

**FEASIBILITY STUDY WORK PLAN
EAST CENTRAL PHOENIX
40TH STREET AND INDIAN SCHOOL ROAD
WQARF REGISTRY SITE
PHOENIX, ARIZONA**



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Figure 1. East Central Phoenix 40th Street and Indian School Road WQARF Site – Phoenix, Arizona

LIST OF ABBREVIATIONS & ACRONYMS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
A.R.S.	Arizona Revised Statutes
AWQS	Aquifer Water Quality Standard
bgs	below ground surface
Earth Tech	Earth Technology Corporation
ECP	East Central Phoenix
EPA	Environmental Protection Agency
FS	Feasibility Study
GPL	Groundwater Protection Limit
MDL	method detection limit
MRL	method reporting limit
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
PCE	Tetrachloroethene
RO	Remedial Objectives
RI	Remedial Investigation
SRL	Soil Remediation Level
SRP	Salt River Project
SVE/AS	soil vapor extraction/air sparging
TCE	Trichloroethene
The site	East Central Phoenix, 40 th Street and Indian School Road Water Quality Assurance Revolving Fund site
VOC	Volatile Organic Compound
WP	Work Plan
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

1.1 Purpose

This Work Plan (WP) presents the methodology that will be followed for completion of the feasibility study (FS) for the East Central Phoenix (ECP) 40th Street and Indian School Road Water Quality Assurance Revolving Fund (WQARF) site (the site) in Phoenix, Arizona. This WP is required as part of the FS process, pursuant to Arizona Administrative Code (A.A.C.) R18-16-407(B).

The purpose of the FS is to develop and evaluate a reference remedy and alternative remedies that are capable of achieving the site's Remedial Objectives (ROs). An FS report will be developed that relies on data and information from the Remedial Investigation (RI), and further work that may be conducted during the FS, and will evaluate the reference remedy and at least two alternative remedies, to ensure that each remedy meets the following in accordance with A.A.C. R18-16-407(H):

- achieves the ROs;
- is consistent with water management plans and general land use plans; and
- is evaluated with comparison criteria including practicability, risk, cost, and benefit.

One of the alternative remedies will be less aggressive than the reference remedy and one will be more aggressive as required by A.A.C. R18-16-407(E).

In accordance with A.A.C. R18-16-407(I), based on the evaluation of the reference remedy and the alternative remedies, the proposed remedy will be developed and described in the FS report. The FS report shall describe the reasons for selecting the remedy including all of the following:

- how the proposed remedy will achieve the ROs;
- how the comparison criteria were considered; and
- how the proposed remedy meets the requirements of Arizona Revised Statutes (A.R.S.) §49-282.06.

1.2 Site Description

The site is located in the 4000 block of East Indian School Road in a mixed residential and commercial area of Phoenix, Arizona. The site is bounded by Devonshire Avenue to the North, 40th Street to the East, East Picadilly Road to the South and 38th Place to the West (Figure 1).

The purpose of the RI was to determine the nature and extent of contamination at the site. The RI also identified present and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be impacted by the contamination. Based upon the RI data collected, the current horizontal extent of tetrachloroethene (PCE) above the Aquifer Water

Quality Standard (AWQS) has been identified as an area downgradient of the former Allen's Cleaners, extending beneath and slightly downgradient of Kachina Cleaners. The vertical extent of PCE above the AWQS has been identified to be within the upper eleven feet of the water table (Arizona Department of Environmental Quality [ADEQ], 2015) (Figure 1).

1.3 Previous Investigations

Historically, the highest detections of PCE in groundwater have been at the four monitor wells located next to and immediately downgradient of the dry cleaning sources. The highest concentrations of PCE in groundwater were detected between 1992 and the early 2000s. Significant declines in PCE concentrations have been observed between the early 2000's to approximately 2006, most likely a result of operating the soil vapor extraction/air sparging (SVE/AS) treatment system. Since 2006, the decline in PCE concentrations has slowed down. During the time period, 1992 to 2006, the highest PCE detections in the furthest downgradient well from both facilities was KMW-01, located just 50 feet downgradient from Kachina Cleaners.

