URS

WORK PLAN FOR FEASIBILITY STUDY MIRACLE MILE WQARF SITE

Prepared for
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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APPENDICES

ACRONYMS

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AWQS	Aqueous Water Quality Standard
bgs	below ground surface
CAP	Central Arizona Project
COC	Contaminant of concern
Cr III	Trivalent Chromium
Cr IV	Hexavalent Chromium
FS	Feasibility Study
FWID	Flowing Wells Irrigation District
GPL	Groundwater Protection Limit
gpm	Gallons per Minute
GPS	Global Positioning Satellite
HASP	Health and Safety Plan
IDW	Investigation Derived Waste
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NTU	Nephelometric Turbidity Units
PID	Photoionization detector
ppm	parts per million
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RO	Remedial Objectives
SAP	Sampling and Analysis Plan
SOPs	Standard Operating Procedures
SPLP	Synthetic Precipitation Leaching Procedure
SRL	Soil Remediation Level
TCE	Trichloroethylene
URS	URS Corporation
USTS	Underground Storage Tanks
VCMHP	Villa Capri Mobile Home Park
VOC	Volatile Organic Compound
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

This Work Plan describes the site background and contaminants of concern (COCs), data gaps assessment, scope of work, community involvement, and schedule for conducting a Feasibility Study for the Miracle Mile Water Quality Assurance Revolving Fund (WQARF) Site in Tucson, Arizona. The primary COC at the site is trichloroethylene (TCE). The contents of this document are based on current knowledge of the site and anticipated field conditions; however, slight changes may be necessary if current conditions change. These conditions and changes will be discussed with and approved by the Arizona Department of Environmental Quality (ADEQ) before implementation.

1.1 FEASIBILITY STUDY SUMMARY

The Feasibility Study is a process to identify a reference remedy and alternative remedies that appear to be capable of achieving remedial objectives. The potential remedies will be evaluated based on the comparison criteria to select a remedy that complies with WQARF regulations. At a minimum, two alternative remedies shall be developed for comparison with a reference remedy. At least one of the alternative remedies will employ a remedial strategy or combination of strategies that is more aggressive than the reference remedy, and at least one of the alternative remedies will employ a remedial strategy or combination of strategies that is less aggressive than the reference remedy.

The description for each remedy developed will include:

- A demonstration that the alternative will achieve the remedial objectives.
- An evaluation of consistency with the water management plans of affected water providers and the general land use plans of local governments.
- An evaluation of the comparison criteria, including:
  - The practicability of the alternative, including its feasibility, short and long-term effectiveness, and reliability,
  - The risk, including the overall protectiveness of public health and aquatic and terrestrial biota under reasonably foreseeable use scenarios and end uses of water,

- The cost of the remedial alternative, consisting of the expenses and losses including capital, operating, maintenance, and life cycle costs,
- The benefit, or value, of the remediation, and
- A discussion of the comparison criteria, as evaluated in relation to each other.

Based upon the results of the evaluation, a proposed remedy for source control and management of plume migration will be described in the Feasibility Study. The report will detail how the comparison criteria were considered and how the proposed remedy meets the requirements of Arizona Revised Statutes § 49-282.06.

1.2 REMEDIAL OBJECTIVES

In June 2012 ADEQ published the *Final Remedial Objectives Report*. The remedial objectives (ROs) for the site were developed as required by R18-16-406 of the remedy selection rules of the Arizona Administrative Code. These rules require that ROs be established for the current and reasonably foreseeable uses of land and waters of the state that have been or are threatened to be affected by release of a hazardous substance above a regulatory or risk-based standard.

The ROs were stated in the following terms: (1) protecting against the loss or impairment of each use; (2) restoring, replacing, or otherwise providing for each use; (3) when action is needed to protect or provide for the use; and (4) how long action is needed to protect or provide for the use.

With regards to land use, the ADEQ report states the following:

The RO for land use at the former Spring Joint Specialists and RSC properties is to protect against possible exposure to hazardous substances in surface and subsurface soils that could occur if property improvements were made to facilitate commercial use. ADEQ will ask the property owners to place a DEUR on their properties (or portions of properties) containing hexavalent chromium above the residential SRL to ensure that current and future property owners maintain the property as non-residential use and maintain the asphalt as an engineering control. If additional work at the Site is necessary beyond maintenance of the

asphalt cover, ADEQ will coordinate with the property owners and work towards a remedy that is compatible with these development plans.

With regards to water use, the ADEQ report states the following:
The Site includes the Flowing Wells Irrigation District (FWID) which is the primary municipal water provider for the area. FWID currently operates eight wells, withdrawing approximately 2,800 acre-feet of groundwater per year for its approximately 15,000 customers. Three of these eight wells are located in or near the Site. FWID also has an inactive well in the Site, FWID-66, in which TCE was detected above the MCL and AWQS of 5 µg/L. FWID has partnered with ADEQ to construct a combination VOC and arsenic treatment system. [NOTE: The arsenic is naturally occurring and thus is not a Site COC.] This system treats the water extracted from FWID wells 70 and 75 within the Site.

