2017 Annual Report

2017 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

JB Sims Power Generation Plant
Grand Haven Board of Light and Power

Prepared for: Grand Haven Board of Light and Power
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Golder Associates Inc.

January 30, 2018

Project No. 1775416B

Golder Associates

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CERTIFICATION STATEMENT

This *2017 Annual Groundwater Monitoring & Corrective Action Report, JB Sims Power Generation Plant Unit 3 Ash Ponds East (A) and West (B)* has been prepared to comply with the United States Environmental Protection Agency (EPA) coal combustion residual (CCR) rule (40 Code of Federal Regulations [CFR] 257 Subpart D; published in 80 FR 21302-21501, April 17, 2015) under the direction of a licensed professional engineer with Golder Associates Inc.

GOLDER ASSOCIATES INC.

Dawn L. Prell

Dawn L. Prell
Senior Hydrogeologist

January 30, 2018
Date

I hereby certify that this *2017 Annual Groundwater Monitoring & Corrective Action Report, JB Sims Power Generation Plant Unit 3 Ash Ponds East (A) and West (B)* located at 1231 North Third Street in Grand Haven, Michigan, has been prepared to meet the requirements of 40 CFR §257.90(e).

GOLDER ASSOCIATES INC.



Tiffany D. Johnson, P.E.
Licensed State of MI, PE No. 6201049160

January 30, 2018
Date

1.0 INTRODUCTION

In accordance with the United States Environmental Protection Agency (EPA) coal combustion residuals (CCR) rule (40 Code of Federal Regulations [CFR] 257 Subpart D; published in 80 FR 21302-21501, April 17, 2015), this *2017 Annual Groundwater Monitoring and Corrective Action Report* has been prepared to document groundwater monitoring activities conducted at *JB Sims Power Generation Plant Unit 3 Ash Ponds East (A) and West (B) (Ash Ponds)* and satisfies the requirements of §257.90(e). Groundwater monitoring and reporting for *the Ash Ponds* is performed in accordance with the requirements of §257.90 through §257.98. This report documents the activities completed to establish the groundwater monitoring program and actions during the 2017 calendar year.

1.1 Site Description & Background

JB Sims Power Generation Plant (Plant) is located on the southwestern portion of Harbor Island in Grand Haven, Michigan, and is operated by the Grand Haven Board of Light and Power (GHBLP). The Plant is situated on Harbor Island with the Grand River and South Channel of the Grand River surrounding the island. The flow of the Grand River and South Channel of the Grand River flow is a westerly direction towards Lake Michigan, which is about one mile west of the site. Figure 1, Site Location Map, depicts the location of the Plant relative to the surrounding area.

The Plant is a coal-fired power generation facility. CCRs are placed into the Ash Ponds located onsite. The ponds are each approximately 175-190 feet long, 70-80 feet wide, and 4-6 feet deep. Figure 2, Site Plan and Monitoring Well Location Map, depicts the general configuration of Ash Ponds and site monitoring wells.

1.2 Regional Geology & Hydrogeologic Setting

The following sections include a general description of regional geologic and hydrogeologic characteristics of formations that occur beneath the site. Information presented in this section is based on published literature, discussion with local geology experts, and Golder's experience working in this geologic terrain.

As described in the *Groundwater Monitoring System Certification*, prepared by ERM dated November 2017, the Plant is located in an area of glacial drift (consisting of fine to medium sand with occasional beds of gravel) which is underlain by Marshall Sandstone. The glacial drift is between 100 to 200 feet thick in the area.

The Ash Ponds borings consist of unconsolidated fine sand with intervals of silt and sand within the first 20 feet below ground surface (bgs). The fine sand was underlain by silt and clay to the bottom of each boring. The silt and clay represents the confining unit beneath the Ash Ponds (ERM, 2017).

Groundwater was encountered in the fine sand located above the silt and clay unit. As described in the Groundwater Monitoring System Certification, sand in the uppermost aquifer assumes an effective porosity of 30 percent (%) and consists of poorly-graded fine sand with an estimated hydraulic conductivity of 27 feet per day and well-graded fine sand with an estimated hydraulic conductivity of 53 feet per day.

1.3 Groundwater Monitoring Well Network

Pursuant to §257.91, GHBLP installed a groundwater monitoring system within the uppermost aquifer for *Ash Ponds*. The monitoring system is designed to monitor groundwater passing the waste boundary of *Ash Ponds* within the uppermost aquifer. Wells were located to serve as upgradient and downgradient

wells based on groundwater flow direction as determined by the potentiometric surface elevation contour maps.

The monitoring well network was certified by Environmental Resources Management Michigan, Inc. (ERM) in the *Groundwater Monitoring System Certification*, dated November 2017. A network of four monitoring wells was installed in January 2017 for groundwater monitoring near the Ash Ponds. Table 1, Monitoring Well Network Summary, includes the pertinent construction details for the Ash Ponds monitoring well network at the Plant.

The monitoring well network is currently being re-evaluated and additional upgradient and downgradient monitoring wells may be added to the existing network or relocated based on appropriate geologic conditions.

2.0 GROUNDWATER MONITORING ACTIVITIES

As required by §257.90(e), the following describes monitoring-related activities performed during the preceding year. Since this is the first 2017 *Annual Groundwater Monitoring and Corrective Action Report*, it also describes activities performed to establish the groundwater monitoring program. Groundwater sampling was performed in accordance with §257.93. Samples were collected from each well in the certified monitoring system for the CCR unit. The location of the monitoring wells is shown on Figure 2.

Pursuant to §257.90(e)(3), Table 2, Groundwater Elevation Summary, presents a summary of groundwater elevations for each of the background sampling events completed for Ash Ponds in 2017.

2.1 Monitoring Well Installation and Maintenance

In accordance with §257.91, a groundwater monitoring system was installed that (1) consists of the minimum number of wells, (2) installed at locations and depths to yield groundwater samples from the uppermost aquifer, and (3) meets the performance standards of §257.91(a). In summary, monitoring well-related activities included the following:

- Installation of a groundwater monitoring system for the Ash Ponds CCR unit. The monitoring well network and pertinent construction details is presented on Table 1.
- Visual inspection of well conditions prior to sampling, recording the site conditions, and performing exterior maintenance to perform sampling under safe and clean conditions.

2.2 Detection Monitoring Program

A detection monitoring well network that has been certified by a Professional Engineer in Michigan. Notice of that certification in the Operating Record pursuant to §257.90(f)(6) has been established for Ash Ponds. The monitoring well network certification was conducted by ERM. After reviewing recent groundwater elevation data, it has been determined that an additional upgradient well may be necessary.

2.2.1 Background Monitoring

In accordance with §257.94(b), a minimum of eight independent samples were collected from the certified well network for Ash Ponds and analyzed for the constituents listed in Appendix III and IV. Pursuant to §257.90(e)(3), data reports for the background sampling is included in Appendix A, Analytical Results & Field Data Forms. Tables A-1 through A-4, Analytical Data Summary, present a tabulation of the background data for each well.

2.2.2 Initial Detection Monitoring

Following completion of the eight independent sampling events, groundwater samples will be collected analyzed for Appendix III constituents as part of the first semi-annual detection monitoring event. Detection monitoring is scheduled to be completed during the first semiannual monitoring period of 2018.

3.0 SAMPLE METHODOLOGY & ANALYSIS

Sampling events completed for Ash Ponds during 2017 represent eight background monitoring events.

3.1 Groundwater Elevation Measurement

Prior to each sampling event, groundwater elevations were recorded from the certified well network at the Plant. Groundwater elevations recorded during the background monitoring events are summarized in Table 2, Summary of Groundwater Elevations. Groundwater elevation data from the first background monitoring event was used to develop a groundwater contour map (Figure 3, Potentiometric Surface Elevation Contour Map (March 2017)). The general direction of groundwater flow across Ash Ponds is west towards Grand River and ultimately toward Lake Michigan. Groundwater flow in the vicinity of Ash Ponds shows fluctuation based on the elevation of the Grand River. Groundwater elevations recorded on June 26, 2017 show a flow direction toward the east.

3.2 Groundwater Gradient and Flow Velocity

Groundwater flow rates at the site have been calculated based on hydraulic gradients, hydraulic conductivity, and an estimated effective porosity of the screened horizon provided in the *Groundwater Monitoring System Certification*, prepared by ERM dated November 2017. Based on the information provided in the Groundwater Monitoring System Certification, hydraulic conductivity ranges from 27 to 53 feet per day with an assumed an effective porosity of 30%. The hydraulic gradient was calculated between MW-01 and MW-03 shown on Table 3, Groundwater Flow Velocity Calculations – March 2017.

Horizontal flow velocity was calculated using the commonly-used derivative of Darcy's Law:

$$V = \frac{K * i}{n_e}$$

Where:

$V =$ Groundwater flow velocity $\left(\frac{feet}{day}\right)$

$K =$ Average Permeability of the aquifer $\left(\frac{feet}{day}\right)$

$i =$ Horizontal hydraulic gradient $\left(\frac{feet}{feet}\right)$

$n_e =$ Effective porosity

Using this equation, groundwater flow velocities are calculated between MW-01 and MW-03. Table 3 presents the velocities calculated using groundwater elevation data from the March 2017 sampling event.

As presented on Table 4 groundwater flow velocity at the site ranges from approximately 0.48 feet/day to 0.94 feet/day (or approximately 176 to 345 feet/year) across Ash Ponds. However, Golder notes that these calculated velocities are estimates based on field data and default data for soils based on the Groundwater Monitoring System Certification, and therefore, should not be taken as absolute values, but rather as estimated values that may vary with future data collected at the site.

3.3 Groundwater Sampling

Groundwater samples were collected in accordance with §257.93(a). Monitoring wells were purged and sampled using low-flow sampling procedures. Monitoring wells were purged and sampled using a peristaltic pump. A multi parameter meter was used to monitor field parameters, namely: pH, temperature, conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP), during well purging to verify stabilization prior to sampling. Turbidity is also recorded during purging using a field meter to verify

stabilization. Groundwater samples were collected when the following general stabilization criteria were met:

- 0.1 standard units for pH
- 3% for specific conductance
- 0.2 mg/L or 10% for DO > 0.5 milligrams per liter (mg/l) (whichever is greater)
- Turbidity measurements less than 5 nephelometric turbidity unit (NTU) or 10% when above 5 NTU

Any deviation from stabilization criteria, if applicable, is identified on field sampling forms. Following well stabilization, unfiltered samples were collected directly into appropriately preserved laboratory supplied sample containers, placed in iced coolers, and submitted to the laboratory following standard chain-of-custody protocol. Field information forms as well as chain-of-custody records are included in Appendix A.

3.4 Laboratory Analyses

Groundwater samples collected for background monitoring included both Appendix III and Appendix IV parameters. Analytical methods used for groundwater sample analysis are listed on the analytical laboratory reports included in Appendix A.

Laboratory analyses for the background events were performed by the TestAmerica Laboratories, Inc. (TAL) in Canton, Ohio. Groundwater data and chain of custody records for the monitoring events are presented in Appendix A.

3.5 Quality Assurance & Quality Control

The background monitoring events followed the quality assurance and quality control (QA/QC) approach described in the *Sampling and Analysis Plan* (SAP) prepared by ERM dated March 10, 2017.

Data validation generally consisted of reviewing sample integrity, holding times, laboratory method blanks, laboratory control samples, matrix spikes/matrix spike duplicate recoveries and relative percent differences, post digestions spikes, laboratory RPDs, and reporting limits. Where appropriate, validation qualifiers and flags are applied to the data using the procedures in *USEPA National Functional Guidelines for Inorganic Data Review* (USEPA, 2014), as guidance. Flagged data is identified in the statistical analysis reports described in the following section.

4.0 SUMMARY OF STATISTICAL ANALYSES

Groundwater samples were collected from eight background monitoring events, conducted between March 2017 and August 2017, and analyzed for Appendix III/IV parameters. Tables A-1 through A-4, Analytical Data Summary, present a tabulation of the background data for each well.

4.1 Summary of the Statistical Analysis Plan

Statistical analysis of Appendix III groundwater monitoring data will be performed pursuant to §257.93 following the certified statistical method for the Ash Ponds. Since the first detection monitoring event is scheduled for the first semiannual monitoring period of 2018, no statistical analysis of a detection monitoring event was conducted as part of this Annual Report.

As described in the *Statistical Analysis Plan* (Stats Plan) prepared by Golder dated October 2017, the selected statistical method for the Ash Ponds was developed in accordance with 40 CFR §257.93(f) using methodology presented in *Statistical Analysis of Groundwater Data at RCRA Facilities, Unified Guidance*, March 2009, EPA 530/R-09-007 (Unified Guidance). The Sanitas™ Groundwater statistical software was used to perform the statistical analyses. Sanitas™ is a decision-support software package, that incorporates the statistical tests required of Subtitle C and D facilities by EPA regulations and guidance as recommended in the EPA Unified Guidance (2009) document.

The following table provides a summary of the statistical methodology used at the Ash Ponds for routine detection groundwater monitoring.

STATISTICAL METHOD SUMMARY		
Monitoring Well Network	Upgradient Wells	MW-01 (Additional Wells May be Added)
	Downgradient Wells	MW-02, MW-03, and MW-04
CCR Monitoring Parameters	Appendix III (Detection Monitoring)	Boron, Calcium, Chloride, Fluoride, pH, Sulfate, and TDS
	Appendix IV (Assessment Monitoring)	Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, combined Radium 226 + 228, Fluoride, Lead, Lithium, Mercury, Molybdenum, Selenium, and Thallium
Statistical Methodology	Data Screening on Proposed Background	Evaluate outliers, trends, and seasonality when sufficient data are available
	Statistical Limits	Interwell statistical limits will be applied on a constituent basis, depending on the appropriateness of the method as determined by the Analysis of Variance
	Prediction Limits	Parametric when data follow a normal or transformed normal distribution and when less than 50% non-detects, utilizing Kaplan Meier non-detect adjustment when applicable; nonparametric when data sets contain greater than 50% non-detects or when data are not normally or transformed-normally distributed.
	Trend Tests	Prediction limit exceedances tested through the Sen's Slope/Mann Kendall test to determine whether increasing or decreasing trends are present, or whether data are stable over time
	Confidence Intervals	Used in Assessment and Corrective Action monitoring.
	No Statistical Testing	Statistical testing is not required for parameters with 100% non-detects.
	Verification Resample Plan	1-of-2 with minimum of 8 samples per well for interwell testing.

	(Optional)	▪ Initial statistical exceedance warrants independent resampling within 90 days. ▪ If resample passes, well/parameter is not a confirmed statistically significant increase (SSI). ▪ If resample exceeds, well/parameter has a confirmed SSI. ▪ If no resample is collected, the original result is deem verified.

The following guidance is also applicable to the statistical analysis method:

- Statistical analyses are not performed on analytes containing 100% non-detects (EPA Unified Guidance, 2009, Chapter 6).
- When data contain less than or equal to 15% non-detects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for non-detects is the PQL as reported by the laboratory.
- When data contain between 15-50% non-detects, a non-detect adjustment such as the Kaplan-Meier or Regression on Order Statistics (ROS) method for adjustment of the mean and standard deviation will be used prior to constructing a parametric prediction limit.
- Nonparametric prediction limits are used on data containing greater than 50% non-detects.

4.2 Appendix III Background Data

A summary of the background groundwater data collected between March and August 2017 is tabulated in Analytical Data Summary Tables A-1 through A-4.

Since the monitoring well network is currently being re-evaluated and additional upgradient and downgradient monitoring wells may be added to the existing network, additional background groundwater data may be collected in 2018 and added to the existing background groundwater collected in 2017.

4.3 Appendix IV Background Data

Pursuant to §257.95, Appendix IV groundwater quality data is statistically analyzed and compared to groundwater protection standards if assessment monitoring is implemented. The Plant is initiating the detection monitoring per §257.94 during the first semiannual monitoring period of 2018 and has not implemented assessment monitoring. Therefore, statistical analysis of the Appendix IV data has not been performed.

5.0 MONITORING PROGRAM STATUS

The Plant is implementing the first detection monitoring event during the first semiannual monitoring period of 2018. Table 2 presents the status of each well within the certified monitoring network for the Ash Ponds. Following the receipt of the first detection monitoring event, statistical analysis will be conducted and GHBLP will address the potential SSIs in accordance with the requirements, and options, of §257.94(e)(1-3) and (f).

6.0 CONCLUSIONS & FUTURE ACTIONS

This *2017 Annual Groundwater Monitoring and Corrective Action Report, Grand Haven Board of Light and Power, JB Sims Power Generation Plant Unit 3 Ash Ponds East (A) & West (B)* has been prepared to fulfill the requirements of EPA CCR rule 40 CFR 257 Subpart D.

The monitoring well network is currently being re-evaluated and additional upgradient and downgradient monitoring wells may be added to the existing network. As a result of the re-evaluation of the monitoring well network, additional background groundwater may be collected.

Since detection monitoring will be conducted during the first semiannual monitoring period of 2018, statistical analysis was not conducted as part of this *Annual Report*.

7.0 REFERENCES

Electric Power Research Institute, 2015 Technical Report, *Groundwater Monitoring Guidance for the Coal Combustion Residuals Rule.*

Environmental Resources Management Michigan, Inc. 2017 *Sampling and Analysis Plan* for the Grand Haven Board of Light and Power.

Environmental Resources Management Michigan, Inc. 2017 *Groundwater Monitoring System Certification* for the Grand Haven Board of Light and Power.

Golder Associates. 2017 Statistical Analysis Plan for the Grand Haven Board of Light and Power.

Sanitas: Groundwater Statistical Software (2014), Sanitas Technologies, Shawnee, KS, 2007. www.sanitastech.com

State Waste Management Board. 2016. State Solid Waste Management Regulations – (9VAC20-81 *et seq*.). January.

US EPA, September 2011. *Data Validation Standard Operating Procedures*

US EPA, November 2001. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*

US EPA. 2015. Federal Register. Volume 80. No. 74. Friday April 17, 2015. Part II. Environmental Protection Agency. *40 CFR Parts 257and 261. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule.* [EPA-HQ-RCRA–2009–0640; FRL–9919–44–OSWER]. RIN–2050–AE81.

US EPA, 1986 *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*.

US EPA, 1996 *Soil Guidance Manual*

US EPA, 1993. *Subpart E, Groundwater Monitoring and Corrective Action*, in Chapter 5, *Solid Waste Disposal Facility Criteria Technical Manual*. EA530-R-93-017.

TABLES & FIGURES

TABLE 1.
MONITORING WELL NETWORK
Grand Haven Board of Light and Power - JB Sims Power Generation Plant
Grand Haven, Michigan

Well ID	Hydraulic Location	Northing	Easting	Top of Casing Elevation (feet msl[1])	Total Depth[2] (feet)	Screen Interval (feet)	Screen Length (feet)
Unit 3 Ash Ponds East (A) & West (B)							
MW-01	Upgradient	176201.04	3847934.63	100.90	12.32	4-9	5
MW-02	Downgradient	176247.03	3847865.05	109.30	23.37	15-20	5
MW-03	Downgradient	176214.10	3847846.67	106.78	20.34	12-17	5
MW-04	Downgradient	176182.57	3847848.69	105.19	18.00	10-15	5

Notes:

1. feet msl = feet above mean sea level
2. total depth was measured from the top of casing to the bottom of the well.
3. Elevations referenced to site datum. Elevations based on Driesenga & Associates, Inc. Topographic Survey (October 2017 Coal Pile Survey), Job No. 1710732.5A, Dated 10-18-2017.

TABLE 2.

SUMMARY OF GROUNDWATER ELEVATIONS

Grand Haven Board of Light and Power - JB Sims Power Generation Plant

Grand Haven, Michigan

Well ID	Hydraulic Location	Groundwater Elevations							
		March 13, 2017	April 5, 2017	April 24, 2017	May 15, 2017	June 5, 2017	June 26, 2017	July 17, 2017	August 7, 2017
Purpose of Sampling Event		Background	Background	Background	Background	Background	Background	Background	Background
Unit 3 Ash Ponds East (A) & West (B)									
MW-01	Upgradient	95.24	96.23	95.57	95.25	95.00	95.10	95.40	95.02
MW-02	Downgradient	93.68	93.90	94.15	94.45	94.36	94.46	94.90	94.45
MW-03	Downgradient	93.69	93.87	94.21	94.44	94.63	94.74	95.00	95.22
MW-04	Downgradient	94.02	94.19	94.54	94.55	94.44	94.68	95.14	95.19

Notes:

Background events conducted by Environmental Resources Management Michigan, Inc. (ERM)

TABLE 3.

GROUNDWATER VELOCITY CALCULATIONS - MARCH 2017

Grand Haven Board of Light and Power - JB Sims Power Generation Plant

Grand Haven, Michigan

Flow Paths	Date	Groundwater Elevation (feet msl)	Δ h (feet)[2]	Δ l (feet)[3]	Hydraulic Gradient (Δ h/Δ l)	Average Hydraulic Conductivity, K (feet per day)[5]	Assumed Effective Porosity (n_e)	Average Linear Groundwater Velocity	
								(feet per day)[4]	(feet per year)[4]
Unit 3 Ash Ponds East (A) & West (B)									
MW-01/ MW-03	13-Mar-17	95.24 93.69	1.55	290.0	0.005	27.00 to 53.00	0.3	0.48 to 0.94	175.6 to 344.7

Notes:

1. Δ H = Change in groundwater elevation.
2. Δ L = Distance along flow path.
3. I = Δ H / Δ L.
4. Velocity = (I * K)/n_e .
5. Hydraulic conductivity range and assumed effective porosity based on Groundwater Monitoring System Certification, prepared by ERM dated November 2017.

TABLE 4.

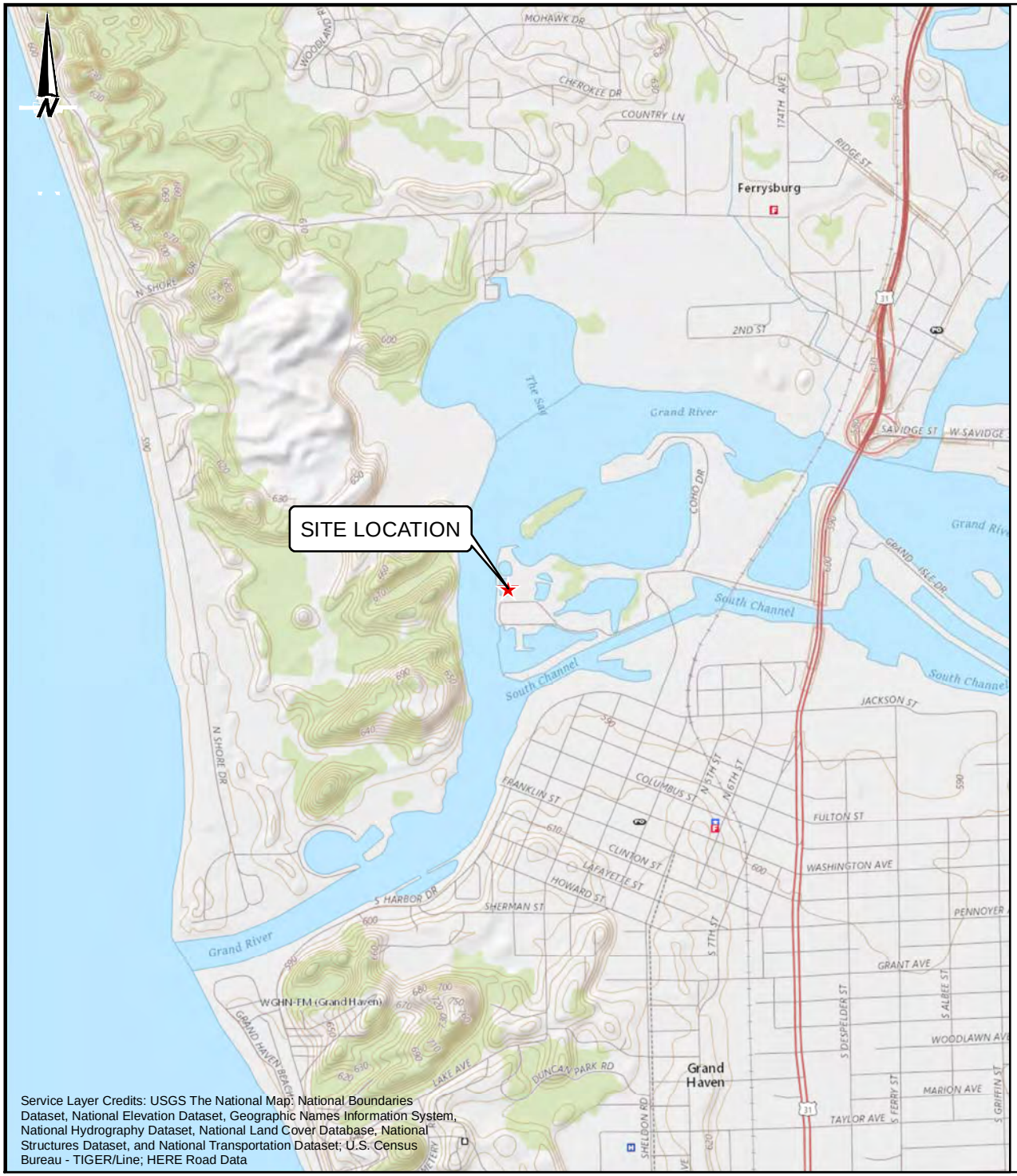
APPENDIX III/IV ANALYTICAL PARAMETERS METHODS

Grand Haven Board of Light and Power - JB Sims Power Generation Plant

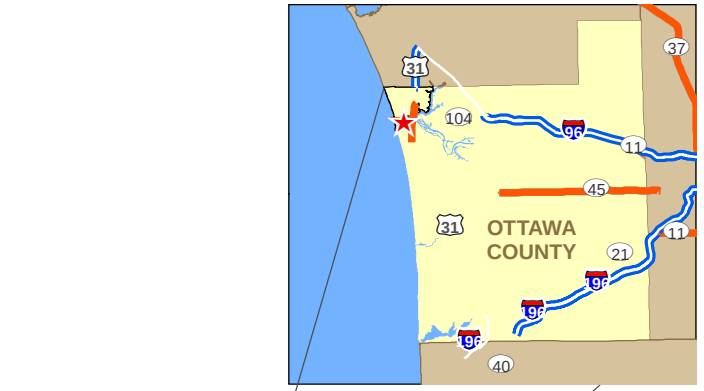
Grand Haven, Michigan

PARAMETER	ANALYTICAL METHOD
Appendix III Parameters	
Boron	EPA 200.7/200.8
Calcium	EPA 200.7/200.8
Chloride	EPA 300.0
Fluoride	EPA 300.0
pH	EPA 150.1 (field test)
Sulfate	EPA 300.0
Total Dissolved Solids (TDS)	SM 2540C
Appendix IV Parameters	
Antimony	EPA 200.7/200.8
Arsenic	EPA 200.7/200.8
Barium	EPA 200.7/200.8
Beryllium	EPA 200.7/200.8
Cadmium	EPA 200.7/200.8
Chromium	EPA 200.7/200.8
Cobalt	EPA 200.7/200.8
Fluoride	EPA 300.0
Lead	EPA 200.7/200.8
Lithium	EPA 200.7/200.8
Mercury	EPA 7470A
Molybdenum	EPA 200.7/200.8
Selenium	EPA 200.7/200.8
Thallium	EPA 200.7/200.8
Radium 226 + 228 Combined	EPA 9315/9320

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Service Layer Credits: USGS The National Map: National Boundaries Dataset, National Elevation Dataset, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; U.S. Census Bureau - TIGER/Line; HERE Road Data





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1231 NORTH 3RD STREET
GRAND HAVEN, MICHIGAN

PROJECT
JB SIMS POWER GENERATING PLANT
2017 ANNUAL REPORT

TITLE
SITE LOCATION MAP

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-01-16
PREPARED	DJC
DESIGN	DLP
REVIEW	CEP
APPROVED	DLP

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LEGEND

- MONITORING WELL LOCATION
- PARCEL BOUNDARY (SEE REFERENCE 2)
- EXISTING TOPOGRAPHY

REFERENCE

1. EXISTING TOPOGRAPHY OBTAINED FROM THE U.S. DEPARTMENT OF AGRICULTURE, SERVICE CENTER AGENCIES.

2. PARCEL BOUNDARIES ARE APPROXIMATE BASED ON INFORMATION COLLECTED FROM OTTAWA COUNTY GEOSPATIAL INSIGHTS &' SOLUTIONS: Ottawa County GIS, DigitalGlobe, Microsoft, CNES/Airbus DS | Esri, HERE, Garmin, INCREMENT P, NGA, USGS.

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CLIENT
GRAND HAVEN BOARD OF LIGHT & POWER
1231 NORTH 3RD STREET
GRAND HAVEN, MICHIGAN

PROJECT
JB SIMS POWER GENERATING PLANT
2017 ANNUAL REPORT

TITLE
SITE PLAN AND MONITORING WELL LOCATION MAP

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-10-26
PREPARED	DJC
DESIGN	DLP
REVIEW	CEP
APPROVED	DLP

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LEGEND

- MONITORING WELL LOCATION
- PARCEL BOUNDARY (SEE REFERENCE 2)
- EXISTING TOPOGRAPHY
- GROUNDWATER ELEVATION CONTOURS

NOTE

GROUNDWATER ELEVATIONS REFERENCED TO SITE DATUM. ELEVATIONS BASED ON DRIESENGA & ASSOCIATES, INC. TOPOGRAPHIC SURVEY (MARCH 2016 COAL PILE SURVEY)

REFERENCE

1. EXISTING TOPOGRAPHY OBTAINED FROM THE U.S. DEPARTMENT OF AGRICULTURE, SERVICE CENTER AGENCIES.

2. PARCEL BOUNDARIES ARE APPROXIMATE BASED ON INFORMATION COLLECTED FROM OTTAWA COUNTY GEOSPATIAL INSIGHTS &' SOLUTIONS: Ottawa County GIS, DigitalGlobe, Microsoft, CNES/Airbus DS | Esri, HERE, Garmin, INCREMENT P, NGA, USGS.

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CLIENT
GRAND HAVEN BOARD OF LIGHT & POWER
1231 NORTH 3RD STREET
GRAND HAVEN, MICHIGAN

PROJECT
JB SIMMS POWER GENERATING PLANT
GROUNDWATER SUMMARY

TITLE
POTENTIOMETRIC SURFACE ELEVATION CONTOUR MAP
MARCH 13, 2017

CONSULTANT
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YYYY-MM-DD	2017-10-26
PREPARED	DJC
DESIGN	DLP
REVIEW	CEP
APPROVED	DLP

PROJECT No.	CONTROL	Rev.	FIGURE
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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APPENDIX A

ANALYTICAL SUMMARY TABLES

A-1 through A-4

TABLE A-1.
Summary of Background Events for MW-1
Grand Haven Board of Light and Power - JG Sims Power Generation Plant
Grand Haven, Michigan

Analyte	Units	SCREENING/TARGET LEVELS			MW-1							
		MCL	SMCL	RL	Background Event #1	Background Event #2	Background Event #3	Background Event #4	Background Event #5	Background Event #6	Background Event #7	Background Event #8
				Sample Date:	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017
Appendix III												
BORON, TOTAL	mg/L	N/R	N/R	0.2	83	77	67	76	110	110	120	120
CALCIUM, TOTAL	mg/L	N/R	N/R	5	170	180	200	190	140	120	110	100
CHLORIDE, TOTAL	mg/L	N/R	**250**	1	180	170	150	160	190	170	180	180
FLUORIDE, TOTAL	mg/L	**4**	**2**	0.25	**13**	**15**	**12**	**14**	**18**	**18**	**20**	**19**
pH	S.U.	N/R	**6.5-8.5**	N/R	**9.22**	8.46	7.51	7.7	8.17	8.04	8.02	8.38
SULFATE, TOTAL	mg/L	N/R	**250**	1	**450**	**480**	**540**	**530**	**430**	190	22	13
TOTAL DISSOLVED SOLIDS	mg/L	N/R	**500**	20	**1900**	**1700**	**1900**	**1800**	**1900**	**1600**	**1600**	**1500**
Appendix IV												
ANTIMONY, TOTAL	mg/L	**0.006**	N/R	0.0020	0.00034 J	<0.0020	0.00084 J	0.00095 J	0.00064 J	<0.0020	<0.0020	<0.0020
ARSENIC, TOTAL	mg/L	**0.01**	N/R	0.0050	0.00069 J	0.00055 J	0.00075 J	0.0016 J	0.0011 J	0.00080 J	<0.0050	0.00080 J
BARIUM, TOTAL	mg/L	**2**	N/R	0.0050	0.34 B	0.32 B	0.22	0.27	0.27	0.29	0.56	0.63
BERYLLIUM, TOTAL	mg/L	**0.004**	N/R	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
CADMIUM, TOTAL	mg/L	**0.005**	N/R	0.0010	<0.0010	<0.0010	<0.0010	0.00076 J	<0.0010	<0.0010	<0.0010	<0.0010
CHROMIUM, TOTAL	mg/L	**0.1**	N/R	0.0020	0.00032 J	<0.0020	0.00041 J	0.0015 J	<0.0020	<0.0020	<0.0020	<0.0020
COBALT, TOTAL	mg/L	N/R	N/R	0.0010	0.00037 J	0.00030 J	0.00038 J	0.0012	0.00053 J	0.00042 J	0.00045 J	0.00050 J
LEAD, TOTAL	mg/L	**0.015**	N/R	0.0010	0.00065 J	0.00026 J B	0.00059 J	0.0016	0.00057 J	<0.0010	<0.0010	0.00063 J
LITHIUM, TOTAL	mg/L	N/R	N/R	0.0080	2.1 B	1.9	1.5 B	1.6	2.5	2.2	2.7	1.9
MERCURY, TOTAL	mg/L	**0.002**	N/R	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
MOLYBDENUM, TOTAL	mg/L	N/R	N/R	0.010	0.0023 J	0.0017 J	0.0022 J	0.0023 J	0.0025 J	0.0026 J	0.0014 J	0.0013 J
RADIUM (226 + 228)	pCi/L	**5**	N/R	Varies	0.308 U	0.181 U	0.346 U	0.458 U	0.0790 U	0.372 U	0.721	1.35 U
SELENIUM, TOTAL	mg/L	**0.05**	N/R	0.0050	0.00073 J	0.00059 J	0.0011 J	0.0018 J	<0.0050	<0.0050	<0.0050	0.0017 J
THALLIUM, TOTAL	mg/L	**0.002**	N/R	0.0010	<0.0010	<0.0010	<0.0010	0.00039 J	<0.0010	<0.0010	<0.0010	<0.0010

NOTES:

1. Bold Data exceeds MCL/SMCL.
2. mg/L - Milligrams per Liter
3. pCi/L - picocuries per Liter
4. N/R - Indicates consitiuent is not regulated by Hazardous Site Response Act
5. J - Result is an estimated value. The result is greater than or equal to the Method Detection Limit (MDL) and less than the Practical Quantitation Limit (PQL). Values are displayed as less than the PQL with a J.
6. < - Constituent was analyzed for, but was not detected above the MDL and is considered a non-detect. Value is displayed as less than the PQL.
7. MCL/SMCL - Maximum Contaminant Level/Secondary Contaminant Level - United States Environmental Protection Agency (USEPA) Table of Regulated Drinking Water Contaminants (updated June 2016). Available at https://www.epa.gov/ground-water- and-drinking-water/table-regulated-drinking-water-contaminants. USEPA Secondary Drinking Water Standards: Guidance for Nuisance Chemicals (updated January 2016). Available at https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.
8. Radium data is a combination of radium isotopes 226 and 228. When results are reported below the MDC (Minimum Detectable Concentration), data is displayed with an accompanying U. The MDC varies depending upon the sample amount and elapsed time of the measurement.

TABLE A-2.
Summary of Background Events for MW-2
Grand Haven Board of Light and Power - JG Sims Power Generation Plant
Grand Haven, Michigan

Analyte	Units	SCREENING/TARGET LEVELS			MW-2							
		MCL	SMCL	RL	Background Event #1	Background Event #2	Background Event #3	Background Event #4	Background Event #5	Background Event #6	Background Event #7	Background Event #8
				Sample Date:	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017
Appendix III												
BORON, TOTAL	mg/L	N/R	N/R	0.2	110	110	110	110	130	120	130	160
CALCIUM, TOTAL	mg/L	N/R	N/R	5	190	170	200	190	190	180	180	190
CHLORIDE, TOTAL	mg/L	N/R	**250**	1	140	150	130	140	150	160	150	160
FLUORIDE, TOTAL	mg/L	**4**	**2**	0.25	**10**	**12**	**11**	**14**	**12**	**14**	**14**	**12**
pH	S.U.	N/R	**6.5-8.5**	N/R	8.09	8.21	6.9	7.22	7.31	7.72	7.35	7.8
SULFATE, TOTAL	mg/L	N/R	**250**	1	13 J	12	<20	<20	<5	<10	<20	<10
TOTAL DISSOLVED SOLIDS	mg/L	N/R	**500**	20	**2100**	**1900**	**2000**	**1900**	**2300**	**2000**	**2100**	**2400**
Appendix IV												
ANTIMONY, TOTAL	mg/L	**0.006**	N/R	0.0020	0.00042 J	<0.0020	0.00060 J	**<0.020**	0.00068 J	<0.002	<0.002	**<0.020**
ARSENIC, TOTAL	mg/L	**0.01**	N/R	0.0050	0.0079	0.0056	0.0059	**<0.050**	0.0070	0.0067	0.0061	0.010 J
BARIUM, TOTAL	mg/L	**2**	N/R	0.0050	0.48 B	0.45 B	0.47	0.44	0.47	0.45	0.44	0.48
BERYLLIUM, TOTAL	mg/L	**0.004**	N/R	0.0010	<0.0010	<0.0010	<0.0010	**<0.010**	0.00077 J	<0.0010	<0.0010	**<0.010**
CADMIUM, TOTAL	mg/L	**0.005**	N/R	0.0010	<0.0010	<0.0010	<0.0010	**<0.010**	0.00025 J	<0.0010	0.00021 J	**<0.010**
CHROMIUM, TOTAL	mg/L	**0.1**	N/R	0.0020	0.046	0.037 B	0.043	0.048	0.060	0.053	0.053	0.073
COBALT, TOTAL	mg/L	N/R	N/R	0.0010	0.0092	0.0067	0.0074	0.0084 J	0.0087	0.0072	0.0068	0.0092 J
LEAD, TOTAL	mg/L	**0.015**	N/R	0.0010	0.0038	0.0027 B	0.0026	0.010	0.0057	0.0042	0.0034	0.0084 J
LITHIUM, TOTAL	mg/L	N/R	N/R	0.0080	1.6 B	1.5	1.6 B	1.3	1.7	1.6	1.2	1.5
MERCURY, TOTAL	mg/L	**0.002**	N/R	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.002
MOLYBDENUM, TOTAL	mg/L	N/R	N/R	0.010	0.017	0.014	0.012	<0.10	0.0069 J	0.0074 J	0.0051 J	<0.10
RADIUM (226 + 228)	pCi/L	**5**	N/R	Varies	1.34	0.430	1.02	1.56	1.89	1.85	2.27	3.01
SELENIUM, TOTAL	mg/L	**0.05**	N/R	0.0050	0.0025 J	0.0017 J	0.0022 J	<0.050	0.0027 J	0.0023 J	0.0028 J	0.014 J
THALLIUM, TOTAL	mg/L	**0.002**	N/R	0.0010	<0.0010	<0.0010	<0.0010	**<0.010**	<0.0010	<0.0010	<0.0010	**<0.010**

NOTES:

1. Bold Data exceeds MCL/SMCL.
2. mg/L - Milligrams per Liter
3. pCi/L - picocuries per Liter
4. N/R - Indicates consitiuent is not regulated by Hazardous Site Response Act
5. J - Result is an estimated value. The result is greater than or equal to the Method Detection Limit (MDL) and less than the Practical Quantitation Limit (PQL). Values are displayed as less than the PQL with a J.
6. < - Constituent was analyzed for, but was not detected above the MDL and is considered a non-detect. Value is displayed as less than the PQL.
7. MCL/SMCL - Maximum Contaminant Level/Secondary Contaminant Level - United States Environmental Protection Agency (USEPA) Table of Regulated Drinking Water Contaminants (updated June 2016). Available at https://www.epa.gov/ground-water- and-drinking-water/table-regulated-drinking-water-contaminants. USEPA Secondary Drinking Water Standards: Guidance for Nuisance Chemicals (updated January 2016). Available at https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.
8. Radium data is a combination of radium isotopes 226 and 228. When results are reported below the MDC (Minimum Detectable Concentration), data is displayed with an accompanying U. The MDC varies depending upon the sample amount and elapsed time of the measurement.

TABLE A-3.
Summary of Background Events for MW-3
Grand Haven Board of Light and Power - JG Sims Power Generation Plant
Grand Haven, Michigan

Analyte	Units	SCREENING/TARGET LEVELS			MW-3							
		MCL	SMCL	RL	Background Event #1	Background Event #2	Background Event #3	Background Event #4	Background Event #5	Background Event #6	Background Event #7	Background Event #8
				Sample Date:	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017
Appendix III												
BORON, TOTAL	mg/L	N/R	N/R	0.2	5	4.9	5.6	6.4	5.9	4.8	4.9	4.7
CALCIUM, TOTAL	mg/L	N/R	N/R	5	660	620	600	620	590	540	590	520
CHLORIDE, TOTAL	mg/L	N/R	**250**	1	**570**	**620**	**450**	**480**	**450**	**370**	**400**	**370**
FLUORIDE, TOTAL	mg/L	**4**	**2**	0.25	0.74 J	0.97	1.3	1.9	1.7	1.6	1.2	1.2
pH	S.U.	N/R	**6.5-8.5**	N/R	7.91	7.14	**6.27**	6.92	7.07	7.7	7.44	7.61
SULFATE, TOTAL	mg/L	N/R	**250**	1	**1300**	**1200**	**1200**	**1500**	**990**	**580**	**820**	**600**
TOTAL DISSOLVED SOLIDS	mg/L	N/R	**500**	20	**4000**	**3600**	**3900**	4100	**3600**	**3000**	3100	**2700**
Appendix IV												
ANTIMONY, TOTAL	mg/L	**0.006**	N/R	0.0020	<0.0020	<0.0020	0.00041 J	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
ARSENIC, TOTAL	mg/L	**0.01**	N/R	0.0050	0.0024 J	0.0021 J	0.0017 J	0.0020 J	0.0027 J	0.0029 J	0.0025 J	0.0021 J
BARIUM, TOTAL	mg/L	**2**	N/R	0.0050	0.31 B	0.36 B	0.25	0.21	0.31	0.37	0.41	0.4
BERYLLIUM, TOTAL	mg/L	**0.004**	N/R	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
CADMIUM, TOTAL	mg/L	**0.005**	N/R	0.0010	<0.0010	<0.0010	<0.0010	0.00033 J	<0.0010	<0.0010	<0.0010	<0.0010
CHROMIUM, TOTAL	mg/L	**0.1**	N/R	0.0020	0.0014 J	0.0014 J B	0.0014 J	0.0015 J	0.0018 J	0.0015 J	0.0014 J	0.0013 J
COBALT, TOTAL	mg/L	N/R	N/R	0.0010	0.00097 J	0.00097 J	0.00080 J	0.00099 J	0.0016	0.0013	0.00079 J	0.00081 J
LEAD, TOTAL	mg/L	**0.015**	N/R	0.0010	0.00038 J	0.00045 J B	0.00026 J	0.00079 J	< 0.0010	< 0.0010	< 0.0010	< 0.0010
LITHIUM, TOTAL	mg/L	N/R	N/R	0.0080	0.079 B	0.064	0.081 B	0.097	0.076	0.066	0.057	0.054
MERCURY, TOTAL	mg/L	**0.002**	N/R	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
MOLYBDENUM, TOTAL	mg/L	N/R	N/R	0.010	0.0070 J	0.0049 J	0.0076 J	0.0099 J	0.0065 J	0.0034 J	0.0015 J	<0.010
RADIUM (226 + 228)	pCi/L	**5**	N/R	Varies	0.731	0.392	0.190 U	0.666	0.502	0.874	1.38	1.96
SELENIUM, TOTAL	mg/L	**0.05**	N/R	0.0050	0.0012 J	0.0012 J	0.0013 J	0.0016 J	0.0012 J	<0.0050	0.00094 J	0.0015 J
THALLIUM, TOTAL	mg/L	**0.002**	N/R	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

NOTES:

1. Bold Data exceeds MCL/SMCL.
2. mg/L - Milligrams per Liter
3. pCi/L - picocuries per Liter
4. N/R - Indicates consitiuent is not regulated by Hazardous Site Response Act
5. J - Result is an estimated value. The result is greater than or equal to the Method Detection Limit (MDL) and less than the Practical Quantitation Limit (PQL). Values are displayed as less than the PQL with a J.
6. < - Constituent was analyzed for, but was not detected above the MDL and is considered a non-detect. Value is displayed as less than the PQL.
7. MCL/SMCL - Maximum Contaminant Level/Secondary Contaminant Level - United States Environmental Protection Agency (USEPA) Table of Regulated Drinking Water Contaminants (updated June 2016). Available at https://www.epa.gov/ground-water- and-drinking-water/table-regulated-drinking-water-contaminants. USEPA Secondary Drinking Water Standards: Guidance for Nuisance Chemicals (updated January 2016). Available at https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.
8. Radium data is a combination of radium isotopes 226 and 228. When results are reported below the MDC (Minimum Detectable Concentration), data is displayed with an accompanying U. The MDC varies depending upon the sample amount and elapsed time of the measurement.

