Final

Facility-Wide Groundwater Monitoring Program
RVAAP-66 Facility-Wide Groundwater
Semi-Annual Report for May 2016 Sampling Event

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

January 3, 2017

Contract Number: W9133L-14-D-0008
Task Order Number: 0003

Prepared for:

National Guard Bureau

NGB-ZC-AQ
111 South George Mason Drive
Building 2, 4th Floor
Arlington, VA 22204-1373

Prepared by:

TEC-WESTON Joint Venture

2496 Old Ivy Road, Suite 300
Charlottesville, VA 22903-4895

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
1-3-2017	Technical	NA

4. TITLE AND SUBTITLE

Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Groundwater Semi-Annual Report for May 2016 Sampling Event

5a. CONTRACT NUMBER

W9133L-14-D-0008

5b. GRANT NUMBER

NA

5c. PROGRAM ELEMENT NUMBER

NA

6. AUTHOR(S)

Andris Slesers
TEC-WESTON Joint Venture
2496 Old Ivy Road, Suite 300
Charlottesville, VA 22903-4895

5d. PROJECT NUMBER

NA

5e. TASK NUMBER

0003

5f. WORK UNIT NUMBER

NA

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

TEC-WESTON Joint Venture
2496 Old Ivy Road, Suite 300
Charlottesville, VA 22903-4895

8. PERFORMING ORGANIZATION REPORT NUMBER

NA

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

National Guard Bureau
NGB-ZC-AQ
111 South George Mason Drive
Building 2, 4th Floor
Arlington, VA 22204-1373

10. SPONSOR/MONITOR'S ACRONYM(S)

NGB-ZC-AQ

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

NA

12. DISTRIBUTION/AVAILABILITY STATEMENT

Reference distribution page

13. SUPPLEMENTARY NOTES

None

14. ABSTRACT

The TEC-Weston Joint Venture (JV) is submitting this facility-wide groundwater Semi-Annual Report for May 2016 in accordance with the Performance Work Statement (PWS), Contract Number W9133L-14-D-0008, Task Order Number 0003, to provide Groundwater and Environmental Investigation Services for the RVAAP-66 Facility-Wide Groundwater Area of Concern (AOC) at the Former Ravenna Army Ammunition Plant (RVAAP); now known as Camp Ravenna Joint Military Training Center (Camp Ravenna) in Portage and Trumbull Counties, Ohio.

15. SUBJECT TERMS

RVAAP-66, Groundwater Monitoring

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Brent Ferry
U	U	U	SAR	24,541	19b. TELEPHONE NUMBER *(Include area code)* 512-651-7108

Reset

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18

THIS PAGE INTENTIONALLY LEFT BLANK

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

January 18, 2017

Mr. Mark Leeper, Acting Chief
Cleanup and Restoration Branch
Army National Guard Directorate
111 South George Mason Street
Arlington, VA 22204

Re: US Army Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage
267000859036

Subject: Ravenna Army Ammunition Plant, Portage/Trumbull Counties. Approval of the "Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Semi-Annual Report for May 2016 Sampling Event," Dated January 3, 2017. Ohio EPA Project ID # 267-000859-036

Dear Mr. Leeper:

The Ohio Environmental Protection Agency (Ohio EPA) has received the Response to Comments on the Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Semi-Annual Report for May 2016 Sampling Event. These responses to comments were received at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) on November 17, 2016. The report was prepared for the US Army National Guard Directorate by the TEC-Weston Joint Venture, under Contract Number W9133L-14-D-0008.

The response to Ohio EPA comments provided an agreement to modify the Executive Summary, Section 4.1, and Section 4.2 based on minor comments related to the categorization of 2,4-dinitrotoluene detections.

The Ohio Environmental Protection Agency (Ohio EPA) has received the "Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Report on the May 2016 Sampling Event" at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. This document was received at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) on January 4, 2017. The report was prepared for the Army National Guard Directorate by TEC-Weston Joint Venture, under Contract Number W9133L-14-D-0008.

This document was reviewed by personnel from Ohio EPA's DERR. Pursuant to the Director's Findings and Orders paragraph 39 (b), Ohio EPA considers the document final and approved.

If you have any questions, please call me at (330) 963-1292.

Sincerely,

Bob Princic for

Kevin M. Palombo
Environmental Specialist
Division of Environmental Response and Revitalization

KP/nvr

cc: Katie Tait, OHARNG RTLS
Kevin Sedlak, ARNG
Rebecca Shreffler/Gail Harris, VISTA Sciences Corp.

ec: Bob Princic, Ohio EPA, NEDO DERR
Rodney Beals, Ohio EPA, NEDO DERR
Tom Schneider, Ohio EPA, SWDO DERR
Albert Muller, Ohio EPA, NEDO DDAGW

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

TEC-Weston Joint Venture (JV) has completed the Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Semi-Annual Report for May 2016. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumption; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing National Guard Bureau policy.

1/3/2017

Andris Slesers, TEC-Weston JV — Date
Study/Design Team Leader

1/3/2017

Mike Chapa, TEC-Weston JV — Date
Independent Technical Review Team Leader

Significant concerns and the explanation of the resolutions are as follows:

THIS PAGE INTENTIONALLY LEFT BLANK

Final

Facility-Wide Groundwater Monitoring Program
RVAAP-66 Facility-Wide Groundwater
Semi-Annual Report for May 2016 Sampling Event

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

January 3, 2017

Contract Number: W9133L-14-D-0008
Task Order Number: 0003

Prepared for:

National Guard Bureau

NGB-ZC-AQ
111 South George Mason Drive
Building 2, 4th Floor
Arlington, VA 22204-1373

Prepared by:

TEC-WESTON Joint Venture

2496 Old Ivy Road, Suite 300
Charlottesville, VA 22903-4895

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT DISTRIBUTION

for the

Final

Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Semi-Annual Report for May 2016 Sampling Event

Former Ravenna Army Ammunition Plant

Portage and Trumbull Counties, Ohio

Name/Organization	Number of Printed Copies	Number of Electronic Copies
Kevin Palombo, Ohio EPA, DERR-NEDO	1	3
Mark Leeper, ARNG-ILE-CR	0	1
Katie Tait, OHARNG-Camp Ravenna	1	0
Kevin Sedlak, ARNG-Camp Ravenna	0	1
Gail Harris, Vista Sciences Corporation	2	2
Brent Ferry, TEC-Weston JV Project Manager	0	1
	4 HC	8 CD

Rod Beals, Ohio EPA NEDO — 1 HC of transmittal letter only
Al Muller, Ohio EPA NEDO — 1 HC of transmittal letter only
Bob Princic, Ohio EPA NEDO — 1 HC of transmittal letter only

ARNG = Army National Guard
NGB = National Guard Bureau
OHARNG = Ohio Army National Guard

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS/ABBREVIATIONS

AOC	Area of Concern
ARNG	Army National Guard
bgs	below ground surface
COPC	constituent of potential concern
CRJMTC	Camp Ravenna Joint Military Training Center (aka Camp Ravenna)
DA2	Open Demolition Area #2
EQM	Environmental Quality Management, Inc.
ft/day	feet per day
FWCUG	Facility-Wide Cleanup Goal
FWGW	Facility-Wide Groundwater
FWGWMP	Facility-Wide Groundwater Monitoring Program
FWSAP	Facility-Wide Sampling and Analysis Plan
GSI	groundwater/surface water interface
HQ	hazard quotient
IDW	investigation-derived waste
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
LOD	Limit of Detection
LOQ	limit of quantitation
MCL	Maximum Contaminant Level
NGB	National Guard Bureau
NTU	nephelometric turbidity unit
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PCB	polychlorinated biphenyl
PWS	Performance Work Statement
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
REIMS	Ravenna Environmental Information Management System
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-trazine
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
RQL	Ramsdell Quarry Landfill

RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
s.u.	Standard pH Units
SAIC	Science Applications International Corporation
SVOC	semi-volatile organic compound
TEC-Weston JV	TEC-Weston Joint Venture
THQ	total hazard quotient
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
U.S.	United States
USEPA	United States Environmental Protection Agency
USP&FO	United States Property and Fiscal Officer for Ohio
Vista	Vista Sciences Corporation
VOC	volatile organic compound
WAWP	Well Abandonment Work Plan

EXECUTIVE SUMMARY

The TEC-Weston Joint Venture (TEC-Weston JV) is submitting this facility-wide groundwater Semi-Annual Report for May 2016 in accordance with the Performance Work Statement (PWS), Contract Number W9133L-14-D-0008 Task Order Number 0003, to provide Groundwater and Environmental Investigation Services for the RVAAP-66 Facility-Wide Groundwater Area of Concern (AOC) at the Former Ravenna Army Ammunition Plant (RVAAP); now known as Camp Ravenna Joint Military Training Center (Camp Ravenna) in Portage and Trumbull Counties, Ohio.

The United States (U.S.) Army and the Ohio Environmental Protection Agency (Ohio EPA) finalized the *Facility-Wide Groundwater Monitoring Program (*FWGWMP*) Plan* in 2004, and initiated the plan in April 2005 with quarterly sampling of the FWGWMP monitoring wells. The current monitoring well network consists of 284 wells, including five Resource Conservation and Recovery Act (RCRA) wells. The five RCRA wells are sampled on a semi-annual basis. In 2012, the FWGWMP was modified from quarterly to semi-annual sampling; however, all newly installed monitoring wells are initially sampled for four consecutive quarters. The current FWGWMP, as amended, includes the sampling of 46 monitoring wells, 5 of which are the RCRA wells.

The following tasks were performed at Camp Ravenna as part of the May 2016 monitoring program under the FWGWMP Plan:

- Collected groundwater samples from 46 monitoring wells, including the 5 RCRA wells, and the four wells sampled for pH only, during May 2016.
- Gauged depth to water levels at the 46 sampled monitoring wells prior to sampling each well.
- Performed laboratory analyses and data validation for the collected samples.
- Prepared the Investigation Derived Waste Characterization and Disposal Letter Report.

Potentiometric surface maps were not created from the limited set of depth to groundwater measurements read in May 2016; however, potentiometric surface maps from the Final 2015 Annual FWGW Report (TEC-Weston JV, 2016b) are included for reference. The next comprehensive monitoring well gauging event is planned for Fall 2016. Based on findings from

the July 2015 sampling event and other previous monitoring events when all of the Camp Ravenna monitoring wells were gauged, the generalized groundwater flow direction across Camp Ravenna is toward the east; however, variations exist where the aquifers (unconsolidated and Upper Sharon Sandstone) are in direct hydraulic communication with the local stream system. Portions of these streams are likely groundwater discharge zones. Areas of mounded groundwater are identified in the unconsolidated, Homewood, and Upper Sharon Sandstone aquifers where radial flow is evident.

The groundwater analytical data were compared to facility-wide cleanup goals (FWCUGs) and/or Maximum Contaminant Levels (MCLs), or Regional Screening Levels (RSLs). Metals data were not screened against previously established background values because the Ohio EPA has questioned their validity. The following summarizes the screening criteria exceedances of contaminants detected in May 2016:

- VOCs were not detected above screening criteria.
- Semi-volatile organic compounds (SVOCs): One SVOC, benzo(a)anthracene, was detected at concentrations exceeding screening criteria. Exceedances were detected in the NACA Test Area and Ramsdell Quarry Landfill AOCs.
- Explosives and propellants: These constituents were detected above screening criteria in monitoring wells located in the Open Demolition Area #2, Fuze and Booster Quarry, Load Line 1, Load Line 2, Load Line 3, and Winklepeck Burning Grounds AOCs.
- One pesticide, beta-BHC, was detected above screening criteria in well LL3mw-238, located in the Load Line 3 AOC.
- Polychlorinated biphenyls (PCBs) were not detected above screening criteria.
- Total metals, including aluminum, antimony, arsenic, cadmium, cobalt, iron, manganese, and vanadium, were detected in 33 monitoring wells at concentrations above screening criteria.
- Dissolved metals were sampled in only one well, FWGmw-011, which had elevated turbidity readings during purging. Dissolved arsenic, cobalt, iron, and manganese were detected above screening criteria.

- Hexavalent chromium was not detected in the three monitoring wells sampled for this constituent.
- Cyanide exceeded its screening criteria in each of the five RCRA wells sampled for this constituent. These wells are located in the Open Demolition Area #2 and Ramsdell Quarry Landfill AOCs.

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 BACKGROUND

1.1 PROJECT BACKGROUND

In 2004, the United States (U.S.) Army and the Ohio Environmental Protection Agency (Ohio EPA) finalized the *Facility-Wide Groundwater Monitoring Program (*FWGWMP*) Plan* (Portage Environmental, 2004) for the Former Ravenna Army Ammunition Plant (RVAAP); now known as Camp Ravenna Joint Military Training Center (Camp Ravenna) (**Figure 1-1**). The FWGWMP was initiated in April 2005 with quarterly sampling of 36 FWGWMP monitoring wells. The five Resource Conservation and Recovery Act (RCRA) wells were incorporated into the FWGWMP after May 2005 and are sampled semi-annually.

The FWGWMP Plan contains the Facility-Wide Sampling and Analysis Plan (FWSAP), Site Safety and Health Plan, and Quality Assurance Project Plan (QAPP) addenda. Additional details pertaining to the performance of field and laboratory activities are contained in the *Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC, 2011). As described in the FWGWMP Plan, the initial monitoring program consisted of sampling 36 monitoring wells, and 5 RCRA wells.

The current monitoring well network consists of 284 wells. The Remedial Investigation (RI) currently in progress will include the installation of additional monitoring wells to supplement the existing FWGWMP well network and to support a determination of naturally occurring background conditions for metals constituents in groundwater. The purpose and locations of the currently proposed RI and background monitoring wells is described in Table 3-1 of the Final Remedial Investigation Work Plan (RIWP) (TEC-Weston JV, 2016a).

The Final RIWP (TEC-Weston JV, 2016a) serves as the 2016 Semiannual Facility-Wide Groundwater Monitoring Addendum and supersedes the *Facility-Wide Groundwater Monitoring Program Plan RVAAP-66 Facility-Wide Groundwater Semiannual Groundwater Monitoring Addendum for 2015* (EQM, 2015a). The Final RIWP presents the monitoring wells to be monitored in 2016 and the constituent of potential concern (COPCs) that are to be evaluated at each of these wells. The 2016 groundwater monitoring program includes semi-annual sampling of a total of 46 existing wells to evaluate potential offsite migration along with potential source area attenuation

and temporal fluctuations. This approach is a continuation of the program executed for calendar year 2015.

1.2 REPORT ORGANIZATION

This Semi-Annual Report describes the semi-annual FWGWMP sampling events that took place in May 2016. This report was prepared in accordance with the Camp Ravenna Submission Format Guidelines, Version 21 (Vista, 2015). The report organization is as follows:

- Section 1 – Introduction. This section describes the project background, presents the facility description, and the project description.
- Section 2 – Monitoring Program. This section identifies the scope of work completed during the May 2016 FWGWMP, including the monitoring wells sampled and the analytes by monitoring well.
- Section 3 – May 2016 Monitoring Results. This section presents groundwater elevations measured during the May 2016 semi-annual sampling event, and the groundwater chemistry analytical results from monitoring wells sampled in May 2016.
- Section 4 – Summary of Results. This section presents the analytical results, focusing on the COPCs detected above screening criteria.
- Tables and Figures are included after Section 4.

This Semi-Annual Report for May 2016 includes five appendices as follows:

Appendix A	Field Forms and Notes
Appendix B	Laboratory Data and Verification/Validation Reports
Appendix C	Investigation Derived Waste Characterization and Disposal Letter Report.
Appendix D	Potentiometric Surface Map – Unconsolidated Aquifer
Appendix E	Correspondence and Comments/Responses

1.3 FACILITY DESCRIPTION

The former Ravenna Army Ammunition Plant (RVAAP), now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna), located in northeastern Ohio within Portage and Trumbull counties, is approximately 3 miles east/northeast of the City of Ravenna and 1 mile north/northwest of the City of Newton Falls. The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by

State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland.

Administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio and the property subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site, Camp Ravenna. The RVAAP restoration program involves cleanup of former production/operational areas throughout the facility related to former activities conducted under the RVAAP.

1.4 PROJECT DESCRIPTION

The May 2016 groundwater monitoring was a continuation of monitoring activities conducted at Camp Ravenna since 2005 under the FWGWMP Plan. The following tasks were performed in accordance with specifications contained in the Final RIWP and the FWSAP:

- Performed groundwater sampling of selected wells during May 2016. The sampled wells are identified in **Table 1-1**. The RCRA wells at Ramsdell Quarry Landfill (RQLmw-007, RQLmw-008, and RQLmw-009) and at Open Demolition Area #2 (DETmw-003 and DETmw-004) were also sampled.
- Gauged depth to water levels at 46 Camp Ravenna monitoring wells.
- Performed laboratory analyses and data validation for the collected samples.
- Prepared the Investigation Derived Waste Characterization and Disposal Letter Report.

THIS PAGE INTENTIONALLY LEFT BLANK

2.0 MAY 2016 MONITORING PROGRAM

The following subsections summarize the activities completed during May 2016 as they relate to the FWGWMP. The primary activity was groundwater sampling. **Appendix A** includes purge logs, log books, calibration logs, daily reports, and chains-of-custody for the May 2016 sampling event.

2.1 GROUNDWATER ELEVATION MONITORING

Water-level measurements were obtained in accordance with procedures in Section 5.4.3.1 of the FWSAP (SAIC, 2011) and the Final RIWP (TEC-Weston JV, 2016a). The monitoring well locations are presented on **Figures 2-1** through **2-3**. For the May 2016 sampling event, depth to water measurements were obtained only at the sampled monitoring wells. The depth to water in each monitoring well was measured from the top of the inner casing-level indicator. These measurements are included in **Table 3-1**, along with the resulting groundwater elevations; however, these elevations were not used to create potentiometric surface maps. A comprehensive monitoring well gauging event is planned to be conducted in association with the second semi-annual FWGWMP sampling for 2016 so that it can include new wells to be installed as part of pending Facility-Wide Groundwater RI activities. Results of the Fall 2016 comprehensive gauging event and updated potentiometric surface maps will be provided in the 2016 FWGWMP Annual Report.

2.2 MAY 2016 MONITORING WELL SAMPLING EVENT

The May 2016 FWGWMP sampling event was performed May 9 through 13, 2016. A total of 46 monitoring wells were sampled during this event. This includes the five RCRA wells, and the four wells sampled for pH only (FWGmw-002, RQLmw-011, RQLmw-012 and RQLmw-013). The results of this sampling event are presented in Section 3 and summarized in Section 4 of this report.

2.2.1 Groundwater Sampling

Groundwater sampling activities occurred from May 9 to 13, 2016. Each of the 46 monitoring wells were sampled with a dedicated bladder pump and tubing, which were installed in March and April 2016. Monitoring wells were purged and sampled using low-flow methods. Samples were collected into appropriate containers and preserved in accordance with Appendix A.1 of the Final RIWP (TEC-Weston JV, 2016a). **Table 2-1** presents the laboratory analytical methods, sampling

date, and the associated field quality assurance/quality control (QA/QC) samples collected. The QA/QC samples consisted of field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples. Rinsate QA/QC samples were not required due to the use of dedicated and disposable equipment. **Appendix A** includes all of the purge logs, field notes, and calibration log for the May 2016 sampling event.

Monitoring well purging and sampling were completed using dedicated bladder pumps. The pumps were maintained at flow rates from approximately 85 milliliters per minute (ml/min) to 500 ml/min. Purging continued until: drawdown was stabilized, a minimum of two pump and tubing volumes had been withdrawn, 30 minutes of purging had occurred, and water quality parameters had stabilized for three consecutive readings. Water quality parameters were recorded at regular intervals through the end of stabilization. Stabilization requirements are as follows:

Water Quality Parameter	Stabilization Requirement
pH	± 0.1
Conductivity	± 3%
Temperature	± 5°C
DO	± 0.3mg/L
Turbidity	<10 NTUs (well purging goal)
Oxygen Reduction Potential	± 10mV or 10%

Sampling of each monitoring well began immediately after purging. Samples were collected and preserved in accordance with Appendix A.1 of the Final RIWP (TEC-Weston JV, 2016a). **Table 2-1** summarizes the analyses completed for each of the 46 monitoring wells sampled in the May 2016 sampling event.

Samples were placed into iced coolers once collected and maintained under chain-of-custody (COC) until shipped to the TestAmerica Laboratory, in Arvada, Colorado (TestAmerica) via overnight courier. TestAmerica performed each of the required analyses from the May 2016 sampling event.

2.2.2 Data Verification and Validation

The TestAmerica data were verified and validated by the TEC-Weston JV chemist in accordance with the project specifications included in the QAPP. The data verification and validation documentation is provided in **Appendix B**.

2.2.3 Investigation-Derived Waste

An IDW Report was prepared for the liquid waste generated during the May 2016 sampling and water-level measurement activities. Purge and decontamination water was collected at each well location and transferred to 55-gallon drums located inside Building 1036. No more than approximately 4 gallons were purged from any well. Instruments and equipment were decontaminated after purging and sampling each monitoring well. Minimal IDW volume was generated due to the use of dedicated sampling equipment. Pending disposal of the IDW, the IDW fluids were stored in 55-gallon drums at Building 1036 and were inspected on a weekly basis. The IDW Report, dated July 26, 2016 is included in **Appendix C**. The two drums of IDW were properly transported and disposed on August 4, 2016.

THIS PAGE INTENTIONALLY LEFT BLANK

3.0 MAY 2016 MONITORING RESULTS

3.1 GROUNDWATER ELEVATIONS

Groundwater elevations for the 46 FWGW monitoring wells sampled in May 2016 are presented in **Table 3-1**. The potentiometric surface maps for the unconsolidated, Homewood, Upper Sharon Sandstone, and Basal Sharon Conglomerate aquifers are updated on an annual basis, following collection of a complete round of water level measurements. The most-recent complete round of water level measurements occurred in July 2015. Potentiometric surface maps created from the July 2015 groundwater elevations are provided for reference as **Figures 3-1** through **3-4**. **Figure 3-1** presents the potentiometric surface isocontours and monitoring well locations. For legibility, the monitoring well location IDs and measured groundwater elevations are not presented on **Figure 3-1**. These features are presented on the figure included in **Appendix D**.

A complete discussion of the potentiometric surface maps is included in the Final 2015 Annual FWGW Report (TEC-Weston JV, 2016b). In general, the overall flow direction across Camp Ravenna is toward the east; however, variations exist where the aquifers (unconsolidated and Upper Sharon Sandstone) are in direct hydraulic communication with the local stream system. Portions of these streams are likely groundwater discharge zones. Areas of mounded groundwater are identified in the unconsolidated, Homewood, and Upper Sharon Sandstone aquifers where radial flow is evident.

A comprehensive monitoring well gauging event is planned to be conducted in Fall 2016, in association with the second semi-annual FWGWMP sampling for 2016. This comprehensive gauging event will include any new wells installed as part of the pending Facility-Wide Groundwater RI activities. Results of the Fall 2016 comprehensive gauging event and updated potentiometric surface maps will be provided in the 2016 FWGWMP Annual Report.

3.2 DATA VERIFICATION AND VALIDATION

This subsection summarizes the results of the data validation performed on groundwater samples and quality control (QC) sample data for the May 2016 Semi-Annual sampling event. TestAmerica, Inc. performed the analyses in their laboratory located in Arvada, Colorado. Results are reported in laboratory sample delivery groups (SDGs) 280-83089-1, 280-83104-1, 280-

83171-1, and 280-83188-1 and are presented in Appendix B. The validation was performed by qualified chemists on the TEC-WESTON JV team. Data Validation Reports are presented in Appendix B.

The data were reviewed using guidance and quality control criteria documented in the *Draft Remedial Investigation Work Plan for Groundwater and Environmental Services for RVAAP-66 Facility-Wide Groundwater, Appendix A: Sampling Analysis Plan, A.2: Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio, Attachment A Data Validation Evaluation Sheets* (TEC-Weston JV 2015). The guidance and QA/QC criteria are based on the *Department of Defense Quality Systems Manual (DoD QSM), Version 5.0*; *USEPA National Functional Guidelines for Organic Data Review* (*EPA 2014*); and *USEPA National Functional Guidelines for Inorganic Data Review* (*EPA 2014*), the analytical methods, and professional judgment. See the Data Validation Reports (**Appendix B**) for further details on specific data quality issues that are summarized in this section.

Field QC samples, including trip blanks, field duplicates, and MS/MSDs were collected at the frequency specified in the UFP-QAPP (TEC-Weston JV 2015). Trip blanks were collected at a frequency of one per cooler with VOC samples. Field duplicates were collected at or exceeding the 10% frequency of collection criterion. MS/MSD pairs were collected at or exceeding the 5% frequency of collection criterion.

During data validation, qualifiers were assigned to assist in proper data interpretation. If values are estimated, data may be used for site evaluation purposes but reasons for data qualification should be taken into consideration when interpreting sample concentrations. Data that have been rejected (R) should not be used for any purpose. Results with no qualifiers meet all data quality goals as outlined in the UFP-QAPP.

The data was reviewed and validated by calculating Relative Percent Difference (RPD) between spiked sample recoveries according to the *USEPA National Functional Guidelines for Organic Data Review* (*EPA 2014*) and *USEPA National Functional Guidelines for Inorganic Data Review* (*EPA 2014*). SW-846 Methods were utilized for characterization of chemical constituents other than nitrate/nitrite. SW-846 Methods recommend using the actual spiked sample concentrations to calculate RPD values. The laboratory calculated RPDs based on the SW-846 Methods.

However, the spiked sample concentrations varied due to sample aliquot sizes which lead to variations in the spike concentrations. Calculating RPDs from spiked sample concentrations (rather than recoveries) results in poor precision that were not necessarily indicative of the data quality. Comparing spike recoveries during validation was a better indicator of analytical precision.

No major deviations from the planned data collection field event were encountered; therefore, the usability of the data was not impacted. A total of 6 data points were rejected; however, an overwhelming majority (99.8%) of the data for the project was determined to be usable or usable as qualified for their intended purposes.

The following data qualification flags were used by the data validators when QC issues arose in the data packages and required action:

- U = UNDETECTED - the analyte was analyzed for but not detected.
- J = ESTIMATED - the identification of the analyte is acceptable, but the quality assurance criteria indicate that the quantitative values may be outside the normal expected range of precision (i.e., the quantitative value is estimated).
- UJ = UNDETECTED ESTIMATED - a combination of the U and J qualifiers, which indicate that the analyte is not present. The reported value is considered to be an estimated reporting limit.
- R = REJECTED - data are considered to be rejected and shall not be used. This flag denotes the failure of quality control criteria such that it cannot be determined if the analyte is present or absent from the sample.

The Data Validation Reports discuss the application of U, J, UJ, and R validation flags, including the sample results qualified and a detailed description of the anomaly or outlier. The rejected data and the non-detected data reported with limits of detection (LODs) greater than the LODs presented in the UFP-QAPP, which also exceed screening criteria, are discussed below.

All SVOC surrogates in field duplicate sample LL2mw-271-D yielded extremely low (less than 10%) recoveries as reported in SDG 280-83171-1. Six phthalate analytes were reported for sample LL2mw-271-D; these results were rejected and are not usable for project decisions. However, the parent sample LLmw-271, yielded phthalate results that were not rejected. It should be noted that sample LL2mw-271-D was re-extracted and reanalyzed with acceptable surrogate recoveries; however, the holding time was grossly exceeded (greater than 2x) for the re-extraction and reanalysis. The re-extraction and reanalysis results are also not usable. With the exception of a B-flagged result for diethyl phthalate in May 2014, none of the rejected constituents have been historically reported above detection limits in samples collected from LL2mw-271.

In three SDGs (SDGs 280-83089-1, SDG 280-83104-1, and SDG 280-83171-1), the LODs and limits of quantitation (LOQs) were elevated for PCBs because a smaller volume was used for extraction (250 mL) instead of the 1000 mL required to achieve the lower LODs and LOQs presented in the UFP-QAPP. Future sampling events will collect additional sample volume to perform the low-level PCB analysis. As a result of the higher LODs reported during this sampling event, three PCBs (Aroclor-1016, Aroclor-1242, and Aroclor-1260) did not meet the Project Action Level (PAL); these compounds will meet the PAL in future events.

Table 3-3 presents the percent, by analytical method, of data that were acceptable (based on data not rejected) for use. Six SVOC data points were rejected; however, overall data completeness based on usability was 99.8%. All non-rejected data meet the requirements specified in the DoD QSM, method criteria, and the QAPP associated with this project.

3.3 GROUNDWATER SCREENING CRITERIA

The groundwater data were screened in part using the approach presented in the *Facility-Wide Groundwater Monitoring Program Plan, RVAAP-66 Facility-Wide Groundwater, Semiannual Monitoring Addendum*, (EQM, 2012). The approach listed in Subsection 2.6 of that document prescribes groundwater data are to be screened against background values, facility-wide cleanup goals (FWCUGs) and/or maximum contaminant levels (MCLs), or regional screening levels (RSLs). The FWCUGs are listed in Tables 5-8 through 5-10 in the *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, Ravenna, Ohio*, dated March 23, 2010 (SAIC, 2010). Although background levels for metals constituents are presented

in this report, the Ohio EPA has questioned the validity of the background levels. Therefore, a comparison of groundwater data to background levels was not conducted for the May 2016 data. The FWGW RI, currently being implemented, will include a background study that will determine new background values and an update of FWCUGs to reflect exposure and toxicity values recommended by and representative of current USEPA guidance.

May 2016 groundwater data were compared to screening criteria as follows:

- Step 1: Screen data against the FWCUGs – The most stringent of the non-carcinogenic and carcinogenic groundwater FWCUGs, for the National Guard Trainee, Resident Farmer Adult and Resident Farmer Child, were used to screen the data. If this most stringent FWCUG is less than the MCL for a given chemical, the MCL was used for screening purposes. If a chemical concentration was less than the FWCUG (or MCL, as applicable), that chemical was not considered to be an exceedance of screening criteria. If a chemical concentration was equal to or greater than the FWCUG (or MCL), then the chemical was considered to be an exceedance of screening criteria. If a chemical does not have a FWCUG, the chemical was compared against the RSL, as follows in Step 2.
- Step 2 – Screen applicable data against the United States EPA (USEPA) RSLs for tap water. If a chemical concentration was equal to or greater than its RSL, then the chemical was considered to be an exceedance of screening criteria. If a chemical does not have either a FWCUG or RSL, a cleanup goal may need to be developed in coordination with Ohio EPA.

The applicable screening criteria are included as part of **Table 3-2**.

3.4 GROUNDWATER ANALYTICAL RESULTS

The groundwater analytical results for detected constituents are presented in **Table 3-2**. This table only presents the detected groundwater results by analyte group (e.g., volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs]). The AOC and aquifer monitored by each well is also identified on this table. The appropriate screening criteria are included in **Table 3-2**, and data equal to or in excess of the screening criteria are also identified on **Table 3-2**. Complete

data tables, including all of the detected and non-detected analytical data per monitoring well, will be included in the Annual FWGW Report for 2016.

A discussion of analytical result exceedances is presented in Section 4.

3.5 pH MONITORING

As part of each sampling event, field parameter readings of pH are collected during the purging and well stabilization process. The final pH readings obtained during purging, just prior to sampling, are included in **Table 3-2.** Readings below 5.0 standard pH units (s.u.) and above 9.0 s.u. are highlighted in **Table 3-2**. One pH reading of 4.44 s.u., in LL1mw-083, was measured below 5.0 s.u.; and one reading of 13.07 s.u., in LL1mw-086, was measured above 9.0 s.u. The reading in LL1mw-083 is consistent with readings collected in 2015. The elevated reading in LL1mw-086 is higher than the readings of 9.39 and 9.42 s.u. measured in 2015.

In addition to the pH field measurements collected at the sampled monitoring wells, four additional monitoring wells were sampled for pH; FWGmw-002, RQLmw-011, RQLmw-012, and RQLmw-013. As presented on **Table 3-2**, the pH levels measured in these four wells in May 2016 are 7.91, 4.28, 5.26, and 3.89 standard pH units (s.u.), respectively. These values are consistent with the values measured in 2015. A thorough evaluation and discussion of pH levels will be included in the Annual FWGW Report for 2016.

4.0 DISCUSSION

This section presents the analytical results from the May 2016 sampling event found at or above screening criteria. The data are presented in **Table 3-2** and include highlighted values identifying concentrations detected at or in excess of the screening criteria. Constituents not detected above screening criteria include: VOCs, PCBs, hexavalent chromium, nitrate/nitrite, and perchlorate.

4.1 SVOCS

One SVOC, benzo(a)anthracene, was detected at concentrations above screening criteria in the monitoring wells sampled for these analytes in May 2016. Note that 2,4-dinitrotoluene, detected above screening criteria, is discussed below in Subsection 4.2.

Benzo(a)anthracene was detected above screening criteria in monitoring well NTAmw-119, screened within the Unconsolidated Aquifer, and located in the NACA Test Area AOC. Benzo(a)anthracene was also detected in monitoring wells RQLmw-007, RQLmw-008, and RQLmw-009, screened in the Upper Sharon Sandstone, and located in the Ramsdell Quarry Landfill AOC.

4.2 EXPLOSIVES AND PROPELLANTS

A total of six explosives and propellants were detected at concentrations above their screening criteria in the monitoring wells sampled for these analytes in May 2016. Note that although 2,4-dinitrotoluene was analyzed as an SVOC, it is a precursor compound used to make explosives and is included in this subsection.

1,3-Dinitrobenzene was detected above screening criteria in monitoring wells LL1mw-083 and LL1mw-084, screened in the Upper Sharon Sandstone, and located in the Load Line 1 AOC.

2,4-Dinitrotoluene was detected above screening criteria in monitoring wells LL1mw-083 and LL1mw-084, located in the Load Line 1 AOC; LL2mw-059 and LL2mw-267, located in the Load Line 2 AOC; and LL3mw-238 and LL3mw-241, located in the Load Line 3 AOC. Each of these exceedances was detected in wells screened within the Upper Sharon Sandstone.

2,4,6-Trinitrotoluene was detected above screening criteria in monitoring well FBQmw-174, screened in the Homewood Aquifer and located in the Fuze and Booster Quarry AOC. 2,4,6-

Trinitrotoluene was also detected above screening criteria in the following monitoring wells screened in the Upper Sharon Sandstone: LL1mw-083 and LL1mw-084, located in the Load Line 1 AOC; and LL3mw-238 and LL3mw-241, located in the Load Line 3 AOC.

2-Amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene were each detected above screening criteria in monitoring wells LL1mw-083 and LL1mw-084, located in the Load Line 1 AOC; LL2mw-059 and LL2mw-267, located in the Load Line 2 AOC; and LL3mw-238, LL3mw-241, and LL3mw-244, located in the Load Line 3 AOC. Each of these monitoring wells is screened in the Upper Sharon Sandstone.

RDX was detected above screening criteria in the following monitoring wells screened in the Unconsolidated Aquifer: DETmw-004, located in the Open Demolition Area #2 AOC; WBGmw-006 and WBGmw-009, located in the Winklepeck Burning Grounds AOC. RDX was also detected above screening criteria the following monitoring wells screened in the Upper Sharon Sandstone: LL1mw-084, located in the Load Line 1 AOC; LL2mw-267, located in the Load Line 2 AOC; and LL3mw-238 and LL3mw-241, located in the Load Line 3 AOC.

4.3 PESTICIDES

One pesticide, beta-BHC, was detected at a concentration above its screening criteria in only one of the monitoring wells sampled for pesticides in May 2016. Beta-BHC exceeded its screening criteria in LL3mw-238, screened in the Upper Sharon Sandstone, located in the Load Line 3 AOC.

4.4 INORGANICS

Instances of total inorganic constituents exceeding screening criteria are identified on **Table 3-2**. Of the 40 monitoring wells screened in the Unconsolidated, Homewood, and Upper Sharon Sandstone Aquifers, analyzed for at least one inorganic constituent, exceedances were detected in 33 of these wells. At least one exceedance of a total inorganic constituent was detected in each of the two Basal Sharon Conglomerate monitoring wells analyzed for total inorganics.

Total inorganics constituents did not exceed screening criteria in monitoring wells FBQmw-174 screened in the Homewood Aquifer, and located in the Fuze and Booster Quarry AOC; LL10mw-003, screened in the Homewood Aquifer, and located in the Load Line 10 AOC; FWGmw-004,

screened in the Unconsolidated Aquifer; LL2mw-060, screened in the Upper Sharon Sandstone and located in the Load Line 2 AOC; and LL3mw-241, LL3mw-244, and LL3mw-246, screened in the Upper Sharon Sandstone and located in the Load Line 3 AOC.

The total metals detected above screening criteria include aluminum, antimony, arsenic, cadmium, cobalt, iron, manganese, and vanadium. The screening criteria for each of these metals is the corresponding RSL. Previously calculated background FWCUGs are not used to evaluate metals data. A background study is being conducted as part of the FWGW RI. The results of the study will be used to support a determination of background FWCUG requirements for metals. Once established, groundwater metals data will be compared against the revised background FWCUGs.

One sample collected from monitoring well FWGmw-011 was filtered and also analyzed for dissolved metals. This monitoring well had a high turbidity reading of 60.7 nephelometric turbidity units (NTU). The dissolved metals results indicate concentrations of arsenic, cobalt, iron, and manganese were detected in excess of screening criteria.

The dissolved metals exceedances were less than the corresponding total metals exceedances. A large difference in concentrations was noted for iron. This may indicate that sediment entrained in the groundwater sample, as evidenced with the elevated turbidity value, has an influence on the concentrations of inorganics in groundwater. In accordance with the Final RIWP (TEC-Weston JV, 2016a), monitoring wells with measured turbidity values in excess of 10 NTU will be redeveloped to reduce the potential for suspended solids to affect sample results. Based on the May 2016 sampling, five wells (FWGmw-002, FWGmw-004, FWGmw-011, LL7mw-001, and LL12mw-242), will be redeveloped prior to sampling during the Fall 2016 semi-annual monitoring.

The five RCRA wells were sampled for cyanide. Cyanide was detected above screening criteria in each of these wells: DETmw-003, DETmw-004, RQLmw-007, RQLmw-008, and RQLmw-009.

THIS PAGE INTENTIONALLY LEFT BLANK

5.0 REFERENCES

EQM. 2012. *Facility-Wide Groundwater Monitoring Program Plan*. F*acility-wide Groundwater, Semiannual Monitoring Addendum*. January 2012.

EQM. 2015a. *Final Facility-Wide Groundwater Monitoring Program Plan*. *Semiannual Groundwater Monitoring Addendum for 2015*. February 2015.

EQM. 2015b. *Final Facility-Wide Groundwater Monitoring Program Report*. *March 2015 Sampling Event*. September 2015.

EQM. 2015c. *Facility-Wide Groundwater Monitoring Program Report*. *July 2015 Sampling Event*. October 2015.

Portage Environmental. 2004. *Facility-Wide Groundwater Monitoring Program Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio*. Prepared for U.S. Army Corps of Engineers. September 2004.

SAIC. 2010. *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, Ravenna, Ohio*, March 23, 2010.

SAIC. 2011. *Final Facility-Wide Sampling and Analysis Plan for Environmental Investigations.* Revision 0. Ravenna Army Ammunition Plant, Ravenna, Ohio. February 2011.

TEC-Weston JV. 2016a. *Final Remedial Investigation Work Plan for RVAAP-66 Facility-wide Groundwater*. Prepared for National Guard Bureau. December 2016.