Historically, concentrations of trichloroethene (TCE) in groundwater greater than the AWQS were detected between 1992 and 2004 and only from monitor wells AMW-01, AMW-06 and KMW-01. From the early 2000's to approximately 2006, TCE concentrations declined significantly. The highest concentrations of TCE, up to 490 micrograms per liter ($\mu\text{g/L}$), were detected from AMW-01, located next to and downgradient of former Allen's Cleaners.

An October 1988 draft Phase I report prepared by Earth Technology Corporation (Earth Tech) identified Kachina Cleaners as a high potential source of chemical contamination detected in Salt River Project (SRP) Well 17.9E-7.5N because it was located approximately 0.5 mile north of the well and had documented use of PCE. According to the 1988 Phase I report, the concentration of PCE detected in SRP Well 17.9E-7.5N was $66.0 \mu\text{g/L}$. The report also identified Kachina Cleaners as a medium potential source of contamination in another well, SRP Well 17E-8N, located approximately one mile east of Kachina Cleaners. PCE had been detected in this well at a concentration of $8.7 \mu\text{g/L}$ [Earth Tech, 1988; FSDEQP 2396, 2406, 2450-2451, 2527].

Between 1989 and 2008, numerous investigations and remedial activities were performed at former Allen's Cleaners and Kachina Cleaners in connection with the presence of PCE and TCE in the subsurface. Tasks performed during the investigations included various soil/soil vapor investigations, the installation of fifteen groundwater monitor wells, aquifer testing, sludge sampling and monitor well rehabilitation. In October 1989, a soil gas survey was conducted by Earth Tech in the ECP WQARF study area, and a sample was taken at Kachina Cleaners. The soil gas sample was taken at a depth of 16.5 feet below ground surface (bgs) on the north side of the facility and PCE was detected at $270 \mu\text{g/L}$. Another sample collected adjacent to former Allen's Cleaners detected PCE at $370 \mu\text{g/L}$. [Earth Tech, 1989; FSDEQP 2680; TIDEQP 1305-1306, 1312]. Additional details of confirmation of PCE and TCE release to soil and groundwater from this time period can be found in the Remedial Investigation Report.

In December 2003, three SVE and six AS wells were installed at the former Allen's Cleaners. An SVE/AS system was installed and started in November 2004. As of July 8, 2005, the SVE/AS system had removed approximately 33 pounds of PCE and was then decommissioned

on that date [FSDEQP 2686]. No soil remedial activities, such as SVE and or soil excavations, have been performed at Kachina Cleaners.

In 2013 and 2014, RI activities at the site included monitoring existing monitor wells and installation and sampling of ten additional paired groundwater monitor wells at five locations downgradient of Kachina Cleaners facility and the former Allen's Cleaners. In 2013 and 2014, PCE was detected in six of 23 monitor wells sampled ranging in concentration from 1.0 µg/L to 20 µg/L, with PCE concentrations above the AWQS of 5 µg/L being detected in monitor wells AMW-08 and KMW-01. In 2013 and 2014, TCE was detected in one of 23 monitor wells sampled at the concentration of 1.9 µg/L, TCE has not been detected at or above the AWQS of 5 µg/L since 2004.

Land use in the area around the site is expected to remain predominantly residential and commercial. Currently, surface water uses within the site are for residential irrigation and they are likely to remain as such in the future. Groundwater is used to supplement surface water supplies in the vicinity of the site.

The nearest residential housing is located approximately fifty feet from both Kachina Cleaners and former Allen's Cleaners. The potential human receptors, in the vicinity of the site, most likely to be influenced by further downgradient progress of releases from the site include offsite residential populations, site workers, and site visitors. Potential human exposure is most likely to result from groundwater extraction, however, no registered potable or non-potable water wells are located within a 1,000-foot radius of the site. While unlikely, it is possible for onsite workers and/or visitors to be exposed to PCE and or TCE impacted media (soil, groundwater, and investigative derived waste) at the site. Site workers and visitors may be exposed to contaminants through dermal contact or ingestion of contaminated soil/groundwater and/or inhalation of contaminant vapors if any vapors or contaminants remain in soil pores or adhered to the soil.

The properties are mostly covered with asphalt or bare soil. Typical plants in the area are ornamental and native species used for landscaping at business and residential properties. No wildlife species are known to exist at the site. Therefore, ecological receptors are not considered a factor.