TABLE A-4.
Summary of Background Events for MW-4
Grand Haven Board of Light and Power - JG Sims Power Generation Plant
Grand Haven, Michigan

Analyte	Units	SCREENING/TARGET LEVELS			MW-4							
		MCL	SMCL	RL	Background Event #1	Background Event #2	Background Event #3	Background Event #4	Background Event #5	Background Event #6	Background Event #7	Background Event #8
				Sample Date:	3/13/2017	4/5/2017	4/24/2017	5/15/2017	6/5/2017	6/26/2017	7/17/2017	8/7/2017
Appendix III												
BORON, TOTAL	mg/L	N/R	N/R	0.2	3.2	3.4	3.8	3.6	3.9	3.6	3.7	4
CALCIUM, TOTAL	mg/L	N/R	N/R	5	480	470	500	450	450	460	510	470
CHLORIDE, TOTAL	mg/L	N/R	**250**	1	**360**	**390**	**350**	**370**	**360**	**360**	**340**	**280**
FLUORIDE, TOTAL	mg/L	**4**	**2**	0.25	0.84	1.3	1	1.2	1.4	1.2	1.3	1.3
pH	S.U.	N/R	**6.5-8.5**	N/R	8.34	8.1	6.37	7.2	7.36	7.76	7.51	7.72
SULFATE, TOTAL	mg/L	N/R	**250**	1	**890**	**940**	**830**	**940**	**880**	**920**	**940**	**740**
TOTAL DISSOLVED SOLIDS	mg/L	N/R	**500**	20	**2200**	**2400**	**2500**	**2100**	**2400**	**3100**	**2600**	**2000**
Appendix IV												
ANTIMONY, TOTAL	mg/L	**0.006**	N/R	0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
ARSENIC, TOTAL	mg/L	**0.01**	N/R	0.0050	0.0013 J	0.0013 J	0.0012 J	0.0015 J	0.0019 J	0.0020 J	0.0020 J	0.0018 J
BARIUM, TOTAL	mg/L	**2**	N/R	0.0050	0.13 B	0.13 B	0.14	0.14	0.16	0.18	0.17	0.19
BERYLLIUM, TOTAL	mg/L	**0.004**	N/R	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
CADMIUM, TOTAL	mg/L	**0.005**	N/R	0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
CHROMIUM, TOTAL	mg/L	**0.1**	N/R	0.0020	0.0019 J	0.0018 J B	0.0021	0.0021	0.0021	0.0017 J	0.0019 J	0.0016 J
COBALT, TOTAL	mg/L	N/R	N/R	0.0010	0.00033 J	0.00033 J	0.00039 J	0.00031 J	0.00040 J	0.00058 J	0.00048 J	0.00045 J
LEAD, TOTAL	mg/L	**0.015**	N/R	0.0010	0.00028 J	0.00032 J B	0.00019 J	0.00051 J	< 0.0010	< 0.0010	< 0.0010	< 0.0010
LITHIUM, TOTAL	mg/L	N/R	N/R	0.0080	0.053 B	0.047	0.058 B	0.051	0.049	0.051	0.048	0.046
MERCURY, TOTAL	mg/L	**0.002**	N/R	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
MOLYBDENUM, TOTAL	mg/L	N/R	N/R	0.010	0.0014 J	0.0015 J	0.0017 J	0.0015 J	0.0012 J	0.0032 J	0.0016 J	<0.010
RADIUM (226 + 228)	pCi/L	**5**	N/R	Varies	1.05	0.515	0.413	0.252 U	0.342	0.671	0.879	1.99
SELENIUM, TOTAL	mg/L	**0.05**	N/R	0.0050	0.00063 J	< 0.0050	0.00065 J	< 0.0050	< 0.0050	<0.0050	<0.0050	0.0013 J
THALLIUM, TOTAL	mg/L	**0.002**	N/R	0.0010	<0.0010	<0.0010	<0.0010	0.00039 J	<0.0010	<0.0010	<0.0010	<0.0010

NOTES:

1. Bold Data exceeds MCL/SMCL.
2. mg/L - Milligrams per Liter
3. pCi/L - picocuries per Liter
4. N/R - Indicates consitiuent is not regulated by Hazardous Site Response Act
5. J - Result is an estimated value. The result is greater than or equal to the Method Detection Limit (MDL) and less than the Practical Quantitation Limit (PQL). Values are displayed as less than the PQL with a J.
6. < - Constituent was analyzed for, but was not detected above the MDL and is considered a non-detect. Value is displayed as less than the PQL.
7. MCL/SMCL - Maximum Contaminant Level/Secondary Contaminant Level - United States Environmental Protection Agency (USEPA) Table of Regulated Drinking Water Contaminants (updated June 2016). Available at https://www.epa.gov/ground-water- and-drinking-water/table-regulated-drinking-water-contaminants. USEPA Secondary Drinking Water Standards: Guidance for Nuisance Chemicals (updated January 2016). Available at https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.
8. Radium data is a combination of radium isotopes 226 and 228. When results are reported below the MDC (Minimum Detectable Concentration), data is displayed with an accompanying U. The MDC varies depending upon the sample amount and elapsed time of the measurement.

APPENDIX A-1

FIRST BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-76693-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
4/13/2017 3:26:51 PM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
B	Compound was found in the blank and sample.
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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
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)

Job ID: 240-76693-1

Laboratory: TestAmerica Canton

Narrative

CASE NARRATIVE

Client: ERM-North Central Inc

Project: Grand Haven BLP - CCR Monitoring

Report Number: 240-76693-1

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

The Radium analysis was performed at TestAmerica St. Louis Laboratory.

TestAmerica Canton attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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

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

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 3/14/2017 10:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.5º C.

TOTAL RECOVERABLE METALS (ICP)

Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for total recoverable metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 03/15/2017 and analyzed on 03/16/2017.

Samples MW-1 (240-76693-1)[20X] and MW-2 (240-76693-2)[20X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

TOTAL RECOVERABLE METALS (ICPMS)

Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for total recoverable metals (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 03/15/2017 and analyzed on 03/16/2017.

Job ID: 240-76693-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

Barium and Lithium were detected in method blank MB 240-270651/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates, and have been flagged. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Refer to the QC report for details.

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

TOTAL MERCURY
Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for total mercury in accordance with EPA SW-846 Methods 7470A. The samples were prepared on 03/15/2017 and analyzed on 03/17/2017.

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

TOTAL DISSOLVED SOLIDS
Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for total dissolved solids in accordance with SM 2540C. The samples were analyzed on 03/20/2017.

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

ANIONS
Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for anions in accordance with EPA SW-846 Method 9056A. The samples were analyzed on 03/17/2017.

Chloride and Fluoride exceeded the RPD limit for the MSD of sample 240-76631-15 in batch 240-271028.

Refer to the QC report for details.

Samples MW-1 (240-76693-1)[10X], MW-2 (240-76693-2)[20X], MW-3 (240-76693-3)[20X] and MW-4 (240-76693-4)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

N Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-76693-2) and MW-3 (240-76693-3). Elevated reporting limits (RLs) are provided.

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

RADIUM-226
Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for Radium-226 in accordance with SW846 Method 9315. The samples were prepared on 03/20/2017 and analyzed on 04/11/2017.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-298367:
The following sample was reduced to 750 mL due to lots of sediment that turned the sample dark brown.

MW-2 (240-76693-2)

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

RADIUM-228 (GFPC)
Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for Radium-228 (GFPC) in accordance with SW846 Method 9320. The samples were prepared on 03/20/2017 and analyzed on 03/31/2017.

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

COMBINED RADIUM 226 AND RADIUM 228
Samples MW-1 (240-76693-1), MW-2 (240-76693-2), MW-3 (240-76693-3) and MW-4 (240-76693-4) were analyzed for Combined Radium

Job ID: 240-76693-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

226 and Radium 228 in accordance with Ra226_Ra228. The samples were analyzed on 04/12/2017.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-298534:
The following sample was reduced to 750 mL due to lots of sediment that turned the sample dark brown.

MW-2 (240-76693-2)

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-76693-1	MW-1	Water	03/13/17 10:30	03/14/17 10:15
240-76693-2	MW-2	Water	03/13/17 11:30	03/14/17 10:15
240-76693-3	MW-3	Water	03/13/17 13:05	03/14/17 10:15
240-76693-4	MW-4	Water	03/13/17 14:10	03/14/17 10:15

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-1 — Lab Sample ID: 240-76693-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	83000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	170000		100000	14000	ug/L	20		6010C	Total Recoverable
Antimony	0.00034	J	0.0020	0.00027	mg/L	1		6020A	Total Recoverable
Arsenic	0.00069	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.34	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00037	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.00032	J	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0023	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00065	J	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.00073	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	2.1	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	180		10	4.1	mg/L	10		9056A	Total/NA
Fluoride	13		0.50	0.090	mg/L	10		9056A	Total/NA
Sulfate	450		10	1.3	mg/L	10		9056A	Total/NA
Total Dissolved Solids	1900		20	15	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-76693-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	190000		100000	14000	ug/L	20		6010C	Total Recoverable
Antimony	0.00042	J	0.0020	0.00027	mg/L	1		6020A	Total Recoverable
Arsenic	0.0079		0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.48	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.0092		0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.046		0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.017		0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.0038		0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0025	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	1.6	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	140		20	8.1	mg/L	20		9056A	Total/NA
Fluoride	10		1.0	0.18	mg/L	20		9056A	Total/NA
Sulfate	13	J	20	2.6	mg/L	20		9056A	Total/NA
Total Dissolved Solids	2100		50	37	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-3 — Lab Sample ID: 240-76693-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	5000		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	660000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0024	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.31	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00097	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.0014	J	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0070	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00038	J	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0012	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	0.079	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	570		20	8.1	mg/L	20		9056A	Total/NA
Fluoride	0.74	J	1.0	0.18	mg/L	20		9056A	Total/NA
Sulfate	1300		20	2.6	mg/L	20		9056A	Total/NA
Total Dissolved Solids	4000		50	37	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 240-76693-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3200		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	480000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0013	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.13	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00033	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.0019	J	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0014	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00028	J	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.00063	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	0.053	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	360		10	4.1	mg/L	10		9056A	Total/NA
Fluoride	0.84		0.50	0.090	mg/L	10		9056A	Total/NA
Sulfate	890		10	1.3	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2200		40	30	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 03/13/17 10:30
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**83000**		4000	160	ug/L		03/15/17 14:00	03/16/17 17:40	20
Calcium	**170000**		100000	14000	ug/L		03/15/17 14:00	03/16/17 17:40	20

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.00034**	**J**	0.0020	0.00027	mg/L		03/15/17 14:00	03/16/17 14:24	1
Arsenic	**0.00069**	**J**	0.0050	0.00035	mg/L		03/15/17 14:00	03/16/17 14:24	1
Barium	**0.34**	**B**	0.0050	0.00052	mg/L		03/15/17 14:00	03/16/17 14:24	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		03/15/17 14:00	03/16/17 14:24	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		03/15/17 14:00	03/16/17 14:24	1
Cobalt	**0.00037**	**J**	0.0010	0.00013	mg/L		03/15/17 14:00	03/16/17 14:24	1
Chromium	**0.00032**	**J**	0.0020	0.00026	mg/L		03/15/17 14:00	03/16/17 14:24	1
Molybdenum	**0.0023**	**J**	0.010	0.00051	mg/L		03/15/17 14:00	03/16/17 14:24	1
Lead	**0.00065**	**J**	0.0010	0.00016	mg/L		03/15/17 14:00	03/16/17 14:24	1
Selenium	**0.00073**	**J**	0.0050	0.00048	mg/L		03/15/17 14:00	03/16/17 14:24	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		03/15/17 14:00	03/16/17 14:24	1
Lithium	**2.1**	**B**	0.0080	0.00016	mg/L		03/15/17 14:00	03/16/17 14:24	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		03/15/17 14:00	03/17/17 08:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**180**		10	4.1	mg/L			03/17/17 19:24	10
Fluoride	**13**		0.50	0.090	mg/L			03/17/17 19:24	10
Sulfate	**450**		10	1.3	mg/L			03/17/17 19:24	10
Total Dissolved Solids	**1900**		20	15	mg/L			03/20/17 09:50	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.158**		0.0835	0.0847	1.00	0.0979	pCi/L	03/20/17 08:32	04/11/17 08:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*03/20/17 08:32*	*04/11/17 08:14*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.150	U	0.276	0.276	1.00	0.468	pCi/L	03/20/17 09:03	03/31/17 10:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.4*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*
Y Carrier	*69.9*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-1
Date Collected: 03/13/17 10:30
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.308	U	0.288	0.289	5.00	0.468	pCi/L		04/12/17 13:25	1

Client Sample ID: MW-2

Date Collected: 03/13/17 11:30
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-2

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**110000**		4000	160	ug/L		03/15/17 14:00	03/16/17 17:44	20
Calcium	**190000**		100000	14000	ug/L		03/15/17 14:00	03/16/17 17:44	20

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.00042**	**J**	0.0020	0.00027	mg/L		03/15/17 14:00	03/16/17 14:28	1
Arsenic	**0.0079**		0.0050	0.00035	mg/L		03/15/17 14:00	03/16/17 14:28	1
Barium	**0.48**	**B**	0.0050	0.00052	mg/L		03/15/17 14:00	03/16/17 14:28	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		03/15/17 14:00	03/16/17 14:28	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		03/15/17 14:00	03/16/17 14:28	1
Cobalt	**0.0092**		0.0010	0.00013	mg/L		03/15/17 14:00	03/16/17 14:28	1
Chromium	**0.046**		0.0020	0.00026	mg/L		03/15/17 14:00	03/16/17 14:28	1
Molybdenum	**0.017**		0.010	0.00051	mg/L		03/15/17 14:00	03/16/17 14:28	1
Lead	**0.0038**		0.0010	0.00016	mg/L		03/15/17 14:00	03/16/17 14:28	1
Selenium	**0.0025**	**J**	0.0050	0.00048	mg/L		03/15/17 14:00	03/16/17 14:28	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		03/15/17 14:00	03/16/17 14:28	1
Lithium	**1.6**	**B**	0.0080	0.00016	mg/L		03/15/17 14:00	03/16/17 14:28	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		03/15/17 14:00	03/17/17 08:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**140**		20	8.1	mg/L			03/17/17 15:43	20
Fluoride	**10**		1.0	0.18	mg/L			03/17/17 15:43	20
Sulfate	**13**	**J**	20	2.6	mg/L			03/17/17 15:43	20
Total Dissolved Solids	**2100**		50	37	mg/L			03/20/17 09:50	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.670**		0.178	0.188	1.00	0.131	pCi/L	03/20/17 08:32	04/11/17 08:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*03/20/17 08:32*	*04/11/17 08:14*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.669	U	0.444	0.448	1.00	0.691	pCi/L	03/20/17 09:03	03/31/17 10:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*
Y Carrier	*72.5*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-2
Date Collected: 03/13/17 11:30
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.34		0.478	0.486	5.00	0.691	pCi/L		04/12/17 13:25	1

Client Sample ID: MW-3

Date Collected: 03/13/17 13:05
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**5000**		200	8.1	ug/L		03/15/17 14:00	03/16/17 17:49	1
Calcium	**660000**		5000	710	ug/L		03/15/17 14:00	03/16/17 17:49	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		03/15/17 14:00	03/16/17 14:32	1
Arsenic	**0.0024**	**J**	0.0050	0.00035	mg/L		03/15/17 14:00	03/16/17 14:32	1
Barium	**0.31**	**B**	0.0050	0.00052	mg/L		03/15/17 14:00	03/16/17 14:32	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		03/15/17 14:00	03/16/17 14:32	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		03/15/17 14:00	03/16/17 14:32	1
Cobalt	**0.00097**	**J**	0.0010	0.00013	mg/L		03/15/17 14:00	03/16/17 14:32	1
Chromium	**0.0014**	**J**	0.0020	0.00026	mg/L		03/15/17 14:00	03/16/17 14:32	1
Molybdenum	**0.0070**	**J**	0.010	0.00051	mg/L		03/15/17 14:00	03/16/17 14:32	1
Lead	**0.00038**	**J**	0.0010	0.00016	mg/L		03/15/17 14:00	03/16/17 14:32	1
Selenium	**0.0012**	**J**	0.0050	0.00048	mg/L		03/15/17 14:00	03/16/17 14:32	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		03/15/17 14:00	03/16/17 14:32	1
Lithium	**0.079**	**B**	0.0080	0.00016	mg/L		03/15/17 14:00	03/16/17 14:32	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		03/15/17 14:00	03/17/17 08:28	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**570**		20	8.1	mg/L			03/17/17 16:03	20
Fluoride	**0.74**	**J**	1.0	0.18	mg/L			03/17/17 16:03	20
Sulfate	**1300**		20	2.6	mg/L			03/17/17 16:03	20
Total Dissolved Solids	**4000**		50	37	mg/L			03/20/17 09:50	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.279**		0.105	0.108	1.00	0.104	pCi/L	03/20/17 08:32	04/11/17 08:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*03/20/17 08:32*	*04/11/17 08:14*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.452	U	0.309	0.312	1.00	0.481	pCi/L	03/20/17 09:03	03/31/17 10:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*
Y Carrier	*73.3*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-3
Date Collected: 03/13/17 13:05
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.731		0.327	0.330	5.00	0.481	pCi/L		04/12/17 13:25	1

Client Sample ID: MW-4

Date Collected: 03/13/17 14:10
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-4

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**3200**		200	8.1	ug/L		03/15/17 14:00	03/16/17 17:53	1
Calcium	**480000**		5000	710	ug/L		03/15/17 14:00	03/16/17 17:53	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		03/15/17 14:00	03/16/17 14:36	1
Arsenic	**0.0013**	**J**	0.0050	0.00035	mg/L		03/15/17 14:00	03/16/17 14:36	1
Barium	**0.13**	**B**	0.0050	0.00052	mg/L		03/15/17 14:00	03/16/17 14:36	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		03/15/17 14:00	03/16/17 14:36	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		03/15/17 14:00	03/16/17 14:36	1
Cobalt	**0.00033**	**J**	0.0010	0.00013	mg/L		03/15/17 14:00	03/16/17 14:36	1
Chromium	**0.0019**	**J**	0.0020	0.00026	mg/L		03/15/17 14:00	03/16/17 14:36	1
Molybdenum	**0.0014**	**J**	0.010	0.00051	mg/L		03/15/17 14:00	03/16/17 14:36	1
Lead	**0.00028**	**J**	0.0010	0.00016	mg/L		03/15/17 14:00	03/16/17 14:36	1
Selenium	**0.00063**	**J**	0.0050	0.00048	mg/L		03/15/17 14:00	03/16/17 14:36	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		03/15/17 14:00	03/16/17 14:36	1
Lithium	**0.053**	**B**	0.0080	0.00016	mg/L		03/15/17 14:00	03/16/17 14:36	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		03/15/17 14:00	03/17/17 08:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**360**		10	4.1	mg/L			03/17/17 16:23	10
Fluoride	**0.84**		0.50	0.090	mg/L			03/17/17 16:23	10
Sulfate	**890**		10	1.3	mg/L			03/17/17 16:23	10
Total Dissolved Solids	**2200**		40	30	mg/L			03/20/17 09:50	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.102	U	0.0752	0.0757	1.00	0.106	pCi/L	03/20/17 08:32	04/11/17 08:14	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*03/20/17 08:32*	*04/11/17 08:14*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.946**		0.335	0.346	1.00	0.455	pCi/L	03/20/17 09:03	03/31/17 10:50	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.7*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*
Y Carrier	*74.0*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:50*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-4
Date Collected: 03/13/17 14:10
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.05		0.343	0.354	5.00	0.455	pCi/L		04/12/17 13:25	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba (40-110)
240-76693-1	MW-1	91.4
240-76693-2	MW-2	93.2
240-76693-3	MW-3	89.7
240-76693-4	MW-4	89.7
LCS 160-298367/2-A	Lab Control Sample	102
MB 160-298367/1-A	Method Blank	97.6

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-76693-1	MW-1	91.4	69.9
240-76693-2	MW-2	93.2	72.5
240-76693-3	MW-3	89.7	73.3
240-76693-4	MW-4	89.7	74.0
LCS 160-298534/2-A	Lab Control Sample	102	78.5
MB 160-298534/1-A	Method Blank	97.6	73.6

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-270651/1-A
Matrix: Water
Analysis Batch: 270927

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 270651

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		03/15/17 14:00	03/16/17 16:52	1
Calcium	5000	U	5000	710	ug/L		03/15/17 14:00	03/16/17 16:52	1

Lab Sample ID: LCS 240-270651/2-A
Matrix: Water
Analysis Batch: 270927

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 270651

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1030		ug/L		103	80 - 120
Calcium	50000	50400		ug/L		101	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-270651/1-A
Matrix: Water
Analysis Batch: 270964

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 270651

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		03/15/17 14:00	03/16/17 13:38	1
Arsenic	0.0050	U	0.0050	0.00035	mg/L		03/15/17 14:00	03/16/17 13:38	1
Barium	0.000751	J	0.0050	0.00052	mg/L		03/15/17 14:00	03/16/17 13:38	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		03/15/17 14:00	03/16/17 13:38	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		03/15/17 14:00	03/16/17 13:38	1
Cobalt	0.0010	U	0.0010	0.00013	mg/L		03/15/17 14:00	03/16/17 13:38	1
Chromium	0.0020	U	0.0020	0.00026	mg/L		03/15/17 14:00	03/16/17 13:38	1
Molybdenum	0.010	U	0.010	0.00051	mg/L		03/15/17 14:00	03/16/17 13:38	1
Lead	0.0010	U	0.0010	0.00016	mg/L		03/15/17 14:00	03/16/17 13:38	1
Selenium	0.0050	U	0.0050	0.00048	mg/L		03/15/17 14:00	03/16/17 13:38	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		03/15/17 14:00	03/16/17 13:38	1
Lithium	0.000355	J	0.0080	0.00016	mg/L		03/15/17 14:00	03/16/17 13:38	1

Lab Sample ID: LCS 240-270651/3-A
Matrix: Water
Analysis Batch: 270964

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 270651

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.0967		mg/L		97	80 - 120
Arsenic	1.00	1.01		mg/L		101	80 - 120
Barium	1.00	1.06		mg/L		106	80 - 120
Beryllium	1.00	1.17		mg/L		117	80 - 120
Cadmium	1.00	1.05		mg/L		105	80 - 120
Cobalt	1.00	0.992		mg/L		99	80 - 120
Chromium	1.00	0.944		mg/L		94	80 - 120
Molybdenum	0.100	0.0957		mg/L		96	80 - 120
Lead	1.00	0.964		mg/L		96	80 - 120
Selenium	1.00	1.04		mg/L		104	80 - 120
Thallium	0.250	0.239		mg/L		96	80 - 120
Lithium	0.100	0.103		mg/L		103	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-270654/1-A
Matrix: Water
Analysis Batch: 271008

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 270654

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		03/15/17 14:00	03/17/17 07:59	1

Lab Sample ID: LCS 240-270654/2-A
Matrix: Water
Analysis Batch: 271008

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 270654

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00490		mg/L		98	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-271028/3
Matrix: Water
Analysis Batch: 271028

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.41	mg/L			03/17/17 12:59	1
Fluoride	0.050	U	0.050	0.0090	mg/L			03/17/17 12:59	1
Sulfate	1.0	U	1.0	0.13	mg/L			03/17/17 12:59	1

Lab Sample ID: LCS 240-271028/4
Matrix: Water
Analysis Batch: 271028

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	53.4		mg/L		107	90 - 110
Fluoride	2.50	2.55		mg/L		102	90 - 110
Sulfate	50.0	53.7		mg/L		107	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-271165/1
Matrix: Water
Analysis Batch: 271165

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.4	mg/L			03/20/17 09:50	1

Lab Sample ID: LCS 240-271165/2
Matrix: Water
Analysis Batch: 271165

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	208	218		mg/L		105	80 - 120

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-298367/1-A
Matrix: Water
Analysis Batch: 302767

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 298367

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.04429	U	0.0626	0.0627	1.00	0.106	pCi/L	03/20/17 08:32	04/11/17 05:58	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*03/20/17 08:32*	*04/11/17 05:58*	*1*

Lab Sample ID: LCS 160-298367/2-A
Matrix: Water
Analysis Batch: 302767

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 298367

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	10.37		1.08	1.00	0.111	pCi/L	91	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*102*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-298534/1-A
Matrix: Water
Analysis Batch: 300932

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 298534

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.06775	U	0.235	0.235	1.00	0.409	pCi/L	03/20/17 09:03	03/31/17 10:44	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:44*	*1*
Y Carrier	*73.6*		*40 - 110*	*03/20/17 09:03*	*03/31/17 10:44*	*1*

Lab Sample ID: LCS 160-298534/2-A
Matrix: Water
Analysis Batch: 300932

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 298534

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.6	14.87		1.58	1.00	0.340	pCi/L	109	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*102*		*40 - 110*
Y Carrier	*78.5*		*40 - 110*

Metals

Prep Batch: 270651

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total Recoverable	Water	3005A	
240-76693-2	MW-2	Total Recoverable	Water	3005A	
240-76693-3	MW-3	Total Recoverable	Water	3005A	
240-76693-4	MW-4	Total Recoverable	Water	3005A	
MB 240-270651/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-270651/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-270651/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 270654

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total/NA	Water	7470A	
240-76693-2	MW-2	Total/NA	Water	7470A	
240-76693-3	MW-3	Total/NA	Water	7470A	
240-76693-4	MW-4	Total/NA	Water	7470A	
MB 240-270654/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-270654/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 270927

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total Recoverable	Water	6010C	270651
240-76693-2	MW-2	Total Recoverable	Water	6010C	270651
240-76693-3	MW-3	Total Recoverable	Water	6010C	270651
240-76693-4	MW-4	Total Recoverable	Water	6010C	270651
MB 240-270651/1-A	Method Blank	Total Recoverable	Water	6010C	270651
LCS 240-270651/2-A	Lab Control Sample	Total Recoverable	Water	6010C	270651

Analysis Batch: 270964

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total Recoverable	Water	6020A	270651
240-76693-2	MW-2	Total Recoverable	Water	6020A	270651
240-76693-3	MW-3	Total Recoverable	Water	6020A	270651
240-76693-4	MW-4	Total Recoverable	Water	6020A	270651
MB 240-270651/1-A	Method Blank	Total Recoverable	Water	6020A	270651
LCS 240-270651/3-A	Lab Control Sample	Total Recoverable	Water	6020A	270651

Analysis Batch: 271008

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total/NA	Water	7470A	270654
240-76693-2	MW-2	Total/NA	Water	7470A	270654
240-76693-3	MW-3	Total/NA	Water	7470A	270654
240-76693-4	MW-4	Total/NA	Water	7470A	270654
MB 240-270654/1-A	Method Blank	Total/NA	Water	7470A	270654
LCS 240-270654/2-A	Lab Control Sample	Total/NA	Water	7470A	270654

General Chemistry

Analysis Batch: 271028

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total/NA	Water	9056A	
240-76693-2	MW-2	Total/NA	Water	9056A	

General Chemistry (Continued)

Analysis Batch: 271028 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-3	MW-3	Total/NA	Water	9056A	
240-76693-4	MW-4	Total/NA	Water	9056A	
MB 240-271028/3	Method Blank	Total/NA	Water	9056A	
LCS 240-271028/4	Lab Control Sample	Total/NA	Water	9056A	

Analysis Batch: 271165

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total/NA	Water	SM 2540C	
240-76693-2	MW-2	Total/NA	Water	SM 2540C	
240-76693-3	MW-3	Total/NA	Water	SM 2540C	
240-76693-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-271165/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-271165/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Rad

Prep Batch: 298367

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total/NA	Water	PrecSep-21	
240-76693-2	MW-2	Total/NA	Water	PrecSep-21	
240-76693-3	MW-3	Total/NA	Water	PrecSep-21	
240-76693-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-298367/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-298367/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 298534

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-76693-1	MW-1	Total/NA	Water	PrecSep_0	
240-76693-2	MW-2	Total/NA	Water	PrecSep_0	
240-76693-3	MW-3	Total/NA	Water	PrecSep_0	
240-76693-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-298534/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-298534/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-1

Date Collected: 03/13/17 10:30
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	270927	03/16/17 17:40	KLC	TAL CAN
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	270964	03/16/17 14:24	AS1	TAL CAN
Total/NA	Prep	7470A			270654	03/15/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	271008	03/17/17 08:24	WKD	TAL CAN
Total/NA	Analysis	9056A		10	271028	03/17/17 19:24	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	271165	03/20/17 09:50	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			298367	03/20/17 08:32	MBC	TAL SL
Total/NA	Analysis	9315		1	302767	04/11/17 08:14	RTM	TAL SL
Total/NA	Prep	PrecSep_0			298534	03/20/17 09:03	MBC	TAL SL
Total/NA	Analysis	9320		1	300933	03/31/17 10:50	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	303287	04/12/17 13:25	MLK	TAL SL

Client Sample ID: MW-2

Date Collected: 03/13/17 11:30
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	270927	03/16/17 17:44	KLC	TAL CAN
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	270964	03/16/17 14:28	AS1	TAL CAN
Total/NA	Prep	7470A			270654	03/15/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	271008	03/17/17 08:26	WKD	TAL CAN
Total/NA	Analysis	9056A		20	271028	03/17/17 15:43	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	271165	03/20/17 09:50	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			298367	03/20/17 08:32	MBC	TAL SL
Total/NA	Analysis	9315		1	302767	04/11/17 08:14	RTM	TAL SL
Total/NA	Prep	PrecSep_0			298534	03/20/17 09:03	MBC	TAL SL
Total/NA	Analysis	9320		1	300933	03/31/17 10:50	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	303287	04/12/17 13:25	MLK	TAL SL

Client Sample ID: MW-3

Date Collected: 03/13/17 13:05
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	270927	03/16/17 17:49	KLC	TAL CAN
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	270964	03/16/17 14:32	AS1	TAL CAN

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Client Sample ID: MW-3

Date Collected: 03/13/17 13:05
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	7470A			270654	03/15/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	271008	03/17/17 08:28	WKD	TAL CAN
Total/NA	Analysis	9056A		20	271028	03/17/17 16:03	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	271165	03/20/17 09:50	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			298367	03/20/17 08:32	MBC	TAL SL
Total/NA	Analysis	9315		1	302767	04/11/17 08:14	RTM	TAL SL
Total/NA	Prep	PrecSep_0			298534	03/20/17 09:03	MBC	TAL SL
Total/NA	Analysis	9320		1	300933	03/31/17 10:50	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	303287	04/12/17 13:25	MLK	TAL SL

Client Sample ID: MW-4

Date Collected: 03/13/17 14:10
Date Received: 03/14/17 10:15

Lab Sample ID: 240-76693-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	270927	03/16/17 17:53	KLC	TAL CAN
Total Recoverable	Prep	3005A			270651	03/15/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	270964	03/16/17 14:36	AS1	TAL CAN
Total/NA	Prep	7470A			270654	03/15/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	271008	03/17/17 08:30	WKD	TAL CAN
Total/NA	Analysis	9056A		10	271028	03/17/17 16:23	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	271165	03/20/17 09:50	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			298367	03/20/17 08:32	MBC	TAL SL
Total/NA	Analysis	9315		1	302767	04/11/17 08:14	RTM	TAL SL
Total/NA	Prep	PrecSep_0			298534	03/20/17 09:03	MBC	TAL SL
Total/NA	Analysis	9320		1	300933	03/31/17 10:50	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	303287	04/12/17 13:25	MLK	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-76693-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17
West Virginia DEP	State Program	3	210	12-31-16 *

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-17

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

CAMBRIDGE 240506 1.8/1.5

Chain of Custody Record

CAMBRIDGE 240506

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Brian Beach	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41281-17977.1
Client Contact: Mr. Brian Beach	Phone: 616-738-7323	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:			
City: Holland	TAT Requested (days): standard			
State, Zip: MI, 49424				
Phone:	PO #: Purchase Order Requested			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site: #0398257	SSOW#:			

Analysis Requested

Preservation Codes:

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)

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)	9315_Ra226, 9320_Ra228	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1	03/13/17	1030	G	Water			X	X	X		
MW-2		1130		Water			X	X	X		
MW-3		1305		Water			X	X	X		
MW-4		1410		Water			X	X	X		
				Water							

240-76693 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	Company	Received by	Date/Time	Company
1	[signature] /ERM	03/13/17 @ 1700	ERM	[signature]	3.14.17 1015	TA
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: 590784 | Cooler Temperature(s) °C and Other Remarks:

TestAmerica Canton Sample Receipt Form/Narrative **Login # : 76693**
Canton Facility

Client ERM Site Name _____ Cooler unpacked by:

Cooler Received on 3.14.17 Opened on 3.14.17

FedEx: 1st Grd Exp UPS FAS Stetson Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # _____ Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.3** °C) Observed Cooler Temp. 1.8 °C Corrected Cooler Temp. 1.5 °C
   IR GUN #36 (CF **+0.3**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were custody seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels be reconciled with the COC?	Yes	No
9. Were correct bottle(s) used for the test(s) indicated?	Yes	No
10. Sufficient quantity received to perform indicated analyses?	Yes	No
11. Are these work share samples?	Yes	No
If yes, Questions 11-15 have been checked at the originating laboratory.		
11. Were sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC682547**
12. Were VOAs on the COC?	Yes	No
13. Were air bubbles >6 mm in any VOA vials?	Yes	No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	No
15. Was a LL Hg or Me Hg trip blank present? _____	Yes	No

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

14. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

15. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

16. SAMPLE PRESERVATION

Sample(s) MW-2 (HNO3) 2+2 + 12520 were further preserved in the laboratory.
Time preserved: 1210p Preservative(s) added/Lot number(s): _____

Ref: SOP NC-SC-0005, Sample Receiving
\\tacorp\corp\QA\QA_Facilities\Canton-QA\Document-Management\Work-Instruction\In Revision\WI-NC-099-022817 Cooler Receipt Form.doc djl

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-76693-B-1	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-1	240-76693-C-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-1	240-76693-D-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-76693-B-2	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-2	240-76693-C-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-76693-D-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-76693-B-3	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-3	240-76693-C-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-76693-D-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-76693-B-4	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-4	240-76693-C-4	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-76693-D-4	Plastic 1 liter - Nitric Acid	<2	_____	_____

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-76693 Chain of Custody

estAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna	No: J-67952.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP	Page: Page 1 of 1
Address: 13715 Rider Trail North,	Due Date Requested: 4/11/2017		Job #: 240-76693-1
City: Earth City	TAT Requested (days):		
State, Zip: MO, 63045			
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:		
Email:	WO #:		
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882		
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 - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-76693-1)	3/13/17	10:30 Eastern		Water			X	X	X	2	
MW-2 (240-76693-2)	3/13/17	11:30 Eastern		Water			X	X	X	2	
MW-3 (240-76693-3)	3/13/17	13:05 Eastern		Water			X	X	X	2	
MW-4 (240-76693-4)	3/13/17	14:10 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***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) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 3/14/17 1600	Company 240	Received by: Kristen Taylor	Date/Time: 3-16-17 0925	Company TAL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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:		

Login Sample Receipt Checklist

Client: ERM-North Central Inc

Job Number: 240-76693-1

Login Number: 76693
List Number: 2
Creator: Taylor, Kristene N

List Source: TestAmerica St. Louis
List Creation: 03/17/17 11:27 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.4,4.4
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-01
Site Name & Address: Grand Haven Board of Light and Power; JB Sims Generating Station; 1231 N 3rd Street, Grand
Sampler Name:
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 99.35
Initial Water Level (feet below TOC): 5.66
Groundwater Elevation/SWL (feet): 93.69
Well Depth (feet below TOC): 12.32
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): ~8'

Project #: 0398257
Client: GHBLP
Date: 03/13/17
Weather: Snow
Temperature/Bar. Pressure 20-25°F
Start Time of Purging: 0950
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 6.67
Calculated Well Volume* (liters or gal): ~1.1
Well Volume Discharged (liters or gal): ~2.5

Well Inspection: Clearly Labeled (Y) N_; Concrete Pad Intact (Y) N_; Lock Functional _Y_ (N/A) Pro-cover in good condition (Y) N_; Casing in good condition (Y) N_
Calibration: Time; * ; pH 4 Standard *; pH 7 Standard *; pH 10 Standard *; Conductivity Std *; DO *
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1000	5.69	2353	0.40	8.71	-139.4	0.83	5.95	0.200	clearing quickly
1005	5.65	2350	0.35	8.79	-144.4	0.80	5.98	0.200	
1010	5.59	2374	0.29	8.97	-163.8	0.73	6.00	0.200	
1015	5.60	2399	0.34	9.07	-172.4	0.79	6.02	0.200	
1020	5.61	2424	0.24	9.16	-185.5	0.87	6.04	0.200	
1025	5.64	2439	0.21	9.21	-188.4	0.79	6.05	0.200	
1030	5.58	2448	0.30	9.22	-192.2	0.74	6.06	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]		<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1030.
* see attached Cal. sheet.

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-02
Site Name & Address: Grand Haven Board of Light and Power / JB Sims Generating Station / 1231 N 3rd Street, Grand
Sampler Name:
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 107.75
Initial Water Level (feet below TOC): 15.62
Groundwater Elevation/SWL (feet): 92.13
Well Depth (feet below TOC): 23.37
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): ~19'

Project #: 0398257
Client: GHBLP
Date: 03/13/07
Weather: Snow
Temperature/Bar. Pressure 20-25°F
Start Time of Purging: 1100
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 7.75
Calculated Well Volume* (liters or gal): ~1.3
Well Volume Discharged (liters or gal): ~2.5

Well Inspection: Clearly Labeled (Y) N_; Concrete Pad Intact (Y) N_; Lock Functional _Y (N); Pro-cover in good condition (Y) N_; Casing in good condition (Y) N_
Calibration: Time; * ; pH 4 Standard *; pH 7 Standard *; pH 10 Standard *; Conductivity Std *; DO *
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1110	9.43	4174	0.54	8.00	-127.7	4.00	16.82	0.200	Soapy / yellowish tint
1115	8.81	4257	0.46	8.02	-135.2	3.69	16.66	0.~~200~~ 150-100	
1120	8.17	4338	0.52	8.07	-140.3	3.44	16.52	0.~~200~~ 150 100	
1125	8.06	4360	0.49	8.09	-142.9	2.97	16.50	0.~~200~~ 150 100	
1130	7.76	4411	0.46	8.09	-142.0	2.83	16.48	0.~~200~~ 150 100	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: 1 in diameter well = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1130
* See attached Cal. Sheet

Environmental Resources Management

Field Form for Low Flow Rate Sampling

Well ID: MW-03
Site Name & Address: Grand Haven Board of Light and Power; JB Sims Generating Station; 1231 N 3rd Street, Grand
Sampler Name:
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 105.20
Initial Water Level (feet below TOC): 13.09
Groundwater Elevation/SWL (feet): 92.11
Well Depth (feet below TOC): 20.34
Screened Interval (feet below TOC): 12-17'
Depth Pump Intake Set At (feet below TOC): ~16'

Project #: 0398257
Client: GHBLP
Date: 03/13/17
Weather: Snow
Temperature/Bar. Pressure 20-25°F
Start Time of Purging: 1210
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 7.25
Calculated Well Volume* (liters or gal): ~1.2
Well Volume Discharged (liters or gal): ~2.5

Well Inspection: Clearly Labeled (Y) N_; Concrete Pad Intact (Y) N_; Lock Functional _Y_ (NA) Pro-cover in good condition (Y) N_; Casing in good condition (Y) N_
Calibration: Time; * ; pH 4 Standard * ; pH 7 Standard * ; pH 10 Standard * ; Conductivity Std * ; DO *
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1225	9.34	5405	0.56	7.91	-60.6	53.3	13.71	0.250	
1230	8.80	5403	0.30	7.93	-62.6	30.7	13.60	0.150	
1235	8.72	5409	0.40	7.94	-56.5	22.5	13.60	0.150	
1240	8.60	5393	0.32	7.93	-54.2	16.9	13.60	0.150	
1245	8.62	5373	0.28	7.94	-63.5	15.3	13.60	0.150	
1250	8.58	5377	0.22	7.95	-63.9	14.6	13.60	0.150	
1255	8.59	5371	0.19	7.93	-67.6	11.0	13.60	0.150	
1300	8.63	5370	0.18	7.92	-70.0	10.9	13.60	0.150	
1305	8.76	5354	0.18	7.91	-73.5	8.46	13.60	0.150	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: 1 in diameter well = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sample @ 1305
* see attached cal. sheet

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-04
Site Name & Address: Grand Haven Board of Light and Power; JB Sims Generating Station; 1231 N 3rd Street, Grand
Sampler Name:
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 103.59
Initial Water Level (feet below TOC): 11.17
Groundwater Elevation/SWL (feet): 92.42
Well Depth (feet below TOC): 18.00
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): ~14'

Project #: 0398257
Client: GHBLP
Date: 03/13/17
Weather: Snow
Temperature/Bar. Pressure 20-25°F
Start Time of Purging: 1335
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 6.83
Calculated Well Volume* (liters or (gal)): ~1.1
Well Volume Discharged (liters or (gal)): ~2.5

Well Inspection: Clearly Labeled (Y) N_; Concrete Pad Intact (Y) N_; Lock Functional _Y_ (N/A) Pro-cover in good condition (Y) N_; Casing in good condition (Y) N_
Calibration: Time; * ; pH 4 Standard * ; pH 7 Standard * ; pH 10 Standard * ; Conductivity Std * ; DO *
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1345	7.64	3305	0.35	8.32	-93.1	23.8	11.62	0.250	
1350	7.54	3365	0.37	8.32	-87.0	18.4	11.68	0.200	
1355	7.53	3362	0.30	8.32	-81.2	16.4	11.70	0.200	
1400	7.44	3366	0.30	8.33	-78.9	8.69	11.70	0.200	
1405	7.37	3365	0.21	8.33	-72.5	8.05	11.71	0.200	
1410	7.40	3364	0.27	8.34	-74.2	7.20	11.71	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1410
* See attached cal. sheet

APPENDIX A-2

SECOND BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-77863-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
5/9/2017 2:28:42 PM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
B	Compound was found in the blank and sample.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Job ID: 240-77863-1

Laboratory: TestAmerica Canton

Narrative

CASE NARRATIVE

Client: ERM-North Central Inc

Project: Grand Haven BLP - CCR Monitoring

Report Number: 240-77863-1

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

The 9315 Radium-226, 9320 Radium-228, and Ra226Ra228 Combined Radium-226 and Radium-228 analyses were performed at the TestAmerica St. Louis Laboratory.

TestAmerica Canton attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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

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

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 4/7/2017 3:45 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.1º C.

Receipt Exceptions

The reference method requires samples to be preserved to a pH of <2. The following sample was received with insufficient preservation at a pH of >2: MW-2 (240-77863-2) and MW-3 (240-77863-3). The sample(s) was preserved to the appropriate pH in the laboratory.

TOTAL RECOVERABLE METALS (ICP)

Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for total recoverable metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 04/10/2017 and analyzed on 04/11/2017.

Samples MW-1 (240-77863-1)[10X] and MW-2 (240-77863-2)[20X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

Job ID: 240-77863-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

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

TOTAL RECOVERABLE METALS (ICPMS)
Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for total recoverable metals (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 04/10/2017 and analyzed on 04/11/2017.

Chromium was detected in method blank MB 240-273948/1-A at a level exceeding the reporting limit. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Barium and Lead were detected in method blank MB 240-273948/1-A at levels that were above the method detection limit but below the reporting limit. The values should be considered estimates, and have been flagged. If the associated sample reported a result above the MDL and/or RL, the result has been flagged. Refer to the QC report for details.

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

TOTAL MERCURY
Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for total mercury in accordance with EPA SW-846 Methods 7470A. The samples were prepared on 04/10/2017 and analyzed on 04/11/2017.

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

TOTAL DISSOLVED SOLIDS
Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for total dissolved solids in accordance with SM 2540C. The samples were analyzed on 04/12/2017.

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

ANIONS
Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for anions in accordance with EPA SW-846 Method 9056A. The samples were analyzed on 04/14/2017.

Samples MW-1 (240-77863-1)[10X], MW-2 (240-77863-2)[5X], MW-3 (240-77863-3)[20X], MW-3 (240-77863-3)[5X] and MW-4 (240-77863-4)[5X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

RADIUM-226
Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for Radium-226 in accordance with SW846 Method 9315. The samples were prepared on 04/13/2017 and analyzed on 05/06/2017.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-303388
The following samples foamed when sulfuric acid was added.
MW-3 (240-77863-3) and MW-4 (240-77863-4)

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

RADIUM-228 (GFPC)
Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for Radium-228 (GFPC) in accordance with SW846 Method 9320. The samples were prepared on 04/13/2017 and analyzed on 04/27/2017.

Method(s) PrecSep_0: Radium 228 Prep BAtch 160-303391
The following samples foamed when sulfuric acid was added.
MW-3 (240-77863-3) and MW-4 (240-77863-4)

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

Job ID: 240-77863-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

COMBINED RADIUM 226 AND RADIUM 228

Samples MW-1 (240-77863-1), MW-2 (240-77863-2), MW-3 (240-77863-3) and MW-4 (240-77863-4) were analyzed for Combined Radium 226 and Radium 228 in accordance with Ra226_Ra228. The samples were analyzed on 05/09/2017.

