

Patrick Boettcher  
Department of Natural Resources and Environmental Control  
Site Investigation & Restoration Section  
391 Lukens Drive  
New Castle, DE 19720

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Delaware 19801  
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Fax 302 658 2068  
[www.arcadis.com](http://www.arcadis.com)

Subject:  
Atlas Point Ethylene Oxide Release Incident Response  
Soil and Groundwater Sampling and Results

ENVIRONMENT

CONFIDENTIAL  
ATTORNEY-CLIENT PRIVILEGED  
PERFORMED AT THE DIRECTION OF COUNSEL

Date:  
March 8, 2019

Dear Mr. Boettcher:

Contact:  
Bob Helkowski

At the request of Croda Inc. (Croda), and in response to your November 26, 2018, email to Arcadis U.S., Inc. (Arcadis), Arcadis collected soil and groundwater samples for laboratory analyses of chemical constituents (ethylene oxide and 1,4 dioxane) related to the Ethylene Oxide (EO) Release Incident Response at the Croda Atlas Point Site in New Castle, Delaware (Site).

Phone:  
302-884-6907

Email:  
[Bob.Helkowski@arcadis.com](mailto:Bob.Helkowski@arcadis.com)

Our ref:  
05814003.0002

## BACKGROUND

On November 25, 2018, a leak was detected in the Croda Atlas Point EO manufacturing plant. A subsequent response effort by Croda used water cannons and fixed deluge nozzles to apply water to leak point in order to minimize the release of EO into the atmosphere. Runoff from the response action discharged to the on-site 180,000-gallon capacity spill sump, which discharges to the on-site wastewater treatment plant. The sump could not handle the volume of quench water used and as a result approximately 700,000 gallons of water were released from two process sewer manholes located upstream of the EO spill sump. Runoff flowed overland towards the adjacent heavily vegetated area known as the United States Army Corps of Engineers (USACE) Dredge Spoil Area (DSA). Figures 1 and 2 show the suspected overflow area.

## HYDROLOGIC ANALYSIS – MAP OF SUSPECTED OVERFLOW AREA

At the request of DNREC Stormwater Discharges Section in its email dated December 18, 2018, Arcadis completed a hydrologic analysis to map the suspected overflow area from the quench water deluge that occurred on November 25, 2018 into the DSA. The suspected overflow was defined as shown on Figures 1, 2, and 3. The methodology and assumptions used in Arcadis' hydrologic analysis are described in Arcadis' letter to Nicole Smith dated March 6, 2019. The analyses showed that the modeled water surface elevations are lower than the surrounding topographic elevations, indicating that the overflow stayed within Croda's property boundary, as depicted on Figure 3.

## SOIL AND GROUNDWATER INVESTIGATION

The soil and groundwater sampling was performed as discussed and agreed during the December 13, 2018, site visit with DNREC-Site Investigation and Restoration Section (SIRS), and the sampling plan approved by Patrick Boettcher of DNREC-SIRS in his January 3, 2019 email. Results were compared to screening levels in the DNREC-SIRS Screening Level Table dated January 1, 2013 (Last Updated February 2018). Additionally, DNREC's lab director, Bob Schulte, approved the use of the laboratory analytical limit of quantitation as the screening levels for EO concentrations in soil and groundwater samples collected from the EO Release Incident Response.

The screening levels are summarized in the table below:

	Limit of Quantitation- Soil (mg/kg)	DNREC SIRS Screening Levels – Soils (mg/kg)	Limit of Quantitation- Groundwater (µg/L)	DNREC SIRS Screening Levels – Groundwater (µg/L)
1,4-Dioxane	0.00067	5.3	0.3	0.46
Ethylene Oxide	0.025	0.2	25	0.067

### Sampling Plan

The soil and groundwater sampling was completed in accordance with the January 3, 2019 approved sampling plan and included advancing five soil borings and installation of one temporary well in the low-lying area located outside the super silt fence and extending to the fence line adjacent to the DSA (Figures 1 and 2). The soil borings were installed in the pathway of surface water discharge during the EO incident response, based on field observations and reviews of topographic survey maps.

The samples included:

- Advancing four (4) shallow soil borings (IRSB-1, -2, -3, -4) along the fence line and collection of 4 shallow soil (0-2 feet) samples.
- Advancing one deeper soil boring (IRTW-1) and collection of one shallow soil sample (0-2 feet) and four (4) deep soil samples and installation of one temporary well. Continuous samples were collected in two-foot intervals from ground surface to just above the shallow water table, approximately 10 feet below grade. After the soil samples were collected, the tooling was advanced ten feet below the estimated water table surface and a 10-foot length of pre-packed well screen was set. The temporary well was purged and allowed to set for 24 hours prior to collecting a groundwater sample.
- Air monitoring of the breathing zone was conducted using EO sensors provided by Croda Atlas Point, as well as a photoionization detector (PID) rented by Arcadis and calibrated for EO. Weather conditions and primary wind direction were assessed prior to starting work and monitored to establish and maintain a safe working area. Action levels were established based on field screening levels in excess of 1 ppm EO sustained for 5 minutes. Concentrations did not exceed the action level for 5 minutes during the soil and groundwater investigation.
- Samples were screened with the EO sensors and the PID visually inspected, and soil lithologic types were logged. There was no evidence of potential impacts based on the field screening.
- Quality control samples, including field duplicates and trip blank, were collected to ensure accurate results. Groundwater samples and duplicates were collected at separate times due to a low rate of recharge in the temporary well.

## Results and Conclusions

Arcadis submitted samples on January 24, 2019, to Eurofins Lancaster Laboratories under chain of custody for EO and 1,4-dioxane analysis by EPA SW-846 methods, including select ion method (SIM) isotope dilution for 1,4-dioxane. Laboratory data packages are included in Attachment 1.

Results are summarized on Figure 4. EO was not detected in the soil or groundwater samples. 1,4-dioxane was detected in the soil samples at concentrations below the soil screening level of 5.3 mg/kg. 1,4-Dioxane was also detected in the groundwater sample and the duplicate samples collected from the temporary well IRTW-1 above the groundwater screening level of 0.46 µg/L.

Should you have any questions, please feel free to contact Derrick Schweitzer of Croda at 302-429 5201, or Bob helkowski at 302-884-6907.

Mr. Patrick Boettcher  
March 8, 2019

Sincerely,

Arcadis U.S., Inc.

A handwritten signature in blue ink that reads "Robert Helkowski". The signature is written in a cursive style.

Robert Helkowski  
Senior Environmental Engineer

Copies:  
Derrick Schweitzer, Croda Inc.

