

APPENDIX B
REMEDIAL INVESTIGATION COMMENTS AND RESPONSIVENESS
SUMMARY

FINAL RESPONSIVENESS SUMMARY

**FINAL REMEDIAL INVESTIGATION REPORT--
SHANNON ROAD/EL CAMINO DEL CERRO
WATER QUALITY ASSURANCE REVOLVING FUND SITE
TUCSON, ARIZONA**



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Acronyms and Abbreviations

Below are acronyms and abbreviations used either by the Arizona Department of Environmental Quality or by public commenters in their comments reproduced in this responsiveness summary.

A.A.C.	Arizona Administrative Code
ac-ft/yr	acre-feet per year
ADHS	Arizona Department of Health Services
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
A.R.S.	Arizona Revised Statute
AST	Above-ground Storage Tank
AWQS	Aquifer Water Quality Standard
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CAB	Community Advisory Board
CDC	Camino del Cerro
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DCE	Dichloroethene
ECDC	El Camino del Cerro
ESI	Expanded Site Inventory
FS	Feasibility Study
GAC	Granular Activated Carbon
gpm	gallons per minute
gpd/ft	gallons per day per foot
GWSI	Groundwater Site Inventory
HGL	Hydrogeologic, Inc.
LESP	Landfill Environmental Studies Program
LWUS	Land and Water Use Study
M&A	Montgomery & Associates
MDWID	Metropolitan Domestic Water Irrigation District (Metro Water)
MCL	Maximum Contaminant Level
NPL	National Contingency Plan
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene a.k.a. perchloroethene

PID	Photoionization Detector
ppbv	parts per billion by volume
ppmv	part per million by volume
PRP	Potentially responsible party
PRAP	Proposed Remedial Action Plan
RI	Remedial Investigation
Site	Shannon Road/El Camino del Cerro WQARF Site
SR/ECDC	Shannon Road/El Camino del Cerro
SRL	Soil Remediation Level
SVE	Soil vapor extraction
TCA	Trichloroethane
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
URS	URS Corporation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Society
UST	Underground Storage Tank
VOC	Volatile organic compound
WQARF	Water Quality Assurance Revolving Fund
µg/l	Microgram per liter

Introduction

The Arizona Department of Environmental Quality (ADEQ) is presenting this Responsiveness Summary for comments received from various parties on the ADEQ *Draft Remedial Investigation (RI) Report, Shannon Road/El Camino del Cerro WQARF Site, Tucson, Arizona* dated March 2014 and prepared by URS. The draft RI report was made available for public review and comment between March 19, 2014 and May 17, 2014. ADEQ received written comments from the following: (1) Terri Hutts; (2) the Shannon Road/El Camino del Cerro Community Advisory Board; (3) Metropolitan Domestic Water Improvement District; (4) Clear Creek Associates on behalf of Metropolitan Domestic Water Improvement District; (5) Office of the Pima County Attorney; and (6) Montgomery and Associates on behalf of Pima County. ADEQ has prepared this responsiveness summary for all comments received regarding the draft RI report. No other comments were received in the period allotted.

Comments from Terri Hutts, Community Advisory Board Member

Comments regarding the draft RI report were received via email from Terri Hutts to ADEQ, dated May 10, 2014. Additionally, comments regarding past Community Advisory Board (CAB) meeting minutes were received via email from Terri Hutts to ADEQ, dated May 14, 2014. The following section includes the text of comments pertaining to the RI Report (1 – 9) and those pertaining to excerpts from CAB minutes (1 - 14) in boldface italics, along with an ADEQ response to address each comment.

COMMENTS (Final Draft RI Report)

- 1. I am sending you the footprint of the El Corizon de Los Tres Rios Del Norte Park. It appears to be out of the direct plume with the exception of the expansion of the Dan Felix Park.***
- 2. There is a 2015 proposed bond project which is already tentatively approved by the Pima County Bond Advisory Committee for the construction of the Flowing Wells Skate Park. It is my understanding that it will be just north of Acacia Gardens at the north end of Shannon as it abuts the south side of the Rillito River bank. I believe it is adjacent to well Z006 but I might be mistaken as to the number. I have not seen a rendering and do not know if one has been completed to date. It will be located between the Kory Laos Memorial BMX Park and the west end of the Flowing Wells District Park. The Skateboard Park is PR109 on the Pima County web site at a cost of \$1,600,000.***
- 3. The Ina Road/I-10 intersection is the next in the line for re-construction after Prince. I do not know if the Ruthrauff or Sunset is the next on the list. However, it should be noted that these new intersection configurations are quite large. I believe they will be similar in size as to the Miracle Mile intersection. The plan for the Sunset exit is to link up with the elbow in River Road. This intersection and Sunset extension will encompass a great deal of property.***

4. Kory Laos Memorial BMX Park is currently located northwest of Acacia Gardens. It is a dirt track configuration now, but is also included for expansion in the 2015 bond package. It will include such things as concrete bowls. There will be ramadas, bathrooms, parking lot, etc that will co-exist with the Skateboard Park for shared use. It is project PR273 for \$1,300,000.

5. Pima County Flood Control has plans to work on the confluence of the Santa Cruz River and Rillito River. This work needs to be completed to avoid backflow on the Rillito. When that work has been completed the property that Pima County owns along the wash will be lifted out of the flood plan and there has been some discussion to sell it off as commercial property. This work will most probably be completed at the time of the Sunset/I -10 project would be my guess. It is noted as FC58 on the Pima County web site and is a \$10,000,000 project.

6. The property for consideration to expand the Flowing Wells District Park in the 2015 Bond Election is as follows:

Township 13 South, Range 13 East, Section 16- South Bank of the Rillito, East of Shannon Road.

Specific parcels are:

101-14-313D

101-14-313G

101-14-313H

101-14-313L

101-14-313M

These parcels total 8.79 acres and appear to be east of the plume. It is PR237 on the Pima County web site at a cost of \$1,200,000. It is to include parking lots and a new entrance to the park.

The above noted projects are significant use changes planned for the future and should be considered in the RI.

ADEQ Response to Comments 1-6: Comment Noted. ADEQ solicited information from Pima County Zoning in the development of the Land and Water Use Study Report. Information that Pima County provided was incorporated into the final RI report.

7. The map with the Curtis Road Landfill has it located as on the wrong side of the Curtis Road. It is at the corner of La Cholla and Curtis, however, it is on the southwest side not on the northwest side as indicated.

ADEQ Response: Aerial photographs and historical documents show that the Curtis Landfill was located on the northwest corner of Curtis Road and La Cholla Blvd as shown on Figure 11 of the RI. The property to the south is the La Cholla #1 Landfill.

8. Please note that the reclaimed water lines are present in the Flowing Wells District Park and are used to water the field grass. This will also be the same for the Kory Laos Memorial BMX Park and the Skateboard Park.

ADEQ Response: ADEQ appreciates the information regarding reclaimed water uses.

9. On page 8 of the RI report, under CURRENT OR REASONABLY FORESEEABLE USES, it is noted that there are 240 acres which are zoned "Industrial Multiple Use". There is no such zoning as stated. The Multiple Use Zoning is for residential, commercial, and light manufacturing. Many of these uses even require a special use permit.

ADEQ Response: ADEQ understands that the Industrial Multiple Use is not a formal zoning designation. However this designation was used in the final RI report to summarize large portions of the area that can be used for multiple purposes and that, based on responses from the Pima County Zoning Group, were not likely to be changed in the foreseeable future.

COMMENTS (CAB MEETINGS)

1. How was it determined that the natural flow of the groundwater is from the southeast to the northwest in this area and the result of the pumping of the wells is what changes it? Does all water in area go towards the Santa Cruz River? If there were no wells in the area would the water flow into the wash from the landfill then? In other words, go in the other direction

ADEQ Response: The determination of the general groundwater flow direction in the final RI report considered multiple lines of evidence, including the measured hydraulic gradient, groundwater pumping, historical contaminant concentration data, and information on potential source areas collected during extensive field investigations. Groundwater flow direction varies throughout the Site as depicted on Figure 10 of the final RI report. Groundwater from beneath the El Camino del Cerro (ECDC) landfill generally flows east-northeast and is not likely influenced by pumping from the South Shannon Well given the landfill's location a considerable distance from the well. The South Shannon Well appears to affect groundwater flow direction primarily in the northeastern portion of the site.

2. The oil that was too contaminated for AMRI was sent to EC Winters for use as dust control. Meaning that it was spread all over the ground. This area is prone to flooding. How was it determined that the contaminated wells in the area did not get to that status due to the well water being contaminated by the flood waters

ADEQ Response: Multiple lines of evidence were considered as a part of the remedial investigation including time-series data, contaminant ratios, and extensive field work. The resulting data indicate that the ECDC Landfill is the primary source of contamination at the Site.

3. Again, with this area prone to flooding could these contaminants have migrated to other areas and infiltrated the other wells?

ADEQ Response: Flood waters would laterally spread only the contamination present at the surface, and would significantly dilute these contaminants. Thus, it is unlikely that periodic flooding events would contribute to the significant widespread contamination observed at the Site. As described in the above response, multiple lines of evidence were considered as a part of the Remedial Investigation including time-series data, contaminant ratios, and extensive field work. The resulting data indicate that the ECDC Landfill is the primary source of contamination at the Site.

4. Kleinfelder prepared an RI report as early as 2001? The plume boundary was not even established. How many RI reports are there for this site? Kleinfelder in 2001, URS did a draft in 2008, then there was one that was sent back for editing, and now the one that we are reviewing now? So that makes 4, right? Are these reports available for the public or the board members for review?

ADEQ Response: Statutorily ADEQ must issue one draft RI report for public comment and notice of availability of the final RI report. There is only one final remedial investigation report prepared. The 2001 Kleinfelder report documented the initial site characterization activities. The previous draft versions of the Shannon Road/El Camino del Cerro remedial investigation report were not intended to serve as a formal submittal of final RI information.

5. I do not recall any discussion regarding any train wrecks and what chemicals might be involved in any spills. Has this avenue been completely vetted? This is very concerning.

ADEQ Response: Extensive historical research was conducted in 2001 as part of the *Final Report, Historical Research, El Camino Del Cerro WQARF Site*. This effort included research of fire department records pertaining to emergency and hazardous incident calls that would have included serious train wrecks. No such information was ever discovered to the best knowledge of ADEQ.

6. How does one attribute a share of Responsible Party percentage to Generators of a landfill that was open 24 hours a day but only manned by staff during business hours?

ADEQ Response: Responsible Parties are identified as part of the Proposed Remedial Action Plan (PRAP) process that will be completed after the finalization of the Feasibility Study. Discussion of potential liability was not included in the draft RI report nor is it included in the final RI report.

7. Where was the suspected rocket disassembly area? I know that there was a manned missile silo on the Carden of Tucson soccer field at one time which had a well. It is not on the map because I am sure that it was a "secret". However, all of the old timers went over and played checkers with the guy who lived there because he could not leave the property. Was that the missile that was disassembled after the Cold War or were there more and where was this done?

ADEQ Response: A “reported” rocket disassembly area has been discussed in at least one historical document (*Rillito Creek - South Bank Passive Soil Gas Survey Summary Report, Kleinfelder, October 2002*). This area was noted as having been associated with the Pima County Flood Control District properties described in Section 4.5.1 of the final RI report. Details of the suspected disassembly area are not available and likely not relevant to the RI given the lack of evidence suggesting a contaminant source in the area.

8. I cannot believe that anyone could possibly construe that Metro Water could be a contributor to this issue by virtue of the fact that they are simply pumping water at the Shannon Road well.

ADEQ Response: ADEQ has made no such allegation; discussion of potential liability was not included in the draft RI report nor is it included in the final RI report. Responsible Parties are identified as part of the Proposed Remedial Action Plan (PRAP) process that will be completed after the finalization of the Feasibility Study.

9. Has it been ascertained where the shallow and middle area contaminates [sic] actually meet or do they?

ADEQ Response: As part of the conceptual site model presented in Section 7.0 of the final RI report it is proposed that a single plume, located primarily in the shallow portion of the aquifer, moves deeper into the aquifer as it progresses northeast of the I-10 freeway. Details of plume depth at particular wells can be found in Sections 4.0 and 5.0 of the final RI report. Figure 3 presents a visual depiction of the conceptual site model.

10. If freon is in all the contaminated wells--could it also have come from the contaminated oil that was used as dust control commingling with the well water? Please recall what happened in the October 1983 flood where the trailer park which is where the Flowing Wells District Park is now had some trailers that were actually taken away in the flooding.

ADEQ Response: Freon compounds have not been detected in soil samples collected from soils in and around former waste oil operations at the former E.C. Winter and former AMRI Oil facilities. Thus, it is unlikely that these compounds were present in significant concentrations in waste oil applied in these areas. Additionally, the compounds' high vapor pressures make it likely that any Freon that may have been present in waste oil volatilized during or shortly after its application. Given these facts and the correlation between PCE and TCE contamination and Freon discussed in the final RI report, it is unlikely that waste oil application is responsible for the widespread detection of Freon compounds. In fact, the presence of Freon in groundwater at the site is another line of evidence that the ECDC landfill was the primary source of groundwater contamination.

11. What were the waste chemicals at I-10 Surplus? I don't see any real information as to what the chemicals were and if there was an actual release into the soil in the RI report.

ADEQ Response: A range of waste types were found at the I-10 Surplus property. These included numerous drums of inorganic wastes, drums of organic sludges and solids, and Ni-cad batteries. A release to the environment of hydrocarbons at the property was confirmed through soil sampling detailed in Section 4.4 of the final RI report. Results of soil and soil-gas sampling showed no evidence of a significant release of chlorinated solvents at this property.

12. ADEQ was still moving the plume boundary as late as April 2008. Is that the last time the boundary was moved?

ADEQ Response: The plume boundaries are adjusted after every sampling event based on the sampling results. Significant changes in the plume can occur as new information is gathered and new wells are installed, especially during the early stages of an investigation. Figures 5-8 of the Final RI

report show the most recent plume maps available for the Site. Additional groundwater sampling is proposed as part of the forthcoming Feasibility Study.

13. *The Pima County landfill is a source, but ADEQ is emphasizing its efforts on characterizing the plume instead of searching for responsible parties? Then it was determined as early as 2008 who was responsible? If so, why wasn't this pursued back then?*

ADEQ Response: Prior to determining responsible parties, a detailed remedial investigation must be completed. The information collected during the RI process will be used to help identify responsible parties.

14. *The time line in which this RI report is moving is of great concern to me. There seems to be some issues with the RI report that need ample time for vetting. Is the time period for comments going to be extended so that some of these issues can be addressed? I am sure that I am not the only one with questions. Is this all set in stone? I am concerned that some of the conclusions in the report may have been arrived at with the use of faulty data.*

ADEQ Response: The RI process and public comment period are based on state statutes. Additional information collected during data gap evaluations in the Feasibility Study will be continually incorporated into our understanding of the site. Additional public comments are also solicited later during the PRAP stage.

Comments from Metropolitan Domestic Water Improvement District

Comments regarding the Draft RI Report were received in a letter via email from Metropolitan Domestic Water Improvement District (Metro Water) to ADEQ, dated May 16, 2014. The following section includes the text of comments in boldface italics, along with an ADEQ response to address each comment.

GENERAL COMMENTS

1. "Contaminant of Concern" is defined in the Arizona Administrative Code (R-18-16-401). However, it is doubtful that the general public is aware of its significance. The Remedial Investigation Report should explain how ADEQ determines which contaminants present at the subject WQARF site are "of concern" and which are not. Furthermore, "contaminants of potential concern" are defined neither in rule nor statute and should be defined in the report. How a contaminant moves from "potential concern" to "of concern" or "not of concern" should also be explained.

ADEQ Response: This comment has been noted and a further clarification has been included in the final RI report: “A COC, as defined by Arizona Administrative Code R18-16-401, ‘means a hazardous substance that results from a release and that has been identified by the Department as the subject of remedial action at a site.’ COCs are those contaminants that have been detected with some consistency in groundwater, soil or soil gas at concentrations above regulatory or risk-based levels.”

Chemicals of potential concern, are those chemicals that may have been used or disposed of at a facility, or are found in environmental media at a site in concentrations below regulatory standards or inconsistently (spatially or temporally) above a regulatory standard.

2. Section 3.4.4 (Aquifer Parameters) mentions an aquifer test that was performed at the South Shannon Well. In April 2004, aquifer testing was also performed at the Deconcini Well (URS, Aquifer Testing – Deconcini Well, June 2, 2005). This site-specific data should be included in the remedial investigation. Such site-specific data should be given preference over the broadly general information presented by Davidson (1973). Importantly, the Davidson (1973) Fort Lowell Formation, Tinaja beds, etc. nomenclature is outdated and should not be used. For more information, please see Houser and others (Stratigraphy and Tectonic History of the Tucson Basin ..., 2005) and Mason and Hipke's ADWR Tucson groundwater flow modeling report (2013).

ADEQ Response: This section of the report is intended to provide a general overview of the hydrologic setting for the entire WQARF site rather than provide specific parameters available near the Shannon and DeConcini wells. The descriptions included in Davidson (1973) are considered by ADEQ to be sufficient for the purposes of this section.

SPECIFIC COMMENTS (ON APPENDIX A)

1. *Please note on Page 3 that the District funded the wellhead treatment system instead of the ADEQ. ADEQ declined to fund the treatment system because the District installed the system prior to the formation of the Shannon Road-Rillito Creek WQARF Site. Additionally, that first treatment system was an air-shipping unit, not GAC as stated in Table 1 of the main report.*

ADEQ Response: This comment has been noted and the final RI report text and Table 1 have been modified to reflect this information.

2. *On Page 7, the District has 5 supply wells within the SR/ECDC WQARF site boundaries. The same paragraph notes Metro Water as a water service provider, but not Tucson Water. Study Area is not defined and causes confusion if it is the plume boundary or the WQARF site boundaries. An example is the DeConcini Well is stated as outside the Site Boundary instead of outside the plume boundary. Likewise, Site is not defined. Please note in Section 2.2.1.1 that Metro Water has a Designation of Assured Water Supply (DAWS) which means the service area has a 100 year groundwater supply after full service area build out. Therefore, the last sentence in Section 2.2.1.1 does not reflect Metro Water's long-term plans under its DAWS to replace and drill new wells. Lastly, Metro Water is also supplying non-potable water from its Latamore [sic] North Well to Pima County Parks and Recreation Department's linear park on the north side of Rillito Creek. This well has nitrate levels greater than the drinking water standard.*

ADEQ Response: References to the Site Boundary and Plume Boundary have been removed from Appendix A and its associated figures and tables. Appendix A now references two boundaries: the current WQARF study area, which describes the approximate area of focus during the remedial investigation and; the historical plume boundary, which depicts the approximate area of groundwater associated with the Site in which a contaminant of concern has been detected, at any point in time, at a concentration greater than a regulatory standard.

Section 2.2.1.1 has been revised to better reflect Metro Water's long-term plans. Comments regarding the Lattimore North well are noted.

3. *The second paragraph on Page 12 does not acknowledge that City of Tucson wells have also contributed to the patterns of regional groundwater flow. The report should cite the USGS research on Santa Cruz River infiltration rates by Galyean (1996) entitled "Infiltration of Wastewater Effluent in the Santa Cruz River Channel, Pima County, Arizona. U.S. Geological Survey, Water Resources Investigations Report 88-4172." This research was used for the underground storage permitting with the Arizona Department of Water Resources for the Upper Santa Cruz River Managed Effluent Recharge Project.*

ADEQ Response: Comment noted. The final RI report has been revised to note the potential impacts from other pumping wells.

4. Figure 5 has the plume boundary extending to Deconcini Well, but there is no data for supporting that extent. Please change the plume boundary to be consistent with the other figures. Also, the diagram has the Oracle Jaynes Station Well in the wrong location.

ADEQ Response: Figures in the LWUS report in Appendix A have been revised to reflect the historic plume boundary, which has never extended to the Deconcini well. The location of the Oracle Jaynes Station Well on the figures has been corrected.

Comments from Clear Creek Associates

Comments from Clear Creek Associates regarding the Draft RI Report on behalf of Metro Water were received in a letter via email from Metro Water to ADEQ, dated May 14, 2014. The following section includes the text of comments in boldface italics, along with an ADEQ response to address each comment.

GENERAL COMMENTS

1. Nature of Contamination

The draft RI report identifies the contaminants that are present at the site, and data are provided on contaminant concentrations in soil and groundwater. Groundwater flow directions are also evaluated in detail. However, data regarding the nature of the contaminants themselves are missing. In particular, report sections 5.2 (Chemical Properties), 5.3.2 (Chemical and Biological Transformation Processes) and 5.3.3 (Site Specific Transport Mechanisms) do not provide any site-specific data. Since an RI must adequately address the fate and transport of the contaminants present at the site, including the extent to which VOCs transform to daughter products, site specific information is necessary to evaluate appropriate remedial actions. The efficacy of available remedies must be based on an understanding and prediction of daughter products.

ADEQ Response: Section 5.0 of the draft RI report (section 6.0 of the final RI report) has been revised in an effort to include a more detailed analysis of site-specific contaminant fate and transport properties.

2. Extent of Contamination

Figures 16 through 19 in the draft RI report provide contour maps of PCE and TCE at shallow depths and at intermediate depths in the aquifer. It appears from these figures that the western extent of contamination at intermediate aquifer depths has not been adequately delineated. The open-ended contours shown in the last two figures in Appendix M also indicate that the extent of contamination is not fully characterized. In addition, the mechanism causing the plume to "dive" as it moves north is not adequately explained in the report. Although it is reasonable for ADEQ and URS to attribute the vertical migration of the plume to production well pumpage and natural recharge, there is no detailed evaluation of vertical hydraulic gradients in the report. In fact, 2013 water level data presented for well pairs in Table C-2.1 suggest that a vertical gradient does not exist. In the absence of a vertical gradient, it seems unlikely that a plume would migrate downward. We recognize that on page 60 of the draft RI report, the downward movement of contaminants is also attributed to an interface between high permeability and low permeability sediments. However, the presence of this contact is not indicated by the lithology shown on the cross sections included in the report (Figure 3 and Figure 20).

ADEQ Response: The need for a medium-zone monitor well to fully define the western extent of the plume is included as a data gap in Section 8.0 of the final RI report. However, results from the

existing monitor well network, including historical sampling results from the Lattimore-N and Lattimore-S wells indicate that it is not likely that the plume extends significantly beyond the dashed contours depicted on Figures 6 and 8 of the final RI report (Figures 17 and 19 of the draft RI report).

It is acknowledged in the final RI report that the lack of a measured downward gradient in wells south of Rillito Creek and the limited lithologic information available over such a large area make it difficult to draw conclusions as to the cause of the observed downward migration. However, as described in the final RI report, the results of many years of sampling show a clear downward migration of the plume between the I-10 freeway and the Rillito Creek. ADEQ acknowledges that uncertainty exists with regard to the identification of broad hydrogeologic units. The unit dividing lines have been removed from Figures 3 and 20 (Figures 9 and 21 of the final RI report) in an effort to reflect this uncertainty.

3. Potential Impacts to Public Health

The draft RI report does not contain any discussion of the potential impacts of the various contaminants on public health. For example, 1,4-dioxane is a possible human carcinogen and a systemic toxicant, yet there is no MCL for 1,4-dioxane in drinking water, and 1,4-dioxane is not removed by treatment methods that are effective for VOCs such as PCE and TCE. The potential impacts to human health caused by ingesting 1,4-dioxane and other contaminants in groundwater at the site must be addressed by this report, so that a remedy that is protective of human health can be selected. Note that AAC R18-16-406.C.2. requires the RI to assess the toxicity of the substances released, yet the RI has not done this for 1,4-dioxane. Therefore, this section of the report does not meet the requirements of AAC RIS-16-406.A.2 or RIS-16-406.C.2.

ADEQ Response: Where available, information about the toxicity of Site COCs and COPCs has been included in Appendix W of the final RI report. At the request of ADEQ, the Arizona Department of Health Services (ADHS) completed a Health Consultation for 1,4-dioxane at the SR/ECDC WQARF Site. ADHS determined that 1,4-dioxane does not pose an unacceptable risk to human health at the Site. The ADHS report is included as Appendix V in the final RI report.

4. Current and Future Land and Water Uses

Appendix A of the draft RI report notes that MDWID uses groundwater in this area for potable supply, and this is appropriate. A minor point is that the Appendix A text states that the DeConcini well is outside the Site Boundary, whereas Figure 5 in Appendix A clearly shows the well within the Site Boundary but slightly outside the plume boundary. Also, the data source for the MDWID service area shown on Figure 5 should be identified. It does not appear to be accurate, as depicted on Pima County's GIS Map Guide layer for designated service areas.

ADEQ Response: References to the Site Boundary and Plume Boundary have been removed from Appendix A and its associated figures and tables. Appendix A now references two boundaries: the current WQARF study area, which describes the approximate area of focus during the remedial investigation and; the historical plume boundary, which depicts the approximate area of groundwater associated with the Site in which a contaminant of concern has been detected, at any point in time, at a

concentration greater than a regulatory standard. The data source used to depict the MDWID service area on Figure 5 has been updated.

5. Other Information Necessary for Identification and Comparison of Alternative Remedial Actions

It is unclear how ADEQ will compare the effectiveness of various potential remedial actions without developing a numerical model to simulate the lateral and vertical movement of the plume under different scenarios. The selected remedy will need to take into account the hydraulic conductivity and storativity of the aquifer at various depths, in addition to recharge rates, contaminant source location(s), groundwater pumpage, and contaminant dispersion, sorption, and decay reactions. By developing and calibrating a numerical model, reasonable estimates of these parameters can be made, and the importance of any data limitations can be assessed through a sensitivity analysis. Once calibrated, the model can be used to make realistic predictions of future plume behavior, including response to various proposed remedies.

A similar recommendation was made previously, in a report titled Aquifer Testing & Capture Zone Modeling Results, Shannon Road / El Camino del Cerro WQARF Sites (URS, June 2, 2005). This report was prepared as part of the RI but was not discussed in any detail in the final draft RI report. This is unfortunate, because the report provided important data on aquifer parameters and plume behavior, particularly the extent to which the plume is contained by the South Shannon well at different pumping rates. This report also recommended a three-dimensional model to simulate vertical and horizontal distribution of aquifer parameters, recharge, and pumping regimes that change over time.

The final draft RI report contains statements about plume capture by the South Shannon well, and these statements are presumably based on the results of the URS (2005) report. However, without a discussion of the URS (2005) report and the limitations on the methodology applied, the topic is not adequately addressed.

ADEQ Response: Results of the 2005 Aquifer Testing and Capture Zone Modeling are discussed briefly in Section 3.4.4 and Section 6.4.1 of the final RI report to demonstrate that the South Shannon well is capable of capturing the plume under certain conditions. However, the determination of capture at this well relies primarily on results of groundwater quality monitoring. If a numerical model is deemed necessary to complete the Feasibility Study, one may be developed at that time. If a model is developed, data from the URS 2005 Aquifer Testing and Capture Zone Modeling Results will likely be used in the model.

SPECIFIC COMMENTS

1. The report would benefit from an Executive Summary.

ADEQ Response: An Executive Summary is included in the final RI report.

2. Specific criteria used to identify Contaminants of Concern (COCs) versus Contaminants of Potential Concern (COPCs) should be provided, and all COCs and COPCs should be discussed in the report, to comply with the requirements of R18-16-406.A.2 ("identify ...potential impacts to public health"). In particular, ADEQ's basis for addressing some contaminants and not others should be explained. Similarly, the basis for delineating the Site Boundaries, and the locations of the Site Boundaries compared to locations of elevated concentrations of COCs and COPCs in groundwater should be explained.

ADEQ Response: Further clarification has been included in the final RI: "A COC, as defined by Arizona Administrative Code R18-16-401, "means a hazardous substance that results from a release and that has been identified by the Department as the subject of remedial action at a site." COCs are those contaminants that have been detected with some consistency in groundwater, soil or soil gas at concentrations above regulatory or risk-based levels."

Chemicals of potential concern, for the purposes of this RI, are those chemicals that may have been used or disposed of at a facility, or are found in environmental media at a site in concentrations below regulatory standards or inconsistently (spatially or temporally) above a regulatory standard. .

References to the Site Boundary have been removed and figures now reference the historical plume boundary, which depicts the approximate area of groundwater associated with the Site in which a contaminant of concern has been detected, at any point in time, at a concentration greater than a regulatory standard.

3. The hydrogeology discussion should be based on drilling and aquifer testing conducted specifically for the RI, rather than referring to past USGS and ADWR reports that described the Tucson basin in general. For example, the discussions of the Fort Lowell Formation, Santa Cruz Fault, evaporite deposits in the Tinaja Beds, etc. are not supported by any of the site-specific lithologic data presented in the cross sections, and they should be deleted from the RI report.

ADEQ Response: The hydrogeology presented in Section 3.4.4 is intended to provide a general overview of the hydrologic setting for the entire WQARF site rather than provide specific parameters available near the Shannon and DeConcini well. The descriptions included in Davidson (1973) are considered by ADEQ to be sufficient for the purposes of this section.

4. Contour maps of the groundwater contaminant concentrations are provided for the lateral extent of contamination. One or more contour maps in profile, or a conceptual illustration of the plume in profile, would be helpful.

ADEQ Response: A conceptual model of the plume in profile is included as Figure 3 of the final RI report.

5. A separate section discussing the locations of any wells that might have served as conduits, and a description of sampling and abandonment of these wells, should be provided.

ADEQ Response: Details of wells considered potential conduits and associated well abandonment activities are provided in Section 4.0 of the final RI report.

6. The report contains a brief discussion of "Groundwater Treatment" under the larger subject heading of "Monitoring Well Installations" (pages 42 to 44). It is not clear why this project is discussed here rather than under a separate subject heading specific to pilot remediation tests. Also, certain details are vague, such as "relatively stable VOC concentrations" and "the cost of rehabilitating the extraction well".

ADEQ Response: The final RI report has been reorganized for clarity. The discussion of groundwater treatment activities is included in Section 5.4 of the final RI report.

7. Pages 45 and 46 include a discussion of pumping tests, but the results of these tests are not presented.

ADEQ Response: The results of these pumping tests are included in Section 5.2 of the final RI report.

8. The 5 ppb TCE and PCE contour lines on Figures 16 and 18 are not supported by any data to the east. These figures suggest that the plume is not fully characterized in this area.

ADEQ Response: These figures (Figures 5 and 7 of the final RI report) have been revised to show a dashed line reflecting the uncertainty in this area due to monitor wells that have gone dry. The closure of these figures to the east is based on historic plume data which indicates a clearer limit of the plume on the east side. Plume characterization to the east will be evaluated as a possible data gap during the FS process.

9. The 5 ppb PCE contour line on Figure 19 extends east in a manner that suggests that the plume is actually migrating up Rillito Creek. Does ADEQ believe that PCE is present in groundwater at concentrations greater than 5 ppb in the area as shown?

ADEQ Response: Figure 19 (Figure 6 of the final RI report) has been revised to reflect data from the correct sampling event and to provide a more reasonable interpretation of isoconcentration lines.

10. The plume boundaries shown on Figure 5 should be consistent with the plume boundaries shown on Figures 16 through 19.

ADEQ Response: Figure 5 (Figure 4 of the final RI report) has been revised to show the historical plume boundary, which depicts the approximate area of groundwater associated with the Site in which a contaminant of concern has been detected, at any point in time, at a concentration greater than a regulatory standard.

11. On page 54, the report states that contaminants have not been detected at SRC-W31M for five years. Were contaminants detected in this well in the past? If so, what is the reason for the

reduction in concentrations, and to what extent has the possibility that contaminants have migrated below the well and/or north of the well been evaluated?

ADEQ Response: Measured contaminant concentrations at well SRC-W31M are reported in Tables 6-10 of the final RI report. The South Shannon well was shut down in 2005-2006 to install a Granular Activated Carbon (GAC) treatment system. Shortly after the well ceased pumping, contaminants were detected in well SRC-W31M, as expected. After the well was put back into service, concentrations quickly decreased to non-detect. An explanation for the observed concentrations is provided in Section 6.4.1 of the final RI report.

12. The report should explain why contaminant concentrations shown on Figures 16 through 19 are higher in monitor wells at a distance from the landfill compared to concentrations in monitor wells closer to the landfill.

ADEQ Response: As described in Sections 6.4 and 7.0 of the final RI report, the mechanisms controlling contaminant transport at the Site have likely led to the irregular release of contaminants over both space and time. For example, chemical containers disposed of in the ECDC Landfill may have degraded at different rates causing contaminant releases at various times throughout the history of the Site. Additionally, the mass transfer of contaminants to groundwater may have periodically increased following large infiltration events. The migration of these contaminants in groundwater following such events likely explains areas of higher concentration observed downgradient of the ECDC Landfill.

In addition, Pima County installed a soil vapor extraction (SVE) system in the early 2000s, and a groundwater treatment system in 2009 at the landfill property. These remedial efforts appear to have decreased contaminant concentrations in the area of the landfill. A discussion of the effects of these remedial actions as well as interpretation of time series data are presented in Sections 4-7 of the final RI report.

13. The report discusses PCE/TCE concentration ratios. It would be helpful if these ratios were tabulated and/or shown on a map.

ADEQ Response: This map is now provided in Appendix T of the final RI report.

Comments from the Office of the Pima County Attorney

Comments regarding the Draft RI Report were received in a letter from the Office of the Pima County Attorney to ADEQ, dated May 16, 2014. The following section includes the text of comments in boldface italics, along with an ADEQ response to address each comment.

COMMENTS

1. Standards for Remedial Investigations

State law sets the standards for Remedial Investigations to ensure that the product results in a feasibility study, record of decision and, ultimately, a site clean-up that is protective of human health and the environment – all the while meeting the economic reasonableness and technical feasibility directives of the WQARF program. Due to the haphazard, intermittent and unfocussed data collection upon which the RI is based, these goals are not achievable.

ADEQ is charged by law with 1) adequately identifying and evaluating all potential sources of contamination, 2) characterizing the extent of the contamination, 3) identifying rational contaminant transport scenarios, and 4) developing a sufficiently coherent dataset such that the State can develop an economically reasonable feasibility study. It is Pima County's conclusion that the Draft RI:

1.1 Ignores or dismisses a number of potential sources that would be critical to an understanding of the overall situation,

ADEQ Response: URS conducted a thorough investigation of potential source areas, as described in Section 4.0 of the final RI report. A detailed discussion of the investigations undertaken and data collected at numerous potential source areas is presented in this section. ADEQ's interpretation of the data is presented in Sections 4-7 of the final RI report.

1.2 Creates a multiplicity of inconsistent plume maps that can only be interpreted as saying that ADEQ does not have a clear idea what the extent of the contamination is,

ADEQ Response: Figures in the final RI report have been revised to ensure consistency.

1.3 Is based on the flawed and unlawful decision to merge the El Camino Del Cerro and the Shannon Road WQARF sites without objective data refuting the previous determination that there are two distinct areas of pollution,

ADEQ Response: Multiple lines of evidence were considered during the remedial investigation including time-series data, contaminant ratios, and extensive field work. The resulting data indicate that the ECDC Landfill is the primary source of contamination at the Site. The conceptual site model is presented in Section 7.0 of the final RI report and summarizes the findings of numerous investigations and the objective interpretation of data detailed in Sections 3-6 of the final RI report.

