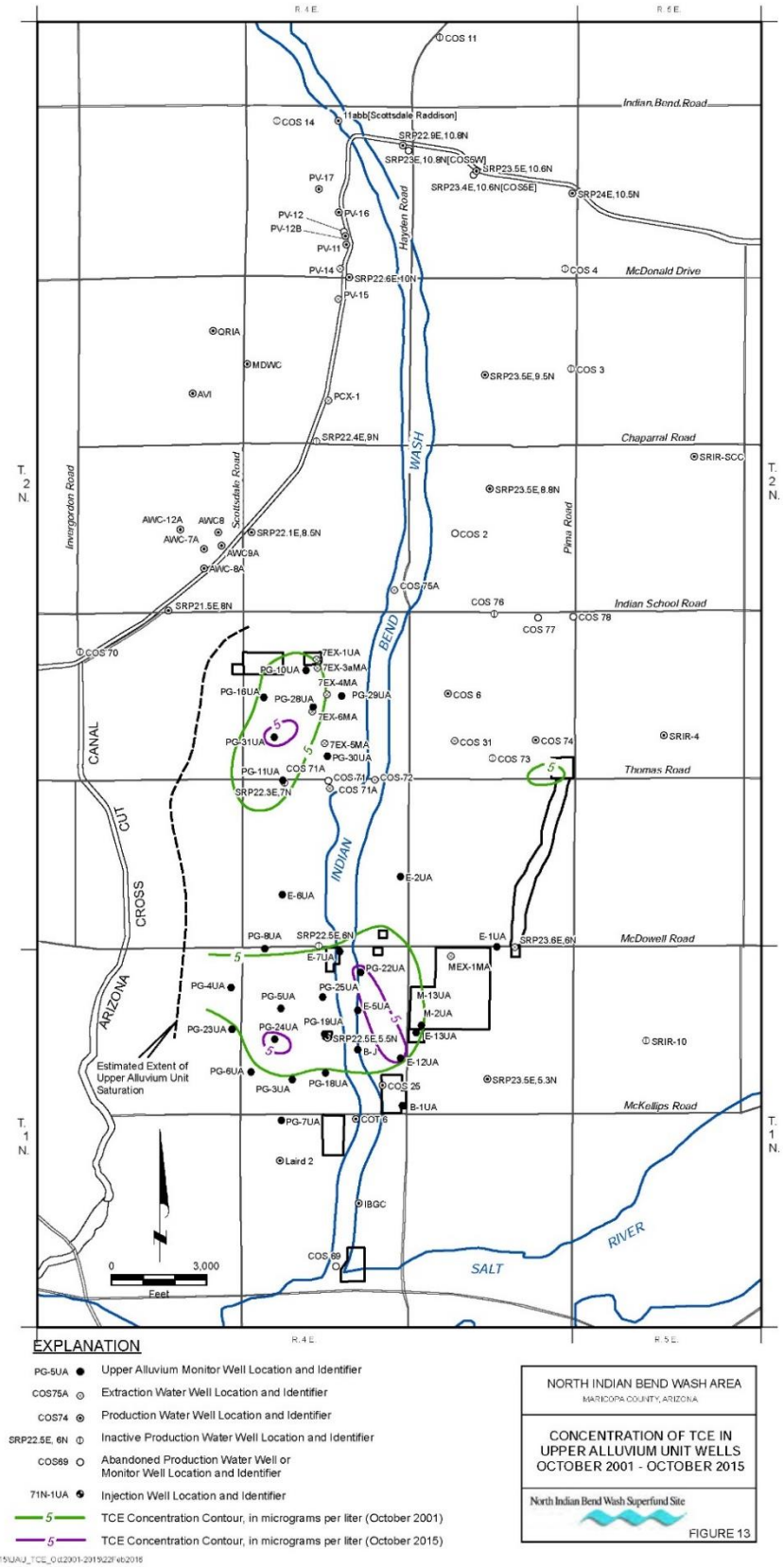


Figure B-1. TCE in UAU wells within NIBW in October 2015

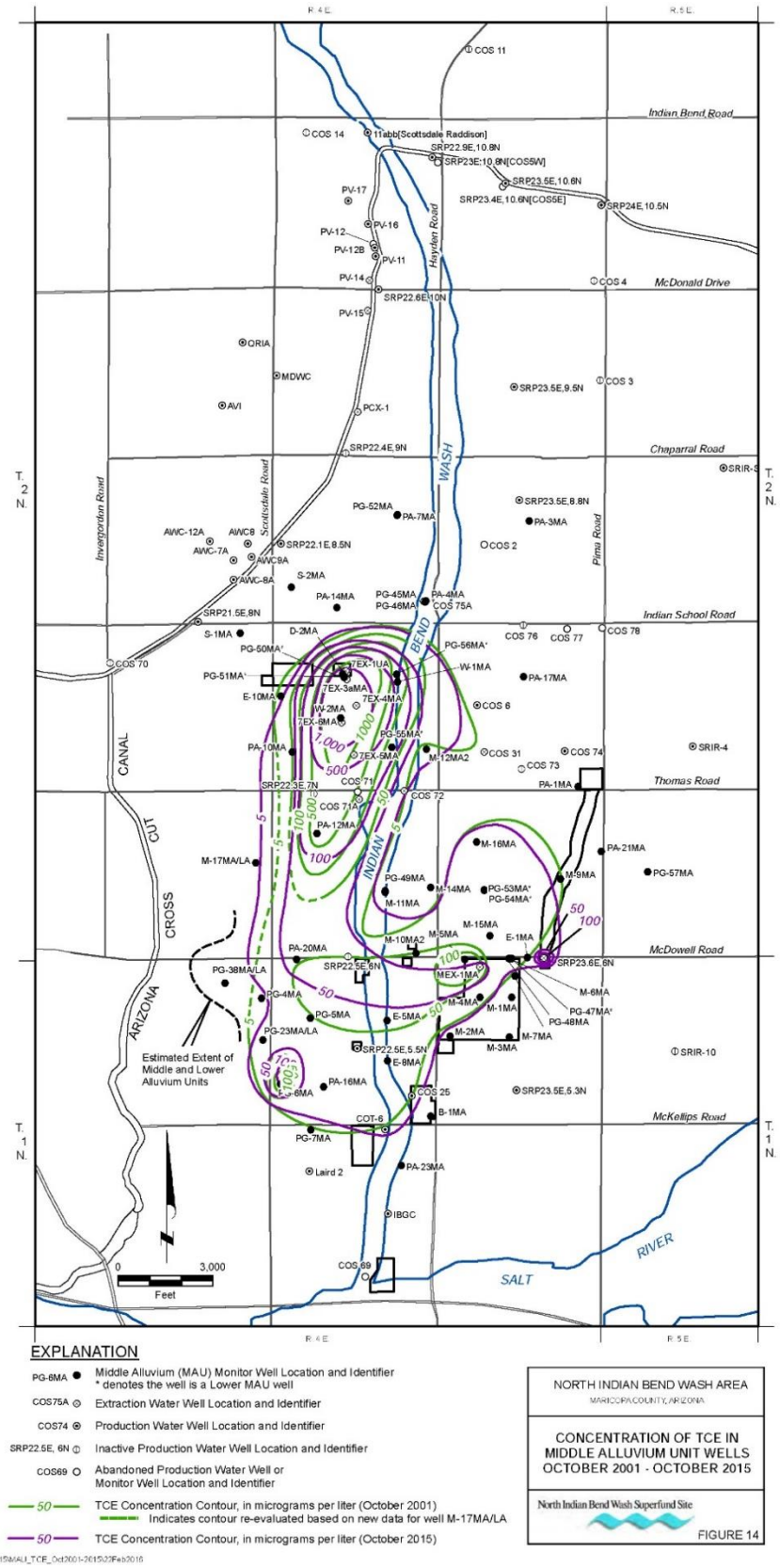
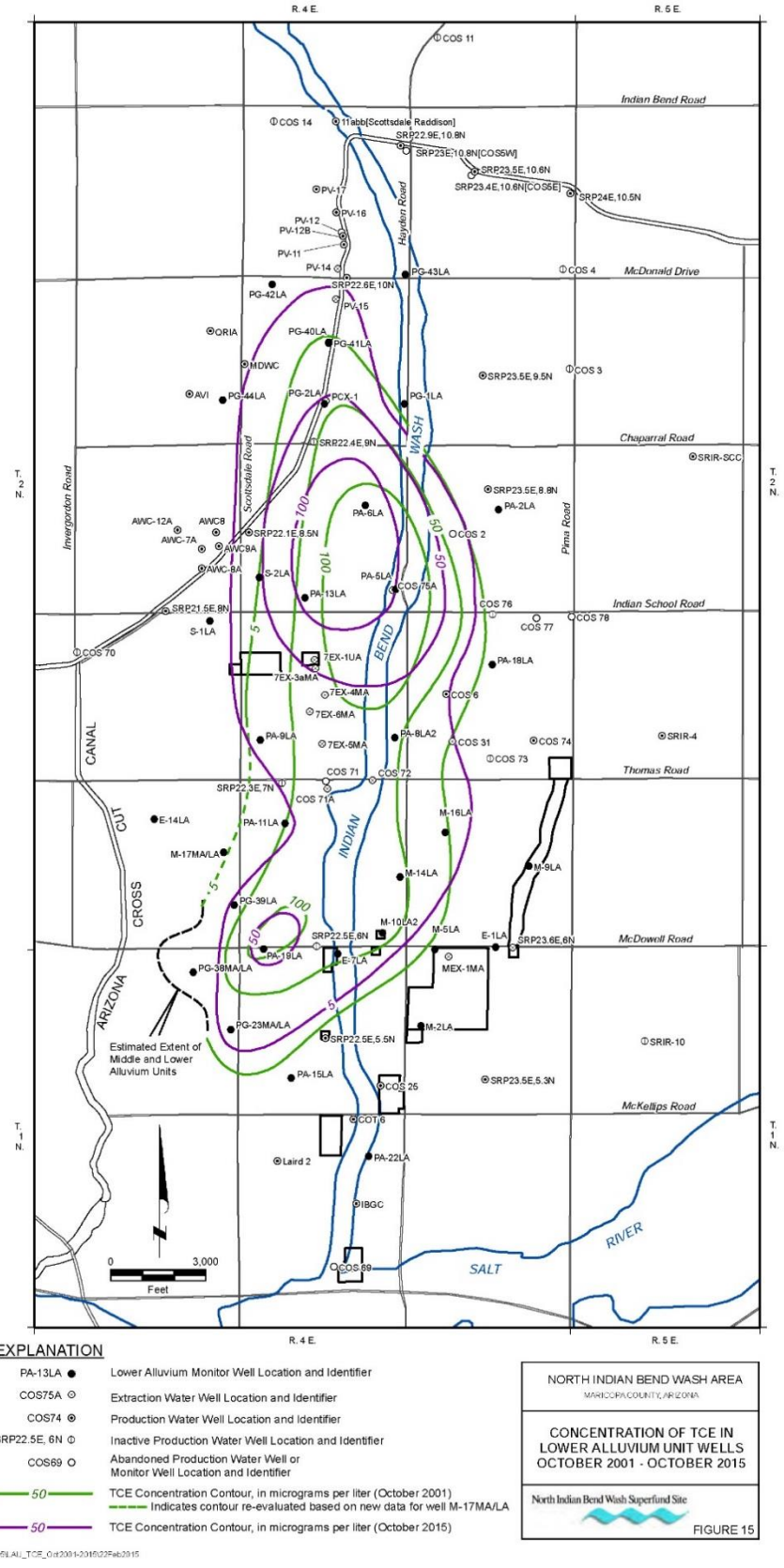


Figure B-2. TCE in MAU wells within NIBW in October 2015



EXPLANATION

PA-13LA ●	Lower Alluvium Monitor Well Location and Identifier
COS75A ⊙	Extraction Water Well Location and Identifier
COS74 ⊙	Production Water Well Location and Identifier
SRP22.5E, 6N ⊙	Inactive Production Water Well Location and Identifier
COS69 ○	Abandoned Production Water Well or Monitor Well Location and Identifier
50	TCE Concentration Contour, in micrograms per liter (October 2001)
----	Indicates contour re-evaluated based on new data for well M-17MA/LA
50	TCE Concentration Contour, in micrograms per liter (October 2015)

