Division of Oil and Gas Resources Management
Radiation Safety Section

Interoffice Memorandum

TO: Richard J. Simmers, Chief

THROUGH: Scott Kell, Assistant Chief

FROM: Chuck McCracken, Manager, Radiation Safety Section

DATE: July 26, 2017

RE: ASSESSMENT OF RA226 & RA228 RADIOACTIVITY IN AQUASALINA

As requested, an analytical assessment of the radioactive content of Nature's Own Source / AquaSalina and the vertical well brine associated with its production was initiated on May 24, 2017. During the month of June 2017, Radiation Safety Section (RSS) staff partnered with Environmental Safety Section staff to collect 14 samples from 6 locations in Ohio. All samples were sent to PACE Radiological Analytical Laboratory with the last of the analytical results being received back from PACE on July 5, 2017.

The attached radiological survey report no. 2017-044 details the RSS radiological assessment process and the results achieved. Based on the findings in this assessment, the following recommendations are being made for your consideration:

1. Advise Nature's Own Source/AquaSalina that our assessment finds that they are producing TENORM however, we require additional details about their production process to be absolutely certain. *(NOTE: We may need to collect additional pre and post samples)*

2. Advise Nature's Own Source/AquaSalina that the average radioactivity in AquaSalina **exceeds** the 40 CFR 141.66 Drinking Water limits for combined Ra-226 and Ra-228 by a factor of 300, thus human consumption of any amount of AquaSalina is highly discouraged.

3. Advise Nature's Own Source/AquaSalina that the radioactivity in AquaSalina **exceeds** State of Ohio discharge to the environment limits for Ra-226 and Ra-228 as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations.

4. DOGRM should continue to analyze the radioactive concentrations in vertical formation brine to create an Ohio specific data set that can be used to further assess impacts to humans and the environment from the use of vertical brine from the oil and gas industry for dust suppression and road stability.

cf: Eric Vendel, Legal Counsel

DIVISION OF OIL & GAS RESOURCES MANAGEMENT, RADIATION SAFETY SECTION

RADIOLOGICAL ASSESSMENT SPECIAL REPORT

Report No: 2017-044

Permit No(s): Chief's Order 2004-82

Location(s): Nature's Own Source/AquaSalina
246 North Cleveland Avenue Mogadore,
OH 44260

Nature's Own Source/AquaSalina
2850 W. 3rd Street
Cleveland, OH 44113

Counties: Guernsey, Summit, Tuscarawas, Cuyahoga

Date(s): June 2, 2017, June 5, 2017, June 12, 2017,
June 15, 2017 and June 21, 2017

Inspector: Robert Leidy Date: 07/20/2017

Robert Leidy
Senior Health Physicist

Inspector: Paul Carder Date: 07/26/2017

Paul Carder
Senior Health Physicist

Supervisor: Date: 07/26/2017

Chuck McCracken
Section Manager

1.0 Purpose

At the request of the Chief, Division of Oil & Gas, an analytical assessment of the radioactive content of Nature's Own Source / AquaSalina and the vertical well brine associated with its production was conducted.

2.0 Scope of Action / Sampling Methodology

May 24, 2017

Two Ohio Department of Natural Resources, Division of Oil & Gas Resources Management (DOGRM) staffs were assigned to go to Nature's Own Source /AquaSalina facility located at 246 North Cleveland Avenue, Mogadore, OH 44260 to collect pre and post-production samples of their liquid deicer, AquaSalina. Upon arrival staff was met by Stephanie Moore. The property owner, Jeff Moore, spoke to staff by phone and requested that they communicate directly with Mr. Dave Mansbery, the owner of Nature's Own Source/AquaSalina. Staff spoke with Mr. Mansbery, who was attending an Ohio DOT trade show. Mr. Mansbery said that AquaSalina is out of season and not currently in production but there is product on site. Mr. Mansbery offered to make arrangements for a qualified individual to be onsite to assist DOGRM staff by providing access and collecting split samples of AquaSalina. Staff suggested to Mr. Mansbery that he coordinate a return visit to the Mogadore facility with DOGRM Management. No samples were collected this day.

June 2, 2017

A DOGRM Columbus office staff member collected two 1-liter samples from a container of AquaSalina that was in storage at the DOGRM Environmental Analytical Laboratory located at 325 N. 7th St., Cambridge, Ohio 43725. Each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 2, 2017

A DOGRM Uniontown office staff member was assigned to go to Hartville Hardware located at 1315 Edison St., NW, Hartville, OH 44632. Staff purchased a 1.74 gallon container of AquaSalina at this location. Staff then went to Lowe's Home Center located at 940 Interstate Parkway, Akron, OH 44312 and at 12:20 pm, purchased a 2.11 gallon container of AquaSalina. Two 1-liter samples were collected from each of the 2 containers of AquaSalina. Each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 12, 2017

Two DOGRM staff members were assigned to go to the ODOT Tuscarawas County Garage located at 384 Stonecreek Road SE, New Philadelphia, 44663 to collect samples of brine that was made by adding halite salt to tap water. Two 1-liter samples were collected and each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 12, 2017

Two DOGRM staff members were met in Mogadore by representatives for Nature's Own

Source/AquaSalina, Larry Gibler, Jim Hogue and Precision Analytical staffer, Jeremy Bratnick. Samples were collected by DOGRM and Precision Analytical of pre and post-production liquid. Each DOGRM sample was preserved with HNO3 and tamperproof seals were placed on the sample containers. A chain of custody was created and the DOGRM samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

DOGRM staffs were then directed to the Nature's Own Source/AquaSalina's Cuyahoga County facility located at 7033 Mill Road, Brecksville, OH 44141 to collect additional samples. Upon arrival staff was told that the location was a corporate office only and AquaSalina was not produced there. Staff was told that the Cuyahoga County production facility is located on the Arcelormittal Steel Mill property located at 2850 W. 3rd St., Cleveland OH. Staff was then informed that DOGRM's legal department needed to contact Nature's Own Source/AquaSalina's lawyer, Scott Doran, to discuss obtaining samples. No samples were collected.

June 15, 2017

Two DOGRM staff members were met at the Nature's Own Source/AquaSalina production facility on the Arcelormittal Steel Mill property by company representatives, Larry Gibler, Jim Hogue and Precision Analytical staffer, Jeremy Bratnick. Samples were collected by DOGRM and Precision Analytical of pre and post-production liquid. Each DOGRM sample was preserved with HNO3 and tamperproof seals were placed on the sample containers. A chain of custody was created and the DOGRM samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

June 21, 2017

DOGRM staff returned to the ODOT Tuscarawas County Garage to collect samples of the raw water used to create the brine mixture sampled on June 12, 2017. Each sample was preserved with HNO3. A chain of custody was created and the samples were delivered to the Pace Analytical Laboratories Service Center located at 4860 Blazer Pkwy, Dublin, OH 43017.

3.0 Observations / Analytical Results

Sample Collection Location	Collection Date	Ra226 Results (pCi/l)*	Ra228 Results (pCi/l)*	Combined Results (pCi/l)*
Lowes – Canton [purchase]	6/2/17	1,059 ± 136	604 ± 111	1,663 ± 247
Hartville Hardware [purchase]	6/2/17	1,158 ± 144	1,333 ± 241	2,491 ± 384
ODNR Cambridge Lab	6/2/17	791 ± 41.8	604 ± 25.7	1,395 ± 67.5
AquaS Mogadore - PRE	6/12/17	925 ± 116	373 ± 69.8	1,298 ± 185.8
- POST	6/12/17	1,010 ± 126	432 ± 80.1	1,442 ± 206.1
AquaS Cleve - PRE (1)	6/15/17	595 ± 772	568 ± 127	1,163 ± 899
- POST (1)	6/15/17	949 ± 478	734 ± 129	1,683 ± 607
- PRE (2)	6/15/17	501 ± 462	387 ± 75	888 ± 537
- POST (2)	6/15/17	997 ± 545	713 ± 102	1,710 ± 647
ODOT tap water - PRE	6/21/17	1.90 ± 0.8	0.922 ± 0.4	2.8 ± 1.2
ODOT mixture - POST	6/12/17	2.77 ± 1.58	5.78 ± 7.67	8.55 ± 9.27

* Analytical laboratory results reports are attached.

4.1 Findings, Discussions & Conclusions

Findings

- All post-samples collected in this study were found to be increased in radioactivity activity from their respective pre-samples.

- There was an 11% increase in combined radium Ra226/Ra228 concentration between the pre and post-samples collected from the Nature's Own Source/AquaSalina Mogadore production facility.

- There was a 45% increase in combined radium Ra226/Ra228 concentration between the pre (1) and post (1) samples collected from the Nature's Own Source/AquaSalina Cleveland production facility.

- There was a 92% increase in combined radium Ra226/Ra228 concentration between the pre (2) and post (2) samples collected from the Nature's Own Source/AquaSalina Cleveland production facility.

- The combined radium Ra226/Ra228 concentration in the Nature's Own Source/AquaSalina container purchased from Hartville Hardware was the highest identified in this study at 2,491 pCi/l.

- The combined radium Ra226/Ra228 concentration in all samples of post-production AquaSalina (except the Hartville Hardware container sample) averaged within 10% of each other at 1,578.6 pCi/l.

- There are no production dates, lot numbers or other unique identifiers on the purchased containers of Nature's Own Source/AquaSalina.

Discussions

- Formation brine is Naturally Occurring Radioactive Material (NORM). Technologically Enhanced NORM (TENORM) is NORM that has been increased in radioactivity by or as a result of human activity[1]. It would appear that Nature's Own Source/AquaSalina is producing TENORM however, without additional batch processing information from them, it cannot be determined with 100% certainty that the sampled pre-production brine has been increased in radioactivity due to the AquaSalina production processes.

- The USEPA National Primary Drinking Water Regulation, 40 CFR 141.66 limits combined Ra-226 and Ra-228 in drinking water to 5.0 pCi/l.

- The State of Ohio discharge to the environment limits for Ra-226 and Ra-228, as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations, are 60 pCi/l for each (120 pCi/l for combined Ra226 & Ra228 and the unity rule applies).

1 Abbreviated TENORM definition. Full definition found in ORC 3748.01 as stated in ORC 1509.074 (C)(1)

- The Pennsylvania Department of Environmental Protection (PADEP) TENORM Study Report, Revision 1, dated May 2016 assessed radiation exposure to humans from road spreading of conventional (vertical) well brine.

  - The assessment was based on surface soil samples taken from roads where brine spreading is known to have occurred. The specific radioactive concentration of the brine that was spread on these roads was not considered in the assessment.

  - The estimated total dose to a recreationist was modeled to be 0.441 mrem/yr, which is well below PADEP's 100 mrem/yr public exposure regulatory limit.

  - The report concluded that while limited potential was found for radiation exposure to recreationist using roads treated with brine from conventional *(vertical)* gas wells, further study of radiological environmental impacts from the use of brine from the oil and gas industry for dust suppression and road stabilization should be conducted.

- Other states in our region of the U.S. that allow road spreading of vertical oil and gas well brine include Michigan, Illinois, Pennsylvania and West Virginia.

Conclusions

- Analytical results suggests that Nature's Own Source/AquaSalina is producing TENORM however, without additional batch processing information, it cannot be determined with 100% certainty that the sampled pre-production brine has been increased in radioactivity due to the AquaSalina production processes.

- All sample results (except the DOT tap water) **exceed** the USEPA 40 CFR 141.66 Drinking Water limits of combined Ra-226 and Ra-228 at less than or equal to 5.0 pCi/l.

➢ None of the sampled liquids (except DOT tap water) in this assessment are meant for human consumption.

- All sample results (except the DOT samples) **exceed** State of Ohio discharge to the environment limits for Ra-226 and Ra-228 as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations.