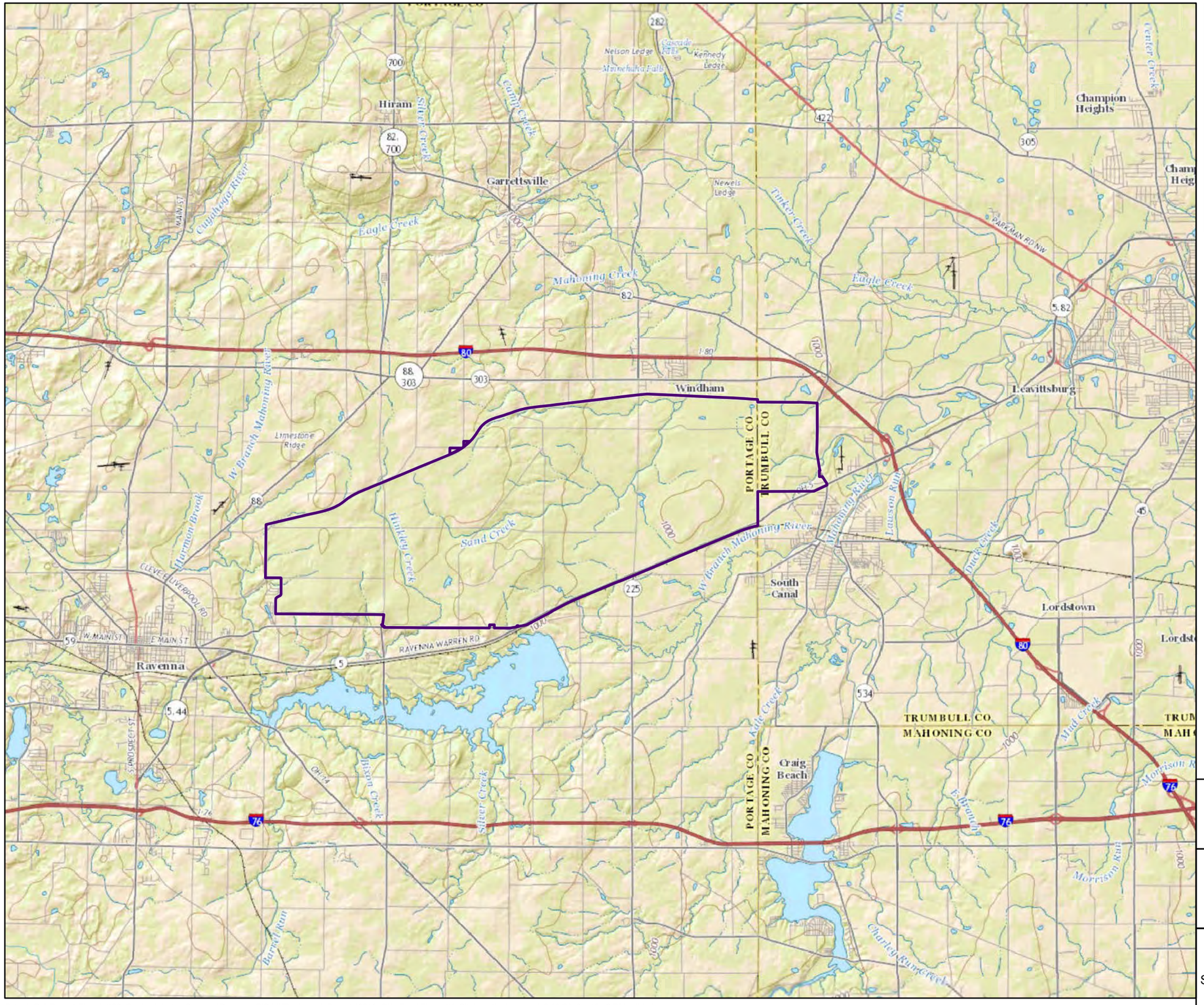
TEC-Weston JV. 2016b. *Final Facility-Wide Groundwater Monitoring Program, RVAAP-66 Facility-wide Groundwater Annual Report for 2015,* Prepared for National Guard Bureau. August 2016.

Vista (Vista Sciences Corporation). 2015. Submission Format Guidelines for the Ravenna Army Ammunition Plant Restoration Program. Version 21. October 2015.

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK



Overview Map

Legend

Camp Ravenna Property Line

Notes:

- Basemap Source: ESRI Map Service - USGSTopo

N

0 1 2 3 4 Miles

1:126,720
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

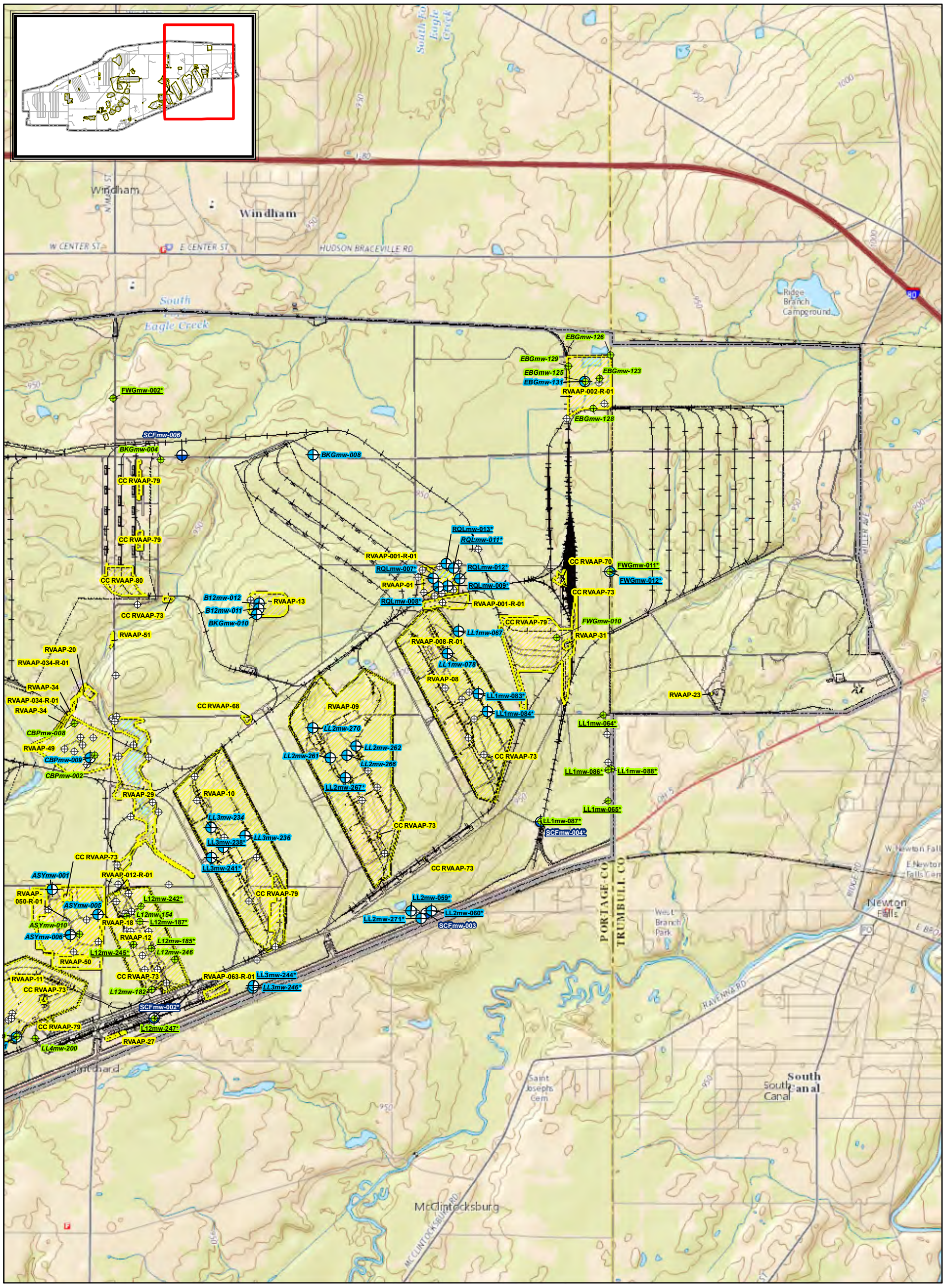
SITE LOCATION MAP

Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 1-1

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig_1_01_SiteLocationMap.mxd, 9/13/2016 1:46:53 PM, wilderj



Existing Groundwater Monitoring Wells to be Sampled During the RI

- Groundwater Station (Unconsolidated Unit)
- Groundwater Station (Homewood)
- Groundwater Station (Upper Sharon Sandstone)
- Groundwater Station (Sharon Shale)
- Groundwater Station (Basal Sharon Cong.)
- Groundwater Station (unknown unit); Current Well Status Under Review

* Wells with underlined labels are Proposed 2016 FWGW Monitoring Program Wells

- Other Existing Monitoring Well - (Not to be sampled during the RI)

- AOCs
- Camp Ravenna Boundary

N

0 1,300 2,600 3,900 5,200 Feet

1 " = 2,500 ft
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

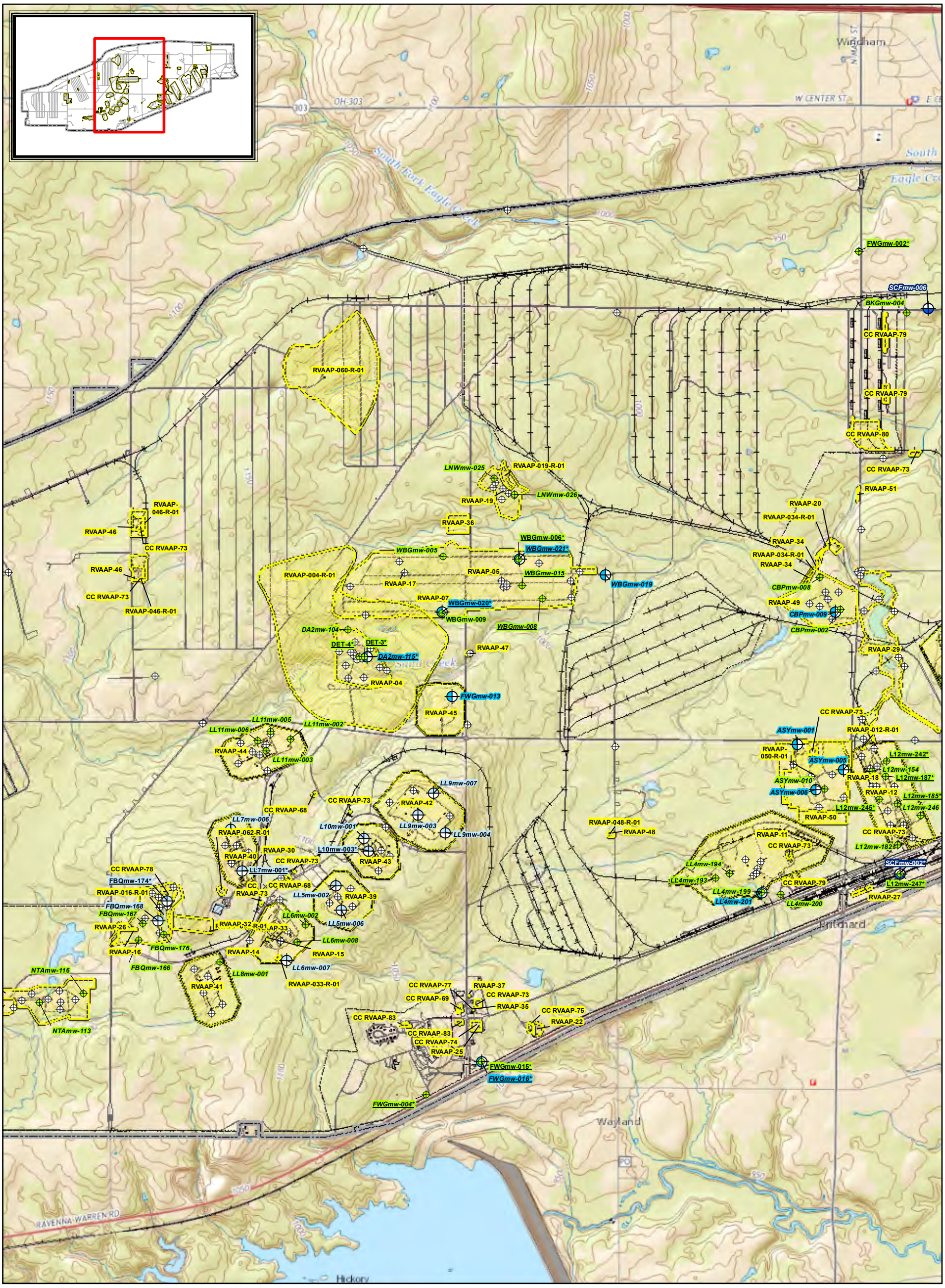
GROUNDWATER MONITORING WELL LOCATIONS - EAST

Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 2-1

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig_2_1-2-3_Well_Location_v20160210.mxd, 1/3/2017 9:51:05 AM, herrinm



Existing Groundwater Monitoring Wells to be Sampled During the RI

- Groundwater Station (Unconsolidated Unit)
- Groundwater Station (Homewood)
- Groundwater Station (Upper Sharon Sandstone)
- Groundwater Station (Sharon Shale)
- Groundwater Station (Basal Sharon Cong.)
- Groundwater Station (unknown unit); Current Well Status Under Review
- * Wells with underlined labels are Proposed 2016 FWGW Monitoring Program Wells
- Other Existing Monitoring Well - (Not to be sampled during the RI)

- AOCs
- Camp Ravenna Boundary

N

0 1,300 2,600 3,900 5,200 Feet

1 " = 2,490 ft
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

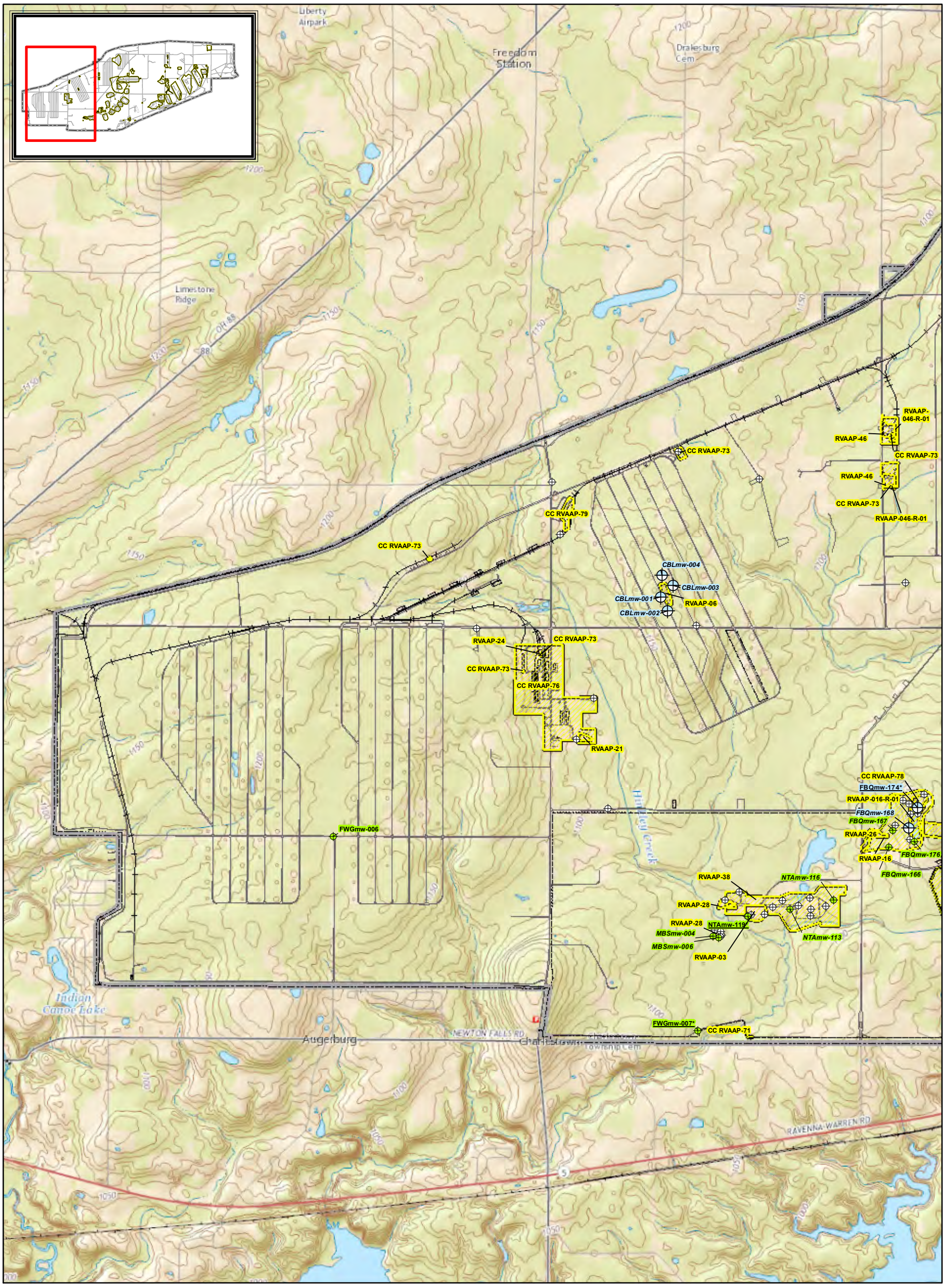
GROUNDWATER MONITORING WELL LOCATIONS - CENTRAL

Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 2-2

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual Reports\2016_GW_Final\Fig_2_1-2-3_Well_Location_v20160210.mxd, 1/3/2017 9:51:05 AM, herrinm



Existing Groundwater Monitoring Wells to be Sampled During the RI

- Groundwater Station (Unconsolidated Unit)
- Groundwater Station (Homewood)
- Groundwater Station (Upper Sharon Sandstone)
- Groundwater Station (Sharon Shale)
- Groundwater Station (Basal Sharon Cong.)
- Groundwater Station (unknown unit); Current Well Status Under Review

* Wells with underlined labels are Proposed 2016 FWGW Monitoring Program Wells

- Other Existing Monitoring Well - (Not to be sampled during the RI)

- AOCs
- Camp Ravenna Boundary

N

0 1,300 2,600 3,900 5,200 Feet

1 " = 2,490 ft
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

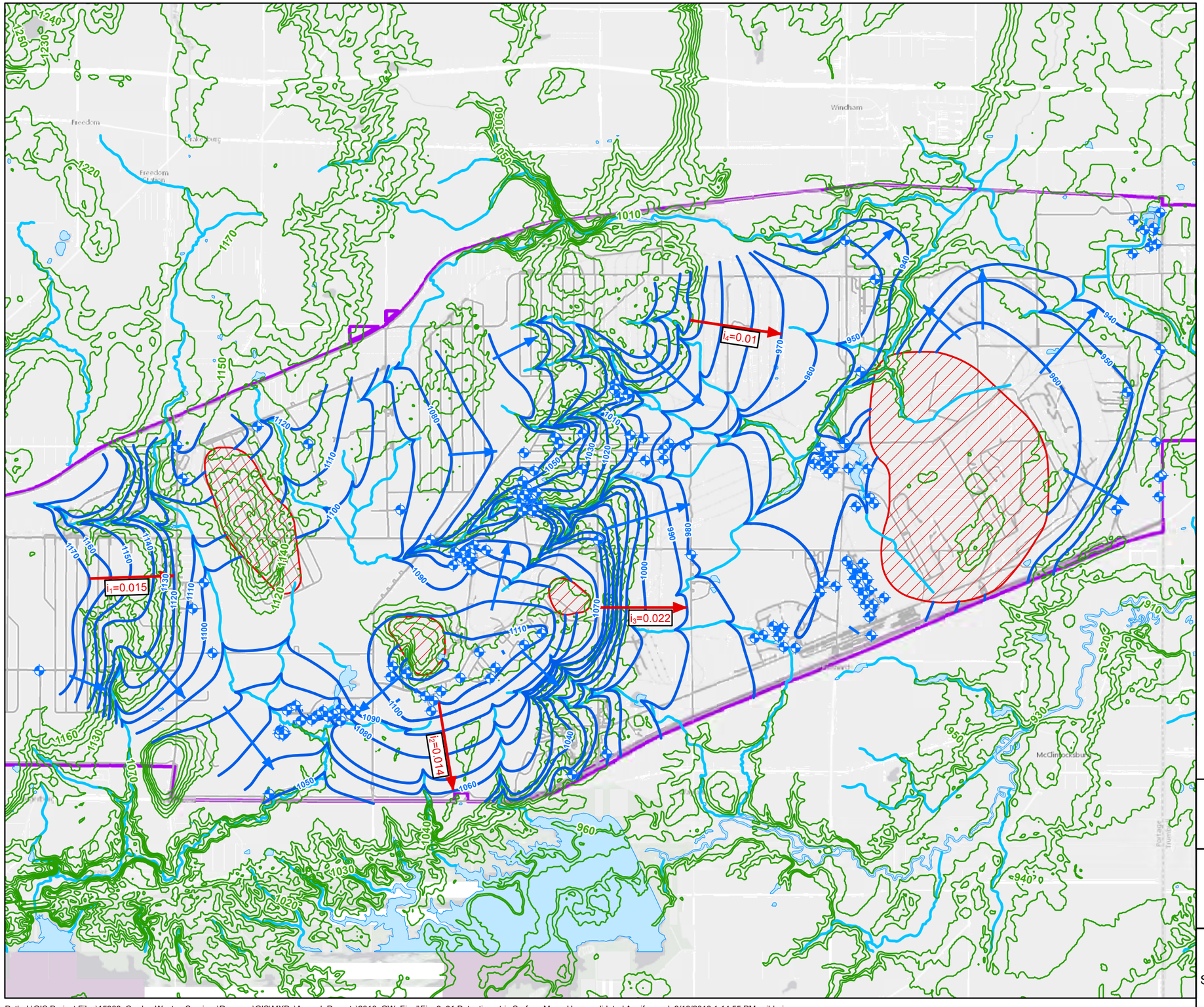
GROUNDWATER MONITORING WELL LOCATIONS - WEST

Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 2-3

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual Reports\2016_GW_Final\Fig_2_1-2-3_Well_Location_v20160210.mxd, 1/3/2017 9:51:05 AM, herrinm



Legend

- Unconsolidated Well Location
- Unconsolidated Contours - 10ft Interval
- Direction Of Flow
- i1 = Hydraulic Gradient (ft/ft)
- Roads
- Creeks and Streams
- Elevation Contours (Feet)
- Unconsolidated Aquifer Missing (See Notes Below)
- Camp Ravenna Property Line

Notes:
- Potentiometric Surfaces based on data collected in July 2015
- Basemap Sources: ESRI Map Services - Canvas/World_Light_Gray_Base and World_Street_Map
- Unconsolidated Aquifer indicated to not be present, based on the most recent Facility Wide Groundwater Monitoring Program Report on the January 2014 Sampling Event

N

0 4,000 8,000 Feet

1:48,000
NAD83 UTM Zone 17N

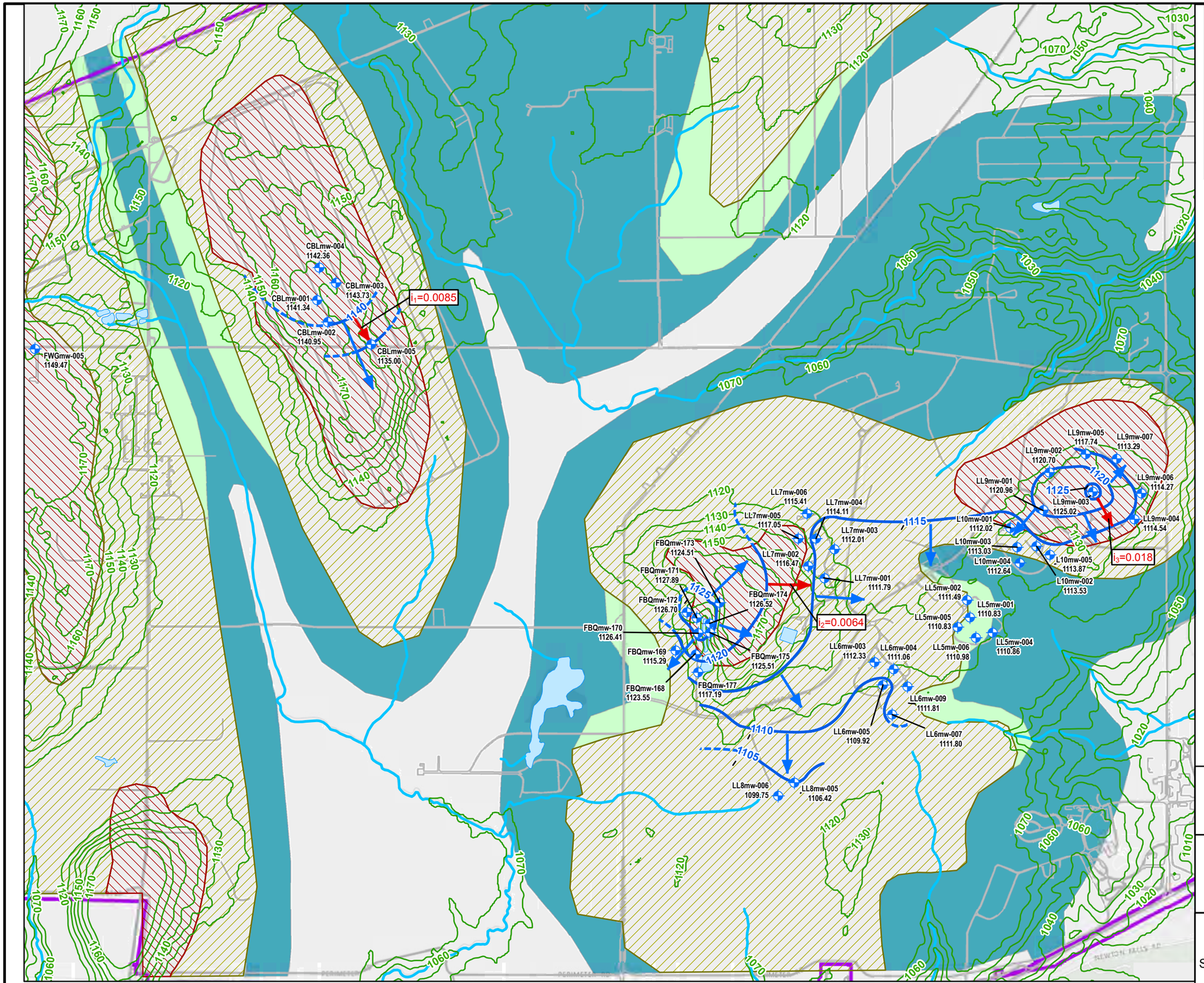
TEC-Weston Joint Venture

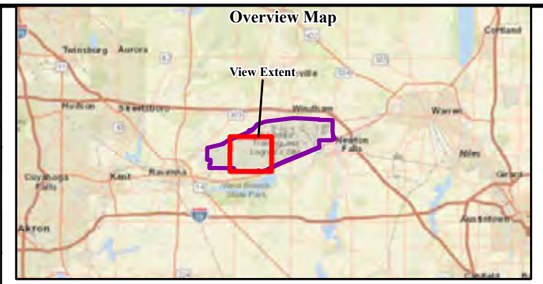
POTENTIOMETRIC SURFACE MAP
UNCONSOLIDATED AQUIFER
Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 3-1

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig_3_01 Potentiometric Surface Map - Unconsolidated Aquifer.mxd, 9/13/2016 1:14:55 PM, wilderj





Legend

- Upper Bedrock Aquifer Well
- Homewood and Mercer Contour Intervals
- Inferred Homewood and Mercer Contour Intervals
- Direction Of Flow
- i1 = Hydraulic Gradient (ft/ft)
- Roads
- Creeks and Streams
- Elevation Contours (Feet)
- Camp Ravenna Property Line

Geology Formation

- Homewood Sandstone Member
- Mercer Member
- Massillon Sandstone
- Sharon Member - Shale

Add note:
All wells presented are installed within the upper contact saturated zone of the initial bedrock formation, reported in previously prepared documents as the Homewood Sandstone. The pending RI will include review of historical well installation records with respect to monitored formations and evaluation of the localized hydrogeology to confirm hydraulic connection of the monitoring well saturated intervals utilized for generating potentiometric surface elevation contours.

Notes:
- Potentiometric Surfaces based on data collected in July 2015
- Basemap Sources: ESRI Map Services - Canvas/World_Light_Gray_Base and World_Street_Map
- Surface Elevation Contours - USDA

N

0 1,625 3,250 Feet

1:19,500
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

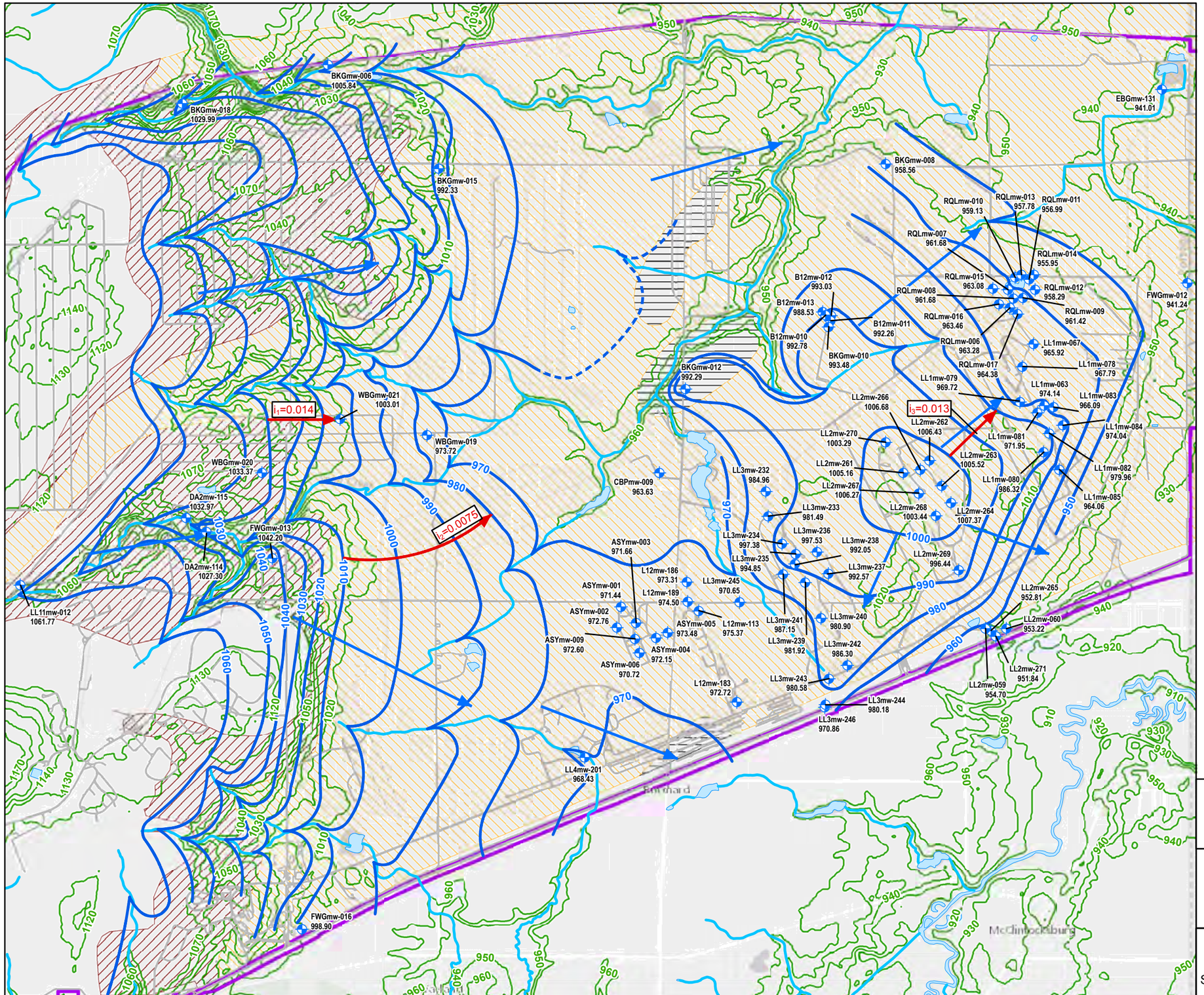
POTENTIOMETRIC SURFACE MAP
HOMEWOOD SANDSTONE AQUIFER

Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 3-2

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig_3_02 Potentiometric Surface Map - Homewood Sandstone Aquifer.mxd, 9/13/2016 1:57:34 PM, wilderj



Legend

- Upper Sharon Sandstone Well Location
- Upper Sharon Sandstone Contour Intervals
- Upper Sharon Sandstone Inferred Contour Intervals
- Direction Of Flow
- i1 = Hydraulic Gradient (ft/ft)
- Creeks and Streams
- Roads
- Camp Ravenna Property Line
- Basal Sharon Conglomerate Shale Lens
- Sharon Member
- Basal Sharon Conglomerate Unit

Notes:
- Potentiometric Surfaces based on data collected July 14-20, 2015
- Basemap Sources: ESRI Map Services - Canvas/World_Light_Gray_Base and World_Street_Map
- Surface Elevation Contours - USDA

N

0 2,500 5,000 Feet

1:30,000
NAD83 UTM Zone 17N

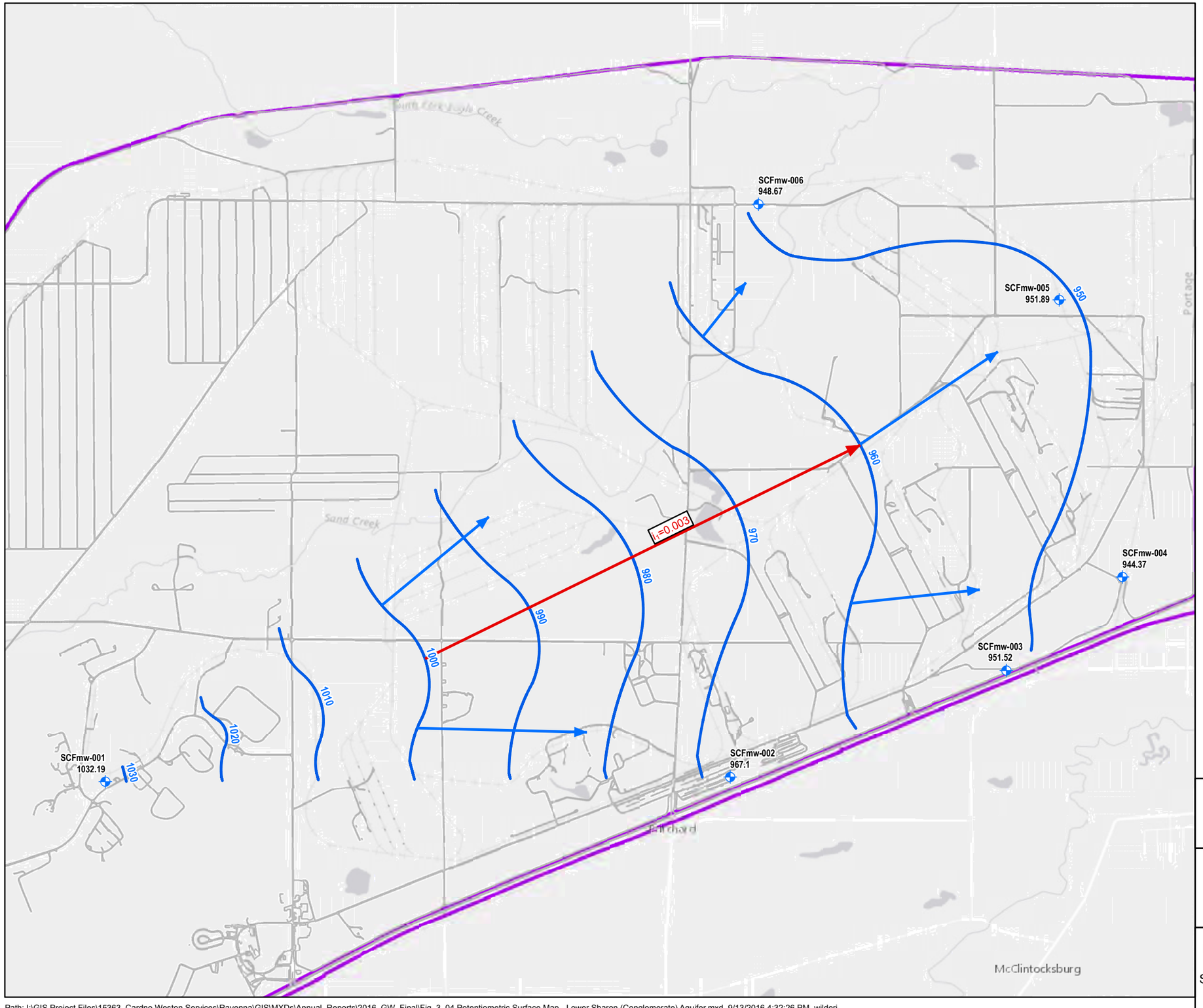
TEC-Weston Joint Venture

POTENTIOMETRIC SURFACE MAP
UPPER SHARON SANDSTONE AQUIFER
Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 3-3

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig_3_03 Potentiometric Surface Map - Upper Sharon Aquifer.mxd, 12/29/2016 11:07:09 AM, wilderj



Legend

- Basal Sharon Conglomerate Well Location
- Basal Sharon Conglomerate Contours - 10ft Interval
- Direction Of Flow
- i1 = Hydraulic Gradient (ft/ft)
- Roads
- Camp Ravenna Property Line

Notes:
- Potentiometric Surfaces based on data collected in July 2015
- Basemap Sources: ESRI Map Services - Canvas/World_Light_Gray_Base and World_Street_Map
- Surface Elevation Contours - USDA

N

0 3,000 6,000 Feet

1:30,000
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

POTENTIOMETRIC SURFACE MAP
BASAL SHARON CONGLOMERATE AQUIFER
Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater
Former Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure: 3-4

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig_3_04 Potentiometric Surface Map - Lower Sharon (Conglomerate) Aquifer.mxd, 9/13/2016 4:32:26 PM, wilderj

TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

Table 1-1
May 2016 Groundwater Analytes by Well

WELL ID	VOCs	SVOC				Explosives/ Propellants	Pesticides	PCBs	Metals	Hexavalent Chromium	Cyanide	Perchlorate	Nitrate	pH
		Nitro-aromatics	Phthalates	Phenols	PAHs									
DA2mw-115			X			X			X					
DETmw-003	X	X	X	X	X	X	X	X	X		X			
DETmw-004	X	X	X	X	X	X	X	X	X		X			
FBQmw-174			X			X	X		X					
FWGmw-002														X
FWGmw-004			X			X			X					
FWGmw-007			X			X			X					
FWGmw-011			X			X			X					
FWGmw-012			X			X			X					
FWGmw-015			X			X			X					
FWGmw-016			X			X			X					
LL1mw-064			X			X			X					
LL1mw-065			X			X			X					
LL1mw-083			X			X	X		X					
LL1mw-084			X			X	X		X					
LL1mw-086			X			X			X					
LL1mw-087			X			X			X					
LL1mw-088			X			X	X		X					
LL2mw-059			X			X			X					
LL2mw-060			X			X			X					
LL2mw-267			X			X			X					
LL2mw-271			X			X			X			X		
LL3mw-238			X			X	X		X					
LL3mw-241			X			X	X		X					
LL3mw-244			X			X	X		X	X				
LL3mw-246			X			X			X			X		
LL7mw-001	X		X			X			X					
LL10mw-003	X	X	X						X					
LL12mw-185								X (As Only)					X	
LL12mw-187			X			X			X				X	
LL12mw-242			X			X			X				X	
LL12mw-245			X			X			X				X	
LL12mw-247			X			X			X	X			X	
NTAmw-119	X	X	X		X	X			X					
RQLmw-007	X		X	X	X	X	X	X	X		X			
RQLmw-008	X		X	X	X	X	X	X	X		X			
RQLmw-009	X		X	X	X	X	X	X	X		X			
RQLmw-011														X
RQLmw-012														X
RQLmw-013														X
SCFmw-002			X			X	X		X	X				
SCFmw-004			X			X	X		X					
WBGmw-006			X			X			X					
WBGmw-009			X			X			X					
WBGmw-020			X			X			X					
WBGmw-021			X			X			X					