NORTH INDIAN BEND WASH AREA
MARICOPA COUNTY, ARIZONA

CONCENTRATION OF TCE IN LOWER ALLUVIUM UNIT WELLS OCTOBER 2001 - OCTOBER 2015

North Indian Bend Wash Superfund Site

FIGURE 15

GIS-TUC\868.1402\TCE\2015\LAU_TCE_Oct2001-2015\02Feb2015

Figure B-3. TCE in LAU wells within NIBW in October 2015

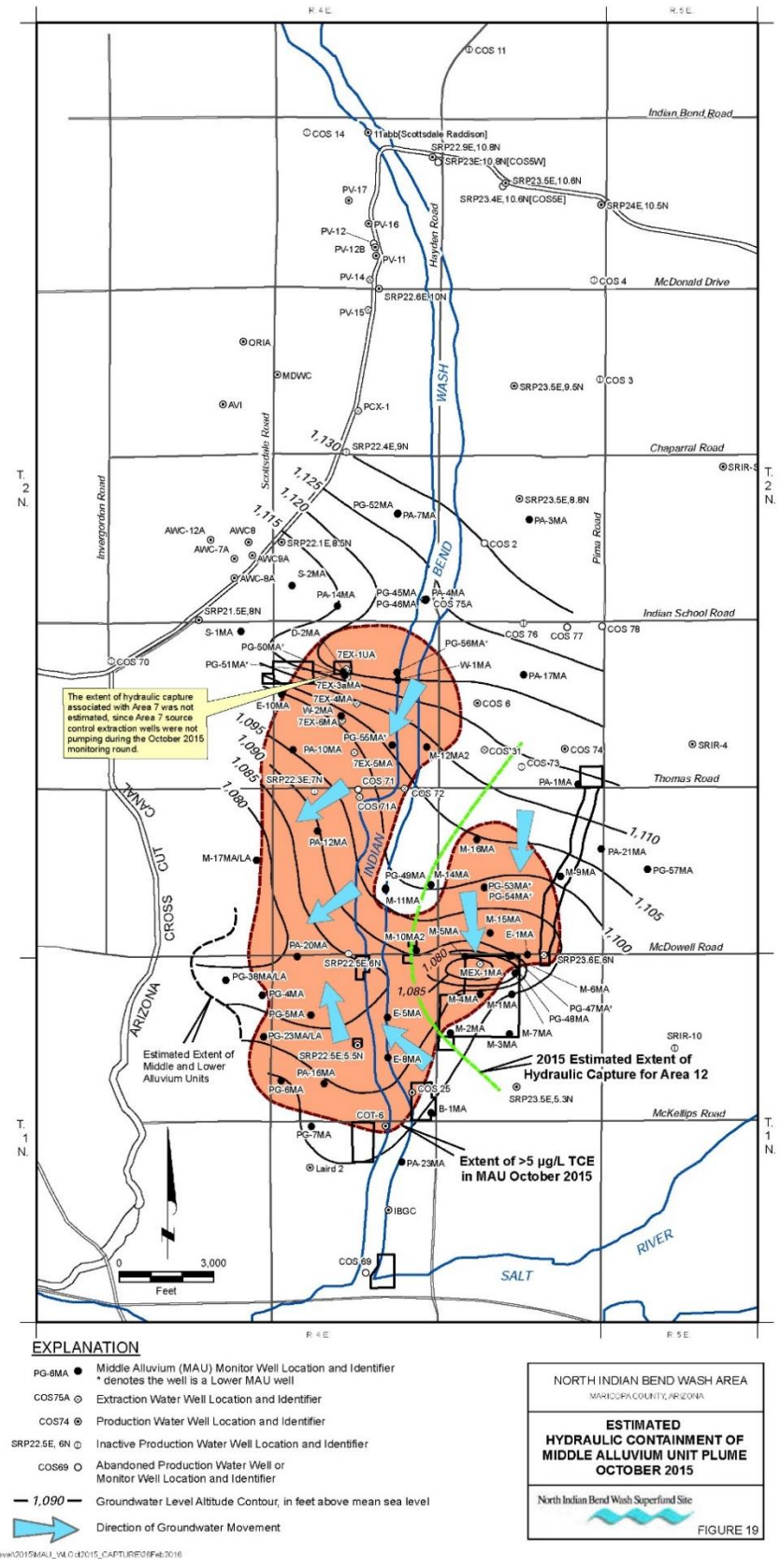


Figure B-4. Hydraulic containment of MAU plume within NIBW in October 2015

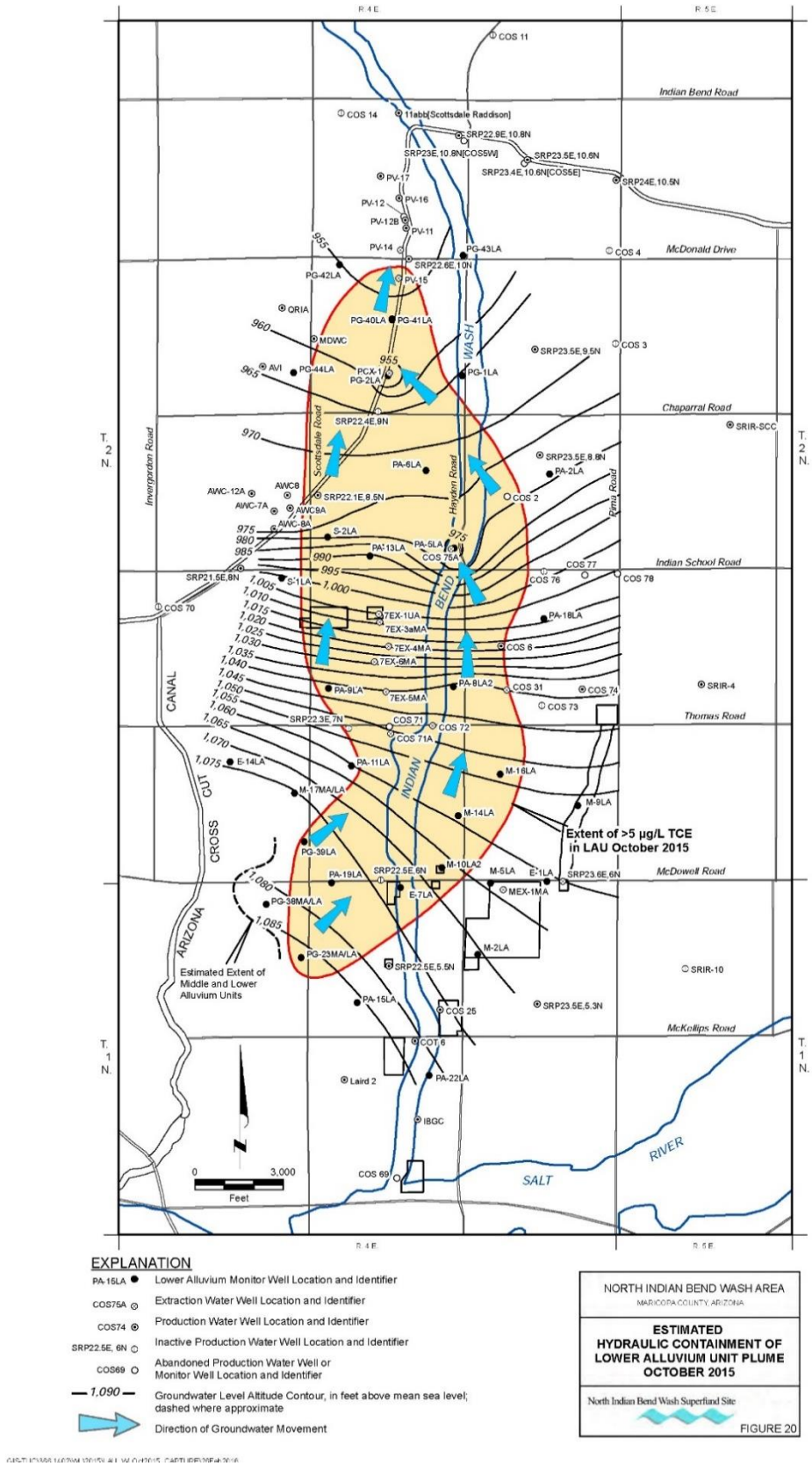


Figure B-5. Hydraulic containment of MAU plume within NIBW in October 2015

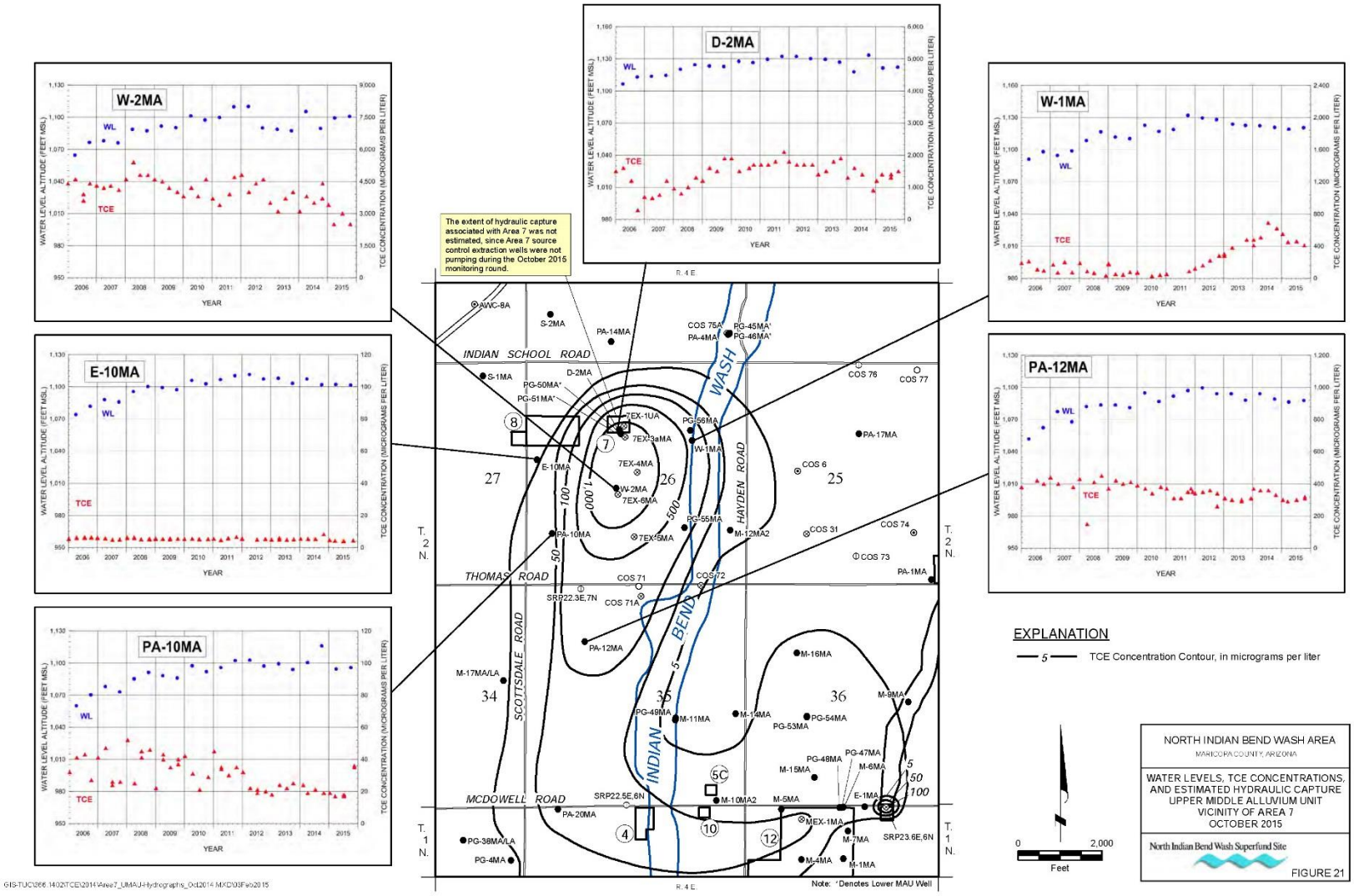


Figure B-6. Monitoring well TCE concentrations in UAU within NIBW

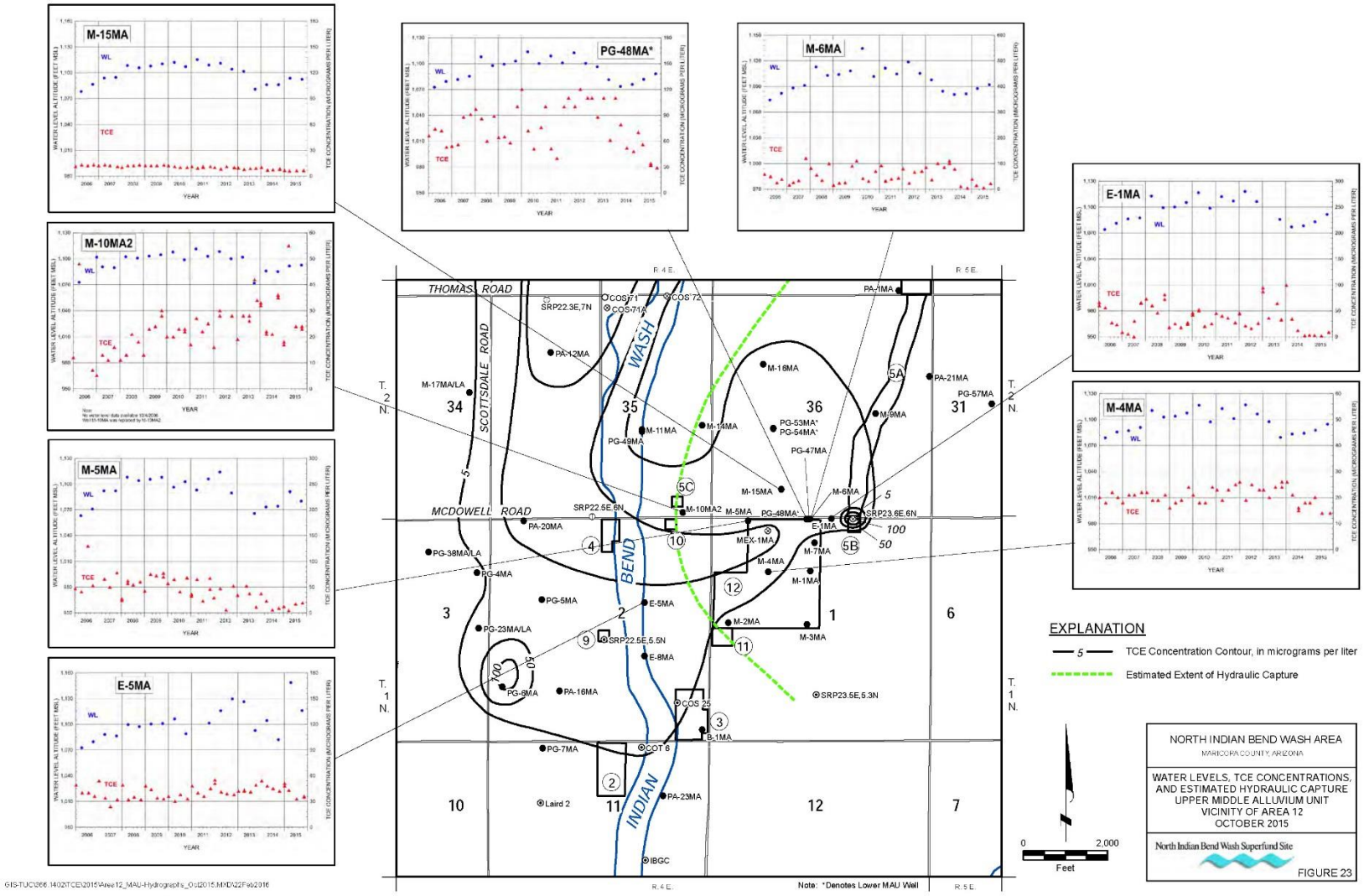


Figure B-7. Monitoring well TCE concentrations in MAU within NIBW

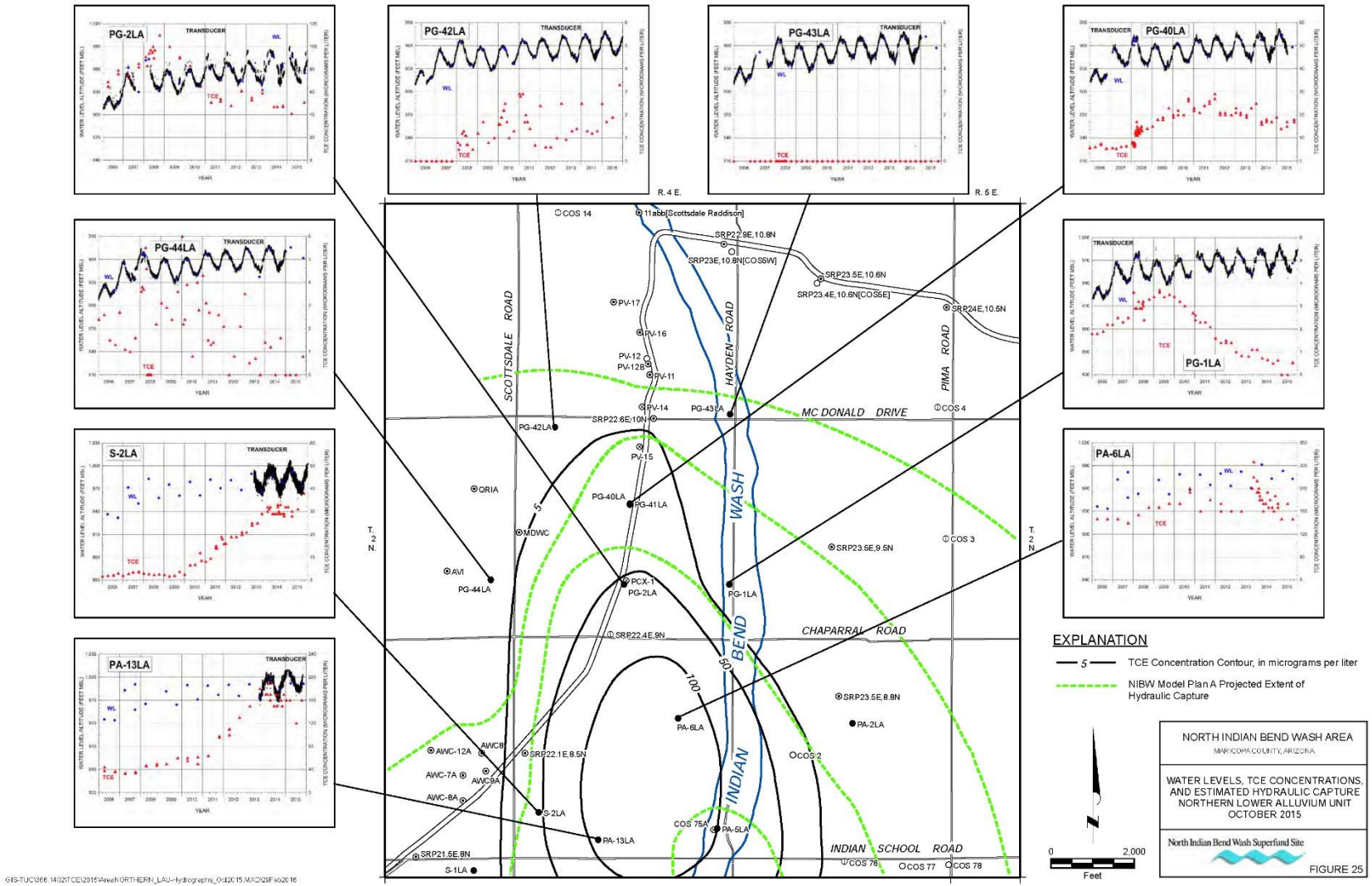


Figure B-8. Monitoring well TCE concentrations in LAU within NIBW

Table B.1: 1,4-DIOXANE GROUNDWATER MONITORING DATA SUMMARY, JANUARY - MARCH 2015
NORTH INDIAN BEND WASH SUPERFUND SITE, SCOTTSDALE, ARIZONA

WELL TYPE	SAMPLE LOCATION	SAMPLE ID	SAMPLE DATE	SAMPLE TYPE	LAB [a]	1,4-DIOXANE (µg/L) [b]
Extraction	7EX-3aMA	7EX-3aMA	3/11/2015	Original	TA	<0.22
Extraction	7EX-4MA	7EX-4MA	3/11/2015	Original	TA	<0.21
Extraction	COS-31	COS-31	3/9/2015	Original	COS	0.27
Extraction	COS-71A	COS-71A	3/19/2015	Original	TA	<0.22
Extraction	COS-72	COS-72	2/11/2015	Original	COS	0.12
Extraction	COS-75A	COS-75A	3/19/2015	Original	TA	**0.84**
--	Common Sump @ CGTF	Common Sump	3/19/2015	Original	TA	**0.42**
--	EPDS-080	EPDS-080	3/19/2015	Original	TA	**0.32**
Extraction	MEX-1MA	MEX-1MA	---	---	---	N/A[c]
Extraction	SRP23.6E6N	SRP23.6E6N	3/11/2015	Original	TA	<0.22
Extraction	PCX-1	PCX-1	3/11/2015	Original	TA	<0.22
Extraction	PV-14	PV-14	3/11/2015	Original	TA	<0.21
Extraction	PV-14	G	3/11/2015	Duplicate	TA	<0.21
Extraction	PV-15	PV-15	3/11/2015	Original	TA	<0.22
--	Clearwell @ MRTF	Clearwell	3/11/2015	Original	TA	<0.22
Monitoring	B-J	B-J	3/16/2015	Original	TA	**0.22**
Monitoring	B-J	H	3/16/2015	Duplicate	TA	<0.21
Monitoring	D-2MA	D-2MA	1/14/2015	Original	TA	<0.21
Monitoring	E-1MA	E-1MA	3/24/2015	Original	TA	<0.22
Monitoring	E-5MA	E-5MA	3/17/2015	Original	TA	<0.21
Monitoring	E-10MA	E-10MA	1/15/2015	Original	TA	<0.21
Monitoring	E-10MA	D	1/15/2015	Duplicate	TA	<0.21
Monitoring	M-4MA	M-4MA	3/24/2015	Original	TA	<0.21
Monitoring	M-5MA	M-5MA	3/24/2015	Original	TA	<0.21
Monitoring	M-6MA	M-6MA	3/18/2015	Original	TA	<0.22
Monitoring	M-9LA	M-9LA	3/19/2015	Original	TA	<0.22

WELL TYPE	SAMPLE LOCATION	SAMPLE ID	SAMPLE DATE	SAMPLE TYPE	LAB [a]	1,4-DIOXANE (µg/L) [b]
Monitoring	M-9LA	K	3/19/2015	Duplicate	TA	<0.21
Monitoring	M-9MA	M-9MA	3/19/2015	Original	TA	<0.22
Monitoring	M-10MA2	M-10MA2	3/24/2015	Original	TA	<0.22
Monitoring	M-15MA	M-15MA	3/24/2015	Original	TA	<0.21
Monitoring	M-16LA	M-16LA	3/20/2015	Original	TA	**0.60**
Monitoring	M-16MA	M-16MA	3/20/2015	Original	TA	<0.21
Monitoring	M-17MA/LA	M-17MA/LA	1/14/2015	Original	TA	<0.21
Monitoring	M-17MA/LA	C	1/14/2015	Duplicate	TA	<0.21
Monitoring	PA-2LA	PA-2LA	---	---	---	N/A [d]
Monitoring	PA-5LA	PA-5LA	1/16/2015	Original	TA	**0.96**
Monitoring	PA-6LA	PA-6LA	1/16/2015	Original	TA	**1.8**
Monitoring	PA-6LA	E	1/16/2015	Duplicate	TA	**1.7**
Monitoring	PA-8LA2	PA-8LA2	3/23/2015	Original	TA	<0.21
Monitoring	PA 9LA-	PA 9LA-	3/20/2015	Original	TA	<0.22
Monitoring	PA-10MA	PA-10MA	1/14/2015	Original	TA	<0.21
Monitoring	PA-11LA	PA-11LA	3/18/2015	Original	TA	<0.21
Monitoring	PA-12MA	PA-12MA	1/16/2015	Original	TA	<0.21
Monitoring	PA-13LA	PA-13LA	1/15/2015	Original	TA	<0.22
Monitoring	PA-15LA	PA-15LA	3/17/2015	Original	TA	<0.22
Monitoring	PA-15LA	I	3/17/2015	Duplicate	TA	<0.22
Monitoring	PA-18LA	PA-18LA	3/24/2015	Original	TA	<0.21
Monitoring	PA-18LA	N	3/24/2015	Duplicate	TA	<0.21
Monitoring	PA-19LA	PA-19LA	3/18/2015	Original	TA	**0.49**
Monitoring	PA-20MA	PA-20MA	3/18/2015	Original	TA	**0.23**
Monitoring	PA-20MA	J	3/18/2015	Duplicate	TA	**0.23**
Monitoring	PG-1LA	PG-1LA	1/16/2015	Original	TA	<0.21
Monitoring	PG-2LA	PG-2LA	3/26/2015	Original	TA	<0.22
Monitoring	PG-6MA	PG-6MA	3/16/2015	Original	TA	**0.78**

WELL TYPE	SAMPLE LOCATION	SAMPLE ID	SAMPLE DATE	SAMPLE TYPE	LAB [a]	1,4-DIOXANE (µg/L) [b]
Monitoring	PG-10UA	PG-10UA	3/26/2015	Original	TA	<0.21
Monitoring	PG-22UA	PG-22UA	3/17/2015	Original	TA	**0.22**
Monitoring	PG-24UA	PG-24UA	3/17/2015	Original	TA	**0.41**
Monitoring	PG-30UA	PG-30UA	---	---	---	N/A [e]
Monitoring	PG-31UA	PG-31UA	3/20/2015	Original	TA	<0.21
Monitoring	PG-40LA	PG-40LA	3/25/2015	Original	TA	<0.22
Monitoring	PG-40LA	O	3/25/2015	Duplicate	TA	<0.22
Monitoring	PG-42LA	PG-42LA	3/25/2015	Original	TA	<0.22
Monitoring	PG 43LA-	PG 43LA-	3/25/2015	Original	TA	<0.20
Monitoring	PG-44LA	PG-44LA	3/25/2015	Original	TA	<0.21
Monitoring	PG-48MA	PG-48MA	3/18/2015	Original	TA	<0.21
Monitoring	PG-55MA	PG-55MA	3/23/2015	Original	TA	<0.21
Monitoring	S-2LA	S-2LA	1/15/2015	Original	TA	<0.21
Monitoring	W-1MA	W-1MA	1/14/2015	Original	TA	<0.21
Monitoring	W-2MA	W-2MA	1/15/2015	Original	TA	<0.21

EXPLANATION:

[a] LAB = Analytical Laboratory Highlighted values are detected results

TA = Test America, Inc.

COS = City of Scottsdale

b µg/L = micrograms per liter

c N/A = Not able to sample, on-gong work on pump control system

d N/A = Unable to sample, bad order pump observed on 3/26/2015 – pump replacement in progress

e N/A = Unable to sample, bad order pump observed on 3/20/2015 - PG-10UA was sampled in place of PG-30UA