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-77863-1	MW-1	Water	04/05/17 12:30	04/07/17 15:45
240-77863-2	MW-2	Water	04/05/17 14:13	04/07/17 15:45
240-77863-3	MW-3	Water	04/05/17 15:50	04/07/17 15:45
240-77863-4	MW-4	Water	04/05/17 17:20	04/07/17 15:45

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-1 — Lab Sample ID: 240-77863-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	77000		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	180000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.00055	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.32	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00030	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0017	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00026	J B	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.00059	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	1.9		0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	170		1.0	0.41	mg/L	1		9056A	Total/NA
Fluoride	15		0.50	0.090	mg/L	10		9056A	Total/NA
Sulfate	480		10	1.3	mg/L	10		9056A	Total/NA
Total Dissolved Solids	1700		20	15	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-77863-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	170000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0056		0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.45	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.0067		0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.037	B	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.014		0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.0027	B	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0017	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	1.5		0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	150		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	12		0.25	0.045	mg/L	5		9056A	Total/NA
Sulfate	12		5.0	0.65	mg/L	5		9056A	Total/NA
Total Dissolved Solids	1900		40	30	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-3 — Lab Sample ID: 240-77863-3

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-3 (Continued) — Lab Sample ID: 240-77863-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	4900		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	620000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0021	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.36	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00097	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.0014	J B	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0049	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00045	J B	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0012	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	0.064		0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	620		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	0.97		0.25	0.045	mg/L	5		9056A	Total/NA
Sulfate	1200		20	2.6	mg/L	20		9056A	Total/NA
Total Dissolved Solids	3600		50	37	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 240-77863-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3400		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	470000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0013	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.13	B	0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00033	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.0018	J B	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0015	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00032	J B	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Lithium	0.047		0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	390		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	1.3		0.25	0.045	mg/L	5		9056A	Total/NA
Sulfate	940		5.0	0.65	mg/L	5		9056A	Total/NA
Total Dissolved Solids	2400		40	30	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 04/05/17 12:30
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**77000**		2000	81	ug/L		04/10/17 14:00	04/11/17 16:47	10
Calcium	**180000**		5000	710	ug/L		04/10/17 14:00	04/11/17 15:39	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/10/17 14:00	04/11/17 18:50	1
Arsenic	**0.00055**	**J**	0.0050	0.00035	mg/L		04/10/17 14:00	04/11/17 18:50	1
Barium	**0.32**	**B**	0.0050	0.00052	mg/L		04/10/17 14:00	04/11/17 18:50	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/10/17 14:00	04/11/17 18:50	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/10/17 14:00	04/11/17 18:50	1
Cobalt	**0.00030**	**J**	0.0010	0.00013	mg/L		04/10/17 14:00	04/11/17 18:50	1
Chromium	0.0020	U	0.0020	0.00026	mg/L		04/10/17 14:00	04/11/17 18:50	1
Molybdenum	**0.0017**	**J**	0.010	0.00051	mg/L		04/10/17 14:00	04/11/17 18:50	1
Lead	**0.00026**	**J B**	0.0010	0.00016	mg/L		04/10/17 14:00	04/11/17 18:50	1
Selenium	**0.00059**	**J**	0.0050	0.00048	mg/L		04/10/17 14:00	04/11/17 18:50	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/10/17 14:00	04/11/17 18:50	1
Lithium	**1.9**		0.0080	0.00016	mg/L		04/10/17 14:00	04/11/17 18:50	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/10/17 14:00	04/11/17 14:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**170**		1.0	0.41	mg/L			04/14/17 03:35	1
Fluoride	**15**		0.50	0.090	mg/L			04/14/17 04:37	10
Sulfate	**480**		10	1.3	mg/L			04/14/17 04:37	10
Total Dissolved Solids	**1700**		20	15	mg/L			04/12/17 15:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.133**		0.0778	0.0787	1.00	0.103	pCi/L	04/13/17 11:01	05/06/17 17:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.1*		*40 - 110*	*04/13/17 11:01*	*05/06/17 17:28*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0482	U	0.242	0.242	1.00	0.424	pCi/L	04/13/17 11:26	04/27/17 16:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.1*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*
Y Carrier	*78.1*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-1
Date Collected: 04/05/17 12:30
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.181	U	0.254	0.254	5.00	0.424	pCi/L		05/09/17 12:03	1

Client Sample ID: MW-2
Date Collected: 04/05/17 14:13
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-2
Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**110000**		4000	160	ug/L		04/10/17 14:00	04/11/17 16:51	20
Calcium	**170000**		5000	710	ug/L		04/10/17 14:00	04/11/17 15:44	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/10/17 14:00	04/11/17 18:55	1
Arsenic	**0.0056**		0.0050	0.00035	mg/L		04/10/17 14:00	04/11/17 18:55	1
Barium	**0.45**	**B**	0.0050	0.00052	mg/L		04/10/17 14:00	04/11/17 18:55	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/10/17 14:00	04/11/17 18:55	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/10/17 14:00	04/11/17 18:55	1
Cobalt	**0.0067**		0.0010	0.00013	mg/L		04/10/17 14:00	04/11/17 18:55	1
Chromium	**0.037**	**B**	0.0020	0.00026	mg/L		04/10/17 14:00	04/11/17 18:55	1
Molybdenum	**0.014**		0.010	0.00051	mg/L		04/10/17 14:00	04/11/17 18:55	1
Lead	**0.0027**	**B**	0.0010	0.00016	mg/L		04/10/17 14:00	04/11/17 18:55	1
Selenium	**0.0017**	**J**	0.0050	0.00048	mg/L		04/10/17 14:00	04/11/17 18:55	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/10/17 14:00	04/11/17 18:55	1
Lithium	**1.5**		0.0080	0.00016	mg/L		04/10/17 14:00	04/11/17 18:55	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/10/17 14:00	04/11/17 14:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**150**		5.0	2.0	mg/L			04/14/17 05:38	5
Fluoride	**12**		0.25	0.045	mg/L			04/14/17 05:38	5
Sulfate	**12**		5.0	0.65	mg/L			04/14/17 05:38	5
Total Dissolved Solids	**1900**		40	30	mg/L			04/12/17 15:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.486**		0.133	0.140	1.00	0.121	pCi/L	04/13/17 11:01	05/06/17 17:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*40 - 110*	*04/13/17 11:01*	*05/06/17 17:28*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0553	U	0.227	0.227	1.00	0.416	pCi/L	04/13/17 11:26	04/27/17 16:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*
Y Carrier	*86.0*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-2
Date Collected: 04/05/17 14:13
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.430		0.263	0.267	5.00	0.416	pCi/L		05/09/17 12:03	1

Client Sample ID: MW-3

Date Collected: 04/05/17 15:50
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**4900**		200	8.1	ug/L		04/10/17 14:00	04/11/17 15:48	1
Calcium	**620000**		5000	710	ug/L		04/10/17 14:00	04/11/17 15:48	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/10/17 14:00	04/11/17 19:07	1
Arsenic	**0.0021**	**J**	0.0050	0.00035	mg/L		04/10/17 14:00	04/11/17 19:07	1
Barium	**0.36**	**B**	0.0050	0.00052	mg/L		04/10/17 14:00	04/11/17 19:07	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/10/17 14:00	04/11/17 19:07	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/10/17 14:00	04/11/17 19:07	1
Cobalt	**0.00097**	**J**	0.0010	0.00013	mg/L		04/10/17 14:00	04/11/17 19:07	1
Chromium	**0.0014**	**J B**	0.0020	0.00026	mg/L		04/10/17 14:00	04/11/17 19:07	1
Molybdenum	**0.0049**	**J**	0.010	0.00051	mg/L		04/10/17 14:00	04/11/17 19:07	1
Lead	**0.00045**	**J B**	0.0010	0.00016	mg/L		04/10/17 14:00	04/11/17 19:07	1
Selenium	**0.0012**	**J**	0.0050	0.00048	mg/L		04/10/17 14:00	04/11/17 19:07	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/10/17 14:00	04/11/17 19:07	1
Lithium	**0.064**		0.0080	0.00016	mg/L		04/10/17 14:00	04/11/17 19:07	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/10/17 14:00	04/11/17 14:14	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**620**		5.0	2.0	mg/L			04/14/17 06:20	5
Fluoride	**0.97**		0.25	0.045	mg/L			04/14/17 06:20	5
Sulfate	**1200**		20	2.6	mg/L			04/14/17 06:40	20
Total Dissolved Solids	**3600**		50	37	mg/L			04/12/17 15:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.246**		0.0943	0.0969	1.00	0.0968	pCi/L	04/13/17 11:01	05/06/17 17:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.1*		*40 - 110*	*04/13/17 11:01*	*05/06/17 17:28*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.147	U	0.212	0.212	1.00	0.355	pCi/L	04/13/17 11:26	04/27/17 16:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*99.1*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*
Y Carrier	*83.7*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-3
Date Collected: 04/05/17 15:50
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.392		0.232	0.233	5.00	0.355	pCi/L		05/09/17 12:03	1

Client Sample ID: MW-4
Date Collected: 04/05/17 17:20
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-4
Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	3400		200	8.1	ug/L		04/10/17 14:00	04/11/17 15:53	1
Calcium	470000		5000	710	ug/L		04/10/17 14:00	04/11/17 15:53	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/10/17 14:00	04/11/17 19:12	1
Arsenic	0.0013	J	0.0050	0.00035	mg/L		04/10/17 14:00	04/11/17 19:12	1
Barium	0.13	B	0.0050	0.00052	mg/L		04/10/17 14:00	04/11/17 19:12	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/10/17 14:00	04/11/17 19:12	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/10/17 14:00	04/11/17 19:12	1
Cobalt	0.00033	J	0.0010	0.00013	mg/L		04/10/17 14:00	04/11/17 19:12	1
Chromium	0.0018	J B	0.0020	0.00026	mg/L		04/10/17 14:00	04/11/17 19:12	1
Molybdenum	0.0015	J	0.010	0.00051	mg/L		04/10/17 14:00	04/11/17 19:12	1
Lead	0.00032	J B	0.0010	0.00016	mg/L		04/10/17 14:00	04/11/17 19:12	1
Selenium	0.0050	U	0.0050	0.00048	mg/L		04/10/17 14:00	04/11/17 19:12	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/10/17 14:00	04/11/17 19:12	1
Lithium	0.047		0.0080	0.00016	mg/L		04/10/17 14:00	04/11/17 19:12	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/10/17 14:00	04/11/17 14:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	390		5.0	2.0	mg/L			04/14/17 07:01	5
Fluoride	1.3		0.25	0.045	mg/L			04/14/17 07:01	5
Sulfate	940		5.0	0.65	mg/L			04/14/17 07:01	5
Total Dissolved Solids	2400		40	30	mg/L			04/12/17 15:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.121		0.0775	0.0783	1.00	0.106	pCi/L	04/13/17 11:01	05/06/17 17:28	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*04/13/17 11:01*	*05/06/17 17:28*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.395		0.229	0.232	1.00	0.342	pCi/L	04/13/17 11:26	04/27/17 16:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*96.8*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:10*	*1*
Y Carrier	*82.6*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:10*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-4
Date Collected: 04/05/17 17:20
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.515		0.242	0.245	5.00	0.342	pCi/L		05/09/17 12:03	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba (40-110)
240-77863-1	MW-1	97.1
240-77863-2	MW-2	90.0
240-77863-3	MW-3	99.1
240-77863-4	MW-4	96.8
LCS 160-303388/2-A	Lab Control Sample	107
MB 160-303388/1-A	Method Blank	97.9

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-77863-1	MW-1	97.1	78.1
240-77863-2	MW-2	90.0	86.0
240-77863-3	MW-3	99.1	83.7
240-77863-4	MW-4	96.8	82.6
LCS 160-303391/2-A	Lab Control Sample	107	86.7
MB 160-303391/1-A	Method Blank	97.9	81.5

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-273948/1-A
Matrix: Water
Analysis Batch: 274191

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 273948

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		04/10/17 14:00	04/11/17 13:52	1
Calcium	5000	U	5000	710	ug/L		04/10/17 14:00	04/11/17 13:52	1

Lab Sample ID: LCS 240-273948/2-A
Matrix: Water
Analysis Batch: 274191

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 273948

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1040		ug/L		104	80 - 120
Calcium	50000	49600		ug/L		99	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-273948/1-A
Matrix: Water
Analysis Batch: 274666

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 273948

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/10/17 14:00	04/13/17 10:51	1
Arsenic	0.0050	U	0.0050	0.00035	mg/L		04/10/17 14:00	04/13/17 10:51	1
Barium	0.00166	J	0.0050	0.00052	mg/L		04/10/17 14:00	04/13/17 10:51	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/10/17 14:00	04/13/17 10:51	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/10/17 14:00	04/13/17 10:51	1
Cobalt	0.0010	U	0.0010	0.00013	mg/L		04/10/17 14:00	04/13/17 10:51	1
Chromium	0.00305		0.0020	0.00026	mg/L		04/10/17 14:00	04/13/17 10:51	1
Molybdenum	0.010	U	0.010	0.00051	mg/L		04/10/17 14:00	04/13/17 10:51	1
Lead	0.000185	J	0.0010	0.00016	mg/L		04/10/17 14:00	04/13/17 10:51	1
Selenium	0.0050	U	0.0050	0.00048	mg/L		04/10/17 14:00	04/13/17 10:51	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/10/17 14:00	04/13/17 10:51	1
Lithium	0.0080	U	0.0080	0.00016	mg/L		04/10/17 14:00	04/13/17 10:51	1

Lab Sample ID: LCS 240-273948/27-A
Matrix: Water
Analysis Batch: 274666

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 273948

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.106		mg/L		106	80 - 120
Arsenic	1.00	1.08		mg/L		108	80 - 120
Barium	1.00	1.07		mg/L		107	80 - 120
Beryllium	1.00	1.07		mg/L		107	80 - 120
Cadmium	1.00	1.13		mg/L		113	80 - 120
Cobalt	1.00	1.13		mg/L		113	80 - 120
Chromium	1.00	1.12		mg/L		112	80 - 120
Molybdenum	0.100	0.104		mg/L		104	80 - 120
Lead	1.00	1.09		mg/L		109	80 - 120
Selenium	1.00	1.10		mg/L		110	80 - 120
Thallium	0.250	0.279		mg/L		111	80 - 120
Lithium	0.100	0.101		mg/L		101	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-273950/1-A
Matrix: Water
Analysis Batch: 274411

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 273950

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/10/17 14:00	04/11/17 13:22	1

Lab Sample ID: LCS 240-273950/2-A
Matrix: Water
Analysis Batch: 274411

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 273950

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00511		mg/L		102	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-274667/27
Matrix: Water
Analysis Batch: 274667

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.41	mg/L			04/14/17 01:32	1
Fluoride	0.050	U	0.050	0.0090	mg/L			04/14/17 01:32	1
Sulfate	1.0	U	1.0	0.13	mg/L			04/14/17 01:32	1

Lab Sample ID: LCS 240-274667/28
Matrix: Water
Analysis Batch: 274667

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	53.5		mg/L		107	90 - 110
Fluoride	2.50	2.69		mg/L		108	90 - 110
Sulfate	50.0	53.0		mg/L		106	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-274476/1
Matrix: Water
Analysis Batch: 274476

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.4	mg/L			04/12/17 15:43	1

Lab Sample ID: LCS 240-274476/2
Matrix: Water
Analysis Batch: 274476

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	208	214		mg/L		103	80 - 120

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-303388/1-A
Matrix: Water
Analysis Batch: 307325

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 303388

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	-0.00007247	U	0.00304	0.00304	1.00	0.00724	pCi/L	04/13/17 11:01	05/05/17 11:50	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.9*		*40 - 110*	*04/13/17 11:01*	*05/05/17 11:50*	*1*

Lab Sample ID: LCS 160-303388/2-A
Matrix: Water
Analysis Batch: 307325

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 303388

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	8.352		0.888	1.00	0.0570	pCi/L	74	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*107*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-303391/1-A
Matrix: Water
Analysis Batch: 305777

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 303391

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.03451	U	0.0263	0.0264	1.00	0.0415	pCi/L	04/13/17 11:26	04/27/17 16:09	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.9*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*
Y Carrier	*81.5*		*40 - 110*	*04/13/17 11:26*	*04/27/17 16:09*	*1*

Lab Sample ID: LCS 160-303391/2-A
Matrix: Water
Analysis Batch: 305777

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 303391

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.5	13.89		1.48	1.00	0.332	pCi/L	103	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*107*		*40 - 110*
Y Carrier	*86.7*		*40 - 110*

Metals

Prep Batch: 273948

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total Recoverable	Water	3005A	
240-77863-2	MW-2	Total Recoverable	Water	3005A	
240-77863-3	MW-3	Total Recoverable	Water	3005A	
240-77863-4	MW-4	Total Recoverable	Water	3005A	
MB 240-273948/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-273948/27-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-273948/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 273950

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total/NA	Water	7470A	
240-77863-2	MW-2	Total/NA	Water	7470A	
240-77863-3	MW-3	Total/NA	Water	7470A	
240-77863-4	MW-4	Total/NA	Water	7470A	
MB 240-273950/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-273950/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 274191

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total Recoverable	Water	6010C	273948
240-77863-1	MW-1	Total Recoverable	Water	6010C	273948
240-77863-2	MW-2	Total Recoverable	Water	6010C	273948
240-77863-2	MW-2	Total Recoverable	Water	6010C	273948
240-77863-3	MW-3	Total Recoverable	Water	6010C	273948
240-77863-4	MW-4	Total Recoverable	Water	6010C	273948
MB 240-273948/1-A	Method Blank	Total Recoverable	Water	6010C	273948
LCS 240-273948/2-A	Lab Control Sample	Total Recoverable	Water	6010C	273948

Analysis Batch: 274388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total Recoverable	Water	6020A	273948
240-77863-2	MW-2	Total Recoverable	Water	6020A	273948
240-77863-3	MW-3	Total Recoverable	Water	6020A	273948
240-77863-4	MW-4	Total Recoverable	Water	6020A	273948

Analysis Batch: 274411

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total/NA	Water	7470A	273950
240-77863-2	MW-2	Total/NA	Water	7470A	273950
240-77863-3	MW-3	Total/NA	Water	7470A	273950
240-77863-4	MW-4	Total/NA	Water	7470A	273950
MB 240-273950/1-A	Method Blank	Total/NA	Water	7470A	273950
LCS 240-273950/2-A	Lab Control Sample	Total/NA	Water	7470A	273950

Analysis Batch: 274666

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 240-273948/1-A	Method Blank	Total Recoverable	Water	6020A	273948
LCS 240-273948/27-A	Lab Control Sample	Total Recoverable	Water	6020A	273948

QC Association Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

General Chemistry

Analysis Batch: 274476

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total/NA	Water	SM 2540C	
240-77863-2	MW-2	Total/NA	Water	SM 2540C	
240-77863-3	MW-3	Total/NA	Water	SM 2540C	
240-77863-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-274476/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-274476/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 274667

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total/NA	Water	9056A	
240-77863-1	MW-1	Total/NA	Water	9056A	
240-77863-2	MW-2	Total/NA	Water	9056A	
240-77863-3	MW-3	Total/NA	Water	9056A	
240-77863-3	MW-3	Total/NA	Water	9056A	
240-77863-4	MW-4	Total/NA	Water	9056A	
MB 240-274667/27	Method Blank	Total/NA	Water	9056A	
LCS 240-274667/28	Lab Control Sample	Total/NA	Water	9056A	

Rad

Prep Batch: 303388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total/NA	Water	PrecSep-21	
240-77863-2	MW-2	Total/NA	Water	PrecSep-21	
240-77863-3	MW-3	Total/NA	Water	PrecSep-21	
240-77863-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-303388/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-303388/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 303391

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-77863-1	MW-1	Total/NA	Water	PrecSep_0	
240-77863-2	MW-2	Total/NA	Water	PrecSep_0	
240-77863-3	MW-3	Total/NA	Water	PrecSep_0	
240-77863-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-303391/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-303391/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-1

Lab Sample ID: 240-77863-1

Date Collected: 04/05/17 12:30

Matrix: Water

Date Received: 04/07/17 15:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	274191	04/11/17 15:39	KLC	TAL CAN
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	274191	04/11/17 16:47	KLC	TAL CAN
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	274388	04/11/17 18:50	AS1	TAL CAN
Total/NA	Prep	7470A			273950	04/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	274411	04/11/17 14:10	DTN	TAL CAN
Total/NA	Analysis	9056A		1	274667	04/14/17 03:35	LCN	TAL CAN
Total/NA	Analysis	9056A		10	274667	04/14/17 04:37	LCN	TAL CAN
Total/NA	Analysis	SM 2540C		1	274476	04/12/17 15:43	JESW	TAL CAN
Total/NA	Prep	PrecSep-21			303388	04/13/17 11:01	LDE	TAL SL
Total/NA	Analysis	9315		1	307487	05/06/17 17:28	ALD	TAL SL
Total/NA	Prep	PrecSep_0			303391	04/13/17 11:26	LDE	TAL SL
Total/NA	Analysis	9320		1	305777	04/27/17 16:09	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	307836	05/09/17 12:03	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-77863-2

Date Collected: 04/05/17 14:13

Matrix: Water

Date Received: 04/07/17 15:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	274191	04/11/17 15:44	KLC	TAL CAN
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	274191	04/11/17 16:51	KLC	TAL CAN
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	274388	04/11/17 18:55	AS1	TAL CAN
Total/NA	Prep	7470A			273950	04/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	274411	04/11/17 14:12	DTN	TAL CAN
Total/NA	Analysis	9056A		5	274667	04/14/17 05:38	LCN	TAL CAN
Total/NA	Analysis	SM 2540C		1	274476	04/12/17 15:43	JESW	TAL CAN
Total/NA	Prep	PrecSep-21			303388	04/13/17 11:01	LDE	TAL SL
Total/NA	Analysis	9315		1	307487	05/06/17 17:28	ALD	TAL SL
Total/NA	Prep	PrecSep_0			303391	04/13/17 11:26	LDE	TAL SL
Total/NA	Analysis	9320		1	305777	04/27/17 16:09	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	307836	05/09/17 12:03	RTM	TAL SL

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Client Sample ID: MW-3

Date Collected: 04/05/17 15:50
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	274191	04/11/17 15:48	KLC	TAL CAN
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	274388	04/11/17 19:07	AS1	TAL CAN
Total/NA	Prep	7470A			273950	04/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	274411	04/11/17 14:14	DTN	TAL CAN
Total/NA	Analysis	9056A		5	274667	04/14/17 06:20	LCN	TAL CAN
Total/NA	Analysis	9056A		20	274667	04/14/17 06:40	LCN	TAL CAN
Total/NA	Analysis	SM 2540C		1	274476	04/12/17 15:43	JESW	TAL CAN
Total/NA	Prep	PrecSep-21			303388	04/13/17 11:01	LDE	TAL SL
Total/NA	Analysis	9315		1	307487	05/06/17 17:28	ALD	TAL SL
Total/NA	Prep	PrecSep_0			303391	04/13/17 11:26	LDE	TAL SL
Total/NA	Analysis	9320		1	305777	04/27/17 16:09	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	307836	05/09/17 12:03	RTM	TAL SL

Client Sample ID: MW-4

Date Collected: 04/05/17 17:20
Date Received: 04/07/17 15:45

Lab Sample ID: 240-77863-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	274191	04/11/17 15:53	KLC	TAL CAN
Total Recoverable	Prep	3005A			273948	04/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	274388	04/11/17 19:12	AS1	TAL CAN
Total/NA	Prep	7470A			273950	04/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	274411	04/11/17 14:20	DTN	TAL CAN
Total/NA	Analysis	9056A		5	274667	04/14/17 07:01	LCN	TAL CAN
Total/NA	Analysis	SM 2540C		1	274476	04/12/17 15:43	JESW	TAL CAN
Total/NA	Prep	PrecSep-21			303388	04/13/17 11:01	LDE	TAL SL
Total/NA	Analysis	9315		1	307487	05/06/17 17:28	ALD	TAL SL
Total/NA	Prep	PrecSep_0			303391	04/13/17 11:26	LDE	TAL SL
Total/NA	Analysis	9320		1	305777	04/27/17 16:10	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	307836	05/09/17 12:03	RTM	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-77863-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17
West Virginia DEP	State Program	3	210	12-31-16 *

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-17 *

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Canton
4101 Shuffel Street, N. U.
North Canton, OH 44720
Phone: 330.497.9396 Fax: 330.497.0772

4.4/CA.1

Chain of Custody Record

118415

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.
TAL-8210 (0713)

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: M. Meyers	Site Contact:	Date:	COC No:
Company Name: ERM	Tel/Fax:	Lab Contact:	Carrier:	1 of 1 COCs
Address: 3352 128th Ave	Analysis Turnaround Time			Sampler:
City/State/Zip: Holland, MI, 49424	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: 616 399-3500	TAT if different from Below			Walk-in Client:
Fax:	☐ 2 weeks			Lab Sampling:
Project Name: Grand Haven/BLP-CCR	☐ 1 week			
Site: LAB: 24017882	☐ 2 days			Job / SDG No.:
PO# 0398257	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	9315 Ra 226	9320 Ra 228	6010C	6020A	7470A	2540C Calcd	9056A-28D	Sample Specific Notes:
MW-1	4/5	1230	G	W	4			X	X	X	X	X	X	X	
MW-2	4/5	1413	G	W	4			X	X	X	X	X	X	X	
MW-3	4/5	1550	G	W	4			X	X	X	X	X	X	X	
MW-4	4/5	1720	G	W	4			X	X	X	X	X	X	X	

240-77863 Chain of Custody

4 4 4 4 4 1 1

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☒ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: _____ Corr'd: _____ Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	ERM	4/5 19:00	[signature]	ERM	4/6
[signature]	ERM	4/6 12:00	FedEx		
			Received in Laboratory by: [signature]	LANC	4/7/17 1545

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5/9/2017

TestAmerica Canton Sample Receipt Form/Narrative **Login # :** 177860
Canton Facility

Client ERM Site Name _____ Cooler unpacked by:

Cooler Received on 9/7/17 Opened on 9/8/17

FedEx: 1st Grd Exp UPS FAS Stetson Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # _____ Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.3** °C) Observed Cooler Temp. 4.4 °C Corrected Cooler Temp. 4.1 °C
   IR GUN #36 (CF **+0.3**°C) Observed Cooler Temp. _____ °C Corrected Cooler Temp. _____ °C

2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were custody seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels be reconciled with the COC?	Yes	No
9. Were correct bottle(s) used for the test(s) indicated?	Yes	No
10. Sufficient quantity received to perform indicated analyses?	Yes	No
11. Are these work share samples?	Yes	No
If yes, Questions 11-15 have been checked at the originating laboratory.		
11. Were sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC682547**
12. Were VOAs on the COC?	Yes	No
13. Were air bubbles >6 mm in any VOA vials?	Yes	No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes	No
15. Was a LL Hg or Me Hg trip blank present? _____	Yes	No

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

14. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

MW-2 1-500ml & 2 1-1r. Needed further preserved w/ Nitric Acid.

MW-3 1 1-1r needed further preserved with Nitric Acid.

See below.

15. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.
Sample(s) _____ were received in a broken container.
Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

16. SAMPLE PRESERVATION

Sample(s) MW-2 & MW-3 (see above) were further preserved in the laboratory.
Time preserved: 9:44 Preservative(s) added/Lot number(s): 0000160739, Nitric Acid

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-77863-A-1	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-1	240-77863-C-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-1	240-77863-D-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-77863-A-2	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-2	240-77863-C-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-77863-D-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-77863-A-3	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-3	240-77863-C-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-77863-D-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-77863-A-4	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-4	240-77863-C-4	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-77863-D-4	Plastic 1 liter - Nitric Acid	<2	_____	_____

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-77863 Chain of Custody

TestAmerica
LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna		lo: 9071.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP		Job #: 240-77863-1
Address: 13715 Rider Trail North,	Due Date Requested: 5/5/2017			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

Other:

Sample Identification - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-77863-1)	4/5/17	12:30 Eastern		Water			X	X	X	2	
MW-2 (240-77863-2)	4/5/17	14:13 Eastern		Water			X	X	X	1	
MW-3 (240-77863-3)	4/5/17	15:50 Eastern		Water			X	X	X	1	
MW-4 (240-77863-4)	4/5/17	17:20 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***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) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

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

Relinquished by:	Date/Time: 41017 1600	Company TAL	Received by: Ali Clark	Date/Time: 4.11.17 0905	Company TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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:

5/9/2017

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-69070.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP		Job #: 240-77863-1
Address: 13715 Rider Trail North,	Due Date Requested: 5/5/2017			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

Other:

Sample Identification - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-2 (240-77863-2)	4/5/17	14:13 Eastern		Water			X	X	X	1	
MW-3 (240-77863-3)	4/5/17	15:50 Eastern		Water			X	X	X	1	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

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

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	[signature]	4/10/17 1600	TAL	[signature] Clark	4.11.17 0905	TAL
	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	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 Checklist

Client: ERM-North Central Inc

Job Number: 240-77863-1
SDG Number:

Login Number: 77863
List Number: 2
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis
List Creation: 04/11/17 10:59 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	21.0, 21.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-01
Site Name & Address: GHBLP, 1231 N 3rd St, Grand Haven
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 4.67'
Groundwater Elevation/SWL (feet): 94.68'
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #: 0298257
Client: GHBLP
Date: 4-5-17
Weather: Rain
Temperature/Bar. Pressure 35°F / 746.3
Start Time of Purging: 1030
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 7.65'
Calculated Well Volume* (liters or gal): 1.25
Well Volume Discharged (liters or gal): 5

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1020; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1040	6.26	3.217	0.79	8.02	-145.3		4.96	0.250	
1045	6.10	3.216	0.71	8.18	-161.2		4.96	0.250	
1050	6.07	3.221	0.65	8.24	-158.0		4.96	0.250	
1055	6.05	3.233	0.52	8.32	-170.2		4.96	0.250	
1100	5.97	3.245	0.50	8.38	-161.6		4.96	0.250	
1105	5.88	3.249	0.49	8.42	-153.1	0.51	4.96	0.250	
1110	5.85	3.252	0.45	8.46	-153.3	0.43	4.96	0.250	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: 1 in diameter well = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled at 1230. Turbidity meter wouldn't calibrate properly. Mark out new one and readings were taken then.

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-02
Site Name & Address: Grand Haven Board of Light and Power, JB Sims Generating Station, 1231 N 3rd Street, Grand
Project #: 0398257
Client: GHBLP
Date: 4/5/17
Sampler Name:
Weather: Rain
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Temperature/Bar. Pressure 40°F 743.3
Top of Casing Elevation (feet): 107.75
Start Time of Purging: 1335
Initial Water Level (feet below TOC): 15.4
Well Material: PVC
Groundwater Elevation/SWL (feet): 92.35
Well Diameter: 2"
Well Depth (feet below TOC): 23.37
Length of Water Column (feet): 7.97
Screened Interval (feet below TOC): 15-20
Calculated Well Volume* (liters or gal): 1.30
Depth Pump Intake Set At (feet below TOC): 19
Well Volume Discharged (liters or gal): 4.5

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1020; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1343	8.71	5.504	0.43	8.29	-174.8	16.74	16.50	0.200	
1348	8.75	5.561	0.49	8.27	-171.5	5.50	16.55	0.200	
1353	8.72	5.594	0.69	8.25	-170.0	3.99	16.55	0.200	
1358	8.75	5.637	0.78	8.24	-168.3	3.13	16.60	0.200	
1403	8.79	5.803	0.84	8.23	-164.3	2.44	16.66	0.200	
1408	8.97	5.884	0.87	8.20	-169.0	2.33	16.71	0.200	
1413	8.78	5.955	0.84	8.21	-164.4	2.25	16.65	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[T]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[T]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments:

Sampled at: 1413

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-03
Site Name & Address: Grand Haven Board of Light and Power
JB Sims Generating Station
1231 N 3rd Street, Grand

Sampler Name:
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 105.20
Initial Water Level (feet below TOC): 12.91
Groundwater Elevation/SWL (feet): 92.29
Well Depth (feet below TOC): 20.34
Screened Interval (feet below TOC): 12-17
Depth Pump Intake Set At (feet below TOC): 16

Project #: 0398.257
Client: GHBLP
Date: 4-5-17
Weather: Rain
Temperature/Bar. Pressure 40°F 743.5
Start Time of Purging: 1505
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 7.43
Calculated Well Volume* (liters or gal): 1.21
Well Volume Discharged (liters or gal): 4.5

Well Inspection: Clearly Labeled (Y) N_; Concrete Pad Intact (Y) N_; Lock Functional (Y) N_; Pro-cover in good condition (Y) N_; Casing in good condition (Y) N_
Calibration: Time: 1020 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1,413 ; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
[illegible]	[illegible]					[illegible]	[illegible]		
[illegible]									
[illegible]									
1525	9.64	7.362	0.66	6.79	-116.2	4.25	13.45	0.200	
1530	9.33	7.319	0.47	7.14	-117.1	4.30	13.45	0.200	
1535	9.21	7.253	0.66	7.18	-116.5	3.92	13.47	0.200	
1540	9.10	7.219	0.82	7.20	-116.7	4.13	13.45	0.200	
1545	8.97	7.194	0.79	7.19	-117.3	4.03	13.45	0.200	
1550	8.97	7.160	0.78	7.14	-118.9	3.95	13.45	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[T]	*	<0.5 L/min = 0.13 gal/min	

Information: 1 in diameter well = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[T]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments:

Sampled at: 1550

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-04
Site Name & Address:

Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 103.59'
Initial Water Level (feet below TOC): 11.00'
Groundwater Elevation/SWL (feet): 92.59'
Well Depth (feet below TOC): 18.00'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #: 0398257
Client: GHBLP
Date: 4-5-17
Weather: Rain
Temperature/Bar. Pressure 40°F / 741.9
Start Time of Purging: 1640
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 7.00
Calculated Well Volume* (liters or gal): 1.14
Well Volume Discharged (liters or gal): 4.5

Well Inspection: Clearly Labeled (Y)__N_; Concrete Pad Intact (Y)__N_; Lock Functional (Y)__N_; Pro-cover in good condition (Y)__N_; Casing in good condition (Y)__N__
Calibration: Time; 1020 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1,413 ; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1655	7.70	4.472	0.56	8.42	-112.6	2.54	11.45	0.200	
1700	7.67	4.501	0.41	8.39	-108.4	1.03	11.46	0.200	
1705	7.67	4.504	0.31	8.33	-111.4	0.65	11.45	0.200	
1710	7.62	4.516	0.31	8.20	-114.9	0.52	11.47	0.200	
1715	7.56	4.528	0.28	8.16	-116.8	0.58	11.48	0.200	
1720	7.57	4.544	0.34	8.10	-122.1	0.53	11.45	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sample taken 1720

APPENDIX A-3

THIRD BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-78636-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
5/24/2017 7:48:55 PM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
B	Compound was found in the blank and sample.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Job ID: 240-78636-1

Laboratory: TestAmerica Canton

Narrative

Job Narrative
240-78636-1

Comments
No additional comments.

Receipt
The samples were received on 4/26/2017 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.7º C.

RAD
Method(s) PrecSep_0: Radium 228 Prep Batch 160-306173
Insufficient sample volume was available to perform a sample duplicate (DU). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.
MW-1 (240-78636-1), MW-2 (240-78636-2), MW-3 (240-78636-3) and MW-4 (240-78636-4)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-306173
The following sample bubbled up after sulfuric acid was added.

MW-3 (240-78636-3)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-306174
Insufficient sample volume was available to perform a sample duplicate (DU). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.
MW-1 (240-78636-1), MW-2 (240-78636-2), MW-3 (240-78636-3) and MW-4 (240-78636-4)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-306174
The following samples bubbled up when sulfuric acid was added.

MW-3 (240-78636-3)

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

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

General Chemistry
Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-78636-2). Elevated reporting limits (RLs) are provided.

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-78636-1	MW-1	Water	04/24/17 11:55	04/26/17 09:30
240-78636-2	MW-2	Water	04/24/17 13:28	04/26/17 09:30
240-78636-3	MW-3	Water	04/24/17 14:55	04/26/17 09:30
240-78636-4	MW-4	Water	04/24/17 16:03	04/26/17 09:30

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-1 — Lab Sample ID: 240-78636-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	67000		1000	41	ug/L	5		6010C	Total Recoverable
Calcium	200000		5000	710	ug/L	1		6010C	Total Recoverable
Antimony	0.00084	J	0.0020	0.00027	mg/L	1		6020A	Total Recoverable
Arsenic	0.00075	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.22		0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00038	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.00041	J	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0022	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00059	J	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0011	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	1.5	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	150		5.0	2.0	mg/L	5		9056A	Total/NA
Fluoride	12		0.25	0.045	mg/L	5		9056A	Total/NA
Sulfate	540		5.0	0.65	mg/L	5		9056A	Total/NA
Total Dissolved Solids	1900		20	16	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-78636-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	200000		5000	710	ug/L	1		6010C	Total Recoverable
Antimony	0.00060	J	0.0020	0.00027	mg/L	1		6020A	Total Recoverable
Arsenic	0.0059		0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.47		0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.0074		0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.043		0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.012		0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.0026		0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0022	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	1.6	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	130		20	8.1	mg/L	20		9056A	Total/NA
Fluoride	11		1.0	0.18	mg/L	20		9056A	Total/NA
Total Dissolved Solids	2000		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-3 — Lab Sample ID: 240-78636-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	5600		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	600000		5000	710	ug/L	1		6010C	Total Recoverable
Antimony	0.00041	J	0.0020	0.00027	mg/L	1		6020A	Total Recoverable
Arsenic	0.0017	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.25		0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00080	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.0014	J	0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0076	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00026	J	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.0013	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	0.081	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	450		20	8.1	mg/L	20		9056A	Total/NA
Fluoride	1.3		1.0	0.18	mg/L	20		9056A	Total/NA
Sulfate	1200		20	2.6	mg/L	20		9056A	Total/NA
Total Dissolved Solids	3900		50	39	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 240-78636-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3800		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	500000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0012	J	0.0050	0.00035	mg/L	1		6020A	Total Recoverable
Barium	0.14		0.0050	0.00052	mg/L	1		6020A	Total Recoverable
Cobalt	0.00039	J	0.0010	0.00013	mg/L	1		6020A	Total Recoverable
Chromium	0.0021		0.0020	0.00026	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0017	J	0.010	0.00051	mg/L	1		6020A	Total Recoverable
Lead	0.00019	J	0.0010	0.00016	mg/L	1		6020A	Total Recoverable
Selenium	0.00065	J	0.0050	0.00048	mg/L	1		6020A	Total Recoverable
Lithium	0.058	B	0.0080	0.00016	mg/L	1		6020A	Total Recoverable
Chloride	350		10	4.1	mg/L	10		9056A	Total/NA
Fluoride	1.0		0.50	0.090	mg/L	10		9056A	Total/NA
Sulfate	830		10	1.3	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2500		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 04/24/17 11:55
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**67000**		1000	41	ug/L		04/28/17 14:00	05/01/17 15:39	5
Calcium	**200000**		5000	710	ug/L		04/28/17 14:00	05/01/17 14:18	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.00084**	**J**	0.0020	0.00027	mg/L		04/28/17 14:00	05/01/17 14:21	1
Arsenic	**0.00075**	**J**	0.0050	0.00035	mg/L		04/28/17 14:00	05/01/17 14:21	1
Barium	**0.22**		0.0050	0.00052	mg/L		04/28/17 14:00	05/01/17 14:21	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/28/17 14:00	05/01/17 14:21	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/28/17 14:00	05/01/17 14:21	1
Cobalt	**0.00038**	**J**	0.0010	0.00013	mg/L		04/28/17 14:00	05/01/17 14:21	1
Chromium	**0.00041**	**J**	0.0020	0.00026	mg/L		04/28/17 14:00	05/01/17 14:21	1
Molybdenum	**0.0022**	**J**	0.010	0.00051	mg/L		04/28/17 14:00	05/01/17 14:21	1
Lead	**0.00059**	**J**	0.0010	0.00016	mg/L		04/28/17 14:00	05/01/17 14:21	1
Selenium	**0.0011**	**J**	0.0050	0.00048	mg/L		04/28/17 14:00	05/01/17 14:21	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/28/17 14:00	05/01/17 14:21	1
Lithium	**1.5**	**B**	0.0080	0.00016	mg/L		04/28/17 14:00	05/01/17 14:21	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/27/17 11:00	04/27/17 15:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**150**		5.0	2.0	mg/L			04/30/17 04:13	5
Fluoride	**12**		0.25	0.045	mg/L			04/30/17 04:13	5
Sulfate	**540**		5.0	0.65	mg/L			04/30/17 04:13	5
Total Dissolved Solids	**1900**		20	16	mg/L			04/28/17 11:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0434	U	0.0586	0.0587	1.00	0.0985	pCi/L	04/28/17 11:14	05/23/17 08:54	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.3*		*40 - 110*	*04/28/17 11:14*	*05/23/17 08:54*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.303	U	0.251	0.252	1.00	0.400	pCi/L	04/28/17 10:55	05/12/17 11:09	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.3*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:09*	*1*
Y Carrier	*84.5*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:09*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-1
Date Collected: 04/24/17 11:55
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.346	U	0.258	0.259	5.00	0.400	pCi/L		05/24/17 16:26	1

Client Sample ID: MW-2

Date Collected: 04/24/17 13:28
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-2

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**110000**		4000	160	ug/L		04/28/17 14:00	05/01/17 15:44	20
Calcium	**200000**		5000	710	ug/L		04/28/17 14:00	05/01/17 14:22	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.00060**	**J**	0.0020	0.00027	mg/L		04/28/17 14:00	05/01/17 14:25	1
Arsenic	**0.0059**		0.0050	0.00035	mg/L		04/28/17 14:00	05/01/17 14:25	1
Barium	**0.47**		0.0050	0.00052	mg/L		04/28/17 14:00	05/01/17 14:25	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/28/17 14:00	05/01/17 14:25	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/28/17 14:00	05/01/17 14:25	1
Cobalt	**0.0074**		0.0010	0.00013	mg/L		04/28/17 14:00	05/01/17 14:25	1
Chromium	**0.043**		0.0020	0.00026	mg/L		04/28/17 14:00	05/01/17 14:25	1
Molybdenum	**0.012**		0.010	0.00051	mg/L		04/28/17 14:00	05/01/17 14:25	1
Lead	**0.0026**		0.0010	0.00016	mg/L		04/28/17 14:00	05/01/17 14:25	1
Selenium	**0.0022**	**J**	0.0050	0.00048	mg/L		04/28/17 14:00	05/01/17 14:25	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/28/17 14:00	05/01/17 14:25	1
Lithium	**1.6**	**B**	0.0080	0.00016	mg/L		04/28/17 14:00	05/01/17 14:25	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/27/17 11:00	04/27/17 15:34	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**130**		20	8.1	mg/L			05/02/17 18:57	20
Fluoride	**11**		1.0	0.18	mg/L			05/02/17 18:57	20
Sulfate	20	U	20	2.6	mg/L			05/02/17 18:57	20
Total Dissolved Solids	**2000**		40	31	mg/L			04/28/17 11:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.521**		0.157	0.164	1.00	0.132	pCi/L	04/28/17 11:14	05/23/17 08:54	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.4*		*40 - 110*	*04/28/17 11:14*	*05/23/17 08:54*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.494	U	0.346	0.349	1.00	0.538	pCi/L	04/28/17 10:55	05/12/17 11:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*84.4*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:10*	*1*
Y Carrier	*83.4*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:10*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-2
Date Collected: 04/24/17 13:28
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.02		0.380	0.386	5.00	0.538	pCi/L		05/24/17 16:26	1

Client Sample ID: MW-3

Date Collected: 04/24/17 14:55
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**5600**		200	8.1	ug/L		04/28/17 14:00	05/01/17 14:27	1
Calcium	**600000**		5000	710	ug/L		04/28/17 14:00	05/01/17 14:27	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.00041**	**J**	0.0020	0.00027	mg/L		04/28/17 14:00	05/01/17 14:30	1
Arsenic	**0.0017**	**J**	0.0050	0.00035	mg/L		04/28/17 14:00	05/01/17 14:30	1
Barium	**0.25**		0.0050	0.00052	mg/L		04/28/17 14:00	05/01/17 14:30	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/28/17 14:00	05/01/17 14:30	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/28/17 14:00	05/01/17 14:30	1
Cobalt	**0.00080**	**J**	0.0010	0.00013	mg/L		04/28/17 14:00	05/01/17 14:30	1
Chromium	**0.0014**	**J**	0.0020	0.00026	mg/L		04/28/17 14:00	05/01/17 14:30	1
Molybdenum	**0.0076**	**J**	0.010	0.00051	mg/L		04/28/17 14:00	05/01/17 14:30	1
Lead	**0.00026**	**J**	0.0010	0.00016	mg/L		04/28/17 14:00	05/01/17 14:30	1
Selenium	**0.0013**	**J**	0.0050	0.00048	mg/L		04/28/17 14:00	05/01/17 14:30	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/28/17 14:00	05/01/17 14:30	1
Lithium	**0.081**	**B**	0.0080	0.00016	mg/L		04/28/17 14:00	05/01/17 14:30	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/27/17 11:00	04/27/17 15:36	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**450**		20	8.1	mg/L			04/30/17 04:54	20
Fluoride	**1.3**		1.0	0.18	mg/L			04/30/17 04:54	20
Sulfate	**1200**		20	2.6	mg/L			04/30/17 04:54	20
Total Dissolved Solids	**3900**		50	39	mg/L			04/28/17 11:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.205**		0.0861	0.0880	1.00	0.0906	pCi/L	04/28/17 11:14	05/23/17 08:54	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*04/28/17 11:14*	*05/23/17 08:54*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.0150	U	0.213	0.213	1.00	0.386	pCi/L	04/28/17 10:55	05/12/17 11:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.4*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:10*	*1*
Y Carrier	*81.1*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:10*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-3
Date Collected: 04/24/17 14:55
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.190	U	0.230	0.231	5.00	0.386	pCi/L		05/24/17 16:26	1

Client Sample ID: MW-4

Date Collected: 04/24/17 16:03
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-4

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**3800**		200	8.1	ug/L		04/28/17 14:00	05/01/17 14:31	1
Calcium	**500000**		5000	710	ug/L		04/28/17 14:00	05/01/17 14:31	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/28/17 14:00	05/01/17 14:34	1
Arsenic	**0.0012**	**J**	0.0050	0.00035	mg/L		04/28/17 14:00	05/01/17 14:34	1
Barium	**0.14**		0.0050	0.00052	mg/L		04/28/17 14:00	05/01/17 14:34	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/28/17 14:00	05/01/17 14:34	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/28/17 14:00	05/01/17 14:34	1
Cobalt	**0.00039**	**J**	0.0010	0.00013	mg/L		04/28/17 14:00	05/01/17 14:34	1
Chromium	**0.0021**		0.0020	0.00026	mg/L		04/28/17 14:00	05/01/17 14:34	1
Molybdenum	**0.0017**	**J**	0.010	0.00051	mg/L		04/28/17 14:00	05/01/17 14:34	1
Lead	**0.00019**	**J**	0.0010	0.00016	mg/L		04/28/17 14:00	05/01/17 14:34	1
Selenium	**0.00065**	**J**	0.0050	0.00048	mg/L		04/28/17 14:00	05/01/17 14:34	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/28/17 14:00	05/01/17 14:34	1
Lithium	**0.058**	**B**	0.0080	0.00016	mg/L		04/28/17 14:00	05/01/17 14:34	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/27/17 11:00	04/27/17 15:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**350**		10	4.1	mg/L			04/30/17 05:15	10
Fluoride	**1.0**		0.50	0.090	mg/L			04/30/17 05:15	10
Sulfate	**830**		10	1.3	mg/L			04/30/17 05:15	10
Total Dissolved Solids	**2500**		40	31	mg/L			04/28/17 11:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.124**		0.0801	0.0808	1.00	0.107	pCi/L	04/28/17 11:14	05/23/17 08:54	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.5*		*40 - 110*	*04/28/17 11:14*	*05/23/17 08:54*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.289	U	0.255	0.257	1.00	0.409	pCi/L	04/28/17 10:55	05/12/17 11:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*83.5*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:10*	*1*
Y Carrier	*81.1*		*40 - 110*	*04/28/17 10:55*	*05/12/17 11:10*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-4
Date Collected: 04/24/17 16:03
Date Received: 04/26/17 09:30

Lab Sample ID: 240-78636-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.413		0.268	0.269	5.00	0.409	pCi/L		05/24/17 16:26	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
240-78636-1	MW-1	90.3
240-78636-2	MW-2	84.4
240-78636-3	MW-3	94.4
240-78636-4	MW-4	83.5
LCS 160-306174/2-A	Lab Control Sample	89.1
LCSD 160-306174/3-A	Lab Control Sample Dup	89.4
MB 160-306174/1-A	Method Blank	90.9

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(40-110)	(40-110)
240-78636-1	MW-1	90.3	84.5
240-78636-2	MW-2	84.4	83.4
240-78636-3	MW-3	94.4	81.1
240-78636-4	MW-4	83.5	81.1
LCS 160-306173/2-A	Lab Control Sample	89.1	84.1
LCSD 160-306173/3-A	Lab Control Sample Dup	89.4	81.5
MB 160-306173/1-A	Method Blank	90.9	88.6

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-276687/1-A
Matrix: Water
Analysis Batch: 277057

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 276687

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		04/28/17 14:00	05/01/17 11:48	1
Calcium	5000	U	5000	710	ug/L		04/28/17 14:00	05/01/17 11:48	1

Lab Sample ID: LCS 240-276687/2-A
Matrix: Water
Analysis Batch: 277057

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 276687

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1010		ug/L		101	80 - 120
Calcium	50000	50800		ug/L		102	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-276687/1-A
Matrix: Water
Analysis Batch: 277066