1.4 Lacks demonstrated historical evidence critical to understanding the potential pollutants disposed of on the east and north of Interstate-10,

ADEQ Response: A detailed discussion of the investigations undertaken and data collected at numerous potential source areas is presented in Section 4.0 of the final RI report. ADEQ's interpretation of the data is presented in Sections 4-7 of the final RI report.

1.5 Fails to adequately define the contamination in the Shannon Road WQARF area such that defining a solution (through the Feasibility Investigation process) is not possible, and

ADEQ Response: A detailed discussion of the investigations undertaken and data collected at numerous potential source areas is presented in Section 4.0 of the final RI report. ADEQ's interpretation of the data is presented in Sections 4-7 of the final RI report.

1.6 Fails to provide sufficient information necessary for identification and comparison of remedial alternatives, and, consequently, is inconsistent with the National Contingency Plan.

ADEQ Response: United States Environmental Protection Agency's (USEPA's) National Oil and Hazardous Substances Pollution Contingency Plan establishes Federal response to oil spills and hazardous substance releases and is a framework for hazardous waste sites requiring emergency removal actions. Pima County will need to clarify how the National Contingency Plan specifically relates to their comment regarding this site. (USEPA's summary of the National Contingency Plan can be found at – <http://www2.epa.gov/emergency-response/national-oil-and-hazardous-substances-pollution-contingency-plan-ncp-overview#Key>). For the remedial activities performed by ADEQ at Water Quality Assurance Revolving Fund Registry sites, the applicable and appropriate regulations are found under Arizona Administrative Codes (A.A.C.), Title 18, Chapter 16. ADEQ believes that the requirements pursuant to A.A.C. R18-16-406 have been met.

ADEQ would have needed to conduct area-wide testing in a reasonable time frame and sequence to perform an adequately scoped RI and to form a cogent professional opinion. The Draft RI acknowledges that such testing has not been performed. See Draft RI at 63. The Draft RI also acknowledges the lack of adequate data east of Interstate- 10 to assess the contributions to groundwater from potential contaminant sources in that area. See e.g., id. at 60-61 The County agrees that these data gaps need to be filled in order to develop an NCP-compliant RI. Such testing also would have needed to include parameters that accounted for the constituents that reflect the significant water quality differential (as revealed by Stiff and Piper diagrams) between groundwater towards the west, and groundwater towards the east. Without such testing, no defensible conclusions on the extent and sources of groundwater contamination can be lawfully derived.

ADEQ Response: The final RI report addresses the known primary and potential source areas with detailed discussions of the activities at each presented in Section 4.0. While additional data is

proposed in Section 8.0 to be collected to fill in any remaining data gaps, it is not anticipated that this additional data will change the conclusions of the final RI report in any substantial way. Conclusions in this report were reached based on multiple lines of evidence collected during extensive investigations at numerous properties over many years.

United States Environmental Protection Agency's (USEPA's) National Oil and Hazardous Substances Pollution Contingency Plan establishes Federal response to oil spills and hazardous substance releases and is a framework for hazardous waste sites requiring emergency removal actions. Pima County will need to clarify how the National Contingency Plan specifically relates to their comment regarding this site. (USEPA's summary of the National Contingency Plan can be found at – <http://www2.epa.gov/emergency-response/national-oil-and-hazardous-substances-pollution-contingency-plan-ncp-overview#Key>). For the remedial activities performed by ADEQ at Water Quality Assurance Revolving Fund Registry sites, the applicable and appropriate regulations are found under Arizona Administrative Codes (A.A.C.), Title 18, Chapter 16. ADEQ believes that the requirements pursuant to A.A.C. R18-16-406 have been met.

2. Reservation of Rights

To the extent that ADEQ has withheld documents and/or information that would allow the public to assess the adequacy of the Draft RI, obviously, we are not able to comment. We note that there are a variety of instances in which documents are cited in the HGL letter report as being privileged or confidential or "attorney work-product." The propriety of such assertions cannot be evaluated. Moreover, the Department's Project Manager, Mr. Scott Green, recently advised a Citizens Advisory Board Member that "ADEQ's contractor, HGL, has done extensive research in investigating PRPs. This information is currently confidential until the PRAP is completed and apportionment takes place." In any event, Pima County reserves the right to comment upon and/or object to subsequent disclosures ADEQ may make in connection with this matter.

ADEQ Response: Comment noted. Responsible Parties are identified as part of the Proposed Remedial Action Plan (PRAP) process that will be completed after the finalization of the Feasibility Study. Discussion of potential liability is not part of the RI process. Source identification is however part of the RI process.

3. Unprecedented Floods of 1977 and 1983

The Draft RI fails to explore the consequences of the historically unprecedented floods of 1977 and 1983. It very nearly fails to mention them. Even if ADEQ were to assert that Pima County could be a PRP under A.R.S. § 49-283(B), Pima County could not be found liable due to the Act of God defense available under both A.R.S. § 49-283(0)(1) and CERCLA (42 U.S.C. § 9607). The floods of 1977 and 1983 were "Acts of God" as defined by WQARF and by CERCLA.

- 3.1 *In 1977 the "100 year flood" predicted by U.S. Army Corps of Engineers methodologies at 21,000 cfs was exceeded by more than 50%. A flood measured at 32,700 cfs inundated the landfill. [The County ceased operations at CDC in 1978]. That inundation resulted not from flooding from the riverside edge of the landfill, but from behind.*
- 3.2 *After the 1977 flood, Pima County made bank improvements incorporating a revised ACOE standard of 35,000 cfs as being the design one hundred year flood. In 1983, however, the Santa Cruz River experienced a flooding event of 52,700 cfs.*
- 3.3 *For some weeks, after each flood, ponding occurred on the CDC landfill which was the only mechanism by which wastes leached into the groundwater. Nevertheless, Pima County believes that most of the groundwater contamination resulting from such Acts of God has been mitigated, and that the subterranean movement of VOC's into the groundwater from pollution sources east and north of Interstate 10 are the only current sources of the plume identified by ADEQ.*

ADEQ Response: Comments addressing the PRP investigation and potential liability of PRPs are inappropriate at this stage of the WQARF process (RI) and will not be addressed.

Multiple lines of evidence were considered as a part of the Remedial Investigation including time-series data, contaminant ratios, and extensive field work. The resulting data indicate that the ECDC Landfill is the primary source of contamination at the Site. In addition to leachate production, it is likely that mass transfer from contaminated soil gas at the landfill contributed to groundwater contamination. The conceptual site model is presented in Section 7.0 of the final RI report.

Page 18 of the Draft RI records the fact that "In July 1994, Pima County Department of Transportation and Flood Control District extended soil cement bank protection from approximately 20 feet to 40 feet below the top of the river bank (Malcolm Pirnie, 1997b)." But the document fails to mention that such bank protection was a reaction to increasing levels of wastewater discharge into the Santa Cruz River, and a desire to avoid potential erosion problems resulting therefrom.

ADEQ Response: Comment noted.

4. Pima County Should Not be a PRP

ADEQ's consultant, HydroGeoLogic (HGL), purported to search for potentially responsible parties. However, no regard was given to A.R.S. § 49-283, which establishes the rationale for when a party may or may not be considered a "responsible party." Consequently, Pima County must supplement the record.

- 4.1 *CDC was not operated as a business, but was offered as a public service. No fee was charged, and no profit was made. And the County certainly did not engage*

"in the business" of disposing of hazardous substances at CDC. ARS § 49-283(B)(1)

4.2 Pima County never permitted any person to use the facility for the disposal of a hazardous substance. ARS § 49-283(B)(2)

4.3 No evidence existed concerning hazardous substance disposal at CDC prior to the purchase and use of CDC by the County. Pima County did not know, nor reasonably should have known, of hazardous substance disposal practices at CDC prior to the County's acquisition of the site. ARS § 49-283(B)(3)

4.4 No evidence exists that the County took action which significantly contributed to the release after it knew or reasonably should have known of the existence of a hazardous substance at CDC. ARS §49-283(B)(4)

4.5 Pima County is not responsible for the acts of unrelated third parties because Pima County exercised due care and took precautions against foreseeable acts or omissions. Among other things:

4.5.1 Pima County designed the bank protection that withstood the flood.

4.5.2 Pima County operated the landfill in compliance with all standards of the day and was, in fact, the model for development of the landfill operating regulations adopted by the Arizona Department of Health Services in 1976.

4.5.3 Pima County never authorized the disposal of hazardous substances, nor did it charge for disposal.

4.5.3 Pima County was required to provide solid waste disposal services by state law, and at all times operated in a manner consistent with those requirements.

ADEQ Response: Comments addressing the PRP investigation and potential liability of PRPs are inappropriate at this stage of the WQARF process (RI) and will not be addressed.

5. Pima County Remediation Efforts

The Draft RI fails to adequately characterize the extensive efforts that Pima County has been engaged in over the last twenty years in remediating the CDC waste disposal site. Indeed, the County is presently taking additional measurements to determine its compliance status. All the while, ADEQ has taken a lackadaisical attitude with respect to orphan sites east and north of Interstate 10, even as the pollution from those sites has expanded the plume. We note that all reports associated with the County's multiple and amended RI/Feasibility Studies (RI/FS) are already part of the official record in connection with the instant Draft RI. To the extent that the Draft RI is inadequate in its discussion of those cleanup efforts (see RI at 22-23), that inadequacy would be inconsistent with the NCP and therefore should be acknowledged.

ADEQ Response: ADEQ acknowledges that Pima County has conducted significant remedial actions in and around the Landfill area. Descriptions of these are included in Sections 2.1, 4.0 and 5.0 of the final RI report. ADEQ has conducted extensive investigations and remedial activities east and north of I-10. A discussion of the actions taken and a thorough analysis of the data collected are included in Section 4.0 of the final RI report. Any evidence that Pima County has obtained to support their claims that pollution from orphan sites east and north of Interstate-10 have expanded the plume should be submitted to ADEQ for evaluation.

In connection with the voluminous previous investigations, and extensive earlier remedial actions at CDC, the Draft RI fails to note that the State of Arizona and Pima County formerly agreed to divide responsibility for remediation based upon the geographical division of Interstate 10. Page 1.1 of the August 25, 2008 Draft RI prepared by URS provides as follows:

"In 1999 Pima County and ADEQ established areas of responsibility for the ECDC WQARF site dividing the site into two response areas: the Pima County Response Area and the ADEQ Response Area. The line of demarcation agreed upon was the centerline of I-10 with Pima County being responsible for investigating and implementing remedial actions of the area south and west of I-10, and ADEQ responsible for all actions taken in the area north and east of I-10."

ADEQ Response: A "formal" agreement was never signed dividing responsibility for remediation between ADEQ and Pima County. A careful reading of the 2014 draft RI will show that language was included in the draft RI in Section 2.0: Site Background and is included in Section 2.0 of the final RI report describing and depicting investigation areas.

Pima County's prior RI and feasibility studies were extensive and were accepted by ADEQ. In reliance on that acceptance, Pima County has conducted extensive remediation work in the County Response Area (south and west of I-10) ever since. Pima County studies included:

- *RI for ECDC WQARF site, 1997*
- *Landfill Operable Unit FS, 1997*
- *Groundwater Operable Unit FS, 1998*
- *1999 Addendum to LOU FS and GOU FS, which included preferred remedies and monitoring plans, and which were submitted to ADEQ for comment.*

In a letter dated July 20, 2000, ADEQ concurred with the information in the revised Feasibility Studies, Addenda and comment responses for the proposed remedial actions for the Groundwater and Landfill Operable Units for ECDC WQARF site. Extensive remediation work in accordance with those reports has been conducted.

An extensive history of State/County cooperative efforts can be found in the attached draft Consent Decree dated Sept. 30, 2003.

ADEQ Response: Comment noted. As mentioned above, a formal agreement, consent decree or working agreement, between ADEQ and Pima County was never reached.

6. *Inappropriate Consolidation*

The El Camino Del Cerro WQARF site and the Shannon Road WQARF site were consolidated inappropriately to form the Shannon Rd/El Camino Del Cerro (SR/ECDC) Water Quality Assurance Revolving Fund (WQARF) site. Pima County objects to the two WQARF sites being "consolidated," and directs ADEQ to the holding in Mead Corp. v. Browner, 100 F.3d 152 (1996). In that case, the EPA tried to aggregate a low risk site with a high risk site. The court ruled to the contrary: "The idea that Congress implicitly allowed EPA broad discretion to lump low-risk sites together with high-risk sites, and thereby to transform the one into the other, is anything but reasonable. ... Permitting the inclusion of low-risk sites on the NPL would thwart rather than advance Congress's purpose of creating a priority list based on evidence of high risk levels."

ADEQ Response: The consideration of extensive data sets collected at numerous sites over the course of many years indicates that contamination at the SR/ECDC Site has a common source, namely the ECDC Landfill. Thus, the decision to create the SR/ECDC WQARF Site does not represent the combination two distinct sites, but rather the recognition that only a single site exists. The final RI report contains a conceptual site model (Section 7.0) that describes ADEQ's interpretation of the available data.

7. *HGL February 6, 2014 Final Letter Report*

The Draft RI incorporates the HGL Final Letter Report that contains several claims of privilege with regards to alleged operational and disposal activities within the WQARF site. Among others, the Department claims a privilege as to information concerning operations at the Lee's Auto Parts facility, AMRI oil customers, and wastes allegedly disposed of in the CDC landfill that is included in the HGL report. Such information is critical to understanding the nature and extent of contamination at these sites.

Additionally, the following points illustrate some of the technical and historical mistakes made by HGL.

- 7.1 Page 4, Table I - This table presents a list of industries and chemicals used. Under aircraft repair including military and defense contractors, and missile maintenance, a footnote claims some Air Force technical orders mandate the use of PCE and TCE for aircraft and missile cleaning. The referenced Air Force technical order is T.O. 42C-1-20 dated 15 May 1983, more than five years after the landfill closed. Clearly, this document does not cover the time period when the landfill was operational. Any technical information relied upon must have been in effect at the time when the landfill was in use, not years after closure.*

ADEQ Response: Comment noted.

- 7.2 *Page 7, last paragraph professes to assert that HGL was unable to find information on the closing of the El Camino del Cerro Landfill. References cited previously in HGL's report show it was closed in December 1977, and newspaper articles also announced the closure at 5:00 PM, December 21, 1977.*

ADEQ Response: Comment noted.

- 7.3 *Page 7, footnote 11 states that no information was found to indicate Lee's Auto Parts began operations at the site prior to 1964. Historic aerial photographs clearly show an automobile junk yard present at the site prior to 1960 regardless of who was operating at the site.*

ADEQ Response: Comment noted.

- 7.4 *Page 8, 3rd paragraph states "Other sources of contamination were suspected but had not been confirmed." Although the cited reference (ECDEQP 1373-1374) does indeed make that statement, the sections following that statement present findings that confirms contamination. For example, the soil gas concentration of vinyl chloride was found to be 82,320 ppb at the Drake property. With respect to other VOCs at the Drake property, the report states they were "higher than concentrations reported by previous investigators" (ECDEQP001382). The report goes further to discuss findings that VOC soil gas concentrations at the E.C. Winter site were comparable to sites around the CDC landfill (meaning the Drake property).*

ADEQ Response: The referenced vinyl chloride detection was approximately 200 feet from the eastern boundary of the landfill, and was associated with high methane concentrations which could have come only from the landfill property. As discussed in Section 4.1.2 of the final RI report, this contaminated soil gas was likely expelled from the landfill with the methane due to the positive pressure caused by methane gas generation. Thus, the VOC concentrations cited, coupled with the methane data, further confirm that the CDC landfill was the source of contamination.

- 7.5 *Page 9, 4th and 5th paragraphs contain discussions regarding agreements between the Sanitary District and AMRI for disposal of waste at a Sanitary District landfill site. The last agreement was to be on a trial basis for 60 days. The agreement could be terminated by the Sanitary District if they found the agreement to be unsatisfactory. HGL states that they did not locate any documents to indicate that this arrangement was unsatisfactory to either party (AMRI or the Sanitary District), but of course HGL also found nothing confirming that the agreement was satisfactory. Furthermore, HGL has cited no document or other evidence to show AMRI actually disposed of their industrial waste at any off-site location.*

ADEQ Response: Comment noted

7.6 *Page 10, 2nd paragraph states that HGL did not locate reports of spills, leaks or releases filed with federal, state or local agencies. During the time period when AMRI was in operation, there were no such reporting requirements to report spills, leaks or releases.*

ADEQ Response: Comment noted.

7.7 *Page 10, 3rd paragraph claims Pima County provided no documentation to support claims that unusable oil was placed into unlined pits on the site. Historic aerial photographs clearly show oil in pits and trenches. Subsequent investigation found no evidence of liner use in trenches or pits.*

ADEQ Response: Comment noted.

7.8 *Page 11, 2nd paragraph claims that soil and sludge samples collected from a trench at the former AMRI property did not contain VOCs. But HGL fails to note that Marvin Motes, the occupant of the property, collected those samples using unknown methods and unknown sample holding conditions. Furthermore, no laboratory report or other data is even referenced. Clearly these results cannot be relied upon. ADEQ should have sampled all delivery and disposal trenches and the results should be discussed in this report, as well as with in the RI.*

ADEQ Response: Comment noted. The results of soil sampling conducted at the former AMRI Oil property are included in Section 4.2 of the final RI report.

7.9 *Page 21, 2nd paragraph – A high soil vapor concentration of vinyl chloride (82,320 ppb) is listed as being found adjacent to the landfill. Later, the report clarifies that this sample was collected at the Lee's Auto Parts property (Drake property). The 82,320 ppb soil gas concentration was the highest concentration found during any of the studies conducted for this entire WQARF site. The presentation of this finding in the report is highly misleading. This sample result is introduced and described in the section relating to the regulatory involvement at the CDC landfill which begins on page 17. This soil gas result is not even discussed in the section for Lee's Auto Parts on page 22. HGL's efforts to minimize the obvious role of PRP's other than Pima County is emblematic of ADEQ's conflict of interests in conducting this investigation.*

ADEQ Response: The referenced vinyl chloride detection was approximately 200 feet from the eastern boundary of the landfill, and was associated with high methane concentrations which could have come only from the landfill property. As discussed in Section 4.1.2 of the final RI report, this VOC-contaminated soil gas was likely expelled from the landfill with the methane due to the positive pressure caused by methane gas generation.

Regarding the accusation that ADEQ has a conflict of interest: it should be noted that ADEQ has no monetary interest in or loyalties to any of the properties investigated during

the RI activities at the SR/ECDC WQARF Site. ADEQ's only interest is the protection of public health and the environment.

7.10 Page 23, 4th paragraph – discussion of the lead contaminated soil remediation is irrelevant to the WQARF site. The statement that there was no unacceptable risk associated with the soils at the property at the end of the paragraph is completely misleading because that finding is related to lead contamination in the soil.

ADEQ Response: ADEQ considers the discussion of lead-contaminated soil remediation to be relevant to this remedial investigation. All contaminated media is a potential threat to human health and the environment and subject to remedial action. Additionally, areas of lead contamination often coincided with the areas of VOC contamination on the property. As noted, the statement regarding risk associated with soils is related to lead contamination. ADEQ does not believe the sentence to be misleading.

7.11 Page 23, 6th paragraph continuing to page 24 concludes that the Western Stucco is not an active release site based upon a comparison with passive soil gas concentrations observed at properties with documented soil contamination. But the results of passive soil gas at this property show soil gas concentration significantly higher than concentrations found at the CDC landfill using the exact same method in 2002. (Refer to January 30, 2003 Soil Gas Survey of El Camino Del Cerro Landfill report prepared by EMCON) Using the same rationale, ADEQ would have to conclude that the CDC landfill is not an active release site.

ADEQ Response: This paragraph describes the conclusions of a specific report documenting the results of the referenced passive soil gas survey. The conclusions of the final RI report concerning potential source properties is based on multiple lines of evidence including soil, groundwater, and active soil-gas sampling. Additionally, passive soil-gas results can only be reliably compared when the data are collected at the same time, with the same method and under the same weather conditions. Therefore, the comparison that Pima County suggests is not valid.

7.12 On page 5-4 of Pima County's Remedial Investigation, Malcolm-Pirnie concluded that the Arizona Truck Service/D&D Garage site was likely a contributor to the groundwater contamination on the east side of I-10. Neither HGL nor ADEQ's Draft RI even mention that site.

ADEQ Response: Page 5-4 of Pima County's Remedial Investigation Report states that "The site investigation report for Arizona Truck Service/D&D Garage concluded that this site *may have* contributed to groundwater contamination based on analytical results for soil gas samples". Later in the paragraph, results of a subsequent shallow soil-gas survey are reported for which only trace levels of VOCs were detected.

Investigations at the Arizona Truck Service property are discussed in Section 4.4 of the final RI report. Conclusions as to the property's potential to have been a source of groundwater

contamination are reached based on multiple lines of evidence, including active soil-gas sampling in the area that occurred after the completion of the Pima County Remedial Investigation Report.

8. ADEQ has failed to analyze the extent to which pollutants on the East side of Interstate 10 have contributed to the plume.

ADEQ Response: The final RI report addresses the known primary and potential source areas with detailed discussions of the activities at each presented in Section 4.0. Conclusions in this report were reached based on multiple lines of evidence collected during extensive investigations at numerous properties over many years.

8.1 AMRI Oil

The Draft RI and supporting documents claim that Pima County completed a soil gas sampling of the AMRI property. In fact, Pima County and its contractor, Hydro Geo Chem, were barred from entry onto that parcel and prevented from collecting soil gas samples to aid determination of the success of ADEQ removal. Pima County sought assistance from ADEQ to gain access to the property. While ADEQ had the authority to grant Pima County access for that purpose, the Department refused to provide such access or provide any assistance with such access. Contrary to the summary of this action provided in the Draft RI, the soil gas survey was actually performed on the next parcel to the North, not on the AMRI site. The landowner provided this access as Pima County was trying to protect the residents of the Western Trailer Park.

ADEQ Response: Figure 18 of the final RI report (Figure 15 the draft RI report) shows that the shallow soil-gas samples were collected north of the subject parcel. The text indicates that sampling was conducted along the northern and eastern boundary of the parcel, which is accurate.

The AMRI site has never been adequately evaluated to determine extent of VOC contamination despite clear evidence of soil contamination. Well drilling logs for wells W-32 and W-33 at the edges of the former AMRI oil property showed high concentrations of VOCs from near surface to the bottom of the wells with concentrations generally increasing with depth. Inexplicably, VOC measurements were not collected during drilling of wells W-44 and W-45 which are located adjacent to the former processing building and oil trench respectively.

ADEQ Response: While well SRC-W32 is located at the edge of the former AMRI Oil property, well SRC-W33 is located approximately 700 feet away from the former property line. ADEQ does not agree that “high” concentrations of VOCs were detected during the installation of well SRC-W32. As seen in Figure 15 of Appendix Q, detected PCE and TCE soil-gas concentrations in this well ranged from 3.6-24 and 7.3-50 ppbv, respectively. As discussed in Section 4.2, if groundwater concentrations were at equilibrium with these soil-gas

concentrations, PCE and TCE concentrations in groundwater, calculated using the respective Henry's Law constants, would be less than 1 µg/L. Groundwater concentrations beneath this area were significantly higher than 1 µg/L.

Passive soil gas surveys using Gore-Sorber passive gas modules were relied upon to evaluate the AMRI site. This same method was used to screen the CDC landfill in 2002, and the results showed lower contamination levels at the CDC landfill than were detected at the former AMRI property. Results of this sampling near the CDC landfill showed contaminants of concern were highest in the drainage channel east of the landfill. This drainage channel received drainage from areas east of I-10 near the former AMRI Oil property, E.C. Winter Oil property, and other industrial properties. Concentrations of Contaminants of Concern found during this study at the landfill site were significantly lower than those found at the former AMRI Oil property using the same method. The results of passive soil gas sampling at the landfill site show less contamination than was present at the former AMRI Oil property.

ADEQ Response: Passive soil-gas surveys were used only as a screening tool to direct further investigations. Multiple lines of evidence were used to interpret data at each suspected source property; conclusions are not based on a single investigation. A detailed discussion of the investigations undertaken and data collected at the former AMRI Oil property is presented in Section 4.0 of the final RI report.

Numerous references in the Draft RI and/or documents referenced in by [sic] it claim that one well was found at the AMRI site. Various reports cited in the Draft RI claim there were anecdotal references to a possible second well. A second well was in fact present on the property. The well was abandoned prior to the sale of AMRI in 1968. A second well, pump and sump hole were located on the western 40 feet of the property outside of the chain link fence (see Jackson v. Harmy Corporation, 16 Ariz. 467, 494 P.2d 72 (1972)). The second well is also contained in the inventory of assets recorded with the Pima County Recorder's Office (Book 2915 page 496) and such inventory was included in a reference cited in the RI (ECNAPR000045)

ADEQ Response: Comment noted.

EPA studies have shown used oil in the re-refining industry to contain contaminants such as PCE at 1300 ppm, TCE at 1000 ppm and TCA at 3100 ppm. (Preliminary Data Summary for the Used Oil Reclamation and Re-Refining Industry, USEPA, September 1989). Using these reported concentrations along with reported volumes of oil processed at the AMRI site (180,000 gallons per year), the following quantities of contaminants would have been present at the AMRI site:

- **TCE - 9,600 kg (600 kg per year)**
- **PCE - 12,800 kg (800 kg/year)**

- **TCA 29,600 kg (1,850 kg/year)**

Another EPA study looked at the composition of over 1,000 used oil samples. PCE, TCE and TCA were detected in the vast majority of the oil samples tested for these constituents.

Concentrations of these contaminants routinely exceeded 1000 ppm. Highest concentrations found in this study were 21,000 ppm PCE, 40,000 ppm TCE and 300,000 ppm TCA.

(Composition and Management of Used Oil Generated in the United States, November 1985).

ADEQ Response: As noted in the RI, VOC contamination at these properties was confirmed through site sampling efforts. However, the available evidence does not suggest that this contamination impacted groundwater. Conclusions in the RI are based on site-specific data collected during numerous investigations conducted over many years and are not based on VOC concentrations measured at unrelated sites. A detailed discussion of the investigations completed at the former AMRI Oil property and the data collected is presented in Section 4.0 of the final RI report.

8.2 Wildcat Dumps on/along/in the Rillito River

ADEQ failed to provide any evidence that contaminants of concern were disposed of in the El Camino Del Cerro landfill. To the extent that the Department simply makes a presumption that contaminants were disposed of in the landfill, the same presumption would have to be made about wildcat dumping in and along the banks of the Rillito River. The Rillito River has been a historic wildcat dumping area. Evidence of oil disposal on the banks of the Rillito River was included in ADEQ documents.

ADEQ inspected an area north of the AMRI property along the Rillito River bank as detailed in ADEQ's February 23, 1994 scoping information report for the AMRI Oil property (Wrecksperts). Oily deposit was found on the south bank of the Rillito River. The report indicated that the deposit appeared to be washed away. The two water wells closest to this location were the Z-006 COT well and the Acacia Gardens well - these were the first wells were shut down due to VOC contamination.

Samples collected during drilling of the two wells along the Rillito downstream from this oily deposit found elevated soil VOC concentrations. VOC concentrations found during drilling of well W48M ranged from 136.6 ppm at 24 feet bgs to 75.5 ppm at 104 feet bgs. VOC concentrations found during drilling of well W30 were as high as 18 ppm down to 207 feet bgs.

ADEQ Response: The final RI report presents multiple lines of evidence that contaminants of concern were disposed of in the ECDC Landfill. This evidence

includes the results of soil, soil-gas, and groundwater sampling in and around the landfill. Discussion of the specific investigations conducted at the ECDC Landfill are included in Section 4.1 of the final RI report.

Photoionization detector (PID) readings collected during drilling are subject to a number of uncertainties and do not necessarily represent the detection of site COCs. Potential source areas near Rillito Creek were investigated using passive soil-gas sampling and through the interpretation of data collected from monitor wells in the area. This information is included in Sections 4-7 of the final RI report.

8.3 ADEQ Witness Testimony Not Included

ADEQ deposed a former so-called solvent recycler, Ernest "Joe" Blankinship, in 2009. Review of Blankinship's testimony as well as interview summaries and exhibits introduced at Blankinship's deposition clearly show he claimed disposal of solvents in and along the Rillito River upstream from the site.

8.3.1 Blankinship testified that he disposed of solvents in the Wetmore, Copeland and Crane landfills located on the Rillito River where the present day Tucson Mall is located

8.3.2 Blankinship's notes also recite the disposal of solvent wastes at the Cardi site, which operated a sand and gravel pit in the Rillito River west of Oracle Road.

8.3.3 Blankinship's notes also evidence the sale of solvents to Young Block Company located upgradient of the CDC WQARF site.

8.3.4 During the deposition of Blankinship in 2009, ADEQ specifically asked Blankinship about his dealings with I-10 Surplus which was located at 5300 N. Casa Grande Highway. Blankinship testified that he routinely collected 55 gallon drums of solvent from I-10 Surplus, and testified further that the owner of I-10 Surplus applied used drums of solvent to settle dust on his lot. While ADEQ has relied heavily on the testimony of Mr. Blankinship in its investigations of other WQARF sites, the Department has not so much as mentioned his testimony with respect to this site nor explained why it is not relevant.

ADEQ Response: Multiple lines of evidence were considered during the remedial investigation including time-series data, contaminant ratios, and extensive field work. The resulting data indicate that the ECDC Landfill is the primary source of contamination at the Site, without having to rely on any testimony. The conceptual site model is presented in Section 7.0 of the final RI report and summarizes the findings of numerous investigations and the objective interpretation of data detailed in Sections 3-6 of the final RI report.

8.4 ADEQ's Inconsistent Application of Standards

Recently the Department published a similar draft Remedial Investigation for the Broadway/Pantano WQARF site in which it determined that the Broadway South Landfill was a source based upon some evidence that Contaminants of Concern could be found in soil gas and groundwater - without regard to concentrations. While the E.C. Winter site and the AMRI site each have volatile organic chemicals in soil gas and groundwater, the Department concludes that they are not contributing to groundwater contamination.

ADEQ Response: The Broadway-Pantano WQARF Site and SR/ECDC Site have different and complex hydrogeologic settings and site histories. The evidence and analysis used to draw conclusions at each of these sites are included in their respective final RI reports.

Comments from Montgomery & Associates

Comments from Montgomery & Associates regarding the Draft RI Report were received in a memorandum via email from the Office of the Pima County Attorney to ADEQ, dated May 16, 2014. The following section includes the text of broad-based and detailed comments in boldface italics, along with an ADEQ response to address each comment. When a comment refers to specific text from the draft RI report, the section and page number (section/page #) are included after the comment number. The referenced draft RI report text is included in quotes.

BROAD-BASED COMMENTS

M&A generally agrees with the conclusions that the tetrachloroethene (PCE) and trichloroethene (TCE) concentrations in groundwater do not appear to pose an immediate risk to public health. Although VOC concentrations are declining in some areas of the Site, the contaminant plume does appear to be relatively stable in the shallow groundwater zone, especially in the vicinity of and downgradient from the E.C. Winters and AMRI Oil properties. The contaminant plume in the medium groundwater zone is migrating to the northeast, presumably toward the South Shannon well. However, the RI report contains insufficient information to assess whether the South Shannon well is capturing the entire medium zone plume. Based on information summarized below, and detailed in the attached tables, M&A disagrees with the conclusion that, among the various areas investigated and found to have confirmed surface and subsurface contamination, the ECDC landfill (and possibly the Drake property) is the only confirmed source of groundwater contamination.

Table 1 summarizes the results of our review and provides detailed comments on the RI report. The comments in Table 1 should be addressed before the final RI report is issued. The following broad-based comments summarize the principal issues and concerns noted during our review:

1. The RI report is Incomplete, Deficient, and Inconclusive.

The presentation, interpretation, and analysis of data on hydrogeologic conditions, contaminant distribution, contaminant fate and transport in the vadose zone and groundwater, and contaminant source areas are incomplete, inadequate, and often confusing in the draft RI report. Numerous examples are cited in Table 1 where critical information is missing from the report text, tables, figures, and appendices (for example, see Comments #8, #30, #32, and #33). Important explanatory information is often missing from figures, and the figures poorly depict the intended concepts. Throughout the report, concepts and terms are introduced but not explained or defined. The incomplete presentation of data suggests that many of the investigations conducted during the RI were incomplete and inadequate.

In lieu of providing a complete and clear presentation of data, the report includes references to numerous external documents and numerous incomplete and poorly organized appendices. Many of the reference documents are lengthy and would require substantial time to review. Some of reference documents were not available for review in ADEQ files. In most cases, the appendix material is merely an assemblage of previously-published figures or tables (sometimes with illegible information) provided without narrative context or explanation. The appendix materials are often internally inconsistent and incohesive, making it difficult for the reader to extract the necessary information. These deficiencies are fundamental and should be corrected before the final document is issued. The report should provide a clear and complete presentation of data to serve as a basis for interpretation and to support associated conclusions, enabling the reader to independently judge the reasonableness of the RI. These minimum standards are or should be a requirement of the WQARF program.

The deficient presentation of data in the report does not support interpretation of Site conditions. However, as cited in Table 1, the report includes a broad range of interpretations that, in most cases, are incomplete, unfounded, subjective, or inconsistent with data and information presented in the report. This is most evident and problematic in Section 4.0, Investigations and Remedial Actions, where flawed interpretation of incompletely summarized soil, soil gas, and ground water quality data leads to critical, and largely unfounded, conclusions about contributions of contaminants to the groundwater from the source areas along the I-10 Corridor and northeast of I-10 (see Comments #34, #35, #43, and #45). After presentation of data in the report is expanded and clarified, complete, objective and thoughtful interpretation of these data should be provided in a revised final report. In addition, uncertainty and limitations in the interpretations and conclusions should be provided to appropriately qualify subsequent conclusions.

The RI report does not include analyses to support conclusions. The lack of analysis of abundant data compounds problems associated with incomplete presentation of data and flawed interpretation of data. For example, it is concluded in the report that soil contamination data collected at the E.C. Winter site did not indicate an impact to groundwater. Not only is the presentation of data incomplete, and the interpretation of data unsupported by the data that are presented, but the report lacks an analysis that demonstrates with any reasonable degree of certainty that soil and soil vapor contamination at the E.C. Winter site is not currently or did not in the past impact groundwater. Vadose zone modeling⁶ would have been appropriate for this site, and most of the other potential source sites. Similarly, the report proposes a conceptual model of groundwater flow and contaminant transport, again, without a supporting analysis. In this case, a groundwater flow and transport model⁷, calibrated to observed conditions, would be appropriate to assess a broad range of conceptual models and identify the conceptual model that best fits the hydrogeologic and groundwater

quality data. This flow and transport model could also be used to evaluate the fundamental question of whether the contaminant plume has evolved only from sources southwest of I-10, as concluded by ADEQ, or whether it is more plausible that sources northeast of I-10 also contributed to the plume (as an overwhelming amount of site-specific data indicate — (see below).

