

TYSON WASH

2014 PERIODIC SITE REVIEW WATER QUALITY ASSURANCE REVOLVING FUND QUARTZSITE, ARIZONA



**2014 PERIODIC SITE REVIEW
TYSON WASH
WATER QUALITY ASSURANCE
REVOLVING FUND SITE
PAYSON, ARIZONA**

**Prepared by
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Tyson Wash WQARF Site
2014 PERIODIC SITE REVIEW
APPROVAL PAGE

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EXECUTIVE SUMMARY

The Arizona Department of Environmental Quality (ADEQ) has conducted this first Periodic Site Review (PSR) of the remedial action at the Tyson Wash Water Quality Assurance Revolving Fund (WQARF) Site (Site) located in Quartzsite, La Paz County, Arizona, pursuant to Arizona Administrative Code (A.A.C.) R18-16-410(B)(8). The trigger for this PSR was the Record of Decision (ROD) dated June 29, 2009.

The assessment of this PSR found that the remedy was constructed in accordance with the requirements of the ROD. The selected remedy for the Site is pumping groundwater from installed extraction wells, treating the extracted groundwater by granulated-activated carbon (GAC) in a 7-10 gallon per minute (gpm) system, and injecting the treated water back into the aquifer by way of injection wells. In June 2014, the GAC treatment was temporarily replaced by in-situ chemical oxidation (ISCO) treatment in order to expedite cleanup of the Tyson Wash Site.

This PSR finds that the selected remedy is protective of human health and the environment. The selected remedy is successfully treating groundwater and is helping ensure that contaminated groundwater is not part of the Town of Quartzsite's (Quartzsite) potable water supply. The ISCO treatment, started in June 2014, is demonstrating that it is capable of removing volatile organic compounds (VOCs) from impacted groundwater quicker than the GAC treatment system. This PSR indicates that the groundwater contaminant plume is not expanding but reducing in size and contaminant concentration. The Site is currently in the Operation, Maintenance & Monitoring (OM&M) phase.

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List of Acronyms

ADEQ	Arizona Department of Environmental Quality
Amec Foster Wheeler	Amec Foster Wheeler Environment and Infrastructure, Inc.
A.R.S	Arizona Revised Statutes
AWQS	Aquifer Water Quality Standards
bgs	below ground surface
c-1,2, DCE	cis-1,2-dichloroethene, cis-1,2-dichloroethylene
COC	Contaminant of Concern
1,1-DCE	1,1-dichloroethene, 1,1-dichloroethylene
EPA	Environmental Protection Agency
ERA	Early Response Action
EW	Extraction Well
FS	Feasibility Study
FY	Fiscal Year
GAC	Granular Activated Carbon
gpd	gallons per day
gpm	gallons per minute
H₂O₂	Hydrogen Peroxide
ISCO	In-Situ Chemical Oxidation
INJ	Injection Well
lbs/month	pounds per month
ORP	oxidation/reduction potential
O&M	Operation and Maintenance
OM&M	Operation, Maintenance, and Monitoring
P&T	pump and treat
PCE	Tetrachloroethylene, Tetrachloroethene, Perchloroethene
PRAP	Proposed Remedial Action Plan
PSR	Periodic Site Review
Quartzsite	Town of Quartzsite
RI	Remedial Investigation
RO(s)	Remedial Objective(s)
ROD	Record of Decision
Site	Tyson Wash WQARF Site
TCE	Trichloroethylene, Trichloroethene
µg/L	Micrograms per liter
VOC(s)	Volatile Organic Compound(s)
WQARF	Water Quality Assurance Revolving Fund

1.0 INTRODUCTION

The purpose of this Periodic Site Review (PSR) is to determine whether the remedy at the Tyson Wash WQARF Site (Site) is protective of human health and the environment. The methods, findings, and evaluations of reviews are documented in this PSR.

This report summarizes PSR activities conducted by ADEQ and Amec Foster Wheeler Environment and Infrastructure, Inc. (Amec Foster Wheeler) for this WQARF Site. Tetrachloroethene (PCE) is the primary contaminant of concern (COC). Table 1 in Appendix A summarizes PCE concentrations for groundwater samples collected in association with this project since January 2010, which is identified as the first remedy performance groundwater monitoring event performed under the June 2009 Record of Decision (ROD). Figures 1 through 9 in Appendix B show the location and extent of the source area, groundwater contour maps, PCE Concentration Maps, and the monitoring well network.

Investigation of the groundwater volatile organic compound (VOC) plume at the Site was initiated by the ADEQ in August 1995. On June 30, 2003, Amec Foster Wheeler (fka MACTEC) submitted the Final Remedial Investigation (RI) Report for the Site. The RI focused on three properties shown on Figure 3: the Welcome RV Park; the former Hi-Ali Motel; and the Cast (formerly Braswell) property. The greatest PCE concentration detected, at 200 micrograms per liter ($\mu\text{g/l}$), was reported in the domestic well at the Welcome RV Park in 1995. PCE was possibly used by historical dry cleaning operations at the Hi-Ali Motel and by truck repair at the Cast Property, both of which had septic systems. However, groundwater PCE concentrations at the former Hi-Ali Motel and Cast properties were much lower than those detected in water samples from the Welcome RV Park well. Septic systems at the Welcome RV Park property were also identified as a possible source. The source of the PCE was not identified based on soil and soil gas sampling.

2.0 SITE CHRONOLOGY

The following table presents a summary of the site chronology amended from ADEQ's online Tyson Wash WQARF Site Summary.

Noted Events	Date
In August, ADEQ collected a groundwater sample from a private drinking water well at the Welcome RV Park. Analytical results indicated a PCE concentration in the well of 200 $\mu\text{g/l}$ and trichloroethene (TCE) concentration of 6.2 $\mu\text{g/l}$.	1995
In April, ADEQ installed three groundwater wells in the vicinity of the Welcome RV Park. ADEQ and La Paz County held a public meeting in the Town of Quartzsite on Sept. 25, 1996. The purpose of the meeting was to inform the community on drinking water and groundwater issues.	1996
Additional site investigations were conducted between 1996 and 1998. ADEQ investigated the Welcome RV Park, Hi-Ali property, and the Cast property. Soil and soil vapor samples were collected at each of the properties in an effort to determine the source of contamination. Groundwater samples were collected from the private wells on the properties. ADEQ installed temporary wells to collect groundwater samples.	1996 1998

Noted Events	Date
In March, ADEQ installed two additional groundwater wells at the Site. The Site was placed on the WQARF Registry in December 1998 with an eligibility and evaluation score of 46 out of a possible 120.	1998
In September, ADEQ began the RI. The RI activities included installing five additional groundwater wells, completion of a health consultation to address the potential risk and completion of a groundwater flow and transport model.	1999
The health consultation indicated that the health risk from potential exposures at the Site was within Environmental Protection Agency (EPA) acceptable ranges. ADEQ began providing bottled water to the residents in December to prevent further exposure to the contaminants. In addition, signs warning of poor water quality were posted at each location where public access to the groundwater was possible. In-line water filters were provided to two residents whom were located on the outer edge of the plume.	2000
In March, ADEQ discontinued to provide bottled water to the residents because residents within the Tyson Wash WQARF area were connected to the Town water supply. In October, the draft RI report was completed and submitted for public comment. The report was finalized in June 2003. ADEQ began an Early Response Action (ERA) at the Site in August. The ERA was initiated to provide source control and remediate the groundwater beneath the Site.	2002
ADEQ installed two extraction wells (EW-1 and EW-2) and one injection well (INJ-1) as part of the pump and treat remediation (P&T) system. The remediation system was installed and startup began in March. ADEQ evaluated the use of bioremediation to be used in conjunction with the pump and treat system. After ADEQ's evaluation, it was determined that bioremediation at the Site was not feasible. A pilot study was completed in October. The results indicate that the P&T system would be effective at reducing the contaminants in the treatment area.	2003
Two groundwater monitor wells (QMW-11 and QMW-12) were installed on the Hi-Ali property in September to determine sources of groundwater contamination.	2004
In September, three additional extraction wells (EW-3, EW-4, and EW-5) and one injection well (INJ-2) were installed at the Site as an expansion to the treatment system in order to obtain capture of the contamination plume.	2005
In the May sampling event, the highest concentration of PCE and TCE in groundwater beneath the site was 130 µg/l and 4.0 µg/l, respectively. At the end of November, the remote monitoring system, known as the AlarmAgent, failed. This resulted in an automatic system shutdown.	2007
The Alarm Agent was off-site for upgrades/repairs twice during the year. In mid-May, the unit was removed and sent for repairs after a voltage spike caused it to lose programming. The unit was returned and re-installed in mid-June. Well EW-2 was taken offline, and the other wells were adjusted so the total pumping rate was between 7.5 and 8.0 gallons per minute (gpm).	2008
The P&T system continued to operate as the selected remedy. Some minor maintenance problems were encountered with the flow meter and the occurrence of algae in the holding tank. On July 30th, ADEQ issued a ROD that documented the long-term plan of action to remediate the site. Due to budget constraints, groundwater sampling was temporarily suspended until funding was available.	2009

Noted Events	Date
<p>The P&T system continued to operate and has reduced PCE and TCE contamination in the treatment area. During the sampling event conducted in November, the highest concentrations of PCE and TCE detected in groundwater beneath the site were 49 µg/l and 2.5 µg/l, respectively.</p> <p>Due to declining injection capacity, injection well # 2 (INJ-2) was re-drilled in October to increase the injection capacity by increasing the screen length. After re-drilling of INJ-2, the P&T system was pumping at a rate of approximately 10 gpm, and approximately 4,800 gallons per day (gpd). Prior to the re-drilling of INJ-2, the P&T system was pumping approximately 8 gpm and approximately 3,500 gpd.</p> <p>In the November groundwater sampling, PCE was detected in EW-5 at a concentration of 12 µg/l. A previous sample collected from EW-5 in December 2008 did not detect PCE above 1 µg/l. EW-5 is the northernmost extraction well in the P&T system. A pump was installed in extraction EW-5 in December.</p>	2010
<p>The P&T system continued to operate and reduced PCE and TCE contamination in the treatment area. At the time of the April sampling event, the highest concentrations of PCE and TCE detected in groundwater were 48 µg/l and 1.8 µg/l, respectively.</p> <p>In order to monitor the northerly movement of the groundwater contamination plume, monitor well QMW-14 was drilled approximately 100 feet north of EW-5. The initial sample collected from QMW-14 in May detected PCE at 1.9 µg/l.</p>	2011
<p>The groundwater sampling still indicates movement of the plume to the north. The 2012 groundwater sample collected from QMW-14 detected PCE at a concentration of 3.0 µg/l. Currently, EW-3, EW-4 and EW-5 are pumping. One additional round of groundwater sampling was conducted.</p> <p>Due to declining injection rates, INJ-2 was re-developed in March to increase the injection capacity. Prior to the re-drilling of INJ-2, the P&T system was pumping approximately 8 gpm and approximately 3,000 gpd. After the re-development of INJ-2 the P&T system was pumping at a rate of approximately 9 gpm, and approximately 4,400 gpd.</p> <p>Due to declining injection rates of INJ-1, INJ-3 was installed in November 2012, replacing INJ-1, to increase the injection capacity. Prior to the installation of re-drilling of injection INJ-3, the P&T system was pumping approximately 8 gpm and approximately 3,400 gpd. After installation of INJ-3, the P&T system was pumping at a rate of approximately 9.1 gpm, and approximately 4,000 gpd.</p>	2012

Noted Events	Date
<p>The March groundwater sampling still indicates movement of the plume to the north. The groundwater sample collected from QMW-14 detected PCE at a concentration of 3.2 µg/l. EW-3, EW-4, and EW-5 are pumping. One additional round of groundwater sampling was conducted in October.</p> <p>An ISCO pilot test was installed in April to inject a low concentration of a catalyzed hydrogen peroxide (H₂O₂) reagent, at a low injection rate, to decrease concentrations of PCE in the groundwater. The baseline PCE concentration for monitor well QMW-3 was 75 µg/L. The QMW-3 PCE concentrations for the samples collected on May 1, May 10, and May 24, 2013 were 33 µg/L, 31 µg/L, and 27 µg/L, respectively. The results indicated an initial 64 percent decrease of PCE concentrations during the pilot test. The baseline TCE concentration of 3.3 µg/L was decreased to <1 µg/L on May 24, 2013. The ISCO pilot test operated until May 28 and was decommissioned and removed from the Site on June 3.</p>	2013
<p>Due to a decrease in concentrations as a result the ISCO pilot test, a full scale ISCO system was placed in operation on June 5, 2014. EW-3, EW-4, and EW-5 pumped through June 2, 2014. EW-3 and EW-4 were then turned off prior to the full scale ISCO startup phase and equipped for chemical oxidant injection. EW-5 continued to be pumped at a low rate for hydraulic control with the water treated by chemical oxidants prior to injection to INJ-2 and INJ-3. By installing the full scale ISCO remediation system, ADEQ has the objective of achieving the groundwater remedial goal and closure of the site in a shorter timeframe than the continued operation of the P&T system. During the period of December 31, 2013 to December 22, 2014, EW-3, EW-4, and EW-5 pumped, treated and re-injected approximately 636,677 gallons of groundwater. An estimated 2.52 pounds of PCE have been removed by the P&T system since its startup on April 7, 2003. The full scale ISCO system was operational from June 5, 2014 through December 31, 2014 with planned operation through at least June 30, 2015.</p> <p>Due to an unexplained chemical reaction, there was a minor release of chemical oxidants on August 7, 2014. The chemical oxidants quickly degraded to hot water and there was no risk to public health or safety. System modifications were put in place to prevent future releases.</p>	2014

3.0 BACKGROUND

3.1 Physical Characteristics

The Site contaminated groundwater plume is bounded by W. Sunset Street to the north, Oregon Avenue to the west, Main Street (Business I-10) to the south, and N. Central Boulevard (SR-95) to the east in the Town of Quartzsite (Quartzsite), Arizona. The known groundwater contamination exists northwest of the intersection of State Hwy. 95 and Business Route I-10. A site map is provided as Figure 1 in Appendix B.

Subsurface soils at the Site consist of two main units. Interbedded layers of well-cemented gravel, sand, silt, and clay exist from approximately ground surface to 70 feet below ground surface (bgs). Below 70 feet the soils consist of silty clay to clay, with the estimated clay percentage ranging from

50 percent to nearly 100 percent. The groundwater system in the vicinity of Quartzsite consists of a shallow and a deep aquifer. The shallow aquifer exists from approximately 45 to 70 feet bgs. The depth to groundwater in the deep aquifer is encountered at approximately 400 to 500 feet bgs. The shallow aquifer beneath the Site has been impacted by PCE and TCE contamination.

As of November 2014, the depth to the shallow groundwater aquifer beneath the Site ranges from approximately 34 to 41 feet bgs. Groundwater levels have risen an average of 10.24 feet since May 2000 and were at the highest measured levels by November 2014. In March 2002, the direction of groundwater flow was to the north/northeast. In September 2003, the direction of groundwater flow was to the north. Quartzsite is currently providing water and sewer to the residents within the Site. Due to the residents receiving Quartzsite water, their private well use has declined. The decline in use of the water in the shallow aquifer may be the reason the direction of groundwater flow is towards the north/northwest along Tyson Wash and why water levels are rising. Figure 2 is a groundwater elevation hydrograph for the Site wells and Figure 3 provides the April 2014 groundwater elevations (Appendix B).

3.2 Land and Resource Use

The Site includes approximately twelve acres of low density residential and commercial properties. Land use within the Site includes residences, a mobile home park, a restaurant, and a former hotel. Future land use within the general Site area is expected to remain similar, but increase in density. The Quartzsite General Plan proposes a commercial development node at the intersection of Business Loop I-10 and Highway 95, just outside the southeast boundary of the Site.