< = Analytical result is less than laboratory detection limit

--- = No information available or not measured

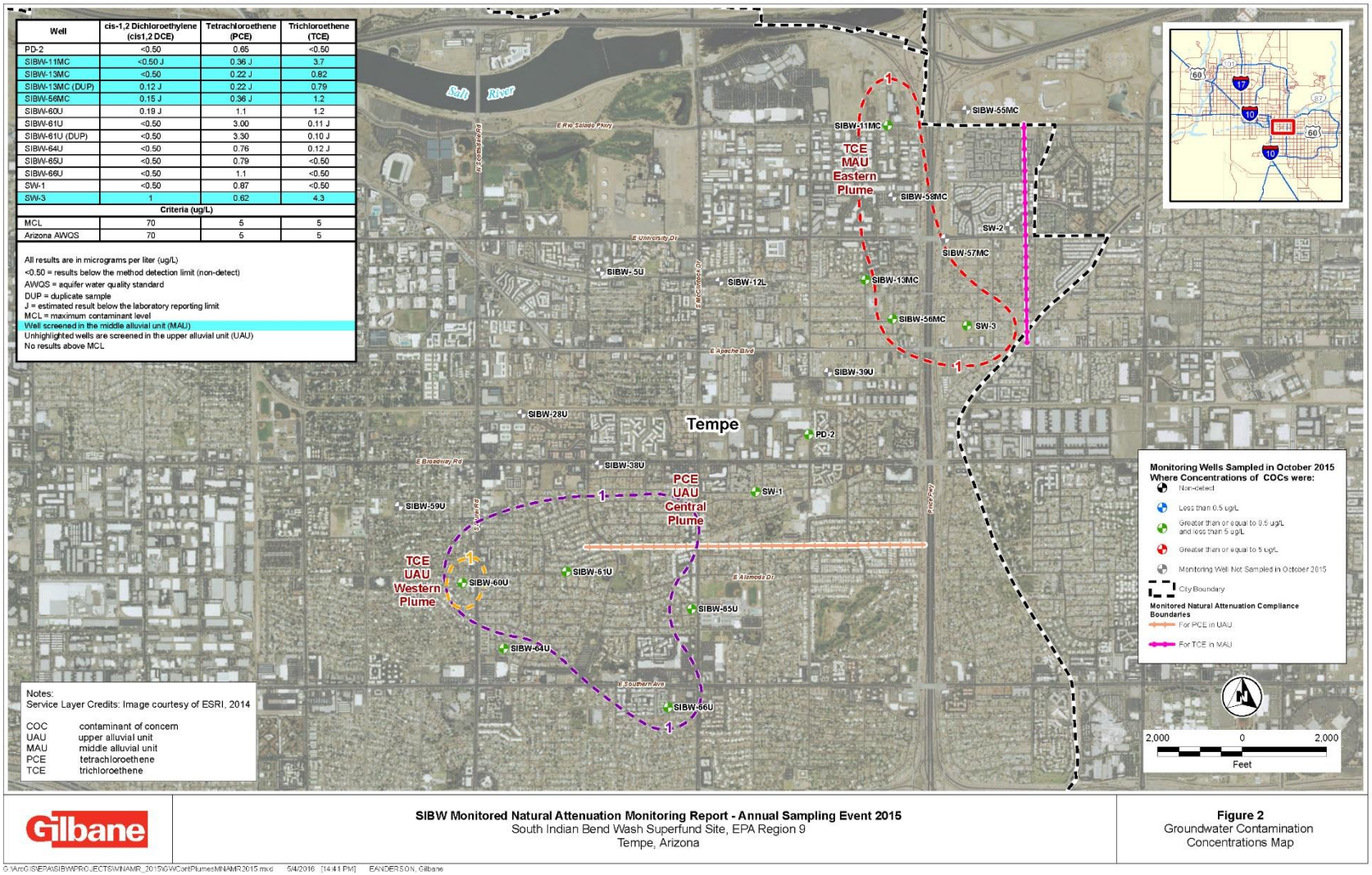


Figure B-9. TCE in UAU wells within SIBW in October 2015

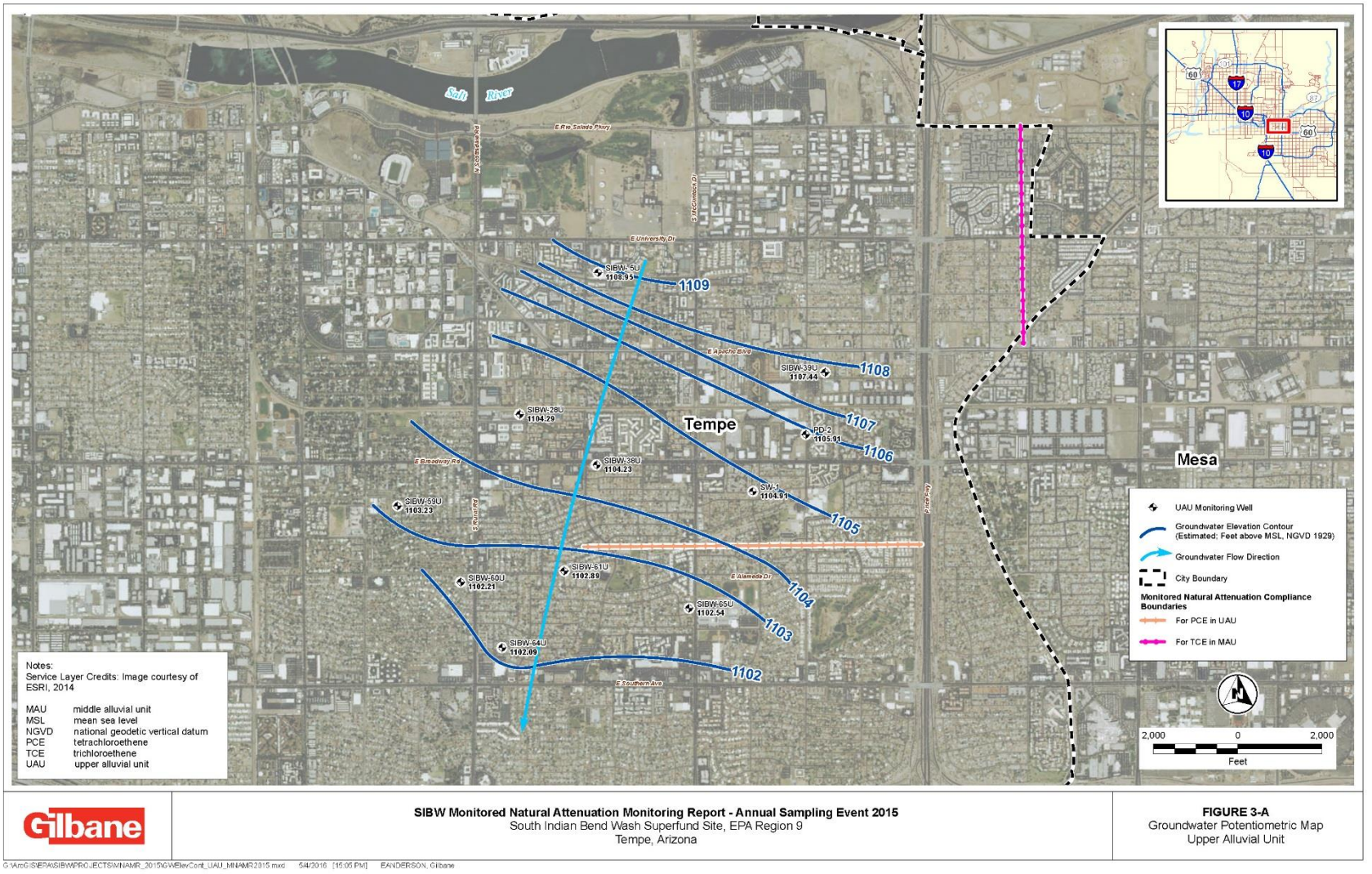


Figure B-10. Groundwater UAU elevations within SIBW in October 2015

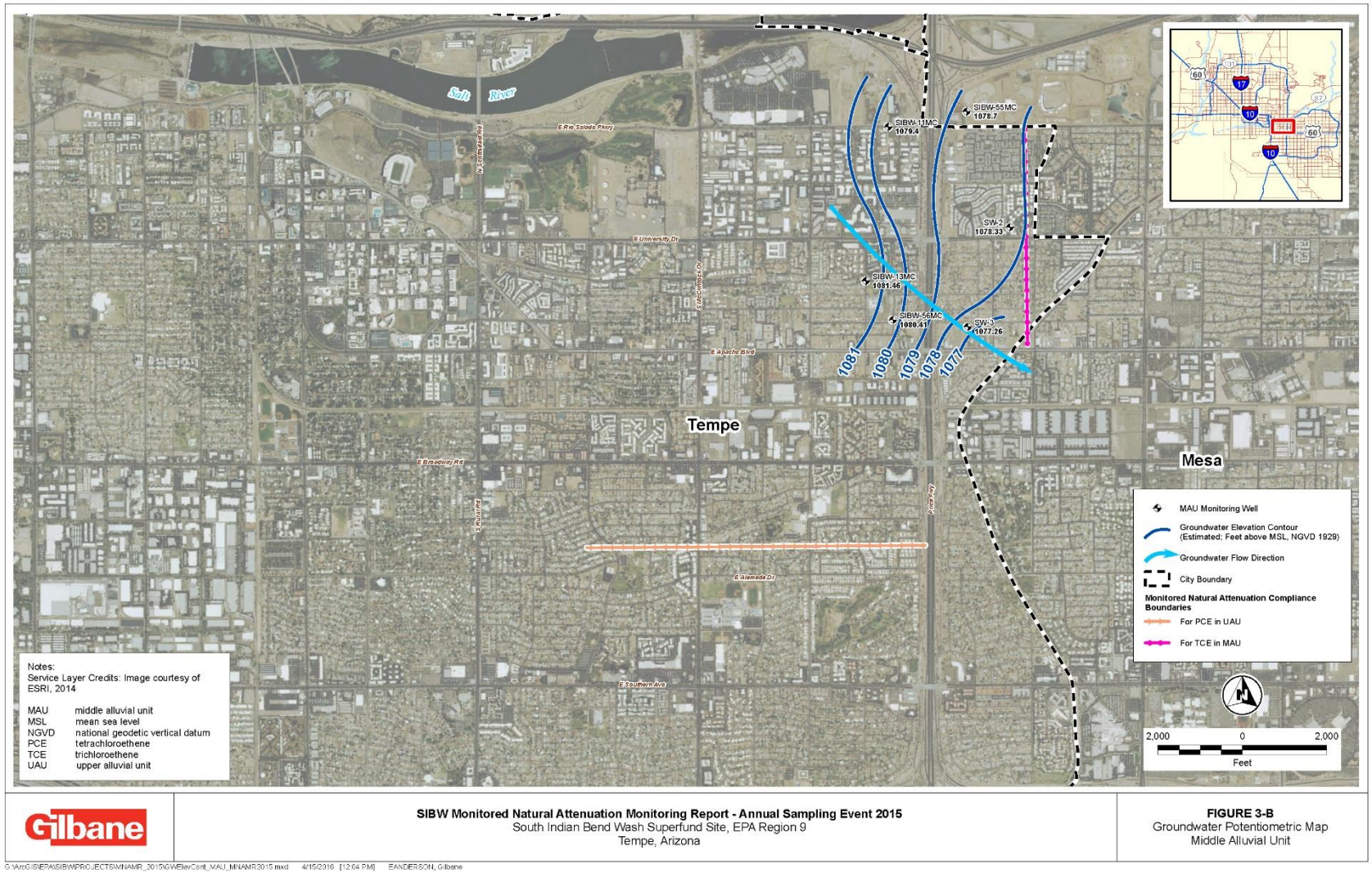


Figure B-11. Groundwater MAU elevations within SIBW in October 2015

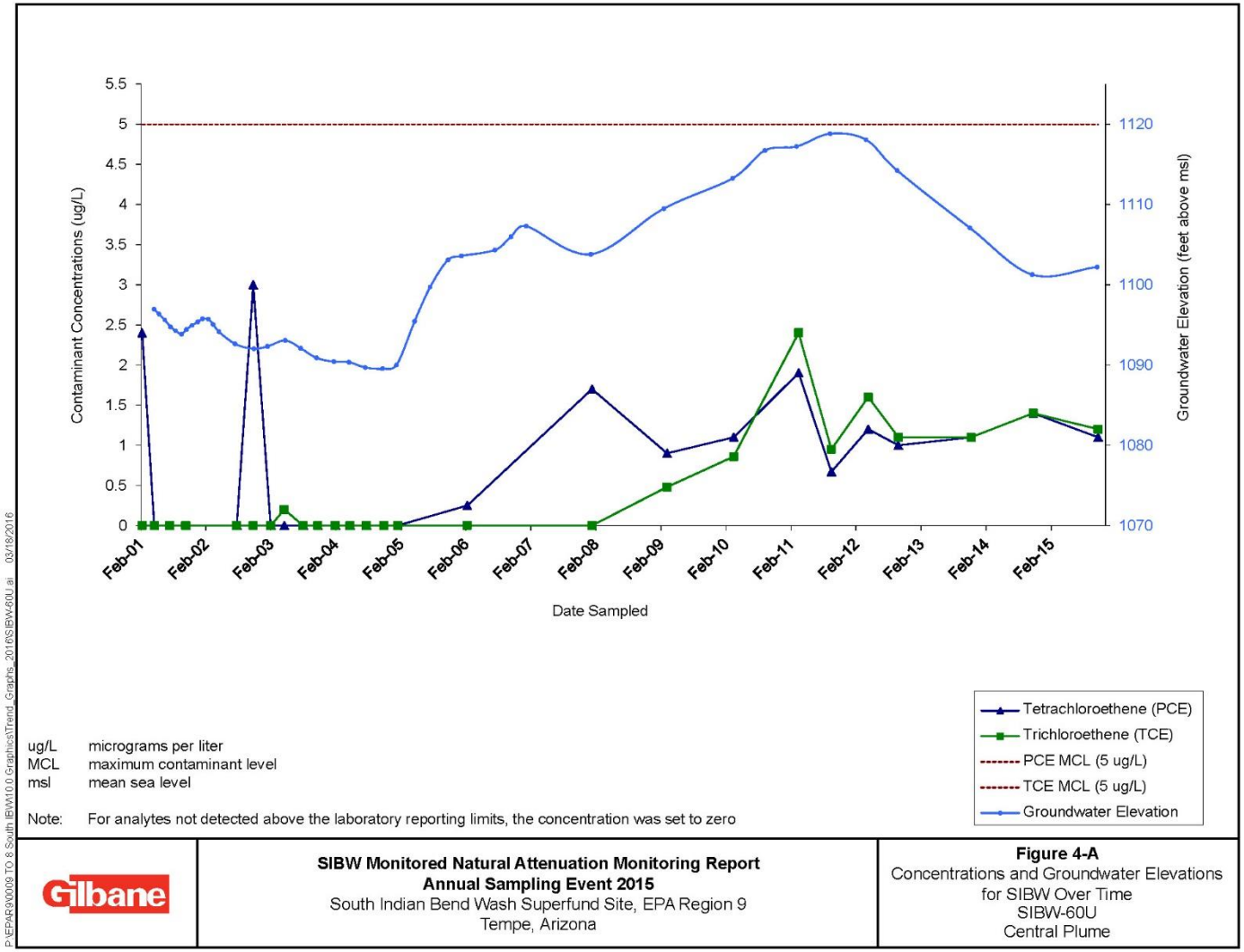


Figure B-12. Groundwater TCE concentrations at SIBW-60U within SIBW

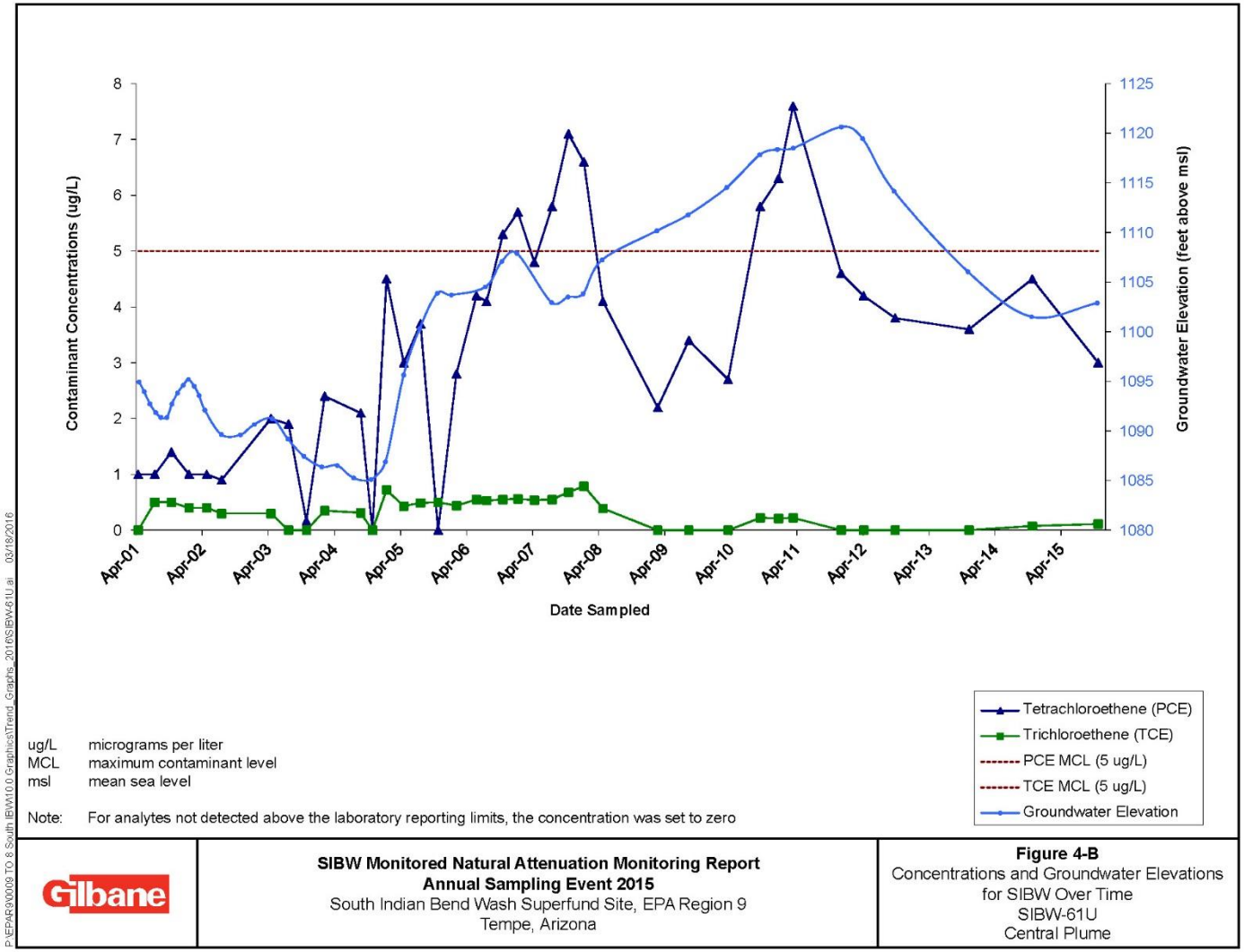


Figure B-13. Groundwater TCE concentrations at SIBW-61U within SIBW

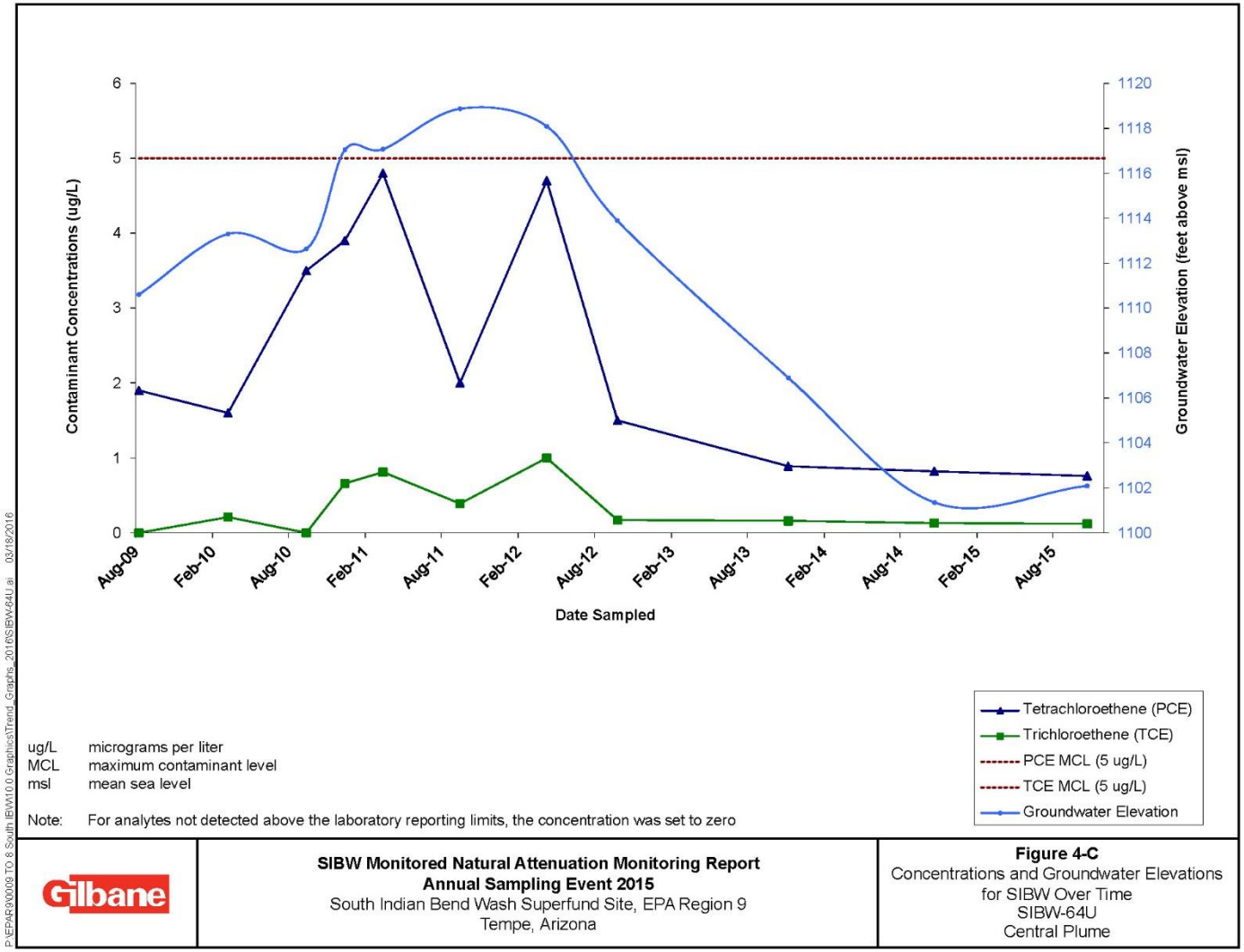


Figure B-14. Groundwater TCE concentrations at SIBW-64U within SIBW

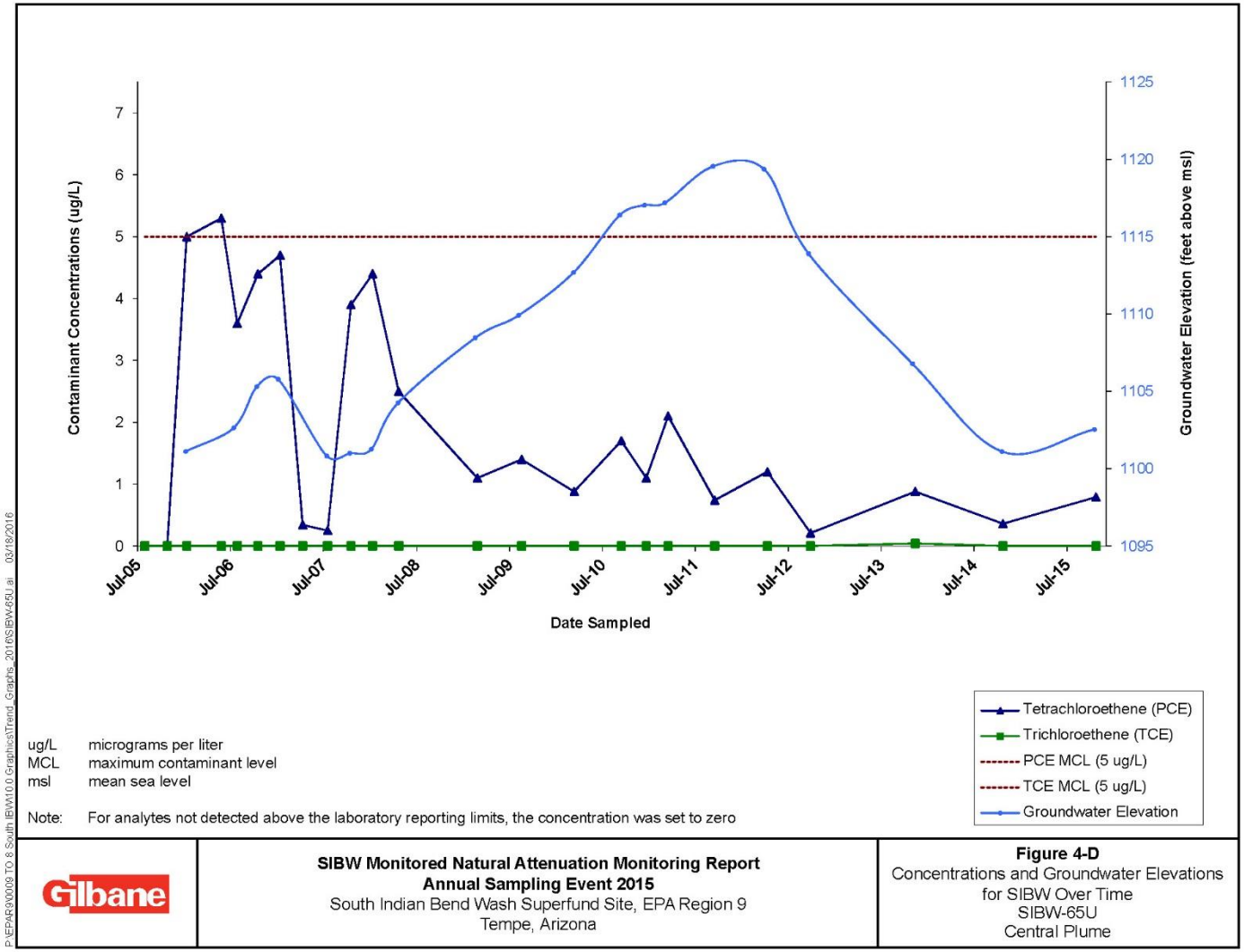


Figure B-15. Groundwater TCE concentrations at SIBW-65U within SIBW

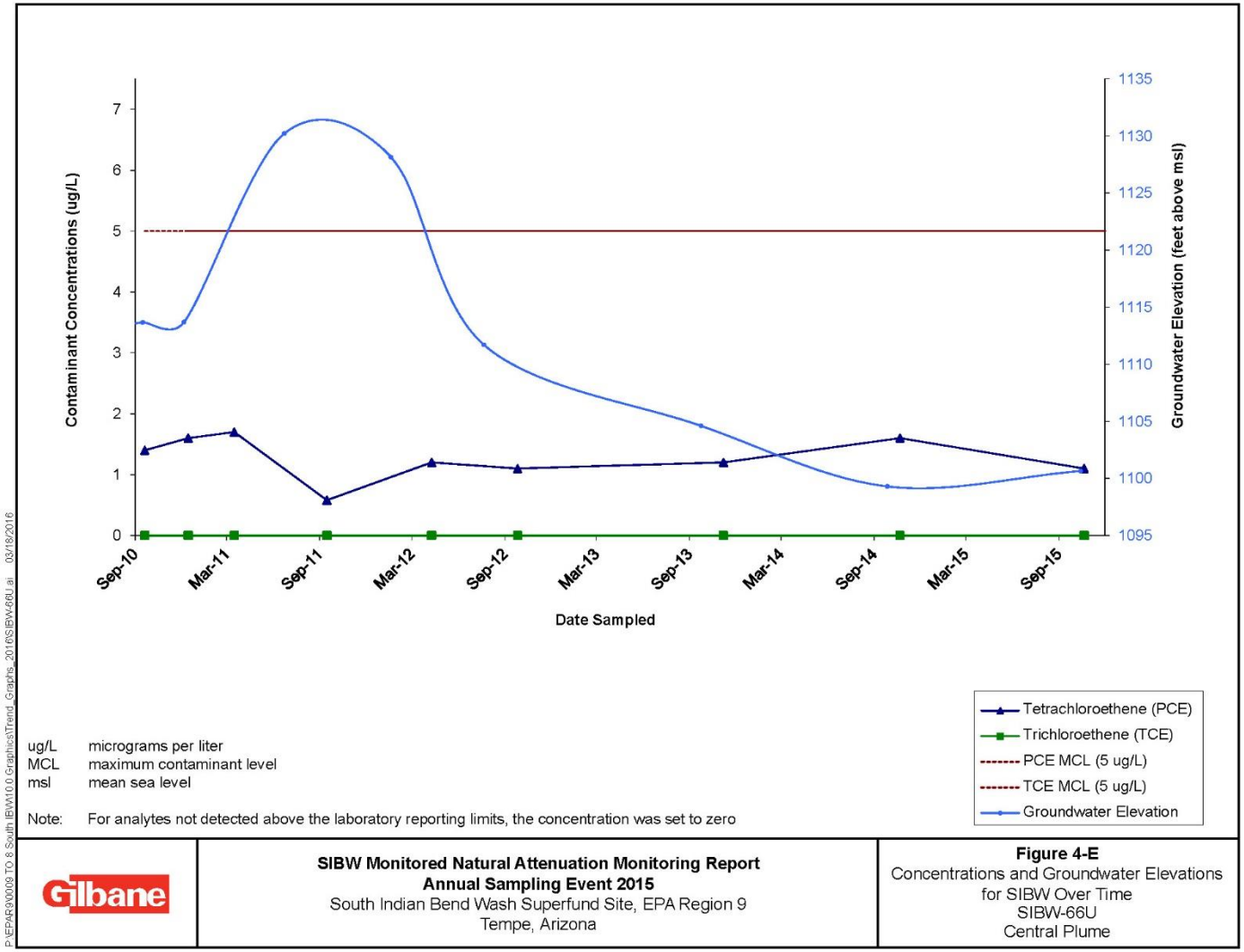


Figure B-16. Groundwater TCE concentrations at SIBW-66U within SIBW

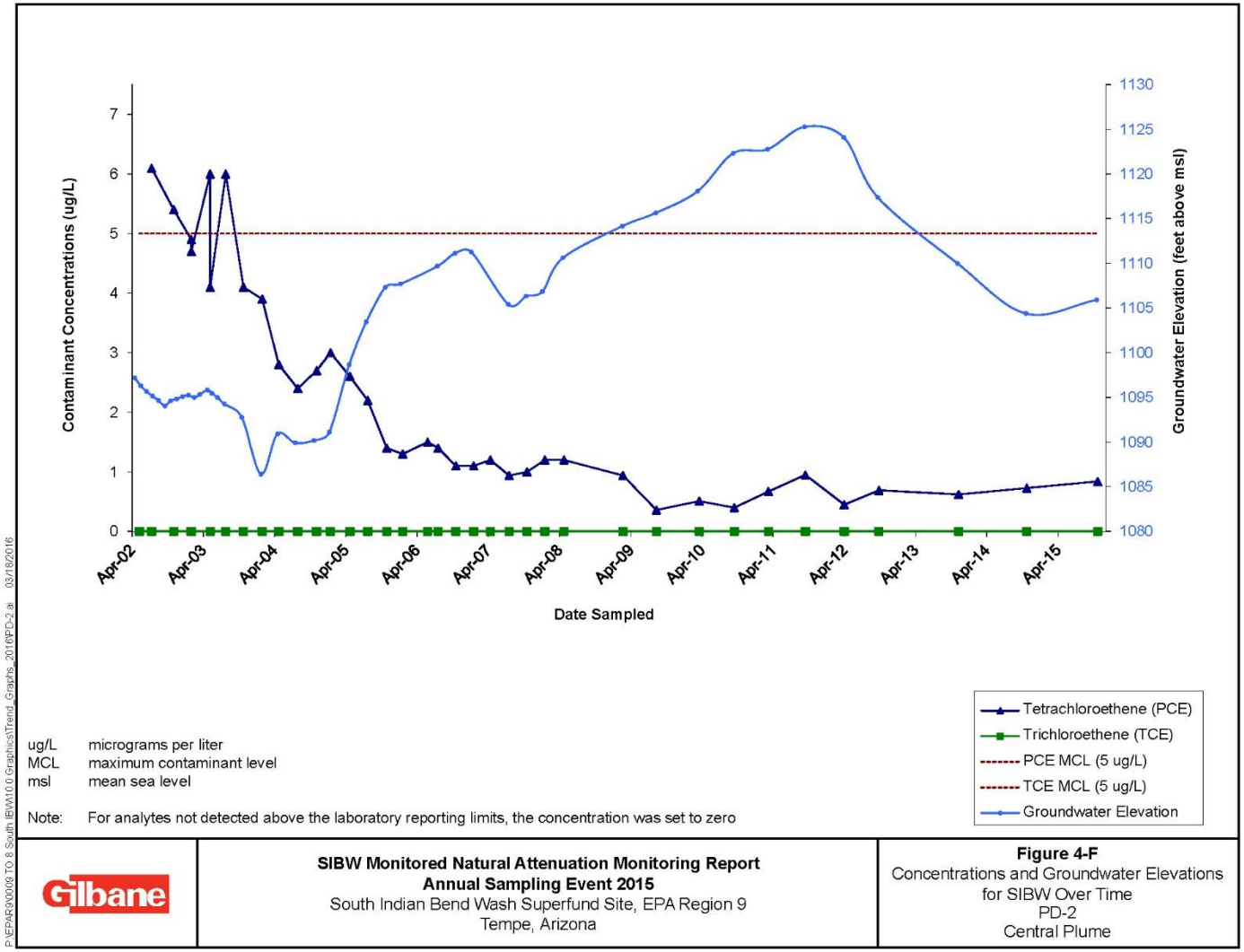


Figure B-17. Groundwater TCE concentrations at PD-2 within SIBW

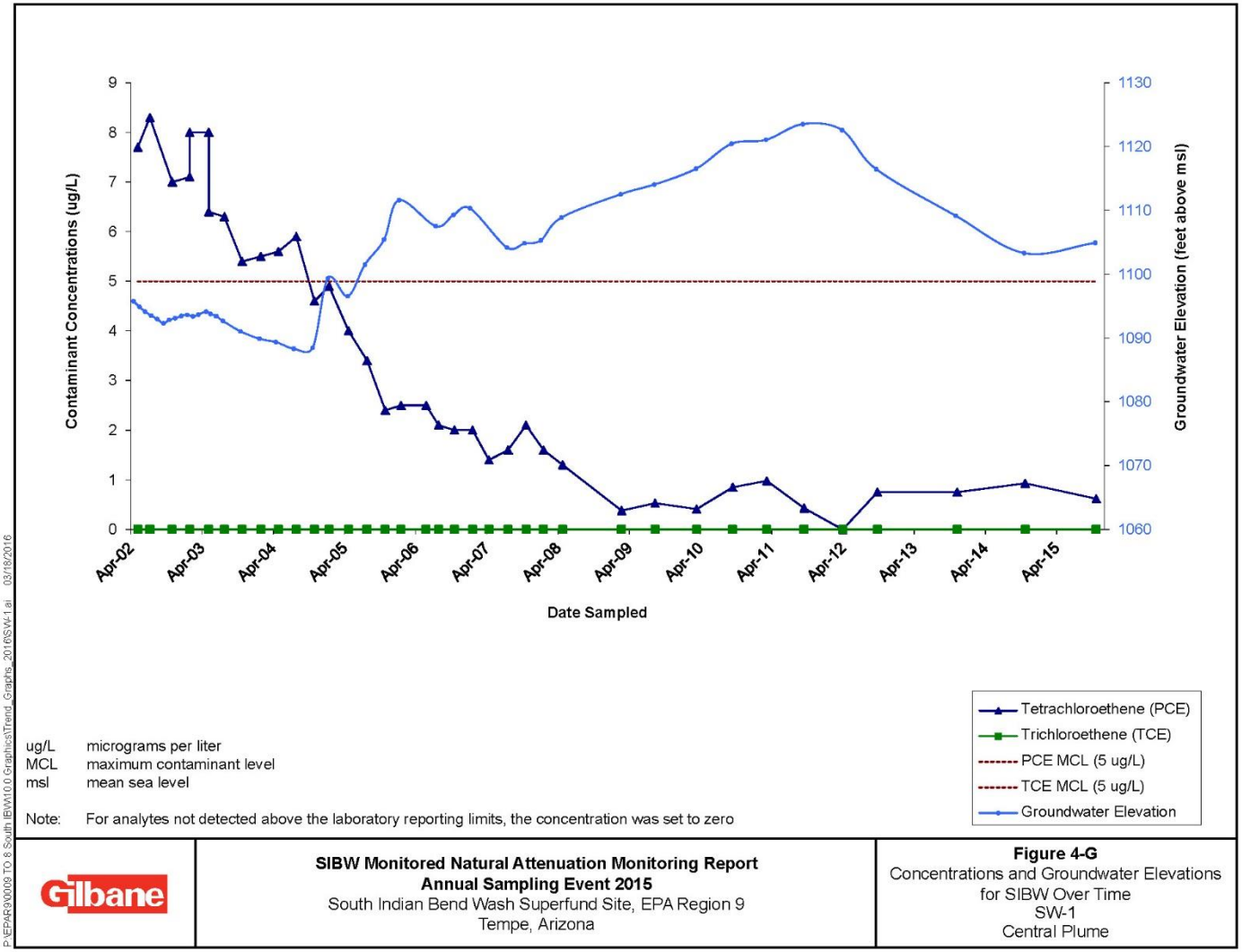


Figure B-18. Groundwater TCE concentrations at SW-1 within SIBW

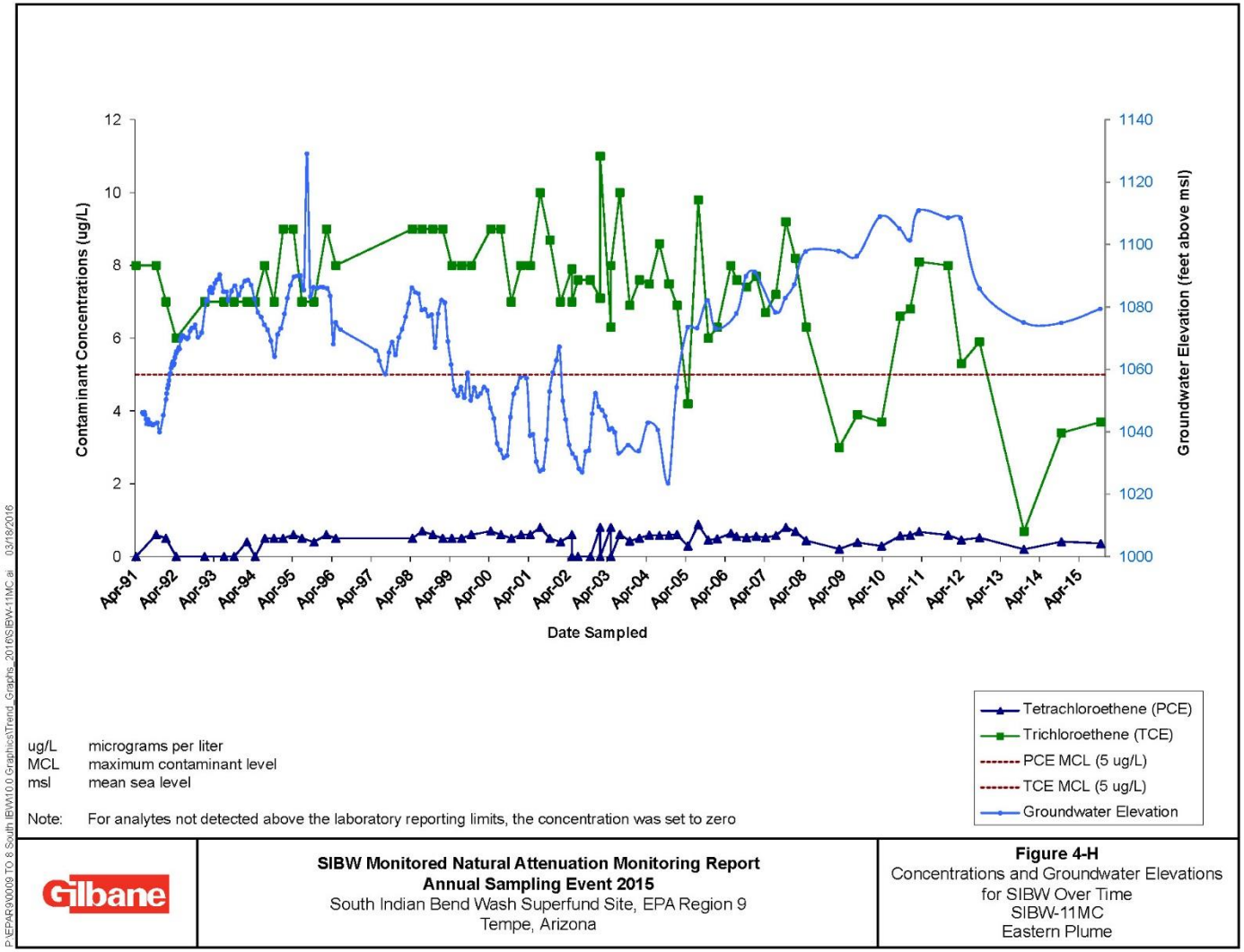


Figure B-19. Groundwater TCE concentrations at SIBW-11MC within SIBW

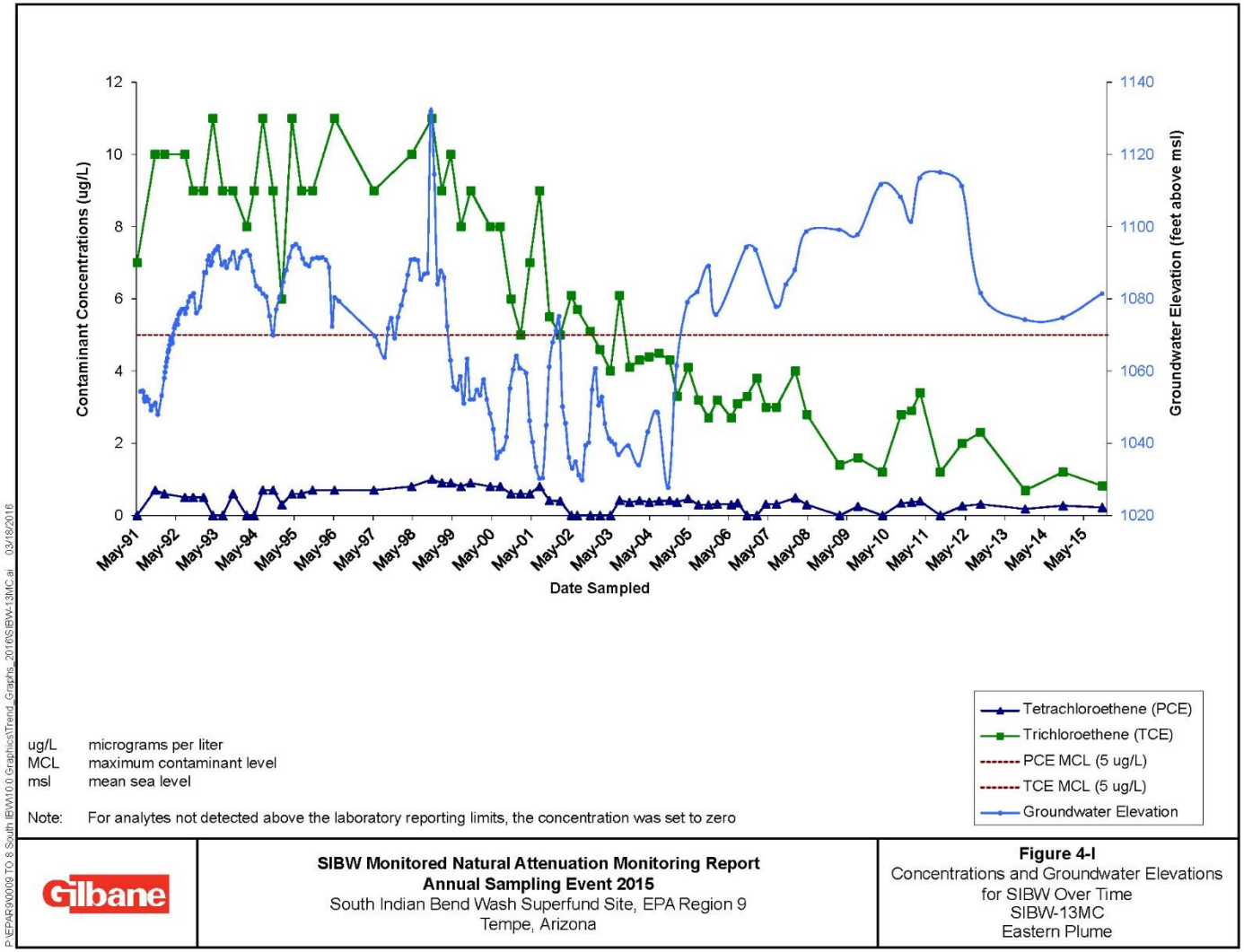


Figure B-20. Groundwater TCE concentrations at SIBW-13MC within SIBW

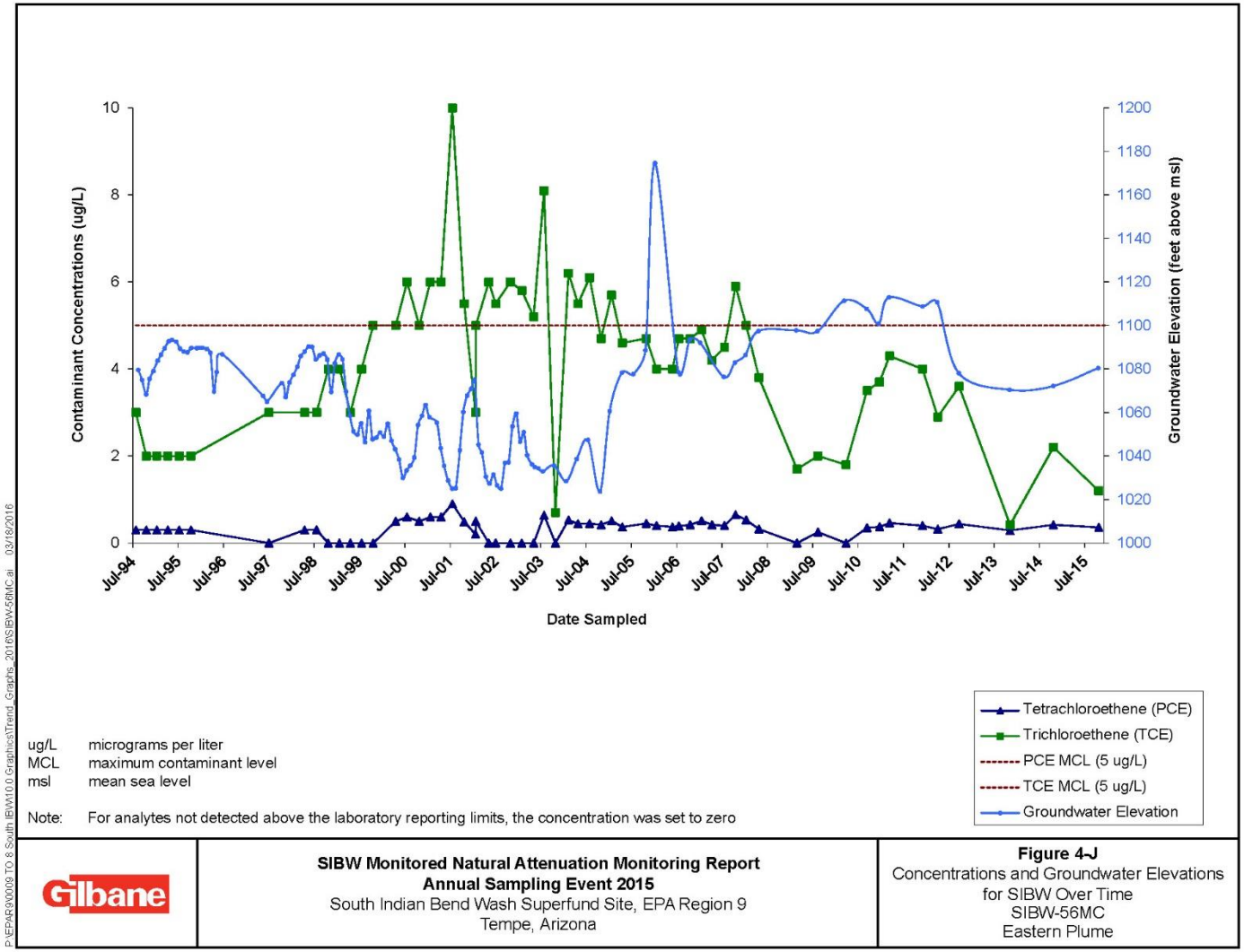


Figure B-21. Groundwater TCE concentrations at SIBW-56MC within SIBW

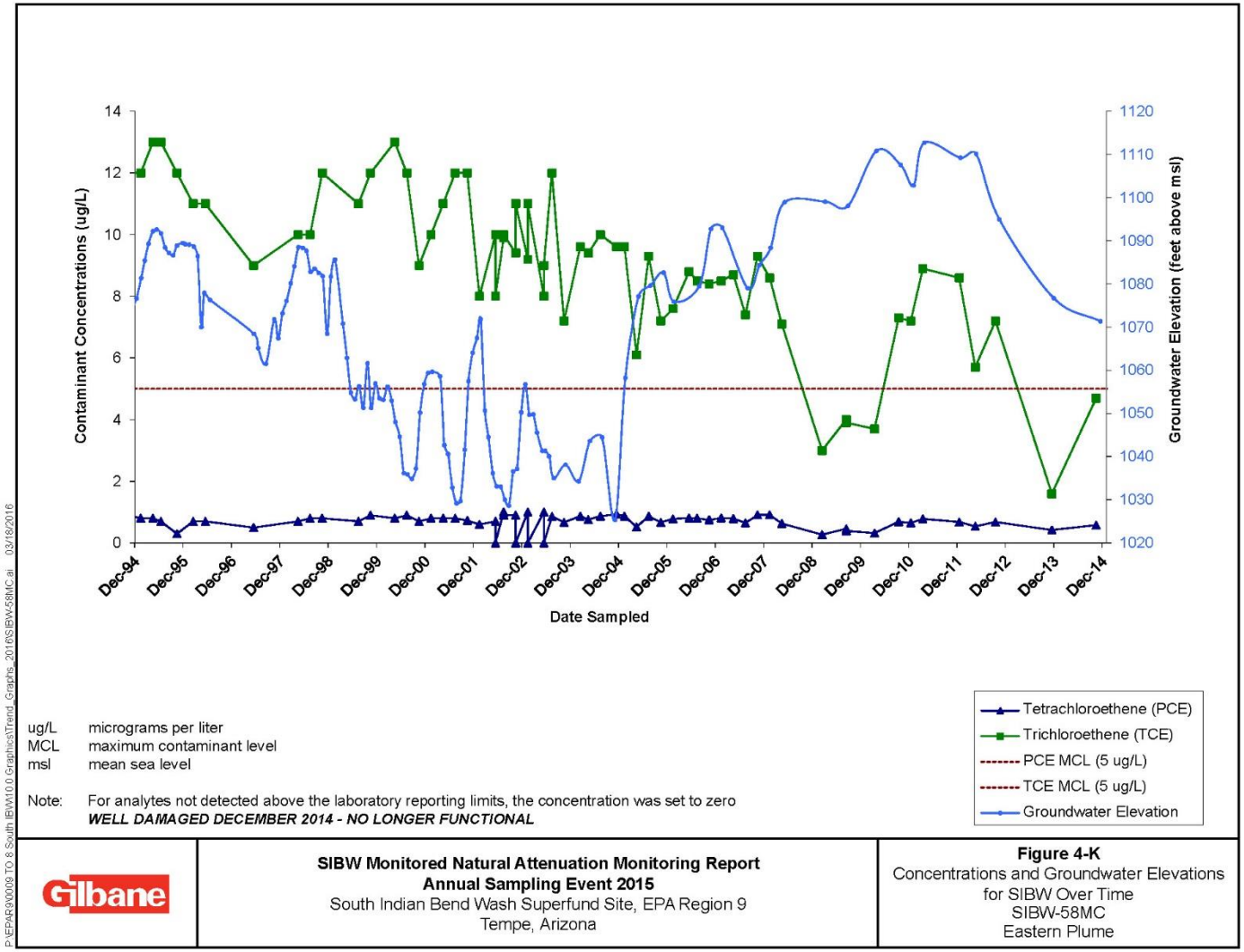


Figure B-22. Groundwater TCE concentrations at SIBW-58MC within SIBW

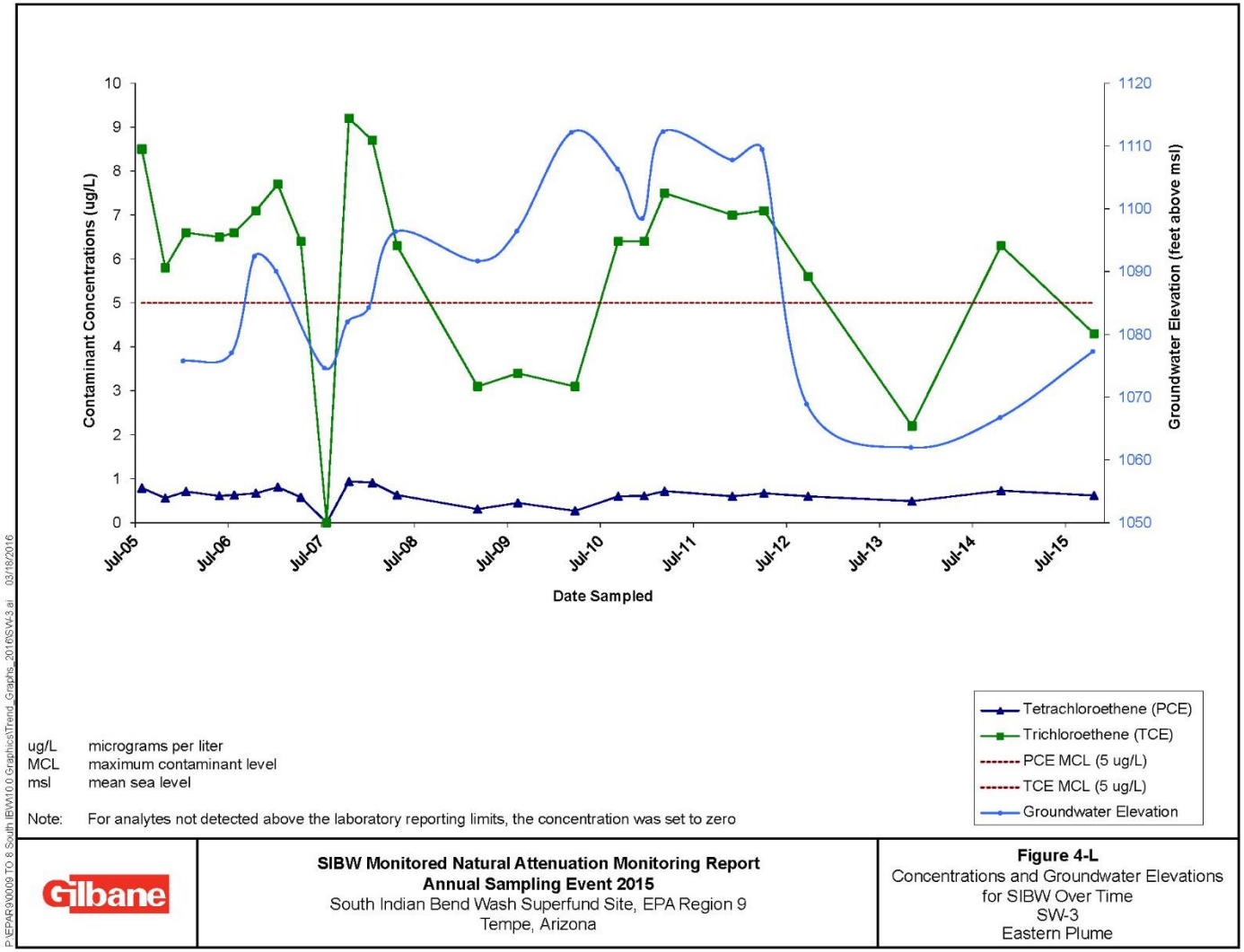


Figure B-23. Groundwater TCE concentrations at SW-3 within SIBW

Appendix C: ARARS Analysis

Appendix C: ARAR Analysis

Section 121(d)(1)(A) of CERCLA requires that remedial actions at CERCLA sites attain (or justify the waiver of) any federal or state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Federal ARARs may include requirements promulgated under any federal environmental laws. State ARARs may only include promulgated, enforceable environmental or facility-siting laws of general application that are more stringent or broader in scope than federal requirements and that are identified by the state in a timely manner. ARARs are identified on a site-specific basis from information about the chemicals at the site, the remedial actions contemplated, the physical characteristics of the site, and other appropriate factors. ARARs include only substantive, not administrative, requirements and pertain only to onsite activities. There are three general categories of ARARs: chemical-specific, action-specific, and location-specific; of the original ARARs, only chemical-specific and location-specific ARARs are still applicable or relevant and are therefore discussed in this appendix. The action-specific ARARs are no longer applicable or relevant because all construction of the chosen remedial alternatives is complete for both NIBW and SIBW. Similarly, some of the location-specific ARARs are no longer applicable or relevant because there are no environmentally sensitive areas that will be impacted by the remedies in place. The ARARs for NIBW and SIBW are reviewed in Tables A-2 and A-3, respectively.

Chemical-specific ARARs identified in the selected remedies for SIBW and NIBW within their respective RODs and subsequent ROD Amendment or ESD for the groundwater treatment and monitoring at this Site and considered for this FYR are shown in Table A-1. Contaminants with cleanup goals that exceed their current Maximum Contaminant Level (MCL) are highlighted in red text in Table A-1.

Most cleanup goals for both SIBW and all cleanup goals for NIBW are still less than or equal to the federal MCL. For SIBW, the 1998 ROD set cleanup goals for two compounds equal to the federal MCL in place at the time of that ROD; however, those cleanup goals are above the current MCL. NIBW has a cleanup goal for chloroform set at 6 µg/L, but in December of 2001, the EPA MCLs and MCL goals (MCLGs) for chloroform and bromodichloromethane changed and the federal MCLs for the individual compounds were eliminated in favor of a combined total trihalomethanes (TTHM) MCL. Specifically, the federal MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as TTHM. The NIBW cleanup goal for chloroform is below the MCL for TTHM and the MCLG for chloroform. The state of Arizona uses federal Safe Drinking Water Act for drinking water standards, so the federal MCLs are incorporated in the state of Arizona code of regulations.

For the purpose of this ARAR analysis, the highest concentration for monitored chemicals is summarized here. For NIBW, sampling and analysis demonstrated that treatment systems are operating effectively and that COC concentrations are consistently below regulatory standards. For SIBW, the highest concentration of TCE was detected in monitoring well SW-3 at 4.3 µg/L, which is below the MCL of 5 µg/L. The highest concentration of PCE was detected in monitoring well SIBW-61U at 3.0 µg/L which is also below the MCL of 5 µg/L.

Table C-1. Summary of Groundwater ARAR Changes

	Federal Maximum Contaminant Level* (µg/L)	South Indian Bend Aquifer Cleanup Standard (µg/L)		Is the Cleanup Standard still protective?	North Indian Bend Treated Water Cleanup Standard (µg/L)	Is the Cleanup Standard still protective?
		1998 ROD	2004 ROD Amendment		2001 ROD	
Benzene	5.0	5[a]	—	Yes	—	—
Bromodichloromethane	80[b]	100[a,b]	—	No	—	—
Chloromethane	—	2.7[d]	—	Yes	—	—
Chloroform	80[b]	100[a,b]	—	No	6[e]	Yes
1,2-Dibromoethane	0.05	0.05[a]	—	Yes	—	—
*cis*1,2-Dichloroethene	70	5[a]	—	Yes	—	—
1,1-Dichloroethene	7.0	7[a,d]	—	Yes	6	Yes
1,2-Dichloropropane	5.0	5[a]	—	Yes	—	—
Methylene Chloride	5.0	5[a]	—	Yes	—	—
1,1,2,2-Tetrachloroethane	—	0.18[c]	—	Yes	—	—
Tetrachloroethene (PCE)	5.0	5[a]	5	Yes	5	Yes
Trichloroethene (TCE)	5.0	5[a]	5	Yes	5	Yes
1,1,1-Trichloroethane	200	—	—	—	200	Yes

South Indian Bend Contaminant of Concern with Clean-up Standard shown in brown
North Indian Bend Contaminant of Concern with Clean-up Standard shown in green
Clean-up standard greater than current MCL shown in red. Although the current standard is lower than specified in the ROD, the protectiveness of the remedy is not affected, as current concentrations are well below both the current and previous standards.

Notes:

*Federal MCLs are the National Primary Drinking Water Regulations under the Safe Drinking Water Act (http://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants). Arizona Department of Environmental Quality (ADEQ) has established aquifer water quality standards, based on the primary maximum contaminant levels (MCLs) under the Safe Drinking Water Act, for all aquifers in the state "to preserve and protect the quality of those waters for all present and reasonably foreseeable future uses" (A.R.S. 49-221). https://www.azdeq.gov/environ/water/standards/

— Not applicable

a. Federal Maximum Contaminant Levels (MCLs)
b. For total trihalomethanes (TTHM)
c. Arizona Human Health-Based Guidance Level (HBGL) for drinking water (December 1997 Update)
d. Maximum Contaminant Level Goal (MCLG) is identical to the MCL
