HALEY ALDRICH

www.haleyaldrich.com

REPORT ON

NPDES RGP APPLICATION FOR TEMPORARY CONSTRUCTION DEWATERING
ERC ROADWAYS AND INFRASTRUCTURE PROJECT
100 WESTERN AVENUE
ALLSTON, MASSACHUSETTS

by Haley & Aldrich, Inc.
Boston, Massachusetts

for Environmental Protection Agency (EPA) Region 1
Boston, Massachusetts

File No. 134544-004
April 2021

HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

21 April 2021
File No. 134544-004

Environmental Protection Agency (EPA) Region 1
5 Post Office Square, Suite 100
Mail Code OEP06-4
Boston, Massachusetts 02129

Attention: Shauna Little

Subject: NPDES RGP Application for Temporary Construction Dewatering
ERC Roadways and Infrastructure Project
100 Western Avenue
Allston, Massachusetts

Ladies and Gentlemen:

On behalf of our client, the Harvard Allston Land Company, Haley & Aldrich, Inc. (Haley & Aldrich) is submitting this application to request authorization under the National Pollutant Discharge Elimination System (NPDES) Remediation General Permit (RGP) for off-site discharge of temporary construction dewatering during construction activities at the planned Enterprise Research Campus (ERC) Roadways and Infrastructure Project located on the Harvard Enterprise Research Campus (herein referred to as the "site") at 100 Western Avenue located in Allston, Massachusetts. The portion of the site requiring dewatering due to the ERC Roadways and Infrastructure Project is referred in this application as the "work area". A copy of the Notice of Intent (NOI) is included in Appendix A.

GENERAL SITE INFORMATION

Site Conditions and Proposed Construction

The site is currently an active construction site. The Project Location is shown on Figure 1. The work area associated with the ERC Roadways and Infrastructure Project is shown on Figure 2.

Proposed construction in the work area includes the construction of new roadways, utility installation, and associated pre-clearing activities. Dewatering is anticipated to be required for construction of utilities and excavation below the groundwater table. Additional water may also be generated from surface runoff from precipitation, groundwater seepage, and construction-generated water (e.g., wheel washes, decontamination activities) at the site and in the work area. Pre-clearing activities are expected to occur from July through December 2021 and utility installation is expected to occur from September 2021 through November 2023.

Regulatory Status

A portion of the work area will be conducted within the limits of two Massachusetts Contingency Plan (MCP) Disposal Sites associated with Release Tracking Numbers (RTNs) 3-29441 (100 Western Avenue) and 3-36214 (115 Cambridge Street), shown on Figure 2.

RTN 3-29441 is associated with Reportable Concentrations of chlorinated volatile organic compounds (CVOCs), petroleum hydrocarbons, semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals in fill samples (typical urban fill constituents), as well as CVOCs in groundwater samples. A Phase V Completion Statement and Permanent Solution Statement with Conditions was submitted to Massachusetts Department of Environmental Protection (MassDEP) for RTN 3-29441 on 28 May 2020. CVOCs in groundwater were remediated to levels below the Method 1 S1/GW2 Standards.

RTN 3-36214 is associated with Reportable Concentrations of SVOCs and metals in fill (typical urban fill constituents). The site is currently in Phase I of the Massachusetts Contingency Plan (MCP).

Certain historically impacted soil within the work area also contains or is presumed to contain debris with asbestos-containing material (ACM). A Non-Traditional Asbestos Abatement Work Plan (NTWP) will be submitted to and approved by MassDEP prior to the start of work.

RECEIVING WATER INFORMATION

Receiving water quality data was collected in support of this NOI on 16 December 2020, the results of which are summarized in Table I. The sample was collected from the Charles River at Outfall location SDO 041, the first proposed Outfall location, and approximately 1,790 ft upstream of Outfall SDO 034, the second proposed Outfall location. Receiving water temperature was measured in the field at 1.0°C, noted on the effluent limitations input calculation page in Appendix B. The receiving water laboratory data report is provided in Appendix G.

The receiving water is the Charles River with Waterbody ID MA72-36 and is identified as a Class B receiving water. The seven-day-ten-year flow (7Q10) of the receiving water was established using the U.S. Geological Survey (USGS) StreamStats program and confirmed by MassDEP on 26 January 2021. The StreamStats report, Dilution Factor calculations, and MassDEP confirmation of the 7Q10 and DF are included in Appendix B.

Copies of the “EnterData” and “FreshwaterResults” tabs from the excel file provided as an additional resource by EPA are included in Appendix B and will be transmitted electronically with the NOI. The effluent limitations calculated are included for reference in Table I.

SOURCE WATER INFORMATION

To evaluate groundwater (source water) quality at the work area, two groundwater samples were obtained from observation wells 006MW02 and 079MW26 on 18 December 2020. The wells are located within the work area as shown on Figure 2.

The groundwater samples were sent to a MassDEP-certified laboratory, Alpha Analytical, for analysis of constituents consistent with requirements for a NPDES RGP. The groundwater samples were analyzed for one or more of the following parameters: VOCs, SVOCs, total metals, hardness, ethanol, PCBs, chloride, total residual chlorine, total cyanide, ammonia nitrogen, total phenolics, total suspended solids (TSS) and total petroleum hydrocarbons (TPH). Temperature and pH were measured in the field.

A summary of the groundwater chemical analytical data is provided in Table I. The data are compared to the applicable 2014 MCP Reportable Groundwater Concentrations (RCGW-2) criteria and the 2017 NPDES RGP Site-Specific Effluent Criteria as determined in the WQBEL calculations. The source water laboratory data report is provided in Appendix G.

DISCHARGE INFORMATION

Construction dewatering will include discharging into catch basins located along Almy Street and Western Avenue. The catch basins proposed for discharge and the proposed discharge routes are shown on Figure 3. We anticipate effluent discharge rates to be about 100 gallons per minute (gpm) or less, with occasional peak flows of about 150 gpm during significant precipitation events. The temporary dewatering will take place in trench excavations and be conducted with sumps.

A Best Management Practices Plan (BMPP), which outlines the proposed discharge operations covered under the RGP, will be available at the site and is not being submitted with this NOI.

DEWATERING TREATMENT SYSTEM INFORMATION

An effluent treatment system will be designed and implemented by the Contractor to meet the applicable 2017 NPDES RGP Site-Specific Effluent Criteria. Prior to discharge, collected water will be routed through a sedimentation tank and bag filters (5-micron bag filters are anticipated to be required by the DEP-approved NTWP) to remove suspended solids and undissolved chemical constituents, as shown on Figure 4. Additional treatment may include granulated activated carbon (GAC), a chemically aided settling system, ion exchange, and/or pH adjustment.

TREATMENT CHEMICALS AND ADDITIVES

If necessary to meet the 2017 NPDES RGP Site-Specific Effluent Criteria, additional treatment including a GAC, a chemically aided settling system, ion exchange, and/or pH adjustment may be added to the treatment system. Product information for the proposed GAC and ion exchange systems, including Safety Data Sheets (SDSs), associated hazards, manufacturer, and proper system operation, are provided in Appendix C.

pH adjustment, if required, will be conducted using sulfuric acid or sodium hydroxide that will be dosed to reduce or increase pH using a metered system. Potential product information, including chemical formula, SDS, CAS registry number, manufacturer, and associated hazards, toxicological and ecological information, and manufacturer information, including dosing and metering, are provided in Appendix C. The sulfuric acid or sodium hydroxide will be stored in 55-gallon drums with secondary containment systems in place; a summary of control measures for proper handling and spill prevention is provided in

Appendix C. The addition of sulfuric acid or sodium hydroxide control pH is a standard treatment for temporary construction dewatering; it is not expected to exceed applicable permit limitations and water quality standards or alter conditions in the receiving water. No additional testing is considered necessary for use of this product or to demonstrate that use of this product will not adversely affect the receiving water.

pH will be automatically and continuously monitored, and additive added only as needed. The specific dosing will be based on the pH of the influent water, but at their maximum, the concentrations for sodium hydroxide or sulfuric acid would be 220 ppm mg/L based on the calculations provided below:

Worst case scenario: pumping at 150 gpm and using 48 gallons of sodium hydroxide or sulfuric acid per day (based on a 2 gal/hr metering rate)

150 gpm = 216,000 gal/day
Sodium Hydroxide or Sulfurc Acid use (one day) = 48 gal/day
48 gal / 216,000 gal = 2.22 x 10-4 gal
2.22 x 10-4 gal * 100% = 0.022%
1% = 10,000 ppm, therefore;
0.022% * 10,000 ppm = 220 ppm (mg/l)

the EC50 for sodium hydroxide for fish is 340.7-469.2 mg/l (ppm), and the EC50 for sulfuric acid for fish is 500 mg/l (ppm) as listed on the provided SDS's. Even at a worst case scenario, the addition of sodium hydroxide or sulfuric acid is less than the EC50.

If necessary, a chemical aided settling system may be added to one or more of the treatment systems. The system would allow of the application of coagulant and nonionic dry polymer. The product information for the proposed coagulant and dry polymer, including product name, manufacturer, purpose and use, associated hazards and risks, reported aquatic toxicity (LC_{50}), and proper handling and storage measures, are included in the attached SDSs in Appendix C. The coagulant and dry polymer is considered a typical treatment for temporary construction dewatering; addition of these compounds is not expected to add pollutants in concentrations which exceed permit effluent limitations or applicable water quality standards or alter conditions in receiving water. No additional testing is considered to be necessary for use of these products or to demonstrate that use of these products will not adversely affect the receiving water.

The dosing concentration for both the coagulant and dry polymer typically ranges from 25-50 parts per million (ppm). The actual dosing concentration is based on visual observations in the field and will be adjusted and calibrated by the operator during startup of the additional components to achieve the appropriate set-point for the system. Dosing is continuous at the set concentration while the system is running.

It is important to note that although the dosing concentration is 25-50 ppm, the detected concentration in the carryover (post bag filter) is in the parts per trillion (ppt) range (about 6 orders of magnitude less than the dosing concentration). This is because nearly all the applied chemical becomes incorporated in the sludge and removed from the waste stream as a solid from the weir tank and as part of typical system operations and maintenance.

DETERMINATION OF ENDANGERED SPECIES ACT ELIGIBILITY

According to the guidelines outlined in Appendix I of the 2017 NPDES RGP, a preliminary determination for the action area associated with this project was established using the U.S. Fish and Wildlife Service (FWS) Information, Planning, and Conservation (IPAC) online system; a copy of the determination is attached in Appendix D. Based on the results of the determination, the project and work area meet FWS Criterion A as no critical habitats have been established to be present within the project action area.

DOCUMENTATION OF NATIONAL HISTORIC PRESERVATION ACT REQUIREMENTS

Based on a review of the resources provided by the U.S. National Register of Historic Places and a review of the Massachusetts Cultural Resource Information System (MACRIS), no historic properties have been established to be present at the project site, and discharges and discharge-related activities are not considered to have the potential to affect historic properties. The discharge is considered to meet Criterion A. Documentation is included in Appendix E.

SUPPLEMENTAL INFORMATION

Permits for temporary construction dewatering will also be required from the Boston Water and Sewer Commission (BWSC). The completed BWSC Permit Application will be submitted concurrently with this NPDES RGP Application. A copy of the BWSC Permit Application is provided in Appendix F.

Owner and operator information are provided below for reference. Shallan Fitzgerald, Infrastructure Manager for the Harvard Allston Land Company, is serving as the contact person.

Owner:
Harvard Allston Land Company
1350 Massachusetts Avenue, Suite 739
Cambridge, MA 02138
Attn: Shallan Fitzgerald

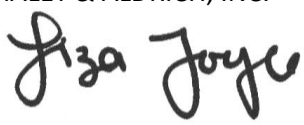
Operator:
Skanska USA Civil Northeast, Inc.
1365 Main Street
Waltham, MA 02451
Attn: Andrew Pramberger

The Harvard Allston Land Company and Skanska USA are seeking coverage under the RGP as co-permittees.

CLOSING

Thank you very much for your consideration. Please feel free to contact us should you wish to discuss the information contained herein or if you need additional information.

Sincerely yours,
HALEY & ALDRICH, INC.



Liza Joyce. E.I.T.
Engineer

Michael Cronan, L.S.P. (MA)
Associate | Senior Project Manager

Enclosures:

- Table I – Summary of Water Quality Data
- Figure 1 – Project Locus
- Figure 2 – Site Plan
- Figure 3 – Proposed Discharge Route
- Figure 4 – Proposed Treatment System Schematic
- Appendix A – Notice of Intent (NOI)
- Appendix B – Effluent Limitations Documentation
- Appendix C – Additional Treatment Information
- Appendix D – Endangered Species Act Assessment
- Appendix E – National Historic Preservation Act Review
- Appendix F – BWSC Permit Application
- Appendix G – Laboratory Data Reports

c: Harvard Allston Company; Shallan Fitzgerald
PMA Consultants; Natalie Robichaud
Skanska USA Civil Northeast, Inc.; Andrew Pramberger

\\haleyaldrich.com\share\CF\Projects\134544\Dewatering\Text\2021-0421-HAI-HALC NPDES-F.docx

TABLES

TABLE I
SUMMARY OF GROUNDWATER QUALITY DATA
100 WESTERN AVE
ALLSTON, MASSACHUSETTS
FILE NO. 134544-004

LOCATION	MassDEP MCP RCGW-2 2014	2017 NPDES RGP Site-Specific Effluent Criteria	006MW02	079MW26	OUTFALL
SAMPLE NAME			006MW02-2020-1218	079MW26-2020-1218	HA20-CHARLESRIVER
SAMPLING DATE			12/18/2020	12/18/2020	12/16/2020
LAB SAMPLE ID			L2056859-01	L2056859-02	L2056444-01
SAMPLE TYPE			WATER	WATER	WATER
Volatile Organics (µg/l)					
1,1,1-Trichloroethane	4000	200	ND(2)	ND(2)	-
1,1,2-Trichloroethane	900	5	ND(1.5)	ND(1.5)	-
1,1-Dichloroethane	2000	70	ND(1.5)	ND(1.5)	-
1,1-Dichloroethene	80	3.2	ND(1)	ND(1)	-
1,2-Dichlorobenzene	2000	600	ND(5)	ND(5)	-
1,2-Dichloroethane	5	5	ND(1.5)	ND(1.5)	-
1,3-Dichlorobenzene	6000	320	ND(5)	ND(5)	-
1,4-Dichlorobenzene	60	5	ND(5)	ND(5)	-
Acetone	50000	7970	ND(10)	ND(10)	-
Benzene	1000	5	ND(1)	ND(1)	-
Carbon tetrachloride	2	4.4	ND(1)	ND(1)	-
cis-1,2-Dichloroethene	20	70	ND(1)	6.7	-
Ethylbenzene	5000	100	ND(1)	ND(1)	-
Methyl tert butyl ether	5000	70	ND(10)	ND(10)	-
Methylene chloride	2000	4.6	ND(1)	ND(1)	-
o-xylene	3000	NA	ND(1)	ND(1)	-
p/m-Xylene	3000	NA	ND(2)	ND(2)	-
Tert-Butyl Alcohol	NA	120	ND(100)	ND(100)	-
Tertiary-Amyl Methyl Ether	NA	90	ND(20)	ND(20)	-
Tetrachloroethene	50	5	ND(1)	ND(1)	-
Toluene	40000	100	ND(1)	ND(1)	-
Trichloroethene	5	5	ND(1)	ND(1)	-
Vinyl chloride	2	2	ND(1)	**2.1**	-
Xylenes, Total	3000	100	ND(1)	ND(1)	-
SUM of Volatile Organic Compounds	NA	NA	ND	8.80	-
Volatile Organics by SIM (µg/l)					
1,4-Dioxane	6000	200	ND(50)	ND(50)	-
Semivolatile Organics (µg/l)					
Bis(2-ethylhexyl)phthalate	50000	101	ND(2.2)	ND(2.2)	-
Butyl benzyl phthalate	10000	NA	ND(5)	ND(5)	-
Di-n-butylphthalate	5000	NA	ND(5)	ND(5)	-
Di-n-octylphthalate	100000	NA	ND(5)	ND(5)	-
Diethyl phthalate	9000	101	ND(5)	ND(5)	-
Dimethyl phthalate	50000	NA	ND(5)	ND(5)	-
Total Phthalates	NA	190	ND	ND	-
Pentachlorophenol	200	1	ND(1)	ND(1)	-
Phenol	2	1080	ND(30)	ND(30)	-
SUM of Semivolatile Organic Compounds	NA	NA	ND	ND	-
Semivolatile Organics by SIM (µg/l)					
Acenaphthene	10000	Group II PAHs	2.99	ND(0.1)	-
Acenaphthylene	40	Group II PAHs	ND(0.1)	ND(0.1)	-
Anthracene	30	Group II PAHs	ND(0.1)	ND(0.1)	-
Benzo(a)anthracene	1000	1	ND(0.1)	ND(0.1)	-
Benzo(a)pyrene	500	1	ND(0.1)	ND(0.1)	-
Benzo(b)fluoranthene	400	1	ND(0.1)	ND(0.1)	-
Benzo(ghi)perylene	20	Group II PAHs	ND(0.1)	ND(0.1)	-
Benzo(k)fluoranthene	100	1	ND(0.1)	ND(0.1)	-
Chrysene	70	1	ND(0.1)	ND(0.1)	-
Dibenzo(a,h)anthracene	40	1	ND(0.1)	ND(0.1)	-
Fluoranthene	200	Group II PAHs	ND(0.1)	ND(0.1)	-
Fluorene	40	Group II PAHs	ND(0.1)	ND(0.1)	-
Indeno(1,2,3-cd)pyrene	100	1	ND(0.1)	ND(0.1)	-
Naphthalene	700	20	0.366	ND(0.1)	-
Phenanthrene	10000	Group II PAHs	ND(0.1)	ND(0.1)	-
Pyrene	20	Group II PAHs	ND(0.1)	ND(0.1)	-
SUM of Group I PAHs	NA	1	ND	ND	-
SUM of Group II PAHs	NA	100	2.99	ND	-
SUM of Semivolatile Organic Compounds (SIM)	NA	NA	3.356	ND	-

TABLE I
SUMMARY OF GROUNDWATER QUALITY DATA
100 WESTERN AVE
ALLSTON, MASSACHUSETTS
FILE NO. 134544-004

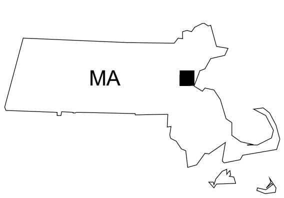
LOCATION	MassDEP MCP RCGW-2 2014	2017 NPDES RGP Site-Specific Effluent Criteria	006MW02	079MW26	OUTFALL
SAMPLE NAME			006MW02-2020-1218	079MW26-2020-1218	HA20-CHARLESRIVER
SAMPLING DATE			12/18/2020	12/18/2020	12/16/2020
LAB SAMPLE ID			L2056859-01	L2056859-02	L2056444-01
SAMPLE TYPE			WATER	WATER	WATER
Total Petroleum Hydrocarbons (µg/l)					
TPH, SGT-HEM	5000	5000	ND(3600)	ND(4000)	-
Total Metals (µg/l)					
Antimony, Total	8000	206	ND(4)	ND(4)	ND(4)
Arsenic, Total	900	104	2.15	4.35	ND(1)
Cadmium, Total	4	10.2	ND(0.2)	ND(0.2)	ND(0.2)
Chromium, Total	300	NA	ND(1)	2.16	ND(1)
Copper, Total	100000	242	ND(1)	ND(1)	1.78
Iron, Total	NA	5000	3580	3940	369
Lead, Total	10	160	ND(1)	ND(1)	ND(1)
Mercury, Total	20	0.739	ND(0.2)	ND(0.2)	ND(0.2)
Nickel, Total	200	1450	ND(2)	ND(2)	ND(2)
Selenium, Total	100	235.8	ND(5)	ND(5)	ND(5)
Silver, Total	7	35.1	ND(0.4)	ND(0.4)	ND(0.4)
Zinc, Total	900	420	ND(10)	11.58	13.54
Polychlorinated Biphenyls (µg/l)					
Aroclor 1016	5	NA	ND(0.25)	ND(0.25)	-
Aroclor 1221	5	NA	ND(0.25)	ND(0.25)	-
Aroclor 1232	5	NA	ND(0.25)	ND(0.25)	-
Aroclor 1242	5	NA	ND(0.25)	ND(0.25)	-
Aroclor 1248	5	NA	ND(0.25)	ND(0.25)	-
Aroclor 1254	5	NA	ND(0.25)	ND(0.25)	-
Aroclor 1260	5	NA	ND(0.2)	ND(0.2)	-
Total PCBs	5	0.000064	ND	ND	-
Microextractables (µg/l)					
1,2-Dibromoethane (Ethylene Dibromide)	2	0.05	ND(0.01)	ND(0.01)	-
General Chemistry (µg/l)					
Chloride	NA	Report	508000	688000	-
Chlorine, Total Residual	NA	0.2	ND(20)	ND(20)	-
Chromium, Hexavalent	300	323	ND(10)	ND(10)	-
Chromium, Trivalent	600	323	ND(10)	ND(10)	-
Cyanide, Total	30	178	ND(5)	ND(5)	-
Ethanol	NA	Report	ND(20000)	ND(20000)	-
Hardness	NA	NA	409000	188000	54500
Nitrogen, Ammonia	NA	Report	3430	1480	171
pH*	NA	6.5 - 8.3	6.72	6.71	8.63
Temperature (°C)*	NS	NA	13.6	14.7	1.0
Phenolics, Total	NA	NA	ND(30)	ND(30)	-
Total Suspended Solids	NA	30000	8800	ND(5000)	-

ABBREVIATIONS NOTES:

- : Not analyzed
µg/l: micrograms per liter
ND (2.5): Result not detected above reporting limit (shown in parentheses)
*measured in the field at the time of sampling

1. Analytes detected in at least one sample are reported herein. For a complete list of analytes see the laboratory data sheets.
2. **Red Bold** values indicate an exceedance of site-specific RGP Criteria.

FIGURES



N

MAP SOURCE: ESRI
SITE COORDINATES: 42°21'41"N, 71°07'19"W

HALEY ALDRICH

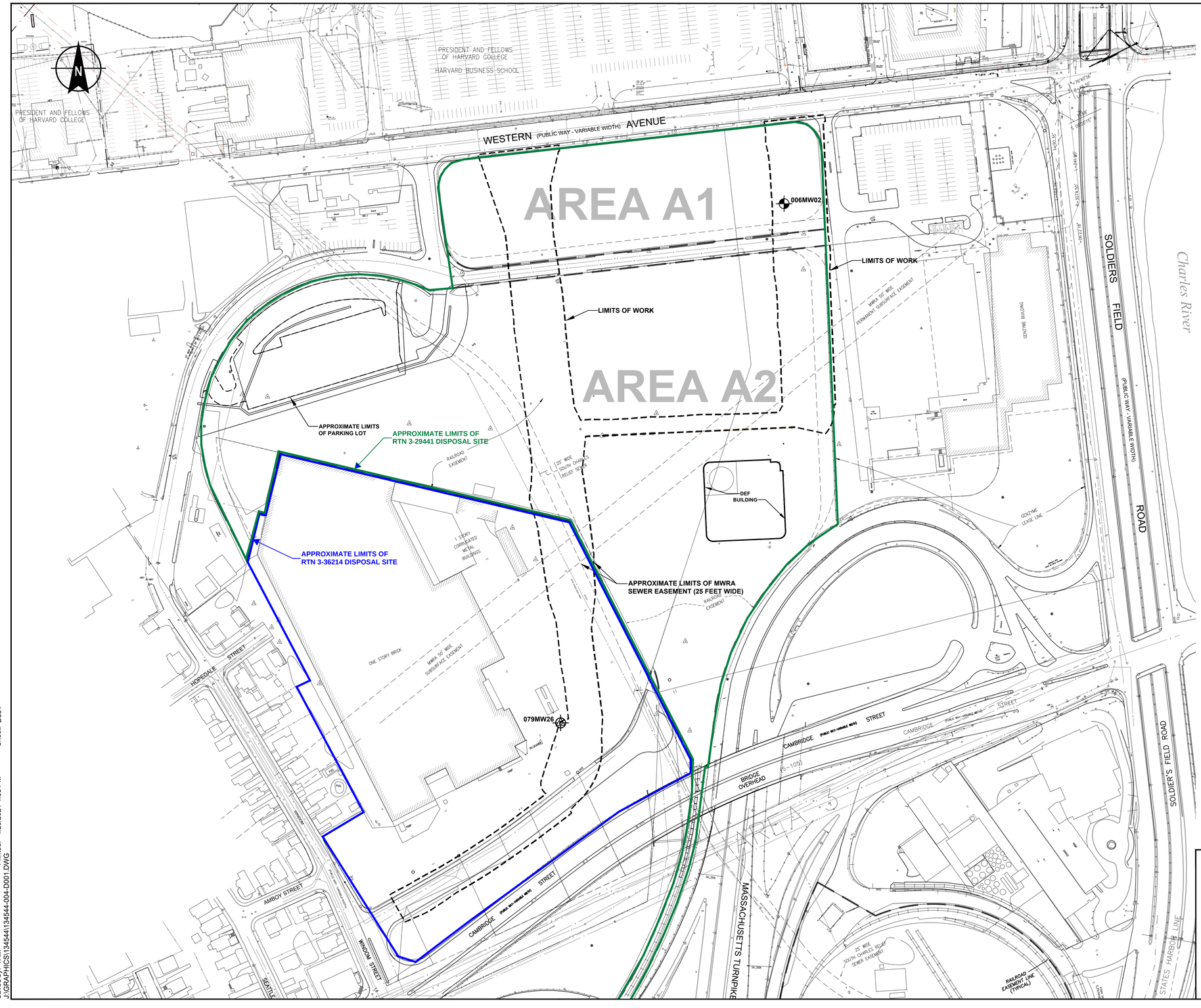
ERC ROADWAYS AND INFRASTRUCTURE
ALLSTON, MASSACHUSETTS

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
APRIL 2021

FIGURE 1

GIS FILE PATH: C:\Users\dverrier\OneDrive - haleyaldrich.com\Desktop\Local\134544\134544_004_0001_PROJECT_LOCUS.mxd — USER: dverrier — LAST SAVED: 1/11/2021 5:34:36 PM



LEGEND

006MW02 — DESIGNATION AND APPROXIMATE LOCATION OF MONITORING WELL INSTALLED BY NORTHERN DRILL SERVICE AND OBSERVED BY HALEY & ALDRICH, INC. ON 14 DECEMBER 2020

079MW26 — DESIGNATION AND APPROXIMATE LOCATION OF MONITORING WELL INSTALLED BY GEOSEARCH, INC. AND OBSERVED BY AMEC FOSTER WHEELER ON 30 DECEMBER 2016

NOTES

1. BASE PLAN CREATED FROM DRAWING TITLED "UTILITY PLAN" DRAWING C-5, DATED 29 JULY 2016 BY LEERS WEINZAPFEL ASSOCIATES ARCHITECTS, INC., RECEIVED ON 31 AUGUST 2016 FROM VHB.

0 80 160 240 320
SCALE IN FEET

HALEY ALDRICH

HARVARD ENTERPRISE RESEARCH CAMPUS
ALLSTON, MASSACHUSETTS

SITE AND SAMPLE LOCATION PLAN

SCALE: AS SHOWN
APRIL 2021

FIGURE 2

Saved by: TAM Printed: 1/20/2021 1:55 PM Sheet: D001
J:\GRAPHICS\134544\134544-004-D001.DWG

PROPOSED DISCHARGE ROUTE 1

APPROXIMATE LOCATION OF CATCH BASINS PROPOSED FOR DISCHARGE

APPROXIMATE LIMITS OF WORK AREA

PROPOSED DISCHARGE ROUTE 2

ERC ROADWAYS AND INFRASTRUCTURE
ALLSTON, MASSACHUSETTS

PROPOSED DISCHARGE ROUTE

APRIL 2021

FIGURE 3

HALEY ALDRICH

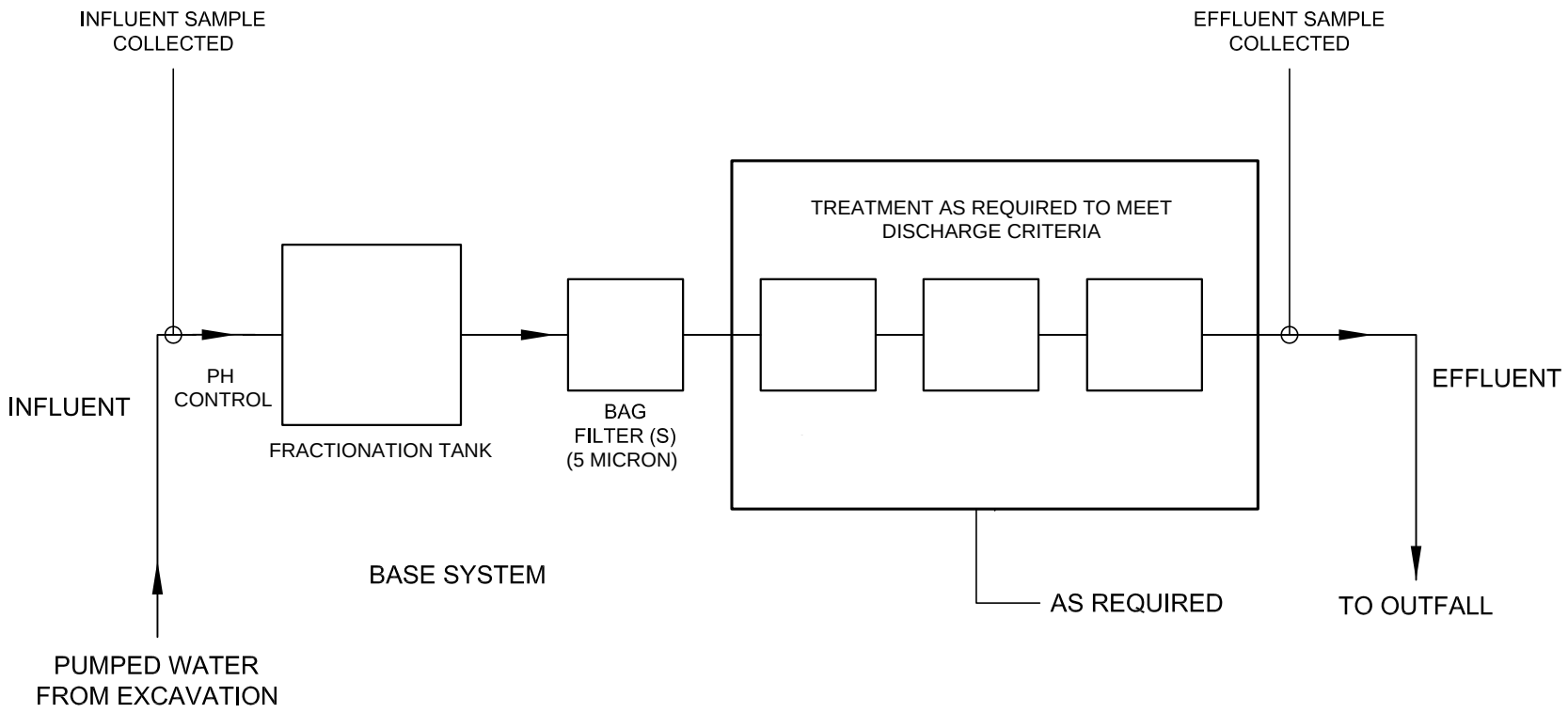
BOSTON WATER AND SEWER

Copyright © Boston Water and Sewer Commission. All rights reserved. Printed on: 1/13/2017

N W E S

100 50 0 100 200 300 Feet

1 inch = 100 feet



LEGEND:

DIRECTION OF FLOW

NOTE:

1. DETAILS OF TREATMENT SYSTEM MAY VARY FROM SYSTEM INDICATED ABOVE. SPECIFIC MEANS AND METHODS OF TREATMENT TO BE SELECTED BY CONTRACTOR. WATER WILL BE TREATED TO MEET REQUIRED EFFLUENT STANDARDS.

HALEY ALDRICH

ERC ROADWAYS AND INFRASTRUCTURE
ALLSTON, MASSACHUSETTS

PROPOSED TREATMENT SYSTEM SCHEMATIC

SCALE: NONE
APRIL 2021

FIGURE 4

APPENDIX A

Notice of Intent (NOI)

II. Suggested Format for the Remediation General Permit Notice of Intent (NOI)

A. General site information:

<table>
<tr><td rowspan="2">1. Name of site:
Harvard Enterprise Research Campus (ERC) Roadways and Infrastructure Project</td><td colspan="3">Site address: 100 Western Avenue
Street:</td></tr>
<tr><td>City: Boston</td><td>State: MA</td><td>Zip: 02134</td></tr>
<tr><td rowspan="4">2. Site owner
Harvard Allston Land Company

Owner is (check one): ☐ Federal ☐ State/Tribal ☐ Private
■ Other; if so, specify: Institution</td><td colspan="3">Contact Person: Shallan Fitzgerald</td></tr>
<tr><td colspan="2">Telephone: 617-495-4221</td><td>Email: shallan_fitzgerald@harvard.edu</td></tr>
<tr><td colspan="3">Mailing address: 1350 Massachusetts Avenue, Suite 739
Street:</td></tr>
<tr><td>City: Cambridge</td><td>State: MA</td><td>Zip: 02138</td></tr>
<tr><td rowspan="4">3. Site operator, if different than owner
Skanska USA Civil Northeast, Inc.</td><td colspan="3">Contact Person: Andrew Pramberger</td></tr>
<tr><td colspan="2">Telephone: 917.417.8576</td><td>Email: andrew.pramberger@skanska.co</td></tr>
<tr><td colspan="3">Mailing address:
Street: 1365 Main Street</td></tr>
<tr><td>City: Waltham</td><td>State: MA</td><td>Zip: 02451</td></tr>
<tr><td colspan="2">4. NPDES permit number assigned by EPA:
Not Applicable

NPDES permit is (check all that apply: ■ RGP ☐ DGP ☐ CGP
☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:</td><td colspan="2">5. Other regulatory program(s) that apply to the site (check all that apply):
■ MA Chapter 21e; list RTN(s):
3-29441; 3-36214
☐ NH Groundwater Management Permit or Groundwater Release Detection Permit:
☐ CERCLA
☐ UIC Program
☐ POTW Pretreatment
☐ CWA Section 404</td></tr>
</table>

B. Receiving water information:

1. Name of receiving water(s):	Waterbody identification of receiving water(s):	Classification of receiving water(s):
Charles River	MA72-36	Class B

Receiving water is (check any that apply): ☐ Outstanding Resource Water ☐ Ocean Sanctuary ☐ territorial sea ☐ Wild and Scenic River

2. Has the operator attached a location map in accordance with the instructions in B, above? (check one): ■ Yes ☐ No

Are sensitive receptors present near the site? (check one): ☐ Yes ■ No
If yes, specify:

3. Indicate if the receiving water(s) is listed in the State's Integrated List of Waters (i.e., CWA Section 303(d)). Include which designated uses are impaired, and any pollutants indicated. Also, indicate if a final TMDL is available for any of the indicated pollutants. For more information, contact the appropriate State as noted in Part 4.6 of the RGP. Impaired - aesthetic (P), fish consumption, fish, other aquatic life and wildlife (P), primary contact rec. (P, pathogens), and secondary contact rec (P): two TMDLs (pathogens and phosphorus)

4. Indicate the seven day-ten-year low flow (7Q10) of the receiving water determined in accordance with the instructions in Appendix V for sites located in Massachusetts and Appendix VI for sites located in New Hampshire.	24.6
5. Indicate the requested dilution factor for the calculation of water quality-based effluent limitations (WQBELs) determined in accordance with the instructions in Appendix V for sites in Massachusetts and Appendix VI for sites in New Hampshire.	74.6

6. Has the operator received confirmation from the appropriate State for the 7Q10and dilution factor indicated? (check one): ■ Yes ☐ No
If yes, indicate date confirmation received: 26 January 2021

7. Has the operator attached a summary of receiving water sampling results as required in Part 4.2 of the RGP in accordance with the instruction in Appendix VIII? (check one): ■ Yes ☐ No

C. Source water information:

1. Source water(s) is (check any that apply):

■ Contaminated groundwater	☐ Contaminated surface water	☐ The receiving water	☐ Potable water; if so, indicate municipality or origin:
Has the operator attached a summary of influent sampling results as required in Part 4.2 of the RGP in accordance with the instruction in Appendix VIII? (check one): ■ Yes ☐ No	Has the operator attached a summary of influent sampling results as required in Part 4.2 of the RGP in accordance with the instruction in Appendix VIII? (check one): ☐ Yes ☐ No	☐ A surface water other than the receiving water; if so, indicate waterbody:	☐ Other; if so, specify:

2. Source water contaminants: cis-1,2-dichloroethene, vinyl chloride, acenaphthene, naphthalene, metals (As, Cr, Fe, Zn), chloride, ammonia, total suspended	
a. For source waters that are contaminated groundwater or contaminated surface water, indicate are any contaminants present that are not included in the RGP? (check one): ☐ Yes ■ No If yes, indicate the contaminant(s) and the maximum concentration present in accordance with the instructions in Appendix VIII.	b. For a source water that is a surface water other than the receiving water, potable water or other, indicate any contaminants present at the maximum concentration in accordance with the instructions in Appendix VIII? (check one): ☐ Yes ☐ No
3. Has the source water been previously chlorinated or otherwise contains residual chlorine? (check one): ☐ Yes ■ No	

D. Discharge information

1.The discharge(s) is a(n) (check any that apply): ■ Existing discharge ☐ New discharge ☐ New source	
Outfall(s): SDO 041 SDO 034	Outfall location(s): (Latitude, Longitude) 42.364297, -71.117680 42.359574, -71.117155
Discharges enter the receiving water(s) via (check any that apply): ☐ Direct discharge to the receiving water ■ Indirect discharge, if so, specify: Into the Charles via BSWC storm drains ☐ A private storm sewer system ■ A municipal storm sewer system If the discharge enters the receiving water via a private or municipal storm sewer system: Has notification been provided to the owner of this system? (check one): ☐ Yes ■ No Has the operator has received permission from the owner to use such system for discharges? (check one): ☐ Yes ■ No, if so, explain, with an estimated timeframe for obtaining permission: BWSC application is being submitted concurrently with this NOI Has the operator attached a summary of any additional requirements the owner of this system has specified? (check one): ☐ Yes ■ No	
Provide the expected start and end dates of discharge(s) (month/year): July 2021 to November 2023 Indicate if the discharge is expected to occur over a duration of: ☐ less than 12 months ■ 12 months or more ☐ is an emergency discharge	
Has the operator attached a site plan in accordance with the instructions in D, above? (check one): ■ Yes ☐ No	

<table>
<tr><td>2. Activity Category: (check all that apply)</td><td colspan="2">3. Contamination Type Category: (check all that apply)</td></tr>
<tr><td rowspan="5">☐ I – Petroleum-Related Site Remediation
☐ II – Non-Petroleum-Related Site Remediation
■ III – Contaminated Site Dewatering
☐ IV – Dewatering of Pipelines and Tanks
☐ V – Aquifer Pump Testing
☐ VI – Well Development/Rehabilitation
☐ VII – Collection Structure Dewatering/Remediation
☐ VIII – Dredge-Related Dewatering</td><td colspan="2">a. If Activity Category I or II: (check all that apply)

☐ A. Inorganics
☐ B. Non-Halogenated Volatile Organic Compounds
☐ C. Halogenated Volatile Organic Compounds
☐ D. Non-Halogenated Semi-Volatile Organic Compounds
☐ E. Halogenated Semi-Volatile Organic Compounds
☐ F. Fuels Parameters</td></tr>
<tr><td colspan="2">b. If Activity Category III, IV, V, VI, VII or VIII: (check either G or H)</td></tr>
<tr><td>■ G. Sites with Known Contamination</td><td>☐ H. Sites with Unknown Contamination</td></tr>
<tr><td>c. If Category III-G, IV-G, V-G, VI-G, VII-G or VIII-G: (check all that apply)

■ A. Inorganics
■ B. Non-Halogenated Volatile Organic Compounds
■ C. Halogenated Volatile Organic Compounds
■ D. Non-Halogenated Semi-Volatile Organic Compounds
☐ E. Halogenated Semi-Volatile Organic Compounds
■ F. Fuels Parameters</td><td>d. If Category III-H, IV-H, V-H, VI-H, VII-H or VIII-H Contamination Type Categories A through F apply</td></tr>
</table>

4. Influent and Effluent Characteristics

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
A. Inorganics									
Ammonia		✔	2	121,4500	75	3430	2455	Report mg/L	---
Chloride		✔	2	44,300.0	12500	688000	598000	Report µg/l	---
Total Residual Chlorine	✔		2	121,4500	20	<20	<20	0.2 mg/L	NA
Total Suspended Solids		✔	2	121,2540D	5000	8800	6900	30 mg/L	---
Antimony	✔		2	3,200.8	4	<4	<4	206 µg/L	NA
Arsenic		✔	2	3,200.8	1	4.35	3.25	104 µg/L	NA
Cadmium	✔		2	3,200.8	0.2	<0.2	<0.2	10.2 µg/L	NA
Chromium III	✔		2	107,-	10	<10	<10	323 µg/L	NA
Chromium VI	✔		2	1,7196A	10	<10	<10	323 µg/L	NA
Copper	✔		2	3,200.8	1	<1	<1	242 µg/L	NA
Iron		✔	2	19,200.7	50	3940	3760	5,000 µg/L	NA
Lead	✔		2	3,200.8	1	<1	<1	160 µg/L	NA
Mercury	✔		2	3,245.1	0.2	<0.2	<0.2	0.739 µg/L	NA
Nickel	✔		2	3,200.8	2	<2	<2	1,450 µg/L	NA
Selenium	✔		2	3,200.8	5	<5	<5	235.8 µg/L	NA
Silver	✔		2	3,200.8	0.4	<0.4	<0.4	35.1 µg/L	NA
Zinc		✔	2	3,200.8	10	11.58	10.79	420 µg/L	NA
Cyanide	✔		2	121,4500	5	<5	<5	178 mg/L	NA
B. Non-Halogenated VOCs									
Total BTEX	✔		2	128,624.1	2	<2	<2	100 µg/L	---
Benzene	✔		2	128,624.1	1	<1	<1	5.0 µg/L	---
1,4 Dioxane	✔		2	128,624.	50	<50	<50	200 µg/L	---
Acetone	✔		2	128,624.1	10	<10	<10	7.97 mg/L	---
Phenol	✔		2	4,420.1	30	<30	<30	1,080 µg/L	NA

