Groundwater Monitoring Report
June 2018

471 & 485 Hague Street
Rochester, New York

Prepared for:

Philip Collins and Stephen Anderson
Jay Hague Properties, LLC
12 Walnut Hill Dr.
Penfield, NY 14526

Prepared by:

Lu Engineers
ENVIRONMENTAL • TRANSPORTATION • CIVIL
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Rochester, NY 14604

Project #: 50380-01

Table of Contents

1.0 Introduction

Lu Engineers has prepared this report to summarize findings of the June 2018 groundwater sampling event completed at 471 and 485 Hague Street (the "Site") in the City of Rochester, Monroe County, New York (Figure 1). The Site is located on the corner of Jay and Hague Street, in a predominantly urban area.

In March 2018, Lu Engineers conducted an in-situ remediation material injection event to address subsurface contamination at the site. PersulfOx™ was injected into the subsurface at twelve (12) locations to oxidize petroleum hydrocarbons and chlorinated compounds across the impacted area of the Site.

Lu Engineers completed post-injection groundwater sampling on June 6, 2018, to document and analyze the effects of oxidation on the targeted contaminants. This report presents the most recent sample results, conclusions, and recommendations for future monitoring activities.

1.1 Background

The site consists of two parcels totaling approximately 1.89 acres, and is currently in use as a furniture manufacturing business.

A Phase I Site Assessment by LaBella cited the historical utilization of the property as a gasoline filling station, automotive repair shop, as well as the former presence of underground storage tanks as potential sources of contamination.

Three interface wells (IW-01, IW-02, and IW-03) were installed in the parking lot east of the machine shop on January 18th and 19th 2017, as part of the Phase II Environmental Site Assessment completed by LaBella Associates. Three (3) monitoring wells (GPMW-21, GPMW-25, GPMW-27) were also installed into Geoprobe® borings located inside the wood shop. The Site Layout Plan (Figure 2) shows all well locations.

Previous soil and groundwater sampling by LaBella indicated exceedances in 1,1,1-Trichloroethane (1,1,1-TCA), 1,2- Dichlorobenzene, cis-1,2- Dichloroethene (cis-1,2-DCE), Tetrachloroethene (PCE), and Trichloroethene (TCE) at the Site (Figure 3).

2.0 Post-Injection Monitoring Activities

Lu Engineers performed post-injection groundwater sampling on June 6, 2018. Samples were analyzed for previously detected NYSDEC Part 703.5 Class GA Ambient Groundwater Quality Standard Baseline Parameters (Table 1). It is noted that well GPMW-25 was dry, and therefore not sampled this round.

2.1 Groundwater Elevations

Prior to sampling, water levels at each well were measured with reference to the inner casing elevation and recorded on field data sheets (Attachment B).

Water elevation data in feet are summarized in the following table:

	Top of PVC Reference Elev. (ft)	Groundwater Elev.6/6/2018
IW-01	99.52	86.92
IW-02	99.32	86.85
IW-03	99.32	86.75
GPMW-21	100.00	94.37
GPMW-25	99.99	94.41
GPMW-27	99.89	94.16

Inferred groundwater flow patterns are shown on Figure 3. Based on previous groundwater sampling data, it is concluded there is an extremely low hydraulic gradient at the site, with groundwater generally flowing northward.

2.2 Groundwater Sampling Procedures

Groundwater samples were obtained using low-flow purging and sampling techniques, in accordance with Environmental Protection Agency (EPA) Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures (Puls and Barcelona, 1996). Well samples were collected using a GeoTech Peristaltic Pump. Dedicated polyethylene tubing was used for each well.

Field parameters including pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and temperature, were measured using a YSI Professional Plus water quality meter with a flow-through cell and recorded on groundwater sampling field logs in five (5) minute intervals. Turbidity was measured with a LaMotte 2020we turbidity meter. All field logs are included as Attachment A.

Once field parameters stabilized, the samples were collected, placed in a cooler pre-chilled with ice, and delivered to the analytical laboratory, Paradigm Environmental, in Rochester, NY.

3.0 Analytical Results

Analytical results from each sampling location are summarized in Table 1. Results were compared to applicable NYSDEC Part 703.5 Class GA Ambient Groundwater Quality Standard Baseline Parameters. The laboratory analytical report is included as Attachment B.

3.1 Organic Parameters

TCE was detected in IW-03, GPMW-21, and GPMW-27, at concentrations exceeding NYCRR Part 703.5 Class GA Ambient Groundwater Quality Standard (AWQS) of 5 PPB. IW-03 also had detections of cis-1,2- DCE and PCE which exceeded the NYCRR Part 703.5 AWQS standard of 5 PPB. 1,1,1- TCA was detected in GPMW-21 exceeding the NYCRR Part 703.5 AWQS standard of

5 PPB. No groundwater was recovered from GPMW-25, therefore no sample was taken. Refer to Table 1 for summary of analytical data.

4.0 Conclusions & Recommendations

General reductions in chlorinated volatile organic compounds have occurred across impacted areas of the site since the injection. No observable reductions in volatile organics were observed at IW-03. This is likely due to lower groundwater elevations decreasing inflow of water from higher elevations within the well bore, amplifying contaminant constituents.

Oxidation reduction potential (ORP) measurements recorded at the time of purging and sampling indicate the subsurface is in a state of oxidation; however, low dissolved oxygen (DO) levels on site indicate attenuation by oxidation is occurring at a slow rate.

The extremely low hydraulic gradient and low groundwater levels on Site require additional time to observe the total effect of the injection process. If acceptable to Jay Hague Properties LLC, based upon additional data provided by additional sampling, it is our hope that significant reductions in target volatile organics will have occurred. It is noted that the current dry conditions and resulting low groundwater levels are likely inhibiting the dispersion of PersulfOx™ to all impacted areas.

Lu Engineers intends to use more aggressive sodium and potassium permanganate oxidizers to supplement the initial PersulfOX™ injections. The “permanganate candles” manufactured by Carus Corporation® will be installed into existing interface wells to slowly release into groundwater in lieu of a more costly and disruptive Geoprobe® injection.

Lu Engineers intends to perform another round of groundwater sampling in September 2018 to further evaluate the effectiveness of previous injections.