3.3 History of Contamination

In August 1995, ADEQ collected a groundwater sample from the private drinking water well at the Welcome RV Park. Analytical results indicated PCE concentrations in the well at 200 µg/l and TCE concentration at 6.2 µg/l, which are above the AWQSs of 5.0 µg/l for PCE and TCE. This triggered additional investigation to identify the source(s) and extent of the contamination. The RI was completed in 2003; however, groundwater wells QMW-11 and QMW-12 were installed at the Hi-Ali Motel property in September 2004 to evaluate the potential source and groundwater well QMW-14 was installed during May 2011 as a downgradient sentinel well.

In addition to PCE, the RI also identified TCE, cis-1,2-dichloroethene (c-1,2-DCE), and 1,1-dichloroethene (1,1-DCE) as additional COCs. Of these, only TCE has been detected slightly above the AWQS of 5.0 µg/l and only in samples collected from wells QMW-1, QMW-3, QMW-4, and the Welcome RV Park Well. TCE has not been reported above the AWQS in a monitoring or domestic well since 2006.

3.4 Initial Response

As an ERA in 2003, ADEQ constructed a pilot P&T system consisting of extraction wells EW-1 and EW-2 and injection well INJ-1. The extracted groundwater was treated below AWQSs and injected into the aquifer by way of INJ-1. The primary objective of this P&T system was to decrease groundwater PCE and TCE concentrations in the Welcome RV Park well. A bench scale bioremediation treatability study was also performed. The results of the treatability study indicated that bioremediation would eventually achieve the remediation goals; however, due to the hydrogeologic conditions it was determined that implementation was not feasible. In September 2005, the pilot P&T system was expanded to a full-scale P&T system which included the addition of three extraction wells (EW-3 through EW-5) and an upgradient injection well (INJ-2). The full-scale P&T system operated as an ERA until June 2009 when it was selected as the groundwater remedy for the ROD. During the ERA period, an estimated 6,104,727 gallons of water were pumped and treated and an estimated 1.27 pounds of PCE were removed from the aquifer. PCE concentration decreases were recorded as follows:

- QMW-1: 98 µg/l (9/28/05) – 5.2 µg/l (12/10/08)
- QMW-3: 200 µg/l (12/07/05) – 44 µg/l (12/10/08)
- Welcome RV Park: 200 µg/l (11/09/05) – 30 µg/l (12/12/08)

3.5 Basis for Taking Action

The PCE contamination currently appears to be limited to groundwater in the upper aquifer located at approximately 30 to 70 feet bgs. This aquifer was used as a source of drinking water for the area. There are 544 registered private wells within an approximately one-half mile radius of the Site. Nineteen privately owned wells are located within or on properties located immediately adjacent to the Site. Seven of the wells have been impacted by the VOC plume under investigation by ADEQ. An additional nine wells are considered to be threatened by the plume. The residents in the area are connected to the Quartzsite water supply system. A human health consultation was completed for the Site in October 2000. Based on this report, signs warning of non-potable water were posted at locations where public access to contaminated water is possible (e.g., outdoor spigots). Drinking water is provided by Quartzsite and must meet all state and federal drinking water standards. Groundwater from the impacted wells may be used for irrigating yards and trees. The lower aquifer, 500 feet bgs, has shown no evidence of contamination to date. The residents no longer need to use their wells as a drinking water supply. However, there are Quartzsite drinking water wells installed in the deeper regional aquifer located approximately 0.5 miles downgradient of the PCE plume boundary. Due to possible well construction issues, should the PCE plume migrate to these wells they may represent a contaminant migration pathway to the regional drinking water supply aquifer. The basis for taking remedial action is to remove PCE from the aquifer to below the AWQS of 5.0 µg/l and to prevent migration of the PCE plume to the regional drinking water wells.

4.0 REMEDIAL ACTIONS

The Site has undergone extensive investigation to characterize the nature and extent of contamination and to manage the effectiveness of the remedial activities. ADEQ completed the RI Report (2003) and the Feasibility Study (FS) Report (2007). The RI Report established the nature and extent of contamination; identified current and potential impacts to public health, welfare, and to the environment; identified current and reasonably foreseeable uses of land and waters of the state; and obtained and evaluated information necessary for identification and comparison of alternative remedial actions. The FS Report used the information collected for the RI to identify a reference remedy and alternative remedies that appeared to be capable of achieving the remedial objectives (ROs) (2003). The remedial actions were then evaluated based upon a comparison criteria that selected a remedy that complied with Arizona Revised Statute (A.R.S.) §49-282.06.

ADEQ used the evaluation of remedial alternatives in the FS Report to choose a remedial method. ADEQ then prepared a Proposed Remedial Action Plan (PRAP) that included a description of the chosen remedy, how the remedy would achieve each of the ROs identified in the RI Report, how accomplishment of the ROs identified would be measured, and a description of the use of the remediated water as defined in A.R.S. §49-287.01 (2008).

4.1 Remedy Selection - Record of Decision

The ROs established for the Site are to protect the public and the environment from exposure to COCs via land or groundwater use. The ROs identify a resource that, without remedial action, would be lost or threatened due to the presence of a contaminant within that resource.

The Selected Remedy to meet the ROs was groundwater P&T with the primary objective of containing plume migration while removing contaminant mass. Contaminant mass was removed using GAC treatment and the treated water was used to flush impacted groundwater toward the extraction wells. The remedial approach was operating as designed; however, mass removal was proceeding slowly and as of December 2013, it was estimated that an additional 10 years of operation may be required to achieve the remedial goals and closeout of the Site. In June 2014, ADEQ temporarily replaced the GAC treatment with ISCO treatment to expedite cleanup of the Site.

More specifically, the ROs for Land Use and Groundwater Use and the Metrics established to measure progress toward the ROs are as follows (2003):

Land Use	
Remedial Objective (RO):	Established Metric:
Established for those properties known to be contaminated with a hazardous substance. However, laboratory analyses of soil samples and soil gas samples have not definitively identified areas of soil contamination within the Site. VOCs in the soil may have been present at one time, but now have appeared to have volatilized, degraded, or dispersed into the groundwater or environment after they were released.	Since there is no evidence of soil contamination present above soil remediation levels in the areas that have been investigated, an RO for land use is not warranted.

Groundwater Use		
Remedial Objective (RO):	Rationale for RO:	Established Metric:
Lost or impaired use of potable water by private well owners. To protect, restore, replace, or otherwise provide a water supply for potable use by private well owners outside the current plume boundaries of the Site if the current use is impaired or lost due to contamination from the Site.	This RO is applicable until Town of Quartzsite water service connections can be confirmed.	Provide alternate drinking water supply until Town of Quartzsite water service connections were confirmed. This included provision of bottled water. This was performed up until March 2002.
Lost or impaired use of non-potable water by private well owners outside the plume boundaries – After the Town water connections are confirmed, to protect, restore, replace, or otherwise provide a water supply for non-potable use by private well owners outside the current plume boundaries of the Site if the current use is impaired or lost due to contamination from the Site.	This RO is needed for as long as the wells are used for non-potable purposes and their use is threatened, impaired, or lost as a result of contamination from the Site.	Preventing plume migration to sentinel well QMW-14 and decreasing PCE concentrations in Site wells below the AWQS of 5.0 µg/l.

The protection of threatened groundwater will continue for as long as the need exists, the resource remains available, and PCE contamination threatens use of groundwater.

4.2 Remedy Implementation

The Selected Remedy consists of the P&T system modified to include ISCO and a program of groundwater monitoring activities to evaluate the achievement of the ROs. The Selected Remedy is operated to achieve the following:

- best assure the protection of the public health and welfare,
- best assure the protection of the environment,
- to the extent practicable, provide for the control, management, and cleanup of the PCE contamination, maximizing beneficial use of the groundwater; and

- be reasonable, necessary, cost-effective, and technically feasible.

4.2.1 Groundwater Remediation System

4.2.1.1 Pump-and-Treat Remediation System Operation and Maintenance, System Design

The O&M of the P&T system is performed by Amec Foster Wheeler. Using this data, Amec Foster Wheeler tracks and calculates selected performance parameters (influent/effluent concentrations, volume of water treated, pounds of contaminants removed, etc.) which are then published in Operation, Maintenance & Monitoring Reports that are submitted semi-annually or annually to ADEQ.

The P&T system that operated from 2003 to June 2014 initially consisted of two extraction wells (EW-1 and EW-2) and one injection well (INJ-1). Groundwater was pumped at approximately 4.0 gpm and treated to below AWQs by a single 250-pound GAC unit prior to gravity reinjection to INJ-1 (see Appendix A, results for sample EFF). The P&T system was expanded in 2005 to include three additional extraction wells (EW-3, EW-4, and EW-5), an additional injection well (INJ-2), and an additional 250-pound GAC unit. The pumping rate was increased to approximately 7 to 8 gpm and the system operated 10 hours per day, approximately one hour on and two hours off to allow treated water to gravity drain to INJ-1 and INJ-2. During 2012, INJ-3 replaced INJ-1 and the pumping rate was increased to approximately 9 gpm on the same 10 hour per day operating schedule. INJ-1 and INJ-2 were subsequently taken off-line due to non-detectable concentrations of PCE and pumping of EW-3, EW-4, and EW-5 continued until June 2014. The treated water is gravity injected to injection wells via a 500-gallon equalization tank (see Photographs in Appendix C). To prevent overfills of the equalization tank, operation of the system is controlled by two components as follows:

1. An analog timer system that turns the pumps off per the programmed schedule; and,
2. A high level float switch in the tank that shuts down the pumps when the maximum water level is reached. Power is re-stored to the pumps when the water level drops below the maximum level.

There is also a notification system known as an AlarmAgent that notifies Amec Foster Wheeler if the system shuts down due to a power disruption. Amec Foster Wheeler can remotely shut down and turn on the system using the AlarmAgent.

P&T system O&M was generally performed monthly and consisted of checking system operation, measuring pumping rates, and measuring total volume of water pumped and treated during the month. Water samples were collected on a quarterly basis from the lead GAC vessel influent (sample INF), lead GAC vessel effluent (sample INT), and the secondary GAC vessel effluent (sample EFF) to evaluate PCE mass removal and breakthrough of the GAC unit. When sample results indicated that PCE concentrations exceeded the AWQS of 5.0 µg/L in sample INT,

the lead GAC unit was removed and the GAC regenerated, the secondary GAC unit was moved to the lead position, and the new GAC unit was placed at the secondary position. The GAC was provided and regenerated by Siemens. Photographs of the P&T system are provided in Appendix C.

4.2.1.2 ISCO Remediation System Operation and Maintenance, System Design

The groundwater remediation goal is to have PCE concentrations below the AWQS of 5.0 µg/L in monitoring wells and production wells, which are the point-of-compliance wells. The existing P&T system was performing as designed by controlling downgradient migration and removing PCE mass. A full-scale EN Rx, Inc. (EN Rx) SmartFOCIS™ ISCO remediation system (ISCO system) was designed and built in 2014 based on the results of the ISCO pilot test that was performed during 2013. The ISCO system is intended to augment the modified P&T system with the objective of achieving the groundwater remedial goal and closure of the Site in a shorter timeframe than the continued operation of the P&T system.

EN Rx is able to apply reagents a variety of ways. For the Tyson Wash design, EN Rx provided the SmartFOCIS™, with the anticipated operational duration being approximately twelve months. The anticipated benefits of using the continuous flexible SmartFOCIS™ over standard aqueous batch injections are:

- Slower injection offers more control, less forcing of reagents.
- More oxidant can be loaded and more contact can be achieved without the limitation of time and building up of pressure.
- A longer injection time allows more matrix diffusion thus limiting rebound.
- Less initial time onsite and less manpower over the course of the project with better operational monitoring.
- Injection may be programmed and adjusted with the existing P&T system to enhance dispersion.

Based on the results of the pilot test, the radius of influence was no less than 25 feet. Therefore, the full-scale well spacing is approximately 50 feet. Using available space along Washington Avenue, the injection well layout was placed within the core of the plume (Figure 3). As VOC concentrations decrease in this area, VOC concentrations are expected to decrease in the outlying area. Additionally, it is expected that oxidant injection into this zone will propagate outward with time. The treatment was designed to be robust with respect to the central source plume. The system designed by Amec Foster Wheeler and EN Rx consists of 12 injection points shown on Figure 3; previously installed ISCO-1 and ISCO-2 (deep intervals only), existing EW-3 and EW-4, and eight (8) new injection points designated as ISCO-3 through ISCO-10.

The planned operation period is through June 2015. The EN Rx reagent™ consists of 35% strength H₂O₂ that is delivered as follows:

Months 1-3: 6,000 pounds per month (lbs/month)
Months 4-6: 4,000 lbs/month
Months 7-12: 2,500 lbs/month

The H₂O₂ is delivered to the subsurface from a 300-gallon chemical resistant tote using adductors and diluted with potable water to approximately 2% - 4% strength. During the operation period, the EN Rx additives Synergist-D™ (activator/catalyst) and SSO™ are periodically added to optimize the oxidation of the COCs. During the first month of operation (June 6, 2014 – July 7, 2014), un-catalyzed H₂O₂ was injected to “burn” natural oxidant demand in the soils. This was done to conserve the EN Rx additives. Two SSO™ treatments, each consisting of 200 lbs of SSO™, were scheduled for October and December 2014. Based on the H₂O₂ delivery schedule, site visits to fill the chemical delivery tank and mix EN Rx additives were scheduled once weekly for the first month of operation, twice monthly for the next two months of operation, and then once monthly thereafter. Contingency visits are performed as necessary to address shut downs, make system repairs, and to make up chemical delivery in the event operation time was lost. ISCO system monitoring and remote operation is provided by a website developed by EN Rx. The system operation log through December 23, 2014 is provided on page 19.

Well EW-5 continues to be operated at a rate of approximately 2 gpm during the remedial period to provide downgradient plume control and facilitation of EN Rx reagent migration to this area. The GAC treatment was removed and EN Rx chemical oxidants are mixed at a 3% solution with the water pumped from EW-5. This is expected to immediately oxidize the low concentration of PCE. The oxidant enriched water is then gravity fed to INJ-2 and INJ-3 through the equalization tank, thus delivering oxidant to the upgradient edge of the plume. Operation of EW-5 is timed to the SmartFOCIS™ operation schedule. Photographs of the ISCO system are included in Appendix C.

4.2.2 Groundwater Monitoring Program

Groundwater monitoring activities began in 1997 and increased in scope as additional monitoring wells and other wells were added to the monitoring network. Since 1999, the groundwater monitoring activities for the Site have been performed by Amec Foster Wheeler. The following are the current activities that occur with regards to the groundwater monitoring program:

1. Semi-annual groundwater level measurements;
2. Semi-annual groundwater quality sampling;
3. Maintenance of the remediation systems;
4. Submittals of electronic data for inclusion in the groundwater database maintained by ADEQ; and,
5. System OM&M reporting.

Historically, approximately 38 wells have been included in the groundwater monitoring program, including 14 groundwater monitoring wells, five remediation extraction wells, and 19 private

wells. With time, wells have been removed from the groundwater monitoring program because they are either inaccessible or are located outside the identified plume boundaries. Currently, the groundwater sampling program includes seven monitoring wells, three remediation wells, and three private wells, for a total of 13 wells.

4.3 Operation and Maintenance Costs

The P&T system O&M activities consist of routine system O&M and groundwater monitoring of the remedy extraction wells and monitoring well network, and up until March 2014 included P&T system influent and effluent monitoring. ADEQ has assumed the cost for P&T system O&M. The costs incurred by ADEQ include costs for the O&M and influent/effluent monitoring prior from 2009-2014, as well as the cost for routine groundwater monitoring of extraction wells and the monitoring well network. The following table compares the projected costs versus the actual costs for ADEQ's expenditures for the Site from 2009 through 2014.