  These liquid effluent concentration limits were originally codified by the U.S. Nuclear Regulatory Commission to limit public radiation exposure to 50 millirem per year from ingestion of radioactive material discharged into rivers, streams and other bodies of water by companies and facilities licensed to possess and handle radioactive materials.

➢ None of the sampled liquids (except DOT tap water) in this assessment are meant for human consumption.

- Using the assumptions and findings in the PADEP study, RSS evaluated the post-processing sample results from this assessment and determined that it is unlikely that radiation exposure to Ohioans from road spreading of vertical brine would exceed the 100 mrem/yr public dose limit.

5.1 Recommendations

1. Advise Nature's Own Source/AquaSalina that our assessment finds that they are producing TENORM however, we require additional details about their production process to be absolutely certain. (NOTE: We may need to collect additional pre and post samples)

2. Advise Nature's Own Source/AquaSalina that the average radioactivity in AquaSalina **exceeds** the 40 CFR 141.66 Safe Drinking Water limits for combined Ra-226 and Ra-228 by a factor of 300, thus human consumption of any amount of AquaSalina is highly discouraged.

3. Advise Nature's Own Source/AquaSalina that the radioactivity in AquaSalina **exceeds** State of Ohio discharge to the environment limits for Ra-226 and Ra-228 as delineated in Ohio Administrative Code 3701:1-38-12, Appendix C, Table II, Effluent Concentrations.

4. DOGRM should continue to analyze the radioactive concentrations in vertical formation brine to create an Ohio specific data set that can be used to further assess impacts to humans and the environment from the use of brine from the oil and gas industry for dust suppression and road stabilization.

ATTACHMENT
1

Radiological Analytical Results for:

ODNR Cambridge Lab

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

June 19, 2017

Ms. Michelle Taylor
Microbac Laboratories, Inc.
158 Starlite Drive
Marietta, OH 45750

RE: Project: Aqua
Pace Project No.: 30220752

Dear Ms. Taylor:
Enclosed are the analytical results for sample(s) received by the laboratory on June 06, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl
robbin.robl@pacelabs.com
(724)850-5613
Project Manager

Enclosures

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: Aqua
Pace Project No.: 30220752

Pennsylvania Certification IDs
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: Aqua
Pace Project No.: 30220752

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30220752001	**Aqua-1-226**	Water	06/02/17 12:00	06/06/17 10:15
30220752002	**Aqua-2-228**	Water	06/02/17 12:00	06/06/17 10:15

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: Aqua
Pace Project No.: 30220752

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30220752001	**Aqua-1-226**	EPA 903.1	WRR	1
30220752002	**Aqua-2-228**	EPA 904.0	JLW	1

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: Aqua
Pace Project No.: 30220752

Method: **EPA 903.1**
Description: 903.1 Radium 226
Client: Microbac Laboratories, Inc.-OH
Date: June 19, 2017

General Information:
1 sample was analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: Aqua
Pace Project No.: 30220752

Method: **EPA 904.0**
Description: 904.0 Radium 228
Client: Microbac Laboratories, Inc.-OH
Date: June 19, 2017

General Information:
1 sample was analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 261657

1c: During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

- BLANK (Lab ID: 1288491)
  - Radium-228

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: Aqua
Pace Project No.: 30220752

Sample: Aqua-1-226 **Lab ID: 30220752001** Collected: 06/02/17 12:00 Received: 06/06/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**791 ± 41.8 (6.84)** **C:NA T:92%**	pCi/L	06/19/17 10:12	13982-63-3	

Sample: Aqua-2-228 **Lab ID: 30220752002** Collected: 06/02/17 12:00 Received: 06/06/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-228	EPA 904.0	**604 ± 25.7 (11.8)** **C:82% T:74%**	pCi/L	06/19/17 10:30	15262-20-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: Aqua
Pace Project No.: 30220752

QC Batch: 261657 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30220752002

METHOD BLANK: 1288491 Matrix: Water
Associated Lab Samples: 30220752002

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.246 ± 3.98 (9.19) C:78% T:7%	pCi/L	06/19/17 10:30	1c

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: Aqua
Pace Project No.: 30220752

QC Batch: 261516
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30220752001

METHOD BLANK: 1287919
Matrix: Water
Associated Lab Samples: 30220752001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0622 ± 0.284 (0.578) C:NA T:91%	pCi/L	06/19/17 10:12	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: Aqua
Pace Project No.: 30220752

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1c During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

COC No. A-43160

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Toll Free: 800-373-4071

Company Name: **State of Ohio-DNR-Division of Oil & Gas**

Project Contact: **Chuck McCracken**

Contact Phone #: **614-265-6672**

Turn Around Requirements: Rush ok per RLR 6-2-17 2d

Location: Cambridge

Project ID: Aqua

Sampler (print): Paul Carder

Signature: Paul C

Program: ☐ CWA ☐ RCRA ☐ DOD ☐ AFCEE ☒ Other DAS

ADDITIONAL REQUIREMENTS

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold	Ra-226 EPA 901.1 m (5day Quick Turn)	Ra-226 EPA 901.1 m (21 day Ingrowth)	Ra-226 EPA 901.1 m (5day QT & 21 day)	Ra-226 EPA 903.0 ~ Radiochemistry	Ra-226 EPA 903.1 ~ Radon Emanation	Ra-226 EPA 901.1	Ra-228 EPA 901.1m (5-day Quick Turn)	Ra-228 EPA 901.1m (21-day Ingrowth)	Ra-228 EPA 901.1m (5-day QT & 21-Day)	Ra-228 EPA 904.0 ~ Radiochemistry	Ra-228 EPA 901.1	TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS
Aqua-1-226			6-2-17	1200	AW							X								001
Aqua-2-228			6-2-17	1200	AW											X				002

WO#:30220752

30220752

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Paul C	6-2-17	1351	[illegible]	[illegible]	6-5-17	1700	

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
[illegible]	6-5-17	1700	[illegible]	6-6-17	1015	

Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Page _____ of _____

Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: Microbac Project # 30220752

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 727804394288

Custody Seal on Cooler/Box Present: ☒ yes ☐ no Seals intact: ☒ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue (None)

Cooler Temperature Observed Temp N/A °C Correction Factor: — °C Final Temp: — °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: ML 6-6-17

Comments:	Yes	No	N/A	
Chain of Custody Present:	X			1.
Chain of Custody Filled Out:	X			2.
Chain of Custody Relinquished:	X			3.
Sampler Name & Signature on COC:	X			4.
Sample Labels match COC: -Includes date/time/ID Matrix: WT	X			5.
Samples Arrived within Hold Time:	X			6.
Short Hold Time Analysis (<72hr remaining):		X		7.
Rush Turn Around Time Requested:		X		8.
Sufficient Volume:	X			9.
Correct Containers Used: -Pace Containers Used:	X			10.
Containers Intact:	X			11.
Orthophosphate field filtered		X		12.
Organic Samples checked for dechlorination:			X	13.
Filtered volume received for Dissolved tests			X	14.
All containers have been checked for preservation. All containers needing preservation are found to be in compliance with EPA recommendation. exceptions: VOA, coliform, TOC, O&G, Phenolics	X			15. pH < 2
				Initial when completed: ML Date/time of preservation
				Lot # of added preservative
Headspace in VOA Vials (>6mm):			X	16.
Trip Blank Present:		X		17.
Trip Blank Custody Seals Present			X	
Rad Aqueous Samples Screened > 0.5 mrem/hr		X		Initial when completed: ML Date: 6-6-17

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

☐ A check in this box indicates that additional information has been stored in ereports.

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ATTACHMENT
2

Radiological Analytical Results for:

Lowes – Canton [purchase]
Hartville Hardware [purchase]

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

June 19, 2017

Ms. Michelle Taylor
Microbac Laboratories, Inc.
158 Starlite Drive
Marietta, OH 45750

RE: Project: 2017-Aqua-NE
Pace Project No.: 30220748

Dear Ms. Taylor:
Enclosed are the analytical results for sample(s) received by the laboratory on June 06, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl
robbin.robl@pacelabs.com
(724)850-5613
Project Manager

Enclosures

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: 2017-Aqua-NE
Pace Project No.: 30220748

Pennsylvania Certification IDs
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: 2017-Aqua-NE
Pace Project No.: 30220748

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30220748001	Lowes-1	Water	06/05/17 08:00	06/06/17 10:15
30220748002	Lowes-2	Water	06/05/17 08:02	06/06/17 10:15
30220748003	HH-1	Water	06/05/17 08:04	06/06/17 10:15
30220748004	HH-2	Water	06/05/17 08:06	06/06/17 10:15

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: 2017-Aqua-NE
Pace Project No.: 30220748

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30220748001	**Lowes-1**	EPA 903.1	WRR	1
30220748002	**Lowes-2**	EPA 904.0	JLW	1
30220748003	**HH-1**	EPA 903.1	WRR	1
30220748004	**HH-2**	EPA 904.0	JLW	1

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-Aqua-NE
Pace Project No.: 30220748

Method: **EPA 903.1**
Description: 903.1 Radium 226
Client: Microbac Laboratories, Inc.-OH
Date: June 19, 2017

General Information:
2 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-Aqua-NE
Pace Project No.: 30220748

Method: **EPA 904.0**
Description: 904.0 Radium 228
Client: Microbac Laboratories, Inc.-OH
Date: June 19, 2017

General Information:
2 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: 261657

1c: During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

- BLANK (Lab ID: 1288491)
  - Radium-228

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 2017-Aqua-NE
Pace Project No.: 30220748

Sample: Lowes-1 **Lab ID: 30220748001** Collected: 06/05/17 08:00 Received: 06/06/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**1,059 ± 136 (11.7)** **C:NA T:71%**	pCi/L	06/19/17 10:12	13982-63-3	

Sample: Lowes-2 **Lab ID: 30220748002** Collected: 06/05/17 08:02 Received: 06/06/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-228	EPA 904.0	**604 ± 111 (11.1)** **C:67% T:90%**	pCi/L	06/19/17 10:30	15262-20-1	

Sample: HH-1 **Lab ID: 30220748003** Collected: 06/05/17 08:04 Received: 06/06/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**1,158 ± 144 (7.11)** **C:NA T:95%**	pCi/L	06/19/17 10:12	13982-63-3	

Sample: HH-2 **Lab ID: 30220748004** Collected: 06/05/17 08:06 Received: 06/06/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-228	EPA 904.0	**1,333 ± 241 (14.8)** **C:75% T:65%**	pCi/L	06/19/17 10:30	15262-20-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-Aqua-NE
Pace Project No.: 30220748

QC Batch: 261657 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30220748002, 30220748004

METHOD BLANK: 1288491 Matrix: Water
Associated Lab Samples: 30220748002, 30220748004

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.246 ± 3.98 (9.19) C:78% T:7%	pCi/L	06/19/17 10:30	1c

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-Aqua-NE
Pace Project No.: 30220748

QC Batch: 261516
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30220748001, 30220748003

METHOD BLANK: 1287919
Matrix: Water
Associated Lab Samples: 30220748001, 30220748003

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0622 ± 0.284 (0.578) C:NA T:91%	pCi/L	06/19/17 10:12	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: 2017-Aqua-NE
Pace Project No.: 30220748

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

1c	During the ingrowthing process, part of the MB was lost, and the resulting chemical yield is below 10% and the associated MB MDC is greater than 1.0 pCi/L. Individual sample results are not impacted by the elevated MDC or low MB yield.