THIS PAGE INTENTIONALLY LEFT BLANK

Table 2-1
QA/QC Sample Summary for May 2016

	Contractor Laboratory						Government Laboratory		Requested Laboratory Analysis														
Sample Locations	Primary Lab Sample ID	Date	Sample Type	Assoc. QC Dup	Assoc. QC Trip Blank	MS/ MSD	QA Lab Sample ID	Assoc. QC Trip Blank Number	353.2	6860	6010C	6020A	7196A	7470A	8081B	8082A	8260B	8270D	8270D SIM	8330B	9012B
DA2mw-115	DA2mw-115	5/10/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	
DETmw-003	DETmw-003	5/10/2016	GW	--	051016-TB	--	--	--			X	X		X	X	X	X	X	X	X	X
DETmw-004	DETmw-004	5/10/2016	GW	--	051116-TB	--	--	--			X	X		X	X	X	X	X	X	X	X
FBQmw-174	FBQmw-174	5/11/2016	GW	--	051216-TB	--	--	--			X	X		X	X			X		X	
FWGmw-002	--	5/11/2016	GW	--	051216-TB	--	--	--	field pH monitoring only												
FWGmw-004	FWGmw-004	5/9/2016	GW	FWGmw-004-D	051016-TB	--	--	--			X	X		X				X		X	
FWGmw-007	FWGmw-007	5/11/2016	GW	--	051216-TB	--	--	--			X	X		X				X		X	
FWGmw-011	FWGmw-011	5/12/2016	GW	FWGmw-011-D	051316-TB	Y	--	--			X	X		X				X		X	
FWGmw-012	FWGmw-012	5/12/2016	GW	--	051316-TB	--	--	--			X	X		X				X		X	
FWGmw-015	FWGmw-015	5/9/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	
FWGmw-016	FWGmw-016	5/9/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	
LL1mw-064	LL1mw-064	5/12/2016	GW	--	051316-TB	--	--	--			X	X		X				X		X	
LL1mw-065	LL1mw-065	5/12/2016	GW	--	051216-TB	--	--	--			X	X		X				X		X	
LL1mw-083	LL1mw-083	5/13/2016	GW	--	051316-TB	--	--	--			X	X		X	X			X		X	
LL1mw-084	LL1mw-084	5/13/2016	GW	--	051316-TB	--	--	--			X	X		X	X			X		X	
LL1mw-086	LL1mw-086	5/12/2016	GW	--	051216-TB	--	--	--			X	X		X				X		X	
LL1mw-087	LL1mw-087	5/12/2016	GW	--	051216-TB	--	--	--			X	X		X				X		X	
LL1mw-088	LL1mw-088	5/11/2016	GW	--	051216-TB	--	--	--			X	X		X	X			X		X	
LL2mw-059	LL2mw-059	5/13/2016	GW	--	051316-TB	--	--	--			X	X		X				X		X	
LL2mw-060	LL2mw-060	5/13/2016	GW	--	051316-TB	--	--	--			X	X		X				X		X	
LL2mw-267	LL2mw-267	5/13/2016	GW	--	051316-TB	--	--	--			X	X		X				X		X	
LL2mw-271	LL2mw-271	5/12/2016	GW	LL2mw-271-D	051216-TB	--	--	--		X	X	X		X				X		X	
LL3mw-238	LL3mw-238	5/12/2016	GW	--	051216-TB	--	--	--			X	X		X	X			X		X	
LL3mw-241	LL3mw-241	5/12/2016	GW	--	051216-TB	--	--	--			X	X		X	X			X		X	
LL3mw-244	LL3mw-244	5/13/2016	GW	LL3mw-244-D	051316-TB	--	--	--			X	X	X	X	X			X		X	
LL3mw-246	LL3mw-246	5/12/2016	GW	--	051216-TB	Y	--	--		X	X	X		X				X		X	
LL7mw-001	LL7mw-001	5/10/2016	GW	--	051116-TB	--	--	--			X	X		X			X	X		X	
LL10mw-003	L10mw-003	5/11/2016	GW	L10mw-003-D	051216-TB	--	--	--			X	X		X			X	X			
LL12mw-185	L12mw-185	5/11/2016	GW	--	051116-TB	--	--	--	X			X								X	
LL12mw-187	L12mw-187	5/11/2016	GW	--	051216-TB	Y	--	--	X		X	X		X				X		X	
LL12mw-242	L12mw-242	5/11/2016	GW	--	051216-TB	--	--	--	X		X	X		X				X		X	
LL12mw-245	L12mw-245	5/11/2016	GW	--	051216-TB	--	--	--	X		X	X		X				X		X	
LL12mw-247	L12mw-247	5/11/2016	GW	L12mw-247-D	051116-TB	--	--	--	X		X	X	X	X				X		X	
NTAmw-119	NTAmw-119	5/11/2016	GW	--	051216-TB	Y	--	--			X	X		X			X	X	X	X	
RQLmw-007	RQLmw-007	5/12/2016	GW	--	051216-TB	Y	--	--			X	X		X	X	X	X	X	X	X	X
RQLmw-008	RQLmw-008	5/12/2016	GW	--	051216-TB	--	--	--			X	X		X	X	X	X	X	X	X	X
RQLmw-009	RQLmw-009	5/12/2016	GW	RQLmw-009-D	051216-TB	--	--	--			X	X		X	X	X	X	X	X	X	X
RQLmw-011	--	5/12/2016	GW	--	--	--	--	--	field pH monitoring only												
RQLmw-012	--	5/12/2016	GW	--	--	--	--	--	field pH monitoring only												
RQLmw-013	--	5/12/2016	GW	--	--	--	--	--	field pH monitoring only												
SCFmw-002	SCFmw-002	5/11/2016	GW	--	051116-TB	Y	--	--			X	X	X	X	X			X		X	
SCFmw-004	SCFmw-004	5/13/2016	GW	--	051316-TB	--	--	--			X	X		X	X			X		X	
WBGmw-006	WBGmw-006	5/10/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	
WBGmw-009	WBGmw-009	5/10/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	
WBGmw-020	WBGmw-020	5/10/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	
WBGmw-021	WBGmw-021	5/10/2016	GW	--	051016-TB	--	--	--			X	X		X				X		X	

THIS PAGE INTENTIONALLY LEFT BLANK

Table 3-1
Well Construction Details and Groundwater Elevations - May 2016

RVAAP Area	Well ID	Ohio State Plane Easting	Ohio State Plane Northing	Ground Elevation (ft, AMSL)	Total Drilled Depth (ft, BGS)	TOC Elevation (ft, AMSL)	Well Head Type[1]	Monitored Zone	Top of Screen (ft, BGS)	Bottom of Screen (ft, BGS)	Bottom of Inner Casing Plug or End Cap (ft, BGS)	Stickup height (ft, AGS)	Reported Bottom of Inner Casing (ft, BTOC)	Depth to Water - May 2016 (ft, BTOC)	Groundwater Elevation - May 2016 (ft, AMSL)
Open Demolition Area #2	DA2mw-115	2355269.00	560459.00	1,035.40	44.0	1,038.08	A	Upper Sharon SS	33.75	43.75	44.05	2.68	46.8	5.62	1032.46
	DETmw-003	2355204.94	560456.10	1,035.81	15.0	1,036.81	A	Unconsolidated	7.0	12.0	12.0	1.00	13.0	9.27	1027.54
	DETmw-004	2355072.36	560454.22	1,037.68	11.0	1,038.68	A	Unconsolidated	6.0	11.0	11.0	1.00	12.0	11.20	1027.48
Fuze and Booster Quarry Landfill/Ponds	FBQmw-174	2350289.81	554142.44	1,135.78	22.5	1,139.97	A	Homewood	12.0	22.0	22.0	4.19	26.2	15.05	1124.92
Facility-Wide Groundwater	FWGmw-002	2367606.00	571015.00	970.60	71.0	973.10	A	Unconsolidated	57	67	67.3	2.50	70.05	23.89	949.21
	FWGmw-004	2356970.00	549319.00	1,034.50	20.0	1,037.15	A	Unconsolidated	9.5	19.5	19.8	2.65	22.6	12.43	1024.72
	FWGmw-007	2344785.00	548356.00	1,072.80	30.0	1,075.41	A	Unconsolidated	19.5	29.5	29.8	2.61	32.35	23.55	1051.86
	FWGmw-011	2380390.00	566801.00	939.00	17.5	941.61	A	Unconsolidated	6	16	16.3	2.61	17.8	2.02	939.59
	FWGmw-012	2380389.00	566790.00	938.90	40.0	941.39	A	Sharon Shale	29.5	39.5	39.8	2.49	42.45	0.50	940.89
	FWGmw-015	2358353.00	550179.00	1,012.10	26.0	1,014.51	A	Unconsolidated	13.5	23.5	23.8	2.41	26.35	5.37	1009.14
	FWGmw-016	2358364.00	550171.00	1,011.90	65.0	1,014.39	A	Upper Sharon SS	54.5	64.5	64.8	2.49	67.5	15.91	998.48
Load Line 1	LL1mw-064	2380286.97	563118.74	932.32	18.4	935.10	A	Unconsolidated	8.0	18.0	18.4	2.78	21.1	0.60	934.50
	LL1mw-065	2380452.00	560916.92	941.53	20.5	944.41	A	Unconsolidated	10.2	20.2	20.5	2.88	23.4	10.68	933.73
	LL1mw-083	2377074.80	563612.75	992.80	39.3	995.20	A	Upper Sharon SS	29.1	38.6	39.3	2.40	41.7	31.76	963.44
	LL1mw-084	2377316.02	563160.44	996.40	37.0	998.73	A	Upper Sharon SS	26.7	36.3	37.0	2.33	39.3	26.47	972.26
	LL1mw-086	2380437.00	561714.00	938.00	75.0	940.63	A	Unconsolidated	64.5	74.5	74.8	2.63	77.38	7.02	933.61
	LL1mw-087	2378732.00	560375.00	941.80	17.5	944.32	A	Unconsolidated	7	17	17.3	2.52	18.55	5.42	938.90
	LL1mw-088	2380525.00	561746.00	936.30	24	938.63	A	Unconsolidated	13.9	23.9	24.51	3.00	27.54	5.88	932.75
Load Line 2	LL2mw-059	2375453.00	558020.00	964.33	19.5	966.67	A	Upper Sharon SS	9.3	19.1	19.5	2.34	21.8	12.90	953.77
	LL2mw-060	2375978.00	558022.00	958.93	18.3	961.57	A	Upper Sharon SS	8.1	17.9	18.3	2.64	20.9	9.59	951.98
	LL2mw-267	2373715.04	561393.22	1,012.81	20.5	1,014.81	A	Upper Sharon SS	9.8	19.8	20.0	2.00	22.0	9.06	1005.75
	LL2mw-271	2375714.00	557827.00	958.70	24	961.19	A	Upper Sharon SS	14.6	24.6	24.8	3	27.8	10.31	950.88
Load Line 3	LL3mw-238	2370625.34	559569.06	1,004.75	20.7	1,006.91	A	Upper Sharon SS	10.5	20.5	20.7	2.16	22.9	15.59	991.32
	LL3mw-241	2370332.80	559298.09	992.41	23.8	994.65	A	Upper Sharon SS	12.7	22.7	22.9	2.24	25.1	9.94	984.71
	LL3mw-244	2371456.00	556033.00	986.20	45	988.78	A	Upper Sharon SS	34.5	44.5	44.8	2.58	47.25	9.85	978.93
	LL3mw-246	2371441.00	555969.00	986.50	43	988.84	A	Upper Sharon SS	32.8	42.8	43.0	2.75	45.75	18.78	970.06
Load Line 7 Pink Waste Water Treatment	LL7mw-001	2352192.91	554925.77	1,126.90	30.0	1,129.64	A	Homewood	19.5	29.5	29.5	2.74	32.2	18.79	1110.85
Load Line 10	LL10mw-003	2355389.92	555494.71	1,127.40	26.4	1,130.28	A	Homewood	16.0	26.0	26.0	2.88	28.9	17.97	1112.31
Load Line 12	LL12mw-185	2368829.86	556946.75	979.09	24.0	981.31	A	Unconsolidated	10.8	20.8	21.0	2.22	23.2	7.01	974.30
	LL12mw-187	2368524.14	557633.10	977.90	29.0	979.94	A	Unconsolidated	17.2	27.2	27.4	2.04	29.4	8.67	971.27
	LL12mw-242	2368545.29	558020.51	978.40	26.3	981.20	A	Unconsolidated	15.5	25.5	25.5	2.80	28.3	8.12	973.08
	LL12mw-245	2368370.74	557044.55	977.50	29.0	980.04	A	Unconsolidated	18.0	28.0	28.0	2.54	30.5	7.56	972.48
	LL12mw-247	2368932.00	555141.00	981.30	20.5	984.25	A	Unconsolidated	10	20	20.3	2.95	22.6	4.94	979.31
NACA Test Area	NTAmw-119	2346013.00	551286.00	1,077.40	130	1,080.07	A	Unconsolidated	90.0	100.0	100.3	2.67	104.6	12.00	1068.07
Ramsdell Quarry Landfill	RQLmw-007	2375872.56	566544.36	963.86	18.7	965.91	A	Upper Sharon SS	6.0	16.0	16.2	2.05	18.2	5.76	960.15
	RQLmw-008	2376011.08	566327.94	963.82	18.7	966.08	A	Upper Sharon SS	6.0	16.0	16.2	2.26	18.5	5.93	960.15
	RQLmw-009	2376253.65	566351.20	962.60	18.8	964.58	A	Upper Sharon SS	5.9	15.9	16.4	1.98	18.4	4.75	959.83
	RQLmw-011	2376398.19	566819.66	974.60	35.4	976.57	A	Upper Sharon SS	12.4	32.4	32.6	1.97	34.6	20.74	955.83
	RQLmw-012	2376558.19	566551.95	975.12	30.5	977.65	A	Upper Sharon SS	19.8	29.8	30.0	2.53	32.5	20.47	957.18
	RQLmw-013	2376204.93	566928.09	978.04	34.4	980.71	A	Upper Sharon SS	23.7	33.7	33.9	2.67	36.6	24.09	956.62
Basal Sharon Conglomerate	SCFmw-002	2368927.36	555152.38	982.28	153	984.56	A	Basal Sharon Cong.	137	147	NA	2.28	149.65	18.59	965.97
	SCFmw-004	2378730.23	560361.03	941.87	120	944.17	A	Basal Sharon Cong.	100	110	NA	2.30	112.47	0.00	944.17
Winklepeck Burning	WBGmw-006	2359087.79	563008.87	1,012.16	19.0	1,014.66	A	Unconsolidated	7.6	17.6	17.9	2.50	20.4	6.26	1008.40
	WBGmw-009	2357159.20	561603.54	1,045.03	24.0	1,047.53	A	Unconsolidated	11.4	21.4	21.5	2.50	24.0	14.50	1033.03
	WBGmw-020	2357161.00	561623.00	1,043.40	43.3	1,044.31	A	Upper Sharon SS	32.9	42.9	43.2	0.91	43.8	11.73	1032.58
	WBGmw-021	2359106.00	563009.00	1,010.00	42.5	1,010.92	A	Upper Sharon SS	32	42	42.3	0.92	43.1	8.53	1002.39

Notes and Abbreviations:

[1] A = above grade completion; F = flush-mount completion

[2] Sediment accumulation is based on historical construction depths that may not be accurate; only positive sediment accumulation is presented.

Sediment accumulation values with gray-shading and bold font identify a calculated sediment thickness greater than 0.20 feet, with a "soft" or "medium" bottom description.

AGS = above ground surface

ASML - above mean sea level

BGS = below ground surface

BTOC - below top of casing

ft - feet

N/A - not applicable

nm - not measured

TOC - top of casing

Table 3-2
Summary of May 2016 Detected Constituents

Well Number				DA2mw-115	DETmw-003	DETmw-004	FBQmw-174	FWGmw-002	FWGmw-004	FWGmw-004-D	FWGmw-007	FWGmw-011	FWGmw-011-D	FWGmw-012	FWGmw-015	FWGmw-016	LL10mw-003	LL10mw-003-D
Sample Date				5/10/2016	5/10/2016	5/10/2016	5/11/2016	5/11/2016	5/9/2016	5/9/2016	5/11/2016	5/12/2016	5/12/2016	5/12/2016	5/9/2016	5/9/2016	5/11/2016	5/11/2016
RVAAP Area	**Screening Criteria**			Open Demolition Area #2	Open Demolition Area #2	Open Demolition Area #2	Fuze and Booster Quarry	Facility-Wide	Facility-Wide	Facility-Wide	Facility-Wide	Facility-Wide	Facility-Wide	Facility-Wide	Facility-Wide	Facility-Wide	Load Line 10	Load Line 10
Monitored Zone	**FWCUG**	**MCL**	**RSL**	Upper Sharon Sandstone	Unconsolidated	Unconsolidated	Homewood	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Upper Sharon Sandstone	Unconsolidated	Upper Sharon Sandstone	Homewood	Homewood
Field Measurements																		
pH (s.u.)	See Notes			7.83	7.74	6.89	5.48	7.91 HF	7.58	7.58	6.89	7.05	7.05	5.85	6.88	7.17	7.07	7.07
Turbidity (NTU)	---			0.00	0.00	0.00	0.00	296	25.9	25.9	8.00	60.7	60.7	0.00	0.00	0.00	0.00	0.00
VOCs (ug/L)																		
1,1,1-Trichloroethane		200	800	NA	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U
1,1-Dichloroethane			2.8	NA	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U
1,1-Dichloroethene		7	28	NA	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U
Acetone			1400	NA	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U
Carbon tetrachloride	5	5	0.46	NA	2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.6 J	1.8 J
SVOCs (ug/L)																		
2,4-Dinitrotoluene	0.12		0.24	0.45 U	0.46 U	21 U	0.41 U	NA	0.51 UJ	0.48 UJ	0.47 U	0.46 U	NA	0.48 U	0.42 UJ	0.44 UJ	19 U	21 U
3&4-Methylphenol	--	--	--	NA	20 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene			53	NA	0.12 U	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene			180	NA	0.12 U	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.004		0.012	NA	0.12 U	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol			200	NA	26 U	26 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	6	6	5.6	11 U	0.91 J	10 U	0.7 J	NA	11 U	12 U	11 U	11 U	NA	0.56 J	10 UJ	9.7 U	1 J	10 U
Dibenzofuran			0.79	NA	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate			1500	22 U	20 U	21 U	22 U	NA	22 U	24 U	21 U	22 U	NA	19 U	21 UJ	19 U	19 U	21 U
Dimethyl phthalate	--	--	--	22 U	20 U	21 U	22 U	NA	22 U	24 U	21 U	22 U	NA	19 U	21 UJ	19 U	19 U	21 U
Fluoranthene			80	NA	0.12 U	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene			29	NA	0.12 U	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone			78	NA	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene			0.17	NA	0.12 U	0.012 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.521		0.14	0.45 U	0.46 U	0.44 U	0.41 U	NA	0.51 UJ	0.48 UJ	0.47 U	0.46 U	NA	0.48 U	0.42 UJ	0.44 UJ	19 U	21 U
Explosives (ug/l)																		
1,3,5-Trinitrobenzene			59	1.1 U	1.1 U	1.1 U	1 U	NA	1.3 UJ	1.2 UJ	1.2 U	1.2 U	NA	1.2 U	1 UJ	1.1 UJ	NA	NA
1,3-Dinitrobenzene	0.104		0.2	0.45 U	0.46 U	0.44 U	0.41 U	NA	0.51 UJ	0.48 UJ	0.47 U	0.46 U	NA	0.48 U	0.42 UJ	0.44 UJ	NA	NA
2,4,6-Trinitrotoluene	0.521		0.98	0.45 U	0.46 U	0.44 U	31 D Q	NA	0.51 UJ	0.48 UJ	0.47 U	0.46 U	NA	0.48 U	0.42 UJ	0.44 UJ	NA	NA
2-Amino-4,6-dinitrotoluene	0.209		3.9	0.22 U	0.23 U	0.22 U	0.2 U	NA	0.25 UJ	0.24 UJ	0.24 U	0.23 U	NA	0.24 U	0.21 UJ	0.22 UJ	NA	NA
4-Amino-2,6-dinitrotoluene	0.209		3.9	0.22 U	0.23 U	0.076 J	0.2 U	NA	0.25 UJ	0.24 UJ	0.24 U	0.23 U	NA	0.24 U	0.21 UJ	0.22 UJ	NA	NA
HMX (Explosive)	100			0.45 U	0.46 U	2 M	0.64 J	NA	0.51 UJ	0.48 UJ	0.47 U	0.46 U	NA	0.48 U	0.42 UJ	0.44 UJ	NA	NA
PETN (Explosive)			3.9	2.2 U	2.3 U	2.2 U	2 U	NA	2.5 UJ	2.4 UJ	2.4 U	2.3 U	NA	2.4 U	2.1 UJ	2.2 UJ	NA	NA
RDX (Explosive)	0.774		0.7	0.22 U	0.23 U	3.2 M	0.2 U	NA	0.25 UJ	0.24 UJ	0.24 U	0.23 U	NA	0.24 U	0.21 UJ	0.22 UJ	NA	NA
Pesticides (ug/L)																		
beta-BHC	0.047		0.025	NA	0.061 U	0.057 U	0.057 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Common Anions (ug/L)																		
Nitrite/Nitrate (NO3/NO2-N)	10000	10000	3200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Inorganics (ug/L)																		
Aluminum			2000	23 J	300 U	300 U	130 J	NA	170 J	220 J	1100	3000	NA	23 J	59 J	300 U	300 U	300 U
Antimony		6	0.78	6 U	6 U	6 U	6 U	NA	6 U	6 U	6 U	6 U J	NA	6 U	6 U	6 U	6 U	6 U
Arsenic		10	0.052	2 J	8.6	5 U	5 U	NA	5 U	5 U	0.95 J	6	NA	2.2 J	0.4 J	4.3 J	5 U	5 U
Barium		2000	380	19	49	52	14	NA	20 D	17 D	25	43	NA	24	7.7 D	53 D	3.6	4.7
Beryllium		4	2.5	0.095 J	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U
Cadmium		5	0.92	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	NA	1 U	1 U	1 U	1 U	1 U
Calcium	---	---	---	97000	90000	120000	4900	NA	94000	94000	110000	64000	NA	24000	290000	110000	62000	60000
Chromium	---	---	---	10 U	10 U	10 U	10 U	NA	0.57 J	10 U	0.68 J	3.4 J	NA	10 U	10 U	10 U	10 U	10 U
Cobalt			0.6	0.17 J	0.32 J	1 U	0.23 J	NA	0.09 J	0.11 J	1.1	3.2	NA	1.8	0.36 J	1 U	1 U	1 U
Copper		1300	80	2 U	2 U	1.1 J	0.8 J	NA	2 U	2 U	0.81 J	4.5	NA	1 J	0.63 J	2 U	2 U	2 U
Iron			1400	900	1800	100 U	160	NA	210 J	360 J	1200	12000 B	NA	4500 B	160	620	100 U	55 J
Lead		15	15	0.2 J	3 U	3 U	3 U	NA	3 U	3 U	0.47 J	3	NA	0.22 J	3 U	3 U	3 U	3 U
Magnesium	---	---	---	29000	36000	25000	1800	NA	49000	49000	51000	14000	NA	5300	310000	31000	19000	19000
Manganese			43	100	260	3.3 J	23 Q	NA	9.3	12	230 J	330 J	NA	86 J	340	210	0.43 J Q	3.5 U Q
Nickel			39	3 U	3 U	3 U	5.4	NA	0.35 J	0.52 J	2.5 J	4.5	NA	1.3 J	1.3 J	3 U	3 U	3 U
Potassium	---	---	---	3500	1900 J	1300 J	910 J	NA	740 J	730 J	2300 J	1900 J	NA	980 J	3800	2400 J	620 J	600 J
Selenium		50	10	5 U	5 U	5 U	5 U	NA	5 U	0.96 J	5 U	5 U	NA	5 U	5 U	5 U	5 U	5 U
Silver			9.4	5 U	5 U	5 U	5 U Q	NA	0.061 J	5 U	5 U Q	5 U	NA	5 U Q	5 U	5 U	5 U	5 U Q
Sodium	---	---	---	13000	13000	1900 J	1200 J	NA	4000 J	4000 J	7300	5800	NA	6200	48000	12000	8400	8000
Vanadium			8.6	6 U	6 U	6 U	6 U	NA	6 U	6 U	1.3 J	3.7 J	NA	6 U	6 U	6 U	6 U	6 U
Zinc			600	20 U	20 U	9.2 J	25	NA	20 U Q	20 U Q	6.1 J	12 J	NA	2.4 J	20 U Q	20 U Q	20 U	20 U
Cyanide		200	0.15	NA	2.9 J	2.9 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate			1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Inorganics (ug/L)																		
Arsenic, Dissolved		10	0.052	NA	NA	NA	NA	NA	NA	NA	NA	3 J	3.5 J	NA	NA	NA	NA	NA
Barium, Dissolved		2000	380	NA	NA	NA	NA	NA	NA	NA	NA	32	36	NA	NA	NA	NA	NA
Calcium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	58000 J	58000 J	NA	NA	NA	NA	NA
Cobalt, Dissolved			0.6	NA	NA	NA	NA	NA	NA	NA	NA	0.96 J	1	NA	NA	NA	NA	NA
Iron, Dissolved			1400	NA	NA	NA	NA	NA	NA	NA	NA	5300 J	5200 J	NA	NA	NA	NA	NA
Magnesium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	12000	12000	NA	NA	NA	NA	NA
Manganese, Dissolved			43	NA	NA	NA	NA	NA	NA	NA	NA	290	310 J	NA	NA	NA	NA	NA
Potassium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	1200 J	1000 J	NA	NA	NA	NA	NA
Sodium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	5600	5500	NA	NA	NA	NA	NA

Table 3-2
Summary of May 2016 Detected Constituents

Well Number				DA2mw-115	LL12MW-185	LL12mw-187	LL12mw-242	LL12mw-245	LL12MW-247	LL12MW-247D	LL1mw-064	LL1mw-065	LL1mw-083	LL1mw-084	LL1mw-086	LL1mw-087	LL1mw-088	LL2mw-059
Sample Date				5/10/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/12/2016	5/12/2016	5/13/2016	5/13/2016	5/12/2016	5/12/2016	5/11/2016	5/13/2016
RVAAP Area	**Screening Criteria**			Open Demolition Area #2	Load Line 12	Load Line 12	Load Line 12	Load Line 12	Load Line 12	Load Line 12	Load Line 1	Load Line 1	Load Line 1	Load Line 1	Load Line 1	Load Line 1	Load Line 1	Load Line 2
Monitored Zone	**FWCUG**	**MCL**	**RSL**	Upper Sharon Sandstone	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Unconsolidated	Upper Sharon Sandstone	Upper Sharon Sandstone	Unconsolidated	Unconsolidated	Unconsolidated	Upper Sharon Sandstone
Field Measurements																		
pH (s.u.)	See Notes			7.83	6.55	6.36	7.23	6.90	7.16	7.16	7.71	7.50	4.44	5.60	13.07	7.20	7.34	6.17
Turbidity (NTU)	---			0.00	0.00	0.00	27.00	0.00	9.70	9.70	0.00	0.00	4.00	8.70	0.00	0.00	0.00	9.80
VOCs (ug/L)																		
1,1,1-Trichloroethane		200	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane			2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene		7	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone			1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	5	5	0.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs (ug/L)																		
2,4-Dinitrotoluene	0.12		0.24	0.45 U	0.47 U	0.46 U	0.49 U	0.47 U	0.42 U	0.42 UJ	0.43 U	0.42 U	2.5 M	1.2	0.42 U	0.44 UJ	0.41 UJ	0.33 J
3&4-Methylphenol	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene			53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene			180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.004		0.012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol			200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	6	6	5.6	11 U	NA	10 U	10 U	10 U	10 U	10 U	11 U	10 U	9.9 U	11 U	11 U	10 U	9.8 U	12 U
Dibenzofuran			0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate			1500	22 U	NA	21 U	21 U	20 U	21 U	21 U	21 U	21 U	20 U	22 U	21 U	21 U	20 U	23 U
Dimethyl phthalate	--	--	--	22 U	NA	21 U	0.32 J	20 U	21 U	21 U	21 U	21 U	20 U	22 U	21 U	21 U	20 U	23 U
Fluoranthene			80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene			29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone			78	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene			0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.521		0.14	0.45 U	0.47 U	0.46 U	0.49 U	0.47 U	0.42 U	0.42 UJ	0.43 U	0.42 U	0.44 U	0.45 U	0.42 U	0.44 UJ	0.41 UJ	0.51 U
Explosives (ug/l)																		
1,3,5-Trinitrobenzene			59	1.1 U	1.2 U	1.1 U	1.2 U	1.2 U	1 U	1 UJ	1.1 U	1.1 U	4.8	1.8	1.1 U	1.1 UJ	1 UJ	0.94 J M
1,3-Dinitrobenzene	0.104		0.2	0.45 U	0.47 U	0.46 U	0.49 U	0.47 U	0.42 U	0.42 UJ	0.43 U	0.42 U	0.3 J	0.31 J	0.42 U	0.44 UJ	0.41 UJ	0.51 U
2,4,6-Trinitrotoluene	0.521		0.98	0.45 U	0.47 U	0.46 U	0.49 U	0.47 U	0.42 U	0.42 UJ	0.43 U	0.42 U	2.5	5.6	0.42 U	0.44 UJ	0.41 UJ	0.51 U
2-Amino-4,6-dinitrotoluene	0.209		3.9	0.22 U	0.23 U	0.23 U	0.24 U	0.23 U	0.21 U	0.21 UJ	0.21 U	0.21 U	10 M	8.7	0.21 U	0.22 UJ	0.2 UJ	0.43
4-Amino-2,6-dinitrotoluene	0.209		3.9	0.22 U	0.23 U	0.23 U	0.24 U	0.23 U	0.21 U	0.21 UJ	0.21 U	0.21 U	19	22	0.21 U	0.22 UJ	0.2 UJ	0.45
HMX (Explosive)	100			0.45 U	0.47 U	0.46 U	0.49 U	0.47 U	0.42 U	0.42 UJ	0.43 U	0.42 U	0.25 J	0.73	0.42 U	0.44 UJ	0.41 UJ	0.51 U
PETN (Explosive)			3.9	2.2 U	2.3 U	2.3 U	2.4 U	2.3 U	2.1 U	1.5 J	2.1 U	2.1 U	2.2 U	2.2 U	2.1 U	2.2 UJ	2 UJ	2.6 U
RDX (Explosive)	0.774		0.7	0.22 U	0.23 U	0.23 U	0.24 U	0.23 U	0.21 U	0.21 U	0.21 U	0.21 U	0.22 U	0.8 J	0.49	0.22 UJ	0.2 UJ	0.26 U
Pesticides (ug/L)																		
beta-BHC	0.047		0.025	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.051 U	0.056 U	NA	NA	0.05 U	NA
Common Anions (ug/L)																		
Nitrite/Nitrate (NO3/NO2-N)	10000	10000	3200	NA	140	1500	0.1 U	0.029 J	0.1 U	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Total Inorganics (ug/L)																		
Aluminum			2000	23 J	NA	88 J	7000	79 J	330	360	420	140 J	800	690	110 J	270 J	1100	300 U
Antimony		6	0.78	6 U	NA	6 U	6 U	6 U Q	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
Arsenic		10	0.052	2 J	0.49 J	0.49 J	56	1.7 J	6.1	5.8	17	0.51 J	5 U	0.39 J	2.4 J	0.7 J	18	0.64 J
Barium		2000	380	19	NA	250 J	68	25	24	27	59	55	15	15	230	21	50	15
Beryllium		4	2.5	0.095 J	NA	1 U	0.6 J	1 U	1 U	1 U	1 U	1 U	0.34 J	0.19 J	1 U	1 U	0.14 J	1 U
Cadmium		5	0.92	1 U	NA	1 U Q	1 U Q	1 U Q	1 U	1 U	1 U	1 U	0.71 J	1.7	1 U	1 U	1 U	1 U
Calcium	---	---	---	97000	NA	1000000 D J	78000	160000	98000	97000	62000	89000	30000	62000	110000	100000	83000	28000
Chromium	---	---	---	10 U	NA	10 U	17	10 U	10 U	10 U	0.64 J	10 U	10 U	10 U	0.86 J	0.63 J	2.2 J	10 U
Cobalt			0.6	0.17 J	NA	10	11	0.75 J	0.68 J	0.58 J	1 U	0.53 J	7.8	12	2.6	0.86 J	1.1	1.1
Copper		1300	80	2 U	NA	2 U	19	2 U	2 U	2 U	1 J	2 U	2.5	9.2	7.5	0.66 J	1.5 J	0.72 J
Iron			1400	900	NA	160	17000 J	440	1100	1100	4800 B	270	100 U	100 U	390	660	2400	160 B
Lead		15	15	0.2 J	NA	0.2 J	11	0.21 J	0.21 J	0.2 J	1.6 J	0.22 J	3 U	0.9 J	0.54 J	0.42 J	0.93 J	0.2 J
Magnesium	---	---	---	29000	NA	300000 J	47000	72000	55000	55000	10000	23000	5600	3200	15000	27000	39000	11000
Manganese			43	100	NA	2200 J	410	79	210	220	120 J	250 J	400 J	97 J	45 J	78 J	85 J	40 J
Nickel			39	3 U	NA	14	27	3 U	3 U	0.49 J	0.54 J	3 U	28	23	8.3	3	3 U	4
Potassium	---	---	---	3500	NA	56000	3900	3800	2400 J	2400 J	790 J	1500 J	2800 J	3300	89000	770 J	12000	840 J
Selenium		50	10	5 U	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.2 J	5 U	5 U	5 U	5 U
Silver			9.4	5 U	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U Q	5 U Q	5 U	5 U	5 U	5 U Q
Sodium	---	---	---	13000	NA	41000	33000	27000	24000	23000	5400	15000	7600	5000 U	54000	9300	31000	5000 U
Vanadium			8.6	6 U	NA	6 U	16	6 U	6 U	6 U	0.57 J	0.52 J	6 U	6 U	6 U	0.92 J	2.8 J	6 U
Zinc			600	20 U	NA	3.5 J	65	2.9 J	2 J	2.1 J	4.5 J	2.1 J	37	53	3.4 J	2.5 J	5.8 J	2.4 J
Cyanide		200	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate			1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Inorganics (ug/L)																		
Arsenic, Dissolved		10	0.052	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved		2000	380	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved			0.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved			1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved			43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3-2
Summary of May 2016 Detected Constituents