Time Period	Costs Estimated in the ROD	Actual ADEQ Expenditure
Fiscal Year (FY) 2010	\$78,278	\$31,578.42
FY 2011	\$82,191	\$60,034.64
FY 2012	\$86,301	\$30,771.19
FY 2013	\$90,616	\$141,764.46
FY 2014	\$95,147	\$199,087.25
July-December 2014	\$30,500	\$102,975.50
Totals	\$463,033.00	\$566,211.46

The actual ADEQ expenditures for FY 2010-2012 were less than the budgetary estimates due to annual groundwater monitoring being performed twice annually instead of quarterly (includes reporting). The actual ADEQ expenditure for FY 2013 was more than the budgetary estimate due to costs associated with installation and performance of the ISCO pilot test, which was not included in the ROD budgetary estimate. The actual ADEQ expenditure for FY 2014 was more than the ROD budgetary estimate due to costs associated with installation and startup of the full-scale ISCO system, which was also not included in the ROD budgetary estimate. The actual ADEQ expenditure for the first half of FY 2015 (July-December 2014) is higher than the ROD budgetary estimate due to O&M costs for the full-scale ISCO system and implementation of a quarterly groundwater monitoring program. It should be noted that the total life-cycle cost for the remedy from June 2009 through December 2032 presented in the ROD is \$1,629,980.00. The expected expenditure for the second half of FY 2015 (January-June 2015) is \$126,260.30. Fiscal Year 2016 may involve continued operation of the ISCO system or implementation of a post-remediation groundwater monitoring program.

Worst-case expenditure for FY 2016 is estimated as \$230,000. The ISCO system is expected to result in site closeout by June 2017, which is earlier than the ROD estimate of December 2032. Should FY 2017 involve just a quarterly post-remediation groundwater monitoring and reporting program and Site closeout, the estimated FY 2017 expenditure is \$38,000. The total estimated cost for the remedy O&M, monitoring, reporting, and site closeout from July 2009 to June 2017 is \$960,471.76. The ISCO system is expected to result in Site closeout at an earlier date and lower cost than what was presented in the ROD.

5.0 PROGRESS SINCE LAST REVIEW

Operational and overall review of this project is conducted on an ongoing basis by ADEQ and its consultants. This is the first PSR performed for the Site and this section is not applicable at this time.

6.0 PERIODIC SITE REVIEW PROCESS

The following sections describe the process, data gathering, and findings of this PSR.

6.1 Administrative Components

This first PSR was conducted by the ADEQ's project management team and assisted by Amec Foster Wheeler. The PSR consisted of community notification, document review, data review, review of incidents, human health risk assessment, and site inspection. This work was initiated on October 6, 2014 at a kick-off meeting consisting of Mel Bunkers, Tyson Wash WQARF Site Project Manager, Scott Green, Remedial Projects Unit Manager, and James Clarke, PG, Amec Foster Wheeler Project Manager. Components of the PSR process are discussed in the following sections and include: community notification and involvement, document review, data review, site inspection, and site interviews.

6.2 Community Involvement

This PSR is for a five-year term that refers to the approximate period of time between the publication of the ROD and this PSR. ADEQ will determine the appropriate time for the next review, which may be more or less than five years.

Public response interview sessions were not required for this PSR. A PSR questionnaire was sent to the Quartzsite Town Manager on December 23, 2014, the Amec Foster Wheeler Project Manager on March 3, 2015, and the ADEQ Waste Programs Division, Remedial Projects Section Manager on March 17, 2015. A copy of the completed questionnaire is included in Appendix D.

ADEQ will publish a public notice of the PSR in the Parker Pioneer on May 6, 2015. A copy of the notice is included in Appendix E.

6.3 Document Review

Background documents selected for review focused primarily on action taken during the period of this PSR, to evaluate the Site status, details of the remedy implementation, and progress toward meeting the ROs and goals. Section 12.0 provides a list of the most significant documents reviewed such as the ROD, operational reports, groundwater monitoring reports, and hydrogeologic studies. Based on the review of these documents, the following sections describe the findings of this PSR.

6.4 Data Review

Selected available Site references (see Section 12.0) were reviewed to evaluate the progress of remediation in general terms and to assess whether the P & T system and groundwater monitoring program were meeting the ROs (see Section 4.1).

6.4.1 Evaluation of RO Metrics

The goals of each RO detailed in Section 4.1 of this PSR have been met or there is significant progress towards meeting the RO.

6.4.2 Evaluation of P&T Remediation System Performance

The P&T system has been in operation since April 7, 2003 and is intended to control migration of the PCE plume beyond sentinel well QMW-14, remove dissolved PCE mass, and decrease the size of the PCE plume. Prior to installation of the full scale P&T remediation system, the PCE plume covered an area of approximately 8.2 acres extending from QMW-1 on the south, QMW-2 on the east, QMW-10 on the north, and QMW-7 on the west (see Figure 4 in Appendix B). Since the full scale P&T system was started in 2005, approximately 10,517,536 gallons of groundwater have been pumped, treated, and re-injected to the aquifer. By March 2013, the combination of groundwater extraction/treatment and flushing with treated water had decreased the areal extent of the plume above the AWQS of 5.0 µg/L to approximately 2.4 acres; approximately 71% (see Figure 6 in appendix B). The PCE concentrations in well QMW-3, located at the head of the current plume, has decreased from a maximum of 160 µg/L to 75 µg/L. The volume of water pumped and treated daily and the ultimate operation of the P&T system was primarily influenced by the volume of water that could be injected back to the aquifer via INJ-1 and INJ-2. Between 2005 and 2010, groundwater pumping was generally limited to nine hours per day at a combined pumping rate of seven gpm. In March 2008, EW-2 was extracting non-impacted groundwater and was taken off-line and the pumping rates in EW-3 and EW-4 increased. In April 2010, the pump in EW-1 failed which was also extracting non-impacted groundwater, EW-1 remained offline. The rising water levels eventually submerged the screen for INJ-1 and reduced the available screened interval above the water table in INJ-2, further decreasing the operating time and efficiency for the P&T remediation system. During October 2010, INJ-2 was modified with a screened interval of 20-70 feet bgs. This modification resulted in the combined pumping rate from EW-3 through EW-5 being increased from 7.0 gpm to between 9.0-10.0 gpm and an average daily pumping rate between 3,700 and 4,300

gpd. However, treated water was still being injected to INJ-1. By October 2012, the combined average daily pumping rate had decreased to approximately 3,000 gpd. In order to increase the pumping rate, injection well INJ-3 was installed to replace INJ-1 on November 5-6, 2012. The pumping rate from EW-3 through EW-5 was varied between 9.0 gpm and 12.0 gpm, with a pumping rate of approximately 9.3 gpm providing the maximum average daily pumping rate of approximately 4,500 gpd by April 2013. The ISCO pilot test was implemented in April 2013 and the pumping rate was reduced to 7 gpm through November 2013 while EW-3 was off-line. EW-3 was placed back on-line during November 2013 and the pumping rate increased to approximately 9 gpm. The P&T system remained in full operation until April 21, 2014 when EW-3 and EW-4 were taken off-line to accommodate ISCO injection equipment. EW-5 remained operational for downgradient hydraulic control. Operational records for the P&T system since June 2009 (see Appendix F).

Observations and comparisons were made of the change in estimated aerial extent of the PCE plume as well as a review of maximum PCE concentration values for selected groundwater monitoring events (see Appendix A). The selected events included December 2005 (the first comprehensive regular groundwater monitoring event following installation of the full P&T system), January 2010 (the initial groundwater monitoring event during the period of this review), and March 2013 (the last comprehensive groundwater monitoring event prior to ISCO pilot testing) (see Figures 4, 5, and 6 of Appendix B).

For the pre-ISCO portion of the review period (January 2010 through March 2013), the P&T system performance was primarily evaluated by changes in PCE concentrations in wells QMW-3, QMW-4, QMW-8, QMW-14, EW-3, EW-4, EW-5, and Rhoades East. Based on this review, the PCE concentrations detected in samples from these wells changed as follows:

P&T System PCE Concentration Changes			
Well I.D	January 2010	March 2013	% Change
QMW-3	63 µg/L	75 µg/L	+19%
QMW-4	38 µg/L	6 µg/L	-84%
QMW-8	15 µg/L	21 µg/L	+40%
QMW-14	1.9 µg/L ¹	3.5 µg/L	+84%
EW-3	26 µg/L ²	18 µg/L	-31%
EW-4	52 µg/L ²	59 µg/L	+14%
EW-5	51 µg/L ³	39 µg/L	-24%
Rhoades East	34 µg/L	12 µg/L	-65%

¹Well QMW-14 was first sampled on May 25, 2011.

²Wells EW-3 and EW-4 were sampled on April 27, 2010.

³Well EW-5 was sampled on October 20, 2010.

Well QMW-3 is regarded as being located at the “head” of the plume and is influenced primarily by pumping of EW-3 and EW-4. PCE concentrations increased in QMW-3 as PCE concentrations decreased in further upgradient well QMW-1, thus indicating that the P&T system was performing

as designed. Well EW-3 is located on the eastern edge of the PCE plume and is drawing low concentration groundwater from the east. Therefore, PCE concentrations steadily decreased in EW-3. Well QMW-4 is located cross-gradient (east) of the extraction well network and is influenced primarily by EW-3 and EW-4. PCE concentrations decreased in QMW-4 as PCE concentrations decreased in EW-3 and increased in EW-4, thus indicating that the system was successfully removing dissolved PCE from the area of QMW-4. The Rhoades East well is located near the western edge of the plume and is influenced primarily by EW-4 and EW-5. The decreasing PCE concentration in this well with time demonstrates that EW-4 and EW-5 were drawing the plume toward the extraction wells. Well QMW-8 is located near the northeast corner of the plume and is influenced primarily by EW-5. The increased concentrations indicate that impacted water was being drawn from the east toward EW-5. Though PCE concentrations increased during the period of January 2010 to March 2013, the concentrations did not exceed the AWQS of 5.0 µg/L. The P&T system was achieving the objective of controlling plume migration, removing dissolved PCE mass, and decreasing the size of the plume. During the past five years, the period of this review, the P&T system has removed approximately 1.4 pounds of dissolved PCE. From April 7, 2003 to December 22, 2014, the P&T system has removed an estimated 2.52 pounds of dissolved PCE.

6.4.3 Evaluation of the ISCO Remediation System Performance

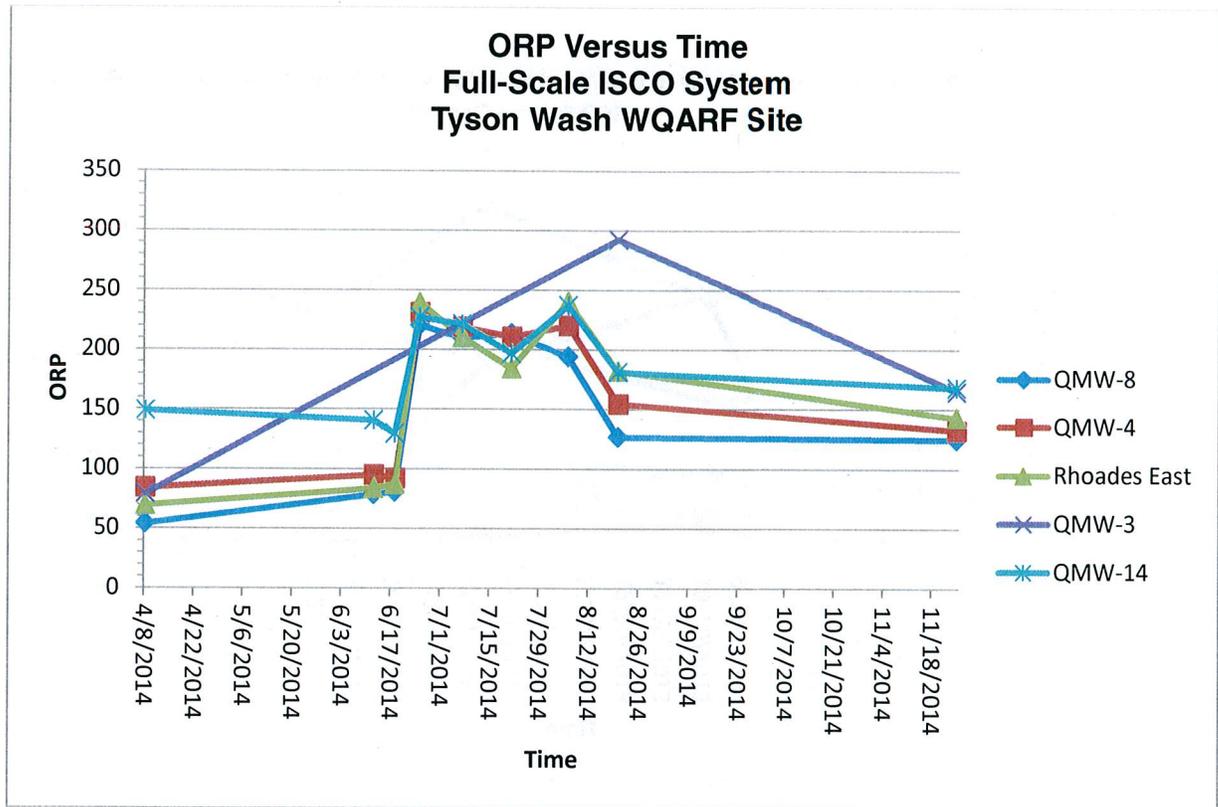
The ISCO remediation system was started in June 6, 2014 to expedite remediation of the Site. The performance of the ISCO remediation system is measured by the following: the mass of oxidants delivered per design; changes in oxidation/reduction potential (ORP) in wells within and near the treatment area; and changes in PCE concentrations with time during operation. The operational period is twelve months through June 2015. The EN Rx reagent is delivered as follows:

Months 1-3:	6,000 lbs/month
Months 4-6:	4,000 lbs/month
Months 7-12:	2,500 lbs/month

During the planned ISCO remediation system operational period, 45,000 pounds of 35% strength H₂O₂ are scheduled to be delivered to the injection well network. The goal for the ISCO system was to deliver 30,000 lbs (3,000 gallons) of H₂O₂ for the first six months of operation. With the addition of the H₂O₂ on December 22, 2014, approximately 30,000 lbs of H₂O₂ had been added through December 2014. The ISCO system was approximately 2,500 lbs (250 gallons) behind schedule. Starting with the January 13, 2015 O&M event, the system will be set to deliver 2,500 lbs (250 gallons) of H₂O₂ per month as scheduled (approximately 8 gallons per day).

The second performance metric is monitoring of changes in ORP in groundwater wells within the treatment zone. Positive ORP is an indicator that oxidation is occurring and an increase in ORP relative to baseline indicates that the reagent is migrating to that particular well and that active oxidation is occurring. The baseline ORP readings were measured in April 2014. The following chart shows changes in ORP with time through November 25, 2014 in wells QMW-3, QMW-4, QMW-8, QMW-14, and Rhoades East (see Figure 3 for locations). QMW-3 is located within the

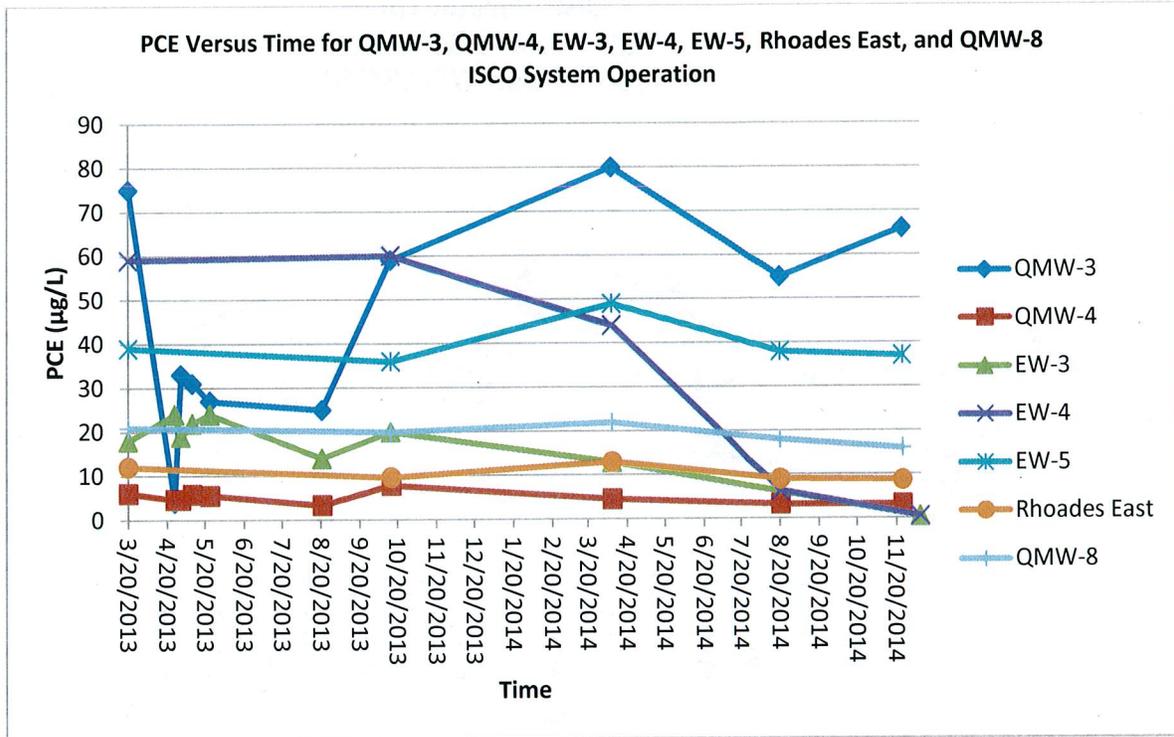
injection well network, wells QMW-4 and Rhoades East are located cross-gradient to the injection well network, and wells QMW-8 and QMW-14 are located downgradient of the injection well network with QMW-14 being the furthest downgradient sentinel well.