2. M&A disagrees with Report Conclusions.

M&A conducted a thorough review of the RI report and reviewed as much of the reference material as was possible in the 60-day comment period. In addition, M&A reviewed monitor well and water quality data from ADEQ and Pima County files, as well as pumping and water level data available in ADWR databases. Where possible, M&A conducted focused analyses of available data to supplement the information presented in the report. Based on our review and focused analyses, M&A believes that the investigations conducted at the potential source areas (other than the ECDC landfill) were incomplete or inadequate to sufficiently characterize the sites to a degree that supports the conclusions about source contributions to groundwater. Further, M&A does not agree with many of the conclusions stated in the RI report. Most importantly, M&A disagrees with the conclusion that the only confirmed sources of groundwater contamination in the SR/ECDC WQARF Site are the ECDC landfill and possibly the larger Drake property. In contrast, M&A believes the soil, soil vapor, and groundwater quality data developed during the RI indicate a high likelihood that sources of ground water contamination exist today or existed in the past at some or all of the sites investigated during the RI, as well as other sites (such as wildcat dumping along Rillito Creek) which were not addressed in the RI.

The RI report and Table 1 cite several examples where Site contaminants of concern (COCs) primarily PCE and TCE were used and/or present in waste materials disposed of at a facility, were detected throughout the vadose zone in soil and/or soil gas, and were also present in groundwater beneath the facility. Table 2 compares the types and selected results of investigations conducted at the ECDC landfill and other potential source area sites. The table provides the highest concentrations of the major COCs (PCE, TCE, etc.) detected in various media at each of the sites. The media considered include shallow and deep soil, shallow and deep soil vapor (or gas), and groundwater. Information provided in Table 2 shows that the distribution of COCs and the maximum detected COC concentrations in the various media are similar at the ECDC landfill, a confirmed source of groundwater contamination, and the other sites which ADEQ concluded were unconfirmed sources of groundwater contamination.

Our interpretation of the Site data (obtained from the RI report as well as from available referenced and unreferenced documents and databases) indicates that one or more additional sites, including the AMRI Oil/Wrecksperts and E.C. Winter sites,

are or were probable sources of VOC contamination to groundwater. M&A's conclusion is based on the following observations:

- Historically, the highest concentrations of PCE and TCE observed in groundwater samples collected during any time period are in wells located in the vicinity of the I-10 corridor, the AMRI Oil/Wrecksperts site, and the E.C. Winter site, and are not in wells located at or immediately north (downgradient) of the former ECDC landfill⁶.*
- Relatively stable, high concentrations of COCs persist in groundwater at monitor wells W-24, W-32, W-38S, and W-45, which are located in the vicinity of the AMRI Oil site and downgradient of the E.C. Winter site. Concentration trends in wells located between the former ECDC landfill and the AMRI/Winters area are declining⁹.*
 - Concentrations of PCE and TCE were detected in deep soil gas from multiport soil vapor monitoring wells at all depths on the E.C. Winter site (well TR-101) and the Wrecksperts portion of the AMRI property (wells SVE 1, SVE2 and SVE3). Soil vapor extraction conducted on the E.C. Winter site resulted in removal of 4 pounds of TCE and 0.85 pounds of PCE from the subsurface. The concentrations of deep soil vapor on the E.C. Winter site are very similar to concentrations detected at similar depths at the ECDC landfill, which is considered a confirmed source of contamination to groundwater.*

The documented persistence of high concentrations of PCE and TCE in groundwater in the proximity of AMRI Oil/Wrecksperts and E.C. Winter sites, where PCE and TCE were also detected in soil vapor near the surface and throughout the vadose zone, suggests that sources of groundwater contamination exist or existed at these sites, or at a minimum, cannot be ruled out by the presently available data.

⁶Using a program like VLEACH for example (<http://www.epa.gov/ada/download/vleach.pdf>)

⁷Using programs like MODFLOW ([HTTP://water.usgs.gov/ogw/modflow/](http://water.usgs.gov/ogw/modflow/)) and MT3D (<http://hydro.goe.uu.edu/mt3d/>) for example

⁸Some monitor wells near the landfill are dry due to declining groundwater levels

⁹Declining concentrations may be due, in part, to the effects of past groundwater pump & treat operations at the landfill

3. The Conceptual Site Model is Incomplete.

The conceptual site model (CSM) for the SR/ECDC WQARF Site is inadequately described in the RI report and incompletely understood. As summarized in Tables 1 and 2, and earlier in this letter, the RI report not only fails to adequately present and interpret site data, it also lacks technical analysis of data to demonstrate that a valid and reasonable CSM has been developed. Such analysis is essential to support the critical conclusions on the nature of groundwater contamination sources and the fate and transport of these contaminants in the groundwater. A well- documented and reasonable CSM

supported by Site data, objective interpretation, and analysis is needed before the remedial objectives (ROs) can be developed.

As summarized in Table 1, the RI report fails to adequately present, interpret, and analyze data to support conclusions about groundwater source areas. In addition, M&A believes that the distribution, fate, and transport of contaminants in the groundwater are poorly understood and not convincingly articulated in the CSM. A complete understanding of contaminant distribution and transport in the groundwater is needed before ROs can be developed, and certainly before a feasibility study can be contemplated to evaluate remedial alternatives. Data gaps identified by ADEQ should be addressed, including development of a comprehensive site-wide water level and water quality data set, to provide an improved basis for future decisions. Modeling should be strongly considered to provide an analytical framework for assessing the validity of the CSM.

The current CSM conceives that the VOC contaminant plume is "diving" from the shallow aquifer zone to the medium aquifer zone as it migrates to the north-northeast, partly as a result of pumping at the South Shannon well. While this may be true, the reason for this observed migration are incompletely understood and poorly presented in the RI report, as illustrated by the following:

- The cross-section in Figure 3 of the report does not clearly and convincingly depict a geologic condition for this pathway to exist.*
- Site water level data do not fully support this migration pathway. M&A examined April 2013 water level data from a number of nested well groups 1 1. The data indicate that vertical gradients between the aquifer zones at these locations were generally small and upward, not downward as might be expected if pumping from the South Shannon well was controlling plume migration. Additional evaluation of water level data should be conducted by ADEQ to ensure that hydraulic gradients are consistent with the conceptualization that the South Shannon well is hydraulically controlling the contaminant plume.*
- The groundwater level contour maps included in the report (Figure 4 and Appendix D) indicate the predominant direction of groundwater flow is to the north-northwest, which does not support the notion that the contaminated groundwater is moving north-northeast from source areas southwest of I-10 and high concentration areas south of Rillito Creek toward the South Shannon well. In fact, it more plausibly suggests that additional source areas may exist in the area south-southeast of the South Shannon well.*

Additional Site investigation, data interpretation, and analysis are needed to better document and develop a more complete CSM. Fundamentally, the CSM must document

and demonstrate a thorough understanding of the effect of all potential groundwater source areas, hydrogeologic conditions, and groundwater recharge and pumping on the fate and transport of contaminants within the study area. Only after complete CSM is developed can ROs be developed.

SUMMARY

M&A has reviewed the Final Draft RI report for the SR/ECDC WQARF Site. Our review included a thorough evaluation of the RI report, a review of available reference documents, and an evaluation of available groundwater elevation and soil, soil vapor, and groundwater quality data. Based on our review, we conclude that the presentation, interpretation, and analysis of data included in the RI report do not support the conclusions reached regarding groundwater source areas. Specifically, we disagree with the overarching conclusion that the only confirmed sources of groundwater contamination are located southwest of I-10 (including primarily the ECDC landfill and possibly the Drake property) and that soil quality data available at potential source areas located along the I-10 Corridor and northeast of I-10 do not indicate that contamination found at these sites is impacting or has impacted groundwater. Finally, we believe additional Site investigations, data interpretation, and analyses are needed to substantially improve the CSM. We recommend that the RI report be substantially revised and expanded to address our detailed comments (Table 1) and to better document a reasonable CSM, before final conclusions are developed about groundwater source areas and before ROs are established.

ADEQ Response to all Broad-Based Comments: The draft RI report has been revised to provide additional details of the numerous investigations conducted at the Site and to further clarify the report conclusions. Several figures and tables have been revised and appendices have been added to provide a more robust presentation and detailed analysis of available data. A revised Conceptual Site Model is provided in Section 7.0 of the final RI report. Responses to detailed comments are provided below.

DETAILED COMMENTS

1. 1.3/3 “[The South Shannon well]... creates a significant cone of influence and provides hydraulic containment of the groundwater plume preventing it from migrating farther north.”

How was this determined? See comment #11 below.

ADEQ Response: As detailed in Sections 6.0 and 7.0 of the final RI report, capture-zone modeling has shown that the South Shannon well is theoretically capable of capturing the plume. Additionally, data collected from the groundwater monitor network, as detailed in Section 5.3 and 6.4, has shown no indication that the plume is migrating north of the well.

2. 1.3/4 (Referring to E.C. Winters, AMRI, and the I-10 Corridor area] “... impacts to the aquifer from (these] area (s)] have not been observed based on available data.”

How was this determined? What analyses were conducted to determine this? Since relatively high concentrations of volatile organic compounds (VOCs) (comparable to the El Camino Del Cerro (ECDC landfill) have been detected in groundwater underlying all of these areas and high concentrations have persisted beneath the E.C. Winters and AMRI sites, how can it be stated with certainty that "impacts to groundwater have not been observed..."? Further, conclusions regarding source areas should not be stated in the introduction section. An executive summary should be added to the report if an overview of the results of the report content is needed.

ADEQ Response: The draft RI report has been revised to provide additional details of the numerous investigations conducted at the Site and to further clarify the report conclusions. Details and conclusions of investigations at individual properties are provided in Section 4.0 of the final RI report. A revised Conceptual Site Model is now provided in Section 7.0 of the final RI report.

3. 2/5 “This RI report presents activities for SR/ECDC conducted through 2013 including groundwater sampling and new well installations in April and May 2013, however, the most recent data available to URS for the CDC Landfill area was through 2011.”

Why were more recent data for the ECDC landfill unavailable to URS? It is our understanding that water level and water quality monitoring were conducted at the ECDC landfill site through at least 2012, and that no request was made to Pima County by Arizona Department of Environmental Quality (ADEQ) for access to the site to sample or measure water levels in these wells to ensure that a comprehensive, recent data set was available to support the Remedial Investigation (RI).

A comprehensive groundwater monitoring round in all accessible monitor wells should be conducted before the RI is finalized.

ADEQ Response: ECDC Landfill area data was available for 2012 and is included in Figures 5 and 7 of the final RI report. The referenced statement has been corrected in the final RI report. ADEQ agrees that a site-wide sampling round is warranted to supplement the conclusions of this remedial investigation. This has been included as a recommendation in Section 8.0 of the final RI report. It is not expected that the results of this sampling will substantially change the conclusions of the final RI report.

4. 2/5 “While the landfill area is the primary source of contamination within the WQARF site boundaries, other potential sources have been investigated.”

This conclusion is not appropriate at this juncture in the report, nor is it supported based on information and analyses provided in subsequent report sections. What secondary sources exist?

ADEQ Response: The draft RI report has been revised to provide additional details of the numerous investigations conducted at the Site and to further clarify the report conclusions. Further detail and interpretation of investigative efforts at potential source areas are provided in Section 4.0 of the final RI report.

5. 3.3/8 “The SR/ECDC area lies within the Tucson Active Management Area and encompasses approximately 110 ADWR registered wells.”

A table and map of these wells should be provided in the report to show location, status, and construction information. Older, unused wells may act as conduits and should be identified and evaluated as a potential mechanism for vertical migration.

ADEQ Response: A list of existing ADWR-registered wells in the SR/ECDC area is provided in Table 3 and Table 4 of Appendix A. ADEQ believes this is sufficient to meet the objectives of this RI.

6. 3.4.2/9 “A generalized geologic cross section is shown on Figure 3....The cross-section indicates a sloping interface from southwest to northeast between the generally coarser-grained sand and gravels at and near the CDC Landfill area adjacent to the Santa Cruz River, and the generally finer-grained silty and clayey gravels northeast of Rillito Creek. As discussed in detail in the Fate and Transport section this may be a contributing factor to the deepening plume phenomenon observed at SR/ECDC.”

The correlation of hydrogeologic units on Figure 3 is difficult to discern; however, gravels appear to be widely distributed throughout the section and the relationships described in the text are not readily apparent. The logs were prepared by different geologists making correlation of units difficult. This cross-section is used here and in several locations throughout the report to indicate that geologic controls are a factor in causing the plume to “dive” as it moves downgradient (north, northwest) from the E.C. Winters and AMRI sites. This hypothesis is not supported by the cross-section, which seems to show a range of relatively permeable sediments interbedded with discontinuous finer-grained zones across the lateral and vertical plume area.

ADEQ Response: ADEQ agrees that uncertainty exists with regard to the identification of broad hydrogeologic units. The unit dividing lines have been removed from Figures 3 and 20 (Figures 9 and 21 of the final RI report) in an effort to reflect this uncertainty.

7. 3.4.3/11 “The regional water level in the Tucson Basin has declined in response to pumping. In the vicinity of the SR/ECDC site, the decline in water levels during the period from 1947 to 1985 is estimated to be approximately 50 to 75 feet (CH2M Hill et al., 1987).”

Why are water level trends only described through 1985, when the ECDC landfill was in operation in the 1970s? The report should include water level hydrographs for water supply wells and monitor wells to document water level trends across the site since the 1970s, if possible.

Montgomery & Associates (M&A) reviewed the Groundwater Site Inventory (GWSI) database available through Arizona Department of Water Resources (ADWR) and found several wells in the Site area with long-term water level records extending from the 1980s through the present. It appears that overall water level decline has been relatively consistent at about 60 feet over the past approximately 30 years for several wells in the area. Short-term water level rise on the order of about 20 feet is observed in response to the major stream flow events in the early 1980s and 1990s. These trends should be discussed in relation to the conceptual model of groundwater flow, the impact of shallower groundwater historically on source potential, and potential mobilization of mass from the lower part of the vadose zone at the various potential source areas during periods of water level rise.

ADEQ Response: The discussion of water levels in Section 3.4.3 of the final RI report has been revised to include more recent trends. Discussion of the effect of a temporary rise in water levels is included in Section 6.3.1 of the final RI report.

8. 3.4.3/11 *“Groundwater level data from April 2013 indicate that the direction of groundwater flow is generally to the north (Figure 4).”*

Figure 4 indicates groundwater flow is to the north-northwest, which is inconsistent with the plume boundary shown on Figure 5. Figure 4 has several problems: (1) contours are for "medium zone" wells, a concept not introduced in report yet; (2) the contours extend too far beyond the network of wells with data; (3) groundwater flow arrows are not perpendicular to contour lines; (4) contours do not cover the entire site area and data are not provided for wells southwest of I-10, including those located at the CDC landfill (which in other locations of the report is identified as the source for the entire plume); and (5) contours do not appropriately interpret drawdown at the South Shannon Well but rather show a cone of depression around monitor well W31M.

Figure 4 should be revised to completely and accurately depict groundwater contours, gradients, and flow directions

Why are some medium zone wells missing? Groundwater elevation contour maps for the shallow and deep aquifer zones should also be provided in the main report.

ADEQ Response: ADEQ has revised Figure 4 (Figure 10 of the final RI report). This figure now includes shallow-zone wells and data from Pima County monitor wells. The revised figure depicts water-level data collected from February-May 2012 which is the last time period in

which data was available for both the ECDC Landfill Area and areas to the northeast. It is not expected that more recent data is substantially different from that depicted on the revised figure.

9. 3.4.3111 “Hydraulic gradient varies from approximately 0.0009 along the western edge of the site to approximately 0.003 north of the Rillito Creek, near the South Shannon well (Kleinfelder, 2001b).”

Why cite Kleinfelder, 2001 for the hydraulic gradients? Estimated gradients from the Figure 4 data set should be reported. Ranges in the historic magnitude and direction of hydraulic gradient should be discussed because they are critical for evaluation the transport of contaminants in groundwater. See comment #10.

ADEQ Response: ADEQ evaluated the gradients as recommended and has updated Section 3.4.3 of the final RI report accordingly. Historic changes in measured hydraulic gradient can be seen in the figures included in Appendix D.

10. 3.4.3/11 “Groundwater levels, direction of groundwater flow, and hydraulic gradient have been observed to vary considerably over time (Malcolm Pirnie.1997a). Appendix D contains groundwater elevation maps from 1988 to 2012.”

Numerous water level contour maps for different time periods and covering different portions of the site are included in Appendix D. Less than half of the maps include data for the entire plume area. There are no discussion of these maps in relation to URS’ analysis of changes in groundwater flow direction over time that explains to the reader the evolution of the observed plume, concentration trends at key wells (including the South Shannon Road well), and potential contributions from the various source areas. In fact, review of the water level contour maps provided in Appendix D clearly indicates that the dominant direction of groundwater movement from the CDC Landfill site over time is to the north or north-northwest. This flow direction is inconsistent with the observed plume extent and with the conclusion reiterated in several places in the draft RI report that the plume is consistent with a source in the southwestern part of the site (CDC Landfill and possibly Drake property).

The RI report should be revised to include a much more detailed analysis of groundwater flow conditions and how they relate to contaminant source areas and transport in groundwater. This is a fundamental concept that needs to be thoroughly assessed in the RI report.

ADEQ Response: As acknowledged in the RI report, the direction of the groundwater gradient varies over time due to a number of factors including recharge events and extraction well pumping. In an area so close to the confluence of two rivers, it is possible that the hydrogeology of the area cannot be fully understood with the limited water level data and lithologic log data available. However, the observed distribution of contaminants in the area is clear and the conclusion that the primary source exists in the southwestern part of the site is based on multiple lines of evidence and not the measured hydraulic gradient alone.

11. 3.4.3/11-12 *“In addition to the impacts of groundwater recharge, groundwater flow directions have likely been affected by groundwater withdrawals in the SR/ECDC site area. Tucson Water has two inactive production wells (Z-004 and Z-006) in the vicinity (Figure 5). Metro Water has seven active production wells (South Shannon, DeConcini, Wildwood, Estes, Moore, Latamore-N and Latamore-S) north of Rillito Creek near South Shannon Road.*

Patterns of groundwater flow in the vicinity of the SR/ECDC site are influenced by groundwater extraction from pumping Metro Water wells. The number and location of wells, the rates for individual wells, and the duration and schedule of pumping have changed over time. Historically, pumping regimens and recharge events have combined to influence the direction of groundwater flow and gradient.”

Pumping data for the Tucson Water and Metro Water wells since the earliest reporting period (likely around 1984) should be provided and discussed to support the concept that groundwater withdrawal has affected flow directions, both laterally and vertically. Other water supply wells and remedial action wells are not included in the report, but should be added. M&A reviewed pumping data reported to ADWR for Metro Water, Tucson Water, and Pima County wells in the area. These data indicate that pumping across the area has been highly variable over time and these variations are expected to be very relevant to plume development.

The influence of groundwater pumping on groundwater flow should be evaluated in more detail because this could be important for historic contaminant transport in groundwater. In fact, URS indicates in several places that pumping from “deeper zones” is a factor in causing the plume to “dive” as it moves north of the E.C. Winter’s site. Review of water level data for April 2013 for paired shallow and medium zone wells does not support this assumption because the vertical gradient between these two zones appears to be relatively small.

Why does the report refer the reader to the plume boundary map to show the Tucson Water well locations? This is confusing.

ADEQ Response: Pumping data for municipal extraction wells is publicly available should members of the public wish to review this information. The final RI report presents the data and interpretation deemed necessary to meet the objectives of the RI, which are to satisfy the requirements of AAC R18-16-406: Establish the nature and extent of contamination and the potential sources; Identify current and potential impacts to public health, welfare, and the environment; Identify current and reasonably foreseeable uses of land and waters of the state, and; Evaluate other information for identification and comparison of alternative remedial actions.

The final RI report refers the reader to the Well Location Map (Figure 2) to show the Tucson Water well locations.

12. 3.4.3/12 *“At the SR/ECDC site, recharge from ephemeral flow may occur along Rillito Creek and the Santa Cruz River depending on the distribution of precipitation and streamflow. From 1904 to 1975, annual peak flow in Rillito Creek ranged from 297 to 70,660*

acre-feet per year (ac-ft/yr) and the average annual peak flow was 11,660 ac-ft/yr. From 1906 to 1980, annual peak flow in the Santa Cruz River ranged from 976 to 58,840 ac-ft/yr and the average annual peak flow was 16,450 ac-ft/yr. In addition to storm water runoff, the Santa Cruz River receives discharge from the Roger Road Wastewater Reclamation Facility (Malcolm Pirnie, 1997b).”

Additional evaluation of the effect of flow in Rillito Creek and Santa Cruz River should be provided because this could be important for historic contaminant transport in groundwater.

ADEQ Response: The final RI report presents the data and interpretation deemed necessary to meet the objectives of the RI, namely to satisfy the requirements of AAC R18-16-406: Establish the nature and extent of contamination and the potential sources; Identify current and potential impacts to public health, welfare, and the environment; Identify current and reasonably foreseeable uses of land and waters of the state, and; Evaluate other information for identification and comparison of alternative remedial actions.

13. 3.4.4/13 “Aquifer Parameters”

The discussion of aquifer parameters pertains to the geologic formations (i.e., Fort Lowell Formation and Tinaja Beds). It is unclear how these formations correlate to the zones where transport of contaminants occurs, or the zones shown on Figure 3. What hydrostratigraphic zone was tested at the South Shannon Well?

ADEQ Response: The general thickness of each formation is included in the Section 3.4.4 and can be compared to zones in which contaminants have been detected. Aquifer testing at the South Shannon well was not conducted to test a specific hydrostratigraphic zone. The South Shannon well testing details are provided in the *Aquifer Testing & Capture Zone Modeling Results, June 2, 2005*. General discussion of these results is included in the final RI report.

14. 3.4.4/13 “In February 2004, an aquifer test was performed on Metro Water’s South Shannon well as documented in Aquifer Testing South Shannon Well, 55-626757, June 2, 2005 prepared by URS....Analysis of the aquifer tests indicated a transmissivity of 53,000 gallons per day per foot....”

Based on review of a draft final version of the referenced report, there were actually two values of transmissivity reported for the South Shannon Well Test. In Addition to the 53,000 gallons per day per foot (gpd/ft) mentioned in the draft RI that was obtained using the Neuman method, a transmissivity value of 102,500 gpd/ft was computed using the Theis and Cooper-Jacob methods. This is relevant to the projected extent of capture, as indicated in comment #68 below.

ADEQ Response: The transmissivity value of 53,000 gpd/ft was reported in Section 3.4.4 of the final RI report because this was considered by the 2005 report authors to be the most representative value. An aquifer transmissivity value was estimated in a separate investigation to

be between 37,000 and 82,000 gpd/ft. These values are also reported in Section 3.4.4 of the final RI report.

With regard to the discussion of plume capture in Section 6.4.1 of the final RI report, the results of the capture-zone modeling study are referenced to demonstrate that the well is theoretically capable of capturing the plume under certain conditions. However, the determination of capture at this well relies primarily on results of groundwater quality monitoring.

15. 3.5.1/14 *“Table 3 presents a summary of the United States Geological Survey (USGS) monthly mean discharge data between 1995 and 2012 from a gauging station just upstream of the SR/ECDC site at the intersection of La Cholla Boulevard and Rillito Creek.”*

A graph rather than a table should be provided for stream flow data so the reader can more easily identify the magnitude and timing of specific event. More importantly, the draft RI should include an analysis of the relationship between stream flow, groundwater elevations, direction of groundwater movement, and plume migration over time.

ADEQ Response: ADEQ believes the information provided in Table 3 is adequate.

16. 3.5.2/15 *“Table 3 presents a summary of the USGS monthly mean discharge data from a gauging station on the Santa Cruz River near Congress Street.”*

Same comment as above.

ADEQ Response: Again, ADEQ believes the information provided in Table 3 is adequate.

17. Investigation and Remedial Activities

General comments

More information should be provided in the report about the historical properties search. In particular, the logic used to determine which properties warranted investigation and which did not should be discussed in more detail.

The lengthy discussion in the report about the lead (a contaminant of potential concern (COPC)) contamination at the various properties and related response actions is important due to the noted potential health impacts from this contamination. However, the information about lead contamination is not important for the identification and analysis of sources of groundwater compounds of concern (COCs), which appears to be the primary focus of the report. Information about lead contamination could be moved to an appendix to improve the report flow, maintain the focus on presenting relevant data, interpretation, and analyses of sources of COCs to groundwater, and to dedicate more of the report to incorporating the missing information identified in our comments.

ADEQ Response: As indicated in Section 4.0 of the final RI report, properties were assessed based on historical occupants, operations, and activities. Properties identified as having possibly used solvents or having had VOCs detected in soils were identified for further field investigations.

ADEQ believes that the discussion of lead contamination throughout the report is warranted because all environmental media with a potentially complete exposure pathway should be assessed to determine whether it represents a threat to human health or the environment.

18. 4.1/16/2 *“The majority of the investigations focused on specific properties and the following text describes those investigations accordingly. However, a geographically broader investigation was conducted in 2002. Specifically, an area-wide passive soil-gas survey was completed in two phases in Pima County Flood Control District properties along the south bank of Rillito Creek. The first phase included the installation of 62 soil-gas monitoring locations on March 14, 2002 and the second phase included the installation of 80 locations on May 22, 2002. It was concluded the discontinuous spatial distribution of soil-gas results and the low concentrations of contamination were unlikely to reflect any potential contaminant sources for the area (Kleinfelder. 2002b).”*

Additional discussion of the soil gas investigation along the south bank of Rillito Creek including the depth of sampling, compounds detected, range in concentrations, and the methods used to determine that these detections were unlikely to indicate contaminant sources is needed. In areas where compounds were found in shallow soil gas, were deeper samples collected to assess the extent of contamination?

ADEQ Response: Additional details of this investigation are provided in Section 4.5.1 of the final RI report and Figures 31-33 of Appendix Q. Given the discontinuous spatial distribution of soil-gas results and the low magnitude of detected masses, it was not deemed necessary to conduct additional sampling.

19. 4.2/17+ General Comment

Maps of contaminant concentrations in soil and soil gas for the ECDC landfill and I-10 Corridor areas should be provided to enable assessment of sources. At a minimum, concentration maps with a brief narrative summary should be provided in an appendix. Referencing previous reports, while necessary, does not allow the reader to assess the relative source potential for the landfill compared with other areas that were investigated.

ADEQ Response: Additional figures and tables are included in Appendix Q of the final RI report. Appendix Q and other appendices are not intended to be standalone documents; relevant narrative information is provided in the final RI report text and the associated figures are provided in Appendix Q as a supplement to this text.

20. 4.2.1/18 ***“It was determined that shallow alluvium at the CDC Landfill was relatively coarse-grained from the surface to a depth of approximately 40 feet bgs. Finer-grained sediments extended from approximately 40 feet bgs to an approximate depth of 175 feet bgs.”***

The geologic cross section in Figure 3 of the report does not support this description, which appears to be based solely on the log from monitor well W-11, located south of the landfill. Based on our review, the W-5 log appears to have predominantly coarse-grained sediments through most of the penetrated depth.

ADEQ Response: The information in the quoted text was taken directly from Pima County LESP Phase II investigations and is not based on the limited geologic information displayed on the cross section depicted in Figure 3 (Figure 9 of the final RI report). A similar description is provided in the *Pima County El Camino del Cerro Study Area Remedial Investigation Report*.

21. 4.3/24 ***“A summary of the activities for Wrecksperts from June 1995 to August 2007 are listed in Table.”***

The table reference should be provided. It should be Table 4.

ADEQ Response: The omitted reference has been added.

22. 4.3.1/25 ***“A summary of the analytical results from June 1995 to August 2007 are presented in Table.”***

The table reference should be provided. It should be Table 4.

ADEQ Response: The omitted reference has been added.

23. 4.3.1/25-26 ***“ADEQ prepared a scope of work to remove the contaminated soils and waste sludge, as well as plug and abandon an unused well on the property (ADEQ,1995).***

In 1996, ADEQ conducted an Expanded Site Inspection (ESI) which included the collection of samples from the north half of the Wrecksperts property as confirmation for the removal and to further characterize the extent of contamination. Soil samples were analyzed for total petroleum hydrocarbon (TPH), PCBs, and lead. Soil samples collected from beneath the trench did not contain detectable concentrations of VOCs.”

According to Pima County, "A second well, sump and pump was present on the site. This second well was listed in the asset inventory that AMRI prepared when the business was sold in 1969. Court records show the second well was located in the west 40 feet of the property that AMRI occupied."

What analytical methods were used for the VOCs analyses? When discussing laboratory analytical results, the method should be provided, as well as information about the detection limits.

ADEQ Response: The specific analytical method used was not provided in the original documentation. However, information on detection limits is included in Section 4.2.1 of the final RI report.

24. 4.3.1/26-27/4 ***“On May 22, 1996, Growth subcontractor, Saguaro Environmental, mobilized personnel and equipment to the Wrecksperts property to abandon a well in order to eliminate a potential conduit from contaminated surface water runoff. The well was first identified by ADEQ in 1987 and was first observed in 1995 during a site inspection. The well was reportedly drilled to 125 feet bgs; however, it was only open to 102 feet bgs.”***

Did this well have water in when it was abandoned in 1996? Was it sampled? Based on interpolation of available water level data from wells at the ECDC landfill for this time period, depth to water in the Wrecksperts area should not have been deeper than the well depth of 125 feet. What is meant by the well only being "open" to 102 feet? Was there fill in the well or an obstruction? More information about this well should be provided in the report, particularly since it could have been a conduit for contaminant migration from the surface and vadose zone to groundwater. Based on long-term water level data from the GWSI database, water levels would have been significantly shallower during the time period of active operations and disposal at this site.

ADEQ Response: Available information concerning this well is included in Section 4.2.1 of the final RI report.

25. 4.3.1/27 ***“During March 2003, W-32 was installed on the Western Stucco property, and was completed as a nested groundwater monitor well. Soil and soil-vapor samples were collected from 30, 60, 90, and 120 feet bgs during the boring installation. The analytical results indicated that soil vapor concentrations exceeded target levels for benzene, PCE, and TCE. The highest detections are as follows: benzene was 110 ppbv at 90 feet bgs, PCE was 24 ppbv at 60 feet bgs and TCE was 50 ppbv from 60 feet bgs.”***

Detection of tetrachloroethene (PCE) and trichloroelhene (TCE) in soil vapor at 60 feet indicates the potential that groundwater contamination sources exist or existed in the past on or near the Western Stucco/AMRI Oil/Wrecksperts properties. The source potential is further supported by the detection of PCE and TCE in shallow soil and soil vapor, and the presence of these compounds in groundwater beneath these properties. The persistence of relatively high VOC concentrations in groundwater in this area provides further support for concluding that these properties are likely sources to the VOC plume.

ADEQ Response: The interpretation of soil and soil vapor data in the vicinity of the former Western Stucco/AMRI Oil/Wrecksperts properties is based on multiple lines of evidence. Details of this interpretation are provided in Sections 4.2 and 7.0 of the final RI report.

26. 4.3.1/28 *“Six polyaromatic hydrocarbon (PAH) compounds were detected, however, no concentrations exceeded the SRLs (URS 2007c). The detections from the results are summarized in Table _.”*

The table reference should be provided. It should be Table 4.

ADEQ Response: The omitted reference has been added.

27. 4.3.1/29 *“The results are summarized in Table _ and the boring locations are illustrated on Figure 14.”*

The table reference should be provided. It should be Table 4. Table 4 should report the depths at which contaminants were detected.

ADEQ Response: The omitted reference has been added.

28. 4.3.1/29 *“In January 1995, ten soil vapor samples were collected and PCE and benzene were detected above the method detection limits in two samples. PCE was detected in the soil vapor sample collected from the surface impoundment at a concentration of 2.5 ppbv. Benzene was detected in one sample collected from the trench at a concentration of 58 ppbv (ADEQ, 1995).”*

At what locations and depths were these soil vapor samples collected? Since the vapor had detectable concentrations of PCE, a key groundwater COC, more information and analysis of these data should be provided in the report.

ADEQ Response: Further detail and interpretation of this and other sampling events is provided in Section 4.2 of the final RI report.

29. 4.3.1/29 *“In April 1996, Pima County subcontracted with Hydro Geo Chem to collect soil-gas samples at the Wrecksperts facility (formerly AMRI Oil). Hydro Geo Chem sampled eight locations along the northern and eastern property boundary. Out of 23 soil gas samples, PCE was detected in a single sample at a concentration of 4.2 µg/l. (Hydro Geo Chem, 1996).”*

The depth at which the PCE detection was found should be reported because this is critical information for assessing the meaningfulness of this detection as an indicator of a groundwater contamination source at the Wrecksperts property.

ADEQ Response: Further detail and interpretation of this and other sampling events is provided in Section 4.2 of the final RI report.

Pima County notes that ADEQ refused access to the Wrecksperts property and that the soil gas survey was actually done on the Western Stucco property, north of Wrecksperts.

ADEQ Response: Comment Noted.

30. 4.3.1/29-30 “During November 2001, ADEQ conducted a passive soil-gas survey at the Western Stucco/Western Trailer Park property.... Soil-gas sampling indicated that PCE was detected in 32 of the 124 samples. This includes 14 samples with detectable masses that were less than the method reporting limit. Two distinct areas were found to contain detectable levels of PCE: around the main office building on the Western Stucco parcel and along the eastern half of the Western Stucco parcel. The levels observed in the vicinity of the main building on the Western Stucco parcel were the highest. PCE was detected in most of the sample locations along the eastern portion of the Western Stucco parcel, but at lower levels than around the main building, See Figure 15 for sample locations and the Soil-Gas Survey Report, Western Stucco/Western Trailer Park Property 5348 North Highway Drive (URS, 2002b) for the analytical results. For analytical maps that illustrate the results see Appendix F.”

The concentration range and depth at which the PCE detections were found should be reported in the text. The concentration values on the color ramp scale on the PCE map in Appendix F are illegible. In addition, the concentration data should be reported on the maps. Regarding Appendix F, it should include some narrative context to support the maps.

This type of incomplete presentation of critical information occurs throughout the report and is an unacceptable deficiency that impedes the reader’s ability to critically evaluate the results or the RI. The reader should not have to obtain and read the original report to fully understand the implications of the information being presented, especially when the information pertains to the sources, magnitude, and extent of a key groundwater COC that will factor into potential future remedial actions at the site.

The report should be revised and expanded to include this information before it is finalized.

Pima County questions the validity of passive soil gas survey methods, since the same type of passive soil gas survey conducted on the landfill property by EMCON in 2003 failed to detect any concentrations of PCE, TCE, cis1,2-DCE or vinyl chloride.

ADEQ Response: Further detail and interpretation of this and other sampling events is provided in Section 4.2 of the final RI report. ADEQ disagrees that the color ramp scale is illegible. Appendix F and other appendices are not intended to be standalone documents; details of the investigation are provided in the final RI report text and the associated figures are provided in Appendix F as a supplement to this text.

Passive soil-gas surveys were used only as a screening tool to direct further investigations. Multiple lines of evidence were used to interpret data at the former AMRI Oil facility; conclusions are not based on one investigation. Furthermore, passive soil-gas surveys are a widely accepted investigative tool; the results of a single investigation should not be used to draw conclusions as to the validity of such a method.

31. 4.3.1/30 “During 2006, additional passive soil-gas sampling occurred at 5280 North Highway Drive and isoconcentration maps illustrating PCE, TCE and PAHs are presented in Appendix G. The relative highest concentrations of PCE were near the center of the parcel. TCE and PAH concentrations were highest in the northwest portion of the site.”