Well Number				DA2mw-115	LL2mw-060	LL2mw-267	LL2mw-271	LL2mw-271-D	LL3mw-238	LL3mw-241	LL3mw-244	LL3mw-244-D	LL3mw-246	LL7MW-001	NTAmw-119	RQLmw-007	RQLmw-008	RQLmw-009
Sample Date				5/10/2016	5/13/2016	5/13/2016	5/12/2016	5/12/2016	5/12/2016	5/12/2016	5/13/2016	5/13/2016	5/12/2016	5/10/2016	5/11/2016	5/12/2016	5/12/2016	5/12/2016
RVAAP Area	**Screening Criteria**			Open Demolition Area #2	Load Line 2	Load Line 2	Load Line 2	Load Line 2	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 3	Load Line 7	NACA Test Area	Ramsdell Quarry Landfill	Ramsdell Quarry Landfill	Ramsdell Quarry Landfill
Monitored Zone	**FWCUG**	**MCL**	**RSL**	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone	Homewood	Unconsolidated	Upper Sharon Sandstone	Upper Sharon Sandstone	Upper Sharon Sandstone
Field Measurements																		
pH (s.u.)	See Notes			7.83	6.49	5.29	6.49	6.49	5.99	5.92	5.13	5.13	5.79	6.40	7.35	5.96	6.59	6.36
Turbidity (NTU)	---			0.00	9.70	0.00	0.00	0.00	7.80	0.00	0.00	0.00	0.00	31.3	9.50	0.00	0.00	0.00
VOCs (ug/L)																		
1,1,1-Trichloroethane		200	800	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.8	1 U	1 U	1 U	1 U
1,1-Dichloroethane			2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1	1 U	1 U	1 U	1 U
1,1-Dichloroethene		7	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.7	1 U	1 U J	1 U	1 U
Acetone			1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	2 J	10 U
Carbon tetrachloride	5	5	0.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	2 U	2 U	2 U	2 U
SVOCs (ug/L)																		
2,4-Dinitrotoluene	0.12		0.24	0.45 U	0.51 U	0.13 J	0.45 UJ	0.46 UJ	0.17 J	0.13 J	0.5 U	0.47 UJ	0.42 U J	0.43 U	22 U	0.46 U	0.45 UJ	0.48 U
3&4-Methylphenol	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U	19 U J	0.27 J	23 U
Acenaphthene			53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.099 U	0.12 U J	0.073 J	0.11 U
Anthracene			180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.099 U	0.12 U	0.0069 J	0.11 U
Benzo(a)anthracene	0.004		0.012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0068 J	0.0086 J	0.0057 J	0.0058 J
Benzyl Alcohol			200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28 U	24 U J	0.32 J	28 UJ
bis(2-Ethylhexyl)phthalate	6	6	5.6	11 U	10 U	11 U	10 U	11 R	11 U	10 U	9.9 U	10 U	9.5 U J	9.6 U	11 U	9.5 U	11 U	11 UJ
Dibenzofuran			0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	9.5 U	0.34 J	11 UJ
Diethyl phthalate			1500	22 U	21 U	0.44 J	21 U	22 R	21 U	21 U	20 U	20 U	19 U J	19 U	22 U	19 UJ	0.41 J	23 UJ
Dimethyl phthalate	--	--	--	22 U	21 U	22 U	21 U	22 R	21 U	21 U	20 U	20 U	0.27 J	19 U	22 U	19 UJ	0.34 J	23 UJ
Fluoranthene			80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.099 U	0.0072 J	0.0068 J	0.11 U
Fluorene			29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.099 U	0.12 U	0.11 J	0.11 U
Isophorone			78	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	9.5 UJ	0.34 J	11 UJ
Naphthalene			0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.019 J	0.022 J	0.01 J	0.01 J
Nitrobenzene	0.521		0.14	0.45 U	0.24 J	0.47 U	0.45 UJ	0.46 UJ	0.47 U	0.48 U	0.5 U	0.47 UJ	0.42 U J	0.43 U	22 U	0.46 U J	0.45 UJ	0.48 U
Explosives (ug/l)																		
1,3,5-Trinitrobenzene			59	1.1 U	1.3 U	1.2 U	1.1 UJ	1.1 UJ	17 M	9.3	1.3 U	1.2 UJ	1 U	1.1 U	1.3 U	1.1 U	1.1 UJ	1.2 U
1,3-Dinitrobenzene	0.104		0.2	0.45 U	0.51 U	0.47 U	0.45 UJ	0.46 UJ	0.47 U	0.48 U	0.5 U	0.47 UJ	0.42 U J	0.43 U	0.52 U	0.46 U	0.45 UJ	0.48 U
2,4,6-Trinitrotoluene	0.521		0.98	0.45 U	0.51 U	0.47 U	0.45 UJ	0.46 UJ	46 D	4.4	0.5 U	0.47 UJ	0.42 U J	0.43 U	0.52 U	0.46 U J	0.45 UJ	0.48 U
2-Amino-4,6-dinitrotoluene	0.209		3.9	0.22 U	0.14 J	0.9	0.22 UJ	0.23 UJ	8.9	2.5	0.44	0.22 J	0.21 U J	0.21 U	0.26 U	0.23 U	0.22 UJ	0.24 U
4-Amino-2,6-dinitrotoluene	0.209		3.9	0.22 U	0.19 J	0.86 M	0.22 UJ	0.23 UJ	24	2.7	0.41	0.21 J	0.21 U J	0.21 U	0.26 U	0.23 U	0.22 UJ	0.24 U
HMX (Explosive)	100			0.45 U	0.51 U	0.36 J	0.45 UJ	0.46 UJ	1.7 J	0.45 J M	0.5 U	0.47 UJ	0.42 U J	0.43 U	0.52 U	0.46 U	0.45 UJ	0.48 U
PETN (Explosive)			3.9	2.2 U	2.5 U	2.4 U	2.2 UJ	2.3 UJ	2.3 U	2.4 U	2.5 U	2.3 UJ	2.1 U	2.1 U	2.6 U	2.3 U	2.2 UJ	2.4 U
RDX (Explosive)	0.774		0.7	0.22 U	0.25 U	1.1 M	0.22 U Q	0.23 UJ	4.7 M	0.8 M	0.33 M	0.24 J	0.27 M	0.21 U	0.26 U	0.23 U	0.68 JS	0.24 U
Pesticides (ug/L)																		
beta-BHC	0.047		0.025	NA	NA	NA	NA	NA	0.072 J	0.06 U	0.052 U	0.052 U	NA	NA	NA	0.057 U	0.054 U	0.057 U
Common Anions (ug/L)																		
Nitrite/Nitrate (NO3/NO2-N)	10000	10000	3200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Inorganics (ug/L)																		
Aluminum			2000	23 J	53 J	41 J	300 U	300 U	250 J	22 J	300 U	300 U	21 J	28 J	600	23 J	88 J	20 J
Antimony		6	0.78	6 U	6 U	6 U	0.8 J	6 U	6 U	6 U	5000 U	5000 U	6 U	6 U	6 U	6 U	0.42 J	6 U
Arsenic		10	0.052	2 J	5 U	0.47 J	2.9 J	3.9 J	1.1 J	5 U	5 U	5 U	5 U	7.7	7	48	22	24
Barium		2000	380	19	30	7.2	3.6	3.5	10	1.5 J	14	17	15	24	93 J	33	110	31
Beryllium		4	2.5	0.095 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.82 J	1 U	1 U	1 U	1 U
Cadmium		5	0.92	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Calcium	---	---	---	97000	56000	27000	58000	58000	59000	16000	24000	24000	23000	40000	80000	100000	49000	23000
Chromium	---	---	---	10 U	10 U	0.71 J	10 U	10 U	0.89 J	10 U	10 U	10 U	10 U	10 U	0.9 J	10 U	10 U	10 U
Cobalt			0.6	0.17 J	1 U	1.5	9.5	9.1	1 U	1 U	1 U	1 U	1 U	6.5	0.43 J	7.6	2.4	2.4
Copper		1300	80	2 U	2 U	0.83 J	2 U	2 U	0.68 J	2 U	2 U	2 U	2 U	2 U	1 J	2 U	2 U	2 U
Iron			1400	900	100 U	1300 B	3400	3600	700 B	110 B	100 U	100 U	100 U	12000	1900	13000 J	71000	9300
Lead		15	15	0.2 J	3 U	0.22 J	3 U	3 U	0.46 J	3 U	3 U	3 U	3 U	3 U	0.61 J	3 U	3 U	0.18 J
Magnesium	---	---	---	29000	7900	14000	18000	18000	6200	6500	7500	7600	7300	14000	20000	84000	59000	18000
Manganese			43	100	7.5	440 J	470 J	460 J	14	5.5	0.89 J	0.72 J	3.5 U	480	350 J	1600 J	490 J	750 J
Nickel			39	3 U	0.34 J	3	37	36	2 J	1.2 J	1.5 J	1.3 J	3 U	9	0.93 J	14	3.9	3
Potassium	---	---	---	3500	420 J	550 J	1400 J	1400 J	2900 J	610 J	1300 J	1300 J	1600 J	1100 J	1300 J	5900	2900 J	3300
Selenium		50	10	5 U	5 U	5 U	5 U	5 U	2.3 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver			9.4	5 U	5 U Q	5 U Q	5 U	5 U	5 U Q	5 U Q	5 U Q	5 U Q	5 U	5 U	5 U	5 U	5 U	5 U
Sodium	---	---	---	13000	5000 U	16000	5000 U	5000 U	5000 U	5000 U	6 U	6 U	5000 U	6500	6300	4100 J	3700 J	1800 J
Vanadium			8.6	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	2.6 J	0.73 J	6 U	0.67 J	6 U
Zinc			600	20 U	20 U	3.2 J	20 U	20 U	2.1 J	20 U	20 U	20 U	20 U	56	3.9 J	7.4 J	5.3 J	3.1 J
Cyanide		200	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 J	2.3 J	6.4 J
Perchlorate			1.4	NA	NA	NA	0.0096 J	0.06 J	NA	NA	NA	NA	0.069	NA	NA	NA	NA	NA
Dissolved Inorganics (ug/L)																		
Arsenic, Dissolved		10	0.052	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved		2000	380	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved			0.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved			1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved			43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3-2
Summary of May 2016 Detected Constituents

Well Number				DA2mw-115	RQLmw-009D	RQLmw-011	RQLmw-012	RQLmw-013	SCFMW-002	SCFmw-004	WBGmw-006	WBGmw-009	WBGmw-020	WBGmw-021
Sample Date				**5/10/2016**	**5/12/2016**	**5/12/2016**	**5/12/2016**	**5/12/2016**	**5/11/2016**	**5/13/2016**	**5/10/2016**	**5/10/2016**	**5/10/2016**	**5/10/2016**
RVAAP Area	**Screening Criteria**			**Open Demolition Area #2**	**Ramsdell Quarry Landfill**	**Ramsdell Quarry Landfill**	**Ramsdell Quarry Landfill**	**Ramsdell Quarry Landfill**	**Sharon Conglomerate**	**Sharon Conglomerate**	**Winklepeck Burning Grounds**	**Winklepeck Burning Grounds**	**Winklepeck Burning Grounds**	**Winklepeck Burning Grounds**
Monitored Zone	**FWCUG**	**MCL**	**RSL**	**Upper Sharon Sandstone**	**Upper Sharon Sandstone**	**Upper Sharon Sandstone**	**Upper Sharon Sandstone**	**Upper Sharon Sandstone**	**Basal Sharon Cong.**	**Basal Sharon Cong.**	**Unconsolidated**	**Unconsolidated**	**Upper Sharon Sandstone**	**Upper Sharon Sandstone**
Field Measurements														
pH (s.u.)	See Notes			7.83	6.36	4.28 HF	5.26 HF	3.89 HF	7.28	5.88	7.56	6.80	7.53	7.14
Turbidity (NTU)	---			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.90
VOCs (ug/L)														
1,1,1-Trichloroethane		200	800	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane			2.8	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene		7	28	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone			1400	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	5	5	0.46	NA	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
SVOCs (ug/L)														
2,4-Dinitrotoluene	0.12		0.24	0.45 U	0.49 U	NA	NA	NA	0.44 U J	0.45 U	0.42 U	0.47 U	0.45 UJ	0.43 U
3&4-Methylphenol	--	--	--	NA	21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene			53	NA	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene			180	NA	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	0.004		0.012	NA	0.0075 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol			200	NA	27 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	6	6	5.6	11 U	11 U	NA	NA	NA	10 U	11 U	9.9 U	10 U	10 U	10 U
Dibenzofuran			0.79	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate			1500	22 U	21 U	NA	NA	NA	20 U	21 U	20 U	21 U	21 U	21 U
Dimethyl phthalate	--	--	--	22 U	21 U	NA	NA	NA	20 U	21 U	20 U	21 U	21 U	21 U
Fluoranthene			80	NA	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene			29	NA	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone			78	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene			0.17	NA	0.013 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	0.521		0.14	0.45 U	0.49 U	NA	NA	NA	0.44 U J	0.45 U	0.42 U	0.47 U	0.45 UJ	0.43 U
Explosives (ug/l)														
1,3,5-Trinitrobenzene			59	1.1 U	1.2 U	NA	NA	NA	1.1 U	1.1 U	1 U	1.2 U	1.1 UJ	1.1 U
1,3-Dinitrobenzene	0.104		0.2	0.45 U	0.49 U	NA	NA	NA	0.44 U	0.45 U	0.42 U	0.47 U	0.45 UJ	0.43 U
2,4,6-Trinitrotoluene	0.521		0.98	0.45 U	0.49 U	NA	NA	NA	0.44 U J	0.45 U	0.42 U	0.47 U	0.45 UJ	0.43 U
2-Amino-4,6-dinitrotoluene	0.209		3.9	0.22 U	0.24 U	NA	NA	NA	0.22 UJ	0.22 U	0.21 U	0.24 U	0.22 UJ	0.22 U
4-Amino-2,6-dinitrotoluene	0.209		3.9	0.22 U	0.24 U	NA	NA	NA	0.22 U J	0.22 U	0.21 U	0.24 U	0.22 UJ	0.22 U
HMX (Explosive)	100			0.45 U	0.49 U	NA	NA	NA	0.44 U	0.45 U	3.5	0.77 M	0.45 UJ	0.43 U
PETN (Explosive)			3.9	2.2 U	2.4 U	NA	NA	NA	2.2 U	2.2 U	2.1 U	2.4 U	2.2 UJ	2.2 U
RDX (Explosive)	0.774		0.7	0.22 U	0.24 U	NA	NA	NA	0.22 U	0.22 U Q	9.3	2.3 M	0.22 UJ	0.22 U
Pesticides (ug/L)														
beta-BHC	0.047		0.025	NA	0.058 U	NA	NA	NA	0.063 U	0.055 U	NA	NA	NA	NA
Common Anions (ug/L)														
Nitrite/Nitrate (NO3/NO2-N)	10000	10000	3200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Inorganics (ug/L)														
Aluminum			2000	23 J	20 J	NA	NA	NA	300 U	32 J	70 J	140 J	300 U	300 U
Antimony		6	0.78	6 U	6 U	NA	NA	NA	6 U	6 U	6 U	6 U	6 U	6 U
Arsenic		10	0.052	2 J	25	NA	NA	NA	12	5 U	5 U	0.47 J	1.4 J	8
Barium		2000	380	19	31	NA	NA	NA	34 J	83	21 D	9.8 D	20 D	55
Beryllium		4	2.5	0.095 J	1 U	NA	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium		5	0.92	1 U	1 U	NA	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U
Calcium	---	---	---	97000	23000	NA	NA	NA	88000	160000	73000	35000	32000	72000
Chromium	---	---	---	10 U	10 U	NA	NA	NA	10 U	10 U	10 U	0.51 J	10 U	10 U
Cobalt			0.6	0.17 J	2.4	NA	NA	NA	1 U	1 U	0.29 J	0.13 J	0.48 J	0.26 J
Copper		1300	80	2 U	2 U	NA	NA	NA	0.71 J	2 U	2 U	2 U	2 U	2 U
Iron			1400	900	9000	NA	NA	NA	470	100 U	250	300	4200	1100
Lead		15	15	0.2 J	3 U	NA	NA	NA	0.3 J	3 U	3 U	0.53 J	3 U	3 U
Magnesium	---	---	---	29000	17000	NA	NA	NA	29000	62000	26000	11000	11000	19000
Manganese			43	100	770 J	NA	NA	NA	74 D	690 J	130	36	280	260
Nickel			39	3 U	2.9 J	NA	NA	NA	3 J	3 U	3 U	1.3 J	2.4 J	3 U
Potassium	---	---	---	3500	3200	NA	NA	NA	2500 J	2800 J	850 J	410 J	680 J	1300 J
Selenium		50	10	5 U	5 U	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U
Silver			9.4	5 U	5 U	NA	NA	NA	5 U	5 U Q	5 U	5 U	5 U	5 U
Sodium	---	---	---	13000	1800 J	NA	NA	NA	21000	12000	6200	3200 J	4100 J	4800 J
Vanadium			8.6	6 U	6 U	NA	NA	NA	6 U	6 U	6 U	6 U	6 U	6 U
Zinc			600	20 U	3.5 J	NA	NA	NA	20 U	20 U	20 U Q	20 U	20 U Q	20 U
Cyanide		200	0.15	NA	2.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate			1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Inorganics (ug/L)														
Arsenic, Dissolved		10	0.052	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved		2000	380	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Dissolved			0.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved			1400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved			43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3-2
Summary of May 2016 Detected Constituents

Notes and Abbreviations:
B - Constituent detected in sample and laboratory blank sample
D - The reported value is from a dilution
HF - Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.
J - Estimated value
M - Manual integrated compound
Q - One or more laboratory quality control criteria failed
R - Rejected during data validation
U - Constituent not detected; Reporting limit presented
NA - Constituent not analyzed
NTU - Nephelometric turbidity units
s.u. - Standard pH units
µg/l - micrograms per liter
Only detected constituents are included in this table
PCBs were not detected in any of the samples analyzed for these constituents; PCBs are therefore not included on this table
Screening Criteria include the Facility-Wide Cleanup Goals (FWCUG), Maximum Contaminant Levels (MCL), and Regional Screening Levels (RSL).
Highlighting identifies the comparison criteria used.
FWCUGs are from *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, Ravenna, Ohio, dated March 23, 2010* (SAIC, 2
FWCUGs will be updated during the RI.
RSLs are from May 2016 (using a THQ=0.1, and HQ=10e-6).
Highlighted pH values identify pH levels less than 5.0 or greater than 9.0 s.u.
Highlighted concentrations indicate the constituent concentration is equal to or greater than the screening criteria
The sample ID only includes the unfiltered sample. All filtered sample results, for metals, are incorporated under the unfiltered sample column

Table 3-3
Data Completeness Summary

Analytical Method	Total Number of Analytes	Number of Rejects	Percent Completeness
VOCs SW8260B	455	0	100%
SVOCs SW8270D	590	6	99.0%
PAHs SW8270D SIM	112	0	100%
Pesticides SW8081B	336	0	100%
PCBs SW8082A	42	0	100%
Explosives SW8330B	880	0	100%
Metals (ICP) SW6010C	294	0	100%
Metals (ICP/MS) SW6020A	785	0	100%
Mercury SW7470A	49	0	100%
Nitrate/Nitrite EPA353.2	6	0	100%
Hexavalent Chromium SW7196A	5	0	100%
Cyanide SW9012B	6	0	100%
pH SW9040C	4	0	100%
Perchlorate SW6860	3	0	100%
TOTAL	3567	6	99.8%

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A
FIELD FORMS AND NOTES

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A.1

FIELD NOTES

THIS PAGE INTENTIONALLY LEFT BLANK

Ravenna 5-9-16

0740 - arrive onsite, met with tom, Danielle, Liz, & chuck
0815 - Begin orientation
- tom & me get keys & head to 1036 Bldg
0900 - arrive at Bldg, Begin organizing
1000 - tailgate with [illegible]
1005 - Begin cal of meters, check ATVs [illegible] equipment
1109 - Begin FWG-MW-04, everyone is training on 1 well
1300 - tom myself & danielle break off, get ATV & move to FWGMW-15 & 16
1458 - Sampled 16, move to 15
1630 - head to 1036 to begin cleanup & prep
1645 - chuck departs, tom & Danielle still sampling
1800 - depart site

Ravenna GWS 5-10-16

0710 - arrive onsite, meet Liz Danielle chuck, tailgate
Begin prep
0738 - called range control to let them know we will be in winklepeck
0745 - head to winklepeck, dummy locked gate.
0830 - Liz/chuck begin WBG-9 & 21
tom/danielle begin WBG 5 & 20
0845 - sampled WBG-MW-09
0945 - sampled WBG-MW-20
1010 chuck & Liz go to DA2, Begin MW 115, tom & danielle finish up 21 @ WBG
- called range control to let them know we are in DA2
1200 - one horiba stopped working, called Pine to get replacement, called [illegible] to pick it up & deliver it. in the meantime the two teams shared
1330 - load coolers meet [illegible] & the courier to drop off samples
1445 - return to DET 2
tom & Danielle still at DET 4, Liz & chuck go to LL 7
1700 - finish LL 7 Begin cleanup. tom finishes DET 4
1735 - depart site

Rite in the Rain

0705 - arrive onsite, meet Tom, Liz, Chuck & Danielle; tailgate; calibrate meters load up.
0800 - start work
Liz & Chuck to hit LL10, FBQ, NTA, & Fus 001
meet Tom & Danielle, go to LL 12 & 3
0815 - Begin at LL12 247
0930 - The new MP-10 is broken, found a split solenoid valve. called Kim, he went & got spare unit from the Bldg
1000 - Begin Purge of SFmw 2
1111 - I stay behind to sample SCFmw-2 while Tom & Danielle begin to Purge ~~185~~ LL12-185
1240 - Finish sampling SCFmw-002, go to LL 12 to collect samples & meet courier
1345 - samples with courier
~~05~~1400 - offsite for ice
~~15~~ -
1430 - return to site
1500 - return to Tom/Danielle, help them sample while they go to 242
1648 - Finish sampling LL12-187, move to 242
1835 - Finish 242, turbidity stabilized at 26. after 2 hrs, head to Bldg clean up

1920 - depart site, let PM know
- Liz & Danielle will meet Kevin @ 0700 to sample 271

MH

Ravenna GWS 5/12/16

60s partly cloudy, Humid

0650 - arrive onsite, meet Liz & Danielle at 271 to collect the ~~fan~~ Horiba

~~Move~~ to 1036 building. conduct tailgate & go over samples collected, Prep

0810 - depart Bldg for ramsdale Quarry

0840 - Begin at RQ-007 w ms/msd

- girls had completed LL-1-mw-88 ~~twit~~ last night, let him know

0910 - sample RQ 007, tom & chuck continue

1130 - Finish sampling RQ 007 meet with tom & kevin ORQ 009 to help them finish

1330 - Finish sampling RQL 009, head for courier

1420 - Drop samples off with courier

1540 - meet tom & chuck at LL3 241 go to pick up sample tube from other team

1710 - return to other ~~tc~~ tom & chuck

1805 - Finish work let him know. head to contractor Bldg, Prep vehicles & samples

1900 - depart site

MH

Ravenna GWS 5/13/16

60s overcast

0700 - arrive onsite, meet tom, Liz, Chuck, danielle, conduct tailgate ~~Prep~~ for today

- last night found a cap for Air Line for SCFmw-004

0725 - teams head to sample

- clean up & mop contractor Bldg

0740 - head to SCFmw 004 to install Pump

0810 - Pump installed, head to ~~sc~~ LL1

0820 - Finish w LL1 team go to LL2 267, Finish sampling Bottles for team m n & chuck. they go to SCFmw 004

0925 - Finish filling LL2 264, head to SCFmw 004

0955 - Finish scfmw-004, left Pump in well, head to LL 12 244

1230 - sample 244. head to Bldg

Begin to clean up. secure site

1300 - collect IDW sample call Mike to let him know to come get ATVs

1420 - Drop off samples with courier

- go to vista to drop off keys

1330 - let rest of team go

1510 - dropped off final key with vista

1530 - waiting for Mike to pick up ATVs & equipment

1745 - Mike Picks up W-50s, 41 ATV gave driver the key & let him know. depart site

KAVENNA APR 19

0951 Mobe to next well along Route 5
1000 Arrive at LL2mw-271 & Install Pump
1010 Arrive at LL3mw-246 & Install Pump
1040 Arrive at SCFmw003 & Install Pump
1130 mobe back to Bldg 1036
1140 Clean up at Bldg 1036
1200 EK & CK offsite. TSJ & MH wait @ Bldg 1036 to return ATVs

Elizabeth Kirby April 20 2016

7

KAVENNA - MAY 19 2016, MONDAY
Weather: SUNNY, 67-80°F, NO WIND
PPE: Level D
Staff: CARDNO - LIZ KIRBY (EK) + DANIELLE PHILLIPS (DP) ATC - CHUCK DUSETZINA (CD), TOM ST JOHN (TSJ) & MATT HUMMEL (MH)
0800 CARDNO + ATC ONSITE
0830 CD, EK, DP - TRAINING IN ENV. MNGT OFFICE W/ KATIE TAIT TSJ + MH - PICK UP KEYS & MOBE TO CONTRACTOR BLDG TO ORG. SUPPLIES.
WORK W/ KATIE + KEVEN FOR EXTENDED HOURS
- STAGE ON S. END
- NEW CONTAINER LOG IN BINDER IN CONTRACTOR BLDG. 1PG. PER DRUM. INSPECTIONS TO KATIE ON WEEKLY BASIS - PHOTO OPTIONAL COC SUBMITTED TO KATIE TAIT
- CHECK WBG SCHEDULE (RANGE CONTROL) KT TO UPDATE
- CHECK IN W/ RANGE CONTROL EVERY DAY

EK

Rite in the Rain 8

RAVENNA ARNG

- WBG & RQL LAND USE RESTRICTION BRIEF FOR DP & CD (ANNUAL
- MON-THURS = TURKEY HUNTING ON W. SIDE OF INSTALLATION.
- WEDS - SPLIT SMPL. W/KEVIN?
→ 22,000 AC. = RAVENNA AREA
- REPORT BEAR SIGHTING, IF YOU SEE UXO
- NBG - NOT FRI. ODA2 - NOT FRI need range control to let you in & out

0900 CHECK IN WITH RANGE CONTROL
0925 CONTRACTOR BLDG. KEVIN SEDLACK (KS) KIM KRUSE (KK) @ BLDG. KT AT CONTRACTOR BLDG.
1000 TAILGATE SAFETY MEETING CALIBRATE EQPT. ORGANIZE SUPPLIES AT CONTRACTOR BLDG (KT away)
1100 MOBE (ALL PERSONELLE) TO SAMPLE MW TOGETHER FWGmw004
1252 KK, DP, MH, TS) mobe to begin sampling other wells near front EK, KS & CD ~~beg~~ continue sampling FWGmw004
1335 collect FWGmw004 & FWGmw084-D collect split smpl
1615 mobe to contractor bldg

RAVENNA ARNG -076003

1700 DISPOSE OF IDW, CLEAN UP BLDG, FILL OUT COC. ALL TEAM BACK AT CONTRACTOR BLDG.
1800 OFFSITE

Elizabeth Kirby

RAVENNA ARNG-076003

TUESDAY MAY 10 2016

PPE: level D

OBJECTIVE: sample GW wells

STAFF: Liz Kirby (LK) & Danyelle Phillips (DP) from Cardno

0655	LK + DP onsite @ contractor bldg. calibrate eqpt.
0700	CD, MH, TSJ ONSITE (ATC)
0715	H&S TAILGATE MTG.
0740	MOBE (all staff) to WBG to SAMPLE WELLS w/ CD
0845	WBGmw009 sample
0945	WBGmw020 Sample
1020	Mobe w/ MH to DETmw003 DA2mw115
1115	DA2mw115 Sample
1225	DETmw003 Sample ANG collected split sample from DETmw003
1335	arrive (EK + CD + MH) at LL7mw001 MH mobe to meet TestAmerica EK+CD stay to sample wells
1550	Sample LL7mw001
1610	Mobe back to Contractor Bldg

RAVENNA ARNG - 076003

1630	AT CONTRACTOR BLDG
1700	DISPOSE OF IDW
1730	OFFSITE

May 10 2016

Elizabeth Kirby

RAVENNA ARNG - WEDS MAY 11 2016

PPE-LevelD

Staff- Same as TUES 5/10/16

Objective- Sample MWs

0645 - check in at gate & provide IDs to Ravenna security

0700- Tailgate Safety Meeting
Calibrate Eqpt. & load up for day

0800 QR & cd @ LL10mw003

0900 LL10mw003 sample

0920 mobe to FBQ

0930 arrive @ FBQmw174

1015 FBQmw174 sample

1035 mobe to W. side wells

1140 NTA mw119 & ms/msD sample

1220 arrive @ FWGmw007

1315 FWGmw007 sample

1335 mobe back to Bldg 1036

1355 Dispose of IDW & mobe up to ~~FWGmw002~~ FWGmw002

1420 arrive at FWGmw002

1625 FWGmw002 sample.

1630 mobe back to Bldg 1036

1640 Dispose of IDW at Bldg 1036

1510 mobe to LL12mw242

Ravenna ARNG

1730 arrive at LL12mw242. All staff at mw. TSJ & CD mobe back to go offsite EK+DP+MH stay to finish sampling well. well has high turbidity & needs to be purged for the full 2hour limit

1821 LL12mw242 sample

1830 mobe back to contractor bldg dispose of IDW

1920 Offsite

2000 arrive at LL1mw088 with DP

2035 sample LL1mw088

2049 end sampling & mobe back to hotel

May 11 2016

Ravenna ARNG – THURS MAY 12, '16

PPE - level D.

Staff - Same as yesterday

Objective - Sample GW

0630 EK & DP arrive at LL2mw271 & begin calibrating equip. (use KIA soil to access well)

0735 Samples LL2mw271
LL2mw271-D
ANG collected split sample at location

0815 Mobe to LL3mw247

0825 Arrive at LL3mw247 & begin purging

0900 Sample LL3mw247 (ms/msd at location)

0915 mobe to west gate

0920 Onsite. Mobe to Bldg 1036 to pick up supplies, drop off samples & dispose of IDW

1045 arrive at LL1mw086

1050 begin purging

1125 sample LL1mw086

1130 mobe to LL1mw065

1135 begin purging LL1mw065

Ravenna ARNG 5/12/16

1208 leave LL1mw065

1214 @ LL1mw087. note artesian well SCFmw-004 is overflowing pump air line filled with H_2O

1245 sample LL1mw087

1254 mobe to Bldg 1036

1313 arrive @ Bldg 1036. Dispose of IDW, Ice down samples. Reload ATV

1335 mobe east to wells on S. Service Rd

1357 @ LL1mw64

1405 begin purge.

1440 sample LL1mw64

1445 leave LL1mw64

1450 arrive at FWGmw012 & 011

1455 purging FWGmw012

1530 sample FWGm012

1540 purging FWGmw011

1745 sample FWGmw011

1800 leave FWGmw012 & 011

1830 arrive at Bldg 1036. All Staff EK, DP, TSJ, MH & CD clean up

Ravenna ARNG 5/13/2016

0600 Mobe to buy ice
0615 Buy ice, water, fuel
0630 onsite (EK+DP) Bldg 1036
PPE - Level D
Staff - Elizabeth Kirby (EK) } caden
Danyelle Phillips (DP) }
atc { Tom St John (TSJ)
Matt Hummel (MH)
Chuck Dusetzina (CD)
Objective: Finish GWMWs left to Sample. Return rental cpt. Return keys & Clean up Bldg 1036
Weather: mdy rain today (80%) currently cool & clear
0700 Calibrate Horiba
0710 Tailgate H&S meeting
0720 EK & DP mobe to LL1
0750 arrive at LL1mw084
0800 begin purging
0835 sample LL1mw084
0845 leave LL1mw084
0855 start purging LL1mw083
0925 sample LL1mw083

Ravenna ARNG 5/13/2016

0950 arrive at LL2mw060
Kevin Sedlack with OEPA
Albert Muller & Kevin Palomoo. Setup at well
1000 start purging MW LL2mw060
1055 OEPA mobe w/ Kevin to inspect potential MW drilling locations
1115 sample LL2mw060
1120 mobe to LL2mw059
1200 sample LL2mw059
1205 mobe back to Bldg 1036
1230 Pickup at Bldg 1036. OEPA & Kevin stopped by to say goodbye
1300 Sample IDW. Pack coolers
1400 offsite

Elizabeth Kirby 5/13/16

5/9/16
9:25 : on site
Tom
Kevin
Liz
Kim
Chuck
Matt
Weather: clear & sunny

Calibration started at 1000 & finished 1103

Time: 1110
Well ID = FWGMW-004

Notes: Water Level indicator not working
1127
Water Level = 12.43 ft TOC

1242
Kevin (ANG cain guard rep?) said can dump hariber filter

1343
Cloudy
70°

FWGMW-015
Tom St. John
Matt

Total Depth = 62 ft
Depth to water = 5.18 ft BTOC

Note: turbidity read 0.0 : not sure if it is a calibration issue
- switching to MW-015

1405

FWGMW-016

Note: at MW-015 tested with cal. fluid - was calibrated. Turbidity is accurate.

1438
MW-016

Note: Turbidity & DO are zero

Sample Start time = 1458
Sample end time = 1555

1555

FWGMW-015

Depth to Water = 5.37

Sample Time: 1650
End Time: 1744

COC

FWGmw-004	5/9/16	1335
FWGmw-004-D	5/9/16	1335
FWGmw-016	5/9/16	1438
FWGmw-015	5/9/16	1650

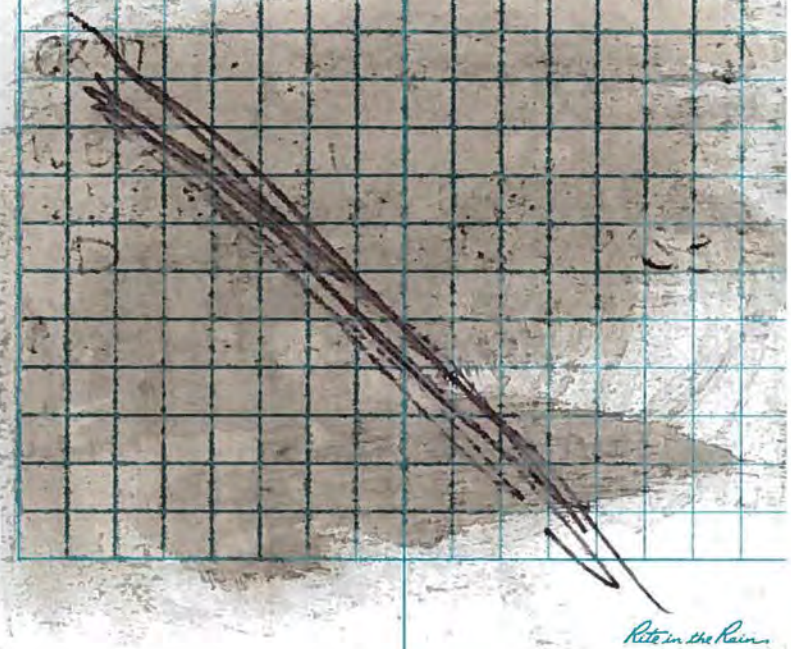
Leave Site = 600pm

Rarenna Arsenall 076003

Tuesday May 10 2016
PPE: Level D
Objective: sample MW
STAFF: Liz Kirby (LK), Danyelle Phillips (DP)

0701 at contractor building calibrating equipment

calibration complete at 0739
PH 10 calibration Stayed at 10.63



Rite in the Rain

Ravenna Arsenal
0831
Well ID= WGB-MW21
Raining; 58°
Clear water
Staff: Tom St. John (TSJ);
Matt, DP

Date: 05/10/11

WGB-MW21
Sample Start Time: 0906
End time: 0944

0950

WGB-MW06

establishing flow rate
flow rate = 100 mL/sec

Purge Start Time = 1005
Purge end Time = 1036

Sample Start Time = 1036
Sample End Time =

1130
PET MW-4

Water Depth = 11.2
Note: top of the pump is not completely submerged
Intake was submerged partially
Pulled the pump out to verify

Will take sample first then take water depths samples

Had to hault purging due to Hariba not turning on.

Started sampling at 1308
End Sampling time: 1658

* Kevin taking Split here

5:26 off site time

Matt

Ravenna Arsenal 026003

0656
Weather: Cloudy & foggy, 56°F
Wednesday, May 11th
Staff: LK, DP, Matt Hamell (MH)
CD, TSJ

Onsite Time: 0700

Calibrating Hanjbas
Finished Calibration at 0756

0816
Staff: TSJ, MH, DP
Weather: Cloudy, 60
Well ID: LL12-247

Purge Start Time = 0831
Purge End Time = 0906

MH started sampling at 0908

TSJ & DP started purging
SCF-MW002

Note: MP10 controller that runs on generator started not work- had a busted solenoid for air pressure. It had a crack. Delayed purging

Started pumping at 1012
ended at 1110

1140
Staff: TSJ & DP
Weather: cloudy, getting warmer, 70°

Well ID: LL12 mw-185

Purge Start Time: 1150
Purge end Time: 1220

Sample Time: 1221

1323
Well ID = MW245-LL12
Staff: DP & TSJ
Weather: cloudy & 70

Sample Start time = 1414
end time = 1437

1505 5-11-16
Well ID: LL12mw-187
Staff: TSJ & DP
Weather: clouldy, possible T-storms
started purging MW-187

Sample Time: 1548

1611
LL12mw-187
Staff: TSJ & DP
Weather: cloudy; possible T-storms

started purging at 1620
end purge time:

Note: turbidity is high at this well

Supervised OSHA Training

Day 2: 5-10-16; sampled 3 wells using bladder pumps; calibrated Horiba

Day 3: 5-11-16; sampled 8 wells using bladder pump; calibrated

up on Monday

1734 = 1 3/4 gallon IDW still more remaining

Note: well is going per full 2hr purge time; Kevin was notified

Sample time: 1821

Note: some samples might have high turbidity due to build up in the hose.

offsite: 1920

2000
Staff: LK & DP
LL1mw-088

purging well
sampled at 2035
ended sampling @ 2049
offsite at 2100

Thursday, May 12th 2016
Weather: foggy, 60

Staff: LK & DP
Onsite: 0630

Calibrating Haribea & sample LL2mw 271

calibration complete at 0707

purging at 0707
end time: 0735

Sample Time: 0735

Kevin pulled a split here at 0804

leaving well at 08017

0824
LL3mw-246

5-12-16 0839

set-up equipment

Purge Start Time: 0825
Purge End Time: 0855

Sample Time: 0900

Note: offsite well; MS/MSD

leaving well at 0912

onsite: 0919
went to 1036 to pick up sampling supplies, dispose of IDW, & pick up gaters

0951
leaving building 1036

1051
at LL1mw-086
Staff: DP & LK
Note ants in cup

Weather: Sunny & warm

8-12-16

Rocky Mtn Arsenal

Purge time: 1050
Flow rate: 125 ml/min
Purge end time: 1120
Sample Time: 1125

1137

at LLImw-065
depth to water = 10.68

Purge start = 1135
purge end = 1205
sample time = 1205

Note water is very clear

leaving well at 1208

1214
at LLImw-087
depth to water 5.42

Note: SCFmw-004 is an artesian well. Took cap off and water was overflowing the pump. Took the pump out - well blew out the pump Matt is coming to blow out line.