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
C. Halogenated VOCs									
Carbon Tetrachloride	✔		2	128,624.1	1	<1	<1	4.4 µg/L	NA
1,2 Dichlorobenzene	✔		2	128,624.1	5	<5	<5	600 µg/L	---
1,3 Dichlorobenzene	✔		2	128,624.1	5	<5	<5	320 µg/L	---
1,4 Dichlorobenzene	✔		2	128,624.1	5	<5	<5	5.0 µg/L	---
Total dichlorobenzene	✔		2	NA	5	<5	<5	763 µg/L in NH	---
1,1 Dichloroethane	✔		2	128,624.1	1.5	<1.5	<1.5	70 µg/L	---
1,2 Dichloroethane	✔		2	128,624.1	1.5	<1.5	<1.5	5.0 µg/L	---
1,1 Dichloroethylene	✔		2	128,624.1	1	<1	<1	3.2 µg/L	---
Ethylene Dibromide	✔		2	14,504.1	0.01	<0.01	<0.01	0.05 µg/L	---
Methylene Chloride	✔		2	128,624.1	1	<1	<1	4.6 µg/L	---
1,1,1 Trichloroethane	✔		2	128,624.1	2	<2	<2	200 µg/L	---
1,1,2 Trichloroethane	✔		2	128,624.1	1.5	<1.5	<1.5	5.0 µg/L	---
Trichloroethylene	✔		2	128,624.1	1	<1	<1	5.0 µg/L	---
Tetrachloroethylene	✔		2	128,624.1	1	<1	<1	5.0 µg/L	NA
cis-1,2 Dichloroethylene		✔	2	128,624.1	1	6.7	3.85	70 µg/L	---
Vinyl Chloride		✔	2	128,624.1	1	2.1	1.55	2.0 µg/L	---
D. Non-Halogenated SVOCs									
Total Phthalates	✔		2	129,625.1	5	<5	<5	190 µg/L	NA
Diethylhexyl phthalate	✔		2	129,625.1	2.2	<2.2	<2.2	101 µg/L	NA
Total Group I PAHs	✔		2	129,625.1	0.1	<0.1	<0.1	1.0 µg/L	---
Benzo(a)anthracene	✔		2	129,625.1	0.1	<0.1	<0.1	As Total PAHs	NA
Benzo(a)pyrene	✔		2	129,625.1	0.1	<0.1	<0.1		NA
Benzo(b)fluoranthene	✔		2	129,625.1	0.1	<0.1	<0.1		NA
Benzo(k)fluoranthene	✔		2	129,625.1	0.1	<0.1	<0.1		NA
Chrysene	✔		2	129,625.1	0.1	<0.1	<0.1		NA
Dibenzo(a,h)anthracene	✔		2	129,625.1	0.1	<0.1	<0.1		NA
Indeno(1,2,3-cd)pyrene	✔		2	129,625.1	0.1	<0.1	<0.1		NA

Parameter	Known or believed absent	Known or believed present	# of samples	Test method (#)	Detection limit (µg/l)	Influent		Effluent Limitations	
						Daily maximum (µg/l)	Daily average (µg/l)	TBEL	WQBEL
Total Group II PAHs		✔	2	129,625.1	0.1	2.99	1.5	100 µg/L	---
Naphthalene		✔	2	129,625.1	0.1	0.366	0.184	20 µg/L	---
E. Halogenated SVOCs									
Total PCBs	✔		2	127,608.3	0.25	<0.25	<0.25	0.000064 µg/L	---
Pentachlorophenol	✔		2	129,625.1	1	<1	<1	1.0 µg/L	---
F. Fuels Parameters									
Total Petroleum Hydrocarbons	✔		2	74,1664A	4000	<4000	<4000	5.0 mg/L	---
Ethanol	✔		2	1671A	20000	<20000	<20000	Report mg/L	---
Methyl-tert-Butyl Ether	✔		2	128,624.1	10	<10	<10	70 µg/L	NA
tert-Butyl Alcohol	✔		2	128,624.1	100	<100	<100	120 µg/L in MA 40 µg/L in NH	---
tert-Amyl Methyl Ether	✔		2	128,624.1	20	<20	<20	90 µg/L in MA 140 µg/L in NH	---
Other (i.e., pH, temperature, hardness, salinity, LC_{50}, additional pollutants present); if so, specify:									
pH		✔	2	Field	NA	6.72	6.715		
Hardeness		✔	2	19,200.7	660	409000	298500		
Acenaphthene		✔	2	129,625.1	0.1	2.99	1.5		
Chromium		✔	2	3,200.8	1	2.16	1.08		
See next page									

LIST OF COMPOUNDS DETECTED IN SOIL AT THE SITE		
Volatile Organic Compounds (mg/kg)	**Semi-Volatile Organic Compounds (mg/kg)**	**Inorganic Compounds (mg/kg)**
1,2,4-Trimethylbenzene	1,4-Dichlorobenzene	Antimony
1,2-Dichlorobenzene	2-Methylnaphthalene	Arsenic
1,3,5-Trimethylbenzene	3&4-Methylphenol	Barium
2-Butanone (Methyl Ethyl Ketone)	Acenaphthene	Beryllium
2-Phenylbutane (sec-Butylbenzene)	Acenaphthylene	Cadmium
Acetone	Acetophenone	Chromium
Benzene	Anthracene	Cyanide
Carbon disulfide	Benzo(a)anthracene	Lead
Chlorobenzene	Benzo(a)pyrene	Mercury
Chloroform (Trichloromethane)	Benzo(b)fluoranthene	Nickel
cis-1,2-Dichloroethene	Benzo(g,h,i)perylene	Selenium
Cymene (p-Isopropyltoluene)	Benzo(k)fluoranthene	Silver
Ethylbenzene	bis(2-Ethylhexyl)phthalate	Vanadium
Isopropylbenzene (Cumene)	Chrysene	Zinc
Naphthalene	Dibenz(a,h)anthracene	**PCBs (mg/kg)**
n-Butylbenzene	Dibenzofuran	Aroclor-1248 (PCB-1248)
n-Propylbenzene	Di-n-octyl phthalate	Aroclor-1254 (PCB-1254)
tert-Butylbenzene	Fluoranthene	Aroclor-1260 (PCB-1260)
Toluene	Fluorene	**Pesticides (mg/kg)**
Trichloroethene	Indeno(1,2,3-cd)pyrene	4,4'-DDD
Xylene (total)	Naphthalene	4,4'-DDE
EPH (mg/kg)	Phenanthrene	4,4'-DDT
MADEP C11-C22 Aromatic Hydrocarbons, Adjusted	Phenol	Chlordane
MADEP C11-C22 Aromatic Hydrocarbons, Unadjusted	Pyrene	Dieldrin
MADEP C19-C36 Aliphatic Hydrocarbons	**VPH (mg/kg)**	Hexachlorobenzene
MADEP C9-C18 Aliphatic Hydrocarbons	MADEP C9-C10 Aromatic Hydrocarbons	**Total Petroleum Hydrocarbons (mg/kg)**
	MADEP C9-C12 Aliphatic Hydrocarbons, Adjusted	Petroleum hydrocarbons
	MADEP C9-C12 Aliphatic Hydrocarbons, Unadjusted	

E. Treatment system information

1. Indicate the type(s) of treatment that will be applied to effluent prior to discharge: (check all that apply)

☐ Adsorption/Absorption ☐ Advanced Oxidation Processes ☐ Air Stripping ☐ Granulated Activated Carbon ("GAC")/Liquid Phase Carbon Adsorption
☐ Ion Exchange ☐ Precipitation/Coagulation/Flocculation ■ Separation/Filtration ■ Other; if so, specify:
Granular activated carbon (GAC), coagulant, Ion Exchange and/or pH adjustment may be added to meet necessary effluent limits.

2. Provide a written description of all treatment system(s) or processes that will be applied to the effluent prior to discharge.
Prior to discharge, collected water will be routed through a sedimentation tank and bag filters (5-micron bag filters are required by the NTWP) to remove suspended solids and undissolved chemical constituents, as shown on Figure 4. Additional treatment may include granulated activated carbon (GAC), coagulant, pH adjustment, and/or ion exchange.

Identify each major treatment component (check any that apply):
■ Fractionation tanks☐ Equalization tank ☐ Oil/water separator ☐ Mechanical filter ☐ Media filter
☐ Chemical feed tank ☐ Air stripping unit ■ Bag filter ■ Other; if so, specify: pH Adjustment, Granulated Activated Carbon (GAC), coagulant, and/or Ion Exchange may be added to meet necessary effluent limits.
Indicate if either of the following will occur (check any that apply):
☐ Chlorination ☐ De-chlorination

3. Provide the **design flow capacity** in gallons per minute (gpm) of the most limiting component. Indicate the most limiting component: Flowmeter Is use of a flow meter feasible? (check one): ■ Yes ☐ No, if so, provide justification:	250 gpm
Provide the proposed maximum effluent flow in gpm.	150 gpm
Provide the average effluent flow in gpm.	100 gpm
If Activity Category IV applies, indicate the estimated total volume of water that will be discharged:	NA

4. Has the operator attached a schematic of flow in accordance with the instructions in E, above? (check one): ■ Yes ☐ No

F. Chemical and additive information

1. Indicate the type(s) of chemical or additive that will be applied to effluent prior to discharge or that may otherwise be present in the discharge(s): (check all that apply)

☐ Algaecides/biocides ☐ Antifoams ☐ Coagulants ☐ Corrosion/scale inhibitors ☐ Disinfectants ☐ Flocculants ☐ Neutralizing agents ☐ Oxidants ☐ Oxygen ☐ scavengers ☐ pH conditioners ☐ Bioremedial agents, including microbes ☐ Chlorine or chemicals containing chlorine ■ Other; if so, specify:
pH or iron treatment conditioners (coagulant) may be added to the treatment system if necessary to meet effluent limits.

2. Provide the following information for each chemical/additive, using attachments, if necessary:

Refer to attached Haley & Aldrich, Inc. letter
a. Product name, chemical formula, and manufacturer of the chemical/additive;
b. Purpose or use of the chemical/additive or remedial agent;
c. Material Safety Data Sheet (MSDS) and Chemical Abstracts Service (CAS) Registry number for each chemical/additive;
d. The frequency (hourly, daily, etc.), duration (hours, days), quantity (maximum and average), and method of application for the chemical/additive;
e. Any material compatibility risks for storage and/or use including the control measures used to minimize such risks; and
f. If available, the vendor's reported aquatic toxicity (NOAEL and/or LC50 in percent for aquatic organism(s)).

3. Has the operator attached an explanation which demonstrates that the addition of such chemicals/additives may be authorized under this general permit in accordance with the instructions in F, above? (check one): ■ Yes ☐ No; if no, has the operator attached data that demonstrates each of the 126 priority pollutants in CWA Section 307(a) and 40 CFR Part 423.15(j)(1) are non-detect in discharges with the addition of the proposed chemical/additive?
(check one): ☐ Yes ☐ No

G. Endangered Species Act eligibility determination

1. Indicate under which criterion the discharge(s) is eligible for coverage under this general permit:

■ **FWS Criterion A**: No endangered or threatened species or critical habitat are in proximity to the discharges or related activities or come in contact with the "action area".

☐ **FWS Criterion B**: Formal or informal consultation with the FWS under section 7 of the ESA resulted in either a no jeopardy opinion (formal consultation) or a written concurrence by FWS on a finding that the discharges and related activities are "not likely to adversely affect" listed species or critical habitat (informal consultation). Has the operator completed consultation with FWS? (check one): ☐ Yes ☐ No; if no, is consultation underway? (check one): ☐ Yes ☐ No

☐ **FWS Criterion C**: Using the best scientific and commercial data available, the effect of the discharges and related activities on listed species and critical habitat have been evaluated. Based on those evaluations, a determination is made by EPA, or by the operator and affirmed by EPA, that the discharges and related activities will have "no effect" on any federally threatened or endangered listed species or designated critical habitat under the jurisdiction of the FWS. This determination was made by: (check one) ☐ the operator ☐ EPA ☐ Other; if so, specify:

☐ **NMFS Criterion**: A determination made by EPA is affirmed by the operator that the discharges and related activities will have "no effect" or are "not likely to adversely affect" any federally threatened or endangered listed species or critical habitat under the jurisdiction of NMFS and will not result in any take of listed species. Has the operator previously completed consultation with NMFS? (check one): ☐ Yes ☐ No

2. Has the operator attached supporting documentation of ESA eligibility in accordance with the instructions in Appendix I, and G, above? (check one): ■ Yes ☐ No

Does the supporting documentation include any written concurrence or finding provided by the Services? (check one): ☐ Yes ■ No; if yes, attach.

H. National Historic Preservation Act eligibility determination

1. Indicate under which criterion the discharge(s) is eligible for coverage under this general permit:

■ **Criterion A**: No historic properties are present. The discharges and discharge-related activities (e.g., BMPs) do not have the potential to cause effects on historic properties.

☐ **Criterion B**: Historic properties are present. Discharges and discharge related activities do not have the potential to cause effects on historic properties.

☐ **Criterion C**: Historic properties are present. The discharges and discharge-related activities have the potential to have an effect or will have an adverse effect on historic properties.

2. Has the operator attached supporting documentation of NHPA eligibility in accordance with the instructions in H, above? (check one): ■ Yes ☐ No

Does the supporting documentation include any written agreement with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (TPHO), or other tribal representative that outlines measures the operator will carry out to mitigate or prevent any adverse effects on historic properties? (check one): ☐ Yes ■ No

I. Supplemental information

Describe any supplemental information being provided with the NOI. Include attachments if required or otherwise necessary.

Refer to attached Haley & Aldrich, Inc. letter

Has the operator attached data, including any laboratory case narrative and chain of custody used to support the application? (check one): ■ Yes ☐ No

Has the operator attached the certification requirement for the Best Management Practices Plan (BMPP)? (check one): ■ Yes ☐ No

J. Certification requirement

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

BMPP certification statement:	A BMPP meeting the requirements of this general permit will be implemented at the site.
Notification provided to the appropriate State, including a copy of this NOI, if required.	Check one: Yes ☐ No ■
Notification provided to the municipality in which the discharge is located, including a copy of this NOI, if requested.	Check one: Yes ☐ No ■ Will be sent concurrently with this NOI
Notification provided to the owner of a private or municipal storm sewer system, if such system is used for site discharges, including a copy of this NOI, if requested.	Check one: Yes ☐ No ■ NA ☐ Will be sent concurrently with this NOI
Permission obtained from the owner of a private or municipal storm sewer system, if such system is used for site discharges. If yes, attach additional conditions. If no, attach explanation and timeframe for obtaining permission.	Check one: Yes ☐ No ■ NA ☐
Notification provided to the owner/operator of the area associated with activities covered by an additional discharge permit(s). Additional discharge permit is (check one): ☐ RGP ☐ DGP ☐ CGP ☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:	Check one: Yes ☐ No ☐ NA ■
Signature:	Date: 04/16/2021
Print Name and Title: Andrew Pramberger, Project Manager	

J. Certification requirement

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

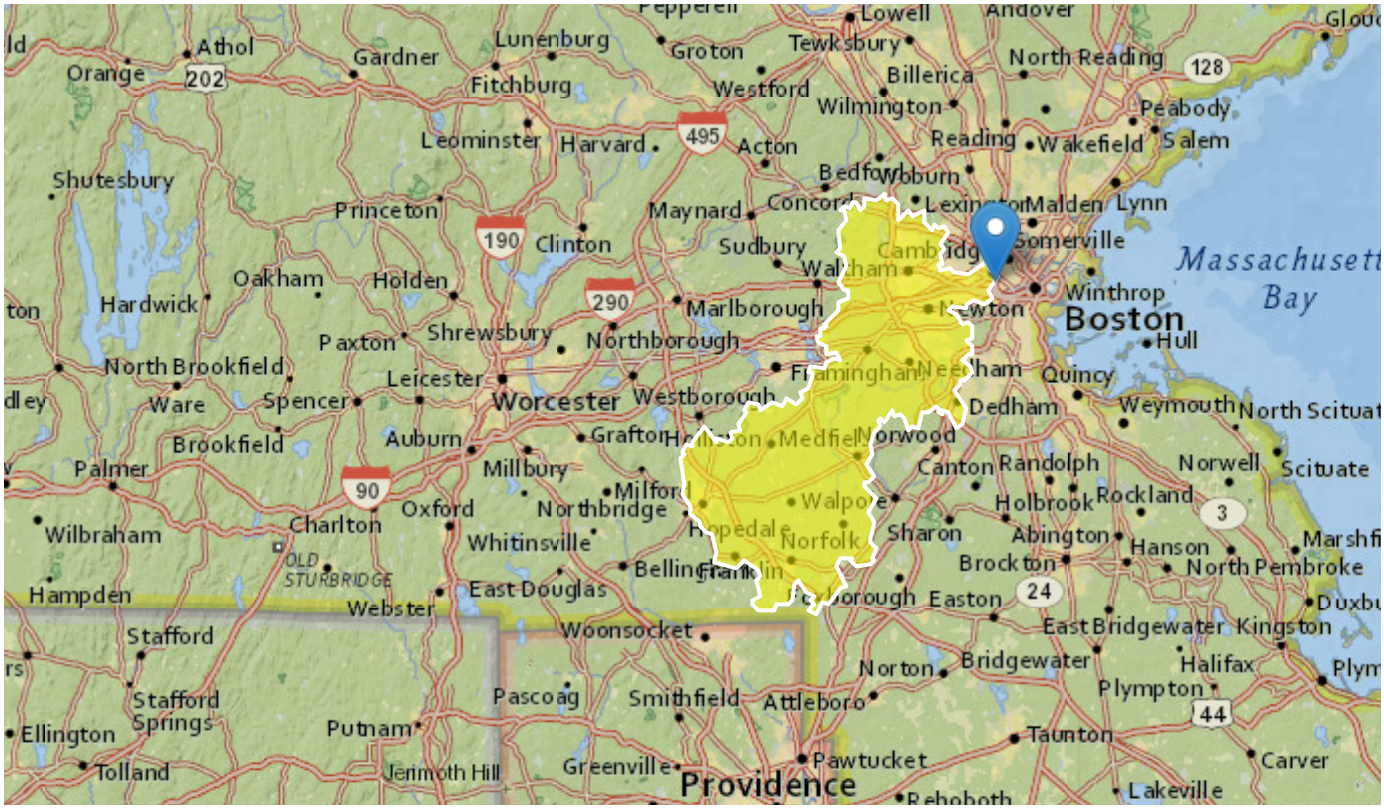
BMPP certification statement: A BMPP meeting the requirements of this general permit will be implemented at the site.	
Notification provided to the appropriate State, including a copy of this NOI, if required.	Check one: Yes ☐ No ■
Notification provided to the municipality in which the discharge is located, including a copy of this NOI, if requested.	Check one: Yes ☐ No ■ Will be sent concurrently with this NOI
Notification provided to the owner of a private or municipal storm sewer system, if such system is used for site discharges, including a copy of this NOI, if requested.	Check one: Yes ☐ No ■ NA ☐ Will be sent concurrently with this NOI
Permission obtained from the owner of a private or municipal storm sewer system, if such system is used for site discharges. If yes, attach additional conditions. If no, attach explanation and timeframe for obtaining permission.	Check one: Yes ☐ No ■ NA ☐
Notification provided to the owner/operator of the area associated with activities covered by an additional discharge permit(s). Additional discharge permit is (check one): ☐ RGP ☐ DGP ☐ CGP ☐ MSGP ☐ Individual NPDES permit ☐ Other; if so, specify:	Check one: Yes ☐ No ☐ NA ■
Signature: Shallan Fitzgerald	Date: 04/21/2021
Print Name and Title: Shallan Fitzgerald, Infrastructure Manager	

APPENDIX B

Effluent Limitations Documentation

StreamStats Report

Region ID: MA
Workspace ID: MA20210108153002827000
Clicked Point (Latitude, Longitude): 42.36420, -71.11708
Time: 2021-01-08 10:30:20 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	282	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.334	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.23	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	282	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.334	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.23	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	49.4	ft^3/s
7 Day 10 Year Low Flow	24.6	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.4.0

HALEY & ALDRICH, INC.		**CALCULATIONS**	FILE NO.	134544-004	
			SHEET	1 of 1	
CLIENT	HARVARD ALLSTON LAND COMPANY		DATE	8-Jan-21	
PROJECT	ERC ROADWAYS AND INFRASTRUCTURE PROJECT		COMPUTED BY	LDJ	
SUBJECT	DILUTION FACTOR CALCULATIONS				

PURPOSE: Calculate Dilution Factor (DF) for project based on 7 Day 10 Year (7Q10) Low Flow values.

APPROACH: Calculate DF based on EPA formula $(Q_S + Q_D)/Q_D$, where Q_S is 7Q10 in million gallons per day (MGD) and Q_D is discharge flow in MGD.

ASSUMPTIONS:
1. 7Q10 is 24.6 cfs (from StreamStats 4.0)
2. A conversion of 7.48 is used to convert cubic feet to gallons
3. A discharge flowrate of 150 gpm is assumed

CALCULATIONS:

7Q10 Low Flow Value (Q_S)

$$Q_S = \frac{24.6\ ft^3}{sec} \times \frac{7.48\ gallons}{ft^3} \times \frac{86{,}400\ sec}{day} \times \frac{1\ MG}{1{,}000{,}000\ gallons}$$

Q_S = 15.90 MGD

Discharge Flowrate (Q_D)

$$Q_D = \frac{150\ gallons}{min} \times \frac{1{,}440\ min}{day} \times \frac{1\ MG}{1{,}000{,}000\ gallons}$$

Q_D = 0.216 MGD

Dilution Factor (DF)

$$DF = \frac{Q_S + Q_D}{QD} = \frac{15.90\ MGD + 0.216\ MGD}{0.216\ MGD} = 74.6$$

CONCLUSION The dilution factor for this project is calculated to be 45.17 based on the provided 7Q10 low flow value and discharge flowrate.

Enter number values in green boxes below

Enter values in the units specified

↓

15.89	Q_R = Enter upstream flow in **MGD**
0.216	Q_P = Enter discharge flow in **MGD**
0	Downstream 7Q10

Enter a dilution factor, if other than zero

↓

74.6

Enter values in the units specified

↓

298.5	C_d = Enter influent hardness in **mg/L** $CaCO_3$
54.5	C_s = Enter receiving water hardness in **mg/L** $CaCO_3$

Enter **receiving water** concentrations in the units specified

↓

8.63	pH in **Standard Units**
1	Temperature in **°C**
0.171	Ammonia in **mg/L**
54.5	Hardness in **mg/L** $CaCO_3$
0	Salinity in **ppt**
0	Antimony in **µg/L**
0	Arsenic in **µg/L**
0	Cadmium in **µg/L**
0	Chromium III in **µg/L**
0	Chromium VI in **µg/L**
1.78	Copper in **µg/L**
369	Iron in **µg/L**
0	Lead in **µg/L**
0	Mercury in **µg/L**
0	Nickel in **µg/L**
0	Selenium in **µg/L**
0	Silver in **µg/L**
13.54	Zinc in **µg/L**

Enter **influent** concentrations in the units specified

↓

0	TRC in **µg/L**
3.43	Ammonia in **mg/L**
0	Antimony in **µg/L**
4.35	Arsenic in **µg/L**
0	Cadmium in **µg/L**
0	Chromium III in **µg/L**
0	Chromium VI in **µg/L**
0	Copper in **µg/L**
3940	Iron in **µg/L**
0	Lead in **µg/L**
0	Mercury in **µg/L**
0	Nickel in **µg/L**
0	Selenium in **µg/L**
0	Silver in **µg/L**
11.58	Zinc in **µg/L**
0	Cyanide in **µg/L**
0	Phenol in **µg/L**
0	Carbon Tetrachloride in **µg/L**
0	Tetrachloroethylene in **µg/L**
0	Total Phthalates in **µg/L**
0	Diethylhexylphthalate in **µg/L**
0	Benzo(a)anthracene in **µg/L**
0	Benzo(a)pyrene in **µg/L**
0	Benzo(b)fluoranthene in **µg/L**
0	Benzo(k)fluoranthene in **µg/L**
0	Chrysene in **µg/L**
0	Dibenzo(a,h)anthracene in **µg/L**
0	Indeno(1,2,3-cd)pyrene in **µg/L**
0	Methyl-tert butyl ether in **µg/L**

Notes:

Freshwater: Q_R equal to the 7Q10; enter alternate Q_R if approved by the State; enter 0 if no dilution factor approved

Saltwater (estuarine and marine): enter Q_R if approved by the State; enter 0 if no entry

Discharge flow is equal to the design flow or 1 MGD, whichever is less

Only if approved by State as the entry for Q_R; leave 0 if no entry

Saltwater (estuarine and marine): only if approved by the State

Leave 0 if no entry

Freshwater only

pH, temperature, and ammonia required for all discharges

Hardness required for freshwater

Salinity required for saltwater (estuarine and marine)

Metals required for all discharges if present and if dilution factor is > 1

Enter 0 if non-detect or testing not required

if >1 sample, enter maximum

if >10 samples, may enter 95th percentile

Enter 0 if non-detect or testing not required

I. Dilution Factor Calculation Method

A. 7Q10

Refer to Appendix V for determining critical low flow; must be approved by State before use in calculations.

B. Dilution Factor

Calculated as follows:

$$Df = \frac{Q_R + Q_P}{Q_P}$$

Q_R = 7Q10 in MGD

Q_P = Discharge flow, in MGD

II. Effluent Limitation Calculation Method

A. Calculate Water Quality Criterion:

Step 1. Downstream hardness, calculated as follows:

$$C_r = \frac{Q_d C_d + Q_s C_s}{Q_r}$$

C_r = Downstream hardness in mg/L

Q_d = Discharge flow in MGD

C_d = Discharge hardness in mg/L

Q_s = Upstream flow (7Q10) in MGD

C_s = Upstream (receiving water) hardness in mg/L

Q_r = Downstream receiving water flow in MGD

Step 2. Total recoverable water quality criteria for hardness-dependent metals, calculated as follows:

Total Recoverable Criteria = $\exp\{m_c [\ln(h)] + b_c\}$

m_c = Pollutant-specific coefficient (m_a for silver)

b_c = Pollutant-specific coefficient (b_a for silver)

ln = Natural logarithm

h = Hardness calculated in Step 1

Step 3. Total recoverable water quality criteria for non-hardness-dependent metals, calculated as follows:

$$\text{WQC in µg/L} = \frac{\text{dissolved WQC in µg/L}}{\text{dissolved to total recoverable factor}}$$

B. Calculate WQBEL:

Step 1. WQBEL calculated as follows for parameter sampled in and detected in the receiving water:

$$C_d = \frac{Q_r C_r - Q_s C_s}{Q_d}$$

C_r = Water quality criterion in µg/L

Dilution Factor	74.6					
A. Inorganics	TBEL applies if bolded		WQBEL applies if bolded		Compliance Level applies if shown	
Ammonia	**Report**	mg/L	---			
Chloride	**Report**	µg/L	---			
Total Residual Chlorine	**0.2**	mg/L	820	µg/L	---	µg/L
Total Suspended Solids	**30**	mg/L	---			
Antimony	**206**	µg/L	47721	µg/L		
Arsenic	**104**	µg/L	746	µg/L		
Cadmium	**10.2**	µg/L	13.4387	µg/L		
Chromium III	**323**	µg/L	4100.0	µg/L		
Chromium VI	**323**	µg/L	852.6	µg/L		
Copper	**242**	µg/L	304.3	µg/L		
Iron	**5000**	µg/L	47419	µg/L		
Lead	**160**	µg/L	117.99	µg/L		
Mercury	**0.739**	µg/L	67.55	µg/L		
Nickel	**1450**	µg/L	2445.2	µg/L		
Selenium	**235.8**	µg/L	372.8	µg/L		
Silver	**35.1**	µg/L	109.8	µg/L		
Zinc	**420**	µg/L	4616.4	µg/L		
Cyanide	**178**	mg/L	387.7	µg/L	---	µg/L
B. Non-Halogenated VOCs						
Total BTEX	**100**	µg/L	---			
Benzene	**5.0**	µg/L	---			
1,4 Dioxane	**200**	µg/L	---			
Acetone	**7970**	µg/L	---			
Phenol	**1,080**	µg/L	22369	µg/L		
C. Halogenated VOCs						
Carbon Tetrachloride	**4.4**	µg/L	119.3	µg/L		
1,2 Dichlorobenzene	**600**	µg/L	---			
1,3 Dichlorobenzene	**320**	µg/L	---			
1,4 Dichlorobenzene	**5.0**	µg/L	---			
Total dichlorobenzene	**---**	µg/L	---			
1,1 Dichloroethane	**70**	µg/L	---			
1,2 Dichloroethane	**5.0**	µg/L	---			
1,1 Dichloroethylene	**3.2**	µg/L	---			
Ethylene Dibromide	**0.05**	µg/L	---			
Methylene Chloride	**4.6**	µg/L	---			
1,1,1 Trichloroethane	**200**	µg/L	---			
1,1,2 Trichloroethane	**5.0**	µg/L	---			
Trichloroethylene	**5.0**	µg/L	---			
Tetrachloroethylene	**5.0**	µg/L	246.1	µg/L		
cis-1,2 Dichloroethylene	**70**	µg/L	---			
Vinyl Chloride	**2.0**	µg/L	---			
D. Non-Halogenated SVOCs						
Total Phthalates	**190**	µg/L	---	µg/L		
Diethylhexyl phthalate	**101**	µg/L	164.0	µg/L		
Total Group I Polycyclic Aromatic Hydrocarbons	**1.0**	µg/L	---			
Benzo(a)anthracene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Benzo(a)pyrene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Benzo(b)fluoranthene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Benzo(k)fluoranthene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Chrysene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Dibenzo(a,h)anthracene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Indeno(1,2,3-cd)pyrene	**1.0**	µg/L	0.2833	µg/L	---	µg/L
Total Group II Polycyclic Aromatic Hydrocarbons	**100**	µg/L	---			
Naphthalene	**20**	µg/L	---			
E. Halogenated SVOCs						
Total Polychlorinated Biphenyls	**0.000064**	µg/L	---		0.5	µg/L
Pentachlorophenol	**1.0**	µg/L	---			
F. Fuels Parameters						
Total Petroleum Hydrocarbons	**5.0**	mg/L	---			
Ethanol	**Report**	mg/L	---			
Methyl-tert-Butyl Ether	**70**	µg/L	1491	µg/L		
tert-Butyl Alcohol	**120**	µg/L	---			
tert-Amyl Methyl Ether	**90**	µg/L	---			

Joyce, Liza

From: Vakalopoulos, Catherine (DEP) <catherine.vakalopoulos@state.ma.us>
Sent: Tuesday, January 26, 2021 2:44 PM
To: Joyce, Liza
Cc: Ruan, Xiaodan (DEP)
Subject: Re: 7Q10 + Dilution Factor for NPDES NOI

CAUTION: External Email

Hi Liza,
The 7Q10 of 24.6 cfs (15.9 MGD) and the dilution factor calculation of 74.6 using a design flow of 150 gpm (0.216 MGD) for the proposed discharge (from either routes 1 or 2) from the area around Rotterdam St. in Allston to the Charles River are correct.

Here is water quality information to assist you with filling out the NOI:

Waterbody and ID: Charles River (MA72-36) within Charles River Watershed
Classification: B
Outstanding Resource Water?: no
State's most recent Integrated List is located here: https://www.epa.gov/sites/production/files/2020-01/documents/2016-ma-303d-list-report.pdf, search for "MA72-36" to see the causes of impairments.
TMDLs: there are two approved TMDLs (pathogens and phosphorus) for this segment.

As you may know, if this is not a *current* MCP site, then in addition to submitting the NOI to EPA, you need to apply with MassDEP and submit a $500 fee (unless fee exempt, e.g., municipality) using ePLACE. Instructions on how to apply are located here: https://www.mass.gov/how-to/wm-15-npdes-general-permit-notice-of-intent and information on how to get ePLACE technical assistance is available on the ePLACE Portal webpage: https://eplace.eea.mass.gov/citizenaccess/.

Please let me know if you have any questions.

Cathy

APPENDIX C

Additional Treatment Information

Operating Pressures

When clean the bag filter houses will typically start with a 1 - 2psig differential pressure across them. When the differential pressure reaches 10psig between the inlet and outlet the bag is dirty and should be changed to prevent reduced flow. The bag filters are set up with isolation valves so that it is not necessary to stop operation while changing one bag at time.

The carbon vessels are equipped with inlet and outlet pressure gauges so that the condition of the carbon bed can be determined to be free of unwanted dirt and clogging. Typical pressure drop across a clean bed of carbon should be in the 3 – 5 psig range. If the inlet pressure goes up significantly the carbon bed has become fouled. It is possible to backflush with CLEAN water to get this dirt out, but if dirty water is used the problem will only be compounded.

O & M Contents

In the following pages there are diagrams of the piping arrangement for "SEQUENCE 1" and "SEQUENCE 2" operation. This is followed by a manual and parts list for the Rosedale bag filter, and AXIS Products trailer axles. An operation and maintenance manual from TIGG has been provided on similar type vessels to those found on the CFS 6150 Mobile Filtration unit. This is provided to further round out the many nuances of proper carbon vessel operation and maintenance.

CARBON FILTRATION SYSTEMS, Inc.

Model 6150 Mobile Treatment System

The Mobile Treatment System model 6150 is designed to for sustained flows of 150 gpm. Optimum contact time between influent and carbon media is obtained at this 150 gpm flow rate. Operation at higher flow rates will reduce effectiveness of carbon to remove contaminates allowing them to pass through the system to drain.

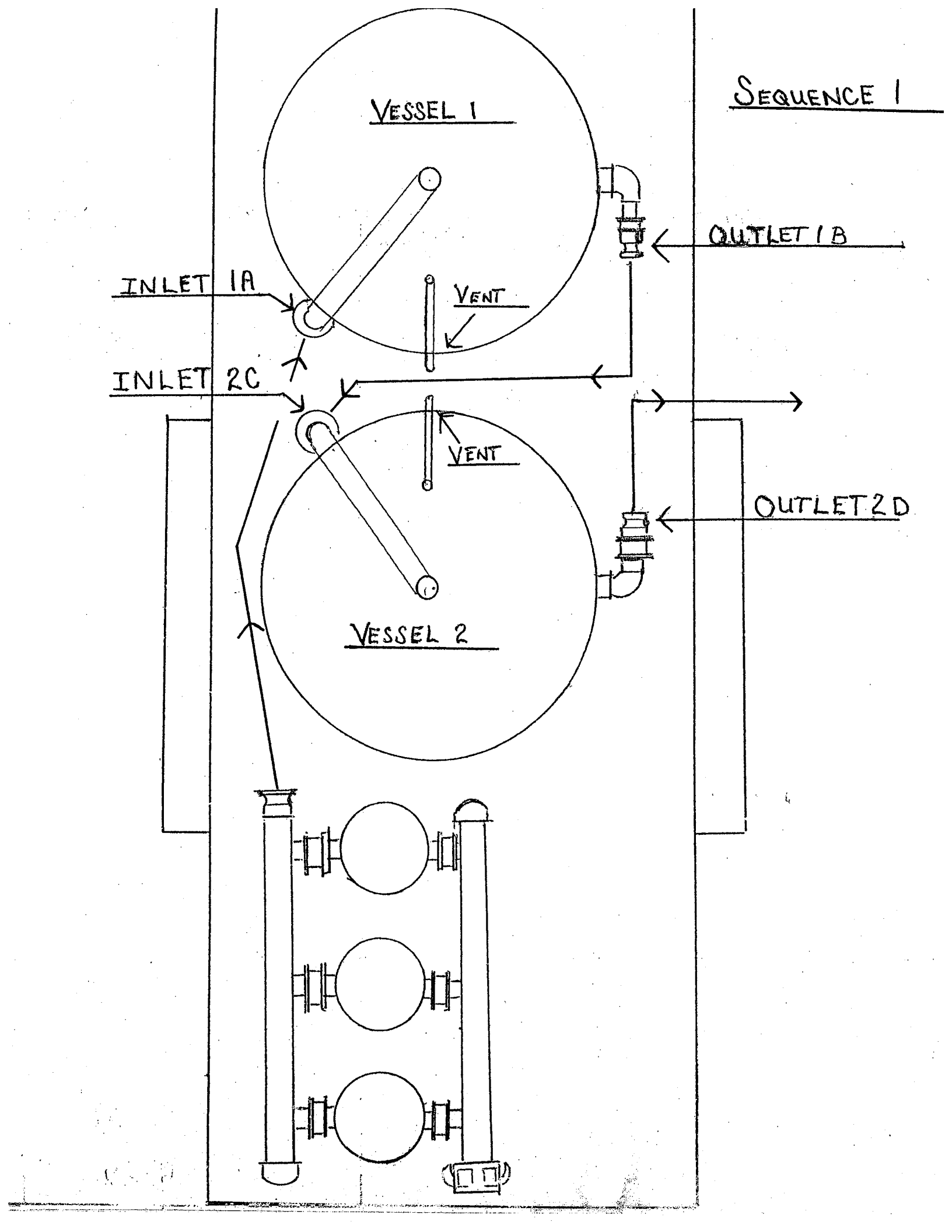
The system is mounted on a 12,230lb GVWR / 9600lb LC equipment hauler manufactured by Superior Trailers of Georgia. The main frame is 7" channel with two (2) 6000lb brake axles. There are four (4) 12000lb drop leg jackets with one mounted in each corner of the trailer. The combined dry weight of the two (2) 3000lb carbon adsorbers fully loaded with 3000lbs of granular carbon per vessel and the Tri-plex bag filter system is approximately 9,7750lbs. When fully loaded and saturated with water the combined loaded weight is nearly 21,100lbs. For this reason all four 12000lb drop leg jacks must be in the fully down position when systems is in operation to prevent main frame damage. In addition it is recommended that the system be fully drained before attempting to move trailer to a new location. Failing to do so could result in damage to the axles, as well as, other structural components.

Deaerating

Prior to start up of system the carbon vessels must be filled with "clean" water. Since hydrant water is not always available the cleanest water available will generally do. This step is necessary to allow the activated carbon to de-gas and become thoroughly wetted. The escaping gas must be vented off through the ¾" vent pipe coming off the top and running down between the two carbon vessels. The recommended time period for this is a full 24 hours to ensure all of the minute pores have been evacuated of air and the carbon completely wetted. This is often hard to do under actual field conditions, but the longer it is allowed to stand before start up the better the result will be.

Vessel SEQUENCE

The carbon vessels are set up in series in a lead / lag sequence. This allows the maximum time exposure to the carbon bed and when breakthrough does occur the second vessel in series will afford protection against dumping raw VOCs into the drain. Each vessel is set up with sample ports top and bottom allowing for influent samples to be drawn before and between the vessels, as well as, downstream of the second vessel. When break through does occur after the first vessel it is necessary to schedule a change out of spent media and replenish it with new. The sequence of the vessels is changed from "sequence 1" to "sequence 2" by moving the inlet hose from the first vessel (inlet 1A) to the inlet of the second vessel (inlet 2C). The corresponding outlet hose off the first vessel must also be moved from outlet 1B to outlet 2D. Vessel 2 now becomes the "lead" vessel. An additional piece of 3" x 12' hose has been provided to allow a smooth transition from the final outlet to a layflat hose that typically is used for longer hose runs to drains and other distant outfall locations.


SEQUENCE 1
VESSEL 1
OUTLET 1B
INLET 1A
VENT
INLET 2C
VENT
OUTLET 2D
VESSEL 2

TIGG® corporation

800 Old Pond Road, Suite 706
Bridgeville, PA 15017
(412)257-9580 ~ (412)257-8520 fax
www.tigg.com

Operation and Maintenance Manual for CANSORB and Econosorb-L Liquid Phase Units

CONTENTS PAGE

1.0 GENERAL

The liquid flow through the CANSORB adsorbers is downflow. Aqueous and non-aqueous liquids can be treated using granular activated carbon. For most efficient utilization of the carbon two vessels should be used in series operation.

If media other than carbon is to be used, contact a TIGG representative for any procedural changes.

2.0 INSTALLING THE CANSORB AND ECONOSORB-L UNITS

2.1 Unloading

Following are the empty and loaded weights of the CANSORB units. This information will dictate what equipment should be used to lift and place the vessel.

UNIT	Empty Wt.	Filled Wt.
C35	750	1410
C50	1040	2040
C75	1470	3470
C100	1790	4750
C200	2440	8440
C500	6500	14500
EL-500	900	1400
EL-1000	1250	2250
EL-2000	1600	3600
EL-3000	2490	5490

If a forklift is used the fork tubes on the unit should be used. If a crane is used it is advisable to use a properly sized spreader beam and lifting cables. **Do not use the lifting lugs to lift a vessel containing wet carbon.** They are not designed for that weight.

2.2 Setup

The CANSORB unit should be placed on a level concrete pad or other support. Connect the piping or hoses to the inlet and outlet flanges or nozzles. Install any gages or other appurtenances that were shipped with the system.

See Sections 4.3 & 4.4 relating to the effluent piping.

3.0 STARTUP PROCEDURES

After the CANSORB unit (s) have been set in place and the piping is installed (See Section 4.0) they are ready to be filled with the media unless they were shipped with the media in place.

Filtration Trailer Equipment List

3) Rosedale simplex bag filter units Model # NCO8-30-2P-*-150-C-B-PB

2) TIGG 3000lb medium pressure carbon adsorbers.

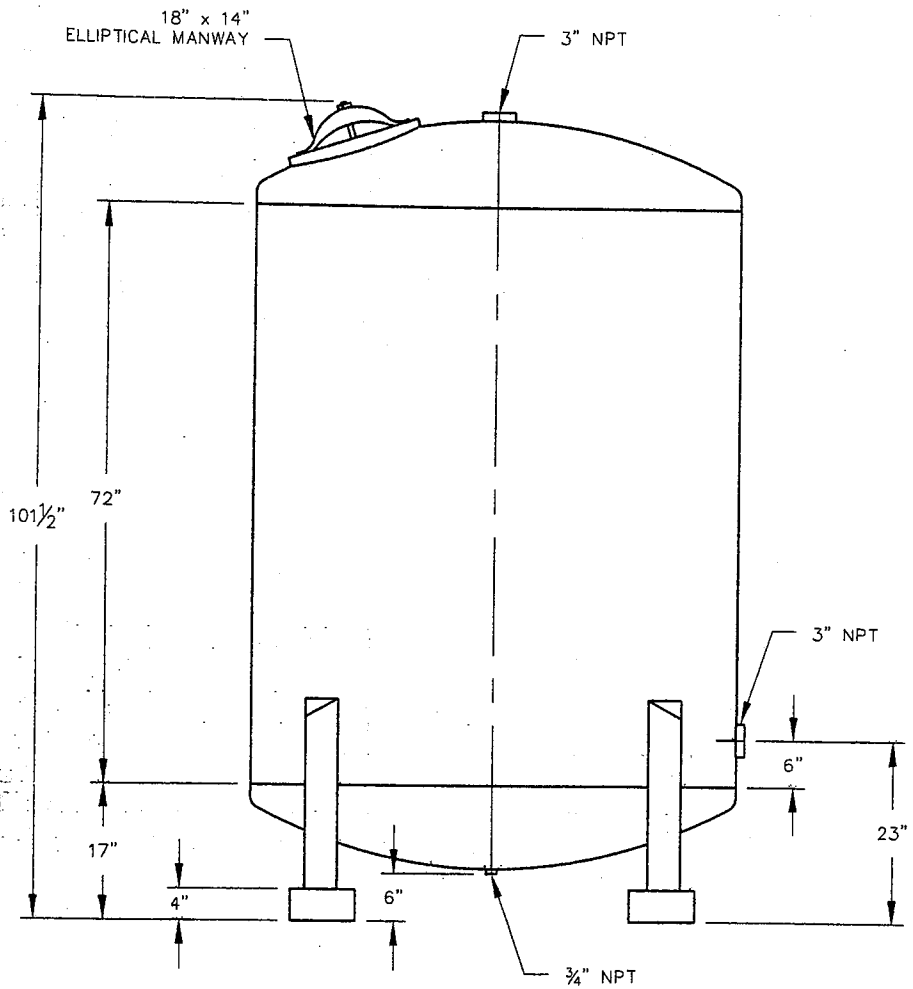
1) Superior Trailers 12,232lb GVWR trailer equipped with two (2) 6000lb AXIS Products brake axles.