Similar to the previous comment, the concentration range and depths at which PCE and TCE were detected should be reported in the text and Appendix G. Appendix G is another example of incomplete presentation of critical information.

ADEQ Response: Further detail and interpretation of this and other sampling events is provided in Section 4.2 of the final RI report. Appendix G and other appendices are not intended to be standalone documents; details of the investigation are provided in the final RI report text and the associated figures are provided in Appendix G as a supplement to this text.

32. 4.3 1/30-31 “March 2003 samples were collected during the installation of the monitoring well W-32 at Western Stucco (URS 2004a). The analytical results indicated that soil vapor concentrations exceeded target levels for benzene at 30, 60, 90, and 120 feet bgs and TCE at 30, 60 and 90 feet bgs. PCE concentrations only exceeded the 10⁻⁶ risk level at 60 feet bgs. The detections at W-32 led to the recommendation to do more deep soil vapor sampling at Wrecksperts to further assess the elevated concentrations of COCs.”

The presence of TCE at 30, 60, and 90 feet below ground surface (bgs) in soil vapor indicates a source of TCE to groundwater likely exists or existed on the Western Stucco or Wrecksperts property. The concentrations of TCE should be reported in the text. What is meant by "target levels"?

With respect to PCE in soil vapor, what is meant by an exceedance of the 10⁻⁶ risk level? Concentrations should be reported in the text and compared to a compliance standards rather than a risk level.

M&A reviewed the soil gas data from W-32 during a records search at ADEQ. Not reported in the RI was the fact that benzene was also detected at all four sampling depths, with the highest concentration (110 parts per billion by volume [ppbv]) recorded in the sample from 90 feet.

Was additional deep soil vapor sampling conducted per the recommendation? If so, the results should be reported. If not, why?

The report should be revised and expanded to include a more complete presentation of data and thorough interpretation and analysis of data so that conclusions made for this potential source area can be assessed.

ADEQ Response: Further detail and interpretation of this and other sampling events is provided in Section 4.2 of the final RI report. References to “target levels” and “risk levels” have been removed and measured concentrations are now reported. Analytical results from the installation of SRC-W32 are provided on Figure 15 of Appendix Q.

As indicated in the quoted text of this comment, the draft RI text did in fact report that benzene was detected at all four sampling depths.

Additional deep soil vapor sampling was conducted in the area of the historic oil pits, immediately upgradient of well CDC-W32. Details of this investigation are included in Section 4.2.1 of the final RI report.

33. 4.3 2/31 ***“VOC contamination in soils at the AMRI facility appeared to be confined to shallow depths.... The relative masses observed at the site are typically indicative of residual contamination, as evidenced by low concentrations and somewhat abrupt changes in concentrations in comparison to surrounding samples. In addition, the detected soil-gas appeared to diffuse from the highest detected masses.***

....the available data also do not indicate that soil contamination at the AMRI facility impacted groundwater.”

It is unclear how it can be concluded that VOC contamination is confined to shallow depths at the AMRI facility when TCE was detected in soil vapor at depths of between 30 and 90 feet bgs and PCE was detected at 30, 60, and 120 feet bgs, particularly in light of the fact that water levels were significantly shallower when the facilities in this area were actively using and disposing of COCs. The first sentence in this paragraph should be revised to accurately characterize the data.

Further, the notion of “relative masses” is qualitative and ambiguous. Further, it is confusing to switch between concentration and mass. It is also unclear what is meant by “residual contamination”? If it is meant to refer to low concentrations that remain in place and are a remnant of past contamination that was presumably more significant in magnitude, then a discussion of the potential for the AMRI facility to have been a historic source area should be provided. As indicated above, the water table was much shallower during the time when operations occurred on the property, increasing the chances for deep vadose zone mass to reach groundwater. Low concentration detections could also indicate there are higher concentrations nearby that were not characterized. In any case, it is unclear how “abrupt changes in concentrations” relate to the undefined concept of residual contamination or how either supports the case for no impact to groundwater?

Finally, the concept and relevance of soil gas appearing to "diffuse from the highest detected masses" is unclear. Is this also meant to somehow relate to the conclusion on that facility operations did not impact groundwater? If so, more explanation on and support are needed.

The conclusion that available data do not indicate that soil contamination at the AMRI facility impacted groundwater is unfounded for many reasons, including: (1) the extent of investigative activities appears too limited to fully characterize the source potential; (2) the presentation of data in the report is incomplete; (3) the interpretation of the data that are reported is minimal and incomplete, and (4) analyses to support the conclusion are not provided. For reasons 3 and 4, the concept of "time" should be considered. The AMRI facility operated from 1950 to 1969, a period when the water table was many tens of feet shallower than today. The potential for COCs to migrate to groundwater was higher in the past than today because the distance from the surface operations to the water table was smaller.

The paragraphs cited in this comment exemplify a critical deficiency in the RI report. With regard to conclusions made about source areas, it is imperative that ADEQ demonstrate that the investigations were sufficient to characterize the source area, present a clear and complete summary of all relevant data, objectively interpret those data considering all reasonable source scenarios, and conduct appropriate analyses where needed to support conclusions. For example, modeling COC transport through the vadose zone should be conducted to assess source potential.

The RI report should be substantially revised to improve the presentation, interpretation and analysis of data at the potential source areas. As is, the content of the report is clearly insufficient to support conclusions about source areas, except the ECDC landfill, where a previous thorough RI was conducted that identified it as a source area.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former AMRI Oil facility are provided in Section 4.2 of the final RI report.

34. 4.3.2/31 *“Evaluation of 2001 soil-gas data for Western Trailer/Western Stucco indicated that the concentrations observed at the site were not indicative of an active source area. The relatively low concentrations of PCE observed on the property were likely the result of a historic release or possible minor cleaning operations.... Available data from Western Trailer/Western Stucco do not indicate any impacts to groundwater from the soil contamination.”*

How was it determined that soil gas concentration data do not indicate an active source area? Since the concentration and sample depth data were omitted from the report, it is impossible to judge the validity of this conclusion. As for other potential source areas investigated, the presentation of data for Western Trailer/Western Stucco in the draft RI is incomplete and missing critical data. The data presentation clearly does not support the conclusion that the source area is inactive, nor does it necessarily indicate that the PCE concentrations were the

result of a release during possible minor cleaning operations. If additional information exists to support these claims, it should be provided in the report. Overall, the interpretation of data at this site is overly simplistic, unfounded based on the information presented in the report, and does not support the conclusion that no impact to groundwater is indicated.

The report should be revised to include a complete summary of the available soil quality data, a thorough and objective interpretation of those data, and relevant analyses to support reasonable conclusions. Further, if uncertainty in the data, interpretation, and analyses exist, the effect of this uncertainty on the ability to conclude the possibility of a groundwater source should be clearly discussed. Key assumptions and limitations of the characterization and interpretation of data should also be discussed.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former AMRI Oil facility is provided in Section 4.2 of the final RI report.

35. 4.3 2/32 *“The pattern of PCE in soil gas appears to be the result of minor historic releases. Two areas had detections of PCE; south of the smaller building on the west side of the Wrecksperts property and west of the center of the property. The highest concentrations were observed in the center of the Wrecksperts (AMRI et al) parcel in the vicinity of the former waste oil surface impoundments. This vicinity also correlates with the location of the former aboveground storage tanks (ASTs)...*

Twenty-eight VOCs were detected in the soil vapor analysis with each sample containing at least five compounds. PCE, TCE, and hexane were detected in every sample. Many of the detected compounds are associated with waste oil and are likely a result of recycling operations on the Wrecksperts (AMRI et al) property (URS,2007b), and the available data do not indicate that the soil contamination found on these properties impacted groundwater.”

Again, the presentation and interpretation of data for the Wrecksperts property do not support the statement that PCE in soil gas was the result of minor releases. The conclusion that data do not indicate that soil contamination impacted groundwater is unfounded and inconsistent with reported data. The fact that PCE and TCE were found in every soil vapor sample should indicate a high likelihood of a significant source, or should have prompted further investigation to determine the meaningfulness of the prevalence of these COCs in soil vapor. Further, the presence of TCE at 30, 60, and 90 feet bgs in soil vapor, along with relatively stable, high concentrations of PCE, TCE, cis 1,2-DCE and vinyl chloride repeatedly detected in groundwater in the W-32 well, indicates a source of VOCs to groundwater likely exists or existed on or near the Wrecksperts property. If other data exist or other interpretation of data was conducted that support the conclusion of no groundwater impacts, they should be provided in the report rather than by reference. The reader should not have to obtain and review reference material to judge the reasonableness of such an important conclusion.

During the ADEQ records search, M&A found the results from deep soil vapor sampling conducted at multi-port vapor sampling wells SVE1, SVE2, and SVE3 on the Wrecksperts property from November 2006. Each well was screened to sample vapor from 33, 53, 73, and 93 feet bgs. All vapor samples from all depths in these wells had reported detections of PCE and TCE, along with a variety of other VOCs. PCE concentrations were between 11 and 220 parts per million by volume (ppmv), and TCE concentrations were between 2.3 and 53 ppmv. The draft RI states that "Twenty-eight VOCs were detected in the soil vapor analysis with each sample containing at least five compounds. PCE, TCE, and hexane were detected in every sample." At no point is it made clear in the RI report that these statements refer to vapor samples collected from depths of 33, 53, 73, and 93 feet bgs in SVE1, SVE2 and SVE3, rather than from shallow vapor samples. Information on the sample depths, specific VOCs detected, and concentrations should be provided in the RI report. This information relates very directly to the question of whether contamination at the AMRI property impacted groundwater, and should not have been omitted from the report.

This section of the report should be substantially expanded and revised to completely summarize all available data, completely and objectively interpret those data, provide the results of analyses conducted, if any, that support the conclusion, and discuss assumptions and uncertainty in the assessment of potential sources on the Wrecksperts property.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former AMRI Oil facility is provided in Section 4.2 of the final RI report.

36. 4.4.1/33 *“TCE in concentrations up to 54 ppm and hydrocarbons in concentrations up to 53,000 ppm were measured in soil samples collected at the [E.C. Winter] site.”*

The location and depth of these samples should be provided. TCE at 54 ppm is a significant concentration. Is this the same sample described two paragraphs later where "TCE exceeded the residential SRL"? The report should include concentrations rather than the concept of SRL exceedances so the reader can make the connection and put the magnitude of the contamination into context.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former E.C. Winter facility is provided in Section 4.3 of the final RI report.

37. 4.4.1/33 *“TCE exceeded the residential SRL in the sample collected at 10 feet bgs. Appendix I contains a figure illustrating the sample locations and summary of analytical results.”*

More information should be provided in the text about the extent of TCE contamination in soil. TCE was detected at 2.3 milligrams per kilogram (mg/kg) at 25 feet bgs in soil boring 2. While TCE was not detected above lab reporting limits in a sample from 30 feet bgs, the

detection at 25 feet should have prompted additional deep soil borings near boring 2 to more completely characterize the presence of TCE in deep soils. Detecting VOCs in soil (i.e. not soil gas) in Arizona, particularly at depth, is meaningful. As ADEQ is aware, soils are often found to be “clean” at sites with known vadose zone and groundwater contamination if organic carbon content is low.

The information presented in Appendix I is difficult to understand and should include narrative text to aid the reader in interpreting the information. For example, the map indicates that a 12th sample was collected from boring 2, but the tables do not include a 12th sample.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former E.C. Winter facility is provided in Section 4.3 of the final RI report.

The relevant detail regarding the tables and figures presented in Appendix I and other appendices is included in the final RI report text. The 12th sample from boring 2 referenced in the comment was a trip blank sample. Minor details such as this were not included in the report in an effort to keep the report clear and concise. These details can be found in the referenced report which are available to the public for review upon request.

38. 4.4.1/33 *“During a January 2001 site visit, a previously undocumented well on the property was observed. Because of concern that the well could be a conduit for the migration of contaminants, the well was abandoned in June 2001 in accordance with ADWR requirements. Based on video obtained during investigation of the well, the total depth was approximately 110 feet bgs. Water was not encountered during the abandonment process. However, because the well had remained open for an unknown period of time, the soil at the bottom of the well was analyzed for semi-volatile organic compounds and VOCs. The results were below method detection limits for all analytes tested (URS, 2001).”*

We agree that this well could have been a conduit for the migration of contaminants to groundwater. Are records available for the original drilled depth of the well or other relevant information? It is likely that the original well was drilled deeper than the 2001 tagged depth of 110 feet. However, even if 110 feet is the original well depth, groundwater was likely present in this well during and for some period after operations occurred at the E.C. Winter property. Was the soil sample obtained from the top of the soil fill in the well or was there an effort to drill into this material to collect a sample that was not exposed to the air? In any case, the lack of VOCs in the soil at the bottom of the well does not rule out the likelihood that this well was a conduit.

ADEQ Response: Records are not available for the original drilled depth of the well. The well was abandoned by overdrilling the well casing using the rotasonic drilling method. Soil samples were taken from the rotasonic core drilled into native soil below 110 feet.

39. 4.4.1/33 *“Five soil borings were drilled to further delineate the vertical and lateral extent of residual contamination beneath the former oil impoundment area. Boring B-1 was drilled to a depth of 375 feet bgs, while boring B-2 through B-5 were completed to approximately 130 feet bgs at locations depicted in Figure 8. Grab groundwater samples were collected from B-1, B-3, B-4 and B-5. No VOCs were reported above (URS, 2002f).”*

The specific compounds and concentration or VOCs detected should be reported in a table rather than simply stating that all concentrations were below Aquifer Water Quality Standards. Also, more information should be presented about the sampling method. Volatilization of the VOCs would likely occur during a grab sample, biasing the results low. This type of information should be discussed in the report.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former E.C. Winter facility is provided in Section 4.3 of the final RI report. Supplemental information is provided in Figures 19 and 20 of Appendix Q.

40. 4.4.1/34 *“In July 1995, as part of the Phase 3 LESP, Tracer Research Corporation performed a shallow soil-gas survey. Twenty-three locations in the vicinity of Curtis Road and Highway Drive including ten sampling points east of the site and adjacent to the former E.C. Winter Oil Service site were selected. Soil-gas samples were also collected from locations within a county easement near several businesses that may have used hazardous materials such as solvents. Sample depths ranged from 5.0 to 6.5 feet bgs. The highest concentrations of PCE, TCE, and 1,1,1-trichloroethane were 2,224 ppbv, 737 ppbv, and 560 ppbv, respectively. These concentrations were found in the northeast corner of the E.C. Winter property (Tracer Research, 1995)....*

A soil-gas monitor well screened at discrete intervals at 20, 40, 60, and 75 feet bgs was installed by Growth Resources, Inc., on the property 20 feet west of the northernmost manufactured home (Growth, 1997b). Three rounds of soil vapor sampling data were collected in 1997. The results showed elevated concentrations of PCE in the soil-gas.”

The ubiquitous detection of PCE, TCE, and 1,1,1-TCA indicates that these compounds are widely distributed in the subsurface at and near the E.C. Winter site. This fact is significant and its implications should be discussed.

The concentrations and depths of detection for PCE (and other compounds, if they were detected) in the soil vapor monitor well should be thoroughly discussed and analyzed. Detection of PCE and other VOCs in soil gas at or below 20 feet suggest a source to groundwater at the E.C. Winter site, especially since VOCs were widely detected in shallow soil vapor, which eliminates the possibility of volatilization from groundwater into the vadose zone.

The name of the soil-gas monitor well with the highest concentrations should be specified in the text. Based on the map in Appendix J, we assume it was TR-101. Details regarding vapor sampling results for well TR-101 were found in a sampling report by Fluor Daniel GTI from 1998. This report was not referenced in the draft RI report; however, it contained useful information on vapor samples collected from vapor monitor well TR-101 during events conducted in June, July, and October 1997. Vapor samples collected at depths of 20, 40, 60, and 80 feet contained TCE ranging from 4,760 to 8,410 ppbv, PCE ranging from 189 to 412 ppbv, 1,1-DCA ranging from <49 to 584 ppbv, 1,1-DCE ranging from <30 to 113 ppbv, and 1,1,1-TCA ranging from <30 to 91 ppbv. Rather than summarizing all of this information using the phrase "elevated concentrations of PCE" were detected, these data should be provided and discussed in greater depth in the report. In fact, TCE concentrations appear to be higher than PCE in the vadose zone below the E.C. Winter site, and in both cases there is a concern with respect to potential groundwater impacts.

The lack of a complete presentation, interpretation, and analysis of data in the report overall, and particularly in this section on a critical potential source areas, is unacceptable. This section should be substantially expanded. The E.C. Winter site appears to have a significant history of VOCs being detected in both soil and soil gas in both the shallow and deeper portions of the vadose zone, which make it a likely source area for groundwater contamination.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former E.C. Winter facility is provided in Section 4.3 of the final RI report.

41. 4.4.1/35 “In April 2002, an investigation of the deep, coarse-grained soils was performed to augment existing property information, and provide site-specific information necessary for design of a bioventing or SVE system. Four borings were advanced to approximately 130 feet bgs. As a part of the investigation, URS collected soil samples, soil gas samples and groundwater samples from borings within and surrounding the former oil impoundment area, VOCs were detected in soil-gas samples and groundwater samples at several locations and depths on the property. No VOCs were detected in sub-surface soil samples.”

It is unclear whether the borings discussed in the paragraph are B-2 through B-5. This should be clarified. Much more information about these soil borings should be presented in the report, including at a minimum the location, sample depths, analytical results of sampling soil, soil vapor, and groundwater, lithologic logs, and information about groundwater (if any). Maps and data tables of the results should be provided. Simply indicating that VOCs were detected in soil-gas and groundwater samples at several locations is clearly insufficient when evaluating potential source areas.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former E.C. Winter facility is provided in Section 4.3 of the final RI report.

42. 4.4.1/35 *“The results for the samples collected from SVE wells B2 and B5 are as follows:*

- *TCE concentrations were highest in the extracted gas sample collected from well SVE B-5 at 2.4 parts per million volume.*
- *PCE concentrations were highest in the extracted gas samples collected from Wells SVE B-2 and SVE B-5, both at 1.1 parts per million volume.*

”

Units for these results are listed as “parts per million by volume” (ppmv), which are significant concentrations. In previous sections of the report, as well as in Appendix K and Table 7 (where these results originated), results are reported in units of ppbv. Reporting concentration results in the text in ppmv rather than ppbv is confusing and could make the concentrations appear lower to readers unaccustomed to working with soil gas data.

ADEQ Response: The draft RI report has been revised to provide consistency in reported data.

43. 4.4.2/36-37 *“... These results indicated that the current levels of TCE in the soil vapor were below that expected in an equilibrium condition. Based on this it is possible that the VOCs in the soil vapor were a result of the groundwater volatilizing into the soil vapor, rather than a continuing source from within the soil.*

Based on review of the existing data and previous remedial actions, current onsite soil and soil-gas conditions do not appear to pose a threat to human health and the environment. In addition, the available data do not indicate that the soil contamination at the E.C. Winter property impacted groundwater.”

The equilibrium TCE concentration between soil vapor and groundwater was estimated to postulate that TCE in soil vapor may be volatilizing from groundwater to vapor, and a continuing source of TCE to groundwater does not exist. More information about this analysis should be provided. Further, the potential that TCE migrated to groundwater from the E.C. Winter site in the past should be evaluated and is not minimized based on the equilibrium analysis. The body of soil quality data at the site indicates that there was likely a source of TCE (and possibly PCE) to groundwater at the E.C. Winter site.

The conclusion that data from the E.C. Winter site do not indicate that the property impacted groundwater is unfounded and inconsistent with the data presented in the report. PCE and TCE were detected in shallow and deep soil vapor. TCE was detected in soil at a concentration above the SRL at a depth of 25 feet. Moreover, a soil vapor extraction (SVE) system was operated at the site and removed 0.85 and 4 pounds of PCE and TCE, respectively, from soil vapor. More PCE and TCE mass would likely have been removed if the system had continued

to operate or was expanded. These results clearly suggest that a source of TCE and PCE to groundwater could exist today or could have existed historically at the E.C. Winter site.

The lack of a complete and objective interpretation of the data and results of the equilibrium analysis is unacceptable. Furthermore, the conclusions made based on the data reported are completely unfounded. We strongly disagree with the conclusion that data do not indicate a source of PCE and TCE to groundwater at the E.C. Winter site. If other data or other analyses are available the support the “no source” conclusion, it should be thoroughly summarized and interpreted in the RI report.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former E.C. Winter facility is provided in Section 4.3 of the final RI report.

44. 4.5.1/40 *“During July, October, and November of 2001, URS conducted an investigation documented in Geophysical and Passive Soil Gas Surveys. Interstate 10 Frontage Road Corridor- El Camino del Cerro to Sunset Road, Tucson, Arizona. (URS. 2002d). Described in this report were increased concentrations of PCE, BTEX, and PAHs observed on the I-10 Surplus property. During this investigation, the highest PCE concentration was located on the north side of the I-10 Surplus site building. The 2002 report stated that the distribution pattern for PCE in soil gas was possibly the historic release of solvents used in the maintenance area.”*

More detail is needed on how the PCE concentrations in soil gas were interpreted? At what depths were PCE concentrations detected? Were follow up investigations at deeper intervals conducted? If not, why?

The information in Appendix L is insufficient to interpret the meaning of the maps. A narrative should be provided to make this information useful to the reader.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts at the former I-10 Surplus (former Cardinal Castings) facility are provided in Section 4.4 of the final RI report.

Appendix L and other appendices are not intended to be standalone documents; details of the investigation are provided in the final RI report text and the associated figures are provided in Appendix L as a supplement to this text.

45. 4.5.2/41 *“The 2002 soil gas survey indicated elevated soil gas concentrations of PCE, BTEX and PAHs for two locations in the I-10 corridor and recommended further soil investigations in the vadose zone for the area of I-10 Surplus.*

The elevated relative mass of PCE, BTEX, and PAHs observed on the I-10 Corridor properties are interpreted to be the result of vehicle maintenance activities. ASTs, and USTs causing isolated minor releases, the available data do not indicate that soil contamination at the properties along the I-10 Corridor impacted groundwater.”

Insufficient information was provided in Section 4.5.1 to support the conclusion that available data do not indicate that soil contamination at the properties along the I-10 Corridor impacted groundwater. Was this conclusion reached in the original work and documented in the report? PCE was detected in over 40% of the soil gas samples, which indicates widespread contamination. The PCE concentrations were not reported; however, they were stated as having exceeded the 10⁻⁴ risk level (which suggests meaningful concentrations were detected). Because the depth and specific concentrations detected during the sampling event were not reported, the reader cannot assess the completeness of the investigative work and validity of the conclusion.

The reader should not be expected to obtain and evaluate the reference material to determine the reasonableness and validity of the site investigation methodology, sufficiency of data, objectivity of the interpretations, and results of any analyses conducted. This information should be provided in the RI report, at a minimum, in a clearly organized and complete appendix.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Further detail and interpretation of investigative efforts in the I-10 corridor is provided in Section 4.4 of the final RI report. Supplemental figures and tables are included in Appendix Q. The discussion of “risk levels” has been removed and measured concentrations are now reported.

46. 4.6.1/42 “Analytical results for select analytes are summarized in Tables 5 through 9.”

Tables 5 through 9 should include all water quality data collected during both the County RI and the ADEQ RI. Data for other constituents for the entire period of record are essential to evaluating source contributions and the evolution of the plume over time.

ADEQ Response: Groundwater quality data for contaminants of concern prior to 2001 are provided in Appendix R of the final RI report. Historical data for additional constituents are included in Appendix O.

47. 4.6.1/42 “The conceptual model for the RI report proposed the VOC contamination in the GOU includes an initial release from the vicinity of the landfill followed by a slow northward movement in groundwater, eventually joining with an area affected by at least one different release of VOCs to the groundwater (Malcolm Pirnie, 1997b). However, this older conceptual model has been revised by the conclusions of this RI Report as presented in Section 5.4.”

The report should provide a clear and complete explanation documenting why this conceptual model of a multiple source plume was discarded by ADEQ in favor of a conclusion that the ECDC landfill is the sole source for the entire plume. In fact, data collected at the various source areas after this conceptual model was proposed in the 1997 ECDC landfill RI report has only strengthened the case for suspecting historical and potentially on-going sources to the plume from other properties with the Site. Multiple source plumes are the norm rather than the exception in areas that were heavily industrialized prior to the advent of modern chemical handling and disposal protocols. The information provided in the draft RI does not support the conclusion of a single source plume.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. The current conceptual site model is presented in Section 7.0 of the final RI report.

48. 4.6.1/42 ***“Three shallow monitor wells (P-1, P-2, and P-3) and 19 regional aquifer monitor wells were installed between January 1988 and October 1995 as part of the Phase 3 LESP (Figure 10).”***

Figure 10 only shows P-1 through P-3 and does not show the other 19 monitor wells referred to in the text. Further, Figure 10 does not clearly distinguish between soil gas and groundwater monitor wells. Figure 2 as well as Figure 10 should be used as references for the well locations. Further, consistent monitor well names should be used throughout the report.

ADEQ Response: The reference for this statement now includes Figure 2 of the final RI report, which shows the location of groundwater monitor wells near the ECDC landfill. Figure 10 (Figure 13 of the final RI report) shows only soil-gas wells; wells P-1, P-2, and P-3 were converted to soil-gas wells when perched water was not encountered, as described in Section 5.1 of the final RI report.

49 4.6.1/43-44 ***“Groundwater Treatment”***

More information about the hydraulic capture attained during treatment system operation should be provided. References to and interpretation of specific water level contour maps (provided in Appendix D) for the period when extraction was occurring at the ECDC landfill should be provided in the report. The reader would also benefit from a description of results of capture zone modeling conducted by Pima County along with interpretation of the degree to which historical and planned future extraction at the ECDC landfill fits into the overall site remediation.

More information about the rebound of COC concentrations in groundwater should be provided to assess the long-term effectiveness of the brief treatment system operation. References to and interpretation of specific plume maps (provided in Appendix M) for the period when extraction was occurring at the ECDC landfill should be provided in the report.

ADEQ Response: A detailed evaluation of groundwater treatment operations near the ECDC landfill and the potential implications for the consideration of long-term remedial alternatives will be included as part of the forthcoming feasibility study.

50. 4.6.2/44-45 “Private Wells”

Available information about the competency of surface well head completions and other well construction details should be provided, along with a reference to Table 2. Discussion of the potential for the private wells to be historical conduits for contaminant migration to groundwater is appropriate.

ADEQ Response: Extensive historical research was conducted to identify areas of potential contamination in the Site vicinity. Each of these properties has been investigated and investigations have included the evaluation of existing wells and in some cases well abandonment. Details of these activities are included in Section 4.0 of the final RI report.

51. 4.6.2/46 “Medium zone wells have submerged screens typically in the upper part of regional aquifer, with screen intervals typically ranging from approximately 200 to 280 feet bgs.”

Why is CDC-29M not considered a deep monitor well, since its screened interval extends from 345-348 ft bgs?

ADEQ Response: CDC-29M is considered a deep monitor well. The “M” designation was assigned in this case because this monitor well was the middle depth of three nested wells. This exception is noted in the first paragraph of Section 5.0 of the final RI report.

52. 4.6.2/46 “Monitor well construction diagrams and boring/cutting descriptions are included in Appendix N.”

What is ADEQ's interpretation of the VOC concentration data obtained using the photoionizing detector (PID) during drilling of Soil Boring #1? The VOC concentrations appear to increase with depth, with the highest concentrations detected below a depth of 300 feet bgs. What is meant by "too hot" with respect to the VOC concentration?

These data could suggest a historic and potentially on-going source of groundwater contamination from the E.C. Winter site. More interpretation of these PID data should be provided in the report. Since the Soil Boring #1 log shows samples were collected, where are the sample results reported and what concentrations of VOCs were detected?

ADEQ Response: The precise meaning of the geologist field notes provided for Soil Boring #1 is not clear. Photoionization detector (PID) readings collected during drilling are subject to a number of uncertainties and cannot be fully relied upon to draw conclusions regarding the presence of Site COC's. Soil sub-samples were collected for lab analysis from the soil cores

where VOC concentrations were increased over the normal background readings. No VOCs were detected in soil sub-samples. Additionally, concentrations in water samples collected at 290 feet bgs from this well were below the method detection limit for all VOCs (Appendix Q, Figure 19). Therefore, these PID data are not considered relevant to the investigation. These results are discussed in Section 4.3.1 of the final RI report.

53. 4.6.2/47 “See Appendix C for details on the 2013 site activities.”

The information in Appendix C indicates that monitor wells located southwest of I-10 were not included in the 2013 monitoring event. Why were these wells omitted from the monitoring event? We understand that ADEQ did not request access to these wells from Pima County for the monitoring event. Including these wells is particularly important because ADEQ has concluded in the RI report that the ECDC landfill is the primary and potentially the exclusive source of groundwater contamination.

A complete groundwater monitoring event that includes all accessible wells in the Water Quality Assurance Revolving Fund (WQARF) site should be conducted before reaching conclusions about source contributions or other fate and transport concepts. This was a data gap identified by URS in the report. In this monitoring event, a comprehensive list of analytes should be used to thoroughly characterize groundwater quality. As previously noted, the potential for current or historical groundwater sources at the AMRI Oil, Wrecksperts, and E.C. Winters sites exists, despite the conclusions presented in the draft RI report. A comprehensive sampling event might indicate spatial variations in chemicals constituents in groundwater that would provide new and useful information for delineating sources and understanding the evolution of the plume.

ADEQ Response: Many factors affect the choice of wells to sample for a particular monitoring event. Numerous sampling events over many years have included monitor wells from the ECDC Landfill area and results from these events are included and discussed in the final RI report. An additional comprehensive sampling event is included as a proposed task in Section 7.2. However, results of future sampling events are not expected to substantially change the conclusions of this RI report.

54. 4.6.3/48 “4.6.3 Distribution and Trends of Contamination in Groundwater.”

This section should include data from the CDC Landfill RI report and other historical data, rather than only data from 2001.

ADEQ Response: Detail and interpretation of data prior to 2001 pertaining to contaminant distribution and trends in groundwater is provided in Section 5.0 of the final RI report.

55. 4.6.3/48 “Summary tables for PCE, TCE, 1,1-DCE cis-1,2-DCE, and vinyl chloride are included as Table through Table.”

Since February 2001, there have been 29 sampling events and sampling of wells at SR/ECDC has been conducted as listed in the schedule presented in Table”

The table references should be provided.

ADEQ Response: The omitted references have been added.

56. 4.6.3/49 “As of 2013, the depth to regional groundwater was approximately 158 feet bgs, falling at a rate of approximately 1 foot per year.”

The report should include groundwater elevation hydrographs to enable the reader to evaluate changes in groundwater elevations over time across the Site. Is 158 feet bgs an average depth to groundwater? Variability across the Site should be discussed. The implication of declining water levels, which would be evident on the hydrographs, should also be discussed with respect to source area contributions in the past when water levels were higher.

ADEQ Response: ADEQ considers the discussion of water levels in the final RI report sufficient to meet the report objectives defined in Section 1.1.

57. 4.6.3/49 “Groundwater flow direction is generally to the north-northwest as shown on Figure 4. Groundwater flow at the north end of the site is influenced by pumping of Metro Water's South Shannon well.”

Figure 4 has several problems: (1) the contours extend too far beyond the network of wells and data shown on the map; (2) groundwater flow arrows are not perpendicular to contour lines (unless information about anisotropy is available); and (3) contours do not cover entire site area no data or interpretation of patterns of groundwater movement are included for the ECDC landfill or other areas in the southwest part of the site.

Why are some medium zone wells missing from Figure 4?

Figure 4 does not show influence from the South Shannon Well on groundwater flow. In fact, contours suggest flow in the north part of the site that is centered on monitor well W-31M.

Groundwater contours for the shallow and deep zones should also be provided in the RI to provide a complete understanding of the groundwater system.

Figure 4 should be revised to completely display groundwater flow conditions in the Site so the reader can interpret them with respect to the extent of groundwater contamination.

ADEQ Response: ADEQ has revised Figure 4 (Figure 10 of the final RI report). This figure now includes shallow zone wells and data from Pima County monitor wells. The revised figure depicts water level data collected from February-May 2012 which is the most recent time period

for which Site-wide data is available. More recent data collected from the Site is not substantially different from that depicted on the revised figure.

58. 4.6.3/49 *“Concentrations of PCE and TCE in the shallow zone often exceed the AWQS of 5 µg/L. In 2013, monitor well SRC-W38S contained the highest concentrations of PCE and TCE at 122 and 63.2 µg/L, respectively. SRC-W38S is the only shallow zone well with concentrations of cis-1,2-DCE that exceed the AWQS of 70 µg/L.”*

The highest PCE and TCE concentrations occur at well SRC-W38S, which is located immediately downgradient of the AMRI Oil/Wrecksperts site. These high concentrations in shallow groundwater suggest that the most likely source of PCE and TCE at this location came from the AMRI Oil/Wrecksperts site not, the ECDC landfill. This is further indicated by the persistence of high PCE and TCE concentrations at well SRC-38S since 2005, possibly indicating a continuing source. Other shallow wells with relative stable, high concentrations of PCE and TCE (see Appendix P) are W-24, W-32S and W-45S which are also in the vicinity of the AMRI/Wrecksperts site and downgradient of the E.C. Winter property. Additional analysis of the shallow groundwater water quality data, including implications for the various potential source areas, should be included in the report.

Consistent monitor well names should be used in the RI report.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. The conceptual site model is presented in Section 7.0 of the final RI report. Conclusions are based on the interpretation of multiple lines of evidence that include the evaluation of time-series data and contaminant ratios from across the Site as well as extensive field investigations conducted at potential source properties.

The final RI report has been revised to refer to monitor wells in a consistent manner.

59. 4.6.3/50 *“Figure 16 through Figure 19 present contours for TCE and PCE in the shallow and medium zone, respectively, in the regional aquifer based on the April 2013 sampling results.”*

In fact the maps appear to show data for February - May 2012. Why are 2013 water quality results for the shallow, medium, and deep zones not shown on maps in the report? Why are data from all the wells not included?

Figures 16 through 19 should be arranged in the order of the text for clarity. Figures 18 and 19 should precede Figures 16 and 17 to coincide with the discussion of PCE data then TCE data.

Figures 16 through 19 should be interpreted in the report. The report text that follows this section relies on the time series chemical graphs in Appendix P.

ADEQ Response: The reference to Figures 16 through 19 (Figures 5-8 of the final RI report) has been revised to indicate the figures depict data from 2012. The order of these figures has been changed for clarity. Data from 2012 was used because this was a more complete data set than that collected in 2013. Data from the 2013 sampling event are included in Tables 6-10 of the final RI report. These figures and data are interpreted in Section 6.4.1 of the final RI report. Discussion of time-series graphs and PCE/TCE ratios aid in the interpretation of the contour maps and are appropriately included after the reference to Figures 5-8 in the final RI report for this reason.

60. 4.6.3/50-53 Tetrachloroethene

Shallow Zone
Medium Zone
Deep Zone

Trichloroethene

Shallow Zone
Medium Zone”

The summary of PCE and TCE concentration data in this section clearly indicates that the highest concentrations in shallow groundwater are immediately downgradient of the AMRI Oil/Wrecksperts site. Given the concept that the contaminated groundwater is migrating to deeper zones as it migrates from south to north, the detection of the highest PCE and TCE concentration in shallow groundwater in the central portion of the plume strongly suggests a source in central portion of the plume.