Enclosures:

**Figures**

- 1 Site Map
- 2 Overflow Location
- 3 Hydrologic Analysis
- 4 Soil and Groundwater Analytical Results

**Attachments**

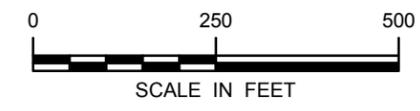
- 1 Laboratory Analytical Data Packages

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 FILE: Z:\GIS\Projects\ ENVACRODA BCEE AtlasPoint DE\2018\MXD\CaskettLeak\CRODA 01\_ResponseWaterRunoffArea\_AppendixLocations.mxd DATE: 2/11/2019 10:14:48 AM



LEGEND		
	Temporary Well	
	Soil Boring	
	EO Sump	
	Property Boundary	
	Underground Conveyance to EO Sump	
	Surface Water Flow path	
	x 5.8 Spot Elevation	
	Topographic Contours	
	Soil Types from Natural Resources Conservation Service (NRCS) Web Soil Survey: TP (Transquaking and Mispillion) and UwA (Udortheents); W (Water)	
	Modeled Water Surface Elevation at Infiltration Rate of 1 in./hour	
	Modeled Water Surface Elevation at Infiltration Rate of 2 in./hour	

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**DIRECTION OF COUNSEL**



ICI AMERICAS INC. ATLAS POINT SITE  
 NEW CASTLE, DELAWARE

**SITE MAP**

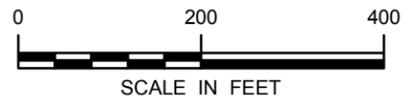


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- LEGEND**
- Temporary Well
  - Soil Boring
  - EO Sump
  - Property Boundary
  - Underground Conveyance to EO Sump
  - Surface Water Flow path

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**DIRECTION OF COUNSEL**

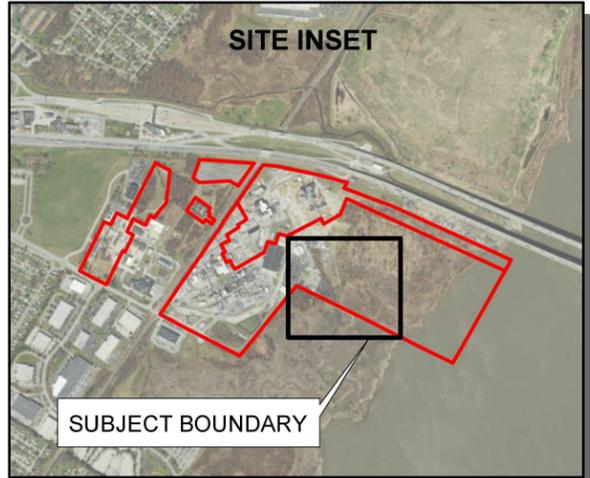
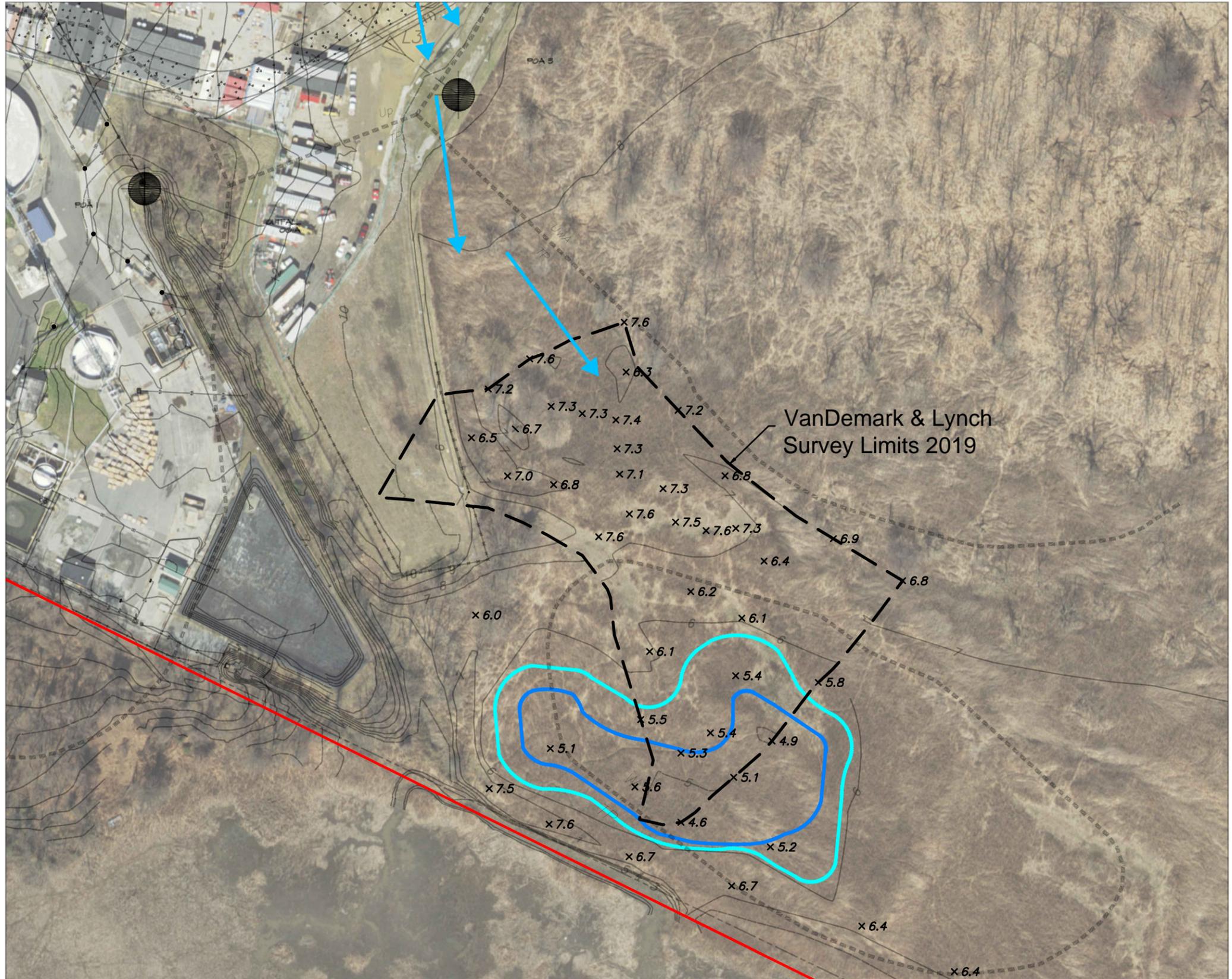