Samples from QMW-3, QMW-8, and Rhoades East have been detected with PCE above the AWQS of 5.0 µg/L since April 2014. ORP increased in the measured monitoring wells from baseline. The decrease in ORP between peak measurements in July 2014 and the November 25, 2014 monitoring event is possibly due to the operational issues that occurred during this time period. However, the data confirms that the reagent is migrating to the wells within the treatment zone.

The third performance metric is changes in PCE concentrations with time during operation of the ISCO system (Appendix A). Observations were made of the change in estimated aerial extent of the PCE plume as well as a review of maximum PCE concentration values for selected groundwater monitoring events. The selected events included April 2014 (pre-ISCO groundwater monitoring event), August 2014 (the first ISCO performance quarterly groundwater monitoring event), and November 2014 (the second ISCO performance quarterly groundwater monitoring event) (see Figures 7, 8, and 9 of Appendix B). Since April 2014, the ISCO system has decreased the apparent size of the PCE plume. Most noticeable are the changes in the core of the plume, which is represented by PCE concentrations above 20 µg/L. The core of the plume is no longer continuous and has been divided into two smaller areas around QMW-3 and EW-5 (see Figure 9).

For the ISCO operation period from June 2014 through December 2014, system performance was primarily evaluated by changes in PCE concentrations in wells QMW-3, QMW-4, QMW-8, QMW-14, EW-3, EW-4, EW-5, and Rhoades East. The following concentration versus time graph presents changes in PCE concentrations since the ISCO pilot test that was completed in May 2013.



Since startup of the full-scale ISCO system in June 2014, PCE concentrations decreased since the pre-ISCO baseline sampling event. However, the trends presented by this PSR are represented by only two data points since startup. Based on review of data collected since April 2014 (pre-ISCO baseline samples), the PCE concentrations detected in samples changed as follows:

PCE Concentration Changes			
Well I.D	April 2014	November 2014	% Change
QMW-3	80 µg/L	66 µg/L	-18%
QMW-4	4.5 µg/L	3.1 µg/L	-31%
QMW-8	22 µg/L	16 µg/L	-38%
QMW-14	3.5 µg/L	2.3 µg/L	-34%
EW-3	13 µg/L	<1.0 µg/L	-100%
EW-4	44 µg/L	<1.0 µg/L	-100%
EW-5	49 µg/L	37 µg/L	-24%
Rhoades East	13 µg/L	8.7 µg/L	-33%

Well QMW-3 is regarded as being located at the “head” of the plume due to samples collected being the highest PCE concentrations of the well network. As shown in the concentration versus

time graph, PCE concentrations in QMW-3 increased from 55 µg/L to 66 µg/L between the August 2014 and November 2014 sampling events. This was attributed to injection of the EN Rx additive SSO on October 14, 2014. SSO can have an effect of desorbing VOCs and requires flushing with un-catalyzed H₂O₂ to distribute it through the treatment zone. The ISCO system operational issues during October and November 2014 resulted in an incomplete SSO flush prior to the November 2014 sampling event. Wells EW-3 and EW-4 were reported with non-detectable (<1.0 µg/L) concentrations of PCE in the November 2014 samples. Well QMW-4 is located cross-gradient (east) of the injection well network. PCE concentrations in samples collected from QMW-4 have been below the AWQS of 5.0 µg/L for three consecutive quarterly groundwater sampling events since October 2013. PCE concentrations have also been steadily decreasing in the Rhoades East well, which is located cross-gradient (west) of the injection well network. Well QMW-8 is located near the northeast corner of the plume. The increased ORP and decreasing PCE concentrations indicate that the oxidants are having an influence on this furthest portion of the plume from the injection well network. PCE concentrations are also decreasing in EW-5. The below AWQS and decreasing PCE concentrations and increased ORP also indicate that the oxidants are also having an influence on the downgradient portion of the plume and the continued operation of EW-5 as an extraction well continues to control migration of the PCE plume. Based on the limited data, the ISCO system is achieving the objective of controlling plume migration, removing dissolved PCE mass, and decreasing the size of the plume.

6.5 Site Operation, Maintenance, and Monitoring (OM&M) Visits

Site OM&M visits are conducted at least once monthly and were conducted twice monthly during the first four months of the ISCO system operation. Each OM&M visit includes checking equipment, checking and recording P&T system flow rates, filling the chemical oxidant tank, and checking overall operation of the ISCO system. System operation is periodically monitored remotely using the system website. System operation can be adjusted remotely and can be remotely shut down, if necessary. Generally, the groundwater monitoring well network is functioning appropriately as designed.

Based on evaluation of groundwater data collected from May 2000 to November 2014, water levels at the Site have been steadily rising with an average of 10.24 feet across the Site (see Figure 2 in Appendix B). This represents an average water level rise of approximately 0.73 feet per year. Water levels have been rising due to residents and businesses being connected to Quartzsite water service, which resulted in decreased groundwater pumping. Though water levels were rising, there were no changes in groundwater flow direction and gradient, which remained in a northerly direction. The combination of pumping from the extraction wells (EW-1 through EW-5) and injecting treated water to the injection wells (INJ-1 and INJ-2) directed the PCE plume toward the extraction well network. The aquifer became impacted when water levels were deeper and the rising water levels are due to recharge. The saturated zone impact remained at approximately 60 feet bgs as the water levels were rising.

The rising water levels did eventually submerge the screen for INJ-1 and reduced the available screened interval above the water table in INJ-2, further decreasing the operating time and efficiency for the P&T system. During October 2010, INJ-2 was modified with a screened interval of 20-70 feet bgs. This modification resulted in increased pumping by the P&T system. However, due to saturation of the vadose zone, the injection rate decreased, further decreasing the pumping rate. In order to increase the pumping rate, injection well INJ-3 was installed to replace INJ-1 on November 5 - 6, 2012. The pumping rate from EW-3 through EW-5 was varied between 9.0 gpm and 12.0 gpm, with a pumping rate of approximately 9.3 gpm providing the maximum average daily pumping rate of approximately 4,500 gpd by April 2013.

The PCE mass is present between 55 and 65 feet bgs and the injection wells have been constructed to deliver oxidants to this interval. Therefore, the increasing water levels do not have an influence on the ISCO system.

With the exception of the August 7, 2014 H₂O₂ release, no activities were observed during the site visits that might indicate potentially unsafe exposures to people or the environment. Visual inspection indicated good housekeeping is practiced, and the groundwater extraction and treatment systems are clean. Though 225 gallons of H₂O₂ were released on August 7, 2014, the H₂O₂ was not present at hazardous concentrations and quickly degraded to water. Therefore, there was no danger to people or the environment.

6.6 Site Interviews

As a part of the PSR process, interviews were conducted with individuals having knowledge of and/or concerns with the Site. E-mail responses to the interview questions were also accepted.

Key personnel associated with the site and interviewed, included the Public Works Director for Quartzsite, the ADEQ Waste Programs Division Remedial Programs Section Manager, and the Amec Foster Wheeler Project Manager. An overall consensus is that the remedy at the Site is functioning as designed. However, the Quartzsite requested improved communication on the Site status. The interviews are summarized and presented in Appendix D.

7.0 TECHNICAL ASSESSMENT

The following is a technical assessment of the Site based on the findings of this PSR. This assessment answers three basic questions:

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

7.1 Question A – Is the Remedy Functioning as Intended by the Decision Document?

The review of documents, interviews and site inspections indicates that the Selected Remedy is functioning as intended by the ROD, the P&T system, modified to include ISCO, is controlling plume migration and is removing contaminant mass.

7.2 Question B – Are the COCs, exposure assumptions, toxicity data, cleanup levels, and remedial objectives (ROs) used at the time of the ROD still valid?

There have been no changes in the physical conditions or exposure assumptions of the site that would affect the protectiveness of the remedy.

The ROs are being met and are still valid. Amendment or modification of the ROs for the Site is not required at this time. The P&T system, modified to include ISCO, is intended to complete remediation in less time than anticipated in the ROD, potentially within the next two years.

7.2.1 COCs

This section presents data from January 2010 to December 31, 2014.

Primary COC - The primary COC is PCE.

Secondary COC - TCE has also been occasionally detected in groundwater samples from wells in various locations of the project. TCE is also a daughter product of the reductive dechlorination of PCE. Therefore, TCE is identified as a secondary concern relative to PCE. However, TCE is below the AWQS of 5.0 µg/L.

7.2.2 Exposure Assumptions

The primary pathway for human exposure to contaminants at the Site is through the domestic wells that are completed in the shallow impacted aquifer. At the time of the RI, five wells in use were impacted and included the Adams North and South wells, the Rhoades West well, the Welcome RV Park well, and the La Casa Del Rancho Restaurant west well. Cast wells B-1 and B-2 had also been impacted, but are out of service. A deep well at the Cast property (well B-3) formerly provided drinking water to the residents, whereas the impacted shallow wells were previously piped directly into a laundromat. Between 1999 and August 2001, ADEQ provided bottled drinking water to the Rhoades, Welcome RV Park, and La Casa Del Rancho Restaurant properties. At the time of the RI, the exposure to groundwater from the impacted shallow wells was considered to be *de minimus*. Since the RI was completed, the properties have been connected to Quartzsite water service and no longer use their wells. The Adams wells are still

present and groundwater samples are periodically collected from them. PCE has not been reported above the AWQS of 5.0 µg/L in the samples collected from the Adams wells. The Rhoades West well is currently inaccessible and is out-of-service. The Welcome RV Park well is not used by the current property owner. Therefore, the groundwater use exposure pathway is currently incomplete.

There is no evidence that surface soils have been impacted; therefore, the potential exposure pathway from surface soils is incomplete. No indication of a free-phase liquid plume has been encountered in the Site characterization investigations, and there is no associated surface water; those pathways are also incomplete. Exposure pathways associated with volatilization from subsurface groundwater are insignificant based on the low PCE concentrations and their depth below the ground surface.

7.2.3 Cleanup Levels

Groundwater is the only media impacted at the Site. Therefore, the groundwater cleanup levels for the Site are the AWQSs. The only compound that exceeds AWQSs is PCE, which has an AWQS of 5.0 µg/L. The remediation system will be operated until all impacted wells are reported with PCE concentrations below the AWQS of 5.0 µg/L. This will then be followed by a post-remediation monitoring period to evaluate if the PCE will rebound above the AWQS of 5.0 µg/L. Site closeout will not be considered by ADEQ until all impacted wells are reported with PCE concentrations below the AWQS of 5.0 µg/L for a minimum of four consecutive quarterly groundwater sampling events following shut down of the remediation system.

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

There is no information that calls into question the protectiveness of this remedy.

Treatment and containment of the plume of PCE impacted groundwater exceeding the AWQS has been demonstrated by a combination of the estimated potentiometric conditions and the trends of declining groundwater concentrations. As of November 2014, only four monitoring wells (QMW-3, QMW-8, EW-5, and Rhoades East) in the Site area remained within the plume of groundwater impacted above the AWQS for PCE.

8.0 ISSUES

No issues immediately impacting the protectiveness of the Selected Remedy were identified during this PSR.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This PSR recommends future consideration of the following items:

1. Continue operation of the P&T system until PCE concentrations are below the AWQS of 5.0 µg/L in groundwater samples collected from wells QMW-3, QMW-4, QMW-8, EW-3, EW-4, EW-5, and Rhoades East. If this is achieved, shut down of the remediation system for rebound testing is recommended. The P&T system, which is owned by ADEQ, will remain on-site until ADEQ determines that the Site is eligible for closeout.
2. If PCE concentrations remain below the AWQS of 5.0 µg/L for a minimum of four consecutive quarterly groundwater sampling events following P&T system shut down, then ADEQ may consider closeout of the Site.
3. If PCE concentrations increase above the AWQS of 5.0 µg/L in one or more wells during the rebound testing period, ADEQ may consider continued remediation system operation per Item 1.
4. Based on the PSR Questionnaire received from Quartzsite, ADEQ will periodically update Quartzsite of remedial activities and progress by sending copies of the Semi-Annual Operation, Maintenance, and Monitoring Reports.

10.0 PROTECTIVENESS STATEMENT

Review of the Selected Remedy for the Site demonstrates that it is currently protective of human health and the environment and those exposure pathways that could result in unacceptable risks are being controlled. The groundwater P&T system, including the ISCO system, is removing VOC mass from the shallow aquifer, containing migration of the PCE plume above AWQSs to QMW-14, reducing VOC concentrations in groundwater, and treating VOC concentrations to below the AWQSs. The groundwater plume appears to be currently contained as demonstrated by analysis of groundwater data and predicted by groundwater modeling.

11.0 NEXT PERIODIC REVIEW

PSRs are typically prepared approximately every five years after the ROD is issued. The current P&T system is expected to achieve the groundwater AWQSs within the next five years. Therefore, another PSR is not anticipated.

12.0 REFERENCES

ADEQ, 2003. *Remedial Objectives Report, Tyson Wash WQARF Site*, May 2003

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AMEC, 2014b. *Full-Scale In-situ Chemical Oxidation (ISCO) Installation, Maintenance, and Monitoring Proposal, Tyson Wash WQARF Site*, March 2014

MACTEC, 2003. *Remedial Investigation Report, Tyson Wash WQARF Site, Quartzsite, Arizona*, June 2003.

