

**FEASIBILITY STUDY WORK PLAN
56th STREET AND EARLL DRIVE
WQARF SITE
PHOENIX, ARIZONA**



Prepared for:
NXP USA, Inc.

Prepared by:
Clear Creek Associates, LLC

November 2018



*Practical Solutions
In Groundwater Science*

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November 19, 2018

Ms. Nichole Osuch, Project Manager
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, Arizona 85007

RE: Feasibility Study Work Plan
56th Street and Earll Drive WQARF Site, Phoenix, Arizona
For NXP USA, Inc.

Dear Nichole:

At the request of Jenn McCall of NXP USA, Inc., Clear Creek Associates, LLC (Clear Creek) hereby submits the Feasibility Study Work Plan for the 56th Street and Earll Drive WQARF Site (hard copy and electronic copies) to the Arizona Department of Environmental Quality (ADEQ).

This submittal is pursuant to the provisions of the Consent Order, Docket No. RP-23-15, issued May 27, 2015 by the Director of the Arizona Department of Environmental Quality (ADEQ) with Freescale Semiconductor, Inc. and has been prepared in accordance with Arizona Administrative Code (A.A.C) R18-16-407.

Please call or contact me at Clear Creek Associates or Jenn McCall at NXP if you have any questions.

Sincerely,

CLEAR CREEK ASSOCIATES, LLC

A handwritten signature in blue ink, appearing to read "Thomas R. Suriano", with a long horizontal flourish extending to the right.

Thomas R. Suriano, RG
Principal

cc: Jenn McCall, NXP USA, Inc. (hardcopy and CD)

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Figure 1. 56th Street and Earll Drive 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 |
| Clear Creek | Clear Creek Associates, LLC |
| COC | Contaminants of Concern |
| COP | City of Phoenix |
| ERA | Early Response Action |
| FS | Feasibility Study |
| LGAC | Liquid-phase Granular Activated Carbon |
| MCLs | Maximum Contaminant Levels |
| NXP | NXP USA, Inc. |
| OCC | Old Crosscut Canal |
| PCE | Tetrachloroethene |
| RO | Remedial Objectives |
| RI | Remedial Investigation |
| Site | 56th Street and Earll Drive WQARF site |
| SRP | Salt River Project |
| TCE | Trichloroethene |
| VI | vapor intrusion |
| 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 56th Street and Earll Drive Water Quality Assurance Revolving Fund (WQARF) site (the Site) in Phoenix, Arizona. This WP was prepared by Clear Creek Associates, LLC (Clear Creek) on behalf of NXP USA, Inc. (NXP) and is required as part of the FS process, pursuant to Arizona Administrative Code (A.A.C.) R18-16-407(B).

The FS is a process 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) (Clear Creek Associates, 2018) 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 defined by the extent of impacted groundwater located downgradient of the former Motorola facility which consists of an approximately 14-acre parcel on the northwest corner of 56th Street and Earll Drive (Facility) (Figure 1). Prior to listing as a WQARF site, the Site was referred to in historical reports as the 56th Street Study Area. The Contaminants of Concern (COCs) at the Site are trichloroethene (TCE) and tetrachloroethene (PCE). Historical soil and vadose zone remediation efforts at the Facility have successfully removed sources of contamination, and the groundwater beneath and immediately downgradient of the Facility is no longer impacted by the COCs.

The Facility was first occupied in the spring of 1950 by Motorola Inc. as a research and development operation and was used for a variety of product development, manufacturing, and

testing operations until 1982. After 1982, manufacturing operations were discontinued and the Facility was redeveloped for office uses. Starting in 1984, investigations were conducted at the Facility to determine if the soils and groundwater in the area were contaminated; other potential sources in the area also were evaluated. Various source removal and remediation activities were conducted at the Facility over time. The Facility was vacated by Motorola and sold to developers in 2005. The Facility is currently used as a charter school and is expected to remain as such for many years. The remaining land use at the Site is primarily residential, light commercial, retail, schools, restaurants, and office buildings. The area is nearly fully developed and no major land use changes are expected.

Groundwater use in the Site is limited to withdrawal by the Early Response Action (ERA) NXP is currently operating at the Site in accordance with A.R.S §49-282.06.A and A.A.C. R18-16-405 and operation of Salt River Project (SRP) supply wells as described below. The ERA was implemented to protect a SRP well (discussed below) and to control or contain contamination to reduce the scope or cost of the remedy needed at the Site. The ERA consists of two extraction wells and a Liquid-phase Granular Activated Carbon (LGAC) groundwater treatment plant on the Grand Canal to remove COCs from the extracted water. Treated water from the ERA is discharged to the Grand Canal and is currently provided to SRP for beneficial re-use for agricultural and urban irrigation, and groundwater replenishment.