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NEW CASTLE, DELAWARE

**OVERFLOW LOCATION**



CITY:\Recep\ DIV\GROUP\Recep\ DB\Recep\ LD\Opt\ PIC\Opt\ PM\Recep\ TM\Opt\ LVR\Option=-OFF=REF\*  
 D:\GIS\Project Files\GRODA\_BCEE\_AtlasPoint\_DEV\CAD\CRODA\_HYDROLOGY\CAD\CRODA\_2019\_Layout.dwg LAYOUT: 3 SAVED: 2/8/2019 4:32 PM ACADVER: 21.05 (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS NOV1.CTB PLOTTED: 2/8/2019 4:35 PM BY: YARBROUGH, TOBI

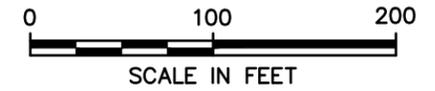


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**LEGEND**

- Property Boundary
- x 5.8 Spot Elevation
- Topographic Contours
- Soil Types from Natural Resources Conservation Service (NRCS) Web Soil Survey: TP (Transquaking and Mispillion) and Uwa (Udortheents); W (Water)

Infiltration Rate (in/hr)	Water Surface Elevation	Area (SF)
1.0	5.73	56662
2.0	5.32	29325



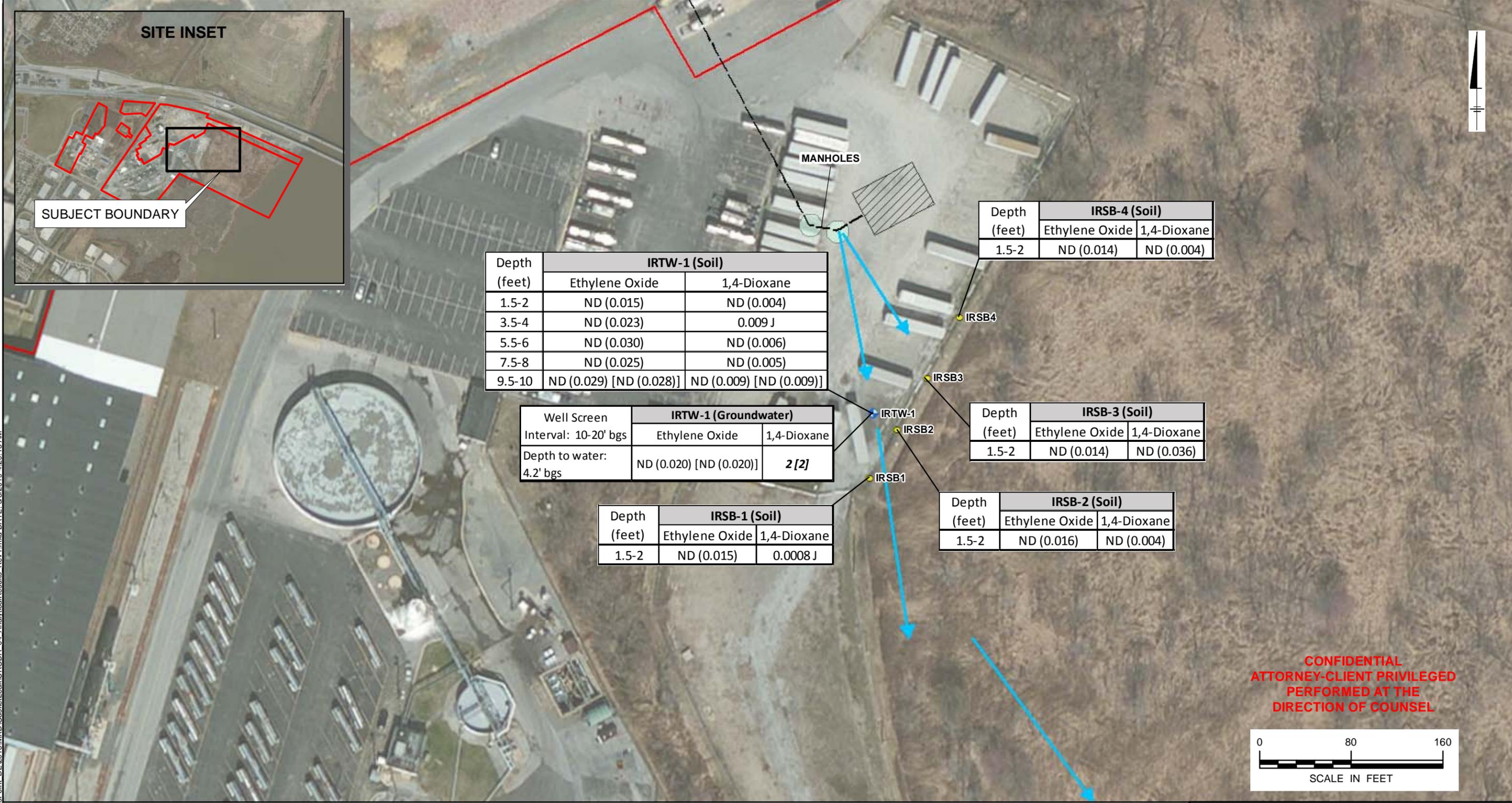
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 NEW CASTLE, DELAWARE

**HYDROLOGIC ANALYSIS**

*Design & Consultancy  
 for natural and built environments*

FIGURE  
**3**

CITY: (KNOXVILLE) DIV(GROUP: (ENV/GIS) DB: kgpeters LD: PIC: PM: TM: PROJECT: AA000000.0000.000000  
 FILE: Z:\GIS\Projects\ENVCRODA\_BCEE\_AtlasPoint\_DE2018\MXD\GasLeak\CRODA\_04\_AnalyticalResults\_Rev1.mxd DATE: 3/8/2019 4:29:13 AM



Depth (feet)	IRTW-1 (Soil)	
	Ethylene Oxide	1,4-Dioxane
1.5-2	ND (0.015)	ND (0.004)
3.5-4	ND (0.023)	0.009 J
5.5-6	ND (0.030)	ND (0.006)
7.5-8	ND (0.025)	ND (0.005)
9.5-10	ND (0.029) [ND (0.028)]	ND (0.009) [ND (0.009)]

Well Screen Interval: 10-20' bgs	IRTW-1 (Groundwater)	
	Ethylene Oxide	1,4-Dioxane
Depth to water: 4.2' bgs	ND (0.020) [ND (0.020)]	<b>2 [2]</b>