2.0 FEASIBILITY STUDY TASKS

This section discusses the tasks associated with the development of the FS report. The FS tasks will be performed in order to meet the requirements of A.A.C. R18-16-407. The FS process considers the data gathered during the RI and further work that may be conducted during the FS and;

- considers the ROs;
- includes the identification of potential treatment and containment technologies that satisfy the ROs;
- includes remedial technology screening;

- includes the development and analysis of remediation alternatives and technologies; and
- includes a comparison of the remedies and proposes a remedy.

2.1 Remedial Objectives

The ROs developed as part of the RI process, pursuant to A.A.C. R18-16-406 (I), were based on field investigation results, the land and water use surveys, the screening level risk evaluation, ADEQ input and input from the community during the draft RO report public comment period. ROs are used during remedial alternatives development to identify appropriate remedial technologies.

2.2 Development and Screening of Remedial Measures

Remedial measures are remediation technologies or methodologies, and are screened based on anticipated removal or reduction of contaminants at a site and the ability to achieve the ROs. The FS evaluation will look at future risk under reasonably foreseeable uses of the source facility and surrounding properties. Typically, appropriate remediation alternatives and technologies are screened using the following criteria:

- compatibility with current and reasonably foreseeable land use,
- contaminants of concern treatment effectiveness,
- regulatory requirements,
- constructability,
- operation and maintenance requirements,
- health and safety considerations,
- generation and management of waste products,
- flexibility/expandability, and
- cost.

Selected remedial measures will then be assembled with selected strategies to develop the reference remedy and alternative remedies. The remedial strategies to be developed, consistent with A.A.C. R18-16-407 (F), are listed below. Source control shall be considered as an element of the reference remedy and all alternative remedies, if applicable, except for the monitoring and no action strategies. A strategy may incorporate more than one remedial measure.

- plume remediation;
- physical containment;
- controlled migration;

- source control;
- monitoring; and,
- no action alternative.

2.3 Development of Reference Remedy and Alternative Remedies

Based upon the retained remedial measures and strategies, a reference remedy and two alternative remedies will be developed as described in A.A.C. R18-16-407(E). The combination of the remedial strategy and the remedial measures for each alternative remedy shall achieve the ROs. The reference remedy and any alternative remedy also may include contingent remedial strategies or remedial measures to address reasonable uncertainties regarding the achievement of ROs or uncertain time-frames in which ROs will be achieved. The reference remedy and alternative remedies will be described in the FS report in sufficient detail to allow evaluation using the comparison criteria, but plans at construction level details are not required at this time. Standard measurements for comparison of alternative remedies are included in Appendix A of A.A.C. R18-16-407 and may be used, as applicable, for comparison of the relevant factors. Where appropriate, the reference remedy and an alternative remedies may incorporate different strategies for different aquifers, or portions of aquifers.

The reference remedy shall be developed based upon best engineering, geological, or hydrogeological judgment following engineering, geological, or hydrogeological standards of practice, considering the following:

- the information in the RI;
- the best available scientific information concerning available remedial technologies,
- preliminary analysis of the comparison criteria and the ability of the reference remedy to comply with A.R.S. §49-282.06.

At a minimum, at least two alternative remedies shall be developed for comparison with the reference remedy. At least one of the alternative remedies must employ a remedial strategy or combination of strategies that is more aggressive than the reference remedy, and at least one of the alternative remedies must employ a remedial strategy or combination of strategies that is less aggressive than the reference remedy. A more aggressive strategy is a strategy that requires fewer remedial measures to achieve the ROs; a strategy that achieves the ROs in a shorter period of time; or a strategy that is more certain in the long term and requires fewer contingencies.

In accordance A.A.C. R18-16-407(G), in identifying remedial measures, the needs of the well owners and the water providers and their customers will be considered, including quantity and quality of water, water rights, and other legal constraints on water supplies, reliability of water suppliers and any operational implications. Such remedial measures may include, but will not be limited to, well replacement, well modification, water treatment, provision of replacement water supplies and engineering controls. Where remedial measures are relied upon to achieve ROs,

such remedial measures will remain in effect as long as required to ensure the continued achievement of those objectives.