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 276687

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00027	mg/L		04/28/17 14:00	05/01/17 13:39	1
Arsenic	0.0050	U	0.0050	0.00035	mg/L		04/28/17 14:00	05/01/17 13:39	1
Barium	0.0050	U	0.0050	0.00052	mg/L		04/28/17 14:00	05/01/17 13:39	1
Beryllium	0.0010	U	0.0010	0.00040	mg/L		04/28/17 14:00	05/01/17 13:39	1
Cadmium	0.0010	U	0.0010	0.00031	mg/L		04/28/17 14:00	05/01/17 13:39	1
Cobalt	0.0010	U	0.0010	0.00013	mg/L		04/28/17 14:00	05/01/17 13:39	1
Chromium	0.0020	U	0.0020	0.00026	mg/L		04/28/17 14:00	05/01/17 13:39	1
Molybdenum	0.010	U	0.010	0.00051	mg/L		04/28/17 14:00	05/01/17 13:39	1
Lead	0.0010	U	0.0010	0.00016	mg/L		04/28/17 14:00	05/01/17 13:39	1
Selenium	0.0050	U	0.0050	0.00048	mg/L		04/28/17 14:00	05/01/17 13:39	1
Thallium	0.0010	U	0.0010	0.00028	mg/L		04/28/17 14:00	05/01/17 13:39	1
Lithium	0.000334	J	0.0080	0.00016	mg/L		04/28/17 14:00	05/01/17 13:39	1

Lab Sample ID: LCS 240-276687/3-A
Matrix: Water
Analysis Batch: 277066

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 276687

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.0835		mg/L		84	80 - 120
Arsenic	1.00	1.04		mg/L		104	80 - 120
Barium	1.00	1.10		mg/L		110	80 - 120
Beryllium	1.00	1.06		mg/L		106	80 - 120
Cadmium	1.00	1.08		mg/L		108	80 - 120
Cobalt	1.00	1.06		mg/L		106	80 - 120
Chromium	1.00	1.02		mg/L		102	80 - 120
Molybdenum	0.100	0.0941		mg/L		94	80 - 120
Lead	1.00	1.05		mg/L		105	80 - 120
Selenium	1.00	1.06		mg/L		106	80 - 120
Thallium	0.250	0.255		mg/L		102	80 - 120
Lithium	0.100	0.108		mg/L		108	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-276504/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 276599 — **Prep Batch: 276504**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		04/27/17 11:00	04/27/17 15:17	1

Lab Sample ID: LCS 240-276504/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 276599 — **Prep Batch: 276504**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00469		mg/L		94	80 - 120

Lab Sample ID: 240-78636-1 MS — **Client Sample ID: MW-1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 276599 — **Prep Batch: 276504**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00020	U	0.00100	0.00107		mg/L		107	80 - 120

Lab Sample ID: 240-78636-1 MSD — **Client Sample ID: MW-1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 276599 — **Prep Batch: 276504**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.00020	U	0.00100	0.000929		mg/L		93	80 - 120	14	20

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-276583/27 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 276583

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.41	mg/L			04/30/17 02:30	1
Fluoride	0.050	U	0.050	0.0090	mg/L			04/30/17 02:30	1
Sulfate	1.0	U	1.0	0.13	mg/L			04/30/17 02:30	1

Lab Sample ID: LCS 240-276583/28 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 276583

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	48.5		mg/L		97	90 - 110
Fluoride	2.50	2.50		mg/L		100	90 - 110
Sulfate	50.0	48.6		mg/L		97	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-276723/1
Matrix: Water
Analysis Batch: 276723

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.8	mg/L			04/28/17 11:43	1

Lab Sample ID: LCS 240-276723/2
Matrix: Water
Analysis Batch: 276723

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	208	210		mg/L		101	80 - 120

Lab Sample ID: 240-78636-1 DU
Matrix: Water
Analysis Batch: 276723

Client Sample ID: MW-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	1900		1880		mg/L		2	20

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-306174/1-A
Matrix: Water
Analysis Batch: 309863

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 306174

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.006452	U	0.0519	0.0519	1.00	0.104	pCi/L	04/28/17 11:14	05/23/17 08:53	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*04/28/17 11:14*	*05/23/17 08:53*	*1*

Lab Sample ID: LCS 160-306174/2-A
Matrix: Water
Analysis Batch: 309863

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 306174

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	9.615		1.01	1.00	0.0848	pCi/L	85	68 - 137

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*89.1*		*40 - 110*

Lab Sample ID: LCSD 160-306174/3-A
Matrix: Water
Analysis Batch: 309863

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 306174

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226	11.4	9.861		1.04	1.00	0.0938	pCi/L	87	68 - 137	0.12	1

Method: 9315 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCSD 160-306174/3-A
Matrix: Water
Analysis Batch: 309863

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 306174

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	89.4		40 - 110

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-306173/1-A
Matrix: Water
Analysis Batch: 308397

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 306173

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.09896	U	0.202	0.203	1.00	0.379	pCi/L	04/28/17 10:55	05/12/17 11:09	1

Carrier	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Ba Carrier	90.9		40 - 110	04/28/17 10:55	05/12/17 11:09	1
Y Carrier	88.6		40 - 110	04/28/17 10:55	05/12/17 11:09	1

Lab Sample ID: LCS 160-306173/2-A
Matrix: Water
Analysis Batch: 308397

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 306173

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.5	16.26		1.73	1.00	0.401	pCi/L	121	56 - 140		

Carrier	LCS %Yield	LCS Qualifier	Limits
Ba Carrier	89.1		40 - 110
Y Carrier	84.1		40 - 110

Lab Sample ID: LCSD 160-306173/3-A
Matrix: Water
Analysis Batch: 308397

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 306173

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			13.5	17.21		1.83	1.00	0.446	pCi/L	128	56 - 140	0.27	1

Carrier	LCSD %Yield	LCSD Qualifier	Limits
Ba Carrier	89.4		40 - 110
Y Carrier	81.5		40 - 110

Metals

Prep Batch: 276504

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total/NA	Water	7470A	
240-78636-2	MW-2	Total/NA	Water	7470A	
240-78636-3	MW-3	Total/NA	Water	7470A	
240-78636-4	MW-4	Total/NA	Water	7470A	
MB 240-276504/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-276504/2-A	Lab Control Sample	Total/NA	Water	7470A	
240-78636-1 MS	MW-1	Total/NA	Water	7470A	
240-78636-1 MSD	MW-1	Total/NA	Water	7470A	

Analysis Batch: 276599

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total/NA	Water	7470A	276504
240-78636-2	MW-2	Total/NA	Water	7470A	276504
240-78636-3	MW-3	Total/NA	Water	7470A	276504
240-78636-4	MW-4	Total/NA	Water	7470A	276504
MB 240-276504/1-A	Method Blank	Total/NA	Water	7470A	276504
LCS 240-276504/2-A	Lab Control Sample	Total/NA	Water	7470A	276504
240-78636-1 MS	MW-1	Total/NA	Water	7470A	276504
240-78636-1 MSD	MW-1	Total/NA	Water	7470A	276504

Prep Batch: 276687

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total Recoverable	Water	3005A	
240-78636-2	MW-2	Total Recoverable	Water	3005A	
240-78636-3	MW-3	Total Recoverable	Water	3005A	
240-78636-4	MW-4	Total Recoverable	Water	3005A	
MB 240-276687/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-276687/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-276687/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 277057

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total Recoverable	Water	6010C	276687
240-78636-1	MW-1	Total Recoverable	Water	6010C	276687
240-78636-2	MW-2	Total Recoverable	Water	6010C	276687
240-78636-2	MW-2	Total Recoverable	Water	6010C	276687
240-78636-3	MW-3	Total Recoverable	Water	6010C	276687
240-78636-4	MW-4	Total Recoverable	Water	6010C	276687
MB 240-276687/1-A	Method Blank	Total Recoverable	Water	6010C	276687
LCS 240-276687/2-A	Lab Control Sample	Total Recoverable	Water	6010C	276687

Analysis Batch: 277066

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total Recoverable	Water	6020A	276687
240-78636-2	MW-2	Total Recoverable	Water	6020A	276687
240-78636-3	MW-3	Total Recoverable	Water	6020A	276687
240-78636-4	MW-4	Total Recoverable	Water	6020A	276687
MB 240-276687/1-A	Method Blank	Total Recoverable	Water	6020A	276687
LCS 240-276687/3-A	Lab Control Sample	Total Recoverable	Water	6020A	276687

General Chemistry

Analysis Batch: 276583

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total/NA	Water	9056A	
240-78636-3	MW-3	Total/NA	Water	9056A	
240-78636-4	MW-4	Total/NA	Water	9056A	
MB 240-276583/27	Method Blank	Total/NA	Water	9056A	
LCS 240-276583/28	Lab Control Sample	Total/NA	Water	9056A	

Analysis Batch: 276723

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total/NA	Water	SM 2540C	
240-78636-2	MW-2	Total/NA	Water	SM 2540C	
240-78636-3	MW-3	Total/NA	Water	SM 2540C	
240-78636-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-276723/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-276723/2	Lab Control Sample	Total/NA	Water	SM 2540C	
240-78636-1 DU	MW-1	Total/NA	Water	SM 2540C	

Analysis Batch: 277197

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-2	MW-2	Total/NA	Water	9056A	

Rad

Prep Batch: 306173

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total/NA	Water	PrecSep_0	
240-78636-2	MW-2	Total/NA	Water	PrecSep_0	
240-78636-3	MW-3	Total/NA	Water	PrecSep_0	
240-78636-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-306173/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-306173/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-306173/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Prep Batch: 306174

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-78636-1	MW-1	Total/NA	Water	PrecSep-21	
240-78636-2	MW-2	Total/NA	Water	PrecSep-21	
240-78636-3	MW-3	Total/NA	Water	PrecSep-21	
240-78636-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-306174/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-306174/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-306174/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-1

Lab Sample ID: 240-78636-1

Date Collected: 04/24/17 11:55
Matrix: Water
Date Received: 04/26/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6010C		1	277057	05/01/17 14:18	KLC	TAL CAN
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6010C		5	277057	05/01/17 15:39	KLC	TAL CAN
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6020A		1	277066	05/01/17 14:21	AS1	TAL CAN
Total/NA	Prep	7470A			276504	04/27/17 11:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	276599	04/27/17 15:23	DTN	TAL CAN
Total/NA	Analysis	9056A		5	276583	04/30/17 04:13	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	276723	04/28/17 11:43	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			306174	04/28/17 11:14	LDE	TAL SL
Total/NA	Analysis	9315		1	309863	05/23/17 08:54	RTM	TAL SL
Total/NA	Prep	PrecSep_0			306173	04/28/17 10:55	LDE	TAL SL
Total/NA	Analysis	9320		1	308397	05/12/17 11:09	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	310413	05/24/17 16:26	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-78636-2

Date Collected: 04/24/17 13:28
Matrix: Water
Date Received: 04/26/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6010C		1	277057	05/01/17 14:22	KLC	TAL CAN
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6010C		20	277057	05/01/17 15:44	KLC	TAL CAN
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6020A		1	277066	05/01/17 14:25	AS1	TAL CAN
Total/NA	Prep	7470A			276504	04/27/17 11:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	276599	04/27/17 15:34	DTN	TAL CAN
Total/NA	Analysis	9056A		20	277197	05/02/17 18:57	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	276723	04/28/17 11:43	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			306174	04/28/17 11:14	LDE	TAL SL
Total/NA	Analysis	9315		1	309863	05/23/17 08:54	RTM	TAL SL
Total/NA	Prep	PrecSep_0			306173	04/28/17 10:55	LDE	TAL SL
Total/NA	Analysis	9320		1	308397	05/12/17 11:10	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	310413	05/24/17 16:26	RTM	TAL SL

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Client Sample ID: MW-3

Lab Sample ID: 240-78636-3

Date Collected: 04/24/17 14:55
Matrix: Water
Date Received: 04/26/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6010C		1	277057	05/01/17 14:27	KLC	TAL CAN
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6020A		1	277066	05/01/17 14:30	AS1	TAL CAN
Total/NA	Prep	7470A			276504	04/27/17 11:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	276599	04/27/17 15:36	DTN	TAL CAN
Total/NA	Analysis	9056A		20	276583	04/30/17 04:54	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	276723	04/28/17 11:43	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			306174	04/28/17 11:14	LDE	TAL SL
Total/NA	Analysis	9315		1	309863	05/23/17 08:54	RTM	TAL SL
Total/NA	Prep	PrecSep_0			306173	04/28/17 10:55	LDE	TAL SL
Total/NA	Analysis	9320		1	308397	05/12/17 11:10	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	310413	05/24/17 16:26	RTM	TAL SL

Client Sample ID: MW-4

Lab Sample ID: 240-78636-4

Date Collected: 04/24/17 16:03
Matrix: Water
Date Received: 04/26/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6010C		1	277057	05/01/17 14:31	KLC	TAL CAN
Total Recoverable	Prep	3005A			276687	04/28/17 14:00	WKD	TAL CAN
Total Recoverable	Analysis	6020A		1	277066	05/01/17 14:34	AS1	TAL CAN
Total/NA	Prep	7470A			276504	04/27/17 11:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	276599	04/27/17 15:38	DTN	TAL CAN
Total/NA	Analysis	9056A		10	276583	04/30/17 05:15	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	276723	04/28/17 11:43	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			306174	04/28/17 11:14	LDE	TAL SL
Total/NA	Analysis	9315		1	309863	05/23/17 08:54	RTM	TAL SL
Total/NA	Prep	PrecSep_0			306173	04/28/17 10:55	LDE	TAL SL
Total/NA	Analysis	9320		1	308397	05/12/17 11:10	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	310413	05/24/17 16:26	RTM	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-78636-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17
West Virginia DEP	State Program	3	210	12-31-17

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-17 *

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

CAMBRIDGE 240506

2.0|C1.7

Chain of Custody Record

CAMBRIDGE 240506

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Corey Finley	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41873-17977.1
Client Contact: Mr. Brian Beach – 616-738-7323	Phone: 6095013605	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:			
City: Holland	TAT Requested (days): standard			
State, Zip: MI, 49424				
Phone:	PO #: 0398257			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site: # 0398257	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)	9315_Ra226; 9320_Ra228	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1	4-24-17	1155	G	Water			X	X	X	4	
MW-2	4-24-17	1328		Water			X	X	X	4	
MW-3	4-24-17	1455		Water			X	X	X	4	
MW-4	4-24-17	1603		Water			X	X	X	4	
				Water							

240-78636 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	Company	Received by	Date/Time	Company
1	[signature] / ERM	4-25-17 / 1430	ERM	[signature]	4-26-17 930	TAC
2						
3						

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

Cooler Temperature(s) °C and Other Remarks:

5/24/2017

TestAmerica Canton Sample Receipt Form/Narrative **Login # : 78636**
Canton Facility

Client ERM Site Name ~

Cooler Received on 4-26-17 Opened on 4-26-17

Cooler unpacked by: [signature]

FedEx: 1st Grd Exp UPS FAS Stetson Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

TestAmerica Cooler # Foam Box Client Cooler Box Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.3** °C) Observed Cooler Temp. 2.0 °C Corrected Cooler Temp. 1.7 °C
   IR GUN #36 (CF **+0.8**°C) Observed Cooler Temp. ____ °C Corrected Cooler Temp. ____ °C
2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
   -Were custody seals on the outside of the cooler(s) signed & dated? Yes No NA
   -Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels be reconciled with the COC? Yes No
9. Were correct bottle(s) used for the test(s) indicated? Yes No
10. Sufficient quantity received to perform indicated analyses? Yes No
11. Are these work share samples? Yes No
    If yes, Questions 11-15 have been checked at the originating laboratory.
11. Were sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# **HC682547**
12. Were VOAs on the COC? Yes No
13. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this. Yes No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # ____ Yes No
15. Was a LL Hg or Me Hg trip blank present? ____ Yes No

Contacted PM ____ Date ____ by ____ via Verbal Voice Mail Other

Concerning ____

14. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

15. SAMPLE CONDITION

Sample(s) ____ were received after the recommended holding time had expired.
Sample(s) ____ were received in a broken container.
Sample(s) ____ were received with bubble >6 mm in diameter. (Notify PM)

16. SAMPLE PRESERVATION

Sample(s) ____ were further preserved in the laboratory.
Time preserved: ____ Preservative(s) added/Lot number(s): ____

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-78636-B-1	Plastic 500ml - with Nitric Acid	<2		
MW-1	240-78636-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-1	240-78636-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-2	240-78636-B-2	Plastic 500ml - with Nitric Acid	<2		
MW-2	240-78636-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-2	240-78636-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-3	240-78636-B-3	Plastic 500ml - with Nitric Acid	<2		
MW-3	240-78636-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-3	240-78636-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-4	240-78636-B-4	Plastic 500ml - with Nitric Acid	<2		
MW-4	240-78636-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-4	240-78636-D-4	Plastic 1 liter - Nitric Acid	<2		

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-78636 Chain of Custody

testAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna	COC No: 40-69743.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP	Page: Page 1 of 1
Address: 13715 Rider Trail North, ,	Due Date Requested: 5/24/2017		Job #: 240-78636-1
City: Earth City	TAT Requested (days):		
State, Zip: MO, 63045			
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:		
Email:	WO #:		
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882		
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 - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-78636-1)	4/24/17	11:55 Eastern		Water			X	X	X	2	
MW-2 (240-78636-2)	4/24/17	13:28 Eastern		Water			X	X	X	2	
MW-3 (240-78636-3)	4/24/17	14:55 Eastern		Water			X	X	X	2	
MW-4 (240-78636-4)	4/24/17	16:03 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

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

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	4-26-17 1460	NA		4-27-17 0825	TAS
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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:

5/24/2017

Login Sample Receipt Checklist

Client: ERM-North Central Inc

Job Number: 240-78636-1

Login Number: 78636
List Number: 2
Creator: Taylor, Kristene N

List Source: TestAmerica St. Louis
List Creation: 04/27/17 12:16 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	19.0,19.0,1.9
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-01
Site Name & Address: GHBLP JBSims Generating Station 1231 N 3rd St Grand Haven, MI
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 5.33'
Groundwater Elevation/SWL (feet): 94.02'
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #: 0398257
Client: GHBLP
Date: 4-24-17
Weather: Sunny
Temperature/Bar. Pressure 65-70F / 748
Start Time of Purging: 1125
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 6.99
Calculated Well Volume* (liters or gal): 1.14
Well Volume Discharged (liters or gal): 2.5

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional Y (N/A); Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1000; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~liter/min~~ or gallon/min)	Comments (i.e., odor, color, etc)
1135	9.85	1.892	0.74	7.61	-111.6	1.03	5.53	0.220	
1140	10.20	1.895	0.55	7.58	-96.2	0.66	5.53	0.220	
1145	10.10	1.906	0.37	7.55	-85.3	0.64	5.53	0.220	
1150	10.20	1.919	0.30	7.55	-79.4	0.65	5.53	0.220	
1155	10.08	1.940	0.27	7.51	-85.3	0.66	5.53	0.220	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled at: 1155

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-02
Site Name & Address: GHBLP JBSims Generating Station 1231 N. 3rd St Grand Haven, MI
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 107.75
Initial Water Level (feet below TOC): 15.15'
Groundwater Elevation/SWL (feet): 92.6'
Well Depth (feet below TOC): 23.37
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): 19'

Project #: 0398257
Client: GHBLP
Date: 4-24-17
Weather: 60-70°F / 747.05
Temperature/Bar. Pressure: Sunny
Start Time of Purging: 1248
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 8.22
Calculated Well Volume* (liters or gal): 1.34
Well Volume Discharged (liters or gal): 2.5

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional Y (N/A); Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1000; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1258	13.95	3.411	0.94	6.98	-120.1	7.60	16.03	0.200	
1303	13.96	3.425	0.66	6.92	-110.2	6.71	16.03	0.200	
1308	14.10	3.501	0.62	6.87	-108.7	6.33	16.03	0.200	
1313	14.08	3.464	0.53	6.86	-113.6	6.04	16.03	0.200	
1318	14.29	3.512	0.46	6.85	-112.4	4.58	16.03	0.200	
1323	14.25	3.499	0.39	6.87	-112.9	4.39	16.03	0.200	
1328	14.08	3.535	0.33	6.90	-107.2	4.51	16.03	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[F]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[F]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: sampled at: 1328

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-03
Site Name & Address: GHBLP
JB Sims Generating Station
1231 N. 3rd St Grand Haven, MI

Project #: 0398257
Client: GHBLP
Date: 4-24-17
Weather: Sunny
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Temperature/Bar. Pressure 70°F | 746.2
Start Time of Purging: 1415
Top of Casing Elevation (feet): 105.20'
Well Material: steel or (PVC)
Initial Water Level (feet below TOC): 12.57'
Well Diameter: 1" or (2")
Groundwater Elevation/SWL (feet): 92.63'
Length of Water Column (feet): 7.77
Well Depth (feet below TOC): 20.34'
Calculated Well Volume* (liters or (gal)): 1.27
Screened Interval (feet below TOC): 12-17'
Well Volume Discharged (liters or (gal)): 3
Depth Pump Intake Set At (feet below TOC): 16'

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional Y (NA) Pro-cover in good condition (Y) N; Casing in good condition (Y) N

Calibration: Time; 1000; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%

Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1425	15.42	3.829	0.97	6.71	-65.1	3.82	12.85	0.220	
1430	15.68	3.897	0.68	6.56	-63.4	3.28	12.85	0.220	
1435	15.10	3.937	0.64	6.41	-54.4	2.86	12.85	0.220	
1440	15.45	3.939	0.52	6.31	-58.0	1.48	12.85	0.220	
1445	15.36	3.947	0.45	6.29	-59.6	1.46	12.85	0.220	
1450	15.20	3.928	0.36	6.29	-59.5	1.66	12.85	0.220	
1455	15.25	3.929	0.32	6.27	-62.7	1.36	12.85	0.220	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled at: 1435

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-04
Site Name & Address: GHBLP JBSims Generating Station 1231 N. 3rd St. Grand Haven, MI
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 103.59'
Initial Water Level (feet below TOC): 10.65'
Groundwater Elevation/SWL (feet): 92.94'
Well Depth (feet below TOC): 18.00'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #: 0398257
Client: GHBLP
Date: 4-24-17
Weather: Sunny
Temperature/Bar. Pressure 65°F | 745.6
Start Time of Purging: 1533
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 7.35
Calculated Well Volume* (liters or gal): 1.20
Well Volume Discharged (liters or gal): 2.75

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional Y (N/A); Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1000; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1543	13.00	2.638	0.77	6.75	-66.5	2.92	11.07	0.280	
1548	13.09	2.634	0.40	6.53	-60.3	1.64	11.07	0.280	
1553	12.75	2.647	0.42	6.45	-57.2	1.16	11.07	0.280	
1558	12.19	2.658	0.43	6.38	-54.4	1.04	11.07	0.280	
1603	12.51	2.650	0.45	6.37	-54.9	1.08	11.07	0.280	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled at: 1603

APPENDIX A-4

FOURTH BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-79573-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Denise D Heckler

Authorized for release by:
6/14/2017 12:55:55 PM
Denise Heckler, Project Manager II
(330)966-9477
denise.heckler@testamericainc.com

Designee for

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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 Narrative

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Job ID: 240-79573-1

Laboratory: TestAmerica Canton

Narrative

Job Narrative
240-79573-1

Comments
No additional comments.

Receipt
The samples were received on 5/16/2017 9:20 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.5º C.

RAD
Method(s) PrecSep_0: Radium 228 Prep Batch 160-309413: The following sample was reduced due to heavy amounts of sediment making sample murky and brown: MW-2 (240-79573-2).

Method(s) PrecSep_0: Radium 228 Prep Batch 160-309413: The following samples were reduced due to limited volume: MW-1 (240-79573-1), MW-3 (240-79573-3) and MW-4 (240-79573-4).

Method(s) PrecSep_0: Radium 228 Prep Batch 160-309413: Insufficient sample volume was available to perform a sample duplicate (DU). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision: MW-1 (240-79573-1), MW-2 (240-79573-2), MW-3 (240-79573-3) and MW-4 (240-79573-4).

Method(s) PrecSep-21: Radium 226 Prep Batch 160-309412: The following sample was reduced due to heavy amounts of sediments making sample murky and brown: MW-2 (240-79573-2).

Method(s) PrecSep-21: Radium 226 Prep Batch 160-309412: The following samples were reduced due to limited volume: MW-1 (240-79573-1), MW-3 (240-79573-3) and MW-4 (240-79573-4).

Method(s) PrecSep-21: Radium 226 Prep Batch 160-309412: Insufficient sample volume was available to perform a sample duplicate (DU). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision: MW-1 (240-79573-1), MW-2 (240-79573-2), MW-3 (240-79573-3) and MW-4 (240-79573-4).

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

Metals
Method(s) 3005A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-79573-2). Elevated reporting limits (RLs) are provided.

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

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-79573-1	MW-1	Water	05/15/17 11:31	05/16/17 09:20
240-79573-2	MW-2	Water	05/15/17 12:54	05/16/17 09:20
240-79573-3	MW-3	Water	05/15/17 14:12	05/16/17 09:20
240-79573-4	MW-4	Water	05/15/17 15:14	05/16/17 09:20

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-1 — Lab Sample ID: 240-79573-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	76000		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	190000		5000	710	ug/L	1		6010C	Total Recoverable
Antimony	0.00095	J	0.0020	0.00057	mg/L	1		6020A	Total Recoverable
Arsenic	0.0016	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.27		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cadmium	0.00076	J	0.0010	0.00021	mg/L	1		6020A	Total Recoverable
Cobalt	0.0012		0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0015	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0023	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.0016		0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Selenium	0.0018	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Thallium	0.00039	J	0.0010	0.00020	mg/L	1		6020A	Total Recoverable
Lithium	1.6		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	160		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	14		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	530		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	1800		20	16	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-79573-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110000		2000	81	ug/L	1		6010C	Total Recoverable
Calcium	190000		50000	7100	ug/L	1		6010C	Total Recoverable
Barium	0.44		0.050	0.022	mg/L	1		6020A	Total Recoverable
Cobalt	0.0084	J	0.010	0.0019	mg/L	1		6020A	Total Recoverable
Chromium	0.048		0.020	0.0098	mg/L	1		6020A	Total Recoverable
Lead	0.010		0.010	0.0045	mg/L	1		6020A	Total Recoverable
Lithium	1.3		0.080	0.017	mg/L	1		6020A	Total Recoverable
Chloride	140		20	5.7	mg/L	20		9056A	Total/NA
Fluoride	14		1.0	0.48	mg/L	20		9056A	Total/NA
Total Dissolved Solids	1900		40	31	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-3 — Lab Sample ID: 240-79573-3

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-3 (Continued) — Lab Sample ID: 240-79573-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	6400		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	620000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0020	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.21		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cadmium	0.00033	J	0.0010	0.00021	mg/L	1		6020A	Total Recoverable
Cobalt	0.00099	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0015	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0099	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.00079	J	0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Selenium	0.0016	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	0.097		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	480		20	5.7	mg/L	20		9056A	Total/NA
Fluoride	1.9		1.0	0.48	mg/L	20		9056A	Total/NA
Sulfate	1500		20	7.0	mg/L	20		9056A	Total/NA
Total Dissolved Solids	4100		50	39	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 240-79573-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3600		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	450000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0015	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.14		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00031	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0021		0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0015	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.00051	J	0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Lithium	0.051		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	370		20	5.7	mg/L	20		9056A	Total/NA
Fluoride	1.2		1.0	0.48	mg/L	20		9056A	Total/NA
Sulfate	940		20	7.0	mg/L	20		9056A	Total/NA
Total Dissolved Solids	2100		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 05/15/17 11:31
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	76000		2000	81	ug/L		05/17/17 14:00	05/19/17 13:31	10
Calcium	190000		5000	710	ug/L		05/17/17 14:00	05/18/17 18:17	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00095	J	0.0020	0.00057	mg/L		05/17/17 14:00	05/21/17 01:35	1
Arsenic	0.0016	J	0.0050	0.00075	mg/L		05/17/17 14:00	05/21/17 01:35	1
Barium	0.27		0.0050	0.0022	mg/L		05/17/17 14:00	05/21/17 01:35	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		05/17/17 14:00	05/22/17 23:00	1
Cadmium	0.00076	J	0.0010	0.00021	mg/L		05/17/17 14:00	05/21/17 01:35	1
Cobalt	0.0012		0.0010	0.00019	mg/L		05/17/17 14:00	05/21/17 01:35	1
Chromium	0.0015	J	0.0020	0.00098	mg/L		05/17/17 14:00	05/21/17 01:35	1
Molybdenum	0.0023	J	0.010	0.0011	mg/L		05/17/17 14:00	05/21/17 01:35	1
Lead	0.0016		0.0010	0.00045	mg/L		05/17/17 14:00	05/21/17 01:35	1
Selenium	0.0018	J	0.0050	0.00089	mg/L		05/17/17 14:00	05/21/17 01:35	1
Thallium	0.00039	J	0.0010	0.00020	mg/L		05/17/17 14:00	05/21/17 01:35	1
Lithium	1.6		0.0080	0.0017	mg/L		05/17/17 14:00	05/22/17 23:00	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		05/17/17 14:00	05/18/17 13:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	160		10	2.8	mg/L			05/23/17 21:32	10
Fluoride	14		0.50	0.24	mg/L			05/23/17 21:32	10
Sulfate	530		10	3.5	mg/L			05/23/17 21:32	10
Total Dissolved Solids	1800		20	16	mg/L			05/19/17 07:46	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.132		0.0858	0.0866	1.00	0.115	pCi/L	05/19/17 09:34	06/12/17 07:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.5*		*40 - 110*	*05/19/17 09:34*	*06/12/17 07:00*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.326	U	0.329	0.330	1.00	0.536	pCi/L	05/19/17 10:01	06/01/17 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.5*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*
Y Carrier	*87.5*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-1
Date Collected: 05/15/17 11:31
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.458	U	0.340	0.342	5.00	0.536	pCi/L		06/14/17 11:06	1

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-2
Date Collected: 05/15/17 12:54
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-2
Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	110000		2000	81	ug/L		05/17/17 14:00	05/18/17 18:22	1
Calcium	190000		50000	7100	ug/L		05/17/17 14:00	05/18/17 18:22	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.020	U	0.020	0.0057	mg/L		05/17/17 14:00	05/21/17 01:39	1
Arsenic	0.050	U	0.050	0.0075	mg/L		05/17/17 14:00	05/21/17 01:39	1
Barium	0.44		0.050	0.022	mg/L		05/17/17 14:00	05/21/17 01:39	1
Beryllium	0.010	U	0.010	0.0031	mg/L		05/17/17 14:00	05/22/17 23:04	1
Cadmium	0.010	U	0.010	0.0021	mg/L		05/17/17 14:00	05/21/17 01:39	1
Cobalt	0.0084	J	0.010	0.0019	mg/L		05/17/17 14:00	05/21/17 01:39	1
Chromium	0.048		0.020	0.0098	mg/L		05/17/17 14:00	05/21/17 01:39	1
Molybdenum	0.10	U	0.10	0.011	mg/L		05/17/17 14:00	05/21/17 01:39	1
Lead	0.010		0.010	0.0045	mg/L		05/17/17 14:00	05/21/17 01:39	1
Selenium	0.050	U	0.050	0.0089	mg/L		05/17/17 14:00	05/21/17 01:39	1
Thallium	0.010	U	0.010	0.0020	mg/L		05/17/17 14:00	05/21/17 01:39	1
Lithium	1.3		0.080	0.017	mg/L		05/17/17 14:00	05/22/17 23:04	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		05/17/17 14:00	05/18/17 13:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	140		20	5.7	mg/L			05/23/17 21:53	20
Fluoride	14		1.0	0.48	mg/L			05/23/17 21:53	20
Sulfate	20	U	20	7.0	mg/L			05/23/17 21:53	20
Total Dissolved Solids	1900		40	31	mg/L			05/19/17 07:46	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.674		0.207	0.216	1.00	0.175	pCi/L	05/19/17 09:34	06/12/17 07:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*05/19/17 09:34*	*06/12/17 07:00*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.888		0.508	0.514	1.00	0.766	pCi/L	05/19/17 10:01	06/01/17 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.9*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*
Y Carrier	*84.9*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-2
Date Collected: 05/15/17 12:54
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.56		0.548	0.558	5.00	0.766	pCi/L		06/14/17 11:06	1

Client Sample ID: MW-3

Date Collected: 05/15/17 14:12
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**6400**		200	8.1	ug/L		05/17/17 14:00	05/18/17 18:26	1
Calcium	**620000**		5000	710	ug/L		05/17/17 14:00	05/18/17 18:26	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		05/17/17 14:00	05/21/17 01:43	1
Arsenic	**0.0020**	**J**	0.0050	0.00075	mg/L		05/17/17 14:00	05/21/17 01:43	1
Barium	**0.21**		0.0050	0.0022	mg/L		05/17/17 14:00	05/21/17 01:43	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		05/17/17 14:00	05/22/17 23:08	1
Cadmium	**0.00033**	**J**	0.0010	0.00021	mg/L		05/17/17 14:00	05/21/17 01:43	1
Cobalt	**0.00099**	**J**	0.0010	0.00019	mg/L		05/17/17 14:00	05/21/17 01:43	1
Chromium	**0.0015**	**J**	0.0020	0.00098	mg/L		05/17/17 14:00	05/21/17 01:43	1
Molybdenum	**0.0099**	**J**	0.010	0.0011	mg/L		05/17/17 14:00	05/21/17 01:43	1
Lead	**0.00079**	**J**	0.0010	0.00045	mg/L		05/17/17 14:00	05/21/17 01:43	1
Selenium	**0.0016**	**J**	0.0050	0.00089	mg/L		05/17/17 14:00	05/21/17 01:43	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		05/17/17 14:00	05/21/17 01:43	1
Lithium	**0.097**		0.0080	0.0017	mg/L		05/17/17 14:00	05/22/17 23:08	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		05/17/17 14:00	05/18/17 13:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**480**		20	5.7	mg/L			05/23/17 22:53	20
Fluoride	**1.9**		1.0	0.48	mg/L			05/23/17 22:53	20
Sulfate	**1500**		20	7.0	mg/L			05/23/17 22:53	20
Total Dissolved Solids	**4100**		50	39	mg/L			05/19/17 07:46	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.322**		0.128	0.132	1.00	0.141	pCi/L	05/19/17 09:34	06/12/17 07:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.1*		*40 - 110*	*05/19/17 09:34*	*06/12/17 07:00*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.344	U	0.325	0.327	1.00	0.525	pCi/L	05/19/17 10:01	06/01/17 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.1*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*
Y Carrier	*85.6*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-3
Date Collected: 05/15/17 14:12
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.666		0.350	0.352	5.00	0.525	pCi/L		06/14/17 11:06	1

Client Sample ID: MW-4

Date Collected: 05/15/17 15:14
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-4

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**3600**		200	8.1	ug/L		05/17/17 14:00	05/18/17 18:31	1
Calcium	**450000**		5000	710	ug/L		05/17/17 14:00	05/18/17 18:31	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		05/17/17 14:00	05/21/17 01:48	1
Arsenic	**0.0015**	**J**	0.0050	0.00075	mg/L		05/17/17 14:00	05/21/17 01:48	1
Barium	**0.14**		0.0050	0.0022	mg/L		05/17/17 14:00	05/21/17 01:48	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		05/17/17 14:00	05/22/17 23:12	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		05/17/17 14:00	05/21/17 01:48	1
Cobalt	**0.00031**	**J**	0.0010	0.00019	mg/L		05/17/17 14:00	05/21/17 01:48	1
Chromium	**0.0021**		0.0020	0.00098	mg/L		05/17/17 14:00	05/21/17 01:48	1
Molybdenum	**0.0015**	**J**	0.010	0.0011	mg/L		05/17/17 14:00	05/21/17 01:48	1
Lead	**0.00051**	**J**	0.0010	0.00045	mg/L		05/17/17 14:00	05/21/17 01:48	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		05/17/17 14:00	05/21/17 01:48	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		05/17/17 14:00	05/21/17 01:48	1
Lithium	**0.051**		0.0080	0.0017	mg/L		05/17/17 14:00	05/22/17 23:12	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		05/17/17 14:00	05/18/17 13:35	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**370**		20	5.7	mg/L			05/23/17 23:13	20
Fluoride	**1.2**		1.0	0.48	mg/L			05/23/17 23:13	20
Sulfate	**940**		20	7.0	mg/L			05/23/17 23:13	20
Total Dissolved Solids	**2100**		40	31	mg/L			05/19/17 07:46	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.186**		0.111	0.112	1.00	0.146	pCi/L	05/19/17 09:34	06/12/17 07:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.4*		*40 - 110*	*05/19/17 09:34*	*06/12/17 07:00*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0662	U	0.358	0.358	1.00	0.626	pCi/L	05/19/17 10:01	06/01/17 14:29	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*86.4*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*
Y Carrier	*80.7*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:29*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-4
Date Collected: 05/15/17 15:14
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.252	U	0.375	0.375	5.00	0.626	pCi/L		06/14/17 11:06	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
240-79573-1	MW-1	93.5
240-79573-2	MW-2	92.9
240-79573-3	MW-3	89.1
240-79573-4	MW-4	86.4
LCS 160-309412/2-A	Lab Control Sample	99.7
LCSD 160-309412/3-A	Lab Control Sample Dup	94.4
MB 160-309412/1-A	Method Blank	93.8

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(40-110)	(40-110)
240-79573-1	MW-1	93.5	87.5
240-79573-2	MW-2	92.9	84.9
240-79573-3	MW-3	89.1	85.6
240-79573-4	MW-4	86.4	80.7
LCS 160-309413/2-A	Lab Control Sample	99.7	84.9
LCSD 160-309413/3-A	Lab Control Sample Dup	94.4	81.9
MB 160-309413/1-A	Method Blank	93.8	83.0

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-279248/1-A
Matrix: Water
Analysis Batch: 279473

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 279248

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		05/17/17 14:00	05/18/17 17:38	1
Calcium	5000	U	5000	710	ug/L		05/17/17 14:00	05/18/17 17:38	1

Lab Sample ID: LCS 240-279248/2-A
Matrix: Water
Analysis Batch: 279473

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 279248

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1050		ug/L		105	80 - 120
Calcium	50000	50200		ug/L		100	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-279248/1-A
Matrix: Water
Analysis Batch: 279833

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 279248

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		05/17/17 14:00	05/21/17 00:58	1
Arsenic	0.0050	U	0.0050	0.00075	mg/L		05/17/17 14:00	05/21/17 00:58	1
Barium	0.0050	U	0.0050	0.0022	mg/L		05/17/17 14:00	05/21/17 00:58	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		05/17/17 14:00	05/21/17 00:58	1
Cobalt	0.0010	U	0.0010	0.00019	mg/L		05/17/17 14:00	05/21/17 00:58	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		05/17/17 14:00	05/21/17 00:58	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		05/17/17 14:00	05/21/17 00:58	1
Lead	0.0010	U	0.0010	0.00045	mg/L		05/17/17 14:00	05/21/17 00:58	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		05/17/17 14:00	05/21/17 00:58	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		05/17/17 14:00	05/21/17 00:58	1

Lab Sample ID: LCS 240-279248/3-A
Matrix: Water
Analysis Batch: 279833

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 279248

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.101		mg/L		101	80 - 120
Arsenic	1.00	0.885		mg/L		89	80 - 120
Barium	1.00	1.01		mg/L		101	80 - 120
Cadmium	1.00	1.04		mg/L		104	80 - 120
Cobalt	1.00	1.04		mg/L		104	80 - 120
Chromium	1.00	1.02		mg/L		102	80 - 120
Molybdenum	0.100	0.0955		mg/L		95	80 - 120
Lead	1.00	1.01		mg/L		101	80 - 120
Selenium	1.00	0.941		mg/L		94	80 - 120
Thallium	0.250	0.245		mg/L		98	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-279260/1-A
Matrix: Water
Analysis Batch: 279504

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 279260

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		05/17/17 14:00	05/18/17 12:54	1

Lab Sample ID: LCS 240-279260/2-A
Matrix: Water
Analysis Batch: 279504

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 279260

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00499		mg/L		100	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-280050/3
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			05/23/17 10:49	1
Fluoride	0.050	U	0.050	0.024	mg/L			05/23/17 10:49	1
Sulfate	1.0	U	1.0	0.35	mg/L			05/23/17 10:49	1

Lab Sample ID: MB 240-280050/45
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			05/24/17 00:54	1
Fluoride	0.050	U	0.050	0.024	mg/L			05/24/17 00:54	1
Sulfate	1.0	U	1.0	0.35	mg/L			05/24/17 00:54	1

Lab Sample ID: LCS 240-280050/4
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	50.9		mg/L		102	90 - 110
Fluoride	2.50	2.70		mg/L		108	90 - 110
Sulfate	50.0	52.1		mg/L		104	90 - 110

Lab Sample ID: LCS 240-280050/46
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	50.8		mg/L		102	90 - 110
Fluoride	2.50	2.71		mg/L		108	90 - 110
Sulfate	50.0	52.1		mg/L		104	90 - 110

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCSD 240-280050/1046
Matrix: Water
Analysis Batch: 280050

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chloride	50.0	50.8		mg/L		102	90 - 110	0	20
Fluoride	2.50	2.71		mg/L		108	90 - 110	0	20
Sulfate	50.0	52.1		mg/L		104	90 - 110	0	20

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-279615/1
Matrix: Water
Analysis Batch: 279615

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.8	mg/L			05/19/17 07:46	1

Lab Sample ID: LCS 240-279615/2
Matrix: Water
Analysis Batch: 279615

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	208	200		mg/L		96	80 - 120

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-309412/1-A
Matrix: Water
Analysis Batch: 312922

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 309412

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.02018	U	0.0594	0.0594	1.00	0.110	pCi/L	05/19/17 09:34	06/12/17 06:58	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.8*		*40 - 110*	*05/19/17 09:34*	*06/12/17 06:58*	*1*

Lab Sample ID: LCS 160-309412/2-A
Matrix: Water
Analysis Batch: 312922

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 309412

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	9.587		0.999	1.00	0.0920	pCi/L	84	68 - 137

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.7*		*40 - 110*

Method: 9315 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCSD 160-309412/3-A
Matrix: Water
Analysis Batch: 312922

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 309412

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226			11.4	9.651		1.01	1.00	0.0979	pCi/L	85	68 - 137	0.03	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*94.4*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-309413/1-A
Matrix: Water
Analysis Batch: 311425

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 309413

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.05889	U	0.221	0.221	1.00	0.386	pCi/L	05/19/17 10:01	06/01/17 14:28	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.8*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:28*	*1*
Y Carrier	*83.0*		*40 - 110*	*05/19/17 10:01*	*06/01/17 14:28*	*1*

Lab Sample ID: LCS 160-309413/2-A
Matrix: Water
Analysis Batch: 311425

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 309413

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.4	12.81		1.39	1.00	0.331	pCi/L	96	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.7*		*40 - 110*
Y Carrier	*84.9*		*40 - 110*

Lab Sample ID: LCSD 160-309413/3-A
Matrix: Water
Analysis Batch: 311425

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 309413

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			13.4	13.64		1.48	1.00	0.365	pCi/L	102	56 - 140	0.29	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*94.4*		*40 - 110*
Y Carrier	*81.9*		*40 - 110*

Metals

Prep Batch: 279248

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total Recoverable	Water	3005A	
240-79573-2	MW-2	Total Recoverable	Water	3005A	
240-79573-3	MW-3	Total Recoverable	Water	3005A	
240-79573-4	MW-4	Total Recoverable	Water	3005A	
MB 240-279248/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-279248/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-279248/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 279260

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total/NA	Water	7470A	
240-79573-2	MW-2	Total/NA	Water	7470A	
240-79573-3	MW-3	Total/NA	Water	7470A	
240-79573-4	MW-4	Total/NA	Water	7470A	
MB 240-279260/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-279260/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 279473

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total Recoverable	Water	6010C	279248
240-79573-2	MW-2	Total Recoverable	Water	6010C	279248
240-79573-3	MW-3	Total Recoverable	Water	6010C	279248
240-79573-4	MW-4	Total Recoverable	Water	6010C	279248
MB 240-279248/1-A	Method Blank	Total Recoverable	Water	6010C	279248
LCS 240-279248/2-A	Lab Control Sample	Total Recoverable	Water	6010C	279248

Analysis Batch: 279504

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total/NA	Water	7470A	279260
240-79573-2	MW-2	Total/NA	Water	7470A	279260
240-79573-3	MW-3	Total/NA	Water	7470A	279260
240-79573-4	MW-4	Total/NA	Water	7470A	279260
MB 240-279260/1-A	Method Blank	Total/NA	Water	7470A	279260
LCS 240-279260/2-A	Lab Control Sample	Total/NA	Water	7470A	279260

Analysis Batch: 279711

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total Recoverable	Water	6010C	279248

Analysis Batch: 279833

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total Recoverable	Water	6020A	279248
240-79573-2	MW-2	Total Recoverable	Water	6020A	279248
240-79573-3	MW-3	Total Recoverable	Water	6020A	279248
240-79573-4	MW-4	Total Recoverable	Water	6020A	279248
MB 240-279248/1-A	Method Blank	Total Recoverable	Water	6020A	279248
LCS 240-279248/3-A	Lab Control Sample	Total Recoverable	Water	6020A	279248

Analysis Batch: 280019

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total Recoverable	Water	6020A	279248

Metals (Continued)

Analysis Batch: 280019 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-2	MW-2	Total Recoverable	Water	6020A	279248
240-79573-3	MW-3	Total Recoverable	Water	6020A	279248
240-79573-4	MW-4	Total Recoverable	Water	6020A	279248

General Chemistry

Analysis Batch: 279615

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total/NA	Water	SM 2540C	
240-79573-2	MW-2	Total/NA	Water	SM 2540C	
240-79573-3	MW-3	Total/NA	Water	SM 2540C	
240-79573-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-279615/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-279615/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 280050

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total/NA	Water	9056A	
240-79573-2	MW-2	Total/NA	Water	9056A	
240-79573-3	MW-3	Total/NA	Water	9056A	
240-79573-4	MW-4	Total/NA	Water	9056A	
MB 240-280050/3	Method Blank	Total/NA	Water	9056A	
MB 240-280050/45	Method Blank	Total/NA	Water	9056A	
LCS 240-280050/4	Lab Control Sample	Total/NA	Water	9056A	
LCS 240-280050/46	Lab Control Sample	Total/NA	Water	9056A	
LCSD 240-280050/1046	Lab Control Sample Dup	Total/NA	Water	9056A	

Rad

Prep Batch: 309412

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total/NA	Water	PrecSep-21	
240-79573-2	MW-2	Total/NA	Water	PrecSep-21	
240-79573-3	MW-3	Total/NA	Water	PrecSep-21	
240-79573-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-309412/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-309412/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-309412/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 309413

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-79573-1	MW-1	Total/NA	Water	PrecSep_0	
240-79573-2	MW-2	Total/NA	Water	PrecSep_0	
240-79573-3	MW-3	Total/NA	Water	PrecSep_0	
240-79573-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-309413/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-309413/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-309413/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-1