COC No. A 43160

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Toll Free: 800-373-4071

Company Name: State of Ohio-DNR-Division of Oil & Gas

Project Contact: Chuck McCracken

Contact Phone #: 614-265-6672

Turn Around Requirements:

Location: HARTVILLE + AVON

Project ID: 2017-Aqua-NE

Sampler (print): ROBERT LEIDY

Signature:

Program: ☐ CWA ☐ RCRA ☐ DSD ☐ AFCEE ☒ Other DAS

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold	Ra-226 EPA 901.1 m (5day Quick Turn)	Ra-226 EPA 901.1 m (21 day ingrowth)	Ra-226 EPA 901.1 m (5day QT & 21 day)	Ra-226 EPA 903.0 ~ Radiochemistry	Ra-226 EPA 903.1 ~ Radon Emanation	Ra-226 EPA 901.1	Ra-228 EPA 901.1m (5-day Quick Turn)	Ra-228 EPA 901.1m (21-day Ingrowth)	Ra-228 EPA 901.1m (5-day QT & 21-Day)	Ra-228 EPA 904.0 ~ Radiochemistry	Ra-228 EPA 901.1				TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS
LOWES-1		X	6-5-17	8:00	W	1						X							X	HNO3 Preserved			001
LOWES-2		X	6-5-17	8:02	W	1											X		X				002
HH-1		X	6-5-17	8:04	W	1						X							X				003
HH-2		X	6-5-17	8:06	W	1											X		X				004

RUSH OK PER PM

WO#: 30220748

30220748

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
	6-5-17	1149			6/5/17	1429	
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:	
	6-5-17	17:00		6-6-17	1015		

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Page _____ of _____

Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: Microbac Project # 30220748

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 772804394288

Custody Seal on Cooler/Box Present: ☒ yes ☐ no Seals intact: ☒ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue None

Cooler Temperature Observed Temp N/A °C Correction Factor: ___ °C Final Temp: ___ °C

Temp should be above freezing to 6°C

Date and initials of person examining contents: ML 6-6-17

Comments:	Yes	No	N/A	
Chain of Custody Present:	X			1.
Chain of Custody Filled Out:	X			2.
Chain of Custody Relinquished:	X			3.
Sampler Name & Signature on COC:	X			4.
Sample Labels match COC: -Includes date/time/ID Matrix: WT	X			5.
Samples Arrived within Hold Time:	X			6.
Short Hold Time Analysis (<72hr remaining):		X		7.
Rush Turn Around Time Requested:	X			8.
Sufficient Volume:	X			9.
Correct Containers Used: -Pace Containers Used:	X X			10.
Containers Intact:	X			11.
Orthophosphate field filtered		X		12.
Organic Samples checked for dechlorination:			X	13.
Filtered volume received for Dissolved tests			X	14.
All containers have been checked for preservation. All containers needing preservation are found to be in compliance with EPA recommendation. exceptions: VOA, coliform, TOC, O&G, Phenolics	X X			15. pH < 2 Initial when completed: ML Date/time of preservation Lot # of added preservative
Headspace in VOA Vials (>6mm):			X	16.
Trip Blank Present:		X		17.
Trip Blank Custody Seals Present			X	
Rad Aqueous Samples Screened > 0.5 mrem/hr		X		Initial when completed: ML Date: 6-6-17

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

☐ **A check in this box indicates that additional information has been stored in ereports.**

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ATTACHMENT
3

Radiological Analytical Results for:

AquaSalina / Mogadore	- PRE
	- POST
AquaSalina / Cleveland	- PRE (1)
	- POST (1)
	- PRE (2)
	- POST (2)
ODOT salt mixture brine	- POST

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

June 30, 2017

Ms. Michelle Taylor
Microbac Laboratories, Inc.
158 Starlite Drive
Marietta, OH 45750

RE: Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Dear Ms. Taylor:
Enclosed are the analytical results for sample(s) received by the laboratory between June 14, 2017 and June 16, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Revision 1 - This report replaces the June 30, 2017 report. This report has been reissued to include the additional COC and SCUR. Please replace the original report with the revised report enclosed.
RLR 6/30/17

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl
robbin.robl@pacelabs.com
(724)850-5613
Project Manager

Enclosures

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Pennsylvania Certification IDs
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30221492001	ODOT-01	Water	06/12/17 09:35	06/14/17 11:50
30221492002	ODOT-02	Water	06/12/17 09:38	06/14/17 11:50
30221492003	AS-MOG PRE 01	Water	06/12/17 12:07	06/14/17 11:50
30221492004	AS-MOG POST 01	Water	06/12/17 12:30	06/14/17 11:50
30221492005	AS-CLE-PRE-01	Water	06/15/17 10:24	06/16/17 10:15
30221492006	AS-CLE-PRE-02	Water	06/15/17 10:22	06/16/17 10:15
30221492007	AS-CLE-POST-01	Water	06/15/17 10:56	06/16/17 10:15
30221492008	AS-CLE-POST-02	Water	06/15/17 10:56	06/16/17 10:15

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30221492001	ODOT-01	EPA 903.1	WRR	1
30221492002	ODOT-02	EPA 904.0	JLW	1
30221492003	AS-MOG PRE 01	EPA 903.1	WRR	1
		EPA 904.0	JLW	1
30221492004	AS-MOG POST 01	EPA 904.0	JLW	1
30221492005	AS-CLE-PRE-01	EPA 901.1	MAH	2
30221492006	AS-CLE-PRE-02	EPA 901.1	MAH	2
30221492007	AS-CLE-POST-01	EPA 901.1	MAH	2
30221492008	AS-CLE-POST-02	EPA 901.1	MAH	2

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Method: **EPA 901.1**
Description: 901.1 Gamma Spec
Client: Microbac Laboratories, Inc.-OH
Date: June 30, 2017

General Information:
4 samples were analyzed for EPA 901.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Method: **EPA 903.1**
Description: 903.1 Radium 226
Client: Microbac Laboratories, Inc.-OH
Date: June 30, 2017

General Information:
2 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Method: **EPA 904.0**
Description: 904.0 Radium 228
Client: Microbac Laboratories, Inc.-OH
Date: June 30, 2017

General Information:
3 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Sample: ODOT-01 **Lab ID: 30221492001** Collected: 06/12/17 09:35 Received: 06/14/17 11:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**2.77 ± 1.58 (1.45) C:NA T:87%**	pCi/L	06/20/17 10:46	13982-63-3	

Sample: ODOT-02 **Lab ID: 30221492002** Collected: 06/12/17 09:38 Received: 06/14/17 11:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-228	EPA 904.0	**5.78 ± 7.69 (16.5) C:74% T:83%**	pCi/L	06/26/17 12:22	15262-20-1	

Sample: AS-MOG PRE 01 **Lab ID: 30221492003** Collected: 06/12/17 12:07 Received: 06/14/17 11:50 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • Low volume

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**925 ± 116 (10.7) C:NA T:91%**	pCi/L	06/21/17 11:35	13982-63-3	
Radium-228	EPA 904.0	**373 ± 69.8 (15.0) C:75% T:91%**	pCi/L	06/26/17 12:22	15262-20-1	

Sample: AS-MOG POST 01 **Lab ID: 30221492004** Collected: 06/12/17 12:30 Received: 06/14/17 11:50 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • Low Volume

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-228	EPA 904.0	**432 ± 80.1 (13.2) C:75% T:94%**	pCi/L	06/26/17 12:22	15262-20-1	
Radium-226	EPA 903.1	**1,010 ± 126 (1.61) C:NA T:99%**	pCi/L	06/21/17 11:49	13982-63-3	

Sample: AS-CLE-PRE-01 **Lab ID: 30221492005** Collected: 06/15/17 10:24 Received: 06/16/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • Low Volume

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**595.260 ± 772.180 (927.900) C:NA T:NA**	pCi/L	06/29/17 10:05	13982-63-3	
Radium-228	EPA 901.1	**568.050 ± 127.440 (123.800) C:NA T:NA**	pCi/L	06/29/17 10:05	15262-20-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

Sample: AS-CLE-PRE-02 **Lab ID: 30221492006** Collected: 06/15/17 10:22 Received: 06/16/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • Low Volume

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**501.820 ± 462.880 (552.800) C:NA T:NA**	pCi/L	06/29/17 16:41	13982-63-3	
Radium-228	EPA 901.1	**387.340 ± 75.616 (64.860) C:NA T:NA**	pCi/L	06/29/17 16:41	15262-20-1	

Sample: AS-CLE-POST-01 **Lab ID: 30221492007** Collected: 06/15/17 10:56 Received: 06/16/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • Low Volume

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**949.330 ± 478.650 (561.700) C:NA T:NA**	pCi/L	06/29/17 12:07	13982-63-3	
Radium-228	EPA 901.1	**734.080 ± 129.300 (78.340) C:NA T:NA**	pCi/L	06/29/17 12:07	15262-20-1	

Sample: AS-CLE-POST-02 **Lab ID: 30221492008** Collected: 06/15/17 10:56 Received: 06/16/17 10:15 Matrix: Water
PWS: Site ID: Sample Type:
Comments: • Low Volume

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 901.1	**997.670 ± 545.050 (593.800) C:NA T:NA**	pCi/L	06/29/17 16:42	13982-63-3	
Radium-228	EPA 901.1	**713.780 ± 102.920 (84.890) C:NA T:NA**	pCi/L	06/29/17 16:42	15262-20-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

QC Batch: 261943
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30221492001

METHOD BLANK: 1289742
Matrix: Water
Associated Lab Samples: 30221492001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.473 ± 0.491 (0.732) C:NA T:92%	pCi/L	06/20/17 10:15	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

QC Batch: 263462 Analysis Method: EPA 901.1
QC Batch Method: EPA 901.1 Analysis Description: 901.1 Gamma Spec
Associated Lab Samples: 30221492005, 30221492006, 30221492007, 30221492008

METHOD BLANK: 1297752 Matrix: Water
Associated Lab Samples: 30221492005, 30221492006, 30221492007, 30221492008

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.000 ± 102.870 (219.900) C:NA T:NA	pCi/L	06/28/17 12:48	
Radium-228	0.000 ± 6.503 (37.220) C:NA T:NA	pCi/L	06/28/17 12:48	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

QC Batch: 261944 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30221492003, 30221492004

METHOD BLANK: 1289743 Matrix: Water
Associated Lab Samples: 30221492003, 30221492004

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.0653 ± 0.339 (0.703) C:NA T:97%	pCi/L	06/21/17 11:16	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

QC Batch: 261946 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30221492002, 30221492003, 30221492004

METHOD BLANK: 1289745 Matrix: Water
Associated Lab Samples: 30221492002, 30221492003, 30221492004

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	-0.107 ± 0.318 (0.773) C:75% T:79%	pCi/L	06/26/17 12:12	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: 2017-AQUA-MOG
Pace Project No.: 30221492

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

WO#:30221492

COC No. A 43160

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phon
Toll Fr 30221492

Company Name: State of Ohio-DNR-Division of Oil & Gas

Project Contact: Chuck McCracken

Contact Phone #: 614-265-6672

Turn Around Requirements: 5 DAY RUSH

Location: MOSADORE/TUSCARAWAS

Project ID: 2017 - AQUA - MO

Sampler (print): JAKE GLASCOCK

Signature:

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold	Ra-226 EPA 901.1 m (5day Quick Turn)	Ra-226 EPA 901.1 m (21 day Ingrowth)	Ra-226 EPA 901.1 m (5day QT & 21 day)	Ra-226 EPA 903.0 ~ Radiochemistry	Ra-226 EPA 903.1 ~ Radon Emanation	Ra-226 EPA 901.1	Ra-228 EPA 901.1m (5-day Quick Turn)	Ra-228 EPA 901.1m (21-day Ingrowth)	Ra-228 EPA 901.1m (5-day QT & 21-Day)	Ra-228 EPA 904.0 ~ Radiochemistry	Ra-228 EPA 901.1	HNO3 PRESERVATIVE		TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS
ODOT-01		X	6-12-2017	09:35	W	1						X							X			001
ODOT-02		X	6-12-2017	09:38	W	1											X		X			002
AS-MOGPRE.01		X	6-12-2017	12:07	W	1						X					X		X			003
AS MOG POST 01		X	6-12-2017	12:30	W	1						X					X		X			004

5 DAY RUSH

Delete 228 from sample 001 please. Thanks

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time
	6-13-17	13:18			6/14	11

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
				6/14/17	1150	

Program: ☐ CWA ☐ RCRA ☐ DOD ☐ AFCEE ☒ Other DAS

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Page ____ of ____

Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: Microbac Project # 30221492

ZH.