The City of Phoenix (COP) does not currently use groundwater from wells in the Site as a source of drinking water. SRP has three irrigation supply wells identified in the Land and Water Use study area. Two of the wells (SRP 18.5E-7N on 44th Street north of Thomas Road and SRP 18E-5N on the Grand Canal west of 40th Street) are located cross-gradient from the identified plume. The third well, SRP 16.9E-6N on McDowell Road west of 32nd Street, is currently outside of and cross-gradient of the identified plume. The wells are not currently impacted by COCs from the Site, however, extended operation of SRP 16.9E-6N has the potential to alter upgradient flow paths to a sufficient degree to represent a potential future risk to the well. Protection of this well is one of the reasons the ERA was implemented at the Site. The SRP wells are occasionally pumped to produce groundwater which is discharged into the various laterals feeding the Grand Canal or directly to the Grand Canal where the groundwater is blended with surface water in the canal. The Grand Canal is currently used for agricultural and urban irrigation and aquifer recharge purposes and meets the water quality standards for such purposes. SRP has stated that they have an agreement with the City of Goodyear for a potential future drinking water use. Treated water from the LGAC groundwater treatment system operated as part of the ERA currently removes the COCs to, or below, their respective drinking water Maximum Contaminant Levels (MCLs).

Surface water in the area is limited to concrete-lined canals. There is no perennial surface water or stream flow and there are no ponds or lakes. There is occasional surface water flow in drainages as a result of storm water runoff such as to the landscaped-covered greenbelt of the Old Crosscut Canal (OCC) along 48th Street and to the north of McDowell Road.

The local hydrogeology is comprised of a saturated alluvial (Basin Fill) aquifer overlying bedrock. Groundwater impacts occur primarily in the alluvial aquifer although there are limited areas with identified impacts in the underlying bedrock. Groundwater flow and contaminant

migration is primarily to the southwest across the majority of the Site. West of the Grand Canal, groundwater flow and contaminant migration changes to a westerly direction in response to the presence of a bedrock high located to the south of the Site which locally re-directs groundwater flow. Review of time series charts for TCE and PCE for off-site monitor wells demonstrate the highest concentrations, representing the centroid of the contaminant mass, have migrated to the southwest over time along the predominant flow path. Peak TCE concentrations have also declined within the center of the plume over time as a result of source removal activities and natural attenuation by varying processes and overall decreasing concentration trends are observed in monitor wells in the central and eastern portion of the Site.

Groundwater impacts generally occur at the base of the alluvial aquifer near the alluvium-bedrock interface. Vertical profile sampling indicates that overlying groundwater is not impacted by COCs except in localized areas where groundwater flows over bedrock highs. Historical soil gas investigations conducted in the eastern portion of the Site (east of approximately 46th Street) identified low to non-detect concentrations of TCE in areas where groundwater impacts occurred near the alluvium-bedrock contact. Elevated soil gas concentrations were observed historically in an area with a bedrock high located at the COP Water Production facility at 52nd Street and Thomas Road.

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, as well as:

- 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. A strategy may incorporate more than one remediation technology or methodology. 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. The remedial strategies are:

- 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 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; and
- 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. With ADEQ's approval, one of the minimum required alternatives may use the same strategy as the reference remedy but use different viable technologies or a more intensive use of the same technology utilized in the reference remedy.

In accordance with A.A.C. R18-16-407(G), remedial measures necessary for each alternative remedy developed under subsection (E) to achieve remedial objectives or to satisfy the requirements of A.R.S. § 49-282.06(B)(4)(b) shall be identified in consultation with water providers or known well owners whose water supplies are affected by the release or threatened release of a hazardous substance. 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; and

- an evaluation of the comparison criteria, including:
 - practicability of the alternative;
 - an evaluation of risk, including the overall protectiveness of public health and aquatic and terrestrial biota;
 - cost of the alternative;
 - benefit or value the alternative; and
 - 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 work plan to implement the Feasibility Study 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 SCHEDULE AND REPORT FORMAT

An FS report will be prepared documenting the FS process. NXP anticipates submitting a draft report to ADEQ by June 30, 2019. 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) and (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

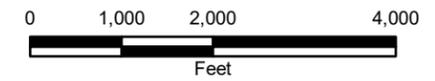
Clear Creek Associates, 2018. Remedial Investigation Report, 56th Street and Earll Drive WQARF Site, Phoenix, Arizona. Report prepared for NXP USA, Inc.

FIGURE



LEGEND:

AREA OF TCE CONCENTRATION
IN GROUNDWATER
ABOVE 5 ug/l IN ALLUVIUM
(OCTOBER 2016)



56TH STREET AND EARLL DRIVE
WQARF SITE

FIGURE 1