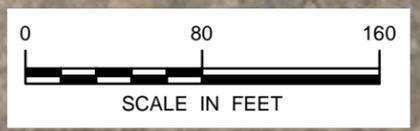
Depth (feet)	IRSB-1 (Soil)	
	Ethylene Oxide	1,4-Dioxane
1.5-2	ND (0.015)	0.0008 J

Depth (feet)	IRSB-4 (Soil)	
	Ethylene Oxide	1,4-Dioxane
1.5-2	ND (0.014)	ND (0.004)

Depth (feet)	IRSB-3 (Soil)	
	Ethylene Oxide	1,4-Dioxane
1.5-2	ND (0.014)	ND (0.036)

Depth (feet)	IRSB-2 (Soil)	
	Ethylene Oxide	1,4-Dioxane
1.5-2	ND (0.016)	ND (0.004)

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- LEGEND**
- Temporary Well
  - Soil Boring
  - EO Sump
  - Property Boundary
  - Underground Conveyance to EO Sump
  - Surface Water Flow path

ND (#) – Non-Detect (Method Detection Limit)  
 ' bgs – Below Ground Surface  
 [ ] – [Field Duplicate Analytical Result]  
 All groundwater concentrations are represented in micrograms per liter (µg/L)  
 All soil concentrations are represented in milligrams per kilogram (mg/kg)

	Limit of Quantitation Soil (mg/kg)	DNREC SIRS Screening Levels Soil (mg/kg)	Limit of Quantitation Groundwater (µg/L)	DNREC SIRS Screening Levels Groundwater (µg/L)
1,4 Dioxane	0.00067	5.3	0.3	0.46
Ethylene Oxide	0.025	0.2	25	0.067

\* - DNREC Screening Levels were increased by a factor of 10 to evaluate unacceptable risk for industrial use.

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 NEW CASTLE, DELAWARE

**SOIL AND GROUNDWATER ANALYTICAL RESULTS**

**ARCADIS** Design & Consultancy for natural and built assets

FIGURE **4**



## ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental  
2425 New Holland Pike  
Lancaster, PA 17601

Prepared for:

ARCADIS U.S., Inc.  
630 Plaza Drive  
Suite 600  
Highlands Ranch CO 80129

Report Date: February 08, 2019 10:16

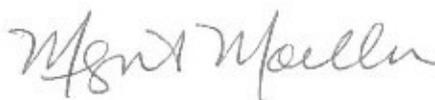
### Project: Croda Atlas Point

Account #: 03074  
Group Number: 2026649  
SDG: CAP99  
PO Number: 05814003  
State of Sample Origin: DE

Electronic Copy To Arcadis  
Electronic Copy To Arcadis  
Electronic Copy To Arcadis

Attn: Bob Helkowski  
Attn: Erika Denkenberger  
Attn: Grayson Basalyga

Respectfully Submitted,



Megan A. Moeller  
Senior Specialist

(717) 556-7261

To view our laboratory's current scopes of accreditation please go to <https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/> . Historical copies may be requested through your project manager.



### SAMPLE INFORMATION

<u>Client Sample Description</u>	<u>Sample Collection Date/Time</u>	<u>ELLE#</u>
IRTW-1 Grab Groundwater	01/23/2019 08:40	9974004
DUP-IRTW-1 Grab Groundwater	01/23/2019 09:30	9974005
FB-012319 Grab Water	01/23/2019	9974006

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

**Sample Description:** IRTW-1 Grab Groundwater  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: WW 9974004  
ELLE Group #: 2026649  
Matrix: Groundwater

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/23/2019 08:40  
SDG#: CAP99-01

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
		<b>SW-846 8270D SIM</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
14244	1,4-Dioxane	123-91-1	2	0.1	0.3	1

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14244	SIM SVOAs 8270D MINI	SW-846 8270D SIM	1	19029WAH026	02/07/2019 13:21	Catherine E Bachman	1
10466	BNA Water Extraction SIM	SW-846 3510C	1	19029WAH026	01/30/2019 09:00	Logan M Brosemer	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** DUP-IRTW-1 Grab Groundwater  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: WW 9974005  
ELLE Group #: 2026649  
Matrix: Groundwater

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/23/2019 09:30  
SDG#: CAP99-02FD

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
		<b>SW-846 8270D SIM</b>	<b>ug/l</b>	<b>ug/l</b>	<b>ug/l</b>	
14244	1,4-Dioxane	123-91-1	2	0.1	0.3	1

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14244	SIM SVOAs 8270D MINI	SW-846 8270D SIM	1	19029WAH026	02/07/2019 13:50	Catherine E Bachman	1
10466	BNA Water Extraction SIM	SW-846 3510C	1	19029WAH026	01/30/2019 09:00	Logan M Brosemer	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** FB-012319 Grab Water  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: WW 9974006  
ELLE Group #: 2026649  
Matrix: Water

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/23/2019  
SDG#: CAP99-03FB

CAT No.	Analysis Name	CAS Number	Result	Method Detection Limit*	Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
14244	1,4-Dioxane	123-91-1	N.D.	0.1	0.3	1

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
14244	SIM SVOAs 8270D MINI	SW-846 8270D SIM	1	19029WAH026	02/07/2019 14:19	Catherine E Bachman	1
10466	BNA Water Extraction SIM	SW-846 3510C	1	19029WAH026	01/30/2019 09:00	Logan M Brosemer	1

\*=This limit was used in the evaluation of the final result

## Quality Control Summary

Client Name: ARCADIS U.S., Inc.  
Reported: 02/08/2019 10:16

Group Number: 2026649

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

### Method Blank

Analysis Name	Result ug/l	MDL** ug/l	LOQ ug/l
Batch number: 19029WAH026 1,4-Dioxane	Sample number(s): 9974004-9974006 N.D.	0.1	0.3

### LCS/LCSD

Analysis Name	LCS Spike Added ug/l	LCS Conc ug/l	LCSD Spike Added ug/l	LCSD Conc ug/l	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 19029WAH026 1,4-Dioxane	Sample number(s): 9974004-9974006 1.00	0.508	1.00	0.516	51	52	10-118	2	30

### Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: SIM SVOAs 8270D MINI  
Batch number: 19029WAH026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
9974004	97	72	80
9974005	91	70	70
9974006	78	84	75
Blank	60	67	61
LCS	77	91	83
LCSD	72	84	74
Limits:	40-132	18-129	33-122

\*- Outside of specification

\*\* - This limit was used in the evaluation of the final result for the blank

(1) The result for one or both determinations was less than five times the LOQ.