FWID does not expect to change the number of wells or the amounts of water removed from the aquifer in the near future. However, FWID does plan to use Central Arizona Project (CAP) water to augment the groundwater supply when CAP water becomes available. This alternative is not expected to occur for several years.

Villa Capri Mobile Home Park (VCMHP) receives its potable water from an onsite well, though it is also connected to a municipal source for emergencies. VCMHP has 258 spaces and it is operating almost at capacity.

The following RO was established in the ADEQ report with regards to groundwater use:
The RO for groundwater will be to restore, replace or otherwise provide and protect for the current and future potable use of the regional aquifer threatened or impacted by TCE and/or chromium contamination emanating from the Site. This action is needed for as long as the level of contamination in the groundwater resource threatens or prohibits its use as a municipal water supply.

Further with regards to groundwater use:

The RO for groundwater will be to protect for the future non-potable use of the regional aquifer threatened by the TCE and/or chromium contamination emanating from the Site. This action is needed for as long as the level of contamination in the groundwater resource threatens its use as a non-potable water supply.

One private domestic well is located within the Site which could be used in the future. The well owner did indicate that the well is currently not used; however, in the future he would like to use the well water to irrigate his property if the groundwater becomes usable. No private domestic wells are currently being used. All other private well owners indicated that they are not using well water and do not intend to do so in the future. Therefore, no RO for domestic water supply use is needed for this Site at this time.

Additional discussion of non-potable water use is as follows:

Pima County Wastewater Management owns a non-exempt water supply well within the Potential Impact Area and west of the Site contaminant plume. The owner has indicated that this well is used for standby/emergency industrial non-potable water supply.

2.0 DATA GAPS ASSESSMENT

As a component of development for this work plan, URS has performed a review of existing data to identify potential gaps in the hydrogeologic/contaminant characterization of the site. This included primarily a review of the Final Remedial Investigation (RI) Report (URS, 2013), which incorporated historical documents prepared by consultants for ADEQ. The data gaps evaluation also incorporated data that have been collected by URS as part of monitoring activities performed on behalf of ADEQ and the long-term groundwater monitoring program which URS has been contracted to perform. The Final Feasibility Study Report will include a description and the results of the work performed to evaluate and close these data gaps:

1. Evaluate whether perched groundwater monitor wells should be installed at the previous passive soil-gas investigation hot spots at the Friedman Recycling and Public Storage properties. New monitoring well IRA-40 will be drilled (See Appendix A – Figure 1).
2. Evaluate whether a regional aquifer monitor well is needed between the IRA-36/IRA-37 well pair and the Villa Capri Mobile Home Park well. New monitoring well IRA-38 will be drilled (See Appendix A – Figure 1).
3. Evaluate whether a regional aquifer monitor well is needed between IRA-25, IRA-24, and IRA-5. New monitoring well IRA-39 will be drilled (See Appendix A – Figure 1).
4. Evaluate whether a vertical delineation well is needed near IRA-14. New monitoring well IRA-41 will be drilled (See Appendix A – Figure 1).
5. Determine the extent of chromium contamination in the soil in the vicinity of the Spring Joint property.
6. Determine the possibility of chromium in the perched groundwater in the vicinity of the Spring Joint property.
7. Additional soil borings, soil sampling and possible installation of perched groundwater monitor wells are recommended in the areas to the north, south and east of the perched groundwater monitor wells SJ-MW-1 and SJ-MW-2 to better define the extent of the chromium contamination in this area.

(See Appendix B for #5, #6 and #7).

8. Perform additional sampling to determine whether nitrate/nitrite is a groundwater COC for the Site. If it is a COC, evaluate the extent of nitrate above the Aquifer Water Quality Standard and the source(s).

3.0 GROUNDWATER MODEL FINALIZATION

The purpose of the groundwater flow model is to provide hydrologic evaluation of the various groundwater remedial strategies. The development and finalization of a three-dimensional groundwater flow model for the site will continue using MODFLOW public domain code. The model is being constructed using available data and, in areas with little data, professional judgment and published information is being used. The current version of Groundwater Vistas, a groundwater modeling environment that couples groundwater design systems with a set of comprehensive graphical analysis tools, is being used to develop, calibrate and utilize the model.

The model will be documented in a report to ADEQ. The report will detail the objectives and limitations of the model, the construction details, and the calibration results. Details will be presented graphically in a form understandable to the general public.

The fully developed model will be calibrated to historic water level information available from past monitoring at Miracle Mile WQARF site, Tucson Water, and City of Tucson Environmental Services. Following development and calibration of the groundwater flow component, particle tracking and contaminant transport modeling will be completed.

The groundwater model will be developed to simulate the regional groundwater flow conditions and the fate and transport of the TCE plume, which is the chemical of concern in the regional groundwater.

3.1 MODEL LAYERING

The groundwater model is a sub-model from the regional groundwater flow model of the Tucson active management area completed by the Arizona Department of Water Resources in 2006 which includes three layers (ADWR, 2006).