e. Concentration not including any byproduct of municipal water supply chlorination in accordance with Arizona HBGL

Federal and State laws and regulations other than the chemical-specific ARARs that have been promulgated or changed over the past five years are described in Table A-2 for NIBW and Table A-3 for SIBW. Now that the response action has transitioned from construction to the long-term Operations and Maintenance (O&M) phase of work, this ARAR review and analysis does not include any ARARs identified from the 1988, 1991, 1994, 1998 RODS as well as the 2001 and 2004 ROD Amendments (ARODs) that are no longer pertinent (e.g., ARARs related to only

construction activities and/or new well installation). For example, ARARs related to remedial design and construction are not included in the table if they do not continue into long-term O&M.

All remedy construction is complete for both NIBW and SIBW. SIBW may replace one damaged well. However, since the plume size is decreasing, abandonment of the damaged well is more likely. At NIBW, the plume is controlled by pumping. The only new SIBW wells expected during the 70 year O&M period are replacements of existing wells, and there also are no new wells expected for NIBW. There have been no revisions to laws or regulations that affect the protectiveness of the remedy.

Occupational safety and health standards were cited as an ARAR in the last Five Year Review, but the Title 28 reference appears to be a typo as that title deals with the judicial system. However Title 29 CFR Part 1910 regulations are about occupational safety and health standards

The following ARARs have not changed since the last Five Year Review and, therefore, do not affect protectiveness:

<u>NIBW</u>

- Clean Air Act (CAA), US Code Title 42 Section 7401 (chapter 85-Air Pollution Prevention and Control, subchapter I – Program and Activities)
- Federal Safe Drinking Water Act (SDWA), 42 USC 300g-1
- Title 40 CFR Part 261
- Title 40 CFR Part 265 Subparts AA and BB; AAC § R18-8-265(A)
- Title 40 CFR Part 262.34
- Title 40 CFR Part 264.171 to 264.178
- Title 40 CFR Part 270
- Title 40 CFR Subparts AA & BB
- Title 40 CFR Subpart F
- Arizona Administrative Code (AAC)R18-8-264
- Arizona Revised Statutes (A.R.S.) Section 49-221,50 FR 3078
- Arizona A.R.S. Section 49-222
- Arizona A.R.S. Section 49-224
- Arizona AAC Section R18-4-701 to R18-4-704 and R18-4-706 - Repealed May 2000
- Arizona AAC Section R18-8-264
- Arizona AAC R18-8-264
- A.R.S. Section 45-454.01
- AAC Section R18-9A901
- AAC Section R12-15-830
- RCRA (contained in principle)

<u>SIBW</u>

- Clean Air Act (CAA), US Code Title 42 Section 7401 (chapter 85-Air Pollution Prevention and Control, subchapter I – Program and Activities)
- Federal Safe Drinking Water Act (SDWA), 42 USC 300g-1
- AAC R12-15-130
- AAC R18-9-A904 & A905

Table C-2. NIBW Original ARARs

North Indian Bend Wash					
ORIGINAL APPLICABLE OR RELEVANT & APPROPRIATE REQUIREMENTS EVALUATION					
Original ARAR	**Document**	**Original ARAR requirement**	**Description**	**Amendment Date between September 2011 – present**	**Effect on Protectiveness**
CHEMICAL-SPECIFIC ARARs					
Clean Water Act (CWA) 33 USC 1311-1387	2001 AROD	Establishes Water Quality Criteria for surface waters	The CWA Water Quality Criteria are designed to protect aquatic life (Marine and freshwater). These standards are expressed on the basis of acute and chronic toxicity levels. The selected remedy complies with these criteria. Any treated groundwater discharged to a surface water body must meet the CWA Quality Criteria.	33 USC 1321 – December 2014 33 USC 1342 – February 2014 33 USC 1362 – June 2014 33 USC 1377 – June 2014 33 USC 1381 – June 2014	None, Changes are administrative such as changes about oil and hazardous substance liability, certification, bridges, coast guard, Indian Tribes, and grants to States for establishing revolving funds.
Clean Water Act 40 CFR 402, 405-471; 40 CFR 125;	2001 AROD	Establishes the National Pollutant Elimination Discharge System (NPDES) Permit Program	The NPDES permit program regulates discharges into "waters of the United States" by establishing numeric limits and monitoring requirements for such discharge. The discharge of treated water to Arizona Canal System must meet the substantive requirements of the NPDES permit.	40 CFR 125.84 – August 2014 40 CFR 125.86-.99 – August 2014 40 CFR 430.01 – May 2012 40 CFR 435.11-.15 – May 2012 App 2 to Subpart A of Part 435 – May 2012 App 4 to Subpart A of Part 435 – May 2012 App 5 to Subpart A – May 2012 App 8 to Subpart A of Part 435 – May 2012 40 CFR 435.41-.45 – May 2012 40 CFR 449 – May 2012 40 CFR 450.11 – March 2014 40 CFR 450.21 – March 2014 40 CFR 450.22 – May 2015	None Changes are administrative or not applicable dealing with such things as cooling water intake, test procedure changes for sampling and analyses, new source performance standards, and effluent limitations standards for construction and development of point source category.
LOCATION-SPECIFIC ARARs					
Maricopa County Air Pollution Control District Rule 330, § 301	2001 AROD	Regulates Air Emissions in Maricopa County	No person shall discharge more than 15 pounds (6.8 kg) of volatile organic compounds into the atmosphere in any one day from any machine, equipment, device, or other article in which any volatile organic compound or any material containing a volatile organic compound comes into contact with flame or is evaporated at temperatures exceeding 200°F (93.3°C), in the presence of oxygen, unless the entire amount of such discharge has been reduced in accordance with Section 304 of this rule.	MCAPCD Rule 330, § 301 – September 2013	None, Sets forth the legal authority for the Air Pollution Rules and Regulations and includes definitions of terms used in all Maricopa County Air Pollution Control Rules. Discharges between 3lbs/day and 15lbs/day are not subject to this reduction requirement.*
40 CFR 52.11-52.151; AAC § Rl 18-2201 to 220 and § R-18-2-730 (D)&(G)	2001 AROD	Requires Compliance with local air standards	Any source of criteria pollutants located in an NAAQS non-attainment area must comply with local air quality regulations. NIBW is located in Maricopa County which is a non-attainment area for ozone, carbon monoxide (CO) and particulate matter less than 10 microns in size. The selected remedy will comply with these emissions standards.	40 CFR 52.123 – August 2015 40 CFR 52.131 – September 2013 40 CFR 52.145 – April 2015 40 CFR 52.147 – July 2013 AAC § Rl 18-2201 to 220	None Changes are administrative & many are for other states.. For Arizona the approval of Air Plan Revisions Rescissions and Corrections was approved and EPA also approved the Revisions to the Arizona State Implementation Plan, Maricopa County Area.
29 CFR 1910 (2011 five Year Review cited as 28 CFR 1910)		Protection of workers	Actions to protect workers from exposure to hazardous materials through monitoring and training	Occupational Exposure to Hazardous Chemicals in Laboratories (Non-Mandatory Appendix); Technical Amendment 4324 - 4331 [FR DOC # 2013-00788]	Does not affect the protectiveness of the remedy, health and safety plans for the workers who maintain or perform monitoring should include any of these applicable changes.