Courier: ☒ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 7278 0439 4504

Custody Seal on Cooler/Box Present: ☒ yes ☐ no Seals intact: ☒ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue (None)

Cooler Temperature Observed Temp N/A °C Correction Factor: N/A °C Final Temp: N/A °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: KBK 6/14/17

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:	✓			4.
Sample Labels match COC: -Includes date/time/ID Matrix: WT	✓			5.
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9. Low volume, samples 003 & 004 have one 1L
Correct Containers Used:	✓			10.
-Pace Containers Used:		✓		
Containers Intact:	✓			11.
Orthophosphate field filtered				12.
Organic Samples checked for dechlorination:			✓	13.
Filtered volume received for Dissolved tests			✓	14.
All containers have been checked for preservation. All containers needing preservation are found to be in compliance with EPA recommendation.	✓			15.
exceptions: VOA, coliform, TOC, O&G, Phenolics				Initial when completed KBK Date/time of preservation
				Lot # of added preservative
Headspace in VOA Vials (>6mm):			✓	16.
Trip Blank Present:			✓	17.
Trip Blank Custody Seals Present			✓	
Rad Aqueous Samples Screened > 0.5 mrem/hr		✓		Initial when completed: KBK Date: 6/14/17

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

☐ **A check in this box indicates that additional information has been stored in ereports.**

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

COC No. A 43160

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Toll Free: 800-373-4071

30221492 RLR 6/16/17

Company Name: State of Ohio-DNR-Division of Oil & Gas

Project Contact: Chuck McCracken
Contact Phone #: 614-265-6672
Turn Around Requirements: 5-DAY RUSH
Location: AS CLEVELAND
Project ID: 2017-AQUA-CLE
Sampler (print): J GLASCOCK
Signature:

Program: ☐ CWA ☐ RCRA ☐ DOD ☐ AFCEE ☒ Other DAS

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold	Ra-226 EPA 901.1 m (5day Quick Turn)	Ra-226 EPA 901.1 m (21 day ingrowth)	Ra-226 EPA 901.1 m (5day QT & 21 day)	Ra-226 EPA 903.0 ~ Radiochemistry	Ra-226 EPA 903.1 ~ Radon Emanation	Ra-226 EPA 901.1	Ra-228 EPA 901.1m (5-day Quick Turn)	Ra-228 EPA 901.1m (21-day Ingrowth)	Ra-228 EPA 901.1m (5-day QT & 21-Day)	Ra-228 EPA 904.0 ~ Radiochemistry	Ra-228 EPA 901.1	HNO3 PRESERVATIVE	TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS
AS-CLE-PRE-01		X	6-15-2017		W	1					X								X		001 005
AS-CLE-PRE-02		X	6-15-2017		W	1											X		X		002 006
AS-CLE-POST-01		X	6-15-2017		W	1					X								X		003 007
AS CLE-POST-02		X	6-15-2017		W	1											X		X		004 008

tem 6/16/17

5-DAY RUSH

WO#: 30221776 RLR 6/16/17

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
	6/15/17	11:23			6-15-17	13:24	

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
	6/15/17	14:26	RLR 6/16/17 PACE	6-15-17	14:26	

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Relinquished. RReistafer/PACE 6-15-17 1700

Recieved by: PACE 6/16/17 10:5

Page _____ of _____

Sample Condition Upon Receipt Pittsburgh

Pace Analytical

Client Name: Microbac Project # 30221492 ZH. RK 6/16/17

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 7278 0439 4623

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue (None)

Cooler Temperature Observed Temp — °C Correction Factor: — °C Final Temp: — °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: ZH 6/16/17

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:		✓		4.
Sample Labels match COC: ZH 6/16/17 -Includes date/time/ID Matrix: WT	✓	✓		5. ~~No date or time on bottle~~ ZH 6/16/17 no time on COC, time on bottles are: Pre01 - 1024 Pre02 - 1022 Post01 - 1056 Post02 - 1056
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:	✓	~~✓~~ ZH 6/16/17		8. 5 day Rush
Sufficient Volume:	✓			9.
Correct Containers Used:	✓			10.
-Pace Containers Used:		✓		
Containers Intact:	✓			11.
Orthophosphate field filtered				12.
Organic Samples checked for dechlorination:			✓	13.
Filtered volume received for Dissolved tests			✓	14.
All containers have been checked for preservation.	✓			15. Pre 2
All containers needing preservation are found to be in compliance with EPA recommendation.	✓			
exceptions: VOA, coliform, TOC, O&G, Phenolics				Initial when completed ZH / Date/time of preservation / Lot # of added preservative
Headspace in VOA Vials (>6mm):			✓	16.
Trip Blank Present:			✓	17.
Trip Blank Custody Seals Present			✓	
Rad Aqueous Samples Screened > 0.5 mrem/hr		✓		Initial when completed: ZH Date: 6/16/17

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

☐ A check in this box indicates that additional information has been stored in ereports.

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ATTACHMENT
4

Radiological Analytical Results for:

ODOT tap water - PRE

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

July 05, 2017

Ms. Michelle Taylor
Microbac Laboratories, Inc.
158 Starlite Drive
Marietta, OH 45750

RE: Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Dear Ms. Taylor:
Enclosed are the analytical results for sample(s) received by the laboratory on June 26, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Robbin Robl
robbin.robl@pacelabs.com
(724)850-5613
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE SUMMARY

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30222632001	**DOTTUSC RAW-01,02**	Water	06/21/17 12:52	06/26/17 09:20

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

SAMPLE ANALYTE COUNT

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30222632001	**DOTTUSC RAW-01,02**	EPA 903.1	WRR	1
		EPA 904.0	JLW	1

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Method: **EPA 903.1**
Description: 903.1 Radium 226
Client: Microbac Laboratories, Inc.-OH
Date: July 05, 2017

General Information:
1 sample was analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

PROJECT NARRATIVE

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Method: **EPA 904.0**
Description: 904.0 Radium 228
Client: Microbac Laboratories, Inc.-OH
Date: July 05, 2017

General Information:
1 sample was analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

Sample: DOTTUSC RAW-01,02 **Lab ID: 30222632001** Collected: 06/21/17 12:52 Received: 06/26/17 09:20 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**1.90 ± 0.805 (0.559) C:NA T:86%**	pCi/L	07/03/17 13:27	13982-63-3	
Radium-228	EPA 904.0	**0.922 ± 0.421 (0.696) C:73% T:84%**	pCi/L	07/03/17 13:13	15262-20-1	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
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(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

QC Batch: 263234 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30222632001

METHOD BLANK: 1296756 Matrix: Water
Associated Lab Samples: 30222632001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.000 ± 0.337 (0.686) C:NA T:90%	pCi/L	07/03/17 12:35	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

QUALITY CONTROL - RADIOCHEMISTRY

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

QC Batch: 263247 Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30222632001

METHOD BLANK: 1296776 Matrix: Water
Associated Lab Samples: 30222632001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.376 ± 0.338 (0.687) C:80% T:84%	pCi/L	07/03/17 13:10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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Greensburg, PA 15601
(724)850-5600

QUALIFIERS

Project: 2017-AQUA SAUNA-TUSC
Pace Project No.: 30222632

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

COC No. A 43160

158 Starlite Drive
Marietta, OH 45750

MICROBAC®

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Toll Free: 800-373-4071

Company Name: State of Ohio-DNR-Division of Oil & Gas

Project Contact: Chuck McCracken
Contact Phone #: 614-265-6672
Turn Around Requirements:
Location: DOTTUSC RAW
Project ID: 2017- AQUA SALINA - TUSC
Sampler (print): ROBERT LEIDY
Signature:

Program: ☐ CWA ☐ RCRA ☐ DOD ☐ ARCEE ☒ Other DAS

ADDITIONAL REQUIREMENTS: 001

Sample I.D. No:	Comp	Grab	Date	Time	Matrix*	Number of Containers	Hold	Ra-226 EPA 901.1 m (5day Quick Turn)	Ra-226 EPA 901.1 m (21 day Ingrowth)	Ra-226 EPA 901.1 m (5day QT & 21 day)	Ra-226 EPA 903.0 ~ Radiochemistry	Ra-226 EPA 903.1 ~ Radon Emanation	Ra-226 EPA 901.1	Ra-228 EPA 901.1m (5-day Quick Turn)	Ra-228 EPA 901.1m (21-day Ingrowth)	Ra-228 EPA 901.1m (5-day QT & 21-Day)	Ra-228 EPA 904.0 ~ Radiochemistry	Ra-228 EPA 901.1	HNO3 PRESERVATIVE		TOTAL # (LAB USE)
DOTTUSC RAW-01		X	6-21-2017	12:52	W							X							X		
DOTTUSC RAW-02		X	6-21-2017	12:53	W											X			X		

5-DAY RUSH

WO#: 30222632

30222632

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Robert Leidy	6-21-2017	1328	Michele Miller	Michele Miller	6/23/17	10:08 am	
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:	
	6-23-17	1216	RMsh/PACE	6-23-17	14:58		

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Received by: Paul 6-23-17 12:16 pm

Relinquished by Paul 6-23-17 14:58

Relinquished by RMsh/PACE 6-23-17 1700

received by: Mackenzie 6-26-17 0920

Page _____ of _____

Sample Condition Upon Receipt Pittsburgh 30222632 - 2H.

Pace Analytical

Client Name: Microbac Project #

Courier: [X] Fed Ex [ ] UPS [ ] USPS [ ] Client [ ] Commercial [ ] Pace Other

Tracking #: 7278 0439 4807

Custody Seal on Cooler/Box Present: [ ] yes [X] no Seals Intact: [ ] yes [ ] no

Thermometer Used N/A Type of Ice: Wet Blue (None)

Cooler Temperature Observed Temp N/A °C Correction Factor: °C Final Temp: °C

Temp should be above freezing to 6°C

Date and initials of person examining contents: M 6-26-17

Comments:	Yes	No	N/A	
Chain of Custody Present:	X			1.
Chain of Custody Filled Out:	X			2.
Chain of Custody Relinquished:	X			3.
Sampler Name & Signature on COC:	X			4.
Sample Labels match COC: -Includes date/time/ID Matrix: W	X			5.
Samples Arrived within Hold Time:	X			6.
Short Hold Time Analysis (<72hr remaining):		X		7.
Rush Turn Around Time Requested:	X			8.
Sufficient Volume:	X			9.
Correct Containers Used: -Pace Containers Used:	X			10.
Containers Intact:	X			11.
Orthophosphate field filtered		X		12.
Organic Samples checked for dechlorination:			X	13.
Filtered volume received for Dissolved tests			X	14.
All containers have been checked for preservation. All containers needing preservation are found to be in compliance with EPA recommendation. exceptions: VOA, coliform, TOC, O&G, Phenolics	X			15. pH < 2
				Initial when completed: MC Date/time of preservation
				Lot # of added preservative
Headspace in VOA Vials (>6mm):			X	16.
Trip Blank Present:		X		17.
Trip Blank Custody Seals Present			X	
Rad Aqueous Samples Screened > 0.5 mrem/hr		X		Initial when completed: ML Date: 6-26-17

Client Notification/ Resolution:

Person Contacted: Date/Time: Contacted By:

Comments/ Resolution:

[ ] A check in this box indicates that additional information has been stored in ereports.