MACTEC, 2007. *Feasibility Study Report, Tyson Wash WQARF Registry Site, Quartzsite, Arizona*, June 2007

MACTEC, 2008. *Proposed Remediation Action Plan, Tyson Wash WQARF Registry Site, Quartzsite, Arizona*, June 2008

APPENDIX A
SUMMARY OF PCE CONCENTRATIONS SINCE JANUARY 2010

**Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona**

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentrations (µg/l)				
				PCE	TCE	cis-1,2-DCE	1,1-DCE	
ADEQ AWQS				5	5	70	7	
Monitoring Well Samples								
QMW-1 (55-561847)	01/27/10	68	0.046	4.1	<1	<1	<2	
	04/26/10	68	0.046	4.8	<1	<1	<2	
	10/19/10	68	0.046	3.3	<1	<1	<2	
	04/05/11	60	0.046	3.4	<1	<1	<2	
	10/18/11	60	0.046	2.5	<1	<1	<2	
	04/17/12	60	0.046	1.6	<1	<1	<2	
	10/23/12	60	0.046	1.2	<1	<1	<2	
	03/20/13	60	0.046	1.1	<1	<1	<2	
	10/15/13	60	0.046	0.86	<0.50	<0.50	<0.50	
	04/08/14	60	0.046	<1	<1	<1	<2	
	08/20/14	60	0.046	<1	<1	<1	<2	
11/25/14	60	0.046	<1	<1	<1	<2		
QMW-2 (55-561849)	01/27/10	--	--	NS	NS	NS	NS	
	04/26/10	--	--	NS	NS	NS	NS	
	10/19/10	60.0	0.046	<1	<1	<1	<2	
	04/05/11	60.0	0.046	<1	<1	<1	<2	
	10/18/11	60.0	0.046	<1	<1	<1	<2	
	04/17/12	60.0	0.046	<1	<1	<1	<2	
	10/23/12	60.0	0.046	<1	<1	<1	<2	
	03/19/13	60.0	0.046	<1	<1	<1	<2	
	10/15/13	--	--	NS	NS	NS	NS	
	04/08/14	--	--	NS	NS	NS	NS	
	Inaccessible	08/20/14	--	--	NS	NS	NS	NS
Inaccessible	11/25/14	--	--	NS	NS	NS	NS	
QMW-3 (55-561848)	01/27/10	60	0.046	63	2.7	<1	<2	
	04/27/10	60	0.046	71	3.7	<1	<2	
	10/20/10	60	0.046	49	2.5	<1	<2	
	04/05/11	60	0.046	25	1.1	<1	<2	
	10/18/11	60	0.046	47/47	2.0/2.1	<1/<1	<2/<2	
	04/17/12	60	0.046	63/67	2.8/3.0	<1/<1	<2/<2	
	10/23/12	60	0.046	90/98	5.1/5.2	<1/<1	<2/<2	
	PDB	02/27/13	40	NA	2.8	<0.5	<0.5	
	PDB	02/27/13	50	NA	11	0.67	<0.5	
		03/20/13	60	0.046	75/69	3.3/3.2	<1/<1	<2/<2
		04/26/13	60	0.046	4.0	<1	<1	<2
		05/01/13	60	0.046	33	1.6	<1	<2
		05/10/13	60	0.046	31	1.4	<1	<2
		05/24/13	60	0.046	27	<1	<1	<2
		08/21/13	60	0.046	25	1.2	<1	<2
		10/15/13	60	0.046	59/59	2.5/2.6	<0.50/<0.50	<0.50/<0.50
		04/08/14	60	0.046	80/81	4.0/4.2	<1/<1	<2/<2
		08/20/14	60	0.046	55/55	2.8/2.7	<1/<1	<2/<2
		11/25/14	60	0.046	66/64	3.1/3.4	<1/<1	<2/<2

**Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona**

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentration: (µg/l)				
				PCE	TCE	cis-1,2-DCE	1,1-DCE	
ADEQ AWQS				5	5	70	7	
QMW-4 (55-567650)	01/27/10	60	0.046	38	1.7	<1	<2	
	04/26/10	60	0.046	46	2.0	<1	<2	
	10/19/10	60	0.046	24	1.2	<1	<2	
	04/05/11	60	0.046	25	1.0	<1	<2	
	10/18/11	60	0.046	25	1.1	<1	<2	
	04/17/12	60	0.046	13	1.1	<1	<2	
	10/23/12	60	0.046	11	<1	<1	<2	
	PDB	02/27/13	40	NA	1.1	<0.5	<0.5	<0.5
	PDB	02/27/13	50	NA	2.7	<0.5	<0.5	<0.5
		03/20/13	60	0.046	6.0	<1	<1	<2
		04/26/13	60	0.046	4.6	<1	<1	<2
		05/01/13	60	0.046	4.6	<1	<1	<2
		05/10/13	60	0.046	5.8	<1	<1	<2
		05/24/13	60	0.046	5.5	<1	<1	<2
		08/21/13	60	0.046	3.3	<1	<1	<2
	10/15/13	60	0.046	7.8	<0.50	<0.50	<0.50	
	04/08/14	60	0.046	4.5	<1	<1	<2	
	08/20/14	60	0.046	3.2	<1	<1	<2	
	11/25/14	60	0.046	3.1	<1	<1	<2	
QMW-5 (55-567649)	01/27/10	50	0.046	3.1	<1	<1	<2	
	04/26/10	50	0.046	4.6	<1	<1	<2	
	10/19/10	50	0.046	2.5	<1	<1	<2	
	04/05/11	50	0.046	2.6	<1	<1	<2	
	10/18/11	50	0.046	2.7	<1	<1	<2	
	04/17/12	50	0.046	1.5	<1	<1	<2	
	10/23/12	50	0.046	1.0	<1	<1	<2	
	03/19/13	50	0.046	<1.0	<1	<1	<2	
	10/15/13	50	0.046	0.75	0.90	0.52	<0.50	
	04/08/14	50	0.046	<1.0	<1	<1	<2	
	08/20/14	50	0.046	<1	<1	<1	<2	
11/25/14	50	0.046	<1	<1	<1	<2		
QMW-7 (55-577300)	01/27/10	--	--	NS	NS	NS	NS	
	04/26/10	--	--	NS	NS	NS	NS	
	10/19/10	--	--	NS	NS	NS	NS	
	04/05/11	--	--	NS	NS	NS	NS	
	10/18/11	--	--	NS	NS	NS	NS	
	04/17/12	--	--	NS	NS	NS	NS	
	10/23/12	--	--	NS	NS	NS	NS	
	03/19/13	--	--	NS	NS	NS	NS	
	10/15/13	--	--	NS	NS	NS	NS	
	04/08/14	--	--	NS	NS	NS	NS	
08/20/14	--	--	NS	NS	NS	NS		
11/25/14	--	--	NS	NS	NS	NS		
QMW-8 (55-577298)	01/27/10	60	0.046	15	<1	<1	<2	
	04/26/10	60	0.046	20	<1	<1	<2	
	10/19/10	60	0.046	14	<1	<1	<2	
	04/05/11	60	0.046	19	<1	<1	<2	
	10/18/11	60	0.046	21	<1	<1	<2	
	04/17/12	60	0.046	20	<1	<1	<2	
	10/23/12	60	0.046	16	<1	<1	<2	
	PDB	02/27/13	40	NA	0.53	<0.5	<0.5	<0.5
	PDB	02/27/13	50	NA	20	0.93	<0.5	<0.5
		03/19/13	60	0.046	21	<1	<1	<2
		10/15/13	60	0.046	20	1.2	<0.50	<0.50
		04/08/14	60	0.046	22	1.2	<1	<2
		08/20/14	60	0.046	18	<1	<1	<2
	11/25/14	60	0.046	16	1.1	<1	<2	

Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentration: (µg/l)			
				PCE	TCE	cis-1,2-DCE	1,1-DCE
ADEQ AWQS				5	5	70	7
QMW-9 (55-577299)	01/27/10	--	--	NS	NS	NS	NS
	04/26/10	--	--	NS	NS	NS	NS
	10/19/10	--	--	NS	NS	NS	NS
	04/05/11	--	--	NS	NS	NS	NS
	10/18/11	--	--	NS	NS	NS	NS
	04/17/12	--	--	NS	NS	NS	NS
	10/23/12	--	--	NS	NS	NS	NS
	03/19/13	--	--	NS	NS	NS	NS
	10/15/13	--	--	NS	NS	NS	NS
	04/08/14	--	--	NS	NS	NS	NS
	Inaccessible	08/20/14	--	--	NS	NS	NS
Inaccessible	11/25/14	--	--	NS	NS	NS	NS
QMW-10 (55-583806)	01/27/10	--	--	NS	NS	NS	NS
	04/26/10	--	--	NS	NS	NS	NS
	10/19/10	60.0	0.046	2.0	<1	<1	<2
	04/06/11	60.0	0.046	2.1	<1	<1	<2
	10/18/11	60.0	0.046	2.4	<1	<1	<2
	04/17/12	60.0	0.046	2.0	<1	<1	<2
	10/23/12	60.0	0.046	2.2	<1	<1	<2
	03/19/13	60.0	0.046	2.2	<1	<1	<2
	10/15/13	60.0	0.046	2.2	<0.50	<0.50	<0.50
	04/07/14	60.0	0.046	2.1	<1	<1	<2
	08/20/14	60.0	0.046	2.0	<1	<1	<2
11/25/14	60.0	0.046	1.8	<1	<1	<2	
QMW-11	01/27/10	--	--	NS	NS	NS	NS
	04/26/10	--	--	NS	NS	NS	NS
	10/19/10	--	--	NS	NS	NS	NS
	04/05/11	--	--	NS	NS	NS	NS
	10/18/11	--	--	NS	NS	NS	NS
	04/17/12	--	--	NS	NS	NS	NS
	10/23/12	--	--	NS	NS	NS	NS
	10/15/13	Well inaccessible - not sampled					
	04/08/14	Well inaccessible - not sampled					
08/20/14	Well inaccessible - not sampled						
11/25/14	Well inaccessible - not sampled						
QMW-12	01/27/10	--	--	NS	NS	NS	NS
	04/26/10	--	--	NS	NS	NS	NS
	10/19/10	--	--	NS	NS	NS	NS
	04/05/11	--	--	NS	NS	NS	NS
	10/18/11	--	--	NS	NS	NS	NS
	04/17/12	--	--	NS	NS	NS	NS
	10/23/12	--	--	NS	NS	NS	NS
	10/15/13	Well inaccessible - not sampled					
	04/08/14	Well inaccessible - not sampled					
	08/20/14	Well inaccessible - not sampled					
11/25/14	Well inaccessible - not sampled						

**Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona**

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentration: (µg/l)			
				PCE	TCE	cis-1,2-DCE	1,1-DCE
ADEQ AWQS				5	5	70	7
QMW-14	05/25/11		0.046	1.9	<1	<1	<2
	10/18/11	60	0.046	2.7	<1	<1	<2
	04/17/12	60	0.046	3.0	<1	<1	<2
	10/23/12	60	0.046	2.5	<1	<1	<2
	03/19/13	60	0.046	3.2	<1	<1	<2
	10/15/13	60	0.046	3.3	<0.50	<0.50	<0.50
	04/08/14	60	0.046	3.5	<1	<1	<2
	08/20/14	60	0.046	2.7	<1	<1	<2
11/25/14	60	0.046	2.3	<1	<1	<2	
Domestic Well Samples							
Rhoades East	01/27/10	50	0.046	34	<1	<1	<2
	04/27/10	50	0.046	48	1.1	<1	<2
	10/20/10	50	0.046	23	<1	<1	<2
	04/05/11	50	0.046	31	<1	<1	<2
	10/18/11	50	0.046	22	<1	<1	<2
	04/17/12	50	0.046	20	<1	<1	<2
	10/23/12	--	--	NS	NS	NS	NS
	03/20/13	50	0.046	12	<1	<1	<2
	10/15/13	50	0.046	9.6	<0.50	<0.50	<0.50
	04/08/14	50	0.046	13	<1	<1	<2
	08/20/14	50	0.046	9.0	<1	<1	<2
11/25/14	50	0.046	8.7	<1	<1	<2	
Welcome RV	01/27/10	--	--	15	<1	<1	<2
	04/27/10	--	--	NS	NS	NS	NS
	10/19/10	--	--	NS	NS	NS	NS
	04/05/11	--	--	NS	NS	NS	NS
	10/18/11	--	--	NS	NS	NS	NS
	04/17/12	--	--	NS	NS	NS	NS
	10/23/12	--	--	NS	NS	NS	NS
	03/18/13	--	--	NS	NS	NS	NS
	10/16/13	--	--	NS	NS	NS	NS
	04/07/14	--	--	NS	NS	NS	NS
	08/20/14	--	--	NS	NS	NS	NS
11/25/14	--	--	NS	NS	NS	NS	
Adams South (55-644020)	01/27/10	--	--	NS	NS	NS	NS
	04/27/10	--	--	NS	NS	NS	NS
	10/20/10	--	--	2.2	<1	<1	<2
	04/05/11	--	--	2.3	<1	<1	<2
	10/18/11	--	--	1.4	<1	<1	<2
	04/16/12	--	--	1.5	<1	<1	<2
	10/22/12	--	--	1.6	<1	<1	<2
	03/18/13	--	--	1.3	<1	<1	<2
	10/16/13	--	--	1.0	<0.50	<0.50	<0.50
	04/07/14	--	--	1.1	<1	<1	<2
	08/20/14	--	--	NS	NS	NS	NS
11/26/14	--	--	1.4	<1	<1	<2	

Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentration: (µg/l)			
				PCE	TCE	cis-1,2-DCE	1,1-DCE
ADEQ AWQS				5	5	70	7
York (55-600695)	04/05/11	--	--	<1	<1	<1	<2
	10/18/11	--	--	NS	NS	NS	NS
	04/16/12	--	--	<1	<1	<1	<2
	10/22/12	--	--	<1	<1	<1	<2
	03/18/13	--	--	<1	<1	<1	<2
	10/16/13	--	--	<0.50	<0.50	<0.50	<0.50
	04/07/14	--	--	<1	<1	<1	<2
	08/20/14	--	--	<1	<1	<1	<2
	11/26/14	--	--	<1	<1	<1	<2
Remediation Well Samples							
EW-1 (55-596439)	01/27/10	60	1.00	NS	NS	NS	NS
	04/27/10			Pump inoperable, not sampled			
	10/28/10	60	1.00	<1	<1	<1	<2
	04/04/11	60	1.00	<1	<1	<1	<2
	10/17/11	60	1.00	<1	<1	<1	<2
	04/16/12	60	1.00	<1	<1	<1	<2
	10/22/12	60	1.00	1.1	<1	<1	<2
	10/16/13			Pump inoperable, not sampled			
	04/07/14			Pump inoperable, not sampled			
	11/26/14			Not sampled			
EW-3 (55-205419)	01/27/10	60	3.00	NS	NS	NS	NS
	04/27/10	60	3.00	26	1.1	<1	<2
	10/20/10	60	3.00	17	<1	<1	<2
	04/04/11	60	3.00	14	<1	<1	<2
	10/17/11	60	4.00	16	<1	<1	<2
	04/16/12	60	3.00	12	<1	<1	<2
	10/22/12	60	2.00	10	<1	<1	<2
	03/18/13	60	2.00	18	<1	<1	<2
	04/26/13	60	1.00	24	1.1	<1	<2
	05/01/13	60	1.00	19	<1	<1	<2
	05/10/13	60	1.00	22	0.95	<1	<2
	05/24/13	60	1.00	24	1.0	<1	<2
	08/21/13	60	1.00	14	1.0	<1	<2
	10/16/13	60	1.00	20	0.61	<0.50	<0.50
	04/07/14	60	3.00	13	<1	<1	<2
08/20/14	--	--	NS	NS	NS	NS	
12/09/14	60	0.046	<1	<1	<1	<2	
EW-4 (55-205422)	01/27/10	60	3.00	NS	NS	NS	NS
	04/27/10	60	3.00	52	2.4	<1	<2
	10/20/10	60	3.00	49	2.2	<1	<2
	04/04/11	60	3.00	48	1.8	<1	<2
	10/17/11	60	3.00	58/49	1.8/1.7	<1/<1	<2/<2
	04/16/12	60	3.50	47/46	1.3/1.2	<1/<1	<2/<2
	10/22/12	60	4.00	63/60	2.0/1.2	<1/<1	<2/<2
	03/18/13	60	4.00	59/60	1.7/1.5	<1/<1	<2/<2
	10/16/13	60	5.00	60/56	1.3/1.3	<0.50/<0.50	<0.50/<0.50
	04/07/14	60	4.00	44/47	1.3/1.3	<1/<1	<2/<2
	08/20/14	60	0.046	6.3	<1	<1	<2
	08/20/14	60	0.046	6.3	<1	<1	<2
	12/09/14	60	0.046	<1	<1	<1	<2

Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentration: (µg/l)			
				PCE	TCE	cis-1,2-DCE	1,1-DCE
ADEQ AWQS				5	5	70	7
EW-5 (55-20520)	01/27/10	60	1.00	NS	NS	NS	NS
	04/27/10	60	1.00	NS	NS	NS	NS
	10/20/10	60	1.00	51	2.1	<1	<2
	11/02/10	60	0.046	12	<1	<1	<2
	04/04/11	60	0.046	14	<1	<1	<2
	10/17/11	60	2.20	27	<1	<1	<2
	04/16/12	60	2.20	28	<1	<1	<2
	10/22/12	60	2.00	35	1.2	<1	<2
	03/18/13	60	2.00	39	1.1	<1	<2
	10/16/13	60	2.00	36	0.93	<0.50	<0.50
	04/07/14	60	2.00	49	1.40	<1	<2
	08/19/14	60	2.00	38/40	1.0/1.1	<1/<1	<2/<2
	11/26/14	60	2.00	37/40	<1/<1	<1/<1	<2/<2
System O&M Samples							
INF	01/28/10	--	7.0	27	<1	<1	<2
	04/27/10	--	7.0	34	1.2	<1	<2
	08/20/10	--	7.0	35	1.4	<1	<2
	10/20/10	--	7.0	43	1.7	<1	<2
	01/27/11	--	9.5	<1	<1	<1	<2
	04/04/11	--	9.5	44	1.6	<1	<2
	07/22/11	--	9.3	32	1.3	<1	<2
	10/17/11	--	7.0	31	1.0	<1	<2
	01/25/12	--	8.8	39	1.2	<1	<2
	04/16/12	--	8.8	41	1.3	<1	<2
	08/02/12	--	8.0	36	1.4	<1	<2
	10/22/12	--	8.0	47	1.4	<1	<2
	01/24/13	--	9.9	37	1.2	<1	<2
	03/18/13	--	10.4	38	1.0	<1	<2
	08/21/13	--	7.0	53	1.4	<1	<2
	10/16/13	--	7.0	60	1.2	<1	<2
	01/31/14	--	9.0	27	<1	<1	<2
04/07/14	--	9.0	41	1.2	<1	<2	
INT	01/28/10	--	7.0	<1	<1	<1	<2
	04/27/10	--	7.0	1.9	<1	<1	<2
	08/20/10	--	7.0	7.7	<1	<1	<2
	10/20/10	--	7.0	<1	<1	<1	<2
	01/27/11	--	9.5	2.1	<1	<1	<2
	04/04/11	--	9.5	5.3	<1	<1	<2
	07/22/11	--	9.3	<1	<1	<1	<2
	10/17/11	--	9.3	1.3	<1	<1	<2
	01/25/12	--	8.8	4.4	<1	<1	<2
	04/16/12	--	8.8	16	1.0	<1	<2
	08/02/12	--	8.0	<1	<1	<1	<2
	10/22/12	--	8.0	<1	<1	<1	<2
	01/24/13	--	9.9	2.6	<1	<1	<2
	03/18/13	--	10.4	3.7	<1	<1	<2
	08/21/13	--	7.0	20	1.0	<1	<2
	10/16/13	--	7.0	<0.50	<0.50	<0.50	<0.50
	01/31/14	--	9.0	<1	<1	<1	<2
04/07/14	--	9.0	2.5	<1	<1	<2	

**Table 1. Results of Groundwater Sample Analyses
Tyson Wash WQARF Site, Quartzsite, Arizona**

Well ID (ADWR No.)	Date Sampled	Pump Intake Depth (ft)	Sample Flow Rate	Volatile Organic Compound Concentration: (µg/l)			
				PCE	TCE	cis-1,2-DCE	1,1-DCE
	ADEQ AWQS			5	5	70	7
EFF	01/28/10	--	7.0	<1	<1	<1	<2
	04/27/10	--	7.0	<1	<1	<1	<2
	08/20/10	--	7.0	<1	<1	<1	<2
	10/20/10	--	7.0	<1	<1	<1	<2
	01/27/11	--	9.5	<1	<1	<1	<2
	04/04/11	--	9.5	<1	<1	<1	<2
	07/22/11	--	9.3	<1	<1	<1	<2
	10/17/11	--	9.3	<1	<1	<1	<2
	01/25/12	--	8.8	<1	<1	<1	<2
	04/16/12	--	8.8	<1	<1	<1	<2
	08/02/12	--	8.0	<1	<1	<1	<2
	10/22/12	--	8.0	<1	<1	<1	<2
	01/24/13	--	9.9	<1	<1	<1	<2
	03/18/13	--	10.4	<1	<1	<1	<2
	08/21/13	--	7.0	<1	<1	<1	<2
	10/16/13	--	7.0	<0.50	<0.50	<0.50	<0.50
	01/31/14	--	9.0	<1	<1	<1	<2
	04/07/14	--	9.0	<1	<1	<1	<2

Notes:

µg/l - micrograms per liter

PCE - tetrachloroethene

TCE - trichloroethene

cis-1,2-DCE - cis-1,2-dichloroethene

1,1-DCE - 1,1-dichloroethene

-- - data unavailable

EPA - U.S. Environmental Protection Agency

ADEQ - Arizona Department of Environmental Quality

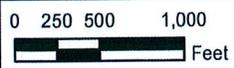
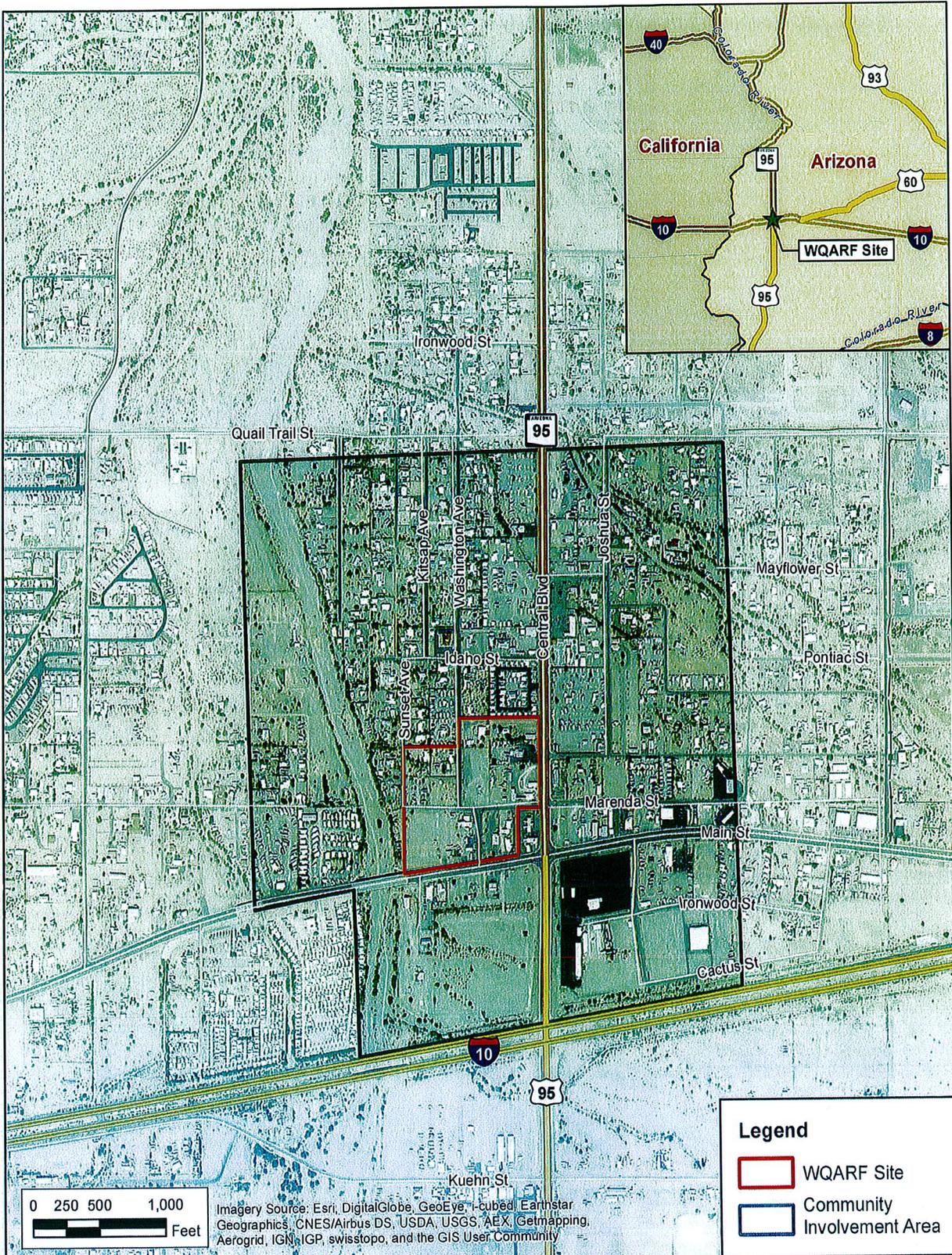
AWQS - Aquifer Water Quality Standards

NE - Not Established

NA - Not Analyzed

D - Duplicate Sample

APPENDIX B
FIGURES



Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar
 Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping,
 Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

-  WQARF Site
-  Community Involvement Area

Job No.: 1420142031
 PM: JC
 Date: 3/17/2015
 Scale: 1" = 1000 feet



**Periodic Site Review
 ADEQ Tyson Wash WQARF Site
 Quartzsite, Arizona**

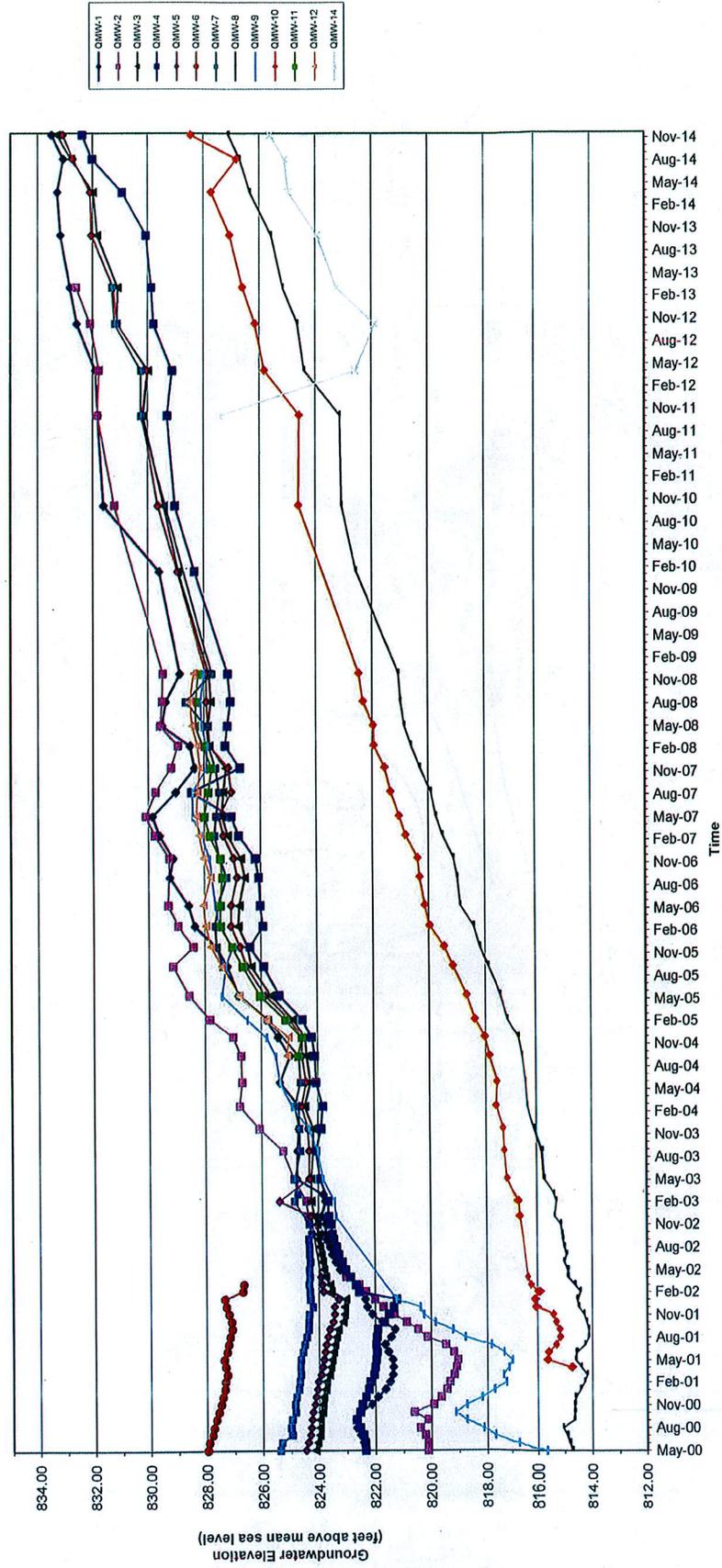


Site Location

FIGURE
 1

The map shown here has been created with all due and reasonable care and is strictly for use with Amec Foster Wheeler Project Number 1420142031. This map has not been certified by a licensed land surveyor, and any third party use of this map comes without warranties of any kind. Amec Foster Wheeler assumes no liability, direct or indirect, whatsoever for any such third party or unintended use.

Figure 2
 Groundwater Elevation vs Time, May 2000 - November 2014
 Tyson Wash WQARF Site



Legend

PCE Concentrations (µg/L) in Groundwater
(Dashed Where Inferred)

5 µg/L
50 µg/L

Monitoring Well Location
Domestic Well Location (Approximate)
Water Treatment Extraction and Injection Well Location
Remediation System Location

Notes:

QMW-1 Well Identification
4.1 Approximate PCE Isoconcentration (µg/L)
µg/L Microgram per liter
NS Not sampled during current event
PCE Tetrachloroethylene

0 25 50 100 Feet

N

Periodic Site Review
ADEQ Tyson Wash WQARF Site
Quartzsite, Arizona

PCE Concentrations
January 27, 2010

FIGURE 5

Job No.: 1420142031
PK: JC
Date: 3/17/2015
Scale: 1" = 100 feet

amec
foster
wheeler

The map shown here has been created with the use of aerial photography and other data. The map is not intended to be used for any purpose other than that for which it was created. The user assumes all liability for any use of the map. The map is not a warranty, representation, or agreement of any kind. The map is provided "as is" and "with all faults".



Image/Sources: Esri, DigitalGlobe, GeoEye, Earthstar, Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, GCP, swisstopo, Mapbox, Mapbox Community



Legend

- Approximate PCE Isoconcentration Line**
- 5 µg/L
 - 20 µg/L
 - 50 µg/L
- Monitoring Well Location**
- Domestic Well Location (Approximate)
 - Water Treatment Extraction and Injection Well Location
 - In Situ Chemical Oxidation (ISCO) Injection Well Location
 - Pipeline
 - Remediation System Location

- Notes:**
- QMW-1 Well Identification
 - <1.0 Approximate PCE Isoconcentration (µg/L)
 - 55/55 Original/Duplicate Results
 - µg/L Microgram per liter
 - NS Not sampled during current event
 - PCE Tetrachloroethylene



Periodic Site Review
ADEQ Tyson Wash WQARF Site
Quartzsite, Arizona

PCE Concentrations
August 2014

FIGURE 8	Job No. 1420142031	
	FW: JC	
	Date: 3/19/2015	
Scale: 1" = 100 feet		

This map was prepared by amec foster wheeler for the Arizona Department of Environmental Quality (ADEQ) under contract number 1420142031. The map is for informational purposes only and does not constitute a warranty or representation of any kind. The map is based on data provided by the client and is subject to change without notice. amec foster wheeler is not responsible for any errors or omissions in this map.

Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGA, swisstopo, Mapbox, Mapbox Community

**APPENDIX C
PHOTOGRAPHS**

Appendix C - Tyson Wash Remediation System Photo Log
106 West Cowell Street, Quartzsite, Arizona



Photo 1: View looking at P&T System GAC canisters and equalization tank.



Photo 2: View looking at P&T system primary GAC canister.