(2) The unspiked result was more than four times the spike added.



## ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental  
2425 New Holland Pike  
Lancaster, PA 17601

Prepared for:

ARCADIS U.S., Inc.  
630 Plaza Drive  
Suite 600  
Highlands Ranch CO 80129

Report Date: February 08, 2019 17:19

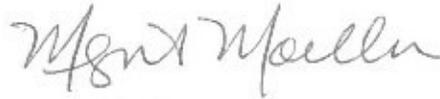
### Project: Croda Atlas Point

Account #: 03074  
Group Number: 2026651  
PO Number: 05814003

Electronic Copy To Arcadis  
Electronic Copy To Arcadis  
Electronic Copy To Arcadis

Attn: Bob Helkowski  
Attn: Erika Denkenberger  
Attn: Grayson Basalyga

Respectfully Submitted,



Megan A. Moeller  
Senior Specialist

(717) 556-7261

To view our laboratory's current scopes of accreditation please go to <https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/> . Historical copies may be requested through your project manager.

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Pensacola

3355 McLemore Drive

Pensacola, FL 32514

Tel: (850)474-1001

TestAmerica Job ID: 400-165428-2

Client Project/Site: 2026651 - Ethylene Oxide

For:

Eurofins Lancaster Laboratories Env LLC

2425 New Holland Pike

Lancaster, Pennsylvania 17601

Attn: Hannah Cottman



Authorized for release by:

2/8/2019 12:08:44 PM

John Cady, Manager of Project Management

(713)690-4444

[john.cady@testamericainc.com](mailto:john.cady@testamericainc.com)

### LINKS

Review your project  
results through

TotalAccess

Have a Question?



Visit us at:

[www.testamericainc.com](http://www.testamericainc.com)

*The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.*

*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.*

# Detection Summary

Client: Eurofins Lancaster Laboratories Env LLC  
Project/Site: 2026651 - Ethylene Oxide

TestAmerica Job ID: 400-165428-2

**Client Sample ID: IRTW-1**

**Lab Sample ID: 400-165428-11**

No Detections.

**Client Sample ID: DUP-IRTW-1**

**Lab Sample ID: 400-165428-12**

No Detections.

**Client Sample ID: FB-012319**

**Lab Sample ID: 400-165428-13**

No Detections.

**Client Sample ID: TFB-012319**

**Lab Sample ID: 400-165428-14**

No Detections.

This Detection Summary does not include radiochemical test results.

TestAmerica Pensacola



# Sample Summary

Client: Eurofins Lancaster Laboratories Env LLC  
Project/Site: 2026651 - Ethylene Oxide

TestAmerica Job ID: 400-165428-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
400-165428-11	IRTW-1	Water	01/23/19 08:40	01/29/19 09:37
400-165428-12	DUP-IRTW-1	Water	01/23/19 09:30	01/29/19 09:37
400-165428-13	FB-012319	Water	01/23/19 00:00	01/29/19 09:37
400-165428-14	TFB-012319	Water	01/23/19 00:00	01/29/19 09:37

1

2

3

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# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026651 - Ethylene Oxide

TestAmerica Job ID: 400-165428-2

**Client Sample ID: IRTW-1**  
**Date Collected: 01/23/19 08:40**  
**Date Received: 01/29/19 09:37**

**Lab Sample ID: 400-165428-11**  
**Matrix: Water**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	20	U	25	20	ug/L			02/03/19 12:51	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	109		78 - 118					02/03/19 12:51	1
Toluene-d8 (Surr)	103		80 - 120					02/03/19 12:51	1
Dibromofluoromethane	102		81 - 121					02/03/19 12:51	1

- 1
- 2
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- 11
- 12
- 13
- 14
- 15

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026651 - Ethylene Oxide

TestAmerica Job ID: 400-165428-2

**Client Sample ID: DUP-IRTW-1**

**Lab Sample ID: 400-165428-12**

**Date Collected: 01/23/19 09:30**

**Matrix: Water**

**Date Received: 01/29/19 09:37**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	20	U	25	20	ug/L			02/03/19 13:13	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	108		78 - 118		02/03/19 13:13	1
Toluene-d8 (Surr)	104		80 - 120		02/03/19 13:13	1
Dibromofluoromethane	103		81 - 121		02/03/19 13:13	1



# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026651 - Ethylene Oxide

TestAmerica Job ID: 400-165428-2

**Client Sample ID: FB-012319**

**Lab Sample ID: 400-165428-13**

**Date Collected: 01/23/19 00:00**

**Matrix: Water**

**Date Received: 01/29/19 09:37**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	20	U	25	20	ug/L			02/03/19 12:07	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	105		78 - 118					02/03/19 12:07	1
Toluene-d8 (Surr)	102		80 - 120					02/03/19 12:07	1
Dibromofluoromethane	104		81 - 121					02/03/19 12:07	1



# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
Project/Site: 2026651 - Ethylene Oxide

TestAmerica Job ID: 400-165428-2

**Client Sample ID: TFB-012319**

**Lab Sample ID: 400-165428-14**

**Date Collected: 01/23/19 00:00**

**Matrix: Water**

**Date Received: 01/29/19 09:37**

## Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	20	U	25	20	ug/L			02/03/19 12:29	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	106		78 - 118					02/03/19 12:29	1
Toluene-d8 (Surr)	100		80 - 120					02/03/19 12:29	1
Dibromofluoromethane	104		81 - 121					02/03/19 12:29	1



## ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental  
2425 New Holland Pike  
Lancaster, PA 17601

Prepared for:

ARCADIS U.S., Inc.  
630 Plaza Drive  
Suite 600  
Highlands Ranch CO 80129

Report Date: February 14, 2019 07:57

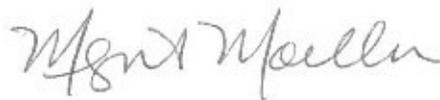
### Project: Croda Atlas Point

Account #: 03074  
Group Number: 2026648  
SDG: CAP98  
PO Number: 05814003  
State of Sample Origin: DE

Electronic Copy To Arcadis  
Electronic Copy To Arcadis  
Electronic Copy To Arcadis

Attn: Bob Helkowski  
Attn: Erika Denkenberger  
Attn: Grayson Basalyga

Respectfully Submitted,



Megan A. Moeller  
Senior Specialist

(717) 556-7261

To view our laboratory's current scopes of accreditation please go to <https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/>. Historical copies may be requested through your project manager.