This concept should be discussed in the report.

The table references in section should be added.

The temporal variations in PCE and TCE concentration in the monitor wells should be analyzed to assess the rate of contaminant transport. This analysis should then be used to assess source areas. For example, do the estimated groundwater directions and velocities support the conclusion that the ECDC landfill is the primary source? This type of analysis could be done using a groundwater model.

In order to conduct a thorough analysis of the temporal variations in PCE and TCE, all historic data VOC data for critical wells should be used. VOC data from W-5 starts in 1987, W-14 in 1989, W-16 in 1991, W-17 in 1994, and W-20 in 1994. These data should be included on the time series graphs in Appendix P for completeness.

The PCE contours on Figure 19 should be dashed on the southeastern portion of the plume given that data do not exist in that area. As is, the figure does not appropriately reflect the uncertainty in the PCE distribution in the medium zone.

The discussion of the observed temporal variations in PCE and TCE concentrations in the report is confusing. Interpretation of the temporal trends with respect to potential source areas and changes in groundwater flow direction (due to pumping and/or recharge events) is needed in order to understand the importance of these variations.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Additional discussion of historical trends of PCE and TCE is provided in Section 6.4 of the final RI report. Additional historical data is included in time-series figures in Appendix S. A revised conceptual site model is included in Section 7.0. Figure 19 (Figure 6 of the final RI report) has been revised.

61. 4.6.3/53 1,4-D-Dioxane

“During the 2013 sampling event, ADEQ requested that URS sample for 1,4-dioxane. 1,4-dioxane was found in shallow, medium, and deep zoned wells. The highest level of 1,4-dioxane was detected in well SRC-W48M at 3.0 ppb. Currently, there is no AWQS for 1,4-dioxane. As this was the first year ADEQ requested sampling for 1,4-dioxane, there are insufficient data for trend analyses. Appendix C illustrates the 1,4-dioxane detections and contains the 2013 analytical data.”

1,4-dioxane is a known stabilizer for 1,1,1-TCA. Correlation between these compounds in the source area should be analyzed. The data suggest the 1,1,1-TCA was more prevalent in the source areas north of I-10 in the area where highest 1,4-dioxane concentrations are detected in groundwater.

Wells W-38S, W-43, W-44S and W-45S, which all have 1,4-dioxane concentrations > 1.0 ug/l, are located immediately downgradient of the E.C. Winters property, where 1,1,1-TCA, and 1,1-DCE were detected in deep soil vapor at concentrations of up to 240 ppbv and 113 ppbv, respectively. 1,1,1-TCA is relatively unstable and degrades directly to 1,1-DCE under aerobic conditions.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. The detection of 1,1,1-TCA at various properties is reported in Section 4.0 of the final RI report. The limited data available show that 1,1,1-TCA and its daughter products have been detected at similar concentrations in soil-gas at various properties, including at a concentration of 165 ppbv in a soil-gas sample collected at the landfill perimeter (Appendix Q, Figure 6).

Because neither 1,1,1-TCA nor 1,4-dioxane have historically been considered contaminants of concern at the Site, data is limited and conclusions as to potential source areas cannot be drawn based upon measured concentrations alone. However, the spatial distribution of 1,4 dioxane is similar to that of the site COC's, whose primary source is the ECDC Landfill based on evidence presented throughout the final RI report and summarized in Section 7.0.

Additional discussion of 1,4-dioxane fate and transport is provided in Section 6.4 of the final RI report. As stated in the final RI report, additional sampling rounds for 1,4-dioxane are required to fully assess the spatial and temporal trends of this contaminant.

62. 4.6.3/53-54 Summary of the Extent of Contamination

“Historically, the highest concentrations of the plume were in the vicinity of Kaylor Trailer from 1994 to 1996 but as discussed previously in Section 4.6.2, the plume extent had not been fully defined in deeper groundwater.”

As noted, it is important to recognize that the plume was only partially delineated by 1996, and as discussed in the previous sections, the highest PCE and TCE concentrations in shallow groundwater were observed immediately downgradient of the AMRI Oil/Wrecksperts site. The steady PCE and TCE concentration near AMRI Oil/Wrecksperts suggests an ongoing source near these sites.

The summary of extent of contamination should include more interpretation and analysis of data, especially to delineate source areas based on the spatial distribution and temporal variations in concentrations.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. A review of time-series data presented in Appendix S indicates that concentrations equivalent to or exceeding those observed immediately downgradient of the AMRI Oil/Wrecksperts property were present historically in wells upgradient of this area including near the SR/ECDC Landfill. Interpretation of this data is provided in Section 6.4 and as part of the revised conceptual site model presented in Section 7.0.

63. 5.4/57-59 “Contamination Variations in the Regional Groundwater

PCE and TCE Distribution

Generally, the groundwater contaminant plume extends from its source at the CDC landfill area north and east to slightly north of the Metro Water South Shannon well. As previously discussed the major components of the groundwater plume include TCE and PCE, with generally lesser concentrations of cis-1,2-DCE, vinyl chloride, and Freon 12 and 11. Much of this analysis is based on an evaluation of the PCE and TCE trends as these appear to be the primary components of the contaminant plume.

***Highest concentrations
PCE/TCE ratio”***

The supposition that the only source of groundwater contaminants is the CDC landfill area is not supported by the data developed during the RI, and as reported in the RI report. Analysis of these data has not been provided in the report, but clearly should be to conclude that the only source is the ECDC landfill.

Assessment of the highest concentrations is complicated by the phased installation of the wells over time. Where have the highest PCE and TCE concentrations been observed for all times when samples were collected?

What is the significance of the PCE/TCE ratio? A map of ratios would support the discussion. If the Roger Road sludge pond provided a carbon source for biodegradation of PCE to TCE in the wells cited in the report, why is this effect not observed in all wells immediately downgradient of the pond? Do field sampling data exist to indicate depressed dissolved oxygen and oxidation-reduction potential (i.e., reducing conditions) in the wells with TCE concentration higher than PCE concentration?

Variations in PCE/TCE ratio could indicate contributions from several source areas to the plume.

Where is well W5S? Is this CDC-W5? The inconsistent naming convention for the wells is distracting and should be fixed.

With regard to biodegradation, data are not provided that characterize conditions in the groundwater to assess the likelihood of biodegradation. A much more detailed analysis of biodegradation should be conducted to assess its importance in delineating sources. ADEQ asserts that cis-1,2-DCE and vinyl chloride are not accumulating; however, water quality data suggest they are.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Maps of historical time-series data and PCE/TCE ratio data are included in Appendix S and Appendix T of the final RI report. Further detail and interpretation of these data is provided in Sections 5-7 of the final RI report.

The final RI report has been revised to refer to monitor wells in a consistent manner.

The potential for biodegradation at the Site is discussed in Sections 4.1.1 and 6.0 of the final RI report.

64. 5.4/59 “The highest concentrations observed within the medium depth wells are located downgradient from the highest concentrations within the shallow depth, which supports the possibility that as the VOC plume moves downgradient from well 38S, it also is

transported downward into a deeper portion of the aquifer (designated as the medium depth). The highest concentrations observed at medium depth wells occur at wells on either side of the Rillito Creek, which may indicate that recharge resulting from ephemeral flows in the creek may contribute to the observed downward movement of VOCs in this area. In addition, the hotspot locations in the medium and shallow depths are upgradient from the Metro Water South Shannon Well, which pumps a significant volume of water annually. This well appears to provide hydraulic containment of the VOC plume and prevents it from migrating farther north. It is also likely one of the contributing factors to the downward movement of the plume.”

Why wouldn't recharge from Rillito Creek dilute the plume instead of causing high concentrations to migrate deeper?

See comment below in relation to vertical gradients and an alternate hypothesis for observed higher concentrations at depth downgradient from the E.C. Winters site.

The hotspots in the shallow and medium depths are centered southwest of the South Shannon Well. Groundwater contours on Figure 4 show the direction of groundwater flow is to the north-northwest. This indicates the hotspots are not directly upgradient of the South Shannon Well and suggests the possibility of an additional unknown source which is upgradient of the South Shannon Well.

A summary of the analysis conducted to determine that pumping at the South Shannon Well contains the plume should be provided in the report. This is an important concept for the WQARF site, especially if the pump and treat system at the well will become part of the final remedy.

ADEQ Response: ADEQ agrees that recharge from Rillito Creek is not likely to contribute to the downward migration of contaminants. This statement is not included in the final RI report.

Figure 4 (Figure 10 of the final RI report) depicts approximate groundwater flow directions based on groundwater elevation data. In addition to this measured hydraulic gradient, the determination of the general groundwater flow direction in the final RI report considered multiple lines of evidence, including groundwater pumping, historical contaminant concentration data and information on potential source areas collected during extensive field investigations.

A summary of the evidence indicating that pumping from the South Shannon Well contains the plume is provided in Sections 6.4.1 and 7.0 of the final RI report.

65. 5.4/60 “1,4-Dioxane is primarily used as a stabilizer for chlorinated solvents and is found in some groundwater plumes with other VOCs. Compared to PCE and TCE, 1,4-dioxane is a cyclic ether that mixes with water readily and can be transported in groundwater far in advance of associated solvents.”

1,4-dioxane is typically believed to have been a stabilizer and corrosion inhibitor for 1,1,1 TCA, not PCE or TCE, which are chemically stable. Therefore, 1,4-dioxane would be expected to be related to the prevalence of 1,1,1-TCA. More analysis of the relationship between 1,1,1-TCA, it's degradation daughter products, and 1,4-dioxane should be provided in the report.

ADEQ Response: Further detail and interpretation of 1,4-dioxane fate and transport is provided in Section 6.4 of the final RI report. The discussion of the detection of 1,1,1-TCA and its potential degradation daughter products such as 1,1-dichloroethene, 1,1-dichloroethane and chloroethane at various properties is included in Section 4.0 of the final RI report.

66. 5.4/60 Vertical VOC Distribution

“North of I-10, the VOC plume shows a clear pattern of transport downward within the aquifer as it moves north. The “diving” of the plume is likely the result of some combination of periodic hydraulic head resulting from recharge during flow events in Rillito Creek, the apparent downward trend of the interface between the higher permeability sands and gravels and the less permeable clayey and silty gravels as shown on the Geologic Cross section Figures 3 and 20, and pumping of groundwater from a deeper portion of the aquifer at the South Shannon Well.”

An analysis of vertical hydraulic gradients, recharge events, and historical pumping from the South Shannon Well should be conducted to support the proposed mechanisms for vertical plume migration. Review of vertical hydraulic gradients for well pairs based on April 2013 water level data does not support the notion that the plume is diving in response to a head change caused by pumping. There is also no explanation for why this vertical movement only occurs in the area north of the E.C. Winters site. Another possible explanation for migration of the plume to deeper zones is the presence of conduit wells.

ADEQ Response: It is acknowledged in the final RI report that the lack of a measured downward vertical gradient in wells south of Rillito Creek and the limited lithologic information available over such a large spatial area make it difficult to draw precise conclusions as to the cause of the observed downward migration. ADEQ agrees that the presence of conduit wells can potentially allow contaminants to spread to deeper portions of the aquifer and thus increase the vertical extent of contamination. For this reason, ADEQ has conducted ERAs to abandon wells considered to be potential conduits to deeper portions of the aquifer. However, such wells would not cause contamination to “dive” into the deeper portion of the aquifer over a broad area and cease to be detected in the shallow zone. Thus, this mechanism is insufficient to explain the observed plume migration. Further characterization of the plume movement and the effects of pumping in the area may be proposed as part of the forthcoming feasibility study. However, the results of such analyses are not expected to significantly alter the conclusions of the final RI report.

67. 5.4/60 “Fate and Transport Conclusions”

The conclusions reported for fate and transport of contaminants in the groundwater are overly simplistic and not supported by information presented in the draft RI report. First, the presentation of data is incomplete in many ways, including: (1) omission of critical data from the early RI work conducted by Pima County at the CDC landfill, (2) omission of important basic information such as concentrations of contaminants and depths of sampling, and (3) information on maps in the appendices are largely illegible and not accompanied by any clarifying text. Second, interpretation of data is insufficient and subjective, largely because the data provided are incomplete and conclusions derived from the data are not supported by information presented in the draft report. Third, the report lacks analysis of data. While the report provides some information on the spatial and temporal variations in contaminant concentrations in groundwater, this information was not subjected to any analysis to determine how trends might indicate the location and status of source areas. Analysis of the spatial and temporal variation in VOCs in groundwater should have been done to correlate the rate and direction of groundwater flow and potential source areas. Impacts of pumping and recharge in relation to fate and transport should be fully evaluated. Typically, this analysis is done using models. In this case, VLEACH would have been appropriate to assess fate and transport of contaminants in soil and soil vapor, leading to an assessment of anticipated groundwater impacts. MODFLOW/MT3D (or RT3D to simulate reactive transport) would have been appropriate to evaluate fate and transport of contaminants in the groundwater system.

The conceptual model of contaminant fate and transport presented in the report is incomplete and one of several equally likely conceptual models. All likely conceptual models should be fully explored and evaluated in terms of their relevance to observed conditions and the potential sources.

Given the issues described above, the report content and deficiencies noted indicate that the RI report was prepared with the presupposed assumption that the ECDC landfill was the only source of VOCs to the groundwater. While the presentation, interpretation, and analysis of VOC data in the soil and soil vapor at potential source areas north-northeast of I-10 were incomplete and insufficient, what is presented clearly indicates a strong potential for contributions to the VOC plume from multiple sources.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. Detailed discussion of contaminant fate and transport is provided in Section 6.0. The conceptual site model and supporting evidence is presented in Section 7.0 of the final RI report.

Appendices included in the final RI report are not intended to be standalone documents; necessary details are included in the final RI report text and the associated figures and tables are provided in appendices as a supplement to this text.

The final RI report presents the data and interpretation deemed necessary to meet the objectives of the RI, namely to satisfy the requirements of AAC R18-16-406: Establish the nature and extent of contamination and the potential sources; Identify current and potential impacts to public health, welfare, and the environment; Identify current and reasonably foreseeable uses of land and waters of the state, and; Evaluate other information for identification and comparison of alternative remedial actions.

As indicated on Figure 1 of the final RI report, when work on the remedial investigation was initiated the Site consisted of two distinct WQARF sites because it was theorized that multiple sources of contamination were present. Only after extensive investigation and careful consideration of available information, was it determined that a single primary source existed and the two sites were administratively combined. Thus the claim that the RI report was prepared with the presupposed assumption that the ECDC landfill was the only source of VOCs to the groundwater is unfounded.

68. 5.4/61 “Specifically, it appears that the dissolved VOC plume is transported downward and northeast toward the high capacity South Shannon well where it is hydraulically captured and prevented from migrating further north.”

The statement that the assumed single source plume is “hydraulically captured and prevented from migrating further north” by pumping at the South Shannon Well is not substantiated, nor does it appear to be well founded.

Based on our review of the draft final URS Aquifer Testing and Analytical Capture Zone Modeling Results Report, dated February 4, 2005, it appears that capture of the entire plume area including the CDC Landfill area, is only projected for the modeling scenario that assumes the lower of the two transmissivity values and continuous pumping of the South Shannon Well. Based on Figure 7 in the 2005 URS report, it appears that continuous pumping of the South Shannon Well translates to an average pumping rate of about 750 gpm, Based on review of reported ADWR pumping data for this well through 2011, the maximum average annual pumping rate sustained at the South Shannon Well was about 425 gpm, with the average rate for the most recent available 5-year period being less than 400 gpm. Even the lower transmissivity value is more representative of the aquifer materials penetrated by the South Shannon Road Well, recent pumping appears to have been insufficient to assume that the plume is being fully captured.

ADEQ Response: As noted by the commenter, the results of capture zone model used a projected average pumping rate of 750 gpm to show that the South Shannon Well was capable of fully capturing the plume. However, the report did not conclude that this was the minimum pumping rate necessary to capture the plume.

The conclusion in the final RI report that the plume is captured by the South Shannon Well was reached based on multiple lines of evidence. In addition to the results of capture-zone modeling showing that capture was theoretically possible, groundwater monitoring results were

considered. Sampling of the groundwater monitoring network near the South Shannon well over many years has provided no evidence that the plume has migrated north of the well while this well has been pumping.

69. 6.0/61-62 “Conclusions and Data Gaps”

As indicated in the above comments, the information presented in the RI report does not support the conclusion that sources of groundwater contamination only exist south-southwest of I-10. It also does not provide a convincing conceptual model to support the conclusion that the entire plume, extending northeast to the South Shannon Well, originated from the single assumed source area (the ECDC landfill and possibly the Drake Property area). Finally, containment of this plume at the South Shannon Well is not substantiated, as mentioned above. The data gaps, along with the broad range of deficiencies in the report, should be addressed before the RI report is finalized, and before the remedial objectives are established.

ADEQ Response: The draft RI report has been revised to provide additional clarity and further support the conclusions of the investigation. A revised conceptual site model is presented in Section 7.0 of the final RI report. Tasks identified in Section 8.0 as necessary to fill remaining data gaps may be completed during the feasibility study but are not expected to substantially alter the conclusions of this RI report.

ATTACHMENT A:

Copies of Shannon Road/El Camino Del Cerro Remedial Investigation Comment Letters Received



May 16, 2013

Mr. Scott R. Green, R.G.
WQARF Project Manager
Southern Regional Office
Arizona Department of Environmental Quality
400 West Congress, Suite 433
Tucson, Arizona 85701

Re: Comments on Draft Remedial Investigation Report for the Shannon Road/El Camino Del Cerro Road Water Quality Assurance Revolving Fund Site, Tucson, Arizona

Dear Mr. Green:

The Metropolitan Domestic Water Improvement District (District) has comments to the Arizona Department of Environmental Quality (ADEQ) on the above draft report. The District serves potable and non-potable water within the WQARF site. As known by ADEQ, one of our supply wells, South Shannon, has volatile organic compounds (VOCs) that exceed drinking water standards and therefore the District has had a long standing interest in ADEQ remediating the contamination. The District has appreciated ADEQ's efforts to fund the removal of the VOCs from the South Shannon well water. We additionally thank the ADEQ for completing the remediation investigation report and look forward to ADEQ completing the Feasibility Study in FY14/15.

The District has outlined below recommended changes and included recommendations from our consultant (attached) regarding the draft Remediation Investigation Report. Such changes should not delay or impede ADEQ from completing the Feasibility Study in FY14/15.

"Contaminant of Concern" is defined in the Arizona Administrative Code (R-18-16-401). However, it is doubtful that the general public is aware of its significance. The Remedial Investigation Report should explain how ADEQ determines which contaminants present at the subject WQARF site are "of concern" and which are not. Furthermore, "contaminants of potential concern" are defined neither in rule nor statute and should be defined in the report. How a contaminant moves from "potential concern" to "of concern" or "not of concern" should also be explained.

Section 3.4.4 (Aquifer Parameters) mentions an aquifer test that was performed at the South Shannon Well. In April 2004, aquifer testing was also performed at the Deconcini Well (URS, Aquifer Testing – Deconcini Well, June 2, 2005). This site-specific data should be included in the remedial investigation. Such site-specific data should be given preference over the broadly general information presented by Davidson (1973). Importantly, the Davidson (1973) Fort Lowell Formation, Tinaja beds, etc. nomenclature is outdated and should not be used. For more information, please see Houser and others (*Stratigraphy and Tectonic History of the Tucson Basin...*, 2005) and Mason and Hipke's ADWR Tucson groundwater flow modeling report (2013).

Specific Comments on Appendix A

Please note on Page 3 that the District funded the wellhead treatment system instead of the ADEQ. ADEQ declined to fund the treatment system because the District installed the system prior to the formation of the Shannon Road-Rillito Creek WQARF Site. Additionally, that first treatment system was an air-stripping unit, not GAC as stated in Table 1 of the main report.

On Page 7, the District has 5 supply wells within the SR/ECDC WQARF site boundaries. The same paragraph notes Metro Water as a water service provider, but not Tucson Water. Study Area is not defined and causes confusion if it is the plume boundary or the WQARF site boundaries. An example is the DeConcini Well is stated as outside the Site Boundary instead of outside the plume boundary. Likewise, Site is not defined. Please note in Section 2.2.1.1 that Metro Water has a Designation of Assured Water Supply (DAWS) which means the service area has a 100 year groundwater supply after full service area build out. Therefore, the last sentence in Section 2.2.1.1 does not reflect Metro Water's long-term plans under its DAWS to replace and drill new wells. Lastly, Metro Water is also supplying non-potable water from its Latamore North Well to Pima County Parks and Recreation Department's linear park on the north side of Rillito Creek. This well has nitrate levels greater than the drinking water standard.

The second paragraph on Page 12 does not acknowledge that City of Tucson wells have also contributed to the patterns of regional groundwater flow. The report should cite the USGS research on Santa Cruz River infiltration rates by Galyean (1996) entitled "*Infiltration of Wastewater Effluent in the Santa Cruz River Channel, Pima County, Arizona*." U.S. Geological Survey, Water Resources Investigations Report 88-4172." This research was used for the underground storage permitting with the Arizona Department of Water Resources for the Upper Santa Cruz River Managed Effluent Recharge Project.

Figure 5 has the plume boundary extending to Deconcini Well, but there is no data for supporting that extent. Please change the plume boundary to be consistent with the other figures. Also, the diagram has the Oracle Jaynes Station Well in the wrong location.

Please call me at (520) 575-8100 if you have questions on these comments. Again, thank you for this opportunity to provide comments.

Sincerely,



Michael W. Block
Water Resources Manager

MWB/mwb

Attachment

c: Joseph Olsen, MDWID General Manager
Warren Tenney, MDWID Assistant General Manager
Gary Burchard, MDWID Hydrogeologist
Marty Drozdoff and Randy Abbey, Shannon-El Camino WQARF Co-Chairs
William Ellet, SRO WQARF Manager



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May 14, 2014

Mr. Michael Block
District Hydrologist
Metropolitan Domestic Water Improvement District
6265 N. La Canada Blvd.
Tucson, Arizona 85740

Re: Peer Review of: *Final Draft Remedial Investigation Report For Shannon Road / El Camino Del Cerro WQARF Site Tucson, Arizona*

Dear Mike:

Pursuant to the Metropolitan Domestic Water Improvement District (MDWID) Notice to Proceed dated February 26, 2014, this letter presents Clear Creek Associates' evaluation of the report titled *Final Draft Remedial Investigation Report For Shannon Road / El Camino Del Cerro WQARF Site, Tucson, Arizona*, dated March 2014, and referred to herein as the "final draft RI report".

In accordance with the project Scope of Work referenced in the Notice to Proceed, Clear Creek Associates focused the review on evaluating whether the requirements in AAC R18-16-406 ("Remedial Investigations") had been met. Key requirements of R18-16-406 include:

- A. The remedial investigation for a site or portion of a site shall:*
- 1. Establish the nature and extent of the contamination and the sources thereof,*
 - 2. Identify current and potential impacts to public health, welfare, and the environment,*
 - 3. Identify current and reasonably foreseeable uses of land and waters of the state, and*
 - 4. Obtain and evaluate any other information necessary for identification and comparison of alternative remedial actions.*

Additional factors that must be assessed in an RI are specified in AAC R18-16-406.C., including the physical characteristics of the site, the characteristics of the hazardous substances released, and the nature and extent of the source of the release.

We offer the following General Comments and Specific Comments for your consideration.

General Comments

Nature of Contamination

The draft RI report identifies the contaminants that are present at the site, and data are provided on contaminant concentrations in soil and groundwater. Groundwater flow directions are also evaluated in detail. However, data regarding the nature of the contaminants themselves are missing. In particular, report sections 5.2 (Chemical Properties), 5.3.2 (Chemical and Biological Transformation Processes) and 5.3.3 (Site Specific Transport Mechanisms) do not provide any site-specific data. Since an RI must adequately address the fate and transport of the contaminants present at the site, including the extent to which VOCs transform to daughter products, site specific information is necessary to evaluate appropriate remedial actions. The efficacy of available remedies must be based on an understanding and prediction of daughter products.

Extent of Contamination

Figures 16 through 19 in the draft RI report provide contour maps of PCE and TCE at shallow depths and at intermediate depths in the aquifer. It appears from these figures that the western extent of contamination at intermediate aquifer depths has not been adequately delineated. The open-ended contours shown in the last two figures in Appendix M also indicate that the extent of contamination is not fully characterized. In addition, the mechanism causing the plume to “dive” as it moves north is not adequately explained in the report. Although it is reasonable for ADEQ and URS to attribute the vertical migration of the plume to production well pumpage and natural recharge, there is no detailed evaluation of vertical hydraulic gradients in the report. In fact, 2013 water level data presented for well pairs in Table C-2.1 suggest that a vertical gradient does not exist. In the absence of a vertical gradient, it seems unlikely that a plume would migrate downward. We recognize that on page 60 of the draft RI report, the downward movement of contaminants is also attributed to an interface between high permeability and low permeability sediments. However, the presence of this contact is not indicated by the lithology shown on the cross sections included in the report (Figure 3 and Figure 20).

Potential Impacts to Public Health

The draft RI report does not contain any discussion of the potential impacts of the various contaminants on public health. For example, 1,4-dioxane is a possible human carcinogen and a systemic toxicant, yet there is no MCL for 1,4-dioxane in drinking water, and 1,4-dioxane is not removed by treatment methods that are effective for VOCs such as PCE and TCE. The potential impacts to human health caused by ingesting 1,4-dioxane and other contaminants in groundwater at the site must be addressed by this report, so that a remedy that is protective of human health can be selected. Note that AAC R18-16-406.C.2. requires the RI to assess the toxicity of the substances

released, yet the RI has not done this for 1,4-dioxane. Therefore, this section of the report does not meet the requirements of AAC R18-16-406.A.2 or R18-16-406.C.2.

Current and Future Land and Water Uses

Appendix A of the draft RI report notes that MDWID uses groundwater in this area for potable supply, and this is appropriate. A minor point is that the Appendix A text states that the DeConcini well is outside the Site Boundary, whereas Figure 5 in Appendix A clearly shows the well within the Site Boundary but slightly outside the plume boundary. Also, the data source for the MDWID service area shown on Figure 5 should be identified. It does not appear to be accurate, as depicted on Pima County's GIS Map Guide layer for designated service areas.

Other Information Necessary for Identification and Comparison of Alternative Remedial Actions

It is unclear how ADEQ will compare the effectiveness of various potential remedial actions without developing a numerical model to simulate the lateral and vertical movement of the plume under different scenarios. The selected remedy will need to take into account the hydraulic conductivity and storativity of the aquifer at various depths, in addition to recharge rates, contaminant source location(s), groundwater pumpage, and contaminant dispersion, sorption, and decay reactions. By developing and calibrating a numerical model, reasonable estimates of these parameters can be made, and the importance of any data limitations can be assessed through a sensitivity analysis. Once calibrated, the model can be used to make realistic predictions of future plume behavior, including response to various proposed remedies.

A similar recommendation was made previously, in a report titled *Aquifer Testing & Capture Zone Modeling Results, Shannon Road / El Camino del Cerro WQARF Sites* (URS, June 2, 2005). This report was prepared as part of the RI but was not discussed in any detail in the final draft RI report. This is unfortunate, because the report provided important data on aquifer parameters and plume behavior, particularly the extent to which the plume is contained by the South Shannon well at different pumping rates. This report also recommended a three-dimensional model to simulate vertical and horizontal distribution of aquifer parameters, recharge, and pumping regimes that change over time.

The final draft RI report contains statements about plume capture by the South Shannon well, and these statements are presumably based on the results of the URS (2005) report. However, without a discussion of the URS (2005) report and the limitations on the methodology applied, the topic is not adequately addressed.

Specific Comments

- The report would benefit from an Executive Summary.

- Specific criteria used to identify Contaminants of Concern (COCs) versus Contaminants of Potential Concern (COPCs) should be provided, and all COCs and COPCs should be discussed in the report, to comply with the requirements of R18-16-406.A.2 (“identify...potential impacts to public health”). In particular, ADEQ’s basis for addressing some contaminants and not others should be explained. Similarly, the basis for delineating the Site Boundaries, and the locations of the Site Boundaries compared to locations of elevated concentrations of COCs and COPCs in groundwater should be explained.
- The hydrogeology discussion should be based on drilling and aquifer testing conducted specifically for the RI, rather than referring to past USGS and ADWR reports that described the Tucson basin in general. For example, the discussions of the Fort Lowell Formation, Santa Cruz Fault, evaporite deposits in the Tinaja Beds, etc. are not supported by any of the site-specific lithologic data presented in the cross sections, and they should be deleted from the RI report.
- Contour maps of the groundwater contaminant concentrations are provided for the lateral extent of contamination. One or more contour maps in profile, or a conceptual illustration of the plume in profile, would be helpful.
- A separate section discussing the locations of any wells that might have served as conduits, and a description of sampling and abandonment of these wells, should be provided.
- The report contains a brief discussion of “Groundwater Treatment” under the larger subject heading of “Monitoring Well Installations” (pages 42 to 44). It is not clear why this project is discussed here rather than under a separate subject heading specific to pilot remediation tests. Also, certain details are vague, such as “relatively stable VOC concentrations” and “the cost of rehabilitating the extraction well”.
- Pages 45 and 46 include a discussion of pumping tests, but the results of these tests are not presented.
- The 5 ppb TCE and PCE contour lines on Figures 16 and 18 are not supported by any data to the east. These figures suggest that the plume is not fully characterized in this area.
- The 5 ppb PCE contour line on Figure 19 extends east in a manner that suggests that the plume is actually migrating up Rillito Creek. Does ADEQ believe that PCE is present in groundwater at concentrations greater than 5 ppb in the area as shown?
- The plume boundaries shown on Figure 5 should be consistent with the plume boundaries shown on Figures 16 through 19.
- On page 54, the report states that contaminants have not been detected at SRC-W31M for five years. Were contaminants detected in this well in the past? If so, what is the reason

for the reduction in concentrations, and to what extent has the possibility that contaminants have migrated below the well and/or north of the well been evaluated?

- The report should explain why contaminant concentrations shown on Figures 16 through 19 are higher in monitor wells at a distance from the landfill compared to concentrations in monitor wells closer to the landfill.
- The report discusses PCE/TCE concentration ratios. It would be helpful if these ratios were tabulated and/or shown on a map.

Conclusion

Clear Creek Associates understands and appreciates ADEQ's desire to move forward with addressing groundwater contamination at this and other sites in Arizona. We believe that appropriate remedies should be identified and implemented without further unnecessary delay. We also recognize that there will always be some data gaps and some degree of uncertainty remaining at the completion of any remedial investigation. However, it is our opinion that the ultimate goals of (1) protecting human health and the environment, (2) cleaning up groundwater at this site in the most timely and efficient manner possible, and (3) protecting MDWID's water resources, would be best served by improving this report such that it includes all of the information necessary to begin evaluating remedial alternatives.

Clear Creek appreciates the opportunity to provide this review to the District. If you have any questions or comments, please call me at (520) 622-3222.

Sincerely,
CLEAR CREEK ASSOCIATES, PLC.



Greg Hess, R.G.
Senior Hydrogeologist



Expires 6/130/16



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Barbara LaWall
PIMA COUNTY ATTORNEY

May 16, 2014

Via Hand Delivery

Mr. Scott Green
Project Manager, Superfund Programs Unit
Southern Regional Office, ADEQ
400 W. Congress, Ste. 433
Tucson AZ 85701

RE: COMMENTS ON THE FINAL DRAFT REMEDIAL INVESTIGATION REPORT, AND REMEDIAL OBJECTIVES FOR SHANNON ROAD/EL CAMINO DEL CERRO WQARF SITE

Dear Mr. Green:

Attached, you will find an analysis undertaken by Montgomery & Associates on behalf of Pima County. The report analyzes the Final Draft Remedial Investigation Report (Draft RI) issued by ADEQ on March 19, 2014 for the Shannon Road/El Camino Del Cerro (SR/ECDC) Water Quality Assurance Revolving Fund (WQARF) site (the CDC Site).

Additionally, Pima County herewith submits its separate comments. With a record in the hundreds of thousands of pages, including the exhaustive work that Pima County has itself put into various assessments of the former El Camino Del Cerro (CDC) landfill, and the sporadic measurements that ADEQ itself undertook over more than a decade, the scant amount of time that ADEQ has allowed the public to respond to the Final Draft RI is insufficient. Nevertheless, even with the limited time available to review the Draft RI, it is clear that the Draft RI cannot satisfy either the applicable statutory criteria or the federal guidance.

PIMA COUNTY'S COMMENTS ON THE FINAL DRAFT RI REPORT

1. Standards for Remedial Investigations

State law sets the standards for Remedial Investigations to ensure that the product results in a feasibility study, record of decision and, ultimately, a site clean-up that is protective of human health and the environment – all the while meeting the economic reasonableness and technical feasibility directives of the WQARF program. Due to the haphazard, intermittent and unfocused data collection upon which the RI is based, these goals are not achievable.

ADEQ is charged by law with 1) adequately identifying and evaluating all potential sources of contamination, 2) characterizing the extent of the contamination, 3) identifying rational contaminant transport scenarios, and 4) developing a sufficiently coherent dataset such that the State can develop an economically reasonable feasibility study. It is Pima County's conclusion that the Draft RI:

- 1.1 Ignores or dismisses a number of potential sources that would be critical to an understanding of the overall situation,
- 1.2 Creates a multiplicity of inconsistent plume maps that can only be interpreted as saying that ADEQ does not have a clear idea what the extent of the contamination is,
- 1.3 Is based on the flawed and unlawful decision to merge the El Camino Del Cerro and the Shannon Road WQARF sites without objective data refuting the previous determination that there are two distinct areas of pollution,
- 1.4 Lacks demonstrated historical evidence critical to understanding the potential pollutants disposed of on the east and north of Interstate-10,
- 1.5 Fails to adequately define the contamination in the Shannon Road WQARF area such that defining a solution (through the Feasibility Investigation process) is not possible, and
- 1.6 Fails to provide sufficient information necessary for identification and comparison of remedial alternatives, and, consequently, is inconsistent with the National Contingency Plan¹.

ADEQ² would have needed to conduct area-wide testing in a reasonable time frame and sequence to perform an adequately scoped RI and to form a cogent professional opinion. The Draft RI acknowledges that such testing has not been performed. *See* Draft RI at 63. The Draft RI also acknowledges the lack of adequate data east of Interstate-10 to assess the contributions to groundwater from potential contaminant sources in that area. *See e.g., id.* at 60-61. The County agrees that these data gaps need to be filled in order to develop an NCP-compliant RI. Such testing also would have needed to include parameters that accounted for the constituents that reflect the significant water quality differential (as revealed by Stiff and Piper diagrams) between groundwater towards the west, and groundwater towards the east. Without such testing, no defensible conclusions on the extent and sources of groundwater contamination can be lawfully derived.

¹ The National Contingency Plan (NCP) establishes standards for the assessment of cleanup actions: 40 C.F.R § 300; also see, 42 U.S.C. §§ 9601-9675 (1988).

² URS prepared the Draft RI for ADEQ.