Tables

Table 1- Analytical Results Trend

Detected Parameter List	NYSDEC Ambient GW Quality Standard[1]	Sample ID	IW-01		IW-02		IW-03		GPMW-21		GPMW-25		GPMW-27	
		Sample Type	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
		Sample Date	2/13/2018	6/6/2018	2/13/2018	6/7/2018	2/13/2018	6/8/2018	2/13/2018	6/9/2018	2/13/2018	6/10/2018	2/13/2018	6/11/2018
1,1,1 - Trichloroethane	5	PPB	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	NS	**2.18**	< 2.0	NS	**6.20**	**5.91**
1,3- Dichlorobenzene	3	PPB	< 2.0	< 2.0	**1.43**	< 2.0	**7.16**	< 2.0	NS	< 2.0	**5.50**	NS	< 2.0	< 2.0
cis-1,2- Dichloroethene	5	PPB	**2.63**	**4.92**	**6.02**	**4.33**	**131.00**	**135.00**	NS	< 2.0	< 2.0	NS	< 2.0	< 2.0
Tetrachloroethene	5	PPB	< 2.0	< 2.0	< 2.0	< 2.0	**19.50**	**33.90**	NS	< 2.0	< 2.0	NS	< 2.0	< 2.0
Trichloroethene	5	PPB	< 2.0	< 2.0	**2.04**	**2.65**	**21.00**	**66.20**	NS	**11.20**	**29.60**	NS	**29.50**	**8.65**

Notes:

1 - Values listed in PPB

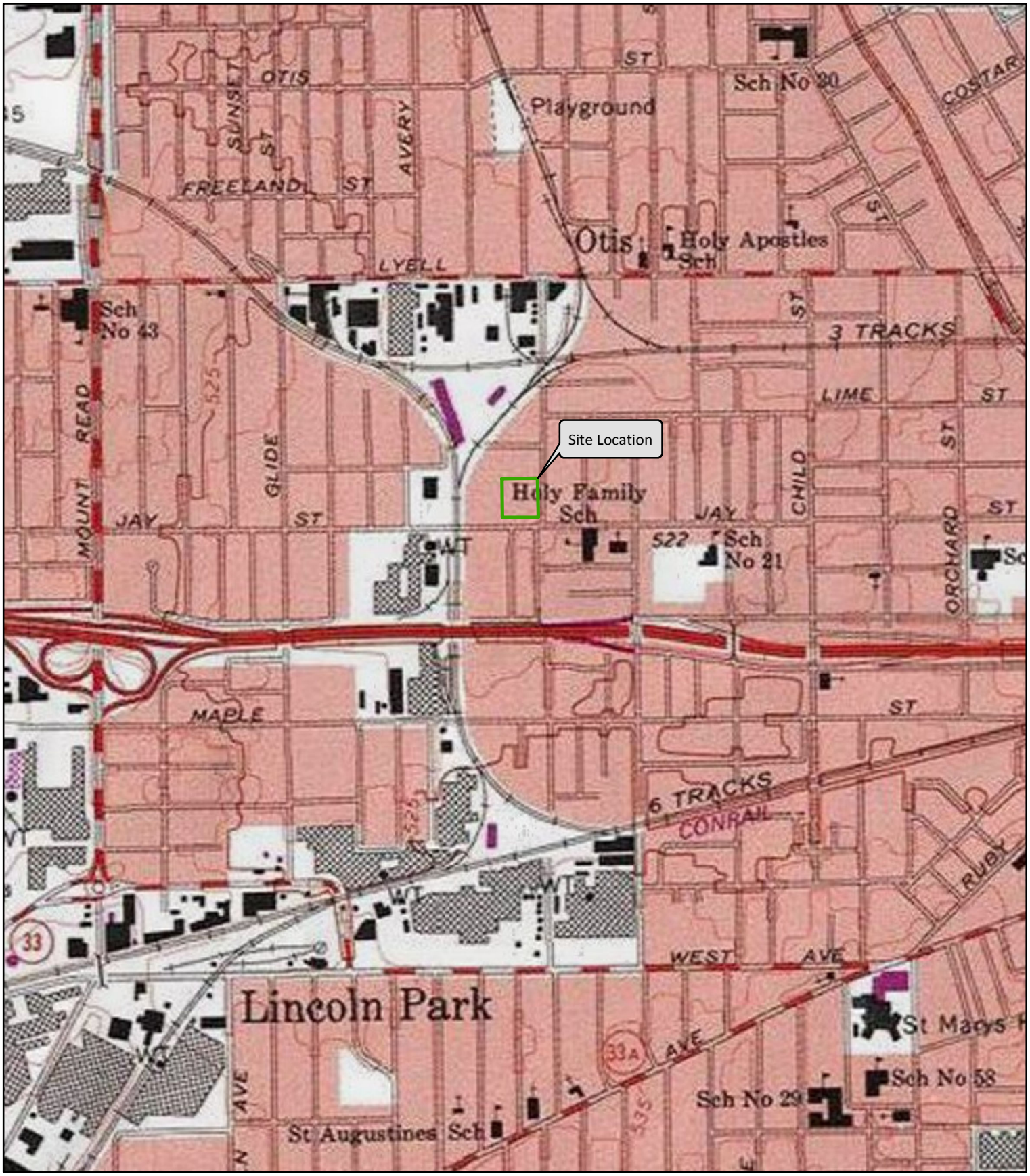
NYDEC = New York State Department of Environmental Conservation

PPB = Parts Per Billion

NS = No sample collected.