## SAMPLE INFORMATION

<u>Client Sample Description</u>	<u>Sample Collection Date/Time</u>	<u>ELLE#</u>
IRTW-1 (1.5-2) Grab Soil	01/22/2019 09:20	9973994
IRTW-1 (3.5-4) Grab Soil	01/22/2019 09:23	9973995
IRTW-1 (5.5-6) Grab Soil	01/22/2019 09:27	9973996
IRTW-1 (7.5-8) Grab Soil	01/22/2019 09:30	9973997
IRTW-1 (9.5-10) Grab Soil	01/22/2019 09:34	9973998
FD-IRTW-1 (9.5-10) Grab Soil	01/22/2019 09:36	9973999
IRSB-1 (1.5-2) Grab Soil	01/22/2019 10:05	9974000
IRSB-2 (1.5-2) Grab Soil	01/22/2019 10:10	9974001
IRSB-3 (1.5-2) Grab Soil	01/22/2019 10:20	9974002
IRSB-4 (1.5-2) Grab Soil	01/22/2019 10:30	9974003

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

**Sample Description:** IRTW-1 (1.5-2) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9973994  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 09:20  
SDG#: CAP98-01

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	N.D.	4	10	5

The GC/MS semivolatile surrogate recoveries were outside of QC limits. The matrix spike and matrix spike duplicate samples were analyzed and surrogate recoveries were again outside of QC limits, indicating a matrix effect.

Reporting limits were raised due to interference from the sample matrix.

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

<b>Wet Chemistry</b>	<b>SM 2540 G-2011</b>	<b>%</b>	<b>%</b>	<b>%</b>
00111	Moisture	n.a.	15.9	0.50

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 08:43	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRTW-1 (3.5-4) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9973995  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 09:23  
SDG#: CAP98-02

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
		<b>SW-846 8270D SIM</b>	<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	9 J	5	13	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

Reporting limits were raised due to interference from the sample matrix.

<b>Wet Chemistry</b>		<b>SM 2540 G-2011</b>	<b>%</b>	<b>%</b>	<b>%</b>	
00111	Moisture	n.a.	36.6	0.50	0.50	1
Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.						

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 10:11	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRTW-1 (5.5-6) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9973996  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 09:27  
SDG#: CAP98-03

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	N.D.	6	15	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

Reporting limits were raised due to interference from the sample matrix.

<b>Wet Chemistry</b>	<b>SM 2540 G-2011</b>	<b>%</b>	<b>%</b>	<b>%</b>		
00111	Moisture	n.a.	46.5	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 10:41	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRTW-1 (7.5-8) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9973997  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 09:30  
SDG#: CAP98-04

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	N.D.	5	13	5

Reporting limits were raised due to interference from the sample matrix.

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

The recovery for the sample surrogate(s) is outside the QC acceptance limits as noted on the QC Summary. Since the recovery is >10%, the data is reported.

<b>Wet Chemistry</b>	<b>SM 2540 G-2011</b>	<b>%</b>	<b>%</b>	<b>%</b>
00111	Moisture	n.a.	38.1	0.50

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 11:11	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRTW-1 (9.5-10) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9973998  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 09:34  
SDG#: CAP98-05

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	N.D.	6	14	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

Reporting limits were raised due to interference from the sample matrix.

The recovery for the sample surrogate(s) is outside the QC acceptance limits as noted on the QC Summary. Since the recovery is >10%, the data is reported.

<b>Wet Chemistry</b>		<b>SM 2540 G-2011</b>	%	%	%	
		<b>%Moisture Calc</b>				
00111	Moisture	n.a.	42.9	0.50	0.50	1
Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.						

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 11:40	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** FD-IRTW-1 (9.5-10) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9973999  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 09:36  
SDG#: CAP98-06FD

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	N.D.	6	14	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

Reporting limits were raised due to interference from the sample matrix.

The recovery for the sample surrogate(s) is outside the QC acceptance limits as noted on the QC Summary. Since the recovery is >10%, the data is reported.

<b>Wet Chemistry</b>		<b>SM 2540 G-2011</b>	%	%	%	
		<b>%Moisture Calc</b>				
00111	Moisture	n.a.	42.1	0.50	0.50	1
Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.						

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 12:10	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRSB-1 (1.5-2) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9974000  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 10:05  
SDG#: CAP98-07

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>						
	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	0.8 J	0.8	2	1
The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.						
<b>Wet Chemistry</b>						
	<b>SM 2540 G-2011</b>		<b>%</b>	<b>%</b>	<b>%</b>	
	<b>%Moisture Calc</b>					
00111	Moisture	n.a.	14.0	0.50	0.50	1
Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.						

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 12:39	Joseph M Gambler	1
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRSB-2 (1.5-2) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9974001  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 10:10  
SDG#: CAP98-08

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
12969	GC/MS Semivolatiles 1,4-Dioxane	SW-846 8270D SIM 123-91-1	ug/kg N.D.	ug/kg 4	ug/kg 10	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

Reporting limits were raised due to interference from the sample matrix.

The recovery for the sample internal standard is outside the QC acceptance limits. The following action was taken:

The sample was re-analyzed and internal standard areas are again outside of the QC acceptance limits, indicating a matrix effect. The reported data is from the initial analysis of the sample.

CAT No.	Analysis Name	Method	Result	Limit	Quantitation	Dilution Factor
00111	Wet Chemistry Moisture	SM 2540 G-2011 %Moisture Calc	% 15.6	% 0.50	% 0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 13:09	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRSB-3 (1.5-2) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9974002  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 10:20  
SDG#: CAP98-09

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
<b>GC/MS Semivolatiles</b>	<b>SW-846 8270D SIM</b>		<b>ug/kg</b>	<b>ug/kg</b>	<b>ug/kg</b>	
12969	1,4-Dioxane	123-91-1	N.D.	36	90	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

Reporting limits were raised due to interference from the sample matrix.

<b>Wet Chemistry</b>	<b>SM 2540 G-2011</b>	<b>%</b>	<b>%</b>	<b>%</b>		
00111	Moisture	n.a.	7.7	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/08/2019 14:34	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

**Sample Description:** IRSB-4 (1.5-2) Grab Soil  
Croda Atlas Point

ARCADIS U.S., Inc.  
ELLE Sample #: SW 9974003  
ELLE Group #: 2026648  
Matrix: Soil

**Project Name:** Croda Atlas Point

Submittal Date/Time: 01/24/2019 16:55  
Collection Date/Time: 01/22/2019 10:30  
SDG#: CAP98-10

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
12969	GC/MS Semivolatiles 1,4-Dioxane	SW-846 8270D SIM 123-91-1	ug/kg N.D.	ug/kg 4	ug/kg 10	5

The stated QC limits are advisory only until sufficient data points can be obtained to calculate statistical limits.