2. Reservation of Rights

To the extent that ADEQ has withheld documents and/or information that would allow the public to assess the adequacy of the Draft RI, obviously, we are not able to comment. We note that there are a variety of instances in which documents are cited in the HGL letter report as being privileged or confidential or “attorney work-product.” The propriety of such assertions cannot be evaluated. Moreover, the Department’s Project Manager, Mr. Scott Green, recently advised a Citizens Advisory Board Member that “ADEQ’s contractor, HGL, has done extensive research in investigating PRPs. This information is currently confidential until the PRAP is completed and apportionment takes place.” In any event, Pima County reserves the right to comment upon and/or object to subsequent disclosures ADEQ may make in connection with this matter.

3. Unprecedented Floods of 1977 and 1983

The Draft RI fails to explore the consequences of the historically unprecedented floods of 1977 and 1983. It very nearly fails to mention them. Even if ADEQ were to assert that Pima County could be a PRP under A.R.S. § 49-283(B), Pima County could not be found liable due to the Act of God defense available under both A.R.S. § 49-283(D)(1) and CERCLA (42 U.S.C. § 9607). The floods of 1977 and 1983 were “Acts of God” as defined by WQARF and by CERCLA.

- 3.1** In 1977 the “100 year flood” predicted by U.S. Army Corps of Engineers methodologies at 21,000 cfs was exceeded by more than 50%. A flood measured at 32,700 cfs inundated the landfill. [The County ceased operations at CDC in 1978]. That inundation resulted not from flooding from the riverside edge of the landfill, but from behind.
- 3.2** After the 1977 flood, Pima County made bank improvements incorporating a revised ACOE standard of 35,000 cfs as being the design one hundred year flood. In 1983, however, the Santa Cruz River experienced a flooding event of 52,700 cfs.
- 3.3** For some weeks, after each flood, ponding occurred on the CDC landfill which was the only mechanism by which wastes leached into the groundwater. Nevertheless, Pima County believes that most of the groundwater contamination resulting from such Acts of God has been mitigated, and that the subterranean movement of VOC’s into the groundwater from pollution sources east and north of Interstate 10 are the only current sources of the plume identified by ADEQ.

Page 18 of the Draft RI records the fact that “In July 1994, Pima County Department of Transportation and Flood Control District extended soil cement bank protection from approximately 20 feet to 40 feet below the top of the river bank (Malcolm Pirnie, 1997b).” But

the document fails to mention that such bank protection was a reaction to increasing levels of wastewater discharge into the Santa Cruz River, and a desire to avoid potential erosion problems resulting therefrom.

4. Pima County Should Not be a PRP

ADEQ's consultant, HydroGeoLogic (HGL), purported to search for potentially responsible parties. However, no regard was given to A.R.S. § 49-283, which establishes the rationale for when a party may or may not be considered a "responsible party." Consequently, Pima County must supplement the record.

- 4.1** CDC was not operated as a business, but was offered as a public service. No fee was charged, and no profit was made. And the County certainly did not engage "in the business" of disposing of hazardous substances at CDC. ARS § 49-283(B)(1).
- 4.2** Pima County never *permitted* any person to use the facility for the disposal of a hazardous substance. ARS § 49-283(B)(2).
- 4.3** No evidence existed concerning hazardous substance disposal at CDC prior to the purchase and use of CDC by the County. Pima County did not know, nor reasonably should have known, of hazardous substance disposal practices at CDC prior to the County's acquisition of the site. ARS § 49-283(B)(3).
- 4.4** No evidence exists that the County took action which significantly contributed to the release after it knew or reasonably should have known of the existence of a hazardous substance at CDC. ARS § 49-283(B)(4).
- 4.5** Pima County is not responsible for the acts of unrelated third parties because Pima County exercised due care and took precautions against foreseeable acts or omissions. Among other things:
 - 4.5.1** Pima County designed the bank protection that withstood the flood.
 - 4.5.2** Pima County operated the landfill in compliance with all standards of the day and was, in fact, the model for development of the landfill operating regulations adopted by the Arizona Department of Health Services in 1976.
 - 4.5.3** Pima County never authorized the disposal of hazardous substances, nor did it charge for disposal.
 - 4.5.3** Pima County was required to provide solid waste disposal services by state law, and at all times operated in a manner consistent with those requirements.

5. Pima County Remediation Efforts

The Draft RI fails to adequately characterize the extensive efforts that Pima County has been engaged in over the last twenty years in remediating the CDC waste disposal site. Indeed, the County is presently taking additional measurements to determine its compliance status. All the while, ADEQ has taken a lackadaisical attitude with respect to orphan sites east and north of Interstate 10, even as the pollution from those sites has expanded the plume. We note that all reports associated with the County's multiple and amended RI/Feasibility Studies (RI/FS) are already part of the official record in connection with the instant Draft RI. To the extent that the Draft RI is inadequate in its discussion of those cleanup efforts (see RI at 22-23), that inadequacy would be inconsistent with the NCP and therefore should be acknowledged.

In connection with the voluminous previous investigations, and extensive earlier remedial actions at CDC, the Draft RI fails to note that the State of Arizona and Pima County formerly agreed to divide responsibility for remediation based upon the geographical division of Interstate 10. Page 1.1 of the August 25, 2008 Draft RI prepared by URS provides as follows:

"In 1999 Pima County and ADEQ established areas of responsibility for the ECDC WQARF site dividing the site into two response areas: the Pima County Response Area and the ADEQ Response Area. The line of demarcation agreed upon was the centerline of I-10 with Pima County being responsible for investigating and implementing remedial actions of the area south and west of I-10, and ADEQ responsible for all actions taken in the area north and east of I-10."

Pima County's prior RI and feasibility studies were extensive and were accepted by ADEQ. In reliance on that acceptance, Pima County has conducted extensive remediation work in the County Response Area (south and west of I-10) ever since. Pima County studies included:

- RI for ECDC WQARF site, 1997
- Landfill Operable Unit FS, 1997
- Groundwater Operable Unit FS, 1998
- 1999 Addendum to LOU FS and GOU FS, which included preferred remedies and monitoring plans, and which were submitted to ADEQ for comment.

In a letter dated July 20, 2000, ADEQ concurred with the information in the revised Feasibility Studies, Addenda and comment responses for the proposed remedial actions for the Groundwater and Landfill Operable Units for ECDC WQARF site. Extensive remediation work in accordance with those reports has been conducted.

An extensive history of State/County cooperative efforts can be found in the attached draft Consent Decree dated Sept. 30, 2003.

6. Inappropriate Consolidation

The El Camino Del Cerro WQARF site and the Shannon Road WQARF site were consolidated inappropriately to form the Shannon Rd/El Camino Del Cerro (SR/ECDC) Water Quality Assurance Revolving Fund (WQARF) site. Pima County objects to the two WQARF

sites being “consolidated,” and directs ADEQ to the holding in Mead Corp. v. Browner, 100 F.3d 152 (1996). In that case, the EPA tried to aggregate a low risk site with a high risk site. The court ruled to the contrary: “The idea that Congress implicitly allowed EPA broad discretion to lump low-risk sites together with high-risk sites, and thereby to transform the one into the other, is anything but reasonable. ... Permitting the inclusion of low-risk sites on the NPL would thwart rather than advance Congress’s purpose of creating a priority list based on evidence of high risk levels.”³

7. HGL February 6, 2014 Final Letter Report

The Draft RI incorporates the HGL Final Letter Report that contains several claims of privilege with regards to alleged operational and disposal activities within the WQARF site. Among others, the Department claims a privilege as to information concerning operations at the Lee’s Auto Parts facility, AMRI oil customers, and wastes allegedly disposed of in the CDC landfill that is included in the HGL report. Such information is critical to understanding the nature and extent of contamination at these sites.

Additionally, the following points illustrate some of the technical and historical mistakes made by HGL.

- 7.1 Page 4, Table 1 - This table presents a list of industries and chemicals used. Under aircraft repair including military and defense contractors, and missile maintenance, a footnote claims some Air Force technical orders mandate the use of PCE and TCE for aircraft and missile cleaning. The referenced Air Force technical order is T.O. 42C-1-20 dated 15 May 1983, more than five years after the landfill closed. Clearly, this document does not cover the time period when the landfill was operational. Any technical information relied upon must have been in effect at the time when the landfill was in use, not years after closure.
- 7.2 Page 7, last paragraph professes to assert that HGL was unable to find information on the closing of the El Camino del Cerro Landfill. References cited previously in HGL’s report show it was closed in December 1977, and newspaper articles also announced the closure at 5:00 PM, December 21, 1977.
- 7.3 Page 7, footnote 11 states that no information was found to indicate Lee’s Auto Parts began operations at the site prior to 1964. Historic aerial photographs clearly show an automobile junk yard present at the site prior to 1960 regardless of who was operating at the site.

³ 43 ERC 1857, 321 U.S.App.D.C. 336, 65 USLW 2345, 27 Env’tl. L. Rep. 20,446

- 7.4 Page 8, 3rd paragraph states “Other sources of contamination were suspected but had not been confirmed.” Although the cited reference (ECDEQP 1373-1374) does indeed make that statement, the sections following that statement present findings that confirms contamination. For example, the soil gas concentration of vinyl chloride was found to be 82,320 ppb at the Drake property. With respect to other VOCs at the Drake property, the report states they were “higher than concentrations reported by previous investigators” (ECDEQP001382). The report goes further to discuss findings that VOC soil gas concentrations at the E.C. Winter site were comparable to sites around the CDC landfill (meaning the Drake property).
- 7.5 Page 9, 4th and 5th paragraphs contain discussions regarding agreements between the Sanitary District and AMRI for disposal of waste at a Sanitary District landfill site. The last agreement was to be on a trial basis for 60 days. The agreement could be terminated by the Sanitary District if they found the agreement to be unsatisfactory. HGL states that they did not locate any documents to indicate that this arrangement was unsatisfactory to either party (AMRI or the Sanitary District), but of course HGL also found nothing confirming that the agreement was satisfactory. Furthermore, HGL has cited no document or other evidence to show AMRI actually disposed of their industrial waste at any off-site location.
- 7.6 Page 10, 2nd paragraph states that HGL did not locate reports of spills, leaks or releases filed with federal, state or local agencies. During the time period when AMRI was in operation, *there were no such reporting requirements* to report spills, leaks or releases.
- 7.7 Page 10, 3rd paragraph claims Pima County provided no documentation to support claims that unusable oil was placed into unlined pits on the site. Historic aerial photographs clearly show oil in pits and trenches. Subsequent investigation found no evidence of liner use in trenches or pits.
- 7.8 Page 11, 2nd paragraph claims that soil and sludge samples collected from a trench at the former AMRI property did not contain VOCs. But HGL fails to note that Marvin Motes, the occupant of the property, collected those samples using unknown methods and unknown sample holding conditions. Furthermore, no laboratory report or other data is even referenced. Clearly these results cannot be relied upon. ADEQ should have sampled all delivery and disposal trenches and the results should be discussed in this report, as well as with in the RI.
- 7.9 Page 21, 2nd paragraph – A high soil vapor concentration of vinyl chloride (82,320 ppb) is listed as being found adjacent to the landfill. Later, the report clarifies that this sample was collected at the Lee’s Auto Parts property (Drake

property). The 82,320 ppb soil gas concentration was the highest concentration found during any of the studies conducted for this entire WQARF site. The presentation of this finding in the report is highly misleading. This sample result is introduced and described in the section relating to the regulatory involvement at the CDC landfill which begins on page 17. This soil gas result is not even discussed in the section for Lee's Auto Parts on page 22. HGL's efforts to minimize the obvious role of PRP's other than Pima County is emblematic of ADEQ's conflict of interests in conducting this investigation.

- 7.10 Page 23, 4th paragraph – discussion of the lead contaminated soil remediation is irrelevant to the WQARF site. The statement that there was no unacceptable risk associated with the soils at the property at the end of the paragraph is completely misleading because that finding is related to lead contamination in the soil.
- 7.11 Page 23, 6th paragraph continuing to page 24 concludes that the Western Stucco is not an active release site based upon a comparison with passive soil gas concentrations observed at properties with documented soil contamination. But the results of passive soil gas at this property show soil gas concentration significantly higher than concentrations found at the CDC landfill using the exact same method in 2002. (Refer to January 30, 2003 Soil Gas Survey of El Camino Del Cerro Landfill report prepared by EMCON) Using the same rationale, ADEQ would have to conclude that the CDC landfill is not an active release site.
- 7.12 On page 5-4 of Pima County's Remedial Investigation, Malcolm-Pirnie concluded that the Arizona Truck Service/D&D Garage site was likely a contributor to the groundwater contamination on the east side of I-10. Neither HGL nor ADEQ's Draft RI even mention that site.

8. ADEQ has failed to analyze the extent to which polluters on the East side of Interstate 10 have contributed to the plume.

8.1 AMRI Oil

The Draft RI and supporting documents claim that Pima County completed a soil gas sampling of the AMRI property.. In fact, Pima County and its contractor, Hydro Geo Chem, were barred from entry onto that parcel and prevented from collecting soil gas samples to aid determination of the success of ADEQ removal. Pima County sought assistance from ADEQ to gain access to the property. While ADEQ had the authority to grant Pima County access for that purpose, the Department refused to provide such access or provide any assistance with such access. Contrary to the summary of this action provided in the Draft RI, the soil gas survey was actually performed on the next parcel to the North, not on the AMRI site. The landowner

provided this access as Pima County was trying to protect the residents of the Western Trailer Park.

The AMRI site has never been adequately evaluated to determine extent of VOC contamination despite clear evidence of soil contamination. Well drilling logs for wells W-32 and W-33 at the edges of the former AMRI oil property showed high concentrations of VOCs from near surface to the bottom of the wells with concentrations generally increasing with depth. Inexplicably, VOC measurements were not collected during drilling of wells W-44 and W-45 which are located adjacent to the former processing building and oil trench respectively.

Passive soil gas surveys using Gore-Sorber passive gas modules were relied upon to evaluate the AMRI site. This same method was used to screen the CDC landfill in 2002, and the results showed lower contamination levels at the CDC landfill than were detected at the former AMRI property. Results of this sampling near the CDC landfill showed contaminants of concern were highest in the drainage channel east of the landfill. This drainage channel received drainage from areas east of I-10 near the former AMRI Oil property, E.C. Winter Oil property, and other industrial properties. Concentrations of Contaminants of Concern found during this study at the landfill site were significantly lower than those found at the former AMRI Oil property using the same method. The results of passive soil gas sampling at the landfill site show less contamination than was present at the former AMRI Oil property.

Numerous references in the Draft RI and/or documents referenced in by it claim that one well was found at the AMRI site. Various reports cited in the Draft RI claim there were anecdotal references to a possible second well. A second well was in fact present on the property. The well was abandoned prior to the sale of AMRI in 1968. A second well, pump and sump hole were located on the western 40 feet of the property outside of the chain link fence (see Jackson v. Harmy Corporation, 16 Ariz. 467, 494 P.2d 72 (1972)). The second well is also contained in the inventory of assets recorded with the Pima County Recorder's Office (Book 2915 page 496) and such inventory was included in a reference cited in the RI (ECNAPR000045)

EPA studies have shown used oil in the re-refining industry to contain contaminants such as PCE at 1300 ppm, TCE at 1000 ppm and TCA at 3100 ppm. (*Preliminary Data Summary for the Used Oil Reclamation and Re-Refining Industry*, USEPA, September 1989). Using these reported concentrations along with reported volumes of oil processed at the AMRI site (180,000 gallons per year), the following quantities of contaminants would have been present at the AMRI site:

- TCE – 9,600 kg (600 kg per year)
- PCE – 12,800 kg (800 kg/year)
- TCA 29,600 kg (1,850 kg/year)

Another EPA study looked at the composition of over 1,000 used oil samples. PCE, TCE and TCA were detected in the vast majority of the oil samples tested for these constituents. Concentrations of these contaminants routinely exceeded 1000 ppm. Highest concentrations

found in this study were 21,000 ppm PCE, 40,000 ppm TCE and 300,000 ppm TCA. (*Composition and Management of Used Oil Generated in the United States, November 1985*).

8.2 Wildcat Dumps on/along/in the Rillito River

ADEQ failed to provide any evidence that contaminants of concern were disposed of in the El Camino Del Cerro landfill. To the extent that the Department simply makes a presumption that contaminants were disposed of in the landfill, the *same* presumption would have to be made about wildcat dumping in and along the banks of the Rillito River. The Rillito River has been a historic wildcat dumping area. Evidence of oil disposal on the banks of the Rillito River was included in ADEQ documents.

ADEQ inspected an area north of the AMRI property along the Rillito River bank as detailed in ADEQ's February 23, 1994 scoping information report for the AMRI Oil property (Wrecksperts). Oily deposit was found on the south bank of the Rillito River. The report indicated that the deposit appeared to be washed away. The two water wells closest to this location were the Z-006 COT well and the Acacia Gardens well – **these were the first wells shut down due to VOC contamination.**

Samples collected during drilling of the two wells along the Rillito downstream from this oily deposit found elevated soil VOC concentrations. VOC concentrations found during drilling of well W48M ranged from 136.6 pm at 24 feet bgs to 75.5 ppm at 104 feet bgs. VOC concentrations found during drilling of well W30 were as high as 18 ppm down to 207 feet bgs.

8.3 ADEQ Witness Testimony Not Included

ADEQ deposed a former so-called solvent recycler, Ernest "Joe" Blankinship, in 2009. Review of Blankinship's testimony as well as interview summaries and exhibits introduced at Blankinship's deposition clearly show he claimed disposal of solvents in and along the Rillito River upstream from the site.

8.3.1 Blankinship testified that he disposed of solvents in the Wetmore, Copeland and Crane landfills located on the Rillito River where the present day Tucson Mall is located.

8.3.2 Blankinship's notes also recite the disposal of solvent wastes at the Cardi site, which operated a sand and gravel pit in the Rillito River west of Oracle Road.

8.3.3 Blankinship's notes also evidence the sale of solvents to Young Block Company located upgradient of the CDC WQARF site.

8.3.4 During the deposition of Blankinship in 2009, ADEQ specifically asked Blankinship about his dealings with I-10 Surplus which was located at 5300 N. Casa Grande Highway. Blankinship testified that he routinely collected 55 gallon drums of solvent from I-10 Surplus, and testified further that the owner of I-10

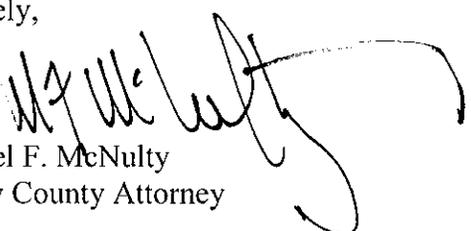
Surplus applied used drums of solvent to settle dust on his lot. While ADEQ has relied heavily on the testimony of Mr. Blankinship in its investigations of other WQARF sites, the Department has not so much as mentioned his testimony with respect to this site nor explained why it is not relevant.

8.4 ADEQ's Inconsistent Application of Standards

Recently the Department published a similar draft Remedial Investigation for the Broadway/Pantano WQARF site in which it determined that the Broadway South Landfill was a source based upon some evidence that Contaminants of Concern could be found in soil gas and groundwater - without regard to concentrations. While the E.C. Winter site and the AMRI site each have volatile organic chemicals in soil gas and groundwater, the Department concludes that they are not contributing to groundwater contamination.

In conclusion, we appreciate this opportunity to comment on the Draft RI Report even as we reiterate our view that the public was not provided with adequate time to respond. And as a postscript, we note that ADEQ just recently issued its Proposed Remedial Objectives Report. We will reply separately to that proposal within the allotted time frame.

Sincerely,


Michael F. McNulty
Deputy County Attorney

MFM:sl

Enclosures: Technical comments on Final Draft Remedial Investigation Report, Shannon Road/El Camino Del Cerro Water Quality Assurance Revolving Fund Site, prepared by Montgomery & Associates., March 15, 2014.

Consent Decree between the State of Arizona and Pima County, September 30, 2003.

cc: Ellen Wheeler – Asst. Pima County Administrator (without enclosures)
Jim Faas – Pima County Risk Management (without enclosures)
Dave Eaker – PDEQ (without enclosures)

TECHNICAL MEMORANDUM

DATE: May 15, 2014 **PROJECT:** 1415.01

TO: Michael McNulty, Pima County

FROM: Tim Leo, PG, Montgomery & Associates
Leslie Katz, PG, Montgomery & Associates
Tim Allen, PG, Montgomery & Associates

cc: Jim Faas, Pima County
Dave Eaker, Pima County

SUBJECT: Technical comments on Final Draft Remedial Investigation Report,
Shannon Road/El Camino Del Cerro Water Quality Assurance
Revolving Fund Site

At the request of Pima County, Montgomery & Associates (M&A) has prepared these comments on the March 2014 *Final Draft Remedial Investigation Report for the Shannon Road/El Camino Del Cerro Water Quality Assurance Revolving Fund Site* (Site). The Final Draft Remedial Investigation (RI) Report was prepared by URS on behalf of the Arizona Department of Environmental Quality (ADEQ). Formal oversight of the Site by ADEQ began in 1992. The Site includes two formerly separate Water Quality Assurance Revolving Fund (WQARF) sites: the Shannon Road (SR) WQARF Site and the El Camino Del Cerro (ECDC) WQARF Site. The sites were administratively combined into the SR/ECDC WQARF Site in 2004. The RI report presents findings of investigative activities for the Site from January 2001 through June 2013.

BACKGROUND

The ECDC landfill was operated by Pima County from about 1973 through 1977. Groundwater contamination in the vicinity of the landfill was first identified in 1983 after Pima County initiated the Landfill Environmental Studies Program (LESP), which was developed to investigate potential environmental issues at closed county landfills. From 1983 to 1997, a broad range of source area and groundwater investigations¹ were conducted in the ECDC landfill study area. Much of this work was documented in a comprehensive RI report prepared by Malcolm Pirnie, Inc. (MPI) on behalf of

¹ See Section 2.0 and the Site Chronology in Table 1 of ADEQ RI report for a list of major investigative activities.

Pima County Solid Waste Management² (Pima County RI). Pima County submitted the RI report to ADEQ in 1997 for review and approval.

For the Pima County RI, two operable units were designated: the landfill operable unit (LOU) and the groundwater operable unit (GOU). A substantial amount of hydrogeologic, soil quality, and groundwater quality data was collected in the ECDC study area during the Pima County RI. Detailed interpretations of these data were summarized in the MPI RI report. Based on the interpretation of data, a number of conclusions were reached by Pima County for the LOU and GOU³ with respect to site hydrogeologic conditions, soil and groundwater quality, contaminant fate and transport in the vadose zone and groundwater, and risks associated with the observed vadose zone and groundwater contamination. Principal among these conclusions were that data indicated: (1) the ECDC landfill was a source of volatile organic compounds (VOCs) to groundwater, and (2) other source areas north of the landfill had previously or were continuing to contribute VOCs to the groundwater system.

REVIEW PROCESS

Our review included the following activities:

- Detailed evaluation of the ADEQ RI report.
- Review of the 1997 Pima County RI report.
- Review of available documents referenced in the ADEQ RI report.
- Evaluation of water quality data obtained from ADEQ and Pima County.
- Evaluation of groundwater pumping data from the Arizona Department of Water Resources (ADWR) databases

A 60-day comment period was established by ADEQ for the Final Draft RI report⁴. In an April 10, 2014 letter to ADEQ, Pima County requested an extension to the review period to prepare comments on the RI report. This request was made because a preliminary review of the RI report indicated that it lacked a complete and organized presentation of data and, instead, it directed the reader to an extensive list of external reports and memorandum. As a result, additional time would be required to obtain and review reference material, to critically evaluate conclusions reached by ADEQ about contaminant source areas, and to prepare written comments. The request for an extension was denied by ADEQ in a letter to Pima County dated April 14, 2014.

The RI report relies extensively on reference material developed during over two decades of investigations by Pima County and ADEQ. Some of this reference material was available in Pima County files. Pima County requested missing reference material directly from ADEQ in the April 10, 2014 letter. The request for this reference material was denied by ADEQ in their April 14, 2014

² Malcolm Pirnie, Inc., July 1997, Landfill Environmental Studies Program (Phase 3), El Camino Del Cerro Study Area, Remedial Investigation Report.

³ See Section 8.0 of Pima County RI report.

⁴ As stated in the March 19, 2014 ADEQ Notice of Public Comment for Site

response letter because, among other reasons, ADEQ asserted that the majority of data, and all of the relevant data, requested by Pima County were included in the appendices of the RI report. A review of the report appendices indicated that important data requested by Pima County were not included in the appendices. Because data and other reference material were readily unavailable in local repositories or in the report, Pima County and M&A representatives formally requested and traveled to Phoenix to review available files at the ADEQ Records Center on April 30, 2014. Some of the reference material was not available in the ADEQ Record Center files; however, M&A proceeded with the evaluation based on available documents and data⁵.

RESULTS OF REVIEW

Conclusions reached by ADEQ in their RI report include:

1. PCE and TCE concentrations in groundwater do not appear to pose an immediate health risk to the public.
2. The contaminant plume in the shallow groundwater zone is relatively stable and the contaminant plume in the medium groundwater zone is migrating to the northeast and is likely captured by the South Shannon well.
3. Based on currently available data, the only confirmed sources of groundwater contamination are the ECDC Landfill and possibly the larger Drake property.
4. While not stated in Section 6.1, Conclusions, ADEQ concluded in earlier report sections, based on soil and soil gas quality data at the potential source areas along the I-10 Corridor and northeast of I-10, that the observed soil contamination did not impact groundwater.

M&A generally agrees with the conclusions that the tetrachloroethene (PCE) and trichloroethene (TCE) concentrations in groundwater do not appear to pose an immediate risk to public health. Although VOC concentrations are declining in some areas of the Site, the contaminant plume does appear to be relatively stable in the shallow groundwater zone, especially in the vicinity of and downgradient from the E.C. Winters and AMRI Oil properties. The contaminant plume in the medium groundwater zone is migrating to the northeast, presumably toward the South Shannon well. However, the RI report contains insufficient information to assess whether the South Shannon well is capturing the entire medium zone plume. Based on information summarized below, and detailed in the attached tables, M&A disagrees with the conclusion that, among the various areas investigated and found to have confirmed surface and subsurface contamination, the ECDC landfill (and possibly the Drake property) is the only confirmed source of groundwater contamination.

Table 1 summarizes the results of our review and provides detailed comments on the RI report. The comments in **Table 1** should be addressed before the final RI report is issued. The following broad-based comments summarize the principal issues and concerns noted during our review:

⁵ Arizona Administrative Code R18-16-406F states "The draft remedial investigation report may consist of a summary of the data and information collected with references to the supporting documentation and the location of the public repository where those documents may be reviewed".

1. The RI report is Incomplete, Deficient, and Inconclusive.

The presentation, interpretation, and analysis of data on hydrogeologic conditions, contaminant distribution, contaminant fate and transport in the vadose zone and groundwater, and contaminant source areas are incomplete, inadequate, and often confusing in the draft RI report. Numerous examples are cited in **Table 1** where critical information is missing from the report text, tables, figures, and appendices (for example, see Comments #8, #30, #32, and #33). Important explanatory information is often missing from figures, and the figures poorly depict the intended concepts. Throughout the report, concepts and terms are introduced but not explained or defined. The incomplete presentation of data suggests that many of the investigations conducted during the RI were incomplete and inadequate.

In lieu of providing a complete and clear presentation of data, the report includes references to numerous external documents and numerous incomplete and poorly organized appendices. Many of the reference documents are lengthy and would require substantial time to review. Some of reference documents were not available for review in ADEQ files. In most cases, the appendix material is merely an assemblage of previously-published figures or tables (sometimes with illegible information) provided without narrative context or explanation. The appendix materials are often internally inconsistent and incohesive, making it difficult for the reader to extract the necessary information. These deficiencies are fundamental and should be corrected before the final document is issued. The report should provide a clear and complete presentation of data to serve as a basis for interpretation and to support associated conclusions, enabling the reader to independently judge the reasonableness of the RI. These minimum standards are or should be a requirement of the WQARF program.

The deficient presentation of data in the report does not support interpretation of Site conditions. However, as cited in **Table 1**, the report includes a broad range of interpretations that, in most cases, are incomplete, unfounded, subjective, or inconsistent with data and information presented in the report. This is most evident and problematic in Section 4.0, Investigations and Remedial Actions, where flawed interpretation of incompletely summarized soil, soil gas, and groundwater quality data leads to critical, and largely unfounded, conclusions about contributions of contaminants to the groundwater from the source areas along the I-10 Corridor and northeast of I-10 (see Comments #34, #35, #43, and #45). After presentation of data in the report is expanded and clarified, complete, objective and thoughtful interpretation of these data should be provided in a revised final report. In addition, uncertainty and limitations in the interpretations and conclusions should be provided to appropriately qualify subsequent conclusions.

The RI report does not include analyses to support conclusions. The lack of analysis of abundant data compounds problems associated with incomplete presentation of data and flawed interpretation of data. For example, it is concluded in the report that soil contamination data collected at the E.C. Winter site did not indicate an impact to groundwater. Not only is the presentation of data incomplete, and the interpretation of data unsupported by the data that are presented, but the report

lacks an analysis that demonstrates with any reasonable degree of certainty that soil and soil vapor contamination at the E.C. Winter site is not currently or did not in the past impact groundwater. Vadose zone modeling⁶ would have been appropriate for this site, and most of the other potential source sites. Similarly, the report proposes a conceptual model of groundwater flow and contaminant transport, again, without a supporting analysis. In this case, a groundwater flow and transport model⁷, calibrated to observed conditions, would be appropriate to assess a broad range of conceptual models and identify the conceptual model that best fits the hydrogeologic and groundwater quality data. This flow and transport model could also be used to evaluate the fundamental question of whether the contaminant plume has evolved only from sources southwest of I-10, as concluded by ADEQ, or whether it is more plausible that sources northeast of I-10 also contributed to the plume (as an overwhelming amount of site-specific data indicate – see below).

2. M&A disagrees with Report Conclusions.

M&A conducted a thorough review of the RI report and reviewed as much of the reference material as was possible in the 60-day comment period. In addition, M&A reviewed monitor well and water quality data from ADEQ and Pima County files, as well as pumping and water level data available in ADWR databases. Where possible, M&A conducted focused analyses of available data to supplement the information presented in the report. Based on our review and focused analyses, M&A believes that the investigations conducted at the potential source areas (other than the ECDC landfill) were incomplete or inadequate to sufficiently characterize the sites to a degree that supports the conclusions about source contributions to groundwater. Further, M&A does not agree with many of the conclusions stated in the RI report. Most importantly, M&A disagrees with the conclusion that the only confirmed sources of groundwater contamination in the SR/ECDC WQARF Site are the ECDC landfill and possibly the larger Drake property. In contrast, M&A believes the soil, soil vapor, and groundwater quality data developed during the RI indicate a high likelihood that sources of groundwater contamination exist today or existed in the past at some or all of the sites investigated during the RI, as well as other sites (such as wildcat dumping along Rillito Creek) which were not addressed in the RI.

The RI report and **Table 1** cite several examples where Site contaminants of concern (COCs) primarily PCE and TCE were used and/or present in waste materials disposed of at a facility, were detected throughout the vadose zone in soil and/or soil gas, and were also present in groundwater beneath the facility. **Table 2** compares the types and selected results of investigations conducted at the ECDC landfill and other potential source area sites. The table provides the highest concentrations of the major COCs (PCE, TCE, etc.) detected in various media at each of the sites. The media considered include shallow and deep soil, shallow and deep soil vapor (or gas), and groundwater. Information provided in **Table 2** shows that the distribution of COCs and the maximum detected COC concentrations in the various media are similar at the ECDC landfill, a confirmed source of

⁶ Using a program like VLEACH for example (<http://www.epa.gov/ada/download/vleach.pdf>)

⁷ Using programs like MODFLOW (<http://water.usgs.gov/ogw/modflow/>) and MT3D (<http://hydro.geo.ua.edu/mt3d/>) for example

groundwater contamination, and the other sites which ADEQ concluded were unconfirmed sources of groundwater contamination.

Our interpretation of the Site data (obtained from the RI report as well as from available referenced and unreferenced documents and databases) indicates that one or more additional sites, including the AMRI Oil/Wrecksperts and E.C. Winter sites, are or were probable sources of VOC contamination to groundwater. M&A's conclusion is based on the following observations:

- Historically, the highest concentrations of PCE and TCE observed in groundwater samples collected during any time period are in wells located in the vicinity of the I-10 corridor, the AMRI Oil/Wrecksperts site, and the E.C. Winter site, and are not in wells located at or immediately north (downgradient) of the former ECDC landfill⁸.
- Relatively stable, high concentrations of COCs persist in groundwater at monitor wells W-24, W-32, W-38S, and W-45, which are located in the vicinity of the AMRI Oil site and downgradient of the E.C. Winter site. Concentration trends in wells located between the former ECDC landfill and the AMRI/Winters area are declining⁹.
- Concentrations of PCE and TCE were detected in deep soil gas from multipoint soil vapor monitoring wells at all depths on the E.C. Winter site (well TR-101) and the Wrecksperts portion of the AMRI property (wells SVE1, SVE2 and SVE3). Soil vapor extraction conducted on the E.C. Winter site resulted in removal of 4 pounds of TCE and 0.85 pounds of PCE from the subsurface. The concentrations of deep soil vapor on the E.C. Winter site are very similar to concentrations detected at similar depths at the ECDC landfill, which is considered a confirmed source of contamination to groundwater.

The documented persistence of high concentrations of PCE and TCE in groundwater in the proximity of AMRI Oil/Wrecksperts and E.C. Winter sites, where PCE and TCE were also detected in soil vapor near the surface and throughout the vadose zone, suggests that sources of groundwater contamination exist or existed at these sites, or at a minimum, cannot be ruled out by the presently available data.

3. The Conceptual Site Model is Incomplete.

The conceptual site model (CSM) for the SR/ECDC WQARF Site is inadequately described in the RI report and incompletely understood. As summarized in **Tables 1 and 2**, and earlier in this letter, the RI report not only fails to adequately present and interpret site data, it also lacks technical analysis of data to demonstrate that a valid and reasonable CSM has been developed. Such analysis is essential to support the critical conclusions on the nature of groundwater contamination sources and the fate and transport of these contaminants in the groundwater. A well- documented and reasonable CSM

⁸ Some monitor wells near the landfill are dry due to declining groundwater levels

⁹ Declining concentrations may be due, in part, to the effects of past groundwater pump & treat operations at the landfill

supported by Site data, objective interpretation, and analysis is needed before the remedial objectives (ROs) can be developed.

As summarized in **Table 1**, the RI report fails to adequately present, interpret, and analyze data to support conclusions about groundwater source areas. In addition, M&A believes that the distribution, fate, and transport of contaminants in the groundwater are poorly understood and not convincingly articulated in the CSM. A complete understanding of contaminant distribution and transport in the groundwater is needed before ROs can be developed, and certainly before a feasibility study can be contemplated to evaluate remedial alternatives. Data gaps identified by ADEQ¹⁰ should be addressed, including development of a comprehensive site-wide water level and water quality data set, to provide an improved basis for future decisions. Modeling should be strongly considered to provide an analytical framework for assessing the validity of the CSM.