1253
LLImw-087
Sample Time = 1245

leaving site at 1254

1313
arrived at contractor building to deposit samples; grab more equipment and Fill out COC.

left at 1385

1400
got to well LLImw-064
very shallow depth to water

Rite in the Rain

some iron sediment in the tube

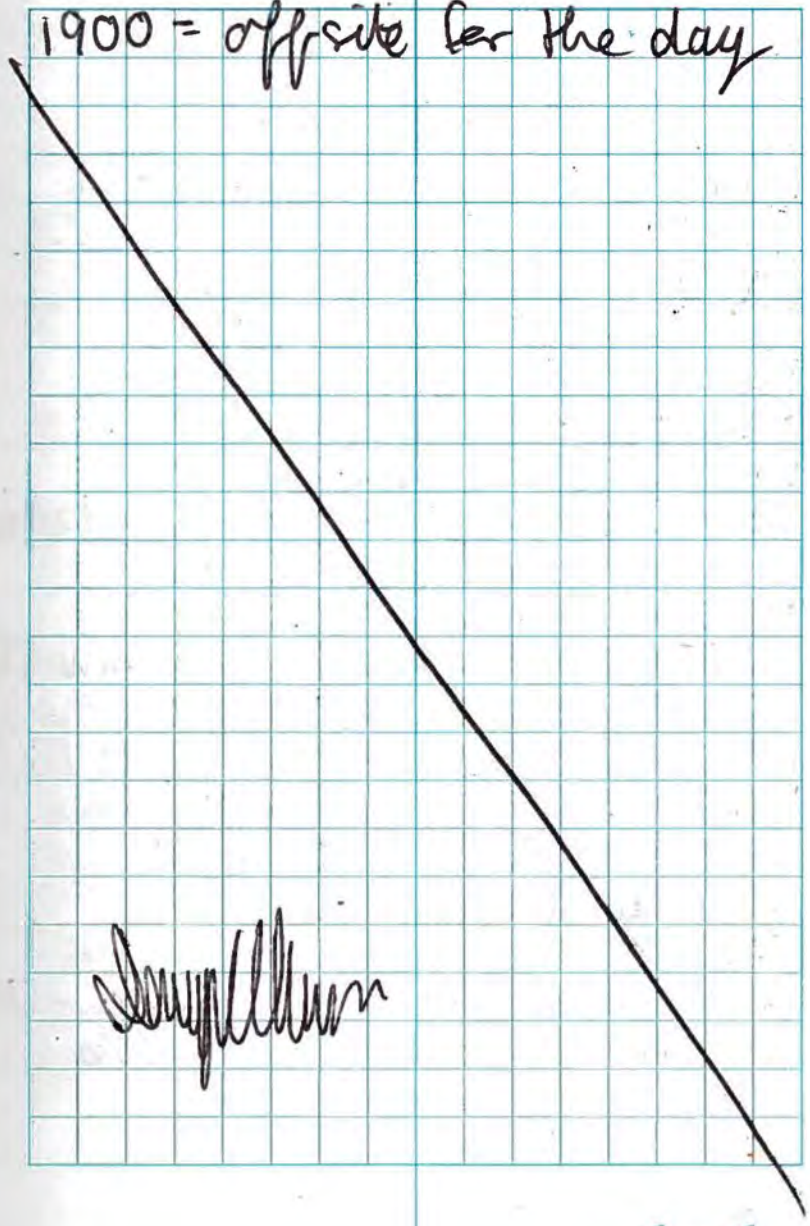
Water very red; draw down staying the same

1440 = sample time

1445 leaving well LLmw-069

1450 - arrived.
FWGmw-012
1455: purging at FWGmw-012 water had iron sludge at first; purged clear
1530: sample start
1536 moved to FWGmw-011
1540 purge start time
1742
had to filter metals; used bottles from LLmw-84 → need to replace metal bottles
1745
sample time
leaving well at 1803
1830 back to building 1036

1900 = offsite for the day



Rite in the Rain

Ravenna Arsenal 076003
Friday, May 13th
Staff: KJ & DP
Weather: Cloudy - 55
0636 on site to calibrate
horiba
0700 calibration complete
0750 arrived at LL1mw-84
Pump start time: 0802
0835 sample time
0845 leave LL1mw-084
0855 got LL1MW-083 & started
purge
0935 leave LL1mw-083
0955 arrived at site - LL2mw-060
1000 start purge, OEPA on site
1032 turbidity staying at 13.0
1048 OEPA said 10 NTU was
an arbitrary number
1115 sampled MW-060
1120 leaving well
1200 sample time at LL2mw-059
1230 back to building 1086
1300 IDW sampling

Work Total for the Week

5-8-16/Sunday = 2pm - 6pm
Total = 4 hrs
5-9-16/Monday = 7:30am - 6:30pm
Total = 11 hrs
5-10-16/Tuesday = 6:30am - 6:30pm
Total = 12 hrs
5-11-16/Wednesday = 6:30am - 9:30pm
Total = 15 hrs
5-12-16/Thursday = 6:15am - 7:15pm
Total = 13 hrs
5-13-16/Friday = 6:00am - 11:00pm
Total = 17 hrs
TOTAL = 72 hrs

4
1
2
5
3
7
22

APPENDIX A.2
CALIBRATION LOG

THIS PAGE INTENTIONALLY LEFT BLANK

Cardno TEC | WESTON | TEC-Weston Joint Venture

Equipment Calibration Log					Project Kawerma		
			Calibration				
Date/ Time	Equipment Description	Equip ID	Calibr standard/ exp date	Pre Cal readings	Post Cal Readings	Performed by:	Comments
5/9/16	HORIBA	18458	0.718mS/cm	—	0.718	ek	Calibration observed
1000		18485	80 mS/cm	—	80	ek	by Kevin Zellack
			0.00	—	0.00	ek	5/9/16
			240 mV ORP	—	240mV ORP	ek	
			4 pH	—	4 pH	ek	
			7 pH	—	7 pH	ek	
			5 mS/cm	—	5ms/cm	ek	
			0.0 NTU	—	0.0	ek	
			800 NTU	—	800	ek	
5/9/16	HORIBA	14419	0.718 mS/cm	—	0.718 mS/cm	DP	
1013			80 mS/cm	—	80.0 mS/cm	DP	
			5 mS/cm	—	5.00 mS/cm	DP	
			0.0 NTU	—	0.0 NTU	DP	
			800 NTU	—	800 NTU	DP	
			0.00	—	0.0 DO	DP	
			4 pH	—	4 pH		
			7 pH	—	7 pH	DP	
			240 mV ORP	—	240 mV ORP	DP	
5/10/16	HORIBA	18458	0.0 NTU	—	0.0	ek	
		14419	0.0 NTU	—	0.0	ek	
		18458	800 NTU	—	800	ek	
		14419	800 NTU	—	800	ek	
		18485	0.718 ms/cm	—	0.718	ek	
		14419	0.718 mS/cm	—	0.718	ek	
		18455	80 mS/cm	—	80	ek	
		14419	80 mS/cm	—	80	ek	
		18485	0.00	—	0	ek	
		14419	0.00	—	0	ek	
		18485	7 pH	—	7	ek	
		14419	7 pH	—	7	ek	

TEC-Weston Joint Venture

Date/ Time	Equipment Description	Equip ID	Calibration				
			Calibr standard/ exp date	Pre Cal readings	Post Cal Readings	Performed by:	Comments
		18485	10	—	10 pH	ek	
		14419	10	—	10 pH	ek	
		18485	+ 240 mV	—	240 mV	ek	
		14419	+ 240 mV	—	240 mV	ek	
5/11/16	HORIBA	18485	0.0 NTU	—	0.0 NTU	ek	Wednesday
		14419	0.0 NTU	—	0.0 NTU	ek	
		↓	800 NTU	—	800	ek	
		↓	800 NTU	—	800	ek	
		↓	0.718 mS/cm	—	0.718 mS/cm	ek	
		↓	0.718 mS/cm	—	0.718 mS/cm	ek	
		↓	5 mS/cm	—	5 mS/cm	ek	
		↓	5 mS/cm	—	5 mS/cm	ek	
		↓	0.000	—	0	ek	
		↓	0.00	—	0	ek	
		↓	240 mV	ORP	240 mV	ek	
		↓	240 mV	ORP	240 mV	ek	
		↓	7.0 pH	—	7	ek	
		↓	7.0 pH	—	↓	ek	
		↓	10.0 pH	—	10	ek	
		↓	10.0 pH	—	↓	ek	
5/12/16	HORIBA		0.0 NTU	—	0.00	ek+dp	Thursday
	18485 &	14419	800 NTU	—	800	ek+dp	
			0.718 mS/cm		0.718	ek+dp	
			240 mV	—	240 mV	ek+dp	
			5 mS/cm	—	5 mS/cm	ek+dp	
			0.00 DO	—	0.00	ek+dp	
			10 pH	—	10 pH	ek+dp	
			7 pH	—	7 pH	ek+dp	
5/13/16	HORIBA		0.0 NTU	—	0.0	ek+dp	FRIDAY
	18485 &		800 NTU	—	800	ek+dp	
	14419		0.718 mS/cm	—	0.718 mS/cm	ek+dp	
			5.0 mS/cm	—	5 mS/cm	ek+dp	
			240 ORP	—	240 ORP	ek+dp	
			0.0 DO	—	0.0 DO	ek+dp	

Standard
7.0 pH ✓
10.0 pH ✓
5/12/16

APPENDIX A.3

WELL PURGE FORMS

THIS PAGE INTENTIONALLY LEFT BLANK

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-12-MW-245	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ & DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	29.84	7.56	—	—	Site Name: Ravenna Arsenal
						Project No. 026003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-245
Bladder pump	HDPE	25.5	1335	1410	105	1.5	Sample Time: 1411
							Duplicate ID: ✓
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1335	105	9.10	18.37	7.05	0.838	0.00	~~290.0~~	0.0	DP	clear
1340	105	9.84	16.68	7.03	0.829	0.00	42	0.0	DP	clear
1345	105	10.39	15.39	7.00	0.839	0.00	22	0.0	DP	clear
1350	105	11.27	14.39	6.99	0.840	0.00	28	0.0	DP	clear
1355	105	11.76	13.32	7.00	0.859	0.00	28	0.0	DP	clear
1400	105	12.35	13.46	6.99	0.853	0.00	29	0.0	DP	clear
1405	105	12.80	13.36	6.97	0.852	0.00	29	0.0	DP	clear
1410	105	13.51	13.06	6.90	0.863	0.00	27	0.0	DP	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: 70

Sampler: **Observer:**

Notes: Draw down will not stabalize; worried might run the well dry will sample anyways - based on the low purge rate and remaining stable wells

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/13/16
SCF-MW-004	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Chris Dunstan + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	112.72	Artesian			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: SCF-MW-004 0
Bladder pump	HDPE		0910	0940	500	3	Sample Time: 0940
							Duplicate ID:
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0910	500	Artesian	11.41	6.85	0.975	0.00	6	0.0	CD	
0915	500	Artesian	11.33	6.83	0.966	0.00	-2	0.0	CD	
0920	500	Artesian	11.32	6.43	0.966	0.00	11	0.0	CD	
0925	500	Artesian	11.34	6.33	0.961	0.00	13	0.0	CD	
0930	500	Artesian	11.31	6.26	0.961	0.00	13	0.0	CD	
0935	500	Artesian	11.32	6.13	0.961	0.00	16	0.0	CD	
0940	500	Artesian	11.30	5.88	0.960	0.00	24	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: ____ Wind Speed/Dir. ____ Temperature: 60

Sampler: [signature] **Observer:** Tom St John

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/13/16
LL-3-MW-244	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dunstan Tom St John Matt H
SITE NAME						Installation:
Ravenna Arsenal	2	46.95	9.85			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-3-MW-244
Bladder pump	HDPE	42	1040	1115	300		Sample Time: 12:30
							Duplicate ID: LL3mw-244D
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1040	100	10.05	12.00	5.78	0.154	2.25	135	0.0	CD	Clear
1045	100	10.05	11.52	5.54	0.155	1.80	149	0.0	CD	
1050	300	10.10	11.22	5.35	0.156	1.55	161	0.0	CD	
1055	300	10.11	10.79	5.22	0.158	1.38	173	0.0	CD	
1100	300	10.11	10.76	5.18	0.157	1.39	179	0.0	CD	
1105	300	10.11	10.88	5.15	0.157	1.38	184	0.0	CD	
1110	300	10.12	10.71	5.14	0.157	1.34	188	0.0	CD	
1115	300	10.10	10.66	5.13	0.157	1.37	191	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 70

Sampler: [signature] **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/13/16
LL-2-MW-267	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Durotan & Tim St John
SITE NAME						Installation:
Ravenna Arsenal	2	22.1	9.06	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-2-MW-267
Bladder pump	HDPE	18.5	0750	0835	100		Sample Time: 08:35
							Duplicate ID: —
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0750	100	9.35	11.08	5.52	0.281	0.00	135	95.3	CD	Slight orang color
0755	100	9.29	11.22	5.03	0.274	0.00	126	112	CD	
0800	100	9.32	11.08	5.02	0.270	0.00	119	120	CD	
0805	100	9.35	10.91	5.06	0.267	0.00	113	94.8	CD	
0810	100	9.35	10.77	5.12	0.267	0.00	111	57.2	CD	
0815	100	9.36	10.70	5.17	0.266	0.00	109	32.2	CD	Clear
0820	100	9.34	10.64	5.21	0.264	0.00	108	14.2	CD	
0825	100	9.37	10.63	5.24	0.263	0.00	106	7.0	CD	
0830	100	9.36	10.65	5.26	0.262	0.00	106	0.0	CD	
0835	100	9.35	10.56	5.29	0.262	0.00	105	0.0	CD	
						0.00		0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir. _____ Temperature: 59

Sampler: [signature] **Observer:** [signature]

Notes:

TEC-Weston Joint Venture

↗ = 8.12

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-12-MW-242	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSS, MH, DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	29.69	~~8.50~~ 8.12	—	—	Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-242
Bladder pump	HDPE	23.5	1620	1820	85	2.25	Sample Time:
							Duplicate ID: —
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1620	85	8.31	18.88	7.41	0.587	0.26	51	42.1	THS	~~light~~ milky, few fe globules ~~few~~ dk gray sediment
1625	85	8.31	17.51	7.35	0.545	0.00	26	66.6	THS	SAA
1630	85	8.31	16.96	7.31	0.522	0.00	16	117	THS	SAA
1635	85	8.32	16.53	7.36	0.517	0.00	5	201	THS	SAA
1640	85	8.38	16.20	7.33	0.510	0.00	-5	145	THS	SAA
1645	85	8.40	16.17	7.32	0.502	0.00	-7	137	THS	SAA
1650	85	8.45	15.92	7.30	0.498	0.00	-20	113	THS	SAA
1655	85	8.44	15.76	7.29	0.495	0.00	-29	98.5	THS	SAA
1700	85	8.45	15.75	7.28	0.493	0.00	-31	97.0	THS	SAA
1705	85	8.49	15.28	7.31	0.506	0.00	-39	98.1	THS	SAA
1710	85	8.46	15.72	7.32	0.495	0.00	-21	139	THS	SAA
1715	85	8.51	15.75	7.32	0.496	0.00	-32	89.0	THS	SAA

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: 63

Sampler: **Observer:**

Notes:

Cardno TEC | WESTON | TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-12-MW-242	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: THS, MH, DP, LK
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	29.69	8.12	—	—	Site Name: Ravenna Arsenal
						Project No. 676003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-242
Bladder pump	HDPE	23.5	1620	1820	85	2.25	Sample Time:
							Duplicate ID:
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1720	85	8.51	16.34	7.32	0.497	0.00	-36	67.0	THS	SAA
1725	85	8.51	17.25	7.32	0.488	0.00	-37	61.0	THS	SAA (Sun came out)
1730	85	~~8.51~~	17.79	7.31	0.488	0.00	-38	55.1	DP	SAA
1735	85	8.48→	18.01	7.31	0.488	0.00	-37	52.1	DP	SAA
1740	85	8.47	18.57	7.30	0.480	0.00	-37	50.2	DP	SAA
1745	85	8.46	18.77	7.32	0.478	0.00	-39	47.4	DP	SAA
1750	85	8.48	19.11	7.31	0.472	0.00	-40	42.3	DP	SAA
1755	85	8.46	19.33	7.31	0.475	0.00	-41	40.3	DP	SAA
1800	85	8.46	19.47	7.31	0.473	0.00	-42	35.0	DP	SAA
1805	85	8.50	18.92	7.32	0.474	0.00	-43	34.0	DP	SAA
★ 1810	85	8.49	19.13	7.31	0.467	0.00	-45	33.9	DP	SAA
1815	85	8.68	18.71	7.29	0.470	0.00	-46	27.9	DP	SAA

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: 75

Sampler: **Observer:**

Notes: Scattered showers

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-12-MW-242	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: LK & DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	29.69	8.12	—	—	Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-242
			1620	1820	85		Sample Time: 1821
Bladder pump	HDPE	23.5	1620	1820	85	2.25	Duplicate ID: —
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1820	85	8.65	17.49	7.23	0.470	0.00	-31	27.0	DP	SAA

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: 75

Sampler: **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-12-MW-185	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ, DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	22.94	7.01	—	—	Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-185
							Sample Time: 1221
Bladder pump	HDPE	17.94	1150	1220	60	0.78	Duplicate ID: —
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1150	60	8.09	16.14	6.56	5.25	0.00	150	0.0	DP	clear
1155	60	8.50	15.39	6.54	5.40	0.00	161	0.0	DP	clear
1200	60	8.81	15.37	6.54	5.41	0.00	167	0.0	DP	clear
1205	60	9.02	15.25	6.55	5.42	0.00	170	0.0	DP	clear
1210	60	9.21	15.39	6.54	5.40	0.00	173	0.0	DP	clear
1215	60	9.46	15.60	6.54	5.39	0.00	177	0.0	DP	clear
1220	60	9.76	15.63	6.55	5.38	0.00	174	0.0	DP	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: 70

Sampler: **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-12-MW-187	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: DP-THS
SITE NAME						Installation:
Ravenna Arsenal	2	29.7	8.67	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-187
Bladder pump	HDPE	24.5	1518	1548	100	1 gal	Sample Time: 1548
							Duplicate ID: LL-12-MW-187D
							MS/MSD: Yes: X No:

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1518	100	8.96	19.90	6.46	12.3	0.00	220	0.0	THS	Clear
1523	100	9.03	17.30	6.39	12.9	0.00	235	0.0	THS	Clear (DTW-903)
1528	100	9.08	16.39	6.39	13.0	0.00	243	0.0	THS	Clear
1533	100	9.08	15.78	6.38	13.3	0.00	249	0.0	THS	Clear
1538	100	9.05	15.71	6.38	13.3	0.00	256	0.0	THS	Clear
1543	100	9.06	15.66	6.37	13.4	0.00	260	0.0	THS	Clear
1548	100	9.06	15.72	6.36	13.2	0.00	261	0.0	THS	Clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir: Slight Breeze Temperature: 70°F

Sampler: **Observer:**

Notes:

Cardno TEC WESTON
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
WBG-MW-006	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ & DP Installation: Ravenna
SITE NAME						Site Name: Ravenna Arsenal
Ravenna Arsenal	2	20.25	6.26	—	—	Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: WBG-MW-006 Sample Time: 1036 Duplicate ID: ———
Bladder pump	HDPE	16	1005	1036	100	6.5 qt 1.58 gal	MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	0.3	±1 °C 0.5	±0.1	mS/cm or ±10%	±0.3	±10	<10 NTU or ±10%		
Time	**Flow Rate (mL/min)**	**DTW (ft)**	**Temp (°C)**	**pH**	**Cond (mS/cm)**	**DO (mg/L)**	**ORP (mV)**	**Turbidity (NTU)**	**Initials**	**Water Conditions / Comments**
1005	100	6.36	10.41	7.61	0.428	5.23	179	0.0	DP	Clear, small particles
1010	100	6.39	10.37	7.59	0.428	4.56	176	0.0	DP	clear
1015	100	6.42	10.29	7.58	0.429	3.86	175	0.0	DP	clear
1020	100	6.44	10.31	7.57	0.429	3.35	175	0.0	DP	clear
1025	100	6.45	10.33	7.56	0.429	2.70	175	0.0	DP	clear
1030	100	6.45	10.32	7.56	0.429	2.03	174	0.0	DP	clear
1035	100	6.45	10.30	7.56	0.429	1.70	173	0.0	DP	clear

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: ✓ Rain: ✓ Wind Speed/Dir. ____ Temperature: 60

Sampler: TSJ & DP **Observer:**

Notes: lite rain, temperature dropping

1.58 6.5

2.5

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
WBG-MW-021	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: THS - DP
SITE NAME						Installation:
Ravenna Arsenal	2	43	8.53	–	–	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: WBG-MW-021
							Sample Time: 0906
							Duplicate ID:
Bladder pump	HDPE	38	0836		100	7.5 qts (1 7/8 gal)	MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0836	100	8.56	10.44	7.58	0.400	0.00	33	48.0	THS	Ito orange, few fe particals
0841	100	8.56	10.36	7.38	0.399	0.00	35	32.3	THS	Clear
0846	100	8.56	10.35	7.27	0.399	0.00	43	16.8	THS	Clear
0851	100	8.56	10.35	7.19	0.400	0.00	41	10.1	THS	Clear
0856	100	8.56	10.35	7.14	0.401	0.00	36	7.6	THS	Clear
0901	100	8.56	10.34	7.14	0.402	0.00	31	5.3	THS	Clear
0906	100	8.56	10.33	7.14	0.404	0.00	12	2.9	THS	Clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: X Wind Speed/Dir. Calm Temperature: ~63 °F

Sampler: **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: MAY 10, 2016
WBG-MW-009	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: CD + EK
SITE NAME						Installation:
Ravenna Arsenal	2	24.34	14.50	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) L	Sample ID:	WBG-MW-009
							Sample Time:	0845
Bladder pump	HDPE	20.5	0810	0845	100	3.5	Duplicate ID:	—
							MS/MSD: Yes:____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±5°C	±0.1	mS/cm or ±3%	±0.3	±10mV	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0810	100	14.75	10.10	6.70	0.311	0	244	7.81	EK	
0815	100	14.75	9.91	6.66	0.273	0	249	5.21	EK	
0820	100	14.76	9.90	6.67	0.274	0	253	0.0	EK	
0830	100	14.75	9.88	6.67	0.280	0	254	0.0	EK	
0835	100	14.76	9.66	6.66	0.284	0	254	0.0	EK	
0840	100	14.75	9.63	6.70	0.291	0	245	0.0	EK	
0845	100	14.76	9.65	6.80	0.297	0	251	0.0	EK	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: ✓ Wind Speed/Dir. _____ Temperature: 51 F

Sampler: EK **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
WBG-MW-020	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: ek + cd
SITE NAME						Installation:
Ravenna Arsenal	2	43.72	11.73	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	WBG-MW-020
Bladder pump	HDPE	39	0910				Sample Time:	
							Duplicate ID:	none
							MS/MSD: Yes:____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	—	±3°C	±0.1	mS/cm or ±3%	±0.3	±10 mV or 10%	<10 NTU or 20%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0910	75	11.73	10.27	6.87	0.286	2.79	18	5.6	ek	clear
0915	120	12.01	10.38	7.12	0.295	1.25	-7	25.0	ek	↓
0920	120	12.00	10.48	7.30	0.296	0.00	-21	55.0	ek	↓
0925	120	12.00	10.50	7.42	0.301	0.00	-36	0.0	ek	↓
0930	120	12.00	10.51	7.50	~~0.307~~ 0.300	0.00	-40	0.0	ek	↓
0935	120	12.00	10.54	7.53	0.304	0.00	-50	0.0	ek	↓
0940	120	12.00	10.54	7.55	0.304	0.00	-54	0.0	ek	↓
0945	120	12.01	10.57	7.53	0.307	0.00	-56	0.0	ek	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: X Wind Speed/Dir. ____ Temperature: 50 F

Sampler: [signature] **Observer:** [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/15
DET-003	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: ER CD
SITE NAME						Installation:
Ravenna Arsenal	2	16.15	9.27			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) L	Sample ID: DET-003
Bladder pump	HDPE	12..4	1150	1225	120	3.5	Sample Time: 1225
							Duplicate ID:
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1150	120	9.47	9.56	7.81	0.730	0.00	-46	0.0	CD	clear
1155	↓	9.45	9.46	7.80	0.729	0.00	-44	0.0	CD	↓
1200		9.46	9.43	7.78	0.730	0.00	-48	0.0	CD	
1205		9.45	9.42	7.76	0.730	0.00	-49	0.0	CD	
1210		9.47	9.41	7.75	0.730	0.00	-51	0.0	CD	
1215		9.47	9.43	7.76	0.732	0.00	-50	0.0	CD	
1220		9.46	9.44	7.74	0.730	0.00	-50	0.0	CD	
1225	↓	9.46	9.45	7.74	0.731	0.00	-50	0.0	CD	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: ✓ Rain: ✓ Wind Speed/Dir.: ____ Temperature: 50F

Sampler: [signature] **Observer:** [signature]

Notes: Split Sample collected by ANG at this location

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
DA2-mw-115	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK+CD
SITE NAME						Installation:
Ravenna Arsenal	2	46.9	5.62	—		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: DA-2-MW-115
Bladder pump	HDPE	41.5	1040	1115	100	3.5 L	Sample Time: 1115
							Duplicate ID: None
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±3°C	±0.1	mS/cm or ±10%		±10mV/10%	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1040	100	5.89	10.70	7.77	0.705	0.00	0.705	0.0	ek	clear
1045	↓	5.89	10.43	7.79	0.712	0.00	-32	0.0	ek	no odor
1050		5.89	10.36	7.81	0.716	0.00	~~-48~~ -35	0.0	ek	↓
1055		5.89	10.33	7.82	0.720	0.00	-38	0.0	ek	
1100		5.89	10.30	7.83	0.720	0.00	-39	0.0	ek	
1105		5.90	10.29	7.83	0.720	0.00	-40	0.0	ek	
1110		5.90	10.29	7.84	0.722	0.00	-42	0.0	ek	
1115	↓	5.90	10.30	7.83	0.722	0.00	-42	0.0	ek	

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: X Wind Speed/Dir. ____ Temperature: 50F

Sampler: [signature] **Observer:** [signature]

Notes: Observed by Kevin Sedlacek

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
LL-7-MW-001	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: ek + cd
SITE NAME						Installation:
Ravenna Arsenal	2	33.15	18.79	—	—	Site Name: Ravenna Arsenal
						Project No. FWGM

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) L	Sample ID: LL-7-MW-001
Bladder pump	HDPE	28.5	1350		100		Sample Time: 1550
							Duplicate ID:
							MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±5C	±0.1	mS/cm or ±3%	±3	±10m ✓	<10 NTU ~~or ±10%~~		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1350	100	18.85	11.88	6.65	0.298	0.00	41	308	ek	lt. rust color
1355	100	18.86	11.46	6.57	0.277	0.00	36	311	ek	lt. rust color
1400	250	18.90	11.24	6.55	0.291	0.00	34	195	ek	lt. orange color
1405	250	18.89	10.99	6.55	0.309	0.00	27	95.3	ek	clear
1410	450	18.92	10.08	6.60	0.318	0.00	22	108	ek	clear
1415	450	18.92	10.78	6.58	0.316	0.00	18	185	ek	clear
1420	450	18.92	10.81	6.40	0.310	0.00	19	211	ek	clear
1425	450	18.99	10.81	6.57	0.315	0.00	17	175	ek	clear
1430	450	18.97	10.80	6.55	0.315	0.00	15	194	ek	clear
1435	450	18.98	10.83	6.54	0.315	0.00	18	173	ek	clear
1440	100	18.98	11.38	6.41	0.315	0.00	23	174	ek	clear
1445	100	18.91	11.36	6.46	0.315	0.0	25	172	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: X Rain: _____ Wind Speed/Dir. _____ Temperature: ~~70~~ 63F

Sampler:

Observer:

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
LL-7-MW-001	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: (see pg #1)
SITE NAME						Installation:
Ravenna Arsenal	2	33.15	(see page #1)			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-7-MW-001
							Sample Time: 1550
Bladder pump	HDPE	28.5	(see pg #1)				Duplicate ID: (see pg #1)
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	~~±5~~°C	±0.1	mS/cm or ~~±3~~%	± 3	±10mV	<10 NTU ~~or 10%~~		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1450	100	18.90	11.37	6.46	0.315	0.00	27	152	ek	clear
1455	100	18.90	11.38	6.47	0.315	0.00	26	131	ek	clear
1500	100	18.90	11.37	6.48	0.315	0.00	26	122	ek	clear
1505	100	18.90	11.34	6.49	0.315	0.00	25	~~62.4~~ 62.4	ek	clear
1510	100	18.91	11.34	6.51	0.286	0.00	26	~~42.5~~ 50.2	ek	clear
1515	100	18.91	11.25	6.53	0.292	0.00	25	47.4	ek	clear
1520	100	18.90	11.25	6.50	0.292	0.00	28	38.0	ek	clear
1525	100	18.90	11.23	6.53	0.294	0.00	26	31.3	ek	clear
1530	100	18.90	11.21	6.54	0.297	0.00	27	31.6	ek	clear
1535	100	18.90	11.24	6.50	0.297	0.00	28	30.5	ek	clear
1540	100	18.90	11.23	6.38	0.296	0.00	~~236~~	30.0	ek	clear
1545	100	18.90	11.24	6.40	0.294	0.00	36	31.3	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: X Rain: _____ Wind Speed/Dir. _____ Temperature: 63 °F

Sampler: Liz Kirby **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/10/16
LL-7-MW-001	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel:
SITE NAME						Installation:
Ravenna Arsenal	2	33.15	—	see pg. #1		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	LL-7-MW-001 (see page #1)
Bladder pump	HDPE	28.5	see page #1				Sample Time: 1550	
							Duplicate ID:	
							MS/MSD: Yes:____ No:____	

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±3°C	±0.1	mS/cm or ±3%	±3 mg/L	±10mV	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1550	100	18.90							ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: _____

Sampler: **Observer:**

Notes: see page #1

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/9/16
FWG-MW-015	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ, DP
SITE NAME						Installation: Camp Ravenna
Ravenna Arsenal	2	26.25	~~5.41~~ 5.18 → 5.37			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: FWG-MW-015
Bladder pump	HDPE	21					Sample Time: 1650
							Duplicate ID:
							MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	0.3	0.5 °C	±0.2	mS/cm or ±3%		±20	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1611	45	6.65	13.08	6.95	3.09	0.00	193	0.00	DP	
1616	45	6.75	13.13	6.90	3.10	0.00	195	0.00	DP	
1621	45	6.81	13.19	6.88	3.10	0.00	198	0.00	DP	
1626	45	6.91	13.20	6.87	3.12	0.00	201	0.0	DP	
1631	45	6.95	13.21	6.87	3.12	0.00	203	0.0	DP	
1636	45	7.04	13.14	6.88	3.12	0.00	205	0.0	DP	
1641	45	7.10	12.95	6.88	3.13	0.00	206	0.0	DP	
1646		7.17	12.84	6.88	3.13	0.00	208	0.0	DP	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir. Breezy Temperature: 64°F

Sampler: DP + TSJ **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/9/16
FWG-MW-016	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel:
SITE NAME						Installation:
Ravenna Arsenal	2	67.6	~~5.18~~ 15.91			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: FWG-MW-016
Bladder pump	HDPE	62	1426	1456	100	0.5	Sample Time: 1458
							Duplicate ID:
							MS/MSD: Yes:_____ No:_____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		0.5 ±1 °C	±0.2	mS/cm or ±10% (3%)	10%	±20 mV	<10 NTU or ±10%		
Time ~~1359~~	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1426	~~60~~ 100	15.96	13.46	7.16	0.623	0.00	11	0.0	DP	clear
1431	60	15.98	13.39	7.12	0.618	0.00	2	0.0	DP	
1436	60	15.98	13.39	7.09	0.614	0.00	-4	0.0	DP	
1441	60	15.98	13.46	7.16	0.610	0.00	-11	0.0	DP	
1446	60	15.97	13.47	7.17	0.606	0.00	-11	0.0	DP	
1451	60	15.97	13.51	7.18	0.603	0.00	-11	0.0	DP	
1456	60	15.97	13.66	7.17	0.601	0.00	-11	0.0	DP	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: _____

Sampler: **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-9-2016
FWG-MW-004	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: KK + EK + TSJ + MH + DR + CD
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	22.5	12.43	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	FWG-MW-004
Bladder pump	HDPE	20.5	1132	1335	100		Sample Time:	1335 1335
							Duplicate ID:	FWGmw004-D
							MS/MSD: Yes:____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	< 0.30	±5C	±0.1	mS/cm or ±3%	±0.3	±10 mV	<10 NTU or 10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1135	100	12.43	13.43	6.59	295	6.70	296	392	ek	H.grey,
1140	100	12.70	13.46	5.50	0.605	5.48	282	430	ek	clear
1145	100	12.59	13.78	6.79	0.604	5.31	275	296	ek	clear
1150	100	12.58	14.24	6.88	0.607	5.04	263	197	ek	clear
1155	100	12.55	14.50	6.95	0.609	4.81	257	178	ek	clear
1200	100	12.55	14.78	6.85	0.609	4.55	264	137	ek	clear
1205	100	12.56	14.84	7.14	0.609	4.32	242	105	ek	clear
1210	100	12.56	14.83	7.21	0.608	4.00	235	77.2	ek	clear
1215	100	12.56	14.78	7.26	0.606	3.79	231	71.0	ek	clear
1220	100	12.56	14.66	7.32	0.606	3.52	224	54.6	ek	clear
1225	100	12.56	14.53	7.38	0.608	3.38	218	47.1	ek	clear
1230	100	12.57	14.45	~~6.8~~ ek 7.19	0.609	3.15	225	45.2	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir. H. breeze Temperature: 70 F

Sampler: EK **Observer:** TSJ

Notes:
sampling observed by Kevin S.

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-9-2016
FWG-MW-004	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: see page #1
SITE NAME						Installation:
Ravenna Arsenal	2	22.5	see page		#1	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: FWG-MW-004	
							Sample Time: see page #1	1335
Bladder pump	HDPE	20.5	see	page #1			Duplicate ID: FWGMW004-D	
							MS/MSD: Yes:____ No: X	

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±5C	±0.1	mS/cm or ±3%	± 0.3	±10 or ≤10	<10 NTU Or <10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1235	100	12.52	14.37	7.46	0.610	2.88	205	37.1	ek	clear water
1240	100	12.57	14.32	7.49	0.610	2.67	199	36.4	ek	clear
1245	100	12.56	14.32	7.49	0.611	2.48	191	32.8	ek	clear
1250	100	12.56	14.42	7.47	0.612	2.31	182	30.2	ek	clear
1255	100	12.57	14.67	7.45	0.613	2.13	173	28.3	ek	clear
1300	100	12.58	14.92	7.56	0.612	2.00	164	26.8	ek	clear
1305	100	12.58	15.12	7.50	0.612	1.84	154	24.3	ek	clear
1310	100	12.58	15.28	7.55	0.611	1.71	148	25.0	ek	clear
1315	100	12.57	15.35	7.58	0.608	1.55	144	21.4	ek	clear
1320	100	12.58	15.29	7.60	0.606	1.38	141	20.5	ek	clear
1325	100	12.58	14.76	7.65	0.617	1.32	140	27.4	ek	clear
1330	100	12.58	14.75	7.58	0.621	1.36	142	25.9	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: _____

Sampler: **Observer:**

Notes:

1335	100	12.57	14.70	7.62	0.618	1.35	145	24.1	ek	clear
(TIME)	(mL/min)	(ft)	(°C)	(pH)	(mS/cm)	(mg/L)	(mV)	(NTU)		

page 2 of 2

TEC-Weston Joint Venture

? why not recorded? * see pump install

WELL NUMBER	WELL INFORMATION					DATE: 5-10-16
DET-004	Well Diameter (in)	Total Depth (ft BTOC)	*Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ & DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	13.81	11.20	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: DET-004
Bladder pump	HDPE	11~~9~~	1237	1308	55	0.5 (gal)	Sample Time:
							Duplicate ID:
							MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±~~°~~°C 5	±0.1	mS/cm or ±10%	0.3	±10	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1237	55	—	11.38	6.88	0.588	0.00	233	0.0	DP	clear, can't take water depth
1242	55	—	11.89	6.86	0.591	0.03	230	0.0	DP	
1247	55	—	12.19	6.86	0.592	0.38	229	0.0	DP	
1252	55	—	12.40	6.87	0.591	0.59	228	0.0	DP	↓
1257	55	—	12.49	6.87	0.590	0.76	228	0.0	DP	↓
1302	55	—	12.76	6.88	0.590	1.13	229	0.0	DP	↓
1307	55	—	12.88	6.89	0.589	1.27	231	0.0	DP	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: ✓ Rain: ____ Wind Speed/Dir. calm Temperature: 63

Sampler: **Observer:**

Notes: pump intake was not fully submerged; water depth was 11.2ft about 1.4 ft of the intake was ~~not~~ the water column. Air in the line — DO won't stabalize.

* some displacement due to taking the pump out to measure depth to water.

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
SCF-MW-002	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ, DP, MH
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	149.86	18.59	—	—	Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: SCF-MW-002
Bladder pump	HDPE	144.5	1040	1110	150	1.25	Sample Time: 1111
							Duplicate ID:
							MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	±0.3	±3 °C	±0.1	mS/cm or ±10%	±0.3	± 10	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1040	150	18.72	13.06	7.31	0.444	0.00	-75	0.0	DP	clear
1045	150	18.75	13.83	7.28	0.450	0.00	-81	0.0	DP	clear
1050	150	18.76	13.80	7.17	0.450	0.00	-76	0.0	DP	clear
1055	150	18.75	13.82	7.21	0.453	0.00	-79	0.0	DP	clear
1100	150	18.81	13.58	7.23	0.455	0.00	-81	0.0	DP	clear
1105	150	18.76	13.79	7.24	0.453	0.00	-83	0.0	DP	clear
1110	150	18.81	13.70	7.28	0.456	0.00	-85	0.0	DP	clear
										~~clear~~

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. calm Temperature: 60

Sampler: **Observer:**

Notes:

Cardno TEC | WESTON | TEC-Weston Joint Venture

see pump install

THURSDAY

WELL NUMBER	WELL INFORMATION					DATE: 5/12/2016
LL-1-MW-064	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: DP & EK
SITE NAME						Installation:
Ravenna Arsenal	2		0.60			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol ~~(gal)~~ L	Sample ID: LL-1-MW-064
							Sample Time:
Bladder pump	HDPE	12	1405		500		Duplicate ID: none
							MS/MSD: Yes:____ No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1405	300	0.60	16.03	8.06	0.287	10.22	-13	141	ek	lt. brown / H. red
1410	~~300~~	0.60	13.25	7.90	0.256	5.40	-114	64.1	ek	lt. brown / H. red
1415	300	0.60	13.05	7.78	0.261	4.02	-129	55.4	ek	lt. brown / lt red
1420	300	0.60	13.19	7.64	0.262	0.00	-126	119	ek	lt brown / lt. red
1425	300	0.60	12.85	7.75	0.261	0.00	-139	126	ek	lt brown / lt. red
1430	500	0.70	~~11.75~~	7.70	0.265	0.00	-142	5.7	ek	clear
1435	↓	0.70	11.73	7.73	0.262	0.00	-143	0.0	ek	↓
1440	↓	0.70	11.74	~~7.68~~ 7.71 ek	0.262	0.00	-144	0.0	ek	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: ✓ Rain: ____ Wind Speed/Dir. ____ Temperature: 78 °F

Sampler: [signature]

Observer: [signature]

Notes:

TEC-Weston Joint Venture

THURSDAY

WELL NUMBER	WELL INFORMATION					DATE: 5-12-2016
FWG-MW-012	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: DP & CK
SITE NAME						Installation:
Ravenna Arsenal	2	42.55	0.50	—		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal/L)	Sample ID: FWG-MW-012
Bladder pump	HDPE	37	1455	1525	see below		Sample Time: 1530
							Duplicate ID: none
							MS/MSD: Yes:____ No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±3°C	±0.1	mS/cm or ±10%	±3mg/L	±10mV	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1455	275	0.6	21.77	7.94	0.000	7.35	168	99.9	ek	IRON SLUDGE IN
1500	275	0.65	20.10	7.45	0.144	1.07	95	100.0	ek	WATER COLUMN
1505	325	0.81	11.67	6.33	0.139	0.00	73	51.2	ek	clearish redish
1510	300	1.26	12.54	5.84	0.139	0.00	80	0.0	ek	clear
1515	100	1.03	12.40	5.81	0.141	0.00	75	0.0	ek	clear
1520	100	1.00	12.40	5.86	0.141	0.00	73	0.0	ek	clear
1525	100	1.00	12.35	5.85	0.141	0.00	73	0.0	ek	clear
1530	100	1.02	12.36	5.89	0.140	0.00	73	0.0	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: ✓ Rain: ____ Wind Speed/Dir. ____ Temperature: 82F

Sampler: [signature]

Observer: [signature]

Notes:

Cardno TEC WESTON
TEC-Weston Joint Venture

22/16/38

WELL NUMBER	WELL INFORMATION					DATE: THURSDAY 5-12-2016
FWG-MW-011	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: DP & EK
SITE NAME						Installation:
Ravenna Arsenal	2	17.66	2.02			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol ~~(gal)~~ L	Sample ID:	FWG-MW-011
							Sample Time:	
							Duplicate ID:	~~None~~ Metals only - filtered
Bladder pump	HDPE	14	1540	1740	see below	12L	MS/MSD: Yes: ✓	No: ~~✓~~ Metals only - filtered

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	500 / <0.3	±5C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1540	~~250~~ 225	2.57	10.73	7.03	0.283	0.00	-96	TOO HI	ek	H. grey
1545	325	2.63	10.93	7.16	0.283	0.00	-102	1000	ek	lt. grey
1550	325	2.42	11.27	6.99	0.285	0.00	-119	705	ek	lt grey
1555	100	2.64	10.46	6.97	0.284	0.00	-127	207	ek	clear
1600	100	2.40	13.91	6.95	0.265	0.00	-110	187	ek	clear
1605	100	2.43	14.10	6.95	0.285	0.00	-136	180	ek	clear
1610	100	2.51	12.05	6.98	0.281	0.00	-130	174	ek	clear
1615	100	2.29	15.35	7.24	0.266	0.00	-142	141	ek	clear
1620	100	2.30	15.94	7.21	0.262	0.00	-144	116	ek	clear
1625	100	2.28	16.54	7.21	0.258	0.00	-143	102	ek	clear
1630	100	2.22	16.75	7.17	0.258	0.00	-142	96.5	ek	clear
1635	100	2.28	16.93	7.19	0.257	0.00	-142	88.5	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: ✓ Rain: _____ Wind Speed/Dir: _____ Temperature: 84F

Sampler: [signature] Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE:
FWG-MW-011	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel:
SITE NAME						Installation:
Ravenna Arsenal	2	17.66				Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION see page #1							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: FWG-MW-011
Bladder pump	HDPE	14					Sample Time: see pg 2 of 3
							Duplicate ID:
							MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1640	100	2.25	17.05	7.16	0.256	0.00	-139	83.3	ek	clear
1645	100	2.26	17.16	7.02	0.255	0.00	-132	80.7	ek	
1650	100	2.25	17.20	7.13	0.254	0.00	-138	79.6	ek	
1655	100	2.25	17.23	7.19	0.253	0.00	-139	79.4	ek	
1700	100	2.27	12.33	7.29	0.278	0.00	-134	88.4	ek	
1705	100	2.25	15.73	7.12	0.264	0.00	-142	88.7	ek	
1710	100	2.25	15.78	7.15	0.263	0.00	-140	80.7	ek	
1715	100	2.23	17.10	7.18	0.259	0.00	-143	78.8	ek	
1720	100	2.23	17.15	7.20	0.258	0.00	-143	76.5	ek	
1725	100	2.23	17.42	6.70	0.256	0.00	-120	72.8	ek	
1730	100	2.23	17.70	7.17	0.254	0.00	-139	64.7	ek	
1735	100	2.20	17.66	7.15	0.253	0.00	-139	60.0	ek	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: _____

Sampler: **Observer:**

Notes: See pg #1

Cardno TEC WESTON
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE:	
FWG-MW-011	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel:	see page #1
SITE NAME						Installation:	
Ravenna Arsenal	2	17.66				Site Name:	Ravenna Arsenal
						Project No.	