Lab Sample ID: 240-79573-1

Date Collected: 05/15/17 11:31

Matrix: Water

Date Received: 05/16/17 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	279473	05/18/17 18:17	KLC	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	279711	05/19/17 13:31	KLC	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	279833	05/21/17 01:35	AS1	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	280019	05/22/17 23:00	AS1	TAL CAN
Total/NA	Prep	7470A			279260	05/17/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	279504	05/18/17 13:25	DTN	TAL CAN
Total/NA	Analysis	9056A		10	280050	05/23/17 21:32	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	279615	05/19/17 07:46	MM	TAL CAN
Total/NA	Prep	PrecSep-21			309412	05/19/17 09:34	LDE	TAL SL
Total/NA	Analysis	9315		1	312922	06/12/17 07:00	RTM	TAL SL
Total/NA	Prep	PrecSep_0			309413	05/19/17 10:01	LDE	TAL SL
Total/NA	Analysis	9320		1	311425	06/01/17 14:29	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	313373	06/14/17 11:06	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-79573-2

Date Collected: 05/15/17 12:54

Matrix: Water

Date Received: 05/16/17 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	279473	05/18/17 18:22	KLC	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	279833	05/21/17 01:39	AS1	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	280019	05/22/17 23:04	AS1	TAL CAN
Total/NA	Prep	7470A			279260	05/17/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	279504	05/18/17 13:31	DTN	TAL CAN
Total/NA	Analysis	9056A		20	280050	05/23/17 21:53	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	279615	05/19/17 07:46	MM	TAL CAN
Total/NA	Prep	PrecSep-21			309412	05/19/17 09:34	LDE	TAL SL
Total/NA	Analysis	9315		1	312922	06/12/17 07:00	RTM	TAL SL
Total/NA	Prep	PrecSep_0			309413	05/19/17 10:01	LDE	TAL SL
Total/NA	Analysis	9320		1	311425	06/01/17 14:29	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	313373	06/14/17 11:06	RTM	TAL SL

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Client Sample ID: MW-3

Date Collected: 05/15/17 14:12
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	279473	05/18/17 18:26	KLC	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	279833	05/21/17 01:43	AS1	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	280019	05/22/17 23:08	AS1	TAL CAN
Total/NA	Prep	7470A			279260	05/17/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	279504	05/18/17 13:33	DTN	TAL CAN
Total/NA	Analysis	9056A		20	280050	05/23/17 22:53	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	279615	05/19/17 07:46	MM	TAL CAN
Total/NA	Prep	PrecSep-21			309412	05/19/17 09:34	LDE	TAL SL
Total/NA	Analysis	9315		1	312922	06/12/17 07:00	RTM	TAL SL
Total/NA	Prep	PrecSep_0			309413	05/19/17 10:01	LDE	TAL SL
Total/NA	Analysis	9320		1	311425	06/01/17 14:29	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	313373	06/14/17 11:06	RTM	TAL SL

Client Sample ID: MW-4

Date Collected: 05/15/17 15:14
Date Received: 05/16/17 09:20

Lab Sample ID: 240-79573-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	279473	05/18/17 18:31	KLC	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	279833	05/21/17 01:48	AS1	TAL CAN
Total Recoverable	Prep	3005A			279248	05/17/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	280019	05/22/17 23:12	AS1	TAL CAN
Total/NA	Prep	7470A			279260	05/17/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	279504	05/18/17 13:35	DTN	TAL CAN
Total/NA	Analysis	9056A		20	280050	05/23/17 23:13	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	279615	05/19/17 07:46	MM	TAL CAN
Total/NA	Prep	PrecSep-21			309412	05/19/17 09:34	LDE	TAL SL
Total/NA	Analysis	9315		1	312922	06/12/17 07:00	RTM	TAL SL
Total/NA	Prep	PrecSep_0			309413	05/19/17 10:01	LDE	TAL SL
Total/NA	Analysis	9320		1	311425	06/01/17 14:29	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	313373	06/14/17 11:06	RTM	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-79573-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17
West Virginia DEP	State Program	3	210	12-31-17

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-18

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

2.8/2.5

CAMBRIDGE 240506

CAMBRIDGE 240506

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Corey Finley	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41874-17977.1
Client Contact: Mr. Brian Beach	Phone: 609 501 3605	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:			
City: Holland	TAT Requested (days):			
State, Zip: MI, 49424				
Phone:	PO #: 0398257			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

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)	9315_Ra226, 9320_Ra228	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1	5-15-17	1131	G	Water			X	X	X		
MW-2	5-15-17	1254	G	Water			X	X	X		
MW-3	5-15-17	1412	G	Water			X	X	X		
MW-4	5-15-17	1514	G	Water			X	X	X		
				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: FedEX overnight			
Relinquished by: Corey Finley	Date/Time: 5-15-17 1707	Company: ERM	Received by: [illegible]	Date/Time: 5-16-17 920	Company: TAC	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company	
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:

6/14/2017

TestAmerica Canton Sample Receipt Form/Narrative **Login # : 94543**
Canton Facility

Client ERM Site Name ——— Cooler unpacked by: POP

Cooler Received on 5-16-17 Opened on 5-16-17

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

TestAmerica Cooler # Foam Box Client Cooler Box Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.3** °C) Observed Cooler Temp. 2.8 °C Corrected Cooler Temp. 2.5 °C
   IR GUN #36 (CF **+0.8**°C) Observed Cooler Temp. ____ °C Corrected Cooler Temp. ____ °C

2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were custody seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels be reconciled with the COC?	Yes	No
9. Were correct bottle(s) used for the test(s) indicated?	Yes	No
10. Sufficient quantity received to perform indicated analyses?	Yes	No
11. Are these work share samples?	Yes	No
If yes, Questions 11-15 have been checked at the originating laboratory.		
11. Were sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC697954**
12. Were VOAs on the COC?	Yes	No
13. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # ____	Yes	No
15. Was a LL Hg or Me Hg trip blank present? ____	Yes	No

Contacted PM ____ Date ____ by ____ via Verbal Voice Mail Other

Concerning ____

16. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

17. SAMPLE CONDITION

Sample(s) ____ were received after the recommended holding time had expired.
Sample(s) ____ were received in a broken container.
Sample(s) ____ were received with bubble >6 mm in diameter. (Notify PM)

18. SAMPLE PRESERVATION

Sample(s) ____ were further preserved in the laboratory.
Time preserved: ____ Preservative(s) added/Lot number(s): ____

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-79573-B-1	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-1	240-79573-C-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-1	240-79573-D-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-79573-B-2	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-2	240-79573-C-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-79573-D-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-79573-B-3	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-3	240-79573-C-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-79573-D-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-79573-B-4	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-4	240-79573-C-4	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-79573-D-4	Plastic 1 liter - Nitric Acid	<2	_____	_____

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-79573 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna		COC No: 240-70750.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP		Job #: 240-79573-1
Address: 13715 Rider Trail North,	Due Date Requested: 6/14/2017			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

Other:

Sample Identification - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-79573-1)	5/15/17	11:31 Eastern		Water			X	X	X	2	
MW-2 (240-79573-2)	5/15/17	12:54 Eastern		Water			X	X	X	2	
MW-3 (240-79573-3)	5/15/17	14:12 Eastern		Water			X	X	X	2	
MW-4 (240-79573-4)	5/15/17	15:14 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***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) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:
Empty Kit Relinquished by:	Date: Time: Method of Shipment:

Relinquished by: Gabriel	Date/Time: 5-16-17 1400	Company: 240	Received by: Jill Clarke	Date/Time: 5.17.17 0920	Company: TA STL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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:

6/14/2017

Login Sample Receipt Checklist

Client: ERM-North Central Inc

Job Number: 240-79573-1

Login Number: 79573
List Number: 2
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis
List Creation: 05/17/17 03:10 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	17.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	Added nitric to samples 2 & 3, pH corrected to < 2
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

0408458

Well ID: MW-01
Site Name & Address: GHBLP JBSims Generating Station
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 5.65'
Groundwater Elevation/SWL (feet): ~~91.68~~ 93.70'
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #: ~~0408458~~
Client: GHBLP
Date: 5-15-17
Weather: Sunny
Temperature/Bar. Pressure 60F / 746.2
Start Time of Purging: 1112
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 10.67
Calculated Well Volume* (liters or (gal)): 1.09
Well Volume Discharged (liters or (gal)): 1.52 including 3L of samples

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1100; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1123	12.5	2165	0.23	7.67	-179.6	2.39	5.79	0.200	
1125	12.8	2159	0.18	7.69	-179.9	1.24	5.79	0.150	
1128	12.6	2154	0.17	7.70	-172.6	1.55	5.79	0.150	
1131	13.5	2152	0.17	7.70	-171.2	1.08	5.79	0.150	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1131

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-02
Site Name & Address: GHBLP
JB Sims Generating Station
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 107.75
Initial Water Level (feet below TOC): 14.85'
Groundwater Elevation/SWL (feet): 92.9'
Well Depth (feet below TOC): 23.37'
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): 19'

Project #: 0408454
Client: GHBLP
Date: 5-15-17
Weather: SUNNY
Temperature/Bar. Pressure: 66F / 745.9
Start Time of Purging: 1225
Well Material: steel or PVC
Well Diameter: 1" or 2"
Length of Water Column (feet): 8.52
Calculated Well Volume* (liters or gal): 1.39
Well Volume Discharged (liters or gal): 1.9 including 3L for sampling

Well Inspection: Clearly Labeled Y N; Concrete Pad Intact Y N; Lock Functional Y N; Pro-cover in good condition Y N; Casing in good condition Y N
Calibration: Time; 1100; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1235	13.9	4260	0.23	7.23	-172.2	9.76	15.80	0.200	
1240	14.4	4035	0.14	7.22	-169.3	9.68	15.78	0.150	
1245	15.1	4029	0.12	7.22	-170.6	9.18	15.78	0.1500	
1248	15.0	4025	0.12	7.22	-169.8	8.79	15.78	0.1500	
1251	14.7	4009	0.11	7.22	-169.6	8.22	15.78	0.1500	
1254	14.7	4028	0.10	7.22	-169.9	8.79	15.78	0.150	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Consistently foamy w/ yellow tint - Sampled @ 1254

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-03
Site Name & Address: GHBLP
JB Sims Generating Station
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 105.20
Initial Water Level (feet below TOC): 12.34'
Groundwater Elevation/SWL (feet): 92.86'
Well Depth (feet below TOC): 20.34'
Screened Interval (feet below TOC): 12-17'
Depth Pump Intake Set At (feet below TOC): 16'

Project #: 0408458
Client: GHBLP
Date: 5-15-17
Weather: Sunny, 66F / 745.2
Start Time of Purging: 1346
Well Material: steel or PVC
Well Diameter: 1" or 2"
Length of Water Column (feet): 8
Calculated Well Volume* (liters or gal): 1.3
Well Volume Discharged (liters or gal): 2.13 including 3L for samples

Well Inspection: Clearly Labeled Y N; Concrete Pad Intact Y N; Lock Functional Y N; Pro-cover in good condition Y N; Casing in good condition Y N
Calibration: Time; 1100; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min~~ or gallon/min)	Comments (i.e., odor, color, etc)
1356	16.2	4425	0.18	6.91	-123.9	6.26	0.200 ↔	13.69	WL & FR switched
1401	16.5	4522	0.15	6.90	-107.6	3.34	12.74	0.200	
1406	16.4	4504	0.13	6.90	-107.6	1.37	12.74	0.200	
1409	16.2	4518	0.12	6.93	-109.4	1.76	12.74	0.200	
1412	16.2	4519	0.13	6.92	-110.8	1.62	12.74	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1412

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-04
Site Name & Address: GHBLP JB Sims Generating Station
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556MPS/Hach 2100P
Top of Casing Elevation (feet): 103.59
Initial Water Level (feet below TOC): 10.64'
Groundwater Elevation/SWL (feet): 92.95
Well Depth (feet below TOC): 18.00'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #: 0408458
Client: GHBLP
Date: 5-15-17
Weather: Sunny
Temperature/Bar. Pressure 66F
Start Time of Purging: 1450
Well Material: steel or (PVC)
Well Diameter: 1" or (2")
Length of Water Column (feet): 7.36
Calculated Well Volume* (liters or gal): 1.20
Well Volume Discharged (liters or gal): 2.03 including 3L for sampling

Well Inspection: Clearly Labeled (Y)__N_; Concrete Pad Intact (Y)__N_; Lock Functional (Y)__N_; Pro-cover in good condition (Y)__N_; Casing in good condition (Y)__N__
Calibration: Time; 1100 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1.413 ; DO 100%.
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (µs/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min~~ or gallon/min)	Comments (i.e., odor, color, etc)
1500	15.2	2921	0.17	7.14	-143.0	1.14	11.05	0.200	
1505	14.5	2917	0.16	7.17	-147.4	0.71	11.09	0.200	
1508	14.7	2927	0.14	7.18	-149.4	0.78	11.08	0.200	
1511	14.6	2931	0.13	7.19	-150.7	0.80	11.08	0.200	
1514	14.7	2939	0.13	7.20	-151.5	0.98	11.08	0.200	
Limits	±3% (Low Mercury)	±3%	±10% when greater than 0.5 mg/L	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	*	<0.5 L/min = 0.13 gal/min	

Information: 1 in diameter well = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- Attempt to achieve drawdown < 0.3 feet.
- If drawdown exceeds 0.3 feet, continue to adjust purge rate to achieve drawdown stabilization
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples

[Ŧ]All attempts will be made to get turbidity below 10 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1514

APPENDIX A-5

FIFTH BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-80732-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
7/11/2017 12:35:18 PM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
*	LCS or LCSD is outside acceptance limits.
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Job ID: 240-80732-1

Laboratory: TestAmerica Canton

Narrative

CASE NARRATIVE

Client: ERM-North Central Inc

Project: Grand Haven BLP - CCR Monitoring

Report Number: 240-80732-1

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

The 9315 Radium-226, 9320 Radium-228, and Ra226Ra228 Combined Radium-226 and Radium-228 analyses were performed at the TestAmerica St. Louis Laboratory.

TestAmerica Canton attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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

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

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 6/9/2017 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.3º C.

TOTAL RECOVERABLE METALS (ICP)

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for total recoverable metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 06/12/2017 and analyzed on 06/13/2017, 06/14/2017 and 06/15/2017.

Boron failed the recovery criteria low for the MS of sample MW-1MS (240-80732-1) in batch 240-283342.

Boron failed the recovery criteria high for the MSD of sample MW-1MSD (240-80732-1) in batch 240-283342.

Refer to the QC report for details.

Job ID: 240-80732-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

Samples MW-1 (240-80732-1)[20X], MW-2 (240-80732-2)[10X], MW-3 (240-80732-3)[10X] and MW-4 (240-80732-4)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

TOTAL RECOVERABLE METALS (ICPMS)

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for total recoverable metals (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 06/12/2017 and analyzed on 06/15/2017.

Beryllium failed the recovery criteria high for LCS 240-282674/27-A. Refer to the QC report for details.

Beryllium and Lithium failed the recovery criteria high for the MS and MSD of sample MW-1 (240-80732-1) in batch 240-283213.

Refer to the QC report for details.

Method(s) 6020, 6020A: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 240-282674 and analytical batch 240-283213 recovered outside control limits for the following analytes: beryllium. These analytes were biased high in the LCS and were below the requested reporting limit in the associated samples; therefore, the data have been reported.MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4)

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

TOTAL MERCURY

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for total mercury in accordance with EPA SW-846 Methods 7470A. The samples were prepared on 06/12/2017 and analyzed on 06/13/2017.

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

TOTAL DISSOLVED SOLIDS

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for total dissolved solids in accordance with SM 2540C. The samples were analyzed on 06/12/2017.

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

ANIONS

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for anions in accordance with EPA SW-846 Method 9056A. The samples were analyzed on 06/17/2017.

Samples MW-1 (240-80732-1)[10X], MW-2 (240-80732-2)[5X], MW-3 (240-80732-3)[5X] and MW-4 (240-80732-4)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-80732-2). Elevated reporting limits (RLs) are provided.

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

RADIUM-226

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for Radium-226 in accordance with SW846 Method 9315. The samples were prepared on 06/14/2017 and analyzed on 07/07/2017.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-313413
The following sample was reduced due to heavy amounts of sediment making sample murky and brown.
MW-2 (240-80732-2)

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

Job ID: 240-80732-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

RADIUM-228 (GFPC)

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for Radium-228 (GFPC) in accordance with SW846 Method 9320. The samples were prepared on 06/15/2017 and analyzed on 06/23/2017.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-313637
The following sample was reduced due to heavy amounts of sediment making sample murky and brown.
MW-2 (240-80732-2)

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

COMBINED RADIUM 226 AND RADIUM 228

Samples MW-1 (240-80732-1), MW-2 (240-80732-2), MW-3 (240-80732-3) and MW-4 (240-80732-4) were analyzed for Combined Radium 226 and Radium 228 in accordance with Ra226_Ra228. The samples were analyzed on 07/07/2017.

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-80732-1	MW-1	Water	06/05/17 11:33	06/09/17 09:30
240-80732-2	MW-2	Water	06/05/17 12:41	06/09/17 09:30
240-80732-3	MW-3	Water	06/05/17 13:40	06/09/17 09:30
240-80732-4	MW-4	Water	06/05/17 14:29	06/09/17 09:30

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Client Sample ID: MW-1 — Lab Sample ID: 240-80732-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	140000		5000	710	ug/L	1		6010C	Total Recoverable
Antimony	0.00064	J	0.0020	0.00057	mg/L	1		6020A	Total Recoverable
Arsenic	0.0011	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.27		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00053	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0025	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.00057	J	0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Lithium	2.5		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	190		1.0	0.28	mg/L	1		9056A	Total/NA
Fluoride	18		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	430		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	1900		20	16	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-80732-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	130000		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	190000		5000	710	ug/L	1		6010C	Total Recoverable
Antimony	0.00068	J	0.0020	0.00057	mg/L	1		6020A	Total Recoverable
Arsenic	0.0070		0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.47		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Beryllium	0.00077	J *	0.0010	0.00031	mg/L	1		6020A	Total Recoverable
Cadmium	0.00025	J	0.0010	0.00021	mg/L	1		6020A	Total Recoverable
Cobalt	0.0087		0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.060		0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0069	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.0057		0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Selenium	0.0027	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	1.7		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	150		5.0	1.4	mg/L	5		9056A	Total/NA
Fluoride	12		0.25	0.12	mg/L	5		9056A	Total/NA
Total Dissolved Solids	2300		50	39	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

TestAmerica Canton

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Client Sample ID: MW-3 — Lab Sample ID: 240-80732-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	5900		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	590000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0027	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.31		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.0016		0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0018	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0065	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Selenium	0.0012	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	0.076		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	450		5.0	1.4	mg/L	5		9056A	Total/NA
Fluoride	1.7		0.25	0.12	mg/L	5		9056A	Total/NA
Sulfate	990		5.0	1.7	mg/L	5		9056A	Total/NA
Total Dissolved Solids	3600		50	39	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 240-80732-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3900		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	450000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0019	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.16		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00040	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0021		0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0012	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lithium	0.049		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	360		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	1.4		0.050	0.024	mg/L	1		9056A	Total/NA
Sulfate	880		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2400		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 06/05/17 11:33
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**110000**		4000	160	ug/L		06/12/17 10:54	06/15/17 14:33	20
Calcium	**140000**		5000	710	ug/L		06/12/17 10:54	06/13/17 15:00	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	**0.00064**	**J**	0.0020	0.00057	mg/L		06/12/17 10:54	06/15/17 00:22	1
Arsenic	**0.0011**	**J**	0.0050	0.00075	mg/L		06/12/17 10:54	06/15/17 15:58	1
Barium	**0.27**		0.0050	0.0022	mg/L		06/12/17 10:54	06/15/17 00:22	1
Beryllium	0.0010	U F1 *	0.0010	0.00031	mg/L		06/12/17 10:54	06/15/17 00:22	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/12/17 10:54	06/15/17 00:22	1
Cobalt	**0.00053**	**J**	0.0010	0.00019	mg/L		06/12/17 10:54	06/15/17 15:58	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		06/12/17 10:54	06/15/17 00:22	1
Molybdenum	**0.0025**	**J**	0.010	0.0011	mg/L		06/12/17 10:54	06/15/17 00:22	1
Lead	**0.00057**	**J**	0.0010	0.00045	mg/L		06/12/17 10:54	06/15/17 00:22	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		06/12/17 10:54	06/15/17 00:22	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/12/17 10:54	06/15/17 00:22	1
Lithium	**2.5**		0.0080	0.0017	mg/L		06/12/17 10:54	06/15/17 00:22	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/12/17 14:00	06/13/17 17:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**190**		1.0	0.28	mg/L			06/17/17 02:05	1
Fluoride	**18**		0.50	0.24	mg/L			06/17/17 02:25	10
Sulfate	**430**		10	3.5	mg/L			06/17/17 02:25	10
Total Dissolved Solids	**1900**		20	16	mg/L			06/12/17 08:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0243	U	0.0490	0.0490	1.00	0.0888	pCi/L	06/14/17 14:57	07/07/17 05:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*06/14/17 14:57*	*07/07/17 05:25*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.0547	U	0.217	0.217	1.00	0.378	pCi/L	06/15/17 13:05	06/23/17 11:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*
Y Carrier	*86.7*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Client Sample ID: MW-1
Date Collected: 06/05/17 11:33
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.0790	U	0.222	0.222	5.00	0.378	pCi/L		07/07/17 17:22	1

Client Sample ID: MW-2

Date Collected: 06/05/17 12:41
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-2

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	130000		2000	81	ug/L		06/12/17 10:54	06/14/17 20:04	10
Calcium	190000		5000	710	ug/L		06/12/17 10:54	06/13/17 15:30	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.00068	J	0.0020	0.00057	mg/L		06/12/17 10:54	06/15/17 00:43	1
Arsenic	0.0070		0.0050	0.00075	mg/L		06/12/17 10:54	06/15/17 16:19	1
Barium	0.47		0.0050	0.0022	mg/L		06/12/17 10:54	06/15/17 00:43	1
Beryllium	0.00077	J *	0.0010	0.00031	mg/L		06/12/17 10:54	06/15/17 00:43	1
Cadmium	0.00025	J	0.0010	0.00021	mg/L		06/12/17 10:54	06/15/17 00:43	1
Cobalt	0.0087		0.0010	0.00019	mg/L		06/12/17 10:54	06/15/17 16:19	1
Chromium	0.060		0.0020	0.00098	mg/L		06/12/17 10:54	06/15/17 00:43	1
Molybdenum	0.0069	J	0.010	0.0011	mg/L		06/12/17 10:54	06/15/17 00:43	1
Lead	0.0057		0.0010	0.00045	mg/L		06/12/17 10:54	06/15/17 00:43	1
Selenium	0.0027	J	0.0050	0.00089	mg/L		06/12/17 10:54	06/15/17 00:43	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/12/17 10:54	06/15/17 00:43	1
Lithium	1.7		0.0080	0.0017	mg/L		06/12/17 10:54	06/15/17 00:43	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/12/17 14:00	06/13/17 18:02	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	150		5.0	1.4	mg/L			06/17/17 02:45	5
Fluoride	12		0.25	0.12	mg/L			06/17/17 02:45	5
Sulfate	5.0	U	5.0	1.7	mg/L			06/17/17 02:45	5
Total Dissolved Solids	2300		50	39	mg/L			06/12/17 08:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.661		0.206	0.215	1.00	0.176	pCi/L	06/14/17 14:57	07/07/17 05:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.2*		*40 - 110*	*06/14/17 14:57*	*07/07/17 05:25*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.22		0.545	0.556	1.00	0.777	pCi/L	06/15/17 13:05	06/23/17 11:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.2*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*
Y Carrier	*81.5*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Client Sample ID: MW-2
Date Collected: 06/05/17 12:41
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.89		0.582	0.596	5.00	0.777	pCi/L		07/07/17 17:22	1

Client Sample ID: MW-3

Date Collected: 06/05/17 13:40
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**5900**		2000	81	ug/L		06/12/17 10:54	06/14/17 20:09	10
Calcium	**590000**		5000	710	ug/L		06/12/17 10:54	06/13/17 15:34	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/12/17 10:54	06/15/17 00:47	1
Arsenic	**0.0027**	**J**	0.0050	0.00075	mg/L		06/12/17 10:54	06/15/17 16:23	1
Barium	**0.31**		0.0050	0.0022	mg/L		06/12/17 10:54	06/15/17 00:47	1
Beryllium	0.0010	U *	0.0010	0.00031	mg/L		06/12/17 10:54	06/15/17 00:47	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/12/17 10:54	06/15/17 00:47	1
Cobalt	**0.0016**		0.0010	0.00019	mg/L		06/12/17 10:54	06/15/17 16:23	1
Chromium	**0.0018**	**J**	0.0020	0.00098	mg/L		06/12/17 10:54	06/15/17 00:47	1
Molybdenum	**0.0065**	**J**	0.010	0.0011	mg/L		06/12/17 10:54	06/15/17 00:47	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/12/17 10:54	06/15/17 00:47	1
Selenium	**0.0012**	**J**	0.0050	0.00089	mg/L		06/12/17 10:54	06/15/17 00:47	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/12/17 10:54	06/15/17 00:47	1
Lithium	**0.076**		0.0080	0.0017	mg/L		06/12/17 10:54	06/15/17 00:47	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/12/17 14:00	06/13/17 18:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**450**		5.0	1.4	mg/L			06/17/17 04:06	5
Fluoride	**1.7**		0.25	0.12	mg/L			06/17/17 04:06	5
Sulfate	**990**		5.0	1.7	mg/L			06/17/17 04:06	5
Total Dissolved Solids	**3600**		50	39	mg/L			06/12/17 08:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.275**		0.0902	0.0936	1.00	0.0769	pCi/L	06/14/17 14:57	07/07/17 05:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*40 - 110*	*06/14/17 14:57*	*07/07/17 05:25*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.227	U	0.201	0.203	1.00	0.323	pCi/L	06/15/17 13:05	06/23/17 11:10	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.2*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*
Y Carrier	*93.1*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Client Sample ID: MW-3
Date Collected: 06/05/17 13:40
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.502		0.221	0.223	5.00	0.323	pCi/L		07/07/17 17:22	1

Client Sample ID: MW-4

Date Collected: 06/05/17 14:29
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-4

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**3900**		2000	81	ug/L		06/12/17 10:54	06/14/17 20:13	10
Calcium	**450000**		5000	710	ug/L		06/12/17 10:54	06/13/17 15:39	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/12/17 10:54	06/15/17 00:51	1
Arsenic	**0.0019**	**J**	0.0050	0.00075	mg/L		06/12/17 10:54	06/15/17 16:35	1
Barium	**0.16**		0.0050	0.0022	mg/L		06/12/17 10:54	06/15/17 00:51	1
Beryllium	0.0010	U *	0.0010	0.00031	mg/L		06/12/17 10:54	06/15/17 00:51	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/12/17 10:54	06/15/17 00:51	1
Cobalt	**0.00040**	**J**	0.0010	0.00019	mg/L		06/12/17 10:54	06/15/17 16:35	1
Chromium	**0.0021**		0.0020	0.00098	mg/L		06/12/17 10:54	06/15/17 00:51	1
Molybdenum	**0.0012**	**J**	0.010	0.0011	mg/L		06/12/17 10:54	06/15/17 00:51	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/12/17 10:54	06/15/17 00:51	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		06/12/17 10:54	06/15/17 00:51	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/12/17 10:54	06/15/17 00:51	1
Lithium	**0.049**		0.0080	0.0017	mg/L		06/12/17 10:54	06/15/17 00:51	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/12/17 14:00	06/13/17 18:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**360**		10	2.8	mg/L			06/17/17 05:06	10
Fluoride	**1.4**		0.050	0.024	mg/L			06/17/17 04:46	1
Sulfate	**880**		10	3.5	mg/L			06/17/17 05:06	10
Total Dissolved Solids	**2400**		40	31	mg/L			06/12/17 08:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.141**		0.0758	0.0768	1.00	0.0952	pCi/L	06/14/17 14:57	07/07/17 05:25	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*06/14/17 14:57*	*07/07/17 05:25*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.201	U	0.188	0.189	1.00	0.303	pCi/L	06/15/17 13:05	06/23/17 11:11	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.6*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:11*	*1*
Y Carrier	*90.1*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:11*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Client Sample ID: MW-4
Date Collected: 06/05/17 14:29
Date Received: 06/09/17 09:30

Lab Sample ID: 240-80732-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.342		0.203	0.204	5.00	0.303	pCi/L		07/07/17 17:22	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba (40-110)
240-80732-1	MW-1	97.3
240-80732-2	MW-2	91.2
240-80732-3	MW-3	98.2
240-80732-4	MW-4	97.6
LCS 160-313413/2-A	Lab Control Sample	94.7
MB 160-313413/1-A	Method Blank	93.2

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-80732-1	MW-1	97.3	86.7
240-80732-2	MW-2	91.2	81.5
240-80732-3	MW-3	98.2	93.1
240-80732-4	MW-4	97.6	90.1
LCS 160-313637/2-A	Lab Control Sample	94.7	87.5
MB 160-313637/1-A	Method Blank	93.2	91.2

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-282674/1-A
Matrix: Water
Analysis Batch: 283002

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	5000	U	5000	710	ug/L		06/12/17 10:54	06/13/17 14:52	1

Lab Sample ID: MB 240-282674/1-A
Matrix: Water
Analysis Batch: 283083

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		06/12/17 10:54	06/14/17 19:31	1

Lab Sample ID: LCS 240-282674/2-A
Matrix: Water
Analysis Batch: 283002

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	50000	53500		ug/L		107	80 - 120

Lab Sample ID: LCS 240-282674/2-A
Matrix: Water
Analysis Batch: 283083

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1120		ug/L		112	80 - 120

Lab Sample ID: 240-80732-1 MS
Matrix: Water
Analysis Batch: 283002

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	140000		50000	183000		ug/L		91	75 - 125

Lab Sample ID: 240-80732-1 MS
Matrix: Water
Analysis Batch: 283342

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	110000		1000	109000	4	ug/L		-27	75 - 125

Lab Sample ID: 240-80732-1 MSD
Matrix: Water
Analysis Batch: 283002

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Calcium	140000		50000	189000		ug/L		103	75 - 125	3	20

Lab Sample ID: 240-80732-1 MSD
Matrix: Water
Analysis Batch: 283342

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Boron	110000		1000	111000	4	ug/L		168	75 - 125	2	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-282674/1-A
Matrix: Water
Analysis Batch: 283213

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/12/17 10:54	06/15/17 00:14	1
Barium	0.0050	U	0.0050	0.0022	mg/L		06/12/17 10:54	06/15/17 00:14	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		06/12/17 10:54	06/15/17 00:14	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/12/17 10:54	06/15/17 00:14	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		06/12/17 10:54	06/15/17 00:14	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		06/12/17 10:54	06/15/17 00:14	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/12/17 10:54	06/15/17 00:14	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		06/12/17 10:54	06/15/17 00:14	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/12/17 10:54	06/15/17 00:14	1
Lithium	0.0080	U	0.0080	0.0017	mg/L		06/12/17 10:54	06/15/17 00:14	1

Lab Sample ID: MB 240-282674/1-A
Matrix: Water
Analysis Batch: 283389

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0050	U	0.0050	0.00075	mg/L		06/12/17 10:54	06/15/17 15:49	1
Cobalt	0.0010	U	0.0010	0.00019	mg/L		06/12/17 10:54	06/15/17 15:49	1

Lab Sample ID: LCS 240-282674/27-A
Matrix: Water
Analysis Batch: 283213

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.106		mg/L		106	80 - 120
Barium	1.00	1.05		mg/L		105	80 - 120
Beryllium	1.00	1.21	*	mg/L		121	80 - 120
Cadmium	1.00	1.03		mg/L		103	80 - 120
Chromium	1.00	1.01		mg/L		101	80 - 120
Molybdenum	0.100	0.0988		mg/L		99	80 - 120
Lead	1.00	1.07		mg/L		107	80 - 120
Selenium	1.00	0.971		mg/L		97	80 - 120
Thallium	0.250	0.260		mg/L		104	80 - 120
Lithium	0.100	0.117		mg/L		117	80 - 120

Lab Sample ID: LCS 240-282674/27-A
Matrix: Water
Analysis Batch: 283389

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	1.00	1.05		mg/L		105	80 - 120
Cobalt	1.00	1.12		mg/L		112	80 - 120

Lab Sample ID: 240-80732-1 MS
Matrix: Water
Analysis Batch: 283213

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.00064	J	0.100	0.107		mg/L		107	75 - 125

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

Lab Sample ID: 240-80732-1 MS
Matrix: Water
Analysis Batch: 283213

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Barium	0.27		1.00	1.32		mg/L		105	75 - 125
Beryllium	0.0010	U F1 *	1.00	1.35	F1	mg/L		135	75 - 125
Cadmium	0.0010	U	1.00	0.956		mg/L		96	75 - 125
Chromium	0.0020	U	1.00	0.998		mg/L		100	75 - 125
Molybdenum	0.0025	J	0.100	0.108		mg/L		106	75 - 125
Lead	0.00057	J	1.00	1.00		mg/L		100	75 - 125
Selenium	0.0050	U	1.00	0.836		mg/L		84	75 - 125
Thallium	0.0010	U	0.250	0.247		mg/L		99	75 - 125
Lithium	2.5		0.100	2.68	4	mg/L		221	75 - 125

Lab Sample ID: 240-80732-1 MS
Matrix: Water
Analysis Batch: 283389

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	0.0011	J	1.00	0.991		mg/L		99	75 - 125
Cobalt	0.00053	J	1.00	1.03		mg/L		103	75 - 125

Lab Sample ID: 240-80732-1 MSD
Matrix: Water
Analysis Batch: 283213

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Antimony	0.00064	J	0.100	0.108		mg/L		107	75 - 125	0	20
Barium	0.27		1.00	1.32		mg/L		105	75 - 125	0	20
Beryllium	0.0010	U F1 *	1.00	1.33	F1	mg/L		133	75 - 125	2	20
Cadmium	0.0010	U	1.00	0.956		mg/L		96	75 - 125	0	20
Chromium	0.0020	U	1.00	0.998		mg/L		100	75 - 125	0	20
Molybdenum	0.0025	J	0.100	0.106		mg/L		104	75 - 125	2	20
Lead	0.00057	J	1.00	0.987		mg/L		99	75 - 125	2	20
Selenium	0.0050	U	1.00	0.833		mg/L		83	75 - 125	0	20
Thallium	0.0010	U	0.250	0.241		mg/L		96	75 - 125	3	20
Lithium	2.5		0.100	2.59	4	mg/L		129	75 - 125	4	20

Lab Sample ID: 240-80732-1 MSD
Matrix: Water
Analysis Batch: 283389

Client Sample ID: MW-1
Prep Type: Total Recoverable
Prep Batch: 282674

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	0.0011	J	1.00	0.977		mg/L		98	75 - 125	1	20
Cobalt	0.00053	J	1.00	1.02		mg/L		102	75 - 125	1	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-282678/1-A
Matrix: Water
Analysis Batch: 283042

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 282678

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/12/17 14:00	06/13/17 17:51	1

Lab Sample ID: LCS 240-282678/2-A
Matrix: Water
Analysis Batch: 283042

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 282678

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00496		mg/L		99	80 - 120

Lab Sample ID: 240-80732-1 MS
Matrix: Water
Analysis Batch: 283042

Client Sample ID: MW-1
Prep Type: Total/NA
Prep Batch: 282678

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00020	U	0.00100	0.00109		mg/L		109	80 - 120

Lab Sample ID: 240-80732-1 MSD
Matrix: Water
Analysis Batch: 283042

Client Sample ID: MW-1
Prep Type: Total/NA
Prep Batch: 282678

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.00020	U	0.00100	0.00101		mg/L		101	80 - 120	8	20

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-283519/27
Matrix: Water
Analysis Batch: 283519

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			06/17/17 00:04	1
Fluoride	0.050	U	0.050	0.024	mg/L			06/17/17 00:04	1
Sulfate	1.0	U	1.0	0.35	mg/L			06/17/17 00:04	1

Lab Sample ID: LCS 240-283519/28
Matrix: Water
Analysis Batch: 283519

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	51.7		mg/L		103	90 - 110
Fluoride	2.50	2.67		mg/L		107	90 - 110
Sulfate	50.0	52.0		mg/L		104	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-282649/1
Matrix: Water
Analysis Batch: 282649

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.8	mg/L			06/12/17 08:58	1

Lab Sample ID: LCS 240-282649/2
Matrix: Water
Analysis Batch: 282649

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Total Dissolved Solids			242	248		mg/L		102	80 - 120		

Lab Sample ID: 240-80732-1 DU
Matrix: Water
Analysis Batch: 282649

Client Sample ID: MW-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Total Dissolved Solids	1900			1910		mg/L				0.3	20

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-313413/1-A
Matrix: Water
Analysis Batch: 316538

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 313413

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.03826	U	0.0456	0.0457	1.00	0.0735	pCi/L	06/14/17 14:57	07/07/17 05:24	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*06/14/17 14:57*	*07/07/17 05:24*	*1*

Lab Sample ID: LCS 160-313413/2-A
Matrix: Water
Analysis Batch: 316538

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 313413

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	10.97		1.12	1.00	0.0785	pCi/L	97	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.7*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-313637/1-A
Matrix: Water
Analysis Batch: 314986

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 313637

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.06176	U	0.190	0.190	1.00	0.353	pCi/L	06/15/17 13:05	06/23/17 11:10	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*93.2*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*
Y Carrier	*91.2*		*40 - 110*	*06/15/17 13:05*	*06/23/17 11:10*	*1*

Lab Sample ID: LCS 160-313637/2-A
Matrix: Water
Analysis Batch: 314986

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 313637

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.3	16.00		1.69	1.00	0.376	pCi/L	121	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.7*		*40 - 110*
Y Carrier	*87.5*		*40 - 110*

Metals

Prep Batch: 282674

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total Recoverable	Water	3005A	
240-80732-2	MW-2	Total Recoverable	Water	3005A	
240-80732-3	MW-3	Total Recoverable	Water	3005A	
240-80732-4	MW-4	Total Recoverable	Water	3005A	
MB 240-282674/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-282674/27-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-282674/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
240-80732-1 MS	MW-1	Total Recoverable	Water	3005A	
240-80732-1 MS	MW-1	Total Recoverable	Water	3005A	
240-80732-1 MSD	MW-1	Total Recoverable	Water	3005A	
240-80732-1 MSD	MW-1	Total Recoverable	Water	3005A	

Prep Batch: 282678

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total/NA	Water	7470A	
240-80732-2	MW-2	Total/NA	Water	7470A	
240-80732-3	MW-3	Total/NA	Water	7470A	
240-80732-4	MW-4	Total/NA	Water	7470A	
MB 240-282678/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-282678/2-A	Lab Control Sample	Total/NA	Water	7470A	
240-80732-1 MS	MW-1	Total/NA	Water	7470A	
240-80732-1 MSD	MW-1	Total/NA	Water	7470A	

Analysis Batch: 283002

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total Recoverable	Water	6010C	282674
240-80732-2	MW-2	Total Recoverable	Water	6010C	282674
240-80732-3	MW-3	Total Recoverable	Water	6010C	282674
240-80732-4	MW-4	Total Recoverable	Water	6010C	282674
MB 240-282674/1-A	Method Blank	Total Recoverable	Water	6010C	282674
LCS 240-282674/2-A	Lab Control Sample	Total Recoverable	Water	6010C	282674
240-80732-1 MS	MW-1	Total Recoverable	Water	6010C	282674
240-80732-1 MSD	MW-1	Total Recoverable	Water	6010C	282674

Analysis Batch: 283042

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total/NA	Water	7470A	282678
240-80732-2	MW-2	Total/NA	Water	7470A	282678
240-80732-3	MW-3	Total/NA	Water	7470A	282678
240-80732-4	MW-4	Total/NA	Water	7470A	282678
MB 240-282678/1-A	Method Blank	Total/NA	Water	7470A	282678
LCS 240-282678/2-A	Lab Control Sample	Total/NA	Water	7470A	282678
240-80732-1 MS	MW-1	Total/NA	Water	7470A	282678
240-80732-1 MSD	MW-1	Total/NA	Water	7470A	282678

Analysis Batch: 283083

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-2	MW-2	Total Recoverable	Water	6010C	282674
240-80732-3	MW-3	Total Recoverable	Water	6010C	282674
240-80732-4	MW-4	Total Recoverable	Water	6010C	282674
MB 240-282674/1-A	Method Blank	Total Recoverable	Water	6010C	282674

Metals (Continued)

Analysis Batch: 283083 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 240-282674/2-A	Lab Control Sample	Total Recoverable	Water	6010C	282674

Analysis Batch: 283213

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total Recoverable	Water	6020A	282674
240-80732-2	MW-2	Total Recoverable	Water	6020A	282674
240-80732-3	MW-3	Total Recoverable	Water	6020A	282674
240-80732-4	MW-4	Total Recoverable	Water	6020A	282674
MB 240-282674/1-A	Method Blank	Total Recoverable	Water	6020A	282674
LCS 240-282674/27-A	Lab Control Sample	Total Recoverable	Water	6020A	282674
240-80732-1 MS	MW-1	Total Recoverable	Water	6020A	282674
240-80732-1 MSD	MW-1	Total Recoverable	Water	6020A	282674

Analysis Batch: 283342

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total Recoverable	Water	6010C	282674
240-80732-1 MS	MW-1	Total Recoverable	Water	6010C	282674
240-80732-1 MSD	MW-1	Total Recoverable	Water	6010C	282674

Analysis Batch: 283389

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total Recoverable	Water	6020A	282674
240-80732-2	MW-2	Total Recoverable	Water	6020A	282674
240-80732-3	MW-3	Total Recoverable	Water	6020A	282674
240-80732-4	MW-4	Total Recoverable	Water	6020A	282674
MB 240-282674/1-A	Method Blank	Total Recoverable	Water	6020A	282674
LCS 240-282674/27-A	Lab Control Sample	Total Recoverable	Water	6020A	282674
240-80732-1 MS	MW-1	Total Recoverable	Water	6020A	282674
240-80732-1 MSD	MW-1	Total Recoverable	Water	6020A	282674

General Chemistry

Analysis Batch: 282649

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total/NA	Water	SM 2540C	
240-80732-2	MW-2	Total/NA	Water	SM 2540C	
240-80732-3	MW-3	Total/NA	Water	SM 2540C	
240-80732-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-282649/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-282649/2	Lab Control Sample	Total/NA	Water	SM 2540C	
240-80732-1 DU	MW-1	Total/NA	Water	SM 2540C	

Analysis Batch: 283519

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total/NA	Water	9056A	
240-80732-1	MW-1	Total/NA	Water	9056A	
240-80732-2	MW-2	Total/NA	Water	9056A	
240-80732-3	MW-3	Total/NA	Water	9056A	
240-80732-4	MW-4	Total/NA	Water	9056A	
240-80732-4	MW-4	Total/NA	Water	9056A	

General Chemistry (Continued)

Analysis Batch: 283519 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 240-283519/27	Method Blank	Total/NA	Water	9056A	
LCS 240-283519/28	Lab Control Sample	Total/NA	Water	9056A	

Rad

Prep Batch: 313413

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total/NA	Water	PrecSep-21	
240-80732-2	MW-2	Total/NA	Water	PrecSep-21	
240-80732-3	MW-3	Total/NA	Water	PrecSep-21	
240-80732-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-313413/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-313413/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 313637

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-80732-1	MW-1	Total/NA	Water	PrecSep_0	
240-80732-2	MW-2	Total/NA	Water	PrecSep_0	
240-80732-3	MW-3	Total/NA	Water	PrecSep_0	
240-80732-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-313637/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-313637/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Client Sample ID: MW-1

Lab Sample ID: 240-80732-1

Date Collected: 06/05/17 11:33

Matrix: Water

Date Received: 06/09/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	283002	06/13/17 15:00	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	283342	06/15/17 14:33	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283213	06/15/17 00:22	AS1	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283389	06/15/17 15:58	AS1	TAL CAN
Total/NA	Prep	7470A			282678	06/12/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	283042	06/13/17 17:55	DTN	TAL CAN
Total/NA	Analysis	9056A		1	283519	06/17/17 02:05	LKG	TAL CAN
Total/NA	Analysis	9056A		10	283519	06/17/17 02:25	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	282649	06/12/17 08:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			313413	06/14/17 14:57	MBC	TAL SL
Total/NA	Analysis	9315		1	316538	07/07/17 05:25	ALD	TAL SL
Total/NA	Prep	PrecSep_0			313637	06/15/17 13:05	LDE	TAL SL
Total/NA	Analysis	9320		1	314986	06/23/17 11:10	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	316603	07/07/17 17:22	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-80732-2

Date Collected: 06/05/17 12:41

Matrix: Water

Date Received: 06/09/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	283002	06/13/17 15:30	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	283083	06/14/17 20:04	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283213	06/15/17 00:43	AS1	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283389	06/15/17 16:19	AS1	TAL CAN
Total/NA	Prep	7470A			282678	06/12/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	283042	06/13/17 18:02	DTN	TAL CAN
Total/NA	Analysis	9056A		5	283519	06/17/17 02:45	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	282649	06/12/17 08:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			313413	06/14/17 14:57	MBC	TAL SL
Total/NA	Analysis	9315		1	316538	07/07/17 05:25	ALD	TAL SL
Total/NA	Prep	PrecSep_0			313637	06/15/17 13:05	LDE	TAL SL
Total/NA	Analysis	9320		1	314986	06/23/17 11:10	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	316603	07/07/17 17:22	RTM	TAL SL

Client Sample ID: MW-3

Lab Sample ID: 240-80732-3

Date Collected: 06/05/17 13:40

Matrix: Water

Date Received: 06/09/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	283002	06/13/17 15:34	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	283083	06/14/17 20:09	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283213	06/15/17 00:47	AS1	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283389	06/15/17 16:23	AS1	TAL CAN
Total/NA	Prep	7470A			282678	06/12/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	283042	06/13/17 18:04	DTN	TAL CAN
Total/NA	Analysis	9056A		5	283519	06/17/17 04:06	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	282649	06/12/17 08:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			313413	06/14/17 14:57	MBC	TAL SL
Total/NA	Analysis	9315		1	316538	07/07/17 05:25	ALD	TAL SL
Total/NA	Prep	PrecSep_0			313637	06/15/17 13:05	LDE	TAL SL
Total/NA	Analysis	9320		1	314986	06/23/17 11:10	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	316603	07/07/17 17:22	RTM	TAL SL

Client Sample ID: MW-4

Lab Sample ID: 240-80732-4

Date Collected: 06/05/17 14:29

Matrix: Water

Date Received: 06/09/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	283002	06/13/17 15:39	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	283083	06/14/17 20:13	RKT	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283213	06/15/17 00:51	AS1	TAL CAN
Total Recoverable	Prep	3005A			282674	06/12/17 10:54	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	283389	06/15/17 16:35	AS1	TAL CAN
Total/NA	Prep	7470A			282678	06/12/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	283042	06/13/17 18:10	DTN	TAL CAN
Total/NA	Analysis	9056A		1	283519	06/17/17 04:46	LKG	TAL CAN
Total/NA	Analysis	9056A		10	283519	06/17/17 05:06	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	282649	06/12/17 08:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			313413	06/14/17 14:57	MBC	TAL SL
Total/NA	Analysis	9315		1	316538	07/07/17 05:25	ALD	TAL SL
Total/NA	Prep	PrecSep_0			313637	06/15/17 13:05	LDE	TAL SL
Total/NA	Analysis	9320		1	314986	06/23/17 11:11	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	316603	07/07/17 17:22	RTM	TAL SL