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

*PM review is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

ODOT TGF

VOC

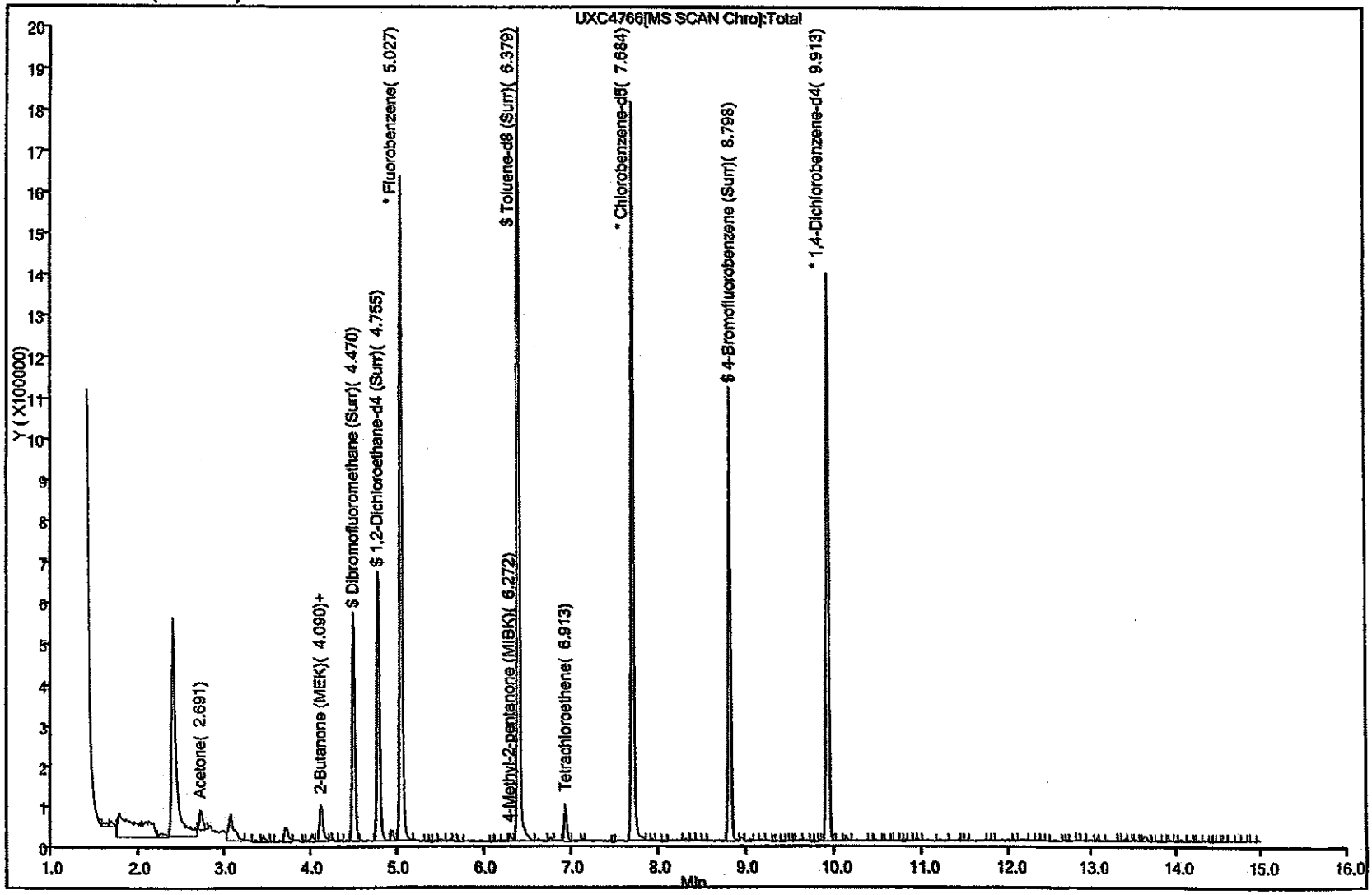
Report Date: 19-Jun-2017 08:32:15 Chrom Revision: 2.2 25-Apr-2017 13:27:22

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A3UX15\20170618-66102.b\UXC4766.D

Injection Date:	18-Jun-2017 22:53:30	Instrument ID:	A3UX15	Operator ID:	
Lims ID:	240-80850-A-1	Lab Sample ID:	240-80850-1	Worklist Smp#:	44
Client ID:	JG-098/ODOT BRINE TANK				
Purge Vol:	5.000 mL	Dil. Factor:	5.0000	ALS Bottle#:	19
Method:	8260_15	Limit Group:	MSV 8260B ICAL		

Column: DB-624 (0.18 mm)



ODOT TGF

SVOC

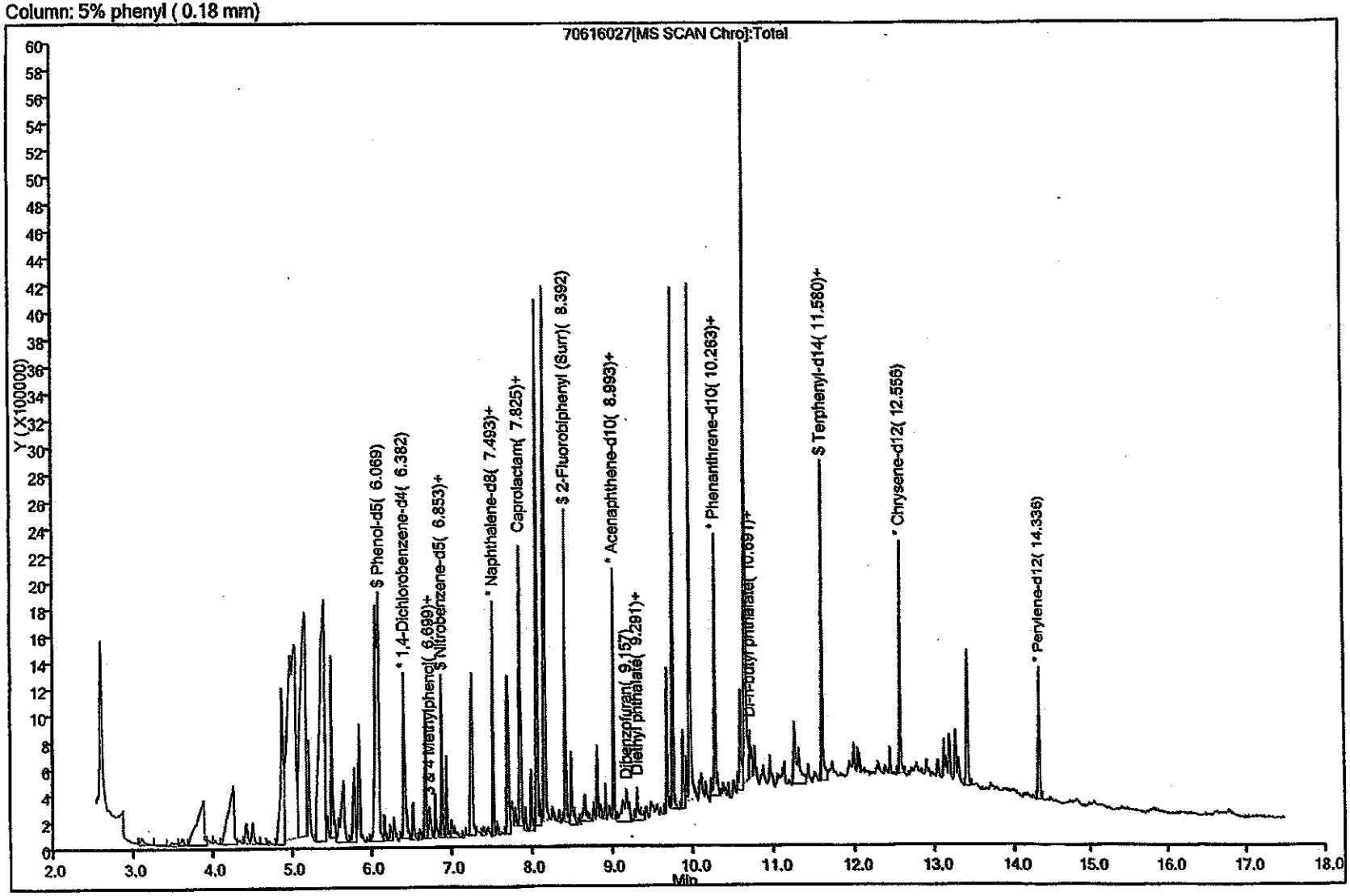
Report Date: 18-Jun-2017 13:14:36 Chrom Revision: 2.2 25-Apr-2017 13:27:22

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A4HP9\20170616-66038.b\70616027.D

Injection Date:	16-Jun-2017 18:44:30	Instrument ID:	A4HP9	Operator ID:	001710
Lims ID:	240-80850-E-1-A	Lab Sample ID:	240-80850-1	Worklist Smp#:	27
Client ID:	JG-098/ODOT BRINE TANK				
Injection Vol:	1.0 ul	Dil. Factor:	1.0000	ALS Bottle#:	27
Method:	8270 _9	Limit Group:	MSS 8270C ICAL		

Column: 5% phenyl (0.18 mm)



MoGADORE

VOC

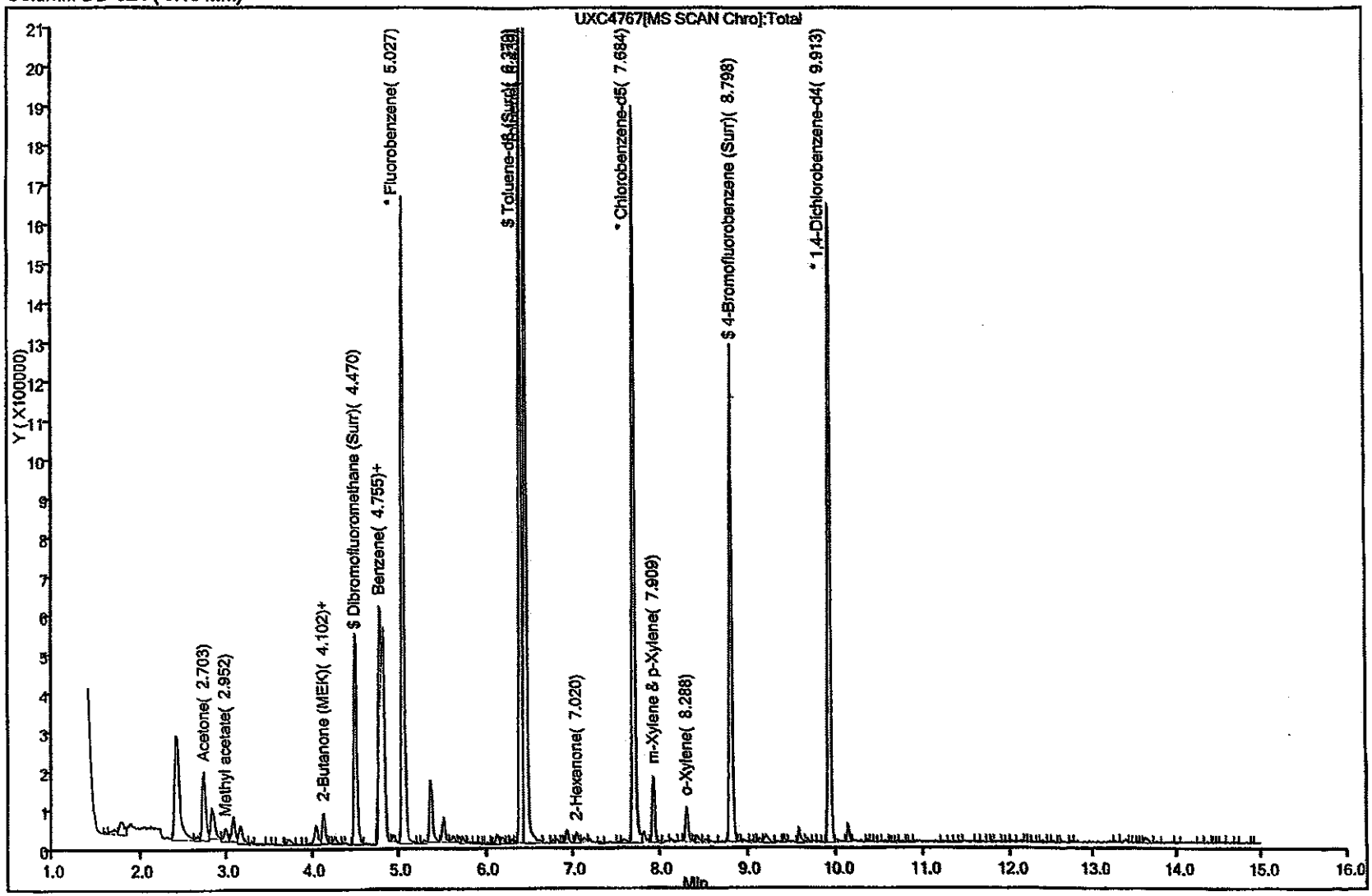
Report Date: 19-Jun-2017 08:32:17 Chrom Revision: 2.2 25-Apr-2017 13:27:22