North Indian Bend Wash					
ORIGINAL APPLICABLE OR RELEVANT & APPROPRIATE REQUIREMENTS EVALUATION					
Original ARAR	**Document**	**Original ARAR requirement**	**Description**	**Amendment Date between September 2011 – present**	**Effect on Protectiveness**
				Hazard Communication; Corrections and Technical Amendment 9311 - 9315 [FR DOC # 2013-01416] Occupational Safety and Health Standards 10490 - 10491 [FR DOC # 2016-04434] Revising Standards Referenced in the Acetylene Standard 13969 - 13970 [FR DOC # 2012-5589] Updating OSHA Standards Based on National Consensus Standards; Eye and Face Protection 16085 - 16093 [FR DOC # 2016-06359] Occupational Exposure to Respirable Crystalline Silica 16285 - 16890 [FR DOC # 2016-04800] Hazard Communication 17573 - 17896 [FR DOC # 2012-4826 Record Requirements in the Mechanical Power Presses Standard 21848 - 21849 [FR DOC # 2014-08864] Updating OSHA Standards Based on National Consensus Standards; Signage P35559 - 35567 [FR DOC # 2013-13909] Vehicle-Mounted Elevating and Rotating Work Platforms and Logging Operations; Corrections37189 - 37190 [FR DOC # 2014-15166] Updating OSHA Standards Based on National Consensus Standards; Head Protection 37587 - 37600 [FR DOC # 2012-15030] Respiratory Protection; Mechanical Power Presses; Scaffold Specifications; Correction and Technical Amendment 46948 - 46950 [FR DOC # 2012-19077] Updating OSHA Standards Based on National Consensus Standards; Head Protection 68684 - 68685 [FR DOC # 2012-27792] Record Requirements in the Mechanical Power Presses Standard 69543 - 69550 [FR DOC # 2013-27695] Revising Standards Referenced in the Acetylene Standard 75782 - 75786 [FR DOC # 2011-30653 Standards Improvement Project-Phase III 76897 - 76897 [FR DOC # 2014-30196] Corrections and Technical Amendments to 16 OSHA Standards 80735 - 80741 [FR DOC # 2011-32853] Incorporation by Reference; Accident Prevention Signs and Tags; Correction	

North Indian Bend Wash					
ORIGINAL APPLICABLE OR RELEVANT & APPROPRIATE REQUIREMENTS EVALUATION					
Original ARAR	**Document**	**Original ARAR requirement**	**Description**	**Amendment Date between September 2011 – present**	**Effect on Protectiveness**
				66641 - 66642 [FR DOC # 2013-26338] Bloodborne Pathogens Standard; Corrections and Technical Amendment Pages 19933 - 19934 [FR DOC # 2012-7715] Electric Power Generation, Transmission, and Distribution; Electrical Protective Equipment 20315 - 20743 [FR DOC # 2013-29579] Electric Power Generation, Transmission, and Distribution; Electrical Protective Equipment; Corrections Pages 56955 - 56962 [FR DOC # 2014-22148] Electrical Safety-Related Work Practices; Electric Power Generation, Transmission, and Distribution; Electrical Protective Equipment; Corrections 60033 - 60040 [FR DOC # 2015-25062] Hazard Communication Standard; Approval of Information Collection Requirements 62433 - 62433 [FR DOC # 2012-24595] Updating OSHA Standards Based on National Consensus Standards; Signage 66642 - 66643 [FR DOC # 2013-26336]	
MCAPCD Rule 330	2001 AROD	Regulates Air Emissions in Maricopa County	Establishes limits for the emissions of volatile organic compounds (VOCs) into the atmosphere that may result from the use of organic solvents or processes that emit VOCs.	(MCAPCD) Rule 330 – September 25, 2013 Notice of Final Rulemaking Section 200 Revised the introductory statement to clarify the applicability of definitions specific to each rule. Section 203 Deleted the definition of non-precursor organic compound. Section 206 Deleted the definition of volatile organic compound (VOC)	None, Sets forth the legal authority for the Air Pollution Rules and Regulations and includes definitions of terms used in all Maricopa County Air Pollution Control Rules.
40 CFR Part 122 & 125	2001 AROD	Regulates discharges to surface waters	Establishes treatment and monitoring requirements for discharges to surface water. The substantive requirements of the NPDES program are applicable when treated groundwater is discharged to surface water (Arizona Canal System)	40 CFR Part 122 - October 31, 2012 through October 22, 2015 40 CFR Part 125 - August 15, 2014	None Administrative changes regarding such things as definitions, permitting, and electronic reporting.

* February 25, 2003 memorandum
NA - Not Applicable

CFR – Code of Federal Regulations
ADEQ – Arizona Department of Environmental Quality

RCRA - Resource Conservation & Recovery Act
NSPS – New Source Performance Standards
USC – United States Code
MCLs - Maximum Contaminant Levels
SRL – Soil Remediation Level
ARS - Arizona Revised Statutes

AAC - Arizona Administrative Code
ARS – Arizona Revised Statutes
CERCLA – Comprehensive Environmental Response Compensation and Liability Act
Maricopa County Air Pollution Control District (MCAPCD) - County including the two cities (Scottsdale and Tempe) the IBW sites are located
https://www.maricopa.gov/aq/divisions/planning_analysis/AdoptedRules.aspx

Table C-3. SIBW Original ARARs

South Indian Bend Wash					
ORIGINAL APPLICABLE OR RELEVANT & APPROPRIATE REQUIREMENTS EVALUATION					
Original ARAR	Document	Original ARAR requirement	Description	Amendment Date between September 2011 – present	Effect on Protectiveness
CHEMICAL-SPECIFIC ARARs					
Clean Water Act (CWA) 33 USC 1311-1387	2004 AROD, 1998 ROD	Establishes Water Quality Criteria for surface waters	The CWA Water Quality Criteria are designed to protect aquatic life (Marine and freshwater). These standards are expressed on the basis of acute and chronic toxicity levels. The selected remedy complies with these criteria. Any treated groundwater discharged to a surface water body must meet the CWA Quality Criteria.	33 USC 1321 – December 2014 33 USC 1342 – February 2014 33 USC 1362 – June 2014 33 USC 1377 – June 2014 33 USC 1381 – June 2014	None, Changes are administrative such as changes about oil and hazardous substance liability, certification, bridges, coast guard, Indian Tribes, and grants to States for establishing revolving funds.
Clean Water Act 40 CFR 402, 405-471; 40 CFR 125;	2004 AROD 1998 ROD	Establishes the National Pollutant Elimination Discharge System (NPDES) Permit Program	The NPDES permit program regulates discharges into "waters of the United States" by establishing numeric limits and monitoring requirements for such discharge. The discharge of treated water to Arizona Canal System must meet the substantive requirements of the NPDES permit.	40 CFR 125.84 – August 2014 40 CFR 125.86-.99 – August 2014 40 CFR 430.01 – May 2012 40 CFR 435.11-.15 – May 2012 App 2 to Subpart A of Part 435 – May 2012 App 4 to Subpart A of Part 435 – May 2012 App 5 to Subpart A – May 2012 App 8 to Subpart A of Part 435 – May 2012 40 CFR 435.41-.45 – May 2012 40 CFR 449 – May 2012 40 CFR 450.11 – March 2014 40 CFR 450.21 – March 2014 40 CFR 450.22 – May 2015	None Changes are administrative or not applicable dealing with such things as cooling water intake, test procedure changes for sampling and analyses, new source performance standards, and effluent limitations standards for construction and development of point source category.
LOCATION-SPECIFIC ARARs					
Maricopa County Air Pollution Control District Rule 330, § 301	2004 AROD	Regulates Air Emissions in Maricopa County	No person shall discharge more than 15 pounds (6.8 kg) of volatile organic compounds into the atmosphere in any one day from any machine, equipment, device, or other article in which any volatile organic compound or any material containing a volatile organic compound comes into contact with flame or is evaporated at temperatures exceeding 200°F (93.3°C), in the presence of oxygen, unless the entire amount of such discharge has been reduced in accordance with Section 304 of this rule.	MCAPCD Rule 330, § 301 – September 2013	None, Sets forth the legal authority for the Air Pollution Rules and Regulations and includes definitions of terms used in all Maricopa County Air Pollution Control Rules. Discharges between 3lbs/day and 15lbs/day are not subject to this reduction requirement.*

* February 25, 2003 memorandum
NA - Not Applicable

CFR – Code of Federal Regulations
ADEQ – Arizona Department of Environmental Quality
RCRA - Resource Conservation & Recovery Act
NSPS – New Source Performance Standards
USC – United States Code
MCLs - Maximum Contaminant Levels
SRL – Soil Remediation Level
ARS - Arizona Revised Statutes
AAC - Arizona Administrative Code
ARS – Arizona Revised Statutes
CERCLA – Comprehensive Environmental Response Compensation and Liability Act
Maricopa County Air Pollution Control District (MCAPCD) - County including the two cities (Scottsdale and Tempe) the IBW sites are located
https://www.maricopa.gov/aq/divisions/planning_analysis/AdoptedRules.aspx

Appendix D: Human Health and the Environment Risk Assessment

Appendix D: Risk Assessment Review

This risk assessment review was conducted in support of the second Five Year Review (FYR) for the Indian Bend Wash (IBW) Superfund Site (Site) located in the cities Scottsdale and Tempe, Maricopa County, Arizona. The intent of this review is to determine if revised toxicity assessments for any site-related contaminants (notably TCE), revisions in risk assessment methodology and/or identification of any new exposure pathways change the protectiveness conclusions for the site remedy or remediation goals specified in the IBW Records of Decision (RODs) and related decision documents.

Three health risk questions are addressed:

1. Do emissions from the treatment facilities create ambient air impacts of potential health concern?
2. Is vapor intrusion an exposure pathway of potential health concern at the site?
3. Are the IBW groundwater remediation goals still protective?

These questions are addressed primarily with regard to reviewing previous health risk determinations in light of the 2011 TCE toxicity reassessment, which revised the toxicity criteria EPA uses for TCE risk assessment. An observation is also made on the potential impact of revised exposure assessment assumptions.

Risk Documents Reviewed: As part of the Five Year Review, previous Risk Assessments, Health Assessments, Health Consultations and ecological risk assessments were reviewed for both the North Indian Bend Wash (NIBW) and South Indian Bend Wash (SIBW) areas of the Site. Reports of the following risk assessments and health consultations were reviewed:

- *Health Consultation, NIBW Area 12 Treatment Facility*, March 2005. This Health Consultation evaluates the effectiveness of the treatment plant on decreasing contaminant concentrations in treated groundwater and evaluates impacts of treatment facility emissions to ambient air on-site and in the local community.
- *Draft Preliminary Risk Assessment, Area 12 Groundwater Extraction and Treatment System (GWETS), NIBW*, January 2005. This risk assessment evaluates impacts of treatment facility emissions to ambient air on-site and in the local community.
- *Health Consultation, NIBW, Area 7, Groundwater Extraction and Treatment Facility*, March 2007. This Health Consultation evaluates the effectiveness of the treatment plant on decreasing contaminant concentrations in treated groundwater and evaluates impacts of treatment facility emissions to ambient air on-site and in the local community.
- *Health Consultation, NIBW Central Groundwater Treatment Facility*, September 2006. This Health Consultation evaluates the effectiveness of the plant on decreasing contaminant concentrations in treated groundwater and evaluates impacts of treatment facility emissions to ambient air on-site and in the local community.
- *Health Consultation, NIBW Miller Road Treatment Facility*, March 2006. This assessment evaluates impacts of treatment facility emissions to ambient air on-site and in the local community.
- *Draft Preliminary Risk Assessment, Miller Road Treatment Facility (MRTF) NIBW*, September 2004. This risk assessment evaluates impacts of treatment facility emissions to ambient air on-site and in the local community.

- A vapor intrusion risk screening evaluation included in *Appendix G, Technical Memorandum, Indian Bend Wash Superfund Site Five Year Review–Risk Assessment and Toxicology Analysis* in the 2011 Five Year Review.
- *Ecological Risk Assessment Evaluation, IBW FYR*, 14 September 2010 email from Lawrence Philips (Gilbane) to Rachel Loftin (EPA).

The first 6 documents address the question of whether treatment facility emissions create ambient air impacts of potential health concern. The question of health impacts from vapor intrusion is addressed in the 2011 Five Year Review vapor intrusion screening evaluation. The protectiveness of remediation goals is addressed below with respect to revised TCE risk-based screening levels based on the 2011 TCE toxicity reassessment.

Human Health Risk Assessments

1.1 Trichloroethylene (TCE) Toxicity Reassessment

In September 2011, EPA finalized an updated toxicity assessment for TCE, a primary contaminant at the IBW site. This toxicity assessment upgraded TCE's carcinogen classification from "Probable Human Carcinogen" to "Carcinogenic to Humans", increased the cancer potency values used to estimate cancer risk by approximately 3-fold and identified non-cancer hazards of potential concern. Most notably, the toxicity assessment identified TCE's potential to cause fetal cardiac malformations arising from short-term in utero exposures occurring as a result of TCE inhalation by pregnant women. This Integrated Risk Information System (IRIS) reassessment set a reference concentration (RfC) of 2 $\mu g/m^3$ to be protective for the non-cancer hazards, including fetal cardiac malformations.

Based on the 2011 IRIS reassessment, EPA Region 9 issued a memorandum in 2014: Region 9 *Interim Action Levels and Response Recommendations to Address Potential Developmental Hazards Arising from Inhalation Exposures to TCE in Indoor Air from Subsurface Vapor Intrusion*. The Region 9 memo presents recommended action levels for "accelerated" and "urgent" responses to protect against non-cancer hazards arising from short-term inhalation exposures to TCE for women of reproductive age. Accelerated responses are recommended for inhalation exposures exceeding 2 $\mu g/m^3$ (equivalent to the reference concentration [RfC] from the IRIS reassessment) in a residential setting and 8 $\mu g/m^3$ in a commercial/industrial setting; Urgent response action levels are 6 $\mu g/m^3$ (residential) and 24 $\mu g/m^3$ (commercial/industrial). Also in 2014, EPA's Office of Superfund Remediation and Technology Innovation (OSRTI) issued a memorandum to the EPA Regional Superfund offices: *Compilation of Information Relating to Early/Interim Actions at Superfund Sites and the TCE IRIS Assessment*.

The 2011 revised TCE toxicity assessment has the potential to affect the protectiveness conclusions related to assessment of ambient air impacts of treatment facility emissions, evaluation of vapor intrusion and groundwater remediation goals established for the site.

1.2 Ambient Air Impacts of Treatment Facility Emissions

The potential impacts of NIBW groundwater treatment facility emissions on ambient air are discussed below for each treatment plant independently. This discussion is based on monitoring data and modeling predictions available mainly from the risk assessment and Health Consultation documents noted above.

Area 12 Groundwater Extraction & Treatment System (GWETS): The 2005 Area 12 Treatment Facility Health Consultation, prepared by the Agency for Toxic Substances and Disease Registry (ATSDR), evaluated potential ambient air impacts by modeling contaminant concentrations in local ambient air from measured concentrations in stack emissions (1,007 $\mu g/m^3$ TCE). This modeling predicted an annual average TCE air concentration of 8.6 $\mu g/m^3$ for a location 100 meters from the facility. The Health Consultation concluded this did not represent a potential health hazard by comparison to an ATSDR Minimal Risk Level (MRL) of 540 $\mu g/m^3$. Using risk-based screening levels developed from the 2011 updated TCE toxicity assessment, this air concentration predicts an estimated excess lifetime cancer risk (ELCR) of $1.8x10^{-5}$. More significantly, this modeled TCE concentration is above the Region 9 screening level for urgent response (6 $\mu g/m^3$) to TCE inhalation exposures for women of reproductive age. Furthermore, it is not clear if 100 meters was chosen as a potential maximum impact location or if it was located appropriately given the prevailing wind direction in the Phoenix area. Thus this predicted TCE ambient air concentration may not represent the maximum short-term TCE exposure concentration at nearby residences. Alternatively, because this is a value predicted by a simple, very conservative air model, actual TCE exposure concentrations in the community may be lower.

Another document, the Draft Preliminary Risk Assessment, Area 12 Groundwater Extraction and Treatment System (GWETS), NIBW, January 2005, also models ambient air TCE concentrations local to the Area 12 treatment plant. This assessment first uses modeling to predict TCE concentrations for contaminated groundwater being treated at the GWETS plant; this modeling predicts a maximum influent concentration and an average concentration over the ensuring 30 years. These predicted TCE groundwater concentrations are then used to model potential stack emissions from the treatment facility (1,482 $\mu g/m^3$ TCE, calculated based on an emission rate of 0.03 lbs/hour and a flow rate of 5,400 cfm noted in the risk assessment). The predicted stack emissions are then used to model ambient air TCE concentrations at various exposure points in the local area using a more sophisticated air dispersion model (ISC3, which was an EPA preferred/recommended model at the time) than did the Health Consultation. The ISC3 model predicted a maximum short-term TCE exposure concentration for nearby residences of 1.0 $\mu g/m^3$. Using then current toxicity values, potential excess lifetime cancer risks (ELCRs) and non-cancer hazard quotients (HQs) are then calculated from the predicted ambient air TCE concentrations. This assessment concludes that potential cancer risks and non-cancer hazards are below protective ranges established for Superfund sites; this conclusion would not change using current TCE toxicity criteria for the exposure scenario addressed in the risk assessment. The modeling in this assessment predicted significantly lower ambient air TCE annual concentrations (annual average 0.01 $\mu g/m^3$) than did the previous Health Consultation for the same treatment facility (annual average 8.6 $\mu g/m^3$).

However, more recent data indicate higher TCE emissions concentrations than were assumed in the Health Consultation and draft risk assessment; these newer data for TCE emissions raise questions about these risk conclusions. Applying the analyses used in both documents to more recent (2015) stack emissions data

suggests that nearby residences may be experiencing TCE concentrations in ambient air which are greater than the Region 9 accelerated response action level for short-term TCE exposure. Using only the simple air model results from the Health Consultation suggests they may be significantly greater than the Region 9 urgent response action level. As noted, the 2005 analyses were based on TCE stack emission concentrations ranging 1,000 to 1,500 µg/m^3; the Health Consultation used data from monitoring (1,007 µg/m^3) and the risk assessment used a modeled TCE concentration of 1,482 µg/m^3. Data from 2015 emissions testing indicates TCE concentrations significantly higher, ranging up to 4,700 µg/m^3 in a sample from December 2015. It is expected that ambient TCE exposure concentrations will scale directly with stack emission concentrations. Multiplying the predicted exposure concentrations from these 2 analyses by the ratio of the recent measured stack TCE concentration (4,700 µg/m^3) to the measured (1,007 µg/m^3) and predicted (1,482 µg/m^3) concentrations in the two analyses yields predicted residential exposure concentrations of 40 µg/m^3 (2005 Health Consultation) and 3.2 µg/m^3 (2005 draft Risk Assessment). The former is above the Region 9 urgent response action level and the latter above the accelerated response action level for residential exposures.

Area 7 Groundwater Extraction & Treatment System (GWETS): The potential for health concerns due to emissions from the Area 7 GWETS was addressed in a 2007 Health Consultation prepared by the Arizona Department of Health Services (ADHS) for ATSDR. This Health Consultation was based on VOC concentrations monitored in ambient air, both on-site and off-site, and concluded exposures were not of concern regarding either cancer risks or non-cancer hazards. This conclusion was based on toxicity criteria in effect at the time. However using current TCE toxicity criteria, the TCE concentration monitored on-site (10.3 µg/m^3) is above the Region 9 short-term action level for accelerated response (8 µg/m^3) in a commercial/industrial setting.

The potential for residential exposure from the Area 7 GWETS was assessed by ambient air monitoring at a nearby location to the south-south-east (the intersection of East Thomas Road and North Miller Road, roughly ¾ of a mile from the facility); the measured TCE concentration was 0.18 µg/m^3, which is not of potential health concern based on current risk screening levels. However, it is questionable whether this represents the location of potential maximal impact from the Area 7 GWETS emissions; no modeling of emissions is presented in the Health Consultation to identify the maximal impact location. A wind rose is presented in the 2006 Health Consultation for the CGTF (see below), which appears to have used the same off-site monitoring date and location. That wind rose indicates that the wind was blowing primarily from the south-south-east /south-east to the north-north-west/north-west during sampling. Thus it would be expected that the maximal impact location during the 2006 sampling would have been north-north-west / north-west of the Area 7 GWETS, not to the south-south-east (i.e., this off-site monitoring location appears to have been generally upwind of the facility during sampling).

The 2007 Health Consultation does not discuss TCE emissions concentrations from the Area 7 GWETS at the time. Recent data indicate that TCE stack emissions have ranged as high as 600 µg/m^3 during 2014.

Central Groundwater Treatment Facility (CGTF): The potential for health concerns due to emissions from the Central Groundwater Treatment Facility (CGTF) was addressed in the 2006 Health Consultation prepared by the ADHS for ATSDR. The conclusions of the Health Consultation were based on VOC concentrations monitored in ambient air, both on-site and at a nearby road intersection (this appears to be the same monitoring location and date as for the Area 7 GWETS and MRTF off-site ambient air sampling). TCE concentrations

monitored both on-site and at the intersection are below current TCE screening levels, indicating exposures at the time were not of potential health concern. However, as with the Area 7 GWETS assessment, it is questionable whether the off-site location represents the location of potential maximal impact from the CGTF emissions. This off-site location is approximately 1.3 miles from the CGTF and due west of the facility, whereas a wind rose presented in the report indicates that the wind was blowing primarily from the south-south-east/south-east to the north-north-west/north-west during sampling. The prevailing wind direction in the Phoenix area is east to west and there are residential developments due west of the CGTF; the maximal impact location for CGTF emissions may be within one of those developments.

The 2006 Health Consultation does not discuss TCE emissions concentrations from the CGTF at the time. No recent emissions data from CGTF were reviewed during this Five Year Review.

Miller Road Treatment Facility (MRTF): The potential for health concerns due to TCE emissions from the Miller Road Treatment Facility (MRTF) was addressed in a 2006 Health Consultation prepared by the ADHS for ATSDR. The conclusions of the Health Consultation were based on VOC concentrations monitored in treatment plant emissions and in ambient air, both on-site and off-site (again this appears to be the same monitoring location and date as for the Area 7 GWETS and CGTF off-site ambient air sampling). TCE concentrations monitored both on-site and at the intersection are below current TCE screening levels, indicating exposures at the time were not of potential health concern. However, as with the Area 7 GWETS and CGTF assessments, it is questionable whether the off-site location represents the location of potential maximal impact from the MRTF emissions. This off-site location is approximately 2.7 miles due south from the MRTF, whereas again a wind rose presented for this sampling indicates that the wind was blowing primarily from the south-south-east/south-east to the north-north-west/north-west during sampling (i.e., this off-site location appears to have been generally upwind of the facility during sampling).

TCE emissions from the MRTF have increased substantially from those monitored to support the 2006 Health Consultation. Emissions concentrations of TCE used in the 2006 Health Consultation ranged 0.43 to 0.86 $\mu g/m^3$. Recently reviewed MRTF emissions data from 2012 indicate TCE stack emission concentrations have increased up to 5,600-fold above those reported in the 2006 Health Consultation (2,000 to 2,400 µg/m3). It is therefore possible that both on-site and off-site TCE exposure concentrations are significantly higher than were assessed in the 2006 Health Consultation.

Another assessment, the Draft Preliminary Risk Assessment, Miller Road Treatment Facility, NIBW, September 2004, models ambient air TCE concentrations for off-site exposures due to MRTF emissions; no assessment of potential on-site exposures is included. As with the draft risk assessment for the Area 12 GWETS, this assessment first uses modeling to predict TCE concentrations 30 years into the future for groundwater being treated at the MRTF. This modeling predicts a maximum annual average influent TCE concentration over the 30 year assessment period. Subsequent monitoring at the facility indicated the model under-predicted actual influent TCE concentrations so before further use the model results are adjusted upwards by the ratio of the discrepancy. These adjusted TCE groundwater concentration predictions are then used to model potential TCE emissions from the treatment facility under 3 scenarios (untreated (no GAC) emissions at 2.7 feet above ground surface (ags); untreated (no GAC) emissions at 48 ft ags and emissions treated (GAC) at 2.7 ft. ags). Predicted TCE emission concentrations range 671 to 1,961 $\mu g/m^3$ (calculated

based on an emission rates and flow rates noted in the risk assessment). The predicted stack emissions are then used to model ambient air TCE concentrations at various exposure points in the local community using the ISC3 air dispersion model. The ISC3 model predicted a maximum short-term TCE exposure concentration for nearby residences of 10.6 µg/m^3. This prediction is based on a TCE emission concentration of 1,961 µg/m^3; emissions testing in 2012 recorded TCE concentrations ranging 2,000 to 2,400 µg/m^3. This predicted off-site TCE concentration is above the Region 9 urgent response action level of 6 µg/m3 for residential exposures.

On-site exposures are not addressed in the 2004 risk assessment. A photograph in the 2010 Five Year Review raises concern about potential on-site exposures given the 2012 monitoring data on TCE concentrations in emissions. Photograph 21 on page 11 of the MRTF section of Appendix D ("Site Inspection Photographs") of the 2010 Five Year Review shows personnel standing approximately 10 to 15 feet away from and slightly above the MRTF ground level emissions vent. This does not appear to be a work station where someone would be continuously exposed, however the photo does raise questions about on-site exposures given the TCE emission concentration of to 2,400 µg/m^3 and the accelerated to urgent action levels of 3 to 8 µg/m^3 for commercial/industrial exposures.

Summary: Treatment facility emissions at NIBW were previously assessed in a number of analyses; it was concluded at the time that emissions do not pose ambient air exposures of potential health concern for either on-site workers or off-site residents. Incorporating new information on the toxicity of TCE and recent TCE emissions concentrations into those analyses indicates that conclusion needs to be re-visited. In light of this information and uncertainties about the appropriateness of the previous off-site monitoring location, this Five Year Review recommends re-evaluating the potential impacts of stack emissions from the NIBW treatment facilities on ambient air TCE exposures on-site and in the local community.

1.3 Revised Exposure Assumptions

In February of 2014, EPA released *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors*, OSWER Directive 9200.1-120. This risk assessment guidance provided updated recommendations for several common exposure factors used to set risk-based screening levels (RSLs) and calculate human health risks. A few exposure factor assumptions used in the previous risk assessments differ from the 2014 EPA recommended ones. However, incorporating these revised exposure assumptions into the original NIBW risk assessments would not change risk estimates substantially enough to require altering the clean-up goals at this Site. Therefore the protectiveness of existing clean-up goals is not affected by these changes.

1.4 Vapor Intrusion

Since the last Five Year Review, EPA has published updated guidance to evaluate the potential for adverse health effects from indoor air exposures due to vapor intrusion. The guidance focuses on sites, such as IBW, at which volatile compounds contaminate groundwater, especially when contaminated groundwater is within 100 feet of a current or potential future building. EPA's understanding of contaminant migration from soil gas and/or groundwater into buildings has evolved over the past few years, leading to the conclusion that vapor

intrusion may have a greater potential for posing risks to human health than was assumed when the IBW RODs were prepared. EPA evaluates the potential for VI using a "multiple lines of evidence" approach consistent with its 2015 vapor intrusion guide, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*, OSWER Publication 9200.2-154.