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-80732-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17 *
West Virginia DEP	State Program	3	210	12-31-17

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-18

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

CAMBRIDGE 240506

23/C23

Chain of Custody Record

CAMBRIDGE 240506

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Corey Finley	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41875-17977.1
Client Contact: Mr. Brian Beach	Phone: 609 501 3605	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:	Analysis Requested		Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3
City: Holland	TAT Requested (days):			
State, Zip: MI, 49424				
Phone: 616 283 7165	PO #: 0398257			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

240-80732 Chain of Custody

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)	9315_Ra226, 9320_Ra228	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1		1133	G	Water			X	X	X		
MW-2		1241	G	Water			X	X	X		
MW-3		1340	G	Water			X	X	X		
MW-4		1429	G	Water			X	X	X		
				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	Corey Finley - ERM	6-5-17 17:55	ERM		6-5-17 17:55	ERM
2		6-8-17 14:00	ERM		6-9-17 930	TA
3		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:

7/11/2017

TestAmerica Canton Sample Receipt Form/Narrative **Login # :** 80732
Canton Facility

Client ERM Site Name

Cooler Received on 6-9-17 Opened on 6-9-17

Cooler unpacked by:

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

TestAmerica Cooler # Foam Box Client Cooler Box Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF -0.4 °C) Observed Cooler Temp. °C Corrected Cooler Temp. °C
   IR GUN #36 (CF +0°C) Observed Cooler Temp. 2.3 °C Corrected Cooler Temp. 2.3 °C
2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
   -Were custody seals on the outside of the cooler(s) signed & dated? Yes No NA
   -Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels be reconciled with the COC? Yes No
9. Were correct bottle(s) used for the test(s) indicated? Yes No
10. Sufficient quantity received to perform indicated analyses? Yes No
11. Are these work share samples? Yes No
    If yes, Questions 11-15 have been checked at the originating laboratory.
11. Were sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# **HC697954**
12. Were VOAs on the COC? Yes No
13. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this. Yes No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # Yes No
15. Was a LL Hg or Me Hg trip blank present? Yes No

Contacted PM Date by via Verbal Voice Mail Other

Concerning

16. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES

Samples processed by:

No sample dates listed on COC, will log all samples 6.5.17 per containers

17. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.
Sample(s) were received in a broken container.
Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

18. SAMPLE PRESERVATION

Sample(s) 11500 + 2mL (H2O2) MW-2 were further preserved in the laboratory.
Time preserved: 1055 Preservative(s) added/Lot number(s): 162025

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-80732-B-1	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-1	240-80732-C-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-1	240-80732-D-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-80732-B-2	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-2	240-80732-C-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-80732-D-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-80732-B-3	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-3	240-80732-C-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-80732-D-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-80732-B-4	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-4	240-80732-C-4	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-80732-D-4	Plastic 1 liter - Nitric Acid	<2	_____	_____

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-80732 Chain of Custody

TestAmerica — LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna		991.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP		Job #: 240-80732-1
Address: 13715 Rider Trail North,	Due Date Requested: 7/12/2017			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

Other:

Sample Identification - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-80732-1)	6/5/17	11:33 Eastern		Water			X	X	X	2	
MW-2 (240-80732-2)	6/5/17	12:41 Eastern		Water			X	X	X	2	
MW-3 (240-80732-3)	6/5/17	13:40 Eastern		Water			X	X	X	2	
MW-4 (240-80732-4)	6/5/17	14:29 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	*Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*
Unconfirmed	☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

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

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1		6-9-17 1630	TAL	Gil Clark	6-10-17 0840	TASR
2		Date/Time:	Company	Received by:	Date/Time:	Company
3	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:

7/11/2017

Login Sample Receipt Checklist

Client: ERM-North Central Inc

Job Number: 240-80732-1

Login Number: 80732
List Number: 2
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis
List Creation: 06/10/17 10:02 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	18.0, 18.0, 18.0, 18.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	Added nitric acid to sample 3 to correct pH to < 2
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-1
Site Name & Address: 1231 N. 3rd St, Grand Haven, MI
Sampler Name: CF
Pump Type: Peristaltic
Meter Type (s): YSI 556 / Hach 2100P
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 5.90'
Groundwater Elevation/SWL (feet): 93.42'
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #:
Client: GHBLP
Date: 6-5-17
Weather: Cloudy
Temperature/Bar. Pressure: 64F / 743.1
Start Time of Purging: 1040
Well Material: PVC
Well Diameter: 2 inch
Length of Water Column (feet): 6.42
Calculated Well Volume* (liters or gal): 1.05
Well Volume Discharged (liters or gal): 3.5

Well Inspection: Clearly Labeled (Y)___N_; Concrete Pad Intact (Y)___N_; Lock Functional (Y)___N_; Pro-cover in good condition (Y)___N_; Casing in good condition (Y)___N__
Calibration: Time: 0940 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1413 ; DO 100
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1050	15.42	1.902	0.42	8.02	-99.0	2.17	6.02	0.200	
1055	15.67	1.903	0.42	8.05	-92.3	1.72	6.04	0.200	
1100	15.16	1.914	0.43	8.07	-107.0	1.61	6.06	0.200	
1103	15.11	1.913	0.48	8.07	-127.0	1.57	6.04	0.200	
1106	15.49	1.914	0.57	8.10	-175.2	1.48	6.06	0.200	
1109	15.66	1.916	0.67	8.11	-150.1	1.46	6.07	0.200	
1112	15.28	1.924	0.78	8.12	-174.9	1.43	6.07	0.200	
1115	15.22	1.917	0.84	8.12	-162.1	1.47	6.07	0.200	
1118	15.58	1.915	0.91	8.15	-184.4	1.34	6.09	0.200	
1121	15.72	1.915	0.88	8.16	-165.1	1.36	6.12	0.200	
1124	15.56	1.916	0.78	8.16	-176.2	1.34	6.12	0.200	
1127	15.86	1.917	0.63	8.17	-200	1.33	6.12	0.200	
1130	15.83	1.917	0.61	8.17	-211	1.32	6.12	0.200	
1133	16.02	1.917	0.58	8.17	-221.4	1.39	6.12	0.200	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1133

ORP not stable

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-2
Site Name & Address: GHBLP - JB Sims Generating Station
1231 N 3rd St Grand Haven, MI
Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 107.75'
Initial Water Level (feet below TOC): 14.94'
Groundwater Elevation/SWL (feet): 92.81'
Well Depth (feet below TOC): 23.37'
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): 19'

Project #:
Client: GHBLP
Date: 10-5-17
Weather: Cloudy
Temperature/Bar. Pressure 64 / 743.9
Start Time of Purging: 1207
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.43
Calculated Well Volume* (liters or gal): 1.37
Well Volume Discharged (liters or gal): 2

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time: 0940 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1,413 ; DO 100
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1217	16.76	4.300	2.69	7.35	-157.5	4.30	15.35	0.200	
1220	15.92	4.264	1.26	7.35	-155.5	3.03	15.43	0.200	
1223	15.97	4.227	0.65	7.34	-132.0	3.43	15.45	0.200	
1226	15.75	4.173	0.54	7.33	-112.6	3.11	15.51	0.200	
1229	15.30	4.124	0.44	7.32	-106.7	2.89	15.52	0.200	
1232	15.05	4.032	0.33	7.33	-118.7	4.03	15.53	0.200	
1235	14.91	4.011	0.29	7.32	-113.3	3.82	15.57	0.200	
1238	15.37	3.988	0.25	7.31	-122.8	4.93	15.57	0.200	
1241	15.76	3.992	0.23	7.31	-120.1	4.98	15.57	0.200	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1241
foamy w/ yellow tint

Environmental Resources Management

Field Form for Low Flow Rate Sampling

Well ID: MW-3
Site Name & Address: 1231 N 3rd St Grand Haven, MI
Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 105.20'
Initial Water Level (feet below TOC): 12.15'
Groundwater Elevation/SWL (feet): 93.05'
Well Depth (feet below TOC): 20.34'
Screened Interval (feet below TOC): 12-17'
Depth Pump Intake Set At (feet below TOC): 16'

Project #:
Client: GHBLP
Date: 6-5-17
Weather: Cloudy
Temperature/Bar. Pressure 64F / 743.8
Start Time of Purging: 1312
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.19'
Calculated Well Volume* (liters or gal): 1.33
Well Volume Discharged (liters or gal): 1.31

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 0940; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (~~liter/min~~ or gallon/min)	Comments (i.e., odor, color, etc)
1322	15.45	3.741	0.63	7.04	-67.3	8.85	12.43	0.180	
1325	15.24	3.734	0.37	7.06	-79.2	8.37	12.47	0.180	
1328	15.53	3.718	0.30	7.07	-74.7	7.88	12.47	0.180	
1331	15.40	3.726	0.32	7.06	-63.0	8.19	12.51	0.180	
1334	15.13	3.726	0.24	7.06	-70.6	6.54	12.51	0.180	
1337	15.27	3.714	0.18	7.06	-68.9	6.08	12.51	0.180	
1340	15.56	3.718	0.17	7.07	-69.0	6.48	12.51	0.180	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[T]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[T]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1340

Environmental Resources Management

Field Form for Low Flow Rate Sampling

Well ID: MW-4
Site Name & Address: 1231 N 3rd St Grand Haven, MI
Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 103.59'
Initial Water Level (feet below TOC): 10.75'
Groundwater Elevation/SWL (feet): 92.84'
Well Depth (feet below TOC): 18'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #:
Client: GHBLP
Date: 6-5-17
Weather: Cloudy
Temperature/Bar. Pressure 64°F / 744.2
Start Time of Purging: 1400
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 7.25
Calculated Well Volume* (liters or gal): 1.18
Well Volume Discharged (liters or gal): 5 1

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 0940; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1420	15.15	2.557	0.29	7.40	+118.3	4.58	10.85	0.200	
1423	15.03	2.534	0.29	7.37	-103.7	2.90	10.89	0.200	
1426	14.96	2.528	0.30	7.38	-101.2	1.75	10.89	0.200	
1429	14.92	2.518	0.32	7.36	-104.6	2.04	10.89	0.200	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1429

APPENDIX A-6

SIXTH BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-81629-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
7/31/2017 9:03:30 AM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

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Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Job ID: 240-81629-1

Laboratory: TestAmerica Canton

Narrative

CASE NARRATIVE

Client: ERM-North Central Inc

Project: Grand Haven BLP - CCR Monitoring

Report Number: 240-81629-1

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

The Radium analysis was performed at TestAmerica St. Louis Laboratory.

TestAmerica Canton attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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

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

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT
The samples were received on 6/28/2017 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.5º C.

TOTAL RECOVERABLE METALS (ICP)
Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for total recoverable metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 06/29/2017 and analyzed on 06/30/2017 and 07/03/2017.

Samples MW-1 (240-81629-1)[10X] and MW-2 (240-81629-2)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

TOTAL RECOVERABLE METALS (ICPMS)
Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for total recoverable

Job ID: 240-81629-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

metals (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 06/29/2017 and analyzed on 07/04/2017 and 07/05/2017.

Method(s) 6020, 6020A: The continuing calibration verification (CCV) associated with batch 240-285889 recovered above the upper control limit for selenium. The samples associated with this CCV were below the requested reporting limit for the affected analytes; therefore, the data have been reported. The following samples are impacted: MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4).

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

TOTAL MERCURY

Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for total mercury in accordance with EPA SW-846 Methods 7470A. The samples were prepared on 06/29/2017 and analyzed on 06/30/2017.

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

TOTAL DISSOLVED SOLIDS

Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for total dissolved solids in accordance with SM 2540C. The samples were analyzed on 06/30/2017.

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

ANIONS

Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for anions in accordance with EPA SW-846 Method 9056A. The samples were analyzed on 06/30/2017, 07/01/2017 and 07/08/2017.

Samples MW-1 (240-81629-1)[10X], MW-2 (240-81629-2)[10X], MW-3 (240-81629-3)[5X] and MW-4 (240-81629-4)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

RADIUM-226

Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for Radium-226 in accordance with SW846 Method 9315. The samples were prepared on 07/05/2017 and analyzed on 07/27/2017.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-316287
The following sample was reduced due to heavy amounts of sediment making sample murky and brown.

MW-2 (240-81629-2)

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

RADIUM-228 (GFPC)

Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for Radium-228 (GFPC) in accordance with SW846 Method 9320. The samples were prepared on 07/05/2017 and analyzed on 07/14/2017.

Radium-228 exceeded the RPD limit for the duplicate of sample 480-120277-1. Refer to the QC report for details.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-316293
The following sample was reduced due to heavy amounts of sediment making sample murky and brown.

MW-2 (240-81629-2)

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

Job ID: 240-81629-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

COMBINED RADIUM 226 AND RADIUM 228

Samples MW-1 (240-81629-1), MW-2 (240-81629-2), MW-3 (240-81629-3) and MW-4 (240-81629-4) were analyzed for Combined Radium 226 and Radium 228 in accordance with Ra226_Ra228. The samples were analyzed on 07/28/2017.

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-81629-1	MW-1	Water	06/26/17 11:37	06/28/17 09:30
240-81629-2	MW-2	Water	06/26/17 12:25	06/28/17 09:30
240-81629-3	MW-3	Water	06/26/17 14:15	06/28/17 09:30
240-81629-4	MW-4	Water	06/26/17 15:29	06/28/17 09:30

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-1 — Lab Sample ID: 240-81629-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	110000		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	120000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.00080	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.29		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00042	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0026	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lithium	2.2		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	170		1.0	0.28	mg/L	1		9056A	Total/NA
Fluoride	18		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	190		1.0	0.35	mg/L	1		9056A	Total/NA
Total Dissolved Solids	1600		20	16	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-81629-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	120000		2000	81	ug/L	10		6010C	Total Recoverable
Calcium	180000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0067		0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.45		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.0072		0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.053		0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0074	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.0042		0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Selenium	0.0023	J ^	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	1.6		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	160		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	14		0.50	0.24	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2000		50	39	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-3 — Lab Sample ID: 240-81629-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	4800		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	540000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0029	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-3 (Continued)

Lab Sample ID: 240-81629-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.37		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.0013		0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0015	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0034	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lithium	0.066		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	370		5.0	1.4	mg/L	5		9056A	Total/NA
Fluoride	1.6		0.25	0.12	mg/L	5		9056A	Total/NA
Sulfate	580		5.0	1.7	mg/L	5		9056A	Total/NA
Total Dissolved Solids	3000		40	31	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4

Lab Sample ID: 240-81629-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3600		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	460000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0020	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.18		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00058	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0017	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0032	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lithium	0.051		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	360		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	1.2		0.050	0.024	mg/L	1		9056A	Total/NA
Sulfate	920		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	3100		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 06/26/17 11:37
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**110000**		2000	81	ug/L		06/29/17 14:00	07/03/17 18:07	10
Calcium	**120000**		5000	710	ug/L		06/29/17 14:00	06/30/17 15:42	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/29/17 14:00	07/04/17 03:43	1
Arsenic	**0.00080**	**J**	0.0050	0.00075	mg/L		06/29/17 14:00	07/04/17 03:43	1
Barium	**0.29**		0.0050	0.0022	mg/L		06/29/17 14:00	07/04/17 03:43	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		06/29/17 14:00	07/05/17 17:57	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/29/17 14:00	07/04/17 03:43	1
Cobalt	**0.00042**	**J**	0.0010	0.00019	mg/L		06/29/17 14:00	07/04/17 03:43	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		06/29/17 14:00	07/04/17 03:43	1
Molybdenum	**0.0026**	**J**	0.010	0.0011	mg/L		06/29/17 14:00	07/04/17 03:43	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/29/17 14:00	07/04/17 03:43	1
Selenium	0.0050	U ^	0.0050	0.00089	mg/L		06/29/17 14:00	07/04/17 03:43	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/29/17 14:00	07/04/17 03:43	1
Lithium	**2.2**		0.0080	0.0017	mg/L		06/29/17 14:00	07/05/17 17:57	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/29/17 14:00	06/30/17 14:50	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**170**		1.0	0.28	mg/L			06/30/17 23:34	1
Fluoride	**18**		0.50	0.24	mg/L			06/30/17 23:54	10
Sulfate	**190**		1.0	0.35	mg/L			06/30/17 23:34	1
Total Dissolved Solids	**1600**		20	16	mg/L			06/30/17 13:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.0710	U	0.0552	0.0556	1.00	0.0763	pCi/L	07/05/17 10:51	07/27/17 06:00	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.3*		*40 - 110*	*07/05/17 10:51*	*07/27/17 06:00*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.223	U	0.229	0.230	1.00	0.372	pCi/L	07/05/17 12:26	07/14/17 14:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*92.3*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*
Y Carrier	*84.5*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-1
Date Collected: 06/26/17 11:37
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.294	U	0.235	0.236	5.00	0.372	pCi/L		07/28/17 15:26	1

Client Sample ID: MW-2

Date Collected: 06/26/17 12:25
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-2

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**120000**		2000	81	ug/L		06/29/17 14:00	07/03/17 18:11	10
Calcium	**180000**		5000	710	ug/L		06/29/17 14:00	06/30/17 15:47	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/29/17 14:00	07/04/17 03:48	1
Arsenic	**0.0067**		0.0050	0.00075	mg/L		06/29/17 14:00	07/04/17 03:48	1
Barium	**0.45**		0.0050	0.0022	mg/L		06/29/17 14:00	07/04/17 03:48	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		06/29/17 14:00	07/05/17 18:02	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/29/17 14:00	07/04/17 03:48	1
Cobalt	**0.0072**		0.0010	0.00019	mg/L		06/29/17 14:00	07/04/17 03:48	1
Chromium	**0.053**		0.0020	0.00098	mg/L		06/29/17 14:00	07/04/17 03:48	1
Molybdenum	**0.0074**	**J**	0.010	0.0011	mg/L		06/29/17 14:00	07/04/17 03:48	1
Lead	**0.0042**		0.0010	0.00045	mg/L		06/29/17 14:00	07/04/17 03:48	1
Selenium	**0.0023**	**J ^**	0.0050	0.00089	mg/L		06/29/17 14:00	07/04/17 03:48	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/29/17 14:00	07/04/17 03:48	1
Lithium	**1.6**		0.0080	0.0017	mg/L		06/29/17 14:00	07/05/17 18:02	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/29/17 14:00	06/30/17 14:56	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**160**		10	2.8	mg/L			07/08/17 06:05	10
Fluoride	**14**		0.50	0.24	mg/L			07/08/17 06:05	10
Sulfate	10	U	10	3.5	mg/L			07/08/17 06:05	10
Total Dissolved Solids	**2000**		50	39	mg/L			06/30/17 13:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.810**		0.222	0.234	1.00	0.167	pCi/L	07/05/17 10:51	07/27/17 06:01	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.1*		*40 - 110*	*07/05/17 10:51*	*07/27/17 06:01*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.04**		0.472	0.482	1.00	0.666	pCi/L	07/05/17 12:26	07/14/17 14:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.1*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*
Y Carrier	*87.9*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-2
Date Collected: 06/26/17 12:25
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.85		0.522	0.536	5.00	0.666	pCi/L		07/28/17 15:26	1

Client Sample ID: MW-3

Date Collected: 06/26/17 14:15
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**4800**		200	8.1	ug/L		06/29/17 14:00	06/30/17 15:51	1
Calcium	**540000**		5000	710	ug/L		06/29/17 14:00	06/30/17 15:51	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/29/17 14:00	07/04/17 03:52	1
Arsenic	**0.0029**	**J**	0.0050	0.00075	mg/L		06/29/17 14:00	07/04/17 03:52	1
Barium	**0.37**		0.0050	0.0022	mg/L		06/29/17 14:00	07/04/17 03:52	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		06/29/17 14:00	07/05/17 18:06	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/29/17 14:00	07/04/17 03:52	1
Cobalt	**0.0013**		0.0010	0.00019	mg/L		06/29/17 14:00	07/04/17 03:52	1
Chromium	**0.0015**	**J**	0.0020	0.00098	mg/L		06/29/17 14:00	07/04/17 03:52	1
Molybdenum	**0.0034**	**J**	0.010	0.0011	mg/L		06/29/17 14:00	07/04/17 03:52	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/29/17 14:00	07/04/17 03:52	1
Selenium	0.0050	U ^	0.0050	0.00089	mg/L		06/29/17 14:00	07/04/17 03:52	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/29/17 14:00	07/04/17 03:52	1
Lithium	**0.066**		0.0080	0.0017	mg/L		06/29/17 14:00	07/05/17 18:06	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/29/17 14:00	06/30/17 14:58	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**370**		5.0	1.4	mg/L			07/01/17 00:15	5
Fluoride	**1.6**		0.25	0.12	mg/L			07/01/17 00:15	5
Sulfate	**580**		5.0	1.7	mg/L			07/01/17 00:15	5
Total Dissolved Solids	**3000**		40	31	mg/L			06/30/17 13:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.347**		0.0999	0.105	1.00	0.0836	pCi/L	07/05/17 10:51	07/27/17 06:01	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*40 - 110*	*07/05/17 10:51*	*07/27/17 06:01*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.528**		0.264	0.268	1.00	0.379	pCi/L	07/05/17 12:26	07/14/17 14:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*
Y Carrier	*75.1*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-3
Date Collected: 06/26/17 14:15
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.874		0.282	0.288	5.00	0.379	pCi/L		07/28/17 15:26	1

Client Sample ID: MW-4

Date Collected: 06/26/17 15:29
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-4

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**3600**		200	8.1	ug/L		06/29/17 14:00	06/30/17 15:56	1
Calcium	**460000**		5000	710	ug/L		06/29/17 14:00	06/30/17 15:56	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/29/17 14:00	07/04/17 03:56	1
Arsenic	**0.0020**	**J**	0.0050	0.00075	mg/L		06/29/17 14:00	07/04/17 03:56	1
Barium	**0.18**		0.0050	0.0022	mg/L		06/29/17 14:00	07/04/17 03:56	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		06/29/17 14:00	07/05/17 18:10	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/29/17 14:00	07/04/17 03:56	1
Cobalt	**0.00058**	**J**	0.0010	0.00019	mg/L		06/29/17 14:00	07/04/17 03:56	1
Chromium	**0.0017**	**J**	0.0020	0.00098	mg/L		06/29/17 14:00	07/04/17 03:56	1
Molybdenum	**0.0032**	**J**	0.010	0.0011	mg/L		06/29/17 14:00	07/04/17 03:56	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/29/17 14:00	07/04/17 03:56	1
Selenium	0.0050	U ^	0.0050	0.00089	mg/L		06/29/17 14:00	07/04/17 03:56	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/29/17 14:00	07/04/17 03:56	1
Lithium	**0.051**		0.0080	0.0017	mg/L		06/29/17 14:00	07/05/17 18:10	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/29/17 14:00	06/30/17 15:00	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**360**		10	2.8	mg/L			07/01/17 01:55	10
Fluoride	**1.2**		0.050	0.024	mg/L			07/01/17 01:35	1
Sulfate	**920**		10	3.5	mg/L			07/01/17 01:55	10
Total Dissolved Solids	**3100**		40	31	mg/L			06/30/17 13:58	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.218**		0.0814	0.0837	1.00	0.0727	pCi/L	07/05/17 10:51	07/27/17 06:01	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.1*		*40 - 110*	*07/05/17 10:51*	*07/27/17 06:01*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.453**		0.266	0.269	1.00	0.403	pCi/L	07/05/17 12:26	07/14/17 14:26	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*94.1*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*
Y Carrier	*81.5*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:26*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-4
Date Collected: 06/26/17 15:29
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.671		0.278	0.282	5.00	0.403	pCi/L		07/28/17 15:26	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Ba (40-110)
240-81629-1	MW-1	92.3
240-81629-2	MW-2	89.1
240-81629-3	MW-3	91.7
240-81629-4	MW-4	94.1
LCS 160-316287/2-A	Lab Control Sample	95.3
MB 160-316287/1-A	Method Blank	97.3

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Ba (40-110)	Y (40-110)
240-81629-1	MW-1	92.3	84.5
240-81629-2	MW-2	89.1	87.9
240-81629-3	MW-3	91.7	75.1
240-81629-4	MW-4	94.1	81.5
LCS 160-316293/2-A	Lab Control Sample	95.3	84.9
MB 160-316293/1-A	Method Blank	97.3	84.1

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-285363/1-A
Matrix: Water
Analysis Batch: 285564

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		06/29/17 14:00	06/30/17 14:48	1
Calcium	5000	U	5000	710	ug/L		06/29/17 14:00	06/30/17 14:48	1

Lab Sample ID: LCS 240-285363/2-A
Matrix: Water
Analysis Batch: 285564

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1030		ug/L		103	80 - 120
Calcium	50000	48700		ug/L		97	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-285363/1-A
Matrix: Water
Analysis Batch: 285889

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		06/29/17 14:00	07/04/17 01:05	1
Arsenic	0.0050	U	0.0050	0.00075	mg/L		06/29/17 14:00	07/04/17 01:05	1
Barium	0.0050	U	0.0050	0.0022	mg/L		06/29/17 14:00	07/04/17 01:05	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		06/29/17 14:00	07/04/17 01:05	1
Cobalt	0.0010	U	0.0010	0.00019	mg/L		06/29/17 14:00	07/04/17 01:05	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		06/29/17 14:00	07/04/17 01:05	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		06/29/17 14:00	07/04/17 01:05	1
Lead	0.0010	U	0.0010	0.00045	mg/L		06/29/17 14:00	07/04/17 01:05	1
Selenium	0.0050	U ^	0.0050	0.00089	mg/L		06/29/17 14:00	07/04/17 01:05	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		06/29/17 14:00	07/04/17 01:05	1

Lab Sample ID: MB 240-285363/1-A
Matrix: Water
Analysis Batch: 286057

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.0010	U	0.0010	0.00031	mg/L		06/29/17 14:00	07/05/17 17:40	1
Lithium	0.0080	U	0.0080	0.0017	mg/L		06/29/17 14:00	07/05/17 17:40	1

Lab Sample ID: LCS 240-285363/3-A
Matrix: Water
Analysis Batch: 285889

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.105		mg/L		105	80 - 120
Arsenic	1.00	1.12		mg/L		112	80 - 120
Barium	1.00	1.04		mg/L		104	80 - 120
Cadmium	1.00	1.06		mg/L		106	80 - 120
Cobalt	1.00	1.11		mg/L		111	80 - 120
Chromium	1.00	1.06		mg/L		106	80 - 120
Molybdenum	0.100	0.0979		mg/L		98	80 - 120

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

Lab Sample ID: LCS 240-285363/3-A
Matrix: Water
Analysis Batch: 285889

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	1.00	1.10		mg/L		110	80 - 120
Selenium	1.00	1.15	^	mg/L		115	80 - 120
Thallium	0.250	0.266		mg/L		106	80 - 120

Lab Sample ID: LCS 240-285363/3-A
Matrix: Water
Analysis Batch: 286057

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 285363

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Beryllium	1.00	1.15		mg/L		115	80 - 120
Lithium	0.100	0.108		mg/L		108	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-285360/1-A
Matrix: Water
Analysis Batch: 285610

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 285360

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		06/29/17 14:00	06/30/17 14:08	1

Lab Sample ID: LCS 240-285360/2-A
Matrix: Water
Analysis Batch: 285610

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 285360

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00495		mg/L		99	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-285598/3
Matrix: Water
Analysis Batch: 285598

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			06/30/17 21:13	1
Fluoride	0.050	U	0.050	0.024	mg/L			06/30/17 21:13	1
Sulfate	1.0	U	1.0	0.35	mg/L			06/30/17 21:13	1

Lab Sample ID: LCS 240-285598/4
Matrix: Water
Analysis Batch: 285598

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	50.3		mg/L		101	90 - 110
Fluoride	2.50	2.68		mg/L		107	90 - 110
Sulfate	50.0	52.2		mg/L		104	90 - 110

Method: 9056A - Anions, Ion Chromatography (Continued)

Lab Sample ID: MB 240-286334/3
Matrix: Water
Analysis Batch: 286334

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			07/08/17 05:04	1
Fluoride	0.050	U	0.050	0.024	mg/L			07/08/17 05:04	1
Sulfate	1.0	U	1.0	0.35	mg/L			07/08/17 05:04	1

Lab Sample ID: LCS 240-286334/4
Matrix: Water
Analysis Batch: 286334

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	51.0		mg/L		102	90 - 110
Fluoride	2.50	2.67		mg/L		107	90 - 110
Sulfate	50.0	52.1		mg/L		104	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-285606/1
Matrix: Water
Analysis Batch: 285606

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.8	mg/L			06/30/17 13:58	1

Lab Sample ID: LCS 240-285606/2
Matrix: Water
Analysis Batch: 285606

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	242	232		mg/L		96	80 - 120

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-316287/1-A
Matrix: Water
Analysis Batch: 319473

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 316287

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.01245	U	0.0409	0.0409	1.00	0.0794	pCi/L	07/05/17 10:51	07/27/17 05:58	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*07/05/17 10:51*	*07/27/17 05:58*	*1*

Method: 9315 - Radium-226 (GFPC) (Continued)

Lab Sample ID: LCS 160-316287/2-A
Matrix: Water
Analysis Batch: 319473

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 316287

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-226			11.4	10.28		1.06	1.00	0.0909	pCi/L	90	68 - 137		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*95.3*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-316293/1-A
Matrix: Water
Analysis Batch: 317416

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 316293

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.3203	U	0.223	0.225	1.00	0.346	pCi/L	07/05/17 12:26	07/14/17 14:25	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.3*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:25*	*1*
Y Carrier	*84.1*		*40 - 110*	*07/05/17 12:26*	*07/14/17 14:25*	*1*

Lab Sample ID: LCS 160-316293/2-A
Matrix: Water
Analysis Batch: 317416

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 316293

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.2	15.30		1.63	1.00	0.317	pCi/L	116	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*95.3*		*40 - 110*
Y Carrier	*84.9*		*40 - 110*

Metals

Prep Batch: 285360

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total/NA	Water	7470A	
240-81629-2	MW-2	Total/NA	Water	7470A	
240-81629-3	MW-3	Total/NA	Water	7470A	
240-81629-4	MW-4	Total/NA	Water	7470A	
MB 240-285360/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-285360/2-A	Lab Control Sample	Total/NA	Water	7470A	

Prep Batch: 285363

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total Recoverable	Water	3005A	
240-81629-2	MW-2	Total Recoverable	Water	3005A	
240-81629-3	MW-3	Total Recoverable	Water	3005A	
240-81629-4	MW-4	Total Recoverable	Water	3005A	
MB 240-285363/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-285363/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-285363/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Analysis Batch: 285564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total Recoverable	Water	6010C	285363
240-81629-2	MW-2	Total Recoverable	Water	6010C	285363
240-81629-3	MW-3	Total Recoverable	Water	6010C	285363
240-81629-4	MW-4	Total Recoverable	Water	6010C	285363
MB 240-285363/1-A	Method Blank	Total Recoverable	Water	6010C	285363
LCS 240-285363/2-A	Lab Control Sample	Total Recoverable	Water	6010C	285363

Analysis Batch: 285610

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total/NA	Water	7470A	285360
240-81629-2	MW-2	Total/NA	Water	7470A	285360
240-81629-3	MW-3	Total/NA	Water	7470A	285360
240-81629-4	MW-4	Total/NA	Water	7470A	285360
MB 240-285360/1-A	Method Blank	Total/NA	Water	7470A	285360
LCS 240-285360/2-A	Lab Control Sample	Total/NA	Water	7470A	285360

Analysis Batch: 285825

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total Recoverable	Water	6010C	285363
240-81629-2	MW-2	Total Recoverable	Water	6010C	285363

Analysis Batch: 285889

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total Recoverable	Water	6020A	285363
240-81629-2	MW-2	Total Recoverable	Water	6020A	285363
240-81629-3	MW-3	Total Recoverable	Water	6020A	285363
240-81629-4	MW-4	Total Recoverable	Water	6020A	285363
MB 240-285363/1-A	Method Blank	Total Recoverable	Water	6020A	285363
LCS 240-285363/3-A	Lab Control Sample	Total Recoverable	Water	6020A	285363

Metals (Continued)

Analysis Batch: 286057

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total Recoverable	Water	6020A	285363
240-81629-2	MW-2	Total Recoverable	Water	6020A	285363
240-81629-3	MW-3	Total Recoverable	Water	6020A	285363
240-81629-4	MW-4	Total Recoverable	Water	6020A	285363
MB 240-285363/1-A	Method Blank	Total Recoverable	Water	6020A	285363
LCS 240-285363/3-A	Lab Control Sample	Total Recoverable	Water	6020A	285363

General Chemistry

Analysis Batch: 285598

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total/NA	Water	9056A	
240-81629-1	MW-1	Total/NA	Water	9056A	
240-81629-3	MW-3	Total/NA	Water	9056A	
240-81629-4	MW-4	Total/NA	Water	9056A	
240-81629-4	MW-4	Total/NA	Water	9056A	
MB 240-285598/3	Method Blank	Total/NA	Water	9056A	
LCS 240-285598/4	Lab Control Sample	Total/NA	Water	9056A	

Analysis Batch: 285606

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total/NA	Water	SM 2540C	
240-81629-2	MW-2	Total/NA	Water	SM 2540C	
240-81629-3	MW-3	Total/NA	Water	SM 2540C	
240-81629-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-285606/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-285606/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 286334

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-2	MW-2	Total/NA	Water	9056A	
MB 240-286334/3	Method Blank	Total/NA	Water	9056A	
LCS 240-286334/4	Lab Control Sample	Total/NA	Water	9056A	

Rad

Prep Batch: 316287

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total/NA	Water	PrecSep-21	
240-81629-2	MW-2	Total/NA	Water	PrecSep-21	
240-81629-3	MW-3	Total/NA	Water	PrecSep-21	
240-81629-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-316287/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-316287/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 316293

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-1	MW-1	Total/NA	Water	PrecSep_0	
240-81629-2	MW-2	Total/NA	Water	PrecSep_0	
240-81629-3	MW-3	Total/NA	Water	PrecSep_0	

Rad (Continued)

Prep Batch: 316293 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-81629-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-316293/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-316293/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-1

Lab Sample ID: 240-81629-1

Date Collected: 06/26/17 11:37

Matrix: Water

Date Received: 06/28/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	285564	06/30/17 15:42	KLC	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	285825	07/03/17 18:07	RKT	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	285889	07/04/17 03:43	AS1	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	286057	07/05/17 17:57	AS1	TAL CAN
Total/NA	Prep	7470A			285360	06/29/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	285610	06/30/17 14:50	DTN	TAL CAN
Total/NA	Analysis	9056A		1	285598	06/30/17 23:34	JMB	TAL CAN
Total/NA	Analysis	9056A		10	285598	06/30/17 23:54	JMB	TAL CAN
Total/NA	Analysis	SM 2540C		1	285606	06/30/17 13:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			316287	07/05/17 10:51	LDE	TAL SL
Total/NA	Analysis	9315		1	319473	07/27/17 06:00	RTM	TAL SL
Total/NA	Prep	PrecSep_0			316293	07/05/17 12:26	LDE	TAL SL
Total/NA	Analysis	9320		1	317416	07/14/17 14:26	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	319718	07/28/17 15:26	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-81629-2

Date Collected: 06/26/17 12:25

Matrix: Water

Date Received: 06/28/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	285564	06/30/17 15:47	KLC	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		10	285825	07/03/17 18:11	RKT	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	285889	07/04/17 03:48	AS1	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	286057	07/05/17 18:02	AS1	TAL CAN
Total/NA	Prep	7470A			285360	06/29/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	285610	06/30/17 14:56	DTN	TAL CAN
Total/NA	Analysis	9056A		10	286334	07/08/17 06:05	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	285606	06/30/17 13:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			316287	07/05/17 10:51	LDE	TAL SL
Total/NA	Analysis	9315		1	319473	07/27/17 06:01	RTM	TAL SL
Total/NA	Prep	PrecSep_0			316293	07/05/17 12:26	LDE	TAL SL
Total/NA	Analysis	9320		1	317416	07/14/17 14:26	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	319718	07/28/17 15:26	RTM	TAL SL

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Client Sample ID: MW-3

Date Collected: 06/26/17 14:15
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	285564	06/30/17 15:51	KLC	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	285889	07/04/17 03:52	AS1	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	286057	07/05/17 18:06	AS1	TAL CAN
Total/NA	Prep	7470A			285360	06/29/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	285610	06/30/17 14:58	DTN	TAL CAN
Total/NA	Analysis	9056A		5	285598	07/01/17 00:15	JMB	TAL CAN
Total/NA	Analysis	SM 2540C		1	285606	06/30/17 13:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			316287	07/05/17 10:51	LDE	TAL SL
Total/NA	Analysis	9315		1	319473	07/27/17 06:01	RTM	TAL SL
Total/NA	Prep	PrecSep_0			316293	07/05/17 12:26	LDE	TAL SL
Total/NA	Analysis	9320		1	317416	07/14/17 14:26	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	319718	07/28/17 15:26	RTM	TAL SL

Client Sample ID: MW-4

Date Collected: 06/26/17 15:29
Date Received: 06/28/17 09:30

Lab Sample ID: 240-81629-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	285564	06/30/17 15:56	KLC	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	285889	07/04/17 03:56	AS1	TAL CAN
Total Recoverable	Prep	3005A			285363	06/29/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	286057	07/05/17 18:10	AS1	TAL CAN
Total/NA	Prep	7470A			285360	06/29/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	285610	06/30/17 15:00	DTN	TAL CAN
Total/NA	Analysis	9056A		1	285598	07/01/17 01:35	JMB	TAL CAN
Total/NA	Analysis	9056A		10	285598	07/01/17 01:55	JMB	TAL CAN
Total/NA	Analysis	SM 2540C		1	285606	06/30/17 13:58	MM	TAL CAN
Total/NA	Prep	PrecSep-21			316287	07/05/17 10:51	LDE	TAL SL
Total/NA	Analysis	9315		1	319473	07/27/17 06:01	RTM	TAL SL
Total/NA	Prep	PrecSep_0			316293	07/05/17 12:26	LDE	TAL SL
Total/NA	Analysis	9320		1	317416	07/14/17 14:26	ALD	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	319718	07/28/17 15:26	RTM	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-81629-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17 *
West Virginia DEP	State Program	3	210	12-31-17 *

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-18

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

2.5/C25

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Corey Finley	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41876-17977.1
Client Contact: Mr. Brian Beach	Phone: 609 501 3605	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:	Analysis Requested		
City: Holland	TAT Requested (days):			
State, Zip: MI, 49424				
Phone:	PO #: 0398257			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Preservation Codes:

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)

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)	9315_Ra226, 9320_Ra226	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1	6-26-17	1137	G	Water			X	X	X		
MW-2		1254	G	Water			X	X	X		
MW-3		1415	G	Water			X	X	X		
MW-4	6-26-17	1529	G	Water			X	X	X		
				Water							

240-81629 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: Fedex Overnight		
Relinquished by: Corey Finley - ERM	Date/Time: 6-27-17 / 1450	Company: ERM	Received by:	Date/Time: 06/28/17 930	Company: TMC
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
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 Canton Sample Receipt Form/Narrative **Login # :** 81629

Canton Facility

Client EAM Site Name Grand Haven

Cooler Received on 06/28/17 Opened on 06/28/17

Cooler unpacked by: DSD

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

TestAmerica Cooler # Foam Box Client Cooler Box Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

☐ See Multiple Cooler Form

1. Cooler temperature upon receipt
   IR GUN# IR-8 (CF **-0.4** °C) Observed Cooler Temp. °C Corrected Cooler Temp. °C
   IR GUN #36 (CF **+0**°C) Observed Cooler Temp. 2.5 °C Corrected Cooler Temp. 2.5 °C
2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1 Yes No
   -Were custody seals on the outside of the cooler(s) signed & dated? Yes No NA
   -Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels be reconciled with the COC? Yes No
9. Were correct bottle(s) used for the test(s) indicated? Yes No
10. Sufficient quantity received to perform indicated analyses? Yes No
11. Are these work share samples? Yes No
    If yes, Questions 11-15 have been checked at the originating laboratory.
11. Were sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# **HC697954**
12. Were VOAs on the COC? Yes No
13. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this. Yes No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # Yes No
15. Was a LL Hg or Me Hg trip blank present? Yes No

Contacted PM Date by via Verbal Voice Mail Other

Concerning

16. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES

Samples processed by:

17. SAMPLE CONDITION

Sample(s) were received after the recommended holding time had expired.

Sample(s) were received in a broken container.

Sample(s) were received with bubble >6 mm in diameter. (Notify PM)

18. SAMPLE PRESERVATION

Sample(s) MW-2 were further preserved in the laboratory.

Time preserved: 1200 pm 6/28/17 Preservative(s) added/Lot number(s): N:Hr.C

Ref: SOP NC-SC-0005, Sample Receiving

\\tacorp\corp\QA\QA_Facilities\Canton-QA\Document-Management\Work-Instruction\Word Version Work Instructions\WI-NC-099-052317 Cooler Receipt Form.doc djl

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-81629-B-1	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-1	240-81629-C-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-1	240-81629-D-1	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-81629-B-2	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-2	240-81629-C-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-2	240-81629-D-2	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-81629-B-3	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-3	240-81629-C-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-3	240-81629-D-3	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-81629-B-4	Plastic 500ml - with Nitric Acid	<2	_____	_____
MW-4	240-81629-C-4	Plastic 1 liter - Nitric Acid	<2	_____	_____
MW-4	240-81629-D-4	Plastic 1 liter - Nitric Acid	<2	_____	_____

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-81629 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna		OC No: 240-72923.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP		Job #: 240-81629-1
Address: 13715 Rider Trail North,	Due Date Requested: 7/31/2017			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

Other:

Sample Identification - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226PrecSep_21 Standard Target List	9320_Ra228PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-81629-1)	6/26/17	11:37 Eastern		Water			X	X	X	2	
MW-2 (240-81629-2)	6/26/17	12:25 Eastern		Water			X	X	X	2	
MW-3 (240-81629-3)	6/26/17	14:15 Eastern		Water			X	X	X	2	
MW-4 (240-81629-4)	6/26/17	15:29 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

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

	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	6-28-17 1515	240		6-29-17 0920	TAL
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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 Checklist

Client: ERM-North Central Inc

Job Number: 240-81629-1

Login Number: 81629
List Number: 2
Creator: Taylor, Kristene N

List Source: TestAmerica St. Louis
List Creation: 06/29/17 02:02 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	17.0,17.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: ERM-North Central Inc

Job Number: 240-81629-1

Login Number: 81629
List Number: 3
Creator: Ehlert, Larissa D

List Source: TestAmerica St. Louis
List Creation: 07/05/17 07:56 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.		
The cooler's custody seal, if present, is intact.		
Sample custody seals, if present, are intact.		
The cooler or samples do not appear to have been compromised or tampered with.		
Samples were received on ice.		
Cooler Temperature is acceptable.		
Cooler Temperature is recorded.		
COC is present.		
COC is filled out in ink and legible.		
COC is filled out with all pertinent information.		
Is the Field Sampler's name present on COC?		
There are no discrepancies between the containers received and the COC.		
Samples are received within Holding Time (excluding tests with immediate HTs)		
Sample containers have legible labels.		
Containers are not broken or leaking.		
Sample collection date/times are provided.		
Appropriate sample containers are used.		
Sample bottles are completely filled.		
Sample Preservation Verified.		
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs		
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").		
Multiphasic samples are not present.		
Samples do not require splitting or compositing.		
Residual Chlorine Checked.		