A comparative evaluation of the reference remedy and the alternative remedies developed will be conducted. In accordance with A.A.C. R18-16-407(H), each remedy will be evaluated using the following:

- A demonstration that the remedial alternative will achieve the ROs.
- An evaluation of consistency with the water management plans of the affected water providers and the general land use plans of the local governments with land use jurisdiction.
- An evaluation of the comparison criteria, including:
 - a. practicability of the alternative;
 - b. an evaluation of risk, including the overall protectiveness of public health and aquatic and terrestrial biota;
 - c. cost of the alternative;
 - d. benefit or value of the alternative;
 - e. a discussion of the comparison criteria as evaluated in relation to each other.

Based upon the evaluation and comparison of the reference remedy and the other alternative remedies developed, a proposed remedy will be developed and described in the FS in accordance with A.A.C. R18-16-407(I). The FS report shall describe the reasons for selection of the proposed remedy including the following:

- how the proposed remedy will achieve the ROs;
- how the comparison criteria were considered; and
- how the proposed remedy meets the requirements of A.R.S. §49-282.06.

3.0 COMMUNITY INVOLVEMENT

ADEQ will issue a Notice to the Public announcing availability of the WP to implement the FS on ADEQ's website at www.azdeq.gov. The notice may be mailed to the Public Mailing List for the site; water providers, the Community Advisory Board, and any other interested parties.

4.0 FEASIBILITY STUDY REPORT FORMAT

An FS report will be prepared documenting the FS process. The FS report will be organized into the following sections:

- **Section 1.0 INTRODUCTION**
This section will summarize the purpose of the FS report.
- **Section 2.0 SITE BACKGROUND**
This section will present a summary of the site description, physiographic setting, nature and extent of contamination and a risk evaluation.
- **Section 3.0 FEASIBILITY STUDY SCOPING**
This section will present the regulatory requirements presented in statute and rule, delineate the remediation areas and present the ROs identified in the RI.
- **Section 4.0 IDENTIFICATION AND SCREENING OF REMEDIAL MEASURES AND REMEDIAL STRATEGIES**
This section will present the evaluation and screening of various remedial measures and strategies related to contamination in soil and groundwater and lists the technologies that have been retained for evaluation as part of the reference and alternative remedies pursuant to A.A.C. R18-16-407 (E)(F).
- **Section 5.0 DEVELOPMENT OF REFERENCE REMEDY AND ALTERNATIVE REMEDIES**
This section will present the selected reference remedy, and at a minimum, a more aggressive remedy and a less aggressive remedy. Each remedy will include a discussion of the associated remedial measures and remedial strategies pursuant to A.A.C. R18-16-407(E).
- **Section 6.0 DETAILED COMPARISON OF THE REFERENCE REMEDY AND THE ALTERNATIVE REMEDIES**
The remedies will be compared to each other based on the comparison criteria of practicability, cost, risk and benefit. Uncertainties, if identified, associated with each remedy or comparison criteria will be discussed pursuant to A.A.C. R18-16-407(H).
- **Section 7.0 PROPOSED REMEDY**
This section will present the proposed remedy as required in A.A.C. R18-16-407(I), and discusses how it will achieve the ROs, how the comparison criteria were considered, and how the proposed remedy will meet the requirements of A.R.S. §49-282.06.
- **Section 8.0 COMMUNITY INVOLVEMENT**
This section will document the community involvement activities conducted in association with the FS.

5.0 REFERENCES

Arizona Department of Environmental Quality, 2015. Remedial Investigation Report, East Central Phoenix 40th Street and Indian School Road, Water Quality Assurance Revolving Fund Site, Phoenix, Arizona. April 2015.