4) Legend Mfg. 3" Butterfly valves model T-335AB with EPBM seat, Aluminum/Bronze construction

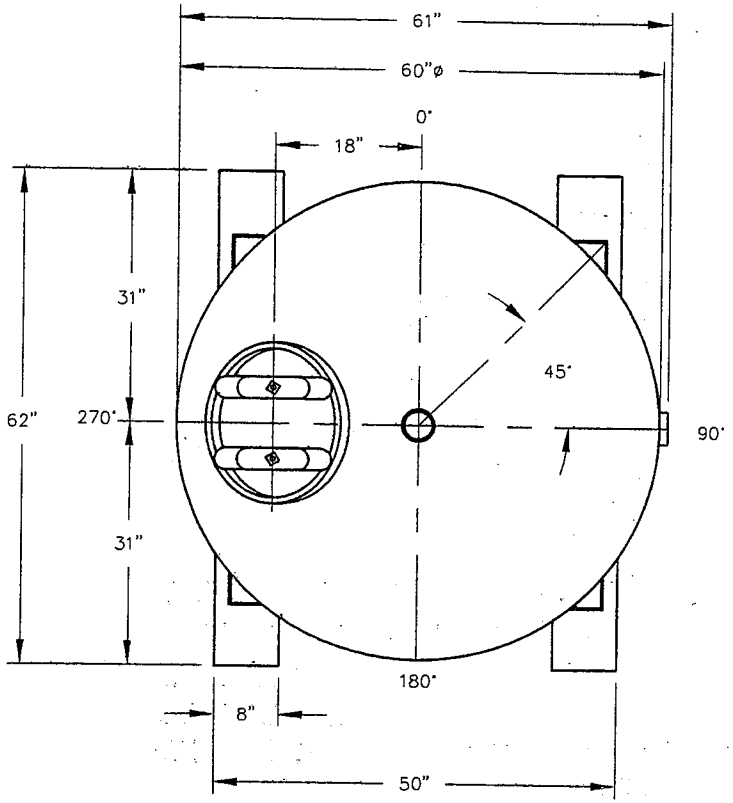
6) Legend Mfg. 2" Butterfly valves model T-335AB with EPDM seat, Aluminum/Bronze construction.

10) 0 – 60 psi, 2.5" pressure gauges

3) 3" x 12' EPDM rubber water hose with camlock fittings.



ELEVATION



PLAN

VESSEL STANDARDS

VESSEL MATERIALS : A-36 CARBON STEEL	LIQUID DRAIN ASSEMBLY : 3/4" NPT
LINING : EPOXY	VOLUME OF VESSEL : 109.1 FT^3
EXTERIOR PAINT : ENAMEL	STANDARD CARBON FILL : 3000 LBS
HEAD THICKNESS : 1/4"	SHIP WT. STD.FILL : 4700 LBS
SHELL THICKNESS : 1/4"	CARBON TYPE : N/A
INTERNALS : PVC	MAX. OPERATING PRESSURE : 75 PSI
ADSORBENT OUTLET ASSEMBLY : 18" x 14" ELL. MANWAY	MAX. OPERATING TEMP. : 125°F

NO.	REVISION	BY	DATE

PROJECT

PROJ. NO.	E07-045-AM
P.O. NO.	
DRAWN BY	JB
DESIGN BY	BB
CHKD. BY	BB
DATE	8/9/07
SCALE	NTS

THIS DRAWING AND DESIGN ARE THE PROPERTY OF TIGG CORP. AND SHALL NOT BE REPRODUCED IN WHOLE OR IN PART NOR EMPLOYED FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY TIGG CORP. THIS DRAWING LOANED SUBJECT TO RETURN ON DEMAND.

TIGG corporation

3000#
PLAN & ELEVATION

DWG. NO. C07-1113 REV. 0

3.1 Filling the vessel with carbon

In order to protect the liquid underdrain (collector) system, **uncontaminated water (liquid) must be added to the vessel prior to adding the carbon.**

A sufficient amount of water should be added so that the water level is at least 2 feet above the underdrain.

The water can be added via the process piping or through the top manway or (handhole on the inlet in PHD models. When filling, the vent, manway or handhole must be open and the inlet on drum units must be open.

Fresh carbon generally will arrive in (1000-1100 pound) super sacks or (55 pound) bags. Each vessel may be filled by emptying the carbon container through the manway on top of the vessel. Drum units usually have the carbon prefilled at TIGG's production facilities.

After all of the carbon is in the vessel, fill the vessel with uncontaminated liquid. This can be done through the process piping (inlet or outlet) or through the manway. Filling from the bottom up is the preferred method. In the event uncontaminated water is not available, fill with contaminated water from the top down at a slow rate so that a depression is not made in the top of the carbon bed. If the process lines are used, the vent or manway should be open.

3.2 Wetting and Deaerating

For peak adsorption performance, as much air as possible should be removed before the adsorber is put onstream.

A bed of carbon consists of the following:

Void volume	-	40%
Pore volume	-	40%
Carbon skeleton	-	20%

Since 80% of the carbon bed volume is air, with 40% being in the pores of the carbon, **special prewetting steps must be taken.** If proper prewetting is not done, channeling will occur and high-pressure drop and/or premature breakthrough of the contaminant(s) will occur.

A relatively long time is required for water to enter the pores and displace the air since the pores in dry carbon are filled with air and some adsorbed oxygen.

Approximately 90% of the pores in dry carbon are filled with water after 24 hours at ambient temperature (70 degrees F.) and any liquid having the same viscosity. With more viscous liquids the time to wet will be longer. After 16 hours check the liquid level. If it is below the top of the carbon, add more liquid until it is above the carbon.

3.2.1 Backwashable System

If there is inadequate prefiltration, and/or there are suspended solids present, backwashing will be required. In this case the carbon must be backwashed for 30-45 minutes prior to treating contaminated water.

This is necessary so that the particles will be segregated (classified) and thereby subsequent backwashing operations won't change the relative position of the particles and destroy the mass transfer zone.

This backwash operation will also remove the air and carbon fines from the bed. If this procedure is not followed the carbon usage rate will be higher, there could be very early breakthrough and the pressure drop will be higher than desired.

The following backwash rates should be used for the various vessels:

	GPM	
Unit	**CANSORB**	**ECONOSORB L**
C25PHD	50-60	-------
C50 PHD	100-115	-------
C35 & EL 500	80-110	80-100
C50 & EL 1000	115-140	115-125
C75 & EL 2000	180-210	90-100
C100 & EL 3000	250-300	200-220
C200	400-475	-------
C500	500-600	-------

If the initial time for prewetting is less than 2 days, backwash the adsorber two days after startup.

3.2.2 Non-backwashable System

Option 1 – When time is available

After the vessel has been filled with the water as described in Section 2.2 use the following procedures to remove air from the carbon and vessel:

1. Allow the adsorber to stand filled with the water for three or more days. The longer the better. If the time can only be two days or less see Option 2.
2. Remove the water from the vessel. This can be done by (1) draining (make sure the adsorber is vented), (2) using air pressure to pressure the liquid out the outlet nozzle, **don't exceed the adsorber design pressure** or (3) siphoning out the outlet (inlet or vent must be open to the atmosphere).

3. When all of the water is out of the adsorber, the adsorber must be refilled with uncontaminated water. During this filling operation the adsorber must be vented. The water addition should continue until water exits the vent on the inlet nozzle. This step removes the air that is in the adsorber and it is now ready to be placed onstream.

Option 2 – When time is limited to less than two days

When time is not available to prewet the carbon for 2 days, do the following:

1. Add uncontaminated water to the adsorber as described in Section 2.1.
2. After the time that can be allowed to wet the carbon, follow the steps described in items 2 & 3 in Option 1.
3. At this point, there is still air in the carbon pores. Therefore, after days 2 and 3 repeat steps described in items 2 & 3 in Option 1.

In a process system where water cannot be tolerated follow the same filling and draining procedures. However, add the liquid into the top of the adsorber.

4.0 OPERATION

Operational flow rates, and thus contact time for a given volume of adsorbent, are a function of:

1. The liquid being treated
2. Temperature
3. Nature and concentration of the contaminants
4. Other system conditions
5. Removal (effluent) requirements

If conditions dictate a longer contact time than is possible in one unit, CANSORB units can be operated in parallel or series. Either one of these options will usually result in a lower adsorbent usage rate.

4.1 Post startup deaeration

After several days of operation it is advantageous, in many cases, to drain and refill the adsorber in order to get rid of air that may not have been removed in the pre-startup deaeration operation.

4.2 Backwashing

If there are suspended solids in the influent, these may be filtered by the carbon bed. If this occurs, they will usually collect on top of the bed and the pressure drop across the bed will increase. When the differential pressure drop across the bed is 8-10 psi greater than it was when the vessel was initially put onstream, the vessel should be backwashed. Use the flow rates listed in Section 3.2.1. For drum units the maximum pressure should not be exceeded.

This operation should remove the solids and the differential pressure should return to normal. If it doesn't repeat the backwash procedure at a higher rate. Have someone observe the backwash water effluent to make sure carbon isn't being removed and to know when the water is clear.

If the backwashing operation doesn't result in lowering the differential pressure, the top few inches of the adsorbent may be loosened by raking and/or removed and discarded per an environmentally acceptable procedure.

4.3 Maintaining a liquid level in the carbon bed

Since the pressure drop through a carbon bed is very low during operation at normal flow rates, it is possible to have the water level reach an equilibrium point low in the bed when the discharge is at a point lower than the top of the carbon bed. This is especially true for the Econosorb L units. Therefore, the discharge piping should be elevated so that there is a section above the top of the carbon bed or a backpressure control valve should be installed in the discharge line.

4.4 Prevention of siphoning

When the flow to the CANSORB vessel is stopped, there is the potential for siphoning to occur, unless provisions are made in the discharge piping to prevent it. This is especially the case when the liquid is being discharged at an elevation lower than the top of the carbon bed.

The siphoning can be prevented by installing (1) an anti-siphon device or a short vertical section of pipe, in a Tee in the effluent pipe open to the atmosphere above the top of the CANSORB unit or (2) discharging into a tank at a level higher than the top of the CANSORB unit.

4.5 Prevention of over pressuring

In addition to the filtering of suspended solids causing a pressure buildup across the carbon such things as bacteria growth, introduction of air into the bed via a pumping operation, and precipitation of metals, can cause the pressure across the carbon bed to increase.

If there is the possibility of any of these occurring and the design pressure of the vessel could be exceeded, a properly sized relief valve or rupture disc should be installed.

4.6 Effluent sampling / Changeout determination

The frequency for sampling will depend on whether the influent concentration of the contaminants is relatively constant or variable.

Sampling should be done on a routine basis until it can be determined what the carbon usage rate is. Then the sampling frequency can usually be reduced.

If there is only one CANSORB unit onstream the time to affect a carbon changeout will depend on the effluent criteria set by the discharge permit.

If there are two CANSORB units operating in series, it is normally possible to allow the concentration of the contaminants in the effluent from the lead vessel to equal that of the influent. This is an indication that the carbon is saturated and thus the carbon usage is the minimum

When this occurs the lead vessel is removed from the system, the spent carbon is removed and the vessel is filled with fresh carbon. This vessel is then put in the secondary (lag) position.

Since the change out, refilling and wetting of the carbon will take 2-3 days, the system will be sized so that during this time, breakthrough will not occur in the lag vessel.

4.7 Removing spent carbon

4.7.1 CANSORB units C35 – C500

Spent carbon can be removed either by vacuuming or in slurry form.

If vacuum is selected, a vac-truck or drum vacuum can be used. The CANSORB unit must be drained and the top manway removed. The carbon is subsequently removed via a non-metallic pipe or hose through the manway. **Extreme care must be exercised to avoid damaging the internals and/or lining.**

If the carbon is to be removed in the slurry form, it can be pressured, using air or water, out the bottom 2-inch outlet. The slurry line should be connected to a vented receiving container prior to carbon removal. The receiving container should have a drain for removing excess water from the carbon, prior to transportation.

The required pressure to move the slurry is generally less than 10 psig. This depends on the length of the slurry line and the elevation of the final point of discharge.

Note: After completing the slurry transfer, there is the possibility of a portion of spent carbon remaining in the bottom head. Therefore, open the manway to inspect the vessel. Depending on the quantity and location of the carbon, it may be necessary to use a hose to flush it into the bottom of the head and/or backwash to level carbon and then repressure the vessel.

When the vessel is empty it is ready to be refilled. The procedures outlined in Sections 3.0 should be followed.

4.7.2 Econosorb-L – 500,1000, 2000 & 3000

The spent carbon is removed from these units via vacuum only since there is no slurry outlet connection.

4.7.3 Open head CANSORB Drum units

In order to remove the spent carbon from the C5 and C15 drums, the bolt/ring closure is removed and the top is lifted or pivoted to one side.

Removing the top requires loosening the male adapter inside the top, immediately below the outlet bung.

For the C20 drum, a flex hose section of the outlet riser below the outlet bung is disconnected or used as a pivot.

The spent carbon is then dumped out and fresh carbon is put in.

The fresh carbon must be prewetted. After the carbon is wetted, the water can be removed by introducing air pressure through the inlet or siphoning through the outlet. **Do not exceed the drum operating pressure!**

5.0 MAINTENANCE

5.1 Regular maintenance

The CANSORB units are designed to require minimal maintenance. The following items should be inspected with regard to the carbon vessels, piping and gages:

1. Internal inspection of the vessel should be performed each time carbon is removed. This would include the lining and the collectors (underdrain).

2. Pressure gages should be checked periodically to insure proper operation

3. Piping and valving should be periodically inspected for signs of wear and/or leakage.

5.2 Short-term shutdown

The adsorption system is designed to operate continuously. A short-term shutdown is expected to last less than 72 hours. It is most likely to occur during a weekend shutdown or routine maintenance of the system. During a short-term shutdown, the adsorber may remain filled with water unless work is being performed on the adsorber itself. It may be necessary to close the inlet and outlet valves to prevent siphoning or drainage from the system.

5.3 Long-term shutdown

A long-term shutdown is most likely to occur during spent carbon change-out, changes in the system configuration, major maintenance, etc. During a long-term shutdown the adsorber should be completely drained to minimize the potential for biological growth and bed septicity.

6.0 SAFETY CONSIDERATIONS

The normal safety procedures that are practiced at the site should be followed.

Read the MSDS sheet for the carbon (media).

Understand the potential hazards of the stream being treated by the system. The media may contain higher concentrations of the contaminants being adsorbed than is in the influent stream. Also the media might be considered hazardous material and may require specific handling precautions.

In order to protect the vessel, a relief device such as a rupture disc or safety valve should be installed.

WARNING: Wet drained activated carbon preferentially removes oxygen from air. In closed or partially closed containers, the oxygen concentration can reach dangerously low levels. Therefore, OSHA procedures related to entering confined low-oxygen spaces should be followed by workers who must enter a vessel containing wet carbon.

7.0 TROUBLESHOOTING

There are a varied number of things that can cause poor performance of an activated carbon system. These are discussed below.

7.1 High pressure drop

Following are possible causes for having a high-pressure drop through the carbon. They are:

1.**Air in the bed. This is the most frequent cause of high-pressure drop.** This is mainly caused when the carbon is not properly prewetted. The other causes are incoming air due to a vortex in the tank feeding the pump and release of dissolved gases within the carbon bed.

Solution: Check for air by slowly closing a valve in the discharge line. Watch the pressure gage in the inlet line. If the pressure increases slowly there is air in the vessel. Drain/remove the liquid and refill the vessel while venting the air out the vent or inlet. If the problem occurs and the proper wetting procedure has been followed, check for a vortex in the feed tank and/or determine if there is the possibility for degassing.

2. **Excessive fines in the carbon.** This is not a frequent cause for a high-pressure drop.

Solution: Backwash the carbon, if possible, at a rate of 8-10 gpm/ft^2 until the water exiting the vessel is clear. If the vessel cannot be backwashed and the pressure is too high to maintain the desired flow it may be necessary to remove the carbon, partially fill the vessel with water and slowly reinstall the carbon so that the fines can float on the top of the water. Then overflow the water to remove the fines.

3. **Solids in the influent**
Suspended solids or sediment in the influent will be filtered out by the carbon.

Solution: Open the manway or remove the top lid in the case of drums and inspect the top of the carbon bed. If the vessel can be backwashed this should solve the problem unless the solids have created a mud like cake on top of the bed. In this case manually remove the cake. If the layer to be removed is more than several inches, it may be necessary to replace with equivalent fresh carbon or if it is expected that the carbon is near exhaustion then replace the entire bed of carbon.

If it is anticipated that the solids will always be in the feed, a filter should be installed in the influent line.

7.2 Carbon loss

In most carbon systems that treat water and wastewater, carbon losses are not usually excessive. They usually result from excessive backwash rates, broken underdrains or physical degradation of the carbon by strong oxidants such as chlorine.

Solution: Lower the backwash rate. It may be too high due to the viscosity being higher than the design value. A seasonal decrease in water temperature is usually the cause for losing carbon during backwash.

Check the effluent liquid for the presence of carbon. If granules are present then the underdrain is damaged or the piping of the inlet and outlet is reversed. Remove the carbon and repair the underdrain or repipe the inlet and outlet.

Chlorine reacts with the carbon skeleton. With prolonged contact the effluent will turn brown. The carbon must be replaced when this occurs.

7.3 Premature breakthrough of organics

This will occur for the following reasons:

1. Channeling in the carbon due to presence of air in the bed.
2. Insufficient contact time in the carbon bed.
3. A change in the influent concentrations of the contaminants.
4. Incomplete removal of spent carbon prior to refilling.

Solution: Check for air by slowly closing a valve in the discharge line. Watch the pressure gage in the inlet line. If the pressure increases slowly there is air in the vessel. Drain/remove the liquid and refill the vessel while venting the air out the vent or inlet.

Add more carbon, if possible. Otherwise reduce the flow rate or consider adding another vessel.

Remove carbon completely and refill vessel.

7.4 Effluent concentration of an organic higher than influent concentration

This is due to a phenomenon termed rollover. This occurs when components that are more strongly adsorbed displace compounds that are less strongly adsorbed.

Solution: If the contaminant is not one of the regulated organics continue to operate the system. If the eluting organic is part of the discharge permit and it is exceeding the permitted level then the carbon needs to be replaced. In order to better utilize carbon it may be desirable to add another vessel downstream so that the lead adsorber can become saturated prior to having to be removed.

For reorders, replacement adsorbents or further technical information please contact TIGG Corporation, 1-800-925-0011

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

ROSEDALE PRODUCTS, INC.

MODEL NCO-8

150 PSIG RATED FILTER UNIT

Table of Contents

Rosedale Engineering Standards are the property of Rosedale Products, Inc. These standards or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms of individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

I. Installation

Please remove all shipping and crating materials carefully. Be sure to remove the plugs from the inlet and outlet openings. Dispose of all crating materials safely.

The Model NCO-8 Filter unit is capable of having several different piping variations based upon the outlet style of your unit. The inlet service line should be connected to the inlet flange or NPT coupling located near the top of the unit (above the basket level).

The outlet service line should be connected to the outlet flange or coupling, located near the middle or bottom of the unit depending upon the style of your unit (below basket level).

There are two 1/4" NPT ports on the shell and one 1/4" NPT port on the cover of the Model NCO-8 Filter unit. These ports can remain plugged or used for pressure gauges or special fittings as your application requires.

Some installations require electrical grounding of all equipment, be sure to provide adequate grounding where necessary.

After completing installation be sure to double check connections for integrity. Your Model NCO-8 Filter unit has been factory pressure tested leak free, therefore, any seepage problems usually occur from improper installation connections.

You are now ready to install the filter basket and bag. Remove cover by loosening the cover eyenuts. The eyenuts in the slotted corners should be loosened sufficiently to swing free. Loosen the third eyenut sufficiently to allow the top cover and closure assembly to swing away from the top of the unit.

If your application requires a basket seal, insert the basket seal into the basket collar groove. Refer to Figure 1 or Figure 2 in the Spare Parts Diagram for installation position of your seal.

Place the basket into the filter housing, make sure the basket flange is firmly seated into the adapter.

Insert bag into the bag basket making sure filter bag ring is firmly seated on top of the basket flange. For best results, be sure filter bag is installed fully extended to the bottom of the basket.

Before replacing cover assembly, inspect cover seal gasket (replacing as necessary). Close cover and alternately tighten the three clamp assemblies evenly to ensure a leak proof seal between the cover and housing body. Torque closure assemblies to a maximum of 60-90$^{\text{foot-lbs}}$. Each installation may have different closure bolting torque requirements to effectively seal the filter vessel cover. Many installations require significantly lower closure bolting torque due to the variables explained below. The suggested torque values are for reference only. They are to be used as a guideline by maintenance personnel. These values are meant as a guideline for safe operation of the filter system at its maximum rated pressure. Many variables affect the torque required to operate the filter vessel without leaks. These variables include the diameter of the bolt, type and number of threads, material type and grade, condition of the nut bearing surface and lubrication of bolt threads and nut bearing surfaces. Other factors such as the condition of the o-ring, o-ring material, viscosity of the fluid being filtered, operating pressures, temperature, and the closure assembly tightening procedure must also be considered.

Your Rosedale Model NCO-8 is now ready for operation.

Rosedale Engineering Standards are the property of Rosedale Products, Inc. A Rosedale Standard or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms or individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

II. Operation

Filter System Start-Up Procedure:

Prior to turning on the flow to the inlet service, please make the following checks:

1. Check inside filter unit to be sure basket and filter bag (if applicable) are in housing and do not require cleaning or replacement. If necessary install a clean filter basket and bag (if applicable).

2. Check that filter unit cover is securely fastened to housing. You are now ready to open the flow to the inlet service line. Slowly open the inlet service line approximately 25% of normal operational flow (open slowly as not to displace filter bag inside the housing). After filter unit is pressurized and vented, slowly open outlet service line unit valve until completely open. Complete opening of inlet service line until desired flow rate is reached.

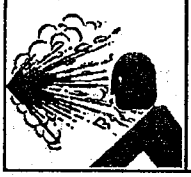
Once the desired service flow has been established, the filter will operate efficiently until dirty. However, under no circumstances should more than *15 PSI Differential Pressure* through the filter be obtained. Operating the filter unit with a high differential may cause filter bags to rupture and/or cause damage to filter system and downstream equipment.

To prevent excessive drop through the filter unit, regular inspection of the filter media is required. Monitoring of differential pressure through the housing can be utilized as a means of determining whether or not the filter media needs cleaning or replacement.

When it becomes necessary to clean or replace filter media, follow the procedure outlined below:

1. First close the flow from the inlet service line.
2. Close the flow to the outlet service line. (In some applications closing flow to outlet is not required.)
3. Relieve the pressure from the filter unit.

⚠ WARNING



CONTENTS UNDER PRESSURE
Relieve Pressure in accordance with Manufacturer's instructions before opening Filter Vessel.
FAILURE TO DO SO MAY RESULT IN SERIOUS BODILY INJURY.

4. Drain housing sufficiently to access filter basket.
5. Remove cover by loosening the cover eyenuts. The eyenuts in the slotted corners should be loosened sufficiently to swing free. Loosen the third eyenut sufficiently to allow the top cover and closure assembly to swing away from the top of the unit.
6. Remove filter basket and clean thoroughly, remove the filter bag (if applicable) and throw away. (Cleaning and reusing the filter bag is not recommended.)
7. Remove debris and sludge from inside the inlet portion of housing to avoid interference with cover seal or flow of fluid being filtered.
8. Remove basket seal and inspect, replace if necessary. Clean basket seal groove and replace

Rosedale Engineering Standards are the property of Rosedale Products, Inc. A Rosedale standard or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms of individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

basket seal (see spare parts diagram for location of basket seal).

9. Install clean filter basket and filter bag (if applicable). Place the basket into the filter housing, make sure the basket flange is firmly seated into the adaptor. If applicable, insert bag on top of the bag basket flange making sure filter bag ring is firmly seated inside the adaptor. For best results, be sure filter bag is installed fully extended to the bottom of the basket
10. Inspect cover gasket for cuts or other signs of failure and make sure it is properly seated.
11. Move cover back into position, and alternately tighten the three clamp assemblies evenly to ensure a leak proof seal between cover and housing body. Torque closure assemblies to a maximum of 60-90$^{foot\text{-}lbs}$. Many installations require significantly lower closure bolting torque due to the variables previously explained in Section I.

Your Rosedale Model NCO-8 Filter unit is now ready for operation. Refer to filter system start-up procedure.

III. Spare Parts List

Your Rosedale Model NCO-8 Filter unit will give you many years of reliable service provided periodic inspections are made of various components and replacement of worn parts are made promptly. The following is meant to be a recommended spare parts list, these parts are illustrated on the following page.

SPARE PARTS LIST			
Balloon	Description	Part Number	Time-Frame
1	Cover Seal	8150CG-*	as needed
2	Basket Seal	9BG-*	as needed
3	Cover	RCO8	as needed
4	Eye Nut	4ENNI	as needed
5	Rod End	4RENI	as needed
6	Clevis Pin Assembly	4CPNI	as needed
7	Filter Bag	(See Order)	as needed
8	Filter Basket	(See Order)	as needed
9	Tripod Legs	8T22*S	as needed

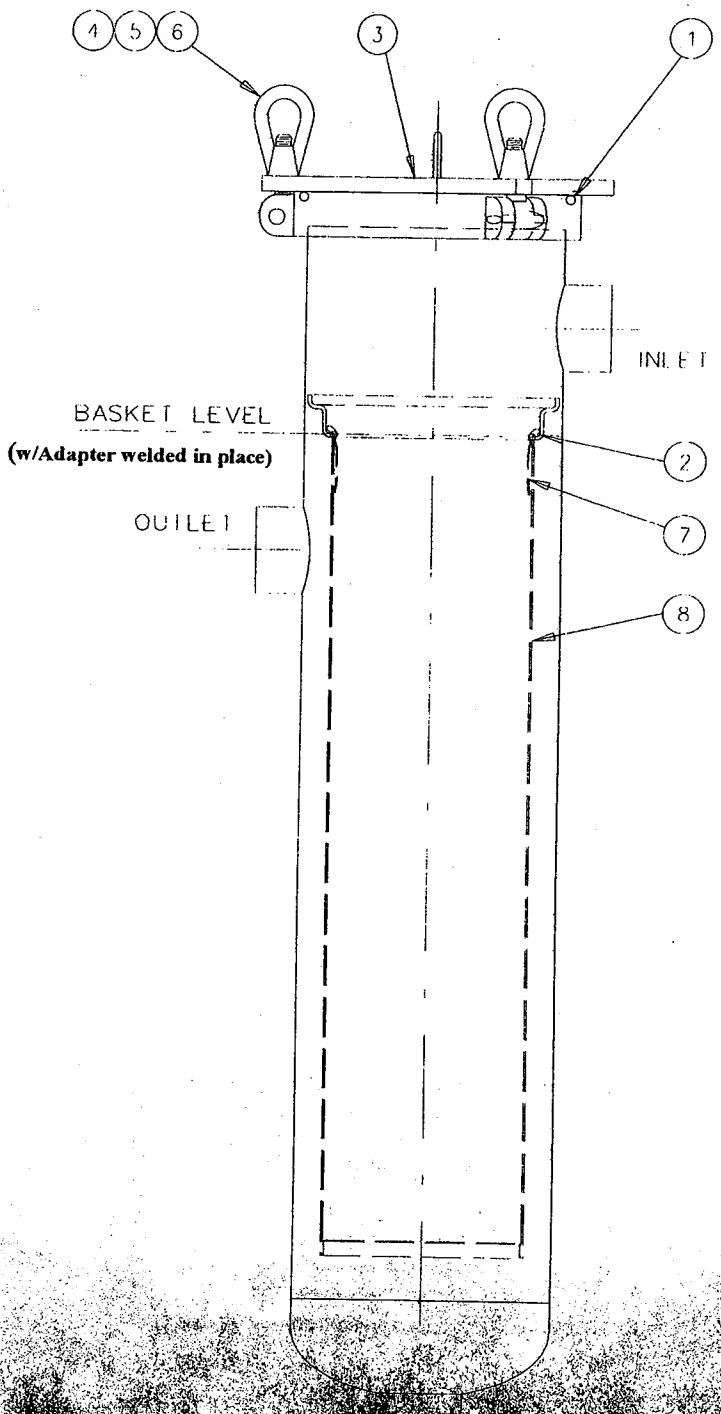
* Select Material Designation:

C=Carbon Steel
S=304 Stainless Steel
S316=316 Stainless Steel

B=Buna N
E=Ethylene Propylene
V=Viton
TEV=Teflon Encapsulated Viton
TSW=Teflon Solid White

Rosedale Engineering Standards are the property of Rosedale Products, Inc. A Rosedale standard or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms of individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

IV. Spare Parts Diagram



Rosedale Engineering Standards are the property of Rosedale Products, Inc. A Rosedale standard or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms of individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

Important Notice

Warranty: In the event any Rosedale Products, Inc. filtration product is found to be defective in material, workmanship, or not in conformance with any express warranty for a specific purpose, Rosedale's only obligation and your exclusive remedy, shall be to repair, replace or refund the purchase price of such parts or products upon timely notification thereof and substantiation that the product has been stored, maintained and used in accordance with Rosedale's written instructions.

EXCLUSIONS TO WARRANTY: THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY, EXCEPT OF TITLE AND AGAINST PATENT INFRINGEMENT.

LIMITATION OF LIABILITY: Except as provided above, Rosedale shall not be liable or responsible for any loss or damage, whether direct, indirect, incidental, special or consequential, arising out of sale, use or misuse of Rosedale filtration products, or the user's inability to use such products.

THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE.

Rosedale Products, Inc.
3730 West Liberty Road
Ann Arbor, MI 48103 USA
734-665-8201
800-821-5373
Fax. 734-665-2214
filters@rosedaleproducts.com
http://www.rosedaleproducts.com

Rosedale Engineering Standards are the property of Rosedale Products, Inc. A Rosedale standard or copy thereof shall not be distributed (except with express approval of Rosedale Products, Inc.) to any individual or firm beyond the intended recipient firm or individual. Firms of individuals acting contrary to the above may be subject to suit, ineligibility for continued or future employment, or removal from Rosedale's "Approved Manufacturers and Specialty Contractors List".

89 Crawford Street
Leominster, Massachusetts 01453
Tel: 774.450.7177
Fax: 888.835.0617
www.lrt-llc.net

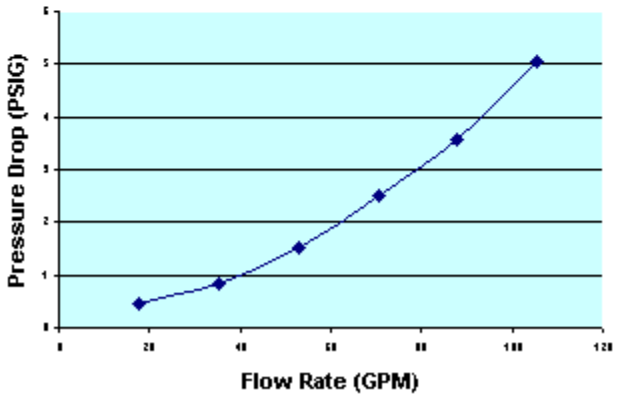
HPAF SERIES FILTERS
MODEL HPAF-2000

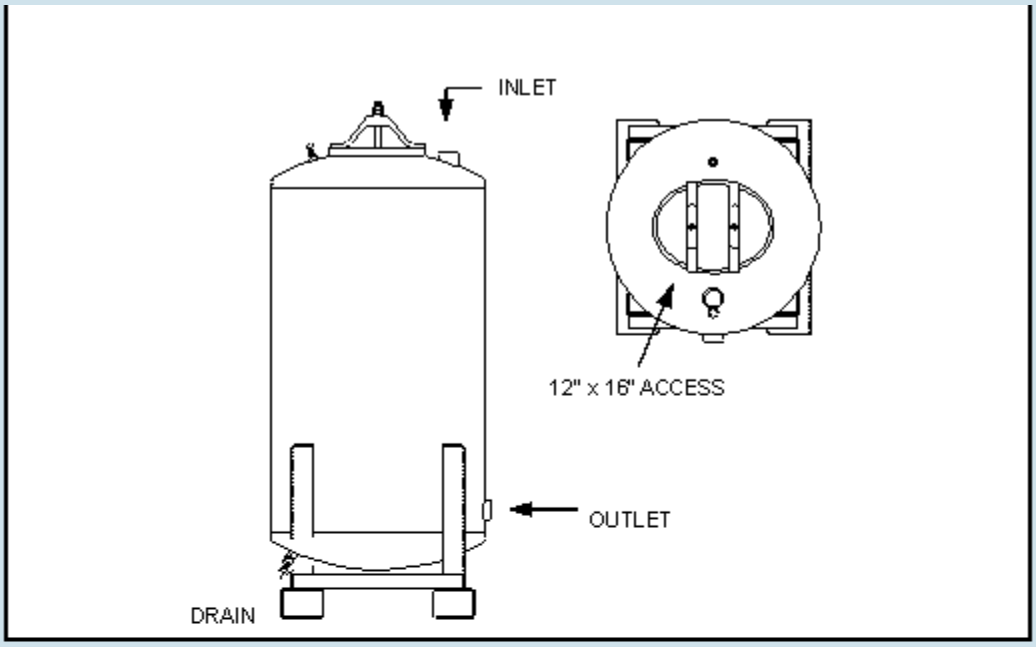
The HPAF-2000 filter is a media filter vessel designed to treat liquid streams. While the typical design application is a activated carbon adsorbtion unit, the filter can easily accommodate many medias. Some applications include:

- Dissolved Organic Removal (Activated Carbon)
- Suspended Solids Removal (Sand Filter)
- Dissolved Minerals (Softener Resin)
- Oil and Grease Removal (Organo-Clays)
- Dissolved and Precipitated Metals Removal
- Special Organics (Resin/Carbon Blend)
- Catalytic Reactor (Chlorine and Peroxide Removal)
- Bio-Remediation Contactor Unit

PRESSURE DROP GRAPH

*(As Filled - 8*30 GAC)*





HPAF-2000 SPECIFICATIONS			
Overall Height	8'6"	Vessel/Internal Piping Materials	CS (SA-36) / SCH 40 PVC
Diameter	48"	Internal Coating	Polyamide Epoxy Resin
Inlet / Outlet (FNPT)	3"	External Coating	Epoxy Mastic
Drain / Vent (FNPT)	3/4" / 1/2"	Maximum Pressure / Temp	75 PSIG / 140° F
GAC Fill (lbs)	2,000	Cross Sectional Bed Area	12.5 FT^2
Shipping / Operational Weight (lbs)	3,020/6,775	Bed Depth/Volume	5.5 FT / 68.7 FT^3

89 Crawford Street
Leominster, Massachusetts 01453
Tel: 774.450.7177
Fax: 888.835.0617
www.lrt-llc.net

FILTRATION MEDIA :
8x30 RE-ACTIVATED CARBON
4x10 RE-ACTIVATED CARBON

GENERAL DESCRIPTION

Select Re-Activated carbon from domestic sources is quality screened during our purchasing process for activity, density and fines. The use of re-activated carbon is recommended as a lower cost alternative for most sites where drinking water quality is not necessary. In many cases our re-activated carbon meets and exceeds imported virgin carbon. In addition all carbon either sold by itself or installed in our filtration units traced by lot number to the installation or sale.

8x30 (Liquid Phase) Standard Specifications:	Standard	Value
Iodine Number	ASTM D-4607	800 Minimum
Moisture Content	ASTM D-2867	5% Maximum (as packed)
Particle Size	ASTM D-2862	8x30 US Mesh
Ash		10% Maximum
Total Surface Area (N2BET)		1050 Minimum
Pore Volume (cc/g)		0.75

4*10 (Vapor Phase) Standard Specifications:	Standard	Value
Carbon Tetrachloride Activity Level	ASTM D-3467	40 Minimum
Moisture Content	ASTM D-2867	5% Maximum (as packed)
Particle Size	ASTM D-2862	4x10 US Mesh
Ash		10% Maximum
Total Surface Area (N2BET)		1050 Minimum
Pore Volume (cc/g)		0.75

Charcoal, Activated Carbon

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Charcoal, Activated Carbon**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25246**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Irritant
Eye irritation, category 2A
Specific target organ toxicity following single exposure, category 3

Flammable
Flammable solids, category 1

Eye Irrit. 2
STOT SE 3
Hazards Not Otherwise Classified - Combustible Dust
Flam. Sol. 2

Signal word :Danger

Hazard statements:
Flammable solid
Causes serious eye irritation
May cause respiratory irritation
Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/light/equipment
Avoid breathing dust/fume/gas/mist/vapours/spray
Wash skin thoroughly after handling
Use only outdoors or in a well-ventilated area

Wear protective gloves/protective clothing/eye protection/face protection
Do not eat, drink or smoke when using this product
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
In case of fire: Use agents recommended in section 5 for extinction
If eye irritation persists get medical advice/attention
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing
Store locked up
Store in a well ventilated place. Keep container tightly closed
Dispose of contents and container to an approved waste disposal plant

Combustible Dust Hazard: :
May form combustible dust concentrations in air (during processing).

Other Non-GHS Classification:

WHMIS

D2B 

B6 

NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 7440-44-0	Carbon	100 %
		Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Loosen clothing as necessary and position individual in a comfortable position.Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen.Get medical assistance if cough or other symptoms appear.

After skin contact: Rinse/flush exposed skin gently using soap and water for 15-20 minutes.Seek medical advice if discomfort or irritation persists.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if

concerned.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea,Headache, Shortness of breath.;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

For safety reasons unsuitable extinguishing agents: None identified.

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors.Thermal decomposition can lead to release of irritating gases and vapors.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.Use spark-proof tools and explosion-proof equipment.Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols.Avoid contact with skin, eyes, and clothing.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Use spark-proof tools and explosion-proof equipment.Ensure that air-handling systems are operational.Ensure adequate ventilation.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

Methods and material for containment and cleaning up:

Keep in suitable closed containers for disposal.Wear protective eyeware, gloves, and clothing. Refer to Section 8.Always obey local regulations.Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8.Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

Conditions for safe storage, including any incompatibilities:

Store away from incompatible materials.Protect from freezing and physical damage.Keep away from food and beverages.Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame.

Store in cool, dry conditions in well sealed containers. Store with like hazards

SECTION 8 : Exposure controls/personal protection



Control Parameters: , , OSHA PEL TWA (Total Dust) 15 mg/m3 (50 mppcf*)
, , ACGIH TLV TWA (inhalable particles) 10 mg/m3

Appropriate Engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling.Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

Respiratory protection: When necessary use NIOSH approved breathing equipment.

Protection of skin: Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation.Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Wear protective clothing.

Eye protection: Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).Safety glasses or goggles are appropriate eye protection.

General hygienic measures: Perform routine housekeeping.Wash hands before breaks and at the end of work.Avoid contact with skin, eyes, and clothing.Before wearing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Black solid	**Explosion limit lower**: **Explosion limit upper**:	Not Determined Not Determined
Odor:	Odorless	**Vapor pressure**:	1 mm Hg @ 3586C
Odor threshold:	Not Determined	**Vapor density**:	Not Determined
pH-value:	6.0 – 9.0	**Relative density**:	1.8 - 2.1
Melting/Freezing point:	3652 - 3697°C / 6606 - 6687°F	**Solubilities**:	Insoluble in water.
Boiling point/Boiling range:	Decomposes	**Partition coefficient (n-octanol/water)**:	Not Determined
Flash point (closed cup):	Not Determined	**Auto/Self-ignition temperature**:	Not Determined
Evaporation rate:	Not Determined	**Decomposition temperature**:	1 mm Hg @ 3586C

Flammability (solid,gaseous):	Not Determined	**Viscosity**:	a. Kinematic:Not Determined b. Dynamic: Not Determined
Density: Not Determined			

SECTION 10 : Stability and reactivity

Reactivity: Nonreactive under normal conditions.
Chemical stability: Stable under normal conditions.
Possible hazardous reactions: None under normal processing
Conditions to avoid: Incompatible Materials.Ignition sources, dust generation, moisture, excess heat.
Incompatible materials: May react vigorously or violently when mixed with strong oxidizing agents such as chlorates, bromates and nitrates, especially when heated. Incompatible with chlorinated paraffins, Lead oxide, manganese oxide, iron oxide, liquid oxygen, oils, and moisture.
Hazardous decomposition products: Oxides of carbon.

SECTION 11 : Toxicological information

Acute Toxicity:		
Oral:	Effect level > 8000 mg/kg bw	LD50 rat
Inhalation:	Effect level > 4.6 mg/m³ air Exp. duration 4 h	rat
Chronic Toxicity: No additional information.		
Corrosion Irritation: No additional information.		
Sensitization:		No additional information.
Single Target Organ (STOT):		No additional information.
Numerical Measures:		No additional information.
Carcinogenicity:		No additional information.
Mutagenicity:		No additional information.
Reproductive Toxicity:		No additional information.

SECTION 12 : Ecological information

Ecotoxicity

Brachydanio rerio (new name: Danio rerio) Duration 96 h Endpoint LC0 : Effect conc. 1000 mg/L

Daphnia magna 24 h Endpoint EC100: Effect conc. 10000 mg/L

Persistence and degradability:
Bioaccumulative potential:
Mobility in soil:
Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.Product or containers must not be disposed with household garbage.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11).Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

1362

UN proper shipping name

Carbon Activated

Transport hazard class(es)

Class:
4.2 Substances liable to spontaneous combustion

Packing group:III
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Fire

SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

None of the ingredients is listed

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients is listed

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:
IMDG: International Maritime Code for Dangerous Goods
PNEC: Predicted No-Effect Concentration (REACH)
CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)

Effective date : 03.02.2015
Last updated : 03.19.2015

CGS

CATION EXCHANGE RESIN
SOFTENING GRADE
Na FORM

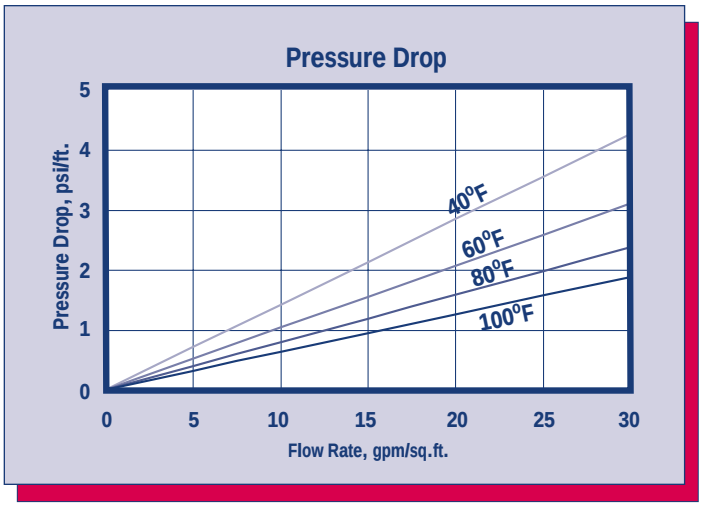
RESINTECH CGS is a high purity, light colored, high capacity, gel type sulfonated polystyrene cation resin supplied in the sodium form as moist, tough uniform spherical beads. *ResinTech CGS* specifically is intended for use in all water softening applications,including beverages, potable water and water used for food processing. It's high capacity and high DVB content provide long life and good chlorine resistance in all potable water applications. (It is also available as a dark colored product *RESINTECH CGS-BL* with identical properties.)