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A3UX15\20170618-66102.b\UXC4767.D

Injection Date:	18-Jun-2017 23:15:30	Instrument ID:	A3UX15	Operator ID:	
Lims ID:	240-80852-B-3	Lab Sample ID:	240-80852-3	Worklist Smp#:	45
Client ID:	JG-099/PRE-TREATMENT TANK				
Purge Vol:	5.000 mL	Dil. Factor:	33.3300	ALS Bottle#:	20
Method:	8260_15	Limit Group:	MSV 8260B ICAL		

Column: DB-624 (0.18 mm)



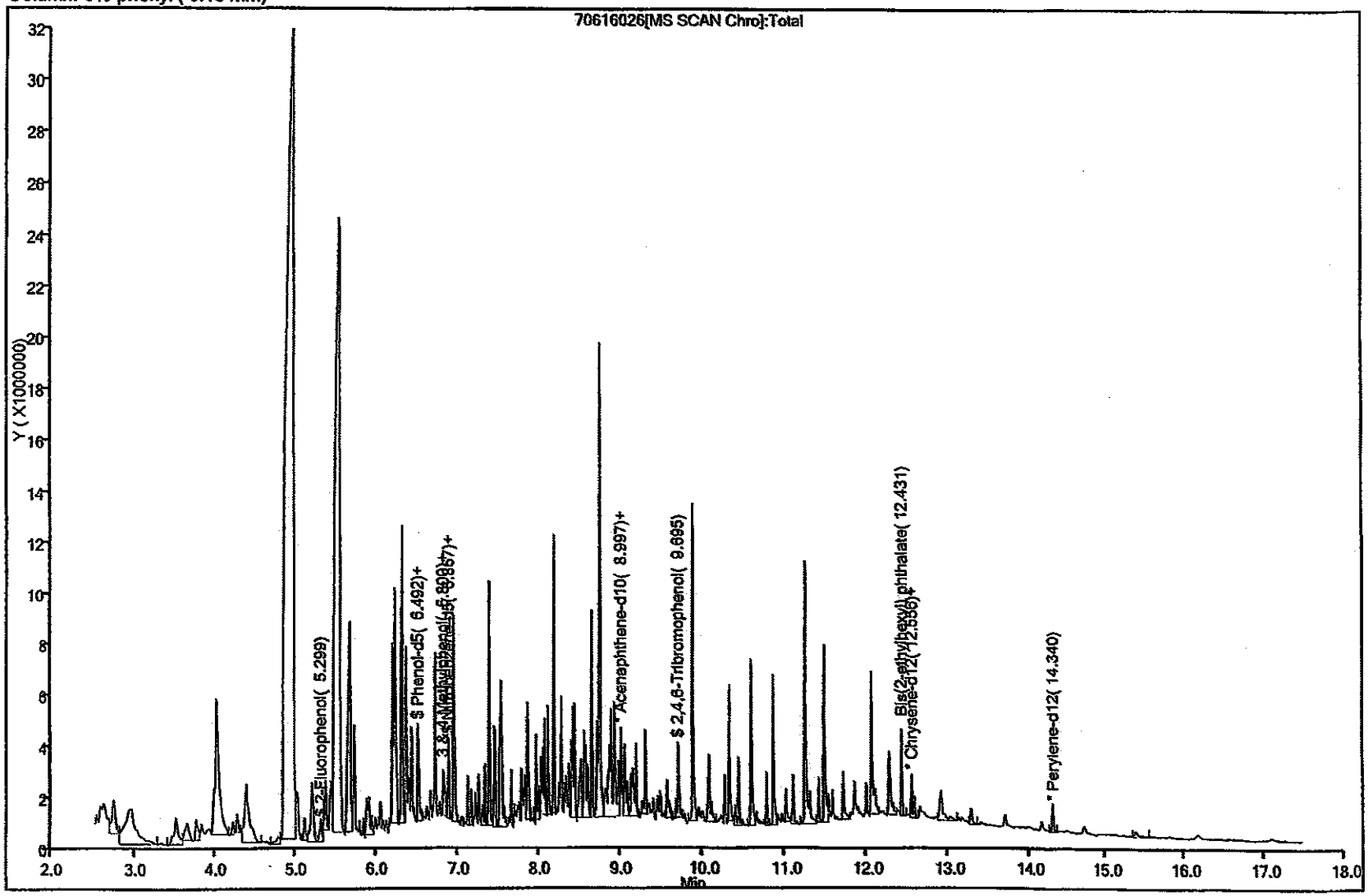
Report Date: 18-Jun-2017 13:14:33 Chrom Revision: 2.2 25-Apr-2017 13:27:22

TestAmerica Canton

Data File:	\\ChromNA\Canton\ChromData\A4HP9\20170616-66038.b\70616026.D				
Injection Date:	16-Jun-2017 18:19:30	Instrument ID:	A4HP9	Operator ID:	001710
Lims ID:	240-80852-A-1-A	Lab Sample ID:	240-80852-1	Worklist Smp#:	26
Client ID:	UG-099/PRE-TREATMENT TANK				
Injection Vol:	1.0 ul	Dil. Factor:	1.0000	ALS Bottle#:	26
Method:	8270 _9	Limit Group:	MSS 8270C ICAL		

Column: 5% phenyl (0.18 mm)

MOGADORE SVOC



MOGADORE

VOC

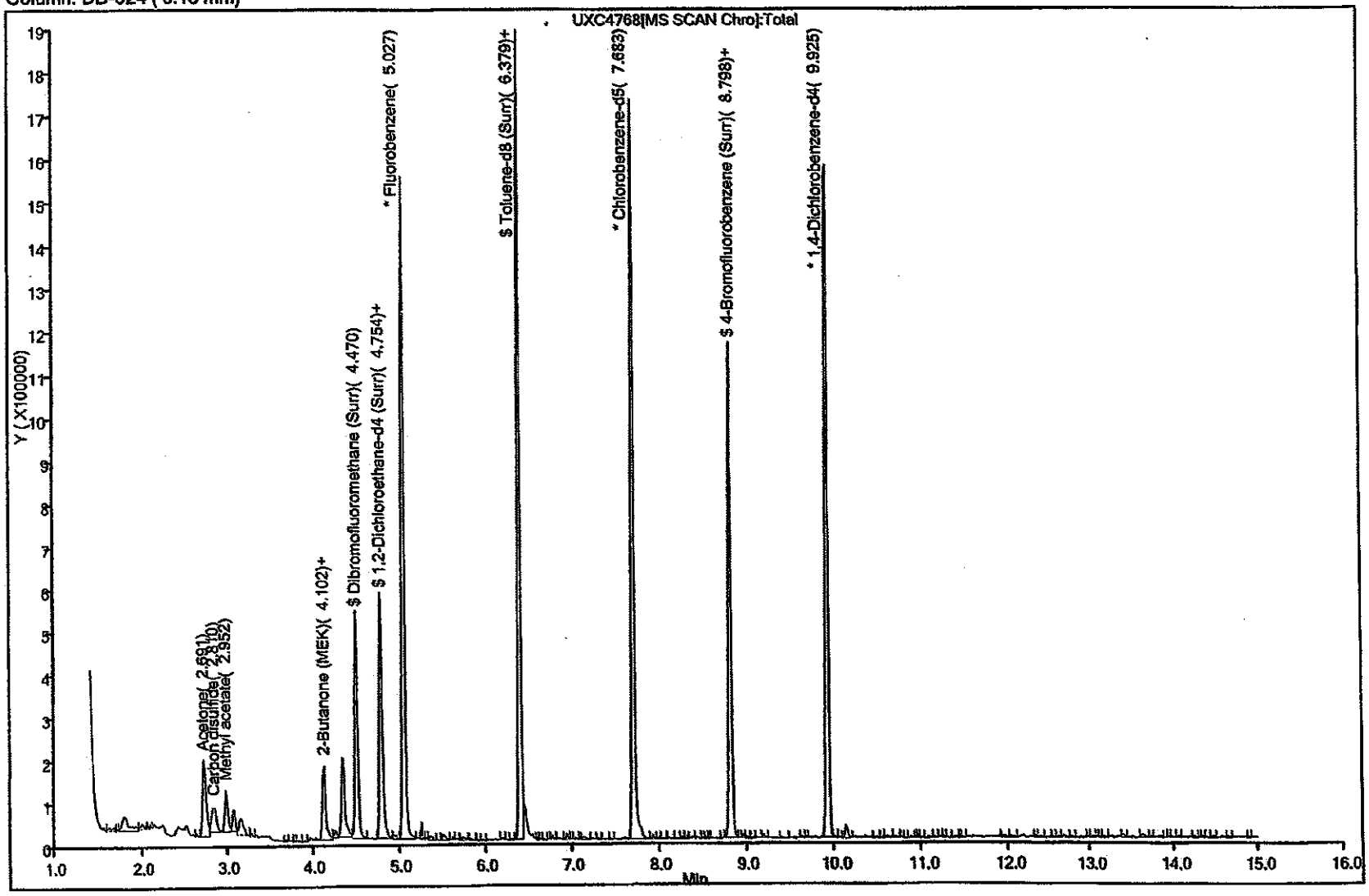
Report Date: 19-Jun-2017 08:32:18 Chrom Revision: 2.2 25-Apr-2017 13:27:22

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A3UX15\20170618-66102.b\UXC4768.D

Injection Date:	18-Jun-2017 23:37:30	Instrument ID:	A3UX15	Operator ID:	
Lims ID:	240-80852-A-6	Lab Sample ID:	240-80852-6	Worklist Smp#:	46
Client ID:	JG-100/POST TREATMENT				
Purge Vol:	5.000 mL	Dil. Factor:	14.2900	ALS Bottle#:	21
Method:	8260_15	Limit Group:	MSV 8260B ICAL		

Column: DB-624 (0.18 mm)