Exceeds 6 NYCRR Part 703.5 Class GA Ambient Groundwater Standard or Guidance Value

Figures



1 inch = 1,000 feet

0 500 1,000 2,000 Feet

N

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Figure 1.
Site Location Plan
471 & 485 Hague Street
Rochester, New York

DATE: June 2018
SCALE: 1"= 1,000 ft.
DRAWN/CHECKED: BGS/GLA
DATA SOURCE: Pictometry ESRI ArcGIS Online Basemap

Legend

- Interface Well January 2017
- Monitoring Well 2017
- March 2018 Injection Points
- September 2017 GeoProbe Borings
- Site Boundary

0 20 40 80 Feet

1 inch = 40 feet

N

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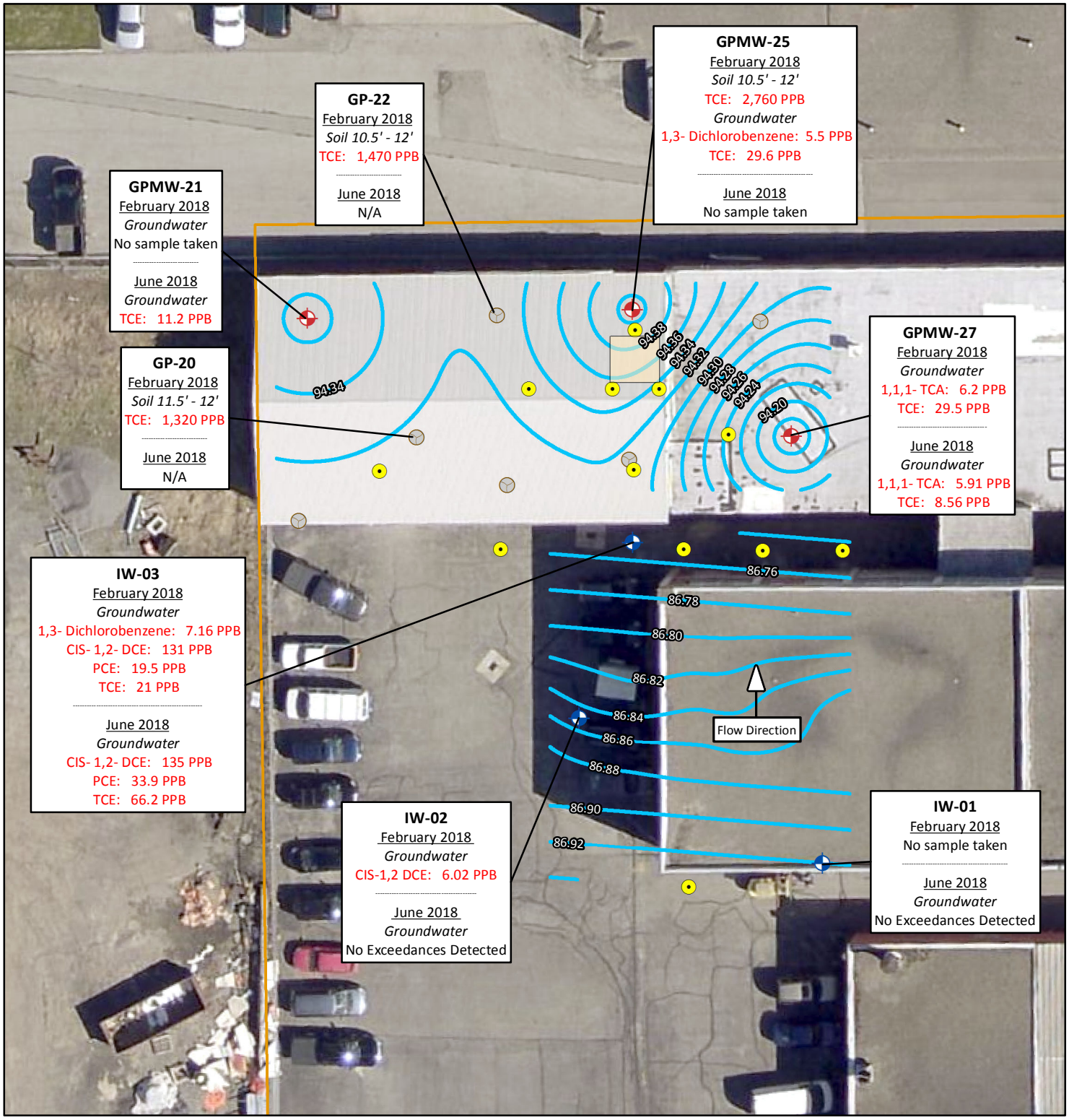
Figure 2.
Site Layout Plan
471 & 485 Hague Street
Rochester, New York

DATE: June 2018
SCALE: 1"= 40 ft.
DRAWN/CHECKED: BGS/GLA
DATA SOURCE: Pictometry Client Provided Data



Legend

- Interface Well January 2017
- Monitoring Well 2017
- March 2018 Injection Points
- Temporary Boring September 2017
- Former Paint Storage Building
- Groundwater Contour
- Site Boundary

N

1 inch = 30 feet

0 15 30 60 Feet

Abbreviations

DCE = Dichloroethene
PCE = Tetrachloroethene
TCA = Trichloroethane
TCE = Trichloroethane
PPB = Parts Per Billion

Note:
1. RED TEXT indicates NYSDEC Part 703 Groundwater Standard or NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives

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Figure 3.
June 2018 Groundwater Sampling Results
471 & 485 Hague Street
Rochester, New York

DATE: June 2018
SCALE: 1"= 30 ft.
DRAWN/CHECKED: BGS/GLA
DATA SOURCE: Pictometry
Client Provided Data

Attachment A-
Low-Flow Groundwater Sampling Field Records

Low Flow Groundwater Sampling Field Record

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Project Name Jay - Hague
Location ID IW-1
Activity Time 09:30
Field Sample ID IW-1_060618
Sample Time 10:05
Job # 50380
Sampling Event # __
Date 06/06/18

SAMPLING NOTES

Initial Depth to Water 12.60 feet
Final Depth to Water ____ feet
Screen Length ____ feet
Total Volume Purged 2.5 gallons
[purge volume (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter]
Volume of Water in casing – 2" diameter = 0.163 gallons per foot of depth, 4" diameter = 0.653 gallons per foot of depth
Measurement Point TOR
Well Depth 21.63 feet
Pump Intake Depth ____
PID Well Head ____
Well Diameter ✓
Well Integrity:
Cap ✓
Casing ✓
Locked ✓
Collar ✓