Assessment of Vapor Intrusion from Groundwater: Since vapor intrusion had not been evaluated previously, the 2011 Five Year Review included a vapor intrusion screening evaluation for VOC contamination in portions of the upper (UAU) and middle (MAU) alluvial units at NIBW, and at areas within SIBW where depth to groundwater is less than 100 feet. The results, using the Johnson & Ettinger model, indicated vapor intrusion was not an exposure pathway of concern. As part of the current Five Year Review, the 2011 screening evaluation was revisited using the updated toxicity criteria from the TCE toxicity reassessment and more recent data on TCE concentrations in the UAU at both NIBW and SIBW.

NIBW: For NIBW, the Johnson & Ettinger (J&E) screening model was applied to the three most highly contaminated monitoring wells: PG-31UA (TCE: 8.1 µg/L; depth to groundwater: 108 feet), PG-22UA (TCE: 6.2 µg/L; depth to groundwater: 85 feet) and E12-UA (TCE: 5.2 µg/L; depth to groundwater: 75 feet); data from the 2015 annual monitoring report (*Site Monitoring Report, North Indian Bend Wash Superfund Site*, February 29, 2016). Using default assumptions in EPA's screening version of the J&E model (www3.epa.gov/ceampubl/learn2model/part-two/onsite/JnE_lite_forward.html), predicted High indoor air TCE concentrations via vapor intrusion were 0.62 µg/m^3, 0.58 µg/m^3 and 0.53 µg/m^3 respectively. By comparison to the residential cancer risk RSL for TCE inhalation exposures (0.48 µg/m^3, which incorporates the updated toxicity criteria from the 2011 TCE reassessment), potential cancer risks range $1.1x10^{-6}$ to $1.3x10^{-6}$, which are at the extreme lower end of the Superfund acceptable risk range. Comparison to the RfC protective for non-cancer hazards (2 µg/m^3, also from the 2011 reassessment) yields non-cancer Hazard Quotients ranging 0.27 to 0.31, again indicating protectiveness.

SIBW: Since groundwater TCE concentrations throughout SIBW are below the 5 µg /L MCL, this TCE concentration was used to screen the potential for vapor intrusion at the shallowest monitoring well where depth to groundwater is 60 feet (Appendix G, 2011 Five Year Review). EPA's J&E screening model predicts a High indoor air TCE concentration of 0.61, which for a residential exposure yields a potential cancer risk of $1.3x10^{-6}$ and potential HQ of 0.31, again indicating protectiveness.

IBW: In summary, based on an updated screening assessment, present conditions at the IBW site remain protective with regard to vapor intrusion arising from groundwater contamination.

Assessment of Vapor Intrusion from Soil Gas: TCE contamination present as vapor in soil gas can also create the potential for vapor intrusion to indoor air. For the IBW site, the potential for vapor intrusion from soil gas was screened using Soil Gas Human Health Screening Levels (SGHHSLs) adopted for potential vapor intrusion at Arizona Superfund sites (*Framework for Investigating Vapor Intrusion at Residential and Commercial/Industrial Buildings, Motorola 52nd Street Superfund Site*, U.S. EPA, Region 9, August 2014). Fewer data on TCE concentrations in soil gas were available to screen for this potential in the current Five Year Review

NIBW: Recent monitoring results at the Area 7 GWETS indicates soil gas TCE concentrations on-site (106 to $3.4x10^6$ µg/m^3) are significantly above the TCE SGHHSLs indicating potential cancer risks (2,500 µg/m^3) and non-cancer hazards (6,700 µg/m^3) from vapor intrusion in a commercial/industrial setting. It is likely this represents vadose zone contamination since this is one of the source areas in NIBW. No off-site data were available for this review, but it is noted there are homes and apartment complexes nearby and residential SGHHSLs are lower than those for commercial/industrial exposures.

No other soil gas monitoring data were available for the current Five Year Review. Therefore, an evaluation of the potential for vapor intrusion at the Area 7 GWETS, and other NIBW source areas, is also recommended by this current Five Year Review.

SIBW: The 1991 ROD employed a "plug-in" approach, using VLEACH, for identifying SIBW sub-sites where soil gas VOC concentrations were sufficiently high as to pose a risk of contributing to groundwater contamination. This approach identified only a single sub-site, DCE Circuits, requiring soil vapor extraction (SVE) treatment to protect groundwater. Indoor air monitoring at the commercial facilities on the DCE Circuits property was instituted to evaluate potential vapor intrusion, which was not identified to be a concern. Review of this sub-site for the current Five Year Review concludes that additional evaluation should be performed to assess the potential for vapor intrusion at an adjacent residential apartment complex. In the most recent data reviewed (2010-2012), the TCE concentration in a soil vapor monitoring well (1,070-4,410 µg/m^3) approximately 120 feet from the apartment complex is above the TCE residential SGHHSL (210 µg/m^3).

Given that the 1991 ROD "plug-in" approach only assessed the potential for soil gas VOCs to contribute to groundwater contamination (not to vapor intrusion), the remaining SIBW sub-sites that were screened out of further consideration at the time should also be revisited with regard to the potential for vapor intrusion.

Summary: Since the previous Five Year Review was completed in 2011 there have been significant updates to the toxicity criteria for TCE and to the Agency's vapor intrusion assessment guidance. Consideration of these changes to risk assessment, along with a review of previous vapor intrusion screening results at locations within the IBW site, leads to the conclusion that the potential for vapor intrusion from soil gas contamination at source areas within both NIBW and SIBW should be re-evaluated.

1.5 Toxicity Values and Remediation Goals

Remediation goals for contaminated groundwater at a Superfund site, such as IBW, are typically set to Maximum Contaminant Levels (MCLs) established by EPA's Office of Drinking Water in accordance with the Safe Drinking Water Act. In the event no MCL has been established for a site-related contaminant, a risk based cleanup goal is typically set using toxicity and exposure information, usually from the baseline risk assessment for that Superfund site. If the Agency determines that extraordinary risk would remain if remedial action attained only the MCL concentration, EPA also has the option to set a risk based cleanup goal for a contaminant at a concentration below its MCL.

Regional Screening Levels (RSLs) are media-specific risk-based screening levels developed using toxicity values reflecting a contaminant's potential to cause or promote cancer and non-cancer health effects, along with default exposure assumptions for specific scenarios (e.g., residential, commercial/industrial). RSLs are used to evaluate potential risks identified by monitoring data and to provide a context for setting risk-based remedial goals (cleanup goals) where needed. As noted, when newer scientific information becomes available, EPA's IRIS program periodically reviews and updates toxicity information used by the Agency in earlier risk assessments; such revised toxicity information can affect protectiveness conclusions regarding cleanup goals. In the past five years, there have been a number of changes to the toxicity values for many COCs at the Site; these changes are reflected in current RSLs.

To evaluate the protectiveness of the existing IBW remediation goals for this FYR, those goals were compared to the contaminant-specific MCLs set under the Safe Drinking Water Act and to EPA's current RSLs; this comparison is presented in Table E-1. MCLs are enforceable drinking water standards and are ARARs which must be achieved, at a minimum, by a Superfund site remediation. The RSLs are contaminant-specific risk-based screening levels. For contaminants with the ability to cause or increase the risk of developing cancer, RSLs are set at the lowest end (10^{-6} excess lifetime cancer risk [ELCR] concentration) of the protective exposure range for cancer risks; this range corresponds to EPA's acceptable ELCR range of 10^{-6} (1-in-one-million) to 10^{-4} (100-in-one-million). For non-cancer health effects, RSLs are set to an exposure concentration that corresponds to a Hazard Quotient equal to 1.0, which EPA deems protective for lifetime daily exposures for even sensitive sub-populations., RSLs are useful risk screening tools; EPA considers exposure to contaminant concentrations equal to or less than RSLs to be sufficiently protective at Superfund sites. The protectiveness of exposure to concentrations greater than RSLs are assessed on a case-by-case basis, taking into account the magnitude of the RSL exceedance.

Two former groundwater clean-up goals listed in the SIBW 1998 ROD (for bromodichloromethane and chloroform) are roughly an order of magnitude greater than the tap water RSLs based on an ELCR of $1X10^{-6}$ and 20 µg/L greater than the MCLs. In December of 2001, the EPA MCLs and MCL goals (MCLGs) for chloroform and bromodichloromethane changed and the federal MCLs for the individual compounds were eliminated in favor of a combined total trihalomethanes (TTHM) MCL. Specifically, the federal MCLs for bromoform, chloroform, and dichlorobromomethane were removed and are now regulated as TTHM. Further, as current concentrations are below both the current and former standards, bromodichloromethane and chloroform are no longer monitored and no further evaluation is necessary.

All other remediation goals listed in the SIBW 1998 and 2004 RODs and all the 2001 NIBW ROD remediation goals are within the current ELCR-based RSL range or below the HQ-based RSL.
TCE: As noted above, the IRIS program issued an updated toxicity assessment of TCE in 2011. This updated assessment set an oral reference dose (RfD) for at 5E-4 mg/kg-d; the corresponding RSL for TCE in tapwater for a residential scenario is 2.8 ug/L and the TCE MCL is 5.0 ug/L. Thus the MCL represents an exposure equivalent to a non-cancer HQ = 1.8, marginally above the default remedial goal HQ =1. The Agency considers remedial actions attaining the MCL to continue to be protective.

During this review period, as discussed in the Data Review Appendix B, NIBW groundwater quality data demonstrated stable to declining TCE concentrations trends. The TCE MCL cleanup goal of 5.0 µg/L was exceeded in 4 UAU monitoring wells, 21 MAU monitoring wells and 14 LAU monitoring wells. The highest TCE detection in the UAU wells was 8.1 µg/L. The highest TCE detection in the MAU wells for the period was 3,400 µg/L and the highest TCE concentration in the LAU wells was 200 µg/L.

During this review period, SIBW groundwater quality data demonstrated stable to declining cis-1,2-DCE, TCE and PCE concentrations trends and remediation goals were met for each of these VOCs.

2.0 Ecological Risk Review

The 1991 NIBW ROD notes VOCs were detected in the tissue of fish taken from the IBW ponds and fishing is currently restricted. This ROD also states "No endangered species or habitat have been identified at NIBW. Contamination at the site does not appear to threaten wetlands." The condition of the IBW ponds was assessed in 1984 and again in 1988 through water and fish sampling. EPA also collected sediment samples. Based on the 1988 data, the use of uncontaminated GW to fill the ponds apparently had flushed VOCs from the ponds. Fish and waterfowl do not appear at further risk with the continued use of uncontaminated water to fill the ponds.

Both the 1998 and 2004 SIBW ROD state “Because no current or future pathways of exposure to VOC-contaminated groundwater exist for ecological receptors at SIBW, an ecological risk assessment was not performed."

As was the case regarding ecological risk for the 2011 FYR, conditions have not changed in such a way as would call into question whether there is potential for any difference in ecological risk. Based on the information presented, even though no ecological risk assessment was done for either NIBW or SIBW, there is no need for additional ecological risk assessment at this time.

3.0 Summary of Risk Review

This risk assessment review of the IBW site addressed pathways of exposure to VOC contamination in groundwater and soil gas at the site. The review focused on TCE because it is the primary contaminant at the site and subsequent to the previous Five Year Review there was a significant revision of the TCE toxicity assessment. As a result of that revision, the toxicity criteria for TCE, and its risk-based screening levels, have changed substantially.

Treatment Plant Emissions: Previous assessments of on-site worker and off-site residential exposures to TCE in ambient air from treatment plant emissions were based on screening levels developed using the former TCE toxicity criteria. Those screening levels have been lowered substantially based on the 2011 revised toxicity criteria. In addition this review notes some potentially significant uncertainties in previous monitoring of

treatment plant emissions. Therefore, a recommendation is made to re-evaluate the potential for treatment plant emissions to impact air quality on-site and off-site, taking these two factors into consideration.

Vapor Intrusion: Taking into account the revised toxicity criteria for TCE, this review confirmed the conclusion of the previous Five Year Review that the potential for vapor intrusion arising from groundwater contamination is not an issue of concern at either NIBW or SIBW. However, the potential for vapor intrusion arising from vadose zone contamination at source areas in both NIBW and SIBW has not been thoroughly assessed previously. Therefore, a recommendation is made to review soil gas contamination at the source areas in both NIBW and SIBW to evaluate the potential for vapor intrusion taking into account newer screening levels based on the revised TCE toxicity criteria.

Ecological Risks: Since the area is becoming progressively more industrial and there is also no ecological risk, the recommendation that "there is no need for additional ecological risk assessment" continues to be appropriate (as documented in the summary of the ecological risk evaluations presented in the RODs that was provided in the 2010 email from Gilbane to EPA).

Table E-1. North and South Indian Bend Wash Risk-based Screening Levels and Cleanup Goal Comparison for Groundwater

Contaminant of Concern	RSL for cancer risk in excess of 1x10-6 (µg/L)[e]	Protective Cancer Risk Range $1x10^{-4}$ to $1x10^{-6}$ (µg/L)[e]	Tap Water RSL[e] non-cancer hazard (µg/L)	Federal Maximum Contaminant Level (µg/L)	South Indian Bend Aquifer Cleanup Standard [(1)] (µg/L)		Is the Cleanup Standard still protective?	North Indian Bend Treated Water Cleanup Standard [(2)] (µg/L)	Is the Cleanup Standard still protective?
—					1998 ROD	2004		2001 ROD	
Benzene	0.46	0.46 - 46	—	5.0	5[a]	—	Yes	—	—
Bromodichloromethane	0.13	0.13 - 13	—	80	100[a,b]	—	No	—	—
Chloromethane	—	—	190	—	2.7[d]	—	Yes	—	—
Chloroform	0.22	0.22 - 22	—	80	100[a,b]	—	No	6[c]	Yes
1,2-Dibromoethane	0.0075	0.0075 - 0.75	—	0.05	0.05[a]	—	Yes	—	—
1,2-Dichloroethene[f]	36	—	36	70/100	5[a,c]	—	Yes	—	—
1,1-Dichloroethene	—	—	280	7.0	7[a,d]	—	Yes	6	Yes
1,2-Dichloropropane	0.44	0.44 - 44	—	5.0	5[a]	—	Yes	—	—
Methylene Chloride	11	11 – 1,100	—	5.0	5[a]	—	Yes	—	—
1,1,2,2-Tetrachloroethane	0.076	0.076 – 7.6	—	—	0.18[c]	—	Yes	—	—
Tetrachloroethene (PCE)	11	11 – 1,100	—	5.0	5[a]	5	Yes	5	Yes
Trichloroethene (TCE)	0.49	0.49-49	—	5.0	5[a]	5	Yes	5	Yes
1,1,1-Trichloroethane	—	—	8,000	200	—	—	—	200	Yes

Current South Indian Bend Contaminant of Concern with Clean-up Standard shown in brown

Current North Indian Bend Contaminant of Concern with Clean-up Standard shown in green

Clean-up standard is no longer protective due to change in health based criteria shown in red; does not affect remedy protectiveness as current concentrations are below both the current and former standard.

Notes

(1) 1998 South Indian Bend Record of Decision (ROD) and 2004 ROD Amendment

(2) 2001 North Indian Bend ROD, MCL/Treatment level

— Not applicable

a. Maximum Contaminant Level (MCL)

b. For total trihalomethanes which include the compounds bromodichloromethane and chloroform

c. Arizona Human Health-Based Guidance Level (HBGL) for drinking water (December 1997 Update)

d. Maximum Contaminant Level Goal is identical to the MCL

e. Regional Screening Level (RSL) May 2016, for Cancer the RSL is set at an Excess Lifetime Cancer Risk of 1 $X10^{-6}$; the EPA acceptable ELCR range of $1X10^{-4}$ to 1 $X10^{-6}$ is listed. The non-cancer risk is set at a hazard quotient (HQ) of 1. Only the lowest (i.e., most protective) of either the cancer or noncancer based RSL is listed http://www.epa.gov/risk/risk-based-screening-table-generic-tables

f. The forms of cis- and trans- 1,2-Dicholoroethane have different MCLs and RSLs, no form was specified in the 1998 ROD. The tapwater RSL listed above is the more health-protective RSL for cis-1,2-DCE.

Appendix E: Press Notice

U.S. Environmental Protection Agency (EPA) Conducts Second Five-Year Review of Cleanup at the Indian Bend Wash Superfund Site

EPA is conducting the second Five-Year Review (FYR) for the existing Records of Decision (RODs), or site cleanup plans, and remedies at the Indian Bend Wash (IBW) Superfund Sites (Sites) in Scottsdale (NIBW) and Tempe (SIBW), Arizona.

Groundwater contaminated with chlorinated solvents in NIBW are being contained, extracted and treated to remove contaminants at five treatment plants while solvent contaminated plumes in the SIBW area are being cleaned up through an in-place chemical treatment and monitored natural attenuation. The FYR is being conducted to determine if the soil vapor extraction remedies for contaminant source areas and groundwater remedies selected for both IBW Sites are adequately protecting human health and the environment. If you have any questions, please contact Carolyn d'Almeida, Remedial Project Manager, at (415) 972-3150 or by email at dalmeida.carolyn@epa.gov. The Five-Year Review Report will be completed in September 2016.

EPA maintains information repositories that hold the Five-Year Review Report for the Indian Bend Wash Superfund Site, as well as other documents related to the investigation and cleanup of this Site:

NIBW
Scottsdale Civic Center Library
3839 N. Drinkwater Blvd.
Scottsdale, AZ 85251
(480) 312-2320

Arizona Department of Environmental Quality (ADEQ) Records Center
1110 W. Washington Street
Phoenix, AZ 85007
(602) 771-2300

SIBW
Tempe Public Library
3500 Rural Road
Tempe, AZ 85282
(480) 350-5511

EPA Superfund Records Center
75 Hawthorne Street (3rd floor)
San Francisco, CA 94105
(415) 820-4700

The Five-Year Review Report will also be available on the EPA website:

http://www.epa.gov/superfund/indianbendwash

CNS-2878704#

Appendix F: Interview Forms

Five-Year Review Interview Record			
Site: NIBW-Area 7		**EPA ID No:**	

Interview Type: Written response
Location of Visit: Area 7 Groundwater Extraction and Treatment Facility
Date: April 6, 2016
Time:

Interviewers

Name	Title	Organization

Interviewees

Name	Organization	Title	Telephone	Email
Ryan O'Keefe	Arcadis U.S., Inc.	Project Engineer	(480) 905-9311	rokeefe@arcadis.com
Michael Nesky	Arcadis U.S., Inc.	Principal Engineer	(480) 905-9311	michael.nesky@arcadis.com

Summary of Conversation

1) What is your overall impression of the project?

Overall the NIBW Area 7 project has been, and continues to be, very successful. Remediation of the Upper Alluvial Unit (UAU) groundwater at the Area 7 source area to below drinking water standards for constituents of concern (COCs) resulted in the recent decommissioning and closure of the UAU groundwater extraction and soil vapor extraction (SVE) portions of the Area 7 system. The Area 7 Ground Water Extraction and Treatment System (GWETS) continues to be an integral component of successful remediation of COCs within the Middle Alluvial Unit (MAU) groundwater at the North Indian Bend Wash superfund site, as evidenced by the removal of approximately 100 pounds of COCs per month on average during the last quarter of 2015.

2) Is the remedy functioning as expected? How well is the remedy performing?

The remedy is functioning as expected.

The Area 7 SVE system removed COC mass from the vadose zone, which reduced COC mass flux to groundwater in the UAU. Combined with UAU groundwater pumping from 7EX-1UA, this portion of the remedy resulted in achievement of cleanup goals for the UAU groundwater in this area, as anticipated. As a result, EPA provided Closure Certification for the Area 7 SVE and UAU Systems in a letter dated March 3, 2016.

Extraction and treatment of MAU groundwater from wells 7EX-3aMA, 7EX-4MA, previously 7EX-5MA, and now 7EX-6MA continues to achieve the purpose of removing additional COC mass from the MAU groundwater as part of a voluntary action for COC source control that became part of the remedy with the Amended Consent Decree. The Area 7 groundwater remedy within the MAU continues to augment COC mass removal by municipal wells tied into treatment at the Central Groundwater Treatment Facility.

3) What does the monitoring data show? Is contaminant containment occurring?

Monitoring data shows that, as intended, the combined extraction from Area 7 and municipal MAU groundwater wells has significantly minimized COC migration to groundwater in the LAU. In addition to COC containment, the monitoring data show that significant COC mass removal has been achieved. Over the last five years of operation, the iso-concentration plume maps have demonstrated that the areal extent of higher COCs in MAU groundwater is receding.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Area 7 is an automated system that does not require a continuous on-site presence. Operators monitor the system remotely on a daily basis to verify system operation and performance. Additionally, weekly, monthly, quarterly, and semi-annual O&M tasks are performed by the operators on a routine interval in accordance with the O&M plan.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

There have been no significant changes to O&M procedures within the last five years. Minor changes in the last five years include installation and operation of MAU extraction well 7EX-6MA to replace MAU extraction well 7EX-5MA, and decommissioning of the SVE system and UAU groundwater extraction well 7EX-1UA.

6) Have there been unexpected O&M difficulties at the site in the last five years? If so, please give details.

PROFIBUS communication architecture and components associated with the GWETS have recently been difficult to service, maintain, and troubleshoot due to the age and obsolescence of this technology. PROFIBUS is no longer a widely supported communication protocol, therefore replacement parts and support are no longer readily available. Arcadis recommends transitioning to an Ethernet based communication protocol in the near future.

7) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

After the addition of MAU extraction well 7EX-6MA in 2015, the effectiveness and efficiency of various pumping scenarios is being evaluated. Data from the pump testing event will be considered with operational constraints inherent to the GWETS and resultant optimization of pumping configurations will be implemented accordingly. Optimal pumping configurations may result in a higher combined average mass removal rate while not overburdening GWETS operation.

8) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

No.

9) Do you have any comments, suggestions, or recommendations regarding the project?
Foremost, Arcadis recommends transitioning to an Ethernet based communication protocol before the next five year review. In general, Arcadis recommends upgrading critical system components upon failure.

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:		**EPA ID No:**	

Interview Type: *[e.g. Visit, Teleconference, etc.]*
Location of Visit: NIBW Scottsdale AZ
Date: 02/10/2016
Time:

Interviewers

Name	Title	Organization

Interviewees

Name	Organization	Title	Telephone	Email
Suzanne Grendahl	City of Scottsdale	Water Quality Director	480-312-8719	sgrendahl@scottsdaleaz.gov

Summary of Conversation

1) What is your overall impression of the project?

Very successful remedy that is containing the plume and removing TCE mass. All stakeholders work well together.

2) Is the remedy functioning as expected? How well is the remedy performing?

Yes, very well.

3) What does the monitoring data show? Is contaminant containment occurring?

TCE concentrations continue to drop across the project. The UAU is almost cleaned up.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

For the CGTF and NGTF the City provides 24/7 monitoring of the performance of the facilities. A crew of staff resides at the CGTF and provides on-site operation and maintenance of both facilities.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

Reduction in air sample monitoring at CGTF due to significant historical data. There is no impact to the protectiveness of the remedy.

Start-up of the NGTF has required the origination of all O&M requirements, maintenance and sampling. All are now routine and functioning well.

6) Have there been unexpected O&M difficulties at the site in the last five years? If so, please give details.

No

7) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

Reduction in air sample monitoring at CGTF due to significant historical data. This has reduced costs and staff time.

8) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

No

9) Do you have any comments, suggestions, or recommendations regarding the project?
No

Additional Site-Specific Questions
[If needed]

Five-Year Review Interview Record				
Site: NIBW-Area 12			**EPA ID No:**	

Interview Type: Written response
Location of Visit: NIBW Area 12
Date: April 5, 2016
Time:

Interviewers

Name	Title	Organization

Interviewees

Name	Organization	Title	Telephone	Email
Larry Lynch	EnSolutions	Project Engineer	(561) 762-7690	larry@ensolutions.us

Summary of Conversation

1) What is your overall impression of the project?

Overall the NIBW Area 12 project has been, and continues to be, very successful. Remediation of the Middle Alluvial Unit (MAU) groundwater at the Area 12 source area to below drinking water standards for constituents of concern (COCs) continues to remove mass and control migration.

2) Is the remedy functioning as expected? How well is the remedy performing?

The remedy is functioning as expected.

Extraction and treatment of MAU groundwater from wells MEX-1MA and Granite Reef continues to achieve the purpose of removing additional COC mass from the MAU groundwater as a voluntary COC source control program that became part of the remedy with the Amended Consent Decree. The Area 12 groundwater remedy within the MAU continues to augment COC mass removal from the MAU by municipal wells tied into treatment at the Central Groundwater Treatment Facility (CGTF).

3) What does the monitoring data show? Is contaminant containment occurring?

Monitoring data shows that, as intended, the combined extraction from Area 12, Area 7, and CGTF MAU groundwater wells has significantly reduced COC migration to groundwater in the LAU. In addition to COC containment, the monitoring data show that significant COC mass removal has been achieved. Over the last five years of operation, the iso-concentration plume maps have demonstrated that the areal extent of higher COC concentrations in MAU groundwater is receding.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

Area 12 is an automated system that does not require a continuous on-site presence. Operators monitor the system on a daily basis to verify system operation and performance. Additionally, weekly, monthly, quarterly, and semi-annual O&M tasks are performed by the operators on a routine interval in accordance with the O&M plan. Please note that this system, although technically the property of Motorola Solutions, is located inside of a General Dynamics facility with routine staffing during the day and a 24 hour per day security presence.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

There have been no significant changes to O&M procedures within the last five years. In the last year, the system has begun to operate both extraction wells at the same time. This change was made in coordination with SRP, the end-user for water from Area 12, to optimism water extraction in this area.

6) Have there been unexpected O&M difficulties at the site in the last five years? If so, please give details.

No major issues have occurred in the last five years. In the last year, the fiber optic link repeaters to the remote well sites were replaced with fiber optic routers. These allow a more complete sharing of data and programming between the master and remote controllers. The fiber optic routers have eliminated some of the historical communication link related shut downs.

7) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

The system is a fairly simple system with only two wells, so opportunities to improve sampling are very limited. By operating both wells continuously, additional mass removal is achieved.

8) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

No.

9) Do you have any comments, suggestions, or recommendations regarding the project?
The use of vapor phase carbon on the air stripper off gas provides little, if any, beneficial use. By removing the carbon, the system pressure will be reduced, allowing the blowers to operate at a lower RPM and save energy and costs.

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:	North Indian Bend Wash (NIBW)	**EPA ID No:**	

Interview Type: Written questionnaire
Location of Visit: Not applicable
Date: April 7, 2016
Time: No applicable

Interviewers

Name	Title	Organization

Interviewees

Name	Organization	Title	Telephone	Email
Leslie Katz	Montgomery & Associates	Project Coordinator	5208814912	lkatz@elmontgomery.com
Dennis Hall	Montgomery & Associates	Project Hydrogeologist	4809487747	dhall@elmontgomery.com
James Lutton	James Lutton	Project Engineer	9164524684	james.lutton@rcip.com
Terry Lockwood	Motorola Solutions	Program Manager	6027604763	terry.lockwood@motorolasolutions.com

Summary of Conversation

1) What is your overall impression of the project?