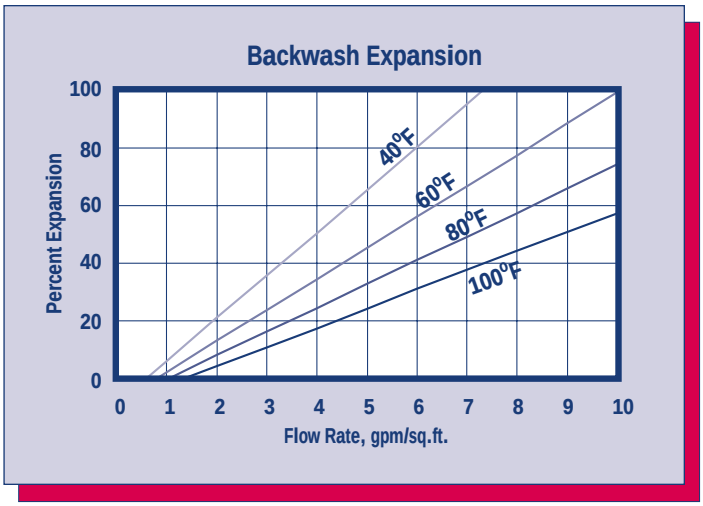
FEATURES & BENEFITS

- **COMPLIES WITH FDA REGULATIONS FOR POTABLE WATER APPLICATIONS**
  Conforms to paragraph 21CFR173.25 of the Food Additives Regulations of the F.D.A.*
- **EXCELLENT REGENERATION EFFICIENCY**
  Virtually the same operating capacity as premium grade *ResinTech CG8-BL*
- **NSF/ANSI-61 VALIDATED**
- **UNIFORM PARTICLE SIZE**
  16 to plus 50 mesh range; gives a LOWER PRESSURE DROP while maintaining SUPERIOR KINETICS.
- **SUPERIOR PHYSICAL STABILITY**
  90% plus sphericity and high crush strengths together with a very uniform particle size provide greater resistance to bead breakage while maintaining low pressure drops.
- **LOW COLOR THROW**

*For potable water applications, the resin must be properly pre-treated, usually by multiple exhaustion and regeneration cycles, to insure compliance with extractable levels.

HYDRAULIC PROPERTIES





PRESSURE DROP - The graph above shows the expected pressure loss per foot of bed depth as a function of flow rate, at various temperatures.

BACKWASH - After each cycle the resin bed should be backwashed at a rate that expands the bed 50 to 75 percent. This will remove any foreign matter and reclassify the bed. The graph above shows the expansion characteristics of *RESINTECH CGS* in the sodium form.

1 Resintech Plaza • 160 Cooper Road • West Berlin,NJ 08091 • Phone:(856)768-9600 • Fax:(856)768-9601 • E-mail:ixresin@resintech.com • Web Site:www.resintech.com

RESINTECH® CGS

PHYSICAL PROPERTIES

Polymer Structure	Styrene Crosslinked with DVB
Functional Group	$R-(SO_3)^-M^+$
Ionic Form, as shipped	Sodium
Physical Form	Tough, Spherical Beads
Screen Size Distribution	16 to 50
+16 mesh (U.S. Std)	< 5 percent
-50 mesh (U.S. Std)	< 1 percent
pH Range	0 to 14
Sphericity	90+ percent
Uniformity Coefficient	Approx. 1.6
Water Retention	
Sodium Form	48 to 54 percent
Solubility	Insoluble
Shipping Weight	
Sodium Form	48 lbs./cu.ft.
Total Capacity	
Sodium Form	1.8 meq/ml min

SUGGESTED OPERATING CONDITIONS

Maximum Temperature	
Sodium Form	250^0 F
Minimum Bed Depth	24 inches
Backwash Rate	50 to 75% Bed Expansion
Regenerant (NaCl or KCl)	
Concentration	10 to 15 percent
Flow Rate	0.5 to 1.5 gpm/cu.ft.
Contact Time	> 20 minutes
Level	4 to 15 pounds/cu.ft.
Displacement Rate	Same as Regen Flow Rate
Volume	10 to 15 gallons/cu.ft.
Fast Rinse Rate	Same as Service Flow Rate
Volume	35 to 60 gallons/cu.ft.
Service Flow Rate	2 to 10 gpm/cu.ft.

OPERATING CAPACITY

Sodium Chloride (NaCl) Regeneration

The sodium cycle operating capacity of *RESINTECH CGS* for hardness removal at various regeneration levels with an influent calcium/magnesium ratio of 2/1 and a hardness level of 500 ppm, as $CaCO_3$, is shown in the following table:

Pounds NaOH/cu.ft.	Capacity Kilograins/cu.ft.
5	20.0
7.5	25.4
10	29.0
15	33.0

Potassium Chloride (KCl) Regeneration

The potassium cycle operating capacity of *RESINTECH CGS* for hardness removal at various regeneration levels with an influent calcium/magnesium ratio of 2/1 and a hardness level of 500 ppm, as $CaCO_3$, is shown in the following table:

Pounds NaOH/cu.ft.	Capacity Kilograins/cu.ft.
5	16.6
7.5	21.8
10	26.6
15	31.2

APPLICATIONS

Softening

RESINTECH CGS is ideally suited for industrial, commercial, or residential softening applications where free chlorine is not present because of its high capacity, uniform particle size and good physical stability.

***CAUTION:DO NOT MIX ION EXCHANGE RESIN WITH STRONG OXIDIZING AGENTS.** Nitric acid and other strong oxidizing agents can cause explosive reactions when mixed with organic materials,such as ion exchange resins.

Material Safety Data Sheets (MSDS) are available for all ResinTech Inc.products.To obtain a copy,contact your local ResinTech sales representative or our corporate headquarters. They contain important health and safety information.That information may be needed to protect your employees and customers from any known health and safety hazards associated with our products.We recommend that you secure and study the pertinent MSDS for our products and any other products being used These suggestions and data are based on information we believe to be reliable.They are offered in good faith.However we do not make any guarantee or warranty.We caution against using these products in an unsafe manner or in violation of any patents;further we assume no liability for the consequences of any such actions.

RESINTECH is a registered trademark ® of RESINTECH INC.

CGSver010603

SBG1

ANION EXCHANGE RESIN TYPE ONE GEL Cl OR OH FORM

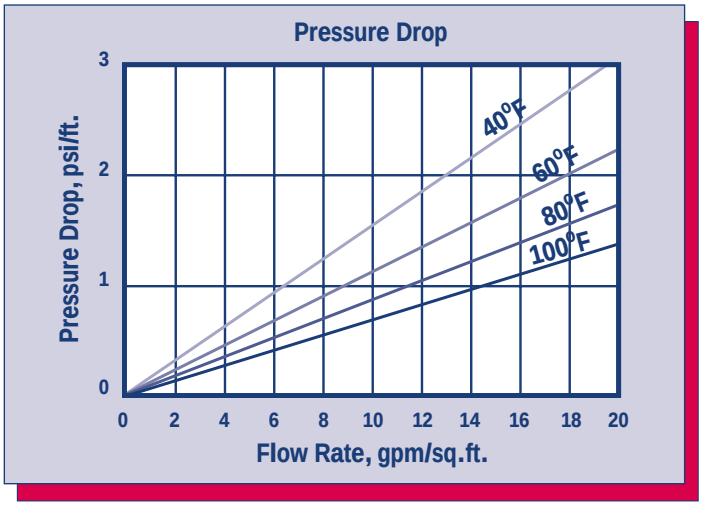
ResinTech SBG1 is a high capacity, shock resistant, gelular, Type 1, strongly basic anion exchange resin supplied in the chloride or hydroxide form as moist, tough, uniform, spherical beads. *ResinTech SBG1* is intended for use in all types of deionization systems and chemical processing applications. It is similar to *ResinTech SBG1P* but has a higher volumetric capacity and exhibits lower TOC leach rates. This makes it the better performer in single use applications such as in cartridge deionization and when high levels of regeneration are used such as in polishing mixed beds. On the other hand, *ResinTech SBG1P* is more resistant to organic fouling and gives higher operating capacities at low regeneration levels such as those used in make up demineralizers.

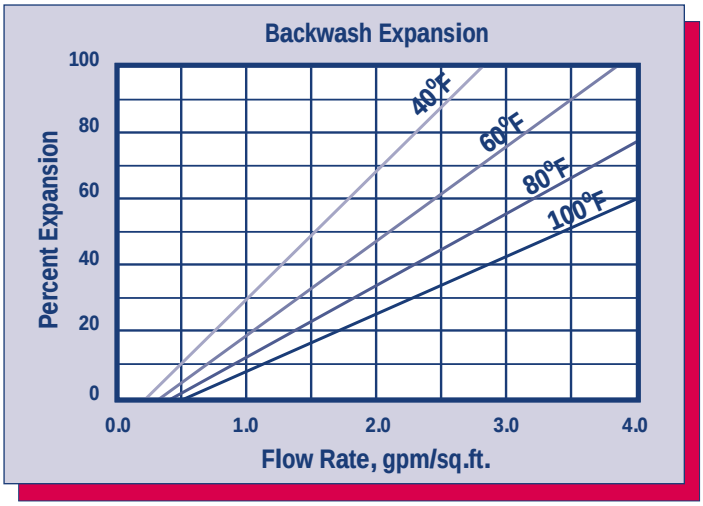
FEATURES & BENEFITS

- **COMPLIES WITH FDA REGULATIONS FOR POTABLE WATER APPLICATIONS.**
  Conforms to paragraph 21CFR173.125 of the Food Additives Regulations of the F.D.A.*
- **HIGH TOTAL CAPACITY**
  Provides longer run lengths in single use applications or where high levels of regeneration are used such as in mixed bed polishers, cartridge demineralizers.
- **UNIFORM PARTICLE SIZE**
  16 to plus 50 mesh range; gives a LOWER PRESSURE DROP while maintaining SUPERIOR KINETICS.
- **SUPERIOR PHYSICAL STABILITY**
- **LOWER TOC LEACH RATE**
  Makes it ideal for polishing mixed beds in wafer washing and other high purity water polishing applications.

*For potable water applications, the resin must be properly pre-treated, usually by multiple exhaustion and regeneration cycles, to ensure compliance with extractable levels.

HYDRAULIC PROPERTIES





PRESSURE DROP

The graph above shows the expected pressure loss per foot of bed depth as a function of flow rate, at various temperatures.

BACKWASH

After each cycle the resin bed should be backwashed at a rate that expands the bed 50 to 75 percent. This will remove any foreign matter and reclassify the bed. The graph above shows the expansion characteristics of *ResinTech SBG1* in the sodium form.

RESINTECH® SBG1

PHYSICAL PROPERTIES

Polymer Structure	Styrene Crosslinked with DVB
Functional Group	R-N-$(CH_3)_3^+Cl^-$
Ionic Form, as shipped	Chloride or Hydroxide
Physical Form	Tough, Spherical Beads
Screen Size Distribution	16 to 50
+16 mesh (U.S. Std)	< 5 percent
-50 mesh (U.S. Std)	< 1 percent
pH Range	0 to14
Sphericity	> 93 percent
Uniformity Coefficient	Approx. 1.6
Water Retention	
Chloride Form	43 to 50 percent
Hydroxide Form	Approx. 53 to 60 percent
Solubility	Insoluble
Approximate Shipping Weight	
Cl Form	44 lbs/cu.ft.
OH Form	41 lbs/cu.ft.
Swelling Cl- to OH-	18 to 25 percent
Total Capacity	
Cl Form	1.45 meq/ml min
OH Form	1.15 meq/ml min

SUGGESTED OPERATING CONDITIONS

Maximum Continuous Temperature	
Hydroxide Form	140°F
alt Form	170°F
Minimum Bed Depth	24 inches
Backwash Rate	50 to 75 percent Bed Expansion
Regenerant Concentration*	2 to 6 percent
Regenerant Flow Rate	0.25 to 1.0 gpm/cu.ft.
Regenerant Contact Time	At least 40 Minutes
Regenerant Level	4 to 10 pounds/cu.ft.
Displacement Rinse Rate	Same as Regenerant Flow Rate
Displacement Rinse Volume	10 to 15 gals/cu.ft.
Fast Rinse Rate	Same as Service Flow Rate
Fast Rinse Volume	35 to 60 gals/cu.ft.
Service Flow Rates	
Polishing Mixed Beds	3 to 15 gpm/cu.ft.
Non-Polishing Apps.	2 to 4 gpm/cu.ft.

OPERATING CAPACITY

The operating capacity of *RESINTECH SBG1* for a variety of acids at various regeneration levels when treating an influent with a concentration 500 ppm, expressed as $CaCO_3$ is shown in the following table:

Pounds NaOH/ft³	Capacity Kilograms per cubic foot			
	HCl	H_2SO_4	H_2SiO_3	H_2CO_3
4	11.3	14.0	14.7	18.6
6	12.8	16.3	17.3	19.8
8	14.3	13.3	19.5	21.6
10	15.5	20.0	22.2	22.2

APPLICATIONS

DEMINERALIZATION – *RESINTECH SBG1* is highly recommended for use in mixed bed demineralizers, wherever complete ion removal; superior physical and osmotic stability and low TOC leachables are required such as in wafer fabrication and other ultrapure applications.

RESINTECH SBG1 has high total capacity and low swelling on regeneration and provides maximum operating capacity in cartridge deionization applications. It is ideal for single use applications such as precious metal recovery, radwaste disposal and purification of toxic waste streams.

Highly crosslinked Type 1, styrenic anion exchangers have greater thermal and oxidation resistance than other types of strong base resins. They can be operated and regenerated at higher temperatures. The combination of lower porosity, high total capacity and Type 1 functionality make *RESINTECH SBG1* the resin of choice when water temperatures exceed 85°F and where the combination of carbon dioxide, borate and silica exceed 40% of the total anions.

RESINTECH SBG1P and *RESINTECH SBG1* are quite similar; the difference between them is the degree of porosity. *RESINTECH SBG1P* has greater porosity that gives it faster kinetics, and greater ability to reversibly sorb slow moving ions such as Naturally occurring Organic Matter (NOM). At lower regeneration levels and where chlorides make up a substantial portion of the anion load, or where the removal and elution of naturally occurring organics is of concern *RESINTECH SBG1P*, SBACR or SBG2 should be considered. At the higher regeneration levels used in mixed bed polishers *RESINTECH SBG1* provides higher capacity, and the lowest possible TOC leach rates.

***CAUTION:DO NOT MIX ION EXCHANGE RESIN WITH STRONG OXIDIZING AGENTS.** Nitric acid and other strong oxidizing agents can cause explosive reactions when mixed with organic materials,such as ion exchange resins.

Material Safety Data Sheets (MSDS) are available for all ResinTech Inc.products.To obtain a copy,contact your local ResinTech sales representative or our corporate headquarters. They contain important health and safety information.That information may be needed to protect your employees and customers from any known health and safety hazards associated with our products.We recommend that you secure and study the pertinent MSDS for our products and any other products being used These suggestions and data are based on information we believe to be reliable.They are offered in good faith.However we do not make any guarantee or warranty. We caution against using these products in an unsafe manner or in violation of any patents;further we assume no liability for the consequences of any such actions.

RESINTECH is a registered trademark ® of RESINTECH INC.

Safety Data Sheet

Product Names: SBG1, SBG1-HP, SBG1-UPS, SBG1-C, SBG1-F, SBMP1, SBMP1-UPS, GP-SBA, SBG1P, SBG1P-UPS

(Type I Strong Base Anion Exchange Resin Chloride Form)

Effective date 31 March 2015

Section 1: Identification

1a	Product Names	ResinTech SBG1, SBG1-HP, SBG1-UPS, SBG1-C, SBG1-F, SBMP1, SBMP1-UPS, GP-SBA, SBG1P, SBG1P-UPS
1b	Common Name	Type I Strong base anion resin in the chloride form.
1c	Intended use	All general purpose anion exchanges for general use including salt form and demineralization.
1d	Manufacturer Address	ResinTech, Inc. 160 Cooper Road, West Berlin, NJ 08091 USA
	Phone Email	856-768-9600 ixresin@resintech.com

Section 2: Hazard Identification

2a Hazard classification — Not hazardous or dangerous

Product Hazard Rating	Scale
Health = 0	0 = Negligible
Fire = 1	1 = Slight
Reactivity = 0	2 = Moderate
Special – N/A	3 = High
	4 = Extreme

2b Product description — White, yellow, or orange colored solid beads approximately 0.6 mm diameter with little or no odor.

2c Precautions for use — Safety glasses and gloves recommended. Slipping hazard if spilled.

2c Potential health effects — Will cause eye irritation. Will cause skin skin irritation. Ingestion is not likely to pose a health risk.

2d Environmental effects — This product may alter the pH of any water that contacts it.

Section 2A: Hazard classification UN OSHA globally harmonized system

WARNING

(contains ion exchange resin)

H320: Causes eye irritation

Precautionary Statements

P264: Wash hands thoroughly after handling.

P280: Wear protective gloves/protective clothing/eye protection/face protection

P305+351+338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.

P333+313: If skin irritation or a rash occurs: Get medical advice/attention.

P337+313: If eye irritation persists get medical advice/attention.

P403+233: Store in a well-ventilated place. Keep container tightly closed.

P411: Store at temperatures not exceeding 50 °C/ 122 °F.

Please refer to the safety data sheet for additional information regarding this product

ResinTech, Inc.
160 Cooper Road
West Berlin, NJ 08091-9234
856 768-9600
Ixresin@resintech.com

Section 3: Composition/ Information on Ingredients

3a	Chemical name	Trimethylamine functionalized chloromethylated copolymer of polystyrene in the chloride form.
3b	Ingredients	
	Trimethylamine functionalized Chloromethlyated copolymer of Styrene and divinylbenzene in the Chloride form	CAS# 60177-39-1 (35 - 65%)
	Water	CAS# 7732-18-5 (35 – 65%)

Section 4: First Aid Measures

4a	Inhalation	No adverse effects expected- normal use of product does not produce odors or vapors.
4b	Skin	Wash with soap and water- seek medical attention if a rash develops.
4c	Eye contact	Wash immediately with water-seek attention if discomfort continues.
4d	Ingestion	No adverse effects expected for small amounts, larger amounts can cause stomach irritation. Seek medical attention if discomfort occurs.

Section 5: Fire Fighting Measures

5a	Flammability	NFPA Fire rating = 1
5b	Extinguishing media	Water, CO2, foam, dry powder.
5c	Fire fighting Procedures	Follow general fire fighting procedures indicated in the work place. Seek medical attention if discomfort continues.
5d	Protective Equipment	MSHA/NIOSH approved self-contained breathing gear, full protective clothing.
5e	Combustion Products	Carbon oxides and other toxic gasses and vapors.
5f	Unusual Hazards	Product is not combustible until moisture is removed. Resin begins to burn at approximately 230º C. Auto ignition can occur above 500º C.

Section 6: Accidental Release Measures

6a	Personal Precautions	Keep people away, spilled resin can be a slipping hazard, wear gloves and safety glasses to minimize skin or eye contact.
6b	Incompatible Chemicals	Strong oxidants can create risk of combustion products similar to burning, exposure to strong bases can cause a rapid temperature increase.
6c	Environmental Precautions	Keep out of public sewers and waterways.
6d	Containment Materials	Use plastic or paper containers, unlined metal containers not recommended.
6e	Methods of Clean-up	Sweep up material and transfer to containers.

Section 7: Handling and Storage

7a	Handling	Avoid prolonged skin contact. Keep resin moist and avoid allowing resin to completely dry.
7b	Storage	Store in a cool dry place (0º to 45º C) in the original shipping container. This product is thermally sensitive and will have reduced shelf life if subjected to extended periods of time at temperatures exceeding 50º C. Although freezing does not usually damage ion exchange resins, avoid repeated freeze thaw cycles.
7c	TSCA considerations	Ion exchange resins should be listed on the TSCA Inventory in compliance with State and Federal Regulations.

Section 8: Exposure Controls/Personal Protection

8a	OSHA exposure limits	None noted.
8b	Engineering Controls	Provide adequate ventilation.
8c	Personal Protection Measures	
	Eye Protection	Safety glasses or goggles.
	Respiratory Protection	Not required for normal use.
	Protective Gloves	Not required for limited exposure but recommended for extended contact.

Section 9: Physical and Chemical Properties

Appearance	Amber, yellow, or red beads approx. 0.6 mm diameter.
Flammability or explosive limits	Flammable above 500º C
Odor	Little or no odor
Physical State	Solid
Vapor pressure	Not available
Odor threshold	Not available
Vapor density	Not available
pH	Near neutral (6 to 8 typical)
Relative density	Approx 710 grams/Liter
Melting point/freezing point	Does not melt, freezes at approx. 0 C
Solubility	Insoluble in water and most solvents
Boiling point	Does not boil
Flash point	Approx 500º C
Evaporation rate	Does not evaporate
Partition Coefficient (n-octonol/water)	Not applicable
Auto-ignition temperature	Approx 500º C
Decomposition temperature	Above 230º C
Viscosity	Not applicable

Section 10: Stability and Reactivity

10a Stability	Stable under normal conditions.
10b Conditions to Avoid	Heat, exposure to strong oxidants.
10c Hazardous by-products	Trimethylamine, charred polystyrene, aromatic acids and hydrocarbons, organic amines, nitrogen oxides, carbon oxides, chlorinated hydrocarbons.
10d Incompatible materials	Strong oxidizing agents, e.g. nitric acid (such as HNO_3)
10e Hazardous Polymerization	Does not occur

Section 11: Toxicological Information

11a Likely Routes of Exposure	Oral, skin or eye contact.
11b Effects of exposure	
Delayed	None known.
Immediate (acute)	None known.
Chronic	None known.
11c Toxicity Measures	
Skin Adsorption	Unlikely, some transfer of acidity is possible.
Ingestion	Oral toxicity believed to be low but no LD50 has been established.
Inhalation	Unknown, vapors are very unlikely due to physical properties (insoluble solid).
11d Toxicity Symptoms	
Skin Adsorption	Mild Rash.
Ingestion	Indigestion or general malaise.
Inhalation	Unknown.
11e Carcinogenicity	None known

Section 12: Ecological information

12a Eco toxicity	Not acutely harmful to plant or animal life.
12b Mobility	Insoluble, acidity or causticity may escape if wet.
12c Biodegradability	Not biodegradable.
12d Bioaccumulation	Insignificant.
12e Other adverse effects	Not Harmful to the environment.

Section 13: Disposal Considerations

13a General considerations	Material is non-hazardous. However, unused material can cause a pH change when wetted.
13b Disposal Containers	Most plastic and paper containers are suitable. Avoid use of unlined metal containers.
13c Disposal methods	No specific method necessary.
13d Sewage Disposal	Not recommended.

13e	Precautions for incineration	May release trimethylamine and toxic vapors when burned.
13f	Precautions for landfills	Resins used to remove hazardous materials may then become hazardous mixtures

Section 14: Transportation Information

14a	Transportation Class	Not classified as a dangerous good for transport by land, sea, or air.
14b	TDG	Not regulated.
14c	IATA	Not regulated.
14d	DOT (49 CFR 172.101)	Not Regulated.

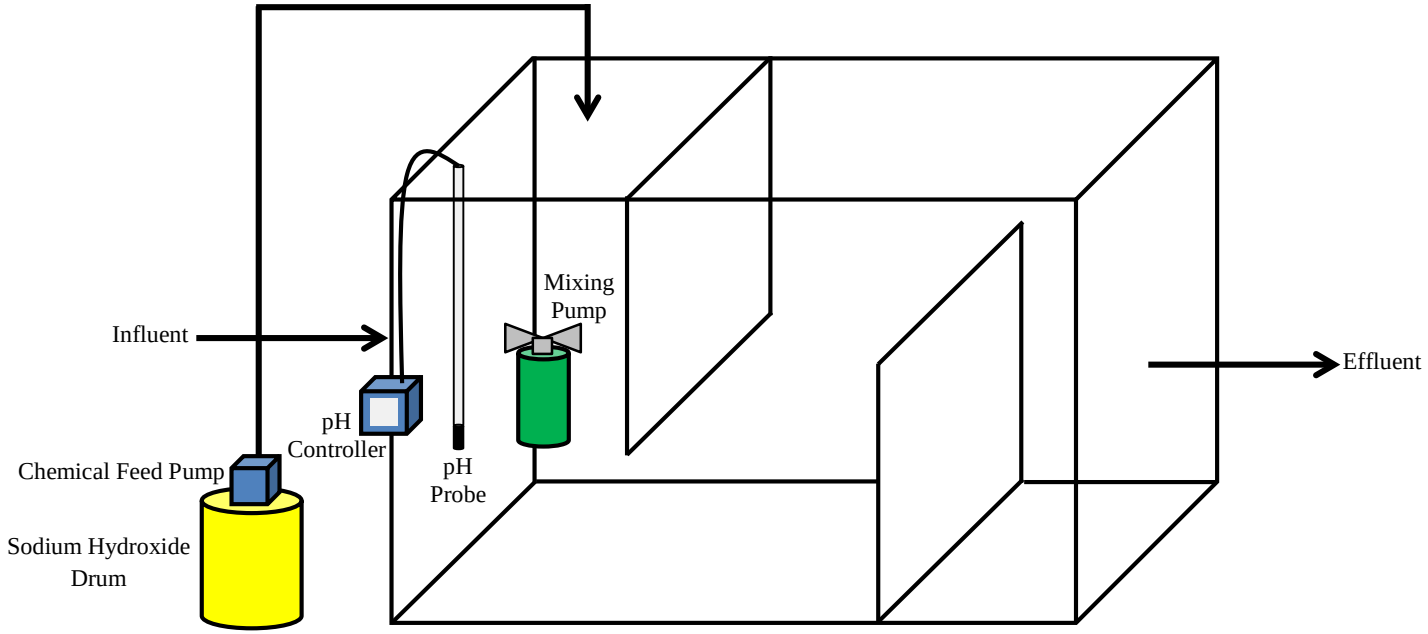
Section 15: Regulatory Information

15a	CERCLA	Not regulated
15b	SARA Title III	Not regulated
15c	Clean Air act	Not regulated
15d	Clean Water Act	Not regulated
15e	TSCA	Not regulated
15f	Canadian Regulations	
	WHMIS	Not a controlled product
	TDG	Not regulated
15g	Mexican Regulations	Not Dangerous

Section 16: Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that their activities comply with federal, state, and local laws.

16a Date of Revision 31 March 2015



Notes:

1.) Figure is not to scale.
2.) System layout can vary with site conditions.

89 Crawford Street
Leominster, Massachusetts 01453
Tel: 774.450.7177
Fax: 888.835.0617
www.lrt-llc.net

Configuration of pH Adjustment System

Lockwood Remediation Technologies, LLC

One Controller for the Broadest Range of Sensors.

Choose from 30 digital and analog sensor families for up to 17 di:erent parameters.

Maximum Versatility

The sc200 controller allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with Hach's broad range of sensors, eliminating the need for dedicated, parameter-specific controllers.

Ease of Use and Confidence in Results

Large, high-resolution, transreflective display provides optimal viewing resolution in any lighting condition. Guided calibration procedures in 19 languages minimize complexity and reduce operator error. Password-protected SD card reader o:ers a simple solution for data download and transfer. Visual warning system provides critical alerts.

Wide Variety of Communication Options

Utilize two to five analog outputs to transmit primary and secondary values for each sensor, or integrate Hach sensors and analyzers into MODBUS RS232/RS485, Profibus® DP, and HART networks.

Password protected SD card reader offers a simple solution for data download and transfer, and sc200 and digital sensor configuration file duplication and backup.

Controller Comparison

Features	Previous Models sc100™ Controller	Previous Models GLI53 Controller	sc200™ Controller	Benefits
Display	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	160 x 240 pixels 48 x 68 mm (1.89 x 2.67 in.) Transreflective	• Improved user interface—50% bigger • Easier to read in daylight and sunlight
Data Management	irDA Port/PDA Service Cable	N/A	SD Card Service Cable	• Simplifies data transfer • Standardized accessories/max compatibility
Sensor Inputs	2 Max Direct Digital Analog via External Gateway	2 Max Analog Depending on Parameter	2 Max Digital and/or Analog with Sensor Card	• Simplifies analog sensor connections • Works with analog and digital sensors
Analog Inputs	N/A	N/A	1 Analog Input Signal Analog 4-20mA Card	• Enables non-sc analyzer monitoring • Accepts mA signals from other analyzers for local display • Consolidates analog mA signals to a digital output
4-20 mA Outputs	2 Standard	2 Standard	2 Standard Optional 3 Additional	• Total of five (5) 4-20 mA outputs allows multiple mA outputs per sensor input
Digital Communication	MODBUS RS232/RS485 Profibus DP V1.0	HART	MODBUS RS232/RS485 Profibus DP V1.0 HART 7.2	• Unprecedented combination of sensor breadth and digital communication options

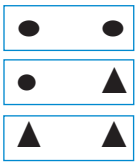
Choose from Hach's Broad Range of Digital and Analog Sensors

Parameter	Sensor	Digital or Analog
Ammonia	AMTAX™ sc, NH4D sc, AISE sc, AN-ISE sc	●
Chlorine	CLF10 sc, CLT10 sc, 9184 sc	●
Chlorine Dioxide	9185 sc	●
Conductivity	GLI 3400 Contacting, GLI 3700 Inductive	▲
Dissolved Oxygen	LDO® Model 2, 5740 sc	●
Dissolved Oxygen	5500	▲
Flow	U53, F53 Sensors	▲
Nitrate	NITRATAX™ sc, NO3D sc, NISE sc, AN-ISE sc	●
Oil in Water	FP360 sc	●
Organics	UVAS sc	●
Ozone	9187 sc	●
pH/ORP	pHD	●
pH/ORP	pHD, pH Combination, LCP	▲
Phosphate	PHOSPHAX™ sc	●
Sludge Level	SONATAX™ sc	●
Suspended Solids	SOLITAX™ sc, TSS sc	●
Turbidity	1720E, FT660 sc, SS7 sc, ULTRATURB sc, SOLITAX sc, TSS sc	●
Ultra Pure Conductivity	8310, 8311, 8312, 8315, 8316, 8317 Contacting	▲
Ultra Pure pH/ORP	8362	▲

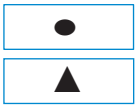
● = Digital ▲ = Analog

Connect up to two of any of the sensors listed above, in any combination, to meet your application needs. The diagrams below demonstrate the potential configurations. Operation of analog sensors requires the controller to be equipped with the appropriate sensor module. Contact Hach Technical Support for help with selecting the appropriate module.

2 Channel Configurations



1 Channel Configurations



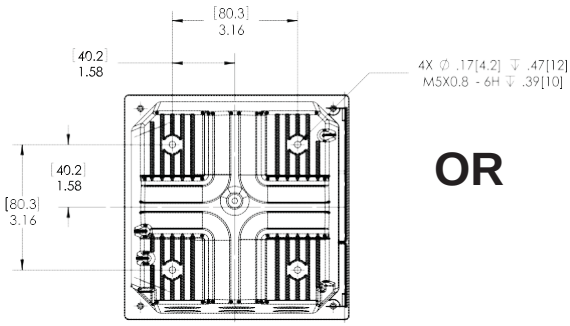
Specifications*

Dimensions (H x W x D)	5.7 in x 5.7 in x 7.1 in (144 mm x 144 mm x 181 mm)
Display	Graphic dot matrix LCD with LED backlighting, transreflective
Display Size	1.9 x 2.7 in. (48 mm x 68 mm)
Display Resolution	240 x 160 pixels
Weight	3.75 lbs. (1.70 kg)
Power Requirements (Voltage)	100 - 240 V AC, 24 V DC
Power Requirements (Hz)	50/60 Hz
Operating Temperature Range	-20 to 60 °C , 0 to 95% RH non-condensing
Analog Outputs	Two (Five with optional expansion module) to isolated current outputs, max 550 Ω , Accuracy: ± 0.1% of FS (20mA) at 25 °C, ± 0.5% of FS over -20 °C to 60 °C range Operational Mode: measurement or calculated value
Analog Output Functional Mode	Linear, Logarithmic, Bi-linear, PID
Security Levels	2 password-protected levels
Mounting Configurations	Wall, pole, and panel mounting
Enclosure Rating	NEMA 4X/IP66
Conduit Openings	1/2 in NPT Conduit
Relay: Operational Mode	Primary or secondary measurement, calculated value (dual channel only) or timer
Relay Functions	Scheduler (Timer), Alarm, Feeder Control, Event Control, Pulse Width Modulation, Frequency Control, and Warning
Relays	Four electromechanical SPDT (Form C) contacts, 1200 W, 5 A
Communication	MODBUS RS232/RS485, PROFIBUS DPV1, or HART 7.2 optional
Memory Backup	Flash memory
Electrical Certifications	EMC CE compliant for conducted and radiated emissions: - CISPR 11 (Class A limits) - EMC Immunity EN 61326-1 (Industrial limits) Safety cETLus safety mark for: - General Locations per ANSI/UL 61010-1 & CAN/CSA C22.2. No. 61010-1 - Hazardous Location Class I, Division 2, Groups A,B,C & D (Zone 2, Group IIC) per FM 3600 / FM 3611 & CSA C22.2 No. 213 M1987 with approved options and appropriately rated Class I, Division 2 or Zone 2 sensors cULus safety mark - General Locations per UL 61010-1 & CAN/CSA C22.2. No. 61010-1

**Subject to change without notice.*

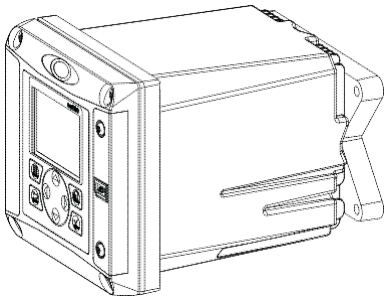
Dimensions

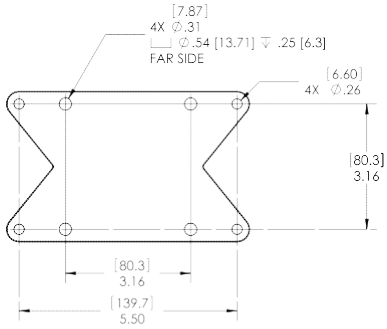
Surface Mounting Dimensions



Mounting Dimensions
(Rear View)

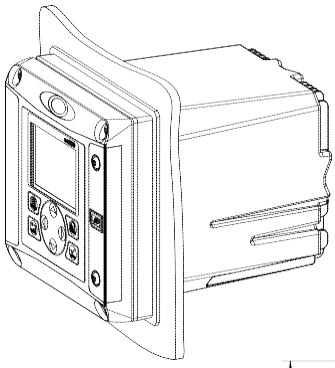
OR

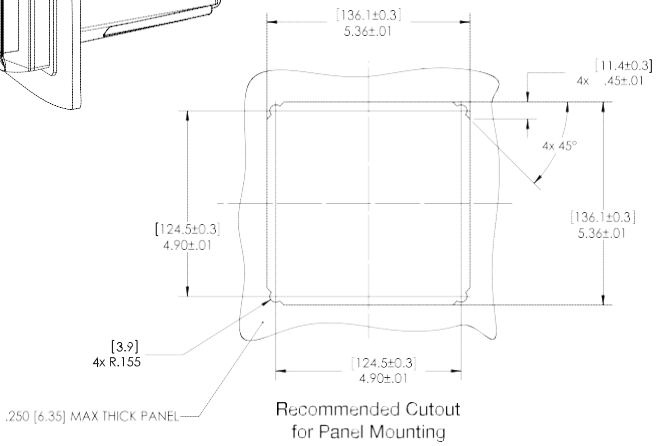




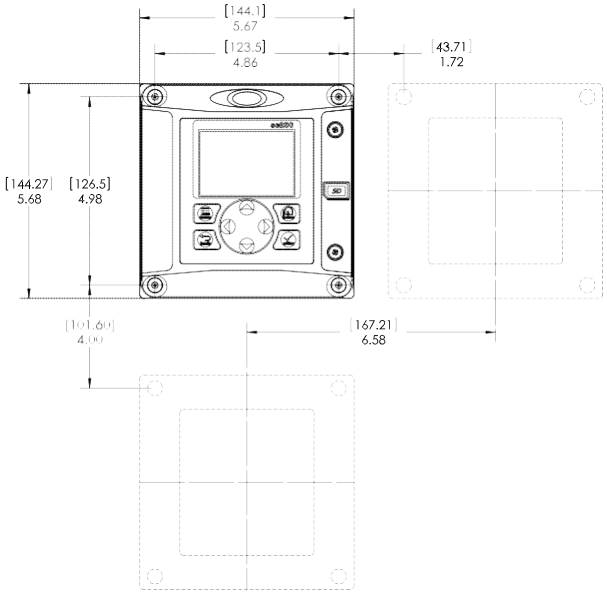
Bracket (supplied) for Surface Mounting
(Not compatible with Weather and Sun Shield
p/n 9220600 when surface mounting.)

Panel Mounting Dimensions



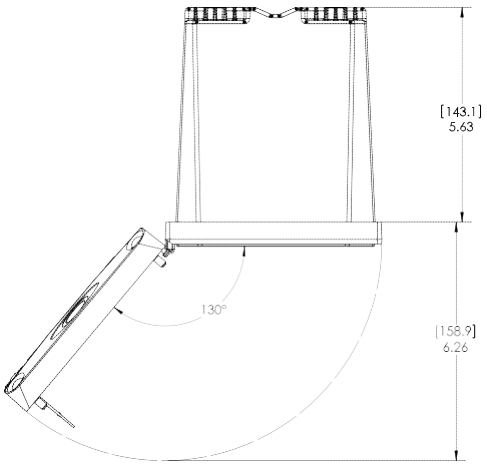


Recommended Cutout
for Panel Mounting

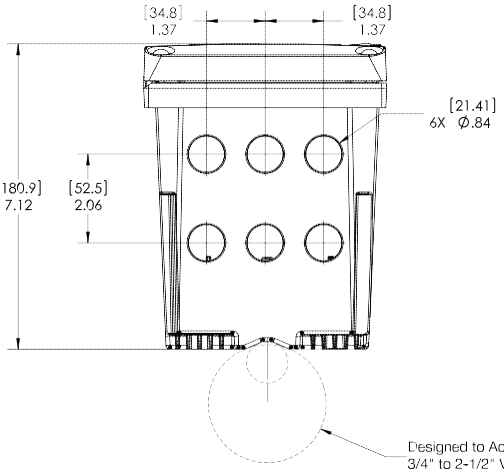


Minimum Spacing Dimensions
for Group Mounting

Top and Bottom Views



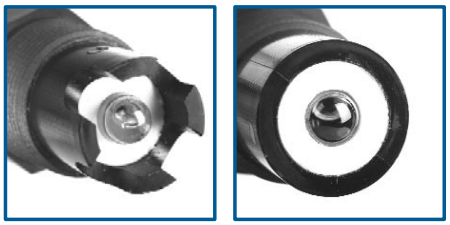
Door Opening Details



Designed to Accommodate
3/4" to 2-1/2" Vertical / Horizontal Pipe

3/4-inch Combination pH and ORP Sensor Kits

Use the Digital Gateway to make any Hach analog combination pH or ORP sensor compatible with the Hach sc1000 Controller.



Digital combination pH and ORP sensors are available in convertible, insertion, and sanitary mounting styles. Choose from rugged dome electrodes or "easy-to-clean" flat glass electrodes.

Features and Benefits

Low Price—High Performance

These combination sensors are designed for specialty applications for immersion or in-line mounting. The reference cell features a double-junction design for extended service life, and a built-in solution ground. The body is molded from chemically-resistant Ryton® or PVDF, and the reference junction is coaxial porous Teflon®. All sensors are rated 0 to 105ºC up to 100 psig, and have integral 4.5 m (15 ft.) cables with tinned leads. The PC-series (for pH) and RC-series (for ORP) combination sensors are ideal for measuring mild and aggressive media.

Special Electrode Configurations

Sensors with rugged dome electrodes, "easy-to-clean" flat glass electrodes, and even HF (hydrofluoric acid) resistant glass electrodes are available for a wide variety of process solutions.

Temperature Compensation Element Option

The PC-series combination pH sensors are available with or without a Pt 1000 ohm RTD temperature element. The RC-series combination ORP sensors are supplied without a temperature element.

Versatile Mounting Styles

Sensors are available in three mounting styles—convertible, insertion, and sanitary. Please turn to page 3 for more information.

Full-Featured "Plug and Play" Hach sc Digital Controllers

There are no complicated wiring or set up procedures with any Hach sc controller. Just plug in any combination of Hach digital sensors and it's ready to use—it's "plug and play."

One or multiple sensors—The sc controller family allows you to receive data from up to eight Hach digital sensors in any combination using a single controller.

Communications—Multiple alarm/control schemes are available using the relays and PID control outputs. Available communications include analog 4-20 mA, digital MODBUS® (RS485 and RS232) or Profibus DP protocols. (Other digital protocols are available. Contact your Hach representative for details.)

Data logger—A built-in data logger collects measurement data, calibration, verification points, and alarm history.

Specifications*

Most pH applications fall in the 2.5-12.5 pH range. General purpose pH glass electrodes perform well in this range. Some industrial applications require accurate measurements and control at pH values below 2 or above 12. Consult Hach Technical Support for details on these applications.

Combination pH Sensors

Measuring Range
0 to 14 pH

Accuracy
Less than 0.1 pH under reference conditions

Temperature Range
0 to 105ºC (32 to 221ºF)

Flow Rate
0 to 2 m/s (0 to 6.6 ft./s); non-abrasive

Pressure Range
0 to 6.9 bar at 100ºC (0 to 100 psig at 212ºF)

Signal Transmission Distance
100 m (328 ft.) when used with the Hach Digital Gateway and a Hach sc Digital Controller.

1000 m (3280 ft.) when used with the Hach Digital Gateway, Termination Box, and a Hach sc Digital Controller.

Sensor Cable
Integral coaxial cable (plus two conductors for temperature compensator option); 4.5 m (15 ft.) long

Wetted Materials

Convertible style: Ryton® body (glass filled)

Insertion style: PVDF body (Kynar®)

Sanitary style: 316 stainless steel sleeved PVDF body

Common materials for all sensor styles include PTFE Teflon double junction, glass process electrode, and Viton® O-rings

Warranty
90 days

Combination ORP Sensors

Measuring Range
-2000 to +2000 millivolts

Accuracy
Limited to calibration solution accuracy (± 20 mV)

Temperature Range
0 to 105ºC (32 to 221ºF)

Flow Rate
0 to 2 m/s (0 to 6.6 ft./s); non-abrasive

Pressure Range
0 to 6.9 bar at 100ºC (0 to 100 psig at 212ºF)

Signal Transmission Distance
100 m (328 ft.) when used with the Hach Digital Gateway and a Hach sc Digital Controller.