- Layer 1 simulates the Upper Tinaja beds with bottom elevation of 1950 feet (ft) mean sea level in the area of interest northeast of the highway. The bottom elevations of other areas of

Layer 1 are the same as the regional model Layer 2, which is for Tinaja Beds. The hydraulic property of Layer 1 is the same as regional model Layer 2.

- Layer 2 simulates the Middle Tinaja beds. The bottom elevations of Layer 2 are equal to the bottom elevations of regional model Layer 2 minus 300 ft. This is to include complete well screen of the FWID wells.
- The regional model Layer 3 is simulated as a confined aquifer given transmissivity without thickness. For the purpose to simulate particle tracking and fate and transport, the layer needs thickness and bottom elevations. In the sub-model, this layer was modified to have an assumed thickness of 1,000 ft. Subtracting 1,000 ft from the bottom elevations of Layer 2 generated the bottom elevations of Layer 3. The hydraulic conductivities are obtained by dividing the original transmissivity by 1,000 ft, thus are equivalent to the hydraulic property that is simulated in the regional model.

3.2 GROUNDWATER FLOW MODEL CALIBRATION

Even though the groundwater conditions at the site are highly transient, a quasi-steady state flow model which represents the long-term average groundwater flow directions and groundwater flow velocity, is considered adequate for the purpose of evaluating the contaminant plume fate and transport. Thus, the groundwater flow model will be calibrated as a quasi-steady state model using the groundwater levels and pumping rates measured in 2011.

3.3 FATE AND TRANSPORT MODELING

The groundwater fate and transport modeling will be conducted in two phases:

- Historical matching of the TCE plume to approximately match the current observed TCE plume extent – This process will allow estimation of the TCE source conditions and fate and transport parameters.
- Prediction of future TCE plume migration under different scenarios (such as natural attenuation and/or active remediation) using the estimated parameters and source assumptions obtained from the historical matching.

3.4 SOURCE ASSUMPTION

The TCE concentrations observed in the perched aquifer have been relatively stable from 2000 to 2011. In the regional groundwater model, the contribution from the perched zone will be simulated as contaminated recharge. The TCE concentration in the recharge will be calibrated through the historical matching of the TCE plume migration.

For model predictions, the calibrated TCE recharge will be assumed as a constant source of contaminant recharge to the regional groundwater system in the near future (30 years).

3.5 FATE AND TRANSPORT PARAMETERS

The fate and transport parameters include:

- Effective porosity (will be estimated based on lithology of the regional aquifer)
- Dispersivity (longitudinal, transverse, and vertical and will be estimated via historical matching of TCE plume migration)
- Soil-water partitioning coefficient
    - Total organic carbon content of saturated soil in regional aquifer
    - Bulk density of saturated soil in regional aquifer
- Biodegradation (will be estimated through data evaluation and historical matching simulation)

4.0 FEASIBILITY STUDY

Based on the updated Conceptual Site Model as developed from the RI Report and recent data, a Feasibility Study (FS) will be performed with the purpose of developing a reference remedy and two alternative remedies for: a) the elevated chromium in soils; b) the TCE contaminant plume. Each remedy will consist of a combination of a remedial strategy or strategies and remedial measures that will achieve the ROs for the Site. The FS will be conducted in accordance with the Arizona Administrative Code (A.A.C.) R18 16 407.

4.1 WORK PLANS AND QAPPS

Preparation and review of work plans and quality assurance project plans (QAPPs) for soil will be included. There are two work plans which can be found as the appendices to this document. Appendix A is the 2013 Monitor Well Installation Work Plan which outlines the installation and development of four new monitoring wells. There is a soil QAPP included with the Former Spring Joint Specialists Chromium Contaminated Soil Characterization Work Plan found in Appendix B. The soil QAPP outlines the procedures for sampling and analyzing the soil borings.

4.2 REMEDY DEVELOPMENT

In developing the reference remedy and two alternative remedies, the remedial strategies itemized in AAC R18-16-407(F) and remedial measures presented in AAC R18-16-407(F) will be considered.

4.3 REMEDY COMPARISON

The practicability, protectiveness, and cost considerations of each remedy will be evaluated as required by AAC R18-16-407(H). Where appropriate the groundwater model will be used to support such evaluation. Detailed cost estimates will be developed for each remedy to evaluate the cost considerations. Supporting documentation for the evaluation will be included in the FS Report. Criteria will be developed for the comparison of the remedies.

To reach the hospital from the intersection of Wetmore Road and Flowing Wells Roads, proceed north on Flowing Wells Road for three miles (Flowing Wells Road becomes La Canada Drive after crossing the Rillito Wash. At River Road, turn left (west), and go about one mile to La Cholla Blvd. Head north on La Cholla Blvd., Northwest Medical Center will be on the right just before reaching Orange Grove Road; it is at the southeast corner of Orange Grove Road and La Cholla Blvd. at 6200 N. La Cholla Blvd., Tucson, Arizona. The location of the hospital is illustrated on the following figure.