The recovery for the sample internal standard is outside the QC acceptance limits. The following action was taken:

The sample was re-analyzed and internal standard areas are again outside of the QC acceptance limits, indicating a matrix effect. The reported data is from the initial analysis of the sample.

Reporting limits were raised due to interference from the sample matrix.

Wet Chemistry	SM 2540 G-2011	%	%	%		
00111	Moisture %Moisture Calc	n.a.	14.6	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

### Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12969	1,4-Dioxane 8270D SIM	SW-846 8270D SIM	1	19036SLA026	02/07/2019 14:08	Joseph M Gambler	5
10811	BNA Soil Microwave SIM	SW-846 3546	1	19036SLA026	02/05/2019 09:00	Joshua S Ruth	1
00111	Moisture	SM 2540 G-2011 %Moisture Calc	1	19028820005A	01/29/2019 09:26	William C Schwebel	1

\*=This limit was used in the evaluation of the final result

## Quality Control Summary

Client Name: ARCADIS U.S., Inc.  
Reported: 02/14/2019 07:57

Group Number: 2026648

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

### Method Blank

Analysis Name	Result ug/kg	MDL** ug/kg	LOQ ug/kg
Batch number: 19036SLA026 1,4-Dioxane	Sample number(s): 9973994-9974003 N.D.	0.7	2

### LCS/LCSD

Analysis Name	LCS Spike Added ug/kg	LCS Conc ug/kg	LCSD Spike Added ug/kg	LCSD Conc ug/kg	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 19036SLA026 1,4-Dioxane	Sample number(s): 9973994-9974003 33.33	17			51*		70-130		
	%	%	%	%					
Batch number: 19028820005A Moisture	Sample number(s): 9973994-9974003 89.5	89.4			100		99-101		

### MS/MSD

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike

Analysis Name	Unspiked Conc ug/kg	MS Spike Added ug/kg	MS Conc ug/kg	MSD Spike Added ug/kg	MSD Conc ug/kg	MS %Rec	MSD %Rec	MS/MSD Limits	RPD	RPD Max
Batch number: 19036SLA026 1,4-Dioxane	Sample number(s): 9973994-9974003 UNSPK: 9973994 N.D.	33.08	13.2	33.12	6.27	40*	19*	70-130	71*	30

### Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc %	DUP Conc %	DUP RPD	DUP RPD Max

\*- Outside of specification

\*\* - This limit was used in the evaluation of the final result for the blank

(1) The result for one or both determinations was less than five times the LOQ.

(2) The unspiked result was more than four times the spike added.

## Quality Control Summary

Client Name: ARCADIS U.S., Inc.  
Reported: 02/14/2019 07:57

Group Number: 2026648

### Laboratory Duplicate

Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	BKG Conc %	DUP Conc %	DUP RPD	DUP RPD Max
Batch number: 19028820005A	Sample number(s): 9973994-9974003 BKG: 9973998			
Moisture	42.88	41.57	3	5

### Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: 1,4-Dioxane 8270D SIM  
Batch number: 19036SLA026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
9973994	73*	58*	87
9973995	72*	68*	73
9973996	70*	64*	85
9973997	79	65*	86
9973998	100	70*	88
9973999	84	69*	72
9974000	90	74	84
9974001	63*	51*	69
9974002	114*	113*	71
9974003	73*	63*	71
Blank	90	81	81
LCS	89	84	84
MS	71*	48*	79
MSD	42*	29*	37*
Limits:	75-100	71-102	69-96

\*- Outside of specification

\*\* - This limit was used in the evaluation of the final result for the blank

(1) The result for one or both determinations was less than five times the LOQ.

(2) The unspiked result was more than four times the spike added.



## ANALYSIS REPORT

Prepared by:

Eurofins Lancaster Laboratories Environmental  
2425 New Holland Pike  
Lancaster, PA 17601

Prepared for:

ARCADIS U.S., Inc.  
630 Plaza Drive  
Suite 600  
Highlands Ranch CO 80129

Report Date: February 08, 2019 17:19

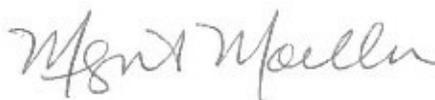
### Project: Croda Atlas Point

Account #: 03074  
Group Number: 2026650  
PO Number: 05814003

Electronic Copy To Arcadis  
Electronic Copy To Arcadis  
Electronic Copy To Arcadis

Attn: Bob Helkowski  
Attn: Erika Denkenberger  
Attn: Grayson Basalyga

Respectfully Submitted,



Megan A. Moeller  
Senior Specialist

(717) 556-7261

To view our laboratory's current scopes of accreditation please go to <https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/> . Historical copies may be requested through your project manager.

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Pensacola

3355 McLemore Drive

Pensacola, FL 32514

Tel: (850)474-1001

TestAmerica Job ID: 400-165428-1

Client Project/Site: 2026650 - Ethylene Oxide

Revision: 1

For:

Eurofins Lancaster Laboratories Env LLC

2425 New Holland Pike

Lancaster, Pennsylvania 17601

Attn: Hannah Cottman



Authorized for release by:

2/8/2019 12:08:22 PM

John Cady, Manager of Project Management

(713)690-4444

[john.cady@testamericainc.com](mailto:john.cady@testamericainc.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.*

*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.*

# Detection Summary

Client: Eurofins Lancaster Laboratories Env LLC  
Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRTW-1 (1.5-2)**

**Lab Sample ID: 400-165428-1**

No Detections.

**Client Sample ID: IRTW-1 (3.5-4)**

**Lab Sample ID: 400-165428-2**

No Detections.

**Client Sample ID: IRTW-1 (5.5-6)**

**Lab Sample ID: 400-165428-3**

No Detections.

**Client Sample ID: IRTW-1 (7.5-8)**

**Lab Sample ID: 400-165428-4**

No Detections.

**Client Sample ID: IRTW-1 (9.5-10)**

**Lab Sample ID: 400-165428-5**

No Detections.

**Client Sample ID: FD-IRTW-1 (9.5-10)**

**Lab Sample ID: 400-165428-6**

No Detections.

**Client Sample ID: IRSB-1 (1.5-2)**

**Lab Sample ID: 400-165428-7**

No Detections.

**Client Sample ID: IRSB-2 (1.5-2)**

**Lab Sample ID: 400-165428-8**

No Detections.

**Client Sample ID: IRSB-3 (1.5-2)**

**Lab Sample ID: 400-165428-9**

No Detections.