1000 m (3280 ft.) when used with the Hach Digital Gateway, Termination Box, and a Hach sc Digital Controller.

Sensor Cable
Integral coaxial cable; 4.5 m (15 ft.) long; terminated with stripped and tinned wires

Wetted Materials

Convertible style: Ryton® body (glass filled)

Insertion style: PVDF body (Kynar®)

Common materials for all sensor styles include PTFE Teflon double junction, glass with platinum process electrode, and Viton® O-rings

Warranty
90 days

**Specifications subject to change without notice.*

Ryton® is a registered trademark of Phillips 66 Co.; Viton® is a registered trademark of E.I. DuPont de Nemours + Co.; Kynar® is a registered trademark of Pennwalt Corp.

Engineering Specifications

1. The pH sensor shall be available in convertible, insertion or sanitary styles. The ORP sensor shall be available in only convertible or insertion styles.
2. The convertible style sensor shall have a Ryton® body. The insertion style sensor shall have a PVDF body. The sanitary style sensor shall have a 316 stainless steel sleeved PVDF body. Common materials for all sensor styles shall include a PTFE Teflon® double junction, and Viton® O-rings. The pH sensor shall have a glass pH electrode. The ORP sensor shall have a platinum ORP electrode.
3. The convertible style pH sensor shall be available with or without a built-in Pt 1000 ohm RTD temperature element. Insertion and sanitary style pH sensors shall have a built-in Pt 1000 ohm RTD temperature element. Convertible and insertion style ORP sensors shall not have a built-in temperature element.
4. The sensor shall communicate via MODBUS® RS-485 to a Hach sc Digital Controller.
5. The sensor shall be Hach Company Model PC sc or PC-series for pH measurement or Model PC sc or RC-series for ORP measurement.

Dimensions

Convertible Style Sensor

The convertible style sensor has a Ryton® body that features 3/4-inch NPT threads on both ends. The sensor can be directly mounted into a standard 3/4-inch pipe tee for flow-through mounting or fastened onto the end of a pipe for immersion mounting. The convertible style sensor enables inventory consolidation, thereby reducing associated costs. Mounting tees and immersion mounting hardware are offered in a variety of materials to suit application requirements.

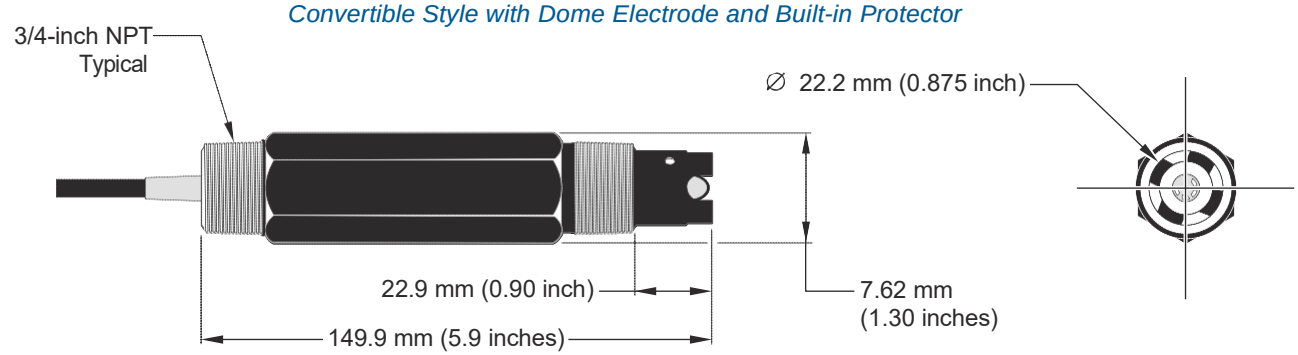
Insertion Style Sensor

Insertion style sensors feature a longer, non-threaded PVDF body with two Viton® O-rings, providing a seal when used with the optional Hach insertion mount hardware assembly. This ball valve hardware enables sensor insertion and retraction from a pipe or vessel without having to stop the process flow.

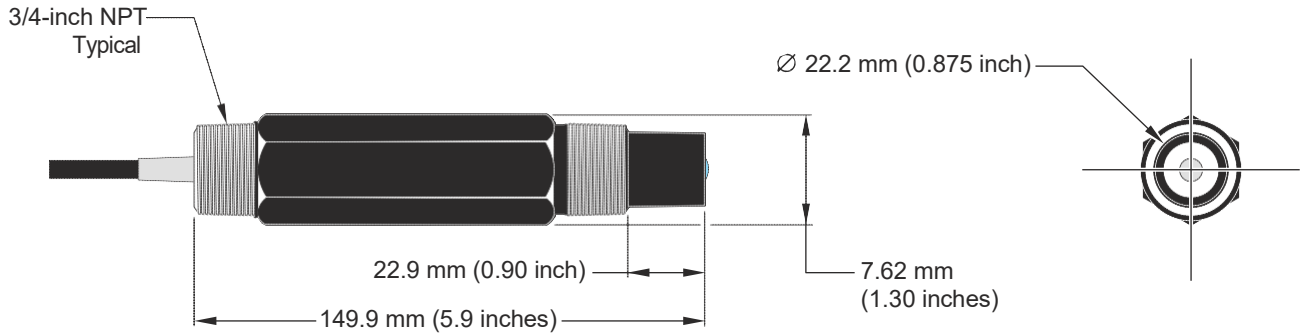
Sanitary Style Sensor

The sanitary style sensor, offered for pH measurement, has a 316 stainless steel-sleeved PVDF body with a 2-inch flange. The sensor mates to a standard 2-inch Tri-Clover fitting. The optional Hach sanitary mounting hardware includes a standard 2-inch sanitary tee, sanitary clamp, and Viton® sanitary gasket.

Convertible Style with Dome Electrode and Built-in Protector



Convertible Style with Flat Electrode



Lockwood Remediation Technologies, LLC

The Pulsatron Series A Plus offers manual function controls over stroke length and stroke rate as standard with the option to select external pace for automatic control.

Ten distinct models are available, having pressure capabilities to 250 PSIG (17 BAR) @ 12 GPO (1.9 lph), and flow capacities to 58 GPO (9.1 lph) @ 100 PSIG (7.0 BAR), with a standard turndown ratio of 100:1, and optional ratio of 1000:1. Metering performance is reproducible to within ± 3% of maximum capacity.

Features

- Manual Control by on-line adjustable stroke rate and stroke length.
- Highly Reliable timing circuit.
- Circuit Protection against voltage and current upsets.
- Solenoid Protection by thermal overload with auto-reset.
- Water Resistant, for outdoor and indoor applications.
- Internally Dampened To Reduce Noise.
- Guided Ball Check Valve Systems, to reduce back flow and enhance outstanding priming characteristics.
- Few Moving Parts and Wall Mountable.
- Safe & Easy Priming with durable leak-free bleed valve assembly (standard).
- Optional Control: External pace with auto/manual selection.

Controls

Manual Stroke Rate

Manual Stroke Length

External Pacing - Optional

External Pace With Stop - Optional (125 SPM only)

Controls Options		
Feature	Standard Configuration	Optional Configuration [1]
External Pacing	--	Auto / Manual Selection
External Pace w/ Stop (125 SPM only)	--	Auto / Manual Selection [2]
Manual Stroke Rate	10:1 Ratio	100:1 Raio
Manual Stroke Length	10:1 Ratio	10:1 Ratio
Total Turndown Ratio	100:1 Ratio	1000:1 Ratio

Note 1: On S2, S3 & S4 sizes only.

Note 2: Not available on 1000:1 turndown pumps.

Operating Benefits

- Reliable metering performance.
- Rated "hot" for continuous duty.
- High viscosity capability.
- Leak-free, sealless, liquid end.

Aftermarket

- KOPkits
- Gauges
- Dampeners
- Pressure Relief Valves
- Tanks
- Pre-Engineered Systems
- Process Controllers (PULSAblue, MicroVision)

Series A Plus
Electronic Metering Pumps

Lockwood Remediation Technologies, LLC

Series A Plus

Specifications and Model Selection

MODEL			LBC2	LB02	LBC3	LB03	LB04	LB64	LBC4	LBS2	LBS3	LBS4
Capacity nominal (max.)		GPH	0.25	0.25	0.42	0.50	1.00	1.25	2.00	0.50	1.38	2.42
		GPO	6	6	10	12	24	30	48	12	33	58
		LPH	0.9	0.9	1.6	1.9	3.8	4.7	7.6	1.9	5.2	9.14
Pressure[3] (max.)	GFPP, PVDF, 316SS or PVC <; N code) wITFE Seats)	PSIG (Bar)	250 (17)	150 (10)	250 (17)	150 (10)	100 (7)	100 (7)	50 (3.3)	250 (17)	150 (10)	100 (7)
	PVC (V code) Viton or CSPE Seats IDegas Liquid End		150 (10)							150 (10)		
Connections:		Tubina	1 14' ID X 3 8' OD						3 8' D X 1 2' OD	1 4' D X 3 8' OD		
		Pioina	1 4' FNPT									
Strokes/Minute		SPM	125							250		

Note 3: Pumps with rated pressure above 150 PSI will be de-rated to 150 PSI Max. when selecting certain valve options, see Price Book for details.

Engineering Data

Pump Head Materials Available:	GFPPL
	PVC
	PVDF
	316 SS
Diaphragm:	PTFE-faced CSPE-backed
Check Valves Materials Available:	
Seats/0-Rings:	PTFE
	CSPE
	Viton
Balls:	Ceramic
	PTFE
	316 SS
	Alloy C
Fittings Materials Available:	GFPPL
	PVC
	PVDF
Bleed Valve:	Same as fitting and check valve selected, except 316SS
Injection Valve & Foot Valve Assy:	Same as fitting and check valve selected
Tubing:	Clear PVC
	White PE

Important: Material Code - GFPPL=Glass-filled Polypropylene, PVC=Polyvinyl Chloride, PE=Polyethylene, PVDF=Polyvinylidene Fluoride, CSPE=Generic formulation of Hypalon, a registered trademark of E.I. DuPont Company. Viton is a registered trademark of E.I. DuPont Company. PVC wetted end recommended for sodium hypochlorite.

Engineering Data

Reproducibility:	+/- 3% at maximum capacity
Viscosity Max CPS:	1000 CPS
Stroke Frequency Max SPM:	125 / 250 by Model
Stroke Frequency Turn-Down Ratio:	10:1 / 100:1 by Model
Stroke Length Turn-Down Ratio:	10:1
Power Input:	115 VAC/50-60 HZ/1 ph
	230 VAC/50-60 HZ/1 ph
Average Current Draw:	
@ 115 VAC; Amps:	0.6 Amps
@ 230 VAC; Amps:	0.3 Amps
Peak hput Power:	130 Watts
Average Input Power @ Max SPM:	50 Watts

Custom Engineered Designs - Pre-Engineered Systems

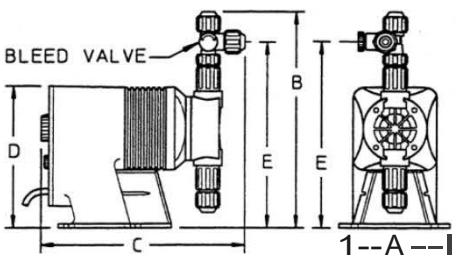
Pre-Engineered Systems

Pulsafeeder's Pre-Engineered Systems are designed to provide complete chemical feed solutions for all electronic metering applications. From stand alone simplex pH control applications to full-featured, redundant sodium hypochlorite disinfection metering, these rugged fabricated assemblies offer turn-key simplicity and industrial-grade durability. The UV-stabilized, high-grade HOPE frame offers maximum chemical compatibility and structural rigidity. Each system is factory assembled and hydrostatically tested prior to shipment.

Dimensions

Series A PLUS Dimensions (inches)						
Model No.	A	B	C	D	E	Shipping Weight
LB02 IS2	5.0	9.6	9.5	6.5	8.2	10
LBC2	5.0	9.9	9.5	6.5	8.5	10
LBC3	5.0	9.9	9.5	6.5	8.5	10
LB03 IS3	5.0	9.9	9.5	6.5	8.5	10
LB0B4	5.0	9.9	9.5	6.5	8.5	10
LB64	5.0	9.9	9.5	6.5	8.5	10
LBC4	5.0	9.9	9.5	6.5	8.5	10

NOTE: Inches X 2.54 cm



95-Gallon OverPack - 32" dia x 41.5", 1 each/package

Stock a SpillTech® OverPack with sorbents for emergency spill response, or use it as a salvage drum to ship damaged containers or hazardous waste.

- DOT-Approved for Salvage: All SpillTech® OverPacks are DOT-approved and X-rated for use as salvage drums. Helps companies conform to federal regulations when shipping damaged or leaking containers of hazardous materials, or absorbents contaminated with hazardous substances.
- Perfect for Spill Kits: Stores sorbent products (not included) for easy access as needed for spill control. Saves time when quick response is necessary.
- Sturdy Construction: 100% polyethylene OverPack resists chemicals, rust and corrosion for years of use. Integrated handles make them easy to lift, move or carry with standard material handling equipment. Twist-on, double-wall lid with closed-cell gasket provides sealed, secure closure to prevent leaks and protect contents from moisture, dirt and damage. Durable to withstand rough handling.
- Customized for You: We can customize a Spill Kit to your exact specifications, including the container, its contents and accessories, with no upcharge! Contact your local Distributor for details.

A95OVER Specifications

Dimensions:	ext. dia. 32" x 41.5" H
Shipping Dimensions:	31.75" W x 41.5" L x 31.75" H
Sold as:	1 per package
Color:	Yellow
Composition:	Polyethylene
# per Pallet:	3
Incinerable:	No
Ship Class:	250

Metric Equivalent Specifications

Dimensions:	ext. dia. 81.3cm x 105.4cm H
Shipping Dimensions:	80.6cm W x 105.4cm L x 80.6cm H

A95OVER Technical Information

Warnings & Restrictions:
There are no known warnings and restrictions for this product.

Regulations and Compliance:
49 CFR 173.3(c)(1) - If a container of hazardous waste is damaged or leaking, it can be placed in a compatible salvage drum that meets UN criteria for shipping

49 CFR 173.12(b)(2)(iv) - When labpacking, "Inner packagings…must be surrounded by a chemically compatible absorbent material in sufficient quantity to absorb the total liquid contents."

49 CFR 173.12(b) - A container used for labpacking must be "a UN 1A2 or UN 1B2 metal drum, a UN 1D plywood drum, a UN 1G fiber drum or a UN 1H2 plastic drum tested and marked at least for the Packing Group III performance level for liquids or solids."

Revision date 2019-15-4

SAFETY DATA SHEET

Revision number 1

SECTION 1) CHEMICAL PRODUCT AND SUPPLIER'S IDENTIFICATION

Product ID:	Redux-823
Product Name:	Processing aid for industrial applications
Revision Date:	Apr 15, 2019
Supersedes Date:	Jan 25, 2018
Manufacturer's Name:	Azure Water Services
Address:	280 Callegari Drive West Haven, CT, US, 06516
Emergency Phone:	Chemtrec 800-424-9300, in US and Canada only

SECTION 2) HAZARDS IDENTIFICATION

Classification of the substance or mixture

Not a hazardous substance or mixture according to United States Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Hazards Not Otherwise Classified (HNOC)

None.

SECTION 3) COMPOSITION / INFORMATION ON INGREDIENTS

None of the chemicals in this product are hazardous according to the GHS.

SECTION 4) FIRST-AID MEASURES

Inhalation

Remove source of exposure or move person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor/. If breathing has stopped, trained personnel should begin rescue breathing or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED).

Eye Contact

Remove source of exposure or move person to fresh air. Rinse eyes cautiously with lukewarm, gently flowing water for several minutes, while holding the eyelids open. Remove contact lenses, if present and easy to do. Continue rinsing for a flushing duration of 30 minutes. Take care not to rinse contaminated water into the unaffected eye or onto the face. Immediately call a POISON CENTER/doctor.

Skin Contact

Take off immediately all contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Rinse skin with lukewarm, gently flowing water/shower for a duration of 30 minutes or until medical aid is available. Immediately call a POISON CENTER/doctor. Wash contaminated clothing before re-use or discard.

Ingestion

Rinse mouth with water. Do NOT induce vomiting. Give 1 to 2 cups of milk or water to drink. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, lie on your side, in the recovery position. Immediately call a POISON CENTER/doctor.

Most Important Symptoms and Effects, Both acute and Delayed

No data available.

Indication of Any Immediate Medical Attention and Special Treatment Needed

No data available.

SECTION 5) FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Dry chemical, foam, carbon dioxide. Sand or earth may be used for small fires only.

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable Extinguishing Media

Do not use direct water stream since this may cause fire to spread.

Specific Hazards in Case of Fire

In case of fire, hazardous decomposition products may include sulphur oxides.

Fire-Fighting Procedures

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Water may be ineffective but can be used to cool containers exposed to heat or flame. Caution should be exercised when using water or foam as frothing may occur, especially if sprayed into containers of hot, burning liquid. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

Special Protective Actions

Wear protective pressure self-contained breathing apparatus (SCBA) and full turnout gear.

SECTION 6) ACCIDENTAL RELEASE MEASURES

Emergency Procedure

Isolate hazard area and keep unnecessary people away. Remove all possible sources of ignition in the surrounding area. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.

Absorb spill with absorbent material or vacuum spill into polyethylene lined steel or plastic drums.

Do not touch or walk through spilled material.

If spilled material is cleaned up using a regulated solvent, the resulting waste mixture may be regulated.

Recommended Equipment

Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).

Personal Precautions

Avoid breathing vapor or mist. Avoid contact with skin, eye or clothing. Ensure adequate ventilation. Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing.

Environmental Precautions

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems and natural waterways by using sand, earth, or other appropriate barriers.

Methods and Materials for Containment and Cleaning Up

Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Contaminated absorbent material may pose the same hazard as the spilled product.

SECTION 7) HANDLING AND STORAGE

General

Wash hands after use.
Do not get in eyes, on skin or on clothing.
Do not breathe vapors or mists.
Use good personal hygiene practices.
Eating, drinking and smoking in work areas is prohibited.
Remove contaminated clothing and protective equipment before entering eating areas.
Eyewash stations and showers should be available in areas where this material is used and stored.

Ventilation Requirements

Use only with adequate ventilation to control air contaminants to their exposure limits. The use of local ventilation is recommended to control emissions near the source.

Storage Room Requirements

Keep container(s) tightly closed and properly labeled. Store in cool, dry, well-ventilated areas away from heat, direct sunlight and strong oxidizers. Store in approved containers and protect against physical damage. Keep containers securely sealed when not in use. Indoor storage should meet OSHA standards and appropriate fire codes. Containers that have been opened must be carefully resealed to prevent leakage. Empty containers retain residue and may be dangerous.
Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored.

SECTION 8) EXPOSURE CONTROLS, PERSONAL PROTECTION

Eye Protection

Wear eye protection with side shields or goggles. Wear indirect-vent, impact and splash resistant goggles when working with liquids. If additional protection is needed for entire face, use in combination with a face shield.

Skin Protection

Use of gloves approved to relevant standards made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Use of an apron and over-boots of chemically impervious materials such as neoprene or nitrile rubber is recommended to avoid skin sensitization. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Launder soiled clothes or properly disposed of contaminated material, which cannot be decontaminated.

Respiratory Protection

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker, a respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed. Check with respiratory protective equipment suppliers.

Appropriate Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

SECTION 9) PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties

Density	6.26 lb/gal
Specific Gravity	0.6 - 0.9
Appearance	granular, white solid
pH	5 - 9 @ 5 g/L
Odor Threshold	N/A
Odor Description	N/A
Water Solubility	Complete
Viscosity	N/A
Vapor Pressure	Similar to water
Vapor Density	N/A
Freezing Point	<32 °F
Boiling Point	>212 °F
Evaporation Rate	N/A
Flammability	Will not burn

SECTION 10) STABILITY AND REACTIVITY

Stability

Stable under normal storage and handling conditions.

Conditions To Avoid

Avoid heat, sparks, flame, high temperature and contact with incompatible materials.

Hazardous Reactions/Polymerization

Hazardous polymerization will not occur.

Incompatible Materials

Strong bases, acids, oxidizing and reducing agents.

Hazardous Decomposition Products

May produce carbon monoxide, carbon dioxide.

SECTION 11) TOXICOLOGICAL INFORMATION

Likely Routes of Exposure

No Data Available

Acute Toxicity

Inhalation, Testing: Not expected to be toxic by inhalation.
Ingestion, Testing: LD50, Rat > 5,00 mg/kg
Dermal, Testing: LD50, Rat > 5,000 mg/kg

Respiratory/Skin Sensitization

No Data Available

Serious Eye Damage/Irritation

No Data Available

Skin Corrosion/Irritation

No Data Available

Specific Target Organ Toxicity - Repeated Exposure

No Data Available

Specific Target Organ Toxicity - Single Exposure

No Data Available

SECTION 12) ECOLOGICAL INFORMATION

Acute Ecotoxicity

Danio Rerio: 96 hr LC50 >100 mg/l (OECD 203)

Fathead Minnow (pimephales promelas): 96hr LC50 >100 mg/l (OECD 203)

Daphnia Magna: 48hr EC50 >100 mg/l (OECD 202)

Scenedesmus Subspicatus: 72hr IC50 >100 mg/l (OECD 201)

Mobility in Soil

No data available.

Bio-accumulative Potential

Not bioaccumulating.

Persistence and Degradability

Not readily biodegradable.

Other Adverse Effect

No data available.

SECTION 13) DISPOSAL CONSIDERATIONS

Waste Disposal

Under RCRA it is the responsibility of the user of the product to determine at the time of disposal whether the product meets RCRA criteria for hazardous waste. Waste management should be in full compliance with federal, state and local laws.
Empty Containers retain product residue which may exhibit hazards of material, therefore do not pressurize, cut, glaze, weld or use for any other purposes. Return drums to reclamation centers for proper cleaning and reuse.

SECTION 14) TRANSPORT INFORMATION

U.S. DOT Information

For all transportation accidents, call CHEMTREC at 800/424-9300. All spills and leaks of this material must be handled in accordance with local, state, and federal regulations.

DOT Shipping Designation:

Non-hazardous under 29-CFR 1910.1200. Water treatment compound

SECTION 15) REGULATORY INFORMATION

CAS	Chemical Name	% By Weight	Regulation List
No applicable CAS	No applicable chemical	-	-

SECTION 16) OTHER INFORMATION

Glossary

ACGIH- American Conference of Governmental Industrial Hygienists; ANSI- American National Standards Institute; Canadian TDGCanadian Transportation of Dangerous Goods; CAS- Chemical Abstract Service; Chemtrec- Chemical Transportation Emergency Center(US); CHIP- Chemical Hazard Information and Packaging; DSL- Domestic Substances List; EC- Equivalent Concentration; EH40 (UK)- HSE Guidance Note EH40 Occupational Exposure Limits; EPCRA- Emergency Planning and Community Right-To-Know Act; ESL Effects screening levels; HMIS- Hazardous Material Information Service; LC- Lethal Concentration; LD- Lethal Dose; NFPA- National Fire Protection Association; OEL- Occupational Exposure Limits; OSHA- Occupational Safety and Health Administration, US Department of Labor; PEL- Permissible Exposure Limit; SARA (Title III)- Superfund Amendments and Reauthorization Act; SARA 313- Superfund Amendments and Reauthorization Act, Section 313; SCBA- Self Contained Breathing Apparatus; STEL-Short Term Exposure Limit; TCEQ Texas Commission on Environmental Quality; TLV- Threshold Limit Value; TSCA- Toxic Substances Control Act Public Law 94-469; TWA Time Weighted Value; US DOT- US Department of Transportation; WHMIS- Workplace Hazardous Materials Information System.

Additional Information

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Version 1.0:

Revision Date: Jan 25, 2018
First Edition.

DISCLAIMER

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

Revision date 2019-15-4

SAFETY DATA SHEET

Revision number 1

SECTION 1) CHEMICAL PRODUCT AND SUPPLIER'S IDENTIFICATION

Product Name:	Redux E50
Product Use:	Water and Wastewater Treatment Coagulant/Flocculant
Revision Date:	Apr 15, 2019
Supersedes Date:	Mar 5, 2015
Manufacturer's Name:	Azure Water Services
Address:	280 Callegari Dr. West Haven CT, 06516
Emergency Phone:	Chemtrec, (1) 800-424-9300, in US and Canada only

SECTION 2) HAZARDS IDENTIFICATION

Classification

Corrosive to metals - Category 1

Eye Irritation - Category 2

Skin Irritation - Category 2

Pictograms

Signal Word

Warning

Hazardous Statements - Health

Causes serious eye irritation

Causes skin irritation

Hazardous Statements - Physical

May be corrosive to metals

Precautionary Statements - General

If medical advice is needed, have product container or label at hand.

Keep out of reach of children.

Read label before use.

Precautionary Statements - Prevention

Keep only in original packaging.

Wash thoroughly after handling.

Wear protective gloves/protective clothing/eye protection/face protection.

Precautionary Statements - Response

Absorb spillage to prevent material damage.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

If eye irritation persists: Get medical advice/attention.

IF ON SKIN: Wash with plenty of water.

Specific treatment (see first-aid on this SDS).

If skin irritation occurs: Get medical advice/attention.

Take off contaminated clothing. And wash it before reuse.

Precautionary Statements - Storage

Store in a corrosive resistant container with a resistant inner liner.

Precautionary Statements - Disposal

No precautionary statement available.

Hazards Not Otherwise Classified (HNOC)

None.

SECTION 3) COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Chemical Name	% By Weight
PROPRIETARY	Trade Secret Ingredient	45 - 55%

Specific chemical identity and/or exact percentage (concentration) of the composition has been withheld to protect confidentiality.

SECTION 4) FIRST-AID MEASURES

Inhalation

Remove source of exposure or move person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor/. If breathing has stopped, trained personnel should begin rescue breathing or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED).

Eye Contact

Remove source of exposure or move person to fresh air. Rinse eyes cautiously with lukewarm, gently flowing water for several minutes, while holding the eyelids open. Remove contact lenses, if present and easy to do. Continue rinsing for a flushing duration of 30 minutes. Take care not to rinse contaminated water into the unaffected eye or onto the face. Immediately call a POISON CENTER/doctor.

Skin Contact

Take off immediately all contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Rinse skin with lukewarm, gently flowing water/shower for a duration of 30 minutes or until medical aid is available. Immediately call a POISON CENTER/doctor. Wash contaminated clothing before re-use or discard.

Ingestion

Rinse mouth with water. Do NOT induce vomiting. Give 1 to 2 cups of milk or water to drink. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, lie on your side, in the recovery position. Immediately call a POISON CENTER/doctor.

Most Important Symptoms and Effects, Both acute and Delayed

No data available.

Indication of Any Immediate Medical Attention and Special Treatment Needed

No data available.

SECTION 5) FIRE-FIGHTING MEASURES

Suitable Extinguishing Media

Dry chemical, foam, carbon dioxide. Sand or earth may be used for small fires only.

Use extinguishing agent suitable for type of surrounding fire.

Unsuitable Extinguishing Media

Do not use direct water stream since this may cause fire to spread.

Specific Hazards in Case of Fire

In case of fire, hazardous decomposition products may include sulphur oxides.

Fire-Fighting Procedures

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Water may be ineffective but can be used to cool containers exposed to heat or flame. Caution should be exercised when using water or foam as frothing may occur, especially if sprayed into containers of hot, burning liquid. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.

Special Protective Actions

Wear protective pressure self-contained breathing apparatus (SCBA) and full turnout gear.

SECTION 6) ACCIDENTAL RELEASE MEASURES

Emergency Procedure

Isolate hazard area and keep unnecessary people away. Remove all possible sources of ignition in the surrounding area. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.

Absorb spill with absorbent material or vacuum spill into polyethylene lined steel or plastic drums.

Do not touch or walk through spilled material.

If spilled material is cleaned up using a regulated solvent, the resulting waste mixture may be regulated.

Recommended Equipment

Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).

Personal Precautions

Avoid breathing vapor or mist. Avoid contact with skin, eye or clothing. Ensure adequate ventilation. Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing.

Environmental Precautions

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems and natural waterways by using sand, earth, or other appropriate barriers.

Methods and Materials for Containment and Cleaning Up

Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Contaminated absorbent material may pose the same hazard as the spilled product.

SECTION 7) HANDLING AND STORAGE

General

Wash hands after use.
Do not get in eyes, on skin or on clothing.
Do not breathe vapors or mists.
Use good personal hygiene practices.
Eating, drinking and smoking in work areas is prohibited.
Remove contaminated clothing and protective equipment before entering eating areas.
Eyewash stations and showers should be available in areas where this material is used and stored.

Ventilation Requirements

Use only with adequate ventilation to control air contaminants to their exposure limits. The use of local ventilation is recommended to control emissions near the source.

Storage Room Requirements

Keep container(s) tightly closed and properly labeled. Store in cool, dry, well-ventilated areas away from heat, direct sunlight and strong oxidizers. Store in approved containers and protect against physical damage. Keep containers securely sealed when not in use. Indoor storage should meet OSHA standards and appropriate fire codes. Containers that have been opened must be carefully resealed to prevent leakage. Empty containers retain residue and may be dangerous.

Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored.

SECTION 8) EXPOSURE CONTROLS, PERSONAL PROTECTION

Eye Protection

Wear eye protection with side shields or goggles. Wear indirect-vent, impact and splash resistant goggles when working with liquids. If additional protection is needed for entire face, use in combination with a face shield.

Skin Protection

Use of gloves approved to relevant standards made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Use of an apron and over-boots of chemically impervious materials such as neoprene or nitrile rubber is recommended to avoid skin sensitization. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Launder soiled clothes or properly disposed of contaminated material, which cannot be decontaminated.

Respiratory Protection

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker, a respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed. Check with respiratory protective equipment suppliers.

Appropriate Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

SECTION 9) PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties

Density	11.10 lb/gal
Specific Gravity	1.33 - 1.35
Appearance	Colorless to yellow liquid
pH	3 - 4
Odor Threshold	N/A
Odor Description	N/A
Water Solubility	complete
Viscosity	< 100cps @20C
Vapor Pressure	Similar to water
Vapor Density	N/A
Freezing Point	<19 °F
Boiling Point	>212 °F
Evaporation Rate	N/A
Flammability	Will not burn

SECTION 10) STABILITY AND REACTIVITY

Stability

Stable under normal storage and handling conditions.

Conditions To Avoid

Avoid heat, sparks, flame, high temperature and contact with incompatible materials.

Hazardous Reactions/Polymerization

Hazardous polymerization will not occur.

Incompatible Materials

Strong bases, acids, oxidizing and reducing agents.

Hazardous Decomposition Products

May produce carbon monoxide, carbon dioxide.

SECTION 11) TOXICOLOGICAL INFORMATION

Likely Routes of Exposure

Inhalation LC50 : Not Available
Oral LD50 : Not Available
Dermal LD50 : Not Available

Acute Toxicity

Component	weight-%	Oral LD50	Dermal LD50	Inhalation LC50
Trade Secret Ingredient	45 - 55%	= 9187 mg/kg (Rat)	> 2000 mg/k (Rat)	--

Aspiration Hazard

No Data Available

Respiratory/Skin Sensitization

No Data Available

Serious Eye Damage/Irritation

Causes serious eye irritation

Skin Corrosion/Irritation

Causes skin irritation

Specific Target Organ Toxicity - Repeated Exposure

No Data Available

Specific Target Organ Toxicity - Single Exposure

No Data Available

SECTION 12) ECOLOGICAL INFORMATION

Ecotoxicity

Acute aquatic toxicity - Product Information

Fish
LC 50 (96 hour, static) 776.4 mg/L *Pimephales promelas* (Fathead Minnow) [1]
EC 50 (96 hour, static) 265.5 mg/L *Pimephales promelas* (Fathead Minnow) [1]

Crustacea
LC 50 (48 hour, static) 803.8 mg/L *Ceriodaphnia dubia* (Water Flea) [1]
EC 50 (48 hour, static) 33.2 mg/L *Ceriodaphnia dubia* (Water Flea) [1]

Algae/aquatic plants
No information available

Acute aquatic toxicity - Component Information

Component	weight-%	Algae/aquatic plants	Fish	Toxicity to daphnia and other aquatic invertebrates
Trade Secret Ingredient	45 - 55%	--	LC50 (96 h static) 100 - 500 mg/L (Brachydanio rerio)	--

Mobility in Soil

No data available.

Bio-accumulative Potential

No data available.

Persistence and Degradability

No data available.

Other Adverse Effect

No data available.

SECTION 13) DISPOSAL CONSIDERATIONS

Waste Disposal

Under RCRA it is the responsibility of the user of the product to determine at the time of disposal whether the product meets RCRA criteria for hazardous waste. Waste management should be in full compliance with federal, state and local laws.
Empty Containers retain product residue which may exhibit hazards of material, therefore do not pressurize, cut, glaze, weld or use for any other purposes. Return drums to reclamation centers for proper cleaning and reuse.

SECTION 14) TRANSPORT INFORMATION

U.S. DOT Information

NOT REGULATED FOR TRANSPORTATION

This product is excepted from DOT regulations under 49 CFR 173.154(d) when shipped by road or railway. The product exception is referenced in 49 CFR 172.101 Table. Packaging material must not be aluminum, steel or be degraded by this product

SECTION 15) REGULATORY INFORMATION

CAS	Chemical Name	% By Weight	Regulation List
No applicable CAS	No applicable chemical	-	-

SECTION 16) OTHER INFORMATION

Glossary

ACGIH- American Conference of Governmental Industrial Hygienists; ANSI- American National Standards Institute; Canadian TDGCanadian Transportation of Dangerous Goods; CAS- Chemical Abstract Service; Chemtrec- Chemical Transportation Emergency Center(US); CHIP- Chemical Hazard Information and Packaging; DSL- Domestic Substances List; EC- Equivalent Concentration; EH40 (UK)- HSE Guidance Note EH40 Occupational Exposure Limits; EPCRA- Emergency Planning and Community Right-To-Know Act; ESL Effects screening levels; HMIS- Hazardous Material Information Service; LC- Lethal Concentration; LD- Lethal Dose; NFPA- National Fire Protection Association; OEL- Occupational Exposure Limits; OSHA- Occupational Safety and Health Administration, US Department of Labor; PEL- Permissible Exposure Limit; SARA (Title III)- Superfund Amendments and Reauthorization Act; SARA 313- Superfund Amendments and Reauthorization Act, Section 313; SCBA- Self Contained Breathing Apparatus; STEL-Short Term Exposure Limit; TCEQ Texas Commission on Environmental Quality; TLV- Threshold Limit Value; TSCA- Toxic Substances Control Act Public Law 94-469; TWA Time Weighted Value; US DOT- US Department of Transportation; WHMIS- Workplace Hazardous Materials Information System.

Additional Information

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Version 1.0:

Revision Date: Apr 15,2019

First Edition.

DISCLAIMER

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

Job Safety Analysis

pH/Chem Feed System

Date: 5/10/2016
Completed By: Tammie Hagie
Approved By: Mike Deso

Required PPE: Hard Hat, Safety Toe Boots, Reflective Vest, Safety Glasses, Chemical Resistant Gloves

TASK	POTENTIAL RISK/HAZARD	CONTROLS
Transporting acid/chemical drum	Splash, spill, heavy lifting	Inspect condition of drum prior to transportation. Use material handling devices when possible to move equipment (lift gates, pallet jacks, hand trucks, etc.). If necessary, use a ramp for loading/unloading wheeled devices, ensuring the ramp is properly supported prior to use. Lift with your knees and use drum dolly. Make sure drum is secure in vehicle prior to transportation. Review SDS on acid/chemical. Wear proper PPE and dispose of materials after clean up in a sealed container. Immediately use the eye wash station if acid or chemical comes in contact with your eye.
Opening acid drum	Splash, spill	Review MSDS on acid/chemical. Wear proper PPE and dispose of materials after clean up in a sealed container. Immediately use the eye wash station if acid or chemical comes in contact with your eye. Use bung wrench to open the drum properly.
Set up chemical feed pump	Splash, spill, leak	Wear proper PPE and dispose of materials after clean up in a sealed container. Immediately use the eye wash station if acid or chemical comes in contact with your eye. Monitor chem feed pump to assure its working and not leaking. Use chemical resistant tubing to transport liquid from the pump.
Notes:		

Note any changes/deviations to this JSA

SAFETY DATA SHEET

Creation Date 16-Jun-2009 **Revision Date** 07-Aug-2015 **Revision Number** 8

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identification

Product Description:	**Sodium hydroxide**
Cat No. :	**SP/1238/25**
Synonyms	Caustic soda
CAS-No	1310-73-2
EC-No.	215-185-5
Molecular Formula	H Na O
Reach Registration Number	01-2119457892-27

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Laboratory chemicals.
Sector of use	SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites
Product category	PC21 - Laboratory chemicals
Process categories	PROC15 - Use as a laboratory reagent
Environmental release category	ERC6a - Industrial use resulting in manufacture of another substance (use of intermediates)
Uses advised against	No Information available

1.3. Details of the supplier of the safety data sheet

Company	Fisher Scientific UK Bishop Meadow Road, Loughborough, Leicestershire LE11 5RG, United Kingdom
E-mail address	begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

Tel: 01509 231166
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards

Substances/mixtures corrosive to metal	Category 1

Health hazards

Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1

Environmental hazards
Based on available data, the classification criteria are not met

2.2. Label elements

Signal Word **Danger**

Hazard Statements

H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage

Precautionary Statements

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower

2.3. Other hazards

No information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008
Sodium hydroxide	1310-73-2	EEC No. 215-185-5	100	Skin Corr. 1A (H314) Eye Dam. 1 (H318) Met. Corr. 1 (H290)

Reach Registration Number	01-2119457892-27

Full text of Hazard Statements: see section 16

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Keep eye wide open while rinsing.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Call a physician immediately.

Ingestion Do not induce vomiting. Immediate medical attention is required. Never give anything by mouth to an unconscious person. Drink plenty of water.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Call a physician or Poison Control Center immediately.

Protection of First-aiders Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

4.2. Most important symptoms and effects, both acute and delayed

Causes burns by all exposure routes. . Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
CO_2, dry chemical, dry sand, alcohol-resistant foam.

Extinguishing media which must not be used for safety reasons
No information available.

5.2. Special hazards arising from the substance or mixture

The product causes burns of eyes, skin and mucous membranes.

Hazardous Combustion Products
Sodium oxides, Hydrogen.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Evacuate personnel to safe areas. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Do not allow material to contaminate ground water system. Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.

6.3. Methods and material for containment and cleaning up

Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Wear personal protective equipment. Use only under a chemical fume hood. Do not get in eyes, on skin, or on clothing. Do not breathe dust. Do not ingest.

7.2. Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits
List source(s): **UK** - EH40/2005 Containing the workplace exposure limits (WELs) for use with the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). Updated by September 2006 official press release and October 2007 Supplement. **IRE -** 2010 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001. Published by the Health and Safety Authority.

Component	European Union	The United Kingdom	France	Belgium	Spain
Sodium hydroxide		2 mg/m³ STEL	TWA / VME: 2 mg/m³ (8 heures).	2 mg/m³ VLE	STEL / VLA-EC: 2 mg/m³ (15 minutos).

Component	Italy	Germany	Portugal	The Netherlands	Finland
Sodium hydroxide		2 mg/m³ TWA (inhalable fraction)	Ceiling: 2 mg/m³		STEL: 2 mg/m³ 15 minuutteina Ceiling: 2 mg/m³

Component	Austria	Denmark	Switzerland	Poland	Norway
Sodium hydroxide	MAK-KZW: 4 mg/m³ 15 Minuten MAK-TMW: 2 mg/m³ 8 Stunden	Ceiling: 2 mg/m³	STEL: 2 mg/m³ 15 Minuten TWA: 2 mg/m³ 8 Stunden	STEL: 1 mg/m³ 15 minutach TWA: 0.5 mg/m³ 8 godzinach	Ceiling: 2 mg/m³

Component	Bulgaria	Croatia	Ireland	Cyprus	Czech Republic
Sodium hydroxide	TWA: 2.0 mg/m³	STEL-KGVI: 2 mg/m³ 15 minutama.	STEL: 2 mg/m³ 15 min		TWA: 1 mg/m³ 8 hodinách. Ceiling: 2 mg/m³

Component	Estonia	Gibraltar	Greece	Hungary	Iceland
Sodium hydroxide	TWA: 1 mg/m³ 8 tundides. Ceiling: 2 mg/m³		STEL: 2 mg/m³ TWA: 2 mg/m³	STEL: 2 mg/m³ 15 percekben. CK TWA: 2 mg/m³ 8 órában. AK	STEL: 2 mg/m³

Component	Latvia	Lithuania	Luxembourg	Malta	Romania
Sodium hydroxide	TWA: 0.5 mg/m³	Ceiling: 2 mg/m³			

Component	Russia	Slovak Republic	Slovenia	Sweden	Turkey
Sodium hydroxide		TWA: 2 mg/m³	TWA: 2 mg/m³ 8 urah inhalable fraction STEL: 2 mg/m³ 15 minutah inhalable fraction	LLV: 1 mg/m³ 8 timmar. inhalable dust CLV: 2 mg/m³	

Biological limit values
This product, as supplied, does not contain any hazardous materials with biological limits established by the region specific regulatory bodies.

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of

exposure to chemical and biological agents.
MDHS14/3 General methods for sampling and gravimetric analysis of respirable and inhalable dust

Derived No Effect Level (DNEL) See table for values

Route of exposure	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral				
Dermal				
Inhalation	1 mg/m³			

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Measures
Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection Goggles (European standard - EN 166)

Hand Protection Protective gloves

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Neoprene	> 480 minutes	0.45 mm	Level 6	As tested under EN374-3 Determination of
Butyl rubber	> 480 minutes	0.35 mm	EN 374	Resistance to Permeation by Chemicals
Viton (R)	> 480 minutes	0.30 mm		

Skin and body protection Long sleeved clothing

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

Respiratory Protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly

Large scale/emergency use Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced
Recommended Filter type: Particulates filter conforming to EN 143

Small scale/Laboratory use Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Recommended half mask:- Valve filtering: EN405; or; Half mask: EN140; plus filter, EN 141
When RPE is used a face piece Fit Test should be conducted

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls Prevent product from entering drains.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance White
Physical State Solid

Odor	Odorless	
Odor Threshold	No data available	
pH	14	(5 %)
Melting Point/Range	318 °C / 604.4 °F	
Softening Point	No data available	
Boiling Point/Range	1390 °C / 2534 °F	@ 760 mmHg
Flash Point	No information available	**Method -** No information available
Evaporation Rate	Not applicable	Solid
Flammability (solid,gas)	Not flammable	
Explosion Limits	No data available	
Vapor Pressure	1 mbar @ 700 °C	
Vapor Density	Not applicable	Solid
Specific Gravity / Density	No data available	
Bulk Density	2.13 g/cm3	
Water Solubility	Completely soluble	
Solubility in other solvents	No information available	
Partition Coefficient (n-octanol/water)		
Autoignition Temperature		
Decomposition Temperature	No data available	
Viscosity	Not applicable	Solid
Explosive Properties	Not explosive	
Oxidizing Properties	No information available	

9.2. Other information

Molecular Formula	H Na O
Molecular Weight	40

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

Yes
Contact with metals may evolve flammable hydrogen gas

10.2. Chemical stability

Stable under normal conditions

10.3. Possibility of hazardous reactions

Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

10.4. Conditions to avoid

Incompatible products. Excess heat.