The current CSM conceives that the VOC contaminant plume is “diving” from the shallow aquifer zone to the medium aquifer zone as it migrates to the north-northeast, partly as a result of pumping at the South Shannon well. While this may be true, the reasons for this observed migration are incompletely understood and poorly presented in the RI report, as illustrated by the following:

- The cross-section in Figure 3 of the report does not clearly and convincingly depict a geologic condition for this pathway to exist.
- Site water level data do not fully support this migration pathway. M&A examined April 2013 water level data from a number of nested well groups¹¹. The data indicate that vertical gradients between the aquifer zones at these locations were generally small and upward, not downward as might be expected if pumping from the South Shannon well was controlling plume migration. Additional evaluation of water level data should be conducted by ADEQ to ensure that hydraulic gradients are consistent with the conceptualization that the South Shannon well is hydraulically controlling the contaminant plume.
- The groundwater level contour maps included in the report (Figure 4 and Appendix D) indicate the predominant direction of groundwater flow is to the north-northwest, which does not support the notion that the contaminated groundwater is moving north-northeast from source areas southwest of I-10 and high concentration areas south of Rillito Creek toward the South Shannon well. In fact, it more plausibly suggests that additional source areas may exist in the area south-southeast of the South Shannon well.

Additional Site investigation, data interpretation, and analysis are needed to better document and develop a more complete CSM. Fundamentally, the CSM must document and demonstrate a thorough understanding of the effect of all potential groundwater source areas, hydrogeologic conditions, and groundwater recharge and pumping on the fate and transport of contaminants within the study area. Only after a complete CSM is developed can ROs be developed.

¹⁰ Section 6.2 of ADEQ RI Report

¹¹ W-30S,M,D; W-31S,M,D; W-32S,M; W-33S,M; W-34S,M,D; W-35S,M; W-38S,M; W-39S,M,D; W-40S,M,D; and W-20, W-28D.

SUMMARY

M&A has reviewed the Final Draft RI report for the SR/ECDC WQARF Site. Our review included a thorough evaluation of the RI report, a review of available reference documents, and an evaluation of available groundwater elevation and soil, soil vapor, and groundwater quality data. Based on our review, we conclude that the presentation, interpretation, and analysis of data included in the RI report do not support the conclusions reached regarding groundwater source areas. Specifically, we disagree with the overarching conclusion that the only confirmed sources of groundwater contamination are located southwest of I-10 (including primarily the ECDC landfill and possibly the Drake property) and that soil quality data available at potential source areas located along the I-10 Corridor and northeast of I-10 do not indicate that contamination found at these sites is impacting or has impacted groundwater. Finally, we believe additional Site investigations, data interpretation, and analyses are needed to substantially improve the CSM. We recommend that the RI report be substantially revised and expanded to address our detailed comments (**Table 1**) and to better document a reasonable CSM, before final conclusions are developed about groundwater source areas and before ROs are established.

**TABLE 1. DETAILED COMMENTS ON FINAL DRAFT REMEDIAL INVESTIGATION REPORT
SHANNON ROAD/EL CAMINO DEL CERRO WATER QUALITY ASSURANCE REVOLVING FUND SITE**

COMMENT NUMBER	SECTION/PAGE NUMBER	RI REPORT TEXT CITATION	COMMENT
1	1.3/3	[The South Shannon well]... creates a significant cone of influence and provides hydraulic containment of the groundwater plume preventing it from migrating farther north.	How was this determined? See comment #11 below.
2	1.3/4	[Referring to E.C. Winters, AMRI, and the I-10 Corridor area]... impacts to the aquifer from [these] area[s] have not been observed based on available data.	How was this determined? What analyses were conducted to determine this? Since relatively high concentrations of volatile organic compounds (VOCs) (comparable to the El Camino Del Cerro [ECDC] landfill) have been detected in groundwater underlying all of these areas and high concentrations have persisted beneath the E.C. Winters and AMRI sites, how can it be stated with certainty that "impacts to groundwater have not been observed..."? Further, conclusions regarding source areas should not be stated in the introduction section. An executive summary should be added to the report if an overview of the results of the report content is needed.
3	2/5	This RI report presents activities for SR/ECDC conducted through 2013 including groundwater sampling and new well installations in April and May 2013. ... However, the most recent data available to URS for the CDC Landfill area was through 2011.	Why were more recent data for the ECDC landfill unavailable to URS? It is our understanding that water level and water quality monitoring were conducted at the ECDC landfill site through at least 2012, and that no request was made to Pima County by Arizona Department of Environmental Quality (ADEQ) for access to the site to sample or measure water levels in these wells to ensure that a comprehensive, recent data set was available to support the Remedial Investigation (RI). A comprehensive groundwater monitoring round in all accessible monitor wells should be conducted before the RI is finalized.
4	2/5	While the landfill area is the primary source of contamination within the WQARF site boundaries, other potential sources have been investigated.	This conclusion is not appropriate at this juncture in the report, nor is it supported based on information and analyses provided in subsequent report sections. What secondary sources exist?
5	3.3/8	The SR/ECDC area lies within the Tucson Active Management Area and encompasses approximately 110 ADWR registered wells.	A table and map of these wells should be provided in the report to show location, status, and construction information. Older, unused wells may act as conduits and should be identified and evaluated as a potential mechanism for vertical migration.
6	3.4.2/9	A generalized geologic cross section is shown on Figure 3.... The cross-section indicates a sloping interface from southwest to northeast between the generally coarser-grained sand and gravels at and near the CDC Landfill area adjacent to the Santa Cruz River, and the generally finer-grained silty and clayey gravels northeast of Rillito Creek. As discussed in detail in the Fate and Transport section this may be a contributing factor to the deepening plume phenomenon observed at SR/ECDC.	The correlation of hydrogeologic units on Figure 3 is difficult to discern; however, gravels appear to be widely distributed throughout the section and the relationships described in the text are not readily apparent. The logs were prepared by different geologists making correlation of units difficult. This cross-section is used here and in several locations throughout the report to indicate that geologic controls are a factor in causing the plume to "dive" as it moves downgradient (north, northwest) from the E.C. Winters and AMRI sites. This hypothesis is not supported by the cross-section, which seems to show a range of relatively permeable sediments interbedded with discontinuous finer-grained zones across the lateral and vertical plume area.
7	3.4.3/11	The regional water level in the Tucson Basin has declined in response to pumping. In the vicinity of the SR/ECDC site, the decline in water levels during the period from 1947 to 1985 is estimated to be approximately 50 to 75 feet (CH2M Hill et al., 1987).	Why are water level trends only described through 1985, when the ECDC landfill was in operation in the 1970s? The report should include water level hydrographs for water supply wells and monitor wells to document water level trends across the site since the 1970s, if possible. Montgomery & Associates (M&A) reviewed the Groundwater Site Inventory (GWSI) database available through Arizona Department of Water Resources (ADWR) and found several wells in the Site area with long-term water level records extending from the 1980s through the present. It appears that overall water level decline has been relatively consistent at about 60 feet over the past approximately 30 years for several wells in the area. Short-term water level rise on the order of about 20 feet is observed in response to the major stream flow events in the early 1980s and 1990s. These trends should be discussed in relation to the conceptual model of groundwater flow, the impact of shallower groundwater historically on source potential, and potential mobilization of mass from the lower part of the vadose zone at the various potential source areas during periods of water level rise.
8	3.4.3/11	Groundwater level data from April 2013 indicate that the direction of groundwater flow is generally to the north (Figure 4)	Figure 4 indicates groundwater flow is to the north-northwest, which is inconsistent with the plume boundary shown on Figure 5. Figure 4 has several problems: (1) contours are for "medium zone" wells, a concept not introduced in report yet; (2) the contours extend too far beyond the network of wells with data; (3) groundwater flow arrows are not perpendicular to contour lines; (4) contours do not cover the entire site area and data are not provided for wells southwest of I-10, including those located at the CDC landfill (which in other locations of the report is identified as the source for the entire plume); and (5) contours do not appropriately interpret drawdown at the South Shannon Well but rather show a cone of depression around monitor well M31M. Figure 4 should be revised to completely and accurately depict groundwater contours, gradients, and flow directions. Why are some medium zone wells missing? Groundwater elevation contour maps for the shallow and deep aquifer zones should also be provided in the main report.
9	3.4.3/11	Hydraulic gradient varies from approximately 0.0009 along the western edge of the site to approximately 0.003 north of the Rillito Creek, near the South Shannon well (Kleinfelder, 2001b).	Why cite Kleinfelder, 2001 for the hydraulic gradients? Estimated gradients from the Figure 4 data set should be reported. Ranges in the historic magnitude and direction of hydraulic gradient should be discussed because they are critical for evaluation the transport of contaminants in groundwater. See comment #10.

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10	3.4.3/11	Groundwater levels, direction of groundwater flow, and hydraulic gradient have been observed to vary considerably over time (Malcolm Pimie, 1997a). Appendix D contains groundwater elevation maps from 1988 to 2012.	Numerous water level contour maps for different time periods and covering different portions of the site are included in Appendix D. Less than half of the maps include data for the entire plume area. There is no discussion of these maps in relation to URS' analysis of changes in groundwater flow direction over time that explains to the reader the evolution of the observed plume, concentration trends at key wells (including the South Shannon Road well), and potential contributions from the various source areas. In fact, review of the water level contour maps provided in Appendix D clearly indicates that the dominant direction of groundwater movement from the CDC Landfill site over time is to the north or north-northwest. This flow direction is inconsistent with the observed plume extent and with the conclusion reiterated in several places in the draft RI report that the plume is consistent with a source in the southwestern part of the site (CDC Landfill and possibly Drake property). The RI report should be revised to include a much more detailed analysis of groundwater flow conditions and how they relate to contaminant source areas and transport in groundwater. This is a fundamental concept the needs to be thoroughly assessed in the RI report.
11	3.4.3/11-12	In addition to the impacts of groundwater recharge, groundwater flow directions have likely been affected by groundwater withdrawals in the SR/ECDC site area. Tucson Water has two inactive production wells (Z-004 and Z-006) in the vicinity (Figure 5). Metro Water has seven active production wells (South Shannon, DeConcini, Wildwood, Estes, Moore, Latamore-N and Latamore-S) north of Rillito Creek near South Shannon Road. Patterns of groundwater flow in the vicinity of the SR/ECDC site are influenced by groundwater extraction from pumping Metro Water wells. The number and location of wells, the rates for individual wells, and the duration and schedule of pumping have changed over time. Historically, pumping regimens and recharge events have combined to influence the direction of groundwater flow and gradient.	Pumping data for the Tucson Water and Metro Water wells since the earliest reporting period (likely around 1984) should be provided and discussed to support the concept that groundwater withdrawal has affected flow directions, both laterally and vertically. Other water supply wells exist in the site vicinity according to ADWR records; these wells should also be included in the report. Pumping data from water supply wells and remedial action wells are not included in the report, but should be added. M&A reviewed pumping data reported to ADWR for Metro Water, Tucson Water, and Pima County wells in the area. These data indicate that pumping across the area has been highly variable over time and these variations are expected to be very relevant to plume development. The influence of groundwater pumping on groundwater flow should be evaluated in more detail because this could be important for historic contaminant transport in groundwater. In fact, URS indicates in several places that pumping from "deeper zones" is a factor in causing the plume to "dive" as it moves north of the E.C. Winter's site. Review of water level data for April 2013 for paired shallow and medium zone wells does not support this assumption because the vertical gradient between these two zones appears to be relatively small. Why does the report refer the reader to the plume boundary map to show the Tucson Water well locations? This is confusing.
12	3.4.3/12	At the SR/ECDC site, recharge from ephemeral flow may occur along Rillito Creek and the Santa Cruz River depending on the distribution of precipitation and streamflow. From 1904 to 1975, annual peak flow in Rillito Creek ranged from 297 to 70,660 acre-feet per year (ac-ft/yr) and the average annual peak flow was 11,660 ac-ft/yr. From 1906 to 1980, annual peak flow in the Santa Cruz River ranged from 976 to 58,840 ac-ft/yr and the average annual peak flow was 16,450 ac-ft/yr. In addition to storm water runoff, the Santa Cruz River receives discharge from the Roger Road Wastewater Reclamation Facility (Malcolm Pimie, 1997b).	Additional evaluation of the effect of flow in Rillito Creek and Santa Cruz River should be provided because this could be important for historic contaminant transport in groundwater.
13	3.4.4/13	Aquifer Parameters	The discussion of aquifer parameters pertains to the geologic formations (i.e., Fort Lowell Formation and Tinaja Beds). It is unclear how these formations correlate to the zones where transport of contaminants occurs, or the zones shown on Figure 3. What hydrostratigraphic zone was tested at the South Shannon Well?
14	3.4.4/13	In February 2004, an aquifer test was performed on Metro Water's South Shannon well as documented in <i>Aquifer Testing South Shannon Well, 55-626757, June 2, 2005</i> prepared by URS.... Analysis of the aquifer tests indicated a transmissivity of 53,000 gallons per day per foot....	Based on review of a draft final version of the referenced report, there were actually two values of transmissivity reported for the South Shannon Well test. In addition to the 53,000 gallons per day per foot (gpd/ft) mentioned in the draft RI that was obtained using the Neuman method, a transmissivity value of 102,500 gpd/ft was computed using the Theis and Cooper-Jacob methods. This is relevant to the projected extent of capture, as indicated in comment #68 below.
15	3.5.1/14	Table 3 presents a summary of the United States Geological Survey (USGS) monthly mean discharge data between 1995 and 2012 from a gauging station just upstream of the SR/ECDC site at the intersection of La Cholla Boulevard and Rillito Creek.	A graph rather than a table should be provided for stream flow data so the reader can more easily identify the magnitude and timing of specific event. More importantly, the draft RI should include an analysis of the relationship between stream flow, groundwater elevations, direction of groundwater movement, and plume migration over time.
16	3.5.2/15	Table 3 presents a summary of the USGS monthly mean discharge data from a gauging station on the Santa Cruz River near Congress Street.	Same comment as above.
17	4.0/16+	Investigations and Remedial Activities General comments	More information should be provided in the report about the historical properties search. In particular, the logic used to determine which properties warranted investigation and which did not should be discussed in more detail. The lengthy discussion in the report about the lead (a contaminant of potential concern (COPC)) contamination at the various properties and related response actions is important due to the noted potential health impacts from this contamination. However, the information about lead contamination is not important for the identification and analysis of sources of groundwater compounds of concern (COCs), which appears to be the primary focus of the report. Information about lead contamination could be moved to an appendix to improve the report flow, maintain the focus on presenting relevant data, interpretation, and analyses of sources of COCs to groundwater, and to dedicate more of the report to incorporating the missing information identified in our comments.

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18	4.1/16/2	The majority of the investigations focused on specific properties and the following text describes those investigations accordingly. However, a geographically broader investigation was conducted in 2002. Specifically, an area-wide passive soil-gas survey was completed in two phases in Pima County Flood Control District properties along the south bank of Rillito Creek. The first phase included the installation of 62 soil-gas monitoring locations on March 14, 2002 and the second phase included installation of 80 locations on May 22, 2002. It was concluded the discontinuous spatial distribution of soil-gas results and the low concentrations of contamination were unlikely to reflect any potential contaminant sources for the area (Kleinfelder, 2002b).	Additional discussion of the soil gas investigation along the south bank of Rillito Creek, including the depth of sampling, compounds detected, range in concentrations, and the methods used to determine that these detections were unlikely to indicate contaminant sources is needed. In areas where compounds were found in shallow soil gas, were deeper samples collected to assess the extent of contamination?
19	4.2/17+	General Comment	Maps of contaminant concentrations in soil and soil gas for the ECDC landfill and I-10 Corridor areas should be provided to enable assessment of sources. At a minimum, concentration maps with a brief narrative summary should be provided in an appendix. Referencing previous reports, while necessary, does not allow the reader to assess the relative source potential for the landfill compared with other areas that were investigated.
20	4.2.1/18	It was determined that shallow alluvium at the CDC Landfill was relatively coarse-grained from the surface to a depth of approximately 40 feet bgs. Finer-grained sediments extended from approximately 40 feet bgs to an approximate depth of 175 feet bgs.	The geologic cross section in Figure 3 of the report does not support this description, which appears to be based solely on the log from monitor well W-11, located south of the landfill. Based on our review, the W-5 log appears to have predominantly coarse-grained sediments through most of the penetrated depth.
21	4.3/24	A summary of the activities for Wrecksperts from June 1995 to August 2007 are listed in Table .	The table reference should be provided. It should be Table 4.
22	4.3.1/25	A summary of the analytical results from June 1995 to August 2007 are presented in Table .	The table reference should be provided. It should be Table 4.
23	4.3.1/25-26	ADEQ prepared a scope of work to remove the contaminated soils and waste sludge, as well as plug and abandon an unused well on the property (ADEQ, 1995). In 1996, ADEQ conducted an Expanded Site Inspection (ESI) which included the collection of samples from the north half of the Wrecksperts property as confirmation for the removal and to further characterize the extent of contamination. Soil samples were analyzed for total petroleum hydrocarbon (TPH), PCBs, and lead. Soil samples collected from beneath the trench did not contain detectable concentrations of VOCs.	According to Pima County, "A second well, sump and pump was present on the site. This second well was listed in the asset inventory that AMRI prepared when the business was sold in 1969. Court records show the second well was located in the west 40 feet of the property that AMRI occupied." What analytical methods were used for the VOCs analyses? When discussing laboratory analytical results, the method should be provided, as well as information about the detection limits.
24	4.3.1/26-27/4	On May 22, 1996, Growth subcontractor, Saguaro Environmental, mobilized personnel and equipment to the Wrecksperts property to abandon a well in order to eliminate a potential conduit from contaminated surface water runoff. The well was first identified by ADEQ in 1987 and was first observed in 1995 during a site inspection. The well was reportedly drilled to 125 feet bgs; however, it was only open to 102 feet bgs.	Did this well have water in it when it was abandoned in 1996? Was it sampled? Based on interpolation of available water level data from wells at the ECDC landfill for this time period, depth to water in the Wrecksperts area should not have been deeper than the well depth of 125 feet. What is meant by the well only being "open" to 102 feet? Was there fill in the well or an obstruction? More information about this well should be provided in the report, particularly since it could have been a conduit for contaminant migration from the groundwater surface and vadose zone to groundwater. Based on long-term water level data from the GWSI database, water levels would have been significantly shallower during the time period of active operations and disposal at this site.
25	4.3.1/27	During March 2003, W-32 was installed on the Western Stucco property, and was completed as a nested groundwater monitor well. Soil and soil-vapor samples were collected from 30, 60, 90, and 120 feet bgs during the boring installation. The analytical results indicated that soil vapor concentrations exceeded target levels for benzene, PCE, and TCE. The highest detections are as follows: benzene was 110 ppbv at 90 feet bgs, PCE was 24 ppbv at 60 feet bgs and TCE was 50 ppbv from 60 feet bgs.	Detection of tetrachloroethene (PCE) and trichloroethene (TCE) in soil vapor at 60 feet indicates the potential that groundwater contamination sources exist or existed in the past on or near the Western Stucco/AMRI Oil/Wrecksperts properties. The source potential is further supported by the detection of PCE and TCE in shallow soil and soil vapor, and the presence of these compounds in groundwater beneath these properties. The persistence of relatively high VOC concentrations in groundwater in this area provides further support for concluding that these properties are likely sources to the VOC plume.
26	4.3.1/28	Six polycyclic aromatic hydrocarbon (PAH) compounds were detected, however, no concentrations exceeded the SRLs (URS, 2007c). The detections from the results are summarized in Table .	The table reference should be provided. It should be Table 4.
27	4.3.1/29	The results are summarized in Table _ and the boring locations are illustrated on Figure 14.	The table reference should be provided. It should be Table 4. Table 4 should report the depths at which contaminants were detected.
28	4.3.1/29	In January 1995, ten soil vapor samples were collected and PCE and benzene were detected above the method detection limits in two samples. PCE was detected in the soil vapor sample collected from the surface impoundment at a concentration of 2.5 ppbv. Benzene was detected in one sample collected from the trench at a concentration of 58 ppbv (ADEQ, 1995).	At what locations and depths were these soil vapor samples collected? Since the vapor had detectable concentrations of PCE, a key groundwater COC, more information and analysis of these data should be provided in the report.
29	4.3.1/29	In April 1996, Pima County subcontracted with Hydro Geo Chem to collect soil-gas samples at the Wrecksperts facility (formerly AMRI Oil). Hydro Geo Chem sampled eight locations along the northern and eastern property boundary. Out of 23 soil gas samples, PCE was detected in a single sample at a concentration of 4.2 µg/L (Hydro Geo Chem, 1996).	The depth at which the PCE detection was found should be reported because this is critical information for assessing the meaningfulness of this detection as an indicator of a groundwater contamination source at the Wrecksperts property. Pima County notes that ADEQ refused access to the Wrecksperts property and that the soil gas survey was actually done on the Western Stucco property, north of Wrecksperts.

**TABLE 1. DETAILED COMMENTS ON FINAL DRAFT REMEDIAL INVESTIGATION REPORT
SHANNON ROAD/EL CAMINO DEL CERRO WATER QUALITY ASSURANCE REVOLVING FUND SITE**

30	4.3.1/29-30	<p>During November 2001, ADEQ conducted a passive soil-gas survey at the Western Stucco/Western Trailer Park property.... Soil-gas sampling indicated that PCE was detected in 32 of the 124 samples. This includes 14 samples with detectable masses that were less than the method reporting limit. Two distinct areas were found to contain detectable levels of PCE: around the main office building on the Western Stucco parcel and along the eastern half of the Western Stucco parcel. The levels observed in the vicinity of the main building on the Western Stucco parcel were the highest. PCE was detected in most of the sample locations along the eastern portion of the Western Stucco parcel, but at lower levels than around the main building. See Figure 15 for sample locations and the Soil-Gas Survey Report, Western Stucco/Western Trailer Park Property 5348 North Highway Drive (URS, 2002b) for the analytical results. For analytical maps that illustrate the results see Appendix F.</p>	<p>The concentration range and depth at which the PCE detections were found should be reported in the text. The concentration values on the color ramp scale on the PCE map in Appendix F are illegible. In addition, the concentration data should be reported on the maps. Regarding Appendix F, it should include some narrative context to support the maps.</p> <p>This type of incomplete presentation of critical information occurs throughout the report and is an unacceptable deficiency that impedes the reader's ability to critically evaluate the results of the RI. The reader should not have to obtain and read the original report to fully understand the implications of the information being presented, especially when the information pertains to the sources, magnitude, and extent of a key groundwater COC that will factor into potential future remedial actions at the site.</p> <p>The report should be revised and expanded to include this information before it is finalized.</p> <p>Pima County questions the validity of passive soil gas survey methods, since the same type of passive soil gas survey conducted on the landfill property by EMCON in 2003 failed to detect any concentrations of PCE, TCE, cis1,2-DCE or vinyl chloride.</p>
31	4.3.1/30	<p>During 2006, additional passive soil-gas sampling occurred at 5280 North Highway Drive and isoconcentration maps illustrating PCE, TCE and PAHs are presented in Appendix G. The relative highest concentrations of PCE were near the center of the parcel. TCE and PAH concentrations were highest in the northwest portion of the site.</p>	<p>Similar to the previous comment, the concentration range and depths at which PCE and TCE were detected should be reported in the text and Appendix G. Appendix G is another example of incomplete presentation of critical information.</p>
32	4.3.1/30-31	<p>March 2003 samples were collected during the installation of the monitoring well W-32 at Western Stucco (URS, 2004a). The analytical results indicated that soil vapor concentrations exceeded target levels for benzene at 30, 60, 90, and 120 feet bgs and TCE at 30, 60 and 90 feet bgs. PCE concentrations only exceeded the 10⁻⁶ risk level at 60 feet bgs. The detections at W-32 led to the recommendation to do more deep soil vapor sampling at Wrecksperts to further assess the elevated concentrations of COCs.</p>	<p>The presence of TCE at 30, 60, and 90 feet below ground surface (bgs) in soil vapor indicates a source of TCE to groundwater likely exists or existed on the Western Stucco or Wrecksperts property. The concentrations of TCE should be reported in the text. What is meant by "target levels"?</p> <p>With respect to PCE in soil vapor, what is meant by an exceedance of the 10⁻⁶ risk level? Concentrations should be reported in the text and compared to a compliance standards rather than a risk level.</p> <p>M&A reviewed the soil gas data from W-32 during a records search at ADEQ. Not reported in the RI was the fact that benzene was also detected at all four sampling depths, with the highest concentration (110 parts per billion per volume [ppbv]) recorded in the sample from 90 feet.</p> <p>Was additional deep soil vapor sampling conducted per the recommendation? If so, the results should be reported. If not, why?</p> <p>The report should be revised and expanded to include a more complete presentation of data and thorough interpretation and analysis of data so that conclusions made for this potential source area can be assessed.</p>

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33	4.3.2/31	<p>VOC contamination in soils at the AMRI facility appeared to be confined to shallow depths.... The relative masses observed at the site are typically indicative of residual contamination, as evidenced by low concentrations and somewhat abrupt changes in concentrations in comparison to surrounding samples. In addition, the detected soil-gas appeared to diffuse from the highest detected masses.</p> <p>.... the available data also do not indicate that soil contamination at the AMRI facility impacted groundwater.</p>	<p>It is unclear how it can be concluded that VOC contamination is confined to shallow depths at the AMRI facility when TCE was detected in soil vapor at depths of between 30 and 90 feet bgs and PCE was detected at 30, 60, and 120 feet bgs, particularly in light of the fact that water levels were significantly shallower when the facilities in this area were actively using and disposing of COCs. The first sentence in this paragraph should be revised to accurately characterize the data.</p> <p>Further, the notion of "relative masses" is qualitative and ambiguous. Further, it is confusing to switch between concentration and mass. It is also unclear what is meant by "residual contamination"? If it is meant to refer to low concentrations that remain in place and are a remnant of past contamination that was presumably more significant in magnitude, then a discussion of the potential for the AMRI facility to have been a historic source area should be provided. As indicated above, the water table was much shallower during the time when operations occurred on the property, increasing the chances for deep vadose zone mass to reach groundwater. Low concentration detections could also indicate there are higher concentrations nearby that were not characterized. In any case, it is unclear how "abrupt changes in concentrations" relate to the undefined concept of residual contamination or how either supports the case for no impact to groundwater?</p> <p>Finally, the concept and relevance of soil gas appearing to "diffuse from the highest detected masses" is unclear. Is this also meant to somehow relate to the conclusion that facility operations did not impact groundwater? If so, more explanation and support are needed.</p> <p>The conclusion that available data do not indicate that soil contamination at the AMRI facility impacted groundwater is unfounded for many reasons, including: (1) the extent of investigative activities appears too limited to fully characterize the source potential; (2) the presentation of data in the report is incomplete; (3) the interpretation of the data that are reported is minimal and incomplete, and (4) analyses to support the conclusion are not provided. For reasons 3 and 4, the concept of "time" should be considered. The AMRI facility operated from 1950 to 1969, a period when the water table was many tens of feet shallower than today. The potential for COCs to migrate to groundwater was higher in the past than today because the distance from the surface operations to the water table was smaller.</p> <p>The paragraphs cited in this comment exemplify a critical deficiency in the RI report. With regard to conclusions made about source areas, it is imperative that ADEQ demonstrate that the investigations were sufficient to characterize the source area, present a clear and complete summary of all relevant data, objectively interpret those data considering all reasonable source scenarios, and conduct appropriate analyses where needed to support conclusions. For example, modeling COC transport through the vadose zone should be conducted to assess source potential.</p> <p>The RI report should be substantially revised to improve the presentation, interpretation, and analysis of data at the potential source areas. As is, the content of the report is clearly insufficient to support conclusions about source areas, except the ECDC landfill, where a previous thorough RI was conducted that identified it as a source area.</p>
34	4.3.2/31	<p>Evaluation of 2001 soil-gas data for Western Trailer/Western Stucco indicated that the concentrations observed at the site were not indicative of an active source area. The relatively low concentrations of PCE observed on the property were likely the result of a historic release or possible minor cleaning operations.... Available data from Western Trailer/Western Stucco do not indicate any impacts to groundwater from the soil contamination.</p>	<p>How was it determined that soil gas concentration data do not indicate an active source area? Since the concentration and sample depth data were omitted from the report, it is impossible to judge the validity of this conclusion. As for other potential source areas investigated, the presentation of data for Western Trailer/Western Stucco in the draft RI is incomplete and missing critical data. The data presentation clearly does not support the conclusion that the source area is inactive, nor does it necessarily indicate that the PCE concentrations were the result of a release during possible minor cleaning operations. If additional information exists to support these claims, it should be provided in the report. Overall, the interpretation of data at this site is overly simplistic, unfounded based on the information presented in the report, and does not support the conclusion that no impact to groundwater is indicated.</p> <p>The report should be revised to include a complete summary of the available soil quality data, a thorough and objective interpretation of those data, and relevant analyses to support reasonable conclusions. Further, if uncertainty in the data, interpretation, and analyses exist, the effect of this uncertainty on the ability to conclude the possibility of a groundwater source should be clearly discussed. Key assumptions and limitations of the characterization and interpretation of data should also be discussed.</p>

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35	4.3.2/32	<p>The pattern of PCE in soil gas appears to be the result of minor historic releases. Two areas had detections of PCE: south of the smaller building on the west side of the Wrecksperts property and west of the center of the property. The highest concentrations were observed in the center of the Wrecksperts (AMRI et al) parcel in the vicinity of the former waste oil surface impoundments. This vicinity also correlates with the location of the former aboveground storage tanks (ASTs)....</p> <p>Twenty-eight VOCs were detected in the soil vapor analysis with each sample containing at least five compounds. PCE, TCE, and hexane were detected in every sample. Many of the detected compounds are associated with waste oil and are likely a result of recycling operations on the Wrecksperts (AMRI et al) property (URS, 2007b), and the available data do not indicate that the soil contamination found on these properties impacted groundwater.</p>	<p>Again, the presentation and interpretation of data for the Wrecksperts property do not support the statement that PCE in soil gas was the result of minor releases. The conclusion that data do not indicate that soil contamination impacted groundwater is unfounded and inconsistent with reported data. The fact that PCE and TCE were found in every soil vapor sample should indicate a high likelihood of a significant source, or should have prompted further investigation to determine the meaningfulness of the prevalence of these COCs in soil vapor. Further, the presence of TCE at 30, 60, and 90 feet bgs in soil vapor, along with relatively stable, high concentrations of PCE, TCE, cis 1,2-DCE and vinyl chloride repeatedly detected in groundwater in the W-32 well, indicates a source of VOCs to groundwater likely exists or existed on or near the Wrecksperts property. If other data exist, or other interpretation of data was conducted that support the conclusion of no groundwater impacts, they should be provided in the report rather than by reference. The reader should not have to obtain and review reference material to judge the reasonableness of such an important conclusion.</p> <p>During the ADEQ records search, M&A found the results from deep soil vapor sampling conducted at multi-port vapor sampling wells SVE1, SVE2, and SVE3 on the Wrecksperts property from November 2006. Each well was screened to sample vapor from 33, 53, 73, and 93 feet bgs. All vapor samples from all depths in these wells had reported detections of PCE and TCE, along with a variety of other VOCs. PCE concentrations were between 11 and 220 parts per million by volume (ppmv), and TCE concentrations were between 2.3 and 53 ppmv. The draft RI states that "Twenty-eight VOCs were detected in the soil vapor analysis with each sample containing at least five compounds. PCE, TCE, and hexane were detected in every sample." At no point is it made clear in the RI report that these statements refer to vapor samples collected from depths of 33, 53, 73, and 93 feet bgs in SVE1, SVE2 and SVE3, rather than from shallow vapor samples. Information on the sample depths, specific VOCs detected, and concentrations should be provided in the RI report. This information relates very directly to the question of whether contamination at the AMRI property impacted groundwater, and should not have been omitted from the report.</p> <p>This section of the report should be substantially expanded and revised to completely summarize all available data, completely and objectively interpret those data, provide the results of analyses conducted, if any, that support the conclusion, and discuss assumptions and uncertainty in the assessment of potential sources on the Wrecksperts property.</p>
36	4.4.1/33	TCE in concentrations up to 54 ppm and hydrocarbons in concentrations up to 53,000 ppm were measured in soil samples collected at the [E.C. Winter] site.	The location and depth of these samples should be provided. TCE at 54 ppm is a significant concentration. Is this the same sample described two paragraphs later where "TCE exceeded the residential SRL"? The report should include concentrations rather than the concept of SRL exceedances so the reader can make the connection and put the magnitude of the contamination into context.
37	4.4.1/33	TCE exceeded the residential SRL in the sample collected at 10 feet bgs. Appendix I contains a figure illustrating the sample locations and summary of analytical results.	<p>More information should be provided in the text about the extent of TCE contamination in soil. TCE was detected at 2.3 milligrams per kilogram (mg/kg) at 25 feet bgs in soil boring 2. While TCE was not detected above lab reporting limits in a sample from 30 feet bgs, the detection at 25 feet should have prompted additional deep soil borings near boring 2 to more completely characterize the presence of TCE in deep soils. Detecting VOCs in soil (i.e., not soil gas) in Arizona, particularly at depth, is meaningful. As ADEQ is aware, soils are often found to be "clean" at sites with known vadose zone and groundwater contamination if organic carbon content is low.</p> <p>The information presented in Appendix I is difficult to understand and should include narrative text to aid the reader in interpreting the information. For example, the map indicates that a 12th sample was collected from boring 2, but the tables do not include a 12th sample.</p>
38	4.4.1/33	During a January 2001 site visit, a previously undocumented well on the property was observed. Because of concern that the well could be a conduit for the migration of contaminants, the well was abandoned in June 2001 in accordance with ADWR requirements. Based on video obtained during investigation of the well, the total depth was approximately 110 feet bgs. Water was not encountered during the abandonment process. However, because the well had remained open for an unknown period of time, the soil at the bottom of the well was analyzed for semi-volatile organic compounds and VOCs. The results were below method detection limits for all analytes tested (URS, 2001).	We agree that this well could have been a conduit for the migration of contaminants to groundwater. Are records available for the original drilled depth of the well or other relevant information? It is likely that the original well was drilled deeper than the 2001 tagged depth of 110 feet. However, even if 110 feet is the original well depth, groundwater was likely present in the top of the soil fill in the well or was there an effort to drill into this material to collect a sample that was not exposed to the air? In any case, the lack of VOCs in the soil at the bottom of the well does not rule out the likelihood that this well was a conduit.
39	4.4.1/33	Five soil borings were drilled to further delineate the vertical and lateral extent of residual contamination beneath the former oil impoundment area. Boring B-1 was drilled to a depth of 375 feet bgs, while boring B-2 through B-5 were completed to approximately 130 feet bgs at locations depicted in Figure 8. Grab groundwater samples were collected from B-1, B-3, B-4 and B-5. No VOCs were reported above (URS, 2002f).	The specific compounds and concentration of VOCs detected should be reported in a table rather than simply stating that all concentrations were below Aquifer Water Quality Standards. Also, more information should be presented about the sampling method. Volatilization of the VOCs would likely occur during a grab sample, biasing the results low. This type of information should be discussed in the report.