MOGADORE

SVOC

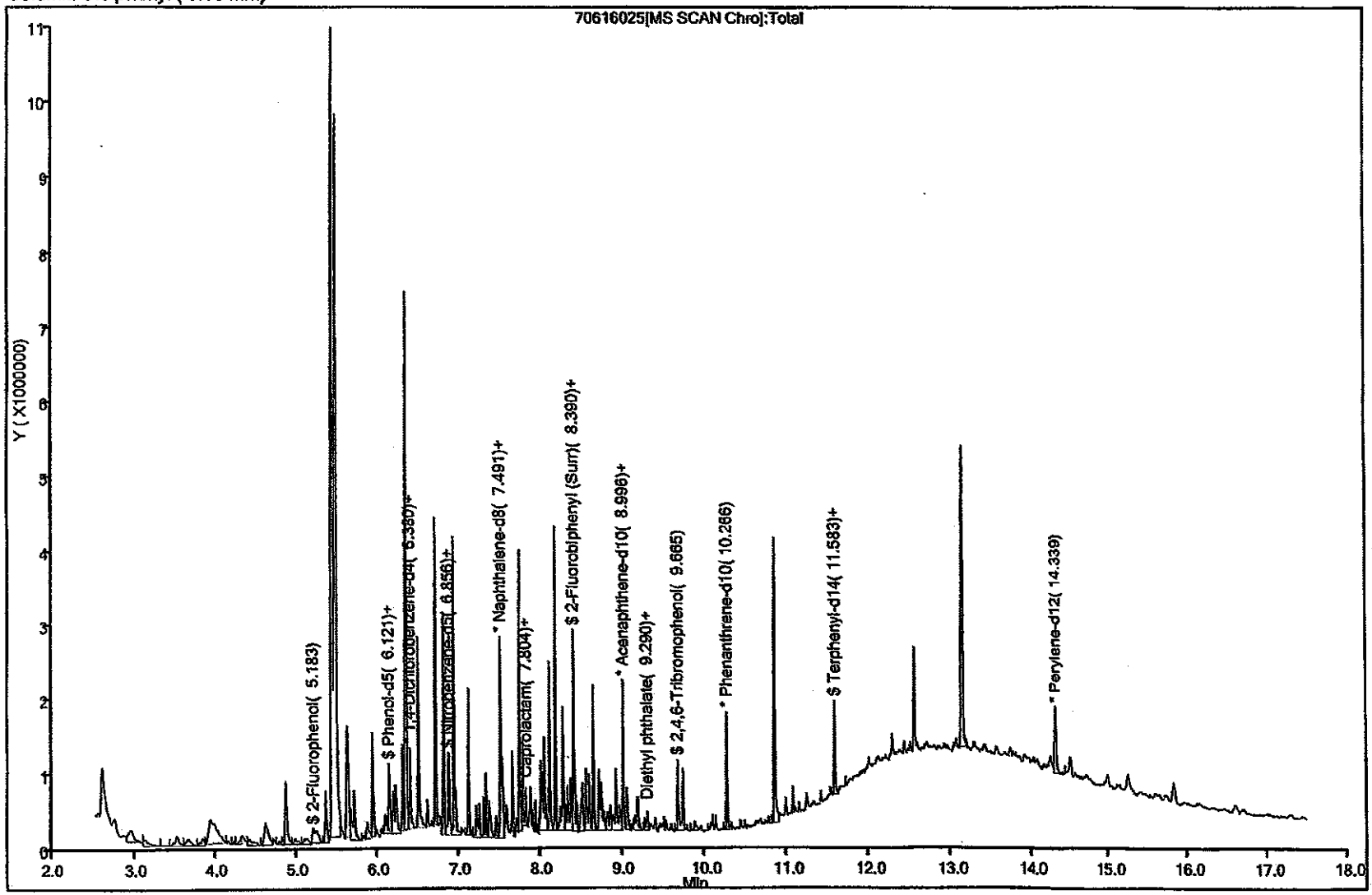
Report Date: 18-Jun-2017 13:14:30 Chrom Revision: 2.2 25-Apr-2017 13:27:22

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A4HP9\20170616-66038.b\70616025.D

Injection Date:	16-Jun-2017 17:54:30	Instrument ID:	A4HP9	Operator ID:	001710
Lims ID:	240-80852-A-4-A	Lab Sample ID:	240-80852-4	Worklist Smp#:	25
Client ID:	JG-100/POST TREATMENT				
Injection Vol:	1.0 ul	Dil. Factor:	1.0000	ALS Bottle#:	25
Method:	8270 _9	Limit Group:	MSS 8270C ICAL		

Column: 5% phenyl (0.18 mm)



CLEVELAND

VOC

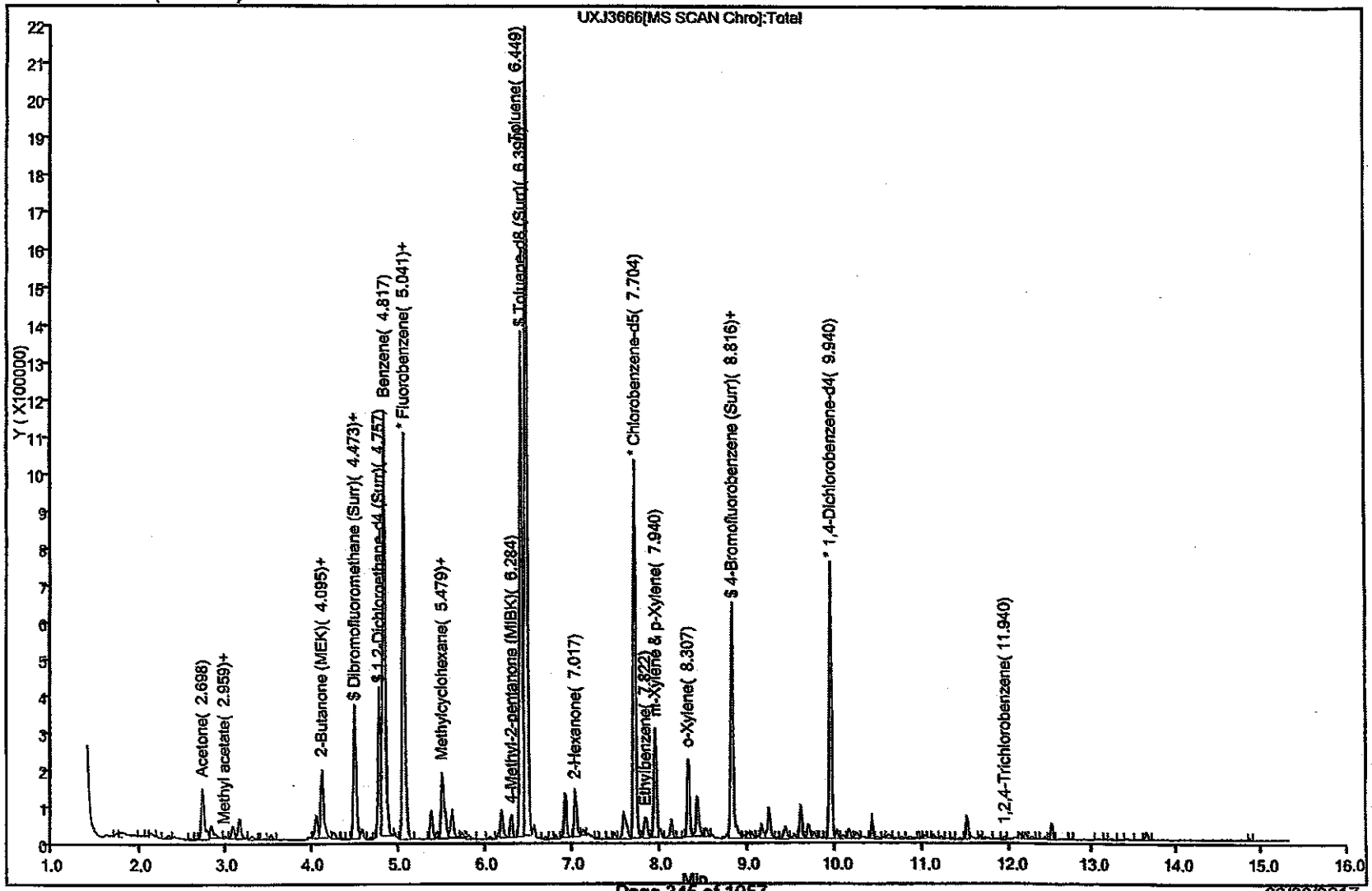
Report Date: 26-Jun-2017 07:40:49 Chrom Revision: 2.2 20-Jun-2017 07:42:38

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A3UX11\20170623-66291.b\UXJ3666.D

Injection Date:	23-Jun-2017 19:40:30	Instrument ID:	A3UX11	Operator ID:	43582
Lims ID:	240-81011-B-3	Lab Sample ID:	240-81011-3	Worklist Smp#:	51
Client ID:	JG-101/PRE-TREATMENT				
Purge Vol:	5.000 mL	Dil. Factor:	6.6700	ALS Bottle#:	29
Method:	8260_11	Limit Group:	MSV 8260B ICAL		

Column: DB-624 (0.18 mm)



06/30/2017

CLEVELAND

SVOC

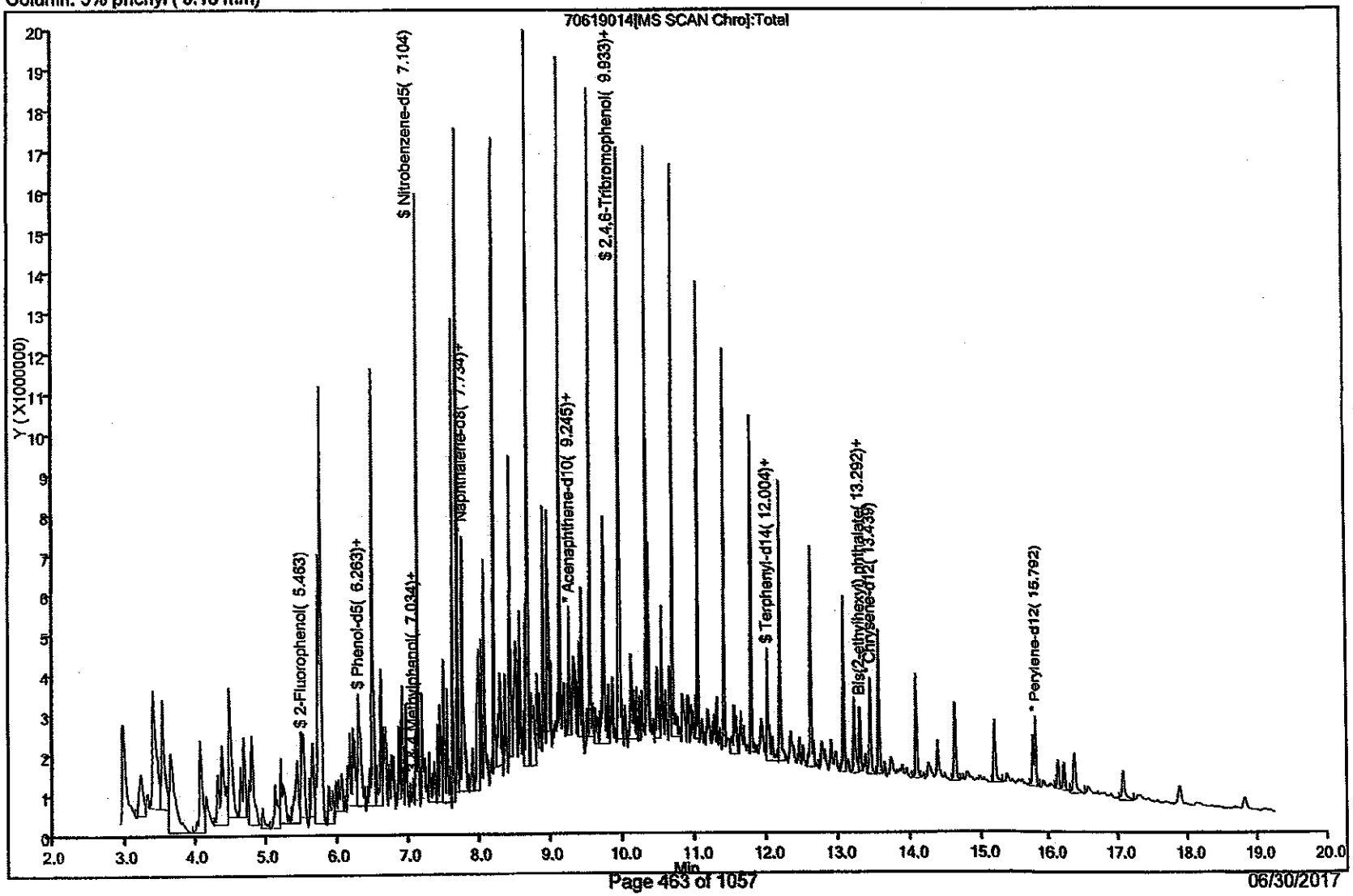
Report Date: 21-Jun-2017 10:02:28 Chrom Revision: 2.2 20-Jun-2017 07:42:38