Environmental Resources Management

Field Form for Low Flow Rate Sampling

Well ID: MW-1
Site Name & Address:

Sampler Name: CF
Pump Type: peristaltic
Meter Type (s): YSI 556 & Turb 2100P
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 5.80
Groundwater Elevation/SWL (feet): 93.55
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #: [illegible]
Client: GHBLP
Date: 6-26-17
Weather:
Temperature/Bar. Pressure: / 747.8
Start Time of Purging: 1048
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 6.52
Calculated Well Volume* (liters or gal): 1.06
Well Volume Discharged (liters or gal): 2.29

Well Inspection: Clearly Labeled (Y)___N_; Concrete Pad Intact (Y)___N_; Lock Functional (Y)___N_; Pro-cover in good condition (Y)___N_; Casing in good condition (Y)___N__
Calibration: Time; 0930 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1.413 ; DO 100%.
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min or~~ gallon/min)	Comments (i.e., odor, color, etc)
1058	17.44	2.223	0.70	8.51	-68.1	1.99	5.90	0.180	
1103	17.27	2.233	0.40	8.52	-100.3	1.55	5.90	0.180	
1108	17.37	2.240	0.25	8.40	-110.2	1.26	5.95	0.180	
1113	17.29	2.238	0.21	8.29	-125.0	1.38	5.95	0.180	
1118	17.31	2.240	0.21	8.21	-142.5	1.52	5.95	0.180	
1123	17.40	2.243	0.20	8.16	-147.9	1.48	5.95	0.180	
1128	17.50	2.247	0.19	8.11	-157.5	1.45	5.95	0.180	
1131	17.36	2.251	0.19	8.09	-169.6	1.49	5.95	0.180	
1134	17.48	2.248	0.21	8.05	-175.7	1.47	5.95	0.180	
1137	17.56	2.248	0.23	8.04	-177.7	1.52	5.95	0.180	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1137

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-2
Site Name & Address:

Sampler Name: CF
Pump Type: Peristaltic
Meter Type (s): YSI 556 / Turb 2100P
Top of Casing Elevation (feet): 107.75
Initial Water Level (feet below TOC): 14.84'
Groundwater Elevation/SWL (feet): 92.91
Well Depth (feet below TOC): 23.37'
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): 19'

Project #:
Client: GHBLP
Date: 6-26-17
Weather:
Temperature/Bar. Pressure / 749.0
Start Time of Purging: 1208
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.53'
Calculated Well Volume* (liters or gal): 1.39
Well Volume Discharged (liters or gal): 1.91

Well Inspection: Clearly Labeled Y N; Concrete Pad Intact Y N; Lock Functional Y N; Pro-cover in good condition Y N; Casing in good condition Y N

Calibration: Time: 0930; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%

Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1218	15.14	4.491	0.60	8.09	-131.2	6.21	15.43	0.180	
1223	14.87	4.528	0.50	7.97	-126.6	6.21	15.45	0.160	
1228	14.74	4.583	0.45	7.85	-122.8	5.56	15.51	0.160	
1233	14.77	4.650	0.41	7.78	-119.3	5.63	15.52	0.160	
1238	14.70	4.685	0.34	7.75	-116.1	5.35	15.52	0.160	
1243	15.10	4.694	0.40	7.72	-118.2	5.42	15.52	0.160	
1248	14.89	4.768	0.29	7.72	-115.7	5.55	15.52	0.160	
1251	14.89	4.775	0.28	7.72	-114.2	5.59	15.52	0.160	
1254	14.81	4.799	0.26	7.72	-112.9	5.65	15.52	0.160	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[F]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[F]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: slightly foamy w/ yellow tint sampled @ 1254

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-3
Site Name & Address:
Sampler Name: CF
Pump Type: Peristaltic
Meter Type (s):
Top of Casing Elevation (feet): 105.20'
Initial Water Level (feet below TOC): 12.04
Groundwater Elevation/SWL (feet): 93.16'
Well Depth (feet below TOC): 20.34'
Screened Interval (feet below TOC): 12-17'
Depth Pump Intake Set At (feet below TOC): 16'

Project #:
Client: GHRLP
Date: 6-26-17
Weather:
Temperature/Bar. Pressure / 748.6
Start Time of Purging: 1328
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.30
Calculated Well Volume* (liters or gal): 1.35
Well Volume Discharged (liters or gal): 2.11

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 0930; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1338	14.65	4.228	0.82	8.04	-46.9	2.60	12.28	0.180	
1343	14.45	4.225	0.58	7.92	-54.9	2.29	12.28	0.180	
1348	14.52	4.214	0.46	7.83	-55.3	2.51	12.30	0.180	
1353	14.47	4.209	0.39	7.75	-54.3	2.95	12.34	0.180	
1358	14.35	4.207	0.35	7.73	-55.9	2.57	12.34	0.180	dropped slightly to stabilize WL
1403	14.44	4.201	0.34	7.69	-55.0	2.30	12.34	0.160	
1408	14.32	4.205	0.32	7.69	-53.3	2.42	12.34	0.160	
1409	14.33	4.195	0.29	7.69	-55.4	2.47	12.34	0.160	
1412	14.33	4.193	0.27	7.70	-56.1	2.54	12.34	0.160	
1415	14.30	4.191	0.24	7.70	-54.7	2.57	12.34	0.160	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[F]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[F]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1415

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-4
Site Name & Address:

Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 103.59'
Initial Water Level (feet below TOC): 10.51
Groundwater Elevation/SWL (feet): 93.08'
Well Depth (feet below TOC): 18'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #:
Client: GHBLP
Date: 6-26-17
Weather:
Temperature/Bar. Pressure /
Start Time of Purging: 1452
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 7.49
Calculated Well Volume* (liters or gal): 1.22
Well Volume Discharged (liters or gal): 1.92

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time: 0930; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1.413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min~~ or gallon/min)	Comments (i.e., odor, color, etc)
1502	15.04	3.245	0.56	8.11	-69.6	3.84	10.70	0.20	
1507	14.96	3.237	0.44	8.02	-71.2	2.29	10.71	0.20	
1512	15.12	3.224	0.44	7.94	-68.5	2.34	10.71	0.20	
1517	15.05	3.230	0.40	7.87	-70.4	2.21	10.71	0.20	
1520	15.06	3.227	0.40	7.85	-71.0	2.16	10.71	0.20	
1523	14.99	3.230	0.37	7.89	-75.3	1.47	10.71	0.20	
1526	14.96	3.231	0.35	7.78	-77.1	1.45	10.71	0.20	
1529	14.93	3.231	0.36	7.76	-77.1	1.42	10.71	0.20	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1529

APPENDIX A-7

SEVENTH BACKGROUND SAMPLING EVENT

ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-82597-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
8/16/2017 11:46:00 AM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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 Narrative

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Job ID: 240-82597-1

Laboratory: TestAmerica Canton

Narrative

Job Narrative
240-82597-1

Comments
No additional comments.

Receipt
The samples were received on 7/20/2017 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.7º C.

RAD
Method(s) PrecSep_0: Radium 228 Prep Batch 160-319102
Insufficient sample volume was available to perform a sample duplicate (DU). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.

MW-1 (240-82597-1), MW-2 (240-82597-2), MW-3 (240-82597-3) and MW-4 (240-82597-4)

Method(s) PrecSep_0: Radium 228 Prep Batch 160-319102
The following sample was reduced due to a heavy amount of sediment making sample murky and brown.

MW-2 (240-82597-2)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-318979
The following sample was reduced due to heavy amounts of sediment making sample murky and brown.

MW-2 (240-82597-2)

Method(s) PrecSep-21: Radium 226 Prep Batch 160-318979
Insufficient sample volume was available to perform a sample duplicate (DU). A laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) were prepared instead to demonstrate batch precision.
MW-1 (240-82597-1), MW-2 (240-82597-2), MW-3 (240-82597-3) and MW-4 (240-82597-4)

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

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

General Chemistry
Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-82597-2). Elevated reporting limits (RLs) are provided.

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-82597-1	MW-1	Water	07/17/17 11:30	07/20/17 09:30
240-82597-2	MW-2	Water	07/17/17 12:50	07/20/17 09:30
240-82597-3	MW-3	Water	07/17/17 14:08	07/20/17 09:30
240-82597-4	MW-4	Water	07/17/17 15:12	07/20/17 09:30

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-1 — Lab Sample ID: 240-82597-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	120000	B	4000	160	ug/L	20		6010C	Total Recoverable
Calcium	110000		5000	710	ug/L	1		6010C	Total Recoverable
Barium	0.56		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00045	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0014	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lithium	2.7		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	180		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	20		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	22		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	1600		20	16	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-82597-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	130000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	180000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0061		0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.44		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cadmium	0.00021	J	0.0010	0.00021	mg/L	1		6020A	Total Recoverable
Cobalt	0.0068		0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.053		0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0051	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.0034		0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Selenium	0.0028	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	1.2		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	150		20	5.7	mg/L	20		9056A	Total/NA
Fluoride	14		1.0	0.48	mg/L	20		9056A	Total/NA
Total Dissolved Solids	2100		50	39	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-3 — Lab Sample ID: 240-82597-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	4900		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	590000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0025	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-3 (Continued)

Lab Sample ID: 240-82597-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.41		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00079	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0014	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0015	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Selenium	0.00094	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	0.057		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	400		20	5.7	mg/L	20		9056A	Total/NA
Fluoride	1.2		1.0	0.48	mg/L	20		9056A	Total/NA
Sulfate	820		20	7.0	mg/L	20		9056A	Total/NA
Total Dissolved Solids	3100		40	31	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4

Lab Sample ID: 240-82597-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	3700		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	510000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0020	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.17		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00048	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0019	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0016	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lithium	0.048		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	340		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	1.3		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	940		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2600		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 07/17/17 11:30
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**120000**	**B**	4000	160	ug/L		07/21/17 14:00	07/24/17 17:18	20
Calcium	**110000**		5000	710	ug/L		07/21/17 14:00	07/24/17 16:03	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		07/21/17 14:00	07/28/17 00:01	1
Arsenic	0.0050	U	0.0050	0.00075	mg/L		07/21/17 14:00	07/28/17 00:01	1
Barium	**0.56**		0.0050	0.0022	mg/L		07/21/17 14:00	07/28/17 00:01	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		07/21/17 14:00	07/28/17 00:01	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		07/21/17 14:00	07/28/17 00:01	1
Cobalt	**0.00045**	**J**	0.0010	0.00019	mg/L		07/21/17 14:00	07/28/17 00:01	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		07/21/17 14:00	07/28/17 00:01	1
Molybdenum	**0.0014**	**J**	0.010	0.0011	mg/L		07/21/17 14:00	07/28/17 00:01	1
Lead	0.0010	U	0.0010	0.00045	mg/L		07/21/17 14:00	07/28/17 00:01	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		07/21/17 14:00	07/28/17 00:01	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		07/21/17 14:00	07/28/17 00:01	1
Lithium	**2.7**		0.0080	0.0017	mg/L		07/21/17 14:00	07/28/17 00:01	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		07/21/17 14:00	07/21/17 17:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**180**		10	2.8	mg/L			07/25/17 10:10	10
Fluoride	**20**		0.50	0.24	mg/L			07/25/17 10:10	10
Sulfate	**22**		10	3.5	mg/L			07/25/17 10:10	10
Total Dissolved Solids	**1600**		20	16	mg/L			07/24/17 10:01	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.285**		0.0983	0.102	1.00	0.0844	pCi/L	07/25/17 08:09	08/16/17 07:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*40 - 110*	*07/25/17 08:09*	*08/16/17 07:05*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.436**		0.249	0.252	1.00	0.377	pCi/L	07/25/17 10:53	08/07/17 09:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.0*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*
Y Carrier	*85.6*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-1
Date Collected: 07/17/17 11:30
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.721		0.268	0.272	5.00	0.377	pCi/L		08/16/17 11:00	1

Client Sample ID: MW-2

Date Collected: 07/17/17 12:50
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-2

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**130000**		4000	160	ug/L		07/21/17 14:00	07/24/17 16:07	20
Calcium	**180000**		5000	710	ug/L		07/21/17 14:00	07/24/17 15:07	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		07/21/17 14:00	07/25/17 22:06	1
Arsenic	**0.0061**		0.0050	0.00075	mg/L		07/21/17 14:00	07/25/17 22:06	1
Barium	**0.44**		0.0050	0.0022	mg/L		07/21/17 14:00	07/25/17 22:06	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		07/21/17 14:00	07/25/17 22:06	1
Cadmium	**0.00021**	**J**	0.0010	0.00021	mg/L		07/21/17 14:00	07/25/17 22:06	1
Cobalt	**0.0068**		0.0010	0.00019	mg/L		07/21/17 14:00	07/25/17 22:06	1
Chromium	**0.053**		0.0020	0.00098	mg/L		07/21/17 14:00	07/25/17 22:06	1
Molybdenum	**0.0051**	**J**	0.010	0.0011	mg/L		07/21/17 14:00	07/25/17 22:06	1
Lead	**0.0034**		0.0010	0.00045	mg/L		07/21/17 14:00	07/25/17 22:06	1
Selenium	**0.0028**	**J**	0.0050	0.00089	mg/L		07/21/17 14:00	07/25/17 22:06	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		07/21/17 14:00	07/25/17 22:06	1
Lithium	**1.2**		0.0080	0.0017	mg/L		07/21/17 14:00	07/26/17 15:50	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		07/21/17 14:00	07/24/17 14:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**150**		20	5.7	mg/L			07/25/17 10:30	20
Fluoride	**14**		1.0	0.48	mg/L			07/25/17 10:30	20
Sulfate	20	U	20	7.0	mg/L			07/25/17 10:30	20
Total Dissolved Solids	**2100**		50	39	mg/L			07/24/17 10:01	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.794**		0.249	0.259	1.00	0.216	pCi/L	07/25/17 08:09	08/16/17 07:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.5*		*40 - 110*	*07/25/17 08:09*	*08/16/17 07:05*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.48**		0.577	0.593	1.00	0.800	pCi/L	07/25/17 10:53	08/07/17 09:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*78.5*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*
Y Carrier	*87.9*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-2
Date Collected: 07/17/17 12:50
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	2.27		0.628	0.647	5.00	0.800	pCi/L		08/16/17 11:00	1

Client Sample ID: MW-3

Date Collected: 07/17/17 14:08
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**4900**		200	8.1	ug/L		07/21/17 14:00	07/24/17 15:12	1
Calcium	**590000**		5000	710	ug/L		07/21/17 14:00	07/24/17 15:12	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		07/21/17 14:00	07/25/17 22:10	1
Arsenic	**0.0025**	**J**	0.0050	0.00075	mg/L		07/21/17 14:00	07/25/17 22:10	1
Barium	**0.41**		0.0050	0.0022	mg/L		07/21/17 14:00	07/25/17 22:10	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		07/21/17 14:00	07/25/17 22:10	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		07/21/17 14:00	07/25/17 22:10	1
Cobalt	**0.00079**	**J**	0.0010	0.00019	mg/L		07/21/17 14:00	07/25/17 22:10	1
Chromium	**0.0014**	**J**	0.0020	0.00098	mg/L		07/21/17 14:00	07/25/17 22:10	1
Molybdenum	**0.0015**	**J**	0.010	0.0011	mg/L		07/21/17 14:00	07/25/17 22:10	1
Lead	0.0010	U	0.0010	0.00045	mg/L		07/21/17 14:00	07/25/17 22:10	1
Selenium	**0.00094**	**J**	0.0050	0.00089	mg/L		07/21/17 14:00	07/25/17 22:10	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		07/21/17 14:00	07/25/17 22:10	1
Lithium	**0.057**		0.0080	0.0017	mg/L		07/21/17 14:00	07/26/17 15:54	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		07/21/17 14:00	07/24/17 14:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**400**		20	5.7	mg/L			07/25/17 10:51	20
Fluoride	**1.2**		1.0	0.48	mg/L			07/25/17 10:51	20
Sulfate	**820**		20	7.0	mg/L			07/25/17 10:51	20
Total Dissolved Solids	**3100**		40	31	mg/L			07/24/17 10:01	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.689**		0.141	0.154	1.00	0.0963	pCi/L	07/25/17 08:09	08/16/17 07:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.3*		*40 - 110*	*07/25/17 08:09*	*08/16/17 07:05*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.686**		0.263	0.270	1.00	0.367	pCi/L	07/25/17 10:53	08/07/17 09:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.3*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*
Y Carrier	*84.5*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-3
Date Collected: 07/17/17 14:08
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.38		0.298	0.311	5.00	0.367	pCi/L		08/16/17 11:00	1

Client Sample ID: MW-4
Date Collected: 07/17/17 15:12
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-4
Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**3700**		200	8.1	ug/L		07/21/17 14:00	07/24/17 15:17	1
Calcium	**510000**		5000	710	ug/L		07/21/17 14:00	07/24/17 15:17	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		07/21/17 14:00	07/25/17 22:14	1
Arsenic	**0.0020**	**J**	0.0050	0.00075	mg/L		07/21/17 14:00	07/25/17 22:14	1
Barium	**0.17**		0.0050	0.0022	mg/L		07/21/17 14:00	07/25/17 22:14	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		07/21/17 14:00	07/25/17 22:14	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		07/21/17 14:00	07/25/17 22:14	1
Cobalt	**0.00048**	**J**	0.0010	0.00019	mg/L		07/21/17 14:00	07/25/17 22:14	1
Chromium	**0.0019**	**J**	0.0020	0.00098	mg/L		07/21/17 14:00	07/25/17 22:14	1
Molybdenum	**0.0016**	**J**	0.010	0.0011	mg/L		07/21/17 14:00	07/25/17 22:14	1
Lead	0.0010	U	0.0010	0.00045	mg/L		07/21/17 14:00	07/25/17 22:14	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		07/21/17 14:00	07/25/17 22:14	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		07/21/17 14:00	07/25/17 22:14	1
Lithium	**0.048**		0.0080	0.0017	mg/L		07/21/17 14:00	07/26/17 16:07	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		07/21/17 14:00	07/24/17 14:27	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**340**		10	2.8	mg/L			07/25/17 11:11	10
Fluoride	**1.3**		0.50	0.24	mg/L			07/25/17 11:11	10
Sulfate	**940**		10	3.5	mg/L			07/25/17 11:11	10
Total Dissolved Solids	**2600**		40	31	mg/L			07/24/17 10:01	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.260**		0.0975	0.100	1.00	0.0995	pCi/L	07/25/17 08:09	08/16/17 07:05	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*40 - 110*	*07/25/17 08:09*	*08/16/17 07:05*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**0.620**		0.240	0.247	1.00	0.333	pCi/L	07/25/17 10:53	08/07/17 09:46	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*91.7*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*
Y Carrier	*90.1*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:46*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-4
Date Collected: 07/17/17 15:12
Date Received: 07/20/17 09:30

Lab Sample ID: 240-82597-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.879		0.259	0.267	5.00	0.333	pCi/L		08/16/17 11:00	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
240-82597-1	MW-1	90.0
240-82597-2	MW-2	78.5
240-82597-3	MW-3	95.3
240-82597-4	MW-4	91.7
LCS 160-318979/2-A	Lab Control Sample	99.1
LCSD 160-318979/3-A	Lab Control Sample Dup	96.2
MB 160-318979/1-A	Method Blank	97.9

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(40-110)	(40-110)
240-82597-1	MW-1	90.0	85.6
240-82597-2	MW-2	78.5	87.9
240-82597-3	MW-3	95.3	84.5
240-82597-4	MW-4	91.7	90.1
LCS 160-319102/2-A	Lab Control Sample	99.1	84.1
LCSD 160-319102/3-A	Lab Control Sample Dup	96.2	86.7
MB 160-319102/1-A	Method Blank	97.9	80.4

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-288136/1-A
Matrix: Water
Analysis Batch: 288408

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 288136

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	70.3	J	200	8.1	ug/L		07/21/17 14:00	07/24/17 15:22	1
Calcium	5000	U	5000	710	ug/L		07/21/17 14:00	07/24/17 15:22	1

Lab Sample ID: LCS 240-288136/2-A
Matrix: Water
Analysis Batch: 288408

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 288136

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1090		ug/L		109	80 - 120
Calcium	50000	50700		ug/L		101	80 - 120

Lab Sample ID: MB 240-288190/1-A
Matrix: Water
Analysis Batch: 288408

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 288190

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		07/21/17 14:00	07/24/17 14:26	1
Calcium	5000	U	5000	710	ug/L		07/21/17 14:00	07/24/17 14:26	1

Lab Sample ID: LCS 240-288190/2-A
Matrix: Water
Analysis Batch: 288408

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 288190

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1040		ug/L		104	80 - 120
Calcium	50000	50900		ug/L		102	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-288136/1-A
Matrix: Water
Analysis Batch: 289046

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 288136

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		07/21/17 14:00	07/27/17 21:19	1
Arsenic	0.0050	U	0.0050	0.00075	mg/L		07/21/17 14:00	07/27/17 21:19	1
Barium	0.0050	U	0.0050	0.0022	mg/L		07/21/17 14:00	07/27/17 21:19	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		07/21/17 14:00	07/27/17 21:19	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		07/21/17 14:00	07/27/17 21:19	1
Cobalt	0.0010	U	0.0010	0.00019	mg/L		07/21/17 14:00	07/27/17 21:19	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		07/21/17 14:00	07/27/17 21:19	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		07/21/17 14:00	07/27/17 21:19	1
Lead	0.0010	U	0.0010	0.00045	mg/L		07/21/17 14:00	07/27/17 21:19	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		07/21/17 14:00	07/27/17 21:19	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		07/21/17 14:00	07/27/17 21:19	1
Lithium	0.0080	U	0.0080	0.0017	mg/L		07/21/17 14:00	07/27/17 21:19	1

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

Lab Sample ID: LCS 240-288136/25-A
Matrix: Water
Analysis Batch: 289046

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 288136

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.0984		mg/L		98	80 - 120
Arsenic	1.00	0.986		mg/L		99	80 - 120
Barium	1.00	1.04		mg/L		104	80 - 120
Beryllium	1.00	1.14		mg/L		114	80 - 120
Cadmium	1.00	1.04		mg/L		104	80 - 120
Cobalt	1.00	1.05		mg/L		105	80 - 120
Chromium	1.00	1.03		mg/L		103	80 - 120
Molybdenum	0.100	0.0983		mg/L		98	80 - 120
Lead	1.00	1.02		mg/L		102	80 - 120
Selenium	1.00	0.989		mg/L		99	80 - 120
Thallium	0.250	0.258		mg/L		103	80 - 120
Lithium	0.100	0.107		mg/L		107	80 - 120

Lab Sample ID: MB 240-288190/1-A
Matrix: Water
Analysis Batch: 288707

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 288190

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		07/21/17 14:00	07/25/17 21:17	1
Arsenic	0.0050	U	0.0050	0.00075	mg/L		07/21/17 14:00	07/25/17 21:17	1
Barium	0.0050	U	0.0050	0.0022	mg/L		07/21/17 14:00	07/25/17 21:17	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		07/21/17 14:00	07/25/17 21:17	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		07/21/17 14:00	07/25/17 21:17	1
Cobalt	0.0010	U	0.0010	0.00019	mg/L		07/21/17 14:00	07/25/17 21:17	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		07/21/17 14:00	07/25/17 21:17	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		07/21/17 14:00	07/25/17 21:17	1
Lead	0.0010	U	0.0010	0.00045	mg/L		07/21/17 14:00	07/25/17 21:17	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		07/21/17 14:00	07/25/17 21:17	1
Thallium	0.0010	U	0.0010	0.00020	mg/L		07/21/17 14:00	07/25/17 21:17	1
Lithium	0.0080	U	0.0080	0.0017	mg/L		07/21/17 14:00	07/25/17 21:17	1

Lab Sample ID: LCS 240-288190/3-A
Matrix: Water
Analysis Batch: 288707

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 288190

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.0946		mg/L		95	80 - 120
Arsenic	1.00	1.02		mg/L		102	80 - 120
Barium	1.00	1.04		mg/L		104	80 - 120
Beryllium	1.00	1.10		mg/L		110	80 - 120
Cadmium	1.00	1.05		mg/L		105	80 - 120
Cobalt	1.00	1.01		mg/L		101	80 - 120
Chromium	1.00	1.01		mg/L		101	80 - 120
Molybdenum	0.100	0.0969		mg/L		97	80 - 120
Lead	1.00	1.01		mg/L		101	80 - 120
Selenium	1.00	1.03		mg/L		103	80 - 120
Thallium	0.250	0.251		mg/L		100	80 - 120
Lithium	0.100	0.105		mg/L		105	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-288140/1-A
Matrix: Water
Analysis Batch: 288348

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 288140

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		07/21/17 14:00	07/21/17 16:17	1

Lab Sample ID: LCS 240-288140/2-A
Matrix: Water
Analysis Batch: 288348

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 288140

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00553		mg/L		111	80 - 120

Lab Sample ID: MB 240-288191/1-A
Matrix: Water
Analysis Batch: 288460

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 288191

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		07/21/17 14:00	07/24/17 12:52	1

Lab Sample ID: LCS 240-288191/2-A
Matrix: Water
Analysis Batch: 288460

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 288191

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00454		mg/L		91	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-288437/3
Matrix: Water
Analysis Batch: 288437

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			07/25/17 04:48	1
Fluoride	0.050	U	0.050	0.024	mg/L			07/25/17 04:48	1
Sulfate	1.0	U	1.0	0.35	mg/L			07/25/17 04:48	1

Lab Sample ID: LCS 240-288437/4
Matrix: Water
Analysis Batch: 288437

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	50.4		mg/L		101	90 - 110
Fluoride	2.50	2.69		mg/L		107	90 - 110
Sulfate	50.0	52.0		mg/L		104	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-288389/1
Matrix: Water
Analysis Batch: 288389

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.8	mg/L			07/24/17 10:01	1

Lab Sample ID: LCS 240-288389/2
Matrix: Water
Analysis Batch: 288389

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	242	250		mg/L		103	80 - 120

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-318979/1-A
Matrix: Water
Analysis Batch: 322486

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 318979

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.1061		0.0623	0.0630	1.00	0.0716	pCi/L	07/25/17 08:09	08/16/17 07:01	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.9*		*40 - 110*	*07/25/17 08:09*	*08/16/17 07:01*	*1*

Lab Sample ID: LCS 160-318979/2-A
Matrix: Water
Analysis Batch: 322486

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 318979

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	10.30		1.07	1.00	0.0712	pCi/L	91	68 - 137

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.1*		*40 - 110*

Lab Sample ID: LCSD 160-318979/3-A
Matrix: Water
Analysis Batch: 322486

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 318979

Analyte	Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-226	11.4	10.02		1.05	1.00	0.0713	pCi/L	88	68 - 137	0.13	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*96.2*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-319102/1-A
Matrix: Water
Analysis Batch: 321174

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 319102

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.2656	U	0.209	0.210	1.00	0.328	pCi/L	07/25/17 10:53	08/07/17 09:40	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*97.9*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:40*	*1*
Y Carrier	*80.4*		*40 - 110*	*07/25/17 10:53*	*08/07/17 09:40*	*1*

Lab Sample ID: LCS 160-319102/2-A
Matrix: Water
Analysis Batch: 321174

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 319102

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.1	14.19		1.51	1.00	0.316	pCi/L	108	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*99.1*		*40 - 110*
Y Carrier	*84.1*		*40 - 110*

Lab Sample ID: LCSD 160-319102/3-A
Matrix: Water
Analysis Batch: 321174

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 319102

Analyte			Spike Added	LCSD Result	LCSD Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	RER	RER Limit
Radium-228			13.1	14.96		1.58	1.00	0.391	pCi/L	114	56 - 140	0.25	1

Carrier	*LCSD %Yield*	*LCSD Qualifier*	*Limits*
Ba Carrier	*96.2*		*40 - 110*
Y Carrier	*86.7*		*40 - 110*

Metals

Prep Batch: 288136

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total Recoverable	Water	3005A	
MB 240-288136/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-288136/25-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-288136/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 288140

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total/NA	Water	7470A	
MB 240-288140/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-288140/2-A	Lab Control Sample	Total/NA	Water	7470A	

Prep Batch: 288190

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-2	MW-2	Total Recoverable	Water	3005A	
240-82597-3	MW-3	Total Recoverable	Water	3005A	
240-82597-4	MW-4	Total Recoverable	Water	3005A	
MB 240-288190/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-288190/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-288190/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 288191

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-2	MW-2	Total/NA	Water	7470A	
240-82597-3	MW-3	Total/NA	Water	7470A	
240-82597-4	MW-4	Total/NA	Water	7470A	
MB 240-288191/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-288191/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 288348

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total/NA	Water	7470A	288140
MB 240-288140/1-A	Method Blank	Total/NA	Water	7470A	288140
LCS 240-288140/2-A	Lab Control Sample	Total/NA	Water	7470A	288140

Analysis Batch: 288408

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total Recoverable	Water	6010C	288136
240-82597-1	MW-1	Total Recoverable	Water	6010C	288136
240-82597-2	MW-2	Total Recoverable	Water	6010C	288190
240-82597-2	MW-2	Total Recoverable	Water	6010C	288190
240-82597-3	MW-3	Total Recoverable	Water	6010C	288190
240-82597-4	MW-4	Total Recoverable	Water	6010C	288190
MB 240-288136/1-A	Method Blank	Total Recoverable	Water	6010C	288136
MB 240-288190/1-A	Method Blank	Total Recoverable	Water	6010C	288190
LCS 240-288136/2-A	Lab Control Sample	Total Recoverable	Water	6010C	288136
LCS 240-288190/2-A	Lab Control Sample	Total Recoverable	Water	6010C	288190

Analysis Batch: 288460

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-2	MW-2	Total/NA	Water	7470A	288191
240-82597-3	MW-3	Total/NA	Water	7470A	288191

Metals (Continued)

Analysis Batch: 288460 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-4	MW-4	Total/NA	Water	7470A	288191
MB 240-288191/1-A	Method Blank	Total/NA	Water	7470A	288191
LCS 240-288191/2-A	Lab Control Sample	Total/NA	Water	7470A	288191

Analysis Batch: 288707

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-2	MW-2	Total Recoverable	Water	6020A	288190
240-82597-3	MW-3	Total Recoverable	Water	6020A	288190
240-82597-4	MW-4	Total Recoverable	Water	6020A	288190
MB 240-288190/1-A	Method Blank	Total Recoverable	Water	6020A	288190
LCS 240-288190/3-A	Lab Control Sample	Total Recoverable	Water	6020A	288190

Analysis Batch: 288778

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-2	MW-2	Total Recoverable	Water	6020A	288190
240-82597-3	MW-3	Total Recoverable	Water	6020A	288190
240-82597-4	MW-4	Total Recoverable	Water	6020A	288190

Analysis Batch: 289046

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total Recoverable	Water	6020A	288136
MB 240-288136/1-A	Method Blank	Total Recoverable	Water	6020A	288136
LCS 240-288136/25-A	Lab Control Sample	Total Recoverable	Water	6020A	288136

General Chemistry

Analysis Batch: 288389

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total/NA	Water	SM 2540C	
240-82597-2	MW-2	Total/NA	Water	SM 2540C	
240-82597-3	MW-3	Total/NA	Water	SM 2540C	
240-82597-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-288389/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-288389/2	Lab Control Sample	Total/NA	Water	SM 2540C	

Analysis Batch: 288437

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total/NA	Water	9056A	
240-82597-2	MW-2	Total/NA	Water	9056A	
240-82597-3	MW-3	Total/NA	Water	9056A	
240-82597-4	MW-4	Total/NA	Water	9056A	
MB 240-288437/3	Method Blank	Total/NA	Water	9056A	
LCS 240-288437/4	Lab Control Sample	Total/NA	Water	9056A	

Rad

Prep Batch: 318979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total/NA	Water	PrecSep-21	
240-82597-2	MW-2	Total/NA	Water	PrecSep-21	

Rad (Continued)

Prep Batch: 318979 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-3	MW-3	Total/NA	Water	PrecSep-21	
240-82597-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-318979/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-318979/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	
LCSD 160-318979/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep-21	

Prep Batch: 319102

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-82597-1	MW-1	Total/NA	Water	PrecSep_0	
240-82597-2	MW-2	Total/NA	Water	PrecSep_0	
240-82597-3	MW-3	Total/NA	Water	PrecSep_0	
240-82597-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-319102/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-319102/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	
LCSD 160-319102/3-A	Lab Control Sample Dup	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-1

Lab Sample ID: 240-82597-1

Date Collected: 07/17/17 11:30
Matrix: Water
Date Received: 07/20/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			288136	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	288408	07/24/17 16:03	KLC	TAL CAN
Total Recoverable	Prep	3005A			288136	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	288408	07/24/17 17:18	KLC	TAL CAN
Total Recoverable	Prep	3005A			288136	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	289046	07/28/17 00:01	AS1	TAL CAN
Total/NA	Prep	7470A			288140	07/21/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	288348	07/21/17 17:08	DTN	TAL CAN
Total/NA	Analysis	9056A		10	288437	07/25/17 10:10	JWW	TAL CAN
Total/NA	Analysis	SM 2540C		1	288389	07/24/17 10:01	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			318979	07/25/17 08:09	LDE	TAL SL
Total/NA	Analysis	9315		1	322485	08/16/17 07:05	ALD	TAL SL
Total/NA	Prep	PrecSep_0			319102	07/25/17 10:53	LDE	TAL SL
Total/NA	Analysis	9320		1	321175	08/07/17 09:46	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	322583	08/16/17 11:00	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-82597-2

Date Collected: 07/17/17 12:50
Matrix: Water
Date Received: 07/20/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	288408	07/24/17 15:07	KLC	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	288408	07/24/17 16:07	KLC	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	288707	07/25/17 22:06	AS1	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	288778	07/26/17 15:50	AS1	TAL CAN
Total/NA	Prep	7470A			288191	07/21/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	288460	07/24/17 14:23	DTN	TAL CAN
Total/NA	Analysis	9056A		20	288437	07/25/17 10:30	JWW	TAL CAN
Total/NA	Analysis	SM 2540C		1	288389	07/24/17 10:01	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			318979	07/25/17 08:09	LDE	TAL SL
Total/NA	Analysis	9315		1	322485	08/16/17 07:05	ALD	TAL SL
Total/NA	Prep	PrecSep_0			319102	07/25/17 10:53	LDE	TAL SL
Total/NA	Analysis	9320		1	321175	08/07/17 09:46	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	322583	08/16/17 11:00	RTM	TAL SL

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Client Sample ID: MW-3

Lab Sample ID: 240-82597-3

Date Collected: 07/17/17 14:08
Matrix: Water
Date Received: 07/20/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	288408	07/24/17 15:12	KLC	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	288707	07/25/17 22:10	AS1	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	288778	07/26/17 15:54	AS1	TAL CAN
Total/NA	Prep	7470A			288191	07/21/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	288460	07/24/17 14:25	DTN	TAL CAN
Total/NA	Analysis	9056A		20	288437	07/25/17 10:51	JWW	TAL CAN
Total/NA	Analysis	SM 2540C		1	288389	07/24/17 10:01	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			318979	07/25/17 08:09	LDE	TAL SL
Total/NA	Analysis	9315		1	322485	08/16/17 07:05	ALD	TAL SL
Total/NA	Prep	PrecSep_0			319102	07/25/17 10:53	LDE	TAL SL
Total/NA	Analysis	9320		1	321175	08/07/17 09:46	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	322583	08/16/17 11:00	RTM	TAL SL

Client Sample ID: MW-4

Lab Sample ID: 240-82597-4

Date Collected: 07/17/17 15:12
Matrix: Water
Date Received: 07/20/17 09:30

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	288408	07/24/17 15:17	KLC	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	288707	07/25/17 22:14	AS1	TAL CAN
Total Recoverable	Prep	3005A			288190	07/21/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	288778	07/26/17 16:07	AS1	TAL CAN
Total/NA	Prep	7470A			288191	07/21/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	288460	07/24/17 14:27	DTN	TAL CAN
Total/NA	Analysis	9056A		10	288437	07/25/17 11:11	JWW	TAL CAN
Total/NA	Analysis	SM 2540C		1	288389	07/24/17 10:01	JMB	TAL CAN
Total/NA	Prep	PrecSep-21			318979	07/25/17 08:09	LDE	TAL SL
Total/NA	Analysis	9315		1	322485	08/16/17 07:05	ALD	TAL SL
Total/NA	Prep	PrecSep_0			319102	07/25/17 10:53	LDE	TAL SL
Total/NA	Analysis	9320		1	321175	08/07/17 09:46	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	322583	08/16/17 11:00	RTM	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-82597-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17 *
West Virginia DEP	State Program	3	210	12-31-17 *

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-18

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-17 *

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

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CAMBRIDGE 240506

CAMBRIDGE 240506

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Client Information	Sampler: Corey Finley	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41877-17977.1
Client Contact: Mr. Brian Beach	Phone: 6095013605	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:			
City: Holland	TAT Requested (days):			
State, Zip: MI, 49424				
Phone:	PO #: 0398257			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

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)

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)	9315_Ra226, 9320_Ra228	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1	7-17-17	1130	G	Water			X	X	X		
MW-2		1250	G	Water			X	X	X		
MW-3		1408	G	Water			X	X	X		
MW-4		1512	G	Water			X	X	X		
				Water							

240-82597 Chain of Custody

Ref:
Dep:
Date: 12Jul17
Wgt: 50.00 LBS
DV: 0.00
Svcs: STANDARD OVERNIGHT
TRCK: 6388 2993 2994

SHIPPING:	0.00
SPECIAL:	0.00
HANDLING:	0.00
TOTAL:	0.00

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: Fedex overnight
Relinquished by: Corey Finley	Date/Time: 7-18-17	Company: ERM	Received by:
Relinquished by:	Date/Time:	Company	Received by:
Relinquished by:	Date/Time:	Company	Received by:

Received by:	Date/Time: 07/20/17 930	Company: TAK	
Received 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 Canton Sample Receipt Form/Narrative **Login # :** 82597
Canton Facility

Client ERM Site Name Grand Haven Cooler unpacked by: DSD

Cooler Received on 07/20/17 Opened on 07/20/17

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

TestAmerica Cooler # Foam Box Client Cooler Box Other

Packing material used: Bubble Wrap Foam Plastic Bag None Other

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form
   IR GUN# IR-8 (CF **-0.4** °C) Observed Cooler Temp. ____ °C Corrected Cooler Temp. ____ °C
   IR GUN #36 (CF **+0**°C) Observed Cooler Temp. 1.7 °C Corrected Cooler Temp. 1.7 °C

2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1	Yes	No
-Were custody seals on the outside of the cooler(s) signed & dated?	Yes	No NA
-Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes	No
3. Shippers' packing slip attached to the cooler(s)?	Yes	No
4. Did custody papers accompany the sample(s)?	Yes	No
5. Were the custody papers relinquished & signed in the appropriate place?	Yes	No
6. Was/were the person(s) who collected the samples clearly identified on the COC?	Yes	No
7. Did all bottles arrive in good condition (Unbroken)?	Yes	No
8. Could all bottle labels be reconciled with the COC?	Yes	No
9. Were correct bottle(s) used for the test(s) indicated?	Yes	No
10. Sufficient quantity received to perform indicated analyses?	Yes	No
11. Are these work share samples?	Yes	No
If yes, Questions 11-15 have been checked at the originating laboratory.		
11. Were sample(s) at the correct pH upon receipt?	Yes	No NA pH Strip Lot# **HC697954**
12. Were VOAs on the COC?	Yes	No
13. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes	No NA
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # ____	Yes	No
15. Was a LL Hg or Me Hg trip blank present? ____	Yes	No

Contacted PM ____ Date ____ by ____ via Verbal Voice Mail Other

Concerning ____

16. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

17. SAMPLE CONDITION

Sample(s) ____ were received after the recommended holding time had expired.
Sample(s) ____ were received in a broken container.
Sample(s) ____ were received with bubble >6 mm in diameter. (Notify PM)

18. SAMPLE PRESERVATION

Sample(s) MW-2 were further preserved in the laboratory.
Time preserved: 1345 Preservative(s) added/Lot number(s): Nitric 0000162025

Ref: SOP NC-SC-0005, Sample Receiving
\\tacorp\corp\QA\QA_Facilities\Canton-QA\Document-Management\Work-Instruction\Word Version Work Instructions\WI-NC-099-052317 Cooler Receipt Form.doc djl

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-82597-B-1	Plastic 500ml - with Nitric Acid	<2		
MW-1	240-82597-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-1	240-82597-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-2	240-82597-B-2	Plastic 500ml - with Nitric Acid	<2		
MW-2	240-82597-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-2	240-82597-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-3	240-82597-B-3	Plastic 500ml - with Nitric Acid	<2		
MW-3	240-82597-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-3	240-82597-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-4	240-82597-B-4	Plastic 500ml - with Nitric Acid	<2		
MW-4	240-82597-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-4	240-82597-D-4	Plastic 1 liter - Nitric Acid	<2		

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

240-82597 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna	COC No: J-73826.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP	Page: Page 1 of 1
Address: 13715 Rider Trail North,	Due Date Requested: 8/17/2017		Job #: 240-82597-1
City: Earth City	TAT Requested (days):		
State, Zip: MO, 63045			
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:		
Email:	WO #:		
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882		
Site:	SSOW#:		

Analysis Requested

Preservation Codes:

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)

Other:

Sample Identification - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9320_Ra228/PrecSep_0 Standard Target List	9315_Ra226/PrecSep_21 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-82597-1)	7/17/17	11:30 Eastern		Water			X	X	X	2	
MW-2 (240-82597-2)	7/17/17	12:50 Eastern		Water			X	X	X	2	
MW-3 (240-82597-3)	7/17/17	14:08 Eastern		Water			X	X	X	2	
MW-4 (240-82597-4)	7/17/17	15:12 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification *Unconfirmed*	***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) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:		Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 7/20/17 1630	Company 240	Received by:	Date/Time: 7.21.17 0900	Company TASR	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company	
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:

8/16/2017

Login Sample Receipt Checklist

Client: ERM-North Central Inc

Job Number: 240-82597-1

Login Number: 82597
List Number: 2
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis
List Creation: 07/21/17 11:27 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	22.0, 22.0, 22.0, 22.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	False	

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-1
Site Name & Address: 1231 N. 3rd St Grand Haven, MI
Sampler Name: CF
Pump Type: peristaltic
Meter Type (s): YSI 556 & 2100P
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 5.50'
Groundwater Elevation/SWL (feet): 93.85
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #: 0419830
Client: GHALP
Date: 7-17-17
Weather: SUNNY
Temperature/Bar. Pressure 78°F/
Start Time of Purging: 1105
Well Material: 2"
Well Diameter: PVC
Length of Water Column (feet): 6.82
Calculated Well Volume* (liters or gal): 1.11
Well Volume Discharged (liters or gal): 1.30

Well Inspection: Clearly Labeled (Y) N_; Concrete Pad Intact (Y) N_; Lock Functional (Y) N_; Pro-cover in good condition (Y) N_; Casing in good condition (Y) N__
Calibration: Time; 1100 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1,409 ; DO 108%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1115	19.65	1.835	0.68	8.13	-206.4	3.01	5.64	0.20	
1120	19.79	1.835	0.63	8.02	-228.1	2.63	5.66	0.20	
1125	19.74	1.833	0.63	8.02	-227.6	2.90	5.66	0.20	
1130	19.74	1.829	0.65	8.02	-235.7	3.50	5.66	0.20	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[T]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[T]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: sampled @ 1130

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-2
Site Name & Address:
Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 107.75'
Initial Water Level (feet below TOC): 14.40'
Groundwater Elevation/SWL (feet): 93.35
Well Depth (feet below TOC): 23.37'
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): 19'

Project #:
Client: GHBLP
Date: 7-17-17
Weather:
Temperature/Bar. Pressure / 749.2
Start Time of Purging: 1210
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.97
Calculated Well Volume* (liters or gal): 1.46
Well Volume Discharged (liters or gal): 1.56

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N

Calibration: Time: 1100; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1409; DO 100%

Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1220	15.89	4.081	1.57	7.61	-137.4	7.23	15.29	0.20	
1225	16.10	4.074	1.41	7.54	-141.0	6.37	15.33	0.20	
1230	16.35	4.066	1.18	7.46	-141.9	6.26	15.33	0.150	
1235	16.51	4.078	1.06	7.38	-140.5	5.97	15.33	0.150	
1240	16.49	4.083	0.93	7.35	-139.6	4.71	15.33	0.150	
1245	16.14	4.100	0.84	7.35	-135.9	4.39	15.33	0.150	
1250	16.25	4.103	0.76	7.35	-135.1	4.45	15.33	0.150	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[T]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[T]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: yellow tint / ~~B~~ foamy Sampled @ 1250

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-3
Site Name & Address:

Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 105.20
Initial Water Level (feet below TOC): 11.78'
Groundwater Elevation/SWL (feet): 93.42'
Well Depth (feet below TOC): 20.34'
Screened Interval (feet below TOC): 12-17'
Depth Pump Intake Set At (feet below TOC): 16'

Project #:
Client: GHRLP
Date: 7-17-17
Weather:
Temperature/Bar. Pressure
Start Time of Purging: 1338
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.56
Calculated Well Volume* (liters or gal): 1.40
Well Volume Discharged (liters or gal): 1.50

Well Inspection: Clearly Labeled (Y)___N_; Concrete Pad Intact (Y)___N_; Lock Functional (Y)___N_; Pro-cover in good condition (Y)___N_; Casing in good condition (Y)___N__
Calibration: Time; 1100 ; pH 4 Standard 4 ; pH 7 Standard 7 ; pH 10 Standard 10 ; Conductivity Std 1409 ; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min or~~ gallon/min)	Comments (i.e., odor, color, etc)
1348	15.56	3.505	1.08	7.62	-74.3	7.19	12.08	0.150	
1353	15.41	3.469	0.92	7.49	-85.1	6.21	12.12	0.150	
1358	15.30	3.450	0.83	7.45	-90.9	5.73	12.12	0.150	
1403	15.20	3.418	0.73	7.43	-93.4	3.96	12.12	0.150	
1408	15.12	3.391	0.66	7.44	-96.8	2.78	12.12	0.150	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1408

Environmental Resources Management

Page ___ of ___

Field Form for Low Flow Rate Sampling

Well ID: MW-4 [redacted]
Site Name & Address:

Sampler Name: CF [redacted]
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 103.59'
Initial Water Level (feet below TOC): 10.05'
Groundwater Elevation/SWL (feet): 93.54'
Well Depth (feet below TOC): 19'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #:
Client: GHBLP
Date: 7-17-17
Weather:
Temperature/Bar. Pressure
Start Time of Purging: 1447
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 7.95
Calculated Well Volume* (liters or gal): 1.30
Well Volume Discharged (liters or gal): 1.30

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1100; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1409; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min)~~ or gallon/min)	Comments (i.e., odor, color, etc)
1457	14.99	2.493	0.61	7.49	-77.5	5.60	10.41	0.20	
1502	16.83	2.498	0.54	7.49	-81.5	5.20	10.42	0.20	
1507	16.86	2.479	8.47	7.50	-93.2	4.39	10.42	0.20	
1512	16.94	2.462	8.45	7.51	-97.0	3.75	10.42	0.20	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1512

APPENDIX A-8

EIGHTH BACKGROUND SAMPLING EVENT ANALYTICAL REPORTS & FIELD DATA FORMS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING



ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

TestAmerica Job ID: 240-83435-1
Client Project/Site: Grand Haven BLP - CCR Monitoring

For:
ERM-North Central Inc
3352 128th Avenue
Holland, Michigan 49424

Attn: Mr. Brian Beach

Madonna Myers

Authorized for release by:
9/8/2017 2:30:11 PM

Madonna Myers, Project Manager II
(615)796-1870
madonna.myers@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Rad

Qualifier	Qualifier Description
G	The Sample MDC is greater than the requested RL.
U	Result is less than the sample detection limit.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	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	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
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 (Radiochemistry)
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)

Job ID: 240-83435-1

Laboratory: TestAmerica Canton

Narrative

CASE NARRATIVE

Client: ERM-North Central Inc

Project: Grand Haven BLP - CCR Monitoring

Report Number: 240-83435-1

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

The 9315 Radium 226, 9320 Radium 228, and Ra226 and Ra228 Radium 226 and Radium 228 analyses were performed at the TestAmerica St. Louis Laboratory.

TestAmerica Canton attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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

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

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 8/9/2017 9:20 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.4º C.

TOTAL RECOVERABLE METALS (ICP)

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for total recoverable metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 08/10/2017 and analyzed on 08/14/2017 and 08/15/2017.

Calcium failed the recovery criteria low for the MS of sample 240-83411-21 in batch 240-291058.

Sample MW-1 (240-83435-1)[20X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

Job ID: 240-83435-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

TOTAL RECOVERABLE METALS (ICPMS)

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for total recoverable metals (ICPMS) in accordance with EPA SW-846 Method 6020A. The samples were prepared on 08/10/2017 and analyzed on 08/11/2017.

Thallium failed the recovery criteria high for the MS/MSD of sample 240-83411-21 in batch 240-291009.

Method(s) 6020, 6020A: The continuing calibration verification (CCV) associated with batch 240-291009 recovered above the upper control limit for lead and thallium. The samples associated with this CCV were below the requested reporting limit for the affected analytes; therefore, the data have been reported. The following samples are impacted: MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4).

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

TOTAL MERCURY

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for total mercury in accordance with EPA SW-846 Methods 7470A. The samples were prepared on 08/10/2017 and analyzed on 08/11/2017.

Method(s) 7470A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-83435-2). Elevated reporting limits (RLs) are provided.

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

TOTAL DISSOLVED SOLIDS

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for total dissolved solids in accordance with SM 2540C. The samples were analyzed on 08/10/2017.

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

ANIONS

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for anions in accordance with EPA SW-846 Method 9056A. The samples were analyzed on 08/10/2017 and 08/11/2017.

Samples MW-1 (240-83435-1)[10X], MW-2 (240-83435-2)[10X], MW-3 (240-83435-3)[10X] and MW-4 (240-83435-4)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

Method(s) 9056A: The following sample was diluted due to the nature of the sample matrix: MW-2 (240-83435-2). Elevated reporting limits (RLs) are provided.