- Making consistent and meaningful progress toward achievement of remedial action objectives (see responses #2 and #3).
- Committed team with long-term history at the site. The North Indian Bend Wash (NIBW) Participating Companies' (PCs') technical and management team has significant institutional memory and depth of understanding of both the hydrogeologic system and the site-specific challenges/opportunities.
- Proactive approach by PCs over time, addressing issues before they are brought up by the agencies and making changes to improve remedy performance that may result in short-term costs but that provide long-term benefits.
- Effective communication between and working relationships with: PCs team, water providers, and agency personnel.
- Dedicated tie-in of extraction and treatment program to beneficial end-use (municipal, irrigation, injection) in community where water resources are carefully managed, with reliable systems in place to ensure protection of human health and the environment.
- Successful balancing of water provider needs and issues, such as naturally-occurring inorganic water quality, with critical objectives of volatile organic compound (VOC) plume containment and clean-up.

2) Is the remedy functioning as expected? How well is the remedy performing?

- The remedy is meeting all remedial action objectives and is performing reliably and effectively.
- With receipt of the final Certification Letter for Area 7 in March 2016, vadose zone remediation programs have now been completed in all previously-identified source areas.
- With 98% reduction in VOC mass and 90% reduction in plume area, Upper Alluvium Unit (UAU) groundwater is almost completely restored.
- Water level data and model projections show that the Middle Alluvium Unit (MAU) and Lower Alluvium Unit (LAU) plumes are contained.
- The two MAU source control programs (Area 7 and Area 12) are effectively capturing and treating higher-concentration areas, reducing mass migrating from the MAU into the LAU along the western margin.
- The groundwater monitoring program is comprehensive and represents a robust water level and water quality dataset that provides a sound basis for on-going remedy effectiveness evaluations.

3) What does the monitoring data show? Is contaminant containment occurring?

- Sampling data show decreasing concentrations in the UAU and in many parts of the MAU and the LAU.
  - Trichloroethene (TCE) concentrations at only four wells remain above the drinking water maximum contaminant level (MCL) of 5 µg/L in the UAU as of October 2015.
  - In the MAU, TCE concentrations are generally stable or decreasing. Increases at some wells are due to operational changes to enhance source control mass removal.
  - TCE concentrations in the LAU in the south part of the site are decreasing due to reductions in mass being added from the overlying UAU and MAU along the western margin. To the north, TCE concentrations in the LAU, which were previously increasing due to anticipated plume migration toward capture wells, are beginning to stabilize. Specific LAU wells with increasing TCE concentrations are within hydraulic capture and monitored more frequently.
- Water level data and capture zone modeling demonstrate plume containment.
  - The MAU source control program at Area 7 is projected to contain all of the MAU plume area delineated by the 1,000 µg/L TCE contour and most of the 500 µg/L area. Capture of TCE concentrations above 1,000 µg/L is the original objective of the Area 7 source control program.
  - The Area 12 MAU extraction system is projected to contain the area with higher TCE concentrations (greater

than 100 µg/L) near the Granite Reef well and to extend across a large area where TCE concentrations are between 5 and 50 µg/L.
    - Pumping of the LAU groundwater extraction system wells is projected to maintain capture over the area within the 5 µg/L contour line for TCE in the LAU.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

- All of the extraction and treatment systems, as well as the monitoring system, are operated and managed by well qualified personnel.
- Operator tasks include, but are not limited to, extraction well and system process sampling, local and automatic data collection and tabulation, chemical and media servicing, mechanical maintenance, and housekeeping.
- Each treatment system is physically monitored on-site at least once per week by an operator. The facilities associated with drinking water end-use are visited by the operators at least once per day. The operators spend several hours at each of these facilities. All groundwater extraction and treatment systems are monitored continuously by electronic control and data collection systems.
- Electronic system controls are used to shutdown the groundwater extraction and treatment systems in the event monitored operating parameters, such as flow rates and/or pressures, drift outside pre-determined ranges or set-points.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

- The NIBW Granular Activated Carbon Treatment Facility (NGTF) was completed in 2013 under an Explanation of Significant Differences. The addition of this fifth treatment plant to the remedial action has resulted in additional O&M requirements. The NGTF treats water from PCX-1, which is the extraction well that captures the most significant portion of the LAU plume. Water from well PCX-1 was previously treated by air stripping at the Miller Road Treatment Facility (MRTF). The NGTF provides the overall remedy with additional flexibility and control. During the change-over for treatment of PCX-1 from the MRTF to the NGTF, changes were made to increase the extraction rate at PCX-1. This results in increased removal of TCE mass from well PCX-1.
- A total of 30 UAU monitor wells were abandoned in 2013 due to reductions in the magnitude and extent of VOCs in the UAU. Since that time, water level monitoring was reduced from semi-annual to annual measurements at the remaining 28 UAU monitor wells. This change has not reduced the quality of the data set available to evaluate performance of the remedial actions.

6) Have there been unexpected O&M difficulties at the site in the last five years? If so, please give details.

- One incident occurred at the NGTF when a pipeline component failed and caused a release of untreated groundwater. The incident involved the failure of a cast iron air valve housing on the PCX-1 pipeline during start-up of the NGTF in 2013. SRP, as the operator, increased the frequency of inspection and replacement of the air valves on the PCX-1 pipeline. A flow rate comparison was also implemented through the computer control system to minimize future failures and to prevent releases of untreated groundwater. The treatment system was shutdown immediately upon detection of the equipment failure. The areas where the released groundwater collected were monitored for residual NIBW COCs. Monitoring data indicated that the release of untreated groundwater did not affect human health or the environment.

  In preparation for a rehabilitation project, the submersible pump in the southern-most extraction well (7EX-5MA) associated with Area 7 Groundwater Extraction and Treatment System (GWETS) became lodged and ultimately stuck in the well. As a result, the well became unusable. A new extraction well (7EX-6MA) was sited and installed at a location that would better affect extraction and treatment of the highest concentrations of VOCs at Area 7. Well 7EX-6MA was designed and constructed in a manner to minimize future issues with installation and removal of the submersible pump. Additionally, hydraulic capture for well 7EX-6MA is project to be generally equivalent to the combined capture associated with existing Area 7 extraction well 7EX-4MA and failed extraction well 7EX-5MA, the well 7EX-6MA was installed to replace.

7) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

- Changes in pumping equipment were made to increase pumping rates at two critical extraction wells – COS-75A (2012) and PCX-1 (2014). These two wells provide capture for the majority of the LAU plume. These increased pumping rates result in increased hydraulic containment in the critical northern portion of the LAU, preventing mass from moving to the furthest down-gradient remedial extraction wells PV-15 and PV-14. While there was a short-term cost increase associated with this remedy enhancement, the increased mass removal reduces remediation time and provides increased assurance that no mass will migrate to the northern Paradise Valley wells, which are not tied into treatment.
- Since 2010, optimization of the pumping regimen used at the Paradise Valley wells has had a beneficial impact on the LAU remedy. The PCs have worked successfully with EPCOR, the water provider who owns and operates the Paradise Valley wells and the MRTF, to implement a south to north pumping strategy that focuses pumping on the two Paradise Valley wells that are tied into treatment (PV-15 and PV-14). Pumping from the other Paradise Valley wells is added in a south to north order in response to demand. This approach has been shown through monitoring and modeling to optimize LAU plume containment.
- As described in response to question #5, the addition of the NGTF represents a remedy optimization in that it provides the overall remedy with additional flexibility and control of extraction and treatment at PCX-1, which is arguably the most critical component of the LAU remedy.

- Two new replacement extraction wells were installed, both of which are more efficient and reliable than the wells they replaced. In 2014, Central Groundwater Treatment Facility (CGTF) extraction well COS-71 was replaced by the City of Scottsdale with well COS-71A, and in 2015 Area 7 source control extraction well 7EX-5MA was replaced by the PCs with well 7EX-6MA. These efforts represent optimization measures for the remedy that should reduce long-term O&M costs.
- Alternatives for operation of the Area 7 MAU extraction wells are presently being evaluated to improve the effectiveness and efficiency of the remedy. This evaluation will assist in determining the proper balance between the two principal goals for the Area 7 source control remedy: maintaining hydraulic containment of groundwater in the area of elevated VOC concentrations and maintaining high TCE mass removal rates.
- As described in response to question #5, abandonment of 30 UAU monitor wells in 2013 resulted in a reduction in both monitoring costs and risks associated with maintaining and conducting monitoring activities at wells that are principally located in public rights-of-way in a populated metropolitan area.
- The current TCE concentrations at the MRTF extraction wells are significantly lower than the design criteria of the air strippers at the MRTF. Consequently, the required air flow rate through the air strippers to meet treatment performance criteria is significantly reduced. As such, the NIBW PCs requested, and EPA approved, reduction of the operating air-to-water ratio in the air strippers at the MRTF in 2015. This change resulted in reduced energy consumption and O&M costs.
- Based on review of the NIBW PCs' draft SAP addendum for the Site, which is currently being finalized, EPA approved the use of HydraSleeve® sampling when aging dedicated pumps fail at monitor wells. To date, 9 wells have been shifted to use of the HydraSleeve sampling protocol after their pumps failed. Four more wells will potentially be shifted to HydraSleeve sampling during the upcoming April 2016 monitoring round, and others will be added over time. This gradual shift away from traditional purge to an in-situ sampling approach reduces risks and costs associated with handling and disposal of investigation derived wastes.
- Recognizing the significant power needs of a project of this magnitude, the NIBW PCs have sought to shift an increase amount of the power to green sources. In the past 5 years (2011-2015), the PCs have incorporated use of about 11 million kilowatt hours of green power into remedy implementation. While this shift came at an additional cost of $116 thousand to the PCs, it reduces the project's carbon footprint and helps stimulate industrial markets for green power.

8) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

- No.

9) Do you have any comments, suggestions, or recommendations regarding the project?

Comments:

- The NIBW Site is a unique success story, where good working relationships between the PCs, agencies, and water providers have resulted in efficient and effective remedy implementation, along with beneficial end-use of a water resource that is valuable to the community.
- The technical and engineering leadership team on the Site continues to be focused on opportunities to optimize the remedy that increase reliability, decrease clean-up time, reduce energy consumption, incorporate green power sources, and minimize community risks and impacts.

Recommendations:

- The ARARs review that was initiated during the last Five Year Review needs to be completed. Clarification is required to so that all parties clearly understand the compliance requirements and to document that the correct ARARs at the Site are those outlined in the Amended Consent Decree, which supersedes the 1991 and 1993 Consent Decrees.
- During the last Five Year Review, the NIBW Technical Committee began a discussion regarding possible updates to the Groundwater Management and Evaluation Plan (GMEP). In some cases, the current performance metrics are no longer appropriate or useful, and these metrics are not focused on the most critical aspects of the remedy. The PCs are committed to working with EPA, where applicable, to develop more meaningful performance measures for evaluating the effectiveness of various remedy components.
- In addition to the GMEP, other Site documents, such as the Sampling & Analysis Plan and Health & Safety Plan, should be updated. The PCs are committed to moving forward with this task in 2016.
- Monthly meetings of the Technical Committee may no longer be warranted, given the status of activities at the Site. The PCs recommend that bi-monthly meetings be held, and that the meetings be held in-person at least several times a year rather than as teleconferences. Face-to-face meetings promote better communication and team-building, which we see as beneficial to implementation of the remedy.

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:	South Indian Bend Wash Superfund Site (SIBW)	**EPA ID No:**	AZD980695969

Interview Type: Visit
Location of Visit: Gilbane, 2355 E. Camelback Road, Suite 850, Phoenix, Arizona 85016
Date: April 29, 2016
Time: 1400

Interviewers

Name	Title	Organization

Interviewees

Name	Organization	Title	Telephone	Email
David J. Bowers	Gilbane Federal	Project Superintendent	602-792-6822	dbowers@gilbaneco.com
Stephanie B Archabal	Gilbane Federal	Project Manager	602-747-0036	sbarchabal@gilbaneco.com

Summary of Conversation

1) What is your overall impression of the project?

The selected remedy, monitored natural attenuation (MNA) has proven successful for this project. EPA has shown motivation to expedite attenuation of groundwater at this site to below the drinking water MCLs and partially de-list SIBW from the IBW.

2) Is the remedy functioning as expected? How well is the remedy performing?

The remedy is functioning as expected. The UAU Western and Central plumes have naturally attenuated to below the MCL for drinking water as predicted in the RI/FS. The MAU Eastern plume contains only one well currently above the MCL as of March 2016 following enhanced attenuation (in situ chemical oxidation [ISCO] with sodium permanganate).

3) What does the monitoring data show? Is contaminant containment occurring?

Monitoring data shows that natural attenuation continues and that all three plumes are reducing in size and overall contaminant concentration.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

There is no continuous O&M presence. Activities at the site are typically limited to two groundwater sampling events per year performed by two Gilbane personnel. This includes a groundwater sampling event in the spring (MAU Eastern Plume – three wells, two days) and a groundwater sampling event in the fall (all three Plumes – 11 wells, four days). The exceptions in the last five years were two groundwater monitoring well abandonment projects. These two events included the abandonment of 25 wells (2013) and 20 wells (2014). ISCO injections were performed at five wells located in the MAU Eastern Plume in 2014.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

The frequency and number of wells sampled has been reduced twice. The first occurred in 2013 and reduced the sampling frequency from semi-annual to annual, and reduced the number of wells sampled from 41 to 21.The second reduction occurred in 2014 and reduced the number of wells sampled from 21 to 12. The spring sampling event (three wells in the MAU Eastern Plume) was added after ISCO injections to monitor post-injection performance. These reductions in sampling frequency and the number of wells sampled are a direct impact of reduction of size and concentration of groundwater contamination plumes due to the selected remedy (MNA).

6) Have there been unexpected O&M difficulties at the site in the last five years? If so, please give details.

The only difficulty in the last five years was the destruction of well SIBW-58MC which occurred during construction activities in January 2014 by an outside party. The well was part of the enhanced attenuation study, and located at the center of the MAU Eastern Plume. The Eastern Plume can still be defined and monitored with upgradient and downgradient wells, but the loss of this well does present a data gap.

7) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

Please see question number 5. The reduction in sampling frequency and the number of wells sampled has reduced both labor and laboratory costs. The enhanced attenuation was estimated to reduce the time required for the MAU Eastern Plume to attenuate naturally to below the MCL by over 20 years.

8) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

No. While there is discussion about vapor intrusion screening levels around the country as it relates to VOCs in groundwater, the depth to groundwater at SIBW, which is approximately 65-80 feet below ground surface in the UAU, and the very low detections below the MCL in the UAU, precludes SIBW from vapor intrusion concerns.

9) Do you have any comments, suggestions, or recommendations regarding the project?

No.

Additional Site-Specific Questions

[If needed]

Appendix G: Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: North Indian Bend Wash, Area 7	**Date of inspection:** 10 February 2016
Location: Scottsdale, AZ	**EPA ID:** EP-S9-08-03
Agency, office, or company leading the five-year review: EPA, Region 9	**Weather/temperature** sunny, 70°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection-team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leslie Katz (Name) Project Coordinator (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 520-881-4912
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** James Lutton (Name) Project Engineer (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 916-698-2726
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ 520-881-4912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Interviews with City of Scottsdale, Motorola and other NIBW staff conducted separately via email. Attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
■ Maintenance logs	■ Readily available	■ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records** Remarks	■ Readily available	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits_____ Remarks	☐ Readily available	☐ Up to date	☐ N/A
5.	**Gas Generation Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
6.	**Settlement Monument Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
7.	**Groundwater Monitoring Records** Remarks	■ Readily available	■ Up to date	☐ N/A
8.	**Leachate Extraction Records** Remarks	■ Readily available	■ Up to date	☐ N/A
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent) Remarks	☐ Readily available	■ Up to date	☐ N/A
10.	**Daily Access/Security Logs** Remarks	■ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

O&M costs not available during Site Inspection.

V. ACCESS AND INSTITUTIONAL CONTROLS ■ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ■ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ■ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ■ N/A

Violations have been reported ☐ Yes ☐ No ■ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ■ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ■ No vandalism evident

Remarks

2. **Land use changes on site** ■ N/A

Remarks

3. **Land use changes off site** ■ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ■ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ■ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on site map	Areal extent_____
☐ Ponding	☐ Location shown on site map	Areal extent_____
☐ Seeps	☐ Location shown on site map	Areal extent_____
☐ Soft subgrade	☐ Location shown on site map	Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ■ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ■ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ■ Good condition ■ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☑ Additive (*e.g.*, chelation agent, flocculent) polyphosphate
☑ Others_____
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is intended to remove VOC mass from the groundwater, contain the groundwater plume, and ultimately restore the groundwater to VOC levels below the MCLs for TCE and PCE. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities appear to be adequate and contribute to the current and long-term effectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: North Indian Bend Wash, Area 7	**Date of inspection:** 10 February 2016
Location: Scottsdale, AZ	**EPA ID:** EP-S9-08-03
Agency, office, or company leading the five-year review: EPA, Region 9	**Weather/temperature** sunny, 70°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection-team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leslie Katz (Name) Project Coordinator (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 520-881-4912
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** James Lutton (Name) Project Engineer (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 916-698-2726
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ 520-881-4912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Interviews with City of Scottsdale, Motorola and other NIBW staff conducted separately via email. Attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
■ Maintenance logs	■ Readily available	■ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records** Remarks	■ Readily available	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks			
5.	**Gas Generation Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
6.	**Settlement Monument Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
7.	**Groundwater Monitoring Records** Remarks	■ Readily available	■ Up to date	☐ N/A
8.	**Leachate Extraction Records** Remarks	■ Readily available	■ Up to date	☐ N/A
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	■ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs** Remarks	■ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

O&M costs not available during Site Inspection.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent_____
- ☐ Ponding ☐ Location shown on site map Areal extent_____
- ☐ Seeps ☐ Location shown on site map Areal extent_____
- ☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ☒ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ☒ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☑ Additive (*e.g.*, chelation agent, flocculent) polyphosphate
☑ Others_____
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is intended to remove VOC mass from the groundwater, contain the groundwater plume, and ultimately restore the groundwater to VOC levels below the MCLs for TCE and PCE. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities appear to be adequate and contribute to the current and long-term effectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: North Indian Bend Wash, Area 7	**Date of inspection:** 10 February 2016
Location: Scottsdale, AZ	**EPA ID:** EP-S9-08-03
Agency, office, or company leading the five-year review: EPA, Region 9	**Weather/temperature** sunny, 70°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection-team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leslie Katz (Name) Project Coordinator (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 520-881-4912
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** James Lutton (Name) Project Engineer (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 916-698-2726
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ 520-881-4912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Interviews with City of Scottsdale, Motorola and other NIBW staff conducted separately via email. Attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
■ Maintenance logs	■ Readily available	■ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records** Remarks	■ Readily available	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks			
5.	**Gas Generation Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
6.	**Settlement Monument Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
7.	**Groundwater Monitoring Records** Remarks	■ Readily available	■ Up to date	☐ N/A
8.	**Leachate Extraction Records** Remarks	■ Readily available	■ Up to date	☐ N/A
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	■ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs** Remarks	■ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

O&M costs not available during Site Inspection.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent_____
- ☐ Ponding ☐ Location shown on site map Areal extent_____
- ☐ Seeps ☐ Location shown on site map Areal extent_____
- ☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ☒ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ☒ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☑ Additive (*e.g.*, chelation agent, flocculent) polyphosphate
☑ Others_____
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is intended to remove VOC mass from the groundwater, contain the groundwater plume, and ultimately restore the groundwater to VOC levels below the MCLs for TCE and PCE. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities appear to be adequate and contribute to the current and long-term effectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: North Indian Bend Wash, Area 7	**Date of inspection:** 10 February 2016
Location: Scottsdale, AZ	**EPA ID:** EP-S9-08-03
Agency, office, or company leading the five-year review: EPA, Region 9	**Weather/temperature** sunny, 70°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection-team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leslie Katz (Name) Project Coordinator (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 520-881-4912
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** James Lutton (Name) Project Engineer (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 916-698-2726
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ 520-881-4912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Interviews with City of Scottsdale, Motorola and other NIBW staff conducted separately via email. Attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
■ Maintenance logs	■ Readily available	■ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records** Remarks	■ Readily available	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks			
5.	**Gas Generation Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
6.	**Settlement Monument Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
7.	**Groundwater Monitoring Records** Remarks	■ Readily available	■ Up to date	☐ N/A
8.	**Leachate Extraction Records** Remarks	■ Readily available	■ Up to date	☐ N/A
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	■ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs** Remarks	■ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

O&M costs not available during Site Inspection.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent_____
- ☐ Ponding ☐ Location shown on site map Areal extent_____
- ☐ Seeps ☐ Location shown on site map Areal extent_____
- ☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ☒ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ☒ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☑ Additive (*e.g.*, chelation agent, flocculent) polyphosphate
☑ Others_____
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is intended to remove VOC mass from the groundwater, contain the groundwater plume, and ultimately restore the groundwater to VOC levels below the MCLs for TCE and PCE. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities appear to be adequate and contribute to the current and long-term effectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: North Indian Bend Wash, Area 7	**Date of inspection:** 10 February 2016
Location: Scottsdale, AZ	**EPA ID:** EP-S9-08-03
Agency, office, or company leading the five-year review: EPA, Region 9	**Weather/temperature** sunny, 70°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ■ Access controls
- ☐ Institutional controls
- ■ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ☐ Monitored natural attenuation
- ■ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection-team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leslie Katz (Name) Project Coordinator (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 520-881-4912
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** James Lutton (Name) Project Engineer (Title) 2/10/16 (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. 916-698-2726
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed ■ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ 520-881-4912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Interviews with City of Scottsdale, Motorola and other NIBW staff conducted separately via email. Attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
■ Maintenance logs	■ Readily available	■ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records** Remarks	■ Readily available	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks			
5.	**Gas Generation Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
6.	**Settlement Monument Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
7.	**Groundwater Monitoring Records** Remarks	■ Readily available	■ Up to date	☐ N/A
8.	**Leachate Extraction Records** Remarks	■ Readily available	■ Up to date	☐ N/A
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	■ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs** Remarks	■ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

O&M costs not available during Site Inspection.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent_____
- ☐ Ponding ☐ Location shown on site map Areal extent_____
- ☐ Seeps ☐ Location shown on site map Areal extent_____
- ☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ☒ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ☒ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☑ Additive (*e.g.*, chelation agent, flocculent) polyphosphate
☑ Others_____
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is intended to remove VOC mass from the groundwater, contain the groundwater plume, and ultimately restore the groundwater to VOC levels below the MCLs for TCE and PCE. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities appear to be adequate and contribute to the current and long-term effectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: North Indian Bend Wash, Area 7	**Date of inspection:** 10 February 2016
Location: Scottsdale, AZ	**EPA ID:** EP-S9-08-03
Agency, office, or company leading the five-year review: EPA, Region 9	**Weather/temperature** sunny, 70°

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☐ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: *e.g. Groundwater monitoring*
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection-team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leslie Katz (Name) | Project Coordinator (Title) | 2/10/16 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 520-881-4912
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** James Lutton (Name) | Project Engineer (Title) | 2/10/16 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 916-698-2726
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ 520-881-4912
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ Project Engineer 2/10/16 916-698-2726
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Interviews with City of Scottsdale, Motorola and other NIBW staff conducted separately via email. Attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

■ O&M manual	■ Readily available	☐ Up to date	☐ N/A
■ As-built drawings	■ Readily available	■ Up to date	☐ N/A
■ Maintenance logs	■ Readily available	■ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ■ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ■ Readily available ☐ Up to date ☐ N/A
Remarks

3.	**O&M and OSHA Training Records** Remarks	■ Readily available	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	■ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	■ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	■ N/A
	☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A
	Remarks			
5.	**Gas Generation Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
6.	**Settlement Monument Records** Remarks	☐ Readily available	☐ Up to date	■ N/A
7.	**Groundwater Monitoring Records** Remarks	■ Readily available	■ Up to date	☐ N/A
8.	**Leachate Extraction Records** Remarks	■ Readily available	■ Up to date	☐ N/A
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☐ N/A
	☐ Water (effluent)	☐ Readily available	■ Up to date	☐ N/A
	Remarks			
10.	**Daily Access/Security Logs** Remarks	■ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other

2. **O&M Cost Records**

☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

O&M costs not available during Site Inspection.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A

Violations have been reported ☐ Yes ☐ No ☒ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
- ☐ Wet areas ☐ Location shown on site map Areal extent_____
- ☐ Ponding ☐ Location shown on site map Areal extent_____
- ☐ Seeps ☐ Location shown on site map Areal extent_____
- ☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks

B. Benches ☐ N/A ☒ Applicable

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks

C. Letdown Channels ☒ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning
☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** ☐ N/A ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Erosion** Areal extent_____ Depth_____ ☐ Erosion not evident
   Remarks

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☐ N/A
   Remarks

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☒ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☑ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☑ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☑ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☑ Air stripping ☐ Carbon adsorbers
☐ Filters_____
☐ Additive (*e.g.*, chelation agent, flocculent) polyphosphate
☐ Others_____
☑ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☑ Sampling/maintenance log displayed and up to date
☑ Equipment properly identified
☑ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ■ Good condition ■ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ■ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ■ Good condition (esp. roof and doorways) ☐ Needs repair
■ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1. Monitoring Data
■ Is routinely submitted on time ■ Is of acceptable quality

2. Monitoring data suggests:
■ Groundwater plume is effectively contained ■ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ■ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is intended to remove VOC mass from the groundwater, contain the groundwater plume, and ultimately restore the groundwater to VOC levels below the MCLs for TCE and PCE. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities appear to be adequate and contribute to the current and long-term effectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

Appendix H: Photographs from Site Inspection Visit

DRAFT Trip Report
North Indian Bend Wash

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1. INTRODUCTION

a. Date of Visit: 10 February 2016

b. Location: Various locations, Scottsdale, AZ

c. Purpose: A site visit was conducted to visually inspect and document the conditions of the remedy, the site, and the surrounding area for inclusion into the Five-Year Review Report.

d. Participants:

Matthew Masten	US Army Corps of Engineers, Env. Engineer	602-230-6873
Leslie Katz	Hydrogeologist/Principal, Montgomery & Associates	520-881-4912
Dennis Hall	Montgomery & Associates	480-948-7747
Terry Lockwood	Program Manager, Motorola	602-760-4763
Larry Lynch	Motorola	
James Lutton	Project Engineer, NIBW	916-698-2726
Suzanne Grendahl	Water Quality Director, City of Scottsdale	480-312-8719
Craig Miller	City of Scottsdale	
Stephanie Archabal	Project Manager, Gilbane	SBArchabal@gilbaneco.com

2. SUMMARY

A site visit to the North Indian Bend Wash Superfund Site was conducted on 10 February, 2016. The inspection included visual observation of overall site conditions and inspection of various components of the remedy. The participants received an overview of the site and the remedial history. The inspection evaluated the various groundwater treatment systems, groundwater extraction wells, and groundwater discharge points.

3. DISCUSSION

On 10 February 2016, Mr. Masten arrived at the Montgomery and Associates office in Scottsdale, AZ at 0800 hrs. The team assembled in the Montgomery and Associates conference room, and the risk assessor from the U.S. Army. Corps of Engineers, Cynthia Colquitt, was dialed in via teleconference. Ms. Katz presented the group with an overview of the site, the site history, remedial progress and future actions at the site. The presentation slides were later made available to the team.