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A4AG2\20170619-66109.b\70619014.D

Injection Date:	19-Jun-2017 12:02:30	Instrument ID:	A4AG2	Operator ID:	
Lims ID:	240-81011-A-1-A	Lab Sample ID:	240-81011-1	Worklist Smp#:	14
Client ID:	JG-101/PRE-TREATMENT				
Injection Vol:	1.0 ul	Dil. Factor:	1.0000	ALS Bottle#:	14
Method:	8270 ag2	Limit Group:	MSS 8270C ICAL		

Column: 5% phenyl (0.18 mm)



06/30/2017

CLEVELAND

VOC

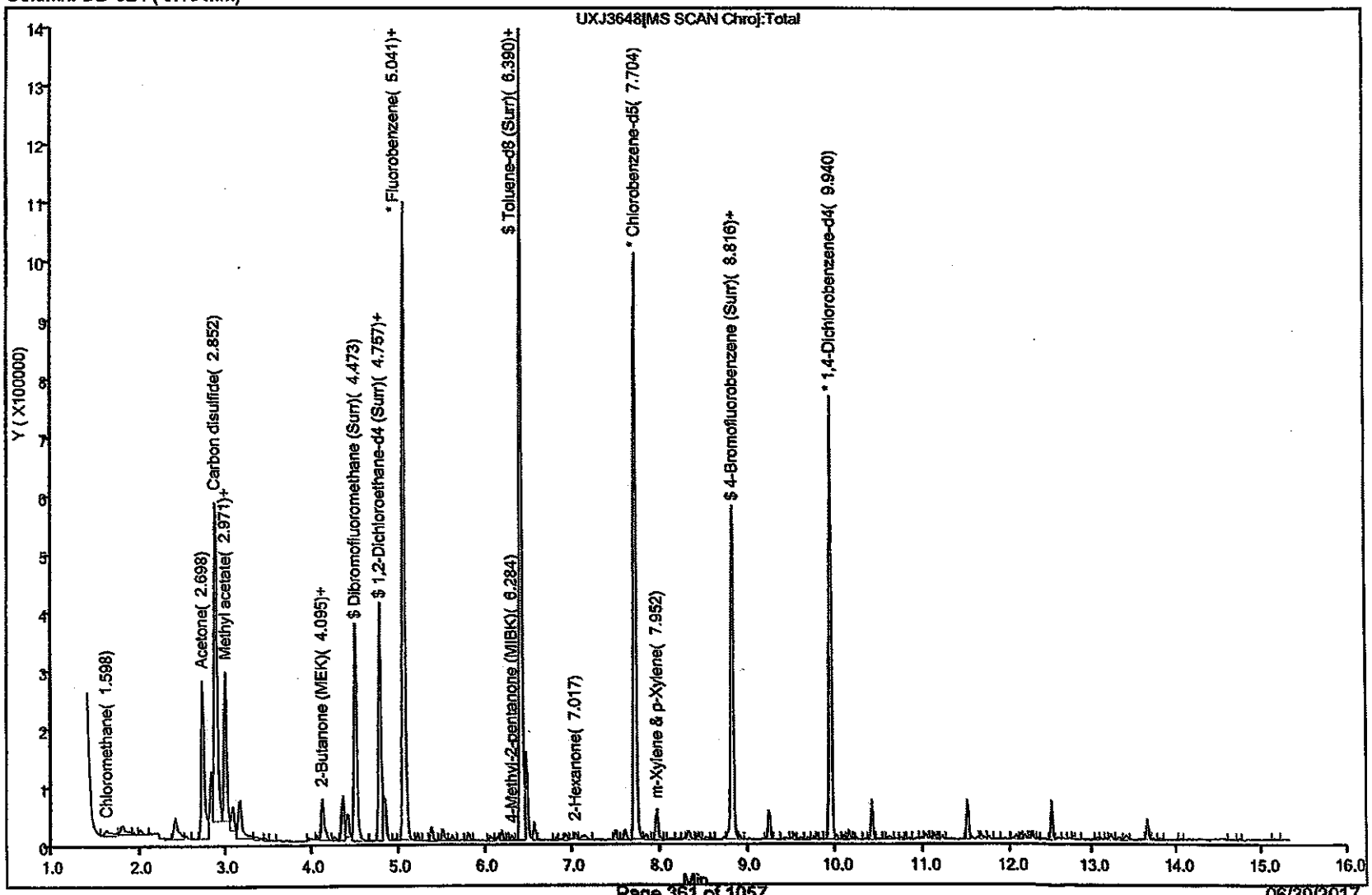
Report Date: 26-Jun-2017 07:40:34 Chrom Revision: 2.2 20-Jun-2017 07:42:38

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A3UX11\20170623-66291.b\UXJ3648.D

Injection Date:	23-Jun-2017 12:51:30	Instrument ID:	A3UX11	Operator ID:	43582
Lims ID:	240-81011-B-6	Lab Sample ID:	240-81011-6	Worklist Smp#:	35
Client ID:	JG-102/POST-TREATMENT				
Purge Vol:	5.000 mL	Dil. Factor:	5.0000	ALS Bottle#:	11
Method:	8260_11	Limit Group:	MSV 8260B ICAL		

Column: DB-624 (0.18 mm)



CLEVELAND

SVOC

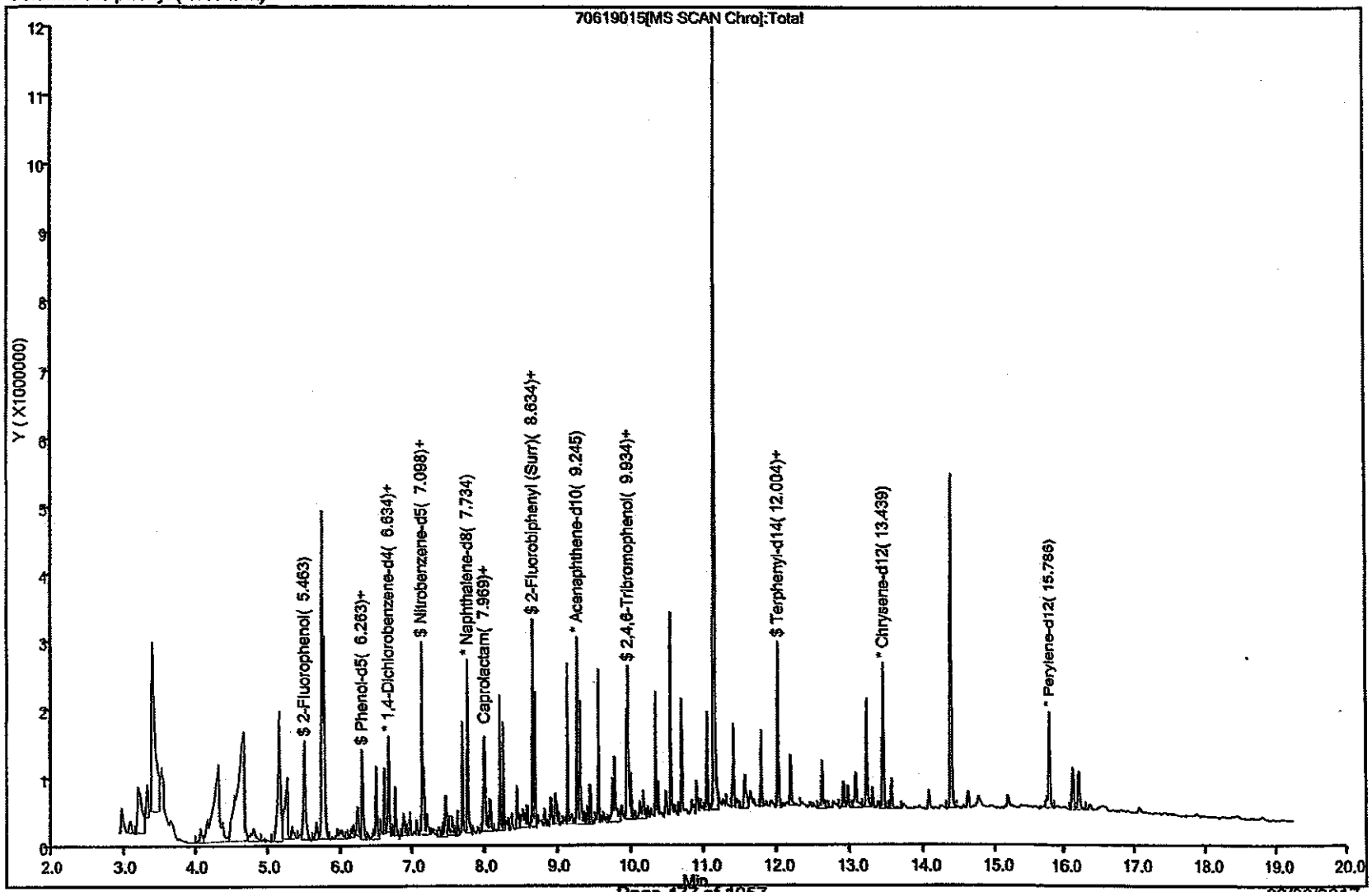
Report Date: 21-Jun-2017 10:02:25 Chrom Revision: 2.2 20-Jun-2017 07:42:38

TestAmerica Canton

Data File: \\ChromNA\Canton\ChromData\A4AG2\20170619-66109.b\70619015.D

Injection Date:	19-Jun-2017 12:26:30	Instrument ID:	A4AG2	Operator ID:	
Lims ID:	240-81011-A-4-A	Lab Sample ID:	240-81011-4	Worklist Smp#:	15
Client ID:	UG-102/POST-TREATMENT				
Injection Vol:	1.0 ul	Dil. Factor:	1.0000	ALS Bottle#:	15
Method:	8270 ag2	Limit Group:	MSS 8270C ICAL		

Column: 5% phenyl (0.18 mm)



Gas Chromatographs of pre-treatment and post-treatment of brine tanks of Duck Creek Energy and ODOT tank containing AquaSalina

The Division of Oil and Gas Resources Management (DOGRM) sampled the pre-treatment and post-treatment brine tanks at Duck Creek Energy's Cleveland and Mogadore facilities. In addition, DOGRM sampled a tank containing AquaSalina delivered to an ODOT facility. The samples were provided to TestAmerica for gas chromatography (GC) analysis. In these samples, GC analysis was used to determine if volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) were present in the brine sampled. Each peak or mound on an analysis represents the presence of VOC or SVOC as indicated on the analysis. Note that a mound indicates that multiple VOCs and SVOCs are present in the mound, but the analysis/equipment was unable to separate the VOCS or SVOCs into individual peaks. If VOCs or SVOCs were not present in the brine, no peaks would appear on an analysis. The table below is a summary GC analysis of the tanks sampled.

Tank Sample	Volatile Organic Compounds	Semi-Volatile Organic Compounds
Pre-Treatment Cleveland	✓	✓
Post-Treatment Cleveland	✓	✓
Pre-Treatment Mogadore	✓	✓
Post-Treatment Mogadore	✓	✓
ODOT tank of AquaSalina	✓	✓

*The DOGRM did not use the GC analysis to substantiate the peaks identified in the analysis. Rather, it was used to determine if VOCs and SVOCs were present in the tanks sampled.