*Appendix C - Tyson Wash Remediation System Photo Log
106 West Cowell Street, Quartzsite, Arizona*

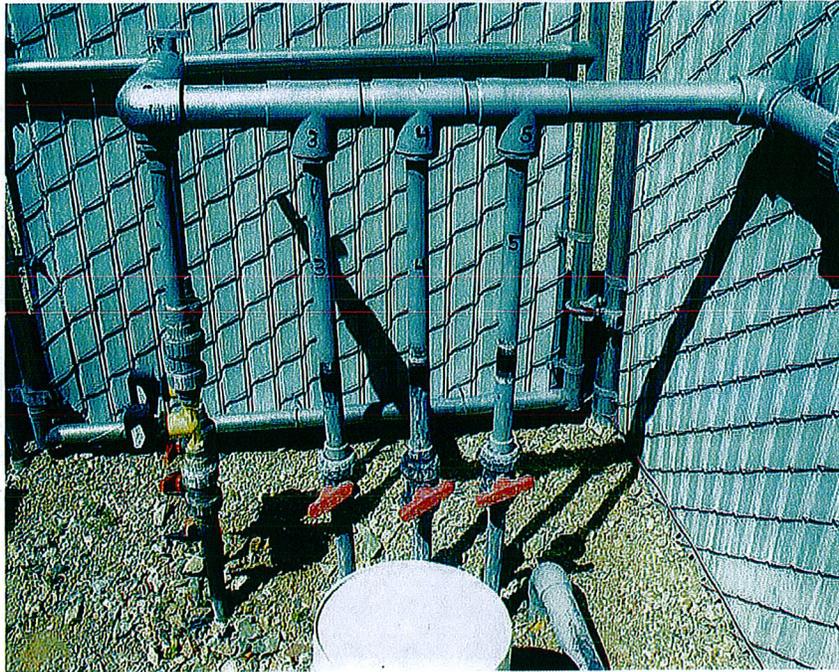


Photo 3: View looking at P&T system manifold piping from EW-1, EW-2, EW-3, EW-4, and EW-5.



Photo 4: View of P&T system piping.

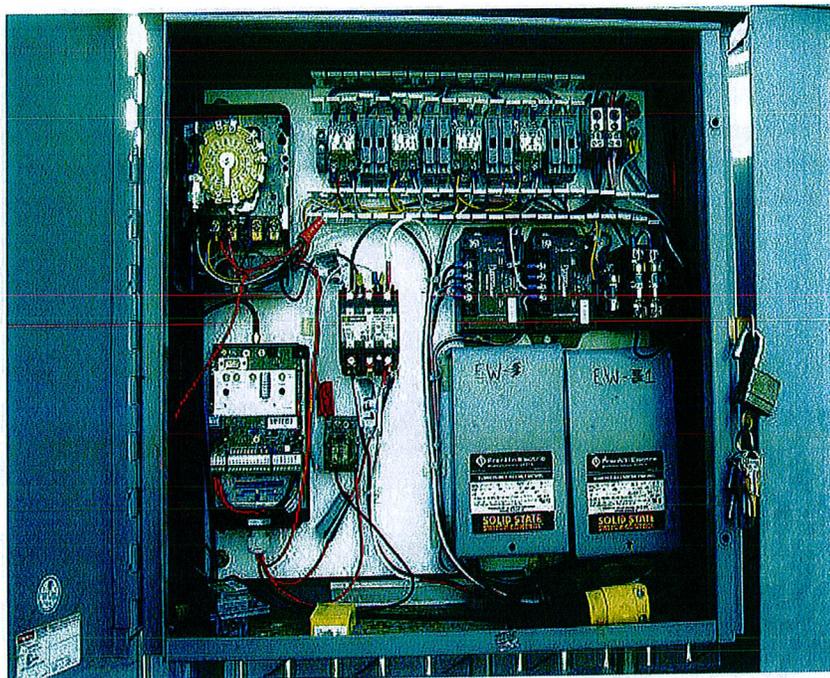


Photo 5: View of P&T system controls



Photo 6: View looking west at FOCIS compound.

*Appendix C - Tyson Wash Remediation System Photo Log
106 West Cowell Street, Quartzsite, Arizona*

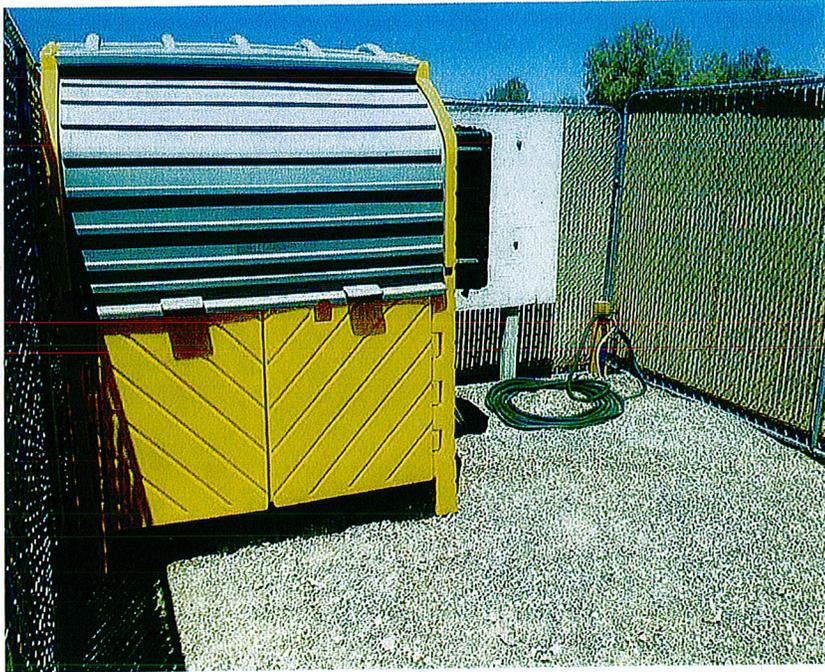


Photo 9: View looking west inside FOCIS compound.



Photo 10: View of 300 gallon tote within secondary containment.

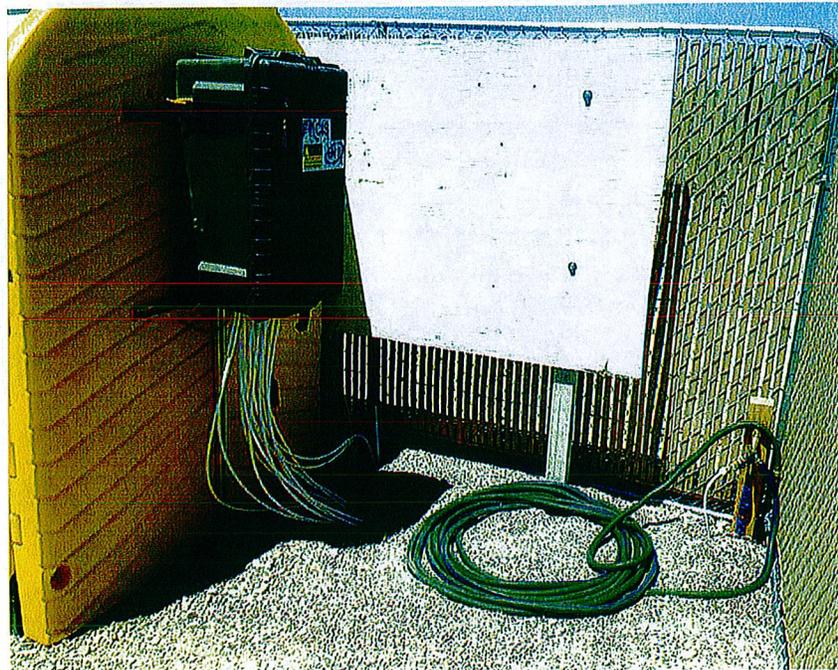


Photo 11: View of FOCIS unit with plumbing and water supply.



Photo 12: View of FOCIS unit with detail.

*Appendix C - Tyson Wash Remediation System Photo Log
106 West Cowell Street, Quartzsite, Arizona*



Photo 13: View of chemical storage area (located 20' south of FOCIS compound).

**APPENDIX D
INTERVIEW SUMMARIES**



Janice K. Brewer
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov



Henry R. Darwin
Director

ADEQ Tyson Wash WQARF Site Periodic Review Questions

Name: Skylor Miller, Quartzsite Town Manager

Date Mailed: 12/23/14

1. Are you familiar with the Tyson Wash WQARF site and what is your overall impression?
The Town is aware of the WQARF. The Town and public are largely uninformed of the scope of work on this project.
2. During the last 5 years have there been any changes to the Town of Quartzsite municipal groundwater management program? None
3. Is the Tyson Wash WQARF site remedy functioning as expected? Unknown- Reports have not been received.
4. Do you feel well informed about the Tyson Wash WQARF activities and progress? No
5. Have there been any complaints, or violations or other incidents related to the Tyson Wash WQARF site? Summer 2014- A H₂O₂ container became volatile and caused a large scale emergency response. No SDS was available on site.
6. Have there been any site visits, inspections, reporting activities conducted for the Tyson Wash WQARF site? Unknown
7. Are you aware of any problems, difficulties, or significant changes in O&M requirements, maintenance schedules or sampling routines encountered? Unknown
8. Do you know of any changes in the Local, State, or Federal regulation requirements? No
9. Do you have any comments or suggestions regarding the operation of the Tyson Wash WQARF site remediation system? Improve communication with local government
10. Do you know of any operations or adjustments that can optimize the site remediation system or make it perform better? No
11. Do you conduct any groundwater monitoring or review groundwater monitoring data? We test at our Town operated wells monthly



Janice K. Brewer
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
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Henry R. Darwin
Director

12. Has the Town of Quartzsite ever detected anything in groundwater like MTBE, boron, chromium, or other constituents that might have caused a problem? None

13. Are you aware of a continuous operation and maintenance presence at the Tyson Wash WQARF site? No

14. Are you familiar with initial conditions and the current status of impact to groundwater? Town staff has a broad understanding of this situation

15. Are you aware of any ongoing community concerns about the Tyson Wash WQARF site or its operation? No

16. Have the local authorities, you, or others heard about any vandalism at the Tyson Wash WQARF site. No

17. Are you aware of repairs or upgrades/replacement that should be made to the remediation system within the next five years? No

18. Are you aware of the information repository at the Quartzsite Public Library and on the ADEQ website? Yes

19. When you have had to contact/work with ADEQ, on the Tyson Wash WQARF site, were your questions and concerns responded to promptly? N/A

20. What is the best way for ADEQ to continue to communicate with you? Email to the following addresses.
Skylor Miller- smiller@ci.quartzsite.az.us
Jeff Sorenson- wwtp@ci.quartzsite.az.us
Emmett Brinkerhoff- pwdirector@ci.quartzsite.az.us



Douglas A. Ducey
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY



Henry R. Darwin
Director

ADEQ Tyson Wash WQARF Site Periodic Review Questions

Name: Jim Clarke, AMEC
Date: 03/03/2015

1. Are you familiar with the Tyson Wash WQARF site and what is your overall impression?
Yes – It is a groundwater site and the contamination is under a neighborhood. In order to protect public human health and the environment, remediation is required.
2. During the last 5 years have there been any changes to the Town of Quartzsite municipal groundwater management program? *Not aware*
3. Is the Tyson Wash WQARF site remedy functioning as expected? *Yes*
4. Do you feel well informed about the Tyson Wash WQARF activities and progress? *Yes*
5. Have there been any complaints, or violations or other incidents related to the Tyson Wash WQARF site? *Yes – last year there was a incident, there was a reaction in the hydrogen proxide tank that allowed it to spill. Fire department was called, it was non hazardous. They responded quickly and cleaned up the spill.*
6. Have there been any site visits, inspections, reporting activities conducted for the Tyson Wash WQARF site? *Yes*
7. Are you aware of any problems, difficulties, or significant changes in O&M requirements, maintenance schedules or sampling routines encountered? *None*
8. Do you know of any changes in the Local, State, or Federal regulation requirements?
No
9. Do you have any comments or suggestions regarding the operation of the Tyson Wash WQARF site remediation system? *Continued operation until cleanup goals are achieved.*
10. Do you know of any operations or adjustments that can optimize the site remediation system or make it perform better? *None at this time*

11. Do you conduct any groundwater monitoring or review groundwater monitoring data?
Yes
12. Has the Town of Quartzsite ever detected anything in groundwater like MTBE, boron, chromium, or other constituents that might have caused a problem? *I do not represent the town so I can not answer the question.*
13. Are you aware of a continuous operation and maintenance presence at the Tyson Wash WQARF site? *Yes*
14. Are you familiar with initial conditions and the current status of impact to groundwater?
Yes
15. Are you aware of any ongoing community concerns about the Tyson Wash WQARF site or its operation? *Yes - the Town of Quartzsite has some concerns that there is a lack of notification.*
16. Have the local authorities, you, or others heard about any vandalism at the Tyson Wash WQARF site? *No*
17. Are you aware of repairs or upgrades/replacement that should be made to the remediation system within the next five years? *Yes*
18. Are you aware of the information repository at the Quartzsite Public Library and on the ADEQ website? *Yes*
19. When you have had to contact/work with ADEQ, on the Tyson Wash WQARF site, were your questions and concerns responded to promptly? *Yes*
20. What is the best way for ADEQ to continue to communicate with you? *Email then telephone*



Douglas A. Ducey
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY



Henry R. Darwin
Director

ADEQ Tyson Wash WQARF Site Periodic Review Questions

Name: Tina LePage
Date: March 17, 2015

1. Are you familiar with the Tyson Wash WQARF site and what is your overall impression?
Yes and I'm very happy with the progress that has been made in recent years
2. During the last 5 years have there been any changes to the Town of Quartzsite municipal groundwater management program? None that I'm aware of
3. Is the Tyson Wash WQARF site remedy functioning as expected? Yes
4. Do you feel well informed about the Tyson Wash WQARF activities and progress? Yes
5. Have there been any complaints, or violations or other incidents related to the Tyson Wash WQARF site? None that I'm aware of
6. Have there been any site visits, inspections, reporting activities conducted for the Tyson Wash WQARF site? Yes – mostly associated with the monthly O&M, semi-annual groundwater sampling and reporting
7. Are you aware of any problems, difficulties, or significant changes in O&M requirements, maintenance schedules or sampling routines encountered? No
8. Do you know of any changes in the Local, State, or Federal regulation requirements? No
9. Do you have any comments or suggestions regarding the operation of the Tyson Wash WQARF site remediation system? ADEQ should always be looking to optimize contaminant mass removal
10. Do you know of any operations or adjustments that can optimize the site remediation system or make it perform better? Optimization of the existing system will depend on how effective the ISCO injections are.
11. Do you conduct any groundwater monitoring or review groundwater monitoring data? No

12. Has the Town of Quartzsite every detected anything in groundwater like MTBE, boron, chromium, or other constituents that might have caused a problem? Not that I'm aware of
13. Are you aware of a continuous operation and maintenance presence at the Tyson Wash WQARF site? Yes
14. Are you familiar with initial conditions and the current status of impact to groundwater? Yes
15. Are you aware of any ongoing community concerns about the Tyson Wash WQARF site or its operation? No
16. Have the local authorities, you, or others heard about any vandalism at the Tyson Wash WQARF site. No
17. Are you aware of repairs or upgrades/replacement that should be made to the remediation system within the next five years? No
18. Are you aware of the information repository at the Quartzsite Public Library and on the ADEQ website? Yes
19. When you have had to contact/work with ADEQ, on the Tyson Wash WQARF site, were your questions and concerns responded to promptly? N/A
20. What is the best way for ADEQ to continue to communicate with you? email

APPENDIX E
PUBLIC NOTIFICATION DOCUMENTS

**NOTICE ANNOUNCING COMPLETION OF THE PERIODIC REVIEW
TYSON WASH
WATER QUALITY ASSURANCE REVOLVING FUND SITE (WQARF)**

The Arizona Department of Environmental Quality (ADEQ), has completed the periodic review of cleanup actions undertaken at the Tyson Wash WQARF site pursuant to A.A.C. R18-16-410(B) (8). The Tyson Wash WQARF site record of decision (ROD) was signed on June 29, 2009. The purpose of the periodic review to evaluate whether the cleanup actions for the Site remain protective of human health and the environment.

This periodic review report concluded that the remedies in place continue to be protective of human health and the environment. Currently, there are no environmental exposure pathways that result in unacceptable risks, and none are expected as long as the engineered and institutional controls selected in the decision documents continue to be properly operated, monitored and maintained, and the land use at the site allows for the integrity of the remedies to continue.