PURGE DATA

Time	Depth to Water (ft)	Purge Rate (ml/min)	Temp. (deg. C)	pH (units)	Dissolved O2 (mg/L)	Turbidity (NTU)	Cond. (mS/cm)	ORP (mV)	Comments
09:45	12.62		14.23	7.02	0.76	1.18	1.316	-65.2	
09:50	12.65		14.04	6.85	0.32	1.10	1.159	-49.5	
09:55	12.65		14.03	6.83	0.24	0.39	1.611	-28.4	
10:00	12.65		14.06	6.83	0.14	0.79	1.659	-23.2	

Purge Observations: Water has a sulfur like odor, no sheen
Purge Water Containerized: No

EQUIPMENT DOCUMENTATION

Type of Pump: Geotech Geopump
Type of Tubing: ¼" HDPE
Type of Water Quality Meter: YSI Pro Plus Quatro; LaMotte 2020
Calibrated: Yes

ANALYTICAL PARAMETERS

Parameter	Volumes	Sample Collected
VOCs	2 x 40 ml	
RCRA Metals		
PCBs		
Pesticides		

LOCATION NOTES

Low Flow Groundwater Sampling Field Record

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Project Name Jay - Hague
Location ID IW - 02
Activity Time 10:30
Field Sample ID IW-02_060618
Sample Time 10:55
Job # 58380
Sampling Event # __
Date 06/06/18

SAMPLING NOTES

Initial Depth to Water 12.47 feet
Final Depth to Water 12.55 feet
Screen Length ____ feet
Total Volume Purged 2.5 gallons
Measurement Point TOR
Well Depth 22.35 feet
Pump Intake Depth ____
PID Well Head ____
Well Diameter ✓
Well Integrity:
Cap ✓
Casing ✓
Locked ✓
Collar ✓

[purge volume (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter]
Volume of Water in casing – 2" diameter = 0.163 gallons per foot of depth, 4" diameter = 0.653 gallons per foot of depth

PURGE DATA

Time	Depth to Water (ft)	Purge Rate (ml/min)	Temp. (deg. C)	pH (units)	Dissolved O2 (mg/L)	Turbidity (NTU)	Cond. (mS/cm)	ORP (mV)	Comments
10:35	12.55		13.09	7.08	0.06	16.0	1.890	8.4	
10:40	12.55		13.08	7.03	0.04	6.81	1.877	7.2	
10:45	12.55		13.11	7.00	0.02	1.19	1.876	3.5	
10:50	12.55		13.10	6.99	0.03	2.29	1.890	3.2	

Purge Observations: Rust orange color to start, light sheen
Purge Water Containerized: No

EQUIPMENT DOCUMENTATION

Type of Pump: Geotech Geopump
Type of Tubing: ¼" HDPE
Type of Water Quality Meter: YSI Pro Plus Quatro; LaMotte 2020
Calibrated: Yes

ANALYTICAL PARAMETERS

Parameter	Volumes	Sample Collected
VOCs	2 x 40 ml	
RCRA Metals		
PCBs		
Pesticides		

LOCATION NOTES

Low Flow Groundwater Sampling Field Record

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Project Name IW-03 | Job # 50380
Location ID Jay - Hayes | Field Sample ID IW-03_060618 | Sampling Event # __
Activity Time 11:05 | Sample Time 11:30 | Date 06/06/18

SAMPLING NOTES

Initial Depth to Water 12.57 feet | Measurement Point TOR | Well Diameter ✓
Final Depth to Water 12.65 feet | Well Depth 23.06 feet | Well Integrity:
Screen Length ____ feet | Pump Intake Depth ____ | Cap ✓
Total Volume Purged 2.5 gallons | PID Well Head ____ | Casing ✓
[purge volume (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter] | Locked ✓
Volume of Water in casing – 2" diameter = 0.163 gallons per foot of depth, 4" diameter = 0.653 gallons per foot of depth | Collar ✓

PURGE DATA

Time	Depth to Water (ft)	Purge Rate (ml/min)	Temp. (deg. C)	pH (units)	Dissolved O2 (mg/L)	Turbidity (NTU)	Cond. (mS/cm)	ORP (mV)	Comments
11:10	12.64		13.99	7.08	0.93	7.13	1.410	77.8	
11:15	12.65		13.96	7.07	0.23	1.74	1.404	10.0	
11:20	12.65		13.96	7.06	0.15	1.21	1.407	1.0	
11:25	12.65		13.95	7.06	0.13	0.70	1.407	7.5	

Purge Observations: No odor, very light sheen
Purge Water Containerized: No

EQUIPMENT DOCUMENTATION

Type of Pump: Geotech Geopump
Type of Tubing: ¼" HDPE
Type of Water Quality Meter: YSI Pro Plus Quatro; LaMotte 2020 | Calibrated: Yes

ANALYTICAL PARAMETERS

Parameter	Volumes	Sample Collected
VOCs	2 x 40 ml	
RCRA Metals		
PCBs		
Pesticides		

LOCATION NOTES

Low Flow Groundwater Sampling Field Record

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Project Name Jay - Hayes
Location ID GPMW-21
Activity Time 11:45
Field Sample ID GPMW-21_060618
Sample Time 12:15
Job # 50380
Sampling Event # __
Date 06/06/18

SAMPLING NOTES

Initial Depth to Water 5.63 feet
Final Depth to Water 6.13 feet
Screen Length ____ feet
Total Volume Purged 1.5 gallons
[purge volume (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter]
Volume of Water in casing – 2" diameter = 0.163 gallons per foot of depth, 4" diameter = 0.653 gallons per foot of depth

Measurement Point TOR
Well Depth 10.7 feet
Pump Intake Depth ____
PID Well Head ____

Well Diameter ✓
Well Integrity:
Cap ✓
Casing ✓
Locked ✓
Collar ✓

PURGE DATA

Time	Depth to Water (ft)	Purge Rate (ml/min)	Temp. (deg. C)	pH (units)	Dissolved O2 (mg/L)	Turbidity (NTU)	Cond. (mS/cm)	ORP (mV)	Comments
12:00			16.23	7.38	0.24	103.0	0.954	149.0	
12:05			16.27	7.22	0.28	76.3	1.021	135.4	
12:10	6.13		16.34	7.31	0.43	60.4	1.024	111.7	