**Client Sample ID: IRSB-4 (1.5-2)**

**Lab Sample ID: 400-165428-10**

No Detections.

This Detection Summary does not include radiochemical test results.

TestAmerica Pensacola

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRTW-1 (1.5-2)**

**Lab Sample ID: 400-165428-1**

**Date Collected: 01/22/19 09:20**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 83.6**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	15	U	19	15	ug/Kg	☼	02/04/19 07:00	02/04/19 12:07	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	105		72 - 122				02/04/19 07:00	02/04/19 12:07	1
Dibromofluoromethane	106		79 - 123				02/04/19 07:00	02/04/19 12:07	1
Toluene-d8 (Surr)	100		80 - 120				02/04/19 07:00	02/04/19 12:07	1

**General Chemistry**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83.6		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	16.4		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRTW-1 (3.5-4)**

**Lab Sample ID: 400-165428-2**

**Date Collected: 01/22/19 09:23**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 66.1**

## Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	23	U	29	23	ug/Kg	☼	02/04/19 07:00	02/04/19 12:29	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	107		72 - 122				02/04/19 07:00	02/04/19 12:29	1
Dibromofluoromethane	109		79 - 123				02/04/19 07:00	02/04/19 12:29	1
Toluene-d8 (Surr)	101		80 - 120				02/04/19 07:00	02/04/19 12:29	1

## General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	66.1		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	33.9		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRTW-1 (5.5-6)**

**Lab Sample ID: 400-165428-3**

**Date Collected: 01/22/19 09:27**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 56.8**

## Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	30	U	38	30	ug/Kg	☼	02/04/19 07:00	02/04/19 12:51	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	104		72 - 122				02/04/19 07:00	02/04/19 12:51	1
Dibromofluoromethane	106		79 - 123				02/04/19 07:00	02/04/19 12:51	1
Toluene-d8 (Surr)	101		80 - 120				02/04/19 07:00	02/04/19 12:51	1

## General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	56.8		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	43.2		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRTW-1 (7.5-8)**

**Lab Sample ID: 400-165428-4**

**Date Collected: 01/22/19 09:30**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 67.8**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	25	U	31	25	ug/Kg	☼	02/04/19 07:00	02/04/19 13:13	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	107		72 - 122				02/04/19 07:00	02/04/19 13:13	1
Dibromofluoromethane	108		79 - 123				02/04/19 07:00	02/04/19 13:13	1
Toluene-d8 (Surr)	98		80 - 120				02/04/19 07:00	02/04/19 13:13	1

**General Chemistry**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	67.8		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	32.2		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRTW-1 (9.5-10)**

**Lab Sample ID: 400-165428-5**

**Date Collected: 01/22/19 09:34**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 57.3**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	29	U	36	29	ug/Kg	☼	02/04/19 07:00	02/04/19 13:35	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	104		72 - 122				02/04/19 07:00	02/04/19 13:35	1
Dibromofluoromethane	108		79 - 123				02/04/19 07:00	02/04/19 13:35	1
Toluene-d8 (Surr)	101		80 - 120				02/04/19 07:00	02/04/19 13:35	1

**General Chemistry**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	57.3		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	42.7		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: FD-IRTW-1 (9.5-10)**

**Lab Sample ID: 400-165428-6**

**Date Collected: 01/22/19 09:36**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 57.7**

## Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	28	U	35	28	ug/Kg	☼	02/04/19 07:00	02/04/19 13:57	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	107		72 - 122				02/04/19 07:00	02/04/19 13:57	1
Dibromofluoromethane	107		79 - 123				02/04/19 07:00	02/04/19 13:57	1
Toluene-d8 (Surr)	99		80 - 120				02/04/19 07:00	02/04/19 13:57	1

## General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	57.7		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	42.3		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRSB-1 (1.5-2)**

**Lab Sample ID: 400-165428-7**

**Date Collected: 01/22/19 10:05**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 84.2**

## Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	15	U	19	15	ug/Kg	☼	02/04/19 07:00	02/04/19 14:19	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	112		72 - 122				02/04/19 07:00	02/04/19 14:19	1
Dibromofluoromethane	104		79 - 123				02/04/19 07:00	02/04/19 14:19	1
Toluene-d8 (Surr)	99		80 - 120				02/04/19 07:00	02/04/19 14:19	1

## General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84.2		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	15.8		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRSB-2 (1.5-2)**

**Lab Sample ID: 400-165428-8**

**Date Collected: 01/22/19 10:10**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 85.5**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	16	U	20	16	ug/Kg	☼	02/04/19 07:00	02/04/19 14:41	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	104		72 - 122				02/04/19 07:00	02/04/19 14:41	1
Dibromofluoromethane	109		79 - 123				02/04/19 07:00	02/04/19 14:41	1
Toluene-d8 (Surr)	100		80 - 120				02/04/19 07:00	02/04/19 14:41	1

**General Chemistry**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85.5		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	14.5		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRSB-3 (1.5-2)**

**Lab Sample ID: 400-165428-9**

**Date Collected: 01/22/19 10:20**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 92.3**

## Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	14	U	17	14	ug/Kg	☼	02/04/19 07:00	02/04/19 15:04	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	106		72 - 122	02/04/19 07:00	02/04/19 15:04	1
Dibromofluoromethane	106		79 - 123	02/04/19 07:00	02/04/19 15:04	1
Toluene-d8 (Surr)	99		80 - 120	02/04/19 07:00	02/04/19 15:04	1

## General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	92.3		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	7.7		0.01	0.01	%			01/31/19 15:40	1

# Client Sample Results

Client: Eurofins Lancaster Laboratories Env LLC  
 Project/Site: 2026650 - Ethylene Oxide

TestAmerica Job ID: 400-165428-1

**Client Sample ID: IRSB-4 (1.5-2)**

**Lab Sample ID: 400-165428-10**

**Date Collected: 01/22/19 10:30**

**Matrix: Solid**

**Date Received: 01/29/19 09:37**

**Percent Solids: 84.7**

**Method: 8260C - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylene oxide	14	U	18	14	ug/Kg	☼	02/04/19 07:00	02/04/19 15:26	1
Surrogate	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene	105		72 - 122				02/04/19 07:00	02/04/19 15:26	1
Dibromofluoromethane	106		79 - 123				02/04/19 07:00	02/04/19 15:26	1
Toluene-d8 (Surr)	99		80 - 120				02/04/19 07:00	02/04/19 15:26	1

**General Chemistry**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84.7		0.01	0.01	%			01/31/19 15:40	1
Percent Moisture	15.3		0.01	0.01	%			01/31/19 15:40	1