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	FWG-MW-011
							Sample Time:	see page #1
Bladder pump	HDPE	14					Duplicate ID:	
							MS/MSD: Yes:_____	No:_____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1740	100	2.23	17.60	7.15	0.254	0.00	-129	62.4	ek	clear
1745	100	2.23	17.50	7.05	0.254	0.00	-134	60.7	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: _____

Sampler: **Observer:**

Notes: see page #1

pg 3 of 3

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/11/16
LL-12-MW-247	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: TSJ, MH, DP
SITE NAME						Installation: Ravenna Arsenal
Ravenna Arsenal	2	22.42	4.94			Site Name: Ravenna Arsenal
						Project No. 07620003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-12-MW-247
							Sample Time: 0908
Bladder pump	HDPE	18	0831	0907	100	1.25	Duplicate ID: LL12MW-247-D
							MS/MSD: Yes:_____ No:_____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	±0.3	±3°C	±0.1	mS/cm or ±10%	±0.3	±10	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0831	100	5.45	12.12	7.41	0.652	0.80	133	28.4	DP	clear
0836	100	5.88	10.76	7.25	0.637	0.00	15	26.2	DP	clear
0841	100	6.09	10.59	7.19	0.628	0.00	-2	28.5	DP	clear
0846	100	6.02	11.21	7.16	0.620	0.00	-5	28.7	DP	clear
0851	100	6.21	10.78	7.18	0.631	0.00	-12	25.1	DP	clear
0856	100	6.42	10.60	7.17	0.630	0.00	-27	13.4	DP	clear
0901	100	6.57	10.51	7.16	0.629	0.00	-30	12.0	DP	clear
0906	100	6.68	10.49	7.16	0.628	0.00	-30	9.7	DP	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. calm Temperature: 60

Sampler: **Observer:**

Notes:

Cardno TEC | WESTON | TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
FWG-MW-007	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK + CD
SITE NAME						Installation:
Ravenna Arsenal	2	32.28	23.55	—		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	FWG-MW-007
Bladder pump	HDPE	29.9	1225	1315	100	5	Sample Time:	1315
							Duplicate ID:	—
							MS/MSD: Yes: ____ No: X	

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.30	±3°C	±0.1	mS/cm or ±3%	±3mg/L	±10mV	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1225	100	23.70	12.44	7.37	0.818	0.00	92	58.1	ek	H.Grey color
1230	↓	↓	12.13	7.44	0.813	0.00	89	38.4	ek	clear
1235			11.66	6.75	0.828	0.00	98	84.8	ek	lt. grey
1240			11.64	6.75	0.824	0.00	87	65.1	ek	clear
1245			11.67	6.77	0.814	0.00	75	83.9	ek	clear
1250		↓	11.79	6.80	0.792	0.00	64	73.0	ek	clear
1255	↓		11.83	6.21	0.789	0.00	85	52.5	ek	clear
1300			12.27	6.76	0.773	0.00	53	30.0	ek	clear
1305			12.44	6.83	0.765	0.00	50	9.4	ek	clear
1310			12.57	6.88	0.758	0.00	48	8.8	ek	clear
1315	↓	↓	12.66	6.89	7.57	0.00	47	8.0	ek	clear
~~1320~~	ek									

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: ____ Wind Speed/Dir. NNE Temperature: 68F

Sampler: [signature] **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-2016
FBQ-MW-174	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK+CD
SITE NAME						Installation:
Ravenna Arsenal	2	23.1	15.05	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: FBQ-MW-174
Bladder pump	HDPE	19.69	0945	1015	100	3.0 L	Sample Time: 10:15
							Duplicate ID: —
							MS/MSD: Yes: ____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
945	100	15.05	10.58	5.40	0.028	10.02	283	15.2	CD	Clear water
950	100	↓	10.72	5.36	0.028	9.76	286	9.6	CD	↓
955	100		11.00	5.34	0.028	9.42	297	0.0	CD	
1000	100		11.29	5.39	0.028	9.27	303	0.0	CD	
1005	100		11.43	5.43	0.028	9.07	304	0.0	CD	
1010	100		11.54	5.48	0.028	9.01	304	0.0	CD	
1015	100	↓	11.55	5.48	0.028	9.03	304	0.0	CD	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: ____ Wind Speed/Dir. ____ Temperature: 65F

Sampler: [signature]

Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
LL-10-MW-003	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: CD + EK
SITE NAME						Installation:
Ravenna Arsenal	2	28.6	17.97	———	———	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (~~gal~~) L	Sample ID: LL-10-MW-003
							Sample Time: 0900
Bladder pump	HDPE	26.9	0825	0855	100	3.5	Duplicate ID: LL10MW003-D
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±3°C	±0.1	mS/cm or ±10%	±3 mg/L	±10 mV	<10 NTU ~~or ±10%~~		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0825	100	18.05	11.62	8.49	0.428	2.77	162	0.0	EK	clear
0830	100	18.05	11.34	7.88	0.414	2.37	170	0.0	EK	clear
0835	100	18.05	11.16	7.43	0.401	1.68	181	0.0	EK	clear
0840	100	18.06	10.96	7.19	0.394	1.29	188	0.0	EK	clear
0845	100	18.05	10.88	7.16	0.393	1.18	191	0.0	EK	clear
0850	100	18.05	10.80	7.06	0.394	1.17	197	0.0	EK	clear
0855	100	18.05	10.78	7.08	0.399	1.28	197	0.0	EK	clear
0900	100	18.05	10.77	7.07	0.398	1.28	197	0.0	EK	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir. light breeze Temperature: 60F

Sampler: Liz Kirby **Observer:**

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-16
NTA-MW-119	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK+CO
SITE NAME						Installation:
Ravenna Arsenal	2	103.6	12.00	—		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: NTA-MW-119
Bladder pump	HDPE	98	1045	1140	100	5.5	Sample Time: 1140
							Duplicate ID: none
							MS/MSD: Yes: X No: ____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1045	100	12.02	11.50	6.49	0.504	0.00	209	0.0	ek	clear
1050	↓	↓	11.47	6.60	0.501	0.68	174	0.0	ek	no odor
1055			11.41	7.02	0.499	0.82	90	0.0	ek	
1100			11.56	7.38	0.492	0.00	-73	120	ek	
1105			11.20	7.28	0.489	0.00	-91	133	ek	
1110			11.13	7.12	0.485	0.00	-87	96.1	ek	
1115			11.08	7.17	0.484	0.00	-93	60.1	ek	
1120			11.07	7.31	0.483	0.00	-100	40.4	ek	
1125			11.07	7.35	0.482	0.00	-103	21.2	ek	
1130			11.09	7.36	0.481	0.00	-103	10.0	ek	
1135			11.20	7.36	0.481	0.00	-104	9.4	ek	
1140	↓	↓	11.19	7.35	0.481	0.00	-105	9.5	ek	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: ____ Wind Speed/Dir. ____ Temperature: 72F

Sampler: [signature]

Observer:

Notes:

Cardno TEC | WESTON | TEC-Weston Joint Venture

THURSDAY

WELL NUMBER	WELL INFORMATION					DATE: 5/12/2016
LL-1-MW-065	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: ek rdp
SITE NAME						Installation:
Ravenna Arsenal	2	23	10.68			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) L	Sample ID: LL-1-MW-065
							Sample Time: 1205
Bladder pump	HDPE	20	1135	1205	100	3	Duplicate ID: none
							MS/MSD: Yes:____ No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±5°C	±0.1	mS/cm or ±10%	±3mg/L	±10mV	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1135	~~500~~	10.70	11.08	8.97	0.466	0.00	126	0.0	ek	clear
1140	300	10.~~70~~	10.92	8.47	0.465	0.00	136	0.0	ek	clear
1145	100	10.70	12.07	7.97	0.460	0.00	134	0.0	ek	clear
1150	↓	10.71	12.83	7.70	0.454	0.00	104	0.0	ek	clear
1155		10.71	13.53	7.55	0.449	0.00	86	0.0	ek	clear
1200		10.71	14.18	7.50	0.448	0.00	89	0.0	ek	clear
1205		10.71	14.17	7.50	0.448	0.00	88	0.0	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: ✓ Rain: ____ Wind Speed/Dir. ____ Temperature: 72F

Sampler:

Observer:

Notes:

TEC-Weston Joint Venture

THURSDAY

WELL NUMBER	WELL INFORMATION					DATE: 5-12-2016
LL-1-MW-086	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK + DP
SITE NAME						Installation:
Ravenna Arsenal	2	77	7.02	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol ~~(gal)~~ L	Sample ID:	LL-1-MW-086
							Sample Time:	~~1130~~ 1125
							Duplicate ID: none	ek
Bladder pump	HDPE	72.5	1050	1120	125	3.75	MS/MSD: Yes:____	No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±3°C	±0.1	mS/cm or ±10%	±3mg/L	±10mV	<10 NTU ~~or <10%~~		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1050	300	7.18	12.42	13.07	4.27	0.41	-62	0.0	ek	clear
1055	275	7.05	12.87	13.14	4.05	0.00	-100	0.0	ek	clear
1100	125	7.05	13.68	13.13	3.95	0.00	-118	0.0	ek	clear
1105	125	7.02	13.27	13.16	3.04	0.00	-151	0.0	ek	clear
1110	125	7.06	13.21	13.14	2.62	0.00	-163	0.0	ek	clear
1115	125	7.04	13.07	13.11	2.22	0.00	-172	0.0	ek	clear
1120	125	7.05	12.88	13.07	1.97	0.00	-174	0.0	ek	clear
1125	125	7.05	12.89	13.07	1.95	0.00	-174	0.0	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: _____ Rain: ✓ Wind Speed/Dir. _____ Temperature: 73°F

Sampler: Liz Kuntz Observer:

Notes:

Cardno TEC WESTON
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION				
LL-1-MW-087	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)
SITE NAME					
Ravenna Arsenal	2	18.03	5.42		

DATE: THURSDAY 5-12-2016
Sample Personnel: EK + DP
Installation:
Site Name: Ravenna Arsenal
Project No.

PURGE INFORMATION						
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (~~gal~~) L
Bladder pump	HDPE	15	1215	1245	100	~3L

SAMPLE INFORMATION
Sample ID: LL-1-MW-087
Sample Time: 1245
Duplicate ID: NME
MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.30	±5°C	±0.1	mS/cm or ±10%	±3mg/L	±10mV	<10 NTU ~~or ±10%~~		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1215	300	6.45	11.55	7.62	0.454	0.48	195	0.0	ek	clear
1220	175	6.82	11.80	7.40	0.451	0.00	196	0.0	ek	clear
1225	65	6.57	12.53	7.34	0.450	0.00	194	0.0	dp	clear
1230	100	6.41	13.54	7.26	0.456	0.00	192	0.0	ek	clear
1235	↓	6.39	13.37	7.24	0.466	0.00	191	0.0	ek	clear
1240		6.32	13.59	7.23	0.473	0.00	189	0.0	ek	clear
1245	↓	6.32	13.89	7.20	0.477	0.00	187	0.0	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir. _____ Temperature: 76 F
Sampler:
Observer:
Notes:

TEC-Weston Joint Venture

THURSDAY

WELL NUMBER	WELL INFORMATION					DATE: 5-12-2016
LL-3-MW-246	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: ek + dp
SITE NAME						Installation:
Ravenna Arsenal	2	45.75	~~18.78~~ ek			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) ek L	Sample ID: LL-3-MW-246
Bladder pump	HDPE	40.5	0825 ok		~150		Sample Time: 0900
							Duplicate ID: none LL3MW246-D ek
							MS/MSD: (Yes: X) No: ~~X~~ ek

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.30	~~5~~ °C	±0.1	mS/cm or ±10%	±3.0 mg/L	±10mV/10%	<10 NTU ~~or 5~~			
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
~~0705~~										
0825	250	19.02	11.53	6.15	0.131	1.80	230	0.0	ek	clear
0830	120	18.84	11.60	6.12	0.131	1.31	232	0.0	ek	clear
0835	200	19.00	10.73	5.91	0.126	0.94	253	0.0	ek	clear
0840	150	18.98	10.90	5.74	0.125	0.75	274	0.0	ek	clear
0845	↓	19.00	10.91	5.74	0.125	0.72	278	0.0	ek	clear
0850		18.98	10.85	~~5.81~~	0.126	0.66	284	0.0	ek	clear
0855		18.99	10.92	5.81	0.126	0.66	284	0.0	ek	clear
0900	↓	18.99	10.98	5.79	0.126	0.66	286	0.0	ek	clear
					5.74	ek				

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: _____ Rain: _____ Wind Speed/Dir. NONE Temperature: 68 F

Sampler: Liz Kirby Observer:

Notes:
Well outside fence. MS/MSD @ location. Good Recharge.

Cardno TEC | WESTON
TEC-Weston Joint Venture

THURSDAY

WELL NUMBER	WELL INFORMATION					DATE: 5·12·2016
LL-2-MW-271	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK-DP
SITE NAME						Installation:
Ravenna Arsenal	2	27.8	10.31	—		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (~~gal~~ L)	Sample ID:	LL-2-MW-271
							Sample Time:	0735
Bladder pump	HDPE	22.5	0705	0735	250	7.5	Duplicate ID:	LL2mw271-D
							MS/MSD: Yes:____	No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0705	300	10.35	11.20	6.47	0.310	0.00	24	58.6	ek	lt. grey/brown
0710	250	10.43	10.83	6.48	0.314	0.00	8	50.3	ek	lt. brown
0715	250	10.39	10.73	6.39	0.314	0.00	7	44.1	ek	lt. brown
0720	250	10.39	10.69	6.34	0.314	0.00	3	0.7	ek	~~lt~~ clear
0725	250	10.62	10.64	6.39	0.310	0.00	11	0.0	ek	clear
0730	250	~~10.66~~ 10.39	10.66	~~6.54~~ 6.48	0.304	0.00	14	0.0	ek	
0735	250	→ 10.38	10.67	6.49	0.304	0.00	14	0.0	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: ____ Wind Speed/Dir. ____ Temperature: 65F

Sampler: [signature] **Observer:** [signature]

Notes:
OUTSIDE OF FENCE. GOOD RECHARGE
SPLIT SAMPLE COLLECTED BY ANG

WESTON
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-2016
LL-1-MW-088	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK + DP
SITE NAME						Installation:
Ravenna Arsenal	2	26.96	5.88	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) L	Sample ID: LL-1-MW-088
							Sample Time:
Bladder pump	HDPE	22	2000		150		Duplicate ID: none
							MS/MSD: Yes:____ No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±5C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
2000	150	5.53	16.05	7.31	0.483	0.00	139	18.5	ek	clear
2005	150	5.54	14.36	7.32	0.506	0.00	131	26.7	ek	no odor
2010	150	5.85	13.61	7.39	0.515	0.00	98	24.9	ek	
2015	150	5.52	12.84	7.42	0.519	0.00	9	~~0.0~~ 16.8	ek	
2020	150	5.51	12.71	7.38	0.519	0.00	-13	7.5	ek	
2025	150	5.51	12.69	7.39	0.519	0.00	-14	~~6.0~~	ek	
2030	150	5.51	12.53	7.34	0.519	0.00	-22	0.0	DP	
2035	150	5.51	12.49	7.34	0.518	0.00	-30	0.0	ek	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: _____ Rain: ✓ Wind Speed/Dir. none Temperature: 67°F

Sampler: [signature]

Observer: [signature]

Notes:

Cardno TEC WESTON
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-2016
FWG-MW-002	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: CD + EK
SITE NAME						Installation:
Ravenna Arsenal	2	68.62	23.89			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	FWG-MW-002
							Sample Time:	1625
Bladder pump	HDPE	64.5	1425	1625	100	12	Duplicate ID:	
							MS/MSD: Yes:____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1525	100	23.60	23.89	7.19	0.000	6.82	-133	290	CD	Murky Light Gray
1530	100	23.60	24.23	7.36	0.000	6.77	-140	292	CD	
1535	100	23.60	24.55	7.48	0.000	6.71	-149	293	CD	
1540	100	23.60	24.84	7.67	0.000	6.62	-159	294	CD	
1545	100	23.60	24.93	7.76	0.000	6.37	-161	294	CD	
1550	100	23.60	25.00	7.84	0.000	6.26	-167	294	CD	
1555	100	23.60	25.12	7.88	0.000	6.14	-169	295	CD	
1600	100	23.60	25.07	7.83	0.000	6.09	-168	295	CD	
1605	100	23.60	25.03	7.88	0.000	6.02	-169	295	CD	
1610	100	23.60	24.93	7.95	0.000	5.92	-173	295	CD	
1615	100	23.60	24.84	7.96	0.000	5.88	-172	296	CD	
1620	100	23.60	24.72	7.94	0.000	5.84	-172	296	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 77

Sampler: [signature]

Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-11-2016
FWG-MW-002	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK+CK
SITE NAME						Installation:
Ravenna Arsenal	2	68.62	23.89	—		Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (~~gal~~) L	Sample ID:	FWG-MW-002
							Sample Time:	1625
Bladder pump	HDPE	64.5	1425	1625	100	12	Duplicate ID:	—
							MS/MSD: Yes:____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1425	100	23.87	13.75	7.10	0.000	14.08	-13	239	ek	lt. grey
1430	100	23.85	17.45	5.91	0.000	9.47	-70	275	ek	
1435	100	23.64	19.68	5.71	0.000	8.41	-55	276	ek	
1440	100	23.60	20.77	5.78	0.000	7.99	-60	281	ek	
1445	100	23.60	21.45	5.99	0.000	7.75	-70	285	ek	
1450	100	23.60	21.76	6.11	0.000	7.65	-77	287	ek	
1455	100	23.59	22.04	6.30	0.000	7.55	-86	288	ek	
1500	100	23.60	22.33	6.46	0.000	7.25	-92	289	ek	
1505	100	23.60	22.65	6.61	0.000	7.11	-102	288	ek	
1510	100	23.57	22.81	6.74	0.000	7.06	-103	289	ek	
1515	100	23.58	23.12	6.81	0.000	6.97	-108	289	ek	
1520	100	23.60	23.50	7.00	0.000	6.89	-124	289	ek	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 73

Sampler: [signature]

Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05-11-16
FWG-MW-002	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: CD + EK
SITE NAME						Installation:
Ravenna Arsenal	2	68.62	23.89			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	FWG-MW-002
						L	Sample Time:	1625
Bladder pump	HDPE	64.5	1425	1625	100	12	Duplicate ID:	
							MS/MSD: Yes:____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1625	100	23.60	24.65	7.93	0.000	5.82	-167	296	CD	Light Gray

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 75

Sampler: [signature] Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
RQL-MW-011	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dysarten + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	35.42	20.74			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: RQL-MW-011
Bladder pump	HDPE	31	1240	1310	100		Sample Time: 1310
							Duplicate ID: ~~~~
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1240	100	20.96	12.37	5.47	0.144	2.50	141	0.0	CD	Clear
1245	100	20.99	11.99	5.54	0.146	1.74	165	0.0	CD	
1250	100	20.99	11.99	5.51	0.149	1.38	187	0.0	CD	
1255	100	20.98	11.98	5.46	0.151	1.20	201	0.0	CD	
1300	100	20.98	12.07	5.42	0.154	0.99	212	0.0	CD	
1305	100	20.98	12.11	5.41	0.157	0.89	216	0.0	CD	
1310	100	20.98	12.21	5.38	0.161	0.72	223	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: X Rain: _____ Wind Speed/Dir. _____ Temperature: ~75

Sampler: Charles Dysarten **Observer:** Thomas St John

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
RQL-MW-009	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dusatch + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	18.58	4.75			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID:	RQL-MW-009
Bladder pump	HDPE	15	1110		125		Sample Time:	1205
							Duplicate ID:	RQL-MW-009-D
							MS/MSD: Yes: ____	No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1110	125	5.10	14.12	6.17	0.135	0.00	11	590	CD	Rust colored + High NTU
1115	125	5.05	13.20	6.34	0.140	0.00	4	989	CD	↓
1120	125	5.15	12.50	6.40	0.145	0.00	-1	374	CD	Clearing up
1125	125	5.20	12.35	6.41	0.148	0.00	-2	175	CD	↓
1130	125	5.20	12.15	6.39	0.153	0.00	-3	122	CD	↓
1135	125	5.21	12.00	6.39	0.150	0.00	-4	95.0	CD	↓
1140	125	5.25	11.94	6.20	0.167	0.00	-5	84.6	CD	↓
1145	125	5.25	11.93	6.33	0.174	0.00	-6	45.2	CD	Clear
1150	125	5.25	12.11	6.37	0.186	0.00	-10	20.2	CD	↓
1155	125	5.25	12.17	6.38	0.195	0.00	-13	4.7	CD	↓
1200	125	5.28	12.04	6.37	0.204	0.00	-14	0.0	CD	↓
~~1205~~ ← 1205	125	5.28	12.13	6.36	0.209	0.00	-15	0.0	CD	↓

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: X Rain: X Wind Speed/Dir. ____ Temperature: 65

Sampler: Observer:

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5/12/16
RQL-MW-007	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles DeStefan Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	18.67	5.76			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: RQL-MW-007
Bladder pump	HDPE	15.9	0840	0910	100		Sample Time: 0910
							Duplicate ID: ~~~~
							MS/MSD: Yes: X No: ____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0840	100	5.99	11.92	6.42	0.666	0.00	-38	14.3	CD	Clear
0845	100	5.98	12.08	6.42	0.683	0.00	-46	0.4	CD	
0850	100	5.98	12.12	6.43	0.692	0.00	-52	0.0	CD	
0855	100	5.98	12.16	6.45	0.711	0.00	-56	0.0	CD	
0900	100	5.97	12.20	6.46	0.733	0.00	-59	0.0	CD	
0905	100	5.96	12.36	6.42	0.751	0.00	-60	0.0	CD	
0910	100	5.96	12.52	6.42	0.766	0.00	-61	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 65

Sampler: [signature] **Observer:** [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
RQL-MW-008	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dustan + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	18.71	5.93			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: RQL-MW-008
Bladder pump	HDPE	15.5	0930	10:00	110		Sample Time: 10:00
							Duplicate ID: ~~~
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0930	110	6.04	13.11	6.66	0.678	0.19	-73	0.0	CD	Clear/slight brown
0935	110	6.00	13.58	6.75	0.691	0.00	-80	0.0	CD	
0940	110	5.99	13.97	6.79	0.699	0.00	-83	0.0	CD	
0945	110	5.99	14.34	6.78	0.704	0.00	-84	0.0	CD	
0950	110	5.99	14.72	6.76	0.706	0.00	-85	0.0	CD	
0955	110	5.99	15.34	6.67	0.706	0.00	-81	0.0	CD	
1000	110	5.99	15.54	6.59	0.707	0.00	-79	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 66

Sampler: [signature]

Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
RQL-MW-012	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dunstan + Tim St John
SITE NAME						Installation:
Ravenna Arsenal	2	30.74	20.47			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: RQL-MW-012
Bladder pump	HDPE	29.5	1335	1405	100		Sample Time: 1405
							Duplicate ID: ———
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1335	100	20.49	13.56	5.30	0.160	8.08	240	0.0	CD	Clear
1340	100	20.49	13.83	5.21	0.179	7.84	247	0.0	CD	
1345	100	20.50	13.30	5.11	0.185	7.78	255	0.0	CD	
1350	100	20.50	13.15	5.07	0.198	7.57	260	0.0	CD	
1355	100	20.50	13.00	5.04	0.209	5.04	265	0.0	CD	
1400	100	20.51	12.94	4.95	0.216	4.81	270	0.0	CD	
1405	100	20.52	13.16	4.95	0.221	4.43	272	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 78

Sampler: [signature] **Observer:** [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
RQL-MW-013	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Deschel + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	36.54	24.09			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: RQL-MW-013
Bladder pump	HDPE	33.5	1430	1506	100		Sample Time: 1500
							Duplicate ID: ———
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1430	100	24.21	14.61	4.38	0.275	0.00	287	0.0	CD	Clear
1435	100	24.20	14.48	4.34	0.276	0.00	288	0.0	CD	
1440	100	24.23	14.36	4.27	0.277	0.00	288	0.0	CD	
1445	100	24.24	14.03	4.20	0.278	0.00	289	0.0	CD	
1450	100	24.24	13.88	4.15	0.280	0.00	291	0.0	CD	
1455	100	24.26	13.74	4.11	0.282	0.00	294	0.0	CD	
1500	100	24.27	13.59	4.08	0.283	0.00	295	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 79

Sampler: [signature]

Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
LL-2-MW-241	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dyszelski + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	25.66	9.94			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-2-MW-241
Bladder pump	HDPE	21.5	1550	1620	150		Sample Time: 1620
							Duplicate ID: ~
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1550	150	9.45	12.12	5.81	0.114	0.60	211	0.0	CD	Clear
1555	150	9.28	11.97	5.82	0.113	0.25	212	0.0	CD	
1600	150	9.20	12.32	5.85	0.112	0.15	213	0.0	CD	
1605	150	9.16	13.16	5.87	0.113	0.25	214	0.0	CD	
1610	150	9.16	13.37	5.89	0.113	0.30	215	0.0	CD	
1615	150	9.18	12.78	5.90	0.113	0.34	216	0.0	CD	
1620	150	9.18	12.84	5.92	0.113	0.39	217	0.0	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 79

Sampler: [signature] **Observer:** [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 05/12/16
LL3-MW-238	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: Charles Dusenbery + Tom St John
SITE NAME						Installation:
Ravenna Arsenal	2	23.44	15.59			Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL3-MW-238
Bladder pump	HDPE	21.9	1720	1750	100		Sample Time: 1750
							Duplicate ID: ~~~~
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1720	100	15.65	16.22	6.92	0.270	3.45	169	0.0	CD	Clear
1725	100	15.89	15.32	6.88	0.270	3.19	170	0.0	CD	
1730	100	15.98	14.81	6.75	0.271	3.09	178	4.2	CD	
1735	100	16.12	15.49	6.09	0.269	2.92	203	7.5	CD	
1740	100	16.21	17.39	6.01	0.262	2.51	205	8.3	CD	
1745	100	16.17	18.14	5.99	0.266	2.61	205	8.4	CD	
1750	100	16.16	18.27	5.99	0.269	2.70	206	7.8	CD	

GENERAL INFORMATION

Weather: Sun/Clear: X Cloudy: _____ Rain: _____ Wind Speed/Dir. _____ Temperature: 78

Sampler: [signature] **Observer:** Thomas H St John

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-13-16
LL-1-MW-083	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK & DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	41.46	31.76	—	—	Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal) L	Sample ID: LL-1-MW-083
Bladder pump	HDPE	40	0855	0925	100	3	Sample Time: 0925
							Duplicate ID: —
							MS/MSD: Yes:____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	20.3'	±3°C	±0.1	mS/cm or ±10%	±3mg/L ±10		<10 NTU		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0855	100	31.76	13.93	5.65	0.093	4.05	318	32.8	DP	clear
0900		31.89	11.70	4.68	0.189	1.97	352	25.7	DP	clear
0905		32.02	10.88	4.60	0.189	1.13	360	20.5	DP	clear
0910		32.00	10.72	4.56	0.189	0.46	371	18.0	EK	clear
0915		32.01	10.66	4.51	0.186	0.86	384	5.9	EK	clear
0920		32.02	10.61	4.53	0.187	0.12	384	4.6	EK	clear
0925	▼	32.06	10.57	4.44	0.187	0.09	399	4.0	EK	clear

GENERAL INFORMATION

Weather: Sun/Clear: ____ Cloudy: ✓ Rain: ____ Wind Speed/Dir: ____ Temperature: 60

Sampler: [signature] Observer: [signature]

Notes:

T. Metals -1 8332B-2
8081-2 8VOCs List #2-2 } 7 bottles!

Cardno TEC WESTON
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-13-16
LL-1-MW-084	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: LK & DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	39.24	26.47			Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (L)	Sample ID: LL-1-MW-084
Bladder pump	HDPE	37	0805	0835	100	3L	Sample Time: 0835
							Duplicate ID: none
							MS/MSD: Yes:____ No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±5°C	±0.1	mS/cm or ±10%	±3mg/L	±mV	<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
0805	500	28.05	11.71	8.10	0.245	4.92	267	13.6	DP	clear
0810	100	28.43	11.06	5.78	0.242	0.82	290	11.3	DP	clear
0815	↓	28.49	10.88	5.62	0.239	0.65	293	12.1	DP	clear
0820	↓	28.57	10.88	5.58	0.238	0.55	288	10.0	EK	clear
0825	↓	28.60	10.89	5.60	0.241	0.49	282	8.8	EK	clear
0830	↓	28.66	10.86	5.60	0.243	0.42	299	8.7	DP	clear
0835	▼	28.69	10.88	5.60	0.244	0.41	294	8.7	DP	clear

GENERAL INFORMATION

Weather: Sun/Clear: _____ Cloudy: ✓ Rain: _____ Wind Speed/Dir. Calm Temperature: 57

Sampler: [signature] **Observer:** [signature]

Notes:

8270D List 2 - 2
Total Metals - 1
8081B - 2
8330B - exp + propellants - 2

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-13-16 Friday
LL-2-MW-059	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: EK & DP
SITE NAME						Installation: Ravenna
Ravenna Arsenal	2	21.84	12.90	—	—	Site Name: Ravenna Arsenal
						Project No. 076003

PURGE INFORMATION							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-2-MW-059
							Sample Time: 1200
Bladder pump	HDPE	19.9	1130	1200	100	3L	Duplicate ID: —
							MS/MSD: Yes: ____ No: X

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min		±1 °C	±0.1	mS/cm or ±10%			<10 NTU or ±10%		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1130	100	13.25	12.03	6.21	0.148	0.00	~~Extreme~~ 271 DP	40.8	DP	clear
1135	↓	13.33	11.51	6.20	0.150	0.00	264	30.3	DP	iron sludge
1140		13.42	11.23	6.20	0.151	0.00	242	18.0	DP	clear
1145		13.42	11.14	6.19	0.151	0.00	237	16.0	DP	clear, sun
1150		13.34	11.20	6.18	0.151	0.00	231	10.0	DP	clear, sun
1155		13.45	11.25	6.19	0.151	0.00	224	9.9	DP	clear
1200	↓	13.45	11.32	6.17	0.150	0.00	223	9.8	DP	clear ↓

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: ✓ Rain: ____ Wind Speed/Dir. ____ Temperature: 70

Sampler: **Observer:**

Notes: 8270 C (List 2) Total Metals 5 total

8330 B

Cardno TEC | WESTON TECHNOLOGY
TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE: 5-13-2016 FRIDAY
LL-2-MW-060	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel: ek + dp
SITE NAME						Installation:
Ravenna Arsenal	2	20.89	9.59	—	—	Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION							SAMPLE INFORMATION	
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol ~~(gal)~~ L	Sample ID:	LL-2-MW-060
							Sample Time:	1115
Bladder pump	HDPE	17	1000	1110	175	12.25	Duplicate ID:	none
							MS/MSD: Yes:____	No: ✓

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	~~±~~5°C	±0.1	mS/cm or ±10%	±3mg/L	±10	<10 NTU ~~or 10%~~		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1000	500	9.59	11.43	6.36	0.240	0.00	240	17.8	ek	clear
1005	300	9.78	11.41	6.34	.238	0.00	237	16.5	ek	clear
1010	~~300 175~~	9.88	11.25	6.44	0.233	0.00	235	16.1	ek	clear
1015	175	9.90	10.80	6.42	0.233	0.00	232	14.2	ek	clear
1020	175	9.90	10.80	6.45	0.230	0.00	234	13.5	ek	clear
1025	175	9.89	10.81	6.45	0.227	0.00	235	14.7	ek	clear
1030	175	9.89	10.81	6.45	0.225	0.00	237	13.4	ek	clear
1035	175	~~10.10~~ 9.88	10.92	6.45	0.222	0.00	237	13.5	dp	clear
1040	175	9.88 9.87	11.13	6.44	0.222	0.00	238	13.3	dp	clear
1045	175	9.87	11.19	6.47	0.221	0.00	239	13.9	ek	clear
1050	175	9.85	11.28	6.47	0.220	0.00	238	13.2	dp	clear, sun
1055	175	9.85	11.04	6.47	0.218	0.00	242	13.2	ek	clear

GENERAL INFORMATION

Weather: (Sun) Clear: ✓ Cloudy: ✓ Rain: none Wind Speed/Dir. none Temperature: 65°F

Sampler: [signature] Observer: [signature]

Notes:

TEC-Weston Joint Venture

WELL NUMBER	WELL INFORMATION					DATE:
LL-2-MW-060	Well Diameter (in)	Total Depth (ft BTOC)	Depth to Water (ft BTOC)	Depth to Product (ft BTOC)	PID (ppm)	Sample Personnel:
SITE NAME						Installation:
Ravenna Arsenal	2	20.89				Site Name: Ravenna Arsenal
						Project No.