The Tyson Wash WQARF site is located in the town of Quartzsite, Arizona. The contaminated groundwater plume is bounded by W. Sunset Street to the north, Main Street (Business I-10) to the south, N. Central Boulevard (SR-95) to the east, and Oregon Avenue to the west in the town of Quartzsite (Town), Arizona. The known groundwater contamination exists northwest of the intersection of State Hwy. 95 and Business Route I-10.

The Periodic Review report is available for review online at: http://www.azdeq.gov/environ/waste/sps/Tyson_Wash.html and at the ADEQ Records Center, 1110 W. Washington St., Phoenix, (602) 771-4380, or (800) 234-5677, ext. (602) 771-4380; please call for hours of operation and to schedule an appointment.

To request an auxiliary aid or service for accessible communication, please contact Alicia Pollard at (602) 771-4791 or at aap@azdeq.gov or dial 7-1-1 for TTY/TTD Services.

Dated this 6 day of May, 2015
Mel Bunkers, ADEQ Project Manager

Si desea esta información en Español, por favor llame al (602) 771-4189 ó sin tarifa al (800) 234-5677 y marque el número 2 para Español.

APPENDIX F
P&T SYSTEM OPERATIONAL RECORDS

TYSON WASH FISCAL YEAR 2011 PUMPING RECORD

DATE	TOTALIZER GALLONS	PUMPING RATE (GPM)	GALLONS PUMPED (Period)	PERIOD DAYS	GALLONS PUMPED (Average GPD)	PCE REMOVED (Lbs)	COMMENTS
6/23/2010	remove broken flow meter and install new flow meter with 0 gallons on it	7.02					Previous FY 2010 Measurement
6/23/2010	16.8						Pumping from EW-3, EW-4, and EW-5
7/30/2010	91040.2	7.04	91023.4	37	2460	0.015	
8/20/2010	166947	7.14	75906.8	21	3615	0.013	
9/20/2010	267314	7.09	100367	31	3238	0.017	
3rd Quarter 2010 Record							
			267297.2			0.045	
10/19/2010	299543	0					Flow meter impeller was blocked by a small rock.
10/20/2010	299741	7.5	97140	30	3238	0.016	Quantity pumped for period is estimated. GAC scrubber replaced.
10/26/2010	312223	off					System is off for sampling and modification of INJ-2.
10/28/2010	312982	off	13241			0.003	INJ-2 modifications completed, EW-1 on-line and EW-5 off-line. System testing and optimization being performed.
11/1/2010	327518	off				0.004	System re-started
11/2/2010	331496	off	18514			0.014	
11/17/2010	396261	9.33	64765	15	4318		EW-5 on-line. Pumping from EW-1, EW-3, EW-4, and EW-5.
12/6/2010	469032	9.3					Storm related power failures affected performance.
12/20/2010	515969	9.51	119708	32	3741	0.025	
12/21/2010	521448	off	5479			0.001	
4th Quarter 2010 Record							
			318847			0.063	
1/4/2011	578329	off	56881			0.012	System off for maintenance.
1/27/2011	668454	9.03	90125	23	3918	0.019	
2/22/2011	766170	10.3	97716	26	3758	0.02	
2/23/2011	769897	9.35	3727				
3/22/2011	870943	9.2	104773	28	3742	0.02	Blockage cleared from discharge line
3/23/2011	875724	9.4	4781	1	4781		
1st Quarter 2011 Record							
			358003			0.075	

4/4/2011	897219		21495	5.76	3732	0.004	
4/6/2011	905799	9.28	8580	2.1	4086		
4/21/2011	964006	9.44	58207	15	3880	0.014	
5/9/2011	34355.1	9.36	70349.1	18	3908	0.015	Totalizer turned over.
5/25/2011	97433.3	9.54	63078.2	16	3942	0.013	
6/23/2011	209821	9.48	112387.7	29	3875	0.024	
2nd Quarter 2011 Record			334097			0.07	
Fiscal Year 2011 Record			1278244.2			0.253	
Total 4/7/03 - 6/23/11			8208701.7			1.633	

Checked by: JNC

TYSON WASH FISCAL YEAR 2012 PUMPING RECORD

DATE	Time	TOTALIZER GALLONS	PUMPING RATE (GPM)	GALLONS PUMPED (Period)	PERIOD DAYS	GALLONS PUMPED (Average GPD)	PCE REMOVED (Lbs)	COMMENTS
6/23/2011	8:45	209821	9.48					Previous FY 2011 Measurement
7/20/2011	8:25	320379	9.33	110558	27	4094.74	0.029	Pumping from EW-1, EW-3, EW-4, and EW-5.
8/23/2011	14:30	447488	9.38	127109	34	3738.50	0.034	Pumping from EW-1, EW-3, EW-4, and EW-5.
9/6/2011	10:30	496558		49070	14	3505.00	0.013	Pumping from EW-1, EW-3, EW-4, and EW-5.
9/19/2011	11:00	542645	9.3	46087	13	3545	0.012	Pumping from EW-1, EW-3, EW-4, and EW-5. Cleaned tank and discharge lines.
3rd Quarter 2011 Record				332824			0.088	
10/17/2011	11:15	639993	9.36	97348	28	3477	0.025	System shut down for sampling event
10/18/2011	17:25							System re-started at 17:25
10/19/2011	12:30	643571	9.36	3578	0.8	4472.5	0.001	Pumping from EW-1, EW-3, EW-4, and EW-5.
11/21/2011	12:00	757626	9.3	114055	32.98	3458.31	0.03	Pumping from EW-1, EW-3, EW-4, and EW-5.
11/21/2011	16:00		8.7					Pumping from EW-3 (3.0 gpm), EW-4 (3.5 gpm), and EW-5 (2.2 gpm). EW-1 taken off-line and gpm rate decreased to increase daily volume pumped.
12/21/2011	12:30	850978	8.35	93352	29.85	3127.37	0.024	
12/30/2011	12:00	877692	8.7	26714	8.98	2974.83	0.007	
4th Quarter 2011 Record				335047			0.062	

TYSON WASH FISCAL YEAR 2012 PUMPING RECORD									
1/25/2012	13:05	941688	8.8	63996	26.05	2457	0.02	Pumping from EW-3 (3.0 gpm), EW-4 (3.5 gpm), and EW-5 (2.3 gpm).	
2/22/2012	10:30	23939.6	8.88	82251.6	27.89	2949	0.027	Pumping from EW-3, EW-4, and EW-5.	
3/22/2012	15:30	62124.8	8.8	38185.2	29.21	1307.26	0.012	Electricity was turned off for two weeks. INJ-2 re-developed.	
1st Quarter 2012 Record				184432.8			0.059		
4/16/2012	11:30	170968		108843.2	24.83	4384	0.037	System shut down at 13:15 for groundwater sampling event. System re-started at 17:45 on 4/17/12.	
4/18/2012	8:30	173974	8.8	3006	0.69	4357		Pumping from EW-3, EW-4, and EW-5.	
5/17/2012	10:00	320692	8.73	146718	29.06	5049	0.05	Pumping from EW-3, EW-4, and EW-5.	
6/19/2012	11:15	443371	8.8	122679	33.05	3712	0.042	Pumping from EW-3, EW-4, and EW-5.	
2nd Quarter 2012 Record				381246.2			0.129		
Fiscal Year 2012 Record				1233550			0.338		
Total 4/7/03 - 6/19/12				9442251.7			1.971		

TYSON WASH FISCAL YEAR 2013 PUMPING RECORD

DATE	Time	TOTALIZER GALLONS	PUMPING RATE (GPM)	GALLONS PUMPED (Period)	PERIOD DAYS	GALLONS PUMPED (Average GPD)	PCE REMOVED (Lbs)	COMMENTS
6/19/2012	11:15	443371	8.8					Previous FY 2012 Measurement
		Total 4/7/03 - 6/19/12		8208701.7			1.633	
8/2/2012	9:30	0	8.9	138082.5 (est)	43.93	3143.24	0.04	Pumping from EW-3, EW-4, and EW-5. Battery in flow meter died; therefore, total gallons pumped was not read. Estimated gallons pumped are based on August 2012 readings.
8/28/2012	9:30	88010.6	8.91	88010.6	28	3143.24	0.0265	Pumping from EW-3, EW-4, and EW-5.
9/18/2012	9:30	153740		65729.4	20	3286.47	0.025	Pumping from EW-3, EW-4, and EW-5.
9/25/2012	11:30	178473	4.3	24733	7.08	3493	0.007	Pump in EW-3 failed, but based on gallons pumped it had likely failed on this day.
9/25/2012	14:45		8.75					Pumping from EW-4 (6.0 gpm) and EW-5 (2.5 gpm).
				316555.5			0.093	
3rd Quarter 2012 Record								
10/22/2012	10:05	276032	7	97559	26.98	3616	0.038	Pump in EW-3 replaced by pump in EW-1. System shut down for sampling event.
10/23/2012	14:50		8					System re-started. Pumping from EW-3 (2 gpm), EW-4 (4 gpm), and EW-5 (2 gpm).
11/26/2012	9:00	390377	8	114345	33.76	3387	0.045	
11/27/2012	14:20	394769	12	4392			0.002	Well INJ-3 connected to remediation system. Pumping from EW-3 (3.5 gpm), EW-4 (6.5 gpm), and EW-5 (2.0 gpm). System timer replaced.

TYSON WASH FISCAL YEAR 2013 PUMPING RECORD

12/27/2012	13:00	496668	11.93	101899	29.94	3403.44	0.04	The air relief device on INJ-3 was not functioning properly resulting in lower than expected volume of water pumped. Pumping from EW-3 (2.5 gpm), EW-4 (5.5 gpm), and EW-5 (2.0 gpm).
4th Quarter 2012 Record				318195			0.125	
2nd Half 2012 Record				634750.5			0.218	
1/23/2013	11:30	587392	9.89	90724	26.94	3367.63	0.028	
1/24/2013	8:30	590955	10.93	3563	0.88	4048.86		New air relief valves were installed on INJ-2 and INJ-3. Pumping rate increased to approximately 12 gpm as follows: EW-3 (3.50 gpm); EW-4 (6.50 gpm), and EW-5 (2.00 gpm).
2/27/2013	11:00	720981	12	130026	33.9	3835.58	0.04	Decreased pumping rate to approximately 10.5 gpm as follows: EW-3 (2.50 gpm); EW-4 (6.00 gpm), and EW-5 (2.00 gpm). Rate stabilized at 10.15 gpm.
3/18/2013	12:00	798877	10.35	77896	19.04	4091.18	0.024	Decreased pumping rate to approximately 9.1 gpm as follows: EW-3 (2.50 gpm); EW-4 (5.00 gpm), and EW-5 (2.00 gpm).
3/20/2013	11:30	798877	9.1	0				
1st Quarter 2013 Record				302209			0.092	

TYSON WASH FISCAL YEAR 2013 PUMPING RECORD									
4/1/2013	10:30	852159	9.3	53282	11.96	4455	0.016		
4/9/2013	12:00	887290	9.3	35131	8.06	4359	0.01	ISCO pilot test implemented and EW-3 taken off-line. Total pumping rate set at 7.0 gpm as follows; EW-4 (5.0 gpm), and EW-5 (2.0 gpm).	
4/26/2013	10:30	946986	7	59696	16.94	3524	0.018		
5/24/2013	11:30	54414	7.04	107428	26.04	4125	0.033		
6/3/2013	12:00	91148.7	7.04	36734.7	10	3673	0.011		
6/11/2013	9:30	120048	6.93	28899.3	7.9	3658	0.009		
2nd Quarter 2013 Record				321171			0.097		
1st Half 2013 Record				623380			0.189		
Fiscal Year 2013 Record				1258130.5			0.407		
Total 4/7/03 - 6/11/13							9466832.2	2.04	

TYSON WASH FISCAL YEAR 2014 PUMPING RECORD									
DATE	Time	TOTALIZER GALLONS	PUMPING RATE (GPM)	GALLONS PUMPED (Period)	PERIOD DAYS	GALLONS PUMPED (Average GPD)	PCE REMOVED (Lbs)	COMMENTS	
6/11/2013	9:30	120048	6.93					Previous FY 2013 Measurement	
		Total 4/7/03 - 6/11/13		9466832.2			2.04		
7/25/2013	11:30	278919	7.03	158871	44.08	3604.15	0.07	Pumping from EW-4 and EW-5.	
8/21/2013	9:00	375875	6.87	98956	26.89	3605.65	0.04	Pumping from EW-4 and EW-5.	
9/26/2013	10:30	499805	6.95	123930	36.063	3436.49	0.06	Pumping from EW-4, and EW-5.	
3rd Quarter 2013 Record									
10/14/2013	15:00	566282	6.72	66477	18.19	3655	0.03	Pumping from EW-4, and EW-5.	
11/27/2013	12:00	653826	6.85	87544	44.875	1951	0.04	System was off due to AlarmAgent problem. Problem was corrected and the system was re-started. EW-3 was placed back on-line and total pumping rate increased to 9.03 gpm.	
12/12/2013	9:20	701054	8.93	47228	14.888	3172	0.02	Pumping from EW-3, EW-4, and EW-5. Daily pumping rate is low for 3 wells pumping at 8.93 gpm.	
4th Quarter 2013 Record									
2nd Half 2013 Record									
				201249			0.09		
				581006			0.26		

TYSON WASH FISCAL YEAR 2014 PUMPING RECORD

1/31/2014	9:30	749811	9					Small rock was stuck in totalizer; therefore total volume of water pumped is unknown.
2/17/2014	3:00	23692	9.06	273881	17.23			System was shut down due to electrical issues.
3/26/2014	10:00	145299	8.97	121607				
1st Quarter 2014 Record								
4/7/2014	10:00	181823	9	395488			0.11	Groundwater sampling event.
				36524			0.012	Wells EW-3 and EW-4 taken off-line to accommodate ISCO injection equipment.
4/21/2014	12:00	224949	3	43126			0.015	Well EW-5 operated for hydraulic control. EW-5 was shut down for ISCO system installation.
6/2/2014	11:00	279982	2	55033			0.019	
6/25/2014		287027	2.18	7045			0.002	
2nd Quarter 2014 Record								
				141728			0.048	
1st Half 2014 Record								
				537216			0.158	
Fiscal Year 2014 Record								
				1118222			0.418	
Total 4/7/03 - 6/25/14				10585054.2			2.458	

TYSON WASH JULY-DECEMBER 2014 PUMPING RECORD									
DATE	Time	TOTALIZER GALLONS	PUMPING RATE (GPM)	GALLONS PUMPED (Period)	PERIOD DAYS	GALLONS PUMPED (Average GPD)	PCE REMOVED (Lbs)	COMMENTS	
6/25/2014		287027	2.18	7045			0.002	Final FY 2014 Measurement	
		Total 4/7/03 - 6/25/14		10418075.2			2.458		
7/7/2014	11:00	299117	2	12090	12	1007.50	0.004	Pumping from EW-5.	
7/21/2014	9:30	311279	1.88	12162	14	868.71	0.004	Pumping from EW-5.	
8/19/2014	10:30	333715	2	22436	29	773.66	0.007	Pumping from EW-5.	
9/5/2014	9:30	344483	2	10768	17	633.41	0.003	Pumping from EW-5.	
9/23/2014	9:44	357148	1.99	12665	18	703.61	0.004	Pumping from EW-5. Replaced batteries and re-set flow meter to	
				70121			0.022	0.00	
3rd Quarter 2014 Record				19813.8	18.19	1089	0.03	Pumping from EW-5.	
10/14/2014	17:30	19813.8	1.69	19813.8					
11/13/2014	12:15	20900.5	1.78	1086.7	2	543	0.0003	A power failure shut down the system on 10/16/14.	
11/24/2014	12:30	29340	1.78	8439.5	11	767	0.003	Pumping from EW-5.	
12/22/2014	12:00	52221.5	1.65	22881.5	28	817	0.007	Pumping from EW-5.	
4th Quarter 2014 Record				29340			0.0403		
2nd Half 2014 Record				99461			0.0623		
		Total 4/7/03 - 12/22/14		10517536.2			2.5203		