10.5. Incompatible materials

Strong oxidizing agents. Acids. Metals. Water. . Alcohols.

10.6. Hazardous decomposition products

Sodium oxides. Hydrogen.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information No acute toxicity information is available for this product

(a) acute toxicity;

Oral	Based on available data, the classification criteria are not met
Dermal	Based on available data, the classification criteria are not met
Inhalation	Based on available data, the classification criteria are not met

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide		1350 mg/kg (Rabbit)	

(b) skin corrosion/irritation; Category 1 A

(c) serious eye damage/irritation; Category 1

(d) respiratory or skin sensitization;
Respiratory Based on available data, the classification criteria are not met
Skin Based on available data, the classification criteria are not met

(e) germ cell mutagenicity; Based on available data, the classification criteria are not met

Mutagenic effects have occurred in experimental animals

(f) carcinogenicity; Based on available data, the classification criteria are not met

There are no known carcinogenic chemicals in this product

(g) reproductive toxicity; Based on available data, the classification criteria are not met

(h) STOT-single exposure; Based on available data, the classification criteria are not met

(i) STOT-repeated exposure; Based on available data, the classification criteria are not met

Target Organs Eyes, Skin, Respiratory system, Gastrointestinal tract (GI).

(j) aspiration hazard; Not applicable
Solid

Other Adverse Effects See actual entry in RTECS for complete information

Symptoms / effects,both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity
Ecotoxicity effects Do not empty into drains. Contains a substance which is:. Harmful to aquatic organisms. The product contains following substances which are hazardous for the environment.

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
Sodium hydroxide	45.4 mg/L LC50 96 h			

12.2. Persistence and degradability
Persistence Soluble in water, Persistence is unlikely, based on information available.
Degradability Not relevant for inorganic substances.
Degradation in sewage treatment plant Neutralization is normally necessary before waste water is discharged into water treatment plants. Contains substances known to be hazardous to the environment or not degradable in waste water treatment plants.

12.3. Bioaccumulative potential Does not bioaccumulate; Bioaccumulation is unlikely

12.4. Mobility in soil The product is water soluble, and may spread in water systems Will likely be mobile in the environment due to its water solubility. Highly mobile in soils

12.5. Results of PBT and vPvB assessment No data available for assessment.

12.6. Other adverse effects

Endocrine Disruptor Information	This product does not contain any known or suspected endocrine disruptors
Persistent Organic Pollutant	This product does not contain any known or suspected substance
Ozone Depletion Potential	This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products	Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.
Contaminated Packaging	Dispose of this container to hazardous or special waste collection point.
European Waste Catalogue (EWC)	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.
Other Information	Do not dispose of waste into sewer. Waste codes should be assigned by the user based on the application for which the product was used. Do not empty into drains. Large amounts will affect pH and harm aquatic organisms. Solutions with high pH-value must be neutralized before discharge.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

14.1. UN number	UN1823
14.2. UN proper shipping name	Sodium hydroxide, solid
14.3. Transport hazard class(es)	8
14.4. Packing group	II

ADR

14.1. UN number	UN1823
14.2. UN proper shipping name	Sodium hydroxide, solid
14.3. Transport hazard class(es)	8
14.4. Packing group	II

IATA

14.1. UN number	UN1823
14.2. UN proper shipping name	Sodium hydroxide, solid
14.3. Transport hazard class(es)	8
14.4. Packing group	II

14.5. Environmental hazards	No hazards identified
14.6. Special precautions for user	No special precautions required
14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories X = listed

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	IECSC	AICS	KECL
Sodium hydroxide	215-185-5	-		X	X	-	X	X	X	X	X

National Regulations

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
Sodium hydroxide	WGK 1	

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Dir 94/33/EC on the protection of young people at work
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has been conducted by the manufacturer/importer

SECTION 16: OTHER INFORMATION

Full Text of H-/EUH-Statements Referred to Under Section 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage

Legend

CAS - Chemical Abstracts Service

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
IECSC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japanese Existing and New Chemical Substances
AICS - Australian Inventory of Chemical Substances
NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit
ACGIH - American Conference of Governmental Industrial Hygienists
DNEL - Derived No Effect Level
RPE - Respiratory Protective Equipment
LC50 - Lethal Concentration 50%
NOEC - No Observed Effect Concentration
PBT - Persistent, Bioaccumulative, Toxic

TWA - Time Weighted Average
IARC - International Agency for Research on Cancer
PNEC - Predicted No Effect Concentration
LD50 - Lethal Dose 50%
EC50 - Effective Concentration 50%
POW - Partition coefficient Octanol:Water
vPvB - very Persistent, very Bioaccumulative

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road
IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code
OECD - Organisation for Economic Co-operation and Development
BCF - Bioconcentration factor

ICAO/IATA - International Civil Aviation Organization/International Air Transport Association
MARPOL - International Convention for the Prevention of Pollution from Ships
ATE - Acute Toxicity Estimate
VOC - Volatile Organic Compounds

Key literature references and sources for data
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.
Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.
First aid for chemical exposure, including the use of eye wash and safety showers.
Chemical incident response training.

Creation Date	16-Jun-2009
Revision Date	07-Aug-2015
Revision Summary	Update to Format.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information

relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet

SAFETY DATA SHEET

Creation Date 12-Nov-2010 **Revision Date** 24-May-2017 **Revision Number** 5

1. Identification

Product Name **Sulfuric Acid (Certified ACS Plus)**

Cat No. : **A300-212; A300-225LB; A300-500; A300-612GAL; A300-700LB; A300C212; A300C212EA; A300P500; A300S212; A300S212EA; A300S500; A300SI212**

Synonyms Hydrogen sulfate; Vitriol brown oil; Oil of vitriol

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wear protective gloves/protective clothing/eye protection/face protection
Wash face, hands and any exposed skin thoroughly after handling
Use only outdoors or in a well-ventilated area
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)

WARNING! This product contains a chemical known in the State of California to cause cancer.
Unknown Acute Toxicity

3. Composition / information on ingredients

Component	CAS-No	Weight %
Sulfuric acid	7664-93-9	90 - 98
Water	7732-18-5	2 - 10

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.

Inhalation If not breathing, give artificial respiration. Remove from exposure, lie down. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician immediately.

Ingestion Do not induce vomiting. Clean mouth with water. Never give anything by mouth to an unconscious person. Call a physician immediately.

Most important symptoms/effects Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam.

Unsuitable Extinguishing Media DO NOT USE WATER

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes.

Hazardous Combustion Products
Sulfur oxides Hydrogen
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	2	W

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from water. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Sulfuric acid	TWA: 0.2 mg/m³	(Vacated) TWA: 1 mg/m³ TWA: 1 mg/m³	IDLH: 15 mg/m³ TWA: 1 mg/m³	TWA: 1 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear, Colorless to brown
Odor	Odorless
Odor Threshold	No information available
pH	0.3 (1N)
Melting Point/Range	10 °C / 50 °F
Boiling Point/Range	290 - 338 °C / 554 - 640.4 °F
Flash Point	Not applicable
Evaporation Rate	Slower than ether
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	< 0.001 mmHg @ 20 °C
Vapor Density	3.38 (Air = 1.0)
Specific Gravity	1.84
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	340°C
Viscosity	No information available
Molecular Formula	H2SO4
Molecular Weight	98.08

10. Stability and reactivity

Reactive Hazard Yes

Stability Reacts violently with water. Hygroscopic.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Water, Organic materials, Strong acids, Strong bases, Metals, Alcohols, Cyanides, Sulfides

Hazardous Decomposition Products Sulfur oxides, Hydrogen

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sulfuric acid	2140 mg/kg (Rat)	Not listed	LC50 = 510 mg/m³ (Rat) 2 h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Exposure to strong inorganic mists containing sulfuric acid may cause cancer by inhalation.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sulfuric acid	7664-93-9	Group 1	Known	A2	X	A2
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

This product contains the following substance(s) which are hazardous for the environment. .

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sulfuric acid	-	LC50: > 500 mg/L, 96h static (Brachydanio rerio)	-	EC50: 29 mg/L/24h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN1830
Proper Shipping Name Sulfuric acid
Hazard Class 8
Packing Group II

TDG

UN-No UN1830
Proper Shipping Name SULFURIC ACID
Hazard Class 8
Packing Group II

IATA

UN-No UN1830
Proper Shipping Name SULFURIC ACID
Hazard Class 8
Packing Group II

IMDG/IMO

UN-No UN1830
Proper Shipping Name SULFURIC ACID
Hazard Class 8
Packing Group II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sulfuric acid	X	X	-	231-639-5	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Sulfuric acid	7664-93-9	90 - 98	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Sulfuric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Sulfuric acid	1000 lb	1000 lb

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Sulfuric acid	7664-93-9	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sulfuric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-Nov-2010
Revision Date 24-May-2017
Print Date 24-May-2017
Revision Summary SDS sections updated. 2.

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

APPENDIX D

Endangered Species Act Assessment

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Suffolk County, Massachusetts

Local office

New England Ecological Services Field Office

(603) 223-2541
(603) 223-0104

70 Commercial Street, Suite 300
Concord, NH 03301-5094

http://www.fws.gov/newengland

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

THERE ARE NO ENDANGERED SPECIES EXPECTED TO OCCUR AT THIS LOCATION.

NOT FOR CONSULTATION

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS

NOT FOR CONSULTATION

ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler Cardellina canadensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Cerulean Warbler Dendroica cerulea This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 29 to Jul 20
Dunlin Calidris alpina arcticola This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Evening Grosbeak Coccothraustes vespertinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Kentucky Warbler Oporornis formosus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere

NOT FOR CONSULTATION

Nelson's Sparrow Ammodramus nelsoni — Breeds May 15 to Sep 5
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prairie Warbler Dendroica discolor — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prothonotary Warbler Protonotaria citrea — Breeds Apr 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-throated Loon Gavia stellata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rusty Blackbird Euphagus carolinus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Semipalmated Sandpiper Calidris pusilla — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Snowy Owl Bubo scandiacus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wood Thrush Hylocichla mustelina — Breeds May 10 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

NOT FOR CONSULTATION

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

NOT FOR CONSULTATION

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

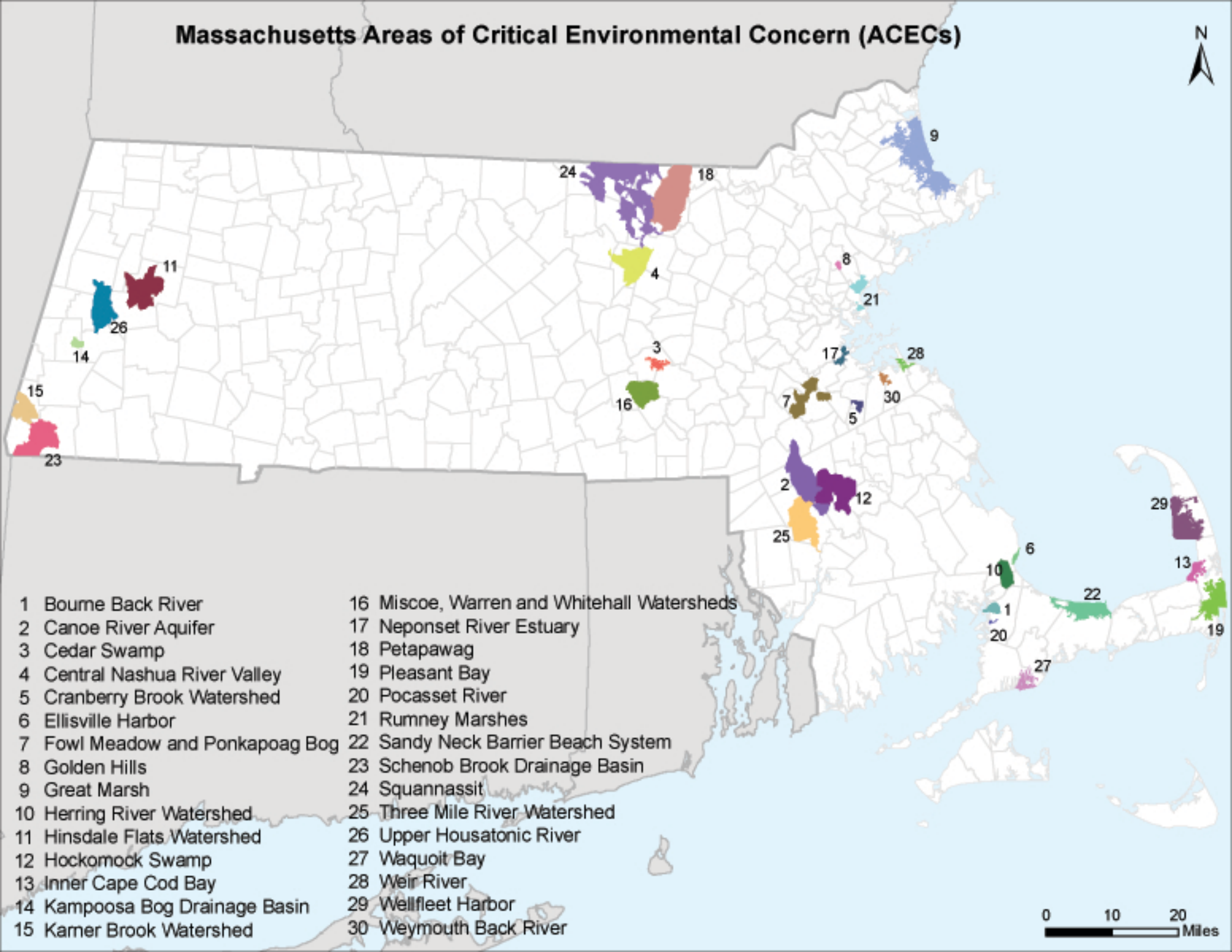
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Massachusetts Areas of Critical Environmental Concern (ACECs)



1 Bourne Back River
2 Canoe River Aquifer
3 Cedar Swamp
4 Central Nashua River Valley
5 Cranberry Brook Watershed
6 Ellisville Harbor
7 Fowl Meadow and Ponkapoag Bog
8 Golden Hills
9 Great Marsh
10 Herring River Watershed
11 Hinsdale Flats Watershed
12 Hockomock Swamp
13 Inner Cape Cod Bay
14 Kampoosa Bog Drainage Basin
15 Karner Brook Watershed
16 Miscoe, Warren and Whitehall Watersheds
17 Neponset River Estuary
18 Petapawag
19 Pleasant Bay
20 Pocasset River
21 Rumney Marshes
22 Sandy Neck Barrier Beach System
23 Schenob Brook Drainage Basin
24 Squannassit
25 Three Mile River Watershed
26 Upper Housatonic River
27 Waquoit Bay
28 Weir River
29 Wellfleet Harbor
30 Weymouth Back River

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Barnstable	Piping Plover	Threatened	Coastal Beaches	All Towns
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Chatham
	Sandplain gerardia	Endangered	Open areas with sandy soils.	Sandwich and Falmouth.
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Bourne (north of the Cape Cod Canal)
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Berkshire	Bog Turtle	Threatened	Wetlands	Egremont and Sheffield
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Bristol	Piping Plover	Threatened	Coastal Beaches	Fairhaven, Dartmouth, Westport
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Fairhaven, New Bedford, Dartmouth, Westport
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Taunton
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Dukes	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	All Towns
	Piping Plover	Threatened	Coastal Beaches	All Towns
	Northeastern beach tiger beetle	Threatened	Coastal Beaches	Aquinnah and Chilmark
	Sandplain gerardia	Endangered	Open areas with sandy soils.	West Tisbury
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

Updated 02/05/2016

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Essex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Gloucester, Essex and Manchester
	Piping Plover	Threatened	Coastal Beaches	Gloucester, Essex, Ipswich, Rowley, Revere, Newbury, Newburyport and Salisbury
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Franklin	Northeastern bulrush	Endangered	Wetlands	Montague, Warwick
	Dwarf wedgemussel	Endangered	Mill River	Whately
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Hampshire	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Hadley
	Puritan tiger beetle	Threatened	Sandy beaches along the Connecticut River	Northampton and Hadley
	Dwarf wedgemussel	Endangered	Rivers and Streams.	Hatfield, Amherst and Northampton
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Hampden	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Southwick
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Middlesex	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Groton
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Nantucket	Piping Plover	Threatened	Coastal Beaches	Nantucket
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Nantucket
	American burying beetle	Endangered	Upland grassy meadows	Nantucket
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

Updated 02/05/2016

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

COUNTY	SPECIES	FEDERAL STATUS	GENERAL LOCATION/HABITAT	TOWNS
Plymouth	Piping Plover	Threatened	Coastal Beaches	Scituate, Marshfield, Duxbury, Plymouth, Wareham and Mattapoisett
	Northern Red-bellied Cooter	Endangered	Inland Ponds and Rivers	Kingston, Middleborough, Carver, Plymouth, Bourne, Wareham, Halifax, and Pembroke
	Roseate Tern	Endangered	Coastal beaches and the Atlantic Ocean	Plymouth, Marion, Wareham, and Mattapoisett.
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Suffolk	Piping Plover	Threatened	Coastal Beaches	Revere, Winthrop
	Red Knot[1]	Threatened	Coastal Beaches and Rocky Shores, sand and mud flats	Coastal Towns
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide
Worcester	Small whorled Pogonia	Threatened	Forests with somewhat poorly drained soils and/or a seasonally high water table	Leominster
	Northern Long-eared Bat	Threatened Final 4(d) Rule	Winter- mines and caves, Summer – wide variety of forested habitats	Statewide

[1]Migratory only, scattered along the coast in small numbers

-Eastern cougar and gray wolf are considered extirpated in Massachusetts.
-Endangered gray wolves are not known to be present in Massachusetts, but dispersing individuals from source populations in Canada may occur statewide.
-Critical habitat for the Northern Red-bellied Cooter is present in Plymouth County.

Updated 02/05/2016

Rare species viewer

Town	Common Name	Scientific Name	Taxonomic Group	MESA Status	Most Recent Obs.
CAMBRIDGE	American Bittern	Botaurus lentiginosus	Bird	Endangered	1906
CAMBRIDGE	American Sea-blite	Suaeda calceoliformis	Vascular Plant	Special Concern	1912
CAMBRIDGE	Andrews' Bottle Gentian	Gentiana andrewsii	Vascular Plant	Endangered	2017
CAMBRIDGE	Barn Owl	Tyto alba	Bird	Special Concern	Historic
CAMBRIDGE	Blue-spotted Salamander (complex)	Ambystoma laterale pop. 1	Amphibian	Special Concern	1917
CAMBRIDGE	Bridle Shiner	Notropis bifrenatus	Fish	Special Concern	1928
CAMBRIDGE	Britton's Violet	Viola brittoniana	Vascular Plant	Threatened	1843
CAMBRIDGE	Common Gallinule	Gallinula galeata	Bird	Special Concern	1890
CAMBRIDGE	Eastern Box Turtle	Terrapene carolina	Reptile	Special Concern	1892
CAMBRIDGE	Eastern Pondmussel	Ligumia nasuta	Mussel	Special Concern	1941
CAMBRIDGE	Eastern Spadefoot	Scaphiopus holbrookii	Amphibian	Threatened	1892
CAMBRIDGE	Engelmann's Flatsedge	Cyperus engelmannii	Vascular Plant	Threatened	2008
CAMBRIDGE	Fries' Pondweed	Potamogeton friesii	Vascular Plant	Endangered	1880
CAMBRIDGE	Imperial Moth	Eacles imperialis	Butterfly/Moth	Threatened	Historic
CAMBRIDGE	Lake Quillwort	Isoetes lacustris	Vascular Plant	Endangered	Historic
CAMBRIDGE	Least Bittern	Ixobrychus exilis	Bird	Endangered	1890
CAMBRIDGE	Long's Bulrush	Scirpus longii	Vascular Plant	Threatened	1913
CAMBRIDGE	New England Medicinal Leech	Macrobdella sestertia	Segmented Worm	Special Concern	1800s
CAMBRIDGE	Pale Green Orchid	Platanthera flava var. herbiola	Vascular Plant	Threatened	Historic
CAMBRIDGE	Peregrine Falcon	Falco peregrinus	Bird	Threatened	2019
CAMBRIDGE	Sedge Wren	Cistothorus platensis	Bird	Endangered	1840
CAMBRIDGE	Slender Woodland Sedge	Carex gracilescens	Vascular Plant	Endangered	1891
CAMBRIDGE	Twelve-spotted Tiger Beetle	Cicindela duodecimguttata	Beetle	Special Concern	1932
CAMBRIDGE	Wood Turtle	Glyptemys insculpta	Reptile	Special Concern	Historic

List provided by Mass.gov (https://www.mass.gov/service-details/rare-species-viewer), accessed 9/18/2020.

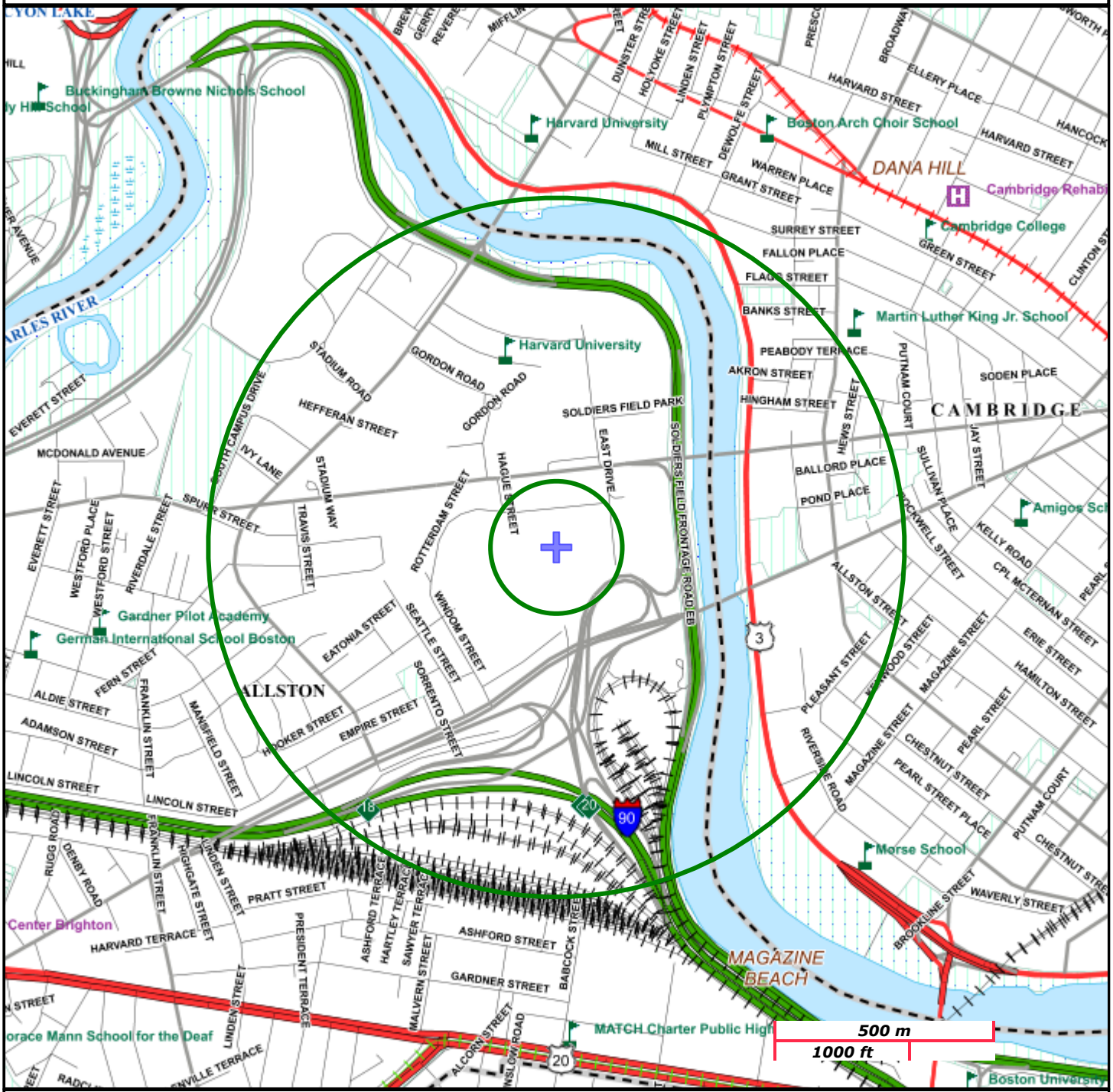
MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

Site Information:
ERC ROADWAYS AND INFRASTRUCTURE PROJECT
CAMBRIDGE, MA
3-000029441
NAD83 UTM Meters:
4692185mN , 325308mE (Zone: 19)
January 4, 2021

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at: https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail
Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct
Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam
Aquifers: Medium Yield, High Yield, EPA Sole Source
Non Potential Drinking Water Source Area: Medium, High (Yield)
PWS Protection Areas: Zone II, IWPA, Zone A
Hydrography: Open Water, PWS Reservoir, Tidal Flat
Wetlands: Freshwater, Saltwater, Cranberry Bog
FEMA 100yr Floodplain; Protected Open Space; ACEC
Est. Rare Wetland Wildlife Hab; Vernal Pool: Cert., Potential
Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

APPENDIX E

National Historic Preservation Act Review

National Register of Historic Places

National Park Service
U.S. Department of the Interior

Public, non-restricted data depicting National Register spatial data processed by the Cultural Resources GIS facility. …

ww.nps.gov) | © Mapbox (https://www.mapbox.com/about/maps/) © OpenStreetMap (https://www.openstreetmap.org/copyright) contributors | Cultural Resources GIS, National Park Service | Geocoding by Esri | Esri

APPROXIMATE SITE LIMITS

Massachusetts Cultural Resource Information System

MACRIS

MACRIS Search Results

Search Criteria: Town(s): Boston; Place: Allston; Resource Type(s): Area, Building, Burial Ground, Object, Structure;

Inv. No.	Property Name	Street	Town	Year
BOS.CA	Charles River Basin Historic District		Boston	
BOS.JL	Harvard Business School		Boston	
BOS.JM	Saint Anthony's Area		Boston	
BOS.KM	Hano Street Area		Boston	
BOS.KN	Harvard Avenue Historic District		Boston	
BOS.KP	Adamson Street, 1-87		Boston	
BOS.KQ	Aldie Street, 1-75		Boston	
BOS.KS	Ashford Street, 5-69		Boston	
BOS.KT	Athol Street, 4-71		Boston	
BOS.LB	Franklin Street, 51-168		Boston	
BOS.LC	Gardner Street, 4-98		Boston	
BOS.LF	Holton Street, 7-60 and Everett Street, 205		Boston	
BOS.LQ	Raymond Street, 1-98		Boston	
BOS.LU	Westford Street, 3-10		Boston	
BOS.SG	Allston Congregational Church		Boston	
BOS.VH	St. Anthony of Padua Roman Catholic Church Complex		Boston	
BOS.YK	Charles River Reservation Parkways		Boston	
BOS.ZQ	Charles River Reservation Speedway - Upper Basin Headquarters		Boston	
BOS.AAC	Charles River Reservation Speedway - Upper Basin Headquarters		Boston	
BOS.ADJ	International Harvester New England Branch Headquarters		Boston	
BOS.8073		8-10 Adamson St	Boston	c 1846
BOS.8074		12-14 Adamson St	Boston	c 1846
BOS.8075		16-18 Adamson St	Boston	c 1846
BOS.8072		72 Adamson St	Boston	

Inv. No.	Property Name	Street	Town	Year
BOS.8079	Rice, Jennie Double House	22-24 Aldie St	Boston	1895
BOS.8076		42-44 Aldie St	Boston	1895
BOS.8077		50 Aldie St	Boston	1895
BOS.8078		62 Aldie St	Boston	1895
BOS.8392	Spinney, David F. Two-Family House	73-75 Aldie St	Boston	r 1895
BOS.8085		24 Ashford St	Boston	
BOS.8086		26 Ashford St	Boston	
BOS.8087		28 Ashford St	Boston	
BOS.8089	Russell, Fred A. House	44 Ashford St	Boston	1899
BOS.8088		53-55 Ashford St	Boston	1909
BOS.8090	Gage, Roscoe W. House	65 Ashford St	Boston	c 1892
BOS.15429	Electric Storage Battery Co. - Whitehall Co. Bldg	120 Ashford St	Boston	1925
BOS.8093	Cushing, S. B. Double House	15-17 Athol St	Boston	c 1875
BOS.8091		27 Athol St	Boston	
BOS.8390	Davenport, Samuel N. House	33 Athol St	Boston	c 1870
BOS.8391	Davenport, Samuel N. House	35 Athol St	Boston	c 1870
BOS.8092		46 Athol St	Boston	
BOS.8389	Cose House	69-71 Athol St	Boston	r 1895
BOS.8393	Davenport, John F. House	70 Athol St	Boston	c 1895
BOS.9550	Claflin, Sleeper and Rich Halls Courtyard	275 Babcock St	Boston	r 1965
BOS.15427	Boston Buick Company Garage	278 Babcock St	Boston	1919
BOS.15428	Pittsburgh Plate Glass Company Glass Warehouse	300-316 Babcock St	Boston	1926
BOS.8108	Roddy Hall	60 Birmingham Pkwy	Boston	1898
BOS.9333	Anderson, Larz Bridge	Boylston St	Boston	1915
BOS.9480	Brighton Avenue Streetlamps	Brighton Ave	Boston	r 1995
BOS.13220	Lincoln Block	101 Brighton Ave	Boston	1902
BOS.13221	Lincoln Block	103-109 Brighton Ave	Boston	1902
BOS.13222	Lincoln Block	113 Brighton Ave	Boston	1902
BOS.13224	Allston Auto Exchange - Allston Auto Body Repairs	116-118 Brighton Ave	Boston	1925
BOS.13223		117-125 Brighton Ave	Boston	1914
BOS.13225	Allston Garage	122-124 Brighton Ave	Boston	c 1914
BOS.13226		127-129 Brighton Ave	Boston	1915
BOS.13227		128 Brighton Ave	Boston	r 1980
BOS.8742	Frost, E. Willard Commercial Block	130-140 Brighton Ave	Boston	1913
BOS.13228		131-137 Brighton Ave	Boston	1915
BOS.13229		139-143 Brighton Ave	Boston	c 1913

Inv. No.	Property Name	Street	Town	Year
BOS.8743	Prindiville Building	143-155 Brighton Ave	Boston	c 1913
BOS.13230	Parkvale Garage	154-162 Brighton Ave	Boston	c 1920
BOS.13231		164-174 Brighton Ave	Boston	c 1920
BOS.9327	B. U. Bridge - Cottage Farm Bridge	Brookline St	Boston	1927
BOS.15426	Noyes Buick Company Service Station	25 Buick St	Boston	1928
BOS.13213		Cambridge St	Boston	r 1965
BOS.8111	Allen Building	334-354 Cambridge St	Boston	1895
BOS.13211		358-362 Cambridge St	Boston	r 1950
BOS.13212		372 Cambridge St	Boston	1935
BOS.8113	Chester, W. R. Block	373-391 Cambridge St	Boston	c 1876
BOS.8744		382-386 Cambridge St	Boston	1911
BOS.8745	English, John House	390 Cambridge St	Boston	c 1870
BOS.9332	Weeks, John Wingate Foot Bridge	Charles River	Boston	1927
BOS.8123	Williams, Peter House	67 Chester St	Boston	c 1896
BOS.9549	Boston University School of Law Courtyard	765 Commonwealth Ave	Boston	r 1965
BOS.15425	Boston University School of Law	765 Commonwealth Ave	Boston	1962
BOS.15424	Boston University Law Library	767 Commonwealth Ave	Boston	1964
BOS.9548	Boston University - Mugar Library Courtyard	771 Commonwealth Ave	Boston	r 1965
BOS.15423	Boston University - Mugar Memorial Library	771 Commonwealth Ave	Boston	1966
BOS.15422	Boston University - Sherman, George Student Union	775 Commonwealth Ave	Boston	1963
BOS.15421	Shell Oil Company Building	785 Commonwealth Ave	Boston	1931
BOS.8069	Noyes, H. K. Buick Company	855-861 Commonwealth Ave	Boston	1920
BOS.15420	Rand-Avery Supply Company - Pinkham Press Building	871 Commonwealth Ave	Boston	1924
BOS.15419	Youth's Companion Printing Plant	881 Commonwealth Ave	Boston	1915
BOS.8068	Commonwealth Armory	925 Commonwealth Ave	Boston	1914
BOS.15418	Holland System Motor Company Building	949 Commonwealth Ave	Boston	1916
BOS.15417	New England Velie Auto Company Building	983-985 Commonwealth Ave	Boston	1919
BOS.15416	Ford Auto Showroom and Service Station	1019-1023 Commonwealth Ave	Boston	1917
BOS.15415		1106-1110 Commonwealth Ave	Boston	1915
BOS.8143		19 Everett St	Boston	r 1840
BOS.8234		205 Everett St	Boston	
BOS.8385	Wright, Jonathan B. - Hammond, Leander House	233-235 Everett St	Boston	r 1830
BOS.13214		4-12 Farrington Ave	Boston	1912
BOS.8746	Longfellow Building	4-8 Franklin St	Boston	c 1880
BOS.8154	Allston Hall Block	10-14 Franklin St	Boston	1890
BOS.8112	Allston Depot	15 Franklin St	Boston	1887

Inv. No.	Property Name	Street	Town	Year
BOS.8159		69 Franklin St	Boston	
BOS.8160	Hill, George A. Row House	73 Franklin St	Boston	1887
BOS.8155		74-76 Franklin St	Boston	
BOS.8161	Hill, George A. Row House	75 Franklin St	Boston	1887
BOS.8162	Hill, George A. Row House	77 Franklin St	Boston	1887
BOS.8163	Hill, George A. Row House	79 Franklin St	Boston	1887
BOS.8164	Hill, George A. Row House	81 Franklin St	Boston	1887
BOS.8156	Tucker, Moses D. Worker Housing	122 Franklin St	Boston	
BOS.8157	Tucker, Moses D. Worker Housing	124 Franklin St	Boston	
BOS.8158	Tucker, Moses D. Worker Housing	126 Franklin St	Boston	
BOS.8165	Tucker, Moses D. House	134 Franklin St	Boston	c 1875
BOS.8166	Mead, John H. Row House	150-152 Franklin St	Boston	1889
BOS.8168	Mead, John H. Row House	154-156 Franklin St	Boston	1889
BOS.8170	Mead, John H. Row House	158-160 Franklin St	Boston	1889
BOS.8172	Mead, John H. Row House	162-164 Franklin St	Boston	1889
BOS.8174	Mead, John H. Row House	166-168 Franklin St	Boston	1889
BOS.8184	Braves Baseball Field Office and Entrance Gate	10-20 Gaffney St	Boston	1915
BOS.8747	Jenkins Apartment	4-8 Gardner St	Boston	1912
BOS.13215		9 Gardner St	Boston	c 1913
BOS.8180	Whitney, Rev. Frederic Augustus House	12 Gardner St	Boston	r 1850
BOS.13216		15 Gardner St	Boston	1915
BOS.8181	Winter, Royal Double House	38-40 Gardner St	Boston	c 1881
BOS.8178		41 Gardner St	Boston	
BOS.8179		53 Gardner St	Boston	
BOS.8176		65 Gardner St	Boston	
BOS.8177		71 Gardner St	Boston	
BOS.8182	Ivanhoe Court Apartments	72 Gardner St	Boston	1905
BOS.8183	Norton, Charles W. House	73 Gardner St	Boston	c 1885
BOS.13217	Ideal Garage	6 Glenville Terr	Boston	c 1914
BOS.13218	Edison Company Garage	9 Glenville Terr	Boston	c 1920
BOS.13219	Glenville Garage	10 Glenville Terr	Boston	c 1918
BOS.8191	Hano, Samuel Company Worker Housing	1-3 Hano St	Boston	1885
BOS.8206	Hano, Samuel Company Worker Housing	2-4 Hano St	Boston	1885
BOS.8192	Hano, Samuel Company Worker Housing	5-7 Hano St	Boston	1885
BOS.8207	Hano, Samuel Company Worker Housing	6-8 Hano St	Boston	1885
BOS.8193	Hano, Samuel Company Worker Housing	9-11 Hano St	Boston	1885
BOS.8194	Hano, Samuel Company Worker Housing	13-15 Hano St	Boston	1885
BOS.8208	Hano, Samuel Company Worker Housing	14-16 Hano St	Boston	1885

Inv. No.	Property Name	Street	Town	Year
BOS.8195	Hano, Samuel Company Worker Housing	17-19 Hano St	Boston	1885
BOS.8209	Hano, Samuel Company Worker Housing	18-20 Hano St	Boston	1885
BOS.8196	Hano, Samuel Company Worker Housing	21-23 Hano St	Boston	1885
BOS.8210	Hano, Samuel Company Worker Housing	22-24 Hano St	Boston	1885
BOS.8197	Hano, Samuel Company Worker Housing	25-27 Hano St	Boston	1885
BOS.8211	Hano, Samuel Company Worker Housing	26-28 Hano St	Boston	1885
BOS.8198	Hano, Samuel Company Worker Housing	29-31 Hano St	Boston	1885
BOS.8212	Hano, Samuel Company Worker Housing	30-32 Hano St	Boston	1885
BOS.8199	Hano, Samuel Company Worker Housing	33-35 Hano St	Boston	1885
BOS.8213	Hano, Samuel Company Worker Housing	34-36 Hano St	Boston	1885
BOS.8200	Hano, Samuel Company Worker Housing	37-39 Hano St	Boston	1885
BOS.8214	Hano, Samuel Company Worker Housing	38-40 Hano St	Boston	1885
BOS.8201	Hano, Samuel Company Worker Housing	41-43 Hano St	Boston	1885
BOS.8215	Hano, Samuel Company Worker Housing	42-44 Hano St	Boston	1885
BOS.8202	Hano, Samuel Company Worker Housing	45-47 Hano St	Boston	1885
BOS.8216	Hano, Samuel Company Worker Housing	46-48 Hano St	Boston	1885
BOS.8203	Hano, Samuel Company Worker Housing	49-51 Hano St	Boston	1885
BOS.8217	Hano, Samuel Company Worker Housing	50-52 Hano St	Boston	1885
BOS.8204	Hano, Samuel Company Worker Housing	53-55 Hano St	Boston	1885
BOS.8218	Hano, Samuel Company Worker Housing	54-56 Hano St	Boston	1885
BOS.8205	Hano, Samuel Company Worker Housing	57-59 Hano St	Boston	1885
BOS.8219	Hano, Samuel Company Worker Housing	58-60 Hano St	Boston	1885
BOS.8220	Hano, Samuel Company Worker Housing	62-64 Hano St	Boston	1885
BOS.8221	Hano, Samuel Company Worker Housing	66-68 Hano St	Boston	1885
BOS.8222	Hano, Samuel Company Worker Housing	70-72 Hano St	Boston	1885
BOS.15414	Braves Baseball Field - Pavilion A	32 Harry Agganis Way	Boston	1915
BOS.9481	Harvard Avenue Road Network	Harvard Ave	Boston	
BOS.8748	Wilson Block	4-8 Harvard Ave	Boston	c 1908
BOS.8749		11-17 Harvard Ave	Boston	c 1918
BOS.8223	Harvard Avenue Fire Station	16 Harvard Ave	Boston	1891
BOS.8750		20-24 Harvard Ave	Boston	c 1910
BOS.8751		25-27 Harvard Ave	Boston	r 1965
BOS.13232		31 Harvard Ave	Boston	r 1950
BOS.8752		32-34 Harvard Ave	Boston	c 1928
BOS.8753	U. S. Post Office - Allston Branch	39 Harvard Ave	Boston	r 1975
BOS.8754		44-58 Harvard Ave	Boston	1912
BOS.8224	Whitehead, R. F. Block	51-63 Harvard Ave	Boston	1913
BOS.8755	Allston Methodist Episcopal Church	62 Harvard Ave	Boston	1877

Inv. No.	Property Name	Street	Town	Year
BOS.13233	Shorey - Bassett House	66-68 Harvard Ave	Boston	c 1883
BOS.8756		67-73 Harvard Ave	Boston	1905
BOS.8757	Bacon and Barret Apartment	74-84 Harvard Ave	Boston	1912
BOS.8758		75-87 Harvard Ave	Boston	c 1920
BOS.8772		5 Harvard Terr	Boston	r 1910
BOS.8773		7 Harvard Terr	Boston	r 1910
BOS.8771		8-16 Harvard Terr	Boston	1912
BOS.8774		9 Harvard Terr	Boston	r 1910
BOS.8775		11 Harvard Terr	Boston	r 1910
BOS.8776		15 Harvard Terr	Boston	c 1910
BOS.8777		17 Harvard Terr	Boston	c 1910
BOS.8232	Ganzheimer, A. Double House	20-22 Highgate St	Boston	r 1880
BOS.8235	Stinson, John D. House	8 Holton St	Boston	1889
BOS.8236	Stinson, John D. Barn	8R Holton St	Boston	1889
BOS.8233		12 Holton St	Boston	r 1890
BOS.8237	Davenport, Jonathan House	21 Holton St	Boston	c 1875
BOS.8238	Saint Anthony of Padua Roman Catholic Church	37 Holton St	Boston	1894
BOS.8388	Saint Anthony of Padua Roman Catholic Rectory	43 Holton St	Boston	1896
BOS.8387	Saint Anthony of Padua Roman Catholic School	57 Holton St	Boston	1915
BOS.8386	Saint Anthony of Padua Roman Catholic Convent	69 Holton St	Boston	c 1930
BOS.9608	Charles River Reservation - Leo Birmingham Parkway	Leo Birmingham Pkwy	Boston	1936
BOS.9609	Charles River Reservation - Birmingham Pkwy Marker	Leo Birmingham Pkwy	Boston	r 1920
BOS.13241	Allen Building	1 Linden St	Boston	1895
BOS.13242	Allen Building	3 Linden St	Boston	1895
BOS.13243	Allen Building	5 Linden St	Boston	1895
BOS.13244	Allen Building	7 Linden St	Boston	1895
BOS.13245	Allen Building	9 Linden St	Boston	1895
BOS.13236		11 Linden St	Boston	1897
BOS.13237		11A Linden St	Boston	1897
BOS.13238		15 Linden St	Boston	1897
BOS.13239		15A Linden St	Boston	1897
BOS.8065	Storrow, James J. School	20 Lothrop St	Boston	1926
BOS.9607	Charles River Reservation - Nonantum Road	Nonantum Rd	Boston	1910
BOS.9610	Charles River Reservation - North Beacon Street	North Beacon St	Boston	r 1920
BOS.9611	North Beacon Street Bridge over Charles River	North Beacon St	Boston	r 1920
BOS.8283		19 North Beacon St	Boston	r 1810