PURGE INFORMATION (see page #1)							SAMPLE INFORMATION
Pump Type	Tubing Type	Pump Intake Depth (ft BTOC)	Purge Start Time	Purge Stop Time	Flow Rate (mL/min)	Total Purge Vol (gal)	Sample ID: LL-2-MW-060
Bladder pump	HDPE	17					Sample Time:
							Duplicate ID: see page #1
							MS/MSD: Yes:____ No:____

PURGING PARAMETERS (Measurements to be taken every 3-5 minutes)

Criteria:	mL/min	<0.3	±3°C	±0.1	mS/cm or ±10%	±3 mg/L	±10	<10 NTU		
Time	Flow Rate (mL/min)	DTW (ft)	Temp (°C)	pH	Cond (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Initials	Water Conditions / Comments
1100	175	9.84	11.07	6.48	0.218	0.00	242	12.7	dp	clear, sun
1105	175	9.85	11.50	6.49	0.217	0.00	239	9.9	ek	clear
1110	175	9.82	11.48	6.49	0.217	0.00	239	9.4	ek	clear
1115	175	9.84	11.52	6.49	0.217	0.00	239	9.7	ek	clear

GENERAL INFORMATION

Weather: Sun/Clear: ✓ Cloudy: ✓ Rain: _____ Wind Speed/Dir. _____ Temperature: 50-60

Sampler: **Observer:**

Notes: see page #1

APPENDIX A.4
CHAIN-OF-CUSTODY FORMS

THIS PAGE INTENTIONALLY LEFT BLANK

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

280-83089 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: MH	Lab PM: McEntee, Patrick	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone:	E-Mail: patrick.mcentee@testamericainc.com	Page: Page 1 of 1
Company: Cardno TEC, Inc		Analysis Requested	Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested:		Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
City: Golden	TAT Requested (days): As Per Contract		
State, Zip: CO, 80401			
Phone:	PO #: Project 076003		Other:
Email: heather.miner@cardno-gs.com	WO #:		
Project Name: Ravenna, OH	Project #: 28014271		
Site:	SSOW#:		

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8270D - List 2	8081 A	8270 D SIM	8330 B	8260 B	9012 B Cyanide	8082 A	Total Metals 6000C 6020 7470A	8270 C List 2	8330 7196A Chromium	Nitrate-Nitrite 353.2	8081 B	Total Number of containers	Special Instructions/Note:
			Preservation Code:																	
DET-004	5/10/16	1308	G	Water			X	X	X	X	X	X	X	X					15	
LL7mw-001	5/10/16	1550	G	Water						X	X			X	X				7	
LL12 mw-247	5/11/16	0908	G	Water			X			X	[redacted]	[redacted]		X		X	HT		8	
LL12 mw-247D	5/11/16	0908	G	Water			X			X	[redacted]	[redacted]		X		X	HT		8	
SCFMW-002	5/11/16	1111	G	Water	[redacted]	[redacted]				X				X	X	X		X	24	MS/MSD
LL12-185	5/11/16	1221	G	Water						X				X			X		3	
051116-TB	5/11/16	1300	G	Water							X									
				Water																
				Water																
				Water																
				Water																

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1		5/11/16 1345	TAC		5/11/16 1345	TAC
2		5/11/16 1515	TAC		5-11-16 1515	TAC
3					5/12/16 0915	TAC

Custody Seals Intact: △ Yes △ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 4.4-0.1 IR#5 Transfered by DW 5/12/16

24, 1.8, 2.5

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

280-83104 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: LIZ KIRBY	Lab PM: McEntee, Patrick J	COC No: 280-52718-18998.1
Client Contact: Ms. Heather Miner	Phone: 303 941 6689	E-Mail: patrick.mcentee@testamericainc.com	Page: Page 1 of 1
Company: Cardno TEC, Inc		Analysis Requested	Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested: per contract		Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
City: Golden	TAT Requested (days): per contract		
State, Zip: CO, 80401			
Phone:	PO #: Project 076003		Other: HNO_3*
Email: heather.miner@cardno-gs.com	WO #:		
Project Name: Ravenna, OH	Project #: 28014271		
Site:	SSOW#:		

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Total Metals 6010C/6020/7470A 8330B	8270D - List a SVOCs	8270 - List 2 SVOCs	VOC, 8260B	8270D List 3 SVOCs	8270D sim PAH	8082A PCBs	Pesticides 8081B	Free Cyanide (SM# 9012)	Total Number of containers	Special Instructions/Note:
			Preservation Code:				X										
FWGmw-004	5/9/16	1335	G	Water			x	x	x							4	use extra for parent/dup if needed
FWGmw-004-D	5/9/16	1335	G	Water			x	x	x							4	
FWGmw-016	5/9/16	1438	G	W			x	x	x							5	
FWGmw-015	5/9/16	1050	G	W			x	x	x							5	
WBGmw-006	5/10/16	1036	G	W			x	x	x							5	
WBGmw-009	5/10/16	0845	G	W			x	x	x							5	
WBGmw-20	5/10/16	0945	G	W			x	x	x							5	
WBGmw-021	5/10/16	0906	G	W			x	x	x							5	
DA2-mw-115	5/10/16	1115	G	W			x	x		x						5	
DET-003	5/10/16	1225	G	W			x	x	x	x	x	x	x	x	x	6	
Trip Blank	5/10/16	1225	G	W						x						2	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	5/10/16 1405	ATC		5-10-16 1405	TAS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	5-10-16 1615	TAS		5/11/16 0910	TAD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 5.4, 2.4, 2.4, 1.1 -0.1 IR#5 transferred by DW 5/11/16

Page 4601 of 4602

06/15/2016

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Matt Hummel	Lab PM: McEntee, Patrick J	Carrier Tracking No(s): LAB	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone: 412-953-7041	E-Mail: patrick.mcentee@testamericainc.com		Page: Page 1 of 3
Company: Cardno TEC, Inc				Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested:			
City: Golden	TAT Requested (days): As Per contract			
State, Zip: CO, 80401				
Phone:	PO #: Project 076003			
Email: heather.miner@cardno-gs.com	WO #:			
Project Name: Ravenna, OH	Project #: 28014271			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8270D/1624	8270 SIM	8330B	VOCs 8260	8082A	8081A	8330B	9021B	total metals 6010C, 6020, 7470A	9040 C pH	Total Number of containers	Special Instructions/Note:
			Preservation Code:															
RQL mw-007	05/12/16	0910	G	Water	N	Y	X	X	X	X	X	X	X	X	X		45	MS/MSD
RQL mw-008	05/12/16	1000	G	Water	N	N	X	X	X	X	X	X	X	X	X		15	
RQL mw-009	05/12/16	1205	G	Water			X	X	X	X	X	X	X	X	X		15	
RQL mw-009D	05/12/16	1205	G	Water			X	X	X	X	X	X	X	X	X		15	
RQL mw-11	5/12/16	1310	G	Water												X	1	
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														

280-83171 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 5/12/16 1420	Company: AJC	Received by:	Date/Time: 5-12-16 1820	Company: TestAm
Relinquished by:	Date/Time: 5-12-16 1600	Company	Received by:	Date/Time: 5-13-16 0950	Company: GRD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: △ Yes △ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 0.3, 5.2, 4.8, 3.9, 5.3, 3.4, 0.6, 1.4, 4.8, 0.5, 3.4 IR #5 -0.1

Transferred by RP 5-13-16

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: LIZ KIRBY	Lab PM: McEntee, Patrick J	Carrier Tracking No(s):	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone: 303 2730231	E-Mail: patrick.mcentee@testamericainc.com		Page: Page 2 of 3
Company: Cardno TEC, Inc		Analysis Requested		Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested: per contract			Preservation Codes:
City: Golden	TAT Requested (days): per contract			A - HCL; B - NaOH; C - Zn Acetate; D - Nitric Acid; E - NaHSO4; F - MeOH; G - Amchlor; H - Ascorbic Acid; I - Ice; J - Di Water; K - EDTA; L - EDA; M - Hexane; N - None; O - AsNaO2; P - Na2O4S; Q - Na2SO3; R - Na2S2O3; S - H2SO4; T - TSP Dodecahydrate; U - Acetone; V - MCAA; W - ph 4-5; Z - other (specify)
State, Zip: CO, 80401				
Phone: 303 273 0231	PO #: Project 076003			Other: * HNO3
Email: heather.miner@cardno-gs.com	WO #:			
Project Name: Ravenna, OH	Project #: 28014271			
Site:	SSOW#:			

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	pH 9040C	8270C (List 2) SVOC's	Metals 6010C 6020 7470A	8330B Explosives and Propellants	8270D SIM PAH	VOC's 8260B	8270C (List 1) SVOC's	8270C (List 3) SVOC's	8081B Pesticides	Nitrate+ Nitrite 353.2	6860 Perchlorate	Total Number of containers	Special Instructions/Note:
			Preservation Code:						*										
FWGmw002	5/11/16	1625	G	Water	N	N	X											5	
FWG mw 007	5/11/16	1315	G	Water	N	N		X	X	X								5	
NTA mw 119	5/11/16	1140	G	Water	N	Y			X	X	X	X	X					8	MS/MSD
LL10 mw 003	5/11/16	0900	G	Water	N	N			X			X		X				6	
LL10 mw 003-D	5/11/16	0900	G	Water	N	N			X			X		X				6	
FBQ mw 174	5/11/16	1015	G	Water	N	N		X	X	X					X			7	
LL12mw 187	5/11/16	1548	G	Water	N	N			X	X	X					X		7	MS/MSD
LL12 mw 242	5/11/16	1821	G	Water	N	N			X	X						X		7	
051216-TB	5/12/16	0730	G	Water	N	N						X						2	
LL12mw 245	5/11/16	1411	G	Water	N	N		X	X	X								5	
LL-3-MW-246	5/12/16	0900	G	Water	N	Y		X	X	X							X	18	MS/MSD

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify)	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 5/12/16 1420	Company: ATC	Received by:	Date/Time: 5-12-16-1920	Company:
Relinquished by:	Date/Time: 5-12-16-1600	Company	Received by:	Date/Time: 5-13-16 0950	Company: TAD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: DP	Lab PM: McEntee, Patrick J	Carrier Tracking No(s):	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone: 303 2730231	E-Mail: patrick.mcentee@testamericainc.com		Page: Page 3 of 3
Company: Cardno TEC, Inc				Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested: per contract			
City: Golden	TAT Requested (days): per contract			
State, Zip: CO, 80401				
Phone: 303 273 0231	PO #: Project 076003			
Email: heather.miner@cardno-gs.com	WO #:			
Project Name: Ravenna, OH	Project #: 28014271			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other: * HNO_3

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8270C (List2) SVOCs	8330 b Explosives & Propellants	6860 Perchlorate	Metals 6010C (6020 7470A	8081B Pesticides											Total Number of containers	Special Instructions/Note:
			Preservation Code:							*													
LL-2-MW-271	5/12/16	0735	G	Water			X	X	X	X	.											6	
LL-2-MW-271-D	5/12/16	0735	G	Water			X		X	X	.											4	<5
LL-1-MW-088	5/12/16	2035	G	Water			X	X		X	X	.										7	
LL-1-MW-087	5/12/16	1245	G	Water			X	X		X	.											5	
LL-1-MW-086	5/12/16	1125	G	Water			X	X		X	.											5	
LL-1-MW-065	5/12/16	1205	G	Water			X	X		X	.											5	
				Water																			
				Water																			
				Water																			
				Water																			
				Water																			

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 5/12/16 1420	Company AIT	Received by:	Date/Time: 5.12.16 1420	Company TestAm
Relinquished by:	Date/Time: 5-12-16 - 1600	Company	Received by:	Date/Time: 5-13-16 0950	Company TAD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

280-83188 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

LAB

Client Information	Sampler: EK	Lab PM: McEntee. Patrick J	COC No: 280-52692-18997.1
Client Contact: Ms. Heather Miner	Phone:	E-Mail: patrick.mcantee@testamericainc.com	Page: 1 of 3
Company: Cardno TEC, Inc			Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested:		
City: Golden	TAT Requested (days): per Contract		
State, Zip: CO, 80401			
Phone:	PO #: Project 076003		
Email: heather.miner@cardno-gs.com	WO #:		
Project Name: Ravenna, OH	Project #: 28014271		
Site:	SSOW#:		

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other: * HNO_3

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	Diss. Metals 6010C/6020/7470	Total metals 6010C/6020/7470	8270C - SVOCs list 2	8330B - Explosives & Propellants	8151B - Pesticides	Total Number of containers	Special Instructions/Note:
			Preservation Code:				*	*					
FWGmw011	5.12.16	1745	G	Water	N	Y	X	X	X	X		8	ms/msd for filt. metals only
FWGmw011-D	5.12.16	1745	G	Water	Y	N		X				1	
LL1mw064	5.12.16	1440	G	Water	N	N		X	X	X		5	
FWGmw012	5.12.16	1530	G	Water	N	N		X	X	X		5	
LL2mw060	5.13.16	1115	G	W	N	N		X	X	X		5	
LL2mw059	5.13.16	1200	G	W	N	N		X	X	X		5	
LL1mw084	5.13.16	0835	G	W	N	N		X	X	X	X	7	5 ek, 5.13.16
LL1mw083	5.13.16	0925	G	W	N	N		X	X	X	X	7	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: [signature]	Date/Time: 5/13/16 1400	Company: AMEC	Received by: [signature] Date/Time: 5-13-16-1412 Company: TestAm
Relinquished by: Robson	Date/Time: 5-13-16-1507	Company: Cardno	Received by: [signature] Date/Time: 5-14-16 0845 Company: TAD
Relinquished by:	Date/Time:	Company	Received by: Date/Time: Company

Custody Seals Intact: ☐ Yes ☐ No
Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 1.7, 0.9, 3.1, 1.6, 0.9, 1.0, 5.1 IR#5 -0.1

Transferred by RP 5-14-16

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: LIZ KIBBY	Lab PM: McEntee, Patrick J	Carrier Tracking No(s): L 213	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone:	E-Mail: patrick.mcentee@testamericainc.com		Page: ~~Page 1 of~~ 2 of 3
Company: Cardno TEC, Inc				Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested: per contract			
City: Golden	TAT Requested (days): per contract			
State, Zip: CO, 80401				
Phone:	PO #: Project 076003			
Email: heather.miner@cardno-gs.com	WO #:			
Project Name: Ravenna, OH	Project #: 28014271			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other: ⊗NaOH&Zn(CH3COO)2

Sample identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wwater, Ssolid, Owaste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	TCLP VOCs	TCLP SVOCs	TCLP metals	TCLP pesticides	Total sulfide ⊗NaOH	Total cyanide ⊗NaOH	pH	Flashpoint	Total Number of containers	Special Instructions/Note:
			Preservation Code:													
051316-IDW	5-13-16	1300	C	Water	N	N	X	X	X	X	X	X	X	X	19	extra volume if needed
051316-TB	5-13-16	1300	G	Water	N	N	X								2	
				Water												
				Water												
				Water												
				Water												
				Water												
				Water												
				Water												
				Water												
				Water												
				Water												

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time	Company		Date/Time	Company
Relinquished by:	5/13/16 1400	AIC	Received by:	5-13-16 1412	Test Am.
Relinquished by: Robison	5-13-16 1507		Received by:	5-14-16 0845	TAD
Relinquished by:			Received by:		

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: M. Hammond	Lab PM: McEntee, Patrick J	Carrier Tracking No(s): LAB	COC No: 280-52718-18998.1
Client Contact: Ms. Heather Miner	Phone: 412-953-7041	E-Mail: patrick.mcentee@testamericainc.com		Page: ~~Page 1 of 1~~ 3 of 3
Company: Cardno TEC, Inc				Job #:

Address: 1658 Cole Boulevard Suite 190	Due Date Requested:	Analysis Requested
City: Golden	TAT Requested (days):	
State, Zip: CO, 80401		
Phone:	PO #: Project 076003	
Email: heather.miner@cardno-gs.com	WO #:	
Project Name: Ravenna, OH	Project #: 28014271	
Site:	SSOW#:	

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time (EST)	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8270D List 2	8330B	8081B	Total metals 6010C, 7470	8270C-List 2	Total Number of containers	Special Instructions/Note:
			Preservation Code:										
LL2-MW-267	5/13/16	0835		Water			X	X		X		5	
SCFmw-604	5/13/16	0940		Water			X	X	X	X		5	
LL3-mw244	5/13/16	1230		W				X	X	X	X	7	
LL3-MW244D	5/13/16	1230		W				X	X	X	X	7	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	5/13/16 1400		R Robin	5/13 16-1412	TestAm
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	5-13-16- 1507		Reed RHA	5-14-16 0845	TAD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks:

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: M. Hammel	Lab PM: McEntee, Patrick J	Carrier Tracking No(s):	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone: 412-953-7041	E-Mail: patrick.mcentee@testamericainc.com		Page: ~~Page 1 of 1~~ 1 of 4 MH 1951
Company: Cardno TEC, Inc				Job #:

Address: 1658 Cole Boulevard Suite 190	Due Date Requested:	Analysis Requested	Preservation Codes:
City: Golden	TAT Requested (days):		A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
State, Zip: CO, 80401			
Phone:	PO #: Project 076003		
Email: heather.miner@cardno-gs.com	WO #:		Other:
Project Name: Ravenna, OH	Project #: 28014271		
Site:	SSOW#:		

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	7196A cr(VI)	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
LL3-MW-244	5/13/16	1230	G	Water			X	1	24 hr turn
LL3-MW-244D	5/13/16	1230	G	Water			X	1	24 hr turn
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					
				Water					

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
MH	5/13/16 1400	ATC		5-13-16 1412	TestAm
Relinquished by: Robison	Date/Time: 5-13-16 1507	Company Canton	Received by:	Date/Time: 5-14-16 0845	Company TAD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A.5
DAILY REPORTS

THIS PAGE INTENTIONALLY LEFT BLANK

TEC-Weston Joint Venture

Daily Report

Project Name: Remedial Investigation Work Plan for RVAAP-66 Facility-Wide Groundwater Sampling

Project Location: Ravenna Army National Guard Base

Project Contract: Contract Number W9133L-14-D-0008; Task Order 0003

Prepared By: Elizabeth Kirby, EIT

Prepared For: Katie Hendrickson

Work Tasks Conducted: Sampling Groundwater Well

Conducted By: Cardno - Danyelle Phillips & Elizabeth Kirby

ATC - Kim Kronke, Tom St. John, Matt Hummel, Charles Dusetzina.

Weather: 50-60F. Cloudy, light breeze

Date of Activity: Monday, May 09, 2016

Field Activity Summary: Attended onsite annual training for staff new to Ravenna.
Conducted Tailgate Health and Safety Equipment

Organized and calibrated field equipment

Team training for new bladder pump controlllers & MW sampling

Collected a MW sample for 3 MWs (FWmw004, FWGmw015, FWGmw016).
FWmw004 did not stabalize below 10NTU. In accordance with the FSP, well was purged for 2 hours. The well did stablize below 50NTU.

Kevin Sedlak on-site to collect split sample at FWGmw004.
Samples were secured overnight in custody of field team staff & will be shipped tomorrow with additional samples.

Deviation From Plan: None

Other Comments:

Completed By: Elizabeth Kirby

Checked By: Katie Hendrickson

Daily Report

Project Name:	Remedial Investigation Work Plan for RVAAP-66 Facility-Wide Groundwater Sampling
Project Location:	Ravenna Army National Guard Base
Project Contract:	Contract Number W9133L-14-D-0008; Task Order 0003
Prepared By:	Elizabeth Kirby, EIT
Prepared For:	Katie Hendrickson
Work Tasks Conducted:	Sampling Groundwater Well
Conducted By:	Cardno - Danyelle Phillips & Elizabeth Kirby ATC - Tom St. John, Matt Hummel, Charles Dusetzina.
Weather:	50-60F. Cloudy, light breeze. Rain in morning.
Date of Activity:	Tuesday, May 10, 2016
Field Activity Summary:	Conducted Tailgate Health and Safety Equipment Organized and calibrated field equipment Collected 8 GW samples. Samples submitted to lab as shown on COC. LL7mw001 did not stabalize below 10NTU. In accordance with the FSP, well was purged for 2 hours. The well did stablize below 50NTU. The pump at DETmw003 was not fully submerged in the water column. Because the pump was partially submerged, purging and sampling took several hours. All of the sample bottles were filled, however it took additional time. Kevin Sedlak on-site to collect split sample at DETmw003 and DET-04. Issues with water quality meter. Kim Kroenke on site to deliver another one. One of the sampling controllers is broken.

Deviation From Plan: None

Other Comments:

Completed By: Elizabeth Kirby
Checked By: Katie Hendrickson

Daily Report

Project Name:	Remedial Investigation Work Plan for RVAAP-66 Facility-Wide Groundwater Sampling
Project Location:	Ravenna Army National Guard Base
Project Contract:	Contract Number W9133L-14-D-0008; Task Order 0003
Prepared By:	Elizabeth Kirby, EIT
Prepared For:	Katie Hendrickson
Work Tasks Conducted:	Sampling Groundwater Well
Conducted By:	Cardno - Danyelle Phillips & Elizabeth Kirby ATC -Tom St. John, Matt Hummel, Charles Dusetzina.
Weather:	60-75F. Cloudy, light breeze. Rain in evening.
Date of Activity:	Wednesday, May 11, 2016
Field Activity Summary:	Conducted Tailgate Health and Safety Equipment Organized and calibrated field equipment Collected 11 GW samples and shipped 7 GW samples via courier as shown on COC. FWGmw002 and LL12mw242 did not stabalize below 10NTU. In accordance with the FSP, well was purged for 2 hours. LL12mw242did stablize below 50NTU; FWQmw002 stabalized above 50NTU.

Deviation From Plan: None

Other Comments:

Completed By: Elizabeth Kirby
Checked By: Katie Hendrickson

Daily Report

Project Name:	Remedial Investigation Work Plan for RVAAP-66 Facility-Wide Groundwater Sampling
Project Location:	Ravenna Army National Guard Base
Project Contract:	Contract Number W9133L-14-D-0008; Task Order 0003
Prepared By:	Elizabeth Kirby, EIT
Prepared For:	Katie Hendrickson
Work Tasks Conducted:	Sampling Groundwater Well
Conducted By:	Cardno - Danyelle Phillips & Elizabeth Kirby ATC -Tom St. John, Matt Hummel, Charles Dusetzina, Kim Kronenke.
Weather:	60-85F. Cloudy, light breeze. Rain in evening.
Date of Activity:	Thursday, May 12, 2016
Field Activity Summary:	Conducted Tailgate Health and Safety Equipment Organized and calibrated field equipment Collected 16 GW samples and shipped 22 GW samples via courier as shown on COC. FWGmw011 did not stabalize below 10NTU (it stabalized around 60 NTU). In accordance with the FSP, well was purged for 2 hours and one sample was collected for totals metals, and one sample was collected for dissolved metals. Kevin collected split sample LL2MW271 and RQLmw-09

Deviation From Plan: None

Other Comments:

Completed By: Elizabeth Kirby
Checked By: Katie Hendrickson

Daily Report

Project Name:	Remedial Investigation Work Plan for RVAAP-66 Facility-Wide Groundwater Sampling
Project Location:	Ravenna Army National Guard Base
Project Contract:	Contract Number W9133L-14-D-0008; Task Order 0003
Prepared By:	Elizabeth Kirby, EIT
Prepared For:	Katie Hendrickson
Work Tasks Conducted:	Sampling Groundwater Wells
Conducted By:	Cardno - Danyelle Phillips & Elizabeth Kirby ATC -Tom St. John, Matt Hummel, Charles Dusetzina, Kim Kronenke.
Weather:	60-85F. Cloudy, light breeze. Rain in evening.
Date of Activity:	Friday, May 13, 2016
Field Activity Summary:	Conducted Tailgate Health and Safety Equipment. Organized and calibrated field equipment. Collected 7 GW samples and shipped all remainaing GW samples via courier as shown on COC. Kevin Palombo and Albert Muller from the OEPA were onsite with Kevin Sedlack to observe GW sampling activities. The artesian well, SCFmw002 was still overflowing above the TOC. The bladder pump air line was filled with water, so the pump was removed to "blow out" the air line. The pump was reinstalled prior to sampling. The MW was purged at 500mL/min, however water still overflowed above the TOC. The air line was capped with a fitting to prevent water from flooding the airline for future events. Conducted IDW management, waste tracking and collected IDW characterization sample. Returned all rental field equipment to Pine Environmental.

Deviation From Plan: None

Other Comments:

Completed By: Elizabeth Kirby
Checked By: Katie Hendrickson

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B
LABORATORY DATA AND VERIFICATION/VALIDATION REPORTS
(PROVIDED ON COMPACT DISC)

This appendix contains 24,334 pages of laboratory data and graphs and is not 508 compliant.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

INVESTIGATION DERIVED WASTE CHARACTERIZATION AND DISPOSAL LETTER REPORT

THIS PAGE INTENTIONALLY LEFT BLANK

TEC-Weston Joint Venture

1658 Cole Blvd. Suite 190
Golden, CO 80401
(303) 273-0231 Fax (303) 273-0235

July 26, 2016

Ms. Katie Tait
OHARNG Environmental Specialist 2
Camp Ravenna Joint Military Training Center
1438 State Route 534 SW
Newton Falls, OH 44444

Reference **Contract Number: W9133L-14-D-0008**
Delivery Order: 0003

Subject: **Investigation Derived Waste Characterization and Disposal Letter Report, Remedial Investigation Work Plan for Groundwater and Environmental Services for RVAAP-66 Facility Wide Groundwater, Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage and Trumbull Counties, Ohio**

Dear Ms. Tait:

TEC–Weston Joint Venture (TEC-Weston JV) field staff performed groundwater sampling activities at 46 monitoring wells from May 9 to May 13, 2016. All work was performed in accordance with the *Draft Final Remedial Investigation Work Plan for Groundwater and Environmental Investigation Services for RVAAP-66 Facility-Wide Groundwater* (TEC-Weston, 2016). These activities resulted in the generation of Investigation Derived Waste (IDW) consisting of decontamination and purge water. The purpose of this letter report is to characterize and classify IDW for disposal and to propose methods for disposing of the IDW. This letter report follows guidance established by the following:

1. *Remedial Investigation Work Plan for Groundwater and Environmental Investigation Services for RVAAP-66 Facility-Wide Groundwater* (RIWP) (TEC-Weston, 2016); and

2. *Facility-Wide Sampling and Analysis Plan for Environmental Investigations* (FWSAP) (SAIC, 2011).

The decontamination and purge water was containerized in two 55-gallon drums. On May 13, 2015, the drums were sampled in accordance with the requirements outlined in Section 7.0 of the RIWP and Section 8.4 of the FWSAP. A composite sample (sample ID: 051316-IDW) was collected from the two drums and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds (VOCs), TCLP semi-VOCs (SVOCs), TCLP metals, TCLP herbicides, TCLP pesticides, total sulfide, total cyanide, corrosivity (pH), and flashpoint.

Hazardous Waste Screening

Upon receipt of the laboratory results, the analytical data were reviewed to determine if the waste was potentially hazardous. The data were compared to disposal screening criteria, which are from three sources:

1. Concentration of Contaminants for Toxicity Characteristic (40 Code of Federal Regulations [CFR] 261.24), as listed in Table 8-1 of the FWSAP;
2. Table 8-2 of the FWSAP; and
3. 40 CFR 261.23 – Characteristic of Reactivity.

Analytical results that do not exceed disposal criteria are classified as "non-hazardous." Analytical results that exceed disposal criteria as classified as "hazardous." All analytical results were below disposal screening criteria. Attachment 1 shows the sample results compared to the disposal screening criteria.

Table 8-2 of the FWSAP lists the cyanide criteria as 0.01 mg/L, which is not consistent with CFR 261.23 and 261.24 and could not be confirmed or validated by the Camp Ravenna Environmental Office. The source for the cyanide criteria could not be verified and appears to be an error. Two disposal vendors, Tradebe Environmental Services, LLC and US Ecology, were contacted to get information regarding the cyanide criteria; and both vendors referred us to CFR 261.23. CFR 261.23 indicates a solid waste exhibits the characteristic of reactivity if a cyanide-bearing waste, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment. A cyanide concentration of 3.3 mg/L was detected in the IDW sample. The US Environmental Protection Agency requires generators to use their knowledge to make a D003 determination per CFR 261.23(a)(5) for cyanide- and sulfide- bearing wastes. Groundwater sampling, which routinely generates IDW, has been conducted for many years as part of the Facility-wide Groundwater Monitoring Program. IDW collected from these same wells routinely in the past has been disposed of as non-hazardous waste. Based on visual assessment of the current condition of the waste and generator knowledge, the waste does not qualify as reactive waste and therefore does not classify as a hazardous waste.

Quality Control Samples

A field quality control (QC) sample (trip blank) was included with the IDW samples. The sample (sample ID 051316-TB) was analyzed for VOCs. There were no detections of VOCs in the trip blank sample. The laboratory analytical report for the IDW sample and for the associated trip blank sample is included in Attachment 1.

Recommendations

Based on the results of the laboratory data and process knowledge, the IDW generated as part of the May 2016 groundwater sampling event will be classified and disposed as non-hazardous, contaminated waste. It is recommended that the IDW be disposed of off-site at a permitted water treatment facility. Since the Former RVAAP/Camp Ravenna , under the Resource Conservation and Recovery Act (RCRA), is identified as the generator of this waste, TEC-Weston JV requests concurrence or direction in the waste classification, prior to disposal, to ensure materials are properly disposed. Following your direction and approval, TEC-Weston JV will proceed with appropriate waste disposal.

We appreciate the opportunity to work with you. If you have any questions or comments regarding this deliverable, please feel free to contact me by telephone (303)-273-0231 or email at Katie.Hendrickson@cardno-gs.com.

Sincerely,

Katie Hendrickson

Digitally signed by Katie Hendrickson
DN: cn=Katie Hendrickson, o=Cardno, ou=Government Services Division, email=katie.hendrickson@cardno-gs.com, c=US
Date: 2016.07.26 09:15:05 -06'00'

Katie Hendrickson

Environmental Remediation Project Manager,
TEC-Weston Joint Venture

Office (+1) 303-273-0231 **Fax** (+1) 303-273-0235
Address 1658 Cole Boulevard, Suite 190, Golden, CO 80401
Email katie.hendrickson@cardno-gs.com **Web** www.cardno.com

Attachment 1: Investigation Derived Waste Screening Summary Table and Laboratory Reports

(This page intentionally left blank.)

Attachment 1: Investigation Derived Waste Screening Summary Table and Laboratory Reports

(This page intentionally left blank.)

Table 1. Investigation Derived Waste Screening (Sample ID: 0513216-IDW)							
CAS Number	**Analyte**	**Result**	**Data Qualifier Flags**	**FWSAP IDW Disposal Standard**	**Units**	**Disposal Standard Source**	**Result Exceeds Hazardous Criteria?**
87-86-5	Pentachlorophenol	0.2	U	100	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
98-95-3	Nitrobenzene	0.01	U	2	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
110-86-1	Pyridine	0.022	U	5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
88-06-2	2,4,6-Trichlorophenol	0.005	U	--	mg/L	--	--
95-95-4	2,4,5-Trichlorophenol	0.005	U	400	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
121-14-2	2,4-Dinitrotoluene	0.022	U	0.13	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
106-46-7	1,4-Dichlorobenzene	0.02	U	7.5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
118-74-1	Hexachlorobenzene	0.01	U	0.13	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
67-72-1	Hexachloroethane	0.022	U	3	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
87-68-3	Hexachlorobutadiene	0.05	U	0.5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
18496-25-8	Sulfide	1900	U	3000	µg/L	FWSAP (2011) Table 8-2	Non-Hazardous
75-35-4	1,1-Dichloroethene	0.008	U	0.7	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
107-06-2	1,2-Dichloroethane	0.004	U	0.5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
127-18-4	Tetrachloroethene	0.004	U	0.7	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
75-01-4	Vinyl chloride	0.002	U	--	mg/L	--	--
79-01-6	Trichloroethene	0.004	U	--	mg/L	--	--
78-93-3	2-Butanone (MEK)	0.04	U	200	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
71-43-2	Benzene	0.004	U	--	mg/L	--	--
56-23-5	Carbon tetrachloride	0.004	U	0.5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
67-66-3	Chloroform	0.004	U	6	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
108-90-7	Chlorobenzene	0.004	U	100	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
15831-10-4	3 & 4 Methylphenol	0.0025	U	--	mg/L	--	--
7440-39-3	Barium	0.011	J	100	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
7440-38-2	Arsenic	0.075	U	5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
7440-43-9	Cadmium	0.009	U	--	mg/L	--	--
7439-92-1	Lead	0.05	U	5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous

Table 1. Investigation Derived Waste Screening (Sample ID: 0513216-IDW)							
CAS Number	**Analyte**	**Result**	**Data Qualifier Flags**	**FWSAP IDW Disposal Standard**	**Units**	**Disposal Standard Source**	**Result Exceeds Hazardous Criteria?**
7440-47-3	Chromium	0.013	U	5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
94-75-7	2,4-D	0.006	U	10	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
57-12-5	Cyanide, Total	3.3		--	mg/L	40 CFR 261.23 – Characteristic of reactivity	Non-Hazardous
93-72-1	Silvex (2,4,5-TP)	0.006	U	1	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
7439-97-6	Mercury	8E-05	U	0.2	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
N/A	Flashpoint	>160		>140	°F	FWSAP (2011) Table 8-2	Non-Hazardous
7782-49-2	Selenium	0.095	U	1	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
8001-35-2	Toxaphene	0.0075	U	0.5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
72-43-5	Methoxychlor	0.0005	U	10	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
57-74-9	Chlordane (technical)	0.004	U	0.03	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
95-48-7	2-Methylphenol	0.01	U	200	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
N/A	pH adj. to 25 deg C	7.22	HF	$2 \leq pH \leq 12.5$	SU	FWSAP (2011) Table 8-2	Non-Hazardous
72-20-8	Endrin	0.0002	U	0.02	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
7440-22-4	Silver	0.018	U J	5	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
76-44-8	Heptachlor	0.0002	U	--	mg/L	--	--
58-89-9	gamma-BHC (Lindane)	0.0002	U	0.4	mg/L	FWSAP (2011) Table 8-1	Non-Hazardous
1024-57-3	Heptachlor epoxide	0.0002	U	--	mg/L	--	--

Notes:

-- no disposal criteria specified
°F – degrees Fahrenheit
µg/L – micrograms per liter
mg/L – milligrams per liter
CAS – Chemical Abstract Service Number
CFR – Code of Federal Regulations
Data Qualifier Flags:
HF– Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.
J – Estimated: The analyte was positively identified; the quantitation is an estimation
U – Undetected at the Limit of Detection
IDW – Investigation Derived Waste
FWSAP – Facility-Wide Sampling and Analysis Plan
N/A – Not applicable or not available
SU – Standard units

ANALYTICAL REPORT

Job Number: 280-83188-1

Job Description: Ravenna, OH

For:
Cardno TEC, Inc
1658 Cole Boulevard
Suite 190
Golden, CO 80401

Attention: Ms. Heather Miner

Approved for release.
Patrick J McEntee
Manager of Project Management
6/30/2016 4:34 PM

Patrick J McEntee, Manager of Project Management
4955 Yarrow Street, Arvada, CO, 80002
(303)736-0107
patrick.mcentee@testamericainc.com
06/30/2016

The test results in this report relate only to the samples in this report and meet all requirements of NELAC, with any exceptions noted. Pursuant to NELAP, this report shall not be reproduced except in full, without the written approval of the laboratory. All questions regarding this report should be directed to the TestAmerica Denver Project Manager.

The Lab Certification ID# is 4025.

Reporting limits are adjusted for sample size used, dilutions and moisture content if applicable.

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

QualifiersGT

C/MS VOAT

QualifierT	Qualifier DescriptionT
U/	Undetected at the Limit of Detection./
J/	Estimated: The analyte was positively identified; the quantitation is an estimation/

C/MS Semi VOAT

QualifierT	Qualifier DescriptionT
U/	Undetected at the Limit of Detection./
J/	Estimated: The analyte was positively identified; the quantitation is an estimation/

C Semi VOAT

QualifierT	Qualifier DescriptionT
U/	Undetected at the Limit of Detection.a/
J/	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteri/.a/
J/	Estimated: The analyte was positively identified; the quantitation is an estimationa/
M/	Manual integrated compound.a/

HPLC/ICT

QualifierT	Qualifier DescriptionT
U/	Undetected at the Limit of Detection.a/
J/	Estimated: The analyte was positively identified; the quantitation is an estimationa/
J/	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteri/.a/
Q/	One or more quality control criteria failed.a/
M/	Manual integrated compound.a/
H/	Sample was prepped or analyzed beyond the specified holding timea/
D/	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.a/
D/	The reported value is from a dilution.a/

MetalsT

QualifierT	Qualifier DescriptionT
J/	Estimated: The analyte was positively identified; the quantitation is an estimation/
U/	Undetected at the Limit of Detection./
J/	Estimated: The quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteri/./
Q/	One or more quality control criteria failed./
B/	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank./
4/	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not / pplicable./
D/	The reported value is from a dilution./
V/	Serial Dilution exceeds the control limits/

eneral ChemistryT

QualifierT	Qualifier DescriptionT
U/	Undetected at the Limit of Detection./
HF/	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request./

lossaryG

AbbreviationT	These commonly used abbreviations may or may not be present in this report.T
¤/	Listed under the "D" column to designate that the result is reported on a dry weight basis/
%R/	Percent Recovery/
CFL/	Contains Free Liquid/
CNF/	Contains no Free Liquid/
DER/	Duplicate error ratio (normalized absolute difference)/
Dil Fac/	Dilution Factor/
DL, RA, RE, IN/	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample/
DLC/	Decision level concentration/

lossary (Continued)G

AbbreviationT	These commonly used abbreviations may or may not be present in this report.T
MDA/	Minimum detectable activity/
EDL/	Estimated Detection Limit/
MDC/	Minimum detectable concentration/
MDL/	Method Detection Limit/
ML/	Minimum Level (Dioxin)/
NC/	Not Calculated/
ND/	Not detected at the reporting limit (or MDL or EDL if shown)/
PQL/	Practical Quantitation Limit/
QC/	Quality Control/
RER/	Relative error ratio/
RL/	Reporting Limit or Requested Limit (Radiochemistry)/
RPD/	Relative Percent Difference, a measure of the relative difference between two points/
TEF/	Toxicity Equivalent Factor (Dioxin)/
TEQ/	Toxicity Equivalent Quotient (Dioxin)/

CASE NARRATIVE2

Client: Cardno TEC, Inc2

Project: Ravenna, OH2

Report Number: 280-83188-12

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no j problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established cjntrol j limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the cjnstraints of j the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, j the reporting limits are adjusted relative to the dilution required.j

Calculations are performed before rounding to avoid round-off errors in calculated results.j

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the j individual sections below.j

RECEIPT2
The samples were received on 5/14/2016 8:45 AM; the samples arrived in good condition, properly preserved and, where required, on j ice. The temperatures of the 7 coolers at receipt time were 0.8º C, 0.8º C, 0.9º C, 1.5º C, 1.6º C, 3.0º C and 5.0º C.j

Receipt Exceptions2
6 of the 7 coolers were received at the laboratory with no custpdy seal. It can be noted that the shipping tape was intact foj these coolers, j and all samples (except as noted below) appeared undisturbed / uncompromised. j

1 of 2 x 1L unpreserved ambers submitted for sample LL3mw-244 was received at the laboratory with its lid loose, and about 1/2 of the j volume spilled into the cooler. Contamination is suspected; this container will not be used. Sufficient volume remains to prjceed with the j 8270D - List 2 SVOCs analysis.j

Samples LL3mw-241, LL3mw-238, RQLmw-013, and RQLmw-012 were received at the laboratory but were not listed on the chain of j custody. These samples were logged per the containers received. The laboratory will proceed with analysis unless instructed jtherwise. j It was noted that the cooler containing these samples was the oje cooler that was received with a custody seal.j

Sample FWGmw011-D, as listed on the chain of custody, was listed as FWGmw011-d-gf on the sample container labels. This was j logged as FWGmw-011-D, per typical nomenclature. The chain of custody indicates that this sample was field filtered; however, Total j Metals analyses are requested. Please advise.j

Sample FWGmw011, as listed on the chain of custody, had 3 x 500mL Nitric Acid (HNO3) preserved poly containers labeled as j FWGmw-011-gf and 1 x 500mL Nitric Acid (HNO3) preserved poly cojntainer labeled as FWGmw-011-gw. These were all labeled as j FWGmw-011, per typical nomenclature.j

All sample IDs were logged per typical nomenclature instead of being logged per the COC. j

The chain of custody requests TCLP VOCs for sample 051316-TB; hjwever, VOCs 8260B has been logged per standard practice; as j TCLP leach is not typically performed for trip blanks.j

8270C List 2 SVOCs is requested on the chain of custody for samjles LL3mw-244 and LL3mw-244D; however, 8270D List 2 SVOCs has j been logged per the predetermined scope of work.j

TCLP VOLATILE ORGANIC COMPOUNDS (GC-MS)2
Sample 051316-IDW (280-83188-9) was analyzed for TCLP volatile jrganic compounds (GC-MS) in accordance with 1311. The samples j were leached on 05/24/2016 and analyzed on 05/26/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

OLATILE ORGANIC COMPOUNDS (GC/MS)2
Sample 051316-TB (280-83188-10) was analyzed for volatile organic compounds (GC/MS) in accordance with 8260B. The samples were j analyzed on 05/26/2016. j

Methylene Chloride was detected in method blank MB 280-327030/6 at a level that was above the method detection limit but below one j half the reporting limit. The value should be considered an estimate, and has been flagged. Refer to the QC report for details.j
j
No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

TCLP SEMIVOLATILE ORGANIC COMPOUNDS (GC-MS)2
Sample 051316-IDW (280-83188-9) was analyzed for TCLP semivolatile organic compounds (GC-MS) in accordance with 8270D. The j samples were leached on 05/23/2016, prepared on 05/24/2016 and analyzed on 05/29/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

SEMIVOLATILE ORGANIC COMPOUNDS2
Samples FWGmw-011 (280-83188-1), LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-060 (280-83188-5), LL2mw-059 j (280-83188-6), LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), j LL3mw-244 (280-83188-13), LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15) and LL3mw-238 (280-83188-16) were analyzed j for Semivolatile organic compounds in accordance with SW-846 8270D. The samples were prepared on 05/18/2016 and 05/19/2016 and j analyzed on 05/27/2016, 05/28/2016 and 05/29/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

ORGANOCHLORINE PESTICIDES (GC)2
Sample 051316-IDW (280-83188-9) was analyzed for Organochlorine Pesticides (GC) in accordance with EPA SW-846 Method j 1311/8081B. The samples were leached on 05/23/2016, prepared on 05/24/2016 and analyzed on 05/26/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

ORGANOCHLORINE PESTICIDES (GC)2
Samples LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), SCFmw-004 (280-83188-12), LL3mw-244 (280-83188-13), j LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15) and LL3mw-238 (280-83188-16) were analyzed for Organochlorine j Pesticides (GC) in accordance with SW 846 8081B. The samples were prepared on 05/19/2016 and analyzed on 05/24/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

HERBICIDES (GC)2
Sample 051316-IDW (280-83188-9) was analyzed for Herbicides (GC) in accordance with 8151A. The samples were leached on j 05/23/2016, prepared on 05/24/2016 and analyzed on 05/28/2016. j
j
No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

EXPLOSIVES2
Samples FWGmw-011 (280-83188-1), LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-060 (280-83188-5), LL2mw-059 j (280-83188-6), LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), j LL3mw-244 (280-83188-13), LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15) and LL3mw-238 (280-83188-16) were analyzed j for Explosives in accordance with 8330B. The samples were prepared on 05/19/2016, 05/20/2016, 05/24/2016 and 05/27/2016 and j analyzed on 05/21/2016, 05/23/2016, 05/24/2016, 05/25/2016 and 05/31/2016. j

Sample LL3mw-238 (280-83188-16)[5X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.j

RDX was detected in method blank MB 280-326068/1-A at a level that was above the method detection limit but below one half the j reporting limit. The detection was confirmed on confirmation column (analytical batch 280-326515). The values should be considered j estimated, and have been flagged. j

2,4,6-Trinitrotoluene was detected in method blank MB 280-326068/1-A and analytical batch 326515 at a level exceeding the reporting j limit. The detection did not confirm; therefore the MB is ND fjr 2,4,6-Trinitrotoluene. j

RDX was detected in method blank MB 280-326249/1-A above one half the reporting limit (RL) on the confirmation column and below j one half the RL on the primary column. None of the samples associated with this method blank contained the target compound; j therefore, re-extraction and/or re-analysis of samples were not performed.j