Purge Observations: No odor, no sheen
Purge Water Containerized: No

EQUIPMENT DOCUMENTATION

Type of Pump: Geotech Geopump
Type of Tubing: ¼" HDPE
Type of Water Quality Meter: YSI Pro Plus Quatro; LaMotte 2020
Calibrated: Yes

ANALYTICAL PARAMETERS

Parameter	Volumes	Sample Collected
VOCs	2 x 40 ml	
RCRA Metals		
PCBs		
Pesticides		

LOCATION NOTES

Low Flow Groundwater Sampling Field Record

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Project Name Jay-Hague
Location ID GPMW-25
Activity Time
Field Sample ID N/A
Sample Time
Job # 50380
Sampling Event #
Date 06/06/18

SAMPLING NOTES

Initial Depth to Water 5.55 feet
Final Depth to Water feet
Screen Length feet
Total Volume Purged gallons
Measurement Point TOR
Well Depth feet
Pump Intake Depth
PID Well Head
Well Diameter ✓
Well Integrity:
Cap ✓
Casing ✓
Locked ✓
Collar ✓

[purge volume (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter]
Volume of Water in casing – 2" diameter = 0.163 gallons per foot of depth, 4" diameter = 0.653 gallons per foot of depth

PURGE DATA

Time	Depth to Water (ft)	Purge Rate (ml/min)	Temp. (deg. C)	pH (units)	Dissolved O2 (mg/L)	Turbidity (NTU)	Cond. (mS/cm)	ORP (mV)	Comments
13:00	5.55		18.15	7.1	0.1	-64	1.540	97.8	

Purge Observations:
Purge Water Containerized: No

EQUIPMENT DOCUMENTATION

Type of Pump: Geotech Geopump
Type of Tubing: ¼" HDPE
Type of Water Quality Meter: YSI Pro Plus Quatro; LaMotte 2020
Calibrated: Yes

ANALYTICAL PARAMETERS

Parameter	Volumes	Sample Collected
VOCs	2 x 40 ml	
RCRA Metals		
PCBs		
Pesticides		

LOCATION NOTES

Well went dry after ~5 min of pumping

Low Flow Groundwater Sampling Field Record

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Project Name Jay - Hagre
Job # 50380
Location ID GPMW - 27
Field Sample ID GPMW-27_060618
Sampling Event # __
Activity Time 12:30
Sample Time 12:55
Date 06/06/18

SAMPLING NOTES

Initial Depth to Water 5.73 feet
Measurement Point TOR
Well Diameter ✓
Final Depth to Water 6.25 feet
Well Depth 7.95 feet
Well Integrity:
Screen Length ____ feet
Pump Intake Depth ____
Cap ✓
Total Volume Purged 1 gallons
PID Well Head ____
Casing ✓
[purge volume (milliliters per minute) x time duration (minutes) x 0.00026 gal/milliliter]
Locked ✓
Volume of Water in casing – 2" diameter = 0.163 gallons per foot of depth, 4" diameter = 0.653 gallons per foot of depth
Collar ✓

PURGE DATA

Time	Depth to Water (ft)	Purge Rate (ml/min)	Temp. (deg. C)	pH (units)	Dissolved O2 (mg/L)	Turbidity (NTU)	Cond. (mS/cm)	ORP (mV)	Comments
12:35			18.41	7.23	0.09	over range	0.661	144.3	
12:40			18.37	7.24	0.18	2415 AU	0.658	147.4	
12:45			18.34	7.29	0.24	1163 AU	0.656	149.4	
12:50			18.33	7.34	0.26	791 AU	0.654	149.4	

Purge Observations: Dirty water
Purge Water Containerized: No

EQUIPMENT DOCUMENTATION

Type of Pump: Geotech Geopump
Type of Tubing: ¼" HDPE
Type of Water Quality Meter: YSI Pro Plus Quatro; LaMotte 2020
Calibrated: Yes

ANALYTICAL PARAMETERS

Parameter	Volumes	Sample Collected
VOCs	2 x 40 ml	
RCRA Metals		
PCBs		
Pesticides		

LOCATION NOTES

Attachment B-
Lab Report

PARADIGM

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Analytical Report For

Lu Engineers, Inc.

For Lab Project ID

182519

Referencing

Jay-Hague

Prepared

Wednesday, June 13, 2018

Any noncompliant QC parameters or other notes impacting data interpretation are flagged or documented on the final report or are noted below.

K R Hansen

Certifies that this report has been approved by the Technical Director or Designee

179 Lake Avenue • Rochester, NY 14608 • (585) 647-2530 • Fax (585) 647-3311 • ELAP ID# 10958

This report is part of a multipage document and should only be evaluated in its entirety. The Chain of Custody provides additional sample information, including compliance with the sample condition requirements upon receipt.

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 182519

Client: **Lu Engineers, Inc.**

Project Reference: Jay-Hague

Sample Identifier: IW-01_060618
Lab Sample ID: 182519-01 **Date Sampled:** 6/6/2018
Matrix: Groundwater **Date Received:** 6/6/2018

Volatile Organics

Analyte	Result	Units	Qualifier	Date Analyzed
1,1,1-Trichloroethane	< 2.00	ug/L		6/11/2018 17:02
1,3-Dichlorobenzene	< 2.00	ug/L		6/11/2018 17:02
cis-1,2-Dichloroethene	**4.92**	ug/L		6/11/2018 17:02
Tetrachloroethene	< 2.00	ug/L		6/11/2018 17:02
Trichloroethene	< 2.00	ug/L		6/11/2018 17:02

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
1,2-Dichloroethane-d4	**91.9**	77.2 - 121		6/11/2018 17:02
4-Bromofluorobenzene	**96.1**	70 - 123		6/11/2018 17:02
Pentafluorobenzene	**97.7**	85.4 - 110		6/11/2018 17:02
Toluene-D8	**102**	83.8 - 112		6/11/2018 17:02

Method Reference(s): EPA 8260C
EPA 5030C
Data File: x51530.D

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 182519

Client: **Lu Engineers, Inc.**

Project Reference: Jay-Hague

Sample Identifier: IW-02_060618
Lab Sample ID: 182519-02 **Date Sampled:** 6/6/2018
Matrix: Groundwater **Date Received:** 6/6/2018

