

**FEASIBILITY STUDY WORK PLAN  
20th STREET AND FACTOR AVENUE  
WQARF REGISTRY SITE  
YUMA, ARIZONA**



November 25, 2014

Arizona Department of Environmental Quality  
Remedial Projects Unit  
1110 West Washington  
Phoenix, Arizona 85007

## TABLE OF CONTENTS

<b>LIST OF ABBREVIATIONS &amp; ACRONYMS .....</b>	<b>ii</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
<b>1.1 Purpose.....</b>	<b>1</b>
<b>1.2 Site Description .....</b>	<b>1</b>
<b>2.0 FEASIBILITY STUDY TASKS .....</b>	<b>3</b>
<b>2.1 Remedial Objectives .....</b>	<b>3</b>
<b>2.2 Development and Screening of Remedial Measures.....</b>	<b>3</b>
<b>2.3 Development of Reference Remedy and Alternative Remedies .....</b>	<b>4</b>
<b>3.0 COMMUNITY INVOLVEMENT.....</b>	<b>6</b>
<b>4.0 FEASIBILITY STUDY REPORT FORMAT .....</b>	<b>6</b>
<b>5.0 REFERENCES.....</b>	<b>7</b>

## FIGURES

**Figure 1. 20th Street and Factor Avenue WQARF Site - Yuma, 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
COC	Contaminants of Concern
1,1-DCE	1,1-dichloroethene
DEHP	Di(2-ethylhexyl)phthalate
FS	Feasibility Study
PCE	Tetrachloroethene
TCE	Trichloroethene
RO	Remedial Objectives
RI	Remedial Investigation
SRL	Soil Remediation Level
1,1,1-TCA	1,1,1-trichloroethane
TCE	Trichloroethene
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 20<sup>th</sup> Street and Factor Water Quality Assurance Revolving Fund (WQARF) site (the site) in Yuma, Arizona. This work plan 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 approximately one-half mile south of 16th Street (U.S. Highway 95) and approximately three-quarters of a mile east of Fourth Avenue (Interstate 8 Business Loop) in Yuma, Arizona. The site is bounded approximately to the north by 17th Street, to the south by 21st Street, to the east by Kennedy Lane and to the west by Fourth Avenue. (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 data collected, the following represents the interpretations and conclusions reached as a result of the RI.

Wastewater containing spent photo-processing chemicals including tetrachloroethene (PCE), and cyanide compounds was discharged onto or into soils at the Houston International Ltd. facility either directly or indirectly through wastewater disposal systems and land application. Investigations have indicated the presence of the following compounds in samples of soil, soil vapor, and groundwater at the site; PCE, trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), Di(2-ethylhexyl)phthalate (DEHP), benzene, total cyanide, and free (amenable to chlorination) cyanide. Based on the results of the RI, the site Contaminants of Concern (COCs) include PCE, TCE, 1,1-DCE, cis-1,2-DCE, DEHP, total cyanide, and free cyanide. These chemicals are all thought to have originated from, or been derived from chemicals that originated from the facility and have all been detected during the RI in soil at concentrations exceeding Soil Remediation Levels (SRLs) and/or groundwater at concentrations exceeding Arizona Aquifer Water Quality Standards (AWQS). The Houston International, Ltd. facility has been identified by ADEQ as a source of the COCs. To date, ADEQ has not identified any other sources.

Based on historical data, COCs were introduced to the subsurface via wastewater disposal systems. Spent wastewater was also disposed directly onto surface soils in one of three ways. It was either discharged to water plants in front of the building, or it was discharged to the soil in the southwest portion of the facility via a sprinkler system, or discharged to a 1,000-gallon concrete underground sump on the east side of the facility. When this sump on the east side of the property was full, it was discharged to a disposal pond on the east side of the facility. Wastewater from this disposal pond overflowed onto the adjacent property to the east of the facility.

As of January 2014, the site groundwater monitoring/sampling network includes 48 groundwater monitoring wells, two triple-nested piezometer wells, one extraction well, and two production wells that are screened within various zones of the aquifer. Groundwater levels have remained relatively stable at the site at depths of approximately 80 feet below ground surface (bgs).

Historical data collected at the site has documented the migration of COCs from the facility downgradient towards groundwater users. The extent of COC contamination in groundwater is as follows:

- In the upper 105 feet of the aquifer (A-Zone), the lateral extent of VOC contamination extends approximately 2,700 feet northwest or downgradient from the source area. The lateral extent of the cyanide contamination in the A-Zone at Site extends approximately 1,300 feet northwest from beneath the facility.
- In the B-Zone (105 to 170 feet bgs) of the aquifer, the lateral extent of VOCs extends approximately 4,100 feet northwest from the source areas at the facility.

Based on hydraulic gradients and aquifer characteristics, groundwater is believed to move at average velocities of approximately 37 feet per year in the A-Zone, 91 feet per year in the B-Zone, and 73 feet per year in the C-Zone, and the general flow direction in each of the three zones is to the northwest.

Land use in the area around the facility consists of mixed-use, low-density residential use, with the usage of properties in the immediate vicinity of the facility consisting of local commercial and light industrial use. There is no appreciable surface water within the site boundaries. Groundwater is used for irrigation in the vicinity of the site. The potential receptors most likely to be influenced by further downgradient progress of releases from the facility are believed to be the irrigation-production well at the Alice Byrne Elementary School and the irrigation-production well at the St. Francis of Assisi School.

## **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,
- COC 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.18-16-407(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 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 Arizona Revised Statutes (A.R.S.) §49-282.06.

### **3.0 COMMUNITY INVOLVEMENT**

ADEQ will issue a Notice to the Public announcing availability of the work plan to implement the Feasibility Study on ADEQ's website at [www.azdeq.gov](http://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**

Tetra Tech, 2014. Remedial Investigation Report 20<sup>th</sup> Street and Factor Avenue WQARF Site. Yuma, Arizona. June 2014.

## **FIGURES**

Figure 1

20th Street and Factor Avenue WQARF Site - Yuma, Arizona