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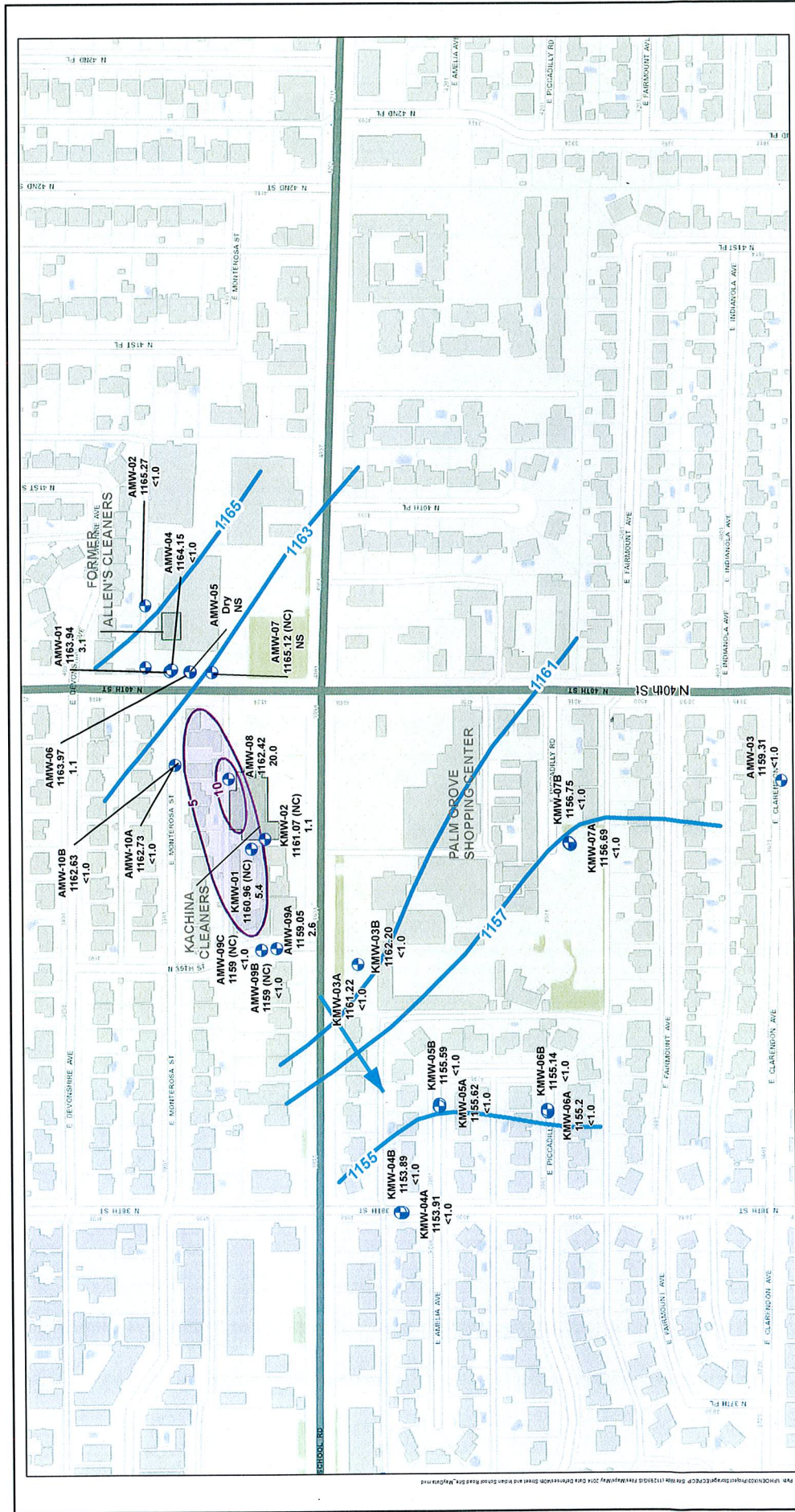
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FIGURES



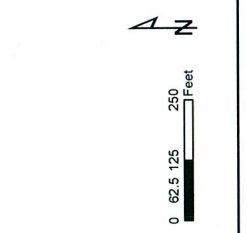
EAST CENTRAL PHOENIX
 WQARF SITE
 PHOENIX, ARIZONA

40TH STREET AND INDIAN SCHOOL ROAD

HARGIS + ASSOCIATES, INC.
 HYDROLOGY - ENGINEERING

10/1/2014
 FIGURE 1

PREP BY NKR REV BY LLJM_RPT NO 1134-41



- EXPLANATION**
- Groundwater Monitor Well Locations
 - Water Level Contour
 - Direction of Groundwater Flow
 - Estimated PCE Plume in Groundwater
 - NS -- Not Sampled
- 1159.31 -- Groundwater elevation (ft above mean sea level) - May 2014
- <1.0 -- Recent PCE groundwater concentration (µg/L)
 (May 2014)
- NC -- Data not used in contouring and interpretation of groundwater flow direction; casing elevation measurement is considered suspect.