2-Nitrotoluene and 3-Nitrotoluene failed the recovery criteria low for LCS 280-326249/2-A. 2-Nitrotoluene, 3-Nitrotoluene and j 4-Nitrotoluene failed the recovery criteria low for LCSD 280-326249/3-A. Refer to the QC report for details. Associated results are j qualified Q. The associated samples, 8330B_DOD5.LL2mw-060 (280-83188-5), LL2mw-059 (280-83188-6), LL1mw-084 (280-83188-7), j LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), LL3mw-244 (280-83188-13) and LL3mw-244-D j (280-83188-14) were re-extracted in prep batch 280-327393. Both sets of data are reported as re-extraction was performed 7 days j utside of the holding time. j

2,4,6-Trinitrotoluene was detected in method blank MB 280-326733/1-A and analytical batch 280-326916 at a level exceeding the j reporting limit. The detection did not confirm; therefore the MB is ND for 2,4,6-Trinitrotoluene. j
j
RDX and 2-Nitrotoluene were detected in method blank MB 280-326733/1-A at levels that were above the method detection limit but j below one half the reporting limit. The detections did not confirm; therefore the MB is ND for RDX and 2-Nitrotoluene. j

Nitrobenzene exceeded the RPD limit for LCSD 280-326733/3-A. Refer to the QC report for details. Associated results are qualified Q. j

The percent recoveries were in control. j
j
RDX was detected in method blank MB 280-327393/1-A at a level that was above the method detection limit but below the reporting limit. j
The detection did not confirm; therefore the MB is ND for RDX.. j

Nitrobenzene exceeded the RPD limit for LCSD 280-327393/3-A. Refer to the QC report for details. Associated results are qualified Q. j
The percent recoveries were in control. j
j
1,2-Dinitrobenzene failed the surrogate recovery criteria low fpr LL3mw-244-D (280-83188-14). Refer to the QC report for details. j
Associated results are qualified Q. Evidence of matrix interference is present on the primary column; therefore, re-extraction and/or j
re-analysis was not performed.j

1,2-Dinitrobenzene failed the surrogate recovery criteria low fpr SCFmw-004 (280-83188-12). Refer to the QC report for details. The j
associated result (RDX) is qualified Q. Evidence of matrix interferences is not obvious; however, no further corrective actioɲ has been j
taken since the surrogate passed on the primary column. j
j
Compounds eluted outside the retention time window on the confirmation column for the following samples: LL3mw-241 (280-83188-15) j
and (MB 280-326733/1-A). This retention time shift was taken into account when reviewing the sample(s) for target compounds. The j
surrogate was found without error to account for RT shift.j
j
Due to sediment present in the sample containers, the following samples were filtered prior to extraction: FWGmw-011 (280-83188-1), j
LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12) and LL3mw-238 j
(280-83188-16).j
j
Samples FWGmw-011 (280-83188-1), LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-060 (280-83188-5), LL2mw-059 j
(280-83188-6), LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), j
LL3mw-244 (280-83188-13), LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15), LL3mw-238 (280-83188-16), (CCV j
280-326515/57), (CCV 280-326515/58), (CCV 280-326916/12), (CCV 280-326916/7), (CCV 280-326926/18), (CCV 280-326926/25), j
(CCV 280-326926/7), (CCV 280-327675/20), (CCV 280-327675/31), (CCV 280-327934/10), (CCV 280-327934/7), (MB 280-326068/1-A), j
(MB 280-326249/1-A), (MB 280-326733/1-A), (MB 280-327393/1-A) were analyzed on the confirmation column in the following analytical j
batches: 326515, 326926, 327675, 327934, and 326916. Sample results will be reported from the confirmation column when it has been j
established that detections do not confirm and/or after taking into consideration dual column RPDs and client instructions. Detections j
with dual column RPDs greater than or equal to 40% will have a J flag. For reporting purposes, all QC and surrogates are contrjlled and j
reported from the primary column [Exception - a confirmation coJumn MB and/or GB will be reported when a sample detection is reported j
from the confirmation column].j

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

TCLP METALS2
Sample 051316-IDW (280-83188-9) was analyzed for TCLP metals in accordance with EPA SW846 Methods 1311/6010C. The samples j
were leached on 05/23/2016, prepared on 05/24/2016 and analyzed on 05/25/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

DISSOLVED METALS (ICP)2
Samples FWGmw-011 (280-83188-1) and FWGmw-011-D (280-83188-2) were analyzed for Dissolved Metals (ICP) in accordance with j
6010C. The samples were prepared on 05/20/2016 and 05/26/2016 and analyzed on 05/21/2016 and 05/26/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

TOTAL METALS (ICP)2
Samples FWGmw-011 (280-83188-1), LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-060 (280-83188-5), LL2mw-059 j
(280-83188-6), LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), j
LL3mw-244 (280-83188-13), LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15) and LL3mw-238 (280-83188-16) were analyzed j
for Total Metals (ICP) in accordance with 6010C. The samples were prepared on 05/20/2016 and analyzed on 05/23/2016, 05/24/2016 j
and 05/25/2016. j

Sodium was detected in method blank MB 280-325965/1-A at a level that was above the method detection limit but below one half the j
reporting limit. The value should be considered an estimate, and has been flagged. j

Iron was detected in method blank MB 280-325965/1-A at a level that was greater than one half the reporting limit. The value should be j
considered an estimate, and has been flagged. Refer to the QC report for details. The client gave the laboratory approval to cjntrol Fe to j
the LOQ.j
j
No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

DISSOLVED METALS (ICP/MS)2
Samples FWGmw-011 (280-83188-1) and FWGmw-011-D (280-83188-2) were analyzed for Metals (ICP/MS) in accordance with 6020A. j
The samples were prepared on 05/21/2016 and 05/26/2016 and analyzed on 05/23/2016 and 05/26/2016. j

Silver was detected in method blank MB 280-326199/1-A at a level that was above the method detection limit but below one half the j reporting limit. The value should be considered an estimate, and has been flagged. j

Manganese, Nickel and Thallium were detected in method blank MB 280-327041/1-A at levels that were above the method detection limit j but below one half the reporting limit. The values should be cjnsidered estimates, and have been flagged. Refer to the QC repj rt for j details.j

Zinc failed the recovery criteria high for the MS of sample FWGmw-011MS (280-83188-1) in batch 280-326679. Antimony failed the j recovery criteria low for the MSD of sample FWGmw-011MSD (280-83188-1) in batch 280-326679. Zinc exceeded the RPD limit.j

Manganese failed the recovery criteria low for the MS of sample FWGmw-011-DMS (280-83188-2) in batch 280-327390. Manganese j failed the recovery criteria low for the MSD of sample FWGmw-011-DMSD (280-83188-2) in batch 280-327390.j

The low level continuing calibration verification (CCVL 280-326755/82) associated with batch 280-326755 recovered above the upjer j control limit for Mn. The samples associated with this CCVL were >10x the level of the CCVL for the affected analytes; therefjre, the data j have been reported. The CCV at 50 ppb is acceptable Associated results are qualified Q.j

The low level continuing calibration verification (CCVL 280-326755/70) associated with batch 280-326755 recovered below the lojwer j control limit for Mn. The samples associated with this CCVL were >10x the level of the CCVL for the affected analytes; therefore, the j data have been reported. The CCV at 50 ppb was acceptable. Assjciated results are qualified Q.j

The low level continuing calibration verification (CCVL 280-326755/92) associated with batch 280-326755 recovered above the upjer j control limit for Mn. The samples associated with this CCVL were >10x the level of the CCVL for the affected analytes; therefore, the j data have been reported. The CCV at 50 ppb was acceptable. Assjciated results are qualified Q.j

The instrument blank (CCB 280-326679/48) for analytical batch 280-326679 contained Ag greater than the limit of detection (LOD), and j were not reanalyzed because the sample was <LOD. The data have been qualified and reported.j

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

TOTAL METALS (ICPMS)2

Samples FWGmw-011 (280-83188-1), LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-060 (280-83188-5), LL2mw-059 j (280-83188-6), LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), j LL3mw-244 (280-83188-13), LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15) and LL3mw-238 (280-83188-16) were analyzed j for metals (ICPMS) in accordance with 6020A. The samples were prepared on 05/20/2016 and analyzed on 05/21/2016 and 05/24/2016. j

Cobalt and Silver were detected in method blank MB 280-325967/1-A at levels that were above the method detection limit but beljw one j half the reporting limit. The values should be considered estimates, and have been flagged. Refer to the QC report for details.j
j
The interference check standard solution (ICSA 280-326891/122) associated with batch 280-326891 had results for one or more j elements at a level greater than the limit of detection (LOD). The closing ICSA result(s) was > LOD for Ag. The samples were all less j than the LOD. These results are not indicative of a matrix interference. Assocaited results are qualified Q.j

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

TCLP MERCURY2

Sample 051316-IDW (280-83188-9) was analyzed for TCLP mercury in accordance with SW-846 1311/7470. The samples were leached j n 05/23/2016, and prepared and analyzed on 05/24/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

DISSOLVED MERCURY2

Samples FWGmw-011 (280-83188-1) and FWGmw-011-D (280-83188-2) were analyzed for mercury in accordance with 7470A. The j samples were prepared and analyzed on 05/25/2016 and 05/27/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

TOTAL MERCURY2

Samples FWGmw-011 (280-83188-1), LL1mw-064 (280-83188-3), FWGmw-012 (280-83188-4), LL2mw-060 (280-83188-5), LL2mw-059 j (280-83188-6), LL1mw-084 (280-83188-7), LL1mw-083 (280-83188-8), LL2mw-267 (280-83188-11), SCFmw-004 (280-83188-12), j LL3mw-244 (280-83188-13), LL3mw-244-D (280-83188-14), LL3mw-241 (280-83188-15) and LL3mw-238 (280-83188-16) were analyzed j for mercury in accordance with 7470A. The samples were prepared and analyzed on 05/23/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

GNITABILITY2

Sample 051316-IDW (280-83188-9) was analyzed for ignitability in accordance with EPA SW-846 Method 1010. The samples were j analyzed on 05/25/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

HEXAVALENT CHROMIUM2
Samples LL3mw-244 (280-83188-13) and LL3mw-244-D (280-83188-14) were analyzed for hexavalent chromium in accordance with j 7196A. The samples were analyzed on 05/14/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

CYANIDE, TOTAL2
Sample 051316-IDW (280-83188-9) was analyzed for Cyanide, Total in accordance with 9012B. The samples were prepared and j analyzed on 05/26/2016. j

Sample 051316-IDW (280-83188-9)[10X] required dilution prior tojanalysis. The reporting limits have been adjusted accordingly.j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

SULFIDE2
Sample 051316-IDW (280-83188-9) was analyzed for sulfide in accjrdance with EPA SW-846 Method 9034. The samples were prepared j and analyzed on 05/19/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

PH2
Samples 051316-IDW (280-83188-9), RQLmw-013 (280-83188-17) and RQLmw-012 (280-83188-18) were analyzed for pH in accordance j with EPA SW-846 9040C. The samples were analyzed on 05/18/2016. j

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.j

2
j
j
j
j
j
j

j
j
j
j
j
j

Client Sample ID: LL1mw-083x

Date Collected: 05/13/16 09:25x
Date Received: 05/14/16 08:45x

Lab Sample ID: 280-83188-8x

Matrix: Waterx

Method: 6020A - Metals (ICP/MS) (Continued)x

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Prepared	Analyzed	Dil Facx
Cobaltx	**7.8x**		1.0/	0.054/	ug/L/		05/20/16 08:05/	05/21/16 04:54/	1/
Copperx	**2.5x**		2.0/	0.56/	ug/L/		05/20/16 08:05/	05/21/16 04:54/	1/
Lead/	0.70/	U/	3.0/	0.18/	ug/L/		05/20/16 08:05/	05/24/16 09:49/	1/
Manganesex	**400x**	**Qx**	3.5/	0.31/	ug/L/		05/20/16 08:05/	05/24/16 09:49/	1/
Nickelx	**28x**		3.0/	0.30/	ug/L/		05/20/16 08:05/	05/24/16 09:49/	1/
Selenium/	2.0/	U/	5.0/	0.70/	ug/L/		05/20/16 08:05/	05/21/16 04:54/	1/
Silver/	0.10/	U Q/	5.0/	0.033/	ug/L/		05/20/16 08:05/	05/24/16 19:19/	1/
Thalliumx	**0.096x**	**Jx**	1.0/	0.050/	ug/L/		05/20/16 08:05/	05/24/16 19:19/	1/
Vanadium/	2.0/	U/	6.0/	0.50/	ug/L/		05/20/16 08:05/	05/21/16 04:54/	1/
Zincx	**37x**		20/	2.0/	ug/L/		05/20/16 08:05/	05/24/16 09:49/	1/

Method: 7470A - Mercury (CVAA)x

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
Mercury/	0.080/	U/	0.20/	0.027/	ug/L/		05/23/16 11:25/	05/23/16 20:16/	1/

Client Sample ID: 051316-IDWx

Date Collected: 05/13/16 13:00x
Date Received: 05/14/16 08:45x

Lab Sample ID: 280-83188-9x

Matrix: Waterx

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLPx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Prepared	Analyzed	Dil Facx
Benzene/	0.0040/	U/	0.010/	0.0016/	mg/L/			05/26/16 15:30/	1/
2-Butanone (MEK)/	0.040/	U/	0.10/	0.018/	mg/L/			05/26/16 15:30/	1/
Carbon tetrachloride/	0.0040/	U/	0.010/	0.0019/	mg/L/			05/26/16 15:30/	1/
Chlorobenzene/	0.0040/	U/	0.010/	0.0017/	mg/L/			05/26/16 15:30/	1/
Chloroform/	0.0040/	U/	0.010/	0.0016/	mg/L/			05/26/16 15:30/	1/
1,2-Dichloroethane/	0.0040/	U/	0.010/	0.0013/	mg/L/			05/26/16 15:30/	1/
1,1-Dichloroethene/	0.0080/	U/	0.010/	0.0023/	mg/L/			05/26/16 15:30/	1/
Tetrachloroethene/	0.0040/	U/	0.010/	0.0020/	mg/L/			05/26/16 15:30/	1/
Trichloroethene/	0.0040/	U/	0.010/	0.0016/	mg/L/			05/26/16 15:30/	1/
Vinyl chloride/	0.0020/	U/	0.010/	0.0010/	mg/L/			05/26/16 15:30/	1/

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*I Fac*
Toluene-d8 (Surr)	*110*		*78 - 120*		*05/26/16 15:30*	*1*
1,2-Dichloroethane-d4 (Surr)	*91*		*64 - 129*		*05/26/16 15:30*	*1*
4-Bromofluorobenzene (Surr)	*99*		*78 - 121*		*05/26/16 15:30*	*1*
Dibromofluoromethane (Surr)	*96*		*79 - 119*		*05/26/16 15:30*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - TCLPx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
2-Methylphenol/	0.010/	U/	0.050/	0.0049/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
3 & 4 Methylphenol/	0.0025/	U/	0.050/	0.0013/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
1,4-Dichlorobenzene/	0.020/	U/	0.020/	0.0016/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
2,4-Dinitrotoluene/	0.022/	U/	0.050/	0.0083/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
Hexachlorobenzene/	0.010/	U/	0.050/	0.0033/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
Hexachlorobutadiene/	0.050/	U/	0.050/	0.017/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
Hexachloroethane/	0.022/	U/	0.050/	0.011/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
Nitrobenzene/	0.010/	U/	0.050/	0.0041/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
Pentachlorophenol/	0.20/	U/	0.25/	0.10/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
Pyridine/	0.022/	U/	0.10/	0.0057/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/

Client Sample ID: 051316-IDWx

Date Collected: 05/13/16 13:00x
Date Received: 05/14/16 08:45mx

Lab Sample ID: 280-83188-9x

Matrix: Waterx

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)mx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
2,4,5-Trichlorophenol/	0.0050/	U/	0.050/	0.0022/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/
2,4,6-Trichlorophenol/	0.0050/	U/	0.025/	0.0014/	mg/L/		05/24/16 17:15/	05/29/16 00:18/	1/

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*I Fac*
2-Fluorobiphenyl	*88*		*49 - 120*	*05/24/16 17:15*	*05/29/16 00:18*	*1*
2-Fluorophenol (Surr)	*80*		*50 - 120*	*05/24/16 17:15*	*05/29/16 00:18*	*1*
2,4,6-Tribromophenol (Surr)	*91*		*51 - 120*	*05/24/16 17:15*	*05/29/16 00:18*	*1*
Nitrobenzene-d5 (Surr)	*85*		*51 - 120*	*05/24/16 17:15*	*05/29/16 00:18*	*1*
Phenol-d5 (Surr)	*69*		*47 - 120*	*05/24/16 17:15*	*05/29/16 00:18*	*1*
Terphenyl-d14 (Surr)	*94*		*56 - 120*	*05/24/16 17:15*	*05/29/16 00:18*	*1*

Method: 8081B - Organochlorine Pesticides (GC) - TCLPx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Prepared	Analyzedx	Dil Facx
Endrin/	0.00020/	U/	0.00050/	0.000079/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/
Heptachlor/	0.00020/	U/	0.00050	0.000077/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/
Heptachlor epoxide/	0.00020/	U/	0.00050	0.000075/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/
gamma-BHC (Lindane)/	0.00020/	U/	0.00050/	0.000069/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/
Methoxychlor/	0.00050/	U/	0.0010/	0.00013/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/
Toxaphene/	0.0075/	U/	0.020/	0.0037/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/
Chlordane (technical)/	0.0040/	U/	0.0050/	0.0014/	mg/L/		05/24/16 17:10/	05/26/16 14:52/	1/

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*I Fac*
Tetrachloro-m-xylene	*102*		*28 - 115*	*05/24/16 17:10*	*05/26/16 14:52*	*1*
DCB Decachlorobiphenyl	*106*		*34 - 122*	*05/24/16 17:10*	*05/26/16 14:52*	*1*

Method: 8151A DOD - Herbicides (GC) - TCLPx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
2,4-D/	0.0060/	U/	0.040/	0.0021/	mg/L/		05/24/16 09:35/	05/28/16 12:50/	1/
Silvex (2,4,5-TP)/	0.0060/	U/	0.010/	0.0017/	mg/L/		05/24/16 09:35/	05/28/16 12:50/	1/

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*I Fac*
2,4-Dichlorophenylacetic acid	*80*		*10 - 131*	*05/24/16 09:35*	*05/28/16 12:50*	*1*

Method: 6010C - Metals (ICP) - TCLPx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
Arsenic/	0.075/	U/	0.50/	0.022/	mg/L/		05/24/16 08:15/	05/25/16 13:12/	1/
Bariumx	**0.011x**	**Jx**	1.0/	0.0020/	mg/L/		05/24/16 08:15/	05/25/16 03:06/	1/
Cadmium/	0.0090/	U/	0.10/	0.0020/	mg/L/		05/24/16 08:15/	05/25/16 03:06/	1/
Chromium/	0.013/	U/	0.50/	0.0030/	mg/L/		05/24/16 08:15/	05/25/16 03:06/	1/
Lead/	0.050/	U/	0.50/	0.013/	mg/L/		05/24/16 08:15/	05/25/16 03:06/	1/
Selenium/	0.095/	U/	0.10/	0.024/	mg/L/		05/24/16 08:15/	05/25/16 13:12/	1/
Silver/	0.018/	U J/	0.50/	0.0040/	mg/L/		05/24/16 08:15/	05/25/16 03:06/	1/

Method: 7470A - Mercury (CVAA) - TCLPx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
Mercury/	0.000080/	U/	0.0020/	0.000030/	mg/L/		05/24/16 10:55/	05/24/16 21:38/	1/

General Chemistryx

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
Flashpointx	**>160x**		1.00/	1.00/	Degrees F/			05/25/16 15:42/	1/
Cyanide, Totalx	**3300x**		100/	20/	ug/L/		05/26/16 06:49/	05/26/16 12:40/	10/

Client Sample ID: 051316-IDWx

Date Collected: 05/13/16 13:00x
Date Received: 05/14/16 08:45x

Lab Sample ID: 280-83188-9x

Matrix: Waterx

General Chemistry (Continued)x

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Preparedx	Analyzedx	Dil Facx
Sulfide/	1900/	U/	4000/	790/	ug/L/		05/19/16 08:58/	05/19/16 10:34/	1/
pH adj. to 25 deg Cx	**7.22x**	**HFx**	0.100/	0.100/	SU/			05/18/16 22:51/	1/

Client Sample ID: 051316-TBx

Date Collected: 05/13/16 13:00x
Date Received: 05/14/16 08:45x

Lab Sample ID: 280-83188-10x

Matrix: Waterx

Method: 8260B - Volatile Organic Compounds (GC/MS)x

Analytex	Resultx	Qualifierx	LOQx	DLx	Unitx	Dx	Prepared	Analyzed	Dil Facx
1,1,1-Trichloroethane/	0.40/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
1,1,2,2-Tetrachloroethane/	0.80/	U/	1.0/	0.20/	ug/L/			05/26/16 04:19/	1/
1,1,2-Trichloroethane/	0.80/	U/	1.0/	0.32/	ug/L/			05/26/16 04:19/	1/
1,1-Dichloroethane/	0.80/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
1,1-Dichloroethene/	0.80/	U/	1.0/	0.14/	ug/L/			05/26/16 04:19/	1/
1,2-Dibromoethane/	0.40/	U/	1.0/	0.18/	ug/L/			05/26/16 04:19/	1/
1,2-Dichloroethane/	0.40/	U/	1.0/	0.13/	ug/L/			05/26/16 04:19/	1/
1,2-Dichloroethene, Total/	0.20/	U/	1.0/	0.15/	ug/L/			05/26/16 04:19/	1/
1,2-Dichloropropane/	0.40/	U/	1.0/	0.13/	ug/L/			05/26/16 04:19/	1/
2-Butanone (MEK)/	4.0/	U/	6.0/	1.8/	ug/L/			05/26/16 04:19/	1/
2-Hexanone/	4.0/	U/	5.0/	1.4/	ug/L/			05/26/16 04:19/	1/
4-Methyl-2-pentanone (MIBK)/	3.2/	U/	5.0/	1.0/	ug/L/			05/26/16 04:19/	1/
Acetone/	6.4/	U/	10/	1.9/	ug/L/			05/26/16 04:19/	1/
Benzene/	0.40/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
Bromochloromethane/	0.20/	U/	1.0/	0.10/	ug/L/			05/26/16 04:19/	1/
Bromodichloromethane/	0.40/	U/	1.0/	0.17/	ug/L/			05/26/16 04:19/	1/
Bromoform/	0.40/	U/	1.0/	0.19/	ug/L/			05/26/16 04:19/	1/
Bromomethane/	0.80/	U/	2.0/	0.21/	ug/L/			05/26/16 04:19/	1/
Carbon disulfide/	1.6/	U/	2.0/	0.45/	ug/L/			05/26/16 04:19/	1/
Carbon tetrachloride/	0.40/	U/	2.0/	0.19/	ug/L/			05/26/16 04:19/	1/
Chlorobenzene/	0.40/	U/	1.0/	0.17/	ug/L/			05/26/16 04:19/	1/
Chloroethane/	1.6/	U/	2.0/	0.41/	ug/L/			05/26/16 04:19/	1/
Chloroform/	0.40/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
Chloromethane/	0.80/	U/	2.0/	0.30/	ug/L/			05/26/16 04:19/	1/
is-1,3-Dichloropropene/	0.40/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
Dibromochloromethane/	0.40/	U/	1.0/	0.17/	ug/L/			05/26/16 04:19/	1/
Ethylbenzene/	0.40/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
Methylene Chloride/	0.80/	U/	5.0/	0.32/	ug/L/			05/26/16 04:19/	1/
Styrene/	0.40/	U/	1.0/	0.17/	ug/L/			05/26/16 04:19/	1/
Tetrachloroethene/	0.40/	U/	1.0/	0.20/	ug/L/			05/26/16 04:19/	1/
Toluene/	0.40/	U/	1.0/	0.17/	ug/L/			05/26/16 04:19/	1/
trans-1,3-Dichloropropene/	0.40/	U/	1.0/	0.19/	ug/L/			05/26/16 04:19/	1/
Trichloroethene/	0.40/	U/	1.0/	0.16/	ug/L/			05/26/16 04:19/	1/
Vinyl chloride/	0.20/	U/	1.5/	0.10/	ug/L/			05/26/16 04:19/	1/
Xylenes, Total/	0.80/	U/	2.0/	0.19/	ug/L/			05/26/16 04:19/	1/

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*I Fac*
1,2-Dichloroethane-d4 (Surr)	*90*		*81 - 118*		*05/26/16 04:19*	*1*
4-Bromofluorobenzene (Surr)	*101*		*85 - 114*		*05/26/16 04:19*	*1*
Dibromofluoromethane (Surr)	*94*		*80 - 119*		*05/26/16 04:19*	*1*
Toluene-d8 (Surr)	*103*		*89 - 112*		*05/26/16 04:19*	*1*

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002
Phone (303) 736-0100 Fax (303) 431-7171

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: LIZ KIBBY	Lab PM: McEntee, Patrick J	Carrier Tracking No(s): L 213	COC No: 280-52694-18995.1
Client Contact: Ms. Heather Miner	Phone:	E-Mail: patrick.mcentee@testamericainc.com		Page: ~~Page 1 of~~ 2 of 3
Company: Cardno TEC, Inc				Job #:
Address: 1658 Cole Boulevard Suite 190	Due Date Requested: per contract	Analysis Requested		Preservation Codes:
City: Golden	TAT Requested (days): per contract			A - HCL M - Hexane B - NaOH N - None C - Zn Acetate O - AsNaO2 D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3 F - MeOH R - Na2S2O3 G - Amchlor S - H2SO4 H - Ascorbic Acid T - TSP Dodecahydrate I - Ice U - Acetone J - DI Water V - MCAA K - EDTA W - ph 4-5 L - EDA Z - other (specify)
State, Zip: CO, 80401				
Phone:	PO #: Project 076003			Other: ⑧NaOH ⑨Zn(CH3COO)2
Email: heather.miner@cardno-gs.com	WO #:			
Project Name: Ravenna, OH	Project #: 28014271			
Site:	SSOW#:			

Sample identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Wwater, Ssolid, Owaste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	TCLP VOCs	TCLP SVOCs	TCLP metals	TCLP pesticides	Total sulfide ⑧ NaOH	Total cyanide ⑧ NaOH	pH	Flashpoint							Total Number of containers	Special Instructions/Note:
			Preservation Code:																			
051316-IDW	5-13-16	1300	C	Water	N	N	X	X	X	X	X	X	X	X							19	extra volume if needed
051316-TB	5-13-16	1300	G	Water	N	N	X														2	
				Water																		
				Water																		
				Water																		
				Water																		
				Water																		
				Water																		
				Water																		
				Water																		
				Water																		
				Water																		

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	5/13/16 1400	AIC	[signature]	5-13-16 1412	TestAm.
Relinquished by: Robison	Date/Time: 5-13-16 1507	Company	Received by: [signature]	Date/Time: 5-14-16 0845	Company TAD
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Login Sample Receipt Checklistf

Client: Cardno TEC, Incv

Job Number: 280-83188-1v

Login Number: 83188f
List Number: 1f
Creator: Pottruf , Reed Wf

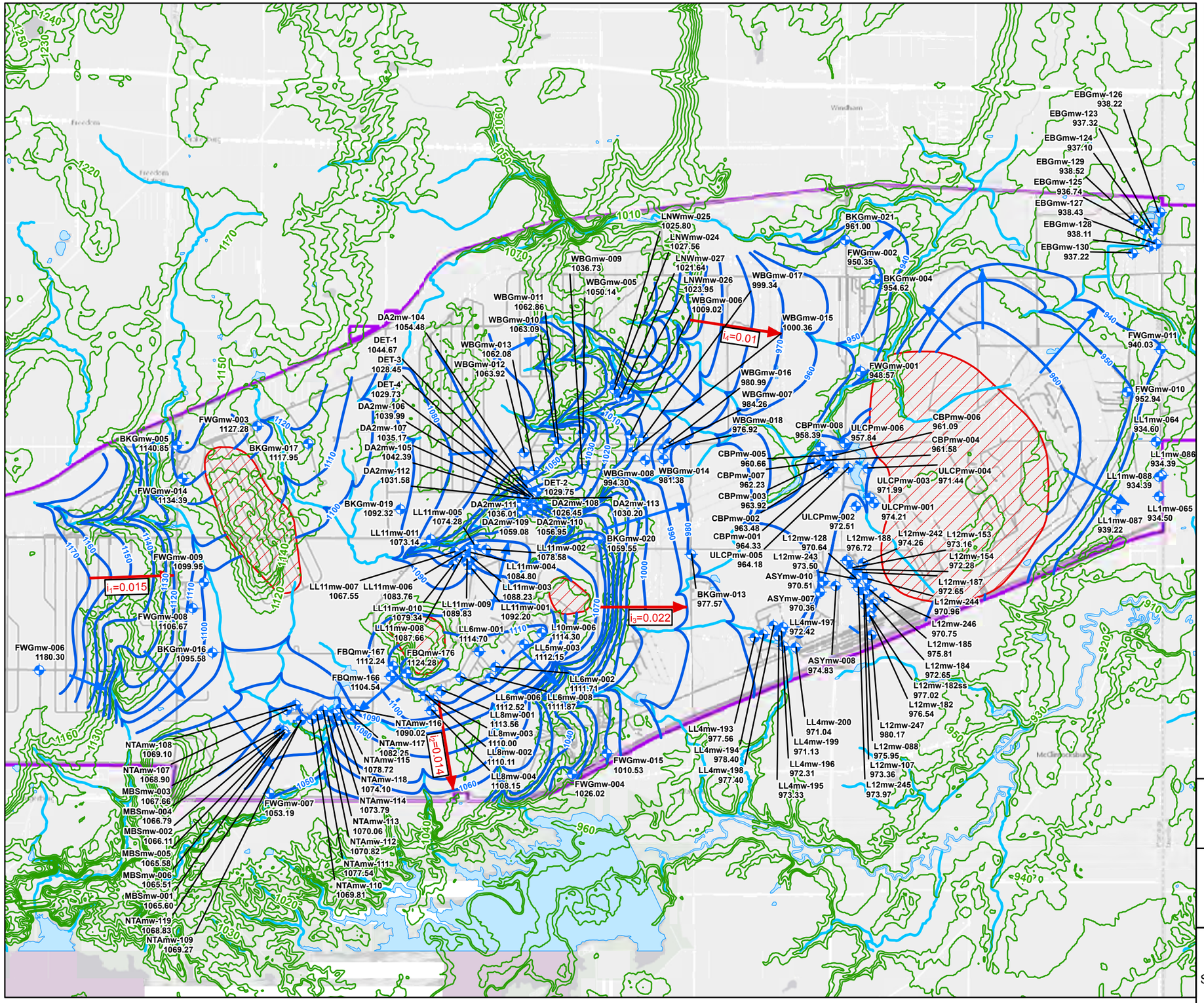
List Source: TestAmerica Denverf

Questionf	Answerf	Commentf
Radioactivity wasn't checked or is </= background as measured by a survey v meter.v	N/Av	
The cooler's custody seal, if present, is intact.v	Falsev	Not presentv
Sample custody seals, if present, are intact.v	N/Av	
The cooler or samples do not appear to have been compromised orw tampered with.v	Truev	
Samples were received on ice.v	Truev	
Cooler Temperature is acceptable.v	Truev	
Cooler Temperature is recorded.v	Truev	
COC is present.v	Truev	
COC is filled out in ink and legible.v	Truev	
COC is filled out with all pertinent information.v	Truev	
Is the Field Sampler's name present on COC?v	Truev	
There are no discrepancies between the containers received and the COC.v	Falsev	Received extra samples not listed on COC.v
Samples are received within Holding Time (excluding tests with immediate v HTs)v	Truev	
Sample containers have legible labels.v	Truev	
Containers are not broken or leaking.v	Falsev	Refer to Job Narrative forvdetails.v
Sample collection date/times are provided.v	Falsev	No date or time on COC or sample containersv
Appropriate sample containers are used.v	Truev	
Sample bottles are completely filled.v	Truev	
Sample Preservation Verified.v	Truev	
There is sufficient vol. for all requested analyses, incl. any vequested v MS/MSDsv	Truev	
Containers requiring zero headspace have no headspace or bubble is v <6mm (1/4").v	Truev	
Multiphasic samples are not present.v	Truev	
Samples do not require splitting or compositing.v	Truev	
Residual Chlorine Checked.v	N/Av	

APPENDIX D

POTENTIOMETRIC SURFACE MAP – UNCONSOLIDATED AQUIFER

THIS PAGE INTENTIONALLY LEFT BLANK



Legend

- Unconsolidated Well Location
- Unconsolidated Contours - 10ft Interval
- Direction Of Flow
- i1 = Hydraulic Gradient (ft/ft)
- Roads
- Creeks and Streams
- Elevation Contours (Feet)
- Unconsolidated Aquifer Missing (See Notes Below)
- Camp Ravenna Property Line

Notes:

- Potentiometric Surfaces based on data collected in July 2015
- Basemap Sources: ESRI Map Services - Canvas/World_Light_Gray_Base and World_Street_Map
- Unconsolidated Aquifer indicated to not be present, based on the most recent Facility Wide Groundwater Monitoring Program Report on the January 2014 Sampling Event

N

0 4,000 8,000 Feet

1:48,000
NAD83 UTM Zone 17N

TEC-Weston Joint Venture

POTENTIOMETRIC SURFACE MAP UNCONSOLIDATED AQUIFER

Groundwater and Environmental Investigation Services for RVAAP-66 Facility-wide Groundwater Former Ravenna Army Ammunition Plant Ravenna, Ohio

Figure: D-1

FINAL

Path: I:\GIS Project Files\15363_Cardno Weston Services\Ravenna\GIS\MXDs\Annual_Reports\2016_GW_Final\Fig D-1 Potentiometric Surface Map - Unconsolidated Aquifer.mxd, 9/13/2016 1:15:49 PM, wilderj

APPENDIX E

CORRESPONDENCE AND COMMENTS/RESPONSES

THIS PAGE INTENTIONALLY LEFT BLANK

NATIONAL GUARD BUREAU
111 SOUTH GEORGE MASON DRIVE, AH2
ARLINGTON VA 22204-1373

November 11, 2016

Ohio Environmental Protection Agency
DERR-NEDO
Attn: Kevin Palombo
2110 East Aurora Road
Twinsburg, OH 44087-1924

Subject: Response to Comments – Draft Facility-Wide Groundwater Monitoring Program
RVAAP-66 Facility-Wide Groundwater Report on the May 2016 Sampling Event
Camp Ravenna, Portage and Trumbull Counties, Ohio
Ohio EPA ID # 267-000859-036
Contract Number: W9133L-14-D-0008
Task Order Number: 0003

Dear Mr. Kevin Palombo:

The Army National Guard is pleased to submit the enclosed Comment Resolution Table to Comments on the Draft Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Report on the May 2016 Sampling Event. This deliverable is in response to Ohio EPA comments dated 21 October 2016. This deliverable consists of one hardcopy and one electronic copy containing a single pdf of the submission.

Please contact the undersigned at 703-607-7955 or mark.s.leeper.civ@mail.mil if you would like to discuss this submission.

Sincerely,

Mark Leeper, P.G., MBA
RVAAP Restoration Program Manager
Army National Guard Directorate

CC:
Rod Beals, Ohio EPA, DERR-NEDO
Al Muller, Ohio EPA, DERR-NEDO
Bob Princic, Ohio EPA, DERR-NEDO
Kevin Sedlak, ARNG, Camp Ravenna
Katie Tait, OHARNG, Camp Ravenna
Gail Harris, Vista Sciences Corporation
Brent Ferry, JV Project Manager

Comment Resolution Table

Installation: RVAAP/Camp Ravenna
Document: Draft Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Report on the May 2016 Sampling Event
Reviewer(s): Kevin M. Palombo, Environmental Specialist, Ohio EPA
Date: October 21, 2016

Cmt. No.	Page or Sheet	Comment	Recommendation	Response
1		In the Executive Summary of the report (page vi) and Section 4.1 (SVOCs) of the report (page 4-1), 2,4-dinitrotoluene is discussed with SVOCs instead of explosive and propellants (Section 4.2). As 2,4-dinitrotoluene is a precursor compound used to make explosives such as trinitrotoluene (TNT), Ohio EPA recommends that it would be more appropriate in the report to discuss detections of 2,4-dinitrotoluene in monitoring wells with explosives and propellant rather than SVOCs.		**The executive summary has been revised. The bullet starting on line 14 on page *vi* now reads as follows:** • Semi-volatile organic compounds (SVOCs): ~~Two~~ One SVOC~~s, 2,4-dinitrotoluene and~~ benzo(a)anthracene~~, were~~ was detected at concentrations exceeding screening criteria. Exceedances were detected in the ~~Load Line1, Load Line 2, Load Line 3,~~ NACA Test Area~~,~~ and Ramsdell Quarry Landfill AOCs. **Section 4.1 has been edited as follows:** ~~Two~~ One SVOC~~s~~, ~~2,4-dinitrotoluene and~~ benzo(a)anthracene, ~~were~~ was detected at concentrations above ~~their~~ screening criteria in the monitoring wells sampled for these analytes in May 2016. Note that 2,4-dinitrotoluene, detected above screening criteria, is discussed below in Subsection 4.2. ~~2,4-Dinitrotoluene was detected above screening criteria in monitoring wells LL1mw-083 and LL1mw-084, located in the Load Line1 AOC; LL2mw-059 and LL2mw-267, located in the Load Line 2 AOC; and LL3mw-238 and LL2mw-241, located in the Load Line 3 AOC. Each of these exceedances was detected in wells screened within the Upper Sharon Sandstone.~~ Benzo(a)anthracene was detected above screening criteria in monitoring well NTAmw-119, screened within the Unconsolidated Aquifer, and located in the NACA Test Area AOC. Benzo(a)anthracene was also detected in monitoring wells RQLmw-007, RQLmw-008, and ~~RWLmw~~RQLmw-009, screened in the Upper Sharon Sandstone, and located in the Ramsdell Quarry Landfill AOC.

Comment Resolution Table

Installation: RVAAP/Camp Ravenna
Document: Draft Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater Report on the May 2016 Sampling Event
Reviewer(s): Kevin M. Palombo, Environmental Specialist, Ohio EPA
Date: October 21, 2016

Cmt. No.	Page or Sheet	Comment	Recommendation	Response
				Section 4.2 has been edited as follows: A total of ~~five~~ six explosives and propellants were detected at concentrations above their screening criteria in the monitoring wells sampled for these analytes in May 2016. Note that although 2,4-dinitrotoluene was analyzed as an SVOC, it is a precursor compound used to make explosives and is included in this subsection. 1,3-Dinitrobenzene was detected above screening criteria in monitoring wells LL1mw-083 and LL1mw-084, screened in the Upper Sharon Sandstone, and located in the Load Line 1 AOC. 2,4-Dinitrotoluene was detected above screening criteria in monitoring wells LL1mw-083 and LL1mw-084, located in the Load Line 1 AOC; LL2mw-059 and LL2mw-267, located in the Load Line 2 AOC; and LL3mw-238 and LL3mw-241, located in the Load Line 3 AOC. Each of these exceedances was detected in wells screened within the Upper Sharon Sandstone. **[No further edits made in this section].**
2		Section 4.1 (SVOCs) contains two typographical errors. On page 4-1 , line 11 , the reference to well "LL2mw-241" should be to well "LL3mw-241 ". Also on page 4-1 , line 16, the reference to well "RWLmw-009" should be to well "RQLmw-009". For clarity, these errors should be corrected.		Both of these typographical errors have been corrected. The highlighted text in the response to comment number 1, above, identify the corrections.