The team arrived at the North Indian Bend Wash Granular Activated Carbon Treatment Facility (NGTF) at approximately 1020 hrs. The weather was sunny, calm, and approximately 70 degrees Fahrenheit. The participants first toured the control room area, where Mr. Lutton gave an overview and history of the facility. The NGTF was completed in 2013 and the system became

fully operational in 2014. Extraction well PCX-1 feeds the system which operates at approximately 2,600 gallons per minute, or 3.7 million gallons per day. The groundwater is diverted across three treatment trains, each consisting of two granular activated carbon vessels. Mr. Lutton informed the team that they are planning on a fourth treatment train for back up purposes. O&M personnel are on-site a few hours per day, the facility is remotely monitored and alarmed with a fail-safe system. The City of Scottsdale Water Campus also remotely monitors the site 24 hours a day, 7 days a week. O&M plans and manuals were on-site, as were Contingency and Emergency Response Plans. Mr. Lutton stated that carbon change outs occur when detections of TCE appear at 80% of the MCL. Virgin coconut shell carbon is being used for the change outs. Mr. Lutton proceeded to point out the large 105,000 gallon backwash storage tank used for vessel maintenance. The facility discharges treated water to either the City of Scottsdale municipal supply or to a Salt River Project (SRP) canal. The system appeared to be in excellent condition and functioning correctly, as would be expected of a new facility.

The team proceeded to inspect the Miller Road Treatment Facility. This facility is operated by EPCOR and discharges to the Paradise Valley water supply. Completed in 1997, the system consists of three air stripper towers. The system runs at approximately 2100 gallons per minute or 3 million gallons per day per tower. The facility operates two towers at a time. Mr. Lutton stated that the towers are descaled once per year using muriatic acid. While no air permits are needed, NPDES and all applicable discharge permits were available. An EPCOR operator is on site 8 hours daily. Carbon adsorption systems are presently being used to scrub the effluent from the towers. The team made it known to Mr. Masten that they have questions about ARARs and the applicability/necessity of the air scrubbers. The groundwater treatment system appeared to be in good shape and functioning correctly.

At 1330 hrs, the team arrived at North Indian Bend Wash Area 7 Treatment Facility. Area 7 consists of three extraction wells, a UV-Oxidation system, and an air stripper followed by reinjection of treated water to the upper aquifer. This facility was completed in 1999 by Siemens and is operated by Motorola. The system runs at 500 gallons per minute, but was off line at the time of the site visit due to an on-going well pump optimization test. Mr. Lutton stated that a food safe polyphosphate was being added to the water as an anti-scaling agent. While the system was offline, maintenance was being performed. Notably, several small weep holes in the air stripper trays had been epoxied. O&M manuals from 2006 were available on site, as well as Health and Safety Plans. The system is remotely monitored and alarmed. Weekly site visits and daily remote checks are performed by O&M personnel. The system appeared to be in good overall shape, and records indicate the system runs as intended when it is online.

The team next inspected the Central Groundwater Treatment Facility. This facility began operation in 1994 and is owned and operated by the City of Scottsdale. This facility was the original remedy for the NIBW site and uses up to four extraction wells treating the groundwater with three air stripper towers. The treated water is discharged to the Scottsdale water supply. Mr. Lutton stated that both the raw and treated water is sampled here three time a week and results have been non-detect since the year 1998-2000 date range. Three staff members are on site daily; a senior operator, and two junior operators. These personnel work a day shift, but there is 24/7 coverage and monitoring by the City of Scottsdale Water Campus. All O&M and safety manuals were available as well as electronic logs and as-builts. Each air intake operates at approximately

14,000 cubic feet per minute with a 30:1 air to water ratio. Two columns were currently running, with a max water flow rate of 3,150 gallons per minute. Mr. Lutton stated that the columns are cleaned yearly. The system appeared to be in excellent condition and functioning correctly.

Area 12 Groundwater Extraction and Treatment System was inspected next. This system began operation in 1999 and is owned and operated by Motorola Solutions. Groundwater is treated here by air stripping and is discharged to the Salt River Project irrigation canal system. Air effluent is treated with a carbon adsorption vessel. The system was off at the time of inspection, due to the fact that water could not be discharged into the SRP canal. SRP was performing their annual 'dry out' maintenance on the canal, and does not allow discharges during this time. Motorola Solutions uses this time as their maintenance period. O&M personnel are on site at Area 12 "as needed", this site is not remotely monitored. There is an alarm that will alert personnel on a pager should the system encounter a fault. O&M manuals and Health and Safety Documentation are present on site. Although the system was not operating, it appeared to be in good shape, and available data show that it has been operating as intended. The team departed Area 12 at 1630 hrs.

All components of the remedial action for North Indian Bend Wash appear to be in good condition and are currently operating as intended. All systems and wells were found to be well secured and free from vandalism. All fences and walls appeared to be in working order and no indication of trespassing was noted.

4. ACTIONS

The USACE will incorporate information obtained from the site visit into the Five Year Review report.

Matthew Masten, P.E.
Environmental Engineer
CESPL-TESB

Site Photos – North Indian Bend Wash Five Year Review Site Inspection

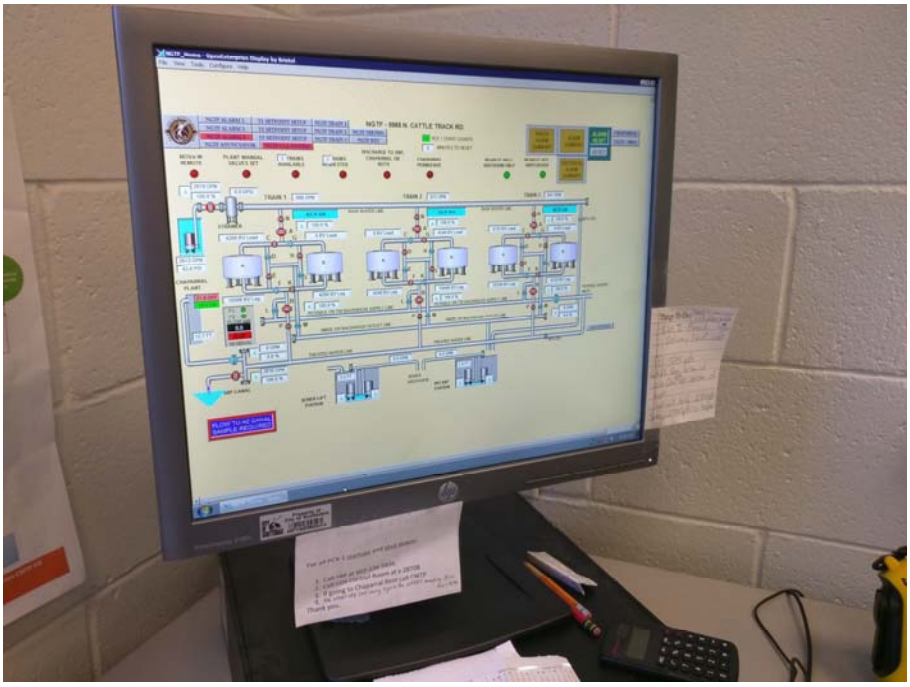

Figure 1- NIBW GAC Treatment Facility control console

Figure 2-NGTF security camera

Site Inspection
North Indian Bend Wash

Figure 3-NGTF groundwater intake piping

Figure 4-NGTF valve tree

Site Inspection
North Indian Bend Wash

Figure 5-NGTF GAC vessel and piping


Figure 6-Room for proposed 4th treatment train

Site Inspection
North Indian Bend Wash

Figure 7-NGTF Backwash holding tank

Figure 8-NGTF Treated water discharge

Site Inspection
North Indian Bend Wash

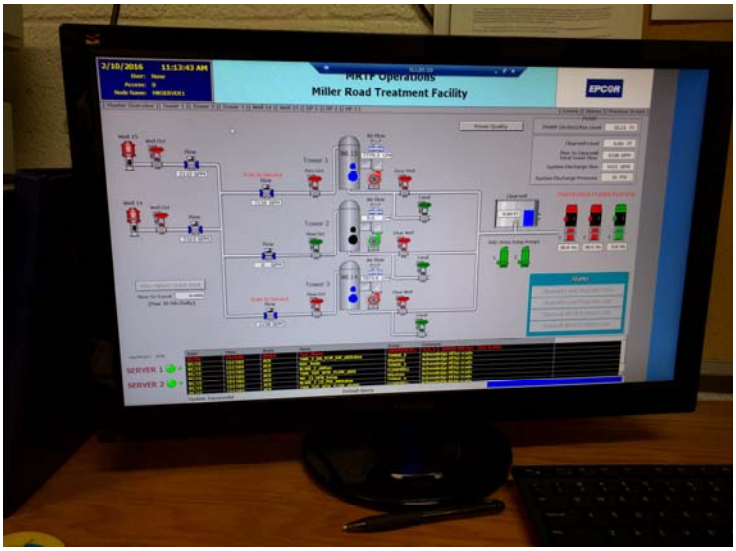

Figure 9-Miller Road Treatment Facility control console

Figure 10-MRTF air stripper tower

Site Inspection
North Indian Bend Wash

Figure 11-MRTF system pumps

Figure 12-MRTF blower control

Figure 13-Former connection to well PCX-1, now capped off

Figure 14-Overview of MRTF interior

Site Inspection
North Indian Bend Wash

Figure 15-MRTF carbon adsorption units

Figure 16-Well 15 at MRTF

Figure 17-Area 7 Treatment Facility exterior

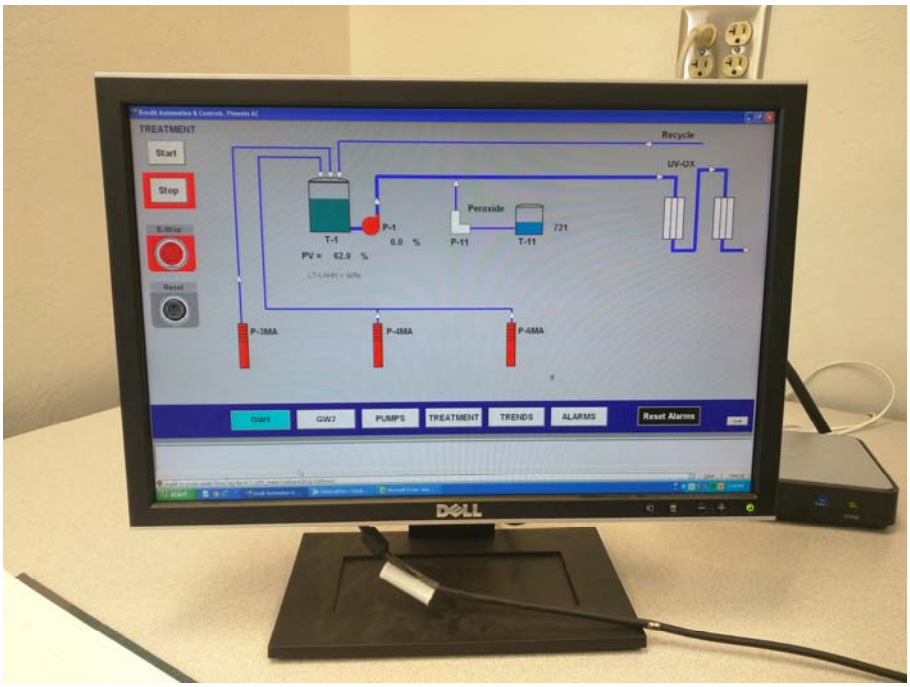

Figure 18-Area 7 control console

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North Indian Bend Wash

Figure 19-Area 7 UVOx system


Figure 20-Area 7 air stripper trays

Figure 21-Area 7 air stripper, epoxied weep hole on lower right

Figure 22-Area 7 metered pump for peroxide

Figure 23-Area 7 reinjection well and sanitary sewer connection


Figure 24- Exterior of Central Groundwater Treatment Facility, looking northeast

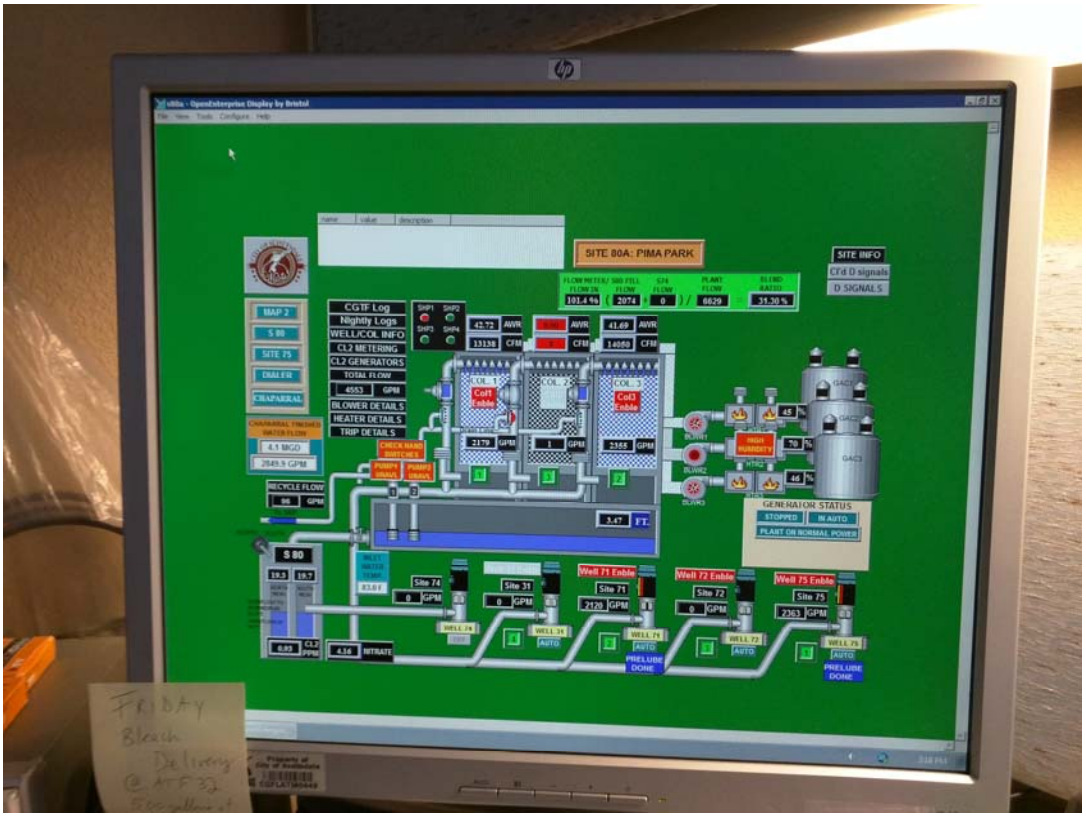

Figure 25- CGTF control console

Figure 26-CGTF air intake #2

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North Indian Bend Wash

Figure 27-CGTF Blower #2

Figure 28-CGTF column #2 viewport

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North Indian Bend Wash

Figure 29-CGTF interior, untreated water intake

Figure 30- CGTF column #3 flow meter

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North Indian Bend Wash

Figure 31-CGTF pre-heater and carbon adsorption vessel

Figure 32-CGTF backup generator and fuel storage

Figure 33-Area 12 air stripper tower, looking southeast

Figure 34-Area 12 blower

Site Inspection
North Indian Bend Wash

Figure 35-Area 12 Carbon adsorption vessel


Figure 36- Area 12 tower view port, showing packing material

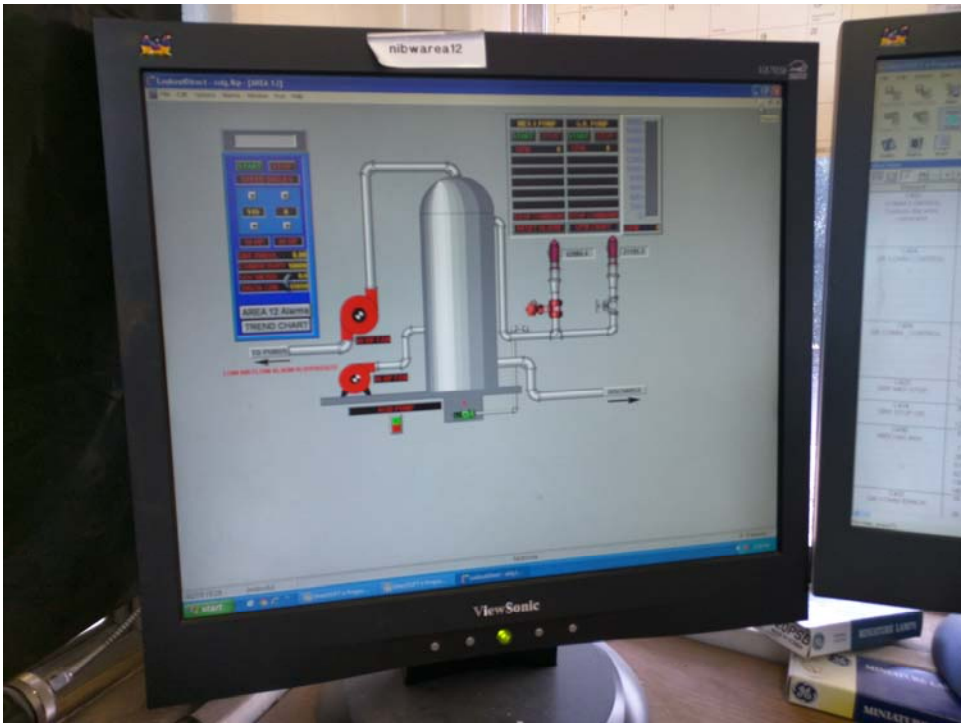

Figure 37- Area 12 control console


Figure 38- Area 12 acid pump

DRAFT Trip Report
South Indian Bend Wash

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1. INTRODUCTION

a. Date of Visit: 20 April 2016

b. Location: Various locations, Tempe, AZ

c. Purpose: A site visit was conducted to visually inspect and document the conditions of the remedy, the site, and the surrounding area for inclusion into the Five-Year Review Report.

d. Participants:

Matthew Masten	US Army Corps of Engineers, Env. Engineer	602-230-6873
Stephanie Archabal	Project Manager, Gilbane	480-747-0036

2. SUMMARY

A site visit to the South Indian Bend Wash Superfund Site was conducted on 20 April, 2016. The inspection included visual observation of overall site conditions and inspection of various components of the remedy. The participants received an overview of the site and the remedial history. The inspection evaluated the various groundwater monitoring wells.

3. DISCUSSION

On 20 April 2016, Mr. Masten arrived at the DCE Circuits site, currently the parking lot for Infusion Coffee and Tea and Café Italia, in Tempe, AZ at 1000 hrs. The weather was sunny, calm, and approximately 80 degrees Fahrenheit. Ms. Archabal presented Mr. Masten with an overview of the site, the site history, remedial progress and future actions at the site.

Ms. Archabal opened up two flush mount SVE wells and two flush mount SVE sampling ports in the parking lot. These wells are no longer sampled. The wells and sampling ports appeared to be in good shape and well secured. Ms. Archabal stated that a pilot test was performed here approximately two years ago, to investigate if extraction could facilitate a quicker site close out. These results are available in the pilot test reports. The group then toured the Café Italia office and workspace and the Infusion Coffee and Tea commercial space, noting areas that Gilbane places air monitoring canisters annually, in the October-November timeframe. Ms. Archabal pointed out a groundwater monitoring well in the Infusion Tea parking lot, SIBW5, which was locked and requires a specialized bit to open. Ms. Archabal was not able to obtain this bit for this site inspection, and thus this well was not opened.

The team arrived at the well vault for monitoring well SIBW-11MC. The vault was latched securely, not locked. Ms. Archabal stated that this well is sampled semi-annually, last sampled

about a month prior. Sampling purge water is discharged to the local sanitary sewer. The well vault and well head appear to be in good condition and functional.

Mr. Masten and Ms. Archabal proceeded to well SIBW-58MC. This well is located in a newly constructed parking lot. The construction company milled over this well and effectively destroyed it in 2014. The well was located, a flush mount well head covers newly installed 6" blue PVC casing. However, it is unknown how far below ground surface this piping extends. At approximately 5 feet below ground surface it is filled with asphalt and other unidentified debris.

The team next arrived at the well vault for monitoring well SIBW-13MC, near a local school. The vault was not locked, but latched securely. Sampling purge water for this well is discharged to the local sanitary sewer. The well vault and well head appear to be in good condition and functional.

Well SIBW-56MC was inspected next, this well is flush mount, and requires a special bit to unlock. This bit was unavailable at the time of inspection. SIBW-56MC is located in the street in a residential area. The cover appears to be in good shape and is undamaged, it was partially covered by a parked car at the time of inspection.

Mr. Masten and Ms. Archabal proceeded to well SW3. This well is located inside of a locked chain link fenced area. The team was able to locate a gap in the fence and obtained entry. The well was secured with a bolted flush mount cover. The well vault was flooded with several inches of water. The well caps were in place and the well appears undamaged and functional. According to Ms. Archabal, this well is sampled semi-annually in March and October.

The team proceeded to well SIBW-61U. This well is flush mount, and requires a special bit to unlock. This bit was unavailable at the time of inspection. SIBW-61U is located in the street in a residential area. The cover appears to be in good shape and undamaged.

The team concluded its tour of SIBW, having seen a fair representation of the overall site. All components of the remedial action for South Indian Bend Wash appear to be in good condition and are currently operating as intended. All wells were found to be well secured and free from vandalism.

4. ACTIONS

The USACE will incorporate information obtained from the site visit into the Five Year Review report.

Matthew Masten, P.E.
Environmental Engineer
CESPL-TESB

Site Photos – South Indian Bend Wash Five Year Review Site Inspection

Figure 1- SVE system sampling port

Figure 2- SVE well 2

Site Inspection
South Indian Bend Wash

Figure 3-Café Italia interior, air monitoring canister placement example

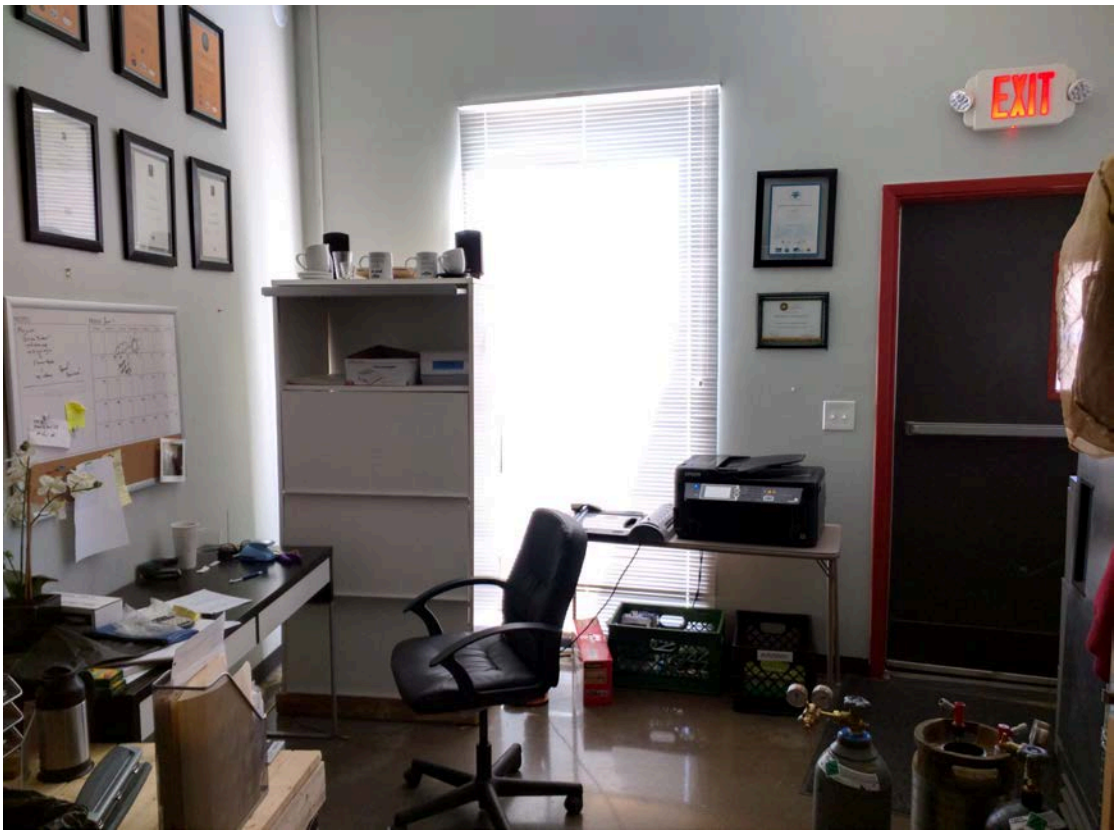

Figure 4-Infusion Coffee and Tea office, air monitoring canister placement example

Figure 5- SIBW-11MC well vault

Figure 6- SIBW-58MC replacement

Site Inspection
South Indian Bend Wash

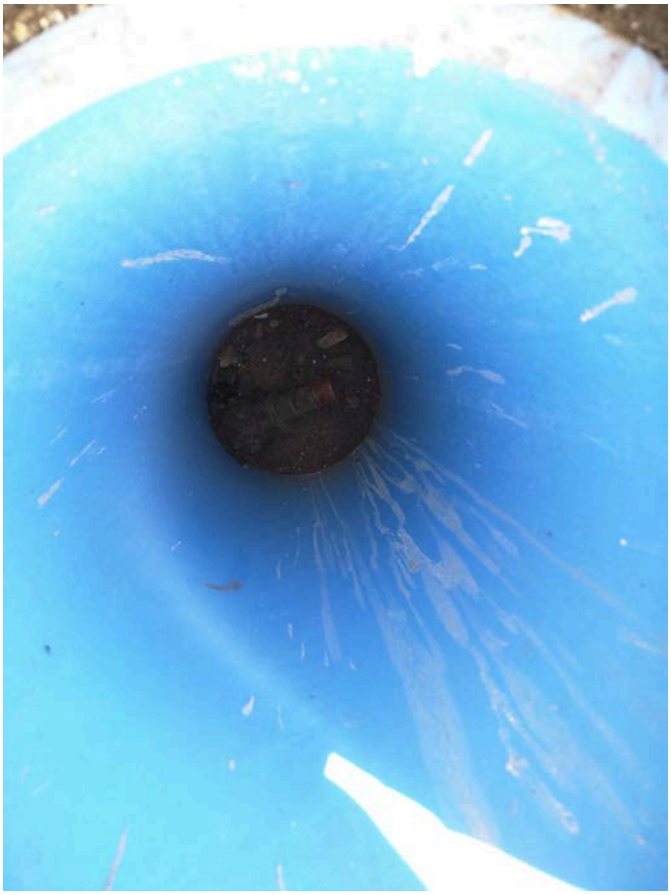

Figure 7-SIBW-58MC downpipe view, debris approx. 5 feet bgs

Figure 8- SIBW-13MC well vault interior

Site Inspection
South Indian Bend Wash

Figure 9-SIBW-13MC well vault exterior

Figure 10-SIBW-56MC

Figure 11- Well SW-3

Figure 12- SW-3, secured

Figure 13- Locked well SIBW-61U


Figure 14-Overview of SIBW-61U, facing south