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

RADIUM-226

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for Radium-226 in accordance with SW846 Method 9315. The samples were prepared on 08/11/2017 and analyzed on 09/05/2017.

Method(s) PrecSep-21: Radium 226 Prep Batch 160-321832: The following samples were reduced due to possible matrix interference. Sample 240-83435 was dark and brown and was labeled preserved in Nitric, but when pH was tested was basic. All sample bottles were expanded: MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4).

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

RADIUM-228 (GFPC)

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for Radium-228 (GFPC) in accordance with SW846 Method 9320. The samples were prepared on 08/11/2017 and analyzed on 08/22/2017.

Method(s) 9320: Radium-228 Prep Batch 160-321835: The radium-228 detection goal was not met for the following samples due to the

Job ID: 240-83435-1 (Continued)

Laboratory: TestAmerica Canton (Continued)

reduced sample volume attributed to the presence of matrix interferences (see prep NCM 117710): MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4). Analytical results are reported with the detection limit achieved.

Method(s) PrecSep_0: Radium 228 Prep Batch 160-321835: The following samples were reduced due to possible matrix interference. Sample 240-83435 was dark and brown and was labeled preserved in Nitric, but when pH was tested was basic. All sample bottles were expanded: MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4).

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

COMBINED RADIUM 226 AND RADIUM 228

Samples MW-1 (240-83435-1), MW-2 (240-83435-2), MW-3 (240-83435-3) and MW-4 (240-83435-4) were analyzed for Combined Radium 226 and Radium 228 in accordance with Ra226_Ra228. The samples were analyzed on 09/08/2017.

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

Method Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CAN
6020A	Metals (ICP/MS)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
9056A	Anions, Ion Chromatography	SW846	TAL CAN
SM 2540C	Solids, Total Dissolved (TDS)	SM	TAL CAN
9315	Radium-226 (GFPC)	SW846	TAL SL
9320	Radium-228 (GFPC)	SW846	TAL SL
Ra226_Ra228	Combined Radium-226 and Radium-228	TAL-STL	TAL SL

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-STL = TestAmerica Laboratories, St. Louis, Facility Standard Operating Procedure.

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
240-83435-1	MW-1	Water	08/07/17 12:20	08/09/17 09:20
240-83435-2	MW-2	Water	08/07/17 13:33	08/09/17 09:20
240-83435-3	MW-3	Water	08/07/17 15:02	08/09/17 09:20
240-83435-4	MW-4	Water	08/07/17 16:32	08/09/17 09:20

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-1 — Lab Sample ID: 240-83435-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	120000		4000	160	ug/L	20		6010C	Total Recoverable
Calcium	100000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.00080	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.63		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00050	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Molybdenum	0.0013	J	0.010	0.0011	mg/L	1		6020A	Total Recoverable
Lead	0.00063	J ^	0.0010	0.00045	mg/L	1		6020A	Total Recoverable
Selenium	0.0017	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	1.9		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	180		1.0	0.28	mg/L	1		9056A	Total/NA
Fluoride	19		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	13		1.0	0.35	mg/L	1		9056A	Total/NA
Total Dissolved Solids	1500		20	16	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-2 — Lab Sample ID: 240-83435-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	160000		2000	81	ug/L	1		6010C	Total Recoverable
Calcium	190000		50000	7100	ug/L	1		6010C	Total Recoverable
Arsenic	0.010	J	0.050	0.0075	mg/L	1		6020A	Total Recoverable
Barium	0.48		0.050	0.022	mg/L	1		6020A	Total Recoverable
Cobalt	0.0092	J	0.010	0.0019	mg/L	1		6020A	Total Recoverable
Chromium	0.073		0.020	0.0098	mg/L	1		6020A	Total Recoverable
Lead	0.0084	J ^	0.010	0.0045	mg/L	1		6020A	Total Recoverable
Selenium	0.014	J	0.050	0.0089	mg/L	1		6020A	Total Recoverable
Lithium	1.5		0.080	0.017	mg/L	1		6020A	Total Recoverable
Chloride	160		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	12		0.50	0.24	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2400		50	39	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-3 — Lab Sample ID: 240-83435-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	4700		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	520000		5000	710	ug/L	1		6010C	Total Recoverable

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-3 (Continued) — Lab Sample ID: 240-83435-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	0.0021	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.40		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00081	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0013	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Selenium	0.0015	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	0.054		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	370		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	1.2		0.50	0.24	mg/L	10		9056A	Total/NA
Sulfate	600		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2700		40	31	mg/L	1		SM 2540C	Total/NA

Client Sample ID: MW-4 — Lab Sample ID: 240-83435-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Boron	4000		200	8.1	ug/L	1		6010C	Total Recoverable
Calcium	470000		5000	710	ug/L	1		6010C	Total Recoverable
Arsenic	0.0018	J	0.0050	0.00075	mg/L	1		6020A	Total Recoverable
Barium	0.19		0.0050	0.0022	mg/L	1		6020A	Total Recoverable
Cobalt	0.00045	J	0.0010	0.00019	mg/L	1		6020A	Total Recoverable
Chromium	0.0016	J	0.0020	0.00098	mg/L	1		6020A	Total Recoverable
Selenium	0.0013	J	0.0050	0.00089	mg/L	1		6020A	Total Recoverable
Lithium	0.046		0.0080	0.0017	mg/L	1		6020A	Total Recoverable
Chloride	280		10	2.8	mg/L	10		9056A	Total/NA
Fluoride	1.3		0.050	0.024	mg/L	1		9056A	Total/NA
Sulfate	740		10	3.5	mg/L	10		9056A	Total/NA
Total Dissolved Solids	2000		40	31	mg/L	1		SM 2540C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MW-1

Date Collected: 08/07/17 12:20
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-1

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**120000**		4000	160	ug/L		08/10/17 14:00	08/15/17 12:24	20
Calcium	**100000**		5000	710	ug/L		08/10/17 14:00	08/14/17 20:59	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		08/10/17 14:00	08/11/17 17:17	1
Arsenic	**0.00080**	**J**	0.0050	0.00075	mg/L		08/10/17 14:00	08/11/17 17:17	1
Barium	**0.63**		0.0050	0.0022	mg/L		08/10/17 14:00	08/11/17 17:17	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		08/10/17 14:00	08/11/17 17:17	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		08/10/17 14:00	08/11/17 17:17	1
Cobalt	**0.00050**	**J**	0.0010	0.00019	mg/L		08/10/17 14:00	08/11/17 17:17	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		08/10/17 14:00	08/11/17 17:17	1
Molybdenum	**0.0013**	**J**	0.010	0.0011	mg/L		08/10/17 14:00	08/11/17 17:17	1
Lead	**0.00063**	**J ^**	0.0010	0.00045	mg/L		08/10/17 14:00	08/11/17 17:17	1
Selenium	**0.0017**	**J**	0.0050	0.00089	mg/L		08/10/17 14:00	08/11/17 17:17	1
Thallium	0.0010	U ^	0.0010	0.00020	mg/L		08/10/17 14:00	08/11/17 17:17	1
Lithium	**1.9**		0.0080	0.0017	mg/L		08/10/17 14:00	08/11/17 17:17	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		08/10/17 14:00	08/11/17 09:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**180**		1.0	0.28	mg/L			08/10/17 21:10	1
Fluoride	**19**		0.50	0.24	mg/L			08/10/17 21:30	10
Sulfate	**13**		1.0	0.35	mg/L			08/10/17 21:10	1
Total Dissolved Solids	**1500**		20	16	mg/L			08/10/17 13:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.301**		0.216	0.218	1.00	0.287	pCi/L	08/11/17 12:18	09/05/17 05:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.9*		*40 - 110*	*08/11/17 12:18*	*09/05/17 05:59*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	0.438	U G	0.795	0.796	1.00	1.35	pCi/L	08/11/17 12:48	08/22/17 10:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*95.9*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*
Y Carrier	*86.4*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-1
Date Collected: 08/07/17 12:20
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-1
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	0.739	U	0.824	0.825	5.00	1.35	pCi/L		09/08/17 11:51	1

Client Sample ID: MW-2

Date Collected: 08/07/17 13:33
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-2

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**160000**		2000	81	ug/L		08/10/17 14:00	08/14/17 21:04	1
Calcium	**190000**		50000	7100	ug/L		08/10/17 14:00	08/14/17 21:04	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.020	U	0.020	0.0057	mg/L		08/10/17 14:00	08/11/17 17:31	1
Arsenic	**0.010**	**J**	0.050	0.0075	mg/L		08/10/17 14:00	08/11/17 17:31	1
Barium	**0.48**		0.050	0.022	mg/L		08/10/17 14:00	08/11/17 17:31	1
Beryllium	0.010	U	0.010	0.0031	mg/L		08/10/17 14:00	08/11/17 17:31	1
Cadmium	0.010	U	0.010	0.0021	mg/L		08/10/17 14:00	08/11/17 17:31	1
Cobalt	**0.0092**	**J**	0.010	0.0019	mg/L		08/10/17 14:00	08/11/17 17:31	1
Chromium	**0.073**		0.020	0.0098	mg/L		08/10/17 14:00	08/11/17 17:31	1
Molybdenum	0.10	U	0.10	0.011	mg/L		08/10/17 14:00	08/11/17 17:31	1
Lead	**0.0084**	**J ^**	0.010	0.0045	mg/L		08/10/17 14:00	08/11/17 17:31	1
Selenium	**0.014**	**J**	0.050	0.0089	mg/L		08/10/17 14:00	08/11/17 17:31	1
Thallium	0.010	U ^	0.010	0.0020	mg/L		08/10/17 14:00	08/11/17 17:31	1
Lithium	**1.5**		0.080	0.017	mg/L		08/10/17 14:00	08/11/17 17:31	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0020	U	0.0020	0.0013	mg/L		08/10/17 14:00	08/11/17 09:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**160**		10	2.8	mg/L			08/11/17 19:17	10
Fluoride	**12**		0.50	0.24	mg/L			08/11/17 19:17	10
Sulfate	10	U	10	3.5	mg/L			08/11/17 19:17	10
Total Dissolved Solids	**2400**		50	39	mg/L			08/10/17 13:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**1.14**		0.389	0.402	1.00	0.363	pCi/L	08/11/17 12:18	09/05/17 05:59	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*08/11/17 12:18*	*09/05/17 05:59*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.88**	**G**	1.04	1.06	1.00	1.58	pCi/L	08/11/17 12:48	08/22/17 10:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*90.9*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*
Y Carrier	*86.7*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-2
Date Collected: 08/07/17 13:33
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-2
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	3.01		1.11	1.13	5.00	1.58	pCi/L		09/08/17 11:51	1

Client Sample ID: MW-3

Date Collected: 08/07/17 15:02
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-3

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**4700**		200	8.1	ug/L		08/10/17 14:00	08/14/17 21:08	1
Calcium	**520000**		5000	710	ug/L		08/10/17 14:00	08/14/17 21:08	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		08/10/17 14:00	08/11/17 17:35	1
Arsenic	**0.0021**	**J**	0.0050	0.00075	mg/L		08/10/17 14:00	08/11/17 17:35	1
Barium	**0.40**		0.0050	0.0022	mg/L		08/10/17 14:00	08/11/17 17:35	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		08/10/17 14:00	08/11/17 17:35	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		08/10/17 14:00	08/11/17 17:35	1
Cobalt	**0.00081**	**J**	0.0010	0.00019	mg/L		08/10/17 14:00	08/11/17 17:35	1
Chromium	**0.0013**	**J**	0.0020	0.00098	mg/L		08/10/17 14:00	08/11/17 17:35	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		08/10/17 14:00	08/11/17 17:35	1
Lead	0.0010	U ^	0.0010	0.00045	mg/L		08/10/17 14:00	08/11/17 17:35	1
Selenium	**0.0015**	**J**	0.0050	0.00089	mg/L		08/10/17 14:00	08/11/17 17:35	1
Thallium	0.0010	U ^	0.0010	0.00020	mg/L		08/10/17 14:00	08/11/17 17:35	1
Lithium	**0.054**		0.0080	0.0017	mg/L		08/10/17 14:00	08/11/17 17:35	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		08/10/17 14:00	08/11/17 09:51	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**370**		10	2.8	mg/L			08/10/17 22:11	10
Fluoride	**1.2**		0.50	0.24	mg/L			08/10/17 22:11	10
Sulfate	**600**		10	3.5	mg/L			08/10/17 22:11	10
Total Dissolved Solids	**2700**		40	31	mg/L			08/10/17 13:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.950**		0.342	0.352	1.00	0.279	pCi/L	08/11/17 12:18	09/05/17 06:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*08/11/17 12:18*	*09/05/17 06:03*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	1.01	U G	1.04	1.05	1.00	1.70	pCi/L	08/11/17 12:48	08/22/17 10:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*89.4*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*
Y Carrier	*84.5*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-3
Date Collected: 08/07/17 15:02
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-3
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.96		1.10	1.11	5.00	1.70	pCi/L		09/08/17 11:51	1

Client Sample ID: MW-4

Date Collected: 08/07/17 16:32
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-4

Matrix: Water

Method: 6010C - Metals (ICP) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	**4000**		200	8.1	ug/L		08/10/17 14:00	08/14/17 21:13	1
Calcium	**470000**		5000	710	ug/L		08/10/17 14:00	08/14/17 21:13	1

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		08/10/17 14:00	08/11/17 17:40	1
Arsenic	**0.0018**	**J**	0.0050	0.00075	mg/L		08/10/17 14:00	08/11/17 17:40	1
Barium	**0.19**		0.0050	0.0022	mg/L		08/10/17 14:00	08/11/17 17:40	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		08/10/17 14:00	08/11/17 17:40	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		08/10/17 14:00	08/11/17 17:40	1
Cobalt	**0.00045**	**J**	0.0010	0.00019	mg/L		08/10/17 14:00	08/11/17 17:40	1
Chromium	**0.0016**	**J**	0.0020	0.00098	mg/L		08/10/17 14:00	08/11/17 17:40	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		08/10/17 14:00	08/11/17 17:40	1
Lead	0.0010	U ^	0.0010	0.00045	mg/L		08/10/17 14:00	08/11/17 17:40	1
Selenium	**0.0013**	**J**	0.0050	0.00089	mg/L		08/10/17 14:00	08/11/17 17:40	1
Thallium	0.0010	U ^	0.0010	0.00020	mg/L		08/10/17 14:00	08/11/17 17:40	1
Lithium	**0.046**		0.0080	0.0017	mg/L		08/10/17 14:00	08/11/17 17:40	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		08/10/17 14:00	08/11/17 09:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	**280**		10	2.8	mg/L			08/10/17 23:13	10
Fluoride	**1.3**		0.050	0.024	mg/L			08/10/17 22:53	1
Sulfate	**740**		10	3.5	mg/L			08/10/17 23:13	10
Total Dissolved Solids	**2000**		40	31	mg/L			08/10/17 13:43	1

Method: 9315 - Radium-226 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.300**		0.220	0.221	1.00	0.288	pCi/L	08/11/17 12:18	09/05/17 06:03	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.0*		*40 - 110*	*08/11/17 12:18*	*09/05/17 06:03*	*1*

Method: 9320 - Radium-228 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	**1.69**	**G**	1.05	1.06	1.00	1.61	pCi/L	08/11/17 12:48	08/22/17 10:04	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*87.0*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*
Y Carrier	*85.2*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:04*	*1*

Client Sample Results

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-4
Date Collected: 08/07/17 16:32
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-4
Matrix: Water

Method: Ra226_Ra228 - Combined Radium-226 and Radium-228

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Combined Radium 226 + 228	1.99		1.07	1.09	5.00	1.61	pCi/L		09/08/17 11:51	1

Tracer/Carrier Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Method: 9315 - Radium-226 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
		Ba
Lab Sample ID	Client Sample ID	(40-110)
240-83435-1	MW-1	95.9
240-83435-2	MW-2	90.9
240-83435-3	MW-3	89.4
240-83435-4	MW-4	87.0
LCS 160-321832/2-A	Lab Control Sample	94.7
MB 160-321832/1-A	Method Blank	98.5

Tracer/Carrier Legend

Ba = Ba Carrier

Method: 9320 - Radium-228 (GFPC)

Matrix: Water

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
		Ba	Y
Lab Sample ID	Client Sample ID	(40-110)	(40-110)
240-83435-1	MW-1	95.9	86.4
240-83435-2	MW-2	90.9	86.7
240-83435-3	MW-3	89.4	84.5
240-83435-4	MW-4	87.0	85.2
LCS 160-321835/2-A	Lab Control Sample	94.7	86.7
MB 160-321835/1-A	Method Blank	98.5	85.2

Tracer/Carrier Legend

Ba = Ba Carrier

Y = Y Carrier

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-290626/1-A
Matrix: Water
Analysis Batch: 291058

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 290626

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	200	U	200	8.1	ug/L		08/10/17 14:00	08/14/17 19:13	1
Calcium	5000	U	5000	710	ug/L		08/10/17 14:00	08/14/17 19:13	1

Lab Sample ID: LCS 240-290626/2-A
Matrix: Water
Analysis Batch: 291058

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 290626

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1100		ug/L		110	80 - 120
Calcium	50000	48500		ug/L		97	80 - 120

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 240-290626/1-A
Matrix: Water
Analysis Batch: 291009

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 290626

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0020	U	0.0020	0.00057	mg/L		08/10/17 14:00	08/11/17 16:40	1
Arsenic	0.0050	U	0.0050	0.00075	mg/L		08/10/17 14:00	08/11/17 16:40	1
Barium	0.0050	U	0.0050	0.0022	mg/L		08/10/17 14:00	08/11/17 16:40	1
Beryllium	0.0010	U	0.0010	0.00031	mg/L		08/10/17 14:00	08/11/17 16:40	1
Cadmium	0.0010	U	0.0010	0.00021	mg/L		08/10/17 14:00	08/11/17 16:40	1
Cobalt	0.0010	U	0.0010	0.00019	mg/L		08/10/17 14:00	08/11/17 16:40	1
Chromium	0.0020	U	0.0020	0.00098	mg/L		08/10/17 14:00	08/11/17 16:40	1
Molybdenum	0.010	U	0.010	0.0011	mg/L		08/10/17 14:00	08/11/17 16:40	1
Lead	0.0010	U ^	0.0010	0.00045	mg/L		08/10/17 14:00	08/11/17 16:40	1
Selenium	0.0050	U	0.0050	0.00089	mg/L		08/10/17 14:00	08/11/17 16:40	1
Thallium	0.0010	U ^	0.0010	0.00020	mg/L		08/10/17 14:00	08/11/17 16:40	1
Lithium	0.0080	U	0.0080	0.0017	mg/L		08/10/17 14:00	08/11/17 16:40	1

Lab Sample ID: LCS 240-290626/3-A
Matrix: Water
Analysis Batch: 291009

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 290626

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Antimony	0.100	0.103		mg/L		103	80 - 120
Arsenic	1.00	1.08		mg/L		108	80 - 120
Barium	1.00	1.01		mg/L		101	80 - 120
Beryllium	1.00	0.985		mg/L		98	80 - 120
Cadmium	1.00	0.958		mg/L		96	80 - 120
Cobalt	1.00	1.04		mg/L		104	80 - 120
Chromium	1.00	1.00		mg/L		100	80 - 120
Molybdenum	0.100	0.0943		mg/L		94	80 - 120
Lead	1.00	1.03	^	mg/L		103	80 - 120
Selenium	1.00	1.07		mg/L		107	80 - 120
Thallium	0.250	0.295	^	mg/L		118	80 - 120
Lithium	0.100	0.0962		mg/L		96	80 - 120

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-290638/1-A
Matrix: Water
Analysis Batch: 290803

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 290638

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.00020	U	0.00020	0.00013	mg/L		08/10/17 14:00	08/11/17 09:35	1

Lab Sample ID: LCS 240-290638/2-A
Matrix: Water
Analysis Batch: 290803

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 290638

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00494		mg/L		99	80 - 120

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 240-290692/3
Matrix: Water
Analysis Batch: 290692

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			08/10/17 12:57	1
Fluoride	0.050	U	0.050	0.024	mg/L			08/10/17 12:57	1
Sulfate	1.0	U	1.0	0.35	mg/L			08/10/17 12:57	1

Lab Sample ID: LCS 240-290692/4
Matrix: Water
Analysis Batch: 290692

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	51.5		mg/L		103	90 - 110
Fluoride	2.50	2.63		mg/L		105	90 - 110
Sulfate	50.0	52.1		mg/L		104	90 - 110

Lab Sample ID: MB 240-290847/3
Matrix: Water
Analysis Batch: 290847

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	1.0	U	1.0	0.28	mg/L			08/11/17 14:09	1
Fluoride	0.050	U	0.050	0.024	mg/L			08/11/17 14:09	1
Sulfate	1.0	U	1.0	0.35	mg/L			08/11/17 14:09	1

Lab Sample ID: LCS 240-290847/4
Matrix: Water
Analysis Batch: 290847

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chloride	50.0	51.0		mg/L		102	90 - 110
Fluoride	2.50	2.61		mg/L		104	90 - 110
Sulfate	50.0	51.3		mg/L		103	90 - 110

Method: SM 2540C - Solids, Total Dissolved (TDS)

Lab Sample ID: MB 240-290710/1
Matrix: Water
Analysis Batch: 290710

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Dissolved Solids	10	U	10	7.8	mg/L			08/10/17 13:43	1

Lab Sample ID: LCS 240-290710/2
Matrix: Water
Analysis Batch: 290710

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Dissolved Solids	480	444		mg/L		93	80 - 120

Lab Sample ID: 240-83435-4 DU
Matrix: Water
Analysis Batch: 290710

Client Sample ID: MW-4
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Dissolved Solids	2000		2060		mg/L		3	20

Method: 9315 - Radium-226 (GFPC)

Lab Sample ID: MB 160-321832/1-A
Matrix: Water
Analysis Batch: 325533

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 321832

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	0.04348	U	0.0520	0.0522	1.00	0.0851	pCi/L	08/11/17 12:18	09/05/17 05:59	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.5*		*40 - 110*	*08/11/17 12:18*	*09/05/17 05:59*	*1*

Lab Sample ID: LCS 160-321832/2-A
Matrix: Water
Analysis Batch: 325533

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 321832

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Radium-226	11.4	9.532		0.991	1.00	0.101	pCi/L	84	68 - 137

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.7*		*40 - 110*

Method: 9320 - Radium-228 (GFPC)

Lab Sample ID: MB 160-321835/1-A
Matrix: Water
Analysis Batch: 323449

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 321835

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Radium-228	-0.06828	U	0.190	0.190	1.00	0.351	pCi/L	08/11/17 12:48	08/22/17 10:03	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Ba Carrier	*98.5*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:03*	*1*
Y Carrier	*85.2*		*40 - 110*	*08/11/17 12:48*	*08/22/17 10:03*	*1*

Lab Sample ID: LCS 160-321835/2-A
Matrix: Water
Analysis Batch: 323449

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 321835

Analyte			Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits		
Radium-228			13.0	13.69		1.47	1.00	0.366	pCi/L	105	56 - 140		

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Ba Carrier	*94.7*		*40 - 110*
Y Carrier	*86.7*		*40 - 110*

Metals

Prep Batch: 290626

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total Recoverable	Water	3005A	
240-83435-2	MW-2	Total Recoverable	Water	3005A	
240-83435-3	MW-3	Total Recoverable	Water	3005A	
240-83435-4	MW-4	Total Recoverable	Water	3005A	
MB 240-290626/1-A	Method Blank	Total Recoverable	Water	3005A	
LCS 240-290626/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCS 240-290626/3-A	Lab Control Sample	Total Recoverable	Water	3005A	

Prep Batch: 290638

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total/NA	Water	7470A	
240-83435-2	MW-2	Total/NA	Water	7470A	
240-83435-3	MW-3	Total/NA	Water	7470A	
240-83435-4	MW-4	Total/NA	Water	7470A	
MB 240-290638/1-A	Method Blank	Total/NA	Water	7470A	
LCS 240-290638/2-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 290803

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total/NA	Water	7470A	290638
240-83435-2	MW-2	Total/NA	Water	7470A	290638
240-83435-3	MW-3	Total/NA	Water	7470A	290638
240-83435-4	MW-4	Total/NA	Water	7470A	290638
MB 240-290638/1-A	Method Blank	Total/NA	Water	7470A	290638
LCS 240-290638/2-A	Lab Control Sample	Total/NA	Water	7470A	290638

Analysis Batch: 291009

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total Recoverable	Water	6020A	290626
240-83435-2	MW-2	Total Recoverable	Water	6020A	290626
240-83435-3	MW-3	Total Recoverable	Water	6020A	290626
240-83435-4	MW-4	Total Recoverable	Water	6020A	290626
MB 240-290626/1-A	Method Blank	Total Recoverable	Water	6020A	290626
LCS 240-290626/3-A	Lab Control Sample	Total Recoverable	Water	6020A	290626

Analysis Batch: 291058

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total Recoverable	Water	6010C	290626
240-83435-2	MW-2	Total Recoverable	Water	6010C	290626
240-83435-3	MW-3	Total Recoverable	Water	6010C	290626
240-83435-4	MW-4	Total Recoverable	Water	6010C	290626
MB 240-290626/1-A	Method Blank	Total Recoverable	Water	6010C	290626
LCS 240-290626/2-A	Lab Control Sample	Total Recoverable	Water	6010C	290626

Analysis Batch: 291210

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total Recoverable	Water	6010C	290626

General Chemistry

Analysis Batch: 290692

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total/NA	Water	9056A	
240-83435-1	MW-1	Total/NA	Water	9056A	
240-83435-3	MW-3	Total/NA	Water	9056A	
240-83435-4	MW-4	Total/NA	Water	9056A	
240-83435-4	MW-4	Total/NA	Water	9056A	
MB 240-290692/3	Method Blank	Total/NA	Water	9056A	
LCS 240-290692/4	Lab Control Sample	Total/NA	Water	9056A	

Analysis Batch: 290710

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total/NA	Water	SM 2540C	
240-83435-2	MW-2	Total/NA	Water	SM 2540C	
240-83435-3	MW-3	Total/NA	Water	SM 2540C	
240-83435-4	MW-4	Total/NA	Water	SM 2540C	
MB 240-290710/1	Method Blank	Total/NA	Water	SM 2540C	
LCS 240-290710/2	Lab Control Sample	Total/NA	Water	SM 2540C	
240-83435-4 DU	MW-4	Total/NA	Water	SM 2540C	

Analysis Batch: 290847

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-2	MW-2	Total/NA	Water	9056A	
MB 240-290847/3	Method Blank	Total/NA	Water	9056A	
LCS 240-290847/4	Lab Control Sample	Total/NA	Water	9056A	

Rad

Prep Batch: 321832

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total/NA	Water	PrecSep-21	
240-83435-2	MW-2	Total/NA	Water	PrecSep-21	
240-83435-3	MW-3	Total/NA	Water	PrecSep-21	
240-83435-4	MW-4	Total/NA	Water	PrecSep-21	
MB 160-321832/1-A	Method Blank	Total/NA	Water	PrecSep-21	
LCS 160-321832/2-A	Lab Control Sample	Total/NA	Water	PrecSep-21	

Prep Batch: 321835

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-83435-1	MW-1	Total/NA	Water	PrecSep_0	
240-83435-2	MW-2	Total/NA	Water	PrecSep_0	
240-83435-3	MW-3	Total/NA	Water	PrecSep_0	
240-83435-4	MW-4	Total/NA	Water	PrecSep_0	
MB 160-321835/1-A	Method Blank	Total/NA	Water	PrecSep_0	
LCS 160-321835/2-A	Lab Control Sample	Total/NA	Water	PrecSep_0	

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-1

Lab Sample ID: 240-83435-1

Date Collected: 08/07/17 12:20

Matrix: Water

Date Received: 08/09/17 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	291058	08/14/17 20:59	KLC	TAL CAN
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		20	291210	08/15/17 12:24	KLC	TAL CAN
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	291009	08/11/17 17:17	AS1	TAL CAN
Total/NA	Prep	7470A			290638	08/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	290803	08/11/17 09:47	DTN	TAL CAN
Total/NA	Analysis	9056A		1	290692	08/10/17 21:10	LKG	TAL CAN
Total/NA	Analysis	9056A		10	290692	08/10/17 21:30	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	290710	08/10/17 13:43	MM	TAL CAN
Total/NA	Prep	PrecSep-21			321832	08/11/17 12:18	LDE	TAL SL
Total/NA	Analysis	9315		1	325533	09/05/17 05:59	ALD	TAL SL
Total/NA	Prep	PrecSep_0			321835	08/11/17 12:48	LDE	TAL SL
Total/NA	Analysis	9320		1	323449	08/22/17 10:04	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	326387	09/08/17 11:51	RTM	TAL SL

Client Sample ID: MW-2

Lab Sample ID: 240-83435-2

Date Collected: 08/07/17 13:33

Matrix: Water

Date Received: 08/09/17 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	291058	08/14/17 21:04	KLC	TAL CAN
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	291009	08/11/17 17:31	AS1	TAL CAN
Total/NA	Prep	7470A			290638	08/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	290803	08/11/17 09:49	DTN	TAL CAN
Total/NA	Analysis	9056A		10	290847	08/11/17 19:17	JWW	TAL CAN
Total/NA	Analysis	SM 2540C		1	290710	08/10/17 13:43	MM	TAL CAN
Total/NA	Prep	PrecSep-21			321832	08/11/17 12:18	LDE	TAL SL
Total/NA	Analysis	9315		1	325533	09/05/17 05:59	ALD	TAL SL
Total/NA	Prep	PrecSep_0			321835	08/11/17 12:48	LDE	TAL SL
Total/NA	Analysis	9320		1	323449	08/22/17 10:04	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	326387	09/08/17 11:51	RTM	TAL SL

Client Sample ID: MW-3

Lab Sample ID: 240-83435-3

Date Collected: 08/07/17 15:02

Matrix: Water

Date Received: 08/09/17 09:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN

Lab Chronicle

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Client Sample ID: MW-3

Date Collected: 08/07/17 15:02
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Analysis	6010C		1	291058	08/14/17 21:08	KLC	TAL CAN
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	291009	08/11/17 17:35	AS1	TAL CAN
Total/NA	Prep	7470A			290638	08/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	290803	08/11/17 09:51	DTN	TAL CAN
Total/NA	Analysis	9056A		10	290692	08/10/17 22:11	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	290710	08/10/17 13:43	MM	TAL CAN
Total/NA	Prep	PrecSep-21			321832	08/11/17 12:18	LDE	TAL SL
Total/NA	Analysis	9315		1	325535	09/05/17 06:03	ALD	TAL SL
Total/NA	Prep	PrecSep_0			321835	08/11/17 12:48	LDE	TAL SL
Total/NA	Analysis	9320		1	323449	08/22/17 10:04	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	326387	09/08/17 11:51	RTM	TAL SL

Client Sample ID: MW-4

Date Collected: 08/07/17 16:32
Date Received: 08/09/17 09:20

Lab Sample ID: 240-83435-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6010C		1	291058	08/14/17 21:13	KLC	TAL CAN
Total Recoverable	Prep	3005A			290626	08/10/17 14:00	AJC	TAL CAN
Total Recoverable	Analysis	6020A		1	291009	08/11/17 17:40	AS1	TAL CAN
Total/NA	Prep	7470A			290638	08/10/17 14:00	AJC	TAL CAN
Total/NA	Analysis	7470A		1	290803	08/11/17 09:53	DTN	TAL CAN
Total/NA	Analysis	9056A		1	290692	08/10/17 22:53	LKG	TAL CAN
Total/NA	Analysis	9056A		10	290692	08/10/17 23:13	LKG	TAL CAN
Total/NA	Analysis	SM 2540C		1	290710	08/10/17 13:43	MM	TAL CAN
Total/NA	Prep	PrecSep-21			321832	08/11/17 12:18	LDE	TAL SL
Total/NA	Analysis	9315		1	325535	09/05/17 06:03	ALD	TAL SL
Total/NA	Prep	PrecSep_0			321835	08/11/17 12:48	LDE	TAL SL
Total/NA	Analysis	9320		1	323449	08/22/17 10:04	RTM	TAL SL
Total/NA	Analysis	Ra226_Ra228		1	326387	09/08/17 11:51	RTM	TAL SL

Laboratory References:

TAL CAN = TestAmerica Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Accreditation/Certification Summary

Client: ERM-North Central Inc
Project/Site: Grand Haven BLP - CCR Monitoring

TestAmerica Job ID: 240-83435-1

Laboratory: TestAmerica Canton

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460175	09-14-17 *
West Virginia DEP	State Program	3	210	12-31-17 *

Laboratory: TestAmerica St. Louis

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Virginia	NELAP	3	460230	06-14-18

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

West Virginia DEP	State Program	3	381	08-31-18

The following analytes are included in this report, but are not accredited/certified under this accreditation/certification:

Analysis Method	Prep Method	Matrix	Analyte
9315	PrecSep-21	Water	Radium-226
9320	PrecSep_0	Water	Radium-228

The following analytes are included in this report, but accreditation/certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Ra226_Ra228		Water	Combined Radium 226 + 228

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

CAMBRIDGE 240506

Chain of Custody Record

1.4/1.4

CAMBRIDGE 240506

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information	Sampler: Corey Finley	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-41878-17977.1
Client Contact: Mr. Brian Beach	Phone: 616 283 7165	E-Mail: madonna.myers@testamericainc.com		Page: Page 1 of 1
Company: ERM-North Central Inc				Job #:
Address: 3352 128th Avenue	Due Date Requested:			
City: Holland	TAT Requested (days):			
State, Zip: MI, 49424				
Phone:	PO #: 0398257			
Email: Brian.Beach@erm.com	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
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)	9315_Ra226, 9320_Ra228	6010C, 6020A, 7470A	2540C_Calcd, 9056A_28D	Total Number of containers	Special Instructions/Note:
			Preservation Code:				D	D	N		
MW-1	8-7-17	1220	G	Water	N		X	X	X	4	
MW-2	8-7-17	1333	G	Water	N		X	X	X	4	
MW-3	8-7-17	1502	G	Water	N		X	X	X	4	
MW-4	8-7-17	1632	G	Water	N		X	X	X	4	
				Water							

240-83435 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:	Company	Received by:	Date/Time:	Company
Corey Finley-ERM	8-8-17 14:22	ERM		8-9-17 820	TAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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:

TestAmerica Canton Sample Receipt Form/Narrative **Login # : 83435**
Canton Facility

Client ERM Site Name ——— Cooler unpacked by: POP

Cooler Received on 8-9-17 Opened on 8-9-17

FedEx: 1st Grd (Exp) UPS FAS Clipper Client Drop Off TestAmerica Courier Other

Receipt After-hours: Drop-off Date/Time Storage Location

TestAmerica Cooler # _____ Foam Box (Client Cooler) Box Other _____

Packing material used: Bubble Wrap Foam (Plastic Bag) None Other _____

COOLANT: (Wet Ice) Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☐ See Multiple Cooler Form

IR GUN# IR-8 (CF **-0.4** °C) Observed Cooler Temp. ——— °C Corrected Cooler Temp. ——— °C

IR GUN #36 (CF **+0**°C) Observed Cooler Temp. 1.4 °C Corrected Cooler Temp. 1.4 °C

2. Were custody seals on the outside of the cooler(s)? If Yes Quantity 1	(Yes) No	
-Were custody seals on the outside of the cooler(s) signed & dated?	(Yes) No NA	
-Were custody seals on the bottle(s) or bottle kits (LLHg/MeHg)?	Yes (No)	
3. Shippers' packing slip attached to the cooler(s)?	(Yes) No	
4. Did custody papers accompany the sample(s)?	(Yes) No	
5. Were the custody papers relinquished & signed in the appropriate place?	(Yes) No	
6. Was/were the person(s) who collected the samples clearly identified on the COC?	(Yes) No	
7. Did all bottles arrive in good condition (Unbroken)?	(Yes) No	
8. Could all bottle labels be reconciled with the COC?	(Yes) No	
9. Were correct bottle(s) used for the test(s) indicated?	(Yes) No	
10. Sufficient quantity received to perform indicated analyses?	(Yes) No	
11. Are these work share samples?	Yes (No)	
If yes, Questions 11-15 have been checked at the originating laboratory.		
11. Were sample(s) at the correct pH upon receipt?	(Yes) No NA	pH Strip Lot# **HC697954**
12. Were VOAs on the COC?	(Yes) No	
13. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this.	Yes No (NA)	
14. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot # _____	Yes (No)	
15. Was a LL Hg or Me Hg trip blank present? _____	Yes (No)	

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

16. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES Samples processed by:

17. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.

Sample(s) _____ were received in a broken container.

Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

18. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s): _____

Login Container Summary Report

Temperature readings: _____

Client Sample ID	Lab ID	Container Type	Container pH	Preservative Added (mls)	Lot #
MW-1	240-83435-B-1	Plastic 500ml - with Nitric Acid	<2		
MW-1	240-83435-C-1	Plastic 1 liter - Nitric Acid	<2		
MW-1	240-83435-D-1	Plastic 1 liter - Nitric Acid	<2		
MW-2	240-83435-B-2	Plastic 500ml - with Nitric Acid	<2		
MW-2	240-83435-C-2	Plastic 1 liter - Nitric Acid	<2		
MW-2	240-83435-D-2	Plastic 1 liter - Nitric Acid	<2		
MW-3	240-83435-B-3	Plastic 500ml - with Nitric Acid	<2		
MW-3	240-83435-C-3	Plastic 1 liter - Nitric Acid	<2		
MW-3	240-83435-D-3	Plastic 1 liter - Nitric Acid	<2		
MW-4	240-83435-B-4	Plastic 500ml - with Nitric Acid	<2		
MW-4	240-83435-C-4	Plastic 1 liter - Nitric Acid	<2		
MW-4	240-83435-D-4	Plastic 1 liter - Nitric Acid	<2		

TestAmerica Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Myers, Madonna	Carrier Tracking No(s):	COC No: 240-74797.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: madonna.myers@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Virginia; State Program - West Virginia DEP		Job #: 240-83435-1
Address: 13715 Rider Trail North,	Due Date Requested: 9/7/2017			
City: Earth City	TAT Requested (days):			
State, Zip: MO, 63045				
Phone: 314-298-8566(Tel) 314-298-8757(Fax)	PO #:			
Email:	WO #:			
Project Name: Grand Haven BLP - CCR Monitoring	Project #: 24017882			
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 - Client ID (Lab ID)	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)	Ra226Ra228_GFPC	9315_Ra226/PrecSep_21 Standard Target List	9320_Ra228/PrecSep_0 Standard Target List	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
MW-1 (240-83435-1)	8/7/17	12:20 Eastern		Water			X	X	X	2	
MW-2 (240-83435-2)	8/7/17	13:33 Eastern		Water			X	X	X	2	
MW-3 (240-83435-3)	8/7/17	15:02 Eastern		Water			X	X	X	2	
MW-4 (240-83435-4)	8/7/17	16:32 Eastern		Water			X	X	X	2	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification: Unconfirmed	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) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

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

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	8/9/17 1830	248		8/10/17 0900	
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
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 Checklist

Client: ERM-North Central Inc

Job Number: 240-83435-1

Login Number: 83435
List Number: 2
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis
List Creation: 08/10/17 04:29 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	20.0, 20.0, 20.0, 20.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	Added nitric acid lot 929870 to samples 2 & 3, pH remained ~ 7.
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-1
Site Name & Address: GHBLP 1231 N. 3rd St Grand Haven, MI
Sampler Name: Corey Finley
Pump Type: Peristaltic
Meter Type (s): YSI 556 & Hach2loop
Top of Casing Elevation (feet): 99.35'
Initial Water Level (feet below TOC): 5.88'
Groundwater Elevation/SWL (feet): 93.47'
Well Depth (feet below TOC): 12.32'
Screened Interval (feet below TOC): 4-9'
Depth Pump Intake Set At (feet below TOC): 8'

Project #: 0421479
Client: GHBLP
Date: 8-7-17
Weather: cloudy
Temperature/Bar. Pressure 69°F
Start Time of Purging: 1125
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 6.44
Calculated Well Volume* (liters or gal): 1.05 3
Well Volume Discharged (liters or gal): 3.21

Well Inspection: Clearly Labeled Y N; Concrete Pad Intact Y N; Lock Functional Y N; Pro-cover in good condition Y N; Casing in good condition Y N
Calibration: Time; 1010; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1135	18.72	2.075	1.63	8.32	-179	1.62	6.04	0.225	
1140	18.65	2.067	1.31	8.32	-200.3	1.14	6.07	0.225	
1145	18.69	2.061	0.95	8.34	-213.3	1.20	6.10	0.225	
1150	18.79	2.055	0.82	8.33	-221	1.21	6.13	0.225	
1155	18.76	2.054	0.75	8.34	-223	1.31	6.13	0.225	
1200	18.83	2.049	0.72	8.35	-230.2	1.25	6.16	0.225	
1205	18.82	2.048	0.71	8.37	-235	1.24	6.16	0.225	
1210	18.95	2.042	0.72	8.38	-244.5	1.48	6.19	0.225	
1215	18.90	2.042	0.72	8.39	-249.3	1.55	6.19	0.225	
1220	18.98	2.040	0.69	8.38	-252.6	1.46	6.19	0.225	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia. =** 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1220

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-2
Site Name & Address:

Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 107.75
Initial Water Level (feet below TOC): 14.85
Groundwater Elevation/SWL (feet): 92.91
Well Depth (feet below TOC): 23.37
Screened Interval (feet below TOC): 15-20'
Depth Pump Intake Set At (feet below TOC): 19'

Project #:
Client: GHBLP
Date: 8-7-17
Weather:
Temperature/Bar. Pressure 67°F / 748.9
Start Time of Purging: 1253
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.52
Calculated Well Volume* (liters or gal): 1.38
Well Volume Discharged (liters or gal): 2.1

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1010; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1303	16.61	4.589	2.13	7.89	-136.3	4.74	15.11	0.20	
1308	15.96	4.543	1.67	7.91	-142.1	3.88	15.24	0.26	
1313	16.26	4.527	1.34	7.87	-149.8	3.96	15.34	0.20	
1318	16.28	4.545	1.17	7.85	-149.6	3.92	15.38	0.20	
1323	14.47	4.548	8.99	7.82	-152.2	3.61	15.44	0.20	
1328	14.80	4.591	8.85	7.79	-152.5	4.01	15.46	0.26	
1333	14.43	4.608	0.78	7.80	-153.3	4.40	15.47	0.20	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[₮]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[₮]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Yellow tint, foamy Sampled @ 1333

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-3
Site Name & Address:

Sampler Name: CE
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 105.20
Initial Water Level (feet below TOC): 11.56
Groundwater Elevation/SWL (feet): 93.64
Well Depth (feet below TOC): 20.34
Screened Interval (feet below TOC): 12-17'
Depth Pump Intake Set At (feet below TOC): 16'

Project #:
Client: GHBLP
Date: 8-7-17
Weather:
Temperature/Bar. Pressure /
Start Time of Purging: 1417
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8.78
Calculated Well Volume* (liters or gal): 1.43
Well Volume Discharged (liters or gal): 2.34

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time; 1010; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%.
Note: TOC = Top of Casing

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate (liter/min or gallon/min)	Comments (i.e., odor, color, etc)
1427	15.79	3.061	1.12	8.14	-58.7	3.85	11.97	0.20	
1432	15.54	3.042	0.85	8.06	-73.0	4.26	12.01	0.20	
1437	15.43	3.019	0.73	7.94	-81.6	4.31	12.05	0.20	
1442	15.61	3.000	0.63	7.87	-87.1	4.32	12.06	0.20	
1447	15.39	2.970	0.58	7.84	-90.4	3.96	12.08	0.20	
1452	15.38	2.947	0.54	7.74	-92.6	3.96	12.10	0.20	
1457	15.18	2.916	0.49	7.66	-94.9	3.88	12.11	0.20	
1502	15.26	2.897	0.49	7.61	-96.6	3.50	12.12	0.20	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[Ŧ]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[Ŧ]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1502

Environmental Resources Management

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Field Form for Low Flow Rate Sampling

Well ID: MW-4
Site Name & Address:

Sampler Name: CF
Pump Type:
Meter Type (s):
Top of Casing Elevation (feet): 103.59
Initial Water Level (feet below TOC): 10.00
Groundwater Elevation/SWL (feet): 93.59
Well Depth (feet below TOC): 18'
Screened Interval (feet below TOC): 10-15'
Depth Pump Intake Set At (feet below TOC): 14'

Project #:
Client: GHBLP
Date: 8-7-17
Weather: 67°F
Temperature/Bar. Pressure
Start Time of Purging: 1542
Well Material: PVC
Well Diameter: 2"
Length of Water Column (feet): 8
Calculated Well Volume* (liters or gal): 1.3
Well Volume Discharged (liters or gal): 2.60

Well Inspection: Clearly Labeled (Y) N; Concrete Pad Intact (Y) N; Lock Functional (Y) N; Pro-cover in good condition (Y) N; Casing in good condition (Y) N
Calibration: Time: 1010; pH 4 Standard 4; pH 7 Standard 7; pH 10 Standard 10; Conductivity Std 1,413; DO 100%
Note: TOC = *Top of Casing*

Time	Temperature (°C)	Specific Conductance (ms/cm)	Dissolved Oxygen (mg/L)	pH (S.U.)	ORP (mV)	Turbidity (N.T.U.)	Water Level (ft)	Flow Rate ~~(liter/min~~ or gallon/min)	Comments (i.e., odor, color, etc)
1592	17.16	2.253	1.19	7.49	-39.1	4.24	10.42	0.20	
1557	17.12	2.199	0.87	7.55	-64.2	3.94	10.45	0.20	
1602	16.92	2.165	0.66	7.61	-78.6	3.20	10.48	0.20	
1607	16.82	2.142	0.58	7.65	-86.0	3.71	10.48	0.20	
1612	17.27	2.128	0.52	7.65	-91.6	4.06	10.39	0.20	
1617	17.29	2.123	0.47	7.66	-94.9	3.77	10.39	0.20	
1622	17.33	2.115	0.42	7.68	-97.4	3.44	10.39	0.20	
1627	17.35	2.104	0.38	7.70	-98.9	3.27	10.39	0.20	
1632	17.12	2.087	0.35	7.72	-100.6	2.90	10.39	0.20	
Limits	±3%	±3%	±10% (Values Greater 0.3 mg/L)	±0.1	±10 mV	±10% (when above 5 NTU)[T]	-0.3 feet	<0.5 L/min = 0.13 gal/min	

Information: **1 in diameter well** = 0.041 gal/ft = 154 ml/ft, **2 in dia.** = 0.163 gal/ft = 617 ml/ft, **4 in dia** = 0.652 gal/ft = 2468 ml/ft; Volume of cylinder = $\pi r^2 h$

- If water level is above the top of the screen, maximum drawdown = screen length/2
- If drawdown does not stabilize, purge well dry and sample as soon as the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples.

[T]All attempts will be made to get turbidity below 5 NTUs. In the event that groundwater turbidity has stabilized above 20 NTU, a filtered metals (dissolved) sample will also be collected.

Comments: Sampled @ 1632

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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Golder Associates

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