Volatile Organics

Analyte	Result	Units	Qualifier	Date Analyzed
1,1,1-Trichloroethane	< 2.00	ug/L		6/11/2018 17:25
1,3-Dichlorobenzene	< 2.00	ug/L		6/11/2018 17:25
cis-1,2-Dichloroethene	**4.33**	ug/L		6/11/2018 17:25
Tetrachloroethene	< 2.00	ug/L		6/11/2018 17:25
Trichloroethene	**2.65**	ug/L		6/11/2018 17:25

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
1,2-Dichloroethane-d4	**91.1**	77.2 - 121		6/11/2018 17:25
4-Bromofluorobenzene	**95.8**	70 - 123		6/11/2018 17:25
Pentafluorobenzene	**97.3**	85.4 - 110		6/11/2018 17:25
Toluene-D8	**101**	83.8 - 112		6/11/2018 17:25

Method Reference(s): EPA 8260C
EPA 5030C
Data File: x51531.D

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 182519

Client: **Lu Engineers, Inc.**

Project Reference: Jay-Hague

Sample Identifier: IW-03_060618
Lab Sample ID: 182519-03 **Date Sampled:** 6/6/2018
Matrix: Groundwater **Date Received:** 6/6/2018

Volatile Organics

Analyte	Result	Units	Qualifier	Date Analyzed
1,1,1-Trichloroethane	< 2.00	ug/L		6/11/2018 17:48
1,3-Dichlorobenzene	< 2.00	ug/L		6/11/2018 17:48
cis-1,2-Dichloroethene	**135**	ug/L		6/11/2018 17:48
Tetrachloroethene	**33.9**	ug/L		6/11/2018 17:48
Trichloroethene	**66.2**	ug/L		6/11/2018 17:48

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
1,2-Dichloroethane-d4	**93.9**	77.2 - 121		6/11/2018 17:48
4-Bromofluorobenzene	**92.2**	70 - 123		6/11/2018 17:48
Pentafluorobenzene	**98.2**	85.4 - 110		6/11/2018 17:48
Toluene-D8	**100**	83.8 - 112		6/11/2018 17:48

Method Reference(s): EPA 8260C
EPA 5030C
Data File: x51532.D

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 182519

Client: **Lu Engineers, Inc.**

Project Reference: Jay-Hague

Sample Identifier: GPMW-21_060618
Lab Sample ID: 182519-04 **Date Sampled:** 6/6/2018
Matrix: Groundwater **Date Received:** 6/6/2018

Volatile Organics

Analyte	Result	Units	Qualifier	Date Analyzed
1,1,1-Trichloroethane	**2.18**	ug/L		6/11/2018 18:12
1,3-Dichlorobenzene	< 2.00	ug/L		6/11/2018 18:12
cis-1,2-Dichloroethene	< 2.00	ug/L		6/11/2018 18:12
Tetrachloroethene	< 2.00	ug/L		6/11/2018 18:12
Trichloroethene	**11.2**	ug/L		6/11/2018 18:12

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
1,2-Dichloroethane-d4	**94.5**	77.2 - 121		6/11/2018 18:12
4-Bromofluorobenzene	**90.2**	70 - 123		6/11/2018 18:12
Pentafluorobenzene	**97.5**	85.4 - 110		6/11/2018 18:12
Toluene-D8	**102**	83.8 - 112		6/11/2018 18:12

Method Reference(s): EPA 8260C
EPA 5030C
Data File: x51533.D

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 182519

Client: **Lu Engineers, Inc.**

Project Reference: Jay-Hague

Sample Identifier: GPMW-27_060618
Lab Sample ID: 182519-05 **Date Sampled:** 6/6/2018
Matrix: Groundwater **Date Received:** 6/6/2018

Volatile Organics

Analyte	Result	Units	Qualifier	Date Analyzed
1,1,1-Trichloroethane	**5.91**	ug/L		6/11/2018 18:35
1,3-Dichlorobenzene	< 2.00	ug/L		6/11/2018 18:35
cis-1,2-Dichloroethene	< 2.00	ug/L		6/11/2018 18:35
Tetrachloroethene	< 2.00	ug/L		6/11/2018 18:35
Trichloroethene	**8.56**	ug/L		6/11/2018 18:35

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
1,2-Dichloroethane-d4	**92.3**	77.2 - 121		6/11/2018 18:35
4-Bromofluorobenzene	**90.4**	70 - 123		6/11/2018 18:35
Pentafluorobenzene	**95.6**	85.4 - 110		6/11/2018 18:35
Toluene-D8	**100**	83.8 - 112		6/11/2018 18:35

Method Reference(s): EPA 8260C
EPA 5030C
Data File: x51534.D

PARADIGM
ENVIRONMENTAL SERVICES, INC.

Lab Project ID: 182519

Client: **Lu Engineers, Inc.**

Project Reference: Jay-Hague

Sample Identifier: Trip Blank
Lab Sample ID: 182519-06 **Date Sampled:** 6/6/2018
Matrix: Water **Date Received:** 6/6/2018

Volatile Organics

Analyte	Result	Units	Qualifier	Date Analyzed
1,1,1-Trichloroethane	< 2.00	ug/L		6/11/2018 16:38
1,3-Dichlorobenzene	< 2.00	ug/L		6/11/2018 16:38
cis-1,2-Dichloroethene	< 2.00	ug/L		6/11/2018 16:38
Tetrachloroethene	< 2.00	ug/L		6/11/2018 16:38
Trichloroethene	< 2.00	ug/L		6/11/2018 16:38

Surrogate	Percent Recovery	Limits	Outliers	Date Analyzed
1,2-Dichloroethane-d4	**90.5**	77.2 - 121		6/11/2018 16:38
4-Bromofluorobenzene	**100**	70 - 123		6/11/2018 16:38
Pentafluorobenzene	**100**	85.4 - 110		6/11/2018 16:38
Toluene-D8	**103**	83.8 - 112		6/11/2018 16:38

Method Reference(s): EPA 8260C
EPA 5030C
Data File: x51529.D

Analytical Report Appendix

The reported results relate only to the samples as they have been received by the laboratory.

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All soil/sludge samples have been reported on a dry weight basis, unless qualified "reported as received". Other solids are reported as received.

Low level Volatiles blank reports for soil/solid matrix are based on a nominal 5 gram weight. Sample results and reporting limits are based on actual weight, which may be more or less than 5 grams.

The Chain of Custody provides additional information, including compliance with sample condition requirements upon receipt. Sample condition requirements are defined under the 2003 NELAC Standard, sections 5.5.8.3.1 and 5.5.8.3.2.

NYSDOH ELAP does not certify for all parameters. Paradigm Environmental Services or the indicated subcontracted laboratory does hold certification for all analytes where certification is offered by ELAP unless otherwise specified. Aliquots separated for certain tests, such as TCLP, are indicated on the Chain of Custody and final reports with an "A" suffix.

Data qualifiers are used, when necessary, to provide additional information about the data. This information may be communicated as a flag or as text at the bottom of the report. Please refer to the following list of analyte-specific, frequently used data flags and their meaning:

"<" = Analyzed for but not detected at or above the quantitation limit.
"E" = Result has been estimated, calibration limit exceeded.
"Z" = See case narrative.
"D" = Sample, Laboratory Control Sample, or Matrix Spike Duplicate results above Relative Percent Difference limit.
"M" = Matrix spike recoveries outside QC limits. Matrix bias indicated.
"B" = Method blank contained trace levels of analyte. Refer to included method blank report.
"J" = Result estimated between the quantitation limit and half the quantitation limit.
"L" = Laboratory Control Sample recovery outside accepted QC limits.
"P" = Concentration differs by more than 40% between the primary and secondary analytical columns.
"NC" = Not calculable. Applicable to RPD if sample or duplicate result is non-detect or estimated (see primary report for data flags). Applicable to MS if sample is greater or equal to ten times the spike added. Applicable to sample surrogates or MS if sample dilution is 10x or higher.
"" = Indicates any recoveries outside associated acceptance windows. Surrogate outliers in samples are presumed matrix effects. LCS demonstrates method compliance unless otherwise noted.*
"(1)" = Indicates data from primary column used for QC calculation.
"A" = denotes a parameter for which ELAP does not offer approval as part of their laboratory certification program.
"F" = denotes a parameter for which Paradigm does not carry certification, the results for which should therefore only be used where ELAP certification is not required, such as personal exposure assessment.

GENERAL TERMS AND CONDITIONS
LABORATORY SERVICES

These Terms and Conditions embody the whole agreement of the parties in the absence of a signed and executed contract between the Laboratory (LAB) and Client. They shall supersede all previous communications, representations, or agreements, either verbal or written, between the parties. The LAB specifically rejects all additional, inconsistent, or conflicting terms, whether printed or otherwise set forth in any purchase order or other communication from the Client to the LAB. The invalidity or unenforceability in whole or in part of any provision, tern or condition hereof shall not affect in any way the validity or enforceability of the remainder of the Terms and Conditions. No waiver by LAB of any provision, term, or condition hereof or of any breach by or obligation of the Client hereunder shall constitute a waiver of such provision, term, or condition on any other occasion or a waiver of any other breach by or obligation of the Client. This agreement shall be administered and interpreted under the laws of the state which services are procured.

Warranty. Recognizing that the nature of many samples is unknown and that some may contain potentially hazardous components, LAB warrants only that it will perform testing services, obtain findings, and prepare reports in accordance with generally accepted analytical laboratory principles and practices at the time of performance of services. LAB makes no other warranty, express or implied.

Scope and Compensation. LAB agrees to perform the services described in the chain of custody to which these terms and conditions are attached. Unless the parties agree in writing to the contrary, the duties of LAB shall not be construed to exceed the services specifically described. LAB wi use LAB default method for all tests unless specified otherwise on the Work Order.
Payment terms are net 30 days from the date of invoice. All overdue payments are subject to an interest charge of one and one-half percent (1-1/2%) per month or a portion thereof. Client shall also be responsible for costs of collection, including payment of reasonable attorney fees if such expense is incurred. The prices, unless stated, do not include any sale, use or other taxes. Such taxes will be added to invoice prices when required.

Prices. Compensation for services performed will be based on the current Lab Analytical Fee Schedule or on quotations agreed to in writing by the parties. Turnaround time based charges are determined from the time of resolution of all work order questions. Testimony, court appearances or data compilation for legal action will be charged separately. Evaluation and reporting of initial screening runs may incur additional fees.

Limitations of Liability. In the event of any error, omission, or other professional negligence, the sole and exclusive responsibility of LAB shall be to re-perform the deficient work at its own expense and LAB shall have no other liability whatsoever. All claims shall be deemed waived unless made in writing and received by LAB within ninety (90) days following completion of services.
LAB shall have no liability, obligation, or responsibility of any kind for losses, costs, expenses, or other damages (including but not limited to any special, direct, incidental or consequential damages) with respect to LAB's services or results.
All results provided by LAB are strictly for the use of its clients and LAB is in no way responsible for the use of such results by clients or third parties. All reports should be considered in their entirety, and LAB is not responsible for the separation, detachment, or other use of any portion of these reports. Client may not assign the lab report without the written consent of the LAB.
Client covenants and agrees, at its/his/her sole expense, to indemnify, protect, defend, and save harmless the LAB from and against any and all damages, losses, liabilities, obligations, penalties, claims, litigation, demands, defenses, judgments, suits, actions, proceedings, costs, disbursements and/or expenses (including, without limitation attorneys' and experts' fees and disbursements) of any kind whatsoever which may at any time be imposed upon, incurred by or asserted or awarded against client relating to, resulting from or arising out of (a) the breach of this agreement by this client, (b) the negligence of the client in handling, delivering or disclosing any hazardous substance, (c) the violation of the Client of any applicable law, (d) non-compliance by the Client with any environmental permit or (e) a material misrepresentation in disclosing the materials to be tested.

Hazard Disclosure. Client represents and warrants that any sample delivered to LAB will be preceded or accompanied by complete written disclosure of the presence of any hazardous substances known or suspected by Client. Client further warrants that any sample containing any hazardous substance that is to be delivered to LAB will be packaged, labeled, transported, and delivered properly and in accordance with applicable laws.

Sample Handling. Prior to LAB's acceptance of any sample (or after any revocation of acceptance), the entire risk of loss or of damage to such sample remains with Client. Samples are accepted when receipt is acknowledged on chain of custody documentation. In no event will LAB have any responsibility for the action or inaction of any carrier shipping or delivering any sample to or from LAB premises.
Client authorizes LAB to proceed with the analysis of samples as received by the laboratory, recognizing that any samples not in compliance with all current DOH-ELAP-NELAP requirements for containers, preservation or holding time will be noted as such on th final report.
Disposal of hazardous waste samples is the responsibility of the Client. If the Client does not wish such samples returned, LAB may add storage and disposal fees to the final invoice. Maximum storage time for samples is 30 days after completion of analysis unless modified by applicable state or federal laws. Client will be required to give the LAB written instructions concerning disposal of these samples.
LAB reserves the absolute right, exercisable at any time, to refuse to receive delivery of, refuse to accept, or revoke acceptance of any sample, which, in the sole judgment of LAB (a) is of unsuitable volume, (b) may be or become unsuitable for or may pose a risk in handling, transport, or processing for any health, safety, environmental or other reason whether or not due to the presence in the sample of any hazardous substance, and whether or not such presence has been disclosed to LAB by Client or (c) if the condition or sample date make the sample unsuitable for analysis.

Legal Responsibility. LAB is solely responsible for performance of this contract, and no affiliated company, director, officer, employee, or agent shall have any legal responsibility hereunder, whether in contract or tort including negligence.

Assignment. LAB may assign its performance obligations under this contract to other parties, as it deems necessary. LAB shall disclose to Client any assignee (subcontractor) by ELAP ID # on the submitted final report.

Force Majeure. LAB shall have no responsibility or liability to the Client for any failure or delay in performance by LAB, which results in whole or in part from any cause or circumstance beyond the reasonable control of LAB. Such causes and circumstances shall include, but not limited to, acts of God, acts or orders of any government authority, strikes or other labor disputes, natural disasters, accidents, wars, civil disturbances, difficulties or delays in transportation, mail or delivery services, inability to obtain sufficient services or supplies from LAB's usual suppliers, or any other cause beyond LAB's reasonable control.

Law. This contract shall be continued under the laws of the State of New York without regard to its conflicts of laws provision.

179 Lake Avenue, Rochester, NY 14608 Office (585) 647-2530 Fax (585) 647-3311

PARADIGM
ENVIRONMENTAL SERVICES, INC

CHAIN OF CUSTODY

REPORT TO:	INVOICE TO:	
CLIENT: LW Engineers	CLIENT:	LAB PROJECT ID: 182519
ADDRESS: 339 East Avenue Suite 200	ADDRESS:	
CITY: Rochester STATE: NY ZIP: 14604	CITY: Same STATE: ZIP:	Quotation #:
PHONE: 585 - 385 - 7417	PHONE:	Email: gregandrus@lwengineers.com
ATTN: Greg Andrus	ATTN:	

PROJECT REFERENCE: Jay - Hague

Matrix Codes:
AQ - Aqueous Liquid; NQ - Non-Aqueous Liquid; WA - Water; WG - Groundwater; DW - Drinking Water; WW - Wastewater; SO - Soil; SL - Sludge; SD - Solid; PT - Paint; WP - Wipe; CK - Caulk; OL - Oil; AR - Air

REQUESTED ANALYSIS

DATE COLLECTED	TIME COLLECTED	COMPOSITE	GRAB	SAMPLE IDENTIFIER	MATRIX CODES	NUMBER OF CONTAINERS	VOCs plus CP-51	REMARKS	PARADIGM LAB SAMPLE NUMBER
06/06/18	10:05			IW-01_060618	WG	2	✓	Test for 1,3-Dichlorobenzene;	01
06/06/18	10:55			IW-02_060618	WG	2	✓	1,1,1-Trichloroethane;	02
06/06/18	11:30			IW-03_060618	WG	2	✓	cis-1,2-Dichloroethene;	03
06/06/18	12:15			GPMW-21_060618	WG	2	✓	Trichloroethylene; Tetrachloroethylene	04
06/06/18	12:55			GPMW-27_060618	WG	2	✓	only per client email. CPG 6/6/18	05
06/06/18				Trip blank	WA	1	✓	T840 per sample label @ 6/6/18	06

Turnaround Time		Report Supplements			
Availability contingent upon lab approval; additional fees may apply.					
Standard 5 day	☑	None Required	☐	None Required	☐
10 day	☐	Batch QC	☐	Basic EDD	☐
Rush 3 day	☐	Category A	☐	NYSDEC EDD	☐
Rush 2 day	☐	Category B	☐		
Rush 1 day	☐				
Other please indicate date needed:	☐	Other please indicate package needed:	☐	Other EDD please indicate EDD needed:	☐

Sampled By: Benjamin Scott Date/Time: 06/06/18 13:45 Total Cost:

Relinquished By: Benjamin Scott Date/Time: 06/06/18 14:40

Received By: [signature] Date/Time: 6/6/18 1440 P.I.F.

Received @ Lab By: Emily Jackson Date/Time: 6/6/18 14:57

14°C iced started in field 6/6/18 14:50

By signing this form, client agrees to Paradigm Terms and Conditions (reverse).

See additional page for sample conditions.

PARADIGM

Chain of Custody Supplement

Client: Lu Engineers **Completed by:** Emily Jackson

Lab Project ID: 182519 **Date:** 6/6/18

Sample Condition Requirements

Per NELAC/ELAP 210/241/242/243/244

Condition	*NELAC compliance with the sample condition requirements upon receipt* Yes	No	N/A
Container Type	X		
Comments			
Transferred to method-compliant container			X
Headspace (<1 mL)	X		
Comments			
Preservation	X		
Comments			
Chlorine Absent (<0.10 ppm per test strip)			X
Comments			
Holding Time	X		
Comments			
Temperature	X		
Comments	14°C iced Started in field		
Sufficient Sample Quantity	X		
Comments			