Inv. No.	Property Name	Street	Town	Year
BOS.17085	International Harvester New England Branch Headquarters and Motor Truck Showroom	61 North Beacon St	Boston	1925
BOS.17086	Charles River Saab Parts Storage	61 North Beacon St	Boston	1995
BOS.17087	International Harvester New England Branch Headquarters - Service Station	67 North Beacon St	Boston	1924
BOS.5952	Englewood Diner	69 North Beacon St	Boston	r 1935
BOS.17088	International Harvester New England Branch Headquarters - Truck Storage Facility	69 North Beacon St	Boston	1925
BOS.8375	Harvard University - Blodgett Pool	North Harvard St	Boston	1978
BOS.9313	Harvard University Athletic Facility Fence	North Harvard St	Boston	c 1897
BOS.8286	Harvard Stadium	60 North Harvard St	Boston	1903
BOS.8285	Harvard University - Carey Cage	65 North Harvard St	Boston	1897
BOS.8067	Hill Memorial Baptist Church	279 North Harvard St	Boston	1903
BOS.14293	Allston Congregational Church Parsonage	31-41 Quint Ave	Boston	1891
BOS.8297	Allston Congregational Church	41 Quint Ave	Boston	1891
BOS.8298		31 Raymond St	Boston	
BOS.8299		33 Raymond St	Boston	
BOS.8381	Rice, Edmund House	34 Raymond St	Boston	c 1870
BOS.8303	McDermott, Patrick Double House	43-45 Raymond St	Boston	c 1875
BOS.8300		80-82 Raymond St	Boston	
BOS.8301		84-86 Raymond St	Boston	
BOS.8302		88-90 Raymond St	Boston	
BOS.9330	River Street Bridge	River St	Boston	1926
BOS.8305	Vanerin, John House	57-59 Royal St	Boston	1905
BOS.8306	Sanford, H. I. House	9 Sawyer Terr	Boston	1914
BOS.8310	Sinclair, Thomas House	1 Sinclair Rd	Boston	r 1835
BOS.8311	Tracy, Jedediah House	2 Sinclair Rd	Boston	r 1833
BOS.9314	Harvard University Athletic Facility Fence	Solders Field Rd	Boston	c 1897
BOS.8350	Harvard Business School - Kresge Hall	Soldiers Field Rd	Boston	1953
BOS.8351	Harvard Business School - Teele Hall	Soldiers Field Rd	Boston	c 1968
BOS.8352	Harvard Business School - Burden Hall	Soldiers Field Rd	Boston	c 1969
BOS.8353	Harvard Business School - Cumnock Hall	Soldiers Field Rd	Boston	1969
BOS.8354	Soldiers Field Park Apartments	Soldiers Field Rd	Boston	c 1974
BOS.8355	Harvard Business School - Shadd Gymnasium	Soldiers Field Rd	Boston	c 1990
BOS.8356	Harvard Business School Chapel	Soldiers Field Rd	Boston	c 1990
BOS.8357	Harvard Business School Dean's Residence	Soldiers Field Rd	Boston	1929
BOS.8358	Harvard Business School - Humphrey Hall	Soldiers Field Rd	Boston	1926
BOS.8359	Harvard Business School - McCullough Hall	Soldiers Field Rd	Boston	1926
BOS.8360	Harvard Business School - Glass Hall	Soldiers Field Rd	Boston	1926

Inv. No.	Property Name	Street	Town	Year
BOS.8361	Harvard Business School - Mellon Hall	Soldiers Field Rd	Boston	1926
BOS.8362	Harvard Business School - Dillon Hall	Soldiers Field Rd	Boston	1926
BOS.8363	Harvard Business School - Chase Hall	Soldiers Field Rd	Boston	1926
BOS.8364	Harvard Business School Students Club	Soldiers Field Rd	Boston	1926
BOS.8365	Harvard Business School - Aldrich Hall	Soldiers Field Rd	Boston	1953
BOS.8366	Harvard Business School - Baker Library	Soldiers Field Rd	Boston	1927
BOS.8367	Harvard Business School - Hamilton Hall	Soldiers Field Rd	Boston	1926
BOS.8368	Harvard Business School Faculty Club	Soldiers Field Rd	Boston	1926
BOS.8369	Harvard Business School - Gallatin Hall	Soldiers Field Rd	Boston	1926
BOS.8370	Harvard Business School - Fowler Hall	Soldiers Field Rd	Boston	1926
BOS.8371	Harvard Business School - Morgan Hall	Soldiers Field Rd	Boston	1927
BOS.8372	Harvard Business School - Loeb Hall	Soldiers Field Rd	Boston	1926
BOS.8373	Harvard Business School - Morris Hall	Soldiers Field Rd	Boston	1926
BOS.8374	Harvard Business School - Sherman Hall	Soldiers Field Rd	Boston	1926
BOS.8376	Harvard University - Briggs Cage	Soldiers Field Rd	Boston	1926
BOS.8377	Harvard University - Dillon Field House	Soldiers Field Rd	Boston	1929
BOS.8378	Harvard University - Dixon, Palmer Tennis Courts	Soldiers Field Rd	Boston	r 1965
BOS.8379	Harvard University - Bright Hockey Center	Soldiers Field Rd	Boston	r 1950
BOS.8380	Harvard University Gordon Track and Tennis Center	Soldiers Field Rd	Boston	r 1950
BOS.9602	Charles River Reservation - Soldiers Field Road	Soldiers Field Rd	Boston	1899
BOS.9603	Soldiers Field Road Planted Median	Soldiers Field Rd	Boston	r 1920
BOS.9605	Soldiers Field Underpass at Western Avenue	Soldiers Field Rd	Boston	c 1954
BOS.9606	Soldiers Field Road - North Beacon Street Oval	Soldiers Field Rd	Boston	c 1958
BOS.8312	Harvard University - Newell Boat House	801-805 Soldiers Field Rd	Boston	1900
BOS.8063	Institute of Contemporary Art	1175 Soldiers Field Rd	Boston	1959
BOS.8064	Charles River Speedway Superintendent's Residence	1420-1440 Soldiers Field Rd	Boston	1899
BOS.9731	Charles River Speedway Courtyard	1420-1440 Soldiers Field Rd	Boston	1899
BOS.15893	Charles River Speedway Headquarters and Stable	1420-1440 Soldiers Field Rd	Boston	1899
BOS.15894	Metropolitan District Commission Police Station	1420-1440 Soldiers Field Rd	Boston	1904
BOS.15895	Charles River Speedway - South Shed	1420-1440 Soldiers Field Rd	Boston	1899
BOS.15896	Charles River Speedway - East Shed	1420-1440 Soldiers Field Rd	Boston	1899
BOS.15897	Charles River Speedway Garage	1420-1440 Soldiers Field Rd	Boston	c 1940
BOS.15898	Charles River Speedway Maintenance Garage	1420-1440 Soldiers Field Rd	Boston	c 1940
BOS.9334	Eliot Bridge	Soldier's Field Rd	Boston	1950
BOS.9335	Soldier's Field Road	Soldier's Field Rd	Boston	1895
BOS.9604	Charles River Reservation - Telford Street Bridge	Telford St	Boston	r 1965

Inv. No.	Property Name	Street	Town	Year
BOS.8066	Barrett, David L. Elementary School	25 Travis St	Boston	1933
BOS.8321	Longefellow, Henry W. House	4 Wadsworth St	Boston	r 1895
BOS.9331	Western Avenue Bridge	Western Ave	Boston	1924
BOS.8342	Ted's Diner	270 Western Ave	Boston	1953
BOS.8343	Sewall and Day Cordage Company	342 Western Ave	Boston	c 1885
BOS.8344	Engine House #34	444 Western Ave	Boston	1887
BOS.8345	Stanley Service Station	500 Western Ave	Boston	1938
BOS.8382	Moore, J. Albert - Reid, Maria House	3 Westford St	Boston	c 1870
BOS.8346		4 Westford St	Boston	r 1880
BOS.8383	Moore, J. Albert House	7 Westford St	Boston	c 1870
BOS.8347		8 Westford St	Boston	r 1880
BOS.8384	Moore, J. Albert House	9 Westford St	Boston	c 1870
BOS.8348		10 Westford St	Boston	r 1880
BOS.13240	Wilton, The	7 Wilton St	Boston	1890

APPENDIX F

BWSC Permit Application

HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

21 April 2021
File No. 134544-004

Boston Water and Sewer Commission
Engineering Customer Services
900 Harrison Avenue
Boston, MA 02119

Attention: Matthew Tuttle

Subject: Request for Approval for Temporary Construction Dewatering
ERC Roadways and Infrastructure Project
100 Western Avenue
Allston, Massachusetts

Dear Mr. Tuttle:

On behalf of our client, Harvard Allston Land Company, Haley & Aldrich, Inc. is submitting this Dewatering Discharge Permit Application in support of the proposed Enterprise Research Campus (ERC) Roadways and Infrastructure Project located on the Harvard Enterprise Research Campus at 100 Western Avenue in Allston, Massachusetts (Figure 1).

Dewatering is necessary to enable roadway and utility work starting in June 2021 and extending into December 2022. Prior to discharge, collected water will be routed through a sedimentation tank and bag filter at minimum to remove suspended solids and un-dissolved chemical constituents. Other pre-treatment may be conducted as necessary to comply with the National Pollutant Discharge Elimination System (NPDES) discharge criteria. The proposed dewatering discharge route and BWSC outfall locations are described and shown on Figure 2 and in the NPDES RGP Permit Application attachments.

A submittal was provided to EPA for discharge of the dewatering effluent under the NPDES Remediation General Permit (RGP). A copy of the submitted RGP application is attached. If you have any questions, please feel free to contact the undersigned at 617-886-7400.

Sincerely yours,
HALEY & ALDRICH, INC.

Liza Joyce. E.I.T
Engineer

Michael Cronan, LSP (MA)
Associate | Senior Project Manager

Attachments:

Dewatering Discharge Permit Application
Figure 1 – Project Locus
Figure 2 – Proposed Discharge Route
Copy of NPDES RGP Permit Application

\\haleyaldrich.com\share\CF\Projects\134544\Dewatering\Appendix F - BWSC Application\2021-0421-HAI-ERC-NPDES BWSC Letter-F.docx

Boston Water and Sewer Commission
980 Harrison Avenue
Boston, MA 02119-2540

DEWATERING DISCHARGE PERMIT APPLICATION

OWNER / AUTHORIZED APPLICANT PROVIDE INFORMATION HERE:

Company Name: Harvard Allston Land Company Address: 1350 Massachusetts Avenue, Suite 739

Phone Number: (617) 495-4221 Fax number: _____

Contact person name: Shallan Fitzgerald Title: Infrastructure Manager

Cell number: (603) 682-4018 Email address: shallan_fitzgerald@harvard.edu

Permit Request (check one): ☑ New Application ☐ Permit Extension ☐ Other (Specify): _____

Owner's Information (if different from above):

Owner of property being dewatered: _____

Owner's mailing address: _____ Phone number: _____

Location of Discharge & Proposed Treatment System(s):

Street number and name: 100 Western Avenue Neighborhood Allston

Discharge is to a: ☐ Sanitary Sewer ☐ Combined Sewer ☑ Storm Drain ☐ Other (specify): _____

Describe Proposed Pre-Treatment System(s): Sedimentation tank, 5micron bag filters, and other components as necessary; see attached H&A NPDES RGP application

BWSC Outfall No. SDO 041, SDO 034 Receiving Waters Charles River

---

Temporary Discharges (Provide Anticipated Dates of Discharge): From 07/01/2021 To 11/30/2023

☐ Groundwater Remediation	☐ Tank Removal/Installation	☐ Foundation Excavation
☐ Utility/Manhole Pumping	☐ Test Pipe	☑ Trench Excavation
☐ Accumulated Surface Water	☐ Hydrogeologic Testing	☐ Other _____

Permanent Discharges

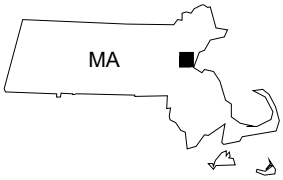
☐ Foundation Drainage	☐ Crawl Space/Footing Drain
☐ Accumulated Surface Water	☐ Non-contact/Uncontaminated Cooling
☐ Non-contact/Uncontaminated Process	☐ Other; _____

---

1. Attach a Site Plan showing the source of the discharge and the location of the point of discharge (i.e. the sewer pipe or catch basin). Include meter type, meter number, size, make and start reading. Note. All discharges to the Commission's sewer system will be assessed current sewer charges.
2. If discharging to a sanitary or combined sewer, attach a copy of MWRA's Sewer Use Discharge permit or application.
3. If discharging to a separate storm drain, attach a copy of EPA's NPDES Permit or NOI application, or NPDES Permit exclusion letter for the discharge, as well as other relevant information.
4. Dewatering Drainage Permit will be denied or revoked if applicant fails to obtain the necessary permits from MWRA or EPA.

Submit Completed Application to: Boston Water and Sewer Commission
Engineering Customer Services
980 Harrison Avenue, Boston, MA 02119
Attn: Jodi Dobay, Engineering Customer Service
E-mail: beginj@bwsc.org
Phone: 617-989-7259 Fax: 617-989-7716

Signature of Authorized Representative for Property Owner: Shallan Fitzgerald Digitally signed by Shallan Fitzgerald Date: 2021.04.21 11:25:51 -04'00' Date: _____



MAP SOURCE: ESRI
SITE COORDINATES: 42°21'41"N, 71°07'19"W

HALEY ALDRICH

ERC ROADWAYS AND INFRASTRUCTURE
ALLSTON, MASSACHUSETTS

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
JANUARY 2021

FIGURE 1

GIS FILE PATH: C:\Users\dverrier\OneDrive - haleyaldrich.com\Desktop\Local\134544\134544_004_0001_PROJECT_LOCUS.mxd — USER: dverrier — LAST SAVED: 1/11/2021 5:34:36 PM

PROPOSED DISCHARGE ROUTE 1

APPROXIMATE LOCATION OF CATCH BASINS PROPOSED FOR DISCHARGE

APPROXIMATE LIMITS OF WORK AREA

PROPOSED DISCHARGE ROUTE 2

ERC ROADWAYS AND INFRASTRUCTURE
ALLSTON, MASSACHUSETTS

PROPOSED DISCHARGE ROUTE

APRIL 2021

FIGURE 3

HALEY ALDRICH

BOSTON WATER AND SEWER

Copyright © Boston Water and Sewer Commission. All rights reserved. Printed on: 1/13/2017

N W E S

100 50 0 100 200 300 Feet

1 inch = 100 feet

APPENDIX G

Laboratory Data Reports

ANALYTICAL REPORT

Lab Number:	L2056444
Client:	Haley & Aldrich, Inc. 465 Medford Street, Suite 2200 Charlestown, MA 02129-1400
ATTN:	Mike Cronan
Phone:	(617) 886-7477
Project Name:	ERC ROADWAYS & INFRASTRUCTURE
Project Number:	134544-004
Report Date:	12/28/20

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056444
Report Date: 12/28/20

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2056444-01	HA20-CHARLESRIVER	WATER	ALLSTON, MA	12/16/20 11:00	12/16/20

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056444
Project Number:	134544-004	**Report Date:**	12/28/20

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056444
Project Number:	134544-004	**Report Date:**	12/28/20

Case Narrative (continued)

Sample Receipt

L2056444-01 (HA20-CHARLESRIVER): A sample container for Hexavalent Chromium was received, but was not listed on the chain of custody. At the client's request, the analysis was not performed.

Total Metals

The WG1448246-2 LCS recoveries, associated with L2056444-01 (HA20-CHARLESRIVER), are above the acceptance criteria for cadmium (122%) and selenium (116%); however, the associated sample is non-detect to the RL for these target analytes. The results of the original analysis are reported.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly Stenstrom

Title: Technical Director/Representative Date: 12/28/20

METALS

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056444

Project Number: 134544-004 **Report Date:** 12/28/20

SAMPLE RESULTS

Lab ID: L2056444-01 Date Collected: 12/16/20 11:00

Client ID: HA20-CHARLESRIVER Date Received: 12/16/20

Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:

Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Antimony, Total	ND		mg/l	0.00400	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Copper, Total	0.00178		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Iron, Total	0.369		mg/l	0.050	--	1	12/22/20 21:30	12/23/20 18:22	EPA 3005A	19,200.7	BV
Lead, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	12/22/20 23:37	12/23/20 12:07	EPA 245.1	3,245.1	VW
Nickel, Total	ND		mg/l	0.00200	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Zinc, Total	0.01354		mg/l	0.01000	--	1	12/22/20 21:30	12/23/20 17:54	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	54.5		mg/l	0.660	NA	1	12/22/20 21:30	12/23/20 18:22	EPA 3005A	19,200.7	BV

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056444

Project Number: 134544-004 **Report Date:** 12/28/20

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1448243-1										
Iron, Total	ND		mg/l	0.050	--	1	12/22/20 21:30	12/23/20 15:24	19,200.7	BV

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 01 Batch: WG1448243-1										
Hardness	ND		mg/l	0.660	NA	1	12/22/20 21:30	12/23/20 15:24	19,200.7	BV

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1448246-1										
Antimony, Total	ND		mg/l	0.00400	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Lead, Total	ND		mg/l	0.00100	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Nickel, Total	ND		mg/l	0.00200	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	12/22/20 21:30	12/23/20 17:37	3,200.8	AM

Prep Information

Digestion Method: EPA 3005A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056444

Project Number: 134544-004 **Report Date:** 12/28/20

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01 Batch: WG1448250-1										
Mercury, Total	ND		mg/l	0.00020	--	1	12/22/20 23:37	12/23/20 11:45	3,245.1	VW

Prep Information

Digestion Method: EPA 245.1

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056444

Report Date: 12/28/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1448243-2								
Iron, Total	105		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 Batch: WG1448243-2								
Hardness	108		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1448246-2								
Antimony, Total	103		-		85-115	-		
Arsenic, Total	110		-		85-115	-		
Cadmium, Total	**122**	Q	-		85-115	-		
Chromium, Total	98		-		85-115	-		
Copper, Total	104		-		85-115	-		
Lead, Total	107		-		85-115	-		
Nickel, Total	99		-		85-115	-		
Selenium, Total	**116**	Q	-		85-115	-		
Silver, Total	97		-		85-115	-		
Zinc, Total	114		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1448250-2								
Mercury, Total	102		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056444
Report Date: 12/28/20

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-3 QC Sample: L2056415-01 Client ID: MS Sample												
Iron, Total	0.766	1	1.72	95		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-3 QC Sample: L2056415-01 Client ID: MS Sample												
Hardness	452	66.2	511	89		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-7 QC Sample: L2056444-01 Client ID: HA20-CHARLESRIVER												
Iron, Total	0.369	1	1.39	102		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-7 QC Sample: L2056444-01 Client ID: HA20-CHARLESRIVER												
Hardness	54.5	66.2	126	108		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448246-3 QC Sample: L2056444-01 Client ID: HA20-CHARLESRIVER												
Antimony, Total	ND	0.5	0.5425	108		-	-		70-130	-		20
Arsenic, Total	ND	0.12	0.1305	109		-	-		70-130	-		20
Cadmium, Total	ND	0.051	0.06278	123		-	-		70-130	-		20
Chromium, Total	ND	0.2	0.1972	99		-	-		70-130	-		20
Copper, Total	0.00178	0.25	0.2648	105		-	-		70-130	-		20
Lead, Total	ND	0.51	0.5479	107		-	-		70-130	-		20
Nickel, Total	ND	0.5	0.4903	98		-	-		70-130	-		20
Selenium, Total	ND	0.12	0.1387	116		-	-		70-130	-		20
Silver, Total	ND	0.05	0.04916	98		-	-		70-130	-		20
Zinc, Total	0.01354	0.5	0.5921	116		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056444
Report Date: 12/28/20

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448250-3 QC Sample: L2055936-01 Client ID: MS Sample									
Mercury, Total	ND	0.005	0.00479	96	-	-	70-130	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056444

Report Date: 12/28/20

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-4 QC Sample: L2056415-01 Client ID: DUP Sample						
Iron, Total	0.766	0.749	mg/l	2		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-8 QC Sample: L2056444-01 Client ID: HA20-CHARLESRIVER						
Iron, Total	0.369	0.378	mg/l	2		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448243-8 QC Sample: L2056444-01 Client ID: HA20-CHARLESRIVER						
Hardness	54.5	56.3	mg/l	3		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448246-4 QC Sample: L2056444-01 Client ID: HA20-CHARLESRIVER						
Antimony, Total	ND	ND	mg/l	NC		20
Arsenic, Total	ND	ND	mg/l	NC		20
Cadmium, Total	ND	ND	mg/l	NC		20
Chromium, Total	ND	ND	mg/l	NC		20
Copper, Total	0.00178	0.00185	mg/l	4		20
Lead, Total	ND	ND	mg/l	NC		20
Nickel, Total	ND	ND	mg/l	NC		20
Selenium, Total	ND	ND	mg/l	NC		20
Silver, Total	ND	ND	mg/l	NC		20
Zinc, Total	0.01354	0.01395	mg/l	3		20
Total Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1448250-4 QC Sample: L2055936-01 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/l	NC		20

INORGANICS
&
MISCELLANEOUS

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004
Lab Number: L2056444
Report Date: 12/28/20

SAMPLE RESULTS

Lab ID: L2056444-01
Client ID: HA20-CHARLESRIVER
Sample Location: ALLSTON, MA
Sample Depth:
Matrix: Water

Date Collected: 12/16/20 11:00
Date Received: 12/16/20
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	0.171		mg/l	0.075	--	1	12/23/20 10:30	12/23/20 20:09	121,4500NH3-BH	AT

Project Name: ERC ROADWAYS & INFRASTRUCTUF
Project Number: 134544-004
Lab Number: L2056444
Report Date: 12/28/20

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1448544-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	12/23/20 10:30	12/23/20 19:41	121,4500NH3-BH	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056444

Report Date: 12/28/20

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1448544-2								
Nitrogen, Ammonia	98		-		80-120	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056444
Report Date: 12/28/20

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1448544-4 QC Sample: L2053228-175 Client ID: MS Sample												
Nitrogen, Ammonia	0.162	4	3.57	85		-	-		80-120	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056444

Report Date: 12/28/20

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1448544-3 QC Sample: L2053228-175 Client ID: DUP Sample						
Nitrogen, Ammonia	0.162	0.190	mg/l	16		20

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056444
Report Date: 12/28/20

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2056444-01A	Plastic 250ml HNO3 preserved	A	<2	<2	2.4	Y	Absent		CD-2008T(180),NI-2008T(180),ZN-2008T(180),FE-UI(180),CU-2008T(180),HARDU(180),AG-2008T(180),HG-U(28),SE-2008T(180),AS-2008T(180),PB-2008T(180),SB-2008T(180),CR-2008T(180)
L2056444-01B	Plastic 500ml H2SO4 preserved	A	<2	<2	2.4	Y	Absent		NH3-4500(28)
L2056444-01C	Plastic 250ml unpreserved	A	7	7	2.4	Y	Absent		HOLD-WETCHEM()

*Values in parentheses indicate holding time in days

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056444
Project Number:	134544-004	**Report Date:**	12/28/20

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056444
Project Number:	134544-004	**Report Date:**	12/28/20

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. (Note: 'PFAS, Total (6)' is applicable to MassDEP DW compliance analysis only.). If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Report Format: Data Usability Report

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056444
Project Number:	134544-004	**Report Date:**	12/28/20

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056444
Project Number:	134544-004	**Report Date:**	12/28/20

REFERENCES

3 Methods for the Determination of Metals in Environmental Samples, Supplement I. EPA/600/R-94/111. May 1994.

19 Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes. Appendix C, Part 136, 40 CFR (Code of Federal Regulations). July 1, 1999 edition.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
EPA TO-12 Non-methane organics
EPA 3C Fixed gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581 — 8 Walkup Dr. — TEL: 508-898-9220 — FAX: 508-898-9193

Mansfield, MA 02048 — 320 Forbes Blvd — TEL: 508-822-9300 — FAX: 508-822-3288

Service Centers: Brewer, ME 04412 — Portsmouth, NH 03801 — Mahwah, NJ 07430 — Albany, NY 12205 — Tonawanda, NY 14150 — Holmes, PA 19043

Page 1 of 1

Date Rec'd in Lab: 12/16/20

ALPHA Job #: L2056444

H&A Information

H&A Client: Harvard

H&A Address: 465 Medford St, Boston, MA 0212-1400

H&A Phone: 617-886-7400

H&A Fax:

H&A Email: mcronan@haleyaldrich.com

Project Information

Project Name: ERC Roadways and Infrastructure

Project Location: Allston, MA

Project #: 134544-004

(Use Project name as Project #)

Project Manager: M Cronan

ALPHAQuote #:

Turn-Around Time

Standard ☑ — Due Date:

(only if pre approved) ☐ — # of Days:

Deliverables

☑ Email ☐ Fax

☑ EQuIS (1 File) ☐ EQuIS (4 File)

☐ Other:

Regulatory Requirements (Program/Criteria)

X NPDES RPG

Note: Select State from menu & identify criteria.

Billing Information

☑ Same as Client info

PO #

Disposal Site Information

Please identify below location of applicable disposal facilities.

Disposal Facility: ☐ NJ ☐ NY

Other:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

3. HOLD PACN & ACN 12. Dissolved Metals ON HOLD (Field Filtered)

Please sample per EPA Approved 2017 RGP Permit methods

Please specify Metals or TAL.

ANALYSIS

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	1. TSS - 2540	2. TRC-4500	3. TCN-4500 HOLD PACN & ACN	4. 504	5. 8260 & 8260 SIM for Dioxane	6. HEXCR-3500 & Trivalent Chromium	7. TPHENOL-420	8. 8270TCL (including Diethylhexylphthalate)	9. 8270TCL-SIM	10. CL-300	11. Total Metals - Ag, As, Cd, Cr,Cu,Ni,Pb,Sb,Se,Zn,Fe,Hg	12. Dissolved Metals - Ag, As,Ba,Cd,Cr,Cu,Ni,Pb,Sb,Se,Tl,Zn	13. Ammonia	14.Total Hardness	15. A2-ALCOHOL (Ethanol)	16. TPH-1664	17. PCB-608	Sample Specific Comments	Total # of Bottles
	~~666MW02~~			AQ		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Temp - pH -	
				AQ		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Temp - pH -	
56444-01	HA20-CharlesRiver	12/16/20	11:00	AQ												X		X	X			Temp - 1.0°C pH - 8.63	3

Container Type

Preservative

Sample Filtration

☐ Done ☐ Lab to do

Preservation ☐ Lab to do

(Please Specify below)

Preservative Code: A = None, B = HCl, C = HNO_3, D = H_2SO_4, E = NaOH, F = MeOH, G = $NaHSO_4$, H = $Na_2S_2O_3$, K/E = Zn Ac/NaOH, O = Other

Container Code: P = Plastic, A = Amber Glass, V = Vial, G = Glass, B = Bacteria Cup, C = Cube, O = Other, E = Encora, D = BOD Bottle

Westboro: Certification No: MA935

Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
	12/16/20 - 11:50		Plum Anal. 12/16/20 1605
	12/16/20 1745		12/16/20 1745

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. Alpha Analytical's services under this Chain of Custody shall be performed in accordance with terms and conditions within Blanket Service Agreement# 2015-18-Alpha Analytical by and between Haley & Aldrich, Inc., its subsidiaries and affiliates and Alpha Analytical.

Document ID: 20455 Rev 1 (1/28/2016)

ANALYTICAL REPORT

Lab Number:	L2056859
Client:	Haley & Aldrich, Inc. 465 Medford Street, Suite 2200 Charlestown, MA 02129-1400
ATTN:	Mike Cronan
Phone:	(617) 886-7477
Project Name:	ERC ROADWAYS & INFRASTRUCTURE
Project Number:	134544-004
Report Date:	01/04/21

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2056859-01	006MW02-2020-1218	WATER	ALLSTON, MA	12/18/20 10:25	12/18/20
L2056859-02	079MW26-2020-1218	WATER	ALLSTON, MA	12/18/20 14:25	12/18/20

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056859
Project Number:	134544-004	**Report Date:**	01/04/21

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056859
Project Number:	134544-004	**Report Date:**	01/04/21

Case Narrative (continued)

Report Submission

The analysis of Ethanol was subcontracted. A copy of the laboratory report is included as an addendum.

Please note: This data is only available in PDF format and is not available on Data Merger.

Chlorine, Total Residual

The WG1447096-4 MS recovery, performed on L2056859-02 (079MW26-2020-1218), is outside the acceptance criteria for chlorine, total residual (0%); however, the associated LCS recovery is within criteria. No further action was taken.

Nitrogen, Ammonia

The WG1449443-4 MS recovery, performed on L2056859-01 (006MW02-2020-1218), is outside the acceptance criteria for nitrogen, ammonia (74%); however, the associated LCS recovery is within criteria. No further action was taken.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 01/04/21

ORGANICS

VOLATILES

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01 Date Collected: 12/18/20 10:25
Client ID: 006MW02-2020-1218 Date Received: 12/18/20
Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 128,624.1
Analytical Date: 12/22/20 09:24
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/l	1.0	--	1
1,1-Dichloroethane	ND		ug/l	1.5	--	1
Carbon tetrachloride	ND		ug/l	1.0	--	1
1,1,2-Trichloroethane	ND		ug/l	1.5	--	1
Tetrachloroethene	ND		ug/l	1.0	--	1
1,2-Dichloroethane	ND		ug/l	1.5	--	1
1,1,1-Trichloroethane	ND		ug/l	2.0	--	1
Benzene	ND		ug/l	1.0	--	1
Toluene	ND		ug/l	1.0	--	1
Ethylbenzene	ND		ug/l	1.0	--	1
Vinyl chloride	ND		ug/l	1.0	--	1
1,1-Dichloroethene	ND		ug/l	1.0	--	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	--	1
Trichloroethene	ND		ug/l	1.0	--	1
1,2-Dichlorobenzene	ND		ug/l	5.0	--	1
1,3-Dichlorobenzene	ND		ug/l	5.0	--	1
1,4-Dichlorobenzene	ND		ug/l	5.0	--	1
p/m-Xylene	ND		ug/l	2.0	--	1
o-xylene	ND		ug/l	1.0	--	1
Xylenes, Total	ND		ug/l	1.0	--	1
Acetone	ND		ug/l	10	--	1
Methyl tert butyl ether	ND		ug/l	10	--	1
Tert-Butyl Alcohol	ND		ug/l	100	--	1
Tertiary-Amyl Methyl Ether	ND		ug/l	20	--	1

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01 Date Collected: 12/18/20 10:25

Client ID: 006MW02-2020-1218 Date Received: 12/18/20

Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Pentafluorobenzene	98		60-140
Fluorobenzene	75		60-140
4-Bromofluorobenzene	93		60-140

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01 Date Collected: 12/18/20 10:25
Client ID: 006MW02-2020-1218 Date Received: 12/18/20
Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 128,624.1-SIM
Analytical Date: 12/22/20 09:24
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS-SIM - Westborough Lab						
1,4-Dioxane	ND		ug/l	50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Fluorobenzene	80		60-140
4-Bromofluorobenzene	104		60-140

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Lab Number: L2056859
Project Number: 134544-004
Report Date: 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01
Client ID: 006MW02-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 10:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 14,504.1
Analytical Date: 12/21/20 15:52
Analyst: AMM

Extraction Method: EPA 8011
Extraction Date: 12/21/20 14:04

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Microextractables by GC - Westborough Lab							
1,2-Dibromoethane	ND		ug/l	0.010	--	1	A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 128,624.1
Analytical Date: 12/22/20 10:01
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/l	1.0	--	1
1,1-Dichloroethane	ND		ug/l	1.5	--	1
Carbon tetrachloride	ND		ug/l	1.0	--	1
1,1,2-Trichloroethane	ND		ug/l	1.5	--	1
Tetrachloroethene	ND		ug/l	1.0	--	1
1,2-Dichloroethane	ND		ug/l	1.5	--	1
1,1,1-Trichloroethane	ND		ug/l	2.0	--	1
Benzene	ND		ug/l	1.0	--	1
Toluene	ND		ug/l	1.0	--	1
Ethylbenzene	ND		ug/l	1.0	--	1
Vinyl chloride	2.1		ug/l	1.0	--	1
1,1-Dichloroethene	ND		ug/l	1.0	--	1
cis-1,2-Dichloroethene	6.7		ug/l	1.0	--	1
Trichloroethene	ND		ug/l	1.0	--	1
1,2-Dichlorobenzene	ND		ug/l	5.0	--	1
1,3-Dichlorobenzene	ND		ug/l	5.0	--	1
1,4-Dichlorobenzene	ND		ug/l	5.0	--	1
p/m-Xylene	ND		ug/l	2.0	--	1
o-xylene	ND		ug/l	1.0	--	1
Xylenes, Total	ND		ug/l	1.0	--	1
Acetone	ND		ug/l	10	--	1
Methyl tert butyl ether	ND		ug/l	10	--	1
Tert-Butyl Alcohol	ND		ug/l	100	--	1
Tertiary-Amyl Methyl Ether	ND		ug/l	20	--	1

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02 Date Collected: 12/18/20 14:25

Client ID: 079MW26-2020-1218 Date Received: 12/18/20

Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Pentafluorobenzene	117		60-140
Fluorobenzene	92		60-140
4-Bromofluorobenzene	94		60-140

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 128,624.1-SIM
Analytical Date: 12/22/20 10:01
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS-SIM - Westborough Lab						
1,4-Dioxane	ND		ug/l	50	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Fluorobenzene	97		60-140
4-Bromofluorobenzene	104		60-140

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Lab Number: L2056859
Project Number: 134544-004
Report Date: 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 14,504.1
Analytical Date: 12/21/20 15:57
Analyst: AMM

Extraction Method: EPA 8011
Extraction Date: 12/21/20 14:04

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Microextractables by GC - Westborough Lab							
1,2-Dibromoethane	ND		ug/l	0.010	--	1	A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 14,504.1
Analytical Date: 12/21/20 15:07
Analyst: AMM

Extraction Method: EPA 8011
Extraction Date: 12/21/20 14:04

Parameter	Result	Qualifier	Units	RL	MDL	
Microextractables by GC - Westborough Lab for sample(s): 01-02 Batch: WG1447760-1						
1,2-Dibromoethane	ND		ug/l	0.010	--	A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 128,624.1
Analytical Date: 12/22/20 04:29
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-02 Batch: WG1447786-10					
Methylene chloride	ND		ug/l	1.0	--
1,1-Dichloroethane	ND		ug/l	1.5	--
Carbon tetrachloride	ND		ug/l	1.0	--
1,1,2-Trichloroethane	ND		ug/l	1.5	--
Tetrachloroethene	ND		ug/l	1.0	--
1,2-Dichloroethane	ND		ug/l	1.5	--
1,1,1-Trichloroethane	ND		ug/l	2.0	--
Benzene	ND		ug/l	1.0	--
Toluene	ND		ug/l	1.0	--
Ethylbenzene	ND		ug/l	1.0	--
Vinyl chloride	ND		ug/l	1.0	--
1,1-Dichloroethene	ND		ug/l	1.0	--
cis-1,2-Dichloroethene	ND		ug/l	1.0	--
Trichloroethene	ND		ug/l	1.0	--
1,2-Dichlorobenzene	ND		ug/l	5.0	--
1,3-Dichlorobenzene	ND		ug/l	5.0	--
1,4-Dichlorobenzene	ND		ug/l	5.0	--
p/m-Xylene	ND		ug/l	2.0	--
o-xylene	ND		ug/l	1.0	--
Xylenes, Total	ND		ug/l	1.0	--
Acetone	ND		ug/l	10	--
Methyl tert butyl ether	ND		ug/l	10	--
Tert-Butyl Alcohol	ND		ug/l	100	--
Tertiary-Amyl Methyl Ether	ND		ug/l	20	--

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 128,624.1
Analytical Date: 12/22/20 04:29
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-02 Batch: WG1447786-10					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Pentafluorobenzene	109		60-140
Fluorobenzene	94		60-140
4-Bromofluorobenzene	92		60-140

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 128,624.1-SIM
Analytical Date: 12/22/20 04:29
Analyst: GT

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01-02 Batch: WG1448091-4					
1,4-Dioxane	ND		ug/l	50	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Fluorobenzene	102		60-140
4-Bromofluorobenzene	102		60-140

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits	Column
Microextractables by GC - Westborough Lab	Associated sample(s): 01-02 Batch: WG1447760-2								
1,2-Dibromoethane	102		-		80-120	-			A

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 Batch: WG1447786-9								
Methylene chloride	125		-		60-140	-		28
1,1-Dichloroethane	130		-		50-150	-		49
Carbon tetrachloride	110		-		70-130	-		41
1,1,2-Trichloroethane	115		-		70-130	-		45
Tetrachloroethene	115		-		70-130	-		39
1,2-Dichloroethane	110		-		70-130	-		49
1,1,1-Trichloroethane	110		-		70-130	-		36
Benzene	105		-		65-135	-		61
Toluene	115		-		70-130	-		41
Ethylbenzene	115		-		60-140	-		63
Vinyl chloride	145		-		5-195	-		66
1,1-Dichloroethene	115		-		50-150	-		32
cis-1,2-Dichloroethene	135		-		60-140	-		30
Trichloroethene	100		-		65-135	-		48
1,2-Dichlorobenzene	105		-		65-135	-		57
1,3-Dichlorobenzene	100		-		70-130	-		43
1,4-Dichlorobenzene	100		-		65-135	-		57
p/m-Xylene	112		-		60-140	-		30
o-xylene	110		-		60-140	-		30
Acetone	104		-		40-160	-		30
Methyl tert butyl ether	100		-		60-140	-		30
Tert-Butyl Alcohol	110		-		60-140	-		30
Tertiary-Amyl Methyl Ether	80		-		60-140	-		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 Batch: WG1447786-9								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Pentafluorobenzene	93				60-140
Fluorobenzene	96				60-140
4-Bromofluorobenzene	92				60-140

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS-SIM - Westborough Lab Associated sample(s): 01-02 Batch: WG1448091-3								
1,4-Dioxane	120		-		60-140	-		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Fluorobenzene	103				60-140
4-Bromofluorobenzene	101				60-140

Matrix Spike Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	*Native Sample*	*MS Added*	*MS Found*	*MS %Recovery*	*Qual*	*MSD Found*	*MSD %Recovery*	*Qual*	*Recovery Limits*	*RPD*	*Qual*	*RPD Limits*	*Column*
Microextractables by GC - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447760-3 QC Sample: L2055822-02 Client ID: MS Sample													
1,2-Dibromoethane	ND	0.249	0.240	96		-	-		80-120	-		20	A
1,2-Dibromo-3-chloropropane	ND	0.249	0.266	107		-	-		80-120	-		20	A
1,2,3-Trichloropropane	ND	0.249	0.227	91		-	-		80-120	-		20	A

SEMIVOLATILES

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01
Client ID: 006MW02-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 10:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 129,625.1
Analytical Date: 12/27/20 08:51
Analyst: SZ

Extraction Method: EPA 625.1
Extraction Date: 12/23/20 09:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Bis(2-ethylhexyl)phthalate	ND		ug/l	2.20	--	1
Butyl benzyl phthalate	ND		ug/l	5.00	--	1
Di-n-butylphthalate	ND		ug/l	5.00	--	1
Di-n-octylphthalate	ND		ug/l	5.00	--	1
Diethyl phthalate	ND		ug/l	5.00	--	1
Dimethyl phthalate	ND		ug/l	5.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	65		42-122
2-Fluorobiphenyl	65		46-121
4-Terphenyl-d14	62		47-138

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01
Client ID: 006MW02-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 10:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 129,625.1-SIM
Analytical Date: 12/29/20 13:12
Analyst: ALS

Extraction Method: EPA 625.1
Extraction Date: 12/23/20 09:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS-SIM - Westborough Lab						
Acenaphthene	2.99		ug/l	0.100	--	1
Fluoranthene	ND		ug/l	0.100	--	1
Naphthalene	0.366		ug/l	0.100	--	1
Benzo(a)anthracene	ND		ug/l	0.100	--	1
Benzo(a)pyrene	ND		ug/l	0.100	--	1
Benzo(b)fluoranthene	ND		ug/l	0.100	--	1
Benzo(k)fluoranthene	ND		ug/l	0.100	--	1
Chrysene	ND		ug/l	0.100	--	1
Acenaphthylene	ND		ug/l	0.100	--	1
Anthracene	ND		ug/l	0.100	--	1
Benzo(ghi)perylene	ND		ug/l	0.100	--	1
Fluorene	ND		ug/l	0.100	--	1
Phenanthrene	ND		ug/l	0.100	--	1
Dibenzo(a,h)anthracene	ND		ug/l	0.100	--	1
Indeno(1,2,3-cd)pyrene	ND		ug/l	0.100	--	1
Pyrene	ND		ug/l	0.100	--	1
Pentachlorophenol	ND		ug/l	1.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	35		25-87
Phenol-d6	26		16-65
Nitrobenzene-d5	76		42-122
2-Fluorobiphenyl	78		46-121
2,4,6-Tribromophenol	112		45-128
4-Terphenyl-d14	82		47-138

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Lab Number: L2056859
Project Number: 134544-004
Report Date: 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 129,625.1
Analytical Date: 12/27/20 09:17
Analyst: SZ

Extraction Method: EPA 625.1
Extraction Date: 12/23/20 09:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Bis(2-ethylhexyl)phthalate	ND		ug/l	2.20	--	1
Butyl benzyl phthalate	ND		ug/l	5.00	--	1
Di-n-butylphthalate	ND		ug/l	5.00	--	1
Di-n-octylphthalate	ND		ug/l	5.00	--	1
Diethyl phthalate	ND		ug/l	5.00	--	1
Dimethyl phthalate	ND		ug/l	5.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	69		42-122
2-Fluorobiphenyl	65		46-121
4-Terphenyl-d14	63		47-138

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 129,625.1-SIM
Analytical Date: 12/29/20 13:29
Analyst: ALS

Extraction Method: EPA 625.1
Extraction Date: 12/23/20 09:01

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS-SIM - Westborough Lab						
Acenaphthene	ND		ug/l	0.100	--	1
Fluoranthene	ND		ug/l	0.100	--	1
Naphthalene	ND		ug/l	0.100	--	1
Benzo(a)anthracene	ND		ug/l	0.100	--	1
Benzo(a)pyrene	ND		ug/l	0.100	--	1
Benzo(b)fluoranthene	ND		ug/l	0.100	--	1
Benzo(k)fluoranthene	ND		ug/l	0.100	--	1
Chrysene	ND		ug/l	0.100	--	1
Acenaphthylene	ND		ug/l	0.100	--	1
Anthracene	ND		ug/l	0.100	--	1
Benzo(ghi)perylene	ND		ug/l	0.100	--	1
Fluorene	ND		ug/l	0.100	--	1
Phenanthrene	ND		ug/l	0.100	--	1
Dibenzo(a,h)anthracene	ND		ug/l	0.100	--	1
Indeno(1,2,3-cd)pyrene	ND		ug/l	0.100	--	1
Pyrene	ND		ug/l	0.100	--	1
Pentachlorophenol	ND		ug/l	1.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	41		25-87
Phenol-d6	29		16-65
Nitrobenzene-d5	79		42-122
2-Fluorobiphenyl	77		46-121
2,4,6-Tribromophenol	116		45-128
4-Terphenyl-d14	80		47-138