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40	4.4.1/34	<p>In July 1995, as part of the Phase 3 LESP, Tracer Research Corporation performed a shallow soil-gas survey. Twenty-three locations in the vicinity of Curtis Road and Highway Drive including ten sampling points east of the site and adjacent to the former E.C. Winter Oil Service site were selected. Soil-gas samples were also collected from locations within a county easement near several businesses that may have used hazardous materials such as solvents. Sample depths ranged from 5.0 to 6.5 feet bgs. The highest concentrations of PCE, TCE, and 1,1,1-trichloroethane were 2,224 ppbv, 737 ppbv, and 560 ppbv, respectively. These concentrations were found in the northeast corner of the E.C. Winter property (Tracer Research, 1995)....</p> <p>A soil-gas monitor well screened at discrete intervals at 20, 40, 60, and 75 feet bgs was installed by Growth Resources, Inc., on the property 20 feet west of the northernmost manufactured home (Growth, 1997b). Three rounds of soil vapor sampling data were collected in 1997. The results showed elevated concentrations of PCE in the soil-gas.</p>	<p>The ubiquitous detection of PCE, TCE, and 1,1,1-TCA indicates that these compounds are widely distributed in the subsurface at and near the E.C. Winter site. This fact is significant and its implications should be discussed.</p> <p>The concentrations and depths of detection for PCE (and other compounds, if they were detected) in the soil vapor monitor well should be thoroughly discussed and analyzed. Detection of PCE and other VOCs in soil gas at or below 20 feet suggest a source to groundwater at the E.C. Winter site, especially since VOCs were widely detected in shallow soil vapor, which eliminates the possibility of volatilization from groundwater into the vadose zone.</p> <p>The name of the soil-gas monitor well with the highest concentrations should be specified in the text. Based on the map in Appendix J, we assume it was TR-101. Details regarding vapor sampling results for well TR-101 were found in a sampling report by Fluor Daniel GTI from 1998. This report was <u>not</u> referenced in the draft RI report; however, it contained useful information on vapor samples collected from vapor monitor well TR-101 during events conducted in June, July, and October 1997. Vapor samples collected at depths of 20, 40, 60, and 80 feet contained TCE ranging from 4,760 to 8,410 ppbv, PCE ranging from 189 to 412 ppbv, 1,1-DCA ranging from <49 to 584 ppbv, 1,1-DCE ranging from <30 to 113 ppbv, and 1,1,1-TCA ranging from <30 to 91 ppbv. Rather than summarizing all of this information using the phrase "elevated concentrations of PCE" were detected, these data should be provided and discussed in greater depth in the report. In fact, TCE concentrations appear to be higher than PCE in the vadose zone below the E.C. Winter site, and in both cases there is a concern with respect to potential groundwater impacts.</p> <p>The lack of a complete presentation, interpretation, and analysis of data in the report overall, and particularly in this section on a critical potential source areas, is unacceptable. This section should be substantially expanded. The E.C. Winter site appears to have a significant history of VOCs being detected in both soil and soil gas in both the shallow and deeper portions of the vadose zone, which make it a likely source area for groundwater contamination.</p>
41	4.4.1/35	<p>In April 2002, an investigation of the deep, coarse-grained soils was performed to augment existing property information, and provide site-specific information necessary for design of a bioventing or SVE system. Four borings were advanced to approximately 130 feet bgs. As a part of the investigation, URS collected soil samples, soil gas samples and groundwater samples from borings within and surrounding the former oil impoundment area. VOCs were detected in soil-gas samples and groundwater samples at several locations and depths on the property. No VOCs were detected in sub-surface soil samples.</p>	<p>It is unclear whether the borings discussed in the paragraph are B-2 through B-5. This should be clarified. Much more information about these soil borings should be presented in the report, including at a minimum the location, sample depths, analytical results of sampling soil, soil vapor, and groundwater, lithologic logs, and information about groundwater (if any). Maps and data tables of the results should be provided. Simply indicating that VOCs were detected in soil-gas and groundwater samples at several locations is clearly insufficient when evaluating potential source areas.</p>
42	4.4.1/35	<p>The results for the samples collected from SVE wells B2 and B5 are as follows:</p> <ul style="list-style-type: none"> • TCE concentrations were highest in the extracted gas sample collected from Well SVE B-5 at 2.4 parts per million volume. • PCE concentrations were highest in the extracted gas samples collected from Wells SVE B-2 and SVE B-5, both at 1.1 parts per million volume. 	<p>Units for these results are listed as "parts per million by volume" (ppmv), which are significant concentrations. In previous sections of the report, as well as in Appendix K and Table 7 (where these results originated), results are reported in units of ppbv. Reporting concentration results in the text in ppmv rather than ppbv is confusing and could make the concentrations appear lower to readers unaccustomed to working with soil gas data.</p>
43	4.4.2/36-37	<p>... These results indicated that the current levels of TCE in the soil vapor were below that expected in an equilibrium condition. Based on this it is possible that the VOCs in the soil vapor were a result of the groundwater volatilizing into the soil vapor, rather than a continuing source from within the soil.</p> <p>Based on review of the existing data and previous remedial actions, current onsite soil and soil-gas conditions do not appear to pose a threat to human health and the environment. In addition, the available data do not indicate that the soil contamination at the E.C. Winter property impacted groundwater.</p>	<p>The equilibrium TCE concentration between soil vapor and groundwater was estimated to postulate that TCE in soil vapor may be volatilizing from groundwater to vapor, and a continuing source of TCE to groundwater does not exist. More information about this analysis should be provided. Further, the potential that TCE migrated to groundwater from the E.C. Winter site in the past should be evaluated and is not minimized based on the equilibrium analysis. The body of soil quality data at the site indicates that there was likely a source of TCE (and possibly PCE) to groundwater at the E.C. Winter site.</p> <p>The conclusion that data from the E.C. Winter site do not indicate that the property impacted groundwater is unfounded and inconsistent with the data presented in the report. PCE and TCE were detected in shallow and deep soil vapor. TCE was detected in soil at a concentration above the SRL at a depth of 25 feet. Moreover, a soil vapor extraction (SVE) system was operated at the site and removed 0.85 and 4 pounds of PCE and TCE, respectively, from soil vapor. More PCE and TCE mass would likely have been removed if the system had continued to operate or was expanded. These results clearly suggest that a source of TCE and PCE to groundwater could exist today or could have existed historically at the E.C. Winter site.</p> <p>The lack of a complete and objective interpretation of the data and results of the equilibrium analysis is unacceptable. Furthermore, the conclusions made based on the data reported are completely unfounded. We strongly disagree with the conclusion that data do not indicate a source of PCE and TCE to groundwater at the E.C. Winter site. If other data or other analyses are available the support the "no source" conclusion, it should be thoroughly summarized and interpreted in the RI report.</p>

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44	4.5.1/40	During July, October, and November of 2001, URS conducted an investigation documented in Geophysical and Passive Soil Gas Surveys, Interstate 10 Frontage Road Corridor – El Camino del Cerro to Sunset Road, Tucson, Arizona, (URS, 2002d). Described in this report were increased concentrations of PCE, BTEX, and PAHs observed on the I-10 Surplus property. During this investigation, the highest PCE concentration was located on the north side of the I-10 Surplus site building. The 2002 report stated that the distribution pattern for PCE in soil gas was possibly the historic release of solvents used in the maintenance area.	<p>More detail is needed on how the PCE concentrations in soil gas were interpreted? At what depths were PCE concentrations detected? Were follow up investigations at deeper intervals conducted? If not, why?</p> <p>The information in Appendix L is insufficient to interpret the meaning of the maps. A narrative should be provided to make this information useful to the reader.</p>
45	4.5.2/41	<p>The 2002 soil-gas survey indicated elevated soil gas concentrations of PCE, BTEX and PAHs for two locations in the I-10 corridor and recommended further soil investigations in the vadose zone for the area of I-10 Surplus.</p> <p>The elevated relative mass of PCE, BTEX, and PAHs observed on the I-10 Corridor properties are interpreted to be the result of vehicle maintenance activities, ASTs, and USTs causing isolated minor releases. The available data do not indicate that soil contamination at the properties along the I-10 Corridor impacted groundwater.</p>	<p>Insufficient information was provided in Section 4.5.1 to support the conclusion that available data do not indicate that soil contamination at the properties along the I-10 Corridor impacted groundwater. Was this conclusion reached in the original work and documented in the report? PCE was detected in over 40% of the soil gas samples, which indicates widespread contamination. The PCE concentrations were not reported; however, they were stated as having exceeded the 10⁻⁴ risk level (which suggests meaningful concentrations were detected). Because the depth and specific concentrations detected during the sampling event were not reported, the reader cannot assess the completeness of the investigative work and validity of the conclusion.</p> <p>The reader should not be expected to obtain and evaluate the reference material to determine the reasonableness and validity of the site investigation methodology, sufficiency of data, objectivity of the interpretations, and results of any analyses conducted. This information should be provided in the RI report, at a minimum, in a clearly organized and complete appendix.</p>
46	4.6.1/42	Analytical results for select analytes are summarized in Tables 5 through 9.	<p>Tables 5 through 9 should include all water quality data collected during both the County RI and the ADEQ RI. Data for other constituents for the entire period of record are essential to evaluating source contributions and the evolution of the plume over time.</p>
47	4.6.1/42	The conceptual model for the RI report proposed the VOC contamination in the GOU includes an initial release from the vicinity of the landfill followed by a slow northward movement in groundwater, eventually joining with an area affected by at least one different release of VOCs to the groundwater (Malcolm Pirnie, 1997b). However, this older conceptual model has been revised by the conclusions of this RI Report as presented in Section 5.4.	The report should provide a clear and complete explanation documenting why this conceptual model of a multiple source plume was discarded by ADEQ in favor of a conclusion that the ECDC landfill is the sole source for the entire plume. In fact, data collected at the various source areas after this conceptual model was proposed in the 1997 ECDC landfill RI report has only strengthened the case for suspecting historical and potentially on-going sources to the plume from other properties with the Site. Multiple source plumes are the norm rather than the exception in areas that were heavily industrialized prior to the advent of modern chemical handling and disposal protocols. The information provided in the draft RI does not support the conclusion of a single source plume.
48	4.6.1/42	Three shallow monitor wells (P-1, P-2, and P-3) and 19 regional aquifer monitor wells were installed between January 1988 and October 1995 as part of the Phase 3 LESP (Figure 10).	Figure 10 only shows P-1 through P-3 and does not show the other 19 monitor wells referred to in the text. Further, Figure 10 does not clearly distinguish between soil gas and groundwater monitor wells. Figure 2 as well as Figure 10 should be used as references for the well locations. Further, consistent monitor well names should be used throughout the report.
49	4.6.1/43-44	Groundwater Treatment	<p>More information about the hydraulic capture attained during treatment system operation should be provided. References to and interpretation of specific water level contour maps (provided in Appendix D) for the period when extraction was occurring at the ECDC landfill should be provided in the report. The reader would also benefit from a description of results of capture zone modeling conducted by Pima County along with interpretation of the degree to which historical and planned future extraction at the ECDC landfill fits into the overall site remediation.</p> <p>More information about the rebound of COC concentrations in groundwater should be provided to assess the long-term effectiveness of the brief treatment system operation. References to and interpretation of specific plume maps (provided in Appendix M) for the period when extraction was occurring at the ECDC landfill should be provided in the report.</p>
50	4.6.2/44-45	Private Wells	Available information about the competency of surface well head completions and other well construction details should be provided, along with a reference to Table 2. Discussion of the potential for the private wells to be historical conduits for contaminant migration to groundwater is appropriate.
51	4.6.2/46	Medium zone wells have submerged screens typically in the upper part of regional aquifer, with screen intervals typically ranging from approximately 200 to 280 feet bgs.	Why is CDC-29M not considered a deep monitor well, since its screened interval extends from 345-348 ft bgs?

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52	4.6.2/46	Monitor well construction diagrams and boring/cutting descriptions are included in Appendix N.	<p>What is ADEQ's interpretation of the VOC concentration data obtained using the photoionizing detector (PID) during drilling of Soil Boring #1? The VOC concentrations appear to increase with depth, with the highest concentrations detected below a depth of 300 feet bgs. What is meant by "too hot" with respect to the VOC concentration?</p> <p>These data could suggest a historic and potentially on-going source of groundwater contamination from the E.C. Winter site. More interpretation of these PID data should be provided in the report.</p> <p>Since the Soil Boring #1 log shows samples were collected, where are the sample results reported and what concentrations of VOCs were detected?</p>
53	4.6.2/47	See Appendix C for details on the 2013 site activities.	<p>The information in Appendix C indicates that monitor wells located southwest of I-10 were not included in the 2013 monitoring event. Why were these wells omitted from the monitoring event? We understand that ADEQ did not request access to these wells from Pima County for the monitoring event. Including these wells is particularly important because ADEQ has concluded in the RI report that the ECDC landfill is the primary and potentially the exclusive source of groundwater contamination.</p> <p>A complete groundwater monitoring event that includes all accessible wells in the Water Quality Assurance Revolving Fund (WQARF) site should be conducted before reaching conclusions about source contributions or other fate and transport concepts. This was a data gap identified by URS in the report. In this monitoring event, a comprehensive list of analytes should be used to thoroughly characterize groundwater quality. As previously noted, the potential for current or historical groundwater sources at the AMRI Oil, Wrecksperts, and E.C. Winters sites exists, despite the conclusions presented in the draft RI report. A comprehensive sampling event might indicate spatial variations in chemicals constituents in groundwater that would provide new and useful information for delineating sources and understanding the evolution of the plume.</p>
54	4.6.3/48	4.6.3 Distribution and Trends of Contamination in Groundwater	This section should include data from the CDC Landfill RI report and other historical data, rather than only data from 2001.
55	4.6.3/48	Summary tables for PCE, TCE, 1,1-DCE cis-1,2-DCE, and vinyl chloride are included as Table _ through Table _ . Since February 2001, there have been 29 sampling events and sampling of wells at SR/ECDC has been conducted as listed in the schedule presented in Table _ .	The table references should be provided.
56	4.6.3/49	As of 2013, the depth to regional groundwater was approximately 158 feet bgs, falling at a rate of approximately 1 foot per year.	The report should include groundwater elevation hydrographs to enable the reader to evaluate changes in groundwater elevations over time across the Site. Is 158 feet bgs an average depth to groundwater? Variability across the Site should be discussed. The implication of declining water levels, which would be evident on the hydrographs, should also be discussed with respect to source area contributions in the past when water levels were higher.
57	4.6.3/49	Groundwater flow direction is generally to the north-northwest as shown on Figure 4. Groundwater flow at the north end of the site is influenced by pumping of Metro Water's South Shannon well.	<p>Figure 4 has several problems: (1) the contours extend too far beyond the network of wells and data shown on the map; (2) groundwater flow arrows are not perpendicular to contour lines (unless information about anisotropy is available); and (3) contours do not cover entire site area no data or interpretation of patterns of groundwater movement are included for the ECDC landfill or other areas in the southwest part of the site.</p> <p>Why are some medium zone wells missing from Figure 4?</p> <p>Figure 4 does not show influence from the South Shannon Well on groundwater flow. In fact, contours suggest flow in the north part of the site that is centered on monitor well W-31M.</p> <p>Groundwater contours for the shallow and deep zones should also be provided in the RI to provide a complete understanding of the groundwater system.</p> <p>Figure 4 should be revised to completely display groundwater flow conditions in the Site so the reader can interpret them with respect to the extent of groundwater contamination.</p>
58	4.6.3/49	Concentrations of PCE and TCE in the shallow zone often exceed the AWQS of 5 µg/L. In 2013, monitor well SRC-W38S contained the highest concentrations of PCE and TCE at 122 and 63.2 µg/L, respectively. SRC-W38S is the only shallow zone well with concentrations of cis-1,2-DCE that exceed the AWQS of 70 µg/L.	<p>The highest PCE and TCE concentrations occur at well SRC-W38S, which is located immediately downgradient of the AMRI Oil/Wrecksperts site. These high concentrations in shallow groundwater suggest that the most likely source of PCE and TCE at this location came from the AMRI Oil/Wrecksperts site not, the ECDC landfill. This is further indicated by the persistence of high PCE and TCE concentrations at well SRC-38S since 2005, possibly indicating a continuing source. Other shallow wells with relative stable, high concentrations of PCE and TCE (see Appendix P) are W-24, W-32S and W-45S which are also in the vicinity of the AMRI/Wrecksperts site and downgradient of the E.C. Winter property. Additional analysis of the shallow groundwater water quality data, including implications for the various potential source areas, should be included in the report.</p> <p>Consistent monitor well names should be used in the RI report.</p>

**TABLE 1. DETAILED COMMENTS ON FINAL DRAFT REMEDIAL INVESTIGATION REPORT
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59	4.6.3/50	Figure 16 through Figure 19 present contours for TCE and PCE in the shallow and medium zone, respectively, in the regional aquifer based on the April 2013 sampling results.	<p>In fact the maps appear to show data for February – May 2012. Why are 2013 water quality results for the shallow, medium, and deep zones not shown on maps in the report? Why are data from all the wells not included?</p> <p>Figures 16 through 19 should be arranged in the order of the text for clarity. Figures 18 and 19 should precede Figures 16 and 17 to coincide with the discussion of PCE data then TCE data.</p> <p>Figures 16 through 19 should be interpreted in the report. The report text that follows this section relies on the time series chemical graphs in Appendix P.</p>
60	4.6.3/50-53	<p>Tetrachloroethene</p> <p>Shallow Zone Medium Zone Deep Zone</p> <p>Trichloroethene</p> <p>Shallow Zone Medium Zone</p>	<p>The summary of PCE and TCE concentration data in this section clearly indicates that the highest concentrations in shallow groundwater are immediately downgradient of the AMRI Oil/Wreckspersts site. Given the concept that the contaminated groundwater is migrating to deeper zones as it migrates from south to north, the detection of the highest PCE and TCE concentration in shallow groundwater in the central portion of the plume strongly suggests a source in central portion of the plume.</p> <p>This concept should be discussed in the report.</p> <p>The table references in section should be added.</p> <p>The temporal variations in PCE and TCE concentration in the monitor wells should be analyzed to assess the rate of contaminant transport. This analysis should then be used to assess source areas. For example, do the estimated groundwater directions and velocities support the conclusion that the ECDC landfill is the primary source? This type of analysis could be done using a groundwater model.</p> <p>In order to conduct a thorough analysis of the temporal variations in PCE and TCE, all historic data VOC data for critical wells should be used. VOC data from W-5 starts in 1987, W-14 in 1989, W-16 in 1991, W-17 in 1994, and W-20 in 1994. These data should be included on the time series graphs in Appendix P for completeness.</p> <p>The PCE contours on Figure 19 should be dashed on the southeastern portion of the plume given that data do not exist in that area. As is, the figure does not appropriately reflect the uncertainty in the PCE distribution in the medium zone.</p> <p>The discussion of the observed temporal variations in PCE and TCE concentrations in the report is confusing. Interpretation of the temporal trends with respect to potential source areas and changes in groundwater flow direction (due to pumping and/or recharge events) is needed in order to understand the importance of these variations.</p>
61	4.6.3/53	<p>1,4-Dioxane</p> <p>During the 2013 sampling event, ADEQ requested that URS sample for 1,4-dioxane. 1,4-dioxane was found in shallow, medium, and deep zoned wells. The highest level of 1,4-dioxane was detected in well SRC-W48M at 3.0 ppb. Currently, there is no AWQS for 1,4-dioxane. As this was the first year ADEQ requested sampling for 1,4-dioxane, there are insufficient data for trend analyses. Appendix C illustrates the 1,4-dioxane detections and contains the 2013 analytical data.</p>	<p>1,4-dioxane is a known stabilizer for 1,1,1-TCA. Correlation between these compounds in the source area should be analyzed. The data suggest the 1,1,1-TCA was more prevalent in the source areas north of I-10 in the area where highest 1,4-dioxane concentrations are detected in groundwater.</p> <p>Wells W-38S, W-43, W-44S and W-45S, which all have 1,4-dioxane concentrations > 1.0 ug/l, are located immediately downgradient of the E. C. Winters property, where 1,1,1-TCA, and 1,1-DCE were detected in deep soil vapor at concentrations of up to 240 ppbv and 113 ppbv, respectively. 1,1,1-TCA is relatively unstable and degrades directly to 1,1-DCE under aerobic conditions.</p>
62	4.6.3/53-54	<p>Summary of the Extent of Contamination</p> <p>Historically, the highest concentrations of the plume were in the vicinity of Kaylor Trailer from 1994 to 1996 but as discussed previously in Section 4.6.2, the plume extent had not been fully defined in deeper groundwater.</p>	<p>As noted, it is important to recognize that the plume was only partially delineated by 1996, and as discussed in the previous sections, the highest PCE and TCE concentrations in shallow groundwater were observed immediately downgradient of the AMRI Oil/Wreckspersts site. The steady PCE and TCE concentration near AMRI Oil/Wreckspersts suggests an ongoing source near these sites.</p> <p>The summary of extent of contamination should include more interpretation and analysis of data, especially to delineate source areas based on the spatial distribution and temporal variations in concentrations.</p>

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63	5,4/57-59	<p>Contamination Variations in the Regional Groundwater</p> <p>PCE and TCE Distribution</p> <p>Generally, the groundwater contaminant plume extends from its source at the CDC landfill area north and east to slightly north of the Metro Water South Shannon well. As previously discussed the major components of the groundwater plume include TCE and PCE, with generally lesser concentrations of cis-1,2-DCE, vinyl chloride, and Freon 12 and 11. Much of this analysis is based on an evaluation of the PCE and TCE trends as these appear to be the primary components of the contaminant plume.</p> <p>Highest concentrations PCE/TCE ratio</p>	<p>The supposition that the only source of groundwater contaminants is the CDC landfill area is not supported by the data developed during the RI, and as reported in the RI report. Analysis of these data has not been provided in the report, but clearly should be to conclude that the only source is the ECDC landfill.</p> <p>Assessment of the highest concentrations is complicated by the phased installation of the wells over time. Where have the highest PCE and TCE concentrations been observed for all times when samples were collected?</p> <p>What is the significance of the PCE/TCE ratio? A map of ratios would support the discussion. If the Roger Road sludge pond provided a carbon source for biodegradation of PCE to TCE in the wells cited in the report, why is this effect not observed in all wells immediately downgradient of the pond? Do field sampling data exist to indicate depressed dissolved oxygen and oxidation-reduction potential (i.e., reducing conditions) in the wells with TCE concentration higher than PCE concentration?</p> <p>Variations in PCE/TCE ratio could indicate contributions from several source areas to the plume.</p> <p>Where is well W5S? Is this CDC-W5? The inconsistent naming convention for the wells is distracting and should be fixed.</p> <p>With regard to biodegradation, data are not provided that characterize conditions in the groundwater to assess the likelihood of biodegradation. A much more detailed analysis of biodegradation should be conducted to assess its importance in delineating sources. ADEQ asserts that cis-1,2-DCE and vinyl chloride are not accumulating; however, water quality data suggest they are.</p>
64	5,4/59	<p>The highest concentrations observed within the medium depth wells are located downgradient from the highest concentrations within the shallow depth, which supports the possibility that as the VOC plume moves downgradient from well 38S, it also is transported downward into a deeper portion of the aquifer (designated as the medium depth). The highest concentrations observed at medium depth wells occur at wells on either side of the Rillito Creek, which may indicate that recharge resulting from ephemeral flows in the creek may contribute to the observed downward movement of VOCs in this area. In addition, the hotspot locations in the medium and shallow depths are upgradient from the Metro Water South Shannon Well, which pumps a significant volume of water annually. This well appears to provide hydraulic containment of the VOC plume and prevents it from migrating farther north. It is also likely one of the contributing factors to the downward movement of the plume.</p>	<p>Why wouldn't recharge from Rillito Creek dilute the plume instead of causing high concentrations to migrate deeper?</p> <p>See comment below in relation to vertical gradients and an alternate hypothesis for observed higher concentrations at depth downgradient from the E.C. Winters site.</p> <p>The hotspots in the shallow and medium depths are centered southwest of the South Shannon Well. Groundwater contours on Figure 4 show the direction of groundwater flow is to the north-northwest. This indicates the hotspots are not directly upgradient of the South Shannon Well and suggests the possibility of an additional unknown source which is upgradient of the South Shannon Well.</p> <p>A summary of the analysis conducted to determine that pumping at the South Shannon Well contains the plume should be provided in the report. This is an important concept for the WQARF site, especially if the pump and treat system at the well will become part of the final remedy.</p>
65	5,4/60	<p>1,4-Dioxane is primarily used as a stabilizer for chlorinated solvents and is found in some groundwater plumes with other VOCs. Compared to PCE and TCE, 1,4-dioxane is a cyclic ether that mixes with water readily and can be transported in groundwater far in advance of associated solvents.</p>	<p>1,4-dioxane is typically believed to have been a stabilizer and corrosion inhibitor for 1,1,1-TCA, not PCE or TCE, which are chemically stable. Therefore, 1,4-dioxane would be expected to be related to the prevalence of 1,1,1-TCA. More analysis of the relationship between 1,1,1-TCA, its degradation daughter products, and 1,4-dioxane should be provided in the report.</p>
66	5,4/60	<p>Vertical VOC Distribution</p> <p>North of I-10, the VOC plume shows a clear pattern of transport downward within the aquifer as it moves north. The "diving" of the plume is likely the result of some combination of periodic hydraulic head resulting from recharge during flow events in Rillito Creek, the apparent downward trend of the interface between the higher permeability sands and gravels and the less permeable clayey and silty gravels as shown on the Geologic Cross section Figures 3 and 20, and pumping of groundwater from a deeper portion of the aquifer at the South Shannon Well.</p>	<p>An analysis of vertical hydraulic gradients, recharge events, and historical pumping from the South Shannon Well should be conducted to support the proposed mechanisms for vertical plume migration. Review of vertical hydraulic gradients for well pairs based on April 2013 water level data does not support the notion that the plume is diving in response to a head change caused by pumping. There is also no explanation for why this vertical movement only occurs in the area north of the E.C. Winters site. Another possible explanation for migration of the plume to deeper zones is the presence of conduit wells.</p>

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67	5.4/60	Fate and Transport Conclusions	<p>The conclusions reported for fate and transport of contaminants in the groundwater are overly simplistic and not supported by information presented in the draft RI report. First, the presentation of data is incomplete in many ways, including: (1) omission of critical data from the early RI work conducted by Pima County at the CDC landfill, (2) omission of important basic information such as concentrations of contaminants and depths of sampling, and (3) information on maps in the appendices are largely illegible and not accompanied by any clarifying text. Second, interpretation of data is insufficient and subjective, largely because the data provided are incomplete and conclusions derived from the data are not supported by information presented in the draft report. Third, the report lacks analysis of data. While the report provides some information on the spatial and temporal variations in contaminant concentrations in groundwater, this information was not subjected to any analysis to determine how trends might indicate the location and status of source areas. Analysis of the spatial and temporal variation in VOCs in groundwater should have been done to correlate the rate and direction of groundwater flow and potential source areas. Impacts of pumping and recharge in relation to fate and transport should be fully evaluated. Typically, this analysis is done using models. In this case, VLEACH would have been appropriate to assess fate and transport of contaminants in soil and soil vapor, leading to an assessment of anticipated groundwater impacts. MODFLOW/MT3D (or RT3D to simulate reactive transport) would have been appropriate to evaluate fate and transport of contaminants in the groundwater system.</p> <p>The conceptual model of contaminant fate and transport presented in the report is incomplete and one of several equally likely conceptual models. All likely conceptual models should be fully explored and evaluated in terms of their relevance to observed conditions and the potential sources.</p> <p>Given the issues described above, the report content and deficiencies noted indicate that the RI report was prepared with the presupposed assumption that the ECDC landfill was the only source of VOCs to the groundwater. While the presentation, interpretation, and analysis of VOC data in the soil and soil vapor at potential source areas north-northeast of I-10 were incomplete and insufficient, what is presented clearly indicates a strong potential for contributions to the VOC plume from multiple sources.</p>
68	5.4/61	Specifically, it appears that the dissolved VOC plume is transported downward and northeast towards the high capacity South Shannon well where it is hydraulically captured and prevented from migrating further north.	<p>The statement that the assumed single source plume is "hydraulically captured and prevented from migrating further north" by pumping at the South Shannon Well is not substantiated, nor does it appear to be well founded.</p> <p>Based on our review of the draft final URS Aquifer Testing and Analytical Capture Zone Modeling Results Report, dated February 4, 2005, it appears that capture of the entire plume area, including the CDC Landfill area, is only projected for the modeling scenario that assumes the lower of the two transmissivity values and continuous pumping of the South Shannon Well. Based on Figure 7 in the 2005 URS report, it appears that continuous pumping of the South Shannon Well translates to an average pumping rate of about 750 gpm. Based on review of reported ADWR pumping data for this well through 2011, the maximum average annual pumping rate sustained at the South Shannon Well was about 425 gpm, with the average rate for the most recent available 5-year period being less than 400 gpm. Even if the lower transmissivity value is more representative of the aquifer materials penetrated by the South Shannon Road Well, recent pumping appears to have been insufficient to assume that the plume is being fully captured.</p>
69	6.0/61-62	Conclusions and Data Gaps	<p>As indicated in the above comments, the information presented in the RI report does not support the conclusion that sources of groundwater contamination only exist south-southwest of I-10. It also does not provide a convincing conceptual model to support the conclusion that the entire plume, extending northeast to the South Shannon Well, originated from the single assumed source area (the ECDC landfill and possibly the Drake Property area). Finally, containment of this plume at the South Shannon Well is not substantiated, as mentioned above.</p> <p>The data gaps, along with the broad range of deficiencies in the report, should be addressed before the RI report is finalized, and before the remedial objectives are established.</p>

**TABLE 2. SUMMARY OF INVESTIGATION RESULTS
SHANNON ROAD / EL CAMINO DEL CERRO WATER QUALITY ASSURANCE REVOLVING FUND SITE**

SITE	El Camino Del Cerro	Drake/Lee's Auto	E C Winter	AMRI Oil-Wreckspts Western Stucco-Western Trailer	I-10 Corridor	Area South of ECDC Landfill
SITE USE	Landfill	Auto salvage	Used oil processing	Used oil processing, auto salvage, truck storage	Various businesses	Vacant
OPERATIONAL PERIOD	1973-77	1964 - 1985	1960s through 1971	AMRI 1950-68, Wreckspts 1985 -2001, others (auto repair etc.) 1967 - 1992	Various, since 1950s	NA
SOIL SAMPLING						
Shallow	yes	no	yes	yes	yes	no
Deep	yes	no	yes	yes	yes, to 25 ft	no
SOIL VAPOR SAMPLING						
Shallow soil vapor samples?, depth in ft bgs	yes, 5 to 13 ft	yes, 5 to 19 ft	yes, 5 to 6.5 ft	yes	yes 6 ft	yes
Gore absorber type shallow samples?	yes	no	no	yes	yes	no
Deep sampling?, depth in ft bgs	yes, to 75 ft	no	yes, to 75 ft	yes, to 93 ft	yes, to 75 ft	no
Number of single completion vapor sampling wells	10	none	none	none	none	none
Number of multiple completion vapor sampling wells	none	none	3 wells, monitor & SVE	3 wells @ 30, 50, 70, and 90 ft	3 wells	none
Soil Vapor Extraction (SVE) system?	no	no	yes	no	no	no
GROUNDWATER SAMPLING						
Groundwater sampling?	Yes	Yes	Yes	Yes	Yes	Yes
Groundwater monitoring wells	W-5, W-10, W-15Q, W-19	W-18	W-20, W-29, W-41	W-24, W-32, W-38	Kaylor, Quality, W-20	W-3, W-11
CONTAMINANTS DETECTED¹						
PCE						
Shallow soil	results not found	not sampled	0.62 mg/kg	77 mg/kg	results not found	not sampled
Deep soil	results not found	not sampled	<0.50 mg/kg	3.5 mg/kg	results not found	not sampled
Shallow soil vapor	1,800 ppbv	1,034 ppbv	2,224 ppbv	4.2 ug/l (621 ppbv)	591 ppbv	946 ppbv
Deep soil vapor	7,100 ppbv	not sampled	1,800 ppbv	220 ppbv	140 ppbv	not sampled
Groundwater	480 ug/l	2.7 ug/l	160 ug/l	410 ug/l	450 ug/l	5 ug/l
TCE						
Shallow soil	results not found	not sampled	54 ppm (53 mg/kg)	0.32 mg/kg	results not found	not sampled
Deep soil	results not found	not sampled	0.23 mg/kg (20 ft)	0.37 mg/kg	results not found	not sampled
Shallow soil vapor	8 ug/l (1,488 ppbv)	746 ppbv	737 ppbv	results not found	37 ppbv	1,492 ppbv
Deep soil vapor	1,400 ppbv	not sampled	8,410 ppbv	53 ppbv	64 ppbv	not sampled
Groundwater	206 ug/l	2.9 ug/l	76 ug/l	206 ug/l	180 ug/l	10 ug/l
TCA						
Shallow soil vapor	110 ppbv	110 ppbv	560 ppbv	results not found	200 ppbv	367 ppbv
Deep soil vapor	Unknown	not sampled	240 ppbv	results not found	<7 ppbv	not sampled
Groundwater	2.3 ug/l	<0.5 ug/l	<0.5 ug/l	<0.5 ug/l	<0.5 ug/l	<0.5 ug/l
VC						
Shallow soil vapor	20,000 ppbv	82,320 ppbv	20 ppbv	results not found	results not found	results not found
Deep soil vapor	7,900 ppbv	not sampled	results not found	<0.50 ppbv	5.8 ppbv	not sampled
Groundwater	680 ug/l	6.8 ug/l	86 ug/l	36 ug/l	160 ug/l	25 ug/l
cis 1,2-DCE						
Shallow soil vapor	5,600 ppbv	not sampled	2.4 ppbv	100 ppbv	11 ppbv	not sampled
Groundwater	420 ug/l	1.6 ug/l	190 ug/l	130 ug/l	190 ug/l	11.7 ug/l
Freon 12						
Shallow soil vapor	results not found	1,000 ppbv	results not found	results not found	results not found	results not found
Deep soil vapor	38,000 ppbv	not sampled	2.2 ppbv	7.1 ppbv	330 ppbv	not sampled
Groundwater	260 ug/l	<0.5 ug/l	44 ug/l	35 ug/l	29 ug/l	5 ug/l
Methane						
Shallow soil vapor	results not found	59%	results not found	results not found	results not found	14%
Deep soil vapor	80%	not sampled	results not found	results not found	results not found	not sampled
Hydrocarbons						
Shallow soil	results not found	results not found	54,000 mg/kg	410,000 mg/kg	55,000 mg/kg	not sampled
Deep soil vapor	254,000 ppbv	not sampled	<49,000 ppbv	results not found	results not found	not sampled
RESPONSE ACTIONS						
Contaminated soil removal	none	none	7,859 tons	61,000 tons, 1,378 tons, and 4,421 yds (separate removal actions)	none	none
Soil vapor extraction	none	none	0.85 lbs PCE, 4 lbs TCE	none	none	none
Groundwater pump & treat	37 lbs VOC removed	none	none	none	none	none
Abandon conduit wells	none	unknown	one	one, 102 ft deep	one	one

Notes:

¹ - Maximum reported concentrations

PCE - tetrachloroethene

TCE - trichloroethene

TCA - 1,1,1-trichloroethane

VC - vinyl chloride

DCE - dichloroethene

ppbv - parts per billion by volume

ft bgs - feet below ground surface

ug/l - micrograms per liter

mg/kg - milligrams per kilogram

ppm - parts per million

yds - yards

VOCs - volatile organic compounds

lbs - pounds

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