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 129,625.1
Analytical Date: 12/27/20 04:34
Analyst: SZ

Extraction Method: EPA 625.1
Extraction Date: 12/23/20 09:01

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01-02 Batch: WG1448570-1					
Bis(2-ethylhexyl)phthalate	ND		ug/l	2.20	--
Butyl benzyl phthalate	ND		ug/l	5.00	--
Di-n-butylphthalate	ND		ug/l	5.00	--
Di-n-octylphthalate	ND		ug/l	5.00	--
Diethyl phthalate	ND		ug/l	5.00	--
Dimethyl phthalate	ND		ug/l	5.00	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	55		42-122
2-Fluorobiphenyl	56		46-121
4-Terphenyl-d14	54		47-138

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 129,625.1-SIM
Analytical Date: 12/29/20 11:34
Analyst: ALS

Extraction Method: EPA 625.1
Extraction Date: 12/23/20 09:01

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS-SIM - Westborough Lab for sample(s): 01-02 Batch: WG1448572-1					
Acenaphthene	ND		ug/l	0.100	--
Fluoranthene	ND		ug/l	0.100	--
Naphthalene	ND		ug/l	0.100	--
Benzo(a)anthracene	ND		ug/l	0.100	--
Benzo(a)pyrene	ND		ug/l	0.100	--
Benzo(b)fluoranthene	ND		ug/l	0.100	--
Benzo(k)fluoranthene	ND		ug/l	0.100	--
Chrysene	ND		ug/l	0.100	--
Acenaphthylene	ND		ug/l	0.100	--
Anthracene	ND		ug/l	0.100	--
Benzo(ghi)perylene	ND		ug/l	0.100	--
Fluorene	ND		ug/l	0.100	--
Phenanthrene	ND		ug/l	0.100	--
Dibenzo(a,h)anthracene	ND		ug/l	0.100	--
Indeno(1,2,3-cd)pyrene	ND		ug/l	0.100	--
Pyrene	ND		ug/l	0.100	--
Pentachlorophenol	ND		ug/l	1.00	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	36		25-87
Phenol-d6	25		16-65
Nitrobenzene-d5	64		42-122
2-Fluorobiphenyl	64		46-121
2,4,6-Tribromophenol	100		45-128
4-Terphenyl-d14	69		47-138

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-02 Batch: WG1448570-3								
Bis(2-ethylhexyl)phthalate	116		-		29-137	-		82
Butyl benzyl phthalate	103		-		1-140	-		60
Di-n-butylphthalate	106		-		8-120	-		47
Di-n-octylphthalate	110		-		19-132	-		69
Diethyl phthalate	100		-		1-120	-		100
Dimethyl phthalate	98		-		1-120	-		183

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Nitrobenzene-d5	94				42-122
2-Fluorobiphenyl	93				46-121
4-Terphenyl-d14	94				47-138

Lab Control Sample Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS-SIM - Westborough Lab Associated sample(s): 01-02 Batch: WG1448572-2								
Acenaphthene	73		-		60-132	-		30
Fluoranthene	85		-		43-121	-		30
Naphthalene	72		-		36-120	-		30
Benzo(a)anthracene	88		-		42-133	-		30
Benzo(a)pyrene	86		-		32-148	-		30
Benzo(b)fluoranthene	95		-		42-140	-		30
Benzo(k)fluoranthene	77		-		25-146	-		30
Chrysene	81		-		44-140	-		30
Acenaphthylene	78		-		54-126	-		30
Anthracene	78		-		43-120	-		30
Benzo(ghi)perylene	92		-		1-195	-		30
Fluorene	76		-		70-120	-		30
Phenanthrene	77		-		65-120	-		30
Dibenzo(a,h)anthracene	93		-		1-200	-		30
Indeno(1,2,3-cd)pyrene	107		-		1-151	-		30
Pyrene	85		-		70-120	-		30
Pentachlorophenol	73		-		38-152	-		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS-SIM - Westborough Lab Associated sample(s): 01-02 Batch: WG1448572-2								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	42				25-87
Phenol-d6	32				16-65
Nitrobenzene-d5	77				42-122
2-Fluorobiphenyl	75				46-121
2,4,6-Tribromophenol	109				45-128
4-Terphenyl-d14	76				47-138

PCBS

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01
Client ID: 006MW02-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 10:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 127,608.3
Analytical Date: 12/27/20 12:17
Analyst: CW

Extraction Method: EPA 608.3
Extraction Date: 12/25/20 21:24
Cleanup Method: EPA 3665A
Cleanup Date: 12/26/20
Cleanup Method: EPA 3660B
Cleanup Date: 12/26/20

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Polychlorinated Biphenyls by GC - Westborough Lab							
Aroclor 1016	ND		ug/l	0.250	--	1	A
Aroclor 1221	ND		ug/l	0.250	--	1	A
Aroclor 1232	ND		ug/l	0.250	--	1	A
Aroclor 1242	ND		ug/l	0.250	--	1	A
Aroclor 1248	ND		ug/l	0.250	--	1	A
Aroclor 1254	ND		ug/l	0.250	--	1	A
Aroclor 1260	ND		ug/l	0.200	--	1	A

Surrogate	% Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	83		37-123	B
Decachlorobiphenyl	84		38-114	B
2,4,5,6-Tetrachloro-m-xylene	68		37-123	A
Decachlorobiphenyl	67		38-114	A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 127,608.3
Analytical Date: 12/27/20 12:25
Analyst: CW

Extraction Method: EPA 608.3
Extraction Date: 12/25/20 21:24
Cleanup Method: EPA 3665A
Cleanup Date: 12/26/20
Cleanup Method: EPA 3660B
Cleanup Date: 12/26/20

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Column
Polychlorinated Biphenyls by GC - Westborough Lab							
Aroclor 1016	ND		ug/l	0.250	--	1	A
Aroclor 1221	ND		ug/l	0.250	--	1	A
Aroclor 1232	ND		ug/l	0.250	--	1	A
Aroclor 1242	ND		ug/l	0.250	--	1	A
Aroclor 1248	ND		ug/l	0.250	--	1	A
Aroclor 1254	ND		ug/l	0.250	--	1	A
Aroclor 1260	ND		ug/l	0.200	--	1	A

Surrogate	% Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	76		37-123	B
Decachlorobiphenyl	72		38-114	B
2,4,5,6-Tetrachloro-m-xylene	63		37-123	A
Decachlorobiphenyl	66		38-114	A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Analytical Method: 127,608.3
Analytical Date: 12/27/20 10:55
Analyst: CW

Extraction Method: EPA 608.3
Extraction Date: 12/25/20 21:24
Cleanup Method: EPA 3665A
Cleanup Date: 12/26/20
Cleanup Method: EPA 3660B
Cleanup Date: 12/26/20

Parameter	Result	Qualifier	Units	RL	MDL	Column
Polychlorinated Biphenyls by GC - Westborough Lab for sample(s): 01-02 Batch: WG1448976-1						
Aroclor 1016	ND		ug/l	0.250	--	A
Aroclor 1221	ND		ug/l	0.250	--	A
Aroclor 1232	ND		ug/l	0.250	--	A
Aroclor 1242	ND		ug/l	0.250	--	A
Aroclor 1248	ND		ug/l	0.250	--	A
Aroclor 1254	ND		ug/l	0.250	--	A
Aroclor 1260	ND		ug/l	0.200	--	A

Surrogate	%Recovery	Qualifier	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	62		37-123	B
Decachlorobiphenyl	79		38-114	B
2,4,5,6-Tetrachloro-m-xylene	53		37-123	A
Decachlorobiphenyl	65		38-114	A

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits	Column
Polychlorinated Biphenyls by GC - Westborough Lab Associated sample(s): 01-02 Batch: WG1448976-2									
Aroclor 1016	75		-		50-140	-		36	A
Aroclor 1260	76		-		8-140	-		38	A

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria	Column
2,4,5,6-Tetrachloro-m-xylene	58				37-123	B
Decachlorobiphenyl	76				38-114	B
2,4,5,6-Tetrachloro-m-xylene	51				37-123	A
Decachlorobiphenyl	62				38-114	A

METALS

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01 Date Collected: 12/18/20 10:25

Client ID: 006MW02-2020-1218 Date Received: 12/18/20

Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:

Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Antimony, Total	ND		mg/l	0.00400	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Arsenic, Total	0.00215		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Iron, Total	3.58		mg/l	0.050	--	1	12/28/20 21:18	12/29/20 17:18	EPA 3005A	19,200.7	BV
Lead, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	12/28/20 22:44	12/29/20 22:36	EPA 245.1	3,245.1	EW
Nickel, Total	0.00268		mg/l	0.00200	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	12/28/20 21:18	12/29/20 10:09	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	409		mg/l	0.660	NA	1	12/28/20 21:18	12/29/20 17:18	EPA 3005A	19,200.7	BV
General Chemistry - Mansfield Lab											
Chromium, Trivalent	ND		mg/l	0.010	--	1		12/29/20 10:09	NA	107,-	

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02 Date Collected: 12/18/20 14:25

Client ID: 079MW26-2020-1218 Date Received: 12/18/20

Sample Location: ALLSTON, MA Field Prep: Not Specified

Sample Depth:

Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Antimony, Total	ND		mg/l	0.00400	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Arsenic, Total	0.00435		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Chromium, Total	0.00216		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Iron, Total	3.94		mg/l	0.050	--	1	12/28/20 21:18	12/29/20 17:23	EPA 3005A	19,200.7	BV
Lead, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Mercury, Total	ND		mg/l	0.00020	--	1	12/28/20 22:44	12/29/20 22:46	EPA 245.1	3,245.1	EW
Nickel, Total	ND		mg/l	0.00200	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Zinc, Total	0.01158		mg/l	0.01000	--	1	12/28/20 21:18	12/29/20 10:13	EPA 3005A	3,200.8	AM
Total Hardness by SM 2340B - Mansfield Lab											
Hardness	188		mg/l	0.660	NA	1	12/28/20 21:18	12/29/20 17:23	EPA 3005A	19,200.7	BV
General Chemistry - Mansfield Lab											
Chromium, Trivalent	ND		mg/l	0.010	--	1		12/29/20 10:13	NA	107,-	

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1449513-1										
Iron, Total	ND		mg/l	0.050	--	1	12/28/20 21:18	12/29/20 14:50	19,200.7	GD

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Hardness by SM 2340B - Mansfield Lab for sample(s): 01-02 Batch: WG1449513-1										
Hardness	ND		mg/l	0.660	NA	1	12/28/20 21:18	12/29/20 14:50	19,200.7	GD

Prep Information

Digestion Method: EPA 3005A

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1449514-1										
Antimony, Total	ND		mg/l	0.00400	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Arsenic, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Cadmium, Total	ND		mg/l	0.00020	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Chromium, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Copper, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Lead, Total	ND		mg/l	0.00100	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Nickel, Total	ND		mg/l	0.00200	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Selenium, Total	ND		mg/l	0.00500	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Silver, Total	ND		mg/l	0.00040	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM
Zinc, Total	ND		mg/l	0.01000	--	1	12/28/20 21:18	12/29/20 09:03	3,200.8	AM

Prep Information

Digestion Method: EPA 3005A

Project Name: ERC ROADWAYS & INFRASTRUCTURE **Lab Number:** L2056859

Project Number: 134544-004 **Report Date:** 01/04/21

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1449515-1										
Mercury, Total	ND		mg/l	0.00020	--	1	12/28/20 22:44	12/29/20 22:23	3,245.1	EW

Prep Information

Digestion Method: EPA 245.1

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1449513-2								
Iron, Total	102		-		85-115	-		
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01-02 Batch: WG1449513-2								
Hardness	105		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1449514-2								
Antimony, Total	97		-		85-115	-		
Arsenic, Total	104		-		85-115	-		
Cadmium, Total	107		-		85-115	-		
Chromium, Total	97		-		85-115	-		
Copper, Total	102		-		85-115	-		
Lead, Total	101		-		85-115	-		
Nickel, Total	97		-		85-115	-		
Selenium, Total	105		-		85-115	-		
Silver, Total	93		-		85-115	-		
Zinc, Total	107		-		85-115	-		
Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1449515-2								
Mercury, Total	88		-		85-115	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449513-3 QC Sample: L2057057-01 Client ID: MS Sample												
Iron, Total	0.099	1	1.08	98		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449513-3 QC Sample: L2057057-01 Client ID: MS Sample												
Hardness	628	66.2	680	79		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449513-7 QC Sample: L2057057-02 Client ID: MS Sample												
Iron, Total	ND	1	1.01	101		-	-		75-125	-		20
Total Hardness by SM 2340B - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449513-7 QC Sample: L2057057-02 Client ID: MS Sample												
Hardness	629	66.2	681	79		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449514-3 QC Sample: L2057057-01 Client ID: MS Sample												
Antimony, Total	ND	0.5	0.4979	100		-	-		70-130	-		20
Arsenic, Total	ND	0.12	0.1285	107		-	-		70-130	-		20
Cadmium, Total	0.00020	0.051	0.05443	106		-	-		70-130	-		20
Chromium, Total	ND	0.2	0.1938	97		-	-		70-130	-		20
Copper, Total	0.00880	0.25	0.2603	100		-	-		70-130	-		20
Lead, Total	ND	0.51	0.5294	104		-	-		70-130	-		20
Nickel, Total	0.00664	0.5	0.4872	96		-	-		70-130	-		20
Selenium, Total	ND	0.12	0.1263	105		-	-		70-130	-		20
Silver, Total	ND	0.05	0.04700	94		-	-		70-130	-		20
Zinc, Total	0.05340	0.5	0.5771	105		-	-		70-130	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449514-5 QC Sample: L2057057-02 Client ID: MS Sample									
Antimony, Total	ND	0.5	0.4864	97	-	-	70-130	-	20
Arsenic, Total	ND	0.12	0.1257	105	-	-	70-130	-	20
Cadmium, Total	ND	0.051	0.05385	106	-	-	70-130	-	20
Chromium, Total	ND	0.2	0.2009	100	-	-	70-130	-	20
Copper, Total	0.00120	0.25	0.2469	98	-	-	70-130	-	20
Lead, Total	ND	0.51	0.5167	101	-	-	70-130	-	20
Nickel, Total	ND	0.5	0.4741	95	-	-	70-130	-	20
Selenium, Total	ND	0.12	0.1223	102	-	-	70-130	-	20
Silver, Total	ND	0.05	0.04752	95	-	-	70-130	-	20
Zinc, Total	0.03657	0.5	0.5490	102	-	-	70-130	-	20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449515-3 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218									
Mercury, Total	ND	0.005	0.00470	94	-	-	70-130	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449513-4 QC Sample: L2057057-01 Client ID: DUP Sample						
Iron, Total	0.099	0.077	mg/l	**25**	Q	20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449513-8 QC Sample: L2057057-02 Client ID: DUP Sample						
Iron, Total	ND	ND	mg/l	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449514-4 QC Sample: L2057057-01 Client ID: DUP Sample						
Antimony, Total	ND	ND	mg/l	NC		20
Arsenic, Total	ND	ND	mg/l	NC		20
Cadmium, Total	0.00020	0.00021	mg/l	3		20
Chromium, Total	ND	ND	mg/l	NC		20
Copper, Total	0.00880	0.00879	mg/l	0		20
Lead, Total	ND	ND	mg/l	NC		20
Nickel, Total	0.00664	0.00662	mg/l	0		20
Selenium, Total	ND	ND	mg/l	NC		20
Silver, Total	ND	ND	mg/l	NC		20
Zinc, Total	0.05340	0.05332	mg/l	0		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449514-6 QC Sample: L2057057-02 Client ID: DUP Sample					
Antimony, Total	ND	ND	mg/l	NC	20
Arsenic, Total	ND	ND	mg/l	NC	20
Cadmium, Total	ND	ND	mg/l	NC	20
Chromium, Total	ND	ND	mg/l	NC	20
Copper, Total	0.00120	ND	mg/l	NC	20
Lead, Total	ND	ND	mg/l	NC	20
Nickel, Total	ND	ND	mg/l	NC	20
Selenium, Total	ND	ND	mg/l	NC	20
Silver, Total	ND	ND	mg/l	NC	20
Zinc, Total	0.03657	0.03710	mg/l	1	20
Total Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1449515-4 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218					
Mercury, Total	ND	ND	mg/l	NC	20

INORGANICS
&
MISCELLANEOUS

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004
Lab Number: L2056859
Report Date: 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-01
Client ID: 006MW02-2020-1218
Sample Location: ALLSTON, MA
Sample Depth:
Matrix: Water

Date Collected: 12/18/20 10:25
Date Received: 12/18/20
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total Suspended	8.8		mg/l	5.0	NA	1	-	12/22/20 15:30	121,2540D	AC
Cyanide, Total	ND		mg/l	0.005	--	1	12/30/20 11:25	12/30/20 16:06	121,4500CN-CE	CR
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	12/19/20 10:15	121,4500CL-D	JA
Nitrogen, Ammonia	3.43		mg/l	0.075	--	1	12/28/20 12:00	12/29/20 19:04	121,4500NH3-BH	AT
TPH, SGT-HEM	ND		mg/l	3.60	--	.9	01/04/21 13:00	01/04/21 14:00	74,1664A	TL
Phenolics, Total	ND		mg/l	0.030	--	1	12/21/20 07:29	12/21/20 11:21	4,420.1	KP
Chromium, Hexavalent	ND		mg/l	0.010	--	1	12/19/20 09:35	12/19/20 09:56	1,7196A	JA
Anions by Ion Chromatography - Westborough Lab										
Chloride	508.		mg/l	12.5	--	25	-	12/22/20 17:09	44,300.0	SH

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004
Lab Number: L2056859
Report Date: 01/04/21

SAMPLE RESULTS

Lab ID: L2056859-02
Client ID: 079MW26-2020-1218
Sample Location: ALLSTON, MA
Sample Depth:
Matrix: Water

Date Collected: 12/18/20 14:25
Date Received: 12/18/20
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	12/22/20 14:05	121,2540D	AC
Cyanide, Total	ND		mg/l	0.005	--	1	12/30/20 11:25	12/30/20 16:07	121,4500CN-CE	CR
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	12/19/20 10:15	121,4500CL-D	JA
Nitrogen, Ammonia	1.48		mg/l	0.075	--	1	12/28/20 12:00	12/29/20 19:07	121,4500NH3-BH	AT
TPH, SGT-HEM	ND		mg/l	4.00	--	1	01/04/21 13:00	01/04/21 14:00	74,1664A	TL
Phenolics, Total	ND		mg/l	0.030	--	1	12/21/20 07:29	12/21/20 11:22	4,420.1	KP
Chromium, Hexavalent	ND		mg/l	0.010	--	1	12/19/20 09:35	12/19/20 09:57	1,7196A	JA
Anions by Ion Chromatography - Westborough Lab										
Chloride	688.		mg/l	12.5	--	25	-	12/22/20 20:47	44,300.0	SH

Project Name: ERC ROADWAYS & INFRASTRUCTUF
Project Number: 134544-004
Lab Number: L2056859
Report Date: 01/04/21

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1447032-1										
Chromium, Hexavalent	ND		mg/l	0.010	--	1	12/19/20 09:35	12/19/20 09:55	1,7196A	JA
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1447096-1										
Chlorine, Total Residual	ND		mg/l	0.02	--	1	-	12/19/20 10:15	121,4500CL-D	JA
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1447567-1										
Phenolics, Total	ND		mg/l	0.030	--	1	12/21/20 07:29	12/21/20 12:06	4,420.1	KP
General Chemistry - Westborough Lab for sample(s): 02 Batch: WG1448063-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	12/22/20 14:05	121,2540D	AC
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1448071-1										
Solids, Total Suspended	ND		mg/l	5.0	NA	1	-	12/22/20 15:30	121,2540D	AC
Anions by Ion Chromatography - Westborough Lab for sample(s): 01-02 Batch: WG1448405-1										
Chloride	ND		mg/l	0.500	--	1	-	12/22/20 16:25	44,300.0	SH
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1449443-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	12/28/20 12:00	12/29/20 18:52	121,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1450316-1										
Cyanide, Total	ND		mg/l	0.005	--	1	12/30/20 11:25	12/30/20 15:54	121,4500CN-CE	CR
General Chemistry - Westborough Lab for sample(s): 01-02 Batch: WG1451279-1										
TPH, SGT-HEM	ND		mg/l	4.00	--	1	01/04/21 13:00	01/04/21 14:00	74,1664A	TL

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1447032-2								
Chromium, Hexavalent	106		-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1447096-2								
Chlorine, Total Residual	92		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1447567-2								
Phenolics, Total	94		-		70-130	-		
General Chemistry - Westborough Lab Associated sample(s): 02 Batch: WG1448063-2								
Solids, Total Suspended	92		-		80-120	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1448071-2								
Solids, Total Suspended	101		-		80-120	-		
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-02 Batch: WG1448405-2								
Chloride	102		-		90-110	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1449443-2								
Nitrogen, Ammonia	102		-		80-120	-		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1450316-2					
Cyanide, Total	104	-	90-110	-	
General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1451279-2					
TPH	72	-	64-132	-	34

Matrix Spike Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447032-4 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218												
Chromium, Hexavalent	ND	0.1	0.101	101		-	-		85-115	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447096-4 QC Sample: L2056859-02 Client ID: 079MW26-2020-1218												
Chlorine, Total Residual	ND	0.25	ND	**0**	Q	-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447567-4 QC Sample: L2056230-02 Client ID: MS Sample												
Phenolics, Total	ND	0.4	0.35	88		-	-		70-130	-		20
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1448405-3 QC Sample: L2056414-03 Client ID: MS Sample												
Chloride	90.5	20	105	**72**	Q	-	-		90-110	-		18
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1449443-4 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218												
Nitrogen, Ammonia	3.43	4	6.41	**74**	Q	-	-		80-120	-		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1450316-4 QC Sample: L2056862-02 Client ID: MS Sample												
Cyanide, Total	ND	0.2	0.116	**58**	Q	-	-		90-110	-		30
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1451279-4 QC Sample: L2100009-02 Client ID: MS Sample												
TPH	554	21.1	237	**0**	Q	-	-		64-132	-		34

Lab Duplicate Analysis
Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447032-3 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218						
Chromium, Hexavalent	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447096-3 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218						
Chlorine, Total Residual	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1447567-3 QC Sample: L2056230-02 Client ID: DUP Sample						
Phenolics, Total	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 02 QC Batch ID: WG1448063-3 QC Sample: L2056611-01 Client ID: DUP Sample						
Solids, Total Suspended	320	340	mg/l	6		29
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1448071-3 QC Sample: L2056978-03 Client ID: DUP Sample						
Solids, Total Suspended	37	37	mg/l	0		29
Anions by Ion Chromatography - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1448405-4 QC Sample: L2056414-03 Client ID: DUP Sample						
Chloride	90.5	89.8	mg/l	1		18
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1449443-3 QC Sample: L2056859-01 Client ID: 006MW02-2020-1218						
Nitrogen, Ammonia	3.43	3.50	mg/l	2		20
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1450316-3 QC Sample: L2057057-01 Client ID: DUP Sample						
Cyanide, Total	ND	ND	mg/l	NC		30

Lab Duplicate Analysis

Batch Quality Control

Project Name: ERC ROADWAYS & INFRASTRUCTURE

Project Number: 134544-004

Lab Number: L2056859

Report Date: 01/04/21

Parameter	Native Sample	Duplicate Sample	Units	RPD		RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1451279-3 QC Sample: L2100009-01 Client ID: DUP Sample						
TPH	25.8	185	mg/l	**151**	Q	34

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
B	Absent
C	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2056859-01A	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		624.1-SIM-RGP(7),624.1-RGP(7)
L2056859-01A1	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		624.1-SIM-RGP(7),624.1-RGP(7)
L2056859-01B	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		624.1-SIM-RGP(7),624.1-RGP(7)
L2056859-01B1	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		624.1-SIM-RGP(7),624.1-RGP(7)
L2056859-01C	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		624.1-SIM-RGP(7),624.1-RGP(7)
L2056859-01C1	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		624.1-SIM-RGP(7),624.1-RGP(7)
L2056859-01D	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		504(14)
L2056859-01E	Vial Na2S2O3 preserved	C	NA		2.0	Y	Absent		504(14)
L2056859-01F	Vial unpreserved	C	NA		2.0	Y	Absent		SUB-ETHANOL(14)
L2056859-01G	Vial unpreserved	C	NA		2.0	Y	Absent		SUB-ETHANOL(14)
L2056859-01H	Vial unpreserved	C	NA		2.0	Y	Absent		SUB-ETHANOL(14)
L2056859-01I	Plastic 120ml unpreserved split	C	7	7	2.0	Y	Absent		-
L2056859-01J	Plastic 250ml NaOH preserved	C	>12	>12	2.0	Y	Absent		TCN-4500(14)
L2056859-01K	Plastic 250ml HNO3 preserved	C	<2	<2	2.0	Y	Absent		CD-2008T(180),NI-2008T(180),ZN-2008T(180),CU-2008T(180),HARDU(180),FE-UI(180),AG-2008T(180),AS-2008T(180),HG-U(28),SE-2008T(180),PB-2008T(180),SB-2008T(180),CR-2008T(180)
L2056859-01L	Plastic 500ml H2SO4 preserved	C	<2	<2	2.0	Y	Absent		NH3-4500(28)
L2056859-01M	Plastic 950ml unpreserved	C	7	7	2.0	Y	Absent		HEXCR-7196(1),CL-300(28),TRC-4500(1)
L2056859-01N	Plastic 950ml unpreserved	C	7	7	2.0	Y	Absent		TSS-2540(7)
L2056859-01O	Amber 950ml H2SO4 preserved	C	<2	<2	2.0	Y	Absent		TPHENOL-420(28)
L2056859-01P	Amber 1000ml Na2S2O3	C	7	7	2.0	Y	Absent		625.1-RGP(7),625.1-SIM-RGP(7)
L2056859-01Q	Amber 1000ml Na2S2O3	C	7	7	2.0	Y	Absent		625.1-RGP(7),625.1-SIM-RGP(7)

*Values in parentheses indicate holding time in days

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2056859-01R	Amber 1000ml Na2S2O3	C	7	7	2.0	Y	Absent		PCB-608.3(365)
L2056859-01S	Amber 1000ml Na2S2O3	C	7	7	2.0	Y	Absent		PCB-608.3(365)
L2056859-01T	Amber 1000ml Na2S2O3	C	7	7	2.0	Y	Absent		PCB-608.3(365)
L2056859-01U	Amber 1000ml Na2S2O3	C	7	7	2.0	Y	Absent		PCB-608.3(365)
L2056859-01V	Amber 1000ml HCl preserved	C	NA		2.0	Y	Absent		TPH-1664(28)
L2056859-01W	Amber 1000ml HCl preserved	C	NA		2.0	Y	Absent		TPH-1664(28)
L2056859-01X	Plastic 120ml HNO3 preserved Filtrates	C	NA		2.0	Y	Absent		FE-RI(180),AG-2008S(180),CR-2008S(180),HOLD-METAL-DISSOLVED(180),AS-2008S(180),PB-2008S(180),ZN-2008S(180),SE-2008S(180),FILTER-METALS-FEE(),NI-2008S(180),CD-2008S(180),SB-2008S(180),CU-2008S(180),HG-R(28)
L2056859-02A	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		624.1-RGP(7),624.1-SIM-RGP(7)
L2056859-02A1	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		624.1-RGP(7),624.1-SIM-RGP(7)
L2056859-02B	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		624.1-RGP(7),624.1-SIM-RGP(7)
L2056859-02B1	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		624.1-RGP(7),624.1-SIM-RGP(7)
L2056859-02C	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		624.1-RGP(7),624.1-SIM-RGP(7)
L2056859-02C1	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		624.1-RGP(7),624.1-SIM-RGP(7)
L2056859-02D	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		504(14)
L2056859-02E	Vial Na2S2O3 preserved	B	NA		2.4	Y	Absent		504(14)
L2056859-02F	Vial unpreserved	B	NA		2.4	Y	Absent		SUB-ETHANOL(14)
L2056859-02G	Vial unpreserved	B	NA		2.4	Y	Absent		SUB-ETHANOL(14)
L2056859-02H	Vial unpreserved	B	NA		2.4	Y	Absent		SUB-ETHANOL(14)
L2056859-02I	Plastic 120ml unpreserved split	B	7	7	2.4	Y	Absent		-
L2056859-02J	Plastic 250ml NaOH preserved	B	>12	>12	2.4	Y	Absent		TCN-4500(14)
L2056859-02K	Plastic 250ml HNO3 preserved	B	<2	<2	2.4	Y	Absent		CD-2008T(180),NI-2008T(180),ZN-2008T(180),FE-UI(180),CU-2008T(180),HARDU(180),AS-2008T(180),SE-2008T(180),AG-2008T(180),HG-U(28),PB-2008T(180),SB-2008T(180),CR-2008T(180)
L2056859-02L	Plastic 500ml H2SO4 preserved	B	<2	<2	2.4	Y	Absent		NH3-4500(28)
L2056859-02M	Plastic 950ml unpreserved	B	7	7	2.4	Y	Absent		CL-300(28),HEXCR-7196(1),TRC-4500(1)

*Values in parentheses indicate holding time in days

Project Name: ERC ROADWAYS & INFRASTRUCTURE
Project Number: 134544-004

Lab Number: L2056859
Report Date: 01/04/21

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2056859-02N	Plastic 950ml unpreserved	B	7	7	2.4	Y	Absent		TSS-2540(7)
L2056859-02O	Amber 950ml H2SO4 preserved	B	<2	<2	2.4	Y	Absent		TPHENOL-420(28)
L2056859-02P	Amber 1000ml Na2S2O3	B	7	7	2.4	Y	Absent		625.1-RGP(7),625.1-SIM-RGP(7)
L2056859-02Q	Amber 1000ml Na2S2O3	B	7	7	2.4	Y	Absent		625.1-RGP(7),625.1-SIM-RGP(7)
L2056859-02R	Amber 1000ml Na2S2O3	B	7	7	2.4	Y	Absent		PCB-608.3(365)
L2056859-02S	Amber 1000ml Na2S2O3	B	7	7	2.4	Y	Absent		PCB-608.3(365)
L2056859-02T	Amber 1000ml Na2S2O3	B	7	7	2.4	Y	Absent		PCB-608.3(365)
L2056859-02U	Amber 1000ml Na2S2O3	B	7	7	2.4	Y	Absent		PCB-608.3(365)
L2056859-02V	Amber 1000ml HCl preserved	B	NA		2.4	Y	Absent		TPH-1664(28)
L2056859-02W	Amber 1000ml HCl preserved	B	NA		2.4	Y	Absent		TPH-1664(28)
L2056859-02X	Plastic 120ml HNO3 preserved Filtrates	B	NA		2.4	Y	Absent		AG-2008S(180),CR-2008S(180),FE-RI(180),HOLD-METAL-DISSOLVED(180),AS-2008S(180),ZN-2008S(180),PB-2008S(180),SE-2008S(180),FILTER-METALS-FEE(),NI-2008S(180),CD-2008S(180),CU-2008S(180),SB-2008S(180),HG-R(28)

*Values in parentheses indicate holding time in days

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056859
Project Number:	134544-004	**Report Date:**	01/04/21

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056859
Project Number:	134544-004	**Report Date:**	01/04/21

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. (Note: 'PFAS, Total (6)' is applicable to MassDEP DW compliance analysis only.). If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where

Report Format: Data Usability Report

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056859
Project Number:	134544-004	**Report Date:**	01/04/21

Data Qualifiers

the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

Report Format: Data Usability Report

Project Name:	ERC ROADWAYS & INFRASTRUCTURE	**Lab Number:**	L2056859
Project Number:	134544-004	**Report Date:**	01/04/21

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

3 Methods for the Determination of Metals in Environmental Samples, Supplement I. EPA/600/R-94/111. May 1994.

4 Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020. Revised March 1983.

14 Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water. EPA/600/4-88/039, Revised July 1991.

19 Inductively Coupled Plasma Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes. Appendix C, Part 136, 40 CFR (Code of Federal Regulations). July 1, 1999 edition.

44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.

74 Method 1664,Revision A: N-Hexane Extractable Material (HEM; Oil & Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry, EPA-821-R-98-002, February 1999.

107 Alpha Analytical - In-house calculation method.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

127 Method 608.3: Organochlorine Pesticides and PCBs by GC/HSD, EPA 821-R-16-009, December 2016.

128 Method 624.1: Purgeables by GC/MS, EPA 821-R-16-008, December 2016.

129 Method 625.1: Base/Neutrals and Acids by GC/MS, EPA 821-R-16-007, December 2016.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
EPA TO-12 Non-methane organics
EPA 3C Fixed gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581 — 8 Walkup Dr. — TEL: 508-898-9220 — FAX: 508-898-9193
Mansfield, MA 02048 — 320 Forbes Blvd — TEL: 508-822-9300 — FAX: 508-822-3288

Service Centers: Brewer, ME 04412 — Portsmouth, NH 03801 — Mahwah, NJ 07430 — Albany, NY 12205 — Tonawanda, NY 14150 — Holmes, PA 19043

Page 1 of 1

Date Rec'd in Lab: 12/18/20

ALPHA Job #: L2056859

H&A Information

H&A Client: Harvard
H&A Address: 465 Medford St
Boston, MA 0212-1400
H&A Phone: 617-886-7400
H&A Fax:
H&A Email: mcronan@haleyaldrich.com

Project Information

Project Name: ERC Roadways and Infrastructure
Project Location: Allston, MA
Project #: 134544-004
(Use Project name as Project #)
Project Manager: M Cronan
ALPHAQuote #:

Turn-Around Time

Standard ☑ Due Date:
(only if pre approved) ☐ # of Days:

Deliverables

☑ Email ☐ Fax
☑ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other:

Regulatory Requirements (Program/Criteria)

X NPDES RPG

Note: Select State from menu & identify criteria.

Billing Information

☑ Same as Client Info
PO #

Disposal Site Information

Please identify below location of applicable disposal facilities.
Disposal Facility: NJ ☐ NY ☐
Other:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

3. HOLD PACN & ACN ~~12. Dissolved Metals ON HOLD (Field Filtered)~~

Please sample per EPA Approved 2017 RGP Permit methods

No bottles field filtered

Please field filter if nessesary in lab.

Please specify Metals or TAL.

ANALYSIS

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	1. TSS - 2540	2. TRC-4500	3. TCN-4500 HOLD PACN & ACN	4. 504	5. 8260 & 8260 SIM for Dioxane	6. HEXCR-3500 & Trivalent Chromium	7. TPHENOL-420	8. 8270TCL (including Diethylhexylphthalate)	9. 8270TCL-SIM	10. CL-300	11. Total Metals - Ag,As,Cd,Cr,Cu,Ni,Pb,Sb,Se,Zn,Fe,Hg	12. Dissolved Metals - Ag,As,Ba,Cd,Cr,Cu,Ni,Pb,Sb,Se,Tl,Zn	13. Ammonia	14. Total Hardness	15. A2-ALCOHOL (Ethanol)	16. TPH-1664	17. PCB-608	Sample Specific Comments	Total Bottles
56859-01	006MW02-2020-1218	12/18/20	1025	AQ	JDB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Temp - 13.6 pH - 6.72	25
02	079-MW26-2020-1218	12/18/20	1425	AQ	JDB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Temp - 14.7 pH - 6.74	25
	~~HA20-CharlesRiver~~			AQ												X		X	X			Temp pH	

Sample Filtration

☐ Done
☐ Lab to do
Preservation
☐ Lab to do
(Please Specify below)

Preservative Code: A = None, B = HCl, C = HNO_3, D = H_2SO_4, E = NaOH, F = MeOH, G = $NaHSO_4$, H = $Na_2S_2O_3$, K/E = Zn Ac/NaOH, O = Other

Container Code: P = Plastic, A = Amber Glass, V = Vial, G = Glass, B = Bacteria Cup, C = Cube, O = Other, E = Encore, D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Container Type
Preservative

Relinquished By:	Date/Time	Received By:	Date/Time
	12/18/20 15:58		Plym DAL 12/18/20 1550
	12/18/20 1746		12/19/20 1744

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. Alpha Analytical's services under this Chain of Custody shall be performed in accordance with terms and conditions within Blanket Service Agreement# 2015-18-Alpha Analytical by and between Haley & Aldrich, Inc., its subsidiaries and affiliates and Alpha Analytical.

Document ID: 20455 Rev 1 (1/28/2016)

ALPHA ANALYTICAL
World Class Chemistry

Subcontract Chain of Custody

Tek Lab, Inc.
5445 Horsehoe Lake Road
Collinsville, IL 62234-7425

Alpha Job Number
L2056859

Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 603.319.5010
Email: mgulli@alphalab.com

Project Information

Project Location: MA
Project Manager: Melissa Gulli

Turnaround & Deliverables Information

Due Date:
Deliverables:

Regulatory Requirements/Report Limits

State/Federal Program:

Regulatory Criteria:

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L2056859

Report to include Method Blank, LCS/LCSD:

Additional Comments: Send all results/reports to subreports@alphalab.com

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
	006MW02-2020-1218	12-18-20 10:25	WATER	Ethanol by EPA 1671 Revision A	
	079MW26-2020-1218	12-18-20 14:25	WATER	Ethanol by EPA 1671 Revision A	

	Relinquished By:	Date/Time:	Received By:	Date/Time:
	C Telvau AAL	12/21/20		
Form No: AL_subcoc				

Teklab, Inc.
Environmental Laboratory

http://www.teklabinc.com/

December 28, 2020

Melissa Gulli
Alpha Analytical
145 Flanders Road
Westborough, MA 01581
TEL: (603) 319-5010
FAX:

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: L2056859 **WorkOrder:** 20121407

Dear Melissa Gulli:

TEKLAB, INC received 2 samples on 12/22/2020 10:25:00 AM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley

Elizabeth A. Hurley
Project Manager
(618)344-1004 ex 33
ehurley@teklabinc.com

Teklab, Inc.
Environmental Laboratory

Report Contents

http://www.teklabinc.com/

Client: Alpha Analytical
Work Order: 20121407
Client Project: L2056859
Report Date: 28-Dec-20

This reporting package includes the following:

Teklab, Inc.
Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Alpha Analytical **Work Order:** 20121407

Client Project: L2056859 **Report Date:** 28-Dec-20

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Teklab, Inc.
Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Alpha Analytical
Work Order: 20121407
Client Project: L2056859
Report Date: 28-Dec-20

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Teklab, Inc.
Environmental Laboratory

Case Narrative

http://www.teklabinc.com/

Client: Alpha Analytical
Client Project: L2056859

Work Order: 20121407
Report Date: 28-Dec-20

Cooler Receipt Temp: 1.4 °C

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Teklab, Inc. Environmental Laboratory

Accreditations

http://www.teklabinc.com/

Client: Alpha Analytical

Client Project: L2056859

Work Order: 20121407

Report Date: 28-Dec-20

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2021	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2021	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2021	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2021	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2021	Collinsville
Arkansas	ADEQ	88-0966		3/14/2021	Collinsville
Illinois	IDPH	17584		5/31/2021	Collinsville
Kentucky	UST	0073		1/31/2021	Collinsville
Missouri	MDNR	00930		5/31/2021	Collinsville
Missouri	MDNR	930		1/31/2022	Collinsville

Teklab, Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Alpha Analytical
Work Order: 20121407
Client Project: L2056859
Report Date: 28-Dec-20
Lab ID: 20121407-001
Client Sample ID: 006MW02-2020-1218
Matrix: AQUEOUS
Collection Date: 12/18/2020 10:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 1671A, PHARMACEUTICAL MANUFACTURING INDUSTRY NON-PURGEABLE VOLATILE ORGANICS								
Ethanol	*	20		**ND**	mg/L	1	12/24/2020 11:57	R285636

Teklab, Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Alpha Analytical
Work Order: 20121407
Client Project: L2056859
Report Date: 28-Dec-20
Lab ID: 20121407-002
Client Sample ID: 079MW26-2020-1218
Matrix: AQUEOUS
Collection Date: 12/18/2020 14:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 1671A, PHARMACEUTICAL MANUFACTURING INDUSTRY NON-PURGEABLE VOLATILE ORGANICS								
Ethanol	*	20		**ND**	mg/L	1	12/24/2020 13:48	R285636

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Alpha Analytical
Client Project: L2056859

Work Order: 20121407
Report Date: 28-Dec-20

EPA 600 1671A, PHARMACEUTICAL MANUFACTURING INDUSTRY NON-PURGEABLE VOLATILE ORG

Batch R285636 **SampType:** MBLK Units **mg/L**
SampID: MBLK-122320

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Ethanol	*	20		**ND**						12/24/202

Batch R285636 **SampType:** LCS Units **mg/L**
SampID: LCS-122320

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Ethanol	*	20		**180**	250.0	0	73.3	70	132	12/24/202

Batch R285636 **SampType:** MS Units **mg/L**
SampID: 20121407-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Ethanol	*	20		**220**	250.0	0	88.6	70	132	12/24/202

Batch R285636 **SampType:** MSD Units **mg/L** RPD Limit **30**
SampID: 20121407-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Ethanol	*	20		**210**	250.0	0	85.2	221.4	3.87	12/24/202

Teklab, Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Alpha Analytical
Client Project: L2056859

Work Order: 20121407
Report Date: 28-Dec-20

Carrier: UPS

Received By: AMD

Completed by: Amber M. Dilallo
On: 22-Dec-20

Reviewed by: Elizabeth A. Hurley
On: 22-Dec-20

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C	1.4
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice	☐
Chain of custody present?	Yes ☑	No ☐			
Chain of custody signed when relinquished and received?	Yes ☑	No ☐			
Chain of custody agrees with sample labels?	Yes ☑	No ☐			
Samples in proper container/bottle?	Yes ☑	No ☐			
Sample containers intact?	Yes ☑	No ☐			
Sufficient sample volume for indicated test?	Yes ☑	No ☐			
All samples received within holding time?	Yes ☑	No ☐			
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑		
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐			

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☑	No ☐	No VOA vials ☐
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

20121407

Subcontract Chain of Custody

Tek Lab, Inc.
5445 Horsehoe Lake Road
Collinsville, IL 62234-7425

Alpha Job Number
L2056859

Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 603.319.5010
Email: mgulli@alphalab.com

Project Information

Project Location: MA
Project Manager: Melissa Gulli

Turnaround & Deliverables Information

Due Date:
Deliverables:

Regulatory Requirements/Report Limits

State/Federal Program:
Regulatory Criteria:

Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L2056859

Report to include Method Blank, LCS/LCSD:

Additional Comments: Send all results/reports to subreports@alphalab.com

Lab ID	Client ID	Collection Date/Time	Sample Matrix	Analysis	Batch QC
20121407-001	006MW02-2020-1218	12-18-20 10:25	WATER	Ethanol by EPA 1671 Revision A	
002	079MW26-2020-1218	12-18-20 14:25	WATER	Ethanol by EPA 1671 Revision A	

1.4° ice LTCL 0848 am 12/22/20

Relinquished By:	Date/Time:	Received By:	Date/Time:
C Jebeau AAL	12/21/20	[signature] UPS	12/22/20 1015

Form No: AL_subcoc

[